Psychiatry Research 316 (2022) 114770

Contents lists available at ScienceDirect

Psychiatry Research

journal homepage: www.elsevier.com/locate/psychres

A novel procedure to investigate social anxiety using videoconferencing software: A proof-of-concept study

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ARTICLE INFO

Keywords:
Mental health
Anxiety disorders
Social anxiety
Social anxiety disorder
Experimental methods

ABSTRACT

Social anxiety disorder (SAD) is very common and can be significantly disabling. New treatments are needed as the remission rate for SAD is the lowest of all the anxiety disorders. Experimental medicine models, in which features resembling a clinical disorder are experimentally induced, are a cost-effective and timely approach to explore potential novel treatments for psychiatric disorders. Following the emergence of SARS-CoV-2, there is a need to develop experimental medicine models that can be carried out remotely. We developed a novel procedure to investigate SAD (the InterneT-based Stress test for Social Anxiety Disorder; ITSSAD) that can be carried out entirely online by a single investigator, potentially reducing costs and maximising internal reliability. The procedure involves an anticipatory period followed by a naturalistic social interaction task. In a sample of 20 non-treatment-seeking volunteers with symptoms of SAD, the ITSSAD induced significant subjective anxiety and reduced positive affect. Further, increased social anxiety symptoms at baseline predicted increased anxiety during the social interaction task. This protocol needs further validation with physiological measures. The ITSSAD is a new tool for researchers to investigate mechanisms underlying social anxiety disorder.

1. Introduction

Social anxiety disorder (SAD) is one of the most common mental disorders, with an estimated lifetime prevalence of more than 6% in Europe (Fehm et al., 2005). SAD can be significantly disabling due to excessive apprehension regarding social situations, leading to avoidance and an impairment in functioning (Hendriks et al., 2016). New treatments for SAD are needed, as only 64.9% of patients remit after 4 years - the lowest remission rate of all the anxiety disorders (Hendriks et al., 2016). Experimental medicine models, in which important resembling features of a clinical disorder are experimentally induced, can be a cost-effective and timely approach to explore potential novel treatments for psychiatric disorders (Baldwin et al., 2017). Following the emergence of the SARS-CoV-2 pandemic, in-person research and social contacts have been restricted in many parts of the World. This has highlighted the need for tasks and experimental procedures that can be conducted virtually or online to allow research into anxiety disorders to continue (Kirschbaum, 2021).

A key element in the development of SAD is social-evaluative threat (Clark and Wells, 1995; Wong et al., 2020; Wong and Rapee, 2016). Social-evaluative stimuli are those that implicitly or explicitly communicate judgement of a person, for example facial expressions, eye contact or behaviours such as applauding or leaving a room (Wong and Rapee, 2016). It is thought that a combination of trait factors such as inherited temperament, culture, parent behaviour and previous life events lead to these social-evaluative stimuli being appraised as threatening (Wong and Rapee, 2016). Resultant changes in neurobiology, cognition and behaviours designed to detect and eliminate threatening social-evaluative situations (e.g. amygdala overactivity, anticipatory and post-event processing, avoidance behaviour) might be important in maintaining that high level of threat (Nelemans et al., 2017; Wong and Rapee, 2016).

A number of tasks have employed social-evaluative situations to investigate stress. Possibly the most widely used paradigm that involves the induction of social-evaluative stress in laboratory conditions is the Trier Social Stress Test (TSST) (Dickerson and Kemeny, 2004; Frisch

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https://doi.org/10.1016/j.psychres.2022.114770
Received 21 February 2022; Received in revised form 2 August 2022; Accepted 3 August 2022
Available online 4 August 2022
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et al., 2015; Kirschbaum et al., 1993). The TSST involves a short preparation period followed by a public speaking task and surprise mental arithmetic task performed in front of an observing panel of two or more experimenters (Kirschbaum et al., 1993). This task reliably induces subjective stress and anxiety, and worsens negative mood (Allen et al., 2014). Two studies in adults (Eagle et al., 2021; Harvie et al., 2021) and one in adolescents (Gunnar et al., 2021) have shown that a TSST administered via videoconferencing platforms can induce as robust a stress response as an in-person version. Variations on the TSST include giving a short speech observed by one or more judges (Kocovski et al., 2011), performing mental arithmetic while being shown feedback about 'expected performance' (Dedovic et al., 2005), and singing in front of an audience (Brouwer and Hogervorst, 2014). Challenges with carrying out such tasks include the logistics of organising an observing panel and controlling for potential confounds such as the gender composition of the panel and their behaviour (Frisch et al., 2015; Narvaez Linares et al., 2020). In addition, although these tasks induce considerable stress, it is unclear whether this stress is consistent with symptoms of SAD. For example, cortisol reactivity is usually an outcome measure of the TSST, and heightened cortisol responses to the TSST (on a population level) have been associated with the prevalence of stress-related disorders generally, not SAD specifically (Miller and Kirschbaum, 2019). Further, those with social anxiety have demonstrated both increased (Roelofs et al., 2009) and reduced (Crişan et al., 2016; Shirotsuki et al., 2009) cortisol responses to the TSST compared with healthy volunteers. Task design has been highlighted as a potential reason for these inconsistent results (Crişan et al., 2016). Furthermore, while patients with SAD do experience fear during public speaking, this is not a specific feature, as many individuals might experience this, without having SAD (Panayiotou et al., 2017).

Here we report a proof-of-concept study to highlight a novel social interaction paradigm designed to induce social anxiety employing a naturalistic social interaction and videoconferencing software (the InterneT-based Stress test for Social Anxiety Disorder; ITSSAD). The ITSSAD includes a simple task involving 'getting to know' another person, which can induce significant anxiety in those with SAD and significant physiological arousal in healthy volunteers with high levels of social anxiety (Nordahl et al., 2016; Shalom et al., 2015). We hypothesised that this naturalistic task, likely to be encountered in daily life by those with SAD and easily reproducible online, would induce detectable anxiety in an online experimental setting. We focused on measuring subjective anxiety as experimentally-induced subjective stress is positively associated with sub-clinical and clinical social anxiety symptoms (Panayiotou et al., 2017; Taylor et al., 2020). Further, there is evidence that subjective stress reactivity in social situations is an important factor in the maintenance of SAD (Nelemans et al., 2017). If subjective stress/anxiety induced by an experimental model of SAD were associated with trait social anxiety symptoms, rather than a more generalized measure of trait anxiety, this would suggest that subjective acute anxiety is specific and relevant for SAD. We therefore hypothesised that the anxiety induced by the ITSSAD task would be associated with trait social anxiety symptoms specifically and not with a generalized trait anxiety measure.

2. Method

2.1. The ITSSAD

The ITSSAD (Fig. 1) can be carried out entirely online. We designed the ITSSAD to induce anxiety through anticipation, and subsequent experience of, a naturalistic social-evaluative situation (Allen et al., 2017; Dickerson and Kemeny, 2004). The ITSSAD begins with a 5-minute anticipatory period. During this, we showed participants task instructions as follows:

"*In 5 minutes you will take part in a social interaction online using videoconferencing software. Your task will be to take some time to get to know the other person as you normally would. Just be yourself. You can talk about anything you want other than this experiment. You will be watched by 3 other experimenters who will be assessing your behaviour. We would like you to have your camera on during this interaction.*"

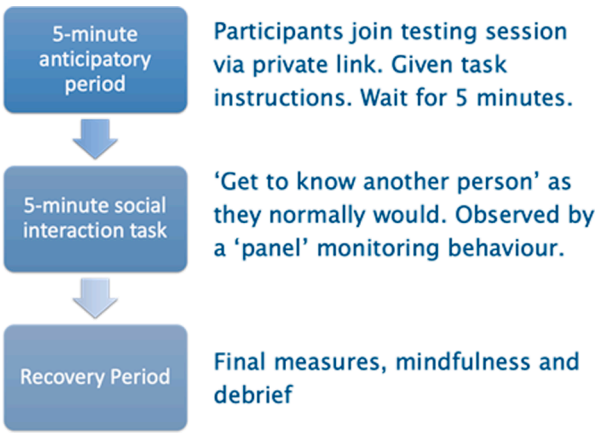

Fig. 1. Summary of the protocol for our modified Trier Social Stress Test, the ITSSAD.

After the anticipatory period, participants enter a videoconference. Present in the videoconference is an experimenter who introduces themselves as the person the participant is tasked with 'getting to know' and introduces a (mock) observing panel of 'experts' who are present to monitor the participants' behaviour. These appeared to be attendees to the videoconference who had turned their cameras off, but in reality were 'dummy' accounts logged into by the experimenter on other devices/browser windows and placed on mute. This allowed us to maintain a social-evaluative context whilst only having one experimenter. A previous study investigated whether a judging panel needed to be visible to induce stress during a public speaking task in healthy male volunteers: there was no significant difference in physiological stress between those who completed the task in front of a visible panel, and those who completed the task while the panel was behind a one-way mirror (Andrews et al., 2007). This indicates that the suggestion of the presence of a panel is adequate to induce a social-evaluative context and subsequent anxiety. We also named the dummy accounts to indicate the panel contained a mix of genders, as this has been shown to induce greater stress than a single-gendered panel (Narvaez Linares et al., 2020). We ensured that, along with the experimenter, two apparently male and two apparently female 'experimenters' were visible to the participant. To reinforce the social-evaluative context, the experimenter also informs the participant that the interaction will be recorded for review later.

The experimenter then begins a 5-minute timer and participants are asked to begin the social interaction task. The experimenter was briefed not to initiate conversation, instead allowing the participant to sit in silence if they did not initiate conversation. Experimenters were briefed to respond with non-elaborate verbal answers to questions posed by a participant whilst maintaining as neutral a facial expression as possible, much like the judging panel in the original TSST (Allen et al., 2017; Kirschbaum et al., 1993). If a silence lasted more than 30 seconds, the experimenter could prompt the participant with a short statement, for example, "I am a student at the university".

On completion of the 5 minutes, participants enter a recovery period. During this time, participants complete a coached mindfulness exercise. Mindfulness strategies are known to reduce post-event processing in SAD (Cassin and Rector, 2011; Shikatani et al., 2014) and so this was included as a 'mood repair'. Following the mindfulness task participants are fully debriefed.

2.2. Design of proof-of-concept study

2.2.1. Ethics statement

This study was reviewed and approved by the Ethics and Research Governance Office at the University of Southampton (reference: 61411) and performed in accordance with relevant local guidelines and regulations and the Declaration of Helsinki. Prior to starting the study, participants were informed that the aim was to explore social anxiety symptoms during videoconferencing. As the protocol involved some deception (described above), participants were fully debriefed at the end of the study and informed consent was sought a second time for us to retain their data. No participants withdrew consent for their data to be used.

2.2.2. Participants

For this proof-of-concept study, we recruited 20 participants aged 18-45 years with sub-clinical to clinical social anxiety symptoms. We felt a practical paradigm for exploring social-evaluative threat should induce anxiety with a large effect size. In a within-subjects design, a sample size of 20 participants will detect an effect of at least $d = 0.66$ with 80% power. Therefore, if subjective anxiety was significantly induced in this study, the effect would likely be moderate to large and suggest proof-of-concept of the paradigm. Social anxiety symptoms were assessed through the social phobia inventory (SPIN): a validated 17-item self-rated questionnaire (Connor et al., 2000). Participants with a SPIN of greater than 14 were included. This cut-off can differentiate between those with SAD of varying intensity and those with no social anxiety symptoms (Connor et al., 2000). We excluded participants via a self-report questionnaire if they reported: any current psychiatric disorder other than SAD; any history of psychosis or bipolar affective disorder; any significant physical illness; any recent treatment (either psychological or any systemic medication excluding paracetamol in the preceding 8 weeks); regularly using illicit substances; consuming more than 21 units of alcohol per week; or consuming more than 8 caffeinated drinks a day.

2.2.3. Study procedure

The study was carried out using both Qualtrics XM online survey software (https://www.qualtrics.com) (Qualtrics, 2021) and Microsoft Teams (https://teams.microsoft.com) (Microsoft, 2021). Participants initially completed a screening questionnaire that included the SPIN. Those who were eligible were then invited to attend a test session. Participants entered the test session via a private, personalised link sent to them by e-mail. The participants completed the test session from a private space of their choosing.

To fully characterize this non-treatment seeking sample, on entry into the session, participants completed the following questionnaires to assess trait anxiety and personality characteristics: Social Interaction Anxiety Scale (SIAS, (Mattick and Clarke, 1998)), Brief Fear of Negative Evaluation Scale (Brief FNE, (Leary, 1983)), and a modified version of the generalised anxiety disorder 7-item (GAD-7, (Spitzer et al., 2006)), where each question was represented by a visual analogue scale ranging from “not at all” to “nearly every day”. After these assessments, participants completed the ITSSAD as described above.

2.2.4. Outcome measures

We measured subjective anxiety and mood before (at session baseline) and after the anticipatory period, and after the social interaction task. At all three timepoints, participants were asked to complete the modified GAD-7 with visual analogue scales ranging from “not at all” to “all of the time”. Each item on this version of the GAD-7 was scored between 0 and 100. All items were then summed to give a total score (maximum 700). This version of the GAD-7 has been shown to be sensitive to state changes in anxiety with high resolution (Huneke et al., 2020). The GAD-7 questionnaire also captures social anxiety symptoms with good sensitivity (Kroenke et al., 2007). Subjective mood was assessed at all three timepoints through the Positive and Negative Affect Schedule (PANAS, (Watson et al., 1988)).

2.2.5. Statistical analysis

We carried out statistical analysis using the afex package in R (https://CRAN.R-project.org/package=afex) (Singmann et al., 2021). We assessed change in anxiety and mood over time through linear mixed-effects models (estimated using restricted maximum likelihood). Time was entered as a fixed effect while participant was included as a random effect. We chose to analyse the data through linear mixed-effects modelling as this allows greater retention of data when repeated measures are unbalanced, e.g. due to dropouts during the study. In this study, one participant dropped out prior to completing the anticipatory period and a further participant dropped out prior to completing the social interaction task. Linear mixed-effects modelling allowed us to retain datapoints already collected for these participants in the analysis. Where there was a significant effect of time (degrees of freedom calculated via Satterthwaite’s method), we carried out *post-hoc* pairwise comparisons (t-tests) to assess for significant differences between timepoints. All statistical hypotheses were two-tailed and significance values for post-hoc comparisons were adjusted using the Tukey method.

To assess whether anxiety during the social interaction task was related to social anxiety symptoms, as opposed to trait generalized anxiety, we created an exploratory linear mixed-effects model including interaction terms of time*SPIN and time*trait GAD-7 as fixed effects, with participant included as a random effect. Both SPIN and GAD-7 variables were centered on the mean prior to carrying out the analysis. The significance of the interactions was tested through two-tailed F tests (degrees of freedom calculated via Satterthwaite’s method). We explored the direction of significant interactions through analysis of simple main effects.

3. Results

Baseline characteristics of the participants are summarised in Table 1. On average, the participants exhibited moderate to severe social anxiety symptoms, with a mean SPIN of 38.95 ± 11.63. The majority (85%) were female.

Linear mixed-effects modelling showed a significant effect of time on anxiety ($F_{(2,35)} = 5.96$, $p = 0.0059$), negative affect ($F_{(2,35)} = 4.41$, $p = 0.0196$), and positive affect ($F_{(2,35)} = 10.15$, $p = 0.0003$). *Post-hoc* t-tests revealed that anxiety and negative affect increased following anticipation, and anxiety remained elevated after the speaking task. Positive affect decreased following anticipation, and remained decreased after the speaking task (Table 2 and Fig. 2).

We also carried out an exploratory linear-mixed effects analysis examining the effect of trait generalized anxiety and social anxiety on subjective anxiety experienced during the ITSSAD. Both time*trait GAD-7 ($F_{(2,33.8)} = 12.06$, $p = 0.0001$) and time*SPIN ($F_{(2,32.3)} = 5.13$, $p = 0.0116$) interactions were significant. *Post-hoc* analysis of simple effects

Table 1
Sample characteristics

Variable	Value
Age (yrs)	19.10 ± 1.21
Females	17 (85%)
SPIN	38.95 ± 11.63
Brief FNE	33.05 ± 6.36
SIAS	38.15 ± 12.86
GAD-7	260.90 ± 161.41

Note: values are reported as mean ± standard deviation for continuous variables, and count (%) for categorical variables. Abbreviations: SPIN, Social Phobia Inventory; Brief FNE, Brief Fear of Negative Evaluation Scale; SIAS, Social Interaction Anxiety Scale; GAD-7, Generalised Anxiety Disorder 7-item.

Table 2
Summary of post-hoc pairwise comparisons.

Comparison	GAD-7		PANAS Negative		PANAS Positive	
	Estimated Mean Difference	t-test results	Estimated Mean Difference	t-test results	Estimated Mean Difference	t-test results
Pre- vs post-anticipation	-124.6 ± 38.2	$t_{(35)}$=3.26, p=0.0068	-4.61 ± 1.56	$t_{(35)}$=2.95, p=0.0151	4.51 ± 1.19	$t_{(35)}$=3.80, p=0.0016
Pre-anticipation vs Post-speaking task	-100.0 ± 38.9	$t_{(35)}$=2.57, p=0.0380	-2.71 ± 1.59	$t_{(35)}$=1.70, p=0.2174	4.81 ± 1.21	$t_{(35)}$=3.97, p=0.0010
Post-anticipation vs Post-speaking task	24.6 ± 39.1	$t_{(35)}$=0.63, p=0.8050	1.90 ± 1.60	$t_{(35)}$=1.19, p=0.4695	0.30 ± 1.22	$t_{(35)}$=0.24, p=0.9678

Note: values are reported as estimated mean difference ± standard error. All significance values are Tukey-adjusted for multiple comparisons. Abbreviations: GAD-7, Generalised Anxiety Disorder 7-item; PANAS, Positive and Negative Affect Schedule.

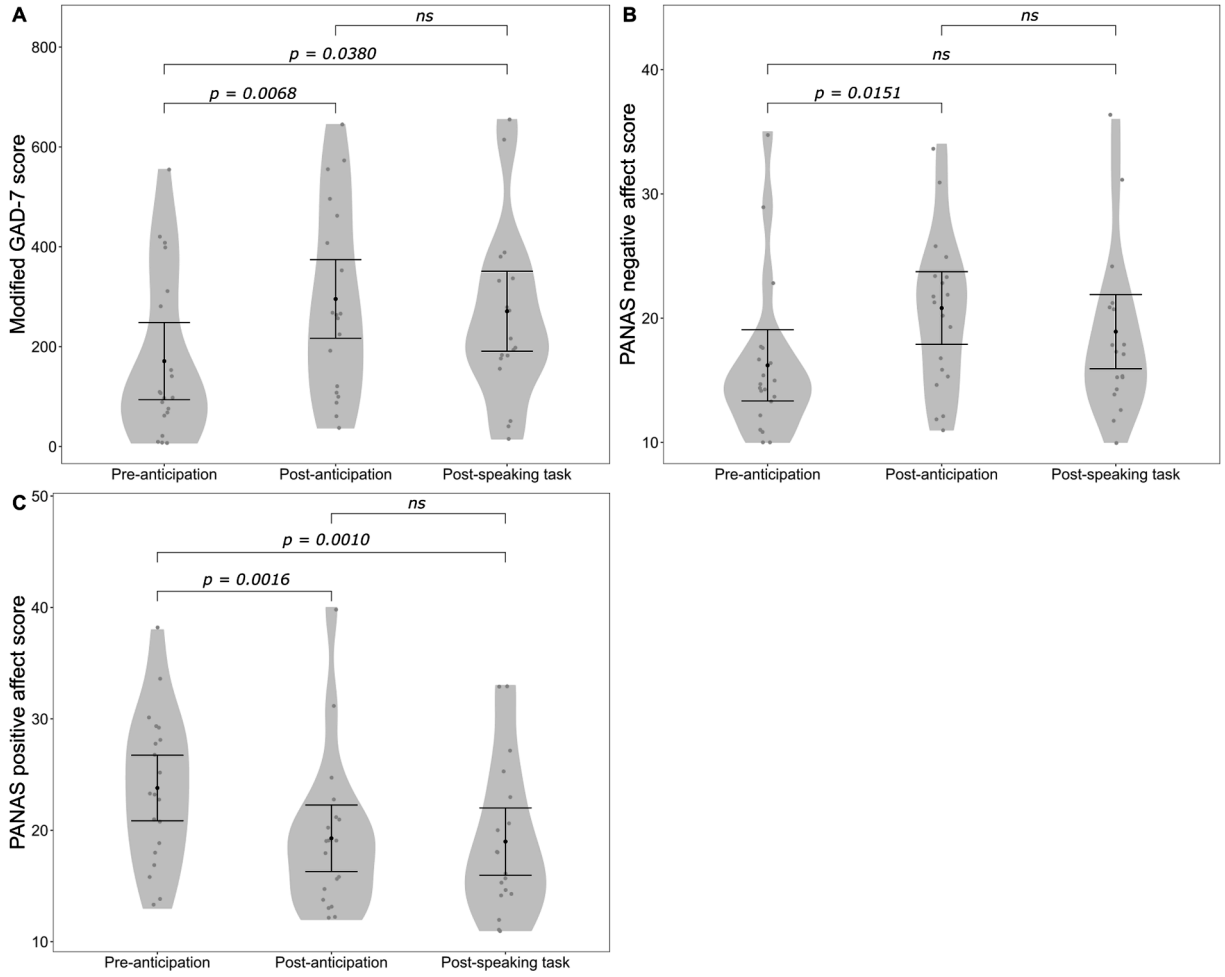

Fig. 2. Violin plots showing modified GAD-7 (A), PANAS negative affect (B) and PANAS positive affect (C) scores over time. Anxiety and negative affect increased (vs. pre-anticipation session baseline), while positive affect decreased. Points represent estimated marginal means, and error bars represent 95% confidence interval. Significance values shown originate from post-hoc pairwise t-tests with Tukey adjustment for multiple comparisons. Abbreviations: GAD-7, Generalised Anxiety Disorder screener; PANAS, Positive and Negative Affect Schedule.

Table 3
Summary of simple effects of trait generalized anxiety and social anxiety symptoms on subjective anxiety experienced during the ITSSAD protocol.

	GAD-7					SPIN				
Time	**Estimate**	**95% CI**	**df**	**t**	**$p_{(tukey)}$**	**Estimate**	**95% CI**	**df**	**t**	**$p_{(tukey)}$**
Pre-anticipation	**0.896**	**0.55, 1.24**	**42.6**	**5.29**	**<0.0001**	1.64	-3.10, 6.38	42.6	0.70	0.4891
Post-anticipation	**0.978**	**0.60, 1.36**	**44.7**	**5.17**	**<0.0001**	1.51	-3.29, 6.30	42.9	0.63	0.5294
Post-speaking task	-0.034	-0.42, 0.35	44.8	-0.18	0.8583	**9.66**	**4.83, 14.50**	**43.2**	**4.03**	**0.0002**

Note: Significant results in bold. Abbreviations: GAD-7, Generalised Anxiety Disorder 7-item; SPIN, Social Phobia Inventory; CI, Confidence Interval; df, degrees of freedom.

demonstrated that SPIN score positively predicted anxiety during the speaking task, but was not significantly related to anxiety beforehand. Conversely, there was a significant positive effect of trait GAD-7 on anxiety during anticipation, but no significant effect on anxiety during the speaking task (Table 3 and Fig. 3).

4. Discussion

In this proof-of-concept study, we showed that it is possible to induce social anxiety symptoms through a novel procedure using videoconferencing software (ITSSAD). Subjective anxiety was increased by a pre-task anticipation period, and anxiety remained elevated following a naturalistic social interaction task. In addition, positive affect decreased during the pre-task anticipation period, and positive affect was not significantly different following the social interaction task. Finally, increased baseline SPIN scores predicted increased anxiety during the social interaction, while trait GAD-7 did not, suggesting this task specifically induces features of social anxiety disorder.

Recently, a number of online versions of social stress tests have been developed (Eagle et al., 2021; Gunnar et al., 2021; Harvie et al., 2021). However, these protocols are designed to induce *stress* and do not necessarily induce social anxiety symptoms specifically.

The ITSSAD utilizes a naturalistic social interaction task that is easy to administer and is likely to be ecologically valid. Subjective anxiety increased following both the anticipation period and social interaction task. In addition, anxiety during the social interaction was predicted specifically by SPIN scores at baseline. This suggests the social interaction activated cognitive factors important in SAD. Social interaction tasks are known to induce social anxiety symptoms and can activate psychological mechanisms, such as negative self-evaluation (Nordahl et al., 2016). Exploration of the factors involved in the ITSSAD are outside the scope of the current proof-of-concept study, but this warrants further investigation.

Our novel approach potentially possesses other advantages over previously developed social stress tests. A limitation of the original TSST and its offline and online variants is the logistical challenge and human resources cost involved in setting up the test sessions. The TSST and its variants require laboratory space and multiple individuals (at least 2) to be available contemporaneously for approximately 30 minutes to test a single participant (Allen et al., 2017; Kirschbaum et al., 1993). In comparison, the ITSSAD can be carried out by a single investigator with only a laptop in any private space. In addition, an important potential confounder of the original TSST and online variants is the characteristics and behaviour of confederates. Variations in acting between different confederates, or within confederates, can affect the internal reliability of the TSST (Allen et al., 2017; Frisch et al., 2015; Wallergård et al., 2011). There is also evidence that committee members can empathically mirror the stress of the participant (Buchanan et al., 2012), potentially leading to distorted interactions. The gender composition of the panel is also known to be an important determinant of stress in the participant (Narvaez Linares et al., 2020). A number of virtual reality adaptations of the TSST have been developed to attempt to mitigate against this: however, the type of virtual reality seems to be relevant. Immersive environments, defined as completely replacing audio-visual cues with virtual reality, demonstrated significantly greater cortisol reactivity than non-immersive environments (Helminen et al., 2019). These kinds of immersive environments require costly headsets and other equipment, as well as resources to build the virtual world. By comparison, in the ITSSAD the observing panel can be 'dummy' accounts controlled by a single experimenter. This allows complete control over confederate behaviour and characteristics of the panel such as gender composition. This is likely to provide high internal reliability of the protocol for minimal cost. Further studies are needed to determine internal reliability and costs of this protocol in comparison to other tests of social-evaluative threat.

There are some limitations of this proof-of-concept study. Firstly, the sample size of 20 is small and our findings should accordingly be interpreted with caution. We also did not recruit a low socially anxious sample, and so it is unclear whether anxiety induced in the ITSSAD only occurs in those with high social anxiety symptoms. Future studies should determine how low socially anxious individuals behave when completing the ITSSAD. In addition, we did not collect physiological measures. The TSST is known to increase cortisol levels as well as activate the sympathetic nervous system, which are important features for its validity in investigating stress-related disorders (Allen et al., 2017; Narvaez Linares et al., 2020). Administering the TSST via videoconference also increases both heart rate (Eagle et al., 2021; Harvie et al., 2021) and salivary cortisol concentrations (Gunnar et al., 2021). For the ITSSAD, we were interested in subjective stress response as this is positively associated with trait social anxiety and might be a factor in the maintenance of SAD (Nelemans et al., 2017; Panayiotou et al., 2017; Taylor et al., 2020). Nevertheless, if the ITSSAD were to induce

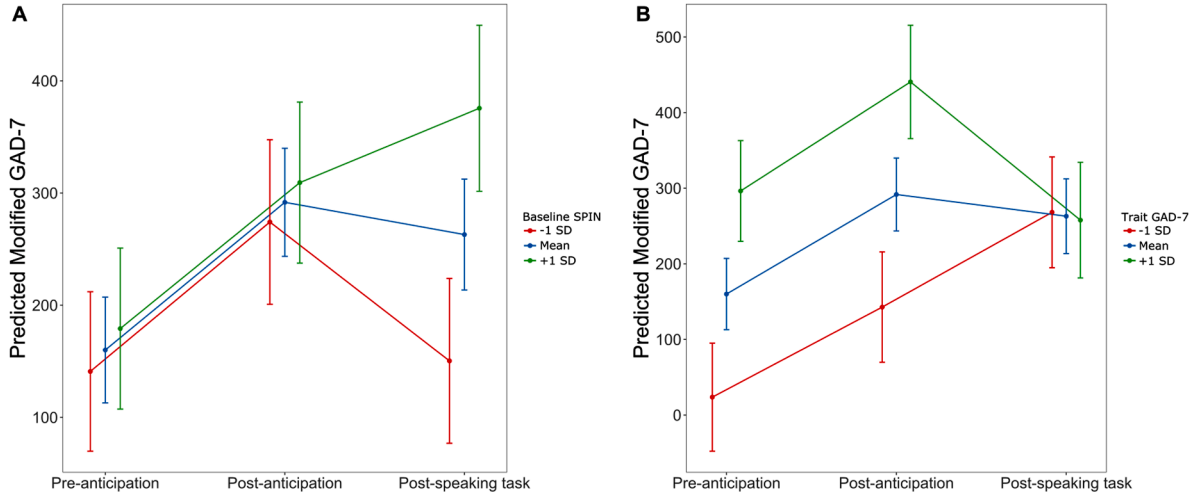

Fig. 3. Line plots showing predicted modified GAD-7 score over time during the ITSSAD protocol. Points represent predicted means, and error bars represent 95% confidence interval. The effect of SPIN score when trait GAD-7 is held constant is shown in (A). This shows that participants with increased SPIN scores are predicted to experience increased anxiety during the speaking task. SPIN scores are predicted to have little effect on anxiety prior to the speaking task. Conversely, the effect of trait GAD-7 when SPIN is held constant is shown in (B). Trait GAD-7 is predicted to affect anxiety experienced during anticipation, but has little effect on anxiety during the speaking task. Abbreviations: GAD-7, Generalised Anxiety Disorder screener; SPIN, Social Phobia Inventory.

autonomic anxiety responses then this paradigm could be useful for investigating other potential psychopathophysiological mechanisms of SAD, for example anxiety sensitivity and interoception (Dixon et al., 2015). Brief social interactions are known to induce cardiovascular responses consistent with threat in those with high trait social anxiety (Shalom et al., 2015; Shimizu et al., 2011). It is therefore likely that our protocol would induce similar physiological responses, but this needs testing empirically. Additionally, our participants were also mostly female and due to the small sample size we could not assess for an effect of gender on subjective anxiety. Women tend to exhibit higher subjective stress reactivity than men (Kelly et al., 2008; Rausch et al., 2008). It is unknown whether our results would replicate in a more male-predominant sample. We also did not measure natural recovery following the task, opting instead for a mood repair after the task. We did this to ensure safety and stabilisation of volunteers who were participating in the study remotely. However, post-event processing is thought to be an important factor in the aetiology and maintenance of SAD (Wong et al., 2020; Wong and Rapee, 2016). Furthermore, we did not measure anxiety and mood following the mood repair, so we cannot be sure how quickly induced anxiety 'washes out' following aided recovery. Future studies exploring natural and aided recovery, and post-event processing, following the ITSSAD are warranted. Lastly, we did not control for activities participants undertook, or substances ingested, prior to the testing session. Activities as diverse as brushing teeth, engaging in physical exercise, and eating can affect cortisol responses in the TSST (Narvaez Linares et al., 2020). However, the impact of these behaviours on subjective anxiety is less clear. Regardless, we observed a robust anxiety response without such rigorous control. Further studies are needed to determine whether controlling activities for a period of time before the testing session can improve signal to noise ratio.

Our novel InterneT-based Stress test for Social Anxiety Disorder (ITSSAD) induced significant anxiety in volunteers with subclinical to clinical social anxiety. Subjective anxiety during the social interaction task correlated with trait symptoms of social anxiety disorder. The ITSSAD possesses many advantages for investigating social anxiety including that it is low-cost, easy to carry out, has high internal validity due to complete control of confederates, and involves a naturalistic social interaction task. The ITSSAD is a new tool for researchers to investigate the mechanisms of social anxiety disorder.

Funding

Conduct of the research was supported by funding awarded to NTMH by the Medical Research Council (grant number MR/T000902/1).

CRediT authorship contribution statement

Nathan T.M. Huneke: Conceptualization, Formal analysis, Data curation, Writing – original draft, Writing – review & editing. **Hannah Rowlatt:** Investigation, Writing – review & editing. **Joshua Hyde:** Investigation, Writing – review & editing. **Alexander McEwan:** Methodology, Investigation, Writing – review & editing. **Louise Maryan:** Investigation, Writing – review & editing. **David S. Baldwin:** Supervision, Writing – review & editing. **Matthew Garner:** Conceptualization, Supervision, Writing – review & editing.

Declaration of Competing Interest

All authors declare no conflict of interest.

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