Journal of Behavior Therapy and Experimental Psychiatry 83 (2024) 101937

Contents lists available at ScienceDirect

Journal of Behavior Therapy and Experimental Psychiatry

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

The legacy of social anxiety-linked negative expectancy: A pathway from pre-event negative expectancies to post-event negative thinking

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ARTICLE INFO

Keywords:
Social anxiety
Expectancy
Pre-event processing
Post-event processing
Negative thinking

ABSTRACT

Background and objectives: Following engagement in a social event people with heightened vulnerability to social anxiety report elevated levels of negative thinking about the event, and this post-event negative thinking is implicated in the maintenance of social anxiety vulnerability. It has also been established that heightened social anxiety vulnerability is associated with disproportionately negative expectations of upcoming social events. However, contribution of social anxiety-linked pre-event negative expectancy to post-event negative thinking has not been directly investigated. The objective of the present study was to test the hypothesis that the relationship between social anxiety vulnerability and post-event negative thinking is mediated by pre-event negative expectancies that drive increased state anxiety at the time of encountering the event.

Methods: One-hundred and ten participants who varied in social anxiety vulnerability completed a simulated job interview. Participants reported negativity of expectancies before the event, state anxiety experienced at the time of encountering the event, and post-event negative thinking across the seven days following the event.

Results: Analyses revealed elevated social anxiety predicted increased negative post-event thinking. The association between social anxiety and post-event negative thinking was fully mediated by a mediation pathway involving pre-event negative expectancies and state anxiety at the time of encountering the interview event.

Limitations: The study used a laboratory-based social experience, and conclusions could usefully be tested in the context of natural social events.

Conclusions: The findings suggest that social anxiety-linked variation in pre-event negative expectancy may contribute to post-event negative thinking following a social event via its impact on state anxiety.

Following engagement in a social event, individuals with heightened social anxiety vulnerability are characterised by an elevated tendency to experience negative thoughts about the event. This inflation of negative thoughts about an experienced social event can continue for hours, days, or longer, and has been implicated as a detrimental feature of elevated social anxiety vulnerability (Clark & Wells, 1995; Hofmann, 2007; Rapee & Heimberg, 1997; Wong & Rapee, 2016). Given its association with social anxiety vulnerability, and the detrimental consequence of such thinking to individual wellbeing, theorists have emphasised a need for research that can reveal specific cognitive and emotional factors that contribute to social anxiety-linked post-event negative thinking (Modini & Abbott, 2016; Penney & Abbott, 2014; Wong, 2016).

Amongst people with heightened social anxiety vulnerability greater levels of negative state emotion at the time of encountering a social event predicts the inflation of post-event negative thinking about the same event (Kiko et al., 2012; Kocovski & Rector, 2007; Laposa & Rector, 2011; Makkar & Grisham, 2011; McEvoy & Kingsep, 2006). For example, Kiko et al. (2012) required participants with high levels of social anxiety vulnerability, and participants with lower levels of vulnerability, to engage in a social event within a lab setting and report the degree to which they experienced negative thoughts about this event. It was observed that participants with high levels of social anxiety vulnerability experienced relatively greater state anxiety at the time of encountering the social event, and importantly, that level of state anxiety experienced predicted the degree of negative thinking reported by participants. Thus, researchers have demonstrated higher levels of negative mood experienced at the time of encountering a social event predict increased negative thinking about the event amongst individuals with heightened social anxiety vulnerability.

Independent avenues of research have observed cognitive processes

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https://doi.org/10.1016/j.jbtep.2023.101937
Received 16 November 2022; Received in revised form 12 July 2023; Accepted 9 December 2023
Available online 17 December 2023

that characterise individuals with elevated social anxiety. One such process is pre-event negative expectancy. Pre-event expectancies are distinct from other investigated forms of pre-event information processing such as 'anticipatory processing', which refers to numerous repetitive negative thinking styles including recollection of past social failures, reviewing negative aspects of the self, and fear of evaluation or rejection. In contrast, expectancies specifically reflect beliefs about the likelihood of specific outcomes that may occur in the future. Studies have shown that heightened social anxiety vulnerability is characterised by disproportionately negative expectancies concerning upcoming social events (see for reviews: Heinrichs & Hofmann, 2001; Hirsch & Clark, 2004). For example, Lucock and Salkovskis (1988) asked individuals with high, or low, levels of social anxiety vulnerability to rate the probability that they would have positive and negative experiences during a range of hypothetical future social and non-social events. Results showed that individuals with high social anxiety vulnerability reported heightened expectations of negative experiences for social events, but not for non-social events, as compared to individuals with low vulnerability. Similarly, Caouette et al. (2015) recruited university students who ranged in social anxiety vulnerability to take part in a simulated chatroom task with an unknown peer, and first asked participants to record their expectancies concerning whether the peer would reject or accept them. Results demonstrated that heightened levels of social anxiety vulnerability were associated with greater expectancies of peer rejection.

Investigators have also demonstrated that amongst individuals with heightened social anxiety vulnerability more negative pre-event expectancy about an upcoming social event predicts increased levels of state anxiety experienced when the social event is encountered. Rapee and Abbott (2007) recruited participants with high social anxiety vulnerability to complete an impromptu speech to an experimenter. Participants reported the negativity of their pre-event expectancies concerning the experimenter's evaluation of themselves during the speech and the level of state anxiety experienced in response to the speech. Results revealed that more negative expectancies concerning evaluation during the speech were correlated with greater levels of state anxiety, and that such expectancies statistically mediated the relationship between social anxiety vulnerability and state anxiety. Such findings indicate that social anxiety-linked negative expectancies may contribute to the level of state anxiety experienced by socially anxious when encountering a social event.

The reviewed findings are each drawn from disparate hypotheses and methods which could postulate a range of theoretical models concerning their relationships. However, when viewed together, these findings invite the plausible hypothesis that the social anxiety-linked post-event negative thinking is, in part, originated from pre-event negative expectancies that in turn drive increased state anxiety at the time of encountering the event. If this hypothesis is valid, it may explain, in part, why people with heightened social anxiety vulnerability experience elevated negative thinking about experienced social events. Thus, determination of its validity would hold implications for larger theoretical models that seek to understand antecedent of social anxiety-linked post-event negative thinking, and clinical implications for interventions seeking to reduce post-event negative thinking amongst people with high social anxiety vulnerability. Critically however, differences in methods and participant samples used across previous research do not allow clear determination of this hypothesis. The strongest test of the hypothesis would come from investigation of the associations between social anxiety vulnerability, negative expectancy, state anxiety, and post-event negative thinking in the same participant sample in response to the same social event.

Thus, the aim of the present study was to evaluate this hypothesis by examining the validity of the serial mediation model using measurements obtained in relation to the same social event. The study recruited participants who varied in social anxiety vulnerability to complete a simulated job interview. Participants reported their endorsement of a range of negative expectancies about the interview, their state anxiety levels at the time of encountering the event, and the degree they experienced negative thoughts about the interview across the following seven days. It was expected that higher levels of social anxiety vulnerability would be associated with greater negative pre-event expectancies, higher levels of state anxiety, and increased negative thinking about the interview.

The hypothesis under test was that the relationship between social anxiety vulnerability post-event negative thinking would be serially mediated by a pathway comprising pre-event negative expectancies and state anxiety at the time of encountering the interview. In the present study, this hypothesis predicted that the variation in the measure of post-event negative thinking that is predicted by social anxiety will be statistically accounted for by a serial mediating pathway between these variables involving the experimental measures of negative expectancy and state anxiety.

1. Method

1.1. Ethics statement

Approval to conduct this research was granted by the University of Western Australia Human Research Ethics Committee and University of Exeter Psychology Ethics Committee.

1.2. Participants

Invitations to participate in the study were delivered to a cohort of several hundred undergraduate psychology students at the University of Western Australia and University of Exeter. From these invitations, 110 individuals chose to participate in the study. Seven participants did not complete the assessment of post-event negative thoughts and one participant's expectancy assessment data was lost. Descriptive statistics for demographic and analysis critical measures are presented in Table 1.

1.3. Materials

1.3.1. Questionnaires

1.3.1.1. Social Interaction Anxiety Scale. The Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998) was used to assess participants' social anxiety vulnerability. The 20-item scale presents statements that describe differing emotional experiences to social situations (e.g., "I am at ease meeting people at parties, etc.", "When mixing socially, I am uncomfortable"). Scores on the SIAS can range from 0 to 80, with higher scores representing higher levels of social anxiety vulnerability. The internal reliability computed across 5000 bootstrapped resamples was, $r_{Chronbach} = 0.92$, $CI_{95\%}$ [0.90, 0.94].

1.3.1.2. State Anxiety Index. The short form of the Spielberger State Anxiety Inventory (SAI-6; Marteau & Bekker, 1992) was used to measure

Table 1
Descriptive statistics of demographic and experiment measures across participants.

Measure	N (Female:Male:Other)	
Gender	82:26:2	
	Mean (Std.Dev)	Range
Age	21.41 (5.19)	18–45
Social Interaction Anxiety Scale	27.39 (12.88)	5–56
Negative Expectancy Index	27.73 (9.34)	6.5–51.25
State Anxiety Index	30.18 (12.46)	1–56.67
Thoughts Questionnaire	28.83 (11.96)	13–57

Gender, Age, Social Interaction Anxiety Scale, State Anxiety Index, N = 110; Negative Expectancy Index, N = 109; Thoughts Questionnaire, N = 103.

the level of state anxiety experienced by participants at the time of encountering the simulated job interview. The six-item scale asks individuals to indicate the degree to which they are experiencing six different anxiety symptoms "Right now. That is at this moment" (e.g., "I feel worried"). To allow a sensitive measure of state anxiety each item presented a 60-point visual analogue scale ranging from 1 (*Not at all*) to 60 (*Very much*). A measure of state anxiety was computed by calculating the mean response across the six items. Thus, final scores could range from 1 to 60 with higher scores representing greater levels of state anxiety. The internal reliability computed across 5000 bootstrapped resamples was, $r_{Chronbach} = 0.91$, $CI_{95\%}$ [0.87, 0.93].

1.3.1.3. Negative Thoughts Questionnaire. The Negative Thoughts subscale of the Thoughts Questionnaire (Donohue, Rapee, Modini, Norton, & Abbott, 2021; Edwards, Rapee, & Franklin, 2003) was used to assess the degree participants experienced negative thoughts about their simulated interview across the 7 days following the interview. Three items in the original 16 item subscale were unrelated to the interview event conducted in the present study, and so were not included.[1] The resulting assessment instrument asked individuals to report how often they had thoughts consistent with each of 13 negative statements concerning the interview, across the 7 days following the interview (e.g., "How bad my responses were", "How anxious I felt"). For each statement, the response indicating the frequency of related thoughts could range from 1 (*Never*) to 5 (*Very often*). Scores could range from 13 to 65, with higher scores representing greater levels of post-event negative thinking. The negative thoughts subscale of the Thoughts Questionnaire has previously demonstrated high face validity (Donohue et al., 2021; Edwards et al., 2003). The internal reliability computed across 5000 bootstrapped resamples was, $r_{Chronbach} = 0.96$, $CI_{95\%}$ [0.95, 0.97].

1.3.2. Experimental tasks

1.3.2.1. Negative Expectancy Assessment Task. The Negative Expectancy Assessment Task provided a measure of the participants' pre-event negative expectancies. To provide participants with equivalent initial information about the simulated interview event, and to ensure that this information was emotionally balanced, all participants commenced the study session by watching short video clips in which other students briefly described the interview experience, with half of these providing a negative account and half providing a positive account. The task then required participants to rate their expectancies concerning the simulated job interview by responding to 16 statements describing possible experiences that were equally distributed across themes of anxiety, self-doubt, evaluation, difficulty, implications, learning, confidence, and reward. Example statements include, "*you will have an itchy throat during the job interview*", "*you will find that the interview questions are difficult to answer*", and "*at the conclusion of the interview you will feel it was a rewarding experience*". Participants indicated the degree to which they expected each of these experiences by rating each statement on a 60-point visual analogue scale ranging from 1 (*Extremely unlikely*) to 60 (*Extremely likely*). Positively worded items were reverse scored after which the mean of participant's rating responses across all statements was computed to create a Negative Expectancy Index. Scores on this index could range from 1 to 60 with higher scores representing more negative expectancies. The internal reliability computed across 5000 bootstrapped resamples was, $r_{Chronbach} = 0.93$, $CI_{95\%}$ [0.89, 0.94].

1.3.2.2. Simulated job interview. The simulated job interview was designed to produce a social evaluative experience. The task simulated an interview for a research assistant position within a university psychology department. The task commenced with delivery of the state anxiety inventory to assess state anxiety at the time of encountering this event. It then proceeded by having participants respond to questions asked in a five and a half minute long scripted video, featuring a panel of four interviewers (two male, two female) seated in a boardroom. Each member of the panel asked the participant four interview-style questions (e.g., "*What interests you most about psychology?*", "*What research questions do you think researchers should put greater effort into answering?*"). Following each question, participants were required to provide a spoken response lasting 1 min, indicated by a timer displayed at the top right-hand corner of the video. Facial expressions of the interview panel were scripted to portray an equal frequency of positive (smiling, nodding) and negative (frowning, headshaking) facial expressions. Audio was delivered through computer speakers. Participants were recorded during the task by a web camera attached to the top of the computer monitor. Prior to commencing the task, participants were informed the recording of their performance during the interview would be evaluated by the research team on a range of metrics, such as quality of responses and body language.

1.3.2.3. Procedure. The study was completed in two assessment phases: a lab assessment phase, and a follow-up assessment phase. During the lab session participants first completed a demographic questionnaire and the Social Interaction Anxiety Scale. Next, the experimenter stated to participants that as part of the study procedure they would take part in a simulated job interview during which their performance would be video recorded and that the recording of their interview performance would be evaluated by the research team on a range of metrics. Participants then completed the Negative Expectancy Assessment Task followed by the simulated job interview. The lab assessment phase concluded with participants instructed on the requirements if the Negative Thoughts Questionnaire. On the seventh day following the lab session, participants were sent an email containing the Negative Thoughts Questionnaire. Participants were instructed to complete the questionnaire on their personal device upon receiving the email.

2. Results

Observed correlations between measures of social anxiety vulnerability, negative pre-event expectancy, state anxiety, and post-event negative thinking are present in Table 2. Scores on the Social Interaction Anxiety Scale were positively correlated with scores on the Negative Expectancy Index, State Anxiety Index, and Negative Thoughts Questionnaire. This indicated that the study design provoked social anxiety-linked variation in expectancies, state anxiety, and negative thinking as anticipated.

2.1. Examination of statistical mediation

The hypothesis under test described a serial mediation pathway whereby variation in social anxiety vulnerability would predict pre-event negative expectancy, which in turn would predict state anxiety, with this in turn predicting variance in post-event negative thinking. Thus, then hypothesis predicted that the variation in the measure of post-event negative thinking that is predicted by the measure of social anxiety will be statistically accounted for by a serial mediating pathway between these variables that involves the experimental measures of negative expectancy and state anxiety.

The mediation analysis was conducted through structural equation modelling path analysis.[2] The analysis used full information maximum likelihood (FIML) estimation to accommodate missing data. A Monte Carlo power analysis for indirect effects using 5000 replications was

[1] The excluded items were: "*That the feedback was inaccurate*", "*I should have chosen a different topic*", and "*How bad the feedback was*".

[2] The analysis was conducted using the jAMM module in Jamovi (Gallucci, 2020; The jamovi project, 2021).

Table 2
Results of Pearson correlation analyses. Values in brackets represent 95% confidence intervals.

	Social Interaction Anxiety Scale	Negative Expectancy Index	State Anxiety Index	Thoughts Questionnaire
Social Interaction Anxiety Scale	–			
Negative Expectancy Index	$r(107) = .42$ $p < .001$ [.25, .56]	–		
State Anxiety Index	$r(108) = .45$ $p = .001$ [.29, .59]	$r(107) = .64$ $p < .001$ [.51, .74]	–	
Thoughts Questionnaire	$r(101) = .27$ $p = .005$ [.09, .44]	$r(100) = .37$ $p < .001$ [.19, .53]	$r(101) = .45$ $p < .001$ [.28, .59]	–

computed to estimate the statistical power obtained by the present sample size under certain conditions (Schoemann, Boulton, & Short, 2017) The recruited sample size (N = 110) provided statistical power (1-β) of 0.71, 0.26, and <0.01 to detect the presence of a serially mediating indirect effect, assuming simple correlations (*r*) between all model variables of 0.5, 0.3, and 0.1 respectively and consistent variance across the measures.

The serial indirect effect pathway was estimated by computing the mean and 95% confidence interval of the product of the component effects along the serial mediation pathway yielded from a bias-corrected bootstrapping procedure that used 5000 random resamples. The presence of direct and indirect pathways were determined by evaluating the resulting confidence intervals. An illustration of the model and a summary of the results pertaining to each path in the model is presented in Fig. 1.

The results revealed that the magnitude of the effect of each component path within the serial mediation pathway was significantly greater than zero. The resulting confidence interval of the serial mediation pathway did not contain zero (0) within its bounds, $b = 0.08$, $CI_{95\%}$ [0.03, 0.17]. When statistically accounting for the effects arising from the serial mediation pathway, the confidence interval for the association between Social Interaction Anxiety Scale scores and Thoughts Questionnaire scores (the 'direct effect') did contain zero (0), $b = 0.08$, $CI_{95\%}$ [−0.11, 0.25], indicating that the serial mediation pathway 'fully mediated' the association between Social Interaction Anxiety Scale scores and Thoughts Questionnaire scores. Evaluation of effects reveals that the size of the serial mediation pathway effect (b = 0.08) accounted for 31% of the "total effect" between Social Interaction Anxiety Scale scores and Thoughts Questionnaire scores (b = 0.26).

Together the results of the mediation analyses were consistent with the predictions that arose from the hypothesis under test in the present study, that pre-event negative expectancy and state anxiety at time of interview event serially mediate the association between social anxiety vulnerability and post-event negative thinking.

3. Discussion

The aim of the present study was to evaluate the validity of the hypothesis that the association between social anxiety vulnerability and post-event negative thinking is be mediated by pre-event negative expectancies that drive increased state anxiety at the time of encountering the event. In the present study, this hypothesis predicted that the variation in the measure of post-event negative thinking that is predicted by social anxiety will be statistically accounted for by a serial mediating pathway between these variables involving the experimental measures of negative expectancy and state anxiety. The results of the study were consistent with this prediction and so demonstrated support for the hypothesis.

The results of correlation analyses are consistent with research that has revealed heightened social anxiety vulnerability to be characterised by elevated negative expectancies of social events (Heinrichs & Hofmann, 2001; Hirsch & Clark, 2004), and elevated post-event negative thinking following social events (Penney & Abbott, 2014; Wong, 2016). The results are also consistent with studies demonstrating associations between social anxiety-linked elevation in state anxiety experienced during a social event and elevated post-event negative thinking following the same event (Kiko et al., 2012; Kocovski & Rector, 2007; Laposa & Rector, 2011; Makkar & Grisham, 2011; McEvoy & Kingsep, 2006). Lastly, the results are consistent with research demonstrating an association between social anxiety-linked elevation in negative expectancy and elevated state anxiety experienced with respect to social events (Rapee & Abbott, 2007; Vassilopoulos, Moberly, & Tsoumanis, 2014). Thus, the pattern of associations found across the present study support several relationships previously argued to be characteristic of elevated social anxiety vulnerability.

The present findings extend existing knowledge by identifying pre-event negative expectancy as a mediator in the relationship between social anxiety vulnerability and post-event negative thinking. This finding holds implications for theoretical models of social anxiety that

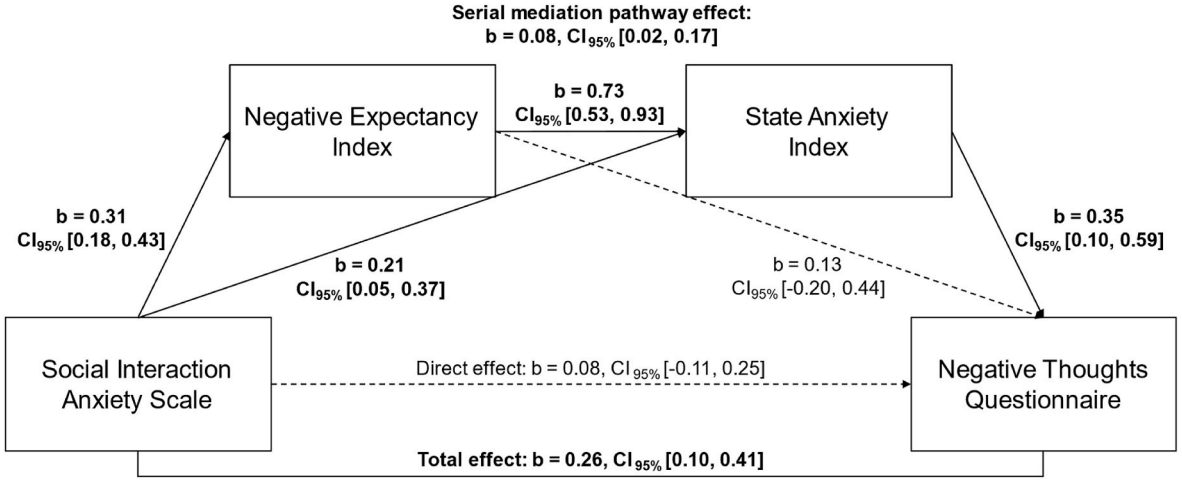

Fig. 1. Summary of results of computed serial mediation model. Path effects with confidence intervals containing zero have dashed lines. Estimates (b) represent unstandardised effect estimates from the SEM model.

seek to explain processes that contribute to post-event negative thinking in elevated social anxiety vulnerability. Though models have typically argued that pre-event information processing mechanisms impact post-event negative thinking, they have not identified pre-event negative expectancies as one of these processes (Clark & Wells, 1995; Heimberg, Brozovich, & Rapee, 2010; Rapee & Heimberg, 1997; Wong & Rapee, 2016). The present findings specifically identify pre-event expectancy in a pathway to post-event negative thinking that can be readily incorporated into existing models, and so refine mechanistic accounts theoretical models of social anxiety.

The present findings hold implications for clinical interventions that would seek to attenuate post-event negative thinking in people with high social anxiety vulnerability. The present findings implicate pre-event negative expectancies as a factor linked to post-event negative thinking about the same event. Such findings are consistent with the possibility that reduction of pre-event negative expectancies may lead to reduced post-event negative thinking about the same event. Importantly however, though the tested mediation model reflected measures that occurred in a temporal order and thus would be consistent with a series of causal processes, the present study did not manipulate expectancies and so causal explanations cannot be drawn. Future research could directly test causal accounts by adapting the current study's design to manipulate the formation of negative expectancies in anticipation of the social event and examining the impact of the manipulation upon post-event negative thinking. If an impact of manipulation is observed, then this would strongly identify pre-event negative expectancy as a candidate target for interventions seeking to reduce post-event negative thinking amongst individuals with elevated social anxiety vulnerability.

It is prudent to consider factors that may limit scope through which the present findings can be considered. The present study evaluated the measures of interest in relation to a laboratory-based social experience. This feature of the study provides the benefit of allowing a social event that is consistent across participants, and such paradigms have been effective in revealing processes that characterise elevated social anxiety in previous research. Nonetheless, it is unknown whether participant's responding in the present study is estranged from their experiences outside of the laboratory. Future research could usefully assess the validity of the present hypothesis in the context of naturally occurring social events.

Though the presently tested serial mediation pathway demonstrated 'full' statistical mediation of the direct association between social anxiety vulnerability and post-event negative thinking, it is important to acknowledge that this does not assert that negative expectancy is the only cognitive factor that may contribute to social anxiety-linked post-event negative thinking. Indeed, the results of correlation analyses demonstrated large degrees of unshared variance between the measured variables, and the size of the serial pathway effect within the serial mediation model was approximately one-third the size of the simple association between social anxiety and post-event negative thinking. Previous studies have shown other pre-event characteristics of social anxiety to be associated with post-event negative thinking, including rumination and threat appraisal (Kocovski & Rector, 2007; Penney & Abbott, 2015). It remains to be determined how pre-event negative expectancy relates with other pre-event cognitive or emotional processes in predicting social anxiety-linked post-event negative thinking.

In summary, the present study demonstrated that the association between social anxiety vulnerability and post-event negative thinking was statistically mediated by a serial mediation pathway, whereby social anxiety-linked elevation in pre-event negative expectancies predicted elevated state anxiety at the time of a social event, which in turn predicted elevated post-event negative thinking. These findings are consistent with the possibility that social anxiety-linked post-event negative thinking is in part a legacy of pre-event negative expectancies. It is hoped these findings will encourage research on the link between negative expectancies and other pre-event cognitive processes upon post-event negative thinking in social anxiety.

Repository

Materials, data, and analysis outputs described in this manuscript are available at https://osf.io/sghuj/

CRediT authorship contribution statement

Julian Basanovic: Project administration, Conceptualization, Investigation, Software, Writing – original draft, Methodology, Visualization, Writing – review & editing, Validation, Formal analysis, Data curation, Supervision. **Lily Kowal:** Conceptualization, Data curation, Methodology, Formal analysis, Writing – original draft, Validation, Formal analysis, Investigation, Data curation, Writing – review & editing, Visualization. **Sophie Millward:** Resources, Investigation, Conceptualization, Formal analysis, Investigation, Data curation, Writing – review & editing. **Colin MacLeod:** Conceptualization, Writing – original draft, Methodology, Supervision, Software, Resources, Funding acquisition, Methodology, Software, Resources, Writing – review & editing, Supervision, Project administration, Funding acquisition.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Materials, data, and analysis outputs described in this manuscript are available at https://osf.io/sghuj/

Acknowledgements

The research reported in this manuscript was supported in part by the Australian Research Council (Grant #: FL170100167). The authors would like to thank Livia Tomacelli for their helpful contribution to data collection.

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