Repetitive Negative Thinking in Social Anxiety Disorder 2: Post-Event Processing

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Abstract

Cognitive models of social anxiety disorder (SAD) emphasize post-event processing as a prominent maintaining factor that occurs after social-evaluative events. Post-event processing involves repetitive negative thinking revolved around perceived social failure. The present review concentrates on the relevant and available empirical literature on post-event processing in social anxiety which centres on Clarke and Wells (1995) theoretical framework. Correlational and experimental studies have investigated the relationship between post-event processing and the behavioural, physiological, cognitive and affective outcomes for socially anxious individuals. The majority of study designs include those investigating post-event processing in response to social-evaluative threat, and in response to treatment. Limitations of the existing literature are discussed and suggestions for future research examining the underlying cognitive functions of post-event processing are proposed.

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Keywords: Social Anxiety Disorder, Social Phobia, Repetitive Negative Thinking, Rumination, Post-Event Processing, Attentional Control.

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Received 11-Jan-2016; received in revised form 03-Aug-2016; accepted 05-Aug-2016

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Introduction

This review focuses on the empirical literature which centres on Clark and Wells' (1995) theoretical framework of the cognitive maintaining factors of social anxiety. This review extends previous work in the area by outlining the cognitive mechanisms thought to be responsible for this perseverative mode of thought. As a more detailed description of repetitive negative thinking (RNT) has been outlined in the first paper of this two-part review (Sluis, Boschen, Neumann, & Murphy, *In press*), the construct of RNT will only be briefly touched upon in this article. The review will focus on the relevant literature on post-event processing in social anxiety. Two renowned cognitive models of social anxiety will be outlined (Clark & Wells, 1995; Rapee & Heimberg, 1997), followed by a theoretical explanation regarding attentional control. Limitations of prior research in the area are noted and suggestions for future research within the social anxiety field are presented.

Procedure for Systematic Review

One of the largest databases of English-language psychological/psychiatric literature, PsycINFO, was used for the search in June 2016. The number of articles published regarding social anxiety and post-event processing was estimated by using the search terms "SOCIAL ANXIETY" and "POST-EVENT PROCESSING". A total of 66 articles were retrieved that were then examined for relevance of which 43 articles were included. Inclusion criteria comprised: only articles specifically investigating post-event processing within the context of social anxiety; use of an adult population; and no comorbid effects of substance use on post-event processing. Any articles retrieved that investigated anticipatory processing in social anxiety were not included as these were comprehensively reviewed in the first paper of this two-part review. The references section of each article retrieved was also examined to locate other related articles that were not located in the original search. This yielded a total of 17 articles which met the inclusion criteria.

Repetitive Negative Thinking

RNT can be described as a maladaptive, repetitive, and perseverative pattern of thinking, which is negatively valenced and perceived to be intrusive or unwanted (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008; Rachman, 1981). Such thinking is typically observed across a range of psychopathologies, including depression and anxiety (American Psychiatric Association, 2013), and is believed to consume cognitive resources that limits availability for the effective operation of other cognitive functions (Linville, 1996).

While RNT is considered a transdiagnostic process that is characteristic of various psychopathologies (Harvey, Watkins, Mansell, & Shafran, 2004), there appear to be functional differences between these modes of thought for different disorders. For example, differences in valence (i.e., positive versus negative content), temporal orientation (i.e., past, present, or future), and discrepancy (i.e., an incomplete versus a completed task) can be used to specify different modes of RNT (Martin & Tesser, 1996). Depressive rumination, has been described as "behaviour and thoughts that focus one's attention on one's depressive symptoms and on the implications of these symptoms" (Nolen-Hoeksema, 1991, p. 569) and is primarily a feature of major depression (Nolen-Hoeksema, 1991; Nolen-Hoeksema, 2000). Post-event processing occurs when a person with social phobia leaves a social event and experiences RNT centred on perceived social failure (Clark & Wells, 1995). While both depressive rumination and post-event processing are overlapping constructs (McEvoy, Mahoney, & Moulds, 2010), slight differences regarding

content and unattained goals ruminated about vary. For example, depressed patients tend to ruminate on their depressive symptoms and consequences (Nolen-Hoeksema, 1991), while individuals with social anxiety disorder (SAD) focus on rumination related to perceived social failure (Clark & Wells, 1995).

Cognitive-Behavioural Models of Social Anxiety

Given that SAD is one of the most prevalent lifetime disorders (Kessler et al., 2005), identifying the processes implicated in the maintenance of social anxiety is important. Two of the most prominent cognitive-behavioural models of social anxiety provide useful frameworks for understanding the role of post-event processing in social anxiety (Clark & Wells, 1995; Rapee & Heimberg, 1997). Both models are similar in that they propose that individuals with social anxiety engage in post-event processing following social-evaluative events. A more detailed account of these models has been given previously (Sluis et al., *In press*), consequently this section will review mainly post-event processing.

Rapee and Heimberg (1997) suggest that the processes maintaining social anxiety are the same regardless of whether a social-evaluative situation is encountered, anticipated, or retrospectively brooded over. However, they do not explicitly emphasise post-event processing as a distinct and important maintaining factor of social anxiety. In contrast, Clark and Wells (1995) specifically note the significance of post-event processing after leaving a social-evaluative situation and describe this as a unique maintaining factor for socially anxious individuals. Due to their explicit account of post-event processing, much of the literature has employed the Clark and Wells (1995) model. Thus, the following review focuses on post-event processing and how it relates to this model.

Post-Event Processing and Social Anxiety

Tables 1 and 2 provide a detailed description of the study details, measures used, and a summary of findings for each study included in this review. The effects of post-event processing in social anxiety are better understood than anticipatory processing given the larger literature base on the former (Sluis et al., *In press*; see Table 1). The first measure of post-event processing (PEPQ; Post-Event Processing Questionnaire) was developed by Rachman, Grüter-Andrew, and Shafran (2000). The authors employed an analogue sample of 130 high and low socially anxious undergraduates to develop the 13-item measure that assesses the intensity and frequency of engaging in post-event processing following a social-evaluative situation. They found that socially anxious individuals reported higher levels of post-event processing on the PEPQ than low socially anxious individuals. The authors also conducted a principal components analysis and found that all items except three loaded significantly on one factor, accounting for 42.8% of the variance. Moreover, post-event processing in high socially anxious individuals was positively associated with: (1) more frequent recall of negative events; (2) avoidance of similar social situations; and (3) memories rated as intrusive and interfering.

In an attempt to replicate and extend the findings of Rachman et al. (2000), McEvoy and Kingsep (2006) employed a clinical sample of 117 participants with a primary diagnosis of social phobia. These authors replicated the single factor solution of Rachman et al. (2000) with the exception of one item, demonstrating the robustness of the factor structure across different samples. Interestingly, they found that the PEPQ was not significantly correlated with measures of performance or social interaction anxiety, but it was independently and strongly related to state anxiety (after controlling for depression, trait anxiety and stress; $r = .26$). While the authors suggest that post-event processing may be a function of situational, transient anxiety in general rather than being specific to social anxiety, the state anxiety experienced by this sample was observed within a social context. The PEPQ has also shown good psychometric properties in a German version of the PEPQ (Fehm, Hoyer, Schneider, Lindemann, & Klusmann, 2008) and has since been further developed into the Extended Post-Event Processing Questionnaire (E-PEPQ; Wong, 2015). A 15-item version of the E-PEPQ demonstrated good internal consistency and two of its three subscales had significantly stronger positive associations with social anxiety than with depression (Wong, 2015).

Researchers have also begun to explore the characteristics and stability of post-event processing in the context of social anxiety. Correlational evidence suggests that social situations elicit significantly more post-event processing than do non-social phobic situations (Fehm, Schneider, & Hoyer, 2007). Kocovski and Rector (2007) recruited a sample of 439 college students who completed a number of anxiety and post-event processing self-report

questionnaires (see Table 1 for measures). They found that higher levels of social anxiety (measured by the Social Phobia Scale [SPS]; Mattick & Clark, 1998) and trait anxious rumination were associated with higher levels of post-event processing in relation to a social event ($\beta = 0.15$). Furthermore, social anxiety and trait anxious rumination accounted for approximately 25% of the variance in post-event processing (Kocovski & Rector, 2007). Thus, emphasizing the relevance of the post-event processing construct for models of social anxiety (Clark & Wells, 1995; Rapee & Heimberg, 1997). Employing a more ecologically valid methodology, Lundh and Sperling (2002) employed a sample of 62 undergraduate students who were required to recall a social anxiety provoking event and use a diary method to record their thoughts while they engaged in post-event processing. Findings showed that social anxiety was significantly associated with the degree of post-event processing after a negative-evaluational event ($r = .51$), and that post-event processing was highly stable over two consecutive days ($r = .75$). However, it should be noted that only one measure of social anxiety was used (SPS; Mattick & Clark, 1998) which may not entirely capture each dimension of social anxiety. Furthermore, it is possible that the diary method recording itself may have facilitated more frequent and intense post-event processing than otherwise may have been experienced. Similarly, Campbell, Bierman, and Molenaar (2016) employed a sample of 10 new undergraduate students starting their first semester at university to investigate how day-to-day processes of social anxiety influenced future social anxiety and social withdrawal. Participants were required to complete brief online daily diaries throughout the 13 weeks of their first semester by outlining salient anxiety-provoking social interactions and completing several brief measures. They found that for most individuals, same-day fear of negative evaluation was associated with maladaptive post-event processing ($\beta = .72$) which influenced social withdrawal behaviours. While their findings provide important idiographic information based on more ecologically valid experiences, the sample size was small. Further support for the stability of post-event processing has also been evidenced by Laposa and Rector (2011) who employed a sample of 75 individuals with a primary diagnosis of social phobia. Participants completed several self-report measures before engaging in cognitive-behavioural group therapy (CBGT). They demonstrated that post-event processing was stable over four weeks in the context of videotaped exposures during treatment ($r = .68$). While these studies provide preliminary support for the stability and pervasiveness of post-event processing, it should be noted that the aforementioned studies did not control for depression which limits the ability to determine specificity of the post-event processing construct to social anxiety (Campbell et al., 2016; Laposa & Rector, 2011; Lundh & Sperling, 2002).

Further support for the Clark and Wells (1995) model of social anxiety has been obtained by research showing that in-situation safety behaviours are uniquely associated with higher levels of post-event processing (Mitchell & Schmidt, 2014), and that interoceptive self-focused attention and post-event processing uniquely predict social performance anxiety, but not social interaction anxiety (Holzman, Valentiner, & McCraw, 2014). Other researchers have investigated underlying metacognitive processes that may maintain post-event processing. In line with the metacognitive model of GAD (Wells, 1995), several studies have revealed associations between social anxiety and positive metacognitive beliefs about rumination, even after controlling for gender, depression, level of rumination, and other metacognitive variables (Fisak & Hammond, 2013; Wong & Moulds, 2010). Taken together, these studies highlight that post-event processing may be a unique and adverse maintaining factor of social anxiety that is relatively stable over time, however it is important for researchers to consistently include measures of depression into study designs in order to further elucidate specificity of post-event processing to social anxiety. Furthermore, the vast majority of these studies have employed analogue samples, thus study designs need to be replicated with clinical samples in order to generalise the findings.

Post-Event Processing in Response to a Social Interaction

Researchers have examined cognitive processes in response to social-evaluative threats. These types of social stressors typically elicit post-event processing using either a social interaction or a speech task. In a social interaction, it is believed that the ambiguity of the situation is primarily responsible for the anxiety-induced effects. In other words, the more ambiguous a situation is perceived to be, the more likely a socially anxious individual will experience anxiety. Mellings and Alden (2000) used the Fear of Negative Evaluation scale (FNE; Watson & Friend, 1969) to distinguish 116 undergraduates into high and low social anxiety groups. Participants were required to engage in a social interaction with a confederate of the opposite sex and then they measured the frequency of post-event processing the following day. They found that high socially anxious individuals, compared to low socially anxious, showed more selective attention to negative self-related information which was associated with more biased

judgments about recollections of the event ($r = .37$). Furthermore, high socially anxious individuals engaged in more post-event processing the day after the interaction, and the frequency of post-event processing predicted recall of negative self-related information ($r = .20$). Dannahy and Stopa (2007) also used an interaction task employing 132 high and low socially anxious undergraduates and found that high socially anxious individuals engaged in more post-event processing, experienced more anxiety, predicted worse performance, and underestimated their actual performance than low socially anxious individuals. The degree of post-event processing was also linked to the extent of social anxiety and negative appraisals of performance both immediately following the interaction ($r = -.26$) and one week later ($r = -.40$; Dannahy & Stopa, 2007). Kashdan and Roberts (2007) employed 83 college students and also found that social anxiety was associated with greater post-event processing following a social interaction, although this finding was largely limited to those with elevated depressive symptoms ($r = 0.42$).

Post-Event Processing in Response to a Speech Performance

Similar findings to social interactions have also been reported by studies inducing social-evaluative threat following a speech task. In studies employing analogue samples, it has been found that in response to a speech task high socially anxious individuals engage in greater and more negative levels of post-event processing (Edwards, Rapee, & Franklin, 2003); are more likely to use ruminative coping strategies than distraction strategies (Kocovski, Endler, Rector, & Flett, 2005); and show greater memory biases for negative feedback regarding speech performance (Cody & Teachman, 2010). Furthermore, for speech tasks, consistently the results reveal that social anxiety is a unique predictor of post-event processing over and above that of depression and trait anxiety (Abbott & Rapee, 2004; Edwards et al., 2003; Makkar & Grisham, 2011a).

Comparable outcomes have also been established for clinical samples of socially phobic individuals. Studies employing patients with a principal diagnosis of SAD have found that speech tasks trigger significantly more intense post-event processing than social interactions (Kiko et al., 2012), and that trait social anxiety accounts for significant and unique variance in post-event processing following a speech task (Chen, Rapee, & Abbott, 2013). Abbott and Rapee (2004) and Perini, Abbott, and Rapee (2006) found that, individuals with social phobia compared to non-anxious controls (43 individuals with social phobia and 30 controls, and 40 individuals with social phobia and 20 controls, respectively), engaged in more negative post-event processing in the week following a speech task ($r = .64$). Furthermore, individuals with social phobia reported experiencing these thoughts as more distressing ($r = .56$), and perceived they had less control over these thoughts ($r = -.44$; Perini et al., 2006). Investigations regarding memory perspective of post-event processing have yielded analogous results to that obtained for anticipatory processing (Hinrichsen & Clark, 2003). For example, Coles, Turk, and Heimberg (2002) examined a clinical sample of 22 individuals who completed two role-plays which involved a speech and a party interaction situation. They found that memories following a role-play tended to be from more of an observer perspective than a field perspective following both a speech performance and a social interaction situation. They concluded that the importance of memory perspective rests on the idea that negative beliefs are further maintained due to the negatively skewed representation of the self.

Post-Event Processing as Disorder-Specific or Transdiagnostic

While some researchers suggest that post-event processing may be indistinguishable from other forms of RNT (e.g., depressive rumination; McEvoy et al., 2010; McEvoy, Watson, Watkins, & Nathan, 2013), others have sought to differentiate post-event processing from depressive rumination. Kocovski and Rector (2008) had 76 patients with SAD complete 2 assessments of post-event processing following exposure to anxiety provoking tasks in CBGT. The first task involved attending a group therapy session, one of which was common to all patients. The second task was an idiosyncratically defined exposure task. Patients with higher social anxiety levels reported higher levels of post-event processing related to these anxiety provoking social events ($R^2 = .34$ and $R^2 = .23$, respectively; results which were consistent across multiple measures of social anxiety). Importantly, depressive rumination was not a significant predictor of post-event processing, and depressive rumination was not correlated with post-event processing or social anxiety. These findings imply that thought content focused upon during post-event processing, is specific to social anxiety and not confounded with depressive rumination (Kocovski & Rector, 2008). The authors concluded that while there is significant comorbidity between SAD and depression, there are important conceptual differences between

these maintaining constructs which have diagnostic specificity (e.g., depressive rumination and post-event processing; Kocovski & Rector, 2008). While depressed patients tend to ruminate on their depressive symptoms and consequences (Nolen-Hoeksema, 1991), individuals with SAD focus on rumination related to perceived social failure (Clark & Wells, 1995).

Conversely, other researchers have found that post-event processing may not be specific to social anxiety, but rather a transdiagnostic process observed across a range of disorders (Laposa, Collimore, & Rector, 2014). For example, Laposa et al. (2014) employed a clinical sample of 233 individuals with a primary diagnosis of either: SAD ($n = 45$), obsessive-compulsive disorder ($n = 61$), generalised anxiety disorder ($n = 65$), or panic disorder with/without agoraphobia ($n = 62$) who attended CBGT specific to their diagnosis. The authors found that all anxiety disorders showed heightened and equivalent post-event processing ratings and that peak state anxiety during the first CBGT session predicted subsequent level of post-event processing, regardless of anxiety group. These findings provide preliminary support that post-event processing may be a transdiagnostic process that is observed across a range of anxiety disorders. While there is a strong empirical basis for post-event processing as a maintaining feature of social anxiety, future research is needed to further elucidate and disentangle whether post-event processing is indeed disorder-specific or transdiagnostic.

Changes in Post-Event Processing in Response to Treatment

The authors are aware of only four studies to date that have examined changes in post-event processing following interventions. McEvoy, Mahoney, Perini and Kingsep (2009) examined changes in post-event processing in a sample of 61 individuals diagnosed with social phobia following a seven week course of CBGT. They found that reductions in post-event processing following treatment were associated with reductions in social anxiety as measured by the SPS and Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998; SPS, $r = .39$ and SIAS, $r = .34$), but not depression. Furthermore, metacognitions were less strongly endorsed following treatment, except for positive metacognitions about post-event processing. These findings further validate the inclusion of post-event processing as a maintaining factor in models of social anxiety (Clark & Wells, 1995; Rapee & Heimberg, 1997), and add to the literature highlighting the unique association of post-event processing to social anxiety. However, given the correlational nature of the study, causation is unable to be established.

Price and Anderson (2011) examined the extent that post-event processing is impacted by cognitive-behavioural therapy (CBT), and the relationship between post-event processing and change during treatment. Participants were a clinical sample of 91 individuals diagnosed with SAD, who were randomly assigned to either CBGT or an individually based virtual reality exposure. While both treatment conditions targeted several processes shown to maintain social anxiety, post-event processing was not specifically focused upon during treatment. However, post-event processing decreased as a result of treatment ($\beta_{10} = -8.82$, $p < .01$), and for individuals reporting higher levels of post-event processing prior to treatment, social anxiety symptoms improved at a slower rate than those with lower levels of post-event processing. These findings are interesting given that none of the treatment packages focused explicitly on post-event processing. However, the authors were unable to determine which components of the treatment packages contributed to reductions in post-event processing.

In a study of a clinical sample of 81 participants with a primary diagnosis of social phobia, McEvoy and Perini (2009) examined whether or not supplementing CBGT with Attention Training (ATT; Wells, 1990) could produce greater changes in anticipatory and post-event processing. McEvoy and Perini (2009) found that both the CBGT group and the ATT group significantly improved on both anticipatory (SPS, $r = .39$ and SIAS, $r = .38$) and post-event processing (SPS, $r = .42$ and SIAS, $r = .34$). Furthermore, increased attentional control during treatment was associated with reductions in both anticipatory ($r = -.36$) and post-event processing ($r = -.44$). Accordingly, these findings provide support for the importance of increased attentional control in regards to reducing engagement in maladaptive RNT processes.

Employing a clinical sample of 94 individuals with social anxiety disorder, Hedman et al. (2013) investigated whether changes in four maintenance processes of social anxiety (i.e., avoidance, self-focused attention, anticipatory processing, and post-event processing) mediate clinical improvement in either individual cognitive therapy (ICT) or CBGT. They found significant between-treatment differences whereby improvement in ICT was mainly mediated by

reductions in avoidance and self-focused attention, whereas improvement in CBGT was mediated by changes in self-focused attention, and anticipatory and post-event processing. These results suggest that it is of greater importance to reduce anticipatory and post-event processing in CBGT than it is in ICT, however it should be noted that the participants were collected from two separate randomised controlled trials so the results are not based on random allocation of a single cohort to ICT or CBGT.

Causes and Consequences of Post-Event Processing

Experimental studies that manipulate post-event processing or related constructs are beginning to accumulate (see Table 2 for study details). Such studies typically manipulate post-event processing following social-evaluative threat (e.g., speech task, social interaction) to examine the cognitive, affective, and behavioural consequences for socially anxious individuals. Researchers have shown that post-event processing maintains anxiety (Wong & Moulds, 2009), social anxiety predicts greater post-event processing and negative thoughts over the course of one week, and distraction leads to decreased anxiety (Rowa, Antony, Swinson, & McCabe, 2014) and more positive thoughts compared to RNT for high socially anxious individuals (Kocovski, MacKenzie, & Rector, 2011).

Post-Event Processing and Memory

Based on Clark and Wells' (1995) suggestion that post-event processing may heighten the availability of previous social failures, several studies have examined autobiographical memories associated with post-event processing. For example, Field and Morgan (2004) compared a student sample of 66 high and low socially anxious participants to determine whether post-event processing affects retrieval of autobiographical memories. Participants were instructed to describe a recent ambiguous social event or interaction and were subsequently allocated to one of three conditions, positive post-event processing, negative post-event processing, or a distraction condition. Compared to the low socially anxious group, high socially anxious participants recalled memories that were rated as significantly more negative ($\beta = -1.33$) and shameful ($\beta = 1.93$), regardless of the type of post-event processing they engaged in. Unexpectedly, it also found that after negative post-event processing, the high socially anxious group, recalled memories that were anxious and shameful but rated as more calming compared to the other conditions. The researchers suggested this may have some adaptive benefit of post-event processing. However given that post-event processing was assessed based on the recall of a recent ambiguous social event, ecological validity of the task is low.

Morgan and Banerjee (2008) also examined autobiographical memories associated with post-event processing following negative feedback in response to a real or imagined social task. Participants were a sample of 50 undergraduates of high and low socially anxious individuals. It was found that negative feedback in response to a speech task, led to the recall of memories with a significantly greater average anxiety rating in the high socially anxious group than the low socially anxious group ($\eta^2 = .11$). Furthermore, high socially anxious individuals who engaged in a ruminative response style (compared to a reflective response style) following an imagined social encounter, recalled memories with the highest average anxiety rating ($\beta = .33$). Similarly, Chiupka, Moscovitch, and Bielak. (2012) employed a sample of 85 undergraduates and found that images and memories during post-event processing were associated with greater reported negative impact on participants' perception of themselves ($\eta^2 = .06$) and others ($\eta^2 = .09$). Nonetheless, results from studies assessing retrieval of autobiographical memories may be prone to recall bias.

Post-Event Processing, Self-Focused Attention and Attention Bias

The process of directing attention towards internal stimuli during social events has been implicated in the maintenance of social anxiety (Clark & Wells, 1995). Thus researchers have begun to examine the role of self-focused attention during post-event processing. Brozovich and Heimberg (2011) employed an analogue sample of 64 high and low socially anxious individuals and randomly assigned participants to either a self-focused post-event processing condition or an other-focused post-event processing condition. Following a social interaction with a confederate, socially anxious individuals in the self-focused condition displayed fewer positive feelings about their

performance than did socially anxious individuals in the other-focused condition as well as low socially anxious in either condition ($\eta^2 = .10$).

Gaydukevych and Kocovski (2012) used a sample of 82 high and low socially anxious undergraduates to investigate the relationship between self-focused attention and post-event processing. Participants were randomly assigned to either a high or a low self-focused attention condition and then engaged in a five minute unstructured conversation with a confederate. Post-event processing was assessed the following day online. They found that those in the high self-focused attention group reported a similar amount of positive post-event processing but more negative post-event processing over the 24-hour period compared to the low self-focused attention group. Extending the work of Gaydukevych and Kocovski (2012), Holzman and Valentiner (2016) examined whether self-focused attention affects the relationships between performance appraisals and post-event processing following a social event that involved reading a book for 5 minutes to an audience of three research assistants. They employed a sample of 137 undergraduates who were distinguished into high and low social anxiety groups and then further randomly assigned into either a high self-focused or low self-focused attention condition. They found that high levels of self-focused attention led to a stronger, inverse relationship between immediate positive performance appraisals and subsequent negative post-event processing (partial $r = -.43$), however this finding was not specific to high social anxiety. They also found that high levels of self-focused attention led to a stronger, inverse relationship between negative post-event processing and changes in positive performance appraisals (partial $r = -.23$). These findings suggest that self-focused attention is important for understanding how negative post-event processing undermines positive performance appraisals. Taken together, these findings provide support for a causal relationship between self-focused attention and post-event processing in support of Clark and Wells (1995) assertion of a self-focused processing mode during this form of RNT.

Using a different design, Makkar and Grisham (2013) employed 80 high and low socially anxious individuals who were shown false physiological feedback regarding an increase or decrease in their heart rate both prior to and during a speech task. Given that socially anxious individuals tend to become self-focused and hyper-vigilant to internal interoceptive cues, a shift to detailed monitoring of internal information was expected. Compared to those who observed a false decreased heart rate, those who observed a false increased heart rate reported higher levels of negative affect ($\eta^2 = .10$), more negative performance appraisals ($\eta^2 = .17$), and more frequent negative post-event processing ($\eta^2 = .11$). These effects were also mediated by an increase in self-focused attention. However, it should be noted that these effects were not specific to high socially anxious participants. These findings suggest that both high and low socially anxious individuals tend to negatively appraise their anxiety symptoms and use this information to erroneously assess their social performance. It may not be surprising that both high and low socially anxious individuals reported similar outcomes because the somatic information was probably sufficiently salient and attention engaging even for low socially anxious individuals (Makkar & Grisham, 2013).

Perfectionism has also been found to be comorbid with SAD (Bieling, Summerfeldt, Israeli, & Antony, 2004). On this basis, Brown and Kocovski (2014) examined perfectionism, in both state and trait forms, as a predictor of post-event processing in a sample of 104 socially anxious undergraduates. Following the administration of several measures, participants delivered an impromptu speech and were then assessed for post-event processing two days later online. They found that both state ($\beta = .39$) and trait ($\beta = .21$) perfectionism was a significant predictor of post-event processing two days following the speech while controlling for baseline social anxiety, depression and state anxiety. These findings suggest that it may be beneficial to use strategies that target perfectionism as a way of reducing post-event processing for socially anxious individuals, however the present study observed these findings within the context of an undergraduate sample, thus replication with a clinical sample is needed.

Given that models of social anxiety propose that biased attention to threat signals plays a key role in symptom development and maintenance, Cek, Sá nchez, and Timpano (2016) employed a sample of 55 undergraduates to assess the associations between social anxiety, attention bias to disgust, subjective emotional and physiological reactivity to a social stressor, and subsequent post-event processing. Participants completed an attention task with facial stimuli which was measured using an eye-tracking device, followed by the delivery of an impromptu speech which was later utilised to assess post-event processing. They found that the association between social anxiety and post-event processing was partially accounted for by attention bias to disgust, however this effect was quite modest

which limits the generalizability of the findings to clinical samples. Moreover, it should be noted that only one measure of social anxiety was used (SIAS) and they neglected to control for depression.

Modes of Post-Event Processing

Several researchers have investigated the distinct modes of self-focused attention that are thought to underlie post-event processing. An experiential processing mode is considered adaptive (i.e., focusing on the direct experience of one's feelings, symptoms and experiences), while an analytical processing mode is deemed maladaptive (i.e., thinking analytically about the meanings of one's feelings, symptoms and experiences; Watkins & Teasdale, 2004). Vassilopoulos (2008) randomly assigned 58 high and low socially anxious undergraduates to either an analytic or experiential self-focus task. Vassilopoulos found that high socially anxious individuals in the experiential self-focus condition had decreased anxious mood ratings from pre to post manipulation which was associated with more positive thoughts. Those in the analytical self-focus condition showed no significant changes in mood and cognition. Nilsson, Lundh, and Viborg (2012) replicated these effects with a clinical sample of 12 outpatients with a diagnosis of SAD. Following a speech task, they found that an experiential self-focus mode disrupted the RNT process while an analytical self-focus mode strengthened the relationship between negative self-evaluation and post-event processing across three time points ($r = .83$, $r = .97$, $r = .91$, respectively). Furthermore, adopting an experiential self-focus mode tended to decrease negative thoughts, whereas an analytical mode was inclined to reduce neutral thoughts, although the effects were weak. Wong and Moulds (2012) also examined the impact of adopting an analytical versus an experiential processing mode during RNT in 74 high and low socially anxious undergraduates following a speech task. Unexpectedly, they found that an experiential mode (compared to an analytical mode) led to stronger maladaptive high standard ($\eta^2 = .08$) and conditional beliefs ($\eta^2 = .07$) during anticipatory processing, and stronger maladaptive unconditional beliefs during post-event processing ($\eta^2 = .10$). While this outcome contrasts with previous findings, the authors suggest that the analytical processing mode may have assisted participants to rationalise their performance thus allowing for disconfirmation of negative beliefs regarding the social situation. Extending the work of Wong and Moulds (2012), Wong, McEvoy, and Rapee (2016) examined the prediction of the trajectory of maladaptive social-evaluative beliefs over time from trait RNT and trait-post-event processing, as well as their interactions with the frequency of recent social stressors and social anxiety levels. Employing a sample of 331 undergraduates, participants were administered a number of online measures (see Table 2) and then given another online measure of self-beliefs related to social anxiety (SBSA; Wong & Moulds, 2009) one week later. They found that a higher number of recent social stressors predicted an increasing trajectory of conditional and unconditional beliefs but only within the context of participants with high levels of social anxiety and low levels of thoughts about the past. This was an unexpected finding which the authors suggested might indicate that the tendency to engage in post-event processing may have adaptive effects, which is consistent with other previous research indicating an adaptive component of post-event processing (Blackie & Kocovski, 2016; Field & Morgan, 2004; Makkar & Grisham, 2012).

Cody and Teachman (2011) employed a sample of 97 high and low socially anxious undergraduates to examine differences in the use of global and local evaluations (e.g., seeing the forest vs. the trees) of public speaking performance. Participants were required to give a series of four brief speeches, and then self-rated their performance on items reflecting global and local performance indicators along with a measure asking how they thought the experimenter would rate their performance. After three days, participants completed the performance assessments again along with a measure of post-event processing. As expected, they found that post-event processing fully mediated the relationship between social anxiety group status and worsening global performance evaluations, suggesting that post-event processing may be an important mechanism by which social anxiety leads to worsening self-perceptions over time. The authors suggest that processing of negative global information during post-event processing is analogous to analytical self-focus in terms of leading to more negative over-generalisations about one's social performance, findings which are consistent with previous research in the area (Nilsson et al., 2012; Vassilopoulos, 2008). While these findings are generally consistent, it is important to note that the aforementioned studies used a variety of measures to assess post-event processing (e.g., thought listing exercise, visual analogue scales, repetitive thinking questionnaire, and the PEPQ; Cody & Teachman, 2011; Nilsson et al., 2012; Vassilopoulos, 2008; Wong & Moulds, 2012; Wong et al., 2016). Given that different measures may be measuring slightly different aspects of post-event processing, comparison of findings between studies may be difficult.

Post-Event Processing and Imagery

The relationship between imagery and post-event processing has also been investigated. Compared to verbal thought, imagery is more likely to activate emotional arousal in addition to triggering distorted beliefs about feared social situations (Holmes & Mathews, 2005). Makkar and Grisham (2011b) had 77 high and low socially anxious participants hold either a negative or a control self-image in mind as they engaged in a speech task. They found that participants who held a negative self-image in mind experienced higher anxiety levels and more negative thoughts, were more self-focused, rated their anxiety as more visible, appraised their performance more negatively, and engaged in more negative and less positive post-event processing, regardless of social anxiety level or depression.

Brozovich and Heimberg (2013) investigated whether post-event processing involving mental imagery is particularly detrimental for social anxiety by employing 114 high and low socially anxious undergraduates. Following a threat of a speech task, participants were randomly assigned to one of three conditions about a past speech: post-event processing involving imagery; post-event processing involving semantics; and a control condition with no post-event processing. They found that high socially anxious individuals in the post-event processing imagery condition experienced greater anxiety than those in the other conditions both immediately following the induction ($\eta^2 = .25$) and before the anticipated speech task ($\eta^2 = .19$). Their participants also interpreted ambiguous social scenarios more anxiously than socially anxious individuals in the control condition. Moreover, high socially anxious individuals made more negative predictions regarding their upcoming speech performance than low anxious participants in all conditions ($\eta^2 = .62$). Findings from these studies provide further support for the interaction of cognitive biases (Hirsch, Clark, & Mathews, 2006) highlighting the detrimental effects of imagery during perseverative modes of thought.

Post-Event Processing and Self-Appraisal

According to the Clark and Wells (1995) model, negative perceptions of performance and post-event processing should have a positive relationship. In an attempt to examine this relationship, Zou and Abbott (2012) employed a clinical sample and had 40 socially phobic individuals and 40 controls engage in a structured five-minute conversation in groups of four people. Following the interaction, participants were randomly assigned to a false feedback condition, receiving either high scores or moderate scores based on performance. Socially anxious participants who received moderate scores exhibited poorer self-appraisals and a higher degree of RNT ($\eta^2 = .09$) compared to those in the high score condition. Controls did not show this effect in either condition. The authors noted that given the subjectivity of the false feedback in the moderate condition (scores of 5/10), it is possible that the situation may have been interpreted as more ambiguous as this score is neither positive nor negative. This finding highlights the prominence of ambiguity as a distinct trigger of distorted beliefs relating to performance in social-evaluative situations.

Gramer, Schild, and Lurz (2012) examined the influence of trait social anxiety on subjective and physiological responses to an anticipated stressor employing 70 undergraduate female students who were split into high and low social anxiety groups. Participants engaged in a five minute speech task after a one week anticipation period to prepare the task. They found that socially anxious individuals displayed higher levels of negative post-event processing, and that post-event processing during recovery was significantly related to post-task reappraisals ($r = -.59$). Group differences in post-event processing were also mediated by cognitive appraisals. While these findings provide further support for the notion that self-evaluations are an important determinant of post-event processing, the study was conducted with a non-clinical female sample and only one measure of social anxiety was used (Social Anxiety Scale [SAP]; Lück, 1971).

Adaptive Effects of Post-Event Processing

In contrast to the reviewed research supporting post-event processing as a maladaptive maintaining process in social anxiety, several studies have revealed some adaptive properties of post-event processing. Makkar and Grisham (2012) had 81 high and low socially anxious participants engage in two speech tasks. After concluding the first speech, participants were randomly assigned to engage in either post-event processing or a distraction task. It was found that engaging in post-event processing as opposed to distraction led to numerous positive outcomes including increased willingness among low socially anxious individuals to give a second speech ($\eta^2 = .20$), reduced positive

self-ratings ($\eta^2 = .12$) and overestimation of visible negative behaviour for high socially anxious individuals ($\eta^2 = .16$), and improved overall perception of speech quality in high and low socially anxious individuals ($\eta^2 = .07$). While the observed positive effects imply that post-event processing may have some adaptive qualities, the authors do acknowledge the possibility that their post-event processing manipulation may have acted as a form of imaginal exposure. Exposure sessions that facilitate emotional processing have shown positive effects (Foa & Kozak, 1986). Thus the positive effects found may be a consequence of instructions given by the experimenter. Furthermore, the second speech may have been less anxiety-provoking due to habituation (Makkar & Grisham, 2012).

Blackie and Kocovski (2016) examined whether a brief distraction period immediately following a speech would lead to less post-event processing the following day employing a sample of 77 undergraduates with elevated social anxiety. Following the delivery of a speech, participants were randomly assigned to a distraction, post-event processing, or control condition and then reported levels of post-event processing in relation to the speech. They found that those in the distraction condition reported less post-event processing ($\eta^2 = .12$) than those in the post-event processing and control conditions, suggesting that distraction may be a potentially useful strategy for reducing post-event processing. Furthermore, Penney, Miedema, and Mazmanian (2015) used a sample of 126 undergraduates to assess the relationship between intelligence and rumination among a range of emotional disorders and found that non-verbal intelligence was a unique negative predictor of post-event processing, however no relationship was found between social anxiety symptoms and verbal or non-verbal intelligence. Interestingly, these findings indicate that intelligence may be linked to the cognitive processes that underlie emotional disorders, such as post-event processing, rather than to the symptoms of emotional disorders per se.

Limitations of Existing Evidence in Post-Event Processing

The post-event processing literature in social anxiety has been more extensively researched than that of anticipatory processing (Sluis et al., In press). While more is known about post-event processing, there are notable limitations. Firstly, while many studies have examined post-event processing in clinical samples of patients with a primary diagnosis of SAD (16 studies), a larger proportion of these studies have employed undergraduates as analogues to those diagnosed with SAD (39 studies). Although it is accepted that social anxiety is continuously distributed in the general population (Stopa & Clark, 2001), studies utilising social anxiety analogue samples have used various measures to categorise high and low social anxiety groups. For example, some studies have split their groups using the Social Phobia and Anxiety Inventory (SPAI; Turner, Biedel, & Dancu, 1996), the Fear of Negative Evaluation scale (FNE; Watson & Friend, 1969), or the Social Avoidance and Distress Scale (SADS; Watson & Friend, 1969). Although these measures are often highly correlated with SAD diagnoses (Watson & Friend, 1969), each measure assesses distinct aspects of social anxiety and on their own may not adequately capture the full range of social anxiety symptoms.

Secondly, studies have used various measures to assess post-event processing. For example, post-event processing has been assessed using the PEPQ (Rachman et al., 2000), the Rumination Questionnaire (RQ; Mellings & Alden, 2000), the Thoughts Questionnaire (TQ; Edwards et al., 2003), the Post-Event Rumination Questionnaire (PERQ; Abbott & Rapee, 2004), the Anxious Rumination Questionnaire (ARQ; Kocovski & Rector, 2007), and the Repetitive Thinking Questionnaire (RTQ; McEvoy et al., 2010). While these measures are similar, each measure may assess slightly different aspects of post-event processing in social anxiety. For example, the PEPQ (Rachman et al., 2000) was specifically developed to measure post-event processing for socially anxious individuals following a social-evaluative event. More recent measures assessing post-event processing have modified previous measures tailored for specific research designs. One such measure, the ARQ (Kocovski & Rector, 2007) was formatted according to Nolen-Hoeksema's (1991) Response Style Theory (i.e., a theory developed to explain ruminative responses to depressive symptoms). Given that some of these measures have been modified based on theories of depression, it is conceivable that specificity relating to post-event processing, as opposed to depressive rumination, is lacking. One possible avenue for researchers to overcome this hurdle may be to include assessments of both constructs, using measures that clearly employ items pertaining to either mode of RNT. In this manner, researchers are able to more accurately interpret outcomes in relation to an anxiety-provoking social event for those with SAD, and further elucidate whether or not depressive rumination and post-event processing are indeed one in the same or separate constructs. Nonetheless, although the outcomes relating to post-event processing are relatively stable, consistent

use of post-event processing measures relative to social-evaluative events would allow for greater ease of comparison between studies.

Thirdly, another methodological concern regarding social anxiety and depression measures is their high correlation. For example, although many studies have measured depression to control for this confound, there are numerous studies that have neglected to control for depression (Campbell et al., 2016; Chen et al., 2013; Fisak & Hammond, 2013; Holzman et al., 2014; Kocovski et al., 2005; Kocovski & Rector, 2007; Laposa & Rector, 2011; Lundh & Sperling, 2002; Price & Anderson, 2011; Rowa et al., 2014). Given that depression and anxiety are highly comorbid, and that RNT is also a primary attribute of depression, it is crucial to control for the effects of depression when examining post-event processing in social anxiety in order to determine specificity of this construct to social anxiety. Furthermore, measures of social anxiety used across studies are also inconsistent, varying, or inadequate. In some instances, only one measure of social anxiety has been assessed. Given that social anxiety is multifaceted (i.e., social performance fears, social interaction fears, fear of negative evaluation), multiple measures of social anxiety assessing fears associated with each dimension, or even a single measure that captures the full spectrum of social anxiety is essential. Using a measure of social anxiety that captures the full spectrum across studies would allow for more accurate interpretation of results by indicating which dimension of social anxiety a construct is most closely associated with.

Lastly, self-report measures have largely been relied upon to investigate post-event processing and how this construct relates to other features of social anxiety. Given that models of social anxiety (Clark & Wells, 1995; Rapee & Heimberg, 1997) elucidate the cognitive, affective, behavioural, and physiological consequences of post-event processing, it would be beneficial to measure such constructs using multi-method paradigms.

A Theory of Attentional Control

As post-event processing involves repetitive and persistent thoughts that centre on a reduced ability to inhibit or shift attention away from one's current stream of thought, researchers have begun to theorise about the attentional mechanisms thought to underlie this phenomenon (Linville, 1996). A weakened attentional control system is thought to be responsible for the cognitive impairments (Linville, 1996) observed in maladaptive thought processes, such as post-event processing, which are the result of anxiety and stress. Attentional control theory (Derakshan & Eysenck, 2009; Eysenck & Derakshan, 2011; Eysenck, Derakshan, Santos, & Calvo, 2007), proposes an explanation as to the higher order cognitive functions that underlie post-event processing which may explain the relationship between social anxiety and cognitive performance.

Attentional control theory has two main tenets: (1) anxiety is associated with deficits in cognitive efficiency, resulting in a decreased ability to inhibit task-irrelevant information, shift attention between tasks, and update working memory; and (2) these deficits are predominantly assumed to affect processing efficiency (i.e., the way cognitive resources are used to achieve desired outcomes), while not negatively impacting performance effectiveness (i.e., ability to perform a task).

This theory emphasises two prominent executive functions thought to be primarily responsible for a reduction in attentional control. The inhibition function uses attentional control to inhibit the allocation of attentional resources to irrelevant stimuli or maladaptive thought processes. The shifting function uses attentional control to shift the allocation of attentional resources to task-relevant stimuli or adaptive thought processes (Eysenck et al., 2007; Miyake et al., 2000). A more detailed description of attentional control theory has been outlined previously (Sluis et al., *In press*). Given the perseverative nature of post-event processing, attentional control theory appears to be one likely theoretical explanation as to why socially anxious individuals find it so difficult to disengage from this mode of thinking. However it is important to note that multiple factors may contribute to the explanation of why socially anxious individuals find it difficult to disengage from post-event processing and only one potential explanation outlining attentional control has been provided in this paper. For example, the role of motivation (Kouneiher, Charron, & Koechlin, 2009), cognitive load of task demands (Gazzaley, 2011), threat load of the task (Van Dillen & Koole, 2009), and emotion regulation (Kanske, Heissler, Schönfelder, Bongers, & Wessa, 2011; McRae et al., 2010) may all partially account for and provide differential explanations as to why socially individuals find it difficult to disengage from this mode of RNT.

Conclusions and Future Directions

This paper has provided a review of the available and relevant literature supporting the maintaining role of post-event processing, consistent with cognitive-behavioural models of social anxiety (Clark & Wells, 1995; Rapee & Heimberg, 1997). While there is a substantial amount of empirical evidence investigating the characteristics, causes, and consequences of post-event processing in social anxiety, future research that addresses the methodological limitations of previous research should enhance interpretation of important findings and provide more accurate results in a more holistic manner.

Current evidence suggests a number of maladaptive cognitive processes that contribute to the negative impact of post-event processing, such as negative memory and interpretation biases, negative self-imagery, negative self-appraisals, and increased self-focused attention. The prevalence of these cognitive processes involved in post-event processing highlights the importance of attentional control regarding an inability to shift attention to more adaptive cognitive processes or inhibit negative thought processes. However, this hypothesis remains to be empirically assessed. Previous research examining the impact of attention training on post-event processing identified that attentional control during treatment was associated with reductions in post-event processing (McEvoy & Perini, 2009). This finding highlights the relevance of attentional control when studying the maintaining processes of social anxiety and is an important area of future research that triggers a number of additional research questions. For example, does a weakened attentional control system lead to symptoms of social anxiety, such as post-event processing? Or, do symptoms of social anxiety lead to a weakened attentional control system?

Future research examining the underlying functions of post-event processing will provide a thorough understanding of these thought processes, and may also elucidate other cognitive processes involved in the maintenance of social anxiety. Moreover, given the contradictory findings regarding post-event processing as being disorder-specific compared to transdiagnostic, future research would benefit from exploring the theoretical underpinnings in more depth to gain a better understanding of this thought process across disorders. This line of research would further contribute to informing theoretical models and treatment protocols for those with SAD, or indeed other emotional disorders.

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1 **Tables**2 *Table 1: Characteristics of Post-Event Processing in Social Anxiety*

Study	Sample	Social-evaluative threat induction	Follow-up	PEP measure (additional measures)	Summary of findings
Rachman et al. (2000)	130 undergraduates (high and low SA)	No	No	PEPQ (scale development; BDI II, SPAI)	High and low SA differ significantly on PEP for social events. High SA report PEP to make matters worse.
McEvoy and Kingsep (2006)	117 SAD	No	No	PEPQ (SPS, SIAS, BDI II, DASS)	PEP did not relate significantly with measures of performance or social interaction anxiety. PEP related most strongly to state anxiety.
Wong (2015)	560 undergraduates	No	No	E-PEPQ (SPS, DASS)	The E-PEPQ-15 demonstrated good internal consistency
Fehm et al. (2008)	130 undergraduates	No	No	PEPQ (German)	Revised PEPQ showed excellent internal consistency
Fehm et al. (2007)	217 undergraduates	No	No	PEPQ (German)	Social events were followed more often and by more intense PEP. FNE was significantly associated with PEP for social but not for general phobic situations (specificity). PEP was particularly elevated for social interactions, as opposed to performance situations.
Kocovski and Rector (2007)	439 undergraduates	No	No	PEPQ, ARQ (SPS, ASI)	High SA associated with higher levels of PEP relating to social events. High levels of trait anxious rumination associated with higher PEP. SA and anxious rumination accounted for 25% of variance in PEP.
Lundh and Sperling (2002)	55 undergraduates	No	1-week	PEPR (SPS)	SA was associated with the degree of negative PEP following negative-evaluational events. Negative PEP was highly stable over two consecutive days.
Campbell, Bierman and Molenaar (2016)	10 undergraduates	No	13-week daily follow-ups	PEPQ (SADS, BFNE, ASBQ)	Same-day fear of negative evaluation was associated with maladaptive post-event rumination which influenced social withdrawal behaviours

Study	Sample	Social-evaluative threat induction	Follow-up	PEP measure (additional measures)	Summary of findings
Laposa and Rector (2011)	75 SAD	No (video-taped exposure during treatment)	1-week	PEPQ, ARQ (SIAS, SADOS, IPES)	PEP was positively associated with baseline SA symptoms, state anxiety during videotaping, anxious rumination, fear of causing discomfort to others, and negative interpretation of positive social events.
Mitchell and Schmidt (2014)	42 undergraduates (high and low SA)	Speech	Four-days	PEPQ-R (BDI II, SIAS, SAFE)	In-situation safety behaviours uniquely associated with greater PEP. State anxiety not uniquely associated with PEP. Restricting and active subtypes of in-situation safety behaviours showed specificity to PEP.
Holzman et al. (2014)	101 undergraduates	No	No	PEPQ-R (SFA, SBSA, SPS, SIAS)	SFA and PEP predicted social performance anxiety after controlling for social interaction anxiety. Associations with social interaction anxiety were non-significant when controlling for performance anxiety.
Fisak & Hammond (2013)	300 undergraduates	No	No	PEPQ	Positive beliefs about PEP positively associated with PEP and SA.
Wong and Moulds (2010)	124 undergraduates	No	No	RTQ (FNE, DASS, PBRs)	SA was positively associated with positive metacognitive beliefs about rumination.
Mellings and Alden (2000)	116 undergraduates (high and low SA)	Interaction	1-day	RQ (SADS; FAQ; STAI; BSQ; BDI)	High SA showed more selective attention to negative self-related information than low SA. High SA also engaged in more PEP the day following the interaction.
Dannahy and Stopa (2007)	50 undergraduates (high and low SA)	Interaction	1-week	TQ, DTQ (FNE, SPRS, BDI II)	High SA engaged in more PEP, and reported more negative PEP than low SA.

Study	Sample	Social-evaluative threat induction	Follow-up	PEP measure (additional measures)	Summary of findings
Kashdan and Roberts (2007)	83 undergraduates	Interaction	1-day	RQ (SIAS, PANAS, BDI-II)	High SA associated with greater negative PEP following interactions with strangers (largely limited to those with high depressive symptoms). High SA and PEP associated with increased negative affect following personal disclosure interactions.
Edwards et al. (2003)	53 undergraduates (high and low SA)	Speech	1-week	TQ (BFNE; SADS; APPQ-S; DASS)	High SA showed greater memory biases, spent more time ruminating over perceived negative aspects of speech, and engaged in greater levels of overall rumination.
Kocovski et al. (2005)	112 undergraduates (high and low SA)	No	No	CHIP (EMAS)	High SA were more likely to ruminate and less likely to distract when faced with social stressors. High SA also recorded more negative thoughts and more upward counterfactual thoughts (i.e., if only).
Cody and Teachman (2010)	81 undergraduates (high and low SA)	Speech	2-days	PEPQ, RSQ (SIAS; BFNE; PANAS; STAI-T)	High SA remembered confederates feedback more positively than their own and remembered their negative feedback as worse than the low SA group.
Kiko et al. (2012)	91 SAD and 20 NC	Speech and interaction	1-day	PEPQ (SIAS; SPS; CES-D; SCQ; SBQ; FAQ)	The speech triggered significantly more intense PEP in SAD. Regardless of the social situation, PEP was best predicted by situational anxiety and dysfunctional cognitions.
Chen et al. (2013)	121 SAD	Speech	1-week	TQ (SPS; SIAS; SPQ)	A direct path from trait social anxiety and PEP was found. Also, indirect paths from trait social anxiety to PEP via inappropriate attentional focus and self-evaluation of performance.
Abbott and Rapee (2004)	43 SAD and 30 NC	Speech	1-week	PERQ (SIAS; SPS; BFNE; DASS)	SAD engaged in more negative PEP about speech than NC. SAD maintained negative self-appraisals of performance over 1 week. Following successful CBT, negative PEP was reduced.

Study	Sample	Social-evaluative threat induction	Follow-up	PEP measure (additional measures)	Summary of findings
Perini et al. (2006)	40 SAD and 20 NC	Speech	1-week	PERQ (SIAS; SPS; DASS; RSQ)	SAD engaged in more negative rumination, experienced these thoughts as more distressing, perceived they had less control over these thoughts, and perceived their performance as worse than NC.
Makkar and Grisham (2011a)	40 undergraduates	Speech and interaction	1-day	PEPQ (FNE; SIAS; SPS; BDI-II; STAI; SBQ; SCQ; FAQ; SBSA)	Higher levels of SA were associated with experiencing more negative self-perceptions and regret-based cognitions during PEP. PEP was greater following the speech than the interaction.
Coles et al. (2002)	22 SAD and 30 NC	Speech and cocktail party interaction	3-weeks	Memory perspective scale (SIAS; SPS; BDI)	SAD group recalled role-plays from more of an observer perspective than NC over 3-week interval. SAD group made more dispositional attributions for their nervousness particularly 3 weeks later.
Kocovski and Rector (2008)	76 SAD	No (exposure therapy tasks)	1-week	PEPQ, RSQ (SPS; SIAS; LSAS; BDI-II)	Significant PEP occurred after both exposure tasks. Anxiety ratings were positively correlated with the severity of subsequent PEP related to exposure task.
Laposa, Collimore and Rector (2014)	233 Individuals with varying anxiety diagnoses	No (CBGT)	1-week	PEPQ (SIAS, PSWQ, YBOCS-SR, PDSS-SR)	All anxiety disorders showed heightened and equivalent post-event processing ratings and that peak state anxiety during the first CBGT session predicted subsequent level of post-event processing, regardless of anxiety group.
McEvoy et al. (2009)	61 SAD	No (CBGT)	7-weeks	PEPQ-R (SPS; SIAS; BDI-II; MCQ)	Reduced PEP was associated with reduced SA, but not depression.
Price and Anderson (2011)	91 SAD	No (CBGT)	8-sessions	RQ (FNE)	PEP reduced as a result of treatment
Hedman et al. (2013)	94 SAD	No (ICT and CBGT)	ICT (16-sessions) CBGT (15-sessions)	SPWSS	ICT was mainly mediated by reductions in avoidance and self-focused attention, whereas improvement in CBGT was mediated by changes in self-focused attention, and anticipatory and post-event processing.

Study	Sample	Social-evaluative threat induction	Follow-up	PEP measure (additional measures)	Summary of findings
McEvoy and Perini (2009)	81 SAD	No (CBGT and ATT)	7-weeks	Single-item measure of PEP and AP (SPS; SIAS; BDI-II; MCQ; ACS)	PEP improved significantly following both CBGT and ATT.

3 *Note:* PEP = post-event processing; SA = social anxiety; SAD = social anxiety disorder; NC = normal controls; AP = Anticipatory Processing; FNE = Fear of Negative Evaluation;
 4 BFNE = Brief Fear of Negative Evaluation Scale; SADS = Social Avoidance and Distress Scale; BDI II = Beck Depression Inventory II; SPAI = Social Phobia and Anxiety Inventory;
 5 DASS = Depression, Anxiety and Stress Scale; SFA = self-focused attention; CBT = cognitive-behavioural therapy; CBGT = cognitive-behavioural group therapy; ICT = Individual
 6 Cognitive Therapy; ASI = Anxiety Sensitivity Index; ATT = Attention Training; PEPQ = Post-Event Processing Questionnaire; PEPQ-R = Post-Event Processing Questionnaire
 7 Revised; E-PEPQ = Extended Post-Event Processing Questionnaire; ARQ = Anxious Rumination Questionnaire; PEPR = Post-Event Processing Record; RTQ = Repetitive
 8 Thinking Questionnaire; RQ = Rumination Questionnaire; SPS = Social Phobia Questionnaire; SIAS = Social Interaction Anxiety Scale; TQ = Thoughts Questionnaire; DTQ = Daily
 9 Thoughts Questionnaire; CHIP = Coping with Health Injuries and Problems; PERQ = Post-Event Rumination Questionnaire; SADOS = Social Anxiety and the Fear of Causing
 10 Discomfort to Others; IPES = Interpretation of Positive Events Scale; SAFE = Subtle Avoidance Frequency Examination; SBSA = Self-Beliefs Related to Social Anxiety Scale;
 11 PBRs = Positive Beliefs about Rumination Scale; SPRS = Social Performance Rating Scale; PANAS = Positive and Negative Affect Scales; BSQ = Body Sensations Questionnaire;
 12 STAI = State Trait Anxiety Inventory; FAQ = Focus of Attention Questionnaire; RSQ = Response Style Questionnaire; APPQ-S = Albany Panic and Phobia Scale; EMAS = Endler
 13 Multidimensional Anxiety Scale; CES = Center of Epidemiological Studies; DFS = Dysfunctional and Functional Self-Consciousness Questionnaire; SCQ = Social Cognitions
 14 Questionnaire; SBQ = Social Behaviours Questionnaire; SPQ = Speech Performance Questionnaire; LSAS = Liebowitz Social Anxiety Scale; MCQ = Meta-Cognitions
 15 Questionnaire; ACS = Attentional Control Scale; SPWSS = Social Phobia Weekly Summary Scale; ASBQ = Anticipatory Social Behaviours Questionnaire; PSWQ = Penn State
 16 Worry Questionnaire; YBOCS-SR = Yale-Brown Obsessive Compulsive Scale-Self Report; PDSS-SR = Panic Disorder Severity Scale-Self Report.
 17

Table 2: Causes and Consequences of Post-Event Processing in Social Anxiety

Study	Sample	Social-evaluative threat induction	Follow-up	PEP measure	Summary of findings
Wong and Moulds (2009)	93 undergraduates (high and low SA)	Speech	No	VAS (FNE; DASS; SBSA; VAS;	Relative to distraction, rumination maintained anxiety in both high and low SA groups.
Rowa et al. (2014)	41 SAD	Speech	1-day	PEPQ-R (SPIN)	Compared to the focus (PEP) condition, those in the distraction condition reported decreased anxiety.
Kocovski et al. (2011)	114 undergraduates	Speech	1-week	PEPQ, TQ (SPS; BDI-II)	High SA group in distraction condition reported more positive thoughts compared with high SA group who ruminated. Both SA and depression predicted greater PEP and negative thoughts 1 week later.
Field and Morgan (2004)	66 students (high and low SA)	No	No	PEPQ (SPAI)	High SA recalled memories rated as significantly more negative and shameful regardless of whether they engaged in positive or negative PEP. High SA group engaged in negative PEP recalled memories as anxious and shameful but rated as more calming.
Morgan and Banerjee (2008)	50 undergraduates (high and low SA)	Speech	No	AMQ (SPAI; BDI)	Negative feedback led to recall of memories with a greater average anxiety rating in high SA group. High SA who engaged in a ruminative response style recalled memories with the highest average anxiety rating.
Chiupka et al. (2012)	85 undergraduates (high and low SA)	Speech	No	PANAS (SPIN; DASS; NSPS)	PEP images and memories were associated with greater reported negative impact on participants' perceptions of self and others.
Brozovich and Heimberg (2011)	64 undergraduates (high and low SA)	Interaction	1-week	PEPQ (SIAS; BDI-II; BFNE; BSAM; SPQ)	High SA group evaluated their performance more poorly than low SA group both immediately after and 1 week following the interaction. High SA assigned to self-focused PEP displayed fewer positive feelings about performance compared to high SA in other-focused PEP condition.

Study	Sample	Social-evaluative threat induction	Follow-up	PEP measure	Summary of findings
Gaydukevych and Kocovski (2012)	82 undergraduates (high and low SA)	Interaction	1-day	TQ, PEPQ (SIAS; BDI-II; TSFAQ; RRQ; FAQ)	The high self-focused attention group reported more frequent negative PEP over the 24-hour period compared to the low self-focused group.
Holzman and Valentiner (2016)	137 undergraduates (high and low SA)	Speech	1-day	TQ (SPS, SIAS, CES-D, FAQ, BQ)	High levels of self-focused attention led to a stronger, inverse relationship between immediate positive performance appraisals and subsequent negative PEP. High levels of self-focused attention led to a stronger, inverse relationship between negative PEP and changes in positive performance appraisals
Makkar and Grisham (2013)	80 undergraduates (high and low SA)	Speech	1-day	TQ (BFNE; SPS; DASS; PANAS; BQ; FAQ; SCQ)	Participants who observed a false increased heart rate reported higher levels of negative affect, more negative performance appraisals, and more frequent negative ruminative thoughts (not specific to high SA's).
Brown and Kocovski (2014)	104 undergraduates	Speech	2-days	PEPQ, TQ, RRQ (SIAS, LSAS, FMPS, BDI-II)	Both state and trait perfectionism was a significant predictor of post-event processing two days following the speech while controlling for baseline social anxiety, depression and state anxiety
Cek, Sá nchez, and Timpano (2016)	55 undergraduates	Speech	30-minutes	TQ (SIAS)	The association between social anxiety and post-event processing was partially accounted for by attention bias to disgust.
Vassilopoulos (2008)	58 undergraduates (high and low SA)	No	No	Thought-listing exercise (FNE; BDI-II)	High SA in the experiential self-focus condition showed decreased anxiety from pre to post manipulation and was associated with more positive thoughts on the thought-listing exercise.
Nilsson et al. (2012)	12 SAD	Speech	No	Thought listing exercise (FNE; SPS; SIAS; BDI-II; VEQ)	An experiential self-focused mode led to a decreased proportion of negative thoughts, whereas an analytical self-focused mode led to a decreased proportion of neutral thoughts.

Study	Sample	Social-evaluative threat induction	Follow-up	PEP measure	Summary of findings
Wong and Moulds (2012)	74 undergraduates (high and low SA)	Speech	No	VAS (FNE; DASS; SBSA; SPORS)	An experiential processing mode led to stronger unconditional beliefs during PEP.
Wong, McEvoy and Rapee (2016)	331 undergraduates	No	1-week	RTQ (E-PEPQ, SPS, DASS, SBSA)	A higher number of recent social stressors predicted an increasing trajectory of conditional and unconditional beliefs but only within the context of participants with high levels of SA and low levels of thoughts about the past.
Cody and Teachman (2011)	97 undergraduates (high and low SA)	4 Speeches	3-days	PEPQ (SIAS, SPS, BFNE, MPSP)	Post-event processing fully mediated the relationship between social anxiety group status and worsening global performance evaluations.
Makkar and Grisham (2011b)	77 participants (high and low SA)	Speech	1-day	TQ, SCQ (BFNE; SIAS; SPS; BDI-II; STAI; BQ; FAQ)	Regardless of SA group, those who held a negative self-image experienced higher levels of anxiety and engaged in more negative PEP.
Brozovich and Heimberg (2013)	114 undergraduates (high and low SA)	Speech	No	PEPQ (PRCA; BDI-II; SIAS; BSAM)	High SA in the PEP-imagery condition displayed greater anxiety than those in the PEP-semantic or control conditions.
Zou and Abbott (2012)	40 SAD and 40 NC	Interaction	No	TQ (SIAS; SPS; BFNE; DASS; PANAS; SAR; PQ)	The moderate score condition (of false feedback) was detrimental for socially anxious individuals self-appraisal's and PEP (whereas controls did not show this effect)
Gramer, Schild and Lurz, 2012	70 female undergraduates	Speech	1-week	TQ (SAP, PANAS, DASS)	Socially anxious individuals displayed higher levels of negative rumination, and post-event rumination during recovery was significantly related to post-task reappraisals. Group differences in rumination were also mediated by cognitive appraisals.

Study	Sample	Social- evaluative threat induction	Follow- up	PEP measure	Summary of findings
Makkar and Grisham (2012)	81 undergraduates (high and low SA)	2 Speeches	No	Response task manipulation (BFNE; SPS; BDI-II; STAI; BQ; SCQ)	Engaging in PEP compared to distraction led to increased willingness to give a second speech, reduction in negative performance appraisals, and better perceived speech quality.
Blackie and Kocovski (2016)	77 undergraduates	2 Speeches	1-day	PEPQ, TQ, SARQ (SIAS, SIBS, BDI-II)	They found that those in the distraction condition reported less post-event processing than those in the rumination and control conditions.
Penney, Miedema and Mazmanian (2015)	126 undergraduates	No	No	PEPQ-R, RRS (GADQ-IV, PSWQ, CES-D, SPIN, PANAS)	Non-verbal intelligence was a unique negative predictor of post-event processing, however no relationship was found between social anxiety symptoms and verbal or non-verbal intelligence.

Note: SA = social anxiety; NC = normal controls; PEP = post-event processing; PEPQ = Post-Event Processing Questionnaire; AMQ = Autobiographical Memory Questionnaire; VAS = Visual Analogue Scales; TQ = Thoughts Questionnaire; SCQ = Social Cognitions Questionnaire; PANAS = Positive and Negative Affect Scale; PEPQ-R = Post-Event Processing Questionnaire Revised; E-PEPQ = Extended Post-Event Processing Questionnaire; FNE = Fear of Negative Evaluation Scale; DASS = Depression, Anxiety, and Stress Scale; SBSA = Self-Beliefs Related to Social Anxiety Scale; VAS = Visual Analogue Scale; SPIN = Social Phobia Inventory; SPS = Social Phobia Scale; BDI-II = Beck Depression Inventory; SPAI = Social Phobia and Anxiety Inventory; NSPS = Negative Self Portrayal Scale; BSAM = Brief State Anxiety Measure; BFNE = Brief Fear of Negative Evaluation Scale; SPQ = Speech Performance Questionnaire; TSFAQ = Trait Self-Focused Attention Questionnaire; RRQ = Rumination-Reflection Questionnaire; FAQ = Focus of Attention Questionnaire; BQ = Behaviour Questionnaire; VEQ = Voice Evaluation Questionnaire; SPORS = Speech Performance Observer Rating Scale; PRCA = Personal Report of Communication Apprehension; SAR = State Anxiety Rating; PQ = Performance Questionnaire; STAI = State Trait Anxiety Inventory; CES-D = Center for Epidemiological Studies Depression Scale; RTQ = Repetitive Thinking Questionnaire; SARQ = Social Anxiety Rumination Questionnaire; SIBS = Social Interaction Phobia Scale; LSAS = Liebowitz Social Anxiety Scale; FMPS = Frost Multidimensional Perfectionism Scale; SAP = Social Anxiety Scale; RRS = Ruminative Response Scale; PSWQ = Penn State Worry Questionnaire; GADQ-IV = Generalised Anxiety Disorder Questionnaire-IV; MPSP = Modified Perception of Speech Performance.

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