Social Anxiety and Its Maintaining Factors: Accounting for the Role of Neuroticism

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Abstract

Models of social anxiety disorder (SAD) and research indicate several cognitive and behavioural maintaining factors that perpetuate social anxiety (i.e., maladaptive social-evaluative beliefs, self-focus, attention towards threat in environment, anticipatory processing, post-event processing, safety behaviours). It is unknown whether these maintaining factors are exclusive to social anxiety or if they are also related to neuroticism – a tendency to experience negative emotions. A community sample of adults ($N = 263$) completed measures of relevant constructs (social anxiety, neuroticism, depression, aforementioned maintaining factors). Structural equation modelling was used to analyse the cross-sectional data. In a good fitting model which included depression, social anxiety had unique positive associations with all maintaining factors. Neuroticism had unique positive associations with social-evaluative beliefs, self-focus, and post-event processing, but not with any of the other maintaining factors. This model also had superior fit compared to a plausible competing model which did not include neuroticism. Certain maintaining factors may not be exclusive to social anxiety, in contrast to how they are conceptualised in models of SAD. Furthermore, neuroticism may play a role in social anxiety, highlighting the potential of interventions for social anxiety to be advanced through greater incorporation of emotion regulation strategies for negative affect.

Keywords Social anxiety · Social anxiety disorder · Maintaining factor · Neuroticism · Emotion regulation

Social anxiety disorder (SAD) is a chronic and debilitating mental disorder characterised by significant anxiety in relation to social situations involving the potential for evaluation from other people (American Psychiatric Association, 2013; Wittchen & Fehm, 2003). Psychological models of SAD have highlighted a number of cognitive and behavioural maintaining factors which function to perpetuate social anxiety (e.g., Clark & Wells, 1995; Rapee & Heimberg, 1997; Wong & Rapee, 2016). However, within these psychological models, there is limited discussion of the role of personality dimensions. One personality trait that may be relevant to social anxiety is neuroticism, defined as a tendency to experience negative emotions and considered to be one of the five higher-order factors of personality (Goldberg, 1993). Given the potential of personality traits to influence psychopathology and its treatment (Bucher et al., 2019; Costache et al., 2020), further

examination of neuroticism in the context of social anxiety and its maintaining factors is warranted.

In a recent psychological model of SAD (Wong & Rapee, 2016), maintaining factors for social anxiety are conceptualised as cognitive and behavioural processes that detect and eliminate social-evaluative threat, but which ultimately result in the maintenance of the threat value of social-evaluative stimuli. This in turn maintains maladaptive social-evaluative beliefs and the experience of anxiety in social situations. Within the model, the cognitive and behavioural processes specified can occur before, during or after social situations. First, the cognitive processes developed to detect social-evaluative threat include those that occur during social situations, which involves the directing of attention towards oneself and to one's surrounds to scan for threat, referred to as self-focus and attention towards threat in the environment, respectively. Self-focused attention is maladaptive as it increases consciousness of internal threat cues (e.g., physiological responses; negative social-evaluative beliefs), whereas attention towards threat in the environment is maladaptive because one's social context is scanned for evidence that confirms negative evaluation (i.e.,

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threat). In addition, these processes are problematic because they reduce attentional resources available for adaptive task focus (e.g., focusing on what the other person is saying in a conversation). Second, the cognitive processes developed to detect social-evaluative threat also include those that occur before and after social situations, which involves a mental review of upcoming social situations or situations just experienced to scan for threat, referred to as anticipatory processing and post-event processing, respectively. Such mental reviews can involve negative mental imagery, recall of past social failures, and negative views of the self which exaggerate the perceived threat of upcoming social situations or situations just experienced. Third, behavioural processes developed to eliminate social-evaluative threat include those that are performed before or during social situations, referred to as safety behaviours. Safety behaviours aim to reduce the likelihood of the threat of negative evaluation from occurring (e.g., not talking during a conversation to prevent others judging what you say) but can ultimately result in increasing the likelihood of negative evaluation (e.g., not talking results in others thinking you are aloof and unfriendly).

A large body of research has shown positive associations between the aforementioned maintaining factors and social anxiety (maladaptive social-evaluative beliefs: e.g., Wong et al., 2021; self-focus and attention towards threat in the environment: e.g., Schultz & Heimberg, 2008; anticipatory processing: e.g., Mills et al., 2013; post-event processing: e.g., Brozovich & Heimberg, 2008; safety behaviours: e.g., Cuming et al., 2009). Although theory and empirical research have underscored the importance of the maintaining factors in social anxiety, it is not clear if these maintaining factors are uniquely related to social anxiety. This is particularly the case given evidence that social anxiety is associated with other negative emotional states.

At the disorder level, SAD typically co-occurs with other mental disorders, most commonly other anxiety disorders and depressive disorders (Crome et al., 2015; Ruscio et al., 2008; Stein et al., 2017). Notably, 30–50% of individuals with SAD also have a depressive disorder (e.g., Andrews et al., 2018). The co-occurrence of SAD and depression is significant, reflected in models developed to account for the symptom overlap and diagnostic comorbidity between anxiety and depression (e.g., tripartite model; Clark & Watson, 1991). Interestingly, there is also research showing that SAD is associated with other negative emotional states such as anger (e.g., Erwin et al., 2003) and shame (e.g., Swee et al., 2021).

One way to conceptualise these various negative emotional states and capture them in a unified fashion is with the personality trait of neuroticism. Research has shown that neuroticism is elevated in internalising disorders (Kotov et al., 2007) and is associated with greater risk of mental disorders (e.g., Kendler & Myers, 2010). A number of studies have demonstrated that

neuroticism has positive cross-sectional associations with SAD as a diagnostic entity and with social anxiety as a continuous variable (e.g., Allan et al., 2017; Bienvenu et al., 2004; Costache et al., 2020; Levinson et al., 2011; Newby et al., 2017; Park & Naragon-Gainey, 2020). This raises the possibility that neuroticism may also have a link with the maintaining factors of social anxiety. However, no study to date has examined this possibility.

Further supporting the potential for associations between neuroticism and the maintaining factors of social anxiety, neuroticism while mainly characterised as elevated negative emotionality has also been described as involving heightened self-consciousness (e.g., McCrae & Costa, 2010). This aspect of neuroticism may prompt those maintaining factors of social anxiety which involve attention directed to the self, such as maladaptive social-evaluative beliefs, self-focus, anticipatory processing, and post-event processing (see Wong & Rapee, 2016). In addition, studies have shown that neuroticism has positive cross-sectional associations with cognitive and behavioural processes similar to the maintaining factors of social anxiety. For example, neuroticism is positively associated with rumination (e.g., Hervas & Vazquez, 2011), a repetitive thinking process similar to anticipatory processing and post-event processing. Neuroticism is also positively associated with behavioural and experiential avoidance (Lommen et al., 2010; Naragon-Gainey & Watson, 2018), which have overlaps with safety behaviours in the context of social anxiety.

Considering the aforementioned theory and research on the maintaining factors of social anxiety, the link between social anxiety and depression, and the link between social anxiety and neuroticism, this study used a community sample and a structural equation modelling framework to examine a model of social anxiety, depression, and neuroticism, and whether in this context social anxiety *and* neuroticism would each have unique associations with the maintaining factors of social anxiety. A community sample was used to allow analysis of individuals with a range of social anxiety levels. Based on previous literature (e.g., McCrae & Costa, 2010; Naragon-Gainey & Watson, 2018; Wong & Rapee, 2016), we hypothesised that while taking into account depression, both social anxiety and neuroticism would have unique positive associations with each of the maintaining factors (i.e., maladaptive social-evaluative beliefs, self-focus, attention towards threat in the environment, anticipatory processing, post-event processing, safety behaviours; see Fig. 1).

Method

Participants

There were 263 adult participants recruited from the Sydney community using social media platforms (e.g., Facebook and Instagram), word-of-mouth, and a university-based research

Fig. 1 Proposed relationships between social anxiety, neuroticism, depression, and the maintaining factors of social anxiety. Double headed arrows reflect expected correlations and single headed arrows reflect expected directional paths. Correlations between the maintaining factors of social anxiety are also expected but are not shown for clarity
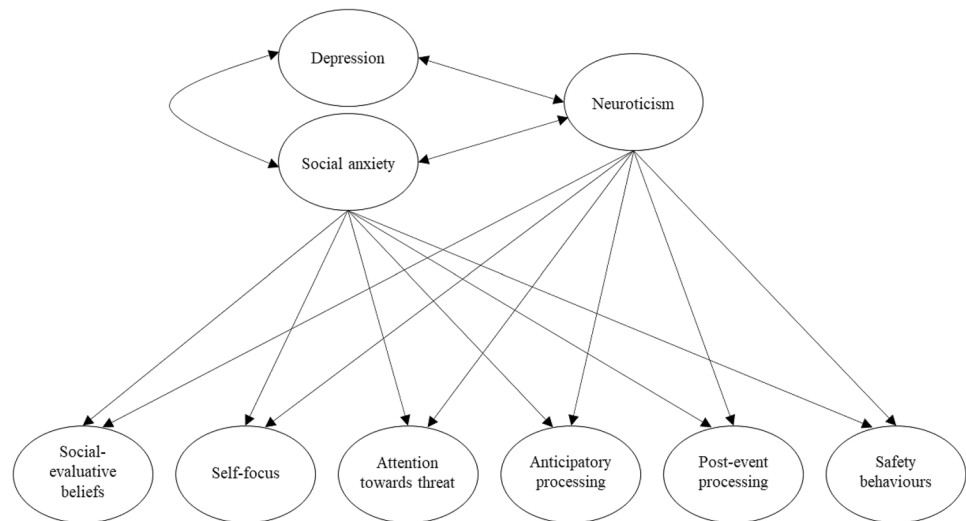
participant recruitment platform. Table 1 shows the demographic and symptom levels of the sample. Participants were entered into a draw to win one of three AU$50 vouchers or, if they were eligible, course credit for their participation. There were no exclusion criteria.

Sample size was determined based on a series of Monte Carlo simulations using the R package simsem (Pornprasertmanit et al., 2021). This method involves drawing many samples (i.e., replications) from a hypothesized population model and power for a given parameter is the proportion of the samples for which the null hypothesis (i.e., parameter=0) is rejected at the .05 level (Muthén & Muthén, 2002). As no similar previous study exists, based on our hypothesised model shown in Fig. 1, we decided for the hypothesised paths from social anxiety and neuroticism to the maintaining factors that medium effect sizes (0.3) would be meaningful to detect. We also set plausible values for the other parameters of the population model (e.g., factor loadings set at 0.75, correlation between social anxiety and neuroticism set at 0.5; see Newby et al., 2017; Park & Naragon-Gainey, 2020). A final simulation with 1000 replications and alpha=.05 indicated a minimum sample size of 255 would have power>0.8 to detect medium paths from social anxiety and neuroticism to the maintaining factors. Our actual sample size of 263 exceeded this minimum.

Measures

Social Interaction Anxiety Scale – Straightforward Items (SIAS-S) and Social Phobia Scale (SPS)

The 17-item SIAS-S and 20-item SPS are companion measures that assess fears in relation to social interactions and while being observed in daily activities or social performance, respectively (Mattick & Clarke,

1998; Rodebaugh et al., 2006). Participants rate SIAS and SPS items on a 5-point Likert scale from 0 (Not at all characteristic or true of me) to 4 (Extremely true or characteristic of me), with higher total scores indicating greater social fears. The SIAS-S and SPS have good reliability (see Table 1) and validity (Mattick & Clarke, 1998; Rodebaugh et al., 2006).

Eysenck Personality Questionnaire Revised–short Form – Neuroticism subscale (EPQR–S–N)

The 12-item EPQR–S–N assesses one's disposition to neuroticism (Eysenck et al., 1985; Sato, 2005). Following Sato's (2005) recommendations, participants rate EPQR–S–N items on a 5-point Likert scale from 1 (Not at all) to 5 (Extremely), with higher total scores indicating greater neuroticism. The EPQR–S–N has good reliability (see Table 1) and validity (Sato, 2005).

Depression Anxiety Stress Scales 21-item Short Version – Depression Subscale (DASS-D)

The 7-item DASS-D assesses levels of depression over the preceding week (Lovibond & Lovibond, 1995). Participants rate DASS-D items on a 4-point Likert scale from 0 (Did not apply to me at all) to 3 (Applied to me very much, or most of the time), with higher total scores indicating greater depression levels. Following Lovibond and Lovibond (1995), the DASS-D score was doubled to obtain the full DASS score equivalent. The DASS depression subscale has good internal consistency (see Table 1) and validity (Antony et al., 1998).

Table 1 Descriptive statistics for demographics and main variables

Variable	Sample (N=263)	Possible minimum to maximum	Actual minimum to maximum	Cronbach's α	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Age in years, M (SD)	25.54 (9.83)	-	-	-															
Sex (female), n (%)	197 (74.9%)	-	-	-															
Country of birth (Australia), n (%)	197 (74.9%)	-	-	-															
Highest qualification (completed post-school qualification), n (%)	117 (44.5%)	-	-	-															
Currently studying (yes), n (%)	208 (79.1%)	-	-	-															
Employment (employed), n (%)	200 (76.0%)	-	-	-															
1. SIAS-S, M (SD)	28.96 (17.70)	0–68	0–66	.96	-														
2. SPS, M (SD)	27.13 (20.28)	0–80	0–80	.96	.85	-													
3. EPQR-S-N, M (SD)	35.07 (11.51)	12–60	12–60	.94	.79	.79	-												
4. DASS-D, M (SD)	12.46 (10.96)	0–42	0–42	.93	.63	.67	.70	-											
5. SBSA-T HSB, M (SD)	19.07 (11.30)	0–40	0–40	.89	.66	.62	.66	.53	-										
6. SBSA-T CB, M (SD)	28.28 (19.68)	0–70	0–70	.95	.77	.71	.73	.64	.88	-									
7. SBSA-T UB, M (SD)	14.80 (10.88)	0–40	0–40	.91	.78	.71	.74	.66	.74	.86	-								
8. AFQ-T SF, M (SD)	12.19 (8.54)	0–36	0–36	.91	.74	.78	.76	.61	.60	.70	.70	-							
9. AFQ-T ATT, M (SD)	10.25 (5.71)	0–20	0–20	.92	.78	.73	.72	.55	.75	.74	.68	.76	-						
10. APQ-T, M (SD)	4.96 (2.63)	0–10	0–10	.97	.76	.79	.77	.55	.62	.70	.70	.72	.72	-					
11. EPEPQ15-T CI, M (SD)	5.11 (2.77)	0–10	0–10	.96	.75	.74	.76	.59	.62	.68	.69	.74	.76	.82	-				
12. EPEPQ15-T NS, M (SD)	5.20 (3.04)	0–10	0–10	.94	.76	.72	.76	.59	.64	.72	.74	.73	.75	.82	.89	-			
13. EPEPQ15-T TAP, M (SD)	4.74 (2.77)	0–10	0–10	.89	.76	.78	.78	.59	.62	.70	.71	.78	.74	.83	.91	.90	-		
14. SAFE IRB, M (SD)	28.63 (10.44)	11–55	11–53	.92	.83	.79	.70	.55	.52	.66	.65	.68	.66	.73	.66	.67	.68	-	
15. SAFE AB, M (SD)	34.82 (12.82)	15–75	15–73	.92	.78	.82	.77	.59	.63	.69	.66	.74	.71	.78	.71	.70	.74	.81	-
16. SAFE MPS, M (SD)	11.53 (5.65)	6–30	6–28	.86	.56	.63	.58	.50	.42	.49	.49	.57	.45	.57	.54	.49	.59	.60	.73

All correlations are significant at the < .001 level

SIAS-S Social Interaction Anxiety Scale – Straightforward items, *SPS* Social Phobia Scale, *EPQR-S-N* Eysenck Personality Questionnaire Revised–Short Form – Neuroticism subscale, *DASS-D* Depression Anxiety Stress Scales – Depression subscale, *SBSA-T HSB* Self-Belief related to Social Anxiety – Trait version – High Standard Beliefs, *SBSA-T CB* Self-Belief related to Social Anxiety – Trait version – Conditional Beliefs, *SBSA-T UB* Self-Belief related to Social Anxiety – Trait version – Unconditional Beliefs, *AFQ-T SF* Attentional Focus Questionnaire–Trait version – Self-Focus, *AFQ-T ATT* Attentional Focus Questionnaire–Trait version – Attention Towards Threat in Environment, *APQ-T* Anticipatory Processing Questionnaire–Trait version, *EPEPQ15-T CI* Extended Post-Event Processing Questionnaire – 15 item Trait version – Cognitive Interference, *EPEPQ15-T NS* Extended Post-Event Processing Questionnaire – 15 item Trait version – Negative Self, *EPEPQ15-T TAP* Extended Post-Event Processing Questionnaire – 15 item Trait version – Thoughts About the Past, *SAFE IRB* Subtle Avoidance Frequency Examination–Inhibiting/Restricting Behaviours, *SAFE AB* Subtle Avoidance Frequency Examination – Active Behaviours, *SAFE MPS* Subtle Avoidance Frequency Examination – Management of Physical Symptoms

Self-Belief Related to Social Anxiety (SBSA) Scale – Trait Version

The 15-item SBSA assesses maladaptive social-evaluative beliefs and has three subscales: a 4-item high standard beliefs subscale, a 7-item conditional beliefs subscale, and a 4-item unconditional beliefs subscale (Wong et al., 2014). Instructions were modified for the current study to assess an individual's agreement with the beliefs typically in relation to social situations. Participants rate SBSA items on an 11-point Likert scale from 0 (Do not agree to all) to 10 (Strongly agree), with higher total scores indicating stronger maladaptive social-evaluative beliefs. The SBSA has good reliability (see Table 1) and validity (Wong et al., 2014, 2021).

Attentional Focus Questionnaire–trait Version (AFQ-T)

The original 24-item AFQ (Rapee & Abbott, 2007) assesses attentional focus during a speech task and has two subscales that collectively measure self-focus (4-item attention to past experiences subscale, 5-item attention to physical symptoms subscale) as well as a subscale that measures attention towards threat in the environment (5-item attention to negative evaluation subscale). Instructions and items were modified for the current study to assess an individual's general tendency to engage in these two forms of attentional focus (i.e., participants asked to rate AFQ-T items based on what they typically focus on during a social situation; example item modification: "I was focusing on my heartbeat" was modified to "I typically focus on my heartbeat."). Participants rated AFQ-T items on a 5-point Likert scale from 0 (Not at all) to 4 (Extremely), with higher total scores indicating greater self-focus or attention towards threat in the environment. The original AFQ has good psychometric properties (Rapee & Abbott, 2007) and preliminary evidence suggests that the AFQ-T has good reliability (see Table 1).

Anticipatory Processing Questionnaire–trait Version (APQ-T)

The original 15-item APQ (Vassilopoulos, 2004) assesses anticipatory processing in relation to a specific social situation. Instructions and items were modified for the current study to assess an individual's general tendency to engage in anticipatory processing (i.e., participants asked to rate APQ-T items based on how they typically are before a social situation; example item modification: "Did you try to stop thinking about the event?" was modified to "Before a social situation, do you typically try to stop thinking about the situation?"). Participants rated APQ-T items on an 11-point Likert scale from 0 (Not at all) to 10 (Very much so), with higher scores (average of items) indicating greater anticipatory processing. The original APQ has good psychometric properties (Vassilopoulos, 2004) and preliminary evidence suggests that the APQ-T has good reliability (see Table 1).

Extended Post-event Processing Questionnaire – 15 Item Trait Version (EPEPQ15-T)

The original EPEPQ15 (Wong, 2015) assesses post-event processing in relation to a specific social situation and has three subscales: a 7-item cognitive interference subscale, a 4-item negative self subscale, and a 4-item thoughts about the past subscale. Instructions and items were modified for the current study to assess an individual's general tendency to engage in post-event processing (i.e., participants asked to rate EPEPQ15-T items based on how they typically are after a social situation; example item modification: "After the event was over, did you think about it a lot?" was modified to "After a social situation is over, do you typically think about the situation a lot?"). Participants rated EPEPQ15-T items on an 11-point Likert scale from 0 (Not at all) to 10 (Very much so), with higher scores (average of items) indicating greater post-event processing. The original EPEPQ15 has good psychometric properties (Wong, 2015) and preliminary evidence suggests that the EPEPQ15-T has good reliability (see Table 1).

Subtle Avoidance Frequency Examination (SAFE)

The 32-item SAFE assesses an individual's utilisation of safety behaviours in relation to social situations and has three subscales: a 11-item inhibiting/restricting behaviours subscale, a 15-item active behaviours subscale, and a 6-item management of physical symptoms subscale (Cuming et al., 2009). Participants rate SAFE items on a 5-point Likert scale from 1 (Never) to 5 (Always), with higher total scores indicating higher levels of engagement in safety behaviours. The SAFE has good reliability (see Table 1) and validity (Cuming et al., 2009).

Procedure

This study was approved by the Western Sydney University Human Research Ethics Committee (H13683). After providing informed consent, participants completed an online demographics questionnaire and then online versions of all study measures (along with other online questionnaires for other studies) presented in a randomised order. This was done while in the presence of a researcher who was on Zoom to maximise data quality.

Statistical Analyses

The R package "lavaan" (Rosseel, 2012) was used for the main analyses, which proceeded in two steps: (a) confirmatory factor analysis (CFA) was used to examine the fit of a measurement model for the latent variables of interest, and (b) this measurement model was entered into a structural equation model (SEM) to examine the relationships between the latent variables. In the first step, where possible we used the subscales of a measure (e.g., subscales of SAFE) or measures assessing an aspect of a construct (e.g., SIAS-S and SPS measuring facets of social anxiety) as indicators of latent variables (cf. Bagozzi & Heatherton, 1994). This was done because we were interested in the constructs broadly defined (as opposed to the specific underlying dimensions), and this also reduced overall model complexity of the SEM in the second step. Where this was not possible (e.g., scale has no subscales), items were used as indicators of latent variables. The latent constructs with indicator variables in parentheses were as follows: social anxiety (SIAS-S and SPS), neuroticism (EPQR-S–N items), depression (DASS-D items), social-evaluative beliefs (SBSA subscales), self-focus (attention to past experiences subscale and attention to physical symptoms subscale of the AFQ-T), attention towards threat in the environment (items of the attention to negative evaluation subscale of the AFQ-T), anticipatory processing (APQ-T items), post-event processing (EPEPQ15-T subscales), and safety behaviour (SAFE subscales). For the second step, relationships between latent variables were specified according to previous theory and research (e.g., McCrae & Costa, 2010; Naragon-Gainey & Watson, 2018; Wong & Rapee, 2016). Thus, social anxiety, neuroticism, and depression were expected to be correlated, and both social anxiety and neuroticism were expected to have regression paths to the maintaining factors. Correlations between social anxiety maintaining factors were also allowed (see also Fig. 1).

All CFAs were conducted using maximum likelihood estimation with robust (Huber-White) standard errors (MLR estimator). This estimator was chosen: (a) to guard against indicator non-normality, and (b) because of the need to treat all indicators as continuous given that subscales were used as indicators for certain latent variables. Notably, there was a small proportion of missing data (see Results) and the MLR estimator can use available data to estimate model parameters if missing values are missing at random (MAR) or missing completely at random (MCAR).

To evaluate model fit, the following fit indices were used (Brown, 2006): the χ^2 statistic (smaller values indicate better fit), the comparative fit index (CFI; $\geq$ .90 suggest acceptable fit; $\geq$ .95 suggest good fit), the Tucker-Lewis Index (TLI; $\geq$ .90 suggest acceptable fit; $\geq$ .95 suggest good fit), the root mean square error of approximation (RMSEA; $\leq$ .08 suggest acceptable fit; $\leq$ .05 suggest good fit), and the standardised root mean square residual (SRMR; $\leq$ .08 suggest acceptable fit; $\leq$ .05 suggest good fit).

Results

Preliminary Analyses

Scale means and correlations are shown in Table 1. All indicators had acceptable levels of skew (all absolute skewness < 3) and kurtosis (all absolute kurtosis < 8; Kline, 2011). A range of scores on all the measures was observed, covering the full scale or close to the full scale (see Table 1), as was expected given the community sample. At the item level, there were 238 missing data-points out of 38,661 possible (99.38%). At the indicator level, there were 72 missing data-points out of 12,624 possible (99.43% completion rate). Little's Missing Completely at Random (MCAR) test was not significant at the indicator level, $\chi^2(120) = 99.31$, $p = .916$, indicating the missing data were MCAR. Analyses proceeded with the full sample ($N = 263$).

Measurement Model

The CFI and TLI indicated the measurement model did not have an acceptable fit with the data, whereas the RMSEA and SRMR indicated acceptable fit, $\chi^2(1238) = 2732.89$, CFI = .889, TLI = .881, RMSEA = .071, SRMR = .055. Thus, modification indices were examined. A number of modification indices suggested correlated errors between certain APQ-T items, certain EPQR-S–N items, and certain AFQ-T items. We decided that it would be justifiable to have correlated errors for item pairs within the same scale which had similar wording (see Brown, 2006). Based on modification indices, correlated errors were added for 8 APQ-T item pairs (e.g., items of one item pair both referenced avoidance), 3 EPQR-S–N item pairs (e.g., items of one item pair both referenced worry), and 1 AFQ-T item pair (items of item pair both referenced other person). This modified measurement model had acceptable fit on all indices, $\chi^2(1226) = 2476.11$, CFI = .908, TLI = .900, RMSEA = .065, SRMR = .054. Across all factors, standardised factor loadings ranged from .67 to .98 (all ps < .001), suggesting all indicators were satisfactory markers of their hypothesised construct.

Structural Model

All fit indices suggested that the structural model had acceptable fit with the data, $\chi^2(1232) = 2495.14$, CFI = .907, TLI = .900, RMSEA = .065, SRMR = .055. Figure 2 shows the standardised estimates of the model. The correlations
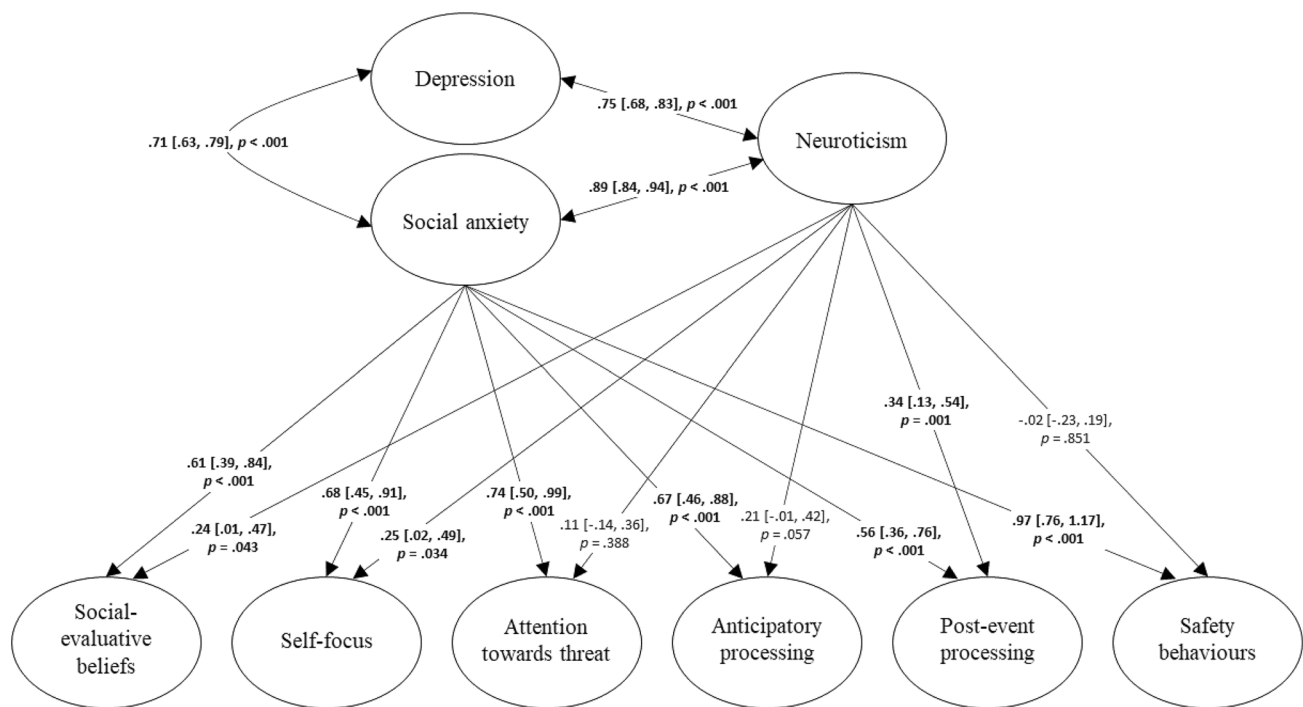
Fig. 2 Relationships between latent variables representing social anxiety, neuroticism, depression, and the maintaining factors of social anxiety. Standardised estimates, 95% confidence intervals in brackets, and *p*-values are shown. Significant relationships are bolded. Double headed arrows reflect correlations and single headed arrows reflect directional paths. Error terms of certain indicator variables were allowed to correlate (see main text) and correlations between social anxiety maintaining factors were allowed. However, for clarity, only estimates for paths of interest are reported. Full model estimates may be requested from the authors

between social anxiety, depression, and neuroticism were large and significant, ranging from .71 to .89 (all *p*s < .001). Social anxiety had medium to large significant paths to each of the maintaining factors, ranging from .56 to .97 (all *p*s < .001). Neuroticism had small significant paths to social-evaluative beliefs, self-focus, and post-event processing, ranging from .24 to .34 (all *p*s < .043). Neuroticism had non-significant paths to attention towards threat in the environment, anticipatory processing, and safety behaviours ranging from –.02 to .21 (all *p*s > .057).

Exploratory Analysis: Competing Model

A plausible competing structural model was examined. The previous structural model was modified such that neuroticism was removed. Social anxiety and depression were still expected to be correlated, and social anxiety was expected to have regression paths to the maintaining factors. Correlations between social anxiety maintaining factors were again allowed. This model reflected the typical variables examined in relation to social anxiety (i.e., neuroticism is not typically taken into account). This model without neuroticism only had the RMSEA indicating acceptable model fit, $\chi^2(1240) = 2841.94$, CFI = .882, TLI = .873, RMSEA = .073, SRMR = .300. Hence, the original structural model with

neuroticism had superior fit indices. A scaled χ^2 difference test based on Satorra and Bentler (2010) was also used to compare the difference in fit between the original structural model with neuroticism and the plausible competing structural model without neuroticism (see also Rosseel et al., 2020, for the lavTestLRT function). Relative to the plausible competing structural model without neuroticism, the original structural model with neuroticism had significantly better fit based on the scaled χ^2 difference test, $\chi^2(8) = 214.43$, *p* < .001.

Discussion

The current study examined whether social anxiety and neuroticism each had unique positive associations with the maintaining factors of social anxiety while taking depression into account. Consistent with predictions, a model reflecting these associations had acceptable fit with the data and indicated that social anxiety had large significant unique positive associations with all maintaining factors. In addition, partially consistent with predictions, this model showed neuroticism had small significant positive unique associations with social-evaluative beliefs, self-focus, and post-event processing, but non-significant associations with attention towards threat in the environment, anticipatory processing,

and safety behaviours. An exploratory analysis also showed that a plausible competing model which was the original tested model but with neuroticism removed had worse fit indices and significantly worse fit based on a scaled χ^2 difference test relative to the original model.

The finding of large significant unique positive associations between social anxiety and its maintaining factors is consistent with theory (e.g., Clark & Wells, 1995) and the large body of existing literature showing the same pattern of results (Brozovich & Heimberg, 2008; Cuming et al., 2009; Mills et al., 2013; Schultz & Heimberg, 2008; Wong et al., 2021). The findings of small significant positive unique associations between neuroticism and social-evaluative beliefs, self-focus, and post-event processing, but not attention towards threat in the environment, anticipatory processing, and safety behaviours, are novel. These results extend previous research (e.g., McCrae & Costa, 2010; Naragon-Gainey & Watson, 2018) which has suggested but never explicitly tested neuroticism's potential unique associations with the maintaining factors of social anxiety.

The obtained unique relationships between neuroticism and certain maintaining factors but not others deserve explanation. One possibility is that relative to the other maintaining factors, social-evaluative beliefs, self-focus, and post-event processing may involve a greater degree of self-consciousness. Given the conceptualisation of neuroticism as involving heightened self-consciousness (McCrae & Costa, 2010), it may thus be the case that individuals with higher levels of neuroticism have a greater tendency to specifically experience social-evaluative beliefs, self-focus, and post-event processing. Another potential explanation is that social-evaluative beliefs, self-focus, and post-event processing involve a higher level of negative affect compared to the other maintaining factors. Individuals with higher levels of neuroticism may therefore have a predisposition to experience these specific maintaining factors involving greater negative affect. Future research will need to further investigate these potential explanations.

The results of this study have several important implications. First, the results suggest certain maintaining factors of social anxiety may not be exclusively related to social anxiety. This contrasts with prominent theoretical models of SAD (e.g., Clark & Wells, 1995) which describe the maintaining factors specifically in relation to social anxiety. However, if this study's results are replicated, in particular with a clinical sample of individuals with SAD, then further research will be needed to determine the exact nature of the relationship between neuroticism and the maintaining factors related to it. Indeed, models of SAD may need to be expanded to include the role that neuroticism plays in relation to social anxiety and its maintaining factors. Second, the results of this study raise the possibility that neuroticism may impact on the treatment of social anxiety. If further research

supports the causal role of neuroticism in this context, then neuroticism will need to be considered as part of the assessment of individuals seeking treatment for social anxiety, and existing gold-standard cognitive behavioural therapies for social anxiety (e.g., Clark et al., 2006; Rapee et al., 2009) may be advanced by incorporating further strategies targeting neuroticism where it is indicated. For example, a greater focus on the practice of cognitive restructuring to encourage cognitive reappraisal for emotion regulation purposes with application to anxiety and other negative affective states may be helpful in this regard (e.g., Dryman & Heimberg, 2018). Elements of emotion regulation therapy (e.g., Mennin et al., 2015) may also be relevant.

The current study has some limitations. First, this study was cross-sectional and causality cannot be inferred. Future research could evaluate the potential causal or temporal relationships between neuroticism and the maintaining factors by conducting studies with experimental or prospective longitudinal designs. As examples, experimental studies could induce negative emotionality and examine the effects on the maintaining factors as dependent variables, and prospective longitudinal studies could examine whether neuroticism can predict future maintaining factor levels. Second, this study examined a community sample. Although this sample allowed inclusion of individuals with a range of values on variables of interest which allowed this initial study to avoid restriction of range issues, future research should nonetheless replicate this study utilising a clinical sample with SAD as a next step. Third, the majority of participants in our sample were female and were highly educated, limiting generalisability. Future research should replicate the current study in more diverse samples and examine whether certain sample characteristics affect results. Fourth, the current study used modified trait versions of existing measures in the literature. Although these modified trait versions showed promising psychometrics in the current study (e.g., good reliability), further psychometric evaluation of these trait measures is warranted. Fifth, the current study used a specific measure of neuroticism, despite other measures of this construct in the literature (e.g., NEO Personality Inventory-Revised Neuroticism Subscale; Costa & McCrae, 1992). Although the EPQR-S–N is a reliable and valid measure of neuroticism, future research may consider replicating the current study with other measures of neuroticism. Finally, the initial measurement model in this study was modified based on modification indices which could have capitalised on chance characteristics in the sample analysed. However, the modifications enabled a sound measurement model before examination of the main structural model.

Overall, this study showed that when social anxiety, neuroticism, and depression are modelled together, social

anxiety has unique positive associations with its maintaining factors, and neuroticism additionally has unique positive associations with social-evaluative beliefs, self-focus, and post-event processing. These results suggest that neuroticism may play a role in the context of social anxiety, and raise the interesting potential of existing interventions for social anxiety to be advanced through greater incorporation of emotion regulation strategies.

Declarations

Consent to Participate Informed consent was obtained from all individual participants included in the study.

Competing Interests Caitlin A. Clague and Quincy J. J. Wong declare that there is no competing interests.

Experiment Participants This study was approved by the Western Sydney University Human Research Ethics Committee (H13683).

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