The Role of Perfectionism and Cognitive Biases in Social Anxiety

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Abstract

Social anxiety disorder is a common condition associated with significant impairments. Prominent cognitive models of social anxiety explain the development and maintenance of the disorder, and highlight two key characteristics: 1) the discrepancy between one's own or perceived high social standards from others and one's perceived ability to attain such standards (also a feature of perfectionism); and 2) cognitive biases that maintain social anxiety. Based on these propositions, this thesis sought to investigate the relationships among social anxiety, perfectionism, and cognitive biases.

Despite numerous cross-sectional studies linking the dimensions of perfectionistic concerns and perfectionistic strivings to social anxiety, longitudinal evidence for the direction of these relationships is scarce and results are inconsistent. Moreover, negative interpretation bias, negative self-imagery, and post-event processing are cognitive biases empirically shown to be related to social anxiety and perfectionism separately, but research investigating these elements simultaneously is currently lacking. Hence, the aims of current thesis were as follows: 1) to clarify the direction of the relationship between social anxiety and perfectionism dimensions; 2) to understand the longitudinal relationships of social anxiety and perfectionism to cognitive biases; and 3) to investigate the role of these cognitive biases as mediators of the relationship between social anxiety and perfectionism dimensions.

Studies 1 and 2 addressed these aims using longitudinal designs. Study 1 employed a six-month, three-wave design, whereas Study 2 was conducted over two weeks and in the context of a social interaction task. The main finding of Studies 1 and 2 was a role for negative interpretation bias as a transdiagnostic process across social anxiety and perfectionistic concerns. Negative self-imagery emerged as a maintenance factor of social anxiety in Study 2, but this cognitive bias, along with post-event processing, had no mediator role in the relationships between social anxiety and perfectionism dimensions in either Study 1 or 2. There was a direct relationship from social anxiety to perfectionistic

concerns in Study 2, but only when cognitive biases were not included in the analysis. Taken together, findings suggest that relationships between social anxiety and perfectionism dimensions are best understood in conjunction with cognitive biases.

Based on these results, Study 3 tested the effect of interpretation bias modification on social anxiety and perfectionism dimensions in individuals with high levels of social anxiety. Overall, the intervention and control groups showed reductions in negative interpretation bias, but no corresponding reduction in state anxiety and perfectionism across trait social anxiety or perfectionistic concerns levels. However, despite the lack of relationships between negative interpretation bias and perfectionistic strivings in Studies 1 and 2, interpretation bias modification appeared effective for those high in perfectionistic strivings. Future research should refine the interpretation bias modification protocol to extend its effectiveness also to those high in perfectionistic concerns and social anxiety.

Overall, the current thesis provided novel evidence regarding the contribution of cognitive biases to social anxiety and perfectionism dimensions. Moreover, it uncovered that transdiagnostic biased information processing underlies social anxiety and perfectionistic concerns. Limitations notwithstanding, the findings provide theoretical and clinical contributions to the areas of social anxiety and perfectionism.

Declaration

I certify that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university; and to the best of my knowledge and belief, does not contain any material previously published or written by another person except where due reference is made in the text.

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Chapter 1: Theoretical Background

Social Anxiety and Social Anxiety Disorder

Social phobia, the specific fear of social situations, was identified for the first time in the third edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-III, American Psychiatric Association [APA], 1980) as a formal diagnosis. In DSM-IV, social phobia was renamed social anxiety disorder and has remained the current term in the latest version of the manual (DSM-5; APA, 2013). Social anxiety disorder is defined as the fear of social situations where scrutiny from others may arise (APA, 2013). The core feature of social anxiety disorder is fear of negative evaluation, with individuals with social anxiety disorder experiencing cognitive (e.g., catastrophising), behavioural (e.g., avoidance) and physical (e.g., elevated heart rate) symptoms. The diagnostic criteria for a diagnosis of social anxiety disorder in the DSM-5 can be seen in Table 1.1.

Table 1.1

Diagnostic Criteria of Social Anxiety Disorder in DSM-5

A. Marked fear or anxiety about one or more social situations in which the individual is exposed to possible scrutiny by others. Examples include social interactions (e.g., having a conversation, meeting unfamiliar people), being observed (e.g., while eating or drinking), and performing in front of others (e.g., giving a speech).
B. The individual fears that they will act in a way or show anxiety symptoms that will be negatively evaluated (i.e., will be humiliating or embarrassing; will lead to rejection or offend others).
C. The social situations almost always provoke fear or anxiety.
D. The social situations are avoided or endured with intense fear or anxiety.
E. The fear or anxiety is out of proportion to the actual threat posed by the social situation and to the socio-cultural context.
F. The fear, anxiety, or avoidance is persistent, typically lasting for six months or more.
G. The fear, anxiety, or avoidance causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.
H-I-J. The fear, anxiety, or avoidance is not attributable to the effects of a substance, medical condition, or mental disorder.

As can be seen in the diagnostic criteria, social anxiety disorder is delineated as a discrete category in the DSM-5, with the threshold for diagnosis being persistent and extreme social fears associated with clinically significant distress and impairment. In relation to this clinical condition, social anxiety at a sub-diagnostic level is characterised as a common fear of evaluation from others about social performance (Morrison & Heimberg, 2013). Researchers have suggested that social anxiety is in fact a continuum, from mild presentations such as slight shyness to severe and impairing forms, namely social anxiety disorder (McNeil, 2001; Rapee & Heimberg, 1997; Rapee & Spence, 2004; Ruscio, 2010). It has further been suggested that individuals with social anxiety at a sub-diagnostic level also experience fear of social situations that inflicts disruptions in functioning (Stopa & Clark, 2001). Therefore, researchers have proposed that studying individuals with social anxiety at a sub-diagnostic level provides empirical and clinical information on social anxiety disorder (McNeil, 2001; Ruscio, 2010; Stopa & Clark, 2001). In line with these suggestions, in the current thesis, social anxiety refers to a sub-diagnostic level and social anxiety disorder to a clinical level of the condition, with both included in the present review of the literature and the subsequent empirical chapters.

In Australia, social anxiety disorder is a common disorder, with a 12-month prevalence of 4.7% (Australian Bureau of Statistics, 2007). Lifetime prevalence in Australia is 8.5%, higher than the 4% average lifetime prevalence found in high-income countries (D. J. Stein et al., 2017). Social anxiety disorder has an early onset compared to other anxiety disorders, usually developing between eight and 15 years of age (Kessler et al., 2005). Women often present higher rates of social anxiety disorder than men (D. J. Stein et al., 2017). In Australia, a 12-month prevalence of 3.3% is seen for men, compared to 5.1% for women (Crome et al., 2015). Comorbidity rates are high in individuals with social anxiety disorder, with 78.8% meeting criteria for another lifetime mental health disorder: the most common comorbid disorders are other anxiety disorders, followed by mood disorders and substance use disorders (D. J. Stein et al., 2017). Given the early onset of social anxiety disorder, literature has

suggested that it may precede disorders it is often comorbid with, and hence may be a risk factor for these comorbid disorders (Ruscio et al., 2008). Correspondingly, 40.4% of individuals with social anxiety disorder and another mental health disorder report developing social anxiety prior to the comorbidity (D. J. Stein et al., 2017). Furthermore, compared to their counterparts without social anxiety, individuals with social anxiety disorder are less likely to be married or in stable relationships, are less likely to be employed full-time, and less likely to be highly educated (Aderka et al., 2012; Crome et al., 2015; D. J. Stein et al., 2017). Social anxiety disorder is also associated with suicidal ideation and attempts (Gallagher et al., 2014; Thibodeau et al., 2013). These problems reflect the impairments in educational, employment, and personal life areas caused by the disorder (Aderka et al., 2012; Crome et al., 2015; D. J. Stein et al., 2017). Consequently, social anxiety disorder is one of the five most debilitating disorders (Alonso et al., 2004). Social anxiety disorder is frequently unremitting if not treated (J. Wong et al., 2014) and hence, it is a commonly seen clinical condition with critical consequences.

Cognitive Behavioural Models of Social Anxiety

Since the first inclusion of social phobia in the DSM-III, researchers have conceptualised theoretical models to increase our understanding of the development and maintenance of the disorder, and to inform treatment for this disorder (J. Wong et al., 2014; Q. J. J. Wong & Rapee, 2016). In one of the most prominent models of social anxiety, Clark and colleagues (2001; 1995) put forward an explanation for the persistence of social fears despite regular exposure to feared situations. Clark (2001) posits that when an individual with social anxiety enters a social situation, a series of assumptions regarding the self and the social world are activated. These assumptions are formed due to early experiences and are divided into three groups: *unreasonably high standards for social performance* (e.g., 'I must not show any flaws'); *beliefs regarding the consequences of social performance* (e.g., 'If I say something wrong, people will think I am stupid'); and *unconditional negative beliefs regarding the self* (e.g., 'I'm dull').

Once these assumptions are activated, the individual tends to perceive the social situation as dangerous, which leads them to process information in a biased manner. For example, the individual turns their attention internally to monitor and observe the self. Information obtained from the internal focus is used to create a negative image of the self as seen by others, and to infer others' views and thoughts regarding the individual. Meanwhile, the individual also interprets external ambiguous social cues in a negative manner; for example, a social partner's neutral, ambiguous facial expression is interpreted in a negative way such as boredom. Furthermore, the perceived social danger leads the individual to experience somatic (e.g., trembling, sweating) and cognitive symptoms (e.g., hypersensitivity to criticism), and to engage in avoidance or safety behaviours (e.g., wearing makeup to hide blushing). These behaviours are performed with an intention to prevent or diminish feared outcomes but often result in an opposite consequence. The safety behaviours, as well as the somatic and cognitive symptoms, aggravate further biased information processing.

In addition to the in-situation cognitive biases described above, the cognitive model by Clark (2001) also proposes *biased processing before and after a social situation*. For example, although the social event has ended, the individual continues to engage in biased cognitive processing by analysing their behaviours in detail from a negative perspective and engaging in negative rumination. These thoughts are tainted by the in-situational cognitive processing and the individual is likely to recall the social situation much more negatively than it was in reality. Overall, Clark's (2001) model emphasises that biased information processing serves as a maintenance factor of social anxiety disorder.

Another prominent cognitive-behavioural model of social anxiety is that of Rapee and Heimberg (1997), which was later revised and updated by Heimberg et al. (2010; 2014). Heimberg et al.'s (2014) model shares most features of the model by Clark (2001). For example, both models acknowledge the discrepancy between standards for performance and an individual's ability to achieve such standards. However, Clark (2001) suggests that this discrepancy is compared to the individual's own high standards

for performance, whereas Heimberg et al. (2014) posit that the discrepancy is contrasted against perceived high standards from others.

In addition, both models place great importance on the role of cognitive biases, although with subtle differences regarding whether these biases are internally or externally focused. For example, although interpretation bias is described by both models as a tendency to negatively interpret cues, Clark (2001) focuses on the interpretation of external cues (e.g., facial expressions of a social partner), while Heimberg et al. (2014) focus on the interpretation of both internal (e.g., sweating) and external cues. In addition, both models suggest that individuals with social anxiety generate negative self-imagery in response to entering a social situation, with individuals forming a mental representation of the self as seen by others, based on previous distressing social experiences. Heimberg et al. (2014) posit that self-imagery is fuelled by external negative feedback (e.g., a yawning audience may lead to mental images of oneself appearing as an uninteresting social partner) and perceived internal cues (e.g., mild blushing may cause an individual to imagine themselves looking severely red-faced in front of social partners). In contrast, Clark (2001) proposes that the negative self-image is perpetuated by the monitoring of internal information, namely internal somatic sensations (i.e., feeling anxious means looking anxious), seeing oneself from an observer's perspective, and *felt sense* (i.e., negative impressions and/or feelings regarding oneself in a social situation).

A third relevant model is that of Hofmann (2007), which similarly proposes that cognitive factors maintain social anxiety disorder. Like that of Clark (2001) and Heimberg et al. (2014), Hofmann's (2007) model emphasises perceived high social standards as the starting point of the maintenance cycle of social anxiety disorder. The proposition of perceived high social standards is based on the self-presentation theory by Leary and Kowalski (1995), which holds that individuals with social anxiety aspire to make a positive impression on others, but lack the confidence to make such impressions. As such, Hofmann (2007) proposes that individuals with social anxiety disorder believe that others have high

expectations of social performance, but feel unable to reach such standards, a similar perspective as that proposed in Heimberg et al.'s (2014) model.

As with Clark (2001) and Heimberg et al. (2014), Hofmann (2007) also emphasises the role of information processing biases in social anxiety. It is recognised that individuals with social anxiety have a tendency to miss positive feedback, which characterises their negative interpretation bias (Hofmann, 2007). In Hofmann's (2007) model, negative self-imagery is referred to as *negative self-perception* and Hofmann emphasises the inability to make a desirable impression on others in socially anxious individuals. This perceived inability, as well as beliefs regarding others' evaluations, contribute to negative self-imagery, as individuals become aware of their shortcomings (Hofmann, 2007).

Overall, the models by Clark (2001), Heimberg et al. (2014), and Hofmann (2007) present a large number of similarities including the discrepancy between one's own or perceived social standards and one's perceived ability to attain such standards, as well as biased information processing that maintains social anxiety disorder. The discrepancy between one's own or perceived social standards and one's perceived ability to attain such standards is similar to a core feature of perfectionism (Limburg et al., 2016; Rice et al., 2014; Slaney et al., 2001), a construct which has consistently been associated with social anxiety and social anxiety disorder (Burgess & DiBartolo, 2016; Cox & Chen, 2015; Gautreau et al., 2015; Levinson et al., 2013; Levinson & Rodebaugh, 2016; S. P. Mackinnon et al., 2014; Nepon et al., 2011; Newby et al., 2017; Rukmini et al., 2014; Shikatani et al., 2016). The next sections focus on perfectionism and its relation to social anxiety, followed by a discussion of the role of information processing biases in social anxiety and perfectionism.

Perfectionism

Perfectionism has been argued to be a personality trait, a cognitive behavioural feature, and a contributor to psychopathology (Egan et al., 2011; Shafran et al., 2002). A review of research pertaining

to perfectionism reveals markedly distinct definitions and conceptualisations of this construct (Sirois & Molnar, 2016). One important debate in research defining perfectionism is whether it is a unidimensional or multidimensional construct (Sirois & Molnar, 2016). The concept of perfectionism was originally suggested to be unidimensional, but since Hamachek (1978) first proposed that perfectionism was multidimensional, researchers have generally worked with multidimensional frameworks (Sirois & Molnar, 2016). Nonetheless, even among multidimensional concepts of perfectionism, differences exist in the definitions and number of dimensions. Table 1.2 shows the most frequently used multidimensional definitions and measures of perfectionism (Sirois & Molnar, 2016; Stoeber, 2017a).

Table 1.2

Common Definitions of Multidimensional Trait Perfectionism

Source	Dimensions	Definitions
Frost Multidimensional Perfectionism Scale (Frost et al., 1990)	Concern over mistakes	Perception of mistakes as failures, and assumptions that failure leads to lack of respect from others.
	Doubts About Actions	Doubts regarding whether actions are completed satisfactorily.
	Parental Expectations	A perception that parents set excessively high goals.
	Parental Criticism	Perception of parents as overly critical.
	Personal Standards	Excessive high standards are set for the self and high importance is placed on achieving standards for self-evaluation.
	Organisation	Great importance placed on order and organisation.
Multidimensional Perfectionism Scale (Hewitt et al., 1991)	Socially Prescribed Perfectionism	Perception of others as having excessively high standards for performance and achievement.
	Self-Oriented Perfectionism	High standards are set for the self.
	Other-Oriented Perfectionism	High standards are set for others.

Although these measures relate to different domains of perfectionism, factor analyses incorporating these dimensions have shown the emergence of a two-factor structure comprising *perfectionistic concerns* and *perfectionistic strivings* (Frost et al., 1993; Limburg et al., 2016; Stoeber, 2017a). Perfectionistic concerns correspond to excessive self-criticism and scrutiny, exaggerated fear of evaluations and criticism from others, whereas perfectionistic strivings are the extremely high self-standards and a requirement for the self to be perfect (Sirois & Molnar, 2016; Stoeber, 2017a). Concerns over Mistakes, Doubts About Actions, Parental Expectations, Parental Criticism, and Socially Prescribed Perfectionism were originally proposed to load on the perfectionistic concerns factor, whereas Personal Standards, Organisation, Self-Oriented Perfectionism and Other-Oriented Perfectionism were thought to be part of perfectionistic strivings (Frost et al., 1993). New perfectionism measures have been created since, also with subscales pertaining to either perfectionistic concerns or perfectionistic strivings (e.g., The Almost Perfect Scale; Slaney et al., 2001). These subscales have since been used as proxies of perfectionistic concerns and perfectionistic strivings (Stoeber, 2017a) rather than fixed configurations of the two factors. Researchers have generally employed varying combinations of perfectionistic concerns-related subscales and, at times, particular items of these subscales to measure perfectionistic concerns (Stoeber, 2017a; Stoeber & Otto, 2006). Likewise, perfectionistic strivings are often determined by varying arrangements of perfectionistic strivings-related subscales and/or items (Stoeber, 2017a; Stoeber & Otto; 2006).

Since Frost et al.'s (1993) establishment of the two factors, the suitability of some subscales as representatives of perfectionistic concerns or perfectionistic strivings has been questioned. For instance, the Organisation subscale has been shown to be part of neither perfectionistic concerns nor perfectionistic strivings and instead appears to be related to a third factor called Order (Kim et al., 2015). Similarly, Other-Oriented Perfectionism has been proposed not to be part of the two-factor structure, as this subscale measures perfectionism aimed at others and not the self (Stoeber, 2017a).

Furthermore, Parental Expectations and Parental Concerns have been suggested to be part of the developmental process of perfectionism (Damian et al., 2013; Stoeber, 2017a; Stoeber & Otto, 2006). These suggestions notwithstanding, some recent studies have still employed some of these subscales as part of their perfectionistic concerns or perfectionistic strivings composites (e.g., Other-Oriented Perfectionism as part of perfectionistic strivings; Cooks & Ciesla, 2019). Hence, the literature varies greatly in the measurement of perfectionistic concerns and perfectionistic strivings.

Historically, perfectionistic concerns have often been found to be related to psychopathology, whereas perfectionistic strivings have frequently been correlated with wellbeing, positive affect, and positive characteristics such as personal motivation (Frost et al., 1993; Stoeber & Otto, 2006). Hence, these two factors were often referred to in the literature as maladaptive and adaptive perfectionism (Dunkley et al., 2016; Levinson et al., 2013), although these polarising labels have started to be phased out (Stoeber, 2017a). This is due to the fact that, despite these opposing labels and definitions, perfectionistic strivings have been shown to be positively related to psychopathology (e.g., eating disorders and symptoms, obsessive beliefs; Limburg et al., 2016). Moreover, perfectionistic concerns and perfectionistic strivings have been shown to be positively correlated (e.g., r = .58 - .72 in Dunkley et al., 2012; r = .45 in Gaudreau, 2012; r = .49 - .62 in Smith et al., 2015), and thus often co-occur within individuals. Indeed, these medium-to-large correlations have led to criticism of the two-factor model, with some researchers arguing that the shared variance between the two factors misrepresents the relationships between the two factors and other psychopathology (Gäde et al., 2017; Hill, 2014, 2017). Suggestions have been made to add a ‘general’ factor to the two-factor structure, to account for this shared variability (Gäde et al., 2017; Smith & Saklofske, 2017). Although this debate is still ongoing, the two-factor model has generally been accepted in the field of perfectionism and has been gathering popularity over the years (Sirois & Molnar, 2016; Stoeber, 2017a; Stoeber et al., 2020; Stoeber & Gaudreau, 2017).

In the same vein, it has been acknowledged that perfectionistic concerns and perfectionistic strivings are not mutually exclusive, but rather individuals may present varying levels of both (Gaudreau & Thompson, 2010; Stoeber, 2017a; Stoeber & Gaudreau, 2017; Stoeber & Otto, 2006). However, the categorisation of different levels of perfectionistic concerns and perfectionistic strivings, as well as the outcomes of these combinations, is still debated in research. The tripartite model of perfectionism (Rice & Ashby, 2007; Stoeber & Otto, 2006), classifies individuals as healthy perfectionists (with high perfectionistic strivings and low perfectionistic concerns), unhealthy perfectionists (with high perfectionistic strivings and perfectionistic concerns) and non-perfectionists (with low perfectionistic strivings and high or low perfectionistic concerns). This model argues that perfectionistic strivings are only adaptive when combined with a low level of perfectionistic concerns (Stoeber & Otto, 2006). Furthermore, the tripartite model proposes that unhealthy perfectionism is related to poorer outcomes than non-perfectionism (Stoeber, 2012).

Although the tripartite model has made theoretical contributions to the field, it is not without limitations. Grouping individuals with low levels of perfectionistic strivings and perfectionistic concerns with individuals with low levels of strivings and high levels of concerns under the umbrella of non-perfectionism appears to be problematic (Gaudreau & Thompson, 2010), given that perfectionistic concerns have often been associated with negative psychological outcomes (e.g., Limburg et al., 2016). In order to address these limitations, a theoretical framework known as the 2 x 2 model of dispositional perfectionism was introduced, and it has gathered empirical support since its introduction (Gaudreau et al., 2017; Gaudreau & Thompson, 2010; Stoeber, 2017a). This model refers to perfectionistic strivings as personal standards perfectionism, and perfectionistic concerns as evaluative concerns perfectionism. As these terms are synonymous, the present thesis uses the terms perfectionistic strivings and perfectionistic concerns to describe this model.

The 2 x 2 model posits that individuals may present four different subtypes of perfectionism: non-perfectionism (low perfectionistic strivings and low perfectionistic concerns), pure perfectionistic strivings (high perfectionistic strivings and low perfectionistic concerns), pure perfectionistic concerns (low perfectionistic strivings and high perfectionistic concerns), and mixed perfectionism (high perfectionistic strivings and high perfectionistic concerns). Gaudreau and Thompson (2010) suggested that perfectionistic concerns are perfectionistic values that are not internalised or personally endorsed by individuals, but rather a perception of external pressure to be perfect placed on by the social environment. On the other hand, perfectionistic strivings were proposed to be internalised and perfection standards towards oneself are held by individuals (Gaudreau & Thompson, 2010). Hence, this model proposes that pure perfectionistic concerns are more detrimental than mixed perfectionism, in which individuals have a perception of standards being imposed, but also endorse these standards for themselves (Gaudreau & Thompson, 2010).

Consistent with the view that perfectionistic concerns and perfectionistic strivings should be analysed together, Stoeber (2017b) proposed that a weakness of some previous research pertaining to perfectionism and psychological outcomes is the lack of measures of perfectionistic strivings. This has been argued to be problematic, as conducting research including perfectionistic concerns exclusively may provide an inaccurate portrayal of the relationships between perfectionism and psychological outcomes (Stoeber, 2017b). Moreover, not accounting for the effects of perfectionistic strivings neglects the multidimensional nature of perfectionism (Stoeber, 2017b).

In the same vein, there has been criticism of previous research that has used the perfectionism subtypes from the 2 x 2 model in a person-centred approach (i.e., dividing a sample of participants into subgroups representing the perfectionism subtypes; Gaudreau et al., 2017; Stoeber, 2017b). Gaudreau et al. (2017) argued that this person-centred approach gives a misleading representation of perfectionism, as even within a specific perfectionism subtype, within-person combinations of

perfectionistic concerns and perfectionistic strivings are not homogenous. Instead, Gaudreau et al. (2017) suggest employing a variable-centred approach (i.e., investigating the two perfectionism dimensions as separate variables and testing their relationships to other constructs, such as psychopathology). Moreover, Gaudreau et al. (2017) recommend using the 2 x 2 model as a framework to test a specific set of hypotheses regarding how the relationships between perfectionism and other variables (e.g., psychopathology) differ between perfectionism dimensions. For example, Gaudreau et al. (2017) propose testing whether pure perfectionistic strivings are associated with more adaptive or maladaptive outcomes than pure perfectionistic concerns (amongst other hypotheses). Although these hypotheses are not the focus of the current thesis, they provide a framework to contextualise the results of previous studies on perfectionism, as will be reviewed in Chapter 2. Taking the suggestions from Stoeber (2017b) and Gautreau et al. (2017) into consideration, the present thesis adopted a two-factor framework of perfectionism and administered measures of both perfectionistic concerns and perfectionistic strivings, using a variable-centred approach to analyse the data.

Perfectionism and Social Anxiety

Cognitive models of social anxiety do not directly refer to perfectionism; however, as reviewed in previous sections, these models emphasise the importance of the discrepancy between standards for performance and one's perceived ability to meet such standards (Clark, 2001; Heimberg et al. 2014, Hofmann, 2007). This discrepancy is referred to as a form of perfectionism in the literature and relates directly to the perfectionism dimension of Discrepancy described by Slaney et al. (2001), which pertains to perfectionistic concerns. The individual's perceived inability to attain such standards (seen across the three cognitive models of social anxiety) corresponds to the dimension of Doubt About Actions, also part of perfectionistic concerns. Additionally, the excessively high standards for the performance imposed by the self in Clark's (2001) model are reflective of the perfectionistic strivings dimension of perfectionism (i.e., Personal Standards, Self-Oriented Perfectionism; see Table 1.2). Hence, the

measurements frequently used in perfectionism are indirectly but consistently described in cognitive models of social anxiety disorder.

Across cognitive models, evidence exists to support the role of perfectionism as a contributor to social anxiety. Clark (2001) suggests that unreasonably high standards for performance are part of the assumptions that individuals hold about the self and the world and are formed early in life. In Heimberg et al.'s (2014) model, when socially anxious individuals enter a social situation, they tend to create a negative mental representation of themselves and compare this with perceived expected standards of others. This comparison often results in a discrepancy between the perceived high standards for performance and one's inability to attain such standards, which leads to behavioural, physical, and cognitive symptoms of social anxiety. Similarly, in Hofmann's (2007) model, perceived high social standards and an inability to reach such standards precede social apprehension when entering social situations. As such, excessively high standards and a perceived inability to meet these standards appear to be a stable characteristic of people with social anxiety, which precede social anxiety symptoms. This presentation is consistent with that of perfectionism, in which perfectionism is a stable personality characteristic (Rice & Aldea, 2006; Sirois & Molnar, 2016). Aetiological models of personality and psychopathology tend to indicate that personality traits precede and may lead to psychopathology (e.g., the vulnerability model; Bagby et al., 2008). Indeed, it has been suggested that perfectionism is a risk factor for the development of poor psychological outcomes (Rice & Aldea, 2006; Sirois & Molnar, 2016).

In terms of the dimensions of perfectionism, perfectionistic concerns and perfectionistic strivings are both seen in the cognitive models of social anxiety as reviewed in a previous section (Clark, 2001; Heimberg et al. 2014, Hofmann, 2007). The individual's perceived inability to achieve standards, as seen in the cognitive models, is analogous to perfectionistic concerns. Moreover, one's own high standards for performance, a key feature of perfectionistic strivings, are part of the cycle of social anxiety in cognitive models. Hence, these cognitive models indirectly suggest that the two factors of

perfectionism are part of the cycle of social anxiety. Although these models suggest that perfectionism may lead to social anxiety, empirical evidence has shown a more inconsistent picture, with some previous studies supporting the direction of effect proposed by cognitive models and others showing the opposite direction (i.e., social anxiety leading to perfectionism). These studies will be reviewed in Chapter 2.

In addition to proposing a relationship between perfectionism and social anxiety, theoretical models have posited that cognitive biases are a key factor in the maintenance of social anxiety. Research has shown that these biases are also related to perfectionism (e.g., Flett et al., 2016; Lee et al., 2011; Yiend et al., 2011), and that information processing biases appear to be related to social anxiety and perfectionism simultaneously (e.g., Abdollahi, 2019; Cox & Chen, 2015). Hence, when examining the associations between social anxiety and perfectionism, the present thesis also addressed their relationships with cognitive biases.

Cognitive Biases in Social Anxiety

Across the cognitive models of social anxiety disorder, biased cognitive processing is an important maintaining factor of the disorder. Indeed, the majority of the literature has highlighted the role of cognitive biases as contributors to the maintenance of social anxiety disorder (Kuckertz & Amir, 2014; Q. J. J. Wong & Rapee, 2016). Cognitive biases such as negative interpretation bias, negative self-imagery, and post-event processing have been shown to be important characteristics of anxiety disorders (Kuckertz & Amir, 2014; Morrison & Heimberg, 2013), and underpinning features of social anxiety disorder (Hirsch et al., 2003; Makkar & Grisham, 2011a; Voncken et al., 2003). The following sections review these cognitive biases from a theoretical perspective.

Negative Interpretation Bias

The nature of social interactions is inherently ambiguous and requires individuals to assess their own performance based on perceived feedback from social partners (Kuckertz & Amir, 2014). For individuals with social anxiety disorder, such judgements are affected by their biased interpretation (Kuckertz & Amir, 2014), defined as the tendency to negatively interpret ambiguous social cues (Beard & Amir, 2010; Hirsch & Clark, 2004). Despite a general lack of overt negative reactions in normal social situations, ambiguous external social cues (e.g., a yawning audience) are processed by socially anxious individuals in a negative fashion (Clark, 2001).

Clark (2001) and Heimberg et al. (2014) suggest a similar mechanism of impact of negative interpretation bias in the cycle of social anxiety disorder, with differences in the triggers for biased interpretation. Clark (2001) proposes that negatively biased interpretations occur when an individual's assumptions regarding the self and the world are activated, whereas Heimberg et al. (2014) suggest that individuals with social anxiety engage in excessively negative thinking in response to social situations, and negative interpretation bias is at the core of these cognitions. Both models hold that negative interpretation of social situations leads the individual to review interactions in a biased manner and to further negative appraisals and rumination. Such negative recollections or ruminations regarding social interactions are further added to a collection of past failures that will be recalled at the next social situation, and fuel increased anxiety and avoidance. In addition, Clark (2001) and Heimberg et al. (2014) suggest that internal cues such as somatic and cognitive anxiety symptoms (e.g., blushing, mental blanks) are interpreted in a biased manner as impending failures. The individual then becomes hypervigilant, which in turn further increases the severity of symptoms and may elicit negative reactions from others, forming a vicious cycle (Clark, 2001; Heimberg et al., 2014).

Hofmann (2007) does not incorporate negative interpretation bias in his model but acknowledges that individuals with social anxiety have a tendency to miss positive cues in social situations. This tendency has been suggested to be a key point of difference in cognitive processes

between people with social anxiety and non-anxious controls (Hirsch & Mathews, 2000). Hence, although some differences exist between cognitive models of social anxiety, negative interpretation bias is suggested to play a key role in the cycle that perpetuates social anxiety disorder.

Negative Self-Imagery

Individuals with anxiety disorders tend to engage in conceptualising excessively negative and distorted images of themselves as seen by others (Ng et al., 2014). Negative self-imagery is defined as 'mental pictures of the self that represent an individual's feared outcomes' (Ng et al., 2014, p. 621). Clark (2001) and Heimberg et al. (2014) propose that when individuals with social anxiety enter social situations, they become anxious and focus on internal sources of information such as intense somatic sensations (e.g., feeling anxious means looking anxious) to generate distorted self-images of how they are seen by others. Hofmann's (2007) model draws from these perspectives to describe negative self-perception, a concept akin to negative-self imagery.

Based on these distorted mental representations of the self, socially anxious individuals perceive their performance in a negative manner. Such mental representations are constantly updated by the individuals' perceived negative feedback from others, leading to further negative self-imagery (Heimberg et al., 2014). Heimberg et al. (2014) further suggest that negative self-imagery exacerbates feelings of anxiety by interfering with social performance as individuals attempt to concurrently monitor feedback from the audience, survey and conceal anxiety symptoms, and engage in social interaction. Furthermore, increased self-monitoring leads to decreased attention to potential positive feedback from others. The negative nature of self-imagery is persistent, given that the information used to generate it is internal, and disproving external feedback is interpreted in a biased and negative manner (Clark, 2001). Hence, negative self-imagery exacerbates the anxiety response to a social situation, creating a cycle in which social anxiety is maintained (Clark, 2001; Heimberg et al. 2014).

Post-Event Processing

Post-event processing, also called post-event rumination, is another key cognitive bias proposed in models of social anxiety. Clark's (2001), Heimberg et al.'s (2014), and Hofmann's (2007) models propose that following a social situation, a socially anxious individual engages in post-event processing by reviewing their actions in detail, primarily focusing on the negatively perceived aspects. These negatively ruminated details regarding a social interaction are further added to a collection of past failures that will be recalled at the next social situation, and fuel increased anxiety and avoidance. Hence, post-event processing is a maintaining factor of social anxiety and acts as a bridge between past perceived social failures and future social anxiety (Heimberg et al., 2014).

Perfectionism and Cognitive Biases

Similar to the propositions above that cognitive biases maintain social anxiety disorder, it has been suggested that cognitive biases are implicated in the development and maintenance of perfectionism, as these biases are posited to lead to a perceived inability to meet performance standards (Flett et al., 2017; Shafran et al., 2002; Shafran et al., 2018). Theoretical frameworks outlining the relationships between perfectionism dimensions and negative interpretation bias, negative self-imagery, and post-event processing in the context of social anxiety do not currently exist; hence, the current thesis adopted elements from theories of perfectionism to contextualise how these cognitive biases arise in perfectionists.

Perfectionism cognition theory (Flett et al., 2016; Flett et al., 2017) provides a multilevel framework describing various processes related to cognitions in perfectionism, the majority of which are beyond the scope and focus of the current thesis; nonetheless, some points are of interest. Based on Ingram's (1990) information processing model of depression, perfectionism cognition theory posits that perfectionists hold schemas regarding the self (such as the need to be perfect), which become activated

in relevant life events (e.g., when encountering setbacks in performance). This theoretical framework further posits that following such events, perfectionistic individuals experience negative self-images and post-event processing regarding, for example, failing to be perfect (Flett et al., 2017). As such, the current thesis investigated whether negative self-imagery and post-event processing are related to perfectionism in the context of social anxiety.

Flett et al. (2017) also acknowledge that perfectionists are more likely to present biases in the interpretation of ambiguous cues, although this is not directly incorporated into perfectionism cognition theory. Nonetheless, similar concepts are part of their theory, namely perfectionists' surveillance and vulnerability to potential threat evaluations from others. Moreover, Ingram's (1990) information processing model of depression outlines that the schemas of people with depression influence their interpretation of incoming information, and although Flett et al. (2017) do not focus on this in perfectionism cognition theory, it is plausible that the schemas held by perfectionistic individuals also influence their interpretation of events.

Likewise, Shafran et al.'s (2002; 2018) cognitive behavioural model of perfectionism outlines that perfectionistic individuals show hypervigilant monitoring of their own performance. In turn, individuals interpret their actions negatively by focusing on aspects of performance that did not meet their standards (whether this failure to achieve these standards was real or imagined; Shafran et al., 2018). This negative interpretation is based on the individual's own perception of their performance, and hence represents a similar process to what is outlined by Clark (2001) and Heimberg et al. (2014), which suggests that internal information (e.g., blushing) is interpreted in a biased manner as impending failure. However, Shafran et al. (2002; 2018) do not address the role of external cues (i.e., perceived information from social partners), a key part of negative interpretation bias as outlined in cognitive models of social anxiety.

Hence, suggestions from these theories indicate that perfectionists have a heightened vulnerability to evaluative threats from others (Flett et al., 2017) and show hypervigilant monitoring of performance (Shafran et al., 2002). It is likely that in social situations, even if evaluations of performance from social partners are not overt (Clark, 2001), perfectionists may show a heightened sensitivity to ambiguous cues from others. Combined with perfectionists' tendency to catastrophise the consequences of evaluation (Shafran et al., 2018), ambiguous cues from others may be interpreted in a negatively biased, catastrophic manner. The current thesis sought to test this proposition and investigate whether perfectionism is related to negative interpretation bias in the context of social anxiety.

Social Anxiety, Perfectionism, and Cognitive Biases

There is scarce literature on the relationships between anxiety (including social anxiety), perfectionism and cognitions (Burgess & DiBartolo, 2016). To my knowledge, only one theoretical model that encompasses social anxiety and cognitive biases has referred directly to perfectionism, namely the extended conceptual model of perfectionism and social anxiety of Flett and Hewitt (2014). This model proposes that perfectionistic concerns, in conjunction with a negative concept of the self (e.g., shame), give rise to biased cognitions such as perfectionistic self-presentation (i.e., the need to conceal imperfection), perfectionistic rumination (i.e., the tendency to continuously think about past mistakes), and perfectionistic discrepancies (i.e., the difference between one's standards and one's perceived ability to attain such standards). Flett and Hewitt (2014) argued that in turn, these cognitions lead to social anxiety. Hence, the extended conceptual model of perfectionism and social anxiety suggests a mediator role for cognitive biases in the relationship between perfectionistic concerns and social anxiety. Based on this proposition, the present thesis adopted the position that cognitive biases may serve as mediators of the relationships between social anxiety and perfectionism dimensions. Further justification for the mediation role of cognitive bias is discussed in Chapter 2.

On the other hand, there are some differences between the extended conceptual model of perfectionism and social anxiety, and the framework adopted in the current thesis. Flett and Hewitt's (2014) model is built upon the perfectionistic self-presentation model of Hewitt and Flett (1991), and as such, it emphasises cognitive biases that are related to perfectionistic content (e.g., rumination of past displays of imperfection). Hence, perfectionism and perfectionistic cognitions are a principal focus in Flett and Hewitt's (2014) framework. In contrast, the current thesis uses cognitive models of social anxiety as its primary theoretical framework and focuses on some cognitive biases highlighted in cognitive models of social anxiety (Clark, 2001; Heimberg et al., 2014; Hofmann, 2007), namely negative interpretation bias, negative self-imagery, and post-event processing. Perfectionistic self-presentation and perfectionistic discrepancies are not measured as cognitive biases in the current thesis. Although perfectionistic rumination is similar to post-event processing, this cognitive bias was measured in the context of social anxiety in the current thesis, as will be outlined in Chapter 2. Hence, the current thesis differs from Flett and Hewitt's (2014) model in its approach to cognitive biases.

Furthermore, considering recent propositions of the problematic nature of not including perfectionistic strivings alongside perfectionistic concerns in research (Stoeber, 2017b), the present thesis incorporates these suggestions, and thus also differs from the extended conceptual model of perfectionism and social anxiety which focuses only on perfectionistic concerns. As such, the current thesis mainly relies on cognitive theories of social anxiety while also adopting elements from theoretical frameworks of perfectionism, thus taking a novel approach to research relating to social anxiety, perfectionism, and cognitive biases.

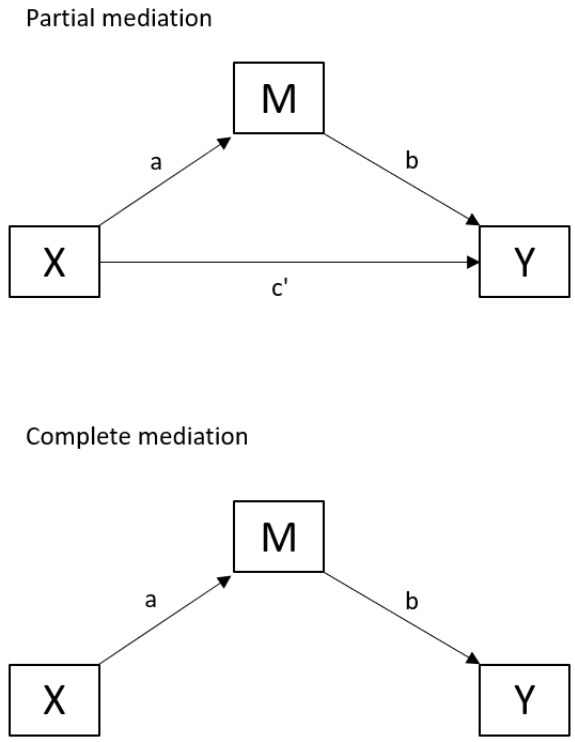
Considerations for the Concept of Mediation

Given the aim to investigate the mediator roles of cognitive biases in the relationships between social anxiety and perfectionism, the concept of mediation is paramount to the current thesis.

Mediation is a method that allows researchers to understand the mechanism of effect of an antecedent on a consequence (Hayes, 2017). Specifically, mediation refers to the statistical process whereby an independent variable affects a dependant variable through one or more mediator variables, completely or partially (Salkind, 2007). In complete mediation, the effect of the independent variable is entirely indirect and through the mediator(s), whereas in partial mediation, the independent variable both directly and indirectly affects the dependant variable (as shown in Figure 1.1). Earlier conceptualisations of mediation imposed a pre-requisite of a significant effect of the independent variable on the dependent variable when the mediator is not taken into account (Kline, 2015). This pre-requisite has since been dropped by researchers, as instances of mediation without a relationship between the independent and dependant variable can occur (Kline, 2015).

Figure 1.1

Examples of Partial and Complete Mediation Models



Note. X represents an independent variable. Y represents a dependent variable. M represents a mediator. Pathway c' represents the direct effect of X on Y. Pathway ab represent the indirect effect of X on Y through M.

From a theoretical standpoint, a series of assumptions must be met for mediation to be established: the causal direction of the model must be correctly defined and reciprocal causation (e.g., the mediation and dependent variable cause each other) must not be present; the model must not be affected by confounds; and variables must not be affected by imperfect measurement (D. P. MacKinnon et al., 2007). In practice, such assumptions may not be testable or achievable (D. P. MacKinnon et al.,

2007). As such, recommendations have been made for researchers to rely on solid theoretical foundations and robust research designs in order to strengthen tentative claims of mediation effects (Hayes, 2017; D. P. MacKinnon et al., 2007).

One possible approach in bolstering research designs to establish mediation is to ensure temporal precedence (i.e., the independent variable precedes the dependent variable), which increases confidence that the causal direction of the model is correct (Cole & Maxwell, 2003). As will be reviewed in Chapter 2, a weakness of previous research investigating the mediating effect of cognitive biases is the lack of temporal precedence, as most studies have used cross-sectional designs. The present thesis addresses this shortcoming of the literature by testing mediation using longitudinal data, thus ensuring temporal precedence. Establishing a robust mediator model of the relationships between social anxiety and perfectionism will contribute to our understanding of the maintenance cycle of these psychopathologies and ultimately provide information to help infer causality. Such information may have theoretical applications and will be useful in determining future cognitive models of social anxiety and perfectionism. In terms of clinical implications, identifying the mediators of the relationships between social anxiety and perfectionism may help understand components that contribute to change, and provide a rationale for treatments targeting such mediators in social anxiety and perfectionism. Hence, in conducting robust tests of the mediators of the relationships between social anxiety and perfectionism dimensions, the present thesis will contribute to theory and clinical practice.

Contributions of the Current Thesis

As described in previous sections, cognitive models of social anxiety (Clark, 2001; Heimberg et al., 2014, Hofmann, 2007) describe the discrepancy between one's own or perceived social standards and one's perceived ability to attain such standards. This assumption regarding the self and the world is similar to a core description of perfectionism. Cognitive models of social anxiety also detail the role of

negative interpretation bias, negative self-imagery, and post-event processing as maintenance factors of social anxiety. In accordance with these propositions, and in conjunction with specific elements from perfectionism-related theory (Flett et al., 2017; Flett & Hewitt, 2014; Gaudreau et al., 2017; Shafran et al., 2018; Stoeber, 2017b), the current thesis aimed to investigate how social anxiety relates to perfectionism dimensions and cognitive biases.

As will be reviewed in Chapter 2, extensive cross-sectional evidence exists demonstrating that perfectionism and social anxiety are associated, but there is far less longitudinal research demonstrating the direction of this relationship. Findings of the present project will provide empirical evidence for the directionality of the relationship between social anxiety and perfectionism that has been scarcely explicitly examined. In addition, theoretical models directly describing and further exploring the role of perfectionism and its dimensions in the context of social anxiety and negative interpretation bias, negative self-imagery, and post-event processing do not exist in the literature. The present thesis will address this gap by testing models that establish the temporal relationships between perfectionism and social anxiety and investigate the mediator role of cognitive bias in these relationships.

Findings of the current thesis may have potential implications for prevention and treatments. Social anxiety disorder is often comorbid with other mental health disorders (e.g., major depressive disorder, generalised anxiety disorder, and substance abuse disorders) and it may be a risk factor for these disorders due to its early onset (Ruscio et al., 2008). Furthermore, compared to those without the disorder, individuals with social anxiety disorder often experience impairments in educational, employment, and personal life areas caused by the disorder (Aderka et al., 2012; Crome et al., 2015; D. J. Stein et al., 2017). Research has shown that social anxiety disorder is one of the five most debilitating disorders (Alonso et al., 2004) and is frequently unremitting if not treated (J. Wong et al., 2014), with existing psychological treatments often failing to lead to a complete remission in symptoms (Hofmann & Bögels, 2006; Mayo-Wilson et al., 2014). Hence, social anxiety is associated with significant impairment.

In addressing how social anxiety is related to perfectionism and cognitive biases, the present thesis will help clarify mechanisms of development and maintenance of social anxiety. Findings from the current thesis are expected to contribute to the development of prevention and/or intervention strategies for social anxiety.

Structure of the Current Thesis

The current thesis contains five chapters. In this first chapter, prominent cognitive models of social anxiety disorder were introduced as the main theoretical frameworks of the thesis, along with elements from theories of perfectionism. Specifically, theoretical perspectives on the relationships among social anxiety, perfectionism dimensions (i.e., perfectionistic concerns and perfectionistic strivings), and cognitive biases (i.e., negative interpretation bias, negative self-imagery, and post-event processing) were reviewed. Chapter 2 provides a review of the empirical literature on these relationships. Based on theories proposed in Chapter 1 and the research reviewed in Chapter 2, Study 1 (Chapter 2) sought to investigate the direct relationships between social anxiety and perfectionism dimensions, and the mediator role of cognitive biases in these relationships, in a six-month longitudinal design. Chapter 3 (Study 2) further investigated these relationships in a shorter time frame of two weeks, and in the context of a social interaction task. Based on the results of Studies 1 and 2, Chapter 4 (Study 3) examined the effectiveness of a brief Cognitive Bias Modification for Interpretation Bias protocol as a transdiagnostic intervention for social anxiety and perfectionism. Finally, Chapter 5 reviews the findings of the three studies, identifies clinical and theoretical implications of the current thesis and outlines its limitations. In addition, future research directions are discussed.

Chapter 2

Empirical Background and Study 1: An Investigation of Longitudinal Relationships Among Social Anxiety, Perfectionism Dimensions, and Cognitive Biases.

Chapter 1 presented a review of prominent theories of social anxiety disorder (Clark, 2001; Heimberg et al., 2014; Hofmann, 2007), and identified central themes common to these theoretical models, namely the discrepancy between one's own or perceived social standards and one's perceived ability to attain such standards (i.e., perfectionism), and cognitive biases (i.e., negative interpretation bias, negative-self imagery, and post-event processing). The two-factor structure of perfectionism was introduced as a theoretical framework, with perfectionistic concerns and perfectionistic strivings identified as two constructs related to social anxiety. In addition, the role of cognitive biases in perfectionism was reviewed to the context of existing theories (Flett et al., 2017; Shafran et al., 2002; Shafran et al., 2018). Moreover, the extended conceptual model of perfectionism and social anxiety (Flett & Hewitt, 2014) was presented as a theoretical underpinning for the role of cognitive biases as mediators of the relationship between social anxiety and perfectionism. Based on the theories described in Chapter 1, the present chapter provides an overview of the empirical support for the relationships among social anxiety, perfectionism dimensions, and cognitive biases, and identifies gaps in this literature.

The Directionality of the Relationship Between Social Anxiety and Perfectionism Dimensions

The theoretical models outlined in Chapter 1 demonstrate the discrepancy between one's own or perceived social standards and one's perceived ability to attain such standards (i.e., perfectionism) as a contributor to social anxiety disorder (Clark, 2001; Heimberg et al., 2014; Hofmann, 2007). Although cognitive models of social anxiety and the extended conceptual model of perfectionism and social anxiety suggest that perfectionism leads to social anxiety, evidence for the direction of the relationship

between these constructs is mixed. A three-wave longitudinal study examined the relationships between perfectionistic concerns and perfectionistic strivings and anxiety symptoms in an adolescent sample (Damian et al., 2017). Anxiety symptoms were measured using the Screen for Child Anxiety Related Emotional Disorders (SCARED; Birmaher et al., 1997), which included a subscale that measured social anxiety. Perfectionism and anxiety symptoms were measured every four to five months. Results showed that perfectionistic concerns, but not perfectionistic strivings, predicted anxiety symptoms. Although Damian et al. (2017) examined anxiety symptoms in general (i.e., social anxiety, panic and somatic symptoms, generalised anxiety, separation anxiety, and school anxiety) without focusing specifically on social anxiety, their results provide evidence that perfectionistic concerns contribute to the development of anxiety, and thus a preliminary longitudinal indication that this perfectionism dimension may contribute to social anxiety.

Although not the main focus of their research, Levinson and Rodebaugh (2016) also provided preliminary evidence for the directionality between social anxiety and perfectionism dimensions. Women from a university sample completed the Social Interaction Anxiety Scale (Mattick & Clarke, 1998), and measures of perfectionistic concerns and perfectionistic strivings, amongst other questionnaires. These measures were completed at two time points, spaced six months apart. Results showed a significant positive path from perfectionistic concerns at time 1 to Social Interaction Anxiety Scale scores at time 2, but no significant path from perfectionistic strivings at time 1 to Social Interaction Anxiety Scale scores at time 2. Taken together, the findings of Damian et al. (2017), and those of Levinson and Rodebaugh (2016) demonstrate that perfectionistic concerns may lead to social anxiety, as proposed by cognitive behavioural models for social anxiety (Clark, 2001; Heimberg et al., 2014; Hofmann, 2007). These suggestions resonate with the vulnerability model, which poses that personality traits, such as perfectionism, are a risk factor for developing mental health problems (Bagby et al., 2008), such as social anxiety disorder.

On the flip side, evidence also exists to support the predicting role of social anxiety on perfectionism. Two models of personality traits and psychopathology support the notion that psychopathology leads to the development of personality traits: the complication model holds that psychopathology leads to non-permanent changes in personality, which are reduced once symptoms diminish (Bagby et al., 2008); and the scar model posits that psychopathology leads to changes in personality that are permanent regardless of symptom remission (Bagby et al., 2008). A longitudinal study by Gautreau et al. (2015) demonstrated evidence for these suggestions. Gautreau et al. (2015) conducted a 12 month, three-wave online survey examining reciprocal relationships between social anxiety and perfectionism, in the form of self-critical perfectionism. Self-critical perfectionism is similarly defined to perfectionistic concerns; for example, Dunkley et al. (2016, p. 158) described self-critical perfectionism as: '… constant and harsh self-scrutiny and overly critical self-evaluation tendencies that are closely linked with chronic concerns about others' criticism and disapproval'. Moreover, this type of perfectionism is often measured using subscales belonging to the perfectionistic concerns dimension, in addition to other self-criticism subscales (Stoeber, 2017b). Congruently, Gautreau et al. (2015) used the Doubts About Actions and Concern Over Mistakes, as well as the Self-Criticism subscale of the Depressive Experiences Questionnaire (Bagby et al., 1994) to measure self-critical perfectionism. Hence, their study measured a type of perfectionism that is similar to perfectionistic concerns. Results showed that social anxiety was a predictor of self-critical perfectionism, but self-critical perfectionism did not predict social anxiety. Hence, Gautreau et al.'s (2015) study showed support for the proposition that social anxiety precedes perfectionistic concerns, contrary to suggestions from theories and the findings by Damian et al. (2017) and Levinson and Rodebaugh (2016).

In line with these contradictory findings, researchers have been urged to undertake further longitudinal studies in this area (Damian et al., 2017; Levinson et al., 2015; Nepon et al., 2011; Newby et al., 2017; Shikatani et al., 2016; Stoeber, 2017b). Indeed, the majority of studies in this area have used a

cross-sectional design (e.g., Cox & Chen, 2015; Levinson et al., 2013; S. P. Mackinnon et al., 2014; Nepon et al., 2011; Newby et al., 2017; Rukmini et al., 2014; Scott et al., 2014; Shikatani et al., 2016) and thus the directionality of the relationship between social anxiety and perfectionism is still subject to debate. Further, several limitations can be seen in the previous studies that have attempted to establish directionality. For example, although Damian et al.'s (2017) longitudinal study provided an indication of directionality, as previously explained, these authors measured anxiety symptoms comprised of several types of anxiety, not only social anxiety. Thus, it is not possible to distinguish the effect of perfectionism specifically on social anxiety from their results. Furthermore, Levinson and Rodebaugh (2016) used the Social Interaction Anxiety Scale, a tool that measures a specific subset of social anxiety symptoms relating to fear of social interactions, rather than social anxiety more broadly (Mattick & Clarke, 1998). In addition, Damian et al. (2017) and Levinson and Rodebaugh (2016) recruited samples which consisted exclusively of adolescents and university women, respectively. Such samples were appropriate for the aims of their studies, but a more diverse sample is needed to ascertain whether the observed relationships can be replicated in a general community population.

To date, Gautreau et al. (2015) produced the most compelling evidence on the directionality of the relationship between perfectionism and social anxiety; however, this study also has its shortcomings. Gautreau et al. (2015) only measured self-critical perfectionism, whereas the literature shows that other dimensions of perfectionism are also related to social anxiety. Additionally, Gautreau et al.'s (2015) sample consisted of individuals with relatively low levels of social anxiety, according to some of the measures used in their study. Participants' mean score on the avoidance subscale of the Liebowitz Social Anxiety Scale (M_{T1} = 15.15, SD_{T1} = 11.01; M_{T2} = 12.16, SD_{T2} = 11.40; M_{T3} = 11.37, SD_{T3} = 11.44) was lower than the means seen in previous studies that have used an undergraduate sample (M = 25.12, SD = 12.75; Heeren et al., 2012), and participants with social phobia (M = 31.60, SD = 14.50; Heimberg et al., 1999). Mean scores on the Social Phobia Scale (M_{T1} = 12.51, SD_{T1} = 11.65; M_{T2} = 12.31,

SD_{T2} = 12.38; M_{T3} = 12.41, SD_{T3} = 12.42 in Gautreau et al., 2015) were similar to those seen in undergraduates (*M* = 14.10, *SD* = 10.20) and community samples (*M* = 14.40, *SD* = 11.20), but lower than those in individuals with social phobia (*M* = 40.00, *SD* = 16.00; Mattick & Clark, 1998). Hence, it appears that despite measuring social anxiety, Gautreau et al.'s (2015) sample consisted mostly of individuals with low or no social anxiety. As such, Gautreau et al.'s (2015) results may not provide solid evidence for the relationship between social anxiety and perfectionism specifically.

Taken together, these limitations show that further research is necessary to ascertain the longitudinal relationships between social anxiety and perfectionism. Therefore, the first aim of this thesis was to investigate the relationships between social anxiety and perfectionism in a longitudinal design. Furthermore, the present study sought to address how the two main dimensions of perfectionism, perfectionistic concerns and perfectionistic strivings, differ in their relationship to social anxiety. Overall, the evidence shows that social anxiety and perfectionistic concerns (or closely related variables such as self-critical perfectionism) are positively related in longitudinal designs (Damian et al., 2017; Gautreau et al., 2015; Levinson & Rodebaugh, 2016). However, the relationship between perfectionistic strivings and social anxiety is less clear. Only Damian et al. (2017) and Levinson and Rodebaugh (2016) measured perfectionistic strivings, hence, information about this relationship is limited. Levinson and Rodebaugh (2016) found no significant associations between perfectionistic strivings and social anxiety, and similarly, Damian et al. (2017) found no association between perfectionistic strivings and anxiety more generally. These findings contradict cognitive models of social anxiety, which indirectly suggest that both perfectionistic concerns and perfectionistic strivings contribute to social anxiety.

Furthermore, cross-sectional research has shown mixed results. A meta-analysis by Limburg et al. (2016) investigated the relationships between perfectionistic concerns and perfectionistic strivings and various domains of psychopathology, including social anxiety symptoms. Results of analyses of 16

studies, which were mostly cross-sectional, showed that perfectionistic concerns had a significant positive direct path to social anxiety symptoms (β = .46), whereas perfectionistic strivings showed a significant negative direct path (β = -.15; Limburg et al., 2016). Hence, Limburg et al.'s (2016) results partially replicate longitudinal findings showing that perfectionistic concerns are positively related to social anxiety. However, Limburg et al. (2016) also demonstrated that perfectionistic strivings were negatively related to social anxiety, in contrast with longitudinal studies which found no evidence of a relationship between these constructs.

These inconsistencies are indicative of the broader literature on perfectionistic strivings, which collectively has shown that this domain of perfectionism is related to some maladaptive outcomes, some adaptive outcomes, and in some cases not related to either (Stoeber et al., 2020). These discrepant findings are similar to propositions put forward by the 2 x 2 model (i.e., perfectionistic strivings are associated with better outcomes than perfectionistic concerns; perfectionistic strivings are associated with poorer outcomes than perfectionistic concerns; perfectionistic strivings are associated with similar outcomes to perfectionistic concerns; Gaudreau & Thompson, 2010), although this model does not acknowledge that there may be no association between perfectionistic strivings and outcomes. In light of the unclear state of the theoretical and empirical literature, further research is required.

Cognitive Biases and Their Relationships to Social Anxiety and Perfectionism

In addition to examining the nature of the relationship between social anxiety and perfectionism, previous research has also investigated their link to cognitive biases. As addressed in Chapter 1, cognitive models of social anxiety outline the importance of information processing biases, namely negative interpretation bias, negative self-imagery, and post-event processing for the maintenance of social anxiety (Clark, 2001; Heimberg et al., 2014; Hofmann, 2007). Similarly, perfectionism cognition theory (Flett et al., 2017) and the cognitive behavioural model of perfectionism

(Shafran et al., 2002; Shafran et al., 2018) suggest that cognitive biases are present in perfectionistic individuals. Research has provided evidence for these propositions, showing that cognitive biases are directly and individually related to social anxiety and perfectionism. Nonetheless, the literature is less well-established for the latter, particularly the dimension of perfectionistic strivings.

Cognitive Biases and Social Anxiety

Social Anxiety and Negative Interpretation Bias. Numerous studies have shown that negatively biased interpretations are more often endorsed by individuals with social anxiety disorder and those with high levels of sub-clinical social anxiety, compared to non-anxious individuals (e.g., Amir et al., 2005; Badra et al., 2017; Beard & Amir, 2009; Chen et al., 2019; Huppert et al., 2003, Huppert et al., 2007; Kanai et al., 2010; Wilson & Rapee, 2005). Indeed, a recent meta-analysis concluded that there is a robust association between social anxiety and negative interpretation bias (Chen et al., 2020). Chen et al. (2020) demonstrated a strong association between negative interpretation bias and social anxiety across samples with social anxiety disorder, as well as those with sub-clinical levels of social anxiety. Furthermore, individuals with social anxiety favoured negatively biased interpretations across a variety of stimuli and study designs.

An example of this relationship between social anxiety and negative interpretation bias can be seen in Stopa and Clark (2000), who assessed the interpretation of ambiguous events in individuals with diagnosed social anxiety disorder and individuals with another anxiety disorder (i.e., panic disorder, agoraphobia, post-traumatic stress disorder, and specific phobia), as well as controls with no anxiety. Participants were presented with social scenarios and given three possible explanations to each scenario, one positive, one negative, and one neutral, and were asked to rank order the three explanations from most likely to least likely. Participants with social anxiety were more likely to rate ambiguous social scenarios as negative, and mildly negative social scenarios as catastrophic, compared

to other anxious participants without social anxiety and controls. This bias was not found in relation to non-social scenarios. Similarly, Voncken et al. (2003) investigated whether individuals with social phobia presented negative biases in the interpretation of positive, ambiguous, mildly negative, and profoundly negative social scenarios. Results showed that compared to normal controls, participants with social anxiety were more likely to show negative biases in the interpretation of all presented scenarios (i.e., positive, ambiguous, mildly negative, and profoundly negative scenarios). Together, these results show that at a cross-sectional level, social anxiety was related to negative interpretation bias.

Social Anxiety and Negative Self-Imagery. Research concerning the relationship between negative-self imagery and social anxiety is also prominent, reflecting propositions from cognitive models of social anxiety. In a systematic review, Ng et al. (2014) found consistent evidence for a relationship between negative self-imagery and social anxiety, with large effect sizes. Although some of the studies had limitations (e.g., lack of control group), Ng et al. (2014) concluded that the results showed support for the role of negative self-imagery in social anxiety proposed by cognitive models of social anxiety.

Brozovich and Heimberg (2013) examined the effects of negative mental imagery on socially anxious individuals' performance. Specifically, they aimed to investigate whether negative self-imagery related to a previous performance situation would induce anxiety in the anticipation of undergoing a similar performance (i.e., an impromptu speech). Participants were allocated to either a negative self-imagery group or a control group. Participants in the negative self-imagery group were asked to recall a past anxiety-provoking speech by imagining the situation, whereas those in the control group were instructed to do a working memory task, following which, participants in both groups were instructed to prepare an impromptu speech. The results showed that participants in the negative self-imagery group had higher levels of anxiety before the anticipated speech, compared to the control group. These findings show that negative-self-imagery intensifies anxiety prior to a social situation.

Hirsch et al. (2003) also investigated the causal role of negative self-imagery in the maintenance of social phobia. Participants with social phobia were asked to interact with a stranger twice, once while holding a negative self-image (e.g., a social situation in which they had felt anxious), and once holding a control self-image (e.g., a social situation in which they had felt relaxed) in mind. After the interactions, participants were asked to rate their own performance and visible symptoms of anxiety. An independent assessor, who was not aware of which image the participant was holding, also rated the participants' performance using the same ratings. Both the ratings from participants and assessors showed that anxiety symptoms were more visible, and performance was poorer, when participants held negative self-images, compared to when they held a control self-image. Moreover, participants rated the visibility of their symptoms and their performance as poorer than assessors did. Based on these results, the authors concluded that negative self-imagery was a maintenance factor of social anxiety.

In the same vein, Makkar and Grisham (2011a) examined emotion and cognition factors in individuals with social anxiety holding negative self-images. Similarly to Hirsch et al. (2003), these authors asked high and low socially anxious participants to either hold a negative (i.e., a social situation that has previously caused them anxiety) or control self-image (i.e., a social situation in which they felt relaxed) as they delivered a speech. Results showed that participants who were instructed to hold negative self-images experienced more negative thoughts, rated their anxiety symptoms as more visible and their social performance more negatively, and reported higher levels of anxiety than participants who held control self-images. These results held after controlling for participants' levels of social anxiety.

In a more recent study, Dobinson et al. (2020) conducted a semi-structured interview with individuals diagnosed with social anxiety disorder. Participants were asked to imagine and describe themselves in their most anxiety-provoking social scenario, and to describe the meaning of this imagery in relation to themselves, others, and the world. Participants were then asked to rate the vividness,

frequency, and distress associated with their self-images, amongst other measures. Dobinson et al. (2020) found that all participants reported negative images of the self as seen by an observer. Moreover, most participants reported negative self-images in the context of social interactions, being observed by others, and public performances. Results also showed that the vividness, frequency, and controllability of negative self-images were mediators of the relationship between trait social anxiety and distress. Based on these findings, Dobinson et al. (2020) confirmed that negative-self imagery has important clinical implications for social anxiety.

Social Anxiety and Post-Event Processing. Brozovich and Heimberg's (2013) review of 14 studies examining the relationships between social anxiety and post-event processing provided a summary of evidence that corroborates the propositions from cognitive models of social anxiety. These authors concluded that individuals with social anxiety have a greater tendency to engage in post-event processing than non-socially anxious individuals. Self-report and diary studies included in their review (i.e., Fehm et al., 2007; Kocovski & Rector, 2007; Lundh & Sperling, 2002; McEvoy & Kingsep, 2006; Rachman et al., 2000) showed that post-event processing perseveres and is self-focused in individuals with social anxiety.

In another study, Rowa et al. (2014) examined the manipulation of post-event processing in individuals with social anxiety disorder. Participants completed measures of social anxiety and state anxiety, and were asked to deliver an impromptu speech. Following the speech, participants were randomly allocated to a focus or distraction condition. Participants in the focus condition were asked to concentrate on their performance during the speech, whereas those in the distraction condition listened to an audiotape and noted examples of animals described on the tape. After this manipulation, participants completed state anxiety measures. Twenty-four hours later, participants completed measures of state anxiety and post-event processing. Contrary to Rowa et al.'s (2014) predictions, post-event processing was higher in the distraction condition than in the focus condition. Analyses showed

that differences in baseline social anxiety and state anxiety levels accounted for these results. Specifically, a positive correlation between baseline state anxiety and post-event processing appeared to account for the higher levels of post-event processing in the distraction group. These results show that anxiety is a strong predictor of post-event processing and suggest that post-event processing is persistent despite distractions.

Cognitive Biases and Perfectionism

Perfectionism and Negative Interpretation Bias. Yiend et al. (2011) were the first to show the relationship between perfectionism and a form of interpretation bias empirically. Participants scoring high and low on a perfectionism measure were asked to read ambiguous text passages (i.e., scenarios) of emotional or perfectionistic meaning. After reading a passage, participants were presented with two sentences that resolved the ambiguity of the passage, one of which contained a negative perfectionistic interpretation, one that reflected a positive non-perfectionistic interpretation, and two other foil (non-related) interpretations. Participants were asked to rate each sentence in terms of their similarity to the passage. Yiend et al. (2011) found that the high perfectionism group were more likely to endorse negative perfectionistic interpretations of the passages than the low perfectionism group. A similar study by Howell et al. (2019), which adapted Yiend et al.'s (2011) perfectionistic interpretation bias task, showed similar results demonstrating that participants high in perfectionistic concerns (specifically, Concerns Over Mistakes) had a high tendency to endorse negative perfectionistic interpretations.

Although Yiend et al. (2011) and Howell et al. (2019) provided information on biased interpretation in perfectionism, it was assessed differently from how negative interpretation bias is commonly assessed in social anxiety. Research on social anxiety and interpretation bias has generally focused on the negatively biased interpretation of ambiguous cues from social partners (e.g., Stopa & Clark, 2000; Voncken et al., 2003). In contrast, Yiend et al.'s (2011) and Howell et al.'s (2019) studies

used ambiguous scenarios that were relevant to various life domains (e.g., employment, physical appearance, social interactions) to measure biased interpretation. Studies specifically examining the negative interpretation of ambiguous cues from others in social situations in perfectionistic individuals are currently lacking. As outlined in Chapter 1, negative interpretation bias is likely present in perfectionists as these individuals show hypervigilant monitoring of performance, are vulnerable to threat evaluations from others, and generally tend to catastrophise the consequences of evaluation (Flett et al., 2017; Shafran et al., 2002; Shafran et al., 2018). Hence, the current study investigated whether the results of Yiend et al. (2011) and Howell et al. (2019) extend to a measure of negative interpretation bias in the context of social anxiety. In doing so, the current study opens the possibility for new transdiagnostic interventions targeting interpretation bias across social anxiety and perfectionism.

Perfectionism and Negative Self-Imagery. Lee et al. (2011) aimed to provide an empirical investigation of the relationship between perfectionism and imagery. Participants completed the Frost Multidimensional Perfectionism Scale, and perfectionism scores were calculated by adding all its subscales, apart from Organisation. As such, Lee et al. (2011) did not distinguish perfectionistic concerns and perfectionistic strivings. Imagery was assessed using a semi-structured interview on mental images of memories or imagined events relating to perfectionism. Lee et al. (2011) found that participants who presented with high levels of perfectionism reported more mental images that were intrusive, distressing, difficult to dismiss, and had more impact on their behaviour, compared to those who presented with low levels of perfectionism. Hence, in line with propositions from perfectionism cognition theory, individuals with perfectionism have negative self-images. The current thesis examined whether this relationship between perfectionism and negative self-imagery is also present specifically in the context of social anxiety.

Perfectionism and Post-Event Processing. Empirical evidence for the relationship between perfectionism and post-event processing is more robust than for other biases. Flett et al. (2016) reviewed 16 studies examining the relationship between perfectionism and post-event processing (or similar constructs) and concluded that perfectionism is related to post-event processing (e.g., r = .48 for Socially Prescribed Perfectionism and post-event processing; Besharat et al., 2014).

For example, one of the studies reviewed by Flett et al. (2016) was by O'Connor et al. (2007), who conducted a series of studies examining perfectionism dimensions, rumination (measured as negative perseverative thinking, a similar concept to post-event processing), and other related constructs (e.g., depression). Participants from university and community settings completed questionnaires. Results showed that perfectionistic concerns and perfectionistic strivings were positively correlated with rumination. Overall, perfectionistic concerns were moderately correlated with rumination, whereas the association between perfectionistic strivings and rumination was small. Nonetheless, O'Connor et al. (2007) showed that both dimensions of perfectionism are related to rumination.

However, contrasting results regarding the relationship between perfectionistic strivings and rumination have been shown in other studies. For example, Di Schiena et al. (2012) administered questionnaires on perfectionism dimensions, adaptive and maladaptive rumination, amongst other measurements (e.g., a questionnaire on depression) to a sample of undergraduate students. Correlational analyses showed that maladaptive rumination was positively correlated with perfectionistic concerns, but not with perfectionistic strivings. Neither perfectionism dimension was correlated with adaptive rumination.

Evidence for the relationship between perfectionism and post-event processing has also been seen in the context of social anxiety. Makkar and Grisham (2011b) examined the content of post-event

processing and possible predicting factors. Participants were asked to deliver a speech and to engage in conversation with another person. Following these tasks, participants completed measures of negative assumptions and other behavioural and cognitive measures. Negative assumptions were defined as assumptions about the self and the world, and included excessively high standards for the self and concerns regarding evaluations from others, which relate to both domains of perfectionism. Twenty-four hours later, participants completed a post-event processing measure in relation to the speech and the conversation. Makkar and Grisham's (2011b) results showed that negative assumptions were a unique predictor of post-event processing, which indicates that perfectionism may be a unique contributor to post-event processing in the context of social anxiety. The current thesis sought to further investigate the links between perfectionistic concerns and perfectionistic strivings to post-event processing in the context of social anxiety.

Cognitive Biases as Mediators of the Relationships Between Social Anxiety and Perfectionism Dimensions

As reviewed in the sections above, the findings of previous research suggest that negative interpretation bias, negative self-imagery, and post-event processing are each individually and directly related to social anxiety and perfectionism. Nonetheless, research that investigates these cognitive biases together is currently lacking, despite suggestions from cognitive models of social anxiety outlining their roles, alongside that of perfectionism in social anxiety (Clark, 2001; Heimberg et al., 2014, Hofmann, 2007). The current study adopted propositions from the extended conceptual model of perfectionism and social anxiety (Flett & Hewitt, 2014), which suggests a mediator role for cognitive biases in the relationship between social anxiety and perfectionism.

Similar propositions were made by Burgess and DiBartolo (2016), who reviewed the existing literature investigating the mediator role of cognitions in the relationship between perfectionism and

anxiety (including social anxiety). Based on these studies, Burguess and DiBartolo (2016) suggested that the relationship between perfectionistic concerns and social anxiety was mediated by cognitive biases. In a more recent example, Abdollahi (2019) recruited university students, who completed measures of perfectionistic concerns, perfectionistic strivings, social anxiety, and post-event processing. Results showed that post-event processing partially mediated the relationship between perfectionistic concerns and social anxiety. However, Abdollahi (2019) found no significant relationships between perfectionistic strivings and social anxiety or post-event processing. They concluded that people high in perfectionistic concerns are likely to ruminate over negative experiences and feedback from others, and in turn, this detailed review of negative events leads individuals to avoid social interactions due to anxiety over evaluations.

Other studies in this area have shown that other cognitive biases mediate the relationship between perfectionistic concerns and social anxiety (e.g., the perceived probability of future negative events in DiBartolo et al., 2007; negative anticipatory processing in Scott et al., 2014). Hence, it is possible that other biases, such as negative interpretation bias and negative self-imagery, also play a similar role. However, this proposition has not yet been investigated, despite evidence that interpretation bias and negative self-imagery are implicated in both social anxiety and perfectionism. Furthermore, the existing studies on the mediator role of cognitive biases in the relationship between perfectionism and social anxiety used a cross-sectional design, which does not meet the temporal precedence requirements of mediation (Cole & Maxwell, 2003). The current study addressed this shortcoming by employing a longitudinal design, designed to provide more robust evidence for the mediator role of cognitive biases in the relationship between social anxiety and perfectionism dimensions.

Study 1 Overview and Aims

Social anxiety and perfectionism are indirectly proposed to be associated in cognitive models of social anxiety (Clark, 2001; Heimberg et al., 2014; Hofmann, 2007) and have been shown to be related to each other in research (e.g., Cox & Chen, 2015; Gautreau et al., 2015; Levinson & Rodebaugh, 2016; Levinson et al., 2013; S. P. Mackinnon et al., 2014; Nepon et al., 2011; Newby et al., 2017; Rukmini et al., 2014; Shikatani et al., 2015). Despite the empirically established relationship between perfectionism and social anxiety, few studies have attempted to determine the directionality of this relationship. Moreover, existing studies on the directionality present limitations in methodology (e.g., only included certain dimensions of perfectionism) and generalisability (e.g., only included a sample with low levels of social anxiety, or only included a sample of adolescents or women). Consequently, researchers have called for further longitudinal studies in this area (Levinson et al., 2015; Nepon et al., 2011; Newby et al., 2017; Shikatani et al., 2015; Stoeber, 2017b). Given the contradicting evidence on directionality from previous studies, the present thesis made no a priori predictions about the directionality of the relationship between social anxiety and perfectionism dimensions, and aimed to investigate this relationship in an exploratory manner. Although suggestions exist that perfectionistic concerns and perfectionistic strivings may interact (Gaudreau & Thompson, 2010; Stoeber & Otto, 2006), the current thesis sought to address these variables individually in accordance with previous longitudinal studies in the area (Damian et al., 2017; Gautreau et al., 2015; Levinson & Rodebaugh, 2016).

Furthermore, cognitive biases have been shown to be related to both social anxiety and perfectionism and a small body of evidence indicates that cognitive biases serve as mediators of the relationship between perfectionism and social anxiety. However, to date, no studies have investigated the role of negative interpretation bias, negative self-imagery, and post-event processing in social anxiety and perfectionism. The current study sought to address this gap. In line with the extended conceptual model of perfectionism and social anxiety (Flett & Hewitt, 2014), a mediator role for cognitive biases in the relationship between perfectionism and social anxiety was proposed.

To test the directionality between perfectionism and social anxiety, and in keeping with requirements for temporal precedence in mediation (Cole & Maxwell, 2003), the current study employed a longitudinal design. Three waves of data were collected to allow for testing of mediation. Following previous studies investigating longitudinal relationships between social anxiety and perfectionism, data was collected over the course of six months (e.g., Levinson & Rodebaugh, 2016), with a three-month interval between each wave. Data were collected from a community sample with the aim to establish directionality and mediation pathways in a generalisable population.

Method

Participants

One hundred and forty-three participants (women = 93, unknown = 3; M_{age} = 29.09, SD_{age} = 9.56, age-range = 18 - 66) completed at least two waves of the study and were included in the final sample. One hundred and seventeen participants were recruited through advertisements on social media platforms such as Facebook, Reddit, and social anxiety forums and were offered entry into a $50 gift card draw at the completion of every wave. An additional 26 participants were recruited from Amazon Mechanical Turk, a crowdsourcing platform. Mechanical Turk participants were remunerated $1.00 USD for participation in the first and second waves and $2.00 USD for the third wave. Participants were mainly from the United States (55.90%) and Australia (12.60%), followed by Canada (5.60%), the United Kingdom (4.20%) and India (2.80%). The remaining participants were from other European countries (7.8%), other Asia-Pacific countries (4.2%), Latin American countries (2.8%), and Middle Eastern countries (2.1%). All participants were required to be at least 18 years old to be able to consent to participate. Additionally, participants were required to be fluent in English, so as to be able to understand the questionnaires.

Sample Size Calculation

Power calculations were performed to determine sample size using sample size suggestions for longitudinal mediation (Pan et al., 2018). Using data on social anxiety and perfectionism collected by a previous Flinders University PhD student (Stevenson, 2019), a within-subject correlation (also referred to as Intraclass Correlation Coefficient [ICC]) of 0.9 was calculated. As such, Table 5 of Pan et al.'s (2018) publication was used to establish the sample size of the current study. Based on large effect sizes found for correlations from previous studies between social anxiety and cognitive biases (e.g., negative interpretation bias in Chen et al., 2020), and between perfectionism and cognitive biases (e.g., interpretation bias in Yiend et al., 2011), it was determined that a sample size of 33 participants was required to detect indirect effects using bootstrap analyses with three waves (referred to as three 'observations' in Pan et al., 2018).

Materials

Social Anxiety

The Social Phobia Inventory (Connor et al., 2000; Appendix A) was used to measure social anxiety. The Social Phobia Inventory consists of 17 items (e.g., 'I am afraid of people in authority') rated on a five-point scale ranging from 0 (not at all) to 4 (extremely). Total scores range from 0 to 68, with higher scores representing greater social anxiety. The Social Phobia Inventory has good test-retest reliability (r = .78 - .86) and internal consistency (α = .82 - .94; Antony et al., 2006; Connor et al., 2000). Moreover, according to Antony et al. (2006), the Social Phobia Inventory has good discriminant validity against the Depression, Anxiety, and Stress Scales (Lovibond & Lovibond, 1995) and good convergent validity with the Social Interaction Anxiety Scale and the Social Phobia Scale (Mattick & Clarke, 1998). The Social Phobia Inventory also has good construct validity (Connor et al., 2000). Internal consistency in the present sample was excellent in all waves, α_{T1} = .92, α_{T2} = .93, α_{T3} = .92.

Perfectionism

Given the multidimensional frameworks used to characterise perfectionism, two scales covering different domains of perfectionism were used: The Frost Multidimensional Perfectionism Scale (Frost et al., 1990; Appendix B) and the Multidimensional Perfectionism Scale (Hewitt et al., 1991; Appendix C).

Frost Multidimensional Perfectionism Scale. The Frost Multidimensional Perfectionism Scale is a 35-item questionnaire that originally measured six dimensions of perfectionism but has since been proposed to measure four dimensions: Concern Over Mistakes and Doubts about Actions; Parental Expectations and Criticism; Personal Standards; and Organisation (Stoeber, 1998). Examples of items for each of the four dimensions include 'I should be upset if I make a mistake', 'My parents set very high standards for me', 'If I do not set the higher standards for myself, I am likely to end up a second-rate person', and 'I am a neat person', respectively. Items are rated on a five-point scale, ranging from 0 (strongly disagree) to 5 (strongly agree). Scores for each domain are summed, with higher scores indicating higher levels of perfectionism. The Frost Multidimensional Perfectionism Scale has good internal consistency (α = .77 - .93) and good convergent validity with the Burns Perfectionism Measure (*r* = .85; Burns, 1980, as cited in Frost et al., 1990) and the perfectionism scale of the Eating Disorders Inventory (*r* = .59; Garner et al., 1983). In the current study, reliability for the questionnaire as a whole was good to excellent across all waves, α_{T1} = .92, α_{T2} = .92, α_{T3} =.90.

Multidimensional Perfectionism Scale. The 45-item Multidimensional Perfectionism Scale measures the perfectionism dimensions of Self-Oriented Perfectionism ('I am perfectionistic in setting my goals'), Other-Oriented Perfectionism ('I seldom expect others to excel at whatever they do'), and Socially Prescribed Perfectionism ('People expect more from me than I am capable of giving'). Items are rated on 7-point agree-disagree Likert scales, with items 2, 3, 4, 8, 10, 11, 13, 19, 22, 25, 31, 34, 37, 38, 44, and 45 reverse-coded. Similar to the Frost Multidimensional Perfectionism Scale, scores for each dimension are summed and higher scores indicate higher levels of perfectionism. The Multidimensional Perfectionism Scale has adequate test-retest reliability (*r* = .60 - .69) and the Self-Oriented and Socially

Prescribed Perfectionism dimensions have good concurrent validity with the Attitudes Toward Self Scale (Carver et al., 1988) subscales of High self-standards ($r_{\text{self-oriented}} = .62$, $r_{\text{socially prescribed}} = .56$), Self-criticism ($r_{\text{self-oriented}} = .47$, $r_{\text{socially prescribed}} = .58$), Overgeneralisation ($r_{\text{self-oriented}} = .55$, $r_{\text{socially prescribed}} = .51$), and Perseveration ($r_{\text{self-oriented}} = .62$, $r_{\text{socially prescribed}} = .69$; Hewitt et al., 1991). The Self-Oriented Perfectionism dimension has good convergent validity with the Frost Multidimensional Perfectionism Scale dimension of Concern Over Mistakes ($r = .52$), Personal Standards ($r = .64$), and Parental Expectations ($r = .47$), and the Other-Oriented Perfectionism dimension has good convergent validity with the Personal Standards dimension (r = .42; Hewitt et al., 1991). The Social Prescribed Perfectionism dimension has good convergent validity with the Frost Multidimensional Perfectionism Scale's Concern Over Mistakes ($r = .65$), Personal Standards ($r = .49$), Parental Expectations ($r = .67$), Parental Criticism ($r = .47$), and Doubts about Actions ($r = .48$; Hewitt et al., 1991). In the current study, internal consistency ranged from acceptable to questionable, $\alpha_{T1} = .74$, $\alpha_{T2} = .75$, $\alpha_{T3} = .67$.

Perfectionistic Concerns and Perfectionistic Strivings. To ensure the subscales loaded on to the perfectionistic concerns or perfectionistic strivings composites, a confirmation of the structure of these two factors was conducted in IMB SPSS AMOS version 25. Organisation and Other-Oriented Perfectionism were excluded as these subscales presented standardised factor loadings below 0.4, and hence, were deemed not to load on the perfectionistic strivings factor (Salkind, 2010). Further details of these analyses can be seen in Appendix D. Based on this factor structure, the Self-Oriented Perfectionism subscale of the Multidimensional Perfectionism Scale and the Personal Standards subscale of the Frost Multidimensional Perfectionism Scale were combined to form a perfectionistic strivings composite; and scores on the Socially Prescribed Perfectionism subscale of the Multidimensional Perfectionism Scale were combined with the Concern Over Mistakes and Doubts about Actions and Parental Expectations and Criticism subscales of the Frost Multidimensional Perfectionism Scale to form a perfectionistic concerns variable. As the Frost Multidimensional Perfectionism Scale and

Multidimensional Perfectionism Scale are rated on five- and seven-point scales, respectively, all subscale scores were first transformed into standard scores.

Negative Interpretation Bias

The Interpretation and Judgement Questionnaire (Voncken et al., 2003; Appendix E) was used as a measure of negative interpretation bias. The Interpretation and Judgement Questionnaire consists of brief descriptions of 20 social scenarios and 5 fillers (i.e., non-social scenarios). For each social scenario, four interpretations ranging from positive to profoundly negative are presented. Respondents are asked to arrange the interpretations in order of likelihood of occurrence and rate the probability of the profoundly negative interpretation. An example of a mildly negative scenario is 'You made an appointment with an acquaintance to go to the movies. Shortly before, this person leaves a message on your answering machine that the appointment has to be cancelled'. Interpretations of this scenario are: a) this acquaintance doesn't like me (profoundly negative interpretation); b) this acquaintance made another appointment and considers the appointment with me not important enough (mildly negative interpretation); c) This acquaintance likes to go to the movies with me but couldn't cancel another tedious appointment (positive interpretation); d) this acquaintance feels sick (neutral interpretation). Participants are asked to rank the order of the alternatives according to how plausible they believe the alternatives are. Participants are then asked to rate the probability of the profoundly negative scenario from 0% to 100%. Scores are calculated by multiplying the rank given to the profoundly negative scenario and the percentage of probability. The social scenario items have good internal consistency (α = .93 - .82) and internal validity (Voncken et al., 2003). The Interpretation and Judgement Questionnaire also has good convergent validity with the Fear of Negative Evaluation scale (Voncken et al., 2003). Further, normative data on the Interpretation and Judgement Questionnaire have shown that people without social anxiety are more likely to endorse neutral interpretations, compared to those with social

phobia (Voncken et al., 2003). Internal consistency in the current sample was excellent, α_{T1} = .94, α_{T2} = .94, α_{T3} =.93.

Post-Event Processing

The Extended Post-Event Processing Questionnaire (Rachman et al., 2000; later revised by Fehm et al., 2008 and Q. J. J. Wong, 2015; Appendix F) was used to measure post-event processing. The Extended Post-Event Processing Questionnaire asks participants to identify a social situation from a list of possible options (e.g., talking in front of people, being at a party, expressing disapproval) that has caused anxiety, discomfort, or shame. In the present study, the following sentence was added before the list of scenarios: 'Please pick the situation that has caused you a great degree of anxiety. For example, if 0 was no anxiety and 100 was extreme anxiety, pick a scenario that would represent at least 70. If none of the scenarios have caused you this level of anxiety, please pick one that is the closest to your experience'. Participants were also allowed to choose 'other' and enter their own social scenario, or choose 'no social scenarios have caused me anxiety'. Participants were then asked to respond to 17 questions in relation to their chosen social scenario (e.g., 'I resist thinking about the event'). Each question was rated on an 11-point Likert scale (0 = not at all to 100 = very much so). Ratings of the 17 questions were summed, with higher scores representing higher levels of post-event processing in relation to the chosen social scenario. The Extended Post-Event Processing Questionnaire has good internal consistency (α = .94) and good construct validity (Q. J. J. Wong, 2015). Internal consistency in the present sample was excellent across all waves, α_{T1} = .91, α_{T2} = .94, α_{T3} =.94. Participants reported high levels of anxiety on average (M_{T1} = 80.63, SD_{T1} = 16.84; M_{T2} = 78.06, SD_{T2} = 17.55; M_{T3} = 75.65, SD_{T3} = 20.29). Frequencies of the chosen scenarios for each wave can be seen in Appendix G.

Negative Self-Imagery

The Appraisal of Social Concerns (Telch et al., 2004; Appendix F) questionnaire was used to measure self-imagery. In the present study, the list of social scenarios provided in the Extended Post-Event Processing Questionnaire was included with the Appraisal of Social Concerns to allow participants to express their negative self-imagery in relation to the same specific event. Participants were then asked to respond to the 20 items of the Appraisal of Social Concerns regarding negative perceptions of the self in social situations, which were rated on a scale from 0 ('not at all concerned') to 100 ('extremely concerned'). Examples of Appraisal of Social Concerns items are: 'trembling', 'appearing stupid', and 'people laughing at you'. Ratings of the 20 items were summed, with higher scores representing higher levels of negative self-imagery in relation to the chosen social scenario. The Appraisal of Social Concerns has excellent internal consistency (α = .94), good test-retest reliability (r = .82), and good convergent validity with the Irrational Beliefs Test (r = .56), and the negative subscale of the Social Interaction Self-Statement Test (r = .59; Telch et al., 2004). The Appraisal of Social Concerns also has good construct validity (Schultz et al., 2006). Internal consistency in the present sample ranged from good to excellent, α_{T1} = .89, α_{T2} = .90, α_{T3} =.91.

Design and Procedure

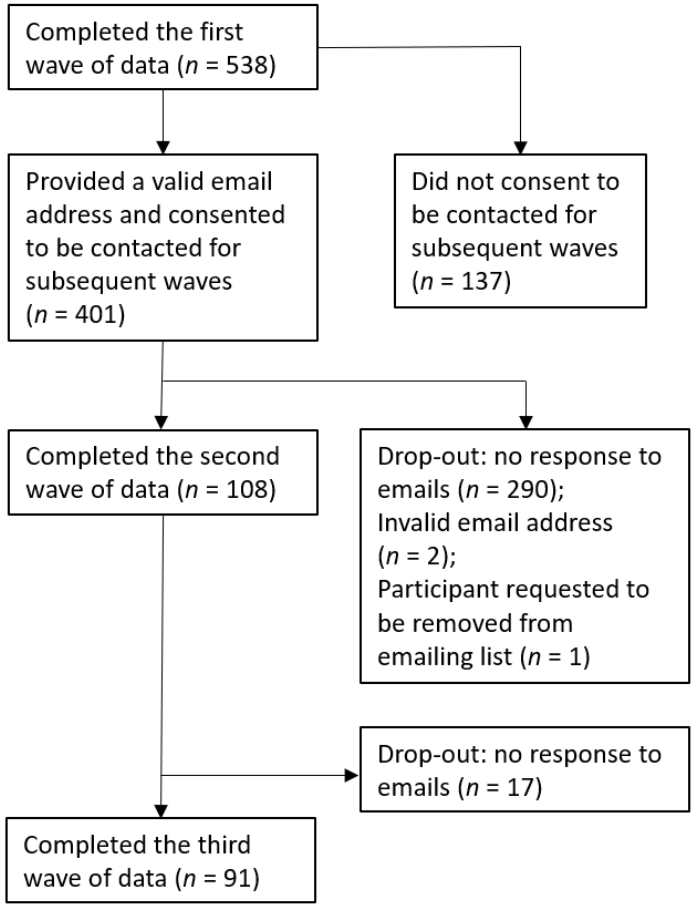
The study was advertised on social media platforms and Mechanical Turk as investigating the relationships among social anxiety, perfectionism, and thinking styles. Prior to commencing the questionnaires, participants were advised that the study consisted of three waves, placed three months apart, and their email address and consent to be contacted for subsequent waves would be requested. Every wave contained the same set of questionnaires consisting of the Social Phobia Inventory, the Frost Multidimensional Perfectionism Scale, the Multidimensional Perfectionism Scale, the Interpretation and Judgment Questionnaire, the Extended Post-Event Processing Questionnaire, and the Appraisal of Social Concerns, in counterbalanced order. At Time 1, participants were also asked for demographic information. All questionnaires were hosted online using Qualtrics. Participants who provided an email

address and consented to be contacted were emailed at the onset of each wave, and up to three reminders were sent to those who did not complete the survey. The lag between Time 1 and Time 2 was, on average, 95.74 days (*SD* = 9.68); between Time 2 and Time 3, 104.33 days (*SD* = 24.64); and between Time 3 and Time 4, 100.36 days (*SD* = 11.03). The study was approved by the Flinders University Social and Behavioural Research Ethics Committee.

Due to high attrition, several groups were collected over the course of three years. One hundred and forty-three participants were included in the final sample; of those, 57 (39.86%) completed all waves. Figure 2.1 shows the number of participants who completed each wave, the number of dropouts at each wave, and the reasons for drop-out.

Figure 2.1

Flowchart of Completion Numbers and Attrition Rates



Check items were placed throughout the questionnaires to ensure participants were reading the questions with attention. These items were added to avoid the inclusion of Mechanical Turk 'bots' (i.e., computer logarithms designed to automatically complete surveys on Mechanical Turk) in the sample. Additionally, in line with previous recommendations for Mechanical Turk studies (Chmielewski & Kucker, 2020), each response was screened for improbable patterns (e.g., every item of multiple questionnaires rated at the most extreme end of the scale; inconsistencies in responses to reverse-coded items).

Further, Mechanical Turk participants were asked to describe an image presented at the beginning of the survey, and those who failed to provide an accurate description were excluded from the sample.

Data Analytic Plan

Missing data analyses, data preparation, and descriptive statistical analyses were conducted in IMB SPSS version 26. All other analyses were conducted using MPlus version 8.4 (Muthén & Muthén, 2017). The current study used structural equation modelling (SEM)[1] techniques to test longitudinal relationships. In accordance with research on social anxiety and perfectionism (e.g., Damian et al., 2017; Gautreau et al., 2015) and recommendations for SEM longitudinal analyses (Newsom, 2015), the direction of the relationship between social anxiety and perfectionism dimensions was tested using a cross-lagged panel model. Cross-lagged panel model provides information on cross-lagged (i.e., effect of one variable on another variable at a subsequent time point) while controlling for autoregressive paths (i.e., stability over time) and correlations within time points (Kearney, 2017; Newsom, 2015). Following Gautreau et al. (2015), *constrained* models were tested: autoregressive (e.g., social anxiety at Time 1 to social anxiety at Time 2, social anxiety at Time 2 to social anxiety at Time 3) and cross-lagged (e.g., perfectionistic concerns at Time 1 to social anxiety at Time 2, perfectionistic concerns at Time 2 to social anxiety at Time 3) paths between the same variables were held equal over time. To test whether these constraints were justified, a chi-square difference test was used to compare the constrained versus unconstrained (i.e., without holding paths to equality) models, as in Gautreau et al. (2015). Where a chi-square difference test was not significant ($p > .05$), constrained and unconstrained versions of the same model were deemed to be statistically equal (Cole & Maxwell, 2003).

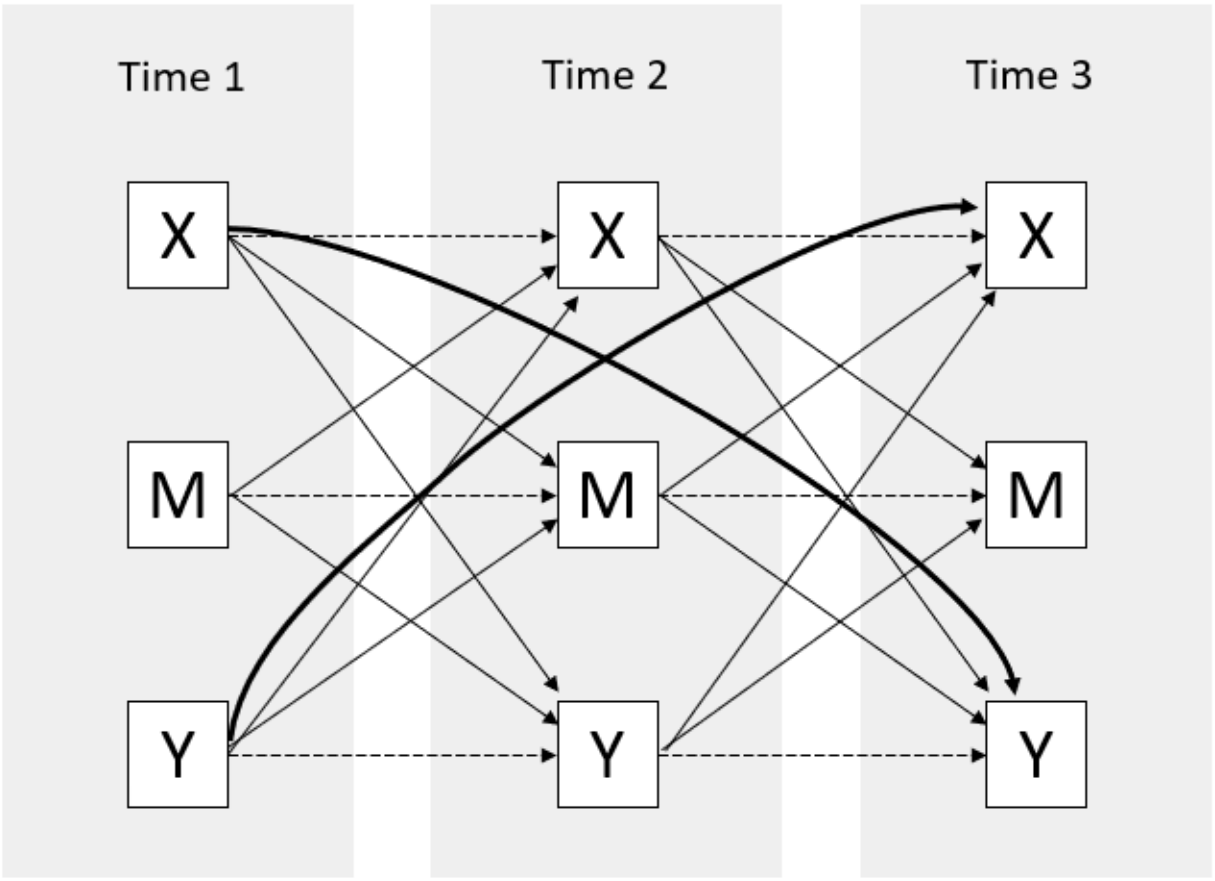
[1]SEM is an umbrella term of techniques used to test complex models, often referred to in the literature as a method for analyses of measurement and structural models simultaneously. However, in the current thesis, this term refers to the testing of structural models only, as no latent variables were included in models.

Furthermore, to test the mediation pathways, a full longitudinal mediation model including all variables at all time points (as recommended by Cole & Maxwell, 2003) was planned. An example of full mediation model can be seen in Figure 2.2. This example of model contains one mediator for ease of representation, however, the planned analysis for the current study contained all three cognitive biases as mediators. Indirect effects were estimated using 1000 bias-corrected bootstrapped confidence intervals (Williams & MacKinnon, 2008), where significance was established if the 95% confidence interval (CI) did not cross zero.

Based on recommended goodness of fit indices for samples sizes with less than 250 participants (Hu & Bentler, 1999), model fit was established using the following fit statistics: model chi-square, which measures overall fit (Kline, 2011; Schreiber et al., 2006); comparative fit index (CFI), which measures the fit of a specified model over an independence or baseline model (Kline, 2011); and the standardised root mean square residual (SRMR), which is the mean difference between the observed and hypothesised covariances (Tabachnick & Fidell, 2013). Good model fit is generally accepted at $\chi^2/df \leq$ 2-3 ($p > .05$), CFI $\geq .95$, and SRMR $\leq .08$ (Schreiber et al., 2006). The root mean square error of approximation (RMSEA), along with its confidence intervals, was also evaluated. The RMSEA is an estimate of lack of fit, with values lower than .05 representing good fit and lower than .08 representing acceptable fit (Browne & Cudeck, 1993; Hu & Bentler, 1999). To facilitate interpretation, all variables were standardised (Goldsmith et al., 2018).

Figure 2.2

Example of Full Mediation Model



Note. Dashed lines represent autoregressive (direct) pathways. Light solid lines represent cross-lagged (direct) pathways. Heavy solid lines represent indirect effects through M. For ease of representation, only one mediator is shown in this figure.

Results

Missing Data

Little's (1988) Missing Completely at Random method was used to compare participants who only completed the first wave and those who completed at least two waves. Results indicated the data was likely missing completely at random, $\chi^2 = 118.10$, $df = 112$, $p = .328$, and accordingly, missing data were handled using maximum likelihood estimation (McKnight et al., 2007; Schafer & Graham, 2002). There were no significant differences at Time 1 between participants who only completed the first wave and those who completed at least two waves in level of social anxiety, $t(394) = 0.08$, $p = .936$, perfectionistic concerns, $t(392) = 0.10$, $p = .919$, perfectionistic strivings, $t(393) = -0.34$, $p = .737$, negative interpretation bias, $t(296.45) = -1.07$, $p = .283$, negative self-imagery, $t(393) = -0.64$, $p = .524$, or post-event processing, $t(393) = -0.87$, $p = .385$.

Data Preparation and Descriptive Statistics

Data was prepared according to recommendations by Kline (2011) and Field (2013). Variables were examined for normality on the basis of skewness and kurtosis values, and outliers were identified based on z-scores with absolute values above 3.29. Negative interpretation bias at Time 1 presented one outlier, which was treated by replacing the outlier score to one unit above the next highest score. Visual inspection of plots of studentised residuals versus predicted values established linearity and homoscedasticity. Variance inflation factor (VIF) was used to determine multicollinearity. All VIF values were below 10, indicating no multicollinearity issues. Means and standard deviations of non-standardised scores, and correlations among variables can be seen in Table 2.1. Overall, there were large positive correlations for the same variables at each of the three time points (e.g., social anxiety measured at Times 1, 2, and 3). Most variables were positively correlated with one another. The few exceptions were perfectionistic strivings at Time 1 and social anxiety at Times 2 and 3; social anxiety at

Time 2 and perfectionistic strivings at Time 3; and negative interpretation bias at Time 2 with post-event processing at Time 3, which were not significantly correlated.

Table 2.1

Means, Standard Deviations, and Correlations Among Variables

	M	*SD*	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
Time 1														
1. SA	40.56	12.81	-											
2. PC	-1.72	16.21	.48***	-										
3. PS	-0.41	10.35	.23**	62***	-									
4. NIB	23.96	12.09	.42***	.42***	.30***	-								
5. NSI	11.66	3.65	.56***	.43***	.40***	.48***	-							
6. PEP	11.22	3.19	.44***	.41***	.37**	.32***	.63***	-						
Time 2														
7. SA	39.28	15.12	.83***	.41***	.14	.35***	.41***	.32**	-					
8. PC	-0.44	14.77	.27**	.80***	.58***	.40***	.36***	.45***	.31**	-				
9. PS	-0.27	10.93	.22*	.57***	.82***	.33**	.40***	.49***	.20*	.66***	-			
10. NIB	21.96	12.32	.40***	.38***	.19*	.76***	.38***	.25**	.45***	.37***	.32**	-		
11. NSI	11.56	3.90	.56***	.33**	.23*	.24*	.59***	.32**	.62***	.36**	.35***	.40***	-	
12. PEP	10.86	3.83	.47***	.39***	.34**	.34***	.47***	.50***	.53***	.42***	.46***	.39***	.63***	-
Time 3														
13. SA	39.04	15.31	.85***	.36***	.19	.42***	.52***	.39***	.86***	.32*	.27*	.55***	.63***	.66***
14. PC	-1.47	15.76	.44***	.78***	.41***	.24*	.21*	.37***	.44***	.83***	.53***	.38**	.35**	.41**
15. PS	-0.25	10.30	.21*	.41***	.76***	.25*	.24*	.28**	.22	.65***	.85***	.30*	.27*	.42**
16. NIB	21.38	12.77	.48***	.37***	.24*	.65***	.34**	.24*	.43***	.34**	.27*	.73***	.26*	.36**
17. NSI	11.64	4.05	.63***	.37***	.29**	.30**	.68***	.56***	.59***	.40**	.34**	.33*	.70***	.52***
18. PEP	10.27	3.92	.48***	.27**	.23*	.29**	.45***	.59***	.43**	.33*	.27*	.20	.45***	.56***

	13.	14.	15.	16.	17.
Time 3					
13. SA	-				
14. PC	.44***	-			
15. PS	.29**	.44***	-		
16. NIB	.63***	.40***	.32**	-	
17. NSI	.68***	.35**	.29**	.42***	-
18. PEP	.55***	.32**	.25*	.40***	.74***

Note. SA = Social Anxiety. PC = Perfectionistic Concerns. PS = Perfectionistic Strivings. NIB = Negative Interpretation Bias. NSI = Negative Self-Imagery. PEP = Post Event-Processing.

***p < .001, **p < .01, *p < .05.

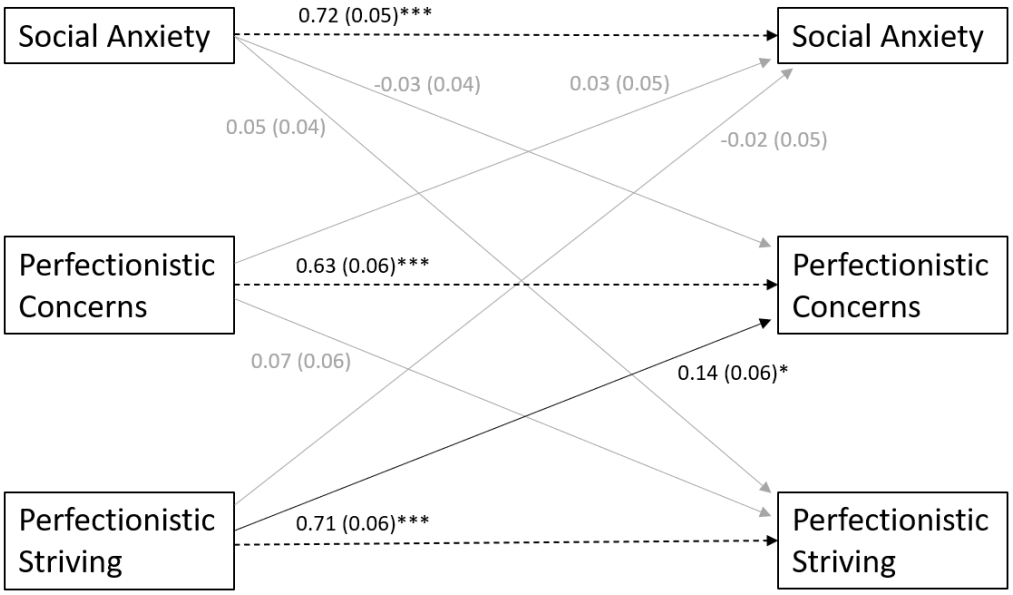
Testing the Directionality Between Social Anxiety and Perfectionism

A cross-lagged panel model including social anxiety, perfectionistic concerns, and perfectionistic strivings at all three time points was conducted[2]. This model had good fit, χ^2 (13, 143) = 19.32, p = .114, χ^2/ df = 1.49, CFI = 0.99, SRMR = 0.02, RMSEA = .06 (90% CI: .00, .11). A non-significant chi-square difference test comparing the constrained model to an unconstrained model showed that these models were statistically equivalent, p = .511, and hence, constraints were justified. Path coefficients for the constrained model can be seen in Figure 2.3. All autoregressive paths were significant, but perfectionistic strivings to perfectionistic concerns was the only significant cross-lagged path.

[2] Given the ongoing debate regarding the shared variance between perfectionistic concerns and perfectionistic strivings (Gäde et al., 2017; Hill, 2014, 2017; Stoeber et al., 2020), the relationships of these variables with social anxiety were also tested in two separate cross-lagged panel models. Results of these additional analyses showed poor fit for the model containing social anxiety and perfectionistic concerns, and good fit for the model containing social anxiety and perfectionistic strivings, but overall, results were similar to those presented in Table 2.2. These additional analyses can be seen in Appendix H.

Figure 2.3

Unstandardised Coefficients (and Standard Error of The Coefficients) of Pathways of Cross-Lagged Panel Model of Social Anxiety, Perfectionistic Concerns, and Perfectionistic Strivings (Constrained Model)



Note. Dashed lines represent autoregressive pathways. Solid lines represent cross-lagged pathways. Black lines represent significant effects. Grey lines represent non-significant effects.

***$p < .001$, *$p < .05$

Mediational Pathways

Following Cole and Maxwell (2003), a full longitudinal mediation model was tested, including social anxiety, perfectionistic concerns, perfectionistic strivings, negative interpretation bias, negative self-imagery, and post-event processing, at each of the three time points. Autoregressive and cross-lagged paths between the same variables were constrained. This model had poor fit, χ^2 (86, 143) = 217.00, $p < .001$, $\chi^2/ df = 2.52$, CFI = .90, SRMR = 0.15, RMSEA = .10 (90% CI: .09, .12). A chi-square difference test comparing the constrained model to an unconstrained model showed that the models

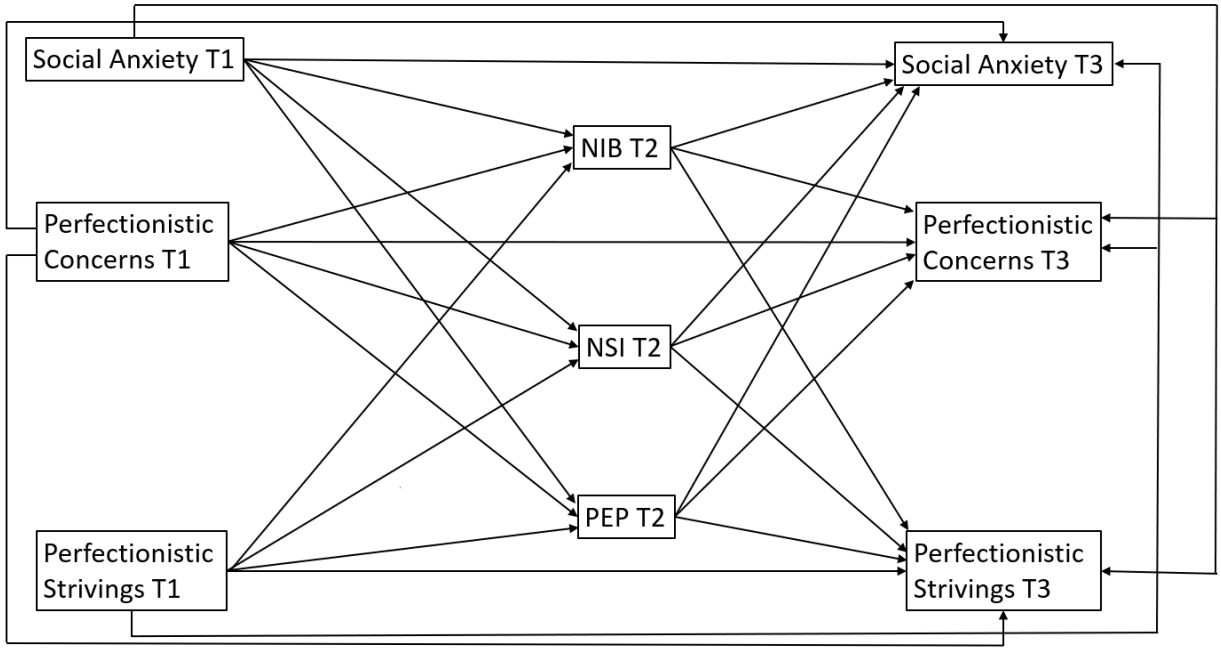
were not significantly different (p = .074). Inferences drawn from poorly fitted models can be misleading (Saris et al., 2009), and hence, direct and indirect path coefficients from this model were not interpreted. These coefficients can be seen in Appendix I.

As the full longitudinal mediation model had a poor fit, the model was respecified (Kline, 2011) and simplified. Following previous research testing longitudinal mediators (e.g., Dermody et al., 2020; Mandel et al., 2018; Smith et al., 2020; Walters, 2020), path analyses models were used to determine the mediational pathways of interest. Path analysis is a technique similar to multiple regression, but it can be used to analyse complex causal structures (Salkind, 2010; Streiner, 2005).

The mediator roles of negative interpretation bias, negative self-imagery, and post-event processing were tested in a model that included social anxiety, perfectionistic concerns, and perfectionistic strivings at Times 1 and 3, and cognitive biases at Time 2, as can be seen in Figure 2.4. This model had overall good fit, χ^2 (2, 143) = 5.57, p = .062, χ^2/ df = 2.79, CFI = .99, SRMR = 0.03, but a high RMSEA = .11 (90% CI: .00, .23). Results showed significant direct paths from social anxiety at Time 1 to all cognitive biases at Time 2, but only negative interpretation bias was related to social anxiety at Time 3 (Table 2.2). There was a significant path from perfectionistic concerns at Time 1 to negative interpretation bias at Time 2, and from perfectionistic strivings at Time 1 to post-event processing at Time 2. Indirect effects analyses (Table 2.3) showed that negative interpretation bias was a mediator of the relationships between social anxiety at Time 1 and Time 3, and perfectionistic concerns at Time 1 and social anxiety at Time 3.

Figure 2.4

Simplified Mediator Model



Note. NIB = Negative Interpretation Bias. NSI = Negative Self-Imagery. PEP = Post-Event Processing. T = Time.

Table 2.2

Direct Effects for the Mediator Model

Predictor	Outcome	*b*	SE_b	*p*
Social Anxiety T1	**Social Anxiety T3**	**0.68**	**0.09**	**< .001**
	Perfectionistic Concerns T3	-0.01	0.10	.912
	Perfectionistic Strivings T3	0.04	0.11	.701
	NIB T2	**0.26**	**0.10**	**.007**
	NSI T2	**0.51**	**0.09**	**< .001**
	PEPT2	**0.38**	**0.10**	**< .001**
Perfectionistic Concerns T1	Social Anxiety T3	-0.10	0.08	.172
	Perfectionistic Concerns T3	**0.80**	**0.10**	**< .001**
	Perfectionistic Strivings T3	-0.18	0.10	.089
	NIB T2	**0.24**	**0.12**	**.037**
	NSI T2	-0.01	0.11	.961
	PEPT2	0.06	0.12	.592
Perfectionistic Strivings T1	Social Anxiety T3	-0.02	0.07	.834
	Perfectionistic Concerns T3	-0.07	0.10	.509
	Perfectionistic Strivings T3	**0.87**	**0.11**	**< .001**
	NIB T2	-0.02	0.11	.875
	NSI T2	0.15	0.11	.169
	PEPT2	**0.23**	**0.10**	**.024**

Predictor	Outcome	*b*	SE_b	*p*
NIB T2	**Social Anxiety T3**	**0.21**	**0.07**	**.002**
	Perfectionistic Concerns T3	0.06	0.10	.598
	Perfectionistic Strivings T3	0.16	0.10	.121
NSI T2	Social Anxiety T3	0.12	0.10	.214
	Perfectionistic Concerns T3	0.02	0.12	.879
	Perfectionistic Strivings T3	-0.08	0.12	.531
PEP T2	Social Anxiety T3	0.12	0.10	.201
	Perfectionistic Concerns T3	0.08	0.12	.519
	Perfectionistic Strivings T3	0.15	0.13	.250

Note. b = unstandardized coefficient. SE_b = standard error of the coefficient. T = Time. NIB = Negative Interpretation Bias. NSI = Negative Self-Imagery. PEP = Post-Event Processing. Bold text represents significant effects.

Table 2.3

Indirect Effects for the Mediator Model

Predictor	Outcome	Mediator	*b*	SE_b	95% CI	
					LB	UB
Social Anxiety T1	Social Anxiety T3	**NIB T2**	**0.06**	**0.03**	**0.01**	**0.12**
		NSI T2	0.06	0.05	-0.03	0.18
		PEP T2	0.05	0.04	-0.02	0.14
	Perfectionistic Concerns T3	NIB T2	0.01	0.03	-0.04	0.08
		NSI T2	0.01	0.06	-0.12	0.10
		PEP T2	0.03	0.05	-0.08	0.12
	Perfectionistic Strivings T3	NIB T2	0.04	0.03	-0.01	0.13
		NSI T2	-0.04	0.06	-0.16	0.08
		PEP T2	0.06	0.05	-0.03	0.18
Perfectionistic Concerns T1	Social Anxiety T3	**NIB T2**	**0.05**	**0.03**	**0.002**	**0.13**
		NSI T2	0.00	0.02	-0.04	0.03
		PEP T2	0.01	0.02	-0.02	0.06
	Perfectionistic Concerns T3	NIB T2	0.01	0.03	-0.03	0.09
		NSI T2	0.00	0.01	-0.03	0.03
		PEP T2	0.01	0.02	-0.02	0.06
	Perfectionistic Strivings T3	NIB T2	0.04	0.03	-0.01	0.13
		NSI T2	0.00	0.02	-0.03	0.04
		PEP T2	0.01	0.03	-0.03	0.09
Perfectionistic Strivings T1	Social Anxiety T3	NIB T2	0.00	0.03	-0.07	0.05
		NSI T2	0.02	0.02	-0.01	0.08
		PEP T2	0.03	0.03	-0.03	0.10

Predictor	Outcome	Mediator	*b*	SE_b	95% CI	
					LB	UB
Perfectionistic Strivings T1	Perfectionistic Concerns T3	NIB T2	0.01	0.01	-0.04	0.02
		NSI T2	0.00	0.02	-0.03	0.06
		PEP T2	0.02	0.03	-0.04	0.10
	Perfectionistic Strivings T3	NIB T2	0.00	0.02	-0.06	0.03
		NSI T2	0.01	0.02	-0.10	0.02
		PEP T2	0.04	0.04	-0.01	0.14

Note. b = unstandardized coefficient. SE_b = standard error of the coefficient. LB = Lower bound. UB = Upper Bound. T = Time. IB = Negative Interpretation Bias. NSI = Negative Self-Imagery. PEP = Post-Event Processing. Bold text represents significant pathways.

Discussion

The current study was the first to investigate the relationships among social anxiety, perfectionism dimensions, and multiple cognitive biases in a longitudinal design. No direct relationships were found between social anxiety and perfectionism dimensions in either direction. However, the relationship between perfectionistic concerns and social anxiety was mediated by negative interpretation bias. In contrast, negative-self imagery and post-event processing did not mediate this relationship. Perfectionistic strivings predicted perfectionistic concerns in the cross-lagged panel model, but this effect was not significant in the mediator model. Furthermore, perfectionistic strivings predicted post-event processing.

The Direct Relationships Between Social Anxiety and Perfectionistic Concerns

In contrast with evidence from previous longitudinal studies (Damian et al., 2017; Gautreau et al., 2015; Levinson & Rodebaugh, 2016), social anxiety did not directly predict perfectionistic concerns, nor did perfectionistic concerns directly predict social anxiety over time. It is crucial to note that despite the lack of direct effects over time, social anxiety and perfectionistic concerns were significant and moderately correlated at all time points. The vast majority of evidence for the relationship between social anxiety and perfectionistic concerns comes from cross-sectional designs (e.g., Cox & Chen, 2015; Levinson et al., 2015; Levinson et al., 2013; S. P. Mackinnon et al., 2014; Nepon et al., 2011; Newby et al., 2017; Rukmini et al. , 2014; Scott et al., 2014; Shikatani et al., 2015), which demonstrated similar findings to the correlations seen in the current study. Taken together, these results could indicate that social anxiety and perfectionistic concerns co-occur, but do not directly lead to one another over time. Nonetheless, the previous longitudinal findings showing significant direct effects cannot be discounted, but perhaps these contrasting results can be explained by differences in samples and methods.

One plausible explanation is the difference in age groups between the current sample and those of Gautreau et al. (2015), Levinson and Rodebaugh (2016), and Damian et al. (2017). Both Levinson and Rodebaugh (2016) and Gautreau et al. (2015) recruited undergraduate samples; in Levinson and Rodebaugh (2016), participants had a median age of 18.00 (*SD* = 1.05) and in Gautreau et al. (2015) the sample had a mean age of 20.87 (*SD* = 4.08). In Damian et al. (2017), the sample was composed of early-to-late adolescents (*M* = 15.90, *SD* = 1.80). In contrast, the sample in the current study spanned a larger age-range (18-66 years), and participants were on average older (*M* =29.09, *SD* = 9.56). Social anxiety disorder has an early onset, with 80% of inflicted individuals developing symptoms by the age of 20 (Ruscio et al., 2008; M. B. Stein & Stein, 2008). Perfectionism may also have an early onset, as previous studies have demonstrated it affects children (Damian et al., 2017) and it is often seen as a precursor to other disorders that develop in adolescence (e.g., eating disorders; Shafran et al., 2002). The current study aimed to provide preliminary evidence in a general sample, but perhaps the direct relationships between social anxiety and perfectionism can only be seen while these issues are still developing. Congruently, the current study saw high trait stability for social anxiety and perfectionism dimensions, indicating that perhaps these issues had already generally developed and stabilised. Post-hoc comparisons of adolescents and adults were not possible in the current study, as only 12 participants were aged 18 or 19. Due to this very small subgroup, the cross-lagged panel model could not be fitted for multigroup comparisons. Although the current study was unable to address this issue, the discrepancy in results between the current and previous studies raises the question of whether direct relationships between social anxiety and perfectionism are dependent on age, which future studies should investigate.

An alternative explanation for the differences in results between the current and previous studies may be the measurements used for perfectionism and social anxiety. The most evident difference was in the study by Damian et al. (2017), who measured general symptoms of anxiety using

the SCARED tool (Birmaher et al., 1997). This measure included a social anxiety disorder subscale, but also other forms of anxiety, such as panic disorder and separation anxiety disorder. Although their study was informative of the potential longitudinal relationship between perfectionism and anxiety, it is not possible to distinguish the unique effect of social anxiety from the results.

In the same vein, Gautreau et al. (2015) measured self-critical perfectionism, which as aforementioned, is a concept similar to perfectionistic concerns. For example, a key feature of perfectionistic concerns is excessive self-criticism and scrutiny (Sirois & Molnar, 2016). Although these perfectionism dimensions are similar, their measurement is not identical. In Gautreau et al. (2015), the measurement of self-critical perfectionism consisted of the Self-Criticism subscale of the Depressive Experiences Questionnaire (Bagby et al., 1994) alongside measures of perfectionistic concerns (i.e., items from the Concerns over Mistakes and Doubts About Actions subscales). Hence, the most salient difference was the use of the Self-Criticism subscale in Gautreau et al. (2015), and it is possible that the effects seen in their study were due to the use of this subscale. Indeed, the Self-Criticism subscale has been shown to be highly associated with social anxiety. In a study comparing features of social anxiety disorder (i.e., low self-esteem, low self-efficacy, high self-criticism, and high dependency), Iancu et al. (2015) demonstrated that high self-criticism, as measured by the Self-Criticism subscale, had a strong association with social anxiety, compared to the other measures. Hence, it is possible that the Self-Criticism subscale accounted for the relationship between social anxiety and self-critical perfectionism found by Gautreau et al. (2015).

In Levinson and Rodebaugh's (2016) study, the measurement of perfectionistic concerns consisted of the Concern over Mistakes, Doubts about Actions, Parental Criticism, and Parental Expectations subscales, and hence, was closer to the current study's perfectionistic concerns composite. However, as aforementioned, Levinson and Rodebaugh (2016) used a measure of social anxiety which is specific to social interactions, whereas the current study used a broader measure of social anxiety

encompassing various symptoms. It is unclear why perfectionistic concerns would predict social interaction anxiety specifically, but not the more general symptoms of social anxiety measured in the current study. One possibility is the context of Levinson and Rodebaugh's (2016) study. The primary aim of their study was to investigate the relationship between eating disorder symptoms and social anxiety. Risk factors hypothesised to be shared by both these issues, such as perfectionism, were also measured. Although Levinson and Rodebaugh (2016) did not use a clinical sample, a high percentage of participants had symptoms of eating disorders in the clinical range: up to 13.3% of participants depending on the measure, whereas the 12-month prevalence of eating disorders in young women is around 0.4% to 1.5% (Hoek, 2006). It is possible that the direct relationship between perfectionistic concerns and social interaction anxiety seen in their study was relevant in the context of eating disorders. Individuals with eating disorders fear having their appearance evaluated (Levinson et al., 2013). As such, for individuals with symptoms of eating disorders, the excessive importance to meet others' standards in perfectionistic concerns may lead to anxiety about interacting with others (where one's appearance may be evaluated against others' standards).

Therefore, the current and previous studies differed in various ways, which may account for the differences in results. Nonetheless, some limitations of the current study may also have contributed to the lack of significant longitudinal relationships between social anxiety and perfectionistic concerns. These are addressed in more detail in a subsequent session.

The Direct Relationships Between Social Anxiety and Perfectionistic Strivings

The lack of relationships between social anxiety and perfectionistic strivings were congruent with previous longitudinal findings, which showed no significant relationships between these constructs (Damian et al., 2017; Levinson & Rodebaugh, 2016). There were small positive correlations between social anxiety and perfectionistic strivings within each wave, but these were mostly not significant across

waves. Taken together, these results demonstrate that social anxiety can co-occur with perfectionistic strivings but overall, these constructs do not influence each other over time.

Social anxiety and perfectionistic strivings share extremely high standards for performance, which are imposed by the self (Clark, 2001; Gautreau & Thompson, 2010). Individuals with social anxiety perceive their ability to attain these standards as lacking (Clark, 2001), whereas individuals high in perfectionistic strivings continuously strive to achieve these standards (Gautreau & Thompson, 2010). A direct examination of standard-setting and achievement in individuals with social anxiety and those high in perfectionistic strivings is currently lacking, but previous evidence supports the idea that this difference is a point of diversion between social anxiety and perfectionistic strivings (Shumaker & Rodebaugh, 2009).

For example, individuals with social anxiety both expect to perform poorly in social situations and have actual deficits in some social performances (e.g., during a conversation) compared to non-socially anxious individuals (Voncken & Bögels, 2008). Furthermore, individuals high in social anxiety tend to engage in avoidance and have more difficulty in achieving goals than non-socially anxious individuals (Goodman et al., 2019). Hence, social anxiety has negative implications for goal pursuit (Goodman et al., 2019). In contrast, those high in perfectionistic strivings are highly motivated to engage in social settings in order to achieve their goals (Abdollahi, 2019; Levinson et al., 2013). These propositions are indicative of a distinction between social anxiety and perfectionistic strivings: whereas individuals with social anxiety perceive and at times demonstrate shortcomings in attaining self-imposed standards, those high in perfectionistic strivings have high self-determination in achieving such standards. Hence, this distinction may contribute to the lack of an association between social anxiety and perfectionistic strivings.

The Direct Relationships Between Perfectionistic Concerns and Perfectionistic Strivings

Although the current study did not focus on the relationships between perfectionistic concerns and perfectionistic strivings, model testing showed that perfectionistic strivings directly predicted perfectionistic concerns in the cross-lagged panel model. This finding indicates that the striving for self-imposed standards leads to self-criticism and fears of not meeting the standards of others over time. However, this direct relationship was not seen in the mediation model. It is unclear whether this is due to a difference in time lags (i.e., three months in the cross-lagged panel model and six months in the mediation model) or the inclusion of cognitive biases in the mediation model. Nonetheless, these findings provide interesting implications for research into perfectionism, namely how perfectionistic concerns and perfectionistic strivings influence each other over time and indeed, whether one dimension may contribute and/or evolve into another. Although some debate exists regarding the relationships between perfectionistic concerns and perfectionistic strivings (Gäde et al., 2017; Hill, 2014, 2017; Stoeber et al., 2020), perfectionism research has generally focused on: 1) how these dimensions relate to other variables, and 2) how one dimension differs from the other in their relationships to other variables. Findings of the current study indicate that longitudinal data may provide information on the relationship between the two dimensions and consequently, have implications for the two-factor framework of perfectionism.

The Mediating Role of Cognitive Biases on the Relationships Between Social Anxiety and Perfectionism Dimensions

Negative Interpretation Bias

Negative interpretation bias emerged as a mediator in two pathways: social anxiety at Time 1 to Time 3, and perfectionistic concerns at Time 1 to social anxiety at Time 3. Specifically, findings indicate that both social anxiety and perfectionistic concerns contribute to negatively biased interpretation of ambiguous cues from others in social situations, which in turn, contribute further to social anxiety.

Cognitive models of social anxiety (Clark, 2001; Heimberg et al., 2014) posit that during social situations, assumptions about the self and the world (e.g., 'If I say something wrong, people will think I am stupid') are activated, and this causes individuals to focus on ambiguous social cues and to negatively interpret such cues. Hence, social anxiety may contribute to negative interpretation bias in this manner. Similarly, perfectionistic concerns likely contribute to negatively biased interpretation as perfectionistic individuals show hypervigilance towards threat evaluations from others and have a tendency to catastrophise the consequences of evaluation (Flett et al., 2017; Shafran et al., 2002; Shafran et al., 2018). In turn, interpreting the ambiguity of a social event in a negative manner strengthens socially anxious individuals' assumptions about the world and the self, further consolidating their social anxiety (Clark, 2001; Heimberg et al., 2014; Hirsch et al., 2016).

The mediation effect of negative interpretation bias between social anxiety at Time 1 and Time 2 is congruent with propositions from cognitive models of social anxiety (Clark, 2001; Heimberg et al., 2014) supporting the maintenance role of this bias in social anxiety. Similarly, the direction of the mediation effect between perfectionistic concerns and social anxiety is in line with propositions from the extended conceptual model of perfectionism and social anxiety (Flett & Hewitt, 2014) and previous studies in the area (e.g., Abdollahi et al., 2019; DiBartolo et al., 2007), which outline that perfectionistic concerns contribute to social anxiety through an effect on cognitive biases. However, the current study provides novel information to this body of literature, by providing evidence of the relationships between negative interpretation bias and perfectionistic concerns in the context of social anxiety, which has neither been explicitly proposed in theory nor tested in previous studies.

The effect of perfectionistic concerns on social anxiety through negative interpretation bias was modest in size, but importantly, it was significant when accounting for the trait stability of social anxiety. Taken together with previous evidence showing direct relationships between social anxiety and perfectionistic concerns in younger age groups, the findings of the current study suggest that perhaps

social anxiety and perfectionism are largely established and do not directly influence each other after adolescence, but perfectionistic concerns only contribute to the maintenance of social anxiety through an effect on negative interpretation bias in adulthood.

Negative interpretation bias did not have a direct relationship with perfectionistic strivings, nor did it play a mediating role in any relationships involving perfectionistic strivings. Previous studies investigating biased interpretation in perfectionism (i.e., Dodd et al., 2019; Howell et al., 2019; Yiend et al., 2011) did not assess associations between interpretation bias and perfectionistic strivings; hence, the current study was the first to indicate that perfectionistic strivings are not related to negatively biased interpretation. Nevertheless, the current findings are congruent with previous research demonstrating that perfectionistic strivings are related to higher resilience to social evaluative threats compared to perfectionistic concerns (Abdollahi, 2019; Levinson et al., 2013; Lo & Abbott, 2019). Individuals high in perfectionistic concerns are negatively affected by others' expectations and seek the approval of others (Bergman et al., 2007; Lo & Abbott, 2019), and hence, may be more sensitive to ambiguous cues regarding their social performance. In contrast, individuals high in perfectionistic strivings have self-imposed standards and engage in social interaction in order to achieve these standards, regardless of feedback from others (Abdollahi, 2019; Gautreau & Thompson, 2010). As such, perceived negative evaluation from others may not be as onerous to these individuals.

A final consideration regarding negative interpretation bias refers to the measurement chosen to assess this cognitive bias in the current study. Previous research has established a multitude of assessments for interpretation bias, including questionnaires, sentence completion tasks, reaction time-based tasks, and the facial expression interpretation task, among others (Chen et al., 2020). Negative interpretation bias questionnaires, particularly the Interpretation and Judgment Questionnaire used in the current study, are less psychometrically established than other types of measurements, such as computer-based scenarios presented in a laboratory environment. Nonetheless, the Interpretation and

Judgment Questionnaire does appear to have sound psychometric properties (Voncken et al., 2003) and was chosen as a convenient method of online measurement of negative interpretation bias. Nonetheless, the results seen in the current study require replication using other negative interpretation bias measurements, particularly laboratory-based assessments, which can yield a more accurate assessment of negative interpretation bias (Gonsalves et al., 2019).

Negative Self-Imagery and Post-Event Processing

A significant direct path was seen from social anxiety at Time 1 to both negative self-imagery and post-event processing at Time 2, indicating that social anxiety contributes to these biases. These direct effects are congruent with parts of the cognitive models of social anxiety, which posit that negative self-imagery and post-event processing are part of the processing of information during and after social situations (Clark, 2001; Heimberg et al., 2014; Hofmann, 2007). The results are also in line with previous research showing direct relationships between social anxiety and negative self-imagery (e.g., Dobinson et al., 2020), and between social anxiety and post-event processing (e.g., Rowa et al., 2014). These direct relationships add support to the propositions that: 1) socially anxious individuals tend to view themselves in social situations in a distorted manner and from an observer's perspective; and 2) individuals with social anxiety engage in reviewing past social situations, focusing on negatively perceived details.

However, negative self-imagery and post-event processing at Time 2 were not significantly related to social anxiety at Time 3. Negative self-imagery and post-event processing also did not play any mediating roles in the relationships between social anxiety and perfectionism dimensions. Hence, the current findings did not support theory from cognitive models of social anxiety which suggest these cognitive biases maintain social anxiety (Clark, 2001; Heimberg et al., 2014; Hofmann, 2007), nor previous findings that make similar propositions (e.g., Hirsch et al., 2003). Instead, the current findings

suggest that social anxiety contributes to negative self-images and post-event processing, but that these biases do not contribute to the maintenance of social anxiety over time. Furthermore, the findings contradict perfectionism cognition theory (Flett et al., 2017) and previous studies (e.g., Lee et al., 2011; O'Connor et al., 2007), as negative self-imagery and post-event processing had no direct relationships with perfectionistic concerns. As these cognitive biases did not have a significant mediator role in the relationships between perfectionistic concerns and social anxiety, the findings also are incongruent with propositions from the extended conceptual model of perfectionism and social anxiety.

Nonetheless, a direct relationship was seen from perfectionistic strivings to post-event processing. As reviewed above, previous studies examining this perfectionism dimension and post-event processing have yielded inconsistent results: some have found no significant relationships between perfectionistic strivings and post-event processing (e.g., Abdollahi, 2019; Di Schiena et al., 2012), and others have found these variables to be positively correlated (e.g., Nepon et al., 2011; O'Connor et al., 2007). In the current study, results indicate that perfectionistic strivings contribute to the rumination of negative details of past social events, in line with suggestions that self-imposed high standards lead individuals to have repetitive, automatic thoughts regarding possible past failures (Levinson et al., 2013).

Limitations

The results of the current study should be interpreted in light of several limitations. First, the high rates of attrition resulted in a relatively small sample, despite multiple attempts to increase completion of all waves. In the current study, mediational pathways were adequately powered and data was likely missing completely at random, which indicate that biases in estimations are unlikely (Button et al., 2013; Newsom, 2015). Nonetheless, attrition was likely the cause for the inflated RMSEA value in the mediation model, as small samples in conjunction with small degrees of freedom often result in poor

RMSEA performance (Kenny et al., 2015). Hence, the current results should be considered as preliminary, and replication in a larger sample is warranted.

Second, the tools used to measure negative self-imagery and post-event processing potentially introduced memory biases to these variables. In order to measure these cognitive biases in relation to a social event relevant to participants' circumstances, participants were asked to recall an event that had happened up to six months prior to completing a survey. The majority of participants picked a scenario that had caused high levels of anxiety, and thus these measures were likely representative of situations that would lead to increased negative self-imagery and post-event processing. However, the potentially long period of time between the event and the survey may have introduced biases, as participants relied on memories of events from up to six months prior, to be able to respond to the negative self-imagery and post-event processing questions. As reviewed by Clark and McManus (2002), individuals high in social anxiety have poor memory of social situations, compared to non-socially anxious individuals. The current sample had high levels of social anxiety (M = 40.56 - 39.04, SD = 12.81 – 15.31 across waves); average scores were well above the clinical cut-off of 19 on the Social Phobia Inventory (Connor et al., 2000). Hence, it is likely that memory biases may have contributed to an unreliable measurement of negative self-imagery and post-event processing, which may have contributed to the lack of significant direct relationships between these cognitive biases and perfectionistic concerns, as well as the lack of evidence for significant mediator roles. Future studies should ask participants to recall more recent social scenarios. Alternatively, future studies may administer a social task (such as a social interaction or speech task) and measure cognitive biases in relation to this task. Engaging in a specific social situation will likely lead to the consistent activation and uniform measurement of cognitive biases across all participants.

Relatedly, all measures used in the current study were self-report, which are vulnerable to lack of insight or response bias. Furthermore, the relationships between social anxiety and perfectionism

dimensions have shown differences depending on who is reporting (i.e., self or third-party informant; Levinson et al., 2015). Hence, it may be informative to collect longitudinal data from multiple parties in future studies. This may be particularly useful when examining the relationships between perfectionistic strivings and social anxiety, as individuals high in perfectionistic strivings appear not to perceive their own high standards (Levinson et al., 2015).

Third, although longitudinal data is useful in determining the directionality of relationships, causal inferences cannot be drawn from the present results. Other psychopathologies (e.g., depression, eating disorders; Levinson & Rodebaugh, 2016; Shafran et al., 2002) and cognitive biases (e.g., anticipatory event processing; Scott et al., 2014) are associated with social anxiety and perfectionism. These variables may be an underlying cause or shared risk factor for the relationships seen in the current study. Likewise, the current study tested cognitive biases as mediators of the relationships between social anxiety and perfectionism, based on the extended conceptual model of perfectionism and social anxiety (Flett & Hewitt, 2014). However, it is acknowledged that evidence exists also showing the role of cognitive biases as precursors to psychopathology (Gotlib & Krasnoperova, 1998; Waters et al., 2008). Based on the present results, it is not possible to rule out the potential role of cognitive biases as vulnerability factors for the development of social anxiety and perfectionism. Future research should focus on other configurations of the longitudinal relationships among social anxiety, perfectionism dimensions, and cognitive biases.

Clinical and Theoretical Implications

Limitations notwithstanding, the findings of the current study have a number of clinical and theoretical implications. First, the results highlight the importance of testing longitudinal relationships in both directions. This point was also made by Gautreau et al. (2015), who aimed to rule out competing explanations by testing relationships between social anxiety and perfectionism in both directions. The

current study reinforced this premise, by showing that negative interpretation bias mediated the relationship from perfectionistic concerns to social anxiety, but not from social anxiety to perfectionistic concerns.

As negative interpretation bias was a mediator of the relationships between perfectionistic concerns and social anxiety, and social anxiety over time, it appears that negative interpretation bias is a maintenance factor of social anxiety. These findings suggest that a time and cost-effective way of treating social anxiety may be to target negative interpretation bias. Negative interpretation bias has been identified as a transdiagnostic factor across multiple disorders (Hirsch et al., 2016), and interpretation bias modifications have been shown to help individuals with social anxiety (Amir & Taylor, 2012; Beard & Amir, 2008) and perfectionism (Dodd et al., 2019). The usefulness of these modifications for social anxiety and perfectionism simultaneously has not been tested but the results of the present study indicate this could be a potential avenue for treatment.

Cognitive models of social anxiety propose that cognitive biases, including negative interpretation bias, maintain social anxiety. As such, the findings of the current study provide support for these theoretical models. Moreover, the results provide evidence of the relationship between perfectionistic concerns and negative interpretation bias. Previously, perfectionism has only been investigated in relation to perfectionistic interpretation bias, and not the socially related form of negative interpretation bias measured in the current study. Hence, a growing body of evidence shows relationships between perfectionistic concerns and different forms of interpretation bias. Accordingly, this evidence should inform theoretical models of perfectionism, namely perfectionism cognition theory (Flett et al., 2017), the cognitive behavioural model of perfectionism (Shafran et al., 2018), and the extended conceptual model of perfectionism and social anxiety (Flett & Hewitt, 2014), which do not explicitly include negative interpretation bias. Although further testing of the current findings is

required, the information regarding the relationships between perfectionistic concerns and negative interpretation bias may be useful in future revisions of these models.

Similarly, the results contribute to the understanding of biased information processing in perfectionistic strivings. Specifically, it appears that perfectionistic strivings are not associated with cognitive biases that relate to perceived evaluations from others, such as negative interpretation bias (measured in the current study as the interpretation of ambiguous cues from others in social situations) and negative self-imagery (the negative mental image of oneself as seen by others). In contrast, perfectionistic strivings were a significant predictor of post-event processing, which in the current study was measured mainly in relation to appraisals of one's own performance (e.g., 'did you criticize yourself for your behaviour in the situation?'). These findings are reflective of propositions from the 2 x 2 model of dispositional perfectionism (Gaudreau & Thompson, 2010) and other research on perfectionism, which outline that perfectionistic strivings are concerned with internalised, self-imposed high standards for performance, rather than a preoccupation with evaluations from others (Abdollahi, 2019; Levinson et al., 2013; Lo & Abbott, 2019; Stoeber, 2017a). These propositions may be useful in future theory development and research on the relationships between cognitive biases and perfectionistic strivings.

Conclusion

The current study provided preliminary evidence of the longitudinal relationships among social anxiety, perfectionism dimensions, and cognitive biases. Results indicate that perfectionistic concerns contribute to social anxiety over time, but only through an effect on negative interpretation bias. Negative interpretation bias appears to be a maintenance factor of social anxiety, as outlined in cognitive models of social anxiety. Negative self-imagery and post-event processing appeared to be a consequence of social anxiety but did not play any mediator roles in the current study, nor were these cognitive biases related to perfectionistic concerns. Furthermore, perfectionistic strivings were related

to perfectionistic concerns (in a model not including cognitive biases) and post-event processing. Due to a number of identified limitations, future studies should seek to replicate and extend the present findings. Nonetheless, the current study provided important and novel evidence that may have clinical and theoretical utility in the area of social anxiety and perfectionism.

Chapter 3

Study 2: Short-Term Longitudinal Relationships Among Social Anxiety, Perfectionism Dimensions, and Cognitive Biases in the Context of a Social Interaction Task.

In the previous chapter, the temporal and directional relationships among social anxiety, perfectionism dimensions, and cognitive biases were investigated. There were two crucial findings: 1) negative interpretation bias was a mediator of the relationship between perfectionistic concerns and social anxiety, and 2) in contrast with theories and research presented in Chapters 1 and 2, there were no direct relationships between social anxiety and the perfectionism dimensions. These results, although partially unexpected, provided key preliminary information on the relationships among social anxiety, perfectionism dimensions, and cognitive biases. The current study aimed to further investigate these relationships. In particular, it sought to address some of the limitations identified in Chapter 2.

The design of Study 1, and that of previous longitudinal studies (Damian et al., 2017; Gautreau et al., 2015; Levinson & Rodebaugh, 2016) on social anxiety and perfectionism, included a lag of three to six months between waves, and thus provided paramount information on the long-term relationships between social anxiety and perfectionism. However, such long-term designs cannot provide information on the short-term variations in the relationships between variables (McGrath et al., 2012). Effect sizes may vary in function of the length of the lags between waves (Cole & Maxwell, 2003). For example, cross-lagged effects between stable trait variables (such as social anxiety and perfectionism) tend to diminish with larger time intervals (Dormann & Griffin, 2015). As such, the current chapter aimed to investigate this proposition by examining the relationships among social anxiety, perfectionism dimensions, and cognitive biases in a short-term longitudinal design. Another limitation of Study 1 was a high attrition rate, which likely occurred due to the extensive time commitments of the survey (i.e., measuring multiple variables at every time point would have incurred a time burden on participants),

and the large intervals between measurements, which may have led to a loss of contact or loss of interest from participants. The short-term design of the current study aimed to address these limitations. In addition, as suggested by Dormann and Griffin (2015), and Stoeber (2017b), short-term longitudinal designs provide higher statistical power for investigating longitudinal relationships. Compared to studies with longer measurement intervals, short-term term designs are less likely to be affected by unmeasured variables (Dormann & Griffin, 2015), such as life events or stress, and thus may produce more reliable estimates. Hence, Study 2 employed a two-week time frame.

Furthermore, the current study addressed the relationships among social anxiety, perfectionism, and cognitive biases in the context of a social interaction task. Following Alden et al. (2008), participants were paired up and asked to interact for five minutes by introducing themselves. Negative self-imagery and post-event processing were then measured in relation to this interaction. In Study 1, participants were asked to remember a situation from a list of social scenarios and then respond to the measures of negative self-imagery and post-event processing in relation to this scenario. As identified in Chapter 2, this was a limitation as it relied on participants' memories of events that had occurred up to six months prior to the survey. This limitation is addressed in the current study, as the social interaction task provided a measure of negative self-imagery and post-event processing in relation to a specific social event that was the same for all participants. As reviewed in Chapter 1, cognitive models of social anxiety (Clark, 2001), propose that beliefs formed in early life give rise to cognitive biases when an individual enters a specific situation. Based on these theories, it was expected that having participants engage in a specific social situation in the same condition would lead to the consistent activation and uniform measurement of cognitive biases across the sample. Furthermore, measuring these variables in relation to a social situation would yield a more accurate understanding of the nature of these situation-specific cognitive biases.

In addition, the current study employed two forms of negative interpretation bias measures: the Interpretation and Judgement Questionnaire (as used in Study 1; Voncken et al., 2003) and the Word Sentence Association Paradigm (WSAP; Beard & Amir, 2008). These two measures were used to capture different aspects of interpretation bias: the Interpretation and Judgement Questionnaire provides information on participants' interpretations of ambiguous social events, whereas the computer-administered WSAP provides individuals' reaction times and rates of endorsement to benign or threat resolutions to ambiguous stimuli. Although interpretation bias measures such as the Interpretation and Judgement Questionnaire (often referred to as 'offline' measures) are shown to be empirically supported, these measures differ from their 'online' counterparts such as the WSAP, which are less prone to response biases (Gonsalves et al., 2019). Online measures capture interpretation bias instantly as participants are presented with ambiguous scenarios, and participants' time taken to react to these scenarios is recorded (Gonsalves et al., 2019). In contrast, offline measures such as the Interpretation and Judgement Questionnaire capture interpretation bias based on rank-ordering, allowing participants to imagine themselves in a described scenario and asking them to identify the most likely explanation to the scenario, without timed measurements. Given the differences between online and offline measures, previous research has recommended using both types of assessments (Huppert et al., 2003). Accordingly, Study 2 aimed to test whether the results of Study 1, which showed that negative interpretation bias as measured by the Interpretation and Judgement Questionnaire was a mediator of the relationship between perfectionistic concerns and social anxiety, can be generalised to other forms of interpretation bias measures.

In addition to providing a measurement relating to threat endorsement (i.e., negative interpretation bias), the WSAP also measures benign endorsements, and hence provides an assessment of positive interpretation bias. However, in the current study, only threat endorsement percentages and latency were analysed. Although previous research suggested that individuals with social anxiety lack

positively biased interpretations (Chen et al., 2020), others have suggested that positive interpretation bias is negatively related to other issues such as general negative affect, and only marginally related to social anxiety (e.g., *r* = -.22; Huppert et al., 2003). As such, positive interpretation bias may only be modestly related to social anxiety. Given that the present study already focuses on three cognitive biases, positive interpretation bias was not included in analyses as to avoid adding further complexity to the mediation models.

As discussed in Study 1, the age of the sample may have contributed to the lack of significant direct relationships between social anxiety and perfectionistic concerns, in contrast to findings of other longitudinal studies (i.e., Damian et al., 2017; Gautreau et al. 2015; Levinson & Rodebaugh, 2016). Specifically, participants in Study 1 were on average older (*M* = 29.09, *SD* = 9.56), compared to samples of other longitudinal studies (e.g., *M* = 20.87, *SD* = 4.08 in Gautreau et al., 2015; *Mdn* = 18.00, *SD* = 1.05 in Levinson & Rodebaugh, 2016). As social anxiety and perfectionism appear early in life (Damian et al., 2017; Ruscio et al., 2008; M. B. Stein & Stein, 2008), it was suggested that participants in Study 1 had already largely developed and stabilised symptoms of social anxiety and perfectionism, and as such, these issues were no longer affecting one another directly. In accordance with the samples of Gautreau et al. (2015), and Levinson and Rodebaugh (2016), the current study recruited an undergraduate sample to test the direct relationships between social anxiety and perfectionism in a sample of similar age to that of previous studies.

As in Study 1, the current study did not impose a social anxiety level criterion for recruiting participants. Although information on the relationships among social anxiety, perfectionism dimensions, and cognitive biases in a clinical sample may be useful in future studies, the current study aimed to further investigate the results of Study 1 and to extend and compare these results to a short-term longitudinal design and in the context of a social interaction task. Hence, in order to compare and

contrast the results of Study 1 with the results of the present study, participants with varying levels of social anxiety were included in the sample.

As for Study 1, the current study made no a priori assumptions of the directionality of the relationship between social anxiety and perfectionism dimensions, and cognitive biases were again investigated as mediators. In line with the aims of the current study, to alleviate participant burden and increase participant retention, each cognitive bias measurement was administered only once (as opposed to Study 1, which measured these biases at three time points; see details in Figure 3.1). Although negative-self-imagery and post-event processing did not play any mediating roles in Study 1, these variables were again included in the current study, but using an improved measurement. Specifically, the current study tested whether these variables would have a mediator role when measured in relation to a specific social situation.

Method

Participants

One hundred and four participants (women = 84, M_{age} = 22.88, SD_{age} = 6.17, age-range = 18 - 53 years) were recruited from the Flinders University Research Participation System in South Australia. Sixty-six first-year undergraduate psychology students earned course credit, and 38 university students from other degrees were remunerated with $20. The study was advertised as investigating the relationships among perfectionism, social anxiety, and thinking styles in a specific social situation. Participants were informed that the study contained four parts to be completed over the course of two weeks and a day, and that they would be paired up for a five-minute 'getting acquainted' task in Part 2. Participants were required to be at least 17 years old, to be able to provide their own informed consent, and to be fluent in English, so as to understand instructions and engage in the social interaction task.

Sample Size Calculation

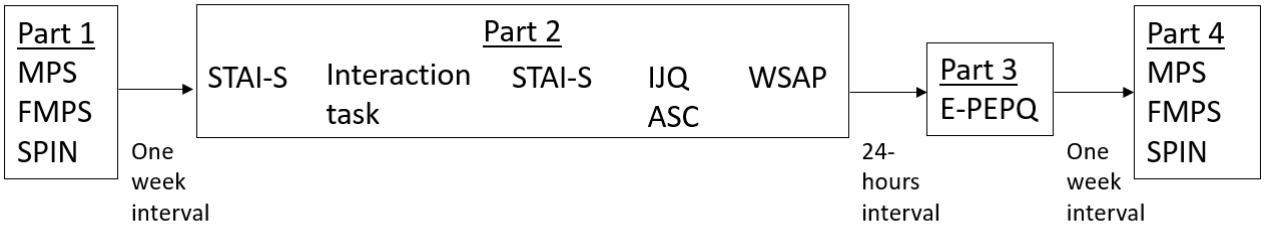
Power calculations were performed to determine sample size using sample size suggestions for longitudinal mediation (Pan et al., 2018). Further details were outlined in Chapter 2. Based on large effect sizes found for correlations from previous studies between social anxiety and cognitive biases (e.g., negative interpretation bias in Chen et al., 2020), and between perfectionism and cognitive biases (e.g., interpretation bias in Yiend et al., 2011), it was determined that a sample size of 37 participants was required for bootstrap analyses with two repeated observations.

Design and Procedure

The study consisted of four parts, which were completed over the course of two weeks and a day. Parts 1, 3, and 4 were completed online. Participants were sent an email with a link to the survey on the night before they were due to complete a given part. Participants who did not complete a given part were reminded to do so the following morning. All questionnaires were hosted on Qualtrics. Part 2 was completed in the laboratory and during this part, participants were paired up. Based on the social interaction task by Alden et al. (2008), participants were asked to engage in a five-minute, open-ended 'getting acquainted' interaction task in their pair. Participants were given the following instructions: 'I would now like you to introduce yourself to your partner. Please take turns in the next five minutes to introduce yourselves. Once five minutes have passed, I will ask you to stop'. Participants who could not be paired with another participant (e.g., because only one participant signed up for a particular timeslot) completed the social interaction task with a volunteer research assistant, who was also an undergraduate student and introduced herself as such. The design of the study and the questionnaires and tasks completed in each part can be seen in Figure 3.1. The lag between Part 1 and Part 2 was, on average, 8.62 days (*SD* = 3.63); between Part 2 and Part 3, 1.70 days (*SD* = 0.76); and between Part 3 and Part 4, 6.33 days (*SD* = 2.20). The study was approved by the Flinders University Social and Behavioural Research Ethics Committee.

Figure 3.1

Design of Study 2



Note. MPS = Multidimensional Perfectionism Scale. FMPS = Frost Multidimensional Perfectionism Scale. SPIN = Social Phobia Inventory. STAI-S = State Trait Anxiety Inventory – State Form. IJQ = Interpretation and Judgement Questionnaire. ASC = Appraisal of Social Concerns. WSAP = Word Sentence Association Paradigm. E-PEPQ = Extended Post-Event Processing Questionnaire. Questionnaires within the same column were counterbalanced to avoid biased responses.

Materials

Social Anxiety

Participants' levels of social anxiety were measured using the Social Phobia Inventory (Connor et al., 2000), as used in Study 1. Internal consistency for the Social Phobia Inventory in the present sample was excellent at Part 1 (α = .93) and Part 4 (α = .95).

Perfectionistic Concerns and Perfectionistic Strivings

As in Study 1, the Frost Multidimensional Perfectionism Scale (Frost et al., 1990) and the Multidimensional Perfectionism Scale MPS (Hewitt et al., 1991) were used to measure perfectionism dimensions. Internal consistency was excellent for the Frost Multidimensional Perfectionism Scale at

Part 1 (α = .94) and Part 4 (α = .95) and good for the Multidimensional Perfectionism Scale at Part 1 (α = .88) and Part 4 (α = .89). As in Study 1, scores of the Multidimensional Perfectionism Scale's Self-Oriented Perfectionism subscale and the Frost Multidimensional Perfectionism Scale's Personal Standards subscale were added to form a perfectionistic strivings composite, and scores of the Multidimensional Perfectionism Scale's Socially Prescribed Perfectionism subscale was combined with the Frost Multidimensional Perfectionism Scale's Concern Over Mistakes and Doubts about Actions and Parental Expectations and Criticism subscales. As the Frost Multidimensional Perfectionism Scale and Multidimensional Perfectionism Scale are rated on a five- and seven-point scale, respectively, the scores of all subscales were transformed into standard scores prior to being added.

Negative Self-Imagery

The Appraisal of Social Concerns (Telch et al., 2004; Appendix J) used to measure self-imagery in Study 1 was modified in relation to the social interaction task. Participants were given the following instructions prior to the questionnaire: 'Thinking about the interaction task you just participated in, please use the scale below (0 – 100) to rate how concerned you felt about the following things happening'. Participants were then asked to respond to the 20 items of the Appraisal of Social Concerns regarding negative perceptions of the self in regards to the social interaction task. Internal consistency in the present sample was excellent (α = .96).

Post-Event Processing

The Extended Post-Event Processing Questionnaire (Rachman et al., 2000; later revised by Fehm et al., 2008 and Q. J. J. Wong, 2015; Appendix K) used in Study 1 was modified to measure post-event processing in relation to the social interaction task. The original E-PEPQ asks participants to identify a social situation that has caused anxiety, discomfort, or shame, from a list of possible options. However, in the present study this sentence was replaced by the following instruction, which was added before

the questionnaire: 'Thinking about the interaction task you participated in yesterday, please use the scale below (0 – 100) to rate your thoughts over the past 24 hours'. Participants were then asked to respond to 15 questions in relation to the social interaction task (e.g., 'I resist thinking about the event'), as in the unmodified version of the questionnaire. To give participants time to engage in processing after the event, the Extended Post-Event Processing Questionnaire was administered 24 hours after the social interaction task. Internal consistency in the present sample was excellent, $\alpha = .95$.

Negative Interpretation Bias

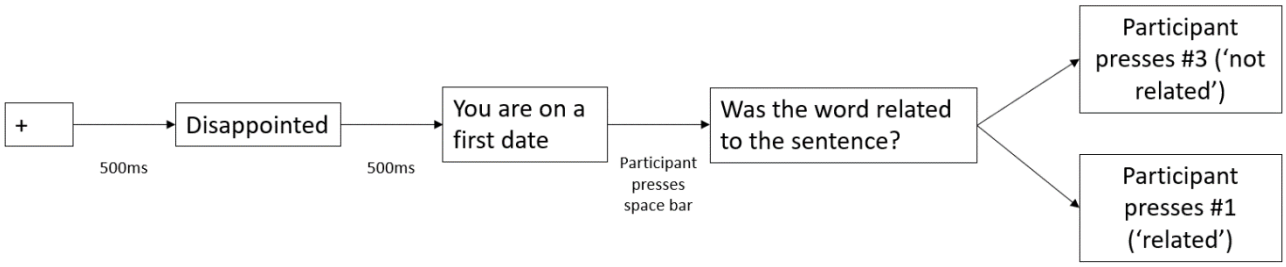
The Interpretation and Judgement Questionnaire (as used in Study 1; Voncken et al., 2003) and the WSAP (Beard & Amir, 2008) were used to capture different aspects of negative interpretation bias. Internal consistency of the Interpretation and Judgement Questionnaire was excellent, $\alpha = .90$.

Word Sentence Association Paradigm. The WSAP was administered using Neurobehavioural Systems software. Participants were randomly allocated to one of two versions (A or B) of the task, each containing six practice trials and 76 experimental trials. Each trial consisted of the following steps: 1) a cross was displayed in the centre of the computer screen for 500 milliseconds to alert participants that a trial was beginning; 2) a word representing either a threat (e.g., 'disappointed') or a benign interpretation (e.g., 'good looking') was shown in the centre of the screen for 500 milliseconds; 3) an ambiguous sentence (e.g., 'You are on a first date') was shown until participants pressed the space bar to indicate that they had read it; and 4) participants were asked to press #1 on the keyboard if they believed the word and sentence were related, or #3 if they believed the word and sentence were not related. An example of a trial can be seen in Figure 3.2 and further examples of practice and experimental trials can be seen in Appendix L. Previous research has demonstrated good test-retest reliability for the WSAP ($r = .71$; Martinelli et al., 2014). Negative interpretation bias scores were determined based on the percentage of endorsed threat interpretations and response latency to

endorse threat interpretations. In accordance with Beard and Amir's (2009) protocol, WSAP trials with reaction times shorter than 50 milliseconds or longer than 2000 milliseconds were excluded from the final data (5.3% of trials) as reaction time outliers.

Figure 3.2

Example of WSAP Experimental Trial



State Anxiety

The State Trait Anxiety Inventory – State Form (Spielberger et al., 1983; Appendix M) was used to measure state anxiety before and after the social interaction task. The purpose of the social interaction task was not to manipulate state anxiety, but this measure was administered to capture any fluctuations in state anxiety. The 20 items of this questionnaire (e.g., 'I feel worried') are rated from 1 ('not at all') to 4 ('very much so'), with items 1, 2, 5, 8, 10, 11, 15, 16, 19, and 20 reverse coded. Item scores were summed, and higher scores reflected higher levels of state anxiety. Previous studies have demonstrated that the State Trait Anxiety Inventory – State Form has high internal consistency (α = .93; Spielberger et al., 1983) and good concurrent validity against other anxiety measures such as the Anxiety Scale Questionnaire (Spielberger et al., 1995). Internal consistency in the present sample was good at pre-task and excellent at post-task ($\alpha_{pre\text{-}task}$ = .89, $\alpha_{post\text{-}task}$ = .91).

Data Analytic Plan

Missing data analyses, data preparation, and descriptive statistical analyses were conducted in IMB SPSS version 26. A two-wave cross-lagged panel model and five path analyses models (i.e., mediator models) were tested using Mplus version 8.4 (Muthén & Muthén, 2017). As reviewed in Chapter 2, model fit was established using the following fit statistics: model chi-square ($\chi^2/df \leq$ 2-3, $p > .05$), CFI (≥ .95), SRMR (≤ .08), and RMSEA (≤ .05 for good fit, ≤ .08 for acceptable fit) (Browne & Cudeck, 1993; Hu & Bentler, 1999; Kline, 2011; Tabachnick & Fidell, 2013). Indirect effects were estimated using 1000 bias-corrected bootstrapped confidence intervals (Williams & MacKinnon, 2008), where significance was established if the 95% confidence interval (CI) did not cross zero. All variables were standardised prior to Mplus analyses (Goldsmith et al., 2018).

Results

Missing Data

One hundred and fifty-six participants completed the first part of the survey. Of those, 118 (75.64%) completed the second part, 107 (68.59%) the third, and 104 (66.67%) the fourth part. Little's (1988) Missing Completely at Random test was used to compare participants who completed all parts and those who did not. Results indicated the data was likely missing at random, $\chi^2 = 68.02$, $df = 53$, $p = .080$.

Data Preparation and Descriptive Statistics

Data was prepared according to recommendations by Kline (2011) and Field (2013). Variables were tested for normality based on skewness and kurtosis values, and outliers were assessed based on z-scores with absolute values above 3.29. Perfectionistic strivings at Part 1 and WSAP threat endorsement percentage contained one outlier each, which were treated by replacing the outlier's

score to one unit above the next highest score. The Extended Post-Event Processing Questionnaire was deemed not normally distributed and treated with square root transformation. Linearity and homoscedasticity were established based on visual inspection of studentised residuals versus predicted values. No multicollinearity issues were found, based on VIF values below 10. Means and standard deviations of non-standardised scores and correlations among variables can be seen in Table 3.1. There were large positive correlations between the same variables assessed at various time points (e.g., social anxiety at Part 1 and Part 4). Most variables were positively correlated with one another, except for the latency variable (which was mostly not significantly related to other variables), perfectionistic strivings at Part 1 (which was not significantly correlated with the percentage of threat endorsements) and post-event processing (which was not related to perfectionistic concerns at Part 1, nor with perfectionistic strivings at Part 1 and Part 4).

Table 3.1

Means, Standard Deviations, and Correlations Among Variables

	M	*SD*	1.	2.	3.	4.	5.	6.
1. Social Anxiety Part 1	29.91	14.11	-					
2. Social Anxiety Part 4	28.37	15.62	.83***	-				
3. Perfectionistic Concerns Part 1	0.00	18.64	.49***	.44***	-			
4. Perfectionistic Concerns Part 4	0.00	19.78	.49***	.49***	.80***	-		
5. Perfectionistic Strivings Part 1	0.00	10.40	.29**	.22*	.70***	.61***	-	
6. Perfectionistic Strivings Part 4	0.08	10.45	.35***	.32**	.66***	.77***	.84***	-
7. Negative Interpretation Bias (IJQ)	15.17	7.18	.29**	.41***	.33**	.37***	.23*	.23*
8. Threat Endorsement (%)	56.19	21.08	.50**	.59***	.39***	.44***	.16	.27**
9. Threat Endorsement Latency (ms)	543.88	250.15	-.06	-.07	.03	-.15	.02	-.11
10. Negative Self Imagery	53.88	41.83	.63***	.71***	.41***	.42***	.29**	.31**
11. Post-Event Processing[a]	36.56	33.92	.47***	.54***	.17	.22*	.10	.13
12. State Anxiety Pre-Task	32.52	9.32	.45***	.44***	.26**	.22*	.09	.11
13. State Anxiety Post-Task	29.95	9.73	.50***	.51***	.25*	.26**	.06	.08

	7.	8.	9.	10.	11.	12.
8. Threat Endorsement (%)	.31**	-				
9. Threat Endorsement Latency (ms)	-.01	-.19[b]	-			
10. Negative Self Imagery	.44***	.52***	.05	-		
11. Post-Event Processing	.25*	.39***	.04	.57***		
12. State Anxiety Pre-Task	.25**	.35***	.09	.41***	.46***	
13. State Anxiety Post-Task	.24*	.43***	.17	.54***	.51***	.61***

Note. IJQ = Interpretation and Judgement Questionnaire. ms = milliseconds.

[a] = non-transformed values are reported for ease of interpretation.

***$p < .001$, **$p < .01$, *$p < .05$, [b]p approached significance ($p < .051$)

Preliminary Analysis

A paired samples *t*-test was conducted to test the fluctuations in state anxiety before and after the task. Results showed a small decline in state anxiety from pre- (M = 32.52, SD = 9.31) to post-task (M = 29.95, SD = 9.73), $t(103) = 3.09$, $p = .003$, $d = 0.27$.

Testing the Directionality Between Social Anxiety and Perfectionism Dimensions

A cross-lagged panel model including social anxiety, perfectionistic concerns, and perfectionistic strivings at Part 1 and Part 4 was conducted[3]. Two wave cross-lagged panel models have zero degrees of freedom and are just-identified (Hamaker et al., 2015), meaning fit indices cannot be computed. Results showed that all autoregressive paths were significant (see Table 3.2). Of all cross-lagged paths, only social anxiety at Part 1 significantly predicted perfectionistic concerns at Part 4.

[3] As in Study 1, the relationships between social anxiety and perfectionism dimensions were also tested separately in two separate cross-lagged panel models. Results of these additional analyses were similar to those presented in Table 3.2 and can be seen in Appendix N.

Table 3.2

Direct Effect Estimates of Cross-Lagged Panel Model of Social Anxiety and Perfectionism Dimensions

	b	SE_b	*p*
Autoregressive paths			
Social Anxiety P1 -> Social Anxiety P4	**0.80**	**0.08**	**< .001**
Perfectionistic Concerns P1 -> Perfectionistic Concerns P4	**0.67**	**0.09**	**< .001**
Perfectionistic Strivings P1 -> Perfectionistic Strivings P4	**0.74**	**0.08**	**< .001**
Cross-lagged paths			
Social Anxiety P1 -> Perfectionistic Concerns P4	**0.13**	**0.07**	**.040**
Social Anxiety P1 -> Perfectionistic Strivings P4	0.08	0.05	.216
Perfectionistic Concerns P1 -> Social Anxiety P4	0.13	0.08	.117
Perfectionistic Concerns P1 -> Perfectionistic Strivings P4	0.10	0.08	.221
Perfectionistic Strivings P1 -> Social Anxiety P4	-0.11	0.08	.144
Perfectionistic Strivings P1 -> Perfectionistic Concerns P4	0.10	0.08	.220

Note. b = unstandardized coefficient. SE_b = standard error of the coefficients. P = Part. Bold text represents significant effects.

Mediational Pathways

Mediational pathways were tested in three models, each containing a different measure of negative interpretation bias: negative interpretation bias as measured by the Interpretation and Judgement Questionnaire (model a); the percentage of threat endorsements (model b); and threat endorsement latency (model c). All models contained social anxiety, perfectionistic concerns, and perfectionistic striving at Parts 1 and 4, as well as negative-self imagery and post-event processing. An example of the models can be seen in Figure 3.3, which displays model a. As can be seen in Table 3.3, models b and c had a good fit overall. Model a had an RMSEA value in the acceptable range but outside the good fit range, but other fit indices for these models indicated a good fit.

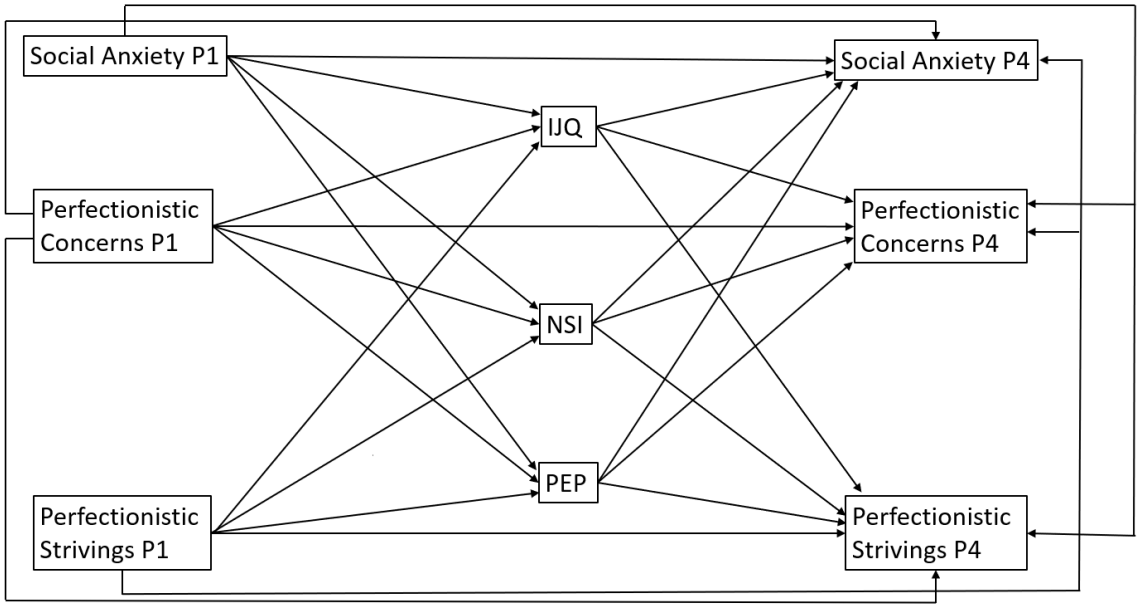
Testing of direct paths showed that in all models, social anxiety at Part 1 significantly predicted social anxiety at Part 4; perfectionistic concerns at Part 1 significantly predicted perfectionistic concerns at Part 4; and perfectionistic strivings at Part 1 significantly predicted perfectionistic strivings at Part 4. In all models, significant direct paths were seen from social anxiety at Part 1 to negative-self imagery and post-event processing, and from negative self-imagery to social anxiety at Part 4. Model a (Table 3.4) showed no relationships between negative interpretation bias as measured by the Interpretation and Judgement Questionnaire and any other variables. In model b (Table 3.5), social anxiety at Part 1 and perfectionistic concerns at Part 1 both significantly predicted the percentage of threat endorsements, and the percentage of threat endorsements significantly predicted social anxiety at Part 4. Moreover, the path from the percentage of threat endorsements to perfectionistic concerns at Part 4 approached significance. In model c (Table 3.6), threat endorsement latency showed no significant relationships with any other variables.

Testing of indirect effects showed that in all models, negative self-imagery partially mediated the relationship between social anxiety at Part 1 and social anxiety at Part 4. Models a (Table 3.7) and c

(Table 3.9) showed no other significant indirect effects. In model b (Table 3.8), the percentage of threat endorsements partially mediated the relationship between social anxiety at Part 1 and social anxiety at Part 4; social anxiety at Part 1 and perfectionistic concerns at Part 4; and perfectionistic concerns at Part 1 and social anxiety at Part 4.

Figure 3.3

Example of Mediator Model (Model a)



Note. IJQ = Interpretation and Judgement Questionnaire. NSI = Negative Self-Imagery. PEP = Post-Event Processing. P = Part.

Table 3.3

Model Fit Indices for Models a, b, and c.

Model	χ^2	*p*	χ^2/ *df*	CFI	SRMR	RMSEA [90% CI]
a	2.84	.242	1.42	0.99	0.01	.06 [.00, .22]
b	2.06	.357	1.03	1.00	0.01	.02 [.00, .20]
c	2.56	.278	1.28	0.99	0.01	.05 [.00, .21]

Note. In all models, *df* = 2, *N* = 104.

Table 3.4

Direct Effects of Model a

Predictor	Outcome	*b*	SE_b	*p*
Social Anxiety P1	**Social Anxiety P4**	**0.61**	**0.07**	**< .001**
	Perfectionistic Concerns P4	0.10	0.08	.220
	Perfectionistic Strivings P4	0.06	0.07	.373
	IJQ	0.17	0.11	.116
	NSI	**0.57**	**0.10**	**< .001**
	PEP	**0.51**	**0.12**	**< .001**
Perfectionistic Concerns P1	Social Anxiety P4	0.09	0.08	.262
	Perfectionistic Concerns P4	**0.65**	**0.10**	**< .001**
	Perfectionistic Strivings P4	0.10	0.08	.216
	IJQ	0.23	.16	.139
	NSI	0.10	0.13	.421
	PEP	-0.07	0.15	.637
Perfectionistic Strivings P1	Social Anxiety P4	-0.12	0.07	.086
	Perfectionistic Concerns P4	0.10	0.10	.313
	Perfectionistic Strivings P4	**0.74**	**0.08**	**< .001**
	IJQ	0.01	0.14	.917
	NSI	0.05	0.12	.686
	PEP	-0.01	0.12	.966

Predictor	Outcome	*b*	SE_b	*p*
IJQ	Social Anxiety P4	0.11	0.06	.072
	Perfectionistic Concerns P4	0.10	0.07	.175
	Perfectionistic Strivings P4	0.01	0.06	.913
NSI	**Social Anxiety P4**	**0.22**	**0.08**	**.005**
	Perfectionistic Concerns P4	0.00	0.09	.963
	Perfectionistic Strivings P4	0.01	0.07	.874
PEP	Social Anxiety P4	0.10	0.06	.095
	Perfectionistic Concerns P4	0.03	0.08	.722
	Perfectionistic Strivings P4	0.01	0.06	.885

Note. IJQ = Interpretation and Judgement Questionnaire. NSI = Negative Self-Imagery. PEP = Post-Event Processing. *b* = unstandardized coefficient. SE_b = standard error of the coefficients. P = Part. Bold text represents significant effects.

Table 3.5

Direct Effects of Model b

Predictor	Outcome	*b*	SE_b	*p*
Social Anxiety P1	**Social Anxiety P4**	**0.59**	**0.07**	**< .001**
	Perfectionistic Concerns P4	0.07	0.08	.389
	Perfectionistic Strivings P4	0.04	0.07	.548
	Threat Endorsement (%)	**0.39**	**0.09**	**< .001**
	NSI	**0.57**	**0.09**	**< .001**
	PEP	**0.51**	**0.12**	**< .001**
Perfectionistic Concerns P1	Social Anxiety P4	0.07	0.08	.405
	Perfectionistic Concerns P4	**0.63**	**0.11**	**< .001**
	Perfectionistic Strivings P4	0.07	0.08	.395
	Threat Endorsement (%)	**0.32**	**0.13**	**.015**
	NSI	0.10	0.13	.421
	PEP	-0.07	0.15	.637
Perfectionistic Strivings P1	Social Anxiety P4	0.04	0.07	.548
	Perfectionistic Concerns P4	0.12	0.10	.219
	Perfectionistic Strivings P4	**0.76**	**0.08**	**< .001**
	Threat Endorsement (%)	-0.17	0.12	.133
	NSI	0.05	0.12	.686
	PEP	-0.01	0.12	.967

Predictor	Outcome	*b*	SE_b	*p*
Threat Endorsement (%)	**Social Anxiety P4**	**0.14**	**0.06**	**.162**
	Perfectionistic Concerns P4	0.13	0.07	.057
	Perfectionistic Strivings P4	0.11	0.07	.096
NSI	**Social Anxiety P4**	**0.23**	**0.07**	**.002**
	Perfectionistic Concerns P4	0.01	0.08	.920
	Perfectionistic Strivings P4	-0.02	0.07	.815
PEP	Social Anxiety P4	0.08	0.06	.162
	Perfectionistic Concerns P4	0.02	0.07	.808
	Perfectionistic Strivings P4	0.00	0.06	.940

Note. NSI = Negative Self-Imagery. PEP = Post-Event Processing. *b* = unstandardized coefficient. SE_b = standard error of the coefficients. P = Part. Bold text represents significant effects.

Table 3.6

Direct Effects of Model c

Predictor	Outcome	*b*	SE_b	*p*
Social Anxiety P1	**Social Anxiety P4**	**0.60**	**0.07**	**< .001**
	Perfectionistic Concerns P4	0.06	0.08	.431
	Perfectionistic Strivings P4	0.04	0.07	.544
	Threat Endorsement Latency	-0.10	0.09	.265
	NSI	**0.57**	**0.10**	**< .001**
	PEP	**0.51**	**0.12**	**< .001**
Perfectionistic Concerns P1	Social Anxiety P4	0.11	0.08	.165
	Perfectionistic Concerns P4	**0.68**	**0.10**	**< .001**
	Perfectionistic Strivings P4	0.11	0.07	.142
	Threat Endorsement Latency	0.09	0.16	.558
	NSI	0.10	0.13	.421
	PEP	-0.07	0.15	.637
Perfectionistic Strivings P1	Social Anxiety P4	-0.12	0.07	.090
	Perfectionistic Concerns P4	0.09	0.09	.300
	Perfectionistic Strivings P4	**0.74**	**0.08**	**< .001**
	Threat Endorsement Latency	-0.01	0.14	.918
	NSI	0.05	0.12	.686
	PEP	-0.01	0.12	.966

Predictor	Outcome	*b*	SE_b	*p*
Threat Endorsement	Social Anxiety P4	-0.05	0.05	.325
Latency	Perfectionistic Concerns P4	**-0.18**	**0.06**	**.002**
	Perfectionistic Strivings P4	-0.11	0.06	.052
NSI	**Social Anxiety P4**	**0.27**	**0.08**	**< .001**
	Perfectionistic Concerns P4	0.06	0.08	.451
	Perfectionistic Strivings P4	0.03	0.07	.700
PEP	Social Anxiety P4	0.10	0.06	.092
	Perfectionistic Concerns P4	0.04	0.07	.543
	Perfectionistic Strivings P4	0.01	0.06	.800

Note. IJQ = Interpretation and Judgement Questionnaire. NSI = Negative Self-Imagery. PEP = Post-Event Processing. *b* = unstandardized coefficient. SE_b = standard error of the coefficients. P = Part. Bold text represents significant effects.

Table 3.7

Indirect Effects for Model a

Predictor	Outcome	Mediator	*b*	SE_b	95% CI	
					LB	UB
Social Anxiety P1	Social Anxiety P4	IB	0.02	0.02	0.00	0.07
		NSI	**0.13**	**0.05**	**0.05**	**0.24**
		PEP	0.05	0.03	-0.01	0.13
	Perfectionistic Concerns P4	IB	0.02	0.02	-0.01	0.08
		NSI	0.00	0.05	-0.10	0.11
		PEP	0.02	0.05	-0.06	0.12
	Perfectionistic Strivings P4	IB	0.00	0.01	-0.02	0.04
		NSI	0.01	0.04	-0.07	0.10
		PEP	0.00	0.03	-0.05	0.09
Perfectionistic Concerns P1	Social Anxiety P4	IB	0.03	0.03	-0.01	0.10
		NSI	0.02	0.03	-0.03	0.10
		PEP	-0.01	0.02	-0.06	0.02
	Perfectionistic Concerns P4	IB	0.02	0.02	-0.01	0.10
		NSI	0.00	0.02	-0.03	0.03
		PEP	0.00	0.02	-0.04	0.02
	Perfectionistic Strivings P4	IB	0.00	0.02	-0.03	0.05
		NSI	0.00	0.01	-0.02	0.03
		PEP	0.00	0.01	-0.02	0.02
Perfectionistic Strivings P1	Social Anxiety P4	IB	0.00	0.02	-0.03	0.04
		NSI	0.01	0.03	-0.04	0.08
		PEP	0.00	0.01	-0.03	0.03

Predictor	Outcome	Mediator	*b*	SE_b	95% CI	
					LB	UB
Perfectionistic Strivings P1	Perfectionistic Concerns P4	IB	0.00	0.02	-0.03	0.05
		NSI	0.00	0.01	-0.02	0.03
		PEP	0.00	0.01	-0.03	0.02
	Perfectionistic Strivings P4	IB	0.00	0.01	-0.02	0.02
		NSI	0.00	0.01	-0.01	0.02
		PEP	0.00	0.01	-0.02	0.01

Note. IJQ = Interpretation and Judgement Questionnaire. NSI = Negative Self-Imagery. PEP = Post-Event Processing. *b* = unstandardized coefficient. SE_b = standard error of the coefficients. LB = Lower Bound. UB = Upper Bound. P = Part. Bold text represents significant pathways.

Table 3.8

Indirect Effects for Model b

Predictor	Outcome	Mediator	*b*	SE_b	95% CI	
					LB	UB
Social Anxiety P1	Social Anxiety P4	**Threat Endorsement (%)**	**0.06**	**0.03**	**0.02**	**0.13**
		NSI	**0.13**	**0.05**	**0.05**	**0.24**
		PEP	0.04	0.03	-0.02	0.12
	Perfectionistic Concerns P4	**Threat Endorsement (%)**	**0.05**	**0.03**	**0.003**	**0.12**
		NSI	0.01	0.05	-0.10	0.10
		PEP	0.01	0.04	-0.06	0.10
	Perfectionistic Strivings P4	Threat Endorsement (%)	0.05	0.03	0.00	0.12
		NSI	-0.01	0.04	-0.09	0.07
		PEP	0.00	0.04	-0.06	0.07
Perfectionistic Concerns P1	Social Anxiety P4	**Threat Endorsement (%)**	**0.04**	**0.03**	**0.01**	**0.13**
		NSI	0.02	0.03	-0.02	0.11
		PEP	-0.01	0.02	-0.05	0.02
	Perfectionistic Concerns P4	Threat Endorsement (%)	0.04	0.03	-0.02	0.10
		NSI	0.00	0.01	-0.03	0.03
		PEP	0.00	0.01	-0.03	0.02
	Perfectionistic Strivings P4	Threat Endorsement (%)	0.04	0.03	0.00	0.12
		NSI	0.00	0.01	-0.04	0.01
		PEP	0.00	0.01	-0.01	0.03
Perfectionistic Strivings P1	Social Anxiety P4	Threat Endorsement (%)	-0.02	0.02	-0.07	0.00
		NSI	0.01	0.03	-0.04	0.07
		PEP	0.00	0.01	-0.04	0.02

Predictor	Outcome	Mediator	*b*	SE_b	95% CI	
					LB	UB
Perfectionistic Strivings P1	Perfectionistic Concerns P4	Threat Endorsement (%)	-0.02	0.02	-0.09	0.00
		NSI	0.00	0.01	-0.02	0.03
		PEP	0.00	0.01	-0.02	0.01
	Perfectionistic Strivings P4	Threat Endorsement (%)	-0.02	0.02	-0.09	0.00
		NSI	0.00	0.01	-0.03	0.01
		PEP	0.00	0.01	-0.02	0.02

Note. NSI = Negative Self-Imagery. PEP = Post-Event Processing. *b* = unstandardized coefficient. SE_b = standard error of the coefficients. LB = Lower Bound. UB = Upper Bound. P = Part. Bold text represents significant pathways.

Table 3.9

Indirect Effects for Model c

Predictor	Outcome	Mediator	*b*	SE_b	95% CI	
					LB	UB
Social Anxiety P1	Social Anxiety P4	Threat Endorsement Latency	0.01	0.01	0.00	0.02
		NSI	**0.15**	**0.05**	**0.07**	**0.27**
		PEP	0.05	0.03	-0.01	0.13
	Perfectionistic Concerns P4	Threat Endorsement Latency	0.02	0.02	-0.01	0.07
		NSI	0.04	0.05	-0.05	0.14
		PEP	0.02	0.04	-0.04	0.12
	Perfectionistic Strivings P4	Threat Endorsement Latency	0.01	0.01	0.00	0.05
		NSI	0.02	0.04	-0.06	0.10
		PEP	0.01	0.03	-0.05	0.08
Perfectionistic Concerns P1	Social Anxiety P4	Threat Endorsement Latency	0.00	0.01	-0.04	0.01
		NSI	0.03	0.04	-0.03	0.12
		PEP	-0.01	0.02	-0.06	0.02
	Perfectionistic Concerns P4	Threat Endorsement Latency	-0.02	0.03	-0.08	0.04
		NSI	0.01	0.01	-0.01	0.06
		PEP	0.00	0.01	-0.05	0.01
	Perfectionistic Strivings P4	Threat Endorsement Latency	-0.01	0.02	-0.07	0.02
		NSI	0.00	0.01	-0.01	0.04
		PEP	0.00	0.01	-0.03	0.01
Perfectionistic Strivings P1	Social Anxiety P4	Threat Endorsement Latency	0.00	0.01	-0.02	0.02
		NSI	0.01	0.03	-0.05	0.08
		PEP	0.00	0.01	-0.04	0.02

Predictor	Outcome	Mediator	*b*	SE_b	95% CI	
					LB	UB
Perfectionistic Strivings P1	Perfectionistic Concerns P4	Threat Endorsement Latency	0.00	0.03	-0.05	0.05
		NSI	0.00	0.01	-0.01	0.04
		PEP	0.00	0.01	-0.03	0.01
	Perfectionistic Strivings P4	Threat Endorsement Latency	0.00	0.02	-0.03	0.04
		NSI	0.00	0.01	-0.01	0.03
		PEP	0.00	0.01	-0.02	0.02

Note. NSI = Negative Self-Imagery. PEP = Post-Event Processing. *b* = unstandardized coefficient. SE_b = standard error of the coefficients. LB = Lower Bound. UB = Upper Bound. P = Part. Bold text represents significant pathways.

Discussion

The present study further investigated the relationships among social anxiety, perfectionism dimensions, and cognitive biases in a short-term longitudinal time frame, designed to address some of the limitations of Study 1. In contrast with Study 1, social anxiety directly predicted perfectionistic concerns in the cross-lagged panel model. However, this effect was not observed in the mediator models. As in Study 1, the mediator model showed that negative interpretation bias was a mediator of 1) social anxiety over time, and 2) the pathway from perfectionistic concerns to social anxiety. This variable also mediated the pathway from social anxiety to perfectionistic concerns, an effect that was not seen in Study 1. However, in the current study, the effect of negative interpretation bias was only significant when this variable was measured as the percentage of threat endorsements.

Furthermore, social anxiety directly predicted negative interpretation bias (as measured by the percentage of threat endorsements), negative self-imagery, and post-event processing. Negative self-imagery was a mediator of social anxiety over time, in contrast with Study 1. Post-event processing did not emerge as a significant mediator, as was also the case in Study 1. Perfectionistic concerns directly predicted the percentage of threat endorsements, but no other cognitive biases. In addition, threat endorsement latency predicted perfectionistic concerns. Perfectionistic strivings were not significantly related to any other variables.

The Direct Relationships Between Social Anxiety and Perfectionistic Concerns

In line with Gautreau et al. (2015), results of the cross-lagged panel model including social anxiety and perfectionism dimensions showed that social anxiety directly contributed to perfectionistic concerns. These findings are in contrast with Study 1, which showed no direct relationships between social anxiety and perfectionism dimensions. The sample of the current study was younger on average (M = 22.88, SD = 6.17) than that of Study 1 (M = 29.09, SD = 9.56). Hence, as discussed in Study 1, it is

possible that the direct link from social anxiety to perfectionistic concerns may be present in younger individuals as these psychopathologies are still developing. This effect may also have been due to the difference in time lags, as it has been proposed that the relationships between trait-stable variables decline over long-term time intervals (Dormann & Griffin, 2015). Hence, this relationship may not have been observed over the longer-term time frame of Study 1.

Another possible explanation for the difference in results between the current study and those of Study 1 is the inclusion of the social interaction task in the current study. Cognitive models of social anxiety propose that assumptions about the self and the world (i.e., unreasonably high standards for performance and a perceived inability to achieve such standards) are activated when the individual enters a social situation (Clark, 2001). As discussed in Chapter 1, this assumption is akin to the concept of perfectionistic concerns. In the current study, it is possible that the social interaction task activated these assumptions in socially anxious individuals, thus contributing to perfectionistic concerns. Study 1 did not include a social situation component, and hence, these assumptions would not have been activated. This may have contributed to the lack of significant direct relationships between social anxiety and perfectionistic concerns in Study 1.

Nonetheless, the direct effect from social anxiety to perfectionistic concerns was no longer significant when cognitive biases were added to the mediator models of the current study. Although this may suggest that negative interpretation bias fully mediated this relationship, it should be noted that the direct relationship between social anxiety and perfectionistic concerns was also not present in models where no significant mediators were found between social anxiety and perfectionistic concerns. Overall, the current results suggest that including cognitive biases in the model accounted for the direct relationship between social anxiety and perfectionistic concerns. Previous longitudinal studies on social anxiety and perfectionism (i.e., Damian et al., 2017; Gautreau et al., 2015; Levinson & Rodebaugh, 2016) did not include cognitive biases in their models. Hence, it is unclear whether the direct relationships

found there would also have disappeared if cognitive biases were included in the analyses. The results of the current study reflect the importance of measuring cognitive biases when investigating the relationships between social anxiety and perfectionistic concerns. Thus, future studies investigating the relationships between social anxiety and perfectionism dimensions should consider including measures of cognitive biases to gain a fuller understanding of these relationships.

The Mediating Role of Cognitive Biases in Social Anxiety and Perfectionistic Concerns

Negative Interpretation Bias

The findings of the present study provide further evidence that negative interpretation bias is a maintenance factor of social anxiety and a mediator of the pathway from perfectionistic concerns to social anxiety. Moreover, in the current study, the opposite pathway (social anxiety to perfectionistic concerns through negative interpretation bias) was also significant. Together with the results of Study 1, the current findings demonstrate that perfectionistic concerns may lead to social anxiety through negative interpretation bias over shorter and longer-term time frames, but the opposite path only occurs in shorter-term designs and in the context of social interactions. Perfectionism is considered to be a personality feature and an enduring trait (Shafran et al., 2002; Stoeber, 2017a), and in accordance with the vulnerability model, personality traits can contribute to psychopathology (Bagby et al., 2008). Being a stable, enduring trait, perfectionism is likely to have a broad effect, over shorter and longer-term time frames, whether in the context of a social situation or not. In contrast, social anxiety may only have a complication effect (i.e., a temporary change in psychopathology symptoms that contributes to transient changes in personality; Bagby et al., 2008). In the context of the current study, the social interaction task may have contributed to this complication effect from social anxiety to perfectionistic concerns through negative interpretation bias.

However, only negative interpretation bias as measured by the percentage of threat endorsements was a mediator; negative interpretation bias as measured by the Interpretation and Judgement Questionnaire was not related to any variables, neither directly nor as a mediator. These results are in contrast with Study 1, which showed that scores on the Interpretation and Judgement Questionnaire mediated the relationship between perfectionistic concerns and social anxiety. Although both the Interpretation and Judgement Questionnaire and the WSAP variables measure negative interpretation bias, these measurements differ in the methods used to capture this cognitive bias. This distinction may account for the difference between the current results and those of Study 1.

The Interpretation and Judgement Questionnaire presents ambiguous social scenarios to participants, and four possible interpretations of each scenario. This requires participants to think about the scenario in question and to evaluate the most plausible interpretation out of the four presented possibilities. In such offline measures, participants are not required to report the first answer that comes to mind (Hirsch et al., 2016) and may instead rely on reflections regarding the social scenarios and make inferences based on previous experiences or beliefs regarding social situations. Indeed, cognitive models of social anxiety propose that ambiguous social cues are interpreted according to individuals' pre-established negative beliefs (Clark, 2001; Heimberg et al., 2014). In Study 1, the Interpretation and Judgement Questionnaire may have served as a mediator between perfectionistic concerns and social anxiety because the relationships between these variables were being measured over the long-term. This time frame may allow for social anxiety and perfectionistic concerns to influence experiences and negative beliefs regarding social situations, which in turn shape how individuals interpret social scenarios. The negatively perceived cues from others then reinforce social anxiety. In contrast, the results of the current study indicate that negative interpretation bias as measured by the Interpretation and Judgement Questionnaire did not mediate the relationship between perfectionistic concerns and social anxiety, likely as the short-term time frame did not allow for significant changes in these variables.

In contrast, the assessment of benign and threat words as related or unrelated to ambiguous social scenarios in the WSAP are made rapidly, and without much time for reflection (Beard & Amir, 2009). In addition, the threat or benign words presented prior to the scenario serve as a prime that elicit interpretation biases, while controlling for potential effects of pre-established negative beliefs (Beard & Amir, 2009; Chen et al., 2019). Hence, the WSAP may yield an assessment in the moment when interpretations are first generated (Gonsalves et al., 2019), without conscious interference from negative beliefs regarding social situations. Thus, the WSAP may be a more context-specific measure than the Interpretation and Judgement Questionnaire. The results of the current study suggest that the short-term relationships between social anxiety and perfectionistic concerns are mediated by negative interpretation bias 'in the moment', as measured by the percentage of threat endorsements. These differences in measures of negative interpretation bias should be taken into account when designing future longitudinal studies, as the time lags between measurements likely impact negative interpretation bias measurement.

Threat endorsement latency did not mediate the relationship between social anxiety and perfectionistic concerns. A negative direct relationship was found from threat endorsement latency to perfectionistic concerns, meaning the time taken to endorse threats inversely predicted perfectionistic concerns; hence, faster endorsement of threat interpretations contributed to higher perfectionistic concerns. These results, in conjunction with the findings regarding the mediator role of the percentage of threat endorsements, suggest that negative interpretation bias has implications for perfectionistic concerns, as the WSAP measures of negative interpretation bias contributed to an increase in perfectionistic concerns. Overall, the findings of the current study suggest that negative interpretation bias is a contributor to perfectionistic concerns.

However, threat endorsement latency was not significantly related to social anxiety. Hence, the current study indicates that time taken to endorse threat interpretations is not a consequence of, nor a

contributor to social anxiety. This may be due to the presence of confounds in the measurement of latencies. Chen et al. (2020) suggested that although time reaction measures are less vulnerable to demand effects, these measurements are not free of problems: biased interpretation as measured by response latency may be confounded with participants taking greater (or lesser) caution when selecting a response. For example, participants may wish to be careful in choosing a correct response, or alternatively, chose their response rapidly to complete the task in a timely manner. Another explanation is the longitudinal context of the current study. Previous research has shown that threat rejection and endorsement latency is relevant to social anxiety, in that individuals with social anxiety take longer to reject threat interpretations (e.g., Beard & Amir, 2009). However, previous studies compared latencies between groups (low versus high socially anxious individuals). Although latencies may be relevant in the context of differentiating interpretation bias levels in individuals with versus those without social anxiety, these variables appear to be less relevant as longitudinal predictors of social anxiety. As such, future longitudinal studies employing the WSAP should not rely solely on reaction time measures to assess interpretation bias.

Negative Self-Imagery and Post-Event Processing

In all mediator models, negative self-imagery was a significant mediator of the relationship between social anxiety at Part 1 and Part 4. This finding suggests that negative self-imagery contributes to the maintenance of social anxiety over time, as outlined in the cognitive models of social anxiety (Clark, 2001; Heimberg et al., 2014; Hofmann, 2007) and observed in previous research (e.g., Hirsch et al., 2003). Moreover, this maintenance effect was larger in effect size (b = 0.13 – 0.15 across models) than that of negative interpretation bias (b = 0.06).

When entering a social situation, socially anxious individuals generate negative images of the self as seen by a third party based on internal sensations and/or perceived negative feedback from

others, which in turn exacerbate social anxiety (Clark, 2001; Heimberg et al. 2014). The current findings support these propositions. Moreover, social anxiety contributed to post-event processing, in line with cognitive models of social anxiety and previous research (e.g., Brozovich & Heimberg, 2008). As outlined by Clark (2001), Heimberg et al. (2014), and Hofmann (2007), individuals with social anxiety tend to engage in reviewing and focusing on negative details after engaging in social situations. The present study provided evidence for these propositions in the context of a social interaction task, as the measurement of post-event processing was tailored to assess this cognitive bias in relation to the task.

However, in contrast with cognitive models of social anxiety, post-event processing did not predict social anxiety. Furthermore, results did not show any significant relationships between perfectionistic concerns and negative self-imagery or post-event processing, in contrast with perfectionism cognition theory. These cognitive biases also did not mediate the relationship between social anxiety and perfectionistic concerns. The measurement of negative self-imagery and post-event processing was improved from Study 1, which required participants to remember a social scenario up to six months prior and potentially introduced memory bias in this recall. In the current study, all participants underwent the same social interaction task, and negative self-imagery and post-event processing were assessed in relation to this task in a short time frame. Hence, although the present study addressed the potential memory bias inherent in the design of Study 1, post-event processing still did not contribute to social anxiety, and negative self-imagery and post-event processing were not related to perfectionistic concerns.

The lack of effect of post-event processing on social anxiety can be explained by the post-hoc analyses (see Appendix O). These showed that post-event processing directly predicted social anxiety at Part 4 in a model containing post-event processing as the only predictor. However, once negative-self imagery and social anxiety at Part 1 were added, post-event processing was no longer a significant predictor of social anxiety at Part 4. Hence, when the trait stability of social anxiety and the effects of

negative self-imagery were controlled for, post-event processing no longer contributed to social anxiety. The different cognitive biases are thought to be distinct processes, yet the literature acknowledges that there is overlap between them (Hirsch et al., 2006). In the current study, negative self-imagery and post-event processing were highly positively related, thus showing a high degree of overlap. As the shared variance between post-event processing and negative self-imagery was controlled for in the mediator models, post-event processing turned out to be a weaker predictor of social anxiety. Moreover, the modest reduction of state anxiety from pre- to post-task indicates that the social interaction may not have provoked substantial anxiety in participants. The objective of the task was not to manipulate state anxiety but to induce negative self-imagery and post-event processing in relation to a specific social event that was the same for all participants. Nonetheless, it appears that state anxiety diminished after the task, perhaps as participants felt relieved that the task was not a big concern after it was over. Hence, it is possible that post-task, participants did not experience enough rumination and as such, post-event processing did not contribute to social anxiety at Part 4 over and above the other cognitive biases.

With regard to the lack of relationship between perfectionistic concerns and negative self-imagery and post-event processing, it is possible that the measures used in the current study (and in Study 1) were not relevant enough to perfectionistic concerns. In a previous study demonstrating that individuals high in perfectionism had negative self-images more often than those low in perfectionism, Lee et al. (2011) conducted interviews aimed to assess imagery pertinent to perfectionism specifically. In contrast, the current study used the Appraisal of Social Concerns questionnaire, which was developed to be relevant to individuals with clinical levels of social anxiety (Telch et al., 2004). Although some items of the Appraisal of Social Concerns scale could be applicable to perfectionistic concerns (e.g., 'Appearing incompetent'), perhaps this scale was too focused on social anxiety aspects and not sufficiently related to negative self-images relevant to perfectionistic concerns. Hence, it is possible that when measured in the context of social anxiety, negative self-imagery is not relevant to perfectionistic concerns.

Similarly, the Extended Post-Event Processing Questionnaire was developed in relation to social anxiety disorder (Q. J. J. Wong, 2015), and thus may not have been directly relevant to perfectionistic concerns. However, Makkar and Grisham (2011b) used this same questionnaire and demonstrated that negative assumptions (defined as assumptions about the self and the world including excessively high standards for the self and concerns regarding evaluations from others, which relate to both domains of perfectionism) predicted Extended Post-Event Processing Questionnaire scores over and above other measures (e.g., depression, anxiety). They measured post-event processing in relation to a speech task and a conversation task with another participant (similar to the social interaction task of the current study). When post-event processing was measured in relation to the conversation task with another participant, negative assumptions did not predict post-event processing. Only post-event processing in relation to the speech task was predicted by negative assumptions. Makkar and Grisham (2011b) told participants that their speech would be taped and that their public speaking skills would later be evaluated by psychologists. These instructions likely elicited concerns regarding evaluation, which are relevant to perfectionism. In contrast, the social interaction task of the current study, like the conversation task of Makkar and Grisham (2011b), may not have been significantly related to perfectionism as neither involved an explicit, specific performance evaluation component. Hence, without concerns over evaluations, participants with perfectionistic concerns may not have ruminated over the social interaction task in the current study. In future studies, a speech task such as that used by Makkar and Grisham (2011b) may be used to yield a more accurate picture of the relationships between perfectionistic concerns and post-event processing in the context of social anxiety.

Perfectionistic Strivings

Although perfectionistic strivings were cross-sectionally related to some variables (e.g., social anxiety, perfectionistic concerns, negative interpretation bias as measured by the Interpretation and Judgement Questionnaire, negative self-imagery), it was not related to any other variables in the cross-

lagged panel model or mediator model. In Study 1, perfectionistic strivings were only related to perfectionistic concerns in the cross-lagged panel model, and to post-event processing in the mediator model. These relationships were not observed in the current study. It is possible that perfectionistic strivings only lead to perfectionistic concerns over long-term intervals, and that these relationships are not observed in the shorter time frame of the current study. Further research on the two perfectionism factors is needed to understand how these dimensions impact one another over time.

The contrast in results between Study 1 and the current study in regards to the relationship between perfectionistic strivings and post-event processing is consistent with previous research, which has shown that perfectionistic strivings are related to post-event processing in some studies (e.g., Nepon et al., 2011; O'Connor et al., 2007) but not in others (e.g., Abdollahi, 2019; Di Schiena et al., 2012). A possible explanation for the difference in results between the current study and those of Study 1 is the addition of the social interaction task. As outlined above, this interaction task did not involve an explicit performance evaluation component. More important in the context of perfectionistic strivings, it also did not involve a threat to personal achievement. As discussed in Chapters 1 and 2, perfectionistic strivings are concerned with internalised, self-imposed high standards for performance and a striving to achieve these standards, rather than a preoccupation with evaluations from others (Abdollahi, 2019; Levinson et al., 2013; Lo & Abbott, 2019; Stoeber, 2017a). It is possible that having participants choose their own social situation in Study 1 allowed those high in perfectionistic strivings to pick situations that had consequences for self-imposed goals and achievement, thus leading to rumination over these events. On the other hand, the social interaction task of the current study may not have imposed a threat to achievement striving, which in turn, may not have contributed to post-event processing. In future studies, it may be useful to ask participants whether they believe the task imposed a threat to personal achievement, in order to better understand the circumstances under which perfectionistic strivings are related to post-event processing.

Limitations

Although the current study addressed several limitations of Study 1, some limitations remained. Attrition was lower but nevertheless occurred, and consequently, the sample was still relatively small (despite the mediation pathways being adequately powered). Other similar limitations to those of Study 1 were also present in the current study (i.e., measures were mainly self-reports; causal inferences cannot be drawn from the results; and other configurations of the models, such as cognitive biases as vulnerability factors for social anxiety and perfectionism, may offer competing explanations).

Although the current study recruited an undergraduate sample that was on average younger than the sample of Study 1, an age-related exclusion criterion was not implemented. Hence, some participants in the current study were still older adults and age may have cofounded some of the results, as in Study 1. Future studies should consider restricting the age group included in their sample or should aim to include a larger number of participants to allow for age comparisons of the relationships among social anxiety, perfectionism domains, and cognitive biases.

Moreover, a record of participants who completed the task with another participant versus those who completed the task with the volunteer research assistant was not kept, and hence, it is unclear whether this difference may have affected the results. Nonetheless, from the participants' perspectives, there was no practical difference between completing the task with another participant or the volunteer research assistant.

The introduction of the social interaction task was a strength of the current study, as it allowed the relationships established in Study 1 to be tested within the context of an actual social interaction, and yielded a more generalised conclusion of cognitive biases across the sample and social contexts. Nonetheless, the social interaction may not have been sufficiently anxiety-provoking to trigger post-event processing in the 24-hour period following the task. This may have resulted in post-event

processing being a weaker predictor of social anxiety at Part 4, making no significant contribution when other cognitive biases were taken into account. However, in the absence of data on participants' perspectives on the perceived probability and negative consequences of the social interaction task, it remains to be determined whether this task could have contributed to post-event processing. Moreover, as discussed above, this task was pertinent mainly to social anxiety. This was in line with the objectives of the current thesis, which aimed to investigate the relationships among social anxiety, perfectionism dimensions, and cognitive biases in the context of social anxiety. Nonetheless, it is possible that the task was not sufficiently relevant to perfectionism, as it may not have imposed a significant threat of evaluations from others or a threat to personal achievement striving. Speech tasks have been used in both social anxiety (e.g., Brozovich & Heimberg, 2013; Goldin et al., 2009) and perfectionism research (e.g., DiBartolo et al., 2001; Shumaker & Rodebaugh, 2009). As such, a speech task may be relevant to both social anxiety and perfectionism, and may yield greater clarity about the relationships between the perfectionism dimensions and cognitive biases. Thus, future studies should consider using speech tasks when investigating the relationships among social anxiety, perfectionism dimensions, and cognitive biases.

Furthermore, the current sample showed elevated levels of social anxiety (*M* = 29.91 - 28.37, *SD* = 14.11 – 15.62), on average above that of the clinical cut-off of the Social Phobia Inventory (i.e., a score of 19 or above; Connor et al., 2000). However, no inclusion criteria were used, in accordance with the aims of comparing and extending the results of Study 1 to a short-term longitudinal design and in the context of a social interaction task. Nonetheless, some individuals may have had low levels of social anxiety: 13.5% had a score below the cutoff of 15 used to distinguish individuals with social anxiety symptoms and non-psychiatric controls on the Social Phobia Inventory (Connor et al., 2000). In particular, as the study was advertised as involving a five-minute 'getting acquainted task' with another participant, individuals with very high levels of social anxiety may have avoided participating. As outlined

in Chapter 1, studying individuals with sub-clinical levels social anxiety provides empirical and clinical information on social anxiety disorder (McNeil, 2001; Ruscio, 2010; Stopa & Clark, 2001). Nonetheless, future studies should investigate whether the relationships found in the current study can be replicated in a clinical sample. Such replication would strengthen the usefulness of the current results in informing future treatment strategies for individuals with clinical levels of social anxiety.

Clinical and Theoretical Implications

The main implication of the current study is its contribution to the evidence that negative interpretation bias may be a maintenance factor of social anxiety, and a mediator of the pathway from perfectionistic concerns to social anxiety. In conjunction with the findings of Study 1, the present findings suggest that these relationships likely occur both in the long-term and in the short-term. The current study also showed that in the short-term and in the context of a social interaction task, social anxiety contributes to perfectionistic concerns through an effect on negative interpretation bias. Together with the results of Study 1, the current study provides emerging evidence for the role of negative interpretation bias as a transdiagnostic factor implicated in social anxiety and perfectionistic concerns. Interpretation bias modifications (i.e., decreasing negative interpretation bias) may be an avenue for future studies investigating treatments for social anxiety and perfectionistic concerns.

A further implication of the findings was the contribution to the understanding of biased information processing in perfectionism. As outlined in Study 1, perfectionism cognition theory (Flett et al., 2017), the cognitive behavioural model of perfectionism (Shafran et al., 2018), and the extended conceptual model of perfectionism and social anxiety (Flett & Hewitt, 2014), which do not explicitly include negative interpretation bias. Together with the results of Study 1, the findings of the current study may be useful in informing future revisions of these models or the conceptualisation of new perfectionism models.

In the current study, negative-self imagery also emerged as a maintenance factor of social anxiety. Accordingly, this finding provides support for the cognitive models of social anxiety (Clark, 2001; Heimberg et al., 2014; Hofmann, 2007). Furthermore, both negative interpretation bias and negative self-imagery (Hirsch et al., 2006) emerged as maintenance factors of social anxiety in model b. This suggests that despite their shared variance, negative interpretation bias and negative self-imagery are unique contributions to the maintenance of social anxiety. In contrast, post-event processing did not predict social anxiety when negative self-imagery was taken into account. Together, these findings confirm the importance of examining multiple cognitive biases (Hirsch et al., 2006). Identifying the cognitive biases that have the strongest relationship with, or make a unique contribution to social anxiety may be beneficial to clinical interventions that target cognitive biases.

Conclusion

The present study further investigated the relationships among social anxiety, perfectionism dimensions, and cognitive biases. The findings contributed to the emerging evidence for the role of negative interpretation bias as a maintenance factor of social anxiety and as a mediator of the relationships between perfectionistic concerns and social anxiety, in both directions. Negative self-imagery was also a maintenance factor of social anxiety, but this cognitive bias was not related to perfectionism dimensions. Similarly, post-event processing had no relationship to perfectionism dimensions, nor did it play mediator roles. The lack of relationships between negative self-imagery and post-event processing and the perfectionism dimensions may have been due to the social interaction task, which likely posed no significant performance evaluation threat from others or threats to personal achievement. Limitations notwithstanding, the findings of the current study, along with the results of Study 1, provide an emerging indication of the role of negative interpretation bias as a transdiagnostic factor across social anxiety and perfectionistic concerns. Such findings may have clinical utility in future treatments of social anxiety and perfectionistic concerns.

Chapter 4

Study 3: Effects of a Single Session Cognitive Bias Modification Protocol on Social Anxiety and Perfectionism Dimensions

Studies 1 and 2 addressed the directional relationships among social anxiety and perfectionism dimensions, and the mediating roles of cognitive biases in these relationships. A key and consistent finding across both studies was the role of negative interpretation bias as a mediator of the relationships between perfectionistic concerns and social anxiety. Negative interpretation bias was also suggested to be a maintenance factor of social anxiety. Accordingly, it was suggested that negative interpretation bias may be a transdiagnostic factor across social anxiety and perfectionistic concerns, and this cognitive bias may be a target for future interventions addressing both conditions. The current study sought to test this proposition.

Previous research has characterised negative interpretation bias as a transdiagnostic factor underlying numerous psychological disorders (Hirsch et al., 2016), and previous research has subsequently demonstrated the efficacy of interpretation bias modifications as a transdiagnostic intervention (Beard et al., 2019). Cognitive Bias Modification for Interpretation Bias (CBM-I) protocols have been designed to alter interpretation bias (i.e., near-transfer effects) and other secondary outcomes, such as psychopathologies and associated symptoms (i.e., far-transfer effects). A number of different CBM-I protocols have successfully altered interpretation bias and diminished social anxiety symptoms (Jones & Sharpe, 2017). The most commonly used CBM-I protocol is the task by Mathews and Mackintosh (2000; Beard, 2011), which presents participants with a short ambiguous scenario, in which the final word resolves the ambiguity in a negative or positive way. Participants are then asked to complete a comprehension question that reinforces either the positive or negative interpretation, thus modifying the interpretation bias (Beard, 2011). Another commonly used protocol, Beard and Amir's

(2008; 2009) Interpretation Modification Program (IMP) and its accompanying Interpretation Control Condition (ICC), contain unique strengths over other protocols (Gonsalves et al., 2019). The IMP modifies interpretations by providing feedback aimed at correcting participants' responses to an ambiguous scenario, whereas the feedback provided on the ICC does not aim to modify interpretation bias and is used as a control task. The IMP/ICC was developed as a modification of the Word Sentence Association Paradigm (WSAP; Beard & Amir, 2008), a task used to assess biased interpretations in Study 2. The IMP has been shown to be psychometrically sound (Gonsalves et al., 2019), and presents an advantage over other CBM-I protocols such as that of Mathews and Mackintosh (2000), which does not have a control condition. In the current study, this protocol was chosen over other existing CBM-I due to these strengths.

The IMP has been shown to successfully decrease threat interpretations and social anxiety symptoms over the course of multiple sessions (Amir & Taylor, 2012; Beard & Amir, 2008; Brosan et al., 2011), but has also shown efficacy in single session protocols. For instance, Amir et al. (2010) randomly assigned participants with high levels of social anxiety to the IMP or the ICC. Amir et al. (2010) demonstrated that participants who completed one session of the IMP showed a decrease in negative interpretation bias from pre-IMP to post-IMP. This reduction in negative interpretation bias was not seen in the ICC group (Amir et al., 2010). Similarly, Yang et al. (2017) tested the effect of 160 IMP trials delivered in one session on interpretation bias in highly socially anxious participants. They randomised participants to the IMP or a control condition (i.e., a probe task), and used smartphones to deliver the protocols. Their results showed that participants made fewer threat interpretations and more benign interpretations on the WSAP after completing the IMP, compared to before the IMP. Participants who completed the control condition task did not show significant changes in interpretation bias.

Emerging evidence suggests that CBM-I may also be useful for perfectionistic individuals. For example, Dodd et al. (2019) modified negatively biased perfectionistic interpretations in a sample of

university participants high in perfectionistic concerns and perfectionistic strivings (i.e., scoring one standard deviation above the mean on the Concerns About Mistakes and the Personal Standards subscales). They first asked participants to complete a series of questionnaires, including a measure of perfectionistic interpretation bias. Participants then completed the CBM-I task. This involved reading 60 ambiguous scenarios and completing a word fragment that resolved the ambiguity of the scenario. The scenarios targeted perfectionistic concerns (e.g., 'You enter a singing contest. You make it to the final round and then receive third place. You feel…', p. 169). Participants were allocated to an intervention (the word to be completed at the end of the scenario was always inconsistent with perfectionistic interpretations) or control condition (the word was inconsistent with perfectionistic interpretations for 50% of the scenarios). An example of a word fragment presented to the intervention group was 'p_oud' (proud), and to the control group, 'terrib_e' (terrible). Participants were then asked to answer a comprehension question that emphasised their allocated interpretation condition, for example, those in the intervention group were asked 'Does receiving third place make you feel proud?', to which participants had to answer yes to be able to proceed.

Dodd et al. (2019) then re-administered the perfectionistic interpretation measure, and also administered a behavioural task (i.e., an impossible anagram designed to target perfectionistic concerns) and asked participants to rate their confidence in their responses to the anagram task, as well as indicate whether they wished to re-do the task. These measures were used to indicate perfectionistic behaviours. Two to three days later, participants were again administered the CBM-I, perfectionistic interpretation measure, and behavioural task. Results showed that participants in the intervention group made fewer perfectionistic interpretations and showed fewer perfectionistic behaviours in the behavioural tasks than those in the control group. Dodd et al. (2019) concluded that CBM-I was a promising avenue for interventions for perfectionism.

Hence, emerging evidence demonstrates that modifying perfectionistic interpretation biases appears beneficial for individuals high in perfectionism. However, as outlined in Study 2, perfectionistic interpretation bias is addressed differently from how negative interpretation bias is commonly assessed in social anxiety. For example, the WSAP (and consequently, the IMP) assess the interpretation of ambiguous cues in social situations. In contrast, Dodd et al. (2019) developed scenarios that were consistent with perfectionistic concerns, and thus involved situations in which individuals are evaluated. Given the findings of Studies 1 and 2, which consistently showed that the negative interpretation of ambiguous cues in social situations is related to perfectionistic concerns, it is possible that a CBM-I protocol such as the IMP may also work for individuals high in perfectionistic concerns. Specifically, Study 2 showed that perfectionistic concerns contributed to the percentage of threat endorsements (as measured by the WSAP), and this variable in turn contributed to perfectionistic concerns in the context of a social interaction. As such, decreasing negative interpretation bias using the IMP may be of benefit for individuals with perfectionistic concerns.

Such proposition, along with the findings of CBM-I research on social anxiety (Beard & Amir, 2008; Amir & Taylor, 2012; Brosan et al., 2011; Yang et al., 2017) and perfectionism (Dodd et al., 2019), raise the question of whether modifying interpretation bias can be beneficial for both issues simultaneously. However, no studies to date have examined the effect of CBM-I in socially anxious and perfectionistic individuals, using protocols such as the IMP, which can be used to target multiple psychopathologies. Such a transdiagnostic intervention could be a time and cost-effective treatment alternative for negatively biased interpretations in these commonly co-occurring psychopathologies. The current study set out to address this question, by using the IMP to modify interpretation bias and testing its effect on perfectionism and anxiety, in individuals with high levels of social anxiety. In so doing, the present study aimed to provide preliminary evidence for the use of interpretation bias modification in the context of social anxiety and perfectionism.

Specifically, the present study examined the effect of a single session CBM-I protocol on interpretation bias, and its subsequent effects on social anxiety and perfectionism. In accordance with previous short-term intervention research (Dodd et al., 2019), we expected a reduction in both state anxiety and state perfectionism (rather than trait variables, which would likely require a more extensive protocol), after the intervention. To induce state anxiety and state perfectionism, a false speech task was announced during the study. Study 2 employed a social interaction task, and as discussed in the previous chapter, this task likely did not elicit fear of evaluations relevant to perfectionistic concerns. Hence, based on previous research (Makkar & Grisham, 2011b), a speech task with a specific evaluation threat was employed. Participants were advised that they would be rated on their performance and receive feedback regarding their speech. Impending speech tasks have frequently been used in cognitive bias and social anxiety research (e.g., Brozovich & Heimberg, 2013). These have been shown to be related to elevated stress responses in individuals with social anxiety disorder (Goldin et al., 2009). Speech tasks have similarly been used in research relating to perfectionism, as these have been suggested to be an evaluative threat (DiBartolo et al., 2001; Shumaker & Rodebaugh, 2009). Hence, it was expected that the anticipation of an impending speech would increase state anxiety and perfectionism.

In Studies 1 and 2, negative-self imagery and post-event processing were related to social anxiety, and negative self-imagery emerged as a maintenance factor of social anxiety in Study 2. Hence, these biases appear to be implicated in social anxiety, as outlined in cognitive models of social anxiety (Clark, 2001; Heimberg et al., 2014; Hofmann, 2007). However, these biases did not show any longitudinal relationships with perfectionistic concerns in Studies 1 and 2. As discussed in the previous chapters, this lack of significant relationships may have been due to limitations in the measurements of negative self-imagery and post-event processing, and the social interaction task used in Study 2, which may not have imposed evaluation threats. Although future research on the relationships between

perfectionistic concerns and these biases in the context of social anxiety is still needed, the current study restricted its focus to the modification of interpretation bias. This decision was driven by the results of Studies 1 and 2, in which negative interpretation bias emerged as the cognitive bias most consistently related to social anxiety and perfectionistic concerns, and as such, is likely to be an effective target for transdiagnostic interventions.

We hypothesised that compared to the ICC group, the IMP group would show a reduction in negative interpretation bias after the modification protocol, compared to before, as measured by the WSAP. We also hypothesised that compared to the control (i.e., ICC) group, the IMP group would show reduced state anxiety and state perfectionism about the speech after the modification protocol compared to before. We further explored whether trait variables (i.e., trait perfectionistic concerns, trait perfectionistic strivings, and trait social anxiety) would moderate the effect of the IMP on state anxiety and state perfectionism.

Method

Participants

Eighty participants (26 women, M_{age} = 29.27 years, SD_{age} = 6.97, age-range = 19 - 57) completed the study. Seventy participants were recruited from Amazon Mechanical Turk, a crowdsourcing platform, and an additional 10 participants were recruited from the Research Participation System at Flinders University in South Australia. Mechanical Turk participants were offered $2.00 USD for their participation, in accordance with the platform's rates. Flinders University students were remunerated with $15 AUD. The study was advertised on Mechanical Turk and the School of Psychology Research Participation System as investigating the relationships among perfectionism, social anxiety, and thinking styles in an online context. Both groups of participants were advised that a screening questionnaire would be administered prior to the remainder of the study and that participants would be remunerated

for taking part in the full study only. Flinders University and Mechanical Turk participants were required to be at least 17 years and 18 years old, respectively, to be able to provide their own consent to participate. Additionally, participants were required to be fluent in English, so as to be able to understand the questionnaires and computer task.

A highly socially anxious sample was recruited as the speech task would be more likely to cause state anxiety in individuals with high social anxiety. Additionally, given the high correlation between social anxiety and perfectionism, participants with elevated social anxiety are also more likely to display state perfectionism in relation to the speech. Participants who scored 19 and over on the Social Phobia Inventory were deemed to have high levels of social anxiety (Connor et al., 2000) and were eligible to participate.

Sample Size Calculation

A priori power calculations were conducted using G*Power 3.1.9.2 (Faul et al., 2007). The type of power analysis entered in G*Power were 'A priori: Compute required sample size – given α, power, and effect size' and the statistical test chosen was 'ANOVA: Repeated measures, within-between interaction' from the 'F tests' test family. Based on previous findings (e.g., Beard & Amir, 2008), a medium effect size (f = .21), α = .05, and 95% power were used. Two groups and two measurements were entered, and correlation among measures and nonsphericity corrections were left in the G*Power default option of 0.5 and 1, respectively. It was established that 76 participants were required to detect a 2 x 2 between-within interaction effect.

Design

This study used a 2 (groups: IMP or ICC; between subjects) x 2 (time: pre- and post-CBM-I; within subjects) mixed design. The Inquisit software, which hosted the CBM-I task, randomly allocated forty participants to each the IMP and ICC conditions.

Materials

Social Anxiety

The Social Phobia Inventory (Connor et al., 2000), also used in Studies 1 and 2, was used to screen participants for social anxiety. Internal consistency in the present sample was good, $\alpha = .89$.

Cognitive Bias Modification for Interpretation Bias Task

To modify interpretation bias, Beard and Amir's (2008) CBM-I protocol was administered. Specifically, the protocol consisted of the WSAP (as used in Study 2) and the IMP/ ICC. The WSAP and IMP/ICC each contain 110 trials each, with 76 social anxiety-related trials and 34 non-social anxiety-related filler trials. For the purposes of the current study, only the social anxiety-related trials were analysed.

Word Sentence Association Paradigm. The WSAP was used to measure negative interpretation bias before and after the IMP or ICC. Inquisit randomly allocated participants to one of two versions (A or B) of the task. Each version contained 6 practice trials and 76 experimental social anxiety-related trials, with 38 experimental trials presented before the IMP or ICC, and 38 after. Inquisit randomly allocated 38 experimental trials to be displayed prior to the IMP or ICC, with the remaining 38 trials presented after the training. Hence, the trials were presented in random order for each participant. Details regarding the trials were described in Study 2. As in Study 2, negative interpretation bias scores were determined based on the percentage of endorsed threat interpretations and on the response latency to endorse threat interpretations. In accordance with Beard and Amir's (2009) protocol, WSAP trials with reaction times shorter than 50 milliseconds or longer than 2000 milliseconds were removed as reaction time outliers (8.7% of trials).

Interpretation Modification Program/ Interpretation Control Condition. The IMP procedure was similar to the WSAP; however, participants were provided with feedback after each response. Positive feedback (i.e., 'You are correct') was given when participants chose #1 ('related') to benign interpretation trials and #3 ('unrelated') to threat interpretation trials. Negative feedback (i.e., 'You are incorrect') was given when participants chose #1 ('related') to threat interpretation trials, and #3 ('unrelated') to benign interpretation trials. This feedback was given to decrease endorsement of threat interpretations and rejection of benign interpretations, and to increase endorsement of benign interpretations and rejection of threat interpretations. As with the WSAP, there were two versions of the IMP (A and B). Participants who were allocated to version A of the WSAP completed version B of the IMP, and vice versa. Unlike the IMP, the ICC does not aim to change interpretation bias and was used as a control condition. The ICC procedure is similar to the IMP; however, the feedback provided is positive on 50% of endorsed threat interpretations, and negative on 50% of endorsed benign interpretations. As such, both types of endorsement are equally reinforced.

Speech Task

An impromptu, false speech task was presented during the study to increase participants' state anxiety and perfectionism. Participants were advised of this task as follows: 'We would now like you to prepare a three-minute speech about yourself. You have three minutes to prepare the speech. Your speech will be recorded later during this study. After you finish the survey, your speech will be watched by two PhD students, who will email you feedback in a couple of days'. Participants were then given three minutes to prepare their speech; a countdown was shown on the Qualtrics page. At the end of the study, participants were informed that they would not be required to deliver the speech, and were asked to rate the extent to which they believed that they had to deliver the speech, from 0 ('not at all') to 4 ('very much'). Results showed reasonable rates of credibility, with 36.3% responding '4 very much',

43.8% responding ‘3’, 8.8% responding ‘2’, 7.5% responding ‘1’, and 3.8% responding ‘0 not at all’ (*M* = 3.01, *SD* = 1.05).

State Anxiety

The State Trait Anxiety Inventory – State Form (as used in Study 2; Spielberger et al., 1983) was used to measure state anxiety prior to informing participants of the speech, after informing them of the speech, and after the CBM-I task. Internal consistency in the present sample was good at all three time points ($\alpha_{baseline}$ = .88, $\alpha_{pre\text{-}task}$ = .84, $\alpha_{post\text{-}task}$ = .89).

State Perfectionism

In the absence of validated state perfectionism tools, state perfectionism in relation to the speech task was measured using a modified version of S. P. Mackinnon et al.’s (2014) perfectionistic self-presentation and perfectionism cognitions questions. To measure perfectionism specifically with regard to the speech, the questions were modified as follows: ‘I expect my speech to be perfect’; ‘My speech should be perfect’; ‘My speech should be flawless’; ‘I think that failing in my speech is awful if other people know about it’; ‘I think it would be awful if I make a fool of myself during my speech in front of others’; ‘I am concerned about making errors in my speech’. The first three questions were selected by S. P. Mackinnon et al. (2014) from Flett et al.'s (1998) Perfectionistic Cognitions Inventory and were rated on a five-point scale from 0 (‘not at all’) to 4 (‘all of the time’), in accordance with the original scale. The other three questions were chosen by S. P. Mackinnon et al. (2014) from Hewitt et al.'s (2003) Perfectionistic Self-Presentation Scale and were rated on a seven-point scale from 1 (‘strongly disagree’) to 7 (‘strongly agree’), also in accordance with the original scale. In the current study, scores from these questions were transformed into standard scores and summed to represent a state perfectionism measure. Participants completed the state perfectionism measure after being informed of the speech,

and again after the CBM-I task. Internal consistency was poor at Time 1 (α = .60) and acceptable at Time 2 (α = .78).

Perfectionistic Concerns and Perfectionistic Strivings (Trait Perfectionism)

As in Studies 1 and 2, the Frost Multidimensional Perfectionism Scale (Frost et al., 1990) and the Multidimensional Perfectionism Scale (Hewitt & Flett, 1991) were used to measure perfectionism. Internal consistency was excellent for the Frost Multidimensional Perfectionism Scale excellent for the questionnaire as a whole, α = .94. For the Multidimensional Perfectionism Scale, internal consistency in the present sample was also excellent for the entire questionnaire, α = .94. As in Studies 1 and 2, scores of the Multidimensional Perfectionism Scale's Self-Oriented Perfectionism and the Frost Multidimensional Perfectionism Scale's Personal Standards subscales were added to form a perfectionistic strivings composite, and scores of the Multidimensional Perfectionism Scale's Socially Prescribed Perfectionism was combined with the Frost Multidimensional Perfectionism Scale's Concern Over Mistakes and Doubts about Actions and Parental Expectations and Criticism. As the Frost Multidimensional Perfectionism Scale and Multidimensional Perfectionism Scale are rated on a five- and seven-point scale, respectively, the scores of all subscales were transformed into standard scores prior to being added.

Procedure

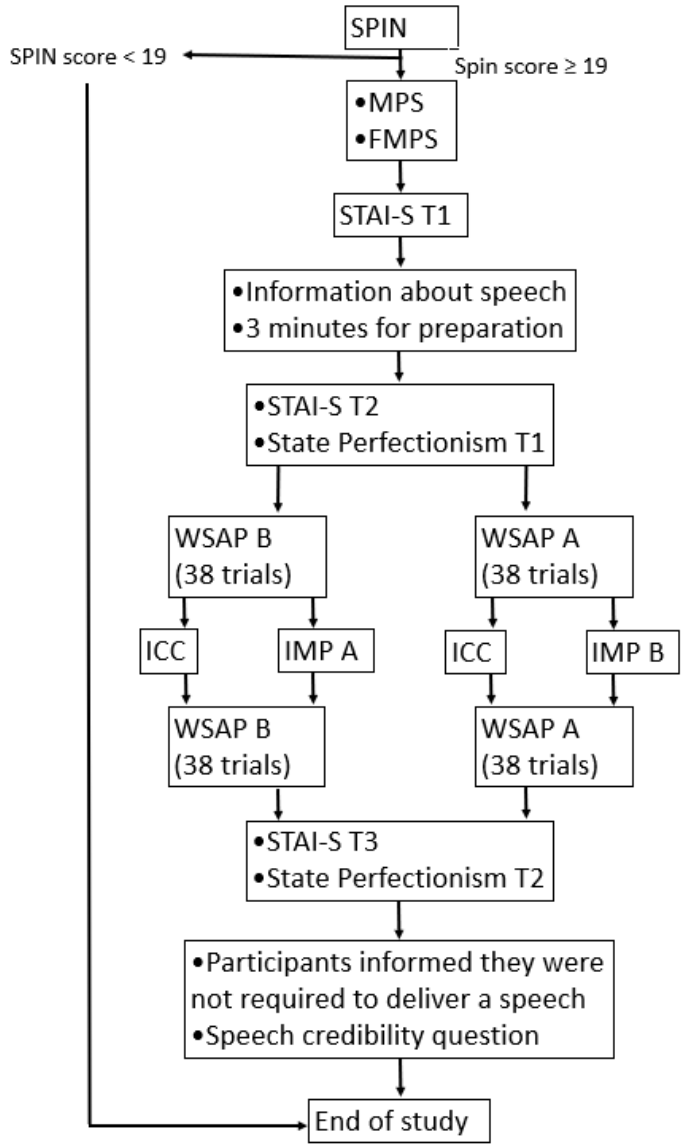
The study was approved by the Flinders University Social and Behavioural Research Ethics Committee. Prior to starting the study, participants were advised that they should complete the study on a desktop or laptop device with a camera and microphone, to increase the credibility of the speech task. They were further advised that they would be required to download Inquisit Web Player, which was used to run the CBM-I task. The questionnaires were hosted on Qualtrics. Participants who used a mobile device were automatically directed to the end of survey page by Qualtrics. Check items were

placed throughout the questionnaires to ensure participants were reading the questions with attention. As outlined in Study 1, these items were added to avoid the inclusion of 'bots' (computer logarithms designed to automatically complete surveys on Mechanical Turk) in the sample. Each response was also screened for improbable patterns (e.g., every item of multiple questionnaires rated at the most extreme end of the scale; inconsistencies in responses to reverse-coded items; Chmielewski & Kucker, 2019) prior to being approved on Mechanical Turk. A total of 109 participants were recruited on Mechanical Turk, 39 of whom did not respond correctly to all the attention checkpoints or presented improbable patterns of responses, and were excluded from the sample. This ensured the requisite number of 70 legitimate responders for inclusion in the final sample, along with 10 participants from Flinders University students.

Participants first completed the Social Phobia Inventory. If eligible to participate, they then completed the Multidimensional Perfectionism Scale and the Frost Multidimensional Perfectionism Scale (in counterbalanced order). Participants subsequently completed the State Trait Anxiety Inventory – State Form (Time 1), received information and prepared their speech, and completed the State Trait Anxiety Inventory – State Form again (Time 2) for manipulation check purposes. Next, participants completed the state perfectionism questions (Time 1). Participants were then directed to Inquisit Web Player and completed 38 social anxiety-related trials of the WSAP, 76 social anxiety-related trials of the IMP or ICC, followed by another 38 social anxiety-related trials of the WSAP. Participants were then redirected to Qualtrics and completed the State Trait Anxiety Inventory – State Form (Time 3) and the state perfectionism questions (Time 2). The study procedure can be seen in Figure 4.1.

Figure 4.1

Study Procedure



Note. T = Time; SPIN = Social Phobia Inventory; MPS = Multidimensional Perfectionism Scale; FMPS = Frost Multidimensional Perfectionism Scale; STAI-S = State Trait Anxiety Inventory – State Form; WSAP = Word Sentence Association Paradigm; IMP = Interpretation Modification Program; ICC = Interpretation Control Condition.

Results

Data Preparation

Data was prepared according to recommendations by Field (2013). Prior to testing the hypotheses, the data were checked for missing values, outliers, and violations of normality. All analyses were conducted using IBM SPSS version 26. Continuous variables were tested for normality based on skewness and kurtosis values, and outliers were assessed based on z-scores with absolute values above 3.29. The distribution of WSAP latency of threat endorsement at Time 1 was identified as skewed and treated using square root transformation. Perfectionistic concerns and speech perfectionism at Time 2 contained one and three outliers respectively, which were treated by replacing the outlier scores to one unit above the next highest score.

Descriptive Statistics

Descriptive statistics for each variable for the entire sample and for the two conditions can be seen in Table 4.1. There were no significant differences between the IMP and ICC groups for trait social anxiety, perfectionistic concerns, perfectionistic strivings, state anxiety at baseline, and state perfectionism pre-CBM-I. There were also no group differences in age (IMP: M = 28.32, SD = 6.27; ICC: M= 30.23, SD = 7.58), $t(60) = 1.08$, p = .286, or gender, $\chi^2(1, N = 80) = 2.39$, p = .123. Table 4.2 shows the correlations between baseline variables; overall, trait and state variables were moderately-to-highly correlated (with the exception of state perfectionism), but no significant relationships were seen amongst trait variables and WSAP variables. Similarly, state variables were not significantly related to WSAP variables.

Table 4.1

Means and Standard Deviations by Group and Total Sample, and Group Difference Test of Baseline Variables

		M	*SD*	*t* (*p*)
Trait Social Anxiety	IMP	46.85	8.91	-1.90 (.061)
	ICC	42.43	11.72	
	Total	44.63	10.58	
Perfectionistic	IMP	-0.17	21.68	0.21 (.832)
Concerns	ICC	0.75	16.48	
	Total	0.29	19.14	
Perfectionistic Strivings	IMP	0.02	19.14	-0.01 (.995)
	ICC	-0.02	22.24	
	Total	0.00	20.62	
State Anxiety at	IMP	50.35	11.67	0.45 (.657)
baseline (T1)	ICC	51.43	9.86	
	Total	50.89	10.74	
State Anxiety	IMP	50.33	10.77	
pre-CBM-I (T2)	ICC	50.96	9.56	
	Total	50.65	10.12	
State Anxiety	IMP	49.13	12.39	
post-CBM-I (T3)	ICC	50.85	10.91	
	Total	49.98	11.63	
State Perfectionism	IMP	10.86	3.46	0.36 (.717)
pre-CBM-I (T1)	ICC	11.14	3.49	
	Total	11.00	3.45	

		M	*SD*	*t* (*p*)
State Perfectionism	IMP	10.04	4.06	
post-CBM-I (T2)	ICC	10.22	3.42	
	Total	10.13	3.73	

Note. IMP = Interpretation Modification Program. ICC = Interpretation Control Condition. CBM-I = Cognitive Bias Modification for Interpretation Bias. T = Time.

Table 4.2

Correlations Between Baseline Variables

Baseline Variable	1.	2.	3.	4.	5.	6.
1. Trait Social Anxiety	-					
2. Trait Perfectionistic Concerns	.37**	-				
3. Trait Perfectionistic Strivings	.40**	.85**	-			
4. State Anxiety (T1)	.32*	.58**	.59**	-		
5. State Perfectionism pre-CBM-I (T1)	.36**	.56**	.50**	.44**	-	
6. WSAP Threat Endorsement (%)	.06	.06	.02	-.14	.10	-
7. WSAP Threat Endorsement (Latency)	.06	.04	.08	-.16	.07	.99**

Note. CBM-I = Cognitive Bias Modification for Interpretation Bias. T = Time.

** $p < .01$. * $p < .05$.

Manipulation Check

A paired-samples *t*-test was used to test whether the false speech task induced state anxiety in the sample. There was no significant increase from baseline to Time 2 (after advising participants of the speech), $t(79) = 0.40$, $p = .688$. To test whether level of trait social anxiety had an effect on state anxiety level before and after informing participants of the speech, a two-way mixed ANCOVA was conducted. Trait social anxiety and group were centred and these variables, as well as their product term, were entered as covariates in the analysis. Assumptions of homogeneity of variances and covariances, and sphericity were met. There was no significant interaction between time and trait social anxiety, $F(1, 78) = 0.71$, $p = .402$, partial $\eta^2 = .01$. Hence, the false speech task appears not to have induced state anxiety, even when accounting for trait social anxiety levels, despite reasonable rates of speech credibility.

Effects of the Interpretation Modification Program/Interpretation Control Condition on Negative Interpretation Bias

To test the effect of CBM-I on negative interpretation bias, the IMP and ICC groups were compared on percentages and latencies of threat endorsement, at Times 1 and 2 (pre- and post-IMP/ICC), using two two-way mixed ANOVAs. Assumptions of homogeneity of variances and covariances, and sphericity were met in all analyses. No significant interactions or main effects of group were found (see Table 4.3). However, there was a significant main effect of time for the percentage of threat endorsements. Specifically, the percentage of threat endorsements decreased from pre (M = 62.14%, SD = 20.93%) to post IMP/ICC (M = 55.68%, SD = 26.09%). There was also a significant main effect of time for threat endorsement latency, such that participants took longer to endorse threat trials after the IMP/ICC protocol (M = 453.83ms, SD = 220.08ms) than before (M = 371.94ms, SD = 199.01ms).

Table 4.3

Two-Way Mixed ANOVA Results for Percentage and Latency of Threat Endorsement

	M (SD)				*F(df)* partial η^2		
	Pre		Post				
	ICC	IMP	ICC	IMP	Time	Group	Interaction
Threat Endorsement (%)	60.38 (21.49)	61.68 (21.58)	53.72 (28.02)	49.28 (30.33)	11.26 (1, 78)*** .13	0.10 (1, 78) .00	1.02 (1, 78) .01
Threat Endorsement Latency[a] (milliseconds)	436.75 (189.38)	370.81 (197.53)	445.38 (244.78)	373.14 (203.37)	7.48 (1, 72)*** .09	0.03 (1, 72) .00	0.33 (1, 72) .01

Note. ICC = Interpretation Control Condition. IMP = Interpretation Modification Program.

[a] Non-transformed means and standard deviations for are reported for ease of interpretation.

***$p < .001$.

Effects of Cognitive Bias Modification for Interpretation Bias on State Anxiety and State Perfectionism

To test the effect of CBM-I on state anxiety a two-way mixed ANOVA (Group: IMP vs. ICC x Time: pre- and post-CBM-I) was conducted. Assumptions of homogeneity of variances and covariances, and sphericity were met. There was no significant interaction between group and time, $F(1, 78)= 0.60$, $p = .441$, partial $\eta^2 = .01$. There were also no main effects of time, $F(1, 78)= 0.91$, $p = .343$, partial $\eta^2 = .01$, or group, $F(1, 78)= 0.26$, $p = .615$, partial $\eta^2 = .00$.

A similar analysis was conducted to test the effect of CBM-I on state perfectionism. Assumptions of homogeneity of variances and covariances, and sphericity were again met. There was again no interaction between group and time, $F(1, 78) = 0.04$, $p = .838$, partial $\eta^2 = .00$, nor significant main effects of time, $F(1, 78) = 0.31$, $p = .580$, partial $\eta^2 = .00$, or group, $F(1, 78) = 0.09$, $p = .764$, partial $\eta^2 = .00$.

Trait Variables as Moderators of the Effects of the Interpretation Modification Program/Interpretation Control Condition on State Anxiety and State Perfectionism

A series of three-way repeated-measures ANCOVAs (Group: IMP vs ICC x Time: pre- vs post-CBM-I x trait variable) were conducted to individually test the moderating role of each of the trait variables (i.e., trait social anxiety, trait perfectionistic concerns, and trait perfectionistic strivings). Prior to conducting the analyses, the trait variables and group were centred, and entered as covariates along with their product terms. Assumptions of homogeneity of variances and covariances, and sphericity were met in all analyses.

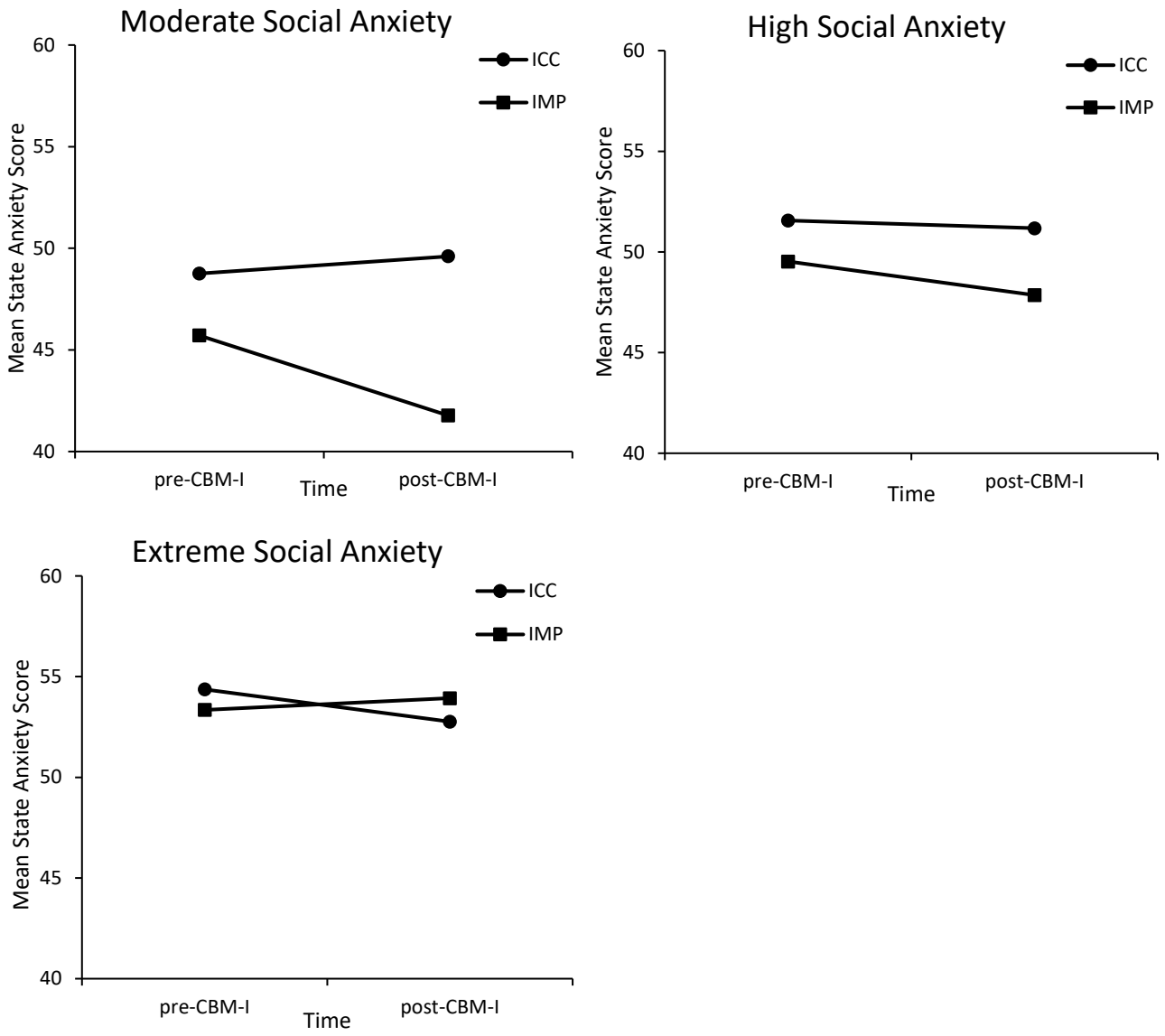
The three-way interaction of time, group, and trait social anxiety on state anxiety was significant, $F(1, 76) = 5.76$, $p = .019$, partial $\eta^2 = .07$. To further investigate this effect, two-way interactions were graphed using pre- and post-CBM-I parameter estimates coefficients of the intercept, trait social anxiety, group, and the product term of trait social anxiety and group on state anxiety. The

interactions between time and group were analysed at three levels of trait social anxiety: moderate[4] (Social Phobia Inventory scores one standard deviation below the mean); high (Social Phobia Inventory scores within one standard deviation of the mean); and extreme (Social Phobia Inventory scores one standard deviation above the mean). As can be seen in Figure 4.2, the interactions between group and time differed at each of the trait social anxiety levels. At moderate social anxiety levels, there was a decline in estimated state anxiety scores from pre- (45.71) to post-CBM-I (41.78) in the IMP group, but not in the ICC group (pre-CBM-I = 48.76; post-CBM-I = 49.60). As trait social anxiety levels increased, the state anxiety slope of the IMP group flattened, such that a smaller decline was seen at high social anxiety levels (pre-CBM-I = 49.53; post-CBM-I = 47.85) and no decline at extreme social anxiety levels (pre-CBM-I = 53.35; post-CMB = 53.93). By contrast, in the ICC group, there were no changes in estimated state anxiety scores neither at high social anxiety levels (pre-CBM-I = 51.56; post-CMB = 51.18) nor at extreme social anxiety levels (pre-CBM-I = 54.37; post-CMB = 52.76).

[4] As the inclusion criteria required a Social Phobia Inventory score $\geq$ 19, there was no low social anxiety group.

Figure 4.2

Time by Group Interactions on State Anxiety at Different Trait Social Anxiety Levels

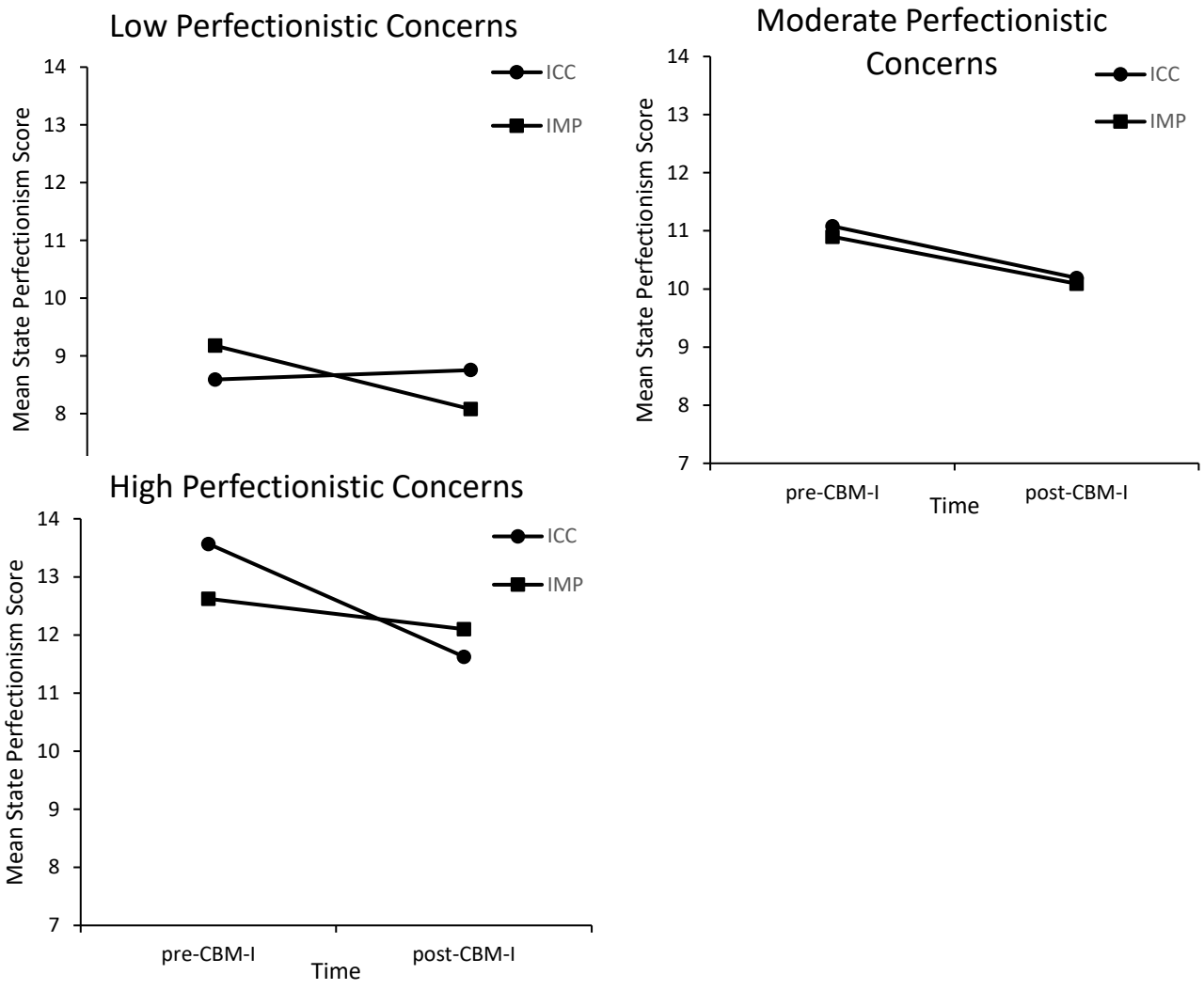


Note. ICC = Interpretation Control Condition. IMP = Interpretation Modification Program. CBM-I = Cognitive Bias Modification for Interpretation Bias.

There was a similar significant three-way interaction between group, time, and trait perfectionistic concerns on state perfectionism, $F(1, 76) = 8.49$, $p = .005$, partial $\eta^2 = .10$. Two-way interactions were again graphed using pre- and post-CBM-I parameter estimates coefficients of the intercept, trait perfectionistic concerns, group, and the product term of trait perfectionistic concerns and group on state perfectionism. Time and group interactions were graphed at three levels of trait perfectionistic concerns: low (perfectionistic concerns scores one standard deviation below the mean); moderate (perfectionistic scores within one standard deviation of the mean); and high (perfectionistic concerns scores one standard deviation above the mean). Figure 4.3 shows the interactions between time and group at each level of trait perfectionistic concerns. In the IMP group, there was a small decline in estimated state perfectionism scores at low levels of perfectionistic concerns, with the slope of state perfectionism flattening as trait perfectionistic concerns increased (low: pre-CBM-I = 9.17; post-CBM-I= 8.08; moderate: pre-CBM-I = 10.90; post-CBM-I = 10.09; high: pre-CBM-I = 12.62; post-CBM-I = 12.10). The opposite pattern was seen in the ICC group, with no changes in estimated state perfectionism scores at low levels of perfectionistic concerns but slightly steeper slopes of state perfectionism as trait perfectionistic concerns increased (low: pre-CBM-I: 8.59; post-CBM-I: 8.75; moderate: pre-CBM-I = 11.08; post-CBM-I= 10.19; high: pre-CBM-I = 13.57; post-CBM-I= 11.63).

Figure 4.3

Time by Group Interactions on State Perfectionism at Different Levels of Trait Perfectionistic Concerns



Note. ICC = Interpretation Control Condition. IMP = Interpretation Modification Program. CBM-I = Cognitive Bias Modification for Interpretation Bias.

The three-way interaction between time, group, and trait social anxiety on state perfectionism was not significant, $F(1, 76) = 0.21$, $p = .650$, partial $\eta^2 = .00$. Neither were the two-way interactions between time and group, $F(1, 76) = 0.12$, $p = .736$, partial $\eta^2 = .00$, time and trait social anxiety, $F(1, 76) = 0.42$, $p = .520$, partial $\eta^2 = .01$, or group and trait social anxiety, $F(1, 76) = 0.35$, $p = .555$, partial $\eta^2 = .01$. There were also no main effects of group, $F(1, 76) = 1.07$, $p = .304$, partial $\eta^2 = .01$, or time, $F(1, 76) = 0.19$, $p = .662$, partial $\eta^2 = .00$, but there was a significant main effect of trait social anxiety $F(1, 76) = 10.98$, $p = .001$, partial $\eta^2 = .12$. To investigate this main effect, a mean of the pre- and post-CBM-I state perfectionism scores was calculated and correlated with trait social anxiety. Pearson correlation results showed a large, positive association between mean state perfectionism and trait social anxiety, $r(80) = .56$, $p < .001$.

The three-way interaction between group, time, and trait perfectionistic concerns on state anxiety was also not significant, $F(1, 76) = 0.15$, $p = .901$, partial $\eta^2 = .00$. In addition, none of the two-way interactions between group and time, $F(1, 76) = 0.58$, $p = .450$, partial $\eta^2 = .01$, time and trait perfectionistic concerns, $F(1, 76) = 0.03$, $p = .875$, partial $\eta^2 = .00$, and group and perfectionistic concerns, $F(1, 76) = 0.08$, $p = .783$, partial $\eta^2 = .00$, were significant. Further, no significant main effects of time, $F(1, 76) = 0.88$, $p = .351$, partial $\eta^2 = .01$, or group, $F(1, 76) = 0.21$, $p = .648$, partial $\eta^2 = .00$ were found. There was, however, a main effect of trait perfectionistic concerns, $F(1, 76) = 32.93$, $p < .001$, partial $\eta^2 = .30$. A Pearson correlation analysis between the mean of the pre- and post-CBM-I state anxiety scores and trait perfectionism revealed a moderate, positive correlation, $r(80) = .34$, $p = .002$.

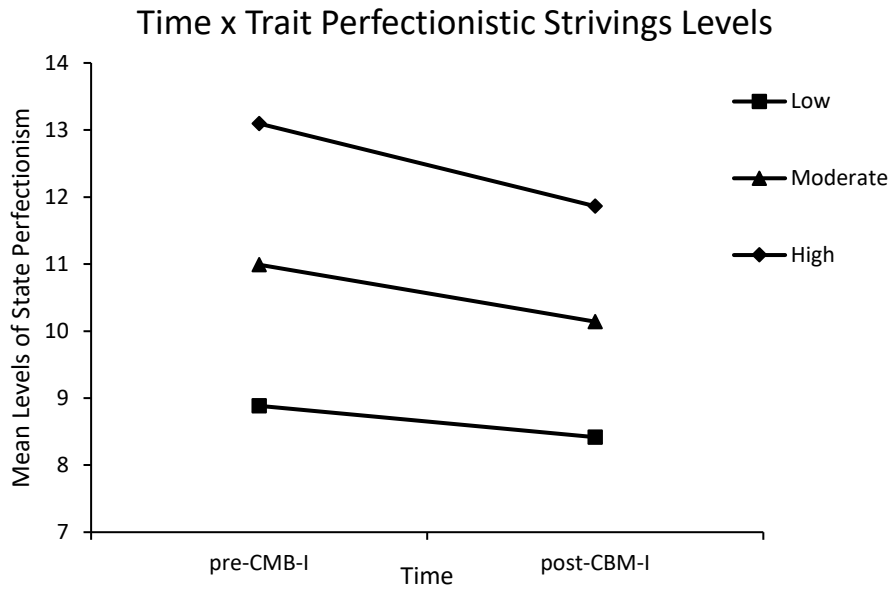
The three-way interaction between time, group, and trait perfectionistic strivings on state anxiety was not significant, $F(1, 76) = 0.17$, $p = .682$, partial $\eta^2 = .00$. Moreover, there were no significant two-way interactions between time and group, $F(1, 76) = 0.59$, $p = .447$, partial $\eta^2 = .01$, time and trait perfectionistic strivings, $F(1, 76) = 0.06$, $p = .804$, partial $\eta^2 = .00$, or group and trait perfectionistic strivings, $F(1, 76) = 0.04$, $p = .850$, partial $\eta^2 = .00$. The main effects of time, $F(1, 76) = 0.89$, $p = .349$,

partial $\eta^2 = .01$, and group, $F(1, 76) = 0.40$, $p = .528$, partial $\eta^2 = .01$, were also not significant. There was, however, a significant main effect of perfectionistic strivings, $F(1, 76) = 43.39$, $p < .001$, partial $\eta^2 = .36$. A Pearson correlation analysis showed a large, positive relationship between the mean of the pre- and post-CBM-I state anxiety scores and trait perfectionistic strivings, $r(80) = .61$, $p < .001$.

The three-way interaction between time, group, and trait perfectionistic strivings on state perfectionism was also not significant, $F(1, 76) = 1.89$, $p = .174$, partial $\eta^2 = .02$. There were also no significant two-way interactions between time and group, $F(1, 76) = 0.05$, $p = .831$, partial $\eta^2 = .00$, or trait perfectionistic strivings and group, $F(1, 76) = 0.31$, $p = .583$, partial $\eta^2 = .00$, and no main effect of group, $F(1, 76) = 0.11$, $p = .740$, partial $\eta^2 = .00$. There were significant main effects of time, $F(1, 76) = 14.41$, $p < .001$, and trait perfectionistic strivings, $F(1, 76) = 15.72$, $p < .001$, partial $\eta^2 = .17$, but these were qualified by a significant two-way interaction between time and trait perfectionistic strivings, $F(1, 76) = 6.48$, $p = .013$, partial $\eta^2 = .08$. Pre- and post-CBM-I parameter estimates coefficients of the intercept and trait perfectionistic strivings on state perfectionism were used to graph the two-way interaction. Changes in state perfectionism were graphed at the low, moderate, and high levels of trait perfectionistic strivings. As can be seen in Figure 4.4, the slope of state perfectionism became slightly steeper as levels of trait perfectionistic strivings increased. At low levels of perfectionistic strivings, there was no change in estimated state perfectionism scores from pre- (8.89) to post-CBM-I (8.42), whereas at moderate and high levels there were increasing declines (moderate: pre-CBM-I =10.99; post-CBM-I = 10.14; high: pre-CBM-I = 13.10; post-CBM-I = 11.86).

Figure 4.4

Interaction Between Time and Trait Perfectionistic Strivings Levels on State Perfectionism



Note. ICC = Interpretation Control Condition. IMP = Interpretation Modification Program. CBM-I = Cognitive Bias Modification for Interpretation Bias.

Discussion

The current study was the first to test the effects of interpretation bias modification in the context of both social anxiety and perfectionism. Given the effectiveness of various protocols for modifying interpretation bias for social anxiety (Amir & Taylor, 2012; Beard & Amir, 2008; Brosan et al., 2011) and perfectionism (Dodd et al., 2019) individually, we predicted a reduction in negative interpretation bias following the IMP, and in turn, a reduction in state anxiety and state perfectionism. In addition, it was expected that trait variables (i.e., trait social anxiety, trait perfectionistic concerns, and trait perfectionistic strivings) would moderate the relationships between time and group.

Modification of Interpretation Bias in the Interpretation Modification Program and Interpretation Control Condition Groups

In contrast to predictions and previous studies (e.g., Amir & Taylor, 2012; Beard & Amir, 2008), there was no significant interaction between group and time on the WSAP variables. There were also no main effects of group; however, there were significant main effects of time for the percentage of threat endorsements and threat endorsement latency. Both groups showed a reduction in the percentage of threat endorsements. These changes demonstrate that post-CBM-I, participants associated ambiguous scenarios with threat words less often and were slower to make such associations, thus demonstrating a reduction in negative interpretation bias in both groups.

Although the ICC is designed not to alter interpretation bias in any direction, it has been shown to modify interpretation bias in some previous research (e.g., Amir & Taylor, 2012; Beard & Amir, 2008), as also found in the current study. A recent meta-analysis showed that control conditions such as the ICC, which mimic the treatment group without consistently reinforcing a specific interpretation, generally lead to small improvements in interpretation bias (Fodor et al., 2020). This is thought to be caused by the 50% of trials in the ICC which reinforce the rejection of threat words, and the endorsement of benign words (Amir & Taylor, 2012; Edwards et al., 2018). Additionally, Amir and Taylor (2012) have suggested that in undertaking the ICC, participants may become mindful of their interpretation bias and make attempts to change it. This suggestion was reinforced by participant feedback post-study (Amir & Taylor, 2012). Furthermore, it is possible that the observed change in negative interpretation bias in the ICC group was due to demand effects. Although the WSAP is generally perceived to be less prone to biased responses than are self-report measures of negative interpretation bias (Gonsalves et al., 2019), some authors have argued that CBM-I protocols are not immune to such effects (Cristea et al., 2015; Edwards et al., 2018). Although participants were not informed of the purpose of the task, it is possible that some may have guessed the aims of the study. Nevertheless, the

latency measures should be a robust indication of the true effect of CBM-I, as participants were unlikely to have known that their response times were recorded.

Nevertheless, it is unclear why the changes in negative interpretation bias in the ICC group were similar in magnitude to those seen in the IMP. In previous studies, the IMP has generally yielded much larger improvements in interpretation bias than the ICC (Amir & Taylor, 2012; Beard & Amir, 2008; Gonsalves et al., 2019). For example, in a 110-trial single-session protocol, Amir et al. (2010) found a large reduction in threat endorsement following the IMP (d = 0.91), whereas the ICC showed no significant reductions. In contrast, the current study found no significant group effects, and effect sizes were medium (d = 0.47) and small (d = 0.27) for the reduction of percentages of threat endorsements from pre- to post-task for the IMP and the ICC, respectively. Furthermore, numerous CMB-I protocols have shown superior effects of the treatment condition, compared to controls equivalent to the ICC (Blackwell, 2020; Fodor et al., 2020). One explanation is that the use of a single CBM-I session, 78-trial protocol may not have been sufficient to produce a substantially greater change in negative interpretation bias in the IMP group than in the ICC group.

Another possibility is that the online administration of the CBM-I protocol may have affected participants' responses. Previous research has shown that CBM-I protocols are often more effective when conducted in a laboratory environment than at home (Jones & Sharp, 2017). It has been suggested that laboratory studies promote uninterrupted attention to tasks compared to at-home studies, which may result in a lack of concentration (Brosan et al., 2011). Moreover, participants are more likely to adhere to task instructions when in a laboratory environment (Brosan et al., 2011). Although online CBM-I programs have been used successfully in the past (e.g., Hirsch et al., 2020; Salemink et al., 2009), the majority of these studies used multi-session protocols. In addition to Amir et al.'s (2010) single session protocol, other single-session studies have also been successful, although only in a group that received 160 IMP trials; not in a group that received only 80 trials (Yang et al., 2017). It is possible that

any effects of inattention were buffered by repeated training sessions and/or a larger number of trials in previous online studies. In the current study, the combination of a single session protocol with only 76 social scenario-related IMP trials in a non-laboratory environment may have contributed to the non-significant difference between groups. Indeed, of the 8.7% of trials that were excluded, 6.7% were removed due to response latencies greater than 2000 milliseconds. The percentage of excluded trials was high compared to other studies (e.g., 3% in Beard & Amir, 2009). This might suggest that participants were taking longer to respond due to a lack of attention to the task.

Furthermore, the administration of the WSAP may also have affected the results. The sets of the WSAP were split in half in order to measure negative interpretation bias at pre- and post-CBM-I. This was in contrast with previous studies in the area, which have employed varying strategies to assess negative interpretation bias at pre- and post-CBM-I; for example, Amir et al. (2010) implemented the IMP/ICC as their CBM-I protocol but chose to use the Posner task to measure negative interpretation bias. Others have used the full set of the WSAP to measure negative interpretation bias before and after several sessions of CBM-I (Amir & Taylor, 2012). The design chosen in the current study aimed to reduce time spent on the task, to avoid participant burden. It is possible that assessing levels of negative interpretation bias using half of the trials at each measurement point may have affected the reliability of this measure and led to a lack of correlation between baseline social anxiety levels and WSAP scores. Future research may choose to employ a different strategy for measuring negative interpretation bias pre-and post-CBM-I, but further studies on the minimum number of trials required for reliable assessment of negative interpretation bias using the WSAP are warranted.

Taken together, these issues highlight the need for further research to determine the number of sessions and trials required in WSAP and CBM-I research, including for online formats. Ascertaining such numbers would also prevent the inclusion of too many sessions and trials, and thus avoid participant burden and attrition. Moreover, as online methods are increasingly popular due to their time and cost-

effectiveness, as well as their flexibility and convenience for participants (Arechar et al., 2018), conducting online research may be a pragmatic choice in future studies. Online protocols should therefore be improved to enhance attention and focus in non-laboratory environments, to better engage participants and increase the effectiveness of the intervention.

Effects of Cognitive Bias Modification for Interpretation Bias on State Anxiety (i.e., Two-Way Interaction) and Trait Social Anxiety as a Moderator (i.e., Three-Way Interaction)

We predicted a two-way interaction between time and group on state anxiety, such that participants in the IMP condition would show lower levels of state anxiety after CBM-I than before, and that at post-CBM-I, state anxiety levels would be lower in the IMP group than the ICC group. As noted above, this prediction was not borne out by the results. However, the hypothesised three-way interaction of group, time, and trait social anxiety on state anxiety when examining trait social anxiety as a moderator was significant. At moderate levels of social anxiety, the IMP group showed a decline in state anxiety from pre- to post-CBM-I, but this effect was dampened at higher levels of trait social anxiety. By contrast, in the ICC group, there were no changes in state anxiety from pre- to post-CBM-I across all trait social anxiety levels.

Although the results of this three-way interaction appear to be in line with predictions, the mechanism of action of the IMP was seemingly different than expected. Specifically, it was expected that state anxiety would decrease as a result of the modification of interpretation bias. However, only individuals in the IMP group with moderate levels of social anxiety showed a decrease in state anxiety, despite both the IMP and ICC groups showing reductions in negative interpretation bias. These results indicate that the IMP did not affect state anxiety through a change in negative interpretation bias. Instead, it seems that the IMP had a direct impact on state anxiety at moderate levels of social anxiety. A similar suggestion has been put forward by other researchers. For example, Salemink et al. (2010)

employed a different CBM-I protocol which showed direct effects on state anxiety. Participants were allocated to either a positive interpretation bias induction group, which exposed participants to benign words only, or a negative interpretation bias induction group, which exposed participants to threat words only. Results showed a direct relationship between CBM-I and a small change in state anxiety that was not mediated by a change in interpretation bias. The authors proposed that exposure to benign words (in the positive interpretation bias condition) directly decreased state anxiety, and exposure to threat words (in the negative interpretation bias condition) directly increased state anxiety.

This mechanism as proposed by Salemink et al. (2010) is unlikely to have played a role in the current study, as both groups were shown benign and threat words equally. The consistent (i.e., reinforcement of benign endorsement and threat rejection in all trials) versus inconsistent (i.e., reinforcement of benign endorsement and threat rejection on 50% of trials) feedback provided to participants was the only difference between the IMP and ICC. Hence, it is possible that receiving consistent feedback about performance on the task during the IMP was responsible for the change in state anxiety. However, evidence for this position is currently lacking and should be addressed in future studies looking at mechanisms of action of CBM-I protocols. Moreover, the direct effect of the IMP on state anxiety was only present at the moderate levels of social anxiety. Perhaps individuals with higher levels of trait social anxiety require a more intensive intervention to show improvements in state anxiety. Future research is required to ascertain the number of CBM-I sessions required for individuals with varying levels of social anxiety.

Effects of Cognitive Bias Modification for Interpretation Bias on State Perfectionism (i.e., Two-Way Interaction) and Trait Perfectionistic Concerns as a Moderator (i.e., Three-Way Interaction)

The hypothesis that state perfectionism would decline post-CBM-I in the IMP group, but not the ICC group, was also not supported as neither group showed changes in state perfectionism over time.

The hypothesised three-way interaction between group, time, and trait perfectionistic concerns showed a significant effect on state perfectionism. At low levels of perfectionistic concerns, there was a small decline in state perfectionism from pre- to post-CBM-I in the IMP group, but not at the moderate and high levels. There was no such change in state perfectionism at low levels of perfectionistic concerns in the ICC group. These results again suggest that the IMP may have a direct effect on state variables, but only at the lower levels, not at the higher levels of trait perfectionistic concerns.

Contrary to our expectation, at high levels of perfectionistic concerns, there was a small decline in state perfectionism in the ICC group, which was not seen in the IMP group. These results again cannot be attributed to a change in negative interpretation bias. In previous studies, ICC-type conditions have been shown to improve psychopathology symptoms; however, such improvements were due to the modification of interpretation bias (MacDonald et al., 2020; Salemink et al., 2014), which does not appear to be the case in the current study. It is unlikely that the ICC would provide an advantage over the IMP in directly modifying state perfectionism at high levels of perfectionistic concerns. It is more likely that these results were due to issues such as demand effects or regression to the mean. Nonetheless, it is puzzling that these issues would only occur at high levels of perfectionistic concerns and specifically in the ICC group. Further research on the effect of CBM-I at various levels of trait perfectionistic concerns is needed to clarify these findings.

Effects of Time, Group, and Trait Perfectionistic Strivings on State Perfectionism

Although the interaction between time, group, and trait perfectionistic strivings on state perfectionism was not significant, there was a significant two-way interaction between trait perfectionistic strivings and time. This interaction showed that although state perfectionism did not differ over time at low levels of perfectionistic strivings, there was a decline in state perfectionism that was steeper with higher levels of trait perfectionistic strivings. This decline, although small, may indicate

that individuals with higher levels of perfectionistic strivings may be more responsive to CBM-I. This argument is in line with previous research that has suggested that individuals high in perfectionistic strivings have a greater ability to employ coping resources to avoid maladaptive outcomes (Gnilka et al., 2017). Specifically, Gnilka et al. (2017) showed that perfectionistic strivings were directly and positively related to a measure of the ability to restructure cognitions to avoid stress. Likewise, in the present study, high levels of perfectionistic strivings appeared to give participants an advantage in reducing state perfectionism as a result of the interpretation bias modification. Participants with lower levels of perfectionistic strivings may have an inferior ability to use coping resources to lower state perfectionism.

Main Effects of Trait Variables on State Variables

The other hypothesised three-way interactions (i.e., group, time, and trait social anxiety on state perfectionism; group, time, and trait perfectionistic concerns on state anxiety; and group, time, and trait perfectionistic strivings on state anxiety) were not significant but showed a significant main effect of trait variables on state variables. Not surprisingly, the results confirmed that individuals with higher levels of social anxiety scored higher on state perfectionism regarding the speech. Similarly, individuals with higher levels of perfectionistic concerns and perfectionistic strivings scored higher on state anxiety.

Limitations and Future Directions

In addition to the aforementioned limitations regarding the number of CBM-I trials or sessions, and a possible lack of attention on the part of the participants when they engaged in the CBM-I paradigm, several other limitations need to be acknowledged. First, in the absence of a validated questionnaire of state perfectionism scale, I modified two measures as also used by S. P. Mackinnon et al. (2014). More generally, modifications of trait scales used to assess state perfectionism have been successful (e.g., Boone et al., 2012; Brown & Kocovski, 2014; Reis & Prestele, 2020; Saboonchi & Lundh,

1999). However, in the current study, the internal consistency of the state perfectionism measure was poor at Time 1 (α = .60) and only acceptable at Time 2 (α = .78), indicating that the items may not have consistently measured state perfectionism. The development and validation of a state perfectionism scale should be the focus of future perfectionism research.

Second, the impromptu speech task did not increase state anxiety, although most participants believed that they would be delivering a speech. The speech was included as an evaluative threat designed to increase state anxiety uniformly across the sample. Other studies have reported an increase in state anxiety after informing participants that they had to prepare a speech (e.g., Chen et al., 2019). However, in the current study, mean state anxiety was already markedly higher at baseline (*M* = 50.89) compared to previous studies (e.g., *M* = 44.92 in a socially anxious group; Beard & Amir, 2009), and over the established clinically significant cut-off scores of 39-40 (Julian, 2011). As such, it appears that participants were already highly anxious prior to being told about the speech and a ceiling effect may have occurred.

Alternatively, the imminent speech may have been less anxiety-provoking due to the online nature of the study and lack of a live audience. Protocols that included an audience (or even the physical presence of the researcher) have successfully induced anxiety, whether the speech task was real (e.g., Chen et al., 2018; Makkar & Grisham, 2011b) or not (e.g., Chen et al., 2019; Helbig-Lang et al., 2015). Perhaps the threat associated with the speech is diminished in the absence of an audience, regardless of whether participants are told they will receive feedback. Future online research could opt to include a virtual reality audience to induce anxiety by way of a speech task (Owens & Beidel, 2015).

Third, the CBM-I protocol focused only on social anxiety, not perfectionism. The scenarios focused specifically on content pertaining to social anxiety (e.g., 'People laugh at something you said'; Beard & Amir, 2008), not perfectionism (e.g., as in Dodd et al., 2019, '… you make it to the final round

and then receive third place', p. 169). Although negative interpretation bias as commonly measured in social anxiety research (i.e., interpretation of ambiguous social scenarios) was shown to be related to perfectionistic concerns in Studies 1 and 2, perhaps the modification of interpretation bias in perfectionists needs to target perfectionism specifically. To establish the effectiveness of CBM-I for perfectionism, future studies should conduct a comparison of CBM-I for social anxiety and CBM-I for perfectionism to ascertain the best transdiagnostic intervention for social anxiety and perfectionism.

Finally, the current study recruited participants with a Social Phobia Inventory score in the clinical range, but there were no inclusion criteria for perfectionism. To the best of my knowledge, benchmarks for high or clinical levels of perfectionism using the Frost Multidimensional Perfectionism Scale or the Multidimensional Perfectionism scale have not been established. As explored in Chapter 1, previous research has varied greatly in the choice subscales and items of subscales used to formulate a perfectionistic concerns and perfectionistic strivings composite. As such, deriving a benchmark of high perfectionistic concerns and perfectionistic strivings from previous research would be inappropriate, as perfectionism composites are likely not comparable. Nonetheless, it is possible that results may have been different if only highly perfectionistic participants were included in the sample. For example, the speech task may have had a more threatening effect if the overall sample was highly perfectionistic. Future research may choose to employ a perfectionism measure that is uniformly utilised across the literature, for which clinical benchmarks have been reported (such as the Clinical Perfectionism Questionnaire; Dickie et al., 2012; Riley et al., 2007).

Clinical and Theoretical Implications

The findings have some important clinical and theoretical implications. First, the changes in negative interpretation bias observed in both the IMP and the ICC groups did not result in corresponding reductions in state anxiety. Previous CBM-I studies that were successful in changing psychopathology

symptoms as a result of interpretation bias modification generally yielded modest effects (Blackwell, 2020) and were more effective in analogous than in clinical samples (Amir & Taylor, 2012). This suggests that CBM-I may be more effective for those with mild presentations. As such, the high levels of state anxiety experienced by some individuals in the current sample were potentially beyond the scope of effectiveness of the interpretation bias modification. Along with past findings, the present results show that CBM-I, and in particular a single session CBM-I, may be best suited for individuals with mild presentations of social anxiety.

Second, the findings add to the limited literature on the modification of interpretation bias and perfectionism. Specifically, they indicate that individuals high in perfectionistic strivings may benefit from CBM-I, even if the CBM-I is a brief intervention. These results were observed despite a lack of significant relationships between perfectionistic strivings and negative interpretation bias in Studies 1 and 2. There is currently no consensus on the adaptive or maladaptive nature of perfectionistic strivings, as this dimension of perfectionism has continued to show contrasting effects on both positive and negative outcomes since its conceptualisation (Stoeber et al., 2020). Accordingly, the findings of the present study reflect the complex nature of perfectionistic strivings: despite its positive and moderate to strong correlations with psychopathology (i.e., trait social anxiety, trait perfectionistic concerns), perfectionistic strivings appear to simultaneously have a positive impact on CBM-I outcomes. The contrasting results of perfectionistic concerns and perfectionistic strivings as moderators of CBM-I effects reflect the two-factor model and theory of the multidimensional nature of perfectionism and reiterate the need to include both dimensions in perfectionism research (Stoeber, 2017b; Stoeber et al., 2020). Nonetheless, given the issues with the measurement of state perfectionism, it should be stated that these results are tentative, and require replication.

Third, the findings have implications for the role of negative interpretation bias in social anxiety and perfectionism. Specifically, negative interpretation bias has long been emphasised in social anxiety

literature as a maintenance factor of the disorder (Clark, 2001; Heimberg et al., 2014; Hofman, 2007). Perfectionism cognition theory (Flett et al., 2017) and the cognitive behavioural model of perfectionism (Shafran et al., 2018) do not explicitly assign a role for negative interpretation bias in perfectionism; however, these models indicate that perfectionists have a heightened vulnerability to evaluative threats from others (Flett et al., 2017) and show hypervigilant monitoring of performance (Shafran et al., 2002). Despite these theoretical suggestions, and research demonstrating that negative interpretation bias is a transdiagnostic process that exists across different disorders (Beard et al., 2019; Hirsch et al., 2016), no previous studies have attempted to modify interpretation bias in social anxiety and perfectionism simultaneously. This study is the first to test whether CBM-I may serve as a time and cost-effective transdiagnostic intervention for negative interpretation bias in both social anxiety and perfectionism. Although the modification of negative interpretation bias did not impact on state anxiety in the current study, a consistent body of previous research has shown that CBM-I protocols are useful for individuals with social anxiety (Beard & Amir, 2008; Amir & Taylor, 2012; Brosan et al., 2011; Yang et al., 2017), even if only for those with mild presentations. These previous findings, along with those from the current study suggesting that CBM-I may be beneficial for those high in perfectionistic strivings, show preliminary evidence of CBM-I as a transdiagnostic intervention. Further research is required to ascertain the clinical utility of CBM-I as a transdiagnostic intervention in social anxiety and perfectionism.

Conclusion

The present study aimed to provide preliminary evidence of the effectiveness of modifying interpretation bias using CBM-I on state anxiety and state perfectionism, in a sample of individuals with elevated social anxiety. Overall, the IMP and ICC groups showed a reduction in negative interpretation bias, but no corresponding reduction in state anxiety across trait social anxiety levels, or state perfectionism across trait perfectionistic concerns levels. However, further research could usefully

ascertain whether the IMP may have direct effects on these state variables at differing levels of trait social anxiety or trait perfectionistic concerns. Notably, state perfectionism appeared to diminish as a result of negative interpretation bias change at high levels of perfectionistic strivings, suggesting that CBM-I may be a promising intervention for individuals high in this perfectionism dimension. However, this conclusion is tentative and requires replication, given the issues with the state perfectionism measure. Despite some limitations, the current study contributes important information to guide the methodology of future studies to further investigate the clinical utility of CBM-I for social anxiety and perfectionism.

Chapter 5: General Discussion

The current thesis investigated the relationships among social anxiety, perfectionism dimensions, and cognitive biases. This final chapter summarises and integrates the results of the three studies and discusses the overall clinical and theoretical implications of the findings. Limitations and considerations for future research are also reviewed.

Summary of Research and Integration of Main Findings

Chapter 1 introduced prominent models of social anxiety disorder (Clark, 2001; Heimberg et al., 2014; Hofmann, 2007) as the main theoretical frameworks of the current thesis, and identified two main features of social anxiety across these models: 1) the discrepancy between one's own or perceived high social standards from others and one's perceived inability to attain such standards (also a feature of perfectionism; Limburg et al., 2016; Slaney et al., 2001; Stoeber, 2017a); and 2) cognitive biases that maintain social anxiety disorder (i.e., negative interpretation bias, negative self-imagery, and post-event processing). Perfectionism was defined in terms of the two-factor model, with the dimensions of perfectionistic concerns and perfectionistic strivings considered in all chapters. The current thesis also adopted elements from theories in the area of perfectionism (i.e., perfectionism cognition theory by Flett et al., 2017, and the cognitive behavioural model of perfectionism by Shafran et al., 2002) to contextualise how cognitive biases relate to perfectionism. Furthermore, the extended conceptual model of perfectionism and social anxiety (Flett & Hewitt, 2014) provided the basis for the role of cognitive biases as mediators of the relationships between social anxiety and perfectionism dimensions.

In Chapter 2, a review of the relevant literature showed that despite robust cross-sectional evidence for the association between social anxiety and perfectionistic concerns, longitudinal research (i.e., Damian et al., 2017; Gautreau et al., 2015; Levinson & Rodebaugh, 2016) testing the directionality of this relationship was limited, and findings were contradictory. Moreover, despite a large body of

literature showing that cognitive biases are related to social anxiety (e.g., Brozovich & Heimberg, 2008; Chen et al., 2020; Ng et al., 2014), fewer studies have examined the relationships between perfectionism dimensions and cognitive biases (e.g., Flett et al., 2016; Lee et al., 2011; Yiend et al., 2011). A small body of research investigated post-event processing as a mediator of the relationship between perfectionistic concerns and social anxiety (e.g., Abdollahi, 2019), but the mediator roles of negative interpretation bias and negative self-imagery had not been examined. Based on the theories presented in Chapter 1, and the research reviewed in Chapter 2, Study 1 (Chapter 2) and Study 2 (Chapter 3) investigated the direct longitudinal relationships between social anxiety and perfectionism dimensions, and cognitive biases were examined as mediators of these relationships.

Study 1 investigated social anxiety, perfectionism dimensions, and cognitive biases at three time points over the course of six months, in a heterogeneous community sample. In contrast with previous longitudinal research (Damian et al., 2017; Gautreau et al., 2015; Levinson & Rodebaugh, 2016), no direct relationships were observed between social anxiety and perfectionistic concerns in either direction. There were also no significant direct relationships between social anxiety and perfectionistic strivings, consistent with longitudinal previous studies (Damian et al., 2017; Levinson & Rodebaugh, 2016). However, both social anxiety and perfectionistic concerns directly contributed to negative interpretation bias. Furthermore, negative interpretation bias served as a mediator of the relationship between perfectionistic concerns and social anxiety, such that perfectionistic concerns contributed to social anxiety through an effect on negative interpretation bias. In addition, negative interpretation bias also mediated social anxiety over time, thus indicating that negative interpretation bias is a maintenance factor of social anxiety. In contrast, negative self-imagery and post-event processing had no mediator roles in any relationships.

Study 2 addressed the same variables, but over a period of two weeks, and in a sample of undergraduates. Furthermore, relationships among social anxiety, perfectionism dimensions, and

cognitive biases were tested in the context of a five-minute social interaction task, in which participants were asked to introduce themselves to another participant. Results showed that social anxiety directly contributed to perfectionistic concerns; this finding was in accordance with Gautreau et al.'s (2015) research but in contrast with Study 1. This difference was suggested to be due to multiple possible factors: differences in average sample age (younger sample in Study 2 than in Study 1); the use of an actual social interaction task in Study 2; and the shorter overall time frame of Study 2, which aimed to address the potential shortcomings caused by the long-term investigation in Study 1. In addition, social anxiety and perfectionistic strivings were not significantly related, as in Study 1 and previous longitudinal studies (Damian et al., 2017; Levinson & Rodebaugh, 2016). Social anxiety and perfectionistic concerns again directly contributed to negative interpretation bias, and negative interpretation bias directly contributed to social anxiety. Negative interpretation bias was again a mediator of the pathway from perfectionistic concerns to social anxiety, and a maintenance factor of social anxiety. In contrast with Study 1, negative interpretation bias also mediated the pathway from social anxiety to perfectionistic concerns. In addition to negative interpretation bias, negative self-imagery also emerged as a maintenance factor of social anxiety. As in Study 1, negative self-imagery and post-event processing did not mediate any relationships between social anxiety and perfectionism dimensions.

Overall, the results of Studies 1 and 2 consistently showed that negative interpretation bias was implicated in the relationship between perfectionistic concerns and social anxiety, across long-term and short-term time frames, and in the context of both general social situations (as measured by the Interpretation and Judgement Questionnaire in Study 1) and a specific social interaction task. Previous research has outlined the transdiagnostic role of negative interpretation bias across several disorders (Beard et al., 2019; Hirsch et al., 2016). Studies 1 and 2 provided evidence supporting this proposition

and indicated that negative interpretation bias has a transdiagnostic role in social anxiety and perfectionistic concerns.

Based on these results, Study 3 sought to conduct a preliminary test of Cognitive Bias Modification for Interpretation Bias (CBM-I) as a transdiagnostic intervention for both social anxiety and perfectionism, in individuals with high levels of social anxiety. Although previous studies had tested modifications in interpretation bias in social anxiety (e.g., Beard & Amir, 2008) and perfectionism (Dodd et al., 2019) separately, no previous study had attempted to use a CBM-I protocol to target both. Overall, the intervention (IMP) and control (ICC) groups showed a similar reduction in negative interpretation bias, but no corresponding reduction in state anxiety across trait social anxiety levels, or state perfectionism across trait perfectionistic concerns levels. These results are in contrast to previous research showing that psychopathology symptoms can be diminished as a result of interpretation bias modification (e.g., Amir & Taylor, 2012). Despite the lack of a relationship between negative interpretation bias and perfectionistic strivings in Studies 1 and 2, state perfectionism appeared to diminish as a result of negative interpretation bias change at high levels of perfectionistic strivings. Nonetheless, the state perfectionism measure presented internal consistency issues and these results require replication.

Overall, the current thesis contributes to the understanding of 1) the longitudinal relationships among social anxiety, perfectionism dimensions, and cognitive biases, and 2) the transdiagnostic biased information processing that underlies social anxiety and perfectionistic concerns. A direct relationship between social anxiety and perfectionistic concerns was only observed in Study 2 (in a model not containing cognitive biases), and the overall pattern of results from Studies 1 and 2 indicates that the direction of this relationship is best understood when examined in conjunction with negative interpretation bias. Although interpretation bias modification in Study 3 did not have a significant effect on state anxiety and state perfectionism across levels of social anxiety and perfectionistic concerns, the

overall findings of the current thesis do have clinical implications. The findings also have implications for the theoretical frameworks described in Chapter 1. Furthermore, the results of the current thesis raise new questions and present directions for future research.

Clinical Implications

The main clinical implication of the current thesis is the indication that negative interpretation bias is a transdiagnostic factor of social anxiety and perfectionistic concerns, which suggests that this cognitive bias may be a target for treatment. As reviewed in Chapter 1, social anxiety is a significantly impairing condition that appears early in life (Aderka et al., 2012; Crome et al., 2015; D. J. Stein et al., 2017), and it is frequently unremitting (Mayo-Wilson et al., 2014; J. Wong et al., 2014). Due to its early onset, social anxiety may be a precursor to other mental health problems (D. J. Stein et al., 2017). Research further suggests that social anxiety is even more detrimental when combined with high levels of perfectionism, such that a combination of high social anxiety and high perfectionism may contribute to other psychopathologies, such as symptoms of bulimia (Silgado et al., 2010). Moreover, perfectionism has been shown to interfere with treatments for social anxiety, as individuals high in perfectionism may engage in procrastinating and avoidance behaviours as a result of not seeing immediate impacts of therapy (Hawley et al., 2016). Hence, finding effective treatments that target both conditions is important. Previous research on treatments targeting social anxiety has generally focused on treatments for social anxiety and its subsequent effects on perfectionism (e.g., Abdollahi et al., 2019; Ashbaugh et al., 2007) or treatments for perfectionism with subsequent effects on social anxiety (e.g., Handley et al., 2015). The findings of Studies 1 and 2 suggest that targeting negative interpretation bias across social anxiety and perfectionism may provide another treatment avenue for both conditions.

Although the modification of negative interpretation bias had no impact on state anxiety and state perfectionism across trait social anxiety and trait perfectionistic concerns levels in Study 3, it is

possible that a slightly modified protocol may be effective. As outlined in Study 3, CBM-I may prove to be effective in diminishing social anxiety and perfectionistic concerns with more intensive (i.e., more sessions and/or number of trials), or in-person (rather than online) protocols. The short duration and low intensity of the CBM-I used in Study 3 was a limitation of the current thesis, as it was likely not sufficient to produce the expected effect of modifying negative interpretation bias on both social anxiety and perfectionistic concerns, given that both are chronic or long-lasting features. Based on the results of Study 3, CBM-I may be useful for individuals high in perfectionistic strivings. As such, it is possible that an improved CBM-I protocol may be effective not only for perfectionistic strivings but potentially also provide a useful intervention for social anxiety and perfectionistic concerns.

Another possibility is that targeting negative interpretation bias may be useful as part of a more extensive treatment protocol. CBM-I interventions have been shown to yield smaller effects in clinical samples than in analogue samples, and as such, it has been suggested that CBM-I is best suited for those with mild social anxiety (Amir & Taylor, 2012; Beard & Amir, 2008). Hence, individuals with more severe presentations may benefit from an enhanced CBM-I combined with a cognitive behavioural therapy (CBT) protocol, rather than a single therapeutic component such as CBM-I. CBT protocols for social anxiety (e.g., Hofmann et al., 2013; Hofmann & Otto, 2017; Ledley et al., 2006) often dedicate several sessions to the identification and restructuring of cognitive distortions, which frequently involves addressing the negatively biased interpretations of ambiguous social events. Given the aforementioned complications of a combination of high levels of social anxiety and perfectionism (Silgado et al., 2010), and the interference that perfectionism can have in therapy (Hawley et al., 2016), placing a greater focus on addressing negative interpretation bias as a way of tackling both conditions within CBT protocols may be beneficial. Future research should compare the effectiveness of existing CBT protocols with CBT that have a greater focus on negative interpretation bias for individuals with social anxiety and perfectionism.

Moreover, CBT for perfectionism protocols do not explicitly address negative interpretation bias (e.g., Kothari et al., 2016; Shafran et al., 2018). Considering the findings of the current thesis showing relationships between perfectionistic concerns and negative interpretation bias, and the results of previous research showing that perfectionistic interpretation bias is a feature of perfectionism (Dodd et al., 2019; Howell et al., 2019; Yiend et al., 2011), a body of evidence suggesting that biased interpretation is present in perfectionism is emerging. These suggestions should be considered in future revisions of treatment manuals, as targeting biased interpretations may help to diminish the hypervigilant monitoring of performance and the tendency to catastrophise the consequences of evaluation, which are suggested to be problems for perfectionists (Flett et al., 2017; Shafran et al., 2002; Shafran et al., 2018).

Moreover, negative self-imagery appeared to be a maintenance factor of social anxiety in Study 2. The findings of the current thesis imply that negative self-imagery is indeed a cognitive bias to be targeted in social anxiety treatment. Negative self-images can be targeted in imagery rescripting, a technique in which an individual reassigns meaning to a negative memory through imagining this memory from an observer's perspective and/or mentally modifying the memory to a more benign situation (Morina et al., 2017; Reimer & Moscovitch, 2015). This intervention can target negative self-images in social situations (e.g., Nilsson et al., 2012). Imagery rescripting has been used both as a stand-alone treatment (e.g., Reimer & Moscovitch, 2015) and as part of CBT (Holmes et al., 2007). Imagery rescripting has been shown to yield large positive effects on social anxiety in a meta-analysis (Morina et al., 2017). The results of Study 2 strengthen the rationale for targeting negative self-imagery in social anxiety. However, together with the results of Study 1, which showed no maintenance role for negative self-imagery outside of a concrete, recent social situation, the results of the current thesis suggest that this cognitive bias only has a significant effect in the context of a specific social situation. Hence,

modifying this bias in individuals with social anxiety may be most beneficial in the setting of a specific recent social situation.

Theoretical Implications

Chapter 1 introduced the discrepancy between one's own or perceived high social standards from others, and one's perceived ability to attain such standards as a feature of cognitive models of social anxiety disorder (Clark, 2001; Heimberg et al., 2014; Hofmann, 2007). This discrepancy was identified as a core feature of perfectionism. Specifically, a perceived inability to attain standards imposed on oneself by others was identified as corresponding to the perfectionism dimension of perfectionistic concerns, and the self-imposed high standards for performance as akin to perfectionistic strivings. Cognitive models of social anxiety hold that one's beliefs regarding social performances become activated in the context of a social situation. Study 1 did not support the proposed relationship between social anxiety and perfectionistic concerns, but Study 2 showed that in the context of a social interaction task, social anxiety contributed to perfectionistic concerns. Hence, as outlined in cognitive models of social anxiety, it is possible that the discrepancy between perceived high social standards from others, and one's perceived inability to attain such standards (i.e., perfectionistic concerns) becomes significantly activated in an actual concrete social situation. However, the association between social anxiety and perfectionistic concerns observed in Study 2 disappeared when analysed in conjunction with cognitive biases, which suggests that cognitive biases may have a more important contributing role to perfectionistic concerns as compared to social anxiety. Hence, further research is needed to confirm the propositions of the cognitive models of social anxiety. Moreover, future research should directly compare the relationship between social anxiety and perfectionistic concerns in the context of a concrete social situation (as in Study 2) versus no social situation, to verify the suggestion that perfectionism is activated only in the context of a concrete social situation.

Furthermore, perfectionistic strivings showed no direct longitudinal relationships with social anxiety, and correlations between these variables varied from moderate to nonsignificant across the three studies. Overall, the results indicate that perfectionistic strivings may not contribute to social anxiety, in contrast with Clark's (2001) cognitive model of social anxiety disorder. Despite the disappearance of the association between social anxiety and perfectionistic concerns when considering cognitive biases, as observed in Study 2, the findings suggest that there are different effects of perfectionistic concerns and perfectionistic strivings in the context of social anxiety. It is likely that perfectionistic concerns may have a relatively greater impact on social anxiety when compared to perfectionistic strivings.

As explored in Study 2, social anxiety and perfectionistic strivings share the notion of extremely high standards for performance, which are imposed by the self (Clark, 2001; Gautreau & Thompson, 2010). However, these constructs appear to differ in the perceived ability to attain such standards: individuals with social anxiety perceive and at times demonstrate shortcomings in attaining self-imposed standards (Goodman et al., 2019; Voncken & Bögels, 2008), whereas individuals high in perfectionistic strivings are highly determined to achieve such standards (Abdollahi, 2019; Levinson et al., 2013). Hence, this distinction may contribute to the lack of an association between social anxiety and perfectionistic strivings. In contrast, individuals high in perfectionistic concerns do not endorse high standards for their own performance but perceive pressure from their social environment to be perfect, and often demonstrate poorer performance achievement than their counterparts high in perfectionistic strivings (Gaudreau & Thompson, 2010). Together, these suggest that perfectionistic concerns and social anxiety are associated due to a potential shared mechanism, namely the discrepancy between perceived high social performance standards from others and an inability to attain such standards, which appears to differ from perfectionistic strivings. Hence, as suggested in the perfectionism literature (Stoeber, 2017b), perfectionistic concerns and perfectionistic strivings are indeed distinct constructs with unique

associations to psychopathology and should be considered separately. Nonetheless, as data on performance achievement was not collected in the current thesis, further research is required to explore whether associations between social anxiety and perfectionistic concerns or perfectionistic strivings differ due to the proposed differences in perceived ability to attain self-imposed high standards.

Cognitive models of social anxiety disorder further outline that individuals with social anxiety process information in a biased manner. These models propose that in social situations, individuals experience cognitive biases that in turn aggravate social anxiety, and thus cognitive biases are seen as maintenance factors of the disorder. Although cognitive models of social anxiety propose that numerous biases have such a role, the current thesis focused specifically on negative interpretation bias, negative self-imagery, and post-event processing. The current thesis provided evidence for the proposition that negative interpretation bias is a more significant maintenance factor of social anxiety compared to the other biases, as this cognitive bias was found to mediate social anxiety over time in Studies 1 and 2, even in the absence of a specific social situation in Study 1. Negative self-imagery was also a maintenance factor of social anxiety, but only in Study 2. It is possible that negative self-imagery only plays this role in the context of a concrete social situation, but it is also probable that this effect was not observed in Study 1 due to issues with the measurement of negative self-imagery. On the other hand, post-event processing did not appear to have a maintenance role in social anxiety. The lack of a mediator role for post-event processing may have been due to the shared variance between negative self-imagery and post-event processing. Alternatively, it is possible that post-event processing did not contribute to the maintenance of social anxiety in Study 2 because the social interaction did not lead to rumination regarding this task in the 24-hour period post-task. Regardless, the current thesis did not provide support for the propositions from cognitive models of social anxiety regarding the maintenance role of post-event processing in social anxiety. Future research is warranted to address issues such as the measurements of negative self-imagery and post-event processing in Study 1.

A strength of the current thesis was testing the role of three cognitive biases simultaneously. In contrast, previous research has generally focused on one or two cognitive biases at a time. Concurrently testing the relationships of multiple cognitive biases with social anxiety provided information on how these biases differ in their associations when accounting for their overlap. Although cognitive models of social anxiety suggest that negative interpretation bias, negative self-imagery, and post-event processing all have a maintenance role, the current thesis showed that each cognitive bias differs in their roles as a mediator. Negative interpretation bias appeared to play the greatest role as it emerged as a maintenance factor of social anxiety in different contexts, followed by negative self-imagery, which was only a maintenance factor in a specific social context. However, the effect size of the pathways including negative self-imagery (b = 0.13 – 0.15) as a mediator in Study 2 was larger than that of negative interpretation bias (b = 0.06). Hence, results indicate that the extent to which different cognitive biases contribute to the maintenance of social anxiety depends on the social context. Literature has suggested that cognitive biases, particularly negative interpretation bias and negative self-imagery, may interact to maintain social anxiety (Hirsch et al., 2006). As such, future studies should investigate how these factors could interact or play different roles in contributing to social anxiety across different contexts (e.g., different social situations).

Findings did not show support for the elements from theories of perfectionism, which were adopted to form the theoretical basis of the current thesis. The majority of processes described in perfectionism cognition theory (Flett et al., 2016; Flett et al., 2017) were outside the scope of the current thesis, but information from this theory regarding negative self-images and post-event processing in perfectionism were used to contextualise how these cognitive biases arise in perfectionistic individuals. Study 1 showed consistent, positive correlations between these cognitive biases and perfectionism dimensions, but the only significant longitudinal relationship was the direct link between perfectionistic strivings and post-event processing. In Study 2, correlations were less consistent

(e.g., perfectionistic concerns were only correlated with post-event processing at Part 1), and there were no significant longitudinal relationships. Overall, the current thesis did not find support for the propositions from perfectionism cognition theory that following a triggering event, perfectionistic individuals experience negative self-images and post-event processing (Flett et al., 2017). However, it is likely that the social situation in Study 2 was not sufficiently relevant to perfectionism and thus did not lead to the activation of these cognitive biases. Additionally, negative self-imagery and post-event processing were assessed in the context of social anxiety, in accordance with the main theoretical frameworks of the current thesis. However, perfectionism cognition theory outlines examples of intrusive negative imagery regarding the self falling short of perfection, and ruminations over mistakes. Hence, it is possible that these biases are only relevant to perfectionism when related to perfectionistic cognitions.

In terms of the extended conceptual model of perfectionism and social anxiety (Flett & Hewitt, 2014), the current thesis supports the propositions that perfectionistic concerns contribute to social anxiety through an effect on cognitive biases. However, as in perfectionism cognition theory, the extended conceptual model of perfectionism and social anxiety highlights perfectionistic cognitions (e.g., mistake rumination). The current thesis provided evidence that perfectionistic concerns contribute to social anxiety through negative interpretation bias, a cognitive bias not incorporated in the extended conceptual model of perfectionism and social anxiety. Similarly, perfectionism cognition theory and the cognitive behavioural model of perfectionism (Shafran et al., 2002; Shafran et al., 2018) do not explicitly incorporate negative interpretation bias. The current findings showing a link between perfectionistic concerns and negative interpretation bias have implications for theory, along with the small body of previous research showing that perfectionistic interpretation bias is present in perfectionists (Dodd et al., 2019; Howell et al., 2019; Yiend et al., 2011). Future revisions of current perfectionism models and new perfectionism models may benefit from this emerging body of evidence, as the contribution of

negative interpretation bias to perfectionism has not been previously incorporated in theory and had scarcely been addressed in research.

Limitations

In addition to the aforementioned limitations (e.g., single session CBM-I protocol, lack of a social task that elicited evaluation concerns), the current thesis was also limited by the usual constraints of PhD projects, namely time and financial resources. As a result, the samples of the studies were relatively small. In particular, the samples of Studies 1 and 2 could have benefitted from more participants, considering the complexity of the models tested in these studies. Studies 1 and 2 were adequately powered for testing indirect effects, which are often the smallest effect sizes within models (Wolf et al., 2013). Nonetheless, replication of the current results in larger samples is warranted. Further to this point, given the large number of statistical analyses conducted in all studies, it is possible that Type 1 errors may have occurred. As such, it should be reiterated that the results of the current thesis are largely preliminary. One possible solution to this problem is to lower the alpha level of the analyses. However, this may have led to inadequately powered analyses due to the small size of the samples and consequently, yielded a misrepresentation of the results. Researchers could address the issue of alpha level in future studies, to ensure results are not a product of Type 1 error.

Although social anxiety was a principal construct of interest in the current thesis, social anxiety disorder as a clinical condition was not measured in any of the studies. In Studies 1 and 2, a comparison of the models in samples with and without social anxiety disorder may have yielded further insight into the relationships among social anxiety, perfectionism dimensions, and cognitive biases. Such comparisons may be the target of future studies. In Study 3, a score of 19 and above on the Social Phobia Inventory was required for participation in the study. Although a score above this threshold is indicative of social anxiety disorder (Connor et al., 2000), the Social Phobia Inventory is not a diagnostic

measure. Having a diagnostic measure, such as the Structured Clinical Interview for DSM-5, would strengthen the usefulness of the current results in informing future treatment strategies for individuals with clinical levels of social anxiety.

The current thesis adopted the two-factor model as its framework for measuring perfectionism, and accordingly, perfectionistic concerns and perfectionistic strivings were included in all studies. Nonetheless, the definition and measurement of perfectionism are still currently debated in the literature (Stoeber, 2017a), and some authors propose different frameworks of perfectionism (e.g., perfectionistic self-presentation in Hewitt et al., 2003). The current thesis adopted elements from perfectionism theories that rely on definitions of perfectionism other than the two-factor model (e.g., clinical perfectionism in the cognitive behavioural model of perfectionism by Shafran et al., 2002), due to a lack of theoretical foundations supporting the relationships between perfectionism dimensions and negative interpretation bias, negative-self imagery, and post-event processing in the context of social anxiety. Hence, in order to form its theoretical basis, the current thesis intertwined elements of theories relating to different characterisations of perfectionism. However, these multiple definitions of perfectionism were not reflected in the methodology of the current thesis, as only perfectionistic concerns and perfectionistic strivings were measured and analysed. Given the breadth of the perfectionism literature, narrowing the focus on a specific framework for the assessment of perfectionism was necessary. Nonetheless, the current thesis is limited by this narrow focus, and the results may not be generalisable to other definitions of perfectionism.

Moreover, based on propositions from theory and previous research, the current thesis included the measurement of specific cognitive biases: negative interpretation bias, negative self-imagery, and post-event processing. However, there are a number of other cognitive biases that were not measured in the present research, but which are included in theory and have been shown to be related to social anxiety and perfectionism in previous research. For example, attentional bias is incorporated in

theoretical models of both social anxiety (Clark, 2001; Heimberg et al., 2014; Hofmann, 2007) and perfectionism (Shafran et al., 2002), and has been shown to be related to both (e.g., Howell et al., 2016; Schultz & Heimberg, 2008). This cognitive bias was outside the scope of the current thesis and it was not incorporated in the studies as participation was already time-consuming; including additional measures would have incurred further burden on participants. Nonetheless, future studies may wish to include this cognitive bias. In the same vein, other psychopathologies, such as eating disorders and depression, have been shown to be correlated with social anxiety and perfectionism (e.g., Levinson et al., 2013). Testing all variables related to social anxiety, perfectionism, and cognitive biases was beyond the scope of the current thesis; however, it is acknowledged that including these unmeasured variables may yield a different picture of results.

Finally, it is acknowledged that the different cognitive biases considered in the current thesis were not measured in the same way in Studies 1 and 2. In both these studies, negative self-imagery and post-event processing were measured in relation to a social event, whether a memory of a social event chosen by the participant in Study 1 or the uniform social interaction task of Study 2. On the other hand, negative interpretation bias was not measured in relation to a specific social event experienced by the participant, but assessed in a more general manner (i.e., in relation to hypothetical scenarios in the case of the Interpretation and Judgment Questionnaire and the ambiguous sentences related to social situations in the WSAP). This was due to the absence of tools assessing negative interpretation bias in relation to a specific social situation experienced by participants, or a measurement that could be adequately modified for this purpose. It is possible that this difference in measurement of the cognitive biases may have impacted the results of Studies 1 and 2 in relation to their individual contribution as mediators of the relationships between social anxiety and perfectionism. In particular, it is possible that negative interpretation bias may have been a consistent mediator of the relationships between social anxiety and perfectionistic concerns in Studies 1 and 2 due to the general, non-situation specific

measurement of this cognitive bias. However, it is unclear whether measuring negative self-imagery and post-event processing in relation to a lived social scenario may have contributed to the inconsistency in the contributions of these cognitive biases to social anxiety and perfectionism dimensions. Hence, comparisons of the contributions of each bias to the models should be taken with caution. In future studies, researchers may consider using more similar strategies for measuring cognitive biases, to ensure the individual contribution of each cognitive bias is comparable.

Towards a New Model of Social Anxiety, Perfectionism, and Cognitive Biases

Considering the numerous limitations and constraints outlined above, conceptualising a new model of social anxiety, perfectionism, and cognitive biases based on the data from the current thesis would not be appropriate. Nonetheless, the evidence provided by Studies 1, 2, and 3 offers several indicators and suggestions for future research looking to establish such a model, assuming that such evidence can be replicated in more robust designs. The primary suggestion would be to consider negative interpretation bias as a mediator and/or maintenance factor when conceptualising the relationships between social anxiety and perfectionistic concerns. Negative self-imagery and post-event processing appear to be less relevant to the relationships between social anxiety and perfectionism, and any future models may consider excluding these constructs. Finally, such models may wish to differentiate how the relationships between social anxiety, perfectionistic concerns, and negative interpretation bias differ in the long and short term, and in the context of varying social situations.

Additional Recommendations for Future Research

In conducting novel research, the current thesis identified some methodological issues that can serve to guide future research in this area. As mentioned throughout this thesis, the use of a social task appears to provide a consistent activation and uniform measurement of cognitive biases. However, in order to be relevant to perfectionism, such a task needs to have an evaluation component or to impose

a threat to personal achievement. Moreover, this threat needs to be tangible, for example, the presence of an audience is required, rather than the threat of feedback at a later time. Hence, taken together, the studies of the current thesis provide direction for the design of future studies aiming to test the role of cognitive biases in social anxiety and perfectionism.

Another potential avenue for future studies is to test the relationships between social anxiety and perfectionism dimensions in different ways. Given that perfectionistic strivings were mostly not significantly directly related to any other variables in Studies 1 and 2, perhaps this variable is best addressed as a moderator. Similar suggestions are made by the 2 x 2 model of dispositional perfectionism (Gaudreau & Thompson, 2010), which holds that a combination of perfectionistic strivings and perfectionistic concerns (i.e., mixed perfectionism) leads to better outcomes than pure perfectionistic concerns. Alternatively, perfectionistic strivings may be found to exacerbate the effect of perfectionistic concerns, as outlined by the tripartite model (Stoeber & Otto, 2006). Accordingly, research exists supporting the role of perfectionistic strivings as a moderator in the relationship between perfectionistic concerns and poor outcomes (e.g., negative emotionality), such that perfectionistic strivings aggravate the effect of perfectionistic concerns on negative emotionality (Smith et al., 2015). As outlined in Chapter 2, testing the interaction of perfectionistic concerns and perfectionistic strivings on social anxiety was beyond the scope of the current thesis, as we sought to address these variables individually (following previous longitudinal studies in the area; Damian et al., 2017; Gautreau et al., 2015; Levinson & Rodebaugh, 2016) as the first step. Nevertheless, supplementary testing of the interaction of perfectionistic concerns and perfectionistic strivings was performed, and the results can be seen in Appendix P. Although no significant results emerged from these analyses, future research may wish to further investigate these propositions.

As discussed in Studies 1 and 2, the age of participants may be the reason why no direct path from perfectionistic concerns to social anxiety (and vice versa) was observed in Study 1, and why these

results contrasted with those of Study 2 and previous longitudinal studies, which had younger samples. It was suggested that future studies examine the role of age in the relationships between social anxiety and perfectionism, as the relatively small samples of Studies 1 and 2 did not allow for these post-hoc investigations. Further to this suggestion, it may be useful to conduct longer-term longitudinal studies from childhood or adolescence (when social anxiety and perfectionism are starting to develop) into adulthood (when these issues would likely stabilise). Conducting such research would provide robust evidence of how the relationships between social anxiety and perfectionism dimensions evolve as individuals age. Moreover, such research may inform how treatments for social anxiety and perfectionism should differ depending on individuals' life stages.

Conclusion

The current thesis addressed the under-researched relationships among social anxiety, perfectionistic concerns, perfectionistic strivings, and cognitive biases (i.e., negative interpretation bias, negative self-imagery, and post-event processing). Specifically, the current thesis sought to establish the directionality of the relationships between social anxiety and perfectionism dimensions, and to investigate the role of cognitive biases as mediators of these relationships. As a direct relationship from social anxiety to perfectionistic concerns was only observed in the context of a social interaction task and in an analysis not including cognitive biases, further research is required to gain a better understanding of the longitudinal relationships between social anxiety and perfectionism dimensions. In terms of cognitive biases, negative self-imagery was identified as a maintenance factor of social anxiety, but this cognitive bias, along with post-event processing, had no mediator role in the relationship between social anxiety and perfectionism dimensions. The main finding of the current thesis was the role of negative interpretation bias as a mediator of the relationship between social anxiety and perfectionistic concerns, and as a maintenance factor of social anxiety. Negative interpretation bias was proposed to be a transdiagnostic process across social anxiety and perfectionistic concerns and a

potential target for cost and time-effective interventions addressing both conditions. Although the modification of this cognitive bias did not yield the expected effects on social anxiety and perfectionistic concerns, this brief intervention appeared to be beneficial for individuals high in perfectionistic strivings. Further research addressing the limitations of the current thesis is required to examine the effectiveness of modifying interpretation bias across social anxiety, perfectionistic concerns, and perfectionistic strivings. Limitations notwithstanding, the findings provided novel evidence regarding the contribution of negative interpretation bias to social anxiety and perfectionistic concerns. Moreover, the current thesis provided important theoretical and clinical contributions to the areas of social anxiety and perfectionism, and identified several pertinent directions for future research.

References

Abdollahi, A. (2019). The association of rumination and perfectionism to social anxiety. *Psychiatry*, *82*(4), 345–353. https://doi.org/10.1080/00332747.2019.1608783

Abdollahi, A., Hosseinian, S., Panahipour, H., & Allen, K. A. (2019). Cognitive behavioural therapy as an effective treatment for social anxiety, perfectionism, and rumination. *Current Psychology*. https://doi.org/10.1007/s12144-019-00411-w

Aderka, I. M., Hofmann, S. G., Nickerson, A., Hermesh, H., Gilboa-Schechtman, E., & Marom, S. (2012). Functional impairment in social anxiety disorder. *Journal of Anxiety Disorders*, *26*(3), 393–400. https://doi.org/10.1016/j.janxdis.2012.01.003

Alden, L. E., Taylor, C. T., Mellings, T. M. J. B., & Laposa, J. M. (2008). Social anxiety and the interpretation of positive social events. *Journal of Anxiety Disorders*, *22*(4), 577–590. https://doi.org/10.1016/j.janxdis.2007.05.007

Alonso, J., Angermeyer, M. C., Bernert, S., Bruffaerts, R., Brugha, T. S., Bryson, H., de Girolamo, G., de Graaf, R., Demyttenaere, K., Gasquet, I., Haro, J. M., Katz, S. J., Kessler, R. C., Kovess, V., Lepine, J. P., Ormel, J., Polidori, G., Russo, L. J., Vilagut, G., … Vollebergh, W. A. M. (2004). Disability and quality of life impact of mental disorders in Europe: Results from the European Study of the Epidemiology of Mental Disorders (ESEMeD) project. *Acta Psychiatrica Scandinavica*, *109*(420), 38–46. https://doi.org/10.1111/j.1600-0047.2004.00329.x

American Psychiatric Association. (1980). *Diagnostic and statistical manual of mental disorders* (3rd ed.). Author.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Author.

Amir, N., Beard, C., & Bower, E. (2005). Interpretation bias and social anxiety. *Cognitive Therapy and Research*, *29*(4), 433–443. https://doi.org/10.1007/s10608-005-2834-5

Amir, N., Bomyea, J., & Beard, C. (2010). The effect of single-session interpretation modification on attention bias in socially anxious individuals. *Journal of Anxiety Disorders*, *24*(2), 178–182. https://doi.org/10.1016/j.janxdis.2009.10.005

Amir, N., & Taylor, C. T. (2012). Interpretation training in individuals with generalized social anxiety disorder: A randomized controlled trial. *Journal of Consulting and Clinical Psychology*, *80*(3), 497–511. https://doi.org/10.1037/a0026928

Antony, M. M., Coons, M. J., McCabe, R. E., Ashbaugh, A., & Swinson, R. P. (2006). Psychometric properties of the Social Phobia Inventory: Further evaluation. *Behaviour Research and Therapy*, *44*(8), 1177–1185. https://doi.org/https://doi.org/10.1016/j.brat.2005.08.013

Arechar, A. A., Gächter, S., & Molleman, L. (2018). Conducting interactive experiments online. *Experimental Economics*, *21*, 99–131. https://doi.org/10.1007/s10683-017-9527-2

Ashbaugh, A., Antony, M. M., Liss, A., Summerfeldt, L. J., McCabe, R. E., & Swinson, R. P. (2007). Changes in perfectionism following cognitive-behavioural treatment for social phobia. *Depression and Anxiety*, *24*(3), 169–177. https://doi.org/10.1002/da.20219

Australian Bureau of Statistics. (2007). *4326.0 - National survey of mental health and wellbeing: Summary of results*. https://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4326.0Main+Features32007?OpenDocument

Badra, M., Schulze, L., Becker, E. S., Vrijsen, J. N., Renneberg, B., & Zetsche, U. (2017). The association between ruminative thinking and negative interpretation bias in social anxiety. *Cognition and Emotion*, *31*(6), 1234–1242. https://doi.org/10.1080/02699931.2016.1193477

Bagby, R. M., Parker, J. D. A., Joffe, R. T., & Buis, T. (1994). Reconstruction and validation of the Depressive Experiences Questionnaire. *Assessment*, *1*(1), 59–68. https://doi.org/10.1177/1073191194001001009

Bagby, R. M., Quilty, L. C., & Ryder, A. C. (2008). Personality and depression. *Canadian Journal of Psychiatry*, *53*(1), 14–25. https://doi.org/10.1177/070674370805300104

Beard, C. (2011). Cognitive bias modification for anxiety: Current evidence and future directions. *Expert Review of Neurotherapeutics, 11*(2), 299-311. https://doi.org/10.1586/ern.10.194

Beard, C., & Amir, N. (2008). A multi-session interpretation modification program: Changes in interpretation and social anxiety symptoms. *Behaviour Research and Therapy*, *46*(10), 1135–1141. https://doi.org/10.1016/j.brat.2008.05.012

Beard, C., & Amir, N. (2009). Interpretation in social anxiety: When meaning precedes ambiguity. *Cognitive Therapy and Research*, *33*(4), 406–415. https://doi.org/10.1007/s10608-009-9235-0

Beard, C., & Amir, N. (2010). Negative interpretation bias mediates the effect of social anxiety on state anxiety. *Cognitive Therapy and Research*, *34*(3), 292–296. https://doi.org/10.1007/s10608-009-9258-6

Beard, C., Rifkin, L. S., Silverman, A. L., & Björgvinsson, T. (2019). Translating CBM-I into real-world settings: Augmenting a CBT-based psychiatric hospital program. *Behavior Therapy*, *50*(3), 515–530. https://doi.org/10.1016/j.beth.2018.09.002

Bergman, A. J., Nyland, J. E., & Burns, L. R. (2007). Correlates with perfectionism and the utility of a dual process model. *Personality and Individual Differences*, *43*(2), 389–399. https://doi.org/10.1016/j.paid.2006.12.007

Besharat, M. A., Issazadegan, A., Etemadinia, M., Golssanamlou, S., & Abdolmanafi, A. (2014). Risk factors associated with depressive symptoms among undergraduate students. *Asian Journal of Psychiatry*, *10*, 21–26. https://doi.org/10.1016/j.ajp.2014.02.002

Birmaher, B., Khetarpal, S., Brent, D., Culle, M., Balach, L., Kaufman, J., & McKenzie Neer, S. (1997). The Screen for Child Anxiety Related Emotional Disorders (SCARED): Scale construction and psychometric characteristics. *Journal of the American Academy of Child & Adolescent Psychiatry*, *36*(4), 545–553.

Blackwell, S. E. (2020). Clinical efficacy of cognitive bias modification interventions. *The Lancet Psychiatry*, *7*(6), 465–467. https://doi.org/10.1016/S2215-0366(20)30170-X

Boone, L., Soenens, B., Mouratidis, A., Vansteenkiste, M., Verstuyf, J., & Braet, C. (2012). Daily fluctuations in perfectionism dimensions and their relation to eating disorder symptoms. *Journal of Research in Personality*, *46*(6), 678–687. https://doi.org/10.1016/j.jrp.2012.08.001

Brosan, L., Hoppitt, L., Shelfer, L., Sillence, A., & MacKintosh, B. (2011). Cognitive bias modification for attention and interpretation reduces trait and state anxiety in anxious patients referred to an out-patient service: Results from a pilot study. *Journal of Behavior Therapy and Experimental Psychiatry*, *42*(3), 258–264. https://doi.org/10.1016/j.jbtep.2010.12.006

Brown, J. R., & Kocovski, N. L. (2014). Perfectionism as a predictor of post-event rumination in a socially anxious sample. *Journal of Rational-Emotive & Cognitive-Behavior Therapy*, *32*(2), 150–163. https://doi.org/https://doi.org/10.1007/s10942-013-0175-y

Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen & J. S. Long (Eds.), *Testing structural equation models* (pp. 136-162). Sage.

Brozovich, F. A., & Heimberg, R. G. (2013). Mental imagery and post-event processing in anticipation of a speech performance among socially anxious individuals. *Behavior Therapy*, *44*(4), 701–716. https://doi.org/10.1016/j.beth.2013.07.001

Brozovich, F. A., & Heimberg, R. G. (2008). An analysis of post-event processing in social anxiety disorder. *Clinical Psychology Review*, *28*(6), 891–903. https://doi.org/10.1016/j.cpr.2008.01.002

Burgess, A. M., & DiBartolo, P. M. (2016). Anxiety and perfectionism: Relationships, mechanisms, and conditions. In F. M. Sirois & D. S. Molnar (Eds.), *Perfectionism, health, and well-being* (pp. 177–203). Springer International Publishing. https://doi.org/10.1007/978-3-319-18582-8_8

Button, K. S., Ioannidis, J. P. A., Mokrysz, C., Nosek, B. A., Flint, J., Robinson, E. S. J., & Munafo, M. R. (2013). Power failure: Why small sample size undermines the reliability of neuroscience. *Nature Reviews Neuroscience*, *14*(5), 365–375. https://doi.org/10.1038/nrn3475

Chen, J., McLean, J. E., & Kemps, E. (2018). Combined audience and video feedback with cognitive review improves state anxiety and self-perceptions during speech tasks in socially anxious individuals. *Behavior Therapy*, *49*(2), 165–179. https://doi.org/10.1016/j.beth.2017.11.006

Chen, J., Milne, K., Dayman, J., & Kemps, E. (2019). Interpretation bias and social anxiety: Does interpretation bias mediate the relationship between trait social anxiety and state anxiety responses? *Cognition and Emotion*, *33*(4), 630–645. https://doi.org/10.1080/02699931.2018.1476323

Chen, J., Short, M., & Kemps, E. (2020). Interpretation bias in social anxiety: A systematic review and meta-analysis. *Journal of Affective Disorders*, *276*, 1119–1130. https://doi.org/10.1016/j.jad.2020.07.121

Chmielewski, M., & Kucker, S. C. (2020). An MTurk crisis? Shifts in data quality and the impact on study results. *Social Psychological and Personality Science*, *11*(4), 464–473. https://doi.org/10.1177/1948550619875149

Clark, D. M. (2001). A cognitive perspective on social phobia. In W. R. Crozier & L. E. Alden (Eds.), *International handbook of social anxiety: Concepts, research and interventions relating to the self and shyness* (pp. 405–430). John Wiley & Sons, Ltd.

Clark, D. M., & McManus, F. (2002). Information processing in social phobia. *Biological Psychiatry*, *51*(1), 92–100. https://doi.org/10.1016/S0006-3223(01)01296-3

Clark, D. M., & Wells, A. (1995). A cognitive model of social phobia. In R. G. Heimberg, M. Liebowitz, D. A. Hope, & F. R. Schneier (Eds.), *Social phobia: Diagnosis, assessment, and treatment* (pp. 69–93). The Guilford Press.

Cole, D. A., & Maxwell, S. E. (2003). Testing mediational models with longitudinal data: Questions and tips in the use of structural equation modeling. *Journal of Abnormal Psychology*, *112*(4), 558–577. https://doi.org/10.1037/0021-843X.112.4.558

Connor, K. M., Davidson, J. R. T., Churchill, L. E., Sherwood, A., Foa, E., & Weisler, R. H. (2000). Psychometric properties of the Social Phobia Inventory (SPIN). New self-rating scale. *British Journal of Psychiatry*, *176*, 379–386. https://doi.org/10.1192/bjp.176.4.379

Cooks, J. A., & Ciesla, J. A. (2019). The impact of perfectionism, performance feedback, and stress on affect and depressive symptoms. *Personality and Individual Differences*, *146*, 62–67. https://doi.org/10.1016/j.paid.2019.03.048

Cox, S. L., & Chen, J. (2015). Perfectionism: A contributor to social anxiety and its cognitive processes. *Australian Journal of Psychology*, *67*(4), 231–240. https://doi.org/10.1111/ajpy.12079

Cristea, I. A., Kok, R. N., & Cuijpers, P. (2015). Efficacy of cognitive bias modification interventions in anxiety and depression: Meta-analysis. *British Journal of Psychiatry*, *206*(1), 7–16. https://doi.org/10.1192/bjp.bp.114.146761

Crome, E., Grove, R., Baillie, A. J., Sunderland, M., Teesson, M., & Slade, T. (2015). DSM-IV and DSM-5 social anxiety disorder in the Australian community. *Australian & New Zealand Journal of Psychiatry*, *49*(3), 227–235. https://doi.org/10.1177/0004867414546699

Damian, L. E., Negru-Subtirica, O., Stoeber, J., & Băban, A. (2017). Perfectionistic concerns predict increases in adolescents' anxiety symptoms: A three-wave longitudinal study. *Anxiety, Stress, & Coping*, *30*(5), 551–561. https://doi.org/https://doi.org/10.1080/10615806.2016.1271877

Damian, L. E., Stoeber, J., Negru, O., & Băban, A. (2013). On the development of perfectionism in adolescence: Perceived parental expectations predict longitudinal increases in socially prescribed perfectionism. *Personality and Individual Differences*, *55*(6), 688–693. https://doi.org/10.1016/j.paid.2013.05.021

Dermody, S. S., Friedman, M., Chisolm, D. J., Burton, C. M., & Marshal, M. P. (2020). Elevated risky sexual behaviors among sexual minority girls: Indirect risk pathways through peer victimization and heavy drinking. *Journal of Interpersonal Violence*, *35*(11–12), 2236–2253. https://doi.org/10.1177/0886260517701450

Di Schiena, R., Luminet, O., Philippot, P., & Douilliez, C. (2012). Adaptive and maladaptive perfectionism in depression: Preliminary evidence on the role of adaptive and maladaptive rumination. *Personality and Individual Differences*, *53*(6), 774–778. https://doi.org/10.1016/j.paid.2012.05.017

DiBartolo, P. M., Frost, R. O., Dixon, A., & Almodovar, S. (2001). Can cognitive restructuring reduce the disruption associated with perfectionistic concerns? *Behavior Therapy*, *32*(1), 167–184. https://doi.org/10.1016/S0005-7894(01)80051-4

DiBartolo, P. M., Li, C. Y., Averett, S., Skotheim, S., Smith, L. M., Raney, C., & McMillen, C. (2007). The relationship of perfectionism to judgmental bias and psychopathology. *Cognitive Therapy and Research*, *31*(5), 573–587. https://doi.org/10.1007/s10608-006-9112-z

Dickie, L., Surgenor, L. J., Wilson, M., & McDowall, J. (2012). The structure and reliability of the Clinical Perfectionism Questionnaire. *Personality and Individual Differences*, *52*(8), 865-869. https://doi.org/10.1016/j.paid.2012.02.003

Dobinson, K. A., Norton, A. R., & Abbott, M. J. (2020). The relationship between negative self-imagery and social anxiety in a clinically diagnosed sample. *Cognitive Therapy and Research*, *44*(1), 156–170. https://doi.org/10.1007/s10608-019-10051-w

Dodd, D. R., Parsons, M. E., Clerkin, E. M., Forrest, L. N., Velkoff, E. A., Kunstman, J. W., & Smith, A. R. (2019). Perfectly imperfect: The use of cognitive bias modification to reduce perfectionism. *Journal of Behavior Therapy and Experimental Psychiatry*, *64*, 5–10. https://doi.org/10.1016/j.jbtep.2019.04.002

Dormann, C., & Griffin, M. A. (2015). Optimal time lags in panel studies. *Psychological Methods*, *20*(4), 489–505. https://doi.org/http://dx.doi.org/10.1037/met0000041

Dunkley, D. M., Blankstein, K. R., & Berg, J.-L. (2012). Perfectionism dimensions and the five-factor model of personality. *European Journal of Personality*, *26*(3), 233–244. https://doi.org/10.1002/per.829

Dunkley, D. M., Solomon-Krakus, S., & Moroz, M. (2016). Personal standards and self-critical perfectionism and distress: Stress, coping, and perceived social support as mediators and moderators. In F. M. Sirois & D. S. Molnar (Eds.), *Perfectionism, health, and well-being* (pp. 157–176). Springer International Publishing.

Edwards, C. B., Portnow, S., Namaky, N., & Teachman, B. A. (2018). Training less threatening interpretations over the internet: Impact of priming anxious imagery and using a neutral control condition. *Cognitive Therapy and Research*, *42*(6), 832–843. https://doi.org/10.1007/s10608-018-9922-9

Egan, S. J., Wade, T. D., & Shafran, R. (2011). Perfectionism as a transdiagnostic process: A clinical review. *Clinical Psychology Review*, *31*(2), 203–212. https://doi.org/10.1016/j.cpr.2010.04.009

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioural, and biomedical sciences. *Behavior Research Methods*, *39*(2), 175–191. https://doi.org/10.3758/bf03193146

Fehm, L., Hoyer, J., Schneider, G., Lindemann, C., & Klusmann, U. (2008). Assessing post-event processing after social situations: A measure based on the cognitive model for social phobia. *Anxiety, Stress, & Coping*, *21*(2), 129–142. https://doi.org/10.1080/10615800701424672

Fehm, L., Schneider, G., & Hoyer, J. (2007). Is post-event processing specific for social anxiety? *Journal of Behavior Therapy and Experimental Psychiatry*, *38*(1), 11–22. https://doi.org/10.1016/j.jbtep.2006.02.004

Field, A. (2013). *Discovering statistics using IBM SPSS statistics* (4th ed.). Sage.

Flett, G. L., Hewitt, P. L., Blankstein, K. R., & Gray, L. (1998). Psychological distress and the frequency of perfectionistic thinking. *Journal of Personality and Social Psychology*, *75*(5), 1363–1381. https://doi.org/10.1037/0022-3514.75.5.1363

Flett, G. L., & Hewitt, P. L. (2014). Perfectionism and perfectionistic self-presentation in social anxiety: Implications for assessment and treatment. In S. G. Hofmann & P. M. DiBartolo (Eds.), *Social anxiety: Clinical, developmental, and social perspectives* (3rd ed., pp. 159–187). Elsevier Academic Press. https://doi.org/10.1016/B978-0-12-394427-6.00007-8

Flett, G. L, Hewitt, P. L., & Molnar, D. S. (2016). Perfectionism in health and illness from a person-focused, historical perspective. In F. M. Sirois & D. S. Molnar (Eds.), *Perfectionism, health, and well-being* (pp. 25–44). Springer International Publishing. https://doi.org/10.1007/978-3-319-18582-8_2

Flett, G. L., Hewitt, P. L., Nepon, T., & Besser, A. (2017). Perfectionism cognition theory. In J. Stoeber (Ed.), *The psychology of perfectionism: Theory, research, applications* (pp. 89–110). Routledge.

Fodor, L. A., Georgescu, R., Cuijpers, P., Szamoskozi, Ş., David, D., Furukawa, T. A., & Cristea, I. A. (2020). Efficacy of cognitive bias modification interventions in anxiety and depressive disorders: A systematic review and network meta-analysis. *The Lancet Psychiatry*, *7*(6), 506–514. https://doi.org/10.1016/S2215-0366(20)30130-9

Frost, R. O., Heimberg, R. G., Holt, C. S., Mattia, J. I., & Neubauer, A. L. (1993). A comparison of two measures of perfectionism. *Personality and Individual Differences*, *14*(1), 119–126. https://doi.org/10.1016/0191-8869(93)90181-2

Frost, R. O., Marten, P., Lahart, C., & Rosenblate, R. (1990). The dimensions of perfectionism. *Cognitive Therapy and Research*, *14*(5), 449–468. https://doi.org/10.1007/BF01172967

Gäde, J. C., Schermelleh-Engel, K., & Klein, A. G. (2017). Disentangling the common variance of perfectionistic strivings and perfectionistic concerns: A bifactor model of perfectionism. *Frontiers in Psychology*, *8*, 1–13. https://doi.org/10.3389/fpsyg.2017.00160

Gallagher, M., Prinstein, M. J., Simon, V., & Spirito, A. (2014). Social anxiety symptoms and suicidal ideation in a clinical sample of early adolescents: Examining loneliness and social support as longitudinal mediators. *Journal of Abnormal Child Psychology*, *42*(6), 871–883. https://doi.org/10.1007/s10802-013-9844-7

Garner, D. M., Olmstead, M. P., & Polivy, J. (1983). Development and validation of a multidimensional eating disorder inventory for anorexia nervosa and bulimia. *International Journal of Eating Disorders*, *2*(2), 15–34. https://doi.org/10.1002/1098-108X(198321)2:2<15::AID-EAT2260020203>3.0.CO;2-6

Gaudreau, P. (2012). A methodological note on the interactive and main effects of dualistic personality dimensions: An example using the 2×2 model of perfectionism. *Personality and Individual Differences*, *52*(1), 26–31. https://doi.org/10.1016/j.paid.2011.08.022

Gaudreau, P., Franche, V., Kljajic, K., & Martinelli, G. (2017). The 2 × 2 model of perfectionism. Assumptions, trends, and potential developments. In J. Stoeber (Ed.), *The psychology of perfectionism: Theory, research, applications* (pp. 45–68). Routledge.

Gaudreau, P., & Thompson, A. (2010). Testing a 2 × 2 model of dispositional perfectionism. *Personality and Individual Differences*, *48*(5), 532–537. https://doi.org/10.1016/j.paid.2009.11.031

Gautreau, C. M., Sherry, S. B., Mushquash, A. R., & Stewart, S. H. (2015). Is self-critical perfectionism an antecedent of or a consequence of social anxiety, or both? A 12-month, three-wave longitudinal

study. *Personality and Individual Differences*, *82*, 125–130. https://doi.org/10.1016/j.paid.2015.03.005

Gnilka, P. B., McLaulin, S. E., Ashby, J. S., & Allen, M. C. (2017). Coping resources as mediators of multidimensional perfectionism and burnout. *Consulting Psychology Journal: Practice and Research*, *69*(3), 209–222. https://doi.org/10.1037/cpb0000078

Goldin, P. R., Manber, T., Hakimi, S., Canli, T., & Gross, J. J. (2009). Neural bases of social anxiety disorder: Emotional reactivity and cognitive regulation during social and physical threat. *Archives of General Psychiatry*, *66*(2), 170–180. https://doi.org/10.1001/archgenpsychiatry.2008.525

Goldsmith, K. A., MacKinnon, D. P., Chalder, T., White, P. D., Sharpe, M., & Pickles, A. (2018). Tutorial: The practical application of longitudinal structural equation mediation models in clinical trials. *Psychological Methods*, *23*(2), 191–207. https://doi.org/10.1037/met0000154

Gonsalves, M., Whittles, R. L., Weisberg, R. B., & Beard, C. (2019). A systematic review of the word sentence association paradigm (WSAP). *Journal of Behavior Therapy and Experimental Psychiatry*, *64*, 133–148. https://doi.org/10.1016/j.jbtep.2019.04.003

Goodman, F. R., Kashdan, T. B., Stiksma, M. C., & Blalock, D. v. (2019). Personal strivings to understand anxiety disorders: Social anxiety as an exemplar. *Clinical Psychological Science*, *7*(2), 283–301. https://doi.org/10.1177/2167702618804778

Gotlib, I. H., & Krasnoperova, E. (1998). Biased information processing as a vulnerability factor for depression. *Behavior Therapy*, *29*(4), 603–617. https://doi.org/10.1016/S0005-7894(98)80020-8

Hallion, L. S., & Ruscio, A. M. (2011). A meta-analysis of the effect of cognitive bias modification on anxiety and depression. *Psychological Bulletin*, *137*(6), 940–958. https://doi.org/10.1037/a0024355

Hamachek, D. E. (1978). Psychodynamics of normal and neurotic perfectionism. *Psychology: A Journal of Human Behavior*, *15*(1), 27–33.

Hamaker, E. L., Kuiper, R. M., & Grasman, R. P. P. P. (2015). A critique of the cross-lagged panel model. *Psychological Methods*, *20*(1), 102–116. https://doi.org/10.1037/a0038889

Handley, A. K., Egan, S. J., Kane, R. T., & Rees, C. S. (2015). A randomised controlled trial of group cognitive behavioural therapy for perfectionism. *Behaviour Research and Therapy*, *68*, 37–47. https://doi.org/https://doi.org/10.1016/j.brat.2015.02.006

Hayes, A. F. (2017). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach* (2nd ed.). Guilford Press.

Heeren, A., Maurage, P., Rossignol, M., Vanhaelen, M., Peschard, V., Eeckhout, C., & Philippot, P. (2012). Self-report version of the Liebowitz Social Anxiety Scale: Psychometric properties of the French version. *Canadian Journal of Behavioural Science*, *44*(2), 99–107. https://doi.org/10.1037/a0026249

Heimberg, R. G., & Brozovich, F. A. (2010). A cognitive behavioural model of social anxiety disorder: Update and extension. In S. G. Hofmann & P. M. DiBartolo (Eds.), *Social anxiety: Clinical, developmental, and social perspectives* (2nd ed., pp. 395–422). Elsevier. https://doi.org/10.1016/B978-0-12-375096-9.00015-8

Heimberg, R. G., Brozovich, F. A., & Rapee, R. M. (2014). A cognitive-behavioral model of social anxiety disorder. In S. G. Hofmann & P. M. DiBartolo (Eds.), *Social anxiety: Clinical, developmental, and social perspectives* (3rd ed., pp. 704–728). Elsevier Academic Press. https://doi.org/10.1016/B978-0-12-394427-6.00024-8

Heimberg, R. G., Horner, K. J., Juster, H. R., Safren, S. A., Brown, E. J., Schneier, F. R., & Liebowitz, M. R. (1999). Psychometric properties of the Liebowitz Social Anxiety Scale. *Psychological Medicine*, *29*(1), 199–212. https://doi.org/10.1017/S0033291798007879

Helbig-Lang, S., Rusch, S., & Lincoln, T. M. (2015). Emotion regulation difficulties in social anxiety disorder and their specific contributions to anxious responding. *Journal of Clinical Psychology*, *71*(3), 241–249. https://doi.org/10.1002/jclp.22135

Hewitt, P. L., & Flett, G. L. (1991). Perfectionism in the self and social contexts: Conceptualization, assessment, and association with psychopathology. *Journal of Personality and Social Psychology*, *60*(3), 456–470. https://doi.org/10.1037/0022-3514.60.3.456

Hewitt, P. L., Flett, G. L., Sherry, S. B., Habke, M., Parkin, M., Lam, R. W., McMurtry, B., Ediger, E., Fairlie, P., & Stein, M. B. (2003). The interpersonal expression of perfection: Perfectionistic self-presentation and psychological distress. *Journal of Personality and Social Psychology*, *84*(6), 1303–1325. https://doi.org/10.1037/0022-3514.84.6.1303

Hewitt, P. L., Flett, G. L., Turnbull-Donovan, W., & Mikail, S. F. (1991). The Multidimensional Perfectionism Scale: Reliability, validity, and psychometric properties in psychiatric samples. *Psychological Assessment*, *3*(3), 464–468. https://doi.org/10.1037//1040-3590.3.3.464

Hill, A. P. (2014). Perfectionistic strivings and the perils of partialling. *International Journal of Sport and Exercise Psychology*, *12*(4), 302–315. https://doi.org/10.1080/1612197X.2014.919602

Hill, A. P. (2017). Real and imagined perils: A reply to Stoeber and Gaudreau (2016). *Personality and Individual Differences*, *108*, 220–224. https://doi.org/10.1016/j.paid.2016.12.026

Hirsch, C. R., & Clark, D. M. (2004). Information-processing bias in social phobia. *Clinical Psychology Review*, *24*(7), 799–825. https://doi.org/10.1016/j.cpr.2004.07.005

Hirsch, C. R., Clark, D. M., & Mathews, A. (2006). Imagery and interpretations in social phobia: Support for the combined cognitive biases hypothesis. *Behavior Therapy*, *37*(3), 223–236. https://doi.org/10.1016/j.beth.2006.02.001

Hirsch, C. R., Clark, D. M., Mathews, A., & Williams, R. (2003). Self-images play a causal role in social phobia. *Behaviour Research and Therapy*, *41*(8), 909–921. https://doi.org/10.1016/S0005-7967(02)00103-1

Hirsch, C. R., Krahé, C., Whyte, J., Bridge, L., Loizou, S., Norton, S., & Mathews, A. (2020). Effects of modifying interpretation bias on transdiagnostic repetitive negative thinking. *Journal of Consulting and Clinical Psychology*, *88*(3), 226–239. https://doi.org/10.1037/ccp0000455

Hirsch, C. R., & Mathews, A. (2000). Impaired positive inferential bias in social phobia. *Journal of Abnormal Psychology*, *109*(4), 705–712. https://doi.org/10.1037/0021-843X.109.4.705

Hirsch, C. R., Meeten, F., Krahé, C., & Reeder, C. (2016). Resolving ambiguity in emotional disorders: The nature and role of interpretation biases. *Annual Review of Clinical Psychology*, *12*, 281–305. https://doi.org/10.1146/annurev-clinpsy-021815-093436

Hoek, H. W. (2006). Incidence, prevalence and mortality of anorexia nervosa and other eating disorders. *Current Opinion in Psychiatry*, *19*(4), 389–394. https://doi.org/10.1097/01.yco.0000228759.95237.78

Hofmann, S. G., Bullis, J., & Gutner, C. (2013). Social anxiety disorder: Treatment targets and strategies. In G. Simos & S. G. Hofmann (Eds.), *CBT for anxiety disorders: A practitioner book* (pp. 87–105). John Wiley & Sons, Ltd.

Hofmann, S. G., & Otto, M. W. (2017). Session-by-session outline. In S.G. Hofmann & M. W. Otto (Eds.), *Cognitive behavioural therapy for social anxiety disorder* (2nd ed., pp. 64–94). Routledge.

Hofmann, S. G. (2007). Cognitive factors that maintain social anxiety disorder: A comprehensive model and its treatment implications. *Cognitive Behaviour Therapy*, *36*(4), 193–209. https://doi.org/10.1080/16506070701421313

Hofmann, S. G., & Bögels, S. M. (2006). Recent advances in the treatment of social phobia: Introduction to the special issue. *Journal of Cognitive Psychotherapy: An International Quarterly*, *20*(1), 3–5. https://doi.org/10.1891/jcop.20.1.3

Holmes, E. A., Arntz, A., & Smucker, M. R. (2007). Imagery rescripting in cognitive behaviour therapy: Images, treatment techniques and outcomes. *Journal of Behavior Therapy and Experimental Psychiatry*, *38*(4), 297–305. https://doi.org/10.1016/j.jbtep.2007.10.007

Howell, J. A., McEvoy, P. M., Grafton, B., Macleod, C., Kane, R. T., Anderson, R. A., & Egan, S. J. (2016). Selective attention in perfectionism: Dissociating valence from perfectionism-relevance. *Journal of Behavior Therapy and Experimental Psychiatry*, *51*, 100–108. https://doi.org/10.1016/j.jbtep.2016.01.004

Howell, J. A., McEvoy, P. M., Grafton, B., Macleod, C., Kane, R. T., Anderson, R. A., & Egan, S. J. (2019). Biased interpretation in perfectionistic concerns: An experimental investigation. *Anxiety, Stress, & Coping*, *32*(3), 259–269. https://doi.org/10.1080/10615806.2019.1586888

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, *6*(1), 1–55. https://doi.org/10.1080/10705519909540118

Huppert, J. D., Foa, E. B., Furr, J. M., Filip, J. C., & Mathews, A. (2003). Interpretation bias in social anxiety: A dimensional perspective. *Cognitive Therapy and Research*, *27*(5), 569–577. https://doi.org/10.1023/A:1026359105456

Huppert, J. D., Pasupuleti, R. V., Foa, E. B., & Mathews, A. (2007). Interpretation biases in social anxiety: Response generation, response selection, and self-appraisals. *Behaviour Research and Therapy*, *45*(7), 1505–1515. https://doi.org/10.1016/j.brat.2007.01.006

Iancu, I., Bodner, E., & Ben-Zion, I. Z. (2015). Self-esteem, dependency, self-efficacy and self-criticism in social anxiety disorder. *Comprehensive Psychiatry*, *58*, 165–171. https://doi.org/10.1016/j.comppsych.2014.11.018

Ingram, R. E. (1990). Depressive cognition: Models, mechanisms, and methods. In R. E. Ingram (Ed.), *Contemporary psychological approaches to depression: Theory, research and treatment* (pp. 169–195). Plenum Press.

Jones, E. B., & Sharpe, L. (2017). Cognitive bias modification: A review of meta-analyses. *Journal of Affective Disorders*, *223*, 175–183. https://doi.org/10.1016/j.jad.2017.07.034

Julian, L. J. (2011). Measures of anxiety: State-Trait Anxiety Inventory (STAI), Beck Anxiety Inventory (BAI), and Hospital Anxiety and Depression Scale-Anxiety (HADS-A). *Arthritis Care and Research*, *63*(S11), 467–472. https://doi.org/10.1002/acr.20561

Kanai, Y., Sasagawa, S., Chen, J., Shimada, H., & Sakano, Y. (2010). Interpretation bias for ambiguous social behavior among individuals with high and low levels of social anxiety. *Cognitive Therapy and Research*, *34*(3), 229–240. https://doi.org/10.1007/s10608-009-9273-7

Kearney, M. W. (2017). Cross-lagged panel analysis. In M. Allen (Ed.), *The SAGE encyclopedia of communication research methods* (pp. 1–6). SAGE Publications, Inc. https://doi.org/10.4135/9781483381411.n117

Kenny, D. A., Kaniskan, B., & McCoach, D. B. (2015). The performance of RMSEA in models with small degrees of freedom. *Sociological Methods and Research*, *44*(3), 486–507. https://doi.org/10.1177/0049124114543236

Kessler, R. C., Chiu, W. T., Demler, O., & Walters, E. E. (2005). Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the national comorbidity survey replication. *Archives of General Psychiatry*, *62*(6), 617–627. https://doi.org/10.1001/archpsyc.62.6.617

Kim, L. E., Chen, L., MacCann, C., Karlov, L., & Kleitman, S. (2015). Evidence for three factors of perfectionism: Perfectionistic strivings, order, and perfectionistic concerns. *Personality and Individual Differences*, *84*, 16–22. https://doi.org/10.1016/j.paid.2015.01.033

Kline, R. B. (2011). *Principles and practice of structural equation modeling* (3rd ed.). The Guilford Press.

Kocovski, N. L., & Rector, N. A. (2007). Predictors of post-event rumination related to social anxiety. *Cognitive Behaviour Therapy*, *36*(2), 112–122. https://doi.org/10.1080/16506070701232090

Kothari, R., Egan, S. J., Wade, T. D., Andersson, G., & Shafran, R. (2016). Overcoming perfectionism: Protocol of a randomized control trial of an internet-based guided self-help cognitive behavioral therapy intervention. *JMIR Research Protocols*, *5*(4), e215. https://doi.org/10.2196/resprot.6378

Kuckertz, J. M., & Amir, N. (2014). Cognitive biases in social anxiety disorder. In S. G. Hofmann & P. M. DiBartolo (Eds.), *Social anxiety: Clinical, developmental, and social perspectives* (3rd ed., pp. 483–510). Elsevier Academic Press. https://doi.org/https://doi.org/10.1016/B978-0-12-394427-6.00016-9

Leary, M. R., & Kowalski, R. M. (1995). The self-presentation model of social phobia. In R. G. Heimberg, M. R. Liebowitz, D. A. Hope, & F. R. Schneier (Eds.), *Social phobia: Diagnosis, assessment, and treatment* (pp. 94–112). The Guilford Press.

Ledley, D. R., Foa, E. B., & Huppert, J. D. (2006). *Comprehensive cognitive behavior therapy for social phobia: A treatment manual*. https://www.div12.org/wp-content/uploads/2014/09/Comprehensive-CBT-for-Social-Phobia-manual.pdf

Lee, M., Roberts-Collins, C., Coughtrey, A., Phillips, L., & Shafran, R. (2011). Behavioural expressions, imagery and perfectionism. *Behavioural and Cognitive Psychotherapy*, *39*(4), 413–425. https://doi.org/10.1017/S1352465810000925

Levinson, C. A., & Rodebaugh, T. L. (2016). Clarifying the prospective relationships between social anxiety and eating disorder symptoms and underlying vulnerabilities. *Appetite*, *107*, 38–46. https://doi.org/10.1016/j.appet.2016.07.024

Levinson, C. A., Rodebaugh, T. L., Shumaker, E. A., Menatti, A. R., Weeks, J. W., White, E. K., Heimberg, R. G., Warren, C. S., Blanco, C., Schneier, F., & Liebowitz, M. R. (2015). Perception matters for clinical perfectionism and social anxiety. *Journal of Anxiety Disorders*, *29*, 61–71. https://doi.org/10.1016/j.janxdis.2014.11.002

Levinson, C. A., Rodebaugh, T. L., White, E. K., Menatti, A. R., Weeks, J. W., Iacovino, J. M., & Warren, C. S. (2013). Social appearance anxiety, perfectionism, and fear of negative evaluation: Distinct or shared risk factors for social anxiety and eating disorders? *Appetite*, *67*, 125–133. https://doi.org/10.1016/j.appet.2013.04.002

Limburg, K., Watson, H. J., Hagger, M. S., & Egan, S. J. (2016). The relationship between perfectionism and psychopathology: A meta-analysis. *Journal of Clinical Psychology*, *73*(10), 1301–1326. https://doi.org/10.1002/jclp.22435

Little, R. J. A. (1988). A test of missing completely at random for multivariate data with missing values. *Journal of the American Statistical Association*, *83*(404), 1198–1202. https://doi.org/10.2307/2290157

Lo, A., & Abbott, M. J. (2019). Affective and cognitive responses to repeated performance feedback across adaptive and maladaptive dimensions of perfectionism. *Canadian Journal of Behavioural Science*, *51*(4), 278–289. https://doi.org/10.1037/cbs0000144

Lovibond, S. H., & Lovibond, P. F. (1995). *Manual for the Depression Anxiety Stress Scales* (2nd ed.). Psychology Foundation.

Lundh, L. G., & Sperling, M. (2002). Social anxiety and the post-event processing of socially distressing events. *Cognitive Behaviour Therapy*, *31*(3), 129–134. https://doi.org/10.1080/165060702320338004

MacDonald, E. M., Koerner, N., Antony, M. M., Vickers, K., Mastorakos, T., & Kuo, J. (2020). Investigating the therapeutic potential of cognitive bias modification for high anxiety sensitivity. *Journal of Behavior Therapy and Experimental Psychiatry*, *68*, 1–9. https://doi.org/10.1016/j.jbtep.2019.101521

MacKinnon, D. P., Fairchild, A. J., & Fritz, M. S. (2007). Mediation analysis. *Annual Review of Psychology, 58*, 593-614. https://doi.org/10.1146/annurev.psych.58.110405.085542

Mackinnon, S. P., Battista, S. R., Sherry, S. B., & Stewart, S. H. (2014). Perfectionistic self-presentation predicts social anxiety using daily diary methods. *Personality and Individual Differences*, *56*(1), 143–148. https://doi.org/10.1016/j.paid.2013.08.038

Makkar, S. R., & Grisham, J. R. (2011a). Social anxiety and the effects of negative self-imagery on emotion, cognition, and post-event processing. *Behaviour Research and Therapy*, *49*(10), 654–664. https://doi.org/https://doi.org/10.1016/j.brat.2011.07.004

Makkar, S. R., & Grisham, J. R. (2011b). The predictors and contents of post-event processing in social anxiety. *Cognitive Therapy and Research*, *35*(2), 118–133. https://doi.org/10.1007/s10608-011-9357-z

Mandel, T., Dunkley, D. M., & Starrs, C. J. (2018). Self-critical perfectionism, daily interpersonal sensitivity, and stress generation: A four-year longitudinal study. *Journal of Psychopathology and Behavioral Assessment*, *40*(4), 701–713. https://doi.org/10.1007/s10862-018-9673-7

Martinelli, M. K., Holzinger, J. B., & Chasson, G. S. (2014). Validation of an interpretation bias assessment for body dissatisfaction. *Body Image*, *11*(4), 557–561. https://doi.org/10.1016/j.bodyim.2014.08.010

Mathews, A., & Mackintosh, B. (2000). Induced emotional interpretation bias and anxiety. *Journal of Abnormal Psychology, 109*(4), 602-615.

Mattick, R. P., & Clarke, J. C. (1998). Development and validation of measures of social phobia scrutiny fear and social interaction anxiety. *Behaviour Research and Therapy*, *36*(4), 455–470. https://doi.org/10.1016/S0005-7967(97)10031-6

Mayo-Wilson, E., Dias, S., Mavranezouli, I., Kew, K., Clark, D. M., Ades, A. E., & Pilling, S. (2014). Psychological and pharmacological interventions for social anxiety disorder in adults: A systematic review and network meta-analysis. *The Lancet Psychiatry*, *1*(5), 368–376. https://doi.org/10.1016/S2215-0366(14)70329-3

McEvoy, P. M., & Kingsep, P. (2006). The post-event processing questionnaire in a clinical sample with social phobia. *Behaviour Research and Therapy*, *44*(11), 1689–1697. https://doi.org/10.1016/j.brat.2005.12.005

McGrath, D. S., Sherry, S. S., Stewart, S. H., Mushquash, A. R., Allen, S. L., Nealis, L. J., & Sherry, D. L. (2012). Reciprocal relations between self-critical perfectionism and depressive symptoms: Evidence from a short-term, four-wave longitudinal study. *Canadian Journal of Behavioural Science*, *44*(3), 169–181. https://doi.org/10.1037/a0027764

McKnight, P. E., McKnight, K., Sidani, S., & Figueredo, J. (2007). *Missing data: A gentle introduction*. The Guilford Press.

McNeil, D. W. (2001). Terminology and evolution of constructs in social anxiety and social phobia. In S. G. Hofmann & P. M. DiBartolo (Eds.), *From social anxiety to social phobia: Multiple perspectives* (pp. 8–19). Allyn & Bacon.

Menne-Lothmann, C., Viechtbauer, W., Höhn, P., Kasanova, Z., Haller, S. P., Drukker, M., van Os, J., Wichers, M., & Lau, J. Y. F. (2014). How to boost positive interpretations? A meta-analysis of the effectiveness of cognitive bias modification for interpretation. *PLoS ONE*, *9*(6), 1–26. https://doi.org/10.1371/journal.pone.0100925

Morina, N., Lancee, J., & Arntz, A. (2017). Imagery rescripting as a clinical intervention for aversive memories: A meta-analysis. *Journal of Behavior Therapy and Experimental Psychiatry*, *55*, 6–15. https://doi.org/10.1016/j.jbtep.2016.11.003

Morrison, A. S., & Heimberg, R. G. (2013). Social anxiety and social anxiety disorder. *Annual Review of Clinical Psychology*, *9*, 249–274. https://doi.org/10.1146/annurev-clinpsy-050212-185631

Muthén, L. K., & Muthén, B. O. (2017). *Mplus statistical analysis with latent variables: User's guide* (8th ed.). Authors.

Nepon, T., Flett, G. L., Hewitt, P. L., & Molnar, D. S. (2011). Perfectionism, negative social feedback, and interpersonal rumination in depression and social anxiety. *Canadian Journal of Behavioural Science*, *43*(4), 297–308. https://doi.org/10.1037/a0025032

Newby, J., Pitura, V. A., Penney, A. M., Klein, R. G., Flett, G. L., & Hewitt, P. L. (2017). Neuroticism and perfectionism as predictors of social anxiety. *Personality and Individual Differences*, *106*, 263–267. https://doi.org/10.1016/j.paid.2016.10.057

Newsom, J. T. (2015). *Longitudinal structural equation modeling: A comprehensive introduction*. Routledge.

Ng, A. S., Abbott, M. J., & Hunt, C. (2014). The effect of self-imagery on symptoms and processes in social anxiety: A systematic review. *Clinical Psychology Review*, *34*(8), 620–633. https://doi.org/10.1016/j.cpr.2014.09.003

Nilsson, J.-E., Lundh, L.-G., & Viborg, G. (2012). Imagery rescripting of early memories in social anxiety disorder: An experimental study. *Behaviour Research and Therapy*, *50*(6), 387–392. https://doi.org/10.1016/j.brat.2012.03.004

O'Connor, D. B., O'Connor, R. C., & Marshall, R. (2007). Perfectionism and psychological distress: Evidence of the mediating effects of rumination. *European Journal of Personality*, *21*, 429–452. https://doi.org/10.1002/per.616

Owens, M. E., & Beidel, D. C. (2015). Can virtual reality effectively elicit distress associated with social anxiety disorder? *Journal of Psychopathology and Behavioral Assessment*, *37*(2), 296–305. https://doi.org/10.1007/s10862-014-9454-x

Pan, H., Liu, S., Miao, D., & Yuan, Y. (2018). Sample size determination for mediation analysis of longitudinal data. *BMC Medical Research Methodology*, *18*(1), 1–11. https://doi.org/10.1186/s12874-018-0473-2

Rachman, S., Grüter-Andrew, J., & Shafran, R. (2000). Post-event processing in social anxiety. *Behaviour Research and Therapy*, *38*(6), 611–617. https://doi.org/10.1016/s0005-7967(99)00089-3

Rapee, R. M., & Heimberg, R. G. (1997). A cognitive-behavioral model of anxiety in social phobia. *Behaviour Research and Therapy*, *35*(8), 741–756. https://doi.org/10.1016/S0005-7967(97)00022-3

Rapee, R. M., & Spence, S. H. (2004). The etiology of social phobia: Empirical evidence and an initial model. *Clinical Psychology Review*, *24*(7), 737–767. https://doi.org/10.1016/j.cpr.2004.06.004

Reimer, S. G., & Moscovitch, D. A. (2015). The impact of imagery rescripting on memory appraisals and core beliefs in social anxiety disorder. *Behaviour Research and Therapy*, *75*, 48–59. https://doi.org/10.1016/j.brat.2015.10.007

Reis, D., & Prestele, E. (2020). The role of trait and state perfectionism in psychological detachment from daily job demands. *Stress and Health*, *36*(2), 228–245. https://doi.org/10.1002/smi.2901

Rice, K. G., & Aldea, M. A. (2006). State dependence and trait stability of perfectionism: A short-term longitudinal study. *Journal of Counseling Psychology*, *53*(2), 205–212. https://doi.org/10.1037/0022-0167.53.2.205

Rice, K. G., & Ashby, J. S. (2007). An efficient method for classifying perfectionists. *Journal of Counseling Psychology*, *54*(1), 72–85. https://doi.org/10.1037/0022-0167.54.1.72

Rice, K. G., Richardson, C. M. E., & Tueller, S. (2014). The short form of the revised Almost Perfect Scale. *Journal of Personality Assessment*, *96*(3), 368–379. https://doi.org/10.1080/00223891.2013.838172

Riley, C., Lee, M., Cooper, Z., Fairburn, C. G., & Shafran, R. (2007). A randomised controlled trial of cognitive-behaviour therapy for clinical perfectionism: A preliminary study. *Behaviour Research and Therapy*, *45*(9), 2221-2231. https://doi.org/10.1016/j.brat.2006.12.003

Rowa, K., Antony, M. M., Swinson, R. P., & McCabe, R. E. (2014). A preliminary attempt to experimentally induce post event processing in social anxiety disorder. *Behavioural and Cognitive Psychotherapy*, *42*(2), 238–242. https://doi.org/10.1017/S1352465813000143

Rukmini, S., Sudhir, P. M., & Math, S. B. (2014). Perfectionism, emotion regulation and their relationship to negative affect in patients with social phobia. *Indian Journal of Psychological Medicine*, *36*(3), 239–245. https://doi.org/10.4103/0253-7176.135370

Ruscio, A. M. (2010). The latent structure of social anxiety disorder: Consequences of shifting to a dimensional diagnosis. *Journal of Abnormal Psychology*, *119*(4), 662–671. https://doi.org/10.1037/a0019341

Ruscio, A. M., Brown, T. A., Chiu, W. T., Sareen, J., Stein, M. B., & Kessler, R. C. (2008). Social fears and social phobia in the USA: Results from the National Comorbidity Survey Replication. *Psychological Medicine*, *38*(1), 15–28. https://doi.org/https://doi.org/10.1017/S0033291707001699

Saboonchi, F., & Lundh, L.-G. (1999). State perfectionism and its relation to trait perfectionism, type of situation, priming, and being observed. *Scandinavian Journal of Behaviour Therapy*, *28*(4), 154–166. https://doi.org/10.1080/028457199439900

Salemink, E., Kindt, M., Rienties, H., & van den Hout, M. (2014). Internet-based cognitive bias modification of interpretations in patients with anxiety disorders: A randomised controlled trial. *Journal of Behavior Therapy and Experimental Psychiatry*, *45*(1), 186–195. https://doi.org/10.1016/j.jbtep.2013.10.005

Salemink, E., van den Hout, M., & Kindt, M. (2009). Effects of positive interpretive bias modification in highly anxious individuals. *Journal of Anxiety Disorders*, *23*(5), 676–683. https://doi.org/10.1016/j.janxdis.2009.02.006

Salemink, E., van den Hout, M., & Kindt, M. (2010). How does cognitive bias modification affect anxiety? Mediation analyses and experimental data. *Behavioural and Cognitive Psychotherapy*, *38*(1), 59–66. https://doi.org/10.1017/S1352465809990543

Salkind, N. J. (2007). *Encyclopedia of measurement and statistics*. SAGE Publications, Inc. https://dx.doi.org/10.4135/9781412952644

Salkind, N. J. (2010). *Encyclopedia of research design*. SAGE Publications, Inc. https://doi.org/10.4135/9781412961288

Saris, W. E., Satorra, A., & van der Veld, W. M. (2009). Testing structural equation models or detection of misspecifications? *Structural Equation Modeling*, *16*(4), 561–582. https://doi.org/10.1080/10705510903203433

Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods*, *7*(2), 147–177. https://doi.org/10.1037/1082-989X.7.2.147

Schreiber, J. B., Nora, A., Stage, F. K., Barlow, E. A., & King, J. (2006). Reporting structural equation modeling and confirmatory factor analysis results: A review. *The Journal of Educational Research*, *99*(6), 323–337. https://doi.org/10.3200/JOER.99.6.323-338

Schultz, L. T., & Heimberg, R. G. (2008). Attentional focus in social anxiety disorder: Potential for interactive processes. *Clinical Psychology Review*, *28*(7), 1206–1221. https://doi.org/10.1016/j.cpr.2008.04.003

Schultz, L. T., Heimberg, R. G., Rodebaugh, T. L., Schneier, F. R., Liebowitz, M. R., & Telch, M. J. (2006). The Appraisal of Social Concerns Scale: Psychometric validation with a clinical sample of patients with social anxiety disorder. *Behavior Therapy*, *37*, 392–405.

Scott, J. H., Yap, K., Francis, A. J. P., & Schuster, S. (2014). Perfectionism and its relationship with anticipatory processing in social anxiety. *Australian Journal of Psychology*, *66*(3), 187–196. https://doi.org/10.1111/ajpy.12045

Shafran, R., Cooper, Z., & Fairburn, C. G. (2002). Clinical perfectionism: A cognitive-behavioural analysis. *Behaviour Research and Therapy*, *40*(7), 773–791. https://doi.org/10.1016/S0005-7967(01)00059-6

Shafran, R., Egan, S. J., & Wade, T. D. (2018). *Overcoming perfectionism: A self-help guide using scientifically supported cognitive behavioural techniques* (2nd ed.). Robinson.

Shikatani, B., Antony, M. M., Cassin, S. E., & Kuo, J. R. (2016). Examining the role of perfectionism and intolerance of uncertainty in post-event processing in social anxiety disorder. *Journal of Psychopathology and Behavioral Assessment*, *38*(2), 297–306. https://doi.org/10.1007/s10862-015-9516-8

Shumaker, E. A., & Rodebaugh, T. L. (2009). Perfectionism and social anxiety: Rethinking the role of high standards. *Journal of Behavior Therapy and Experimental Psychiatry*, *40*(3), 423–433. https://doi.org/10.1016/j.jbtep.2009.04.002

Silgado, J., Timpano, K. R., Buckner, J. D., & Schmidt, N. B. (2010). Social anxiety and bulimic behaviors: The moderating role of perfectionism. *Cognitive Therapy and Research*, *34*(5), 487–492. https://doi.org/10.1007/s10608-009-9278-2

Sirois, F. M., & Molnar, D. S. (2016). Conceptualizations of perfectionism, health, and well-being: An introductory overview. In F. M. Sirois & D. S. Molnar (Eds.), *Perfectionism, health, and well-being* (pp. 1–21). Springer International Publishing.

Slaney, R. B., Rice, K. G., Mobley, M., Trippi, J., & Ashby, J. S. (2001). The revised Almost Perfect Scale. *Measurement and Evaluation in Counseling and Development*, *34*(3), 130–145. https://doi.org/10.1080/07481756.2002.12069030

Smith, M. M., & Saklofske, D. H. (2017). The structure of multidimensional perfectionism: Support for bifactor model with a dominant general factor. *Journal of Personality Assessment*, *99*(3), 297–303. https://doi.org/10.1080/00223891.2016.1208209

Smith, M. M., Saklofske, D. H., Yan, G., & Sherry, S. B. (2015). Perfectionistic strivings and perfectionistic concerns interact to predict negative emotionality: Support for the tripartite model of perfectionism in Canadian and Chinese university students. *Personality and Individual Differences*, *81*, 141–147. https://doi.org/10.1016/j.paid.2014.09.006

Smith, M. M., Sherry, S. B., Vidovic, V., Hewitt, P. L., & Flett, G. L. (2020). Why does perfectionism confer risk for depressive symptoms? A meta-analytic test of the mediating role of stress and social disconnection. *Journal of Research in Personality*, *86*. https://doi.org/10.1016/j.jrp.2020.103954

Spielberger, C. D., Gorsuch, R. L., Lushene, R., Vagg, P. R., & Jacobs, G. A. (1983). *Manual for the State-Trait Anxiety Inventory*. Consulting Psychologists Press.

Spielberger, C. D., Reheiser, E. C., Ritterband, L. M., Sydeman, S. J., & Unger, K. K. (1995). Assessment of emotional states and personality traits: Measuring psychological vital signs. In J. N. Butcher (Ed.), *Clinical personality assessment: Practical approaches*. Oxford University Press.

Stein, D. J., W., Lim. C. C., Roest, A. M., de Jonge, P., Aguilar-Gaxiola, S., Al-Hamzawi, A., Alonso, J., Benjet, C., Bromet, E. J., Bruffaerts, R., de Girolamo, G., Florescu, S., Gureje, O., Haro, J. M., Harris, M. G., He, Y., Hinkov, H., Horiguchi, I., Hu, C., … WHO World Mental Health Survey Collaborators (2017). The cross-national epidemiology of social anxiety disorder: Data from the World Mental Health Survey Initiative. *BMC Medicine*, *15*(1), 1–21. https://doi.org/10.1186/s12916-017-0889-2

Stein, M. B., & Stein, D. J. (2008). Social anxiety disorder. *Lancet*, *371*(9618), 1115–1125. https://doi.org/10.1016/S0140-6736(08)60488-2

Stevenson, J. (2019). *The role of self-criticism and self compassion in social anxiety*. https://theses.flinders.edu.au/view/c4c6297e-d2f5-4487-bb16-a834db363760/1

Stoeber, J. (1998). The frost multidimensional perfectionism scale revisited: More perfect with four (instead of six) dimensions. *Personality and Individual Differences*, *24*(4), 481–491. https://doi.org/10.1016/S0191-8869(97)00207-9

Stoeber, J. (2012). The 2 x 2 model of perfectionism: A critical comment and some suggestions. *Personality and Individual Differences*, *53*(5), 541–545. https://doi.org/10.1016/j.paid.2012.04.029

Stoeber, J. (2017a). The psychology of perfectionism: An introduction. In J. Stoeber (Ed.), *The psychology of perfectionism: Theory, research, applications* (pp. 3–16). Routledge.

Stoeber, J. (2017b). The psychology of perfectionism: Critical issues, open questions, and future directions. In J. Stoeber (Ed.), *The psychology of perfectionism: Theory, research, applications* (pp. 333-352). Routledge.

Stoeber, J., & Gaudreau, P. (2017). The advantages of partialling perfectionistic strivings and perfectionistic concerns: Critical issues and recommendations. *Personality and Individual Differences*, *104*, 379–386. https://doi.org/10.1016/j.paid.2016.08.039

Stoeber, J., Madigan, D. J., & Gonidis, L. (2020). Perfectionism is adaptive and maladaptive, but what's the combined effect? *Personality and Individual Differences*, *161*, 1–9. https://doi.org/10.1016/j.paid.2020.109846

Stoeber, J., & Otto, K. (2006). Positive conceptions of perfectionism: Approaches, evidence, challenges. *Personality and Social Psychology Review*, *10*(4), 295–319. https://doi.org/10.1207/s15327957pspr1004_2

Stopa, L., & Clark, D. M. (2000). Social phobia and interpretation of social events. *Behaviour Research and Therapy*, *38*(3), 273–283. https://doi.org/10.1016/S0005-7967(99)00043-1

Stopa, L., & Clark, D. M. (2001). Social phobia: Comments on the viability and validity of an analogue research strategy and British norms for the fear of negative evaluation questionnaire. *Behavioural and Cognitive Psychotherapy*, *29*(4), 423–430. https://doi.org/10.1017/S1352465801004039

Streiner, D. L. (2005). Finding our way: An introduction to path analysis. *Research Methods in Psychiatry*, *50*(2), 115–122. https://doi.org/10.1177/070674370505000207

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). Pearson.

Telch, M. J., Lucas, R. A., Smits, J. A. J., Powers, M. B., Heimberg, R., & Hart, T. (2004). Appraisal of social concerns: A cognitive assessment instrument for social phobia. *Depression and Anxiety*, *19*(4), 217–224. https://doi.org/10.1002/da.20004

Thibodeau, M. A., Welch, P. G., Sareen, J., & Asmundson, G. J. G. (2013). Anxiety disorders are independently associated with suicide ideation and attempts: Propensity score matching in two epidemiological samples. *Depression and Anxiety*, *30*(10), 947–954. https://doi.org/10.1002/da.22203

Voncken, M. J., & Bögels, S. M. (2008). Social performance deficits in social anxiety disorder: Reality during conversation and biased perception during speech. *Journal of Anxiety Disorders*, *22*(8), 1384–1392. https://doi.org/10.1016/j.janxdis.2008.02.001

Voncken, M. J., Bögels, S. M., & de Vries, K. (2003). Interpretation and judgmental biases in social phobia. *Behaviour Research and Therapy*, *41*(12), 1481–1488. https://doi.org/10.1016/S0005-7967(03)00143-8

Walters, G. D. (2020). Explaining the drug-crime connection with peers, proactive criminal thinking, and victimization: Systemic, cognitive social learning, and person proximity mechanisms. *Psychology of Addictive Behavious*. https://doi.org/10.1037/adb0000606

Waters, A. M., Craske, M. G., Bergman, R. L., & Treanor, M. (2008). Threat interpretation bias as a vulnerability factor in childhood anxiety disorders. *Behaviour Research and Therapy*, *46*(1), 39–47. https://doi.org/10.1016/j.brat.2007.10.002

Williams, J., & MacKinnon, D. P. (2008). Resampling and distribution of the product methods for testing indirect effects in complex models. *Structural Equation Modeling*, *15*(1), 23–51. https://doi.org/10.1080/10705510701758166

Wilson, J. K., & Rapee, R. M. (2005). The interpretation of negative social events in social phobia with versus without comorbid mood disorder. *Journal of Anxiety Disorders*, *19*(3), 245–274. https://doi.org/10.1016/j.janxdis.2004.03.003

Wolf, E. J., Harrington, K. M., Clark, S. L., & Miller, M. W. (2013). Sample size requirements for structural equation models: An evaluation of power, bias, and solution propriety. *Educational and Psychological Measurement*, *73*(6), 913–934. https://doi.org/10.1177/0013164413495237

Wong, J., Gordon, E. A., & Heimberg, R. G. (2014). Cognitive-behavioral models of social anxiety disorder. In J. W. Weeks (Ed.), *The Wiley Blackwell handbook of social anxiety disorder* (1st ed., pp. 3–23). John Wiley & Sons, Ltd.

Wong, Q. J. J. (2015). Psychometric evaluation of the English version of the Extended Post-event Processing Questionnaire. *Anxiety, Stress, & Coping*, *28*(2), 215–225. https://doi.org/10.1080/10615806.2014.925546

Wong, Q. J. J., & Rapee, R. M. (2016). The aetiology and maintenance of social anxiety disorder: A synthesis of complimentary theoretical models and formulation of a new integrated model. *Journal of Affective Disorders*, *203*, 84–100. https://doi.org/10.1016/j.jad.2016.05.069

Yang, R., Cui, L., Li, F., Xiao, J., Zhang, Q., & Oei, T. P. S. (2017). Effects of cognitive bias modification training via smartphones. *Frontiers in Psychology*, *8*, 1–8. https://doi.org/10.3389/fpsyg.2017.01370

Yiend, J., Savulich, G., Coughtrey, A., & Shafran, R. (2011). Biased interpretation in perfectionism and its modification. *Behaviour Research and Therapy*, *49*(12), 892–900. https://doi.org/10.1016/j.brat.2011.10.004

Appendix A

Social Phobia Inventory (Connor et al., 2000)

Instructions: Rate each of the following statements on a scale of 1 ("not at all") to 5 ("extremely").

	Not at all 0	A little bit 1	Somewhat 2	Very much 3	Extremely 4
1. Fear of embarrassment causes me to avoid doing things or speaking to people.					
2. I avoid activities in which I am the centre of attention.					
3. Being embarrassed of looking stupid are among my worst fears.					
4. I am afraid of people in authority.					
5. I am bothered by blushing in front of people.					
6. Parties and social events scare me.					
7. I avoid talking to people I don't know.					
8. Being criticised scares me a lot.					
9. Sweating in front of people causes me distress.					
10. I avoid going to parties.					
11. Talking to strangers scares me.					
12. I avoid having to give speeches.					
13. I would do anything to avoid being criticised.					
14. Heart palpitations bother me when I am around people.					
15. I am afraid of doing things when people might be watching.					
16. I avoid speaking to anyone in authority.					
17. Trembling or shaking in front of others is distressing to me.					

Appendix B

Frost Multidimensional Perfectionism Scale (Frost et al., 1990)

Please answer the following questions in relation to how much they apply to you. Do not spend too much time on any one question.

	1- Strongly disagree				5- Strongly agree
1. My parents set very high standards for me					
2. Organisation if very important to me					
3. As a child, I was punished for doing things less than perfect					
4. If I do not set the higher standards for myself, I am likely to end up a second-rate person					
5. My parents never tried to understand my mistakes					
6. It is important to me that I am thoroughly competent in everything I do					
7. I am a neat person					
8. I try to be an organised person					
9. If I fail at work/school, I am a failure as a person					
10. I should be upset if I make a mistake					
11. My parents set very high standards for me					
12. I set higher goals than most people					
13. If someone does a task at work/school better than I, then I feel like I failed the whole task					
14. If I fail partly, it is as bad as being a complete failure					
15. Only outstanding performance is good enough in my family					
16. I am very good at focusing my efforts on attaining a goal					
17. Even when I do something very carefully, I often feel that it is not quite right					
18. I hate being less than the best at things					
19. I have extremely high goals					

	1- Strongly disagree				5- Strongly agree
20. My parents have expected excellence from me					
21. People will probably think less of me if I make a mistake					
22. I never felt like I could meet my parents' expectations					
23. If I do not do as well as other people, it means I am an inferior human being					
24. Other people seem to accept lower standards than I do					
25. If I do not do well all the time, people will not respect me					
26. My parents have always had higher expectations for my future than I have					
27. I try to be a neat person					
28. I usually have doubts about the simple everyday things I do					
29. Neatness is very Important to me					
30. I expect higher performance in my daily tasks than most people					
31. I am an organized person					
32. I tend to get behind in my work because I repeat things over and over					
33. It takes me a long time to do something "right"					
34. The fewer mistakes I make, the more people will like me					
35. I never felt like I could meet my parents' standards					

Appendix C

Multidimensional Perfectionism Scale (Hewitt et al., 1991)

Listed below are a number of statements concerning personal characteristics and traits. Read each item and decide whether you agree or disagree & to what extent.

		Disagree 1	2	3	4	5	6	Agree 7
1	When I am working on something, I cannot relax until it is perfect							
2	I am not likely to criticize someone for giving up too easily							
3	It is not important that people I am close to are successful							
4	I seldom criticize my friends for accepting second best							
5	I find it difficult to meet others' expectations of me							
6	One of my goals is to be perfect in everything I do							
7	Everything that others do must be of top-notch quality							
8	I never aim for perfection on my work							
9	Those around me readily accept that I can make mistakes too							
10	It doesn't matter when someone close to me does not do their absolute best							
11	The better I do, the better I am expected to do							
12	I seldom feel the need to be perfect							

		Disagree 1	2	3	4	5	6	Agree 7
13	Anything that I do that is less than excellent will be seen as poor work by those around me							
14	I strive to be as perfect as I can be							
15	It is very important that I am perfect in everything I attempt							
16	I have high expectations for the people who are important to me							
17	I strive to be the best at everything I do							
18	The people around me expect me to succeed at everything I do							
19	I do not have very high standards for those around me							
20	I demand nothing less than perfection of myself							
21	Others will like me even if I don't excel at everything							
22	I can't be bothered with people who won't strive to better themselves							
23	It makes me uneasy to see an error in my work							
24	I do not expect a lot from my friends							
25	Success means that I must work even harder to please others							
26	If I ask someone to do something, I expect it to be done flawlessly							
27	I cannot stand to see people close to me make mistakes							
28	I am perfectionistic in setting my goals							
29	The people who matter to me should never let me down							

		Disagree 1	2	3	4	5	6	Agree 7
30	Others think I am okay, even when I do not succeed							
31	I feel that people are too demanding of me							
32	I must work to my full potential at all times							
33	Although they may not say it, other people get very upset with me when I slip up							
34	I do not have to be the best at whatever I am doing							
35	My family expects me to be perfect							
36	I do not have very high goals for myself							
37	My parent rarely expected me to excel in all aspects of my life							
38	I respect people who are average							
39	People expect nothing less than perfection from me							
40	I set very high standards for myself							
41	People expect more from me than I am capable of giving							
42	I must always be successful at school or work							
43	It does not matter to me when a close friend does not try their hardest							
44	People around me think I am still competent even if I make a mistake							
45	I seldom expect others to excel at whatever they do.							

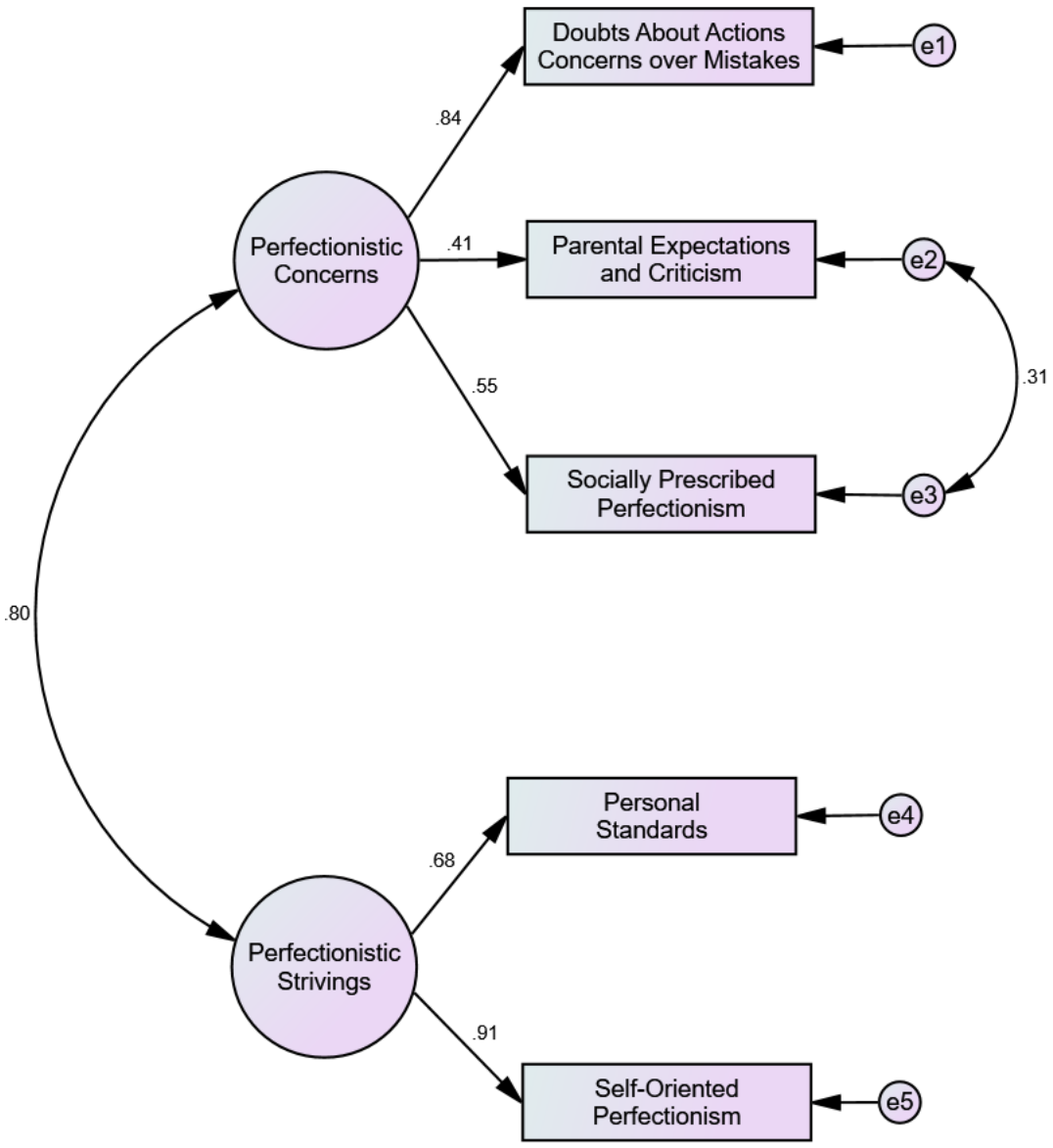
Appendix D

Confirmation of the Factor Structure of Perfectionistic Concerns and Perfectionistic Strivings

IBM SPSS AMOS version 25 was used to test the factor structure of perfectionistic concerns and perfectionistic strivings, using data from 480 participants who completed the first wave of Study 1. An initial test was conducted including the all the subscales from the Frost Multidimensional Perfectionism Scale (Frost et al., 1990) and the Multidimensional Perfectionism Scale (Hewitt et al., 1991) originally proposed to be part of perfectionistic concerns (i.e., Doubts About Actions and Concerns over Mistakes, Parental Expectations and Criticism, and Socially Prescribed Perfectionism) and perfectionistic strivings (i.e., Personal Standards, Organisation, Self-Oriented Perfectionism, and Other-Oriented Perfectionism). Correlation of error terms were allowed in accordance with modification indices reported by AMOS, but only amongst subscales belonging to the same factor (i.e., no error term correlations across factors were allowed; Kline, 2011). This initial model had overall poor fit, χ^2 (9, 480)= 28.19, $p < .001$, $\chi^2/ df = 3.13$, CFI = 0.98, SRMR = 0.03, RMSEA = .07 (90% CI: .04, .10), and the subscales of Other-Oriented Perfectionism and Organisation had low factor loadings (.31 and .37, respectively; Salkind, 2010). These subscales were dropped from the factor structure of perfectionistic strivings and the model was re-tested. A model without these subscales had a good fit, χ^2 (3, 480)= 3.42, $p = .331$, $\chi^2/ df = 1.14$, CFI = 0.99, SRMR = 0.01, RMSEA = .02 (90% CI: .00, .08) and all remaining subscales had satisfactory factor loadings (see Figure D.1).

Figure D.1

Structure of Perfectionistic Concerns and Perfectionistic Strivings Factors



Note. Standardised factor loadings are shown.

Appendix E

Interpretation and Judgement Questionnaire (Voncken et al., 2003)

Each question is followed by four different answers. Imagine yourself in each situation. Which of the four answers do you find most plausible? Please read each answer carefully and arrange them in the order they would be most likely to come to your mind if you were in this situation. Assign number 1 to the explanation that is most likely for you, assign number 2 to the bit less likely answer, number 3 to the less likely answer and number 4 to the least likely answer. Do not worry if the answers don't exactly match with what you would think in such a situation. There are no right or wrong orders.

After you have put the answers in order of likeliness, you are asked to rate how probable a certain answer would be for you if it was really true. This answer may or may not be one that you have indicated to be most plausible. To answer this, read the questions attentively.

To answer the questions about the probability, you have to mark the line under the question. To answer the question about probability, the interpretation will be: The more you put the mark to the left, the smaller you think the probability is. The more you put the mark to the right, the higher the probability will be. Below you will find an example for clarification.

EXAMPLE:

You are cooking a new recipe and the food looks different than on the photo in the cookery book.

Why do you think the food looks different than on the photo?

A. I ruined the food.

B. On a photo it always looks different.

C. I made a mistake during the preparation.

D. The food turned out better than on the photo.

1st	**2nd**	**3rd**	**4th**
C	A	B	D

(In this case you think it is most likely that you made a mistake during the preparation and that it is least likely that the food turned out better than on the photo)

How **probable** is it that you *really* ruined the food?

0% ----------|---------- 100%

(Herewith you indicate that the probability that you really ruined the food is about 60%. The more you put the mark to the right the higher you think the probability is. The more you put the mark to the left the smaller you think the probability will be.)

1. You are with a group of people. When you start talking, nobody looks at you.

Why is nobody looking at you?

A. They do not count on me saying something.

B. They do not want me in the group because they don't think I am interesting.

C. I didn't choose the right moment to say something.

D. By accident, they are not looking at me. They will be interested in what I have to say though.

1st	2nd	3rd	4th

How **probable** do you think it is that they *really* don't want you in the group because they don't think you are interesting?

0% ---------- 100%

2. You are on the telephone to your bank trying to sort out an error in your account. The telephonist can't answer your questions and you ask to speak to someone who can help you out. As she is transferring you, you overhear her say that there's a really annoying customer on the phone.

Why does the telephonist say this?

A. Telephonists are simply used to be grouchy to everybody.

B. She thinks I am an annoying customer, but she is used to think that about other people as well.

C. She is in a bad mood.

D. She thinks I am one of the most annoying customers she has ever had.

1st	2nd	3rd	4th

How **probable** is it that she *really* thinks you are one of the most annoying customers she has ever had?

0% ---------- 100%

3. You stand alone at a party when an unknown person looks in your direction.

Why does this unknown person look in your direction?

A. This person fancies me and tries to contact with me.

B. This person is coincidentally looking in my direction.

C. This person notices I am alone and (s)he thinks that I am a boring person. (S)he therefore pities me.

D. This person notices I am alone and (s)he thinks that I am bored. (S)he feels a bit sorry for me.

1st	2nd	3rd	4th

How **probable** is it that this person *really* thinks that you are a boring person and therefore *really* pities you?

0% ---------- 100%

4. You are in a conversation with some colleagues when they tell you they're offended by something you have said.

How do you think you'll get along in the future?

A. We will get along even better, because you really get to know each other due to such a confrontation.

B. They won't like me very much anymore.

C. Because I offended them, they don't want to be in touch with me anymore.

D. Our relationship won't change, because we will clear this up.

1st	2nd	3rd	4th

How **probable** is it that they *really* don't want to be in touch with you anymore?

0% ---------- 100%

5. You are introduced to a friend of one of your best friends. This new person does not say anything to you.

Why isn't this person talking to you?

A. This person waits to see which way the cat jumps.

B. I didn't respond friendly enough to him/her.

C. This person doesn't like me.

D. There is no reason why we shouldn't get along.

1st	2nd	3rd	4th

How **probable** do you think it is that this person *really* doesn't like you?

0% ---------- 100%

6. You have an argument with a good friend about a topic that you care about. This friend gets angry and says you are wrong.

How does this argument affect your friendship?

A. Eventually, this argument won't affect our friendship.

B. Even the best friends are bound to disagree sometimes. It will improve our friendship.

C. This argument will damage our friendship severely.

D. Because of this argument, our friendship will be less close in the future.

1st	2nd	3rd	4th

How **probable** do you think it is that this argument *really* damages your friendship severely?

0% ---------- 100%

7. You are wearing new clothes when someone compliments you on the way you look.

Why does this person compliment you?

A. This person dislikes my new clothes, but compliments me because (s)he feels sorry for me.

B. This person thinks I am attractive.

C. This person likes my new clothes.

D. This person notices that I wear new clothes and compliments me because that's how it should be.

1st	2nd	3rd	4th

How **probable** do you think it is that this person *really* dislikes your clothes, but compliments you because (s)he feels sorry for you?

0% ---------- 100%

8. In a supermarket, you ask a question to a grocery clerk. He doesn't pay any attention to you and continues with what he was doing.

Why is he continuing with what he was doing?

A. The grocery clerk doesn't think I'm important enough to be bothered by.

B. I asked my question too vaguely.

C. The grocery clerk didn't hear my question.

D. The grocery clerk is very busy, but will definitely try to help me.

1st	2nd	3rd	4th

How **probable** do you think it is that the grocery clerk *really* thinks you aren't important enough to be bothered by?

0% ---------- 100%

9. There is a lot of money debited from your bank account. However, you have never given this order.

What do you think will happen to your money?

A. It will take a lot of time and it's possible I'll never get the money back.

B. Of course, I will receive the money with interest.

C. It will be tough, but I will receive the money eventually.

D. I will never get the money back, so I'll get into trouble.

1st	2nd	3rd	4th

How **probable** do you think it is that you'll *really* loose the money and that you'll *really* get into trouble?

0% ---------- 100%

10. Via your company, you got a beautiful new bicycle for free. It's a bike you've always wanted. After a working day, you walk to the bycicle shed.

What do you think about the bicycle at that moment?

A. I am really looking forward to ride home at my beautiful bike.

B. My new bike has probably been stolen.

C. I am delighted I am going to ride around proudly again.

D. I hope the bike is still in the shed.

1st	2nd	3rd	4th

How **probable** do you think it is that your bike is *really* stolen?

0% ---------- 100%

11. You made an appointment with an acquaintance to go to the cinema. Shortly before the appointment however, the acquaintance leaves a message on your answering machine to cancel.

Why does the acquaintance cancel the appointment?

A. This acquaintance doesn't like me.

B. This acquaintance made a double appointment and doesn't think our appointment is important enough.

C. This acquaintance would have really liked to go to the cinema with me, but couldn't get out of another unpleasant appointment.

D. This acquaintance isn't feeling very well.

1st	2nd	3rd	4th

How **probable** do you think it is the acquaintance doesn't *really* like you?

0% ---------- 100%

12. There is a colleague at work with whom you have little contact. Through a mutual friend you discover that the colleague dislikes you.

What does this mean to you?

A. It's unfortunate that this colleague doesn't like me, but it doesn't bother me.

B. I'm glad we manage to work together pretty well.

C. I worry about the things I could have done wrong.

D. If this colleague doesn't like me, other colleagues will probably dislike me as well.

1st	2nd	3rd	4th

How **probable** do you think it is that other colleagues will *really* dislike you?

0% ---------- 100%

13. At the street, you run into someone you know. This person smiles at you.

Why is this person smiling at you?

A. This person laughs at me.

B. This person is happy to see me.

C. This person laughs dutifully, but doesn't really like running into me.

D. This person greets me, like (s)he greets every other acquaintance.

1st	2nd	3rd	4th

How **probable** do you think it is that this person *really* laughs at you?

0% ---------- 100%

14. You gave a talk to a group of people. When you are finished, they applaud.

Why do they applaud?

A. They think my talk was awful and don't mean anything by the applause.

B. They enjoyed my talk.

C. They are enthusiast about my talk and would like to thank me for it.

D. They applaud because it's a habit (?) to applaud after a talk.

1st	2nd	3rd	4th

How **probable** do you think it is that they *really* disliked your talk and *really* didn't mean anything by the applause?

0% ---------- 100%

15. Two acquaintances look into your direction and talk with each other.

Why do they look into your direction and talk to each other?

A. They like me and want to involve me in their conversation.

B. They gossip about me.

C. They just happen to look my way.

D. They are talking about me; they are criticizing me.

1st	2nd	3rd	4th

How **probable** do you think it *really* is they gossip about you?

0% ---------- 100%

16. You receive a letter, which states 'URGENT' on the envelope.

What is the letter about?

A. I forgot to pay a bill.

B. I won a wonderful price.

C. It's about someone I know who is seriously ill or has died.

D. It's a circular, which is designed to attract my attention.

1st	2nd	3rd	4th

How **probable** do you think it is that you'll *really* read about someone who is seriously ill or has died?

0% ---------- 100%

17. A couple of acquaintances ask you to join them to the cinema.

Why do they ask you to join them to the cinema?

A. They enjoy visiting the cinema with me.

B. They always ask anybody to join them.

C. They would like to become good friends.

D. They actually don't like me, but ask me because of their sense of duty.

1st	2nd	3rd	4th

How **probable** do you think it is that they *really* don't like you, but ask you because of their sense of duty?

0% ---------- 100%

18. You have just moved when your new neighbours come over with flowers.

Why do your neighbours bring you flowers?

A. They think they are obliged to bring me flowers and hope I won't contact them in the future.

B. They'd like to welcome me.

C. They always bring flowers to new neighbours.

D. They think I am a nice and kind person, with whom they can stay in touch (dekt dit het 'contact opbouwen' uit de Nederlandse zin?).

1st	2nd	3rd	4th

How **probable** is it that they *really* think it's an obligation to bring you flowers and that they *truly* hope that you won't contact them in the future?

0% ---------- 100%

19. You've bought a new television, which you're programming at home. When you push a button, the television suddenly doesn't work anymore.

What do you think at that moment?

A. Because of the labour guarantee *(?)*, the problem will be fixed quickly.

B. I broke down the television.

C. This will take me quite a while.

D. I will succeed in fixing this problem by myself.

1st	2nd	3rd	4th

How **probable** do you think it is that you *really* broke down your television?

0% ---------- 100%

20. You have been talking to someone on a party for a long time. This person excuses himself, gets himself a drink and starts talking to someone else.

Why does this person start talking to someone else?

A. (S)he lost interest in the conversation.

B. (S)he would like to get to know other people at the party as well.

C. (S)he really liked talking to me, but saw someone whom (s)he hasn't seen for a long time.

D. (S)he thought I was boring.

1st	2nd	3rd	4th

How **probable** do you think it is (s)he *really* thinks you are a boring?

0% ---------- 100%

21. Not long after starting your new job, your boss asks to see you.

Why would your boss like to talk to you?

A. He is going to tell me how well I have been doing.

B. He wants to make sure I have settled in all right.

C. I made a small mistake, but I think it will turn out fine.

D. I made a terrible mistake and will get fired.

1st	2nd	3rd	4th

How **probable** is it you've *really* made a terrible mistake and that you'll *really* get fired?

0% ---------- 100%

22. You are walking down the aisle in the supermarket when an attractive man/woman bumps into you. This person turns around to look at you.

Why does this person turn and look at you?

A. This person is annoyed by me and expects me to apologize.

B. This person would like to tell me (s)he's sorry.

C. This person is mad at me and wants to talk to me about it.

D. This person thinks I am attractive as well and would like to start a conversation.

1st	2nd	3rd	4th

How probable do you think it is that this person is *really* mad at you and *really* wants to talk to you about it?

0% ---------- 100%

23. During a conversation you are talking about something, which has happened to you lately. During a phrase your conversation partner suddenly interrupts you.

Why does this person interrupt you?

A. This person is very interested in what I say and would like to know more about the subject.

B. This person thinks I'm a dull and uninteresting person.

C. This person doesn't think it's very interesting what I was saying and wants to change the subject.

D. This person likes to respond to something I've just said.

1st	2nd	3rd	4th

How probable do you think it is that this person *really* thinks you're a dull and uninteresting person?

0% ---------- 100%

24. You made your friends laugh. However, when you have left, your partner tells you that you made a fool of yourself.

What do you think your friends think of you?

A. My partner might be right. My friends might think I'm weird.

B. My partner is right. My friends will think I am weird and will have doubts about our friendship.

C. I have another opinion than my partner. My friends just think I'm funny and amusing.

D. I may have made a fool of myself, but that happens to anyone. My friends won't think any worse of me for that.

1st	2nd	3rd	4th

How **probable** is it that your friends think that you are *really* weird and that they *really* doubt about your friendship?

0% ---------- 100%

Appendix F

Extended Post-Event Processing Questionnaire (Q. J. J. Wong et al., 2015) and Appraisal of Social Scenarios (Telch et al., 2004) (Study 1)

We would like you to remember one specific social situation, which has led to unreasonably strong or unrealistic anxiety or discomfort, or in which you had a strong feeling of shame. Please let yourself be guided by the situations listed below. The situation should have been of personal relevance to you, and it should have happened during the past six months.

If you remember more than one situation, please choose the one that was most relevant for you. For example, if 0 was no anxiety and 100 was extreme anxiety, pick a scenario that would represent at least 70. If none of the scenarios have caused you this level of anxiety, please pick the closest. If none of the following scenarios have caused you anxiety, but another type of social scenario has caused you anxiety, please pick “other” and describe the scenario. If no social scenarios have ever caused you anxiety, please pick “no social scenarios have caused me anxiety”. Please select the situation you have chosen and remember to refer to this situation while answering the following questions.

Talking in front of a group Initiating a romantic relationship
Being at a party Dating someone
Talking to authorities
Oral exams/presentations
Participating in group activities
Eating/drinking/writing in public
Using public restrooms
Talking on the phone with others listening
Returning goods to a store

Giving a party

Beginning/maintaining a conversation

Formal and informal meetings

Being criticized

Talking on the phone

Other:

No social situations have caused me anxiety

Please indicate how much anxiety the chosen scenario has caused you:

No anxiety at all										Extreme anxiety
0	10	20	30	40	50	60	70	80	90	100

Extended Post-Event Processing Questionnaire

Thinking about your chosen scenario, please use the scale below (0-100) to rate how concerned you felt about the following things happening:

	0 Not at all, never	10	20	30	40	50	60	70	80	90	100 Very much so, always
1. After the event was over, did you think about it a lot?											
2. Did your memories and thoughts about the event keep coming into your head even when you did not with to think about it again?											
3. Did the thoughts about the event interfere with your concentration?											
4. Did you find it difficult to forget about the event?											
5. Did you try to resist thinking about the event?											
6. If you repeatedly thought about the event, did your feelings about the event worsen?											
7. Have you ever wondered about whether you could have avoided or prevented your behaviour/ feelings during the event?											
8. Have you ever wished that you could turn the clock back and do it again but better this time?											
9. As a result of the event, will you now avoid similar situations?											
10. Did the situation reinforce your pre-existing avoidance of similar situations?											
11. Did you experience a sense of shame while remembering your behaviour during the event?											

	0 Not at all, never	10	20	30	40	50	60	70	80	90	100 Very much so, always
12. Did you think about anxious feelings that you had experienced during the event?											
13. When remembering the situation, did other instances of past failure that you had experienced in the same way come into your mind?											
14. Did you criticize yourself for your behaviour in the situation?											
15. Did you think about the event more than you wanted to?											
16. Did you think about the bodily sensations you had experienced during the situation?											
	0 … in a negative way	10	20	30	40	50	60	70	80	90	100 … in a positive way
17. In my memories about the event, I saw myself (my behaviour, my attributes)…											

Appraisal of Social Concerns (ASC)

Instructions: Imagining yourself in the above social scenario, please use the scale below (0 – 100) to rate how concerned you would feel about the following things happening.

	0 Not at all concerned	10 20 30 Mildly concerned	40 50 60 Moderately concerned	70 80 90 Very concerned	100 Extremely concerned
1. Trembling					
2. Appearing stupid					
3. People laughing at you					
4. Blushing (turning red)					
5. People ignoring you					
6. People staring at you					
7. Twitching					
8. Poor voice quality (cracking, stuttering, squeaking, etc)					
9. Appearing incompetent					
10. Being incoherent					
11. Losing control (screaming, running out, etc)					
12. Not performing adequately					
13. Being tense					
14. Appearing weird					
15. People ridiculing you					
16. Not being able to think (mind going blank)					
17. Appearing ugly					
18. Appearing weak					
19. People rejecting you					

0 Not at all concerned	10	20	30 Mildly concerned	40	50	60 Moderately concerned	70	80	90 Very concerned	100 Extremely concerned
20. Sweating										

Appendix G

Frequencies of Chosen Social Scenarios (Study 1)

Table G.1

Frequencies of Chosen Social Scenarios for the Extended Post-Event Processing Questionnaire and Appraisal of Social Concerns Questionnaire at Times 1, 2, and 3 (Study 1).

	Time 1	Time 2	Time 3
1. Talking in front of a group	7.0%	8.4%	8.4%
2. Initiating a romantic relationship	5.6%	4.2%	2.8%
3. Being at a party	11.2%	7.7%	7.0%
4. Dating someone	5.6%	2.8%	0.7%
5. Talking to authorities	9.1%	3.5%	4.2%
6. Oral exams/presentations	9.8%	4.2%	2.1%
7. Participating in group activities	8.4%	4.9%	4.9%
8. Eating/drinking/ writing in public	1.4%	2.1%	2.1%
9. Using public restrooms	1.4%	1.4%	0.7%
10. Talking on the phone with others listening	1.4%	2.1%	2.1%
11. Returning goods to a store	1.4%	1.4%	2.1%
12. Giving a party	2.1%	1.4%	2.1%
13. Beginning/ maintaining a conversation	9.1%	9.1%	5.6%
14. Formal and informal meetings	2.1%	3.5%	1.4%
15. Being criticised	10.5%	9.1%	2.1%
16. Talking on the phone	4.9%	3.5%	6.3%
17. Other	6.3%	2.1%	6.3%
18. No social scenarios have caused me anxiety	2.8%	1.4%	0.0%

Appendix H

Additional Cross-Lagged Panel Models (Study 1)

A cross-lagged panel model of social anxiety and perfectionistic concerns was tested using constraints. Model fit was poor, χ^2 (6, 143) = 16.32, p = .012, χ^2/ df = 2.72, CFI = 0.98, SRMR = 0.04, RMSEA = .11 (90% CI: .05, .18). A test of an unconstrained model was statistically equivalent as shown by a non-significant chi-scare difference test, p = .644. Path coefficients for the constrained model can be seen in Table H.1.

Table H.1

Pathways of Cross-Lagged Panel Model of Social Anxiety and Perfectionistic Concerns

	b	SE_b	*p*
Autoregressive paths			
Social Anxiety -> Social Anxiety	0.73	0.05	< .001
Perfectionistic Concerns -> Perfectionistic Concerns	0.69	0.05	< .001
Cross-lagged paths			
Social Anxiety -> Perfectionistic Concerns	-0.01	0.04	.764
Perfectionistic Concerns -> Social Anxiety	0.02	0.04	.604

Note. b = unstandardized coefficient. SE_b = standard error of the coefficients.

A cross-lagged panel model of social anxiety and perfectionistic strivings was also tested using constraints, and model fit was good, χ^2 (6, 143) = 9.54, p = .145, χ^2/ df = 1.59, CFI = 0.99, SRMR = 0.03, RMSEA = .06 (90% CI: .00, .14). A non-significant chi-square test comparing this constrained model to an unconstrained model was not significant, p = .171, indicating the models were statistically equivalent. Path coefficients for the constrained model are presented in Table H.2

Table H.2

Pathways of Cross-Lagged Panel Model of Social Anxiety and Perfectionistic Strivings

	b	SE_b	*p*
Autoregressive paths			
Social Anxiety -> Social Anxiety	0.73	0.06	< .001
Perfectionistic Strivings -> Perfectionistic Strivings	0.75	0.05	< .001
Cross-lagged paths			
Social Anxiety -> Perfectionistic Strivings	0.05	0.04	.221
Perfectionistic Strivings -> Social Anxiety	-0.01	0.04	.899

Note. b = unstandardized coefficient. SE_b = standard error of the coefficients.

Appendix I

Direct and Indirect Estimates of the Full Longitudinal Mediation Model (Study 1)

Table I.1

Direct Effects for the Full Longitudinal Mediation Model (Constrained Model)

Predictor	Outcome	*b*	SE_b	*p*
Social Anxiety	Social Anxiety	0.79	0.06	< .001
	Perfectionistic Concerns	-0.04	0.06	.495
	Perfectionistic Strivings	0.04	0.06	.535
	NIB	0.16	0.06	.009
	NSI	0.27	0.09	.001
	PEP	0.20	0.09	.027
Perfectionistic Concerns	Social Anxiety	-0.01	0.05	.817
	Perfectionistic Concerns	0.76	0.08	< .001
	Perfectionistic Strivings	0.09	0.08	.226
	NIB	0.01	0.06	.899
	NSI	0.02	0.07	.832
	PEP	0.03	0.08	.675
Perfectionistic Strivings	Social Anxiety	-0.02	0.05	.676
	Perfectionistic Concerns	0.02	0.08	.810
	Perfectionistic Strivings	0.65	0.09	< .001
	NIB	0.01	0.05	.889
	NSI	0.05	0.07	.459
	PEP	0.02	0.08	.826
NIB	Social Anxiety	0.09	0.04	.031
	Perfectionistic Concerns	0.05	0.05	.360
	Perfectionistic Strivings	0.06	0.04	.117

Predictor	Outcome	*b*	SE_b	*p*
NSI	Social Anxiety	-0.05	0.06	.422
	Perfectionistic Concerns	-0.07	0.06	.292
	Perfectionistic Strivings	-0.09	0.06	.150
PEP	Social Anxiety	0.06	0.05	.203
	Perfectionistic Concerns	0.12	0.06	.069
	Perfectionistic Strivings	0.09	0.06	.170

Note. *b* = unstandardized coefficient. SE_b = standard error of the coefficient. T = Time. NIB = Negative Interpretation bias. NSI = Negative self-imagery. PEP = Post-event processing.

Table I.2

Indirect Effects for the Full Longitudinal Mediation Model (Constrained Model)

Predictor	Outcome	Mediators	*b*	SE_b	95% CI	
					LB	UB
Social anxiety	Social Anxiety	IB	0.01	0.01	0.00	0.04
		NSI	-0.01	0.02	-0.05	0.01
		PEP	0.01	0.01	-0.01	0.04
	Perfectionistic Concerns	NIB	0.01	0.01	-0.01	0.03
		NSI	-0.02	0.02	-0.06	0.01
		PEP	0.02	0.02	0.00	0.07
	Perfectionistic Strivings	NIB	0.01	0.01	0.00	0.03
		NSI	-0.02	0.02	-0.07	0.01
		PEP	0.02	0.01	0.00	0.05
Perfectionistic Concerns	Social Anxiety	NIB	0.00	0.01	-0.01	0.01
		NSI	0.00	0.01	-0.02	0.01
		PEP	0.00	0.01	-0.01	0.02
	Perfectionistic Concerns	NIB	0.00	0.01	-0.01	0.01
		NSI	0.00	0.01	-0.02	0.01
		PEP	0.00	0.01	-0.01	0.04
	Perfectionistic Strivings	NIB	0.00	0.01	-0.01	0.01
		NSI	0.00	0.01	-0.02	0.01
		PEP	0.00	0.01	-0.01	0.03

Predictor	Outcome	Mediators	*b*	SE_b	95% CI	
					LB	UB
Perfectionistic Strivings	Social Anxiety	NIB	0.00	0.01	-0.01	0.01
		NSI	0.00	0.01	-0.03	0.00
		PEP	0.00	0.01	-0.01	0.02
	Perfectionistic Concerns	NIB	0.00	0.00	-0.01	0.01
		NSI	0.00	0.01	-0.04	0.00
		PEP	0.00	0.01	-0.02	0.03
	Perfectionistic Strivings	NIB	0.00	0.00	-0.01	0.01
		NSI	-0.01	0.01	-0.03	0.01
		PEP	0.00	0.01	-0.01	0.03

Note. b = unstandardized coefficient. SE_b = standard error of the coefficient. LB = Lower bound. UB = Upper Bound. T = Time. NIB = Negative Interpretation Bias. NSI = Negative Self-Imagery. PEP = Post-Event Processing.

Appendix J

Appraisal of Social Concerns (Telch et al., 2004; Study 2)

Thinking about the interaction task you just participated in, please use the scale below (0 – 100) to rate how concerned you felt about the following things happening.

	0 Not at all concerned	10 20 30 Mildly concerned	40 50 60 Moderately concerned	70 80 90 Very concerned	100 Extremely concerned
1. Trembling					
2. Appearing stupid					
3. People laughing at you					
4. Blushing (turning red)					
5. People ignoring you					
6. People staring at you					
7. Twitching					
8. Poor voice quality (cracking, stuttering, squeaking, etc)					
9. Appearing incompetent					
10. Being incoherent					
11. Losing control (screaming, running out, etc)					
12. Not performing adequately					
13. Being tense					
14. Appearing weird					
15. People ridiculing you					
16. Not being able to think (mind going blank)					
17. Appearing ugly					
18. Appearing weak					

	0 Not at all concerned	10	20	30 Mildly concerned	40	50	60 Moderately concerned	70	80	90 Very concerned	100 Extremely concerned
19. People rejecting you											
20. Sweating											

Appendix K

Extended Post-Event Processing Questionnaire (Q. J. J. Wong, 2015; Study 2)

Thinking about the interaction task you participated in yesterday, please use the scale below (0 – 100) to rate your thoughts over the past 24 hours.

	0 Not at all, never	10	20	30	40	50	60	70	80	90	100 Very much so, always
1. After the event was over, did you think about it a lot?											
2. Did your memories and thoughts about the event keep coming into your head even when you did not with to think about it again?											
3. Did the thoughts about the event interfere with your concentration?											
4. Did you find it difficult to forget about the event?											
5. Did you try to resist thinking about the event?											
6. If you repeatedly thought about the event, did your feelings about the event worsen?											
7. Have you ever wondered about whether you could have avoided or prevented your behaviour/ feelings during the event?											
8. Have you ever wished that you could turn the clock back and do it again but better this time?											
9. As a result of the event, will you now avoid similar situations?											
10. Did the situation reinforce your pre-existing avoidance of similar situations?											
11. Did you experience a sense of shame while remembering your behaviour during the event?											

	0 Not at all, never	10	20	30	40	50	60	70	80	90	100 Very much so, always
12. Did you think about anxious feelings that you had experienced during the event?											
13. When remembering the situation, did other instances of past failure that you had experienced in the same way come into your mind?											
14. Did you criticize yourself for your behaviour in the situation?											
15. Did you think about the event more than you wanted to?											
16. Did you think about the bodily sensations you had experienced during the situation?											
	0 … in a negative way	10	20	30	40	50	60	70	80	90	100 … in a positive way
17. In my memories about the event, I saw myself (my behaviour, my attributes)…											

Appendix L

Examples of Word Sentence Association Paradigm Trials

Figure L.1

WSAP Practice Item Examples

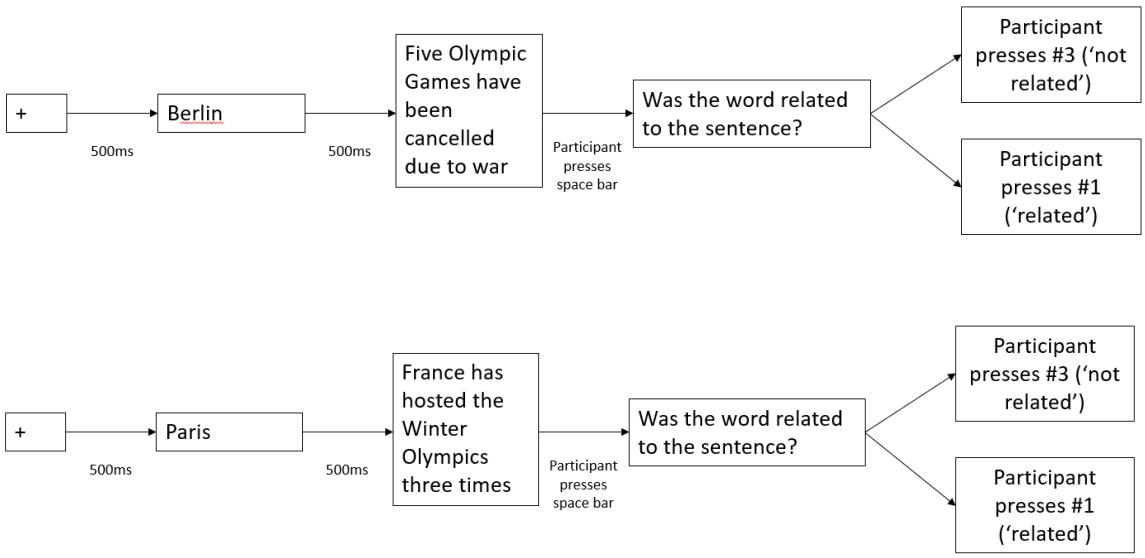
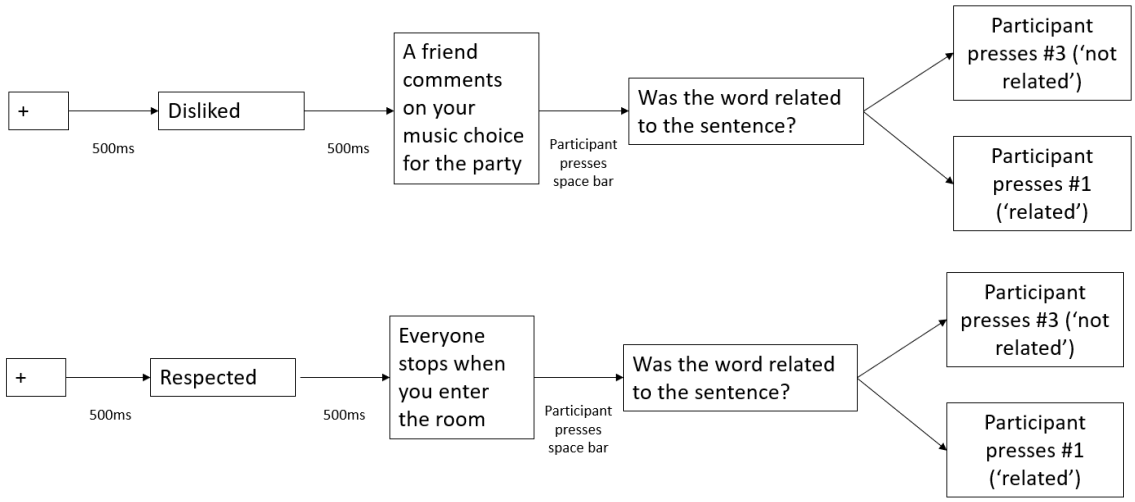


Figure L.2

WSAP Experimental Item Examples



Appendix M

State Trait Anxiety Inventory – State Form (Spielberger et al., 1983)

A number of statements which people have used to describe themselves are given below. Read each statement and then rathe the appropriate number to the right of the statement to indicate how you feel **right now, at this moment**. There are no right or wrong answers. Don't spend too much time on any one statement but give the answer that seems to describe your present feelings best.

	1 Not at all	2 Somewhat	3 Moderately so	4 Very much so
1. I feel calm				
2. I feel secure				
3. I am tense				
4. I feel strained				
5. I feel at ease				
6. I feel upset				
7. I am presently worrying over possible misfortunes				
8. I feel satisfied				
9. I feel frightened				
10. I feel comfortable				
11. I feel self-confident				
12. I feel nervous				
13. I am jittery				

	1 Not at all	2 Somewhat	3 Moderately so	4 Very much so
14. I feel indecisive				
15. I am relaxed				
16. I feel content				
17. I am worried				
18. I feel confused				
19. I feel steady				
20. I feel pleasant				

Appendix N

Additional Cross-Lagged Panel Models (Study 2)

Two cross-lagged panel models were tested, one of social anxiety and perfectionistic concerns (Table N.1) and one of social anxiety and perfectionistic strivings (Table N.2). Both models were just-identified and as such, model fit indices could not be computed.

Table N.1

Pathways of Cross-Lagged Panel Model of Social Anxiety and Perfectionistic Concerns

	b	SE_b	*p*
Autoregressive paths			
Social Anxiety P1 -> Social Anxiety P4	0.81	0.06	< .001
Perfectionistic Concerns P1 -> Perfectionistic Concerns P4	0.74	0.07	< .001
Cross-lagged paths			
Social Anxiety P1 -> Perfectionistic Concerns P4	0.13	0.07	.051
Perfectionistic Concerns P1 -> Social Anxiety P4	0.05	0.06	.431

Note. b = unstandardized coefficient. SE_b = standard error of the coefficients. P = Part.

Table N.2

Pathways of Cross-Lagged Panel Model of Social Anxiety and Perfectionistic Strivings

	b	SE_b	*p*
Autoregressive paths			
Social Anxiety P1 -> Social Anxiety P4	0.84	0.06	< .001
Perfectionistic Strivings P1 -> Perfectionistic Strivings P4	0.80	0.06	< .001
Cross-lagged paths			
Social Anxiety P1 -> Perfectionistic Strivings P4	0.11	0.06	.059
Perfectionistic Strivings P1 -> Social Anxiety P4	-0.03	0.06	.580

Note. b = unstandardized coefficient. SE_b = standard error of the coefficients. P = Part.

Appendix O

Post-hoc Investigation of the Effects of Post-Event Processing on Social Anxiety (Study 2)

A hierarchical regression was conducted to test the contribution of post-event processing, negative self-imagery, and social anxiety at Part 1 to social anxiety at Part 4. A model including post-event processing only (model 1; see Table O.1) showed that post-event processing contributed 29% of the variance in social anxiety at Part 4. After adding negative self-imagery and social anxiety at Part 1 (model 2), the model remained significant, but post-event processing no longer significantly contributed to social anxiety at Part 4.

Table O.1

Hierarchical Multiple Regression Predicting Social Anxiety at Part 4 from Post-Event Processing, Negative Self-Imagery, and Social Anxiety at Part 1.

	Model 1	Model 2
	b	*b*
Post-Event Processing	0.54***	0.10
Negative Self-Imagery		0.26***
Social Anxiety P1		0.61***
R^2	.29	.75
F	42.06***	104.53***
ΔR^2	.29	.47
ΔF	42.06***	96.43***

Note. N = 104. P = Part

***$p < .001$.

Appendix P

Supplementary Testing of the Interaction of Perfectionistic Concerns and Perfectionistic Strivings on Social Anxiety

The effect of interactions between perfectionistic concerns and perfectionistic strivings on social anxiety were tested using PROCESS (Hayes, 2017) simple moderation (Model 1). Data from Study 1 was used to test the interaction of perfectionistic concerns and perfectionistic strivings at Time 1 on social anxiety at Time 2. Social anxiety at Time 1 was entered as a covariate to control for the trait stability of social anxiety. Results showed that perfectionistic concerns and perfectionistic strivings at Time 1 did not significantly interact to predict social anxiety at Time 2, $F(1, 103) = 0.03$, $p = .857$. Similarly, no significant interaction was found between perfectionistic concerns and perfectionistic strivings at Time 1 on social anxiety at Time 3 (with social anxiety at Time 2 as a covariate), $F(1, 52) = 0.05$, $p = .823$, nor perfectionistic concerns and perfectionistic strivings at Time 2 on social anxiety at Time 3 (also with social anxiety at Time 2 as a covariate), $F(1, 51) = 1.87$, $p = .178$. Data from Study 2 showed similar results, with no significant effect of the interaction between perfectionistic concerns and perfectionistic strivings at Part 1 on social anxiety at Part 4 (with social anxiety at Part 1 as a covariate), $F(1, 99) = 1.28$, $p = .262$. Hence, no evidence of the effect of interactions between perfectionistic concerns and perfectionistic strivings on social anxiety was found using longitudinal data from the current thesis.