

The influence of adult attachment style on social anxiety

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Thesis Summary

Cognitive Behavioural Therapy (CBT) is widely recognised as an efficacious treatment for social anxiety disorder (SAD). However, results from recent meta-analyses suggest that CBT is moderately effective in reducing the symptoms of this disorder (Mayo-Wilson et al., 2014; Wersebe, Sijbrandij, & Cuijpers, 2013). It remains unclear why a significant number of individuals do not respond to treatment. Thus, the overall aim of this thesis is to establish adult attachment as an important individual difference variable that can influence factors that maintain symptoms of social anxiety as well as impact treatment outcome. The current thesis specifically examined the influence of attachment style on attention biases as well as on the therapeutic alliance. Attention biases are considered important cognitive factors that maintain symptoms of social anxiety disorder (Clark & Wells, 1995; Rapee & Heimberg, 1997). Study one investigated the influence of adult attachment style on the relationship between attention biases and anxiety in a non-clinical sample. Participants were randomly allocated to receive an anxiety inducing speech task or not, and viewed an emotional stimulus (image of either an angry or a happy face) paired with a neutral stimulus in a passive eye-tracking task. The results showed that those in the anxiety induction condition were less likely to attend to the emotional stimulus than those in the no anxiety condition. Furthermore, the results showed that an avoidant attachment style moderated the relationship between attention and anxiety; however an anxious attachment style did not have a significant moderating effect. Thus, study one establishes adult attachment style as a relevant individual difference variable to consider within the context of attention biases and anxiety. Accordingly, study two examines the time course of attention, in a clinical sample of participants diagnosed with SAD, and whether attachment style is a moderator of this relationship. The findings showed that those with SAD, compared to a non-clinical control sample, were more likely to avoid attending to emotional stimuli in general. Attachment style did not moderate this relationship, however an anxious attachment style independently influenced attention biases, with anxiously attached

individuals displaying greater vigilance for emotional compared to neutral stimuli. Study three examined the effect of attachment style as a moderator of the relationship between attention biases and CBT treatment outcome for individuals with SAD. There were no differences in attention biases (vigilance or difficulty to disengage from threat) between the clinical and control sample. However, clinical participants who were avoidant of threat at pre-treatment became significantly more vigilant for emotional stimuli in general, after treatment, while those who were vigilant for threat at pre-treatment showed no significant changes in attention at post-treatment. Furthermore, attention biases significantly predicted treatment outcome; difficulty disengaging from happy stimuli predicted poorer treatment outcomes and attachment style moderated the relationship between difficulty disengaging from threatening and neutral stimuli and treatment outcome. These findings established not only that attention biases can significantly predict treatment outcome but also that attachment style moderates this relationship. Previous research has identified that the therapeutic alliance is important in producing positive treatment outcomes in a variety of mental health settings. Similarly, there is a large body of research which suggests that adult attachment style significantly influences the development of the therapeutic alliance and consequently treatment outcomes.

Consequently, study four examined the influence of attachment on the development of the therapeutic alliance and treatment outcome for individuals attending a group CBT treatment for SAD. The findings showed that attachment is a significant moderator of the therapeutic alliance and treatment outcome relationship. Specifically, individuals with an insecure attachment style benefit more from CBT when therapeutic alliance scores are high. Taken together, the findings from the current research thesis have demonstrated that attachment style contributes to factors that can maintain symptoms of SAD as well as treatment outcome for these individuals. Thus, attachment style is an important individual difference variable to examine within the context of SAD.

Statement of Candidature

I certify that the work of this thesis entitled “The influence of adult attachment style on social anxiety” has not been previously submitted for a degree to any other university or institution.

All work related to these research studies has been carried out by myself under the supervision of Dr. Lorna Peters. The individual contributions of co-authors on the four papers presented in this thesis are clarified in the title page of the relevant chapter.

Macquarie University Ethics Committee approval was obtained for all aspects of the research studies presented in this thesis (Protocol numbers: 5201300808; 5201300126; 5201100821; 5201100907).

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Date

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Chapter 1

General Introduction

Introduction

Social Anxiety Disorder (SAD) is a prevalent mental health problem. The central concern for those with SAD is “a marked fear or anxiety about one or more social situations in which the individual is exposed to possible scrutiny by others. The individual fears that he or she will act in a way or show anxiety symptoms that will be negatively evaluated.” (American Psychiatric Association, 2013, p.202). Adult attachment style is particularly relevant to those with SAD as it has been identified as an individual difference variable that can influence the development and maintenance of interpersonal relationships. The current thesis aims to identify adult attachment style as a relevant individual difference variable that may influence treatment outcome for those with SAD. Furthermore we aim to understand *how* attachment style can influence factors that cause or maintain symptoms of SAD. In doing so, the current thesis focuses on two areas of study that previous research has identified as factors that can influence treatment outcome for socially anxious individuals, namely, attention biases and the therapeutic alliance. This chapter will firstly discuss the etiology and prevalence of SAD and the rationale for investigating individual differences that may predict treatment outcome for a socially anxious population. A review of attachment theory and research will then be presented, followed by a review of the research relating to attention biases, anxiety, and attachment style, and the therapeutic alliance, anxiety, and attachment style.

Prevalence and Etiology of Social Anxiety Disorder

SAD is a highly prevalent mental health problem and is considered the second most common anxiety disorder affecting approximately 8.4% of the Australian and 13% of the American populations (Crome et al., 2014; Kessler, Petukhova, Sampson, Zaslavsky, & Wittchen, 2012). Typically, individuals diagnosed with SAD are overly concerned about being judged negatively by others; so much so that they develop a high level of fear and anxiety when faced with social situations. The range of severity of SAD symptoms for individuals presenting with this mental health problem can range from mild, to moderate, to

quite severe. The differing level of symptom severity also contributes to quite a wide range of life interference ratings endorsed by those diagnosed with SAD. For example, Aderka et al. (2012) examined functional impairment in a sample of treatment seeking individuals with SAD and found that there were four discrete profiles of impairment of functioning primarily in work or study, social life, both work/study and social impairment, and impairment in all domains. Thus, there is variability in the presentation of those with SAD.

Given the prevalence of SAD, a range of etiological theories have been proposed. The cognitive behavioural models of SAD have gained considerable empirical support and have precipitated the development of effective treatments for SAD (Heimberg, 2002; Mayo-Wilson, et al., 2014; Rodebaugh, Holaway, & Heimberg, 2004). A recent meta-analysis investigating the effects of cognitive behavioural therapy (CBT) for anxiety disorders on quality of life has shown that CBT significantly improved the quality of life for individuals with SAD (Hofmann, Wu, & Boettcher, 2014). Results from another meta-analysis examining the effectiveness of CBT for SAD report significant moderate effects of CBT for those with SAD compared to control samples (Mayo-Wilson, et al., 2014; Wersebe, Sijbrandij, & Cuijpers, 2013). Thus, there is evidence for the efficacy of CBT treatment for SAD. However, there is large variation in terms of the effectiveness of CBT treatment for SAD. Among the studies reviewed in Wersebe et al. (2013), the effect sizes varied between studies from 0, which indicates no effect of treatment on symptoms of SAD, to 1, which is a large treatment effect size. Researchers are, therefore, turning their attention to investigating factors that may influence treatment outcome for those with SAD.

Adult Attachment Style

Adult attachment style is likely to be an individual characteristic that is relevant when considering factors that influence treatment outcome for socially anxious individuals. Attachment style was first described by Bowlby (1982) and refers to the bond formed between an infant and their primary caregiver. When the caregiver is caring, predictable, and

responsive to the infant's needs, a healthy attachment bond or secure attachment style is formed. However, when the caregiver is unpredictable or unresponsive, an unhealthy bond and insecure attachment is formed. The formation of a healthy bond allows the infant to feel safe when exploring their surroundings, which is the main goal of the attachment system. This bond and the availability and responsiveness of the primary caregiver inform the child's expectations, which then form working models that are internalised and influence the child's beliefs and expectations for future interpersonal interactions (Bowlby, 1982). These internalised working models are thought to be relevant even in adulthood and form what is known as adult attachment style (Hazan & Shaver, 1987). The internalised working models are likely to influence an individual's goals, beliefs, and expectations and, therefore, are thought to shape how adults interpret and respond to future relationships (Pietromonaco & Barrett, 1997). Thus, it might be expected that adult attachment style would be involved in social anxiety, which also has relationships with others as its focus.

Shaver and Mikulincer (2002) propose that activation of the attachment system and its related internal working models involves three sequential components: firstly, assessment and monitoring of threat in the environment (Is there threat?). If threat is perceived as present, this leads to the activation of the attachment system. The second component involves evaluating the availability of attachment figures (Is the attachment figure available and responsive?). This component refers to both internal and external representations of the attachment figure. If the individual has secure internal representations of attachment figures (caring and responsive) then they will feel secure and are more likely to engage in exploration and other prosocial activities. However, if the individual has an insecure internal representation of attachment figures (unresponsive and unreliable), then the individual experiences a sense of attachment insecurity and a compounding of distress. The final component involves determining whether seeking proximity to the attachment figure is a viable option.

Adult attachment is measured on two different dimensions: an anxious and an avoidant attachment dimension (Brennan, Clark, & Shaver, 1998). Those individuals who score high on the anxious attachment dimension characteristically are worried about the availability and responsiveness of the attachment figure. Those scoring high on the avoidant attachment dimension are typically uncomfortable opening up to and depending upon others. A prototypical secure individual would score low on both these dimensions (Brennan et al., 1998). Thus, the development of the theory of adult attachment style highlights that it is particularly relevant to interpersonal relationships.

Attachment Style and Anxiety

It is important to note that the theory of attachment began as a theory of psychopathology and, as a result, attachment style has been extensively researched within the domain of mental health problems (Bowlby, 1988; Sroufe, Carlson, Levy, & Egeland, 1999). In fact, according to attachment theory, an insecure attachment style leads to more maladaptive coping styles during stressful life circumstances and may even make individuals more susceptible to psychological breakdowns (Bowlby, 1988). Therefore, adult attachment style is likely to contribute to the development and maintenance of mental health problems, such as anxiety disorders. Brumariu, Obsuth, and Lyons-Ruth (2013) examined the quality of interpersonal relationships among adolescents with anxiety disorders, those with other Axis 1 disorders, and those with no diagnoses. Their findings indicate that those adolescents with anxiety disorders displayed higher levels of attachment insecurity while those with other Axis 1 disorders displayed only differences in the quality of school relationships compared to those with no diagnoses. Similarly, several other studies using nationally representative samples have provided evidence for the strong relationship between anxiety and adult attachment styles (Cooper, Shaver & Collins, 1998; Mickelson, Kessler & Shaver, 1997). Cooper et al. (1998) showed that those with a secure attachment style reported significantly lower levels of general anxiety and phobic anxiety than those with either an anxious or avoidant attachment

style. Mickelson et al. (1997) showed a significant negative correlation between secure attachment styles and panic disorder, agoraphobia, social phobia, simple phobia, PTSD, and generalised anxiety disorder. Thus, it seems that there is an overrepresentation of insecure individuals with anxiety disorders. Given the growing evidence supporting the prevalence of insecure attachment amongst those with anxiety disorders an attachment and psychopathology theory has been recently proposed (Ein-Dor & Doron, 2015). This theory suggests that an anxious attachment style in combination with vigilance toward threat occurring within a chronically threatening environment contributes to the development of anxiety disorders. However, there is a relative lack of research examining the relationship between adult attachment style and social anxiety disorder specifically.

Attachment and Social Anxiety Disorder. Despite the conceptual overlap between the deficits faced by individuals with SAD and attachment style, such as interpersonal difficulties, relatively few studies have examined the prevalence of insecure attachment styles for individuals with SAD. This is surprising, given that individuals with SAD have difficulty establishing and preserving romantic relationships and are also less likely to be married than those without SAD (Schneier, Johnson, Hornig, Liebowitz, & Weissman, 1992; Schneier et al., 1994), outcomes that might be expected for those with insecure attachment styles. Erozkan (2009) report significant moderate correlations between social anxiety symptoms and attachment style in a sample of Turkish university students. Thus, social anxiety and attachment style are related, but conceptually distinct constructs. One study has examined the relationship between SAD and adult attachment style and found that individuals with SAD are more likely to display an anxious or secure, rather than an avoidant, attachment style (Eng, Heimberg, Hart, Schneier, & Liebowitz, 2001). Eng et al. also report that those with an anxious attachment style had more severe social anxiety symptoms, greater levels of avoidance, depression, functional impairment, and a lower quality of life than those with a secure attachment style. These findings support the research that has examined attachment

and anxiety disorders more generally, and indicate that an insecure (anxious) attachment style is prevalent for those with SAD. However, few studies have examined the impact of adult attachment style on factors that may influence maintenance of the disorder, severity of symptoms, and treatment outcome for these individuals. The next step in understanding the influence adult attachment has on those with SAD is to examine the effects of an insecure attachment style on factors relevant to the maintenance of social anxiety symptoms, and those that may influence treatment outcome for SAD, such as attention biases and the therapeutic alliance.

Anxiety related Attention Biases

Cognitive models of anxiety propose that cognitive biases, such as attention biases, maintain symptoms of anxiety (Beck & Clark, 1997). Attention biases refer to patterns of attention usually either towards or away from threat, which are commonly thought to maintain symptoms of anxiety. Attention biases are generally measured in one of two ways: reaction time based measures, which record the time taken to make a behavioural response (e.g., key press) to a stimulus (e.g., a word or a picture with emotional or neutral content), or eye-tracking methods, which directly record eye movements when presented with stimuli which evoke different emotional responses (e.g., a picture of a person with an angry or neutral facial expression). A meta-analysis of studies examining the emotional stroop task, dot probe task, and emotional spatial cuing task, all of which are reaction time based measures of attention biases, found that the threat-related attention bias has been reliably observed across studies (Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van IJzendoorn, 2007). Research using eye-tracking methodology has also been the subject of a meta-analysis, which found that anxious individuals display both vigilance towards, and difficulty disengaging their attention from, threat (Armstrong & Olatunji, 2012). Thus, it seems that attention biases related to threat have been observed in anxious populations. However, since the publication of these meta-analyses there has been a surge in research studies examining attention biases and

anxiety. The literature has also given rise to various competing theories involving attention biases relevant to SAD as well as to anxiety more generally.

Theoretical Accounts of Anxiety and Attention Bias

Vigilance-avoidance model of attention. The vigilance-avoidance model of attention is relevant for anxiety in general and proposes that anxious individuals will be initially vigilant towards threat and, following that, they will avoid attending to a threatening stimulus (Mogg & Bradley, 1998; Mogg, Mathews, & Weinman, 1987). Vigilance towards threat represents a cognitive vulnerability factor for clinical anxiety that prevents the individual from attending to other neutral or positive information (Williams, Watts, MacLeod, & Mathews, 1988), while avoidance is seen as a maladaptive response because it prevents any reappraisal of the threatening information and maintains learned associations with harm (Mogg & Bradley, 1998). When using the dot probe task to measure initial vigilance towards threat, a typical trial involves presenting pairs of stimuli representing differing emotional valences, e.g., a face depicting an angry expression paired with one expressing a neutral expression. Vigilance for threat is estimated by examining the time taken to respond to probes that replace a negative stimulus (e.g. the angry face) compared to the time taken to respond to probes replacing neutral stimuli. If participants are quicker at responding to probes replacing negative stimuli, then they have demonstrated vigilance towards threat. The avoidance stage of this model generally refers to the maintenance of attention on threatening stimuli over time. For the dot probe task, this involves examining responses when stimuli are presented for longer time periods, for example, 1250 msec (Mogg & Bradley, 2002). Previous research studies, using the dot probe task, generally support the vigilance stage of the model. However, the avoidance stage of the model has received mixed support. For example, Mogg and colleagues (Mogg, Bradley, De Bono, & Painter, 1997; Mogg & Bradley, 2002) have demonstrated that high anxious individuals drawn from a non-clinical population demonstrate vigilance to threat, but they failed to demonstrate that anxious individuals are more likely to

avoid attending to threatening stimuli. In contrast, other studies have found evidence for both the vigilance and avoidance stages of attention bias in a non-clinical sample of high and low anxious individuals (Koster, Verschuere, Crombez, & Van Damme, 2005; Vassilopoulos, 2005).

Regarding eye-tracking methods, vigilance for threat is typically examined in one of two ways: either the amount of time taken to fixate on a negative stimulus for the first time (latency to first fixation) is recorded or the first stimulus that a participant fixates on is recorded. When the latency to first fixation is shorter for the angry stimuli relative to the neutral or happy stimuli, or the participant tends to fixate first on the angry stimulus relative to the neutral stimulus, vigilance towards threat has been demonstrated. Eye-tracking studies examine avoidance by segmenting longer stimulus presentation times into shorter time intervals and examining fixations that occur within each time interval (time course of attention). Similar to the pattern of findings reported in the dot probe research, findings from eye-tracking research examining the vigilance-avoidance stages of attention have also been mixed. Quigley, Nelson, Carriere, Smilek, and Purdon (2012) found that individuals with high levels of state anxiety initially displayed vigilance for threatening images relative to neutral and report a trend for these individuals to display avoidance of threatening images during the later stages of viewing time. Alternatively, Nelson, Purdon, Quigley, Carriere, and Smilek (2014) found that all participants irrespective of levels of trait and state anxiety were more likely to display initial vigilance towards emotional stimuli (angry and happy) compared to neutral and maintain this vigilance across all time intervals.

Thus there is mixed support for the vigilance-avoidance hypothesis. While some studies, regardless of methodology, find vigilance for threat amongst anxious participants, there is also evidence that non-anxious participants are vigilant to emotional stimuli in general. Similarly, there is mixed support for the idea that anxious participants avoid

threatening stimuli after initial vigilance. The theoretical models of social anxiety predict a different pattern of attention to threatening stimuli.

Cognitive Behavioural Therapy Models of Social Anxiety and Attention Biases

Attention biases have been incorporated into the major CBT models of social anxiety and have been implicated in maintaining social anxiety symptoms. The Rapee and Heimberg (1997) model of social anxiety proposes that socially anxious individuals are initially vigilant towards threat and, following that, display a difficulty disengaging their attention from threatening stimuli. Conversely, the Clark and Wells (1995) model of SAD proposes that socially anxious individuals are more likely to avoid attending to emotional stimuli, and instead focus their attention towards their own anxious symptoms. Therefore, when a socially anxious individual is faced with a feared social situation, for example, delivering a speech in front of an audience, according to the Rapee and Heimberg model, they will be initially vigilant towards negative stimuli, e.g., an audience member yawning. Once they have detected this audience member, they will then experience difficulty turning their attention away. According to the Clark and Wells model, the socially anxious individual will avoid attending to the yawning audience member, and rather focus their attention inward.

Rapee and Heimberg (1997) CBT model of social anxiety and attention. Empirical support for the Rapee and Heimberg (1997) model, that proposed individuals with SAD will be initially vigilant towards and subsequently display difficulty disengaging from threat, has been mixed. Some studies utilising the dot probe task have found evidence to support an initial vigilance towards threat for individuals diagnosed with SAD (Asmundson & Stein, 1994; Mogg, Philippot, & Bradley, 2004) while others have found no evidence to support this theory (Mansell, Clark, Ehlers, & Chen, 1999). Similarly, eye-tracking studies using clinical samples diagnosed with SAD have found that these individuals are initially vigilant towards threat (Shechner et al., 2013) while findings from other studies indicate no differences in vigilance towards threat between clinical and non-clinical control groups (Chen, Clarke,

Guastella, & Macleod, 2012; Schofield, Inhoff, & Coles, 2013). Other studies have utilised a non-clinical population and found that high socially anxious individuals are more likely to initially attend to emotional stimuli in general (both negative and positive) relative to neutral stimuli (Garner, Mogg, & Bradley, 2006; Schofield, Johnson, Inhoff, & Coles, 2012; Wieser, Pauli, Weyers, Alpers, & Mühlberger, 2009).

Difficulty to disengage from threat has been measured using both reaction time based measures and eye tracking measures. Reaction time tasks, such as the dot probe task, involve comparing the reaction times to a probe replacing the negative stimulus on trials with negative-neutral paired stimuli to baseline trials which present neutral-neutral paired stimuli. A slower response to the negative-neutral trials relative to the baseline trials provides evidence of difficulty disengaging attention from threat (Klumpp & Amir, 2009; Koster, Crombez, Verschuere, & De Houwer, 2004), the assumption being that the participant is attending to the negative stimulus and has difficulty disengaging their attention in order to respond to the probe. The dot probe research investigating difficulty disengaging from threat has resulted in contrasting results. Koster et al. (2004) and Koster, Crombez, Verschuere, Van Damme, and Wiersema (2006), using a modified version of the dot probe task, found evidence supporting the proposal that individuals with high levels of trait anxiety display difficulty disengaging their attention from threat (negative stimuli) compared to those with low trait anxiety levels. In contrast, Klumpp and Amir (2009) found no evidence to support a difficulty disengaging attention from threat in a non-clinical sample comparing high and low levels of social anxiety symptoms. Eye-tracking measures directly record the amount of time taken for an individual to disengage their attention from a threatening stimulus; longer disengagement times from a negative stimulus, e.g., an angry face, compared to a neutral stimulus indicates difficulty to disengage from threat. A pattern of disparate findings emerges when examining studies that have used a clinical sample of individuals diagnosed with SAD compared to a non-clinical control group. Some studies report that those with SAD

demonstrated difficulty disengaging their attention from threat compared to a non-clinical control group (Amir, Elias, Klumpp, & Przeworski, 2003) while others studies have found no differences between clinical and control groups (Niles, Mesri, Burklund, Lieberman, & Craske, 2013; Schofield et al., 2013). Studies utilising eye-tracking methods have reported that non-diagnosed individuals with high levels of SAD symptoms exhibit a difficulty disengaging their attention from threatening stimuli relative to those with low symptom levels (Buckner, Maner, & Schmidt, 2010; Schofield et al., 2012). Thus, support for the Rapee and Heimberg (1997) proposal that socially anxious individuals will exhibit a difficulty disengaging from threat has been mixed.

Clark and Wells (1995) CBT model of social anxiety and attention. The Clark and Wells (1995) proposal that individuals with SAD will avoid attending to emotional information has also received mixed support from the literature. In order to measure this phenomenon (avoidance of positive and negative stimuli over time), the same methods used to measure avoidance in the vigilance-avoidance model of attention, known as the time course of attention, are usually employed. It is also important to note that this theory proposes that both initially and over time the socially anxious individual will avoid attending to emotional stimuli. Mansell et al. (1999), using the dot probe task, demonstrated that individuals with high levels of social anxiety symptoms avoid attending to emotional stimuli (positive and negative) in general. However, they failed to replicate this finding in a follow up study drawn from the same population (Mansell, Ehlers, Clark, & Chen, 2002). Eye-tracking studies have the ability to directly measure attentional avoidance over time (time course of attention). Some studies have observed the avoidance of both positive (e.g., a happy face) and negative stimuli over longer stimulus presentation durations (Chen et al., 2012). Thus, empirical support for the Clark and Wells (1995) proposal that socially anxious individuals will avoid attending to emotional stimuli has been mixed.

Despite previous research findings providing mixed support, for both the Clark and Wells (1995) and the Rapee and Heimberg (1997) models regarding the specific nature of attention biases displayed by socially anxious individuals, researchers have turned to investigating the effects of attention biases on treatment outcome for socially anxious individuals. In this way, we can directly examine the influence of attention biases on the maintenance of SAD symptoms.

Attention Biases and Treatment Outcome for Social Anxiety Disorder.

The influence that attention biases can have on treatment outcome for those with SAD has recently been examined by a few seminal research studies, although these findings have been mixed. Pishyar, Harris, and Menzies (2008) found that a pre-treatment bias towards threat (vigilance towards threat measured before treatment) decreased after treatment for adults diagnosed with SAD and that this decrease was associated with better treatment outcomes. Legerstee et al. (2009) found that a pre-treatment attention bias away from threat (avoidance of threat) was linked to better treatment outcomes for children diagnosed with an anxiety disorder. Since then, the research has begun to focus on the idea of different subtypes of attention biases; that is, the idea that there are socially anxious individuals who are either vigilant towards (vigilant group) or avoidant of (avoidant group) threat and that these subtypes have differential impacts on treatment outcome (Calamaras, Tone, & Anderson, 2012). This novel approach is important as it introduces the idea of individual differences within attention biases displayed by anxious individuals that can account for the mixed findings that have been previously reported. In a clinical sample of socially anxious individuals, Calamaras, Tone and Anderson (2012) found that those in the avoidant group became significantly more vigilant (less avoidant) of threat following CBT treatment, while the vigilant group did not significantly change their attention bias following treatment. In contrast to findings reported by Legerstee et al. (2010), other studies examining children diagnosed with an anxiety disorder (Waters, Mogg, & Bradley, 2012) and adults diagnosed

with social anxiety (Price, Tone, & Anderson, 2011) found that the children who were avoidant of threat at pre-treatment became significantly more vigilant for threat following treatment and both the children and adults who were avoidant of threat at pre-treatment had poorer treatment outcomes than those who were initially vigilant to threat (Price et al., 2011; Waters et al., 2012). Thus, it appears that attention biases are important predictors of treatment outcome for those with SAD. However, given the discrepancy in the findings described above, it is important to investigate other factors which may potentially moderate this relationship. Thus far, the research in this area has examined vigilance toward and avoidance of threat exclusively; no study has examined the effect of difficulty to disengage from threat as a predictor of treatment outcome. The current thesis will examine attention biases as predictors of treatment outcome and whether attachment style moderates the relationship between attention bases and treatment outcome.

Adult Attachment Style and Attention Biases

Despite the inconsistencies in findings regarding attention biases and SAD, very few studies have investigated the potential for unknown third variables to moderate the relationship between attention biases and SAD. Thus, there may be other factors, related to differences between individuals that might influence attention biases and, thus, contribute to these mixed findings. Adult attachment style has been investigated as a potential factor affecting attention biases and the research shows that those with an insecure attachment style (high anxious or avoidant attachment) are more likely to avoid attending to threatening information than those with a secure attachment style (Dewitte & De Houwer, 2008; Dewitte, Koster, De Houwer, & Buysse, 2007). In contrast, attachment theory suggests that those who score high on the anxious attachment dimension are more likely to be vigilant to threat while those who are more avoidantly attached will be more likely to avoid attending to threatening stimuli (Dewitte & De Houwer, 2008). Thus, the empirical evidence supports the prediction that an avoidant attachment style leads to the avoidance of threatening stimuli; however, there

is no evidence to support the prediction that those with an anxious attachment style will be vigilant towards threatening stimuli. To date, there has been only one study which has directly examined the relationship between attachment style and attention biases and anxiety in a sample of anxiety disordered participants (Zeijlmans van Emmichoven, van IJzendoorn, de Ruitter, & Brosschot, 2003). The findings indicate that those who were securely attached were more vigilant for threatening stimuli than those with an insecure attachment style. However, this study failed to find a link between anxiety symptoms and attention biases. To date, no previous study has examined the influence of adult attachment style on the relationship between attention biases and treatment outcome for those with SAD.

Limitations of research investigating attention biases and Social Anxiety Disorder.

The available evidence seems to suggest that research relating to attention biases and social anxiety are mixed. Typically it seems that a substantial amount of research has failed to demonstrate that a threat specific bias exists; that is, attention biases in socially anxious individuals have been observed towards both positive and negative stimuli relative to neutral, rather than in relation to negative stimuli specifically. That is, attention biases towards negative stimuli proposed by Rapee and Heimberg (1997) have commonly been observed for both negative and positive stimuli. A possible explanation for these findings is likely to stem from a recent update to the Rapee and Heimberg model, which suggests that those with SAD experience a fear of being evaluated by others in general, rather than a specific fear of negative evaluation (Weeks, Heimberg, Rodebaugh, & Norton, 2008; Heimberg, Brozovich, & Rapee, 2010). The authors have based this suggestion on research investigating the fear of positive evaluation which proposes that those with social anxiety are fearful of positive evaluation in addition to negative evaluation (Rodebaugh, Weeks, Gordon, Langer, & Heimberg, 2012; Weeks, et al., 2008). This body of research suggests that positive evaluation is based on the psycho-evolutionary premise that bringing positive attention on oneself may lead to greater social reprisal from others that may lie higher on the social dominance

hierarchy. For example, Garner et al. (2006) and Wieser et al. (2009) demonstrate that socially anxious individuals are initially vigilant towards both positive and negative stimuli compared to neutral stimuli and subsequently avoid attending to both positive and negative stimuli. Thus, this theoretical proposal may account for results from previous studies that have observed biased attention toward both positive and negative stimuli, rather than a threat specific attention bias.

The mixed findings for attentional biases in social anxiety may also arise from differences in methods used to measure attention biases, namely dot probe tasks or eye-tracking measures of attention. Recent research suggests that these methods are not analogous, as it has been shown that attention biases measured using the dot probe task and eye-tracking techniques are not correlated (Waechter, Nelson, Wright, Hyatt, & Oakman, 2013). Eye-tracking methodology is thought to be a more robust measure of attention as it directly captures eye-movements, while dot probe research on the other hand relies on a behavioural response to infer where the individual was attending (Armstrong & Olatunji, 2012). Furthermore, research examining the reliability and validity of the dot probe task has shown that the resulting attention bias scores generally have poor reliability and convergent validity estimates (Waechter & Stolz, 2015). To date only one study has examined the reliability of eye-tracking methods and found that when examining the time course of attention (e.g., proportion of viewing time over the entire stimulus presentation) the scores had good reliability, however, when measuring the initial stages of attention bias (e.g., the first fixations during a stimulus presentation), the scores were less reliable (Waechter et al., 2013). Given the differences in the reliability of these tasks, the current thesis used eye-tracking methodology to examine attention biases.

While one question being addressed in this thesis is *how* attachment style can influence factors that maintain symptoms of SAD and treatment outcome, in particular attention biases. Another question is whether adult attachment style may influence therapeutic process variables and thus treatment outcome for those with SAD. The following section will address

the therapeutic alliance, a variable that may predict treatment outcome for those with SAD and that may be impacted by attachment style.

Therapeutic Alliance

Therapeutic alliance and treatment outcome. An important facet of therapy which can influence treatment outcome is known as the therapeutic alliance or working alliance. It refers to the relationship or bond formed between the therapist and client and has important implications for therapeutic process variables such as engagement with treatment and, consequently, treatment outcome (Bordin, 1979; Horvath, Del Re, Flückiger, & Symonds, 2011; Martin, Garske, & Davis, 2000). The development of a healthy alliance is based on the agreement between the client and therapist on tasks and goals set during treatment (Horvath & Greenberg, 1989). Meta-analyses examining the influence of therapeutic alliance on treatment outcomes for a variety of mental health problems indicate that the alliance generally predicts treatment outcome, with stronger alliances associated with better outcomes (Horvath et al., 2011; Martin et al., 2000). With the exception of self-guided and internet based treatments, the therapeutic alliance is applicable to all therapeutic approaches including CBT (Cronin, Lawrence, Taylor, Norton, & Kazantzis, 2015). All CBT interventions require clients to engage with their therapist and to disclose personal information. Furthermore, during treatment, the CBT therapist offers clients alternative options, choices, and provides feedback (Kazantzis, Arntz, Borkovec, Holmes, & Wade, 2013). Overall, these studies clearly indicate that the therapeutic alliance is relevant to CBT and thus may influence treatment outcome.

Factors influencing the Therapeutic Alliance

In a recent review of the working alliance, Doran (2014) suggests that there are other factors that are likely to influence the alliance-outcome relationship, such as specific client diagnoses and individual characteristics (e.g., personality traits). One factor that is likely to have important implications for the development of the alliance is whether the client has difficulty coping with interpersonal relationships (Hayes, Hope, VanDyke, & Heimberg, 2007). Given

this proposal it seems likely that both social anxiety symptoms, as well as an individual's attachment style, will have implications for the development of the therapeutic alliance during treatment.

Social Anxiety Disorder and the therapeutic alliance. Research findings show that during exposure sessions for SAD, a strong therapeutic alliance was associated with greater client engagement with the session and beliefs that the session was helpful (Hayes et al., 2007). However, previous studies have shown that therapeutic alliance does not predict treatment outcome for individuals with SAD. For example, Woody and Adessky (2002) investigated the influence of the alliance on treatment outcome for those with social anxiety disorder attending a group CBT treatment program and found that the alliance was not related to treatment outcome. Similarly, Mörtberg (2014) has shown that the alliance in both individual and group CBT treatment for social anxiety was not related to treatment outcomes. Thus, the results from studies which have investigated whether the therapeutic alliance predicts CBT treatment outcome for SAD specifically (Mörtberg, 2014; Woody & Adessky, 2002) deviate from previous literature which has demonstrated that the therapeutic alliance predicts treatment outcome in individuals presenting with mental health problems more generally (Horvath et al., 2011; Martin et al., 2000). One reason for these null findings may be a third variable that attenuates the relationship between the therapeutic alliance and treatment outcome for socially anxious individuals, e.g., attachment style.

Attachment and the therapeutic alliance. Given that difficulty with interpersonal relationships has been identified as a potential barrier to the formation of a healthy alliance, a second factor that is likely to influence the alliance-outcome relationship is attachment style (Mikulincer, Shaver, & Berant, 2013). Previous research findings generally support this notion and have shown that those who have an avoidant attachment style experience greater fears of humiliation during therapy (Marmarosh et al., 2009), while those with a secure attachment style are more comfortable with self-disclosure during therapy (Shechtman &

Rybko, 2004). Recently, Geller and Farber (2015) examined the influence of attachment style on the therapeutic alliance, their findings suggest that clients who fear abandonment and independence (anxious attachment style) pose differing therapeutic challenges than those who avoid intimacy and relying on others (avoidant attachment style). Furthermore, their findings have shown that those patients who tended to be more self-reliant (avoidant attachment style) are unlikely to have representations signifying that their therapists are emotionally important to them and that insecurely attached patients have difficulty creating and maintaining positive adaptive images of their therapist and therapy more generally (Geller & Farber, 2015). A study conducted by Goldman and Anderson (2007) examined undergraduate university students seeking treatment at the university counselling centre and found that attachment style predicted the quality of the therapeutic alliance. They report that those with a secure attachment style were more likely to develop stronger alliances. This finding is supported by results from recent meta-analyses that indicate that a secure attachment style is related to the development of stronger alliances during therapy and better therapeutic outcomes, while an insecure attachment style is associated with the development of a weaker alliance and poorer treatment outcomes (Diener & Monroe, 2011; Levy, Ellison, Scott, & Bernecker, 2011). To further investigate how the alliance influences treatment outcome, Byrd, Patterson and Turchik's (2010) findings suggest that the alliance partially mediated the relationship between attachment style and treatment outcome for individuals attending treatment for a variety of mental health problems. They propose that those clients who are comfortable developing close relationships with and depending upon others are more likely to display greater reductions in symptom severity after treatment. Taken together these findings suggest that an insecure attachment style, which is prevalent amongst socially anxious individuals (Eng et al., 2001), is likely to influence the development of a strong alliance for those attending a group CBT treatment program for social anxiety disorder.

Limitations of research investigating the therapeutic alliance and Social Anxiety

Disorder.

The limitations that arise when investigating therapeutic alliance and SAD primarily concern a lack of research in this area. To date, very few published studies have examined the effect of the therapeutic alliance in a socially anxious sample attending CBT treatment (Mörtberg, 2014; Woody & Adessky, 2002). This is surprising since it has been demonstrated that therapeutic alliance is relevant for CBT treatment and influences treatment outcome (Cronin et al., 2015; Martin et al., 2000). Furthermore, no studies have investigated the effects of adult attachment style on the alliance-outcome relationship for socially anxious individuals. Thus, chapter 5 of the current thesis aims to address this gap in the literature.

Overview of chapters in this thesis

The overall structure of this thesis takes the form of six chapters, including this introductory chapter. Overall, the empirical studies reported in chapters two to five address the influence of attachment style on social anxiety, with a particular emphasis on attention biases and therapeutic alliance. Each empirical chapter represents a research article that has been submitted for publication, which is the standard practice when doing a thesis by publication. Thus, it is necessary that there will be some repetition from one chapter to the next.

The second chapter presents the paper entitled “Anxiety, Attachment & Attention: The influence of adult attachment style on attentional biases of anxious individuals”. This paper investigates the vigilance-avoidance model of attention in a non-clinical sample of high and low anxious individuals and will introduce the concept that attachment style is a relevant individual characteristic to consider within the context of general anxiety symptoms and the associated attention biases. The third chapter presents the paper entitled “Time course of attention in socially anxious individuals: Investigating the effects of adult attachment style”. Building on the previous chapter, this research study examines the time course of attention in order to understand the influence attention biases measured over time may have on social anxiety symptoms and, furthermore, whether attachment style is a moderator of this relationship. To address this research question, the proposals made by the CBT models of SAD regarding attention biases will be investigated (Clark & Wells, 1995; Rapee & Heimberg, 1997). Furthermore, we will compare the attention patterns of a clinical sample (diagnosed with SAD) to a non-clinical control sample. The fourth chapter presents the paper entitled “The impact of adult attachment style on attention biases and treatment outcome in adults with social anxiety disorder” and seeks to establish the clinical relevance of attention biases associated with SAD. Specifically, this research study aims to extend the findings presented in chapters two and three by investigating, firstly, whether attention biases predict

treatment outcome for those with SAD and, secondly, whether attachment style moderates this relationship. The fifth chapter in this thesis represents a research study entitled “The role of therapeutic alliance and adult attachment in cognitive behavioural therapy for Social Anxiety Disorder”. This chapter aims to address a gap in the SAD literature by investigating the influence of adult attachment style on the therapeutic alliance and CBT treatment outcome. It extends from the previous chapters by examining a novel but important avenue that adult attachment style may influence treatment outcomes for these individuals. The final chapter presents the general discussion, theoretical and clinical implications, and conclusions of the current thesis.

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The following chapter presents the paper entitled “Anxiety, Attachment & Attention: The influence of adult attachment style on attentional biases of anxious individuals”. This paper investigates the vigilance-avoidance model of attention in a non-clinical sample of high and low anxious individuals and will introduce the concept that attachment style is a relevant individual characteristic to consider within the context of general anxiety symptoms and the associated attention biases.

Chapter 2

Anxiety, Attachment & Attention: The influence of adult attachment style on attentional biases of anxious individuals.

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Anxiety, Attachment, and Attention: The influence of adult attachment style on attentional biases of anxious individuals.

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Abstract

The vigilance-avoidance model of attention, which proposes that anxious individuals will initially be vigilant towards, and subsequently will avoid, threatening stimuli (Mogg, Bradley, deBono & Painter, 1997) has received inconsistent support (Armstrong & Olatunji, 2012). Given that attention biases have been identified in studies examining adult attachment style (Dewitte & De Houwer, 2008), the aim of this study is to examine whether adult attachment style influences the relationship between anxiety and attention biases. The present study used a passive viewing eye-tracking task to examine the effect of anxiety and attachment style on attention to emotional images on initial presentation and over time. Participants were randomly allocated to receive an anxiety induction (instructions that they would be presenting a speech) or not and viewed pairs of images (an emotional (either happy or angry) and neutral face) presented for 1.5 seconds. The results indicate that those exposed to the anxiety induction who scored high on the avoidant attachment dimension were more likely to avoid attending to the emotional (angry and happy) stimuli initially, and maintained this pattern of attention over the stimulus presentation time. While attachment avoidance moderated the relationship between attention and anxiety, an anxious attachment style did not have a significant effect. Thus, adult attachment style is an important individual difference to consider within the context of anxiety and attention biases.

Key Words: anxiety; attention bias; adult attachment; social anxiety; time course; eye-tracking

Anxiety, Attachment, and Attention: The influence of adult attachment style on attentional biases of anxious individuals

Cognitive models of anxiety propose that cognitive biases either cause or maintain symptoms of anxiety (Beck & Clark, 1997; Mathews & Mackintosh, 1998; Williams, Watts, MacLeod, & Mathews, 1997). These biases are either interpretive, where anxious individuals are more likely to interpret ambiguous information as threatening (interpretation bias), or attention related, where those with high levels of trait anxiety will selectively attend to threatening information rather than neutral information (attention bias; Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van IJzendoorn, 2007). The current study focuses on the theoretical constructs and empirical evidence relevant to attentional biases displayed by anxious individuals. Specifically, a two stage model of attention bias, known as the vigilance-avoidance model, has proposed that anxious individuals are initially vigilant to threat; however, over extended periods of viewing, they tend to avoid sustained processing of threat in order to alleviate anxious symptoms (Mogg, Bradley, De Bono, & Painter, 1997). There are, however, alternative viewpoints regarding the avoidance of stimuli in attention bias research, for example, whether avoidance of stimuli represents ‘escape’ from a threatening stimulus rather than avoidance per se. Within the context of the vigilance-avoidance theory, attentional avoidance is considered a maladaptive response as it prevents processing of threatening stimuli, reappraisal, and consequently maintains learned associations with harm (Mogg & Bradley, 1998).

The first stage of the vigilance-avoidance model predicts that an anxious individual will be vigilant towards threat. Thus, if a threatening and a neutral stimulus are presented together, anxious individuals will attend to the threatening stimulus first, rather than to the neutral stimulus. The second stage of the vigilance-avoidance model predicts that once the initial threat has been detected, an anxious individual will then avoid attending to threatening stimuli. In order to measure the vigilance-avoidance pattern of attention biases shown by

anxious individuals, previous studies have generally utilised either reaction time measures or eye-tracking technology. Reaction time measures include the dot probe task, emotional Stroop task, and the emotional spatial cueing task (Asmundson & Stein, 1994; Fox, Russo, Bowles, & Dutton, 2007; Mogg & Bradley, 2002; Williams, Mathews, & MacLeod, 1996). In a typical reaction time based measure participants are required to respond, usually by means of a key press, to a cue. The dot probe task commonly involves presenting an emotional stimulus (e.g., angry or happy facial expression) paired with a neutral stimulus (e.g., neutral facial expression). Participants are required to respond to a probe which replaces either the threat-related or neutral stimulus. Vigilance for threat is demonstrated when participants are faster to respond to probes replacing threat-related stimuli (Bar-Haim et al., 2007). Avoidance of threat, using the dot probe task, is measured by presenting stimuli for longer time periods (e.g., 1250ms) and comparing the time taken to respond during these longer stimulus presentation times to responses which occur during shorter stimulus presentations (e.g., 500ms) (Mogg et al., 1997). Research studies utilising reaction time based measures of attention, such as the dot probe task, have provided mixed support for the vigilance-avoidance model of attention. Some studies have found evidence to support both stages of this model by demonstrating that high anxious individuals are initially vigilant for threatening stimuli as well as avoidant of threatening stimuli during longer stimulus presentations, compared to low anxious individuals (Koster, Verschuere, Crombez, & Van Damme, 2005; Vassilopoulos, 2005). Other studies, have demonstrated that high anxious individuals display vigilance towards threat but have failed to demonstrate that anxious individuals are more likely to avoid attending to threat during longer stimulus presentations (Mogg et al., 1997; Mogg & Bradley, 2002). Thus, amongst the dot probe task literature there is relatively consistent evidence supporting the vigilance stage of the vigilance-avoidance model of attention and mixed support for the avoidance stage. An important limitation of reaction time based methods, particularly when measuring avoidance of a stimulus, is that during a typical 500 or 1250ms

stimulus presentation, it is possible for multiple shifts of attention to occur. Thus, probe reaction time measures only capture a snapshot of these nuanced attentional processes (Armstrong & Olatunji, 2012). With the advancement of technology, there are now methods which are able to record and measure eye-movements. Since the development of eye-tracking technology, and given the limitations inherent in utilising reaction time based measures, there has been a surge in research using eye-tracking methods to measure attention biases relevant to anxiety.

The use of eye-tracking methods to measure attention biases provides a more direct and continuous measure of eye movements during the stimulus presentation time. Furthermore, recent research has examined the reliability of the dot probe task and eye tracking in measuring attention biases (Waechter et al., 2014). Their findings indicate that the dot probe task is not a reliable measure of attention bias; however eye tracking methods demonstrated excellent reliability. In a typical eye-tracking study, participants are presented with an emotional stimulus (either threatening e.g., an angry face or positive e.g., a happy face) paired with a neutral stimulus. An eye-tracker records the participant's eye movements for the duration of exposure to the stimulus. Using eye-tracking methods vigilance for threat is determined by examining which stimulus, either threatening or neutral, an individual fixates on first (usually in the first 500 ms). Attentional avoidance is generally examined in trials where stimuli are presented for longer periods of time (from 1 second to 60 seconds) and is measured by examining the amount of time an individual spends looking at threatening compared to neutral stimuli over the entire stimulus presentation. Specifically, the longer stimulus presentation is segmented into shorter time intervals and attention within those time intervals is examined (time course of attention). In this way researchers are able to compare patterns of attention which occur during earlier time intervals to those that occur during the later stages of viewing. Avoidance of threat is demonstrated when individuals spend a shorter amount of time attending to the threatening compared to the neutral stimulus.

The findings of a recent meta-analysis of eye movement studies suggest that anxious individuals attend to the threatening stimulus first, thus providing support for the theory that anxious individuals are vigilant for threat (Armstrong & Olatunji, 2012). In support of the vigilance-avoidance theory, Quigley, Nelson, Carriere, Smilek, and Purdon (2012) report that individuals with high levels of state anxiety display vigilance for threatening stimuli, compared to neutral stimuli, and report a trend towards avoidance of these images during the later stages of stimulus presentation. In contrast, Nelson, Purdon, Quigley, Carriere, and Smilek (2014) report that all participants, regardless of levels of trait or state anxiety, displayed a vigilance towards emotional stimuli in general (both angry and happy faces), relative to neutral stimuli and maintained this pattern of vigilance across all time intervals. Similarly, Gamble & Rapee (2009) examined the time course of attention using eye-tracking methodology and found that clinically anxious participants and non-clinical controls did not differ in the time spent looking at the threatening, relative to neutral, stimuli during later stages of viewing. Thus, similarly to the previously reviewed findings regarding the dot probe task, the findings from studies which have employed eye-tracking measures of attention offer mixed support for the vigilance-avoidance model of attention.

Despite the suggestion that different measures of attention assess different attentional components that are not necessarily mutually exclusive (Armstrong & Olatunji, 2012), it seems unlikely that the differences in methods used to measure attention (e.g., eye-tracking vs. dot probe tasks) in these studies have contributed to the inconsistent support for the vigilance-avoidance model. Evidence for this arises from the inconsistent results, which are still relevant when inspecting studies that have used the same measure of attention. For instance, an examination of the findings from the previously described research, all using eye-tracking methods to measure attention, indicates inconsistent support for the vigilance-avoidance model of attention. Therefore, it is possible that other variables may differentially influence attention biases displayed by anxious individuals, contributing to the previously

reported mixed findings. While there are many potential variables that may influence anxiety and attention biases, the present study will focus on an individual difference variable which may affect the attentional biases displayed by anxious participants, specifically adult attachment style. Previous research findings have implicated attachment style as an important variable within the context of anxiety and attention (Zeijlmans van Emmichoven, van IJzendoorn, de Ruiter, & Brosschot, 2003).

Attachment style, first described by Bowlby, (1969), refers to the relationship formed between a child and their primary caregiver. Ideally, the caregiver would be seen as a safe haven and secure base from which the child may explore their surroundings leading to an adaptive or secure attachment style. However, if there are ruptures in this relationship a more maladaptive (insecure) attachment style is adopted by the child. These early relationship experiences are internalized and function as a script that individuals use to approach relationships in the future. Typically, adult attachment style is measured using questionnaires which provide scores on two dimensions of insecure attachment: anxious attachment and avoidant attachment. Those who have high scores on the anxious attachment dimension tend to worry about the availability and responsiveness of the attachment figure while those who score low on this dimension are more secure in the responsiveness of their attachment figure. Those with high scores on the avoidant attachment dimension tend to avoid relying on others or opening up to them and those who score low on this dimension can be described as comfortable being close to and depending upon others. A securely attached person typically would score low on both the attachment anxiety and avoidance dimensions (Brennan, Clark, & Shaver, 1998).

The association between adult attachment style and psychopathology has been extensively researched. Attachment theory suggests that individuals with insecure attachment styles develop and implement maladaptive coping strategies during times of distress, leading to higher risk of psychological breakdown (Bowlby, 1988). The research findings generally

indicate that there is an over-representation of insecurely attached individuals in anxious samples (Eng, Heimberg, Hart, Schneier, & Liebowitz, 2001; Manassis, Bradley, Goldberg, Hood, & Swinson, 1994; Mikulincer & Shaver, 2007). Furthermore, research shows that greater attachment insecurity is associated with greater severity of anxiety-related symptoms (Eng et al., 2001). Thus, it might be expected that in a sample of anxious individuals, insecure attachment style would be prevalent. A recent theory regarding attachment style and psychopathology proposes that when an anxiously attached individual is vigilant for threat and is exposed to a chronically threatening environment, this can lead to the development of an anxiety disorder (Ein-Dor & Doron, 2015). Thus, threat-related attention biases have been implicated as an important factor to examine within the context of attachment style and anxiety.

Since the development of attachment theory, attention has been thought to be essential in engaging and managing the attachment system, and clear theoretical predictions regarding attachment style and attention have been proposed (Bowlby, 1982). Attachment theory predicts that those who score high on the dimension of anxious attachment will be vigilant for threatening stimuli; that is, they will orient towards threat and signs of rejection. On the other hand, those who score high on the avoidant attachment dimension would be dismissing of threatening information in an attempt to prevent activation of the attachment system (Dewitte & De Houwer, 2008). Research regarding adult attachment style and attention has revealed that attentional biases analogous to those seen in anxious participants are at play. Studies examining attention biases and attachment style have utilized reaction time measures only, such as the dot probe task. The findings generally indicate that when an individual scores high on dimensions of anxious or avoidant attachment (both insecure attachment styles) they are more likely than those who are securely attached to avoid looking at threatening stimuli (Dewitte & De Houwer, 2008; Dewitte, Koster, De Houwer, & Buysse, 2007). Thus, there is support for the prediction that avoidant attachment leads to avoidance of threatening stimuli,

but not for the prediction that anxious attachment leads to hypervigilance to threat. From the findings, it also seems that securely attached individuals exhibit greater attention to threatening stimuli than those who are insecurely attached; that is; they are vigilant to threat. It has been suggested that those who are securely attached attend to threat because their attachment style is protective against distress, allowing them to process the emotional information rather than avoid it (Zeijlmans van Emmichoven et al., 2003). Taken together, these findings indicate that attachment style can differentially influence attention biases. Thus, if there is differential representation of those with secure attachment styles in samples used in previous research examining the association between anxiety and attentional bias, we might expect the differing results that have been presented.

To our knowledge, only one study has examined the relationship between attachment style and anxiety on attention (Zeijlmans van Emmichoven et al., 2003). Using the emotional Stroop task to measure attention biases in a sample of anxiety-disordered outpatients, they found that attachment style independently contributed to attention bias, with secure participants demonstrating a greater bias towards threat than insecure participants. Unexpectedly, they did not find a significant main effect of anxiety on attention. Importantly, their findings also indicate that those who had an anxiety disorder and a secure attachment style showed the largest Stroop effect; that is, they demonstrated the largest threat bias for threatening vs. neutral words. Thus, these findings indicate that when a secure attachment style occurs within the context of anxiety there is an additive effect on attention, specifically an increase in the attentional bias towards threat. However, the Stroop task does not allow us to address how attention changes over the time course of a threatening stimulus. It may be that secure individuals initially are open to processing of threatening information; however, it is possible that with extended viewing there may be a different pattern of attention for secure individuals, one that reflects the protective nature of a secure attachment style. Furthermore, the use of the Stroop task to measure attention biases has been widely criticised. For example,

De Ruiter and Brosschot (1994) suggest that attention biases toward threat, as measured by the Stroop task, may reflect the cognitive avoidance of threatening cues rather than attention-related vigilance. Given the relative paucity of research in this area in combination with the use of the Stroop task to measure attention biases further research is warranted to examine whether attachment style influences the relationship between attention biases and anxiety.

The overall aim of the current study was to investigate whether adult attachment style influences the relationship between attention biases and anxiety, using eye-tracking technology. Both state (as a result of an anxiety inducing speech task), trait anxiety, and attachment style are examined. Firstly, based on the vigilance-avoidance model of attention, it is expected that anxious compared to non-anxious participants will initially be more vigilant for the threatening stimuli than the neutral or positive stimuli but will exhibit avoidance of threatening stimuli during the later stages of viewing. Given that studies examining attention biases in conjunction with attachment style and anxiety have used reaction time based measures only, the following hypotheses are exploratory. Regarding attachment and attention, we expect that attachment style will independently affect attention bias. Regarding attachment style, anxiety and attention biases, we expect that attachment style will moderate the relationship between anxiety and attention bias.

Method

Participants

Seventy two (18 males) first year psychology students at Macquarie University participated in this research study for course credit. Participants ranged in age from 17 to 34 years old ($M = 19.1$ years, $SD = 2.55$).

Materials

Measures of Anxiety.

State-Trait Anxiety Inventory (STAI-T & STAI-S). Trait and state anxiety were examined using the Trait scale and State scale, respectively, of the STAI (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). Each scale consists of 20 statements about common symptoms of state anxiety e.g., “I feel tense” and trait anxiety e.g., “I am a steady person” to which participants respond using a 4 point Likert scale (1 – *not at all* to 4 – *very much so*) to indicate their level of anxiety either in general (trait) or right at this moment (state). Past research has shown that both scales have demonstrated good reliability ($\alpha = .94$) (Crawford, Cayley, Lovibond, Wilson, & Hartley, 2011). There is considerable evidence demonstrating the construct and concurrent validity of both scales (Spielberger et al., 1983). In the current study, the internal consistency for the STAI-T $\alpha = .94$ and for the STAI-S was $\alpha = .94$.

Measures of Attachment Style.

Experiences in Close Relationships-Revised (ECR-R). The instructions of the ECR-R (Fraley, Waller, & Brennan, 2000) were adapted to emphasise close relationships in general rather than just romantic relationships. Adaptation of the ECR-R instructions, to refer to close relationships in general, is commonly conducted in research studies examining adult attachment style (Fraley et al., 2000; Gillath, Sesko, Shaver, & Chun, 2010). The measure consists of 36 items, for example, “I’m afraid I will lose the love of others”, where participants are required to indicate their agreement on a 7 point rating scale ranging from 1- *strongly disagree* to 7- *strongly agree*. ECR-R provides a measure of insecure adult attachment styles based on two continuous dimensions - attachment anxiety and attachment avoidance. Higher scores on each dimension indicate less secure attachment. Previous studies report adequate discriminant and convergent validity (Sibley, Fischer, & Liu, 2005). The internal consistency for both dimensions is good (attachment anxiety dimension: $\alpha = .95$;

attachment avoidance dimension: $\alpha = .94$) (Sibley & Liu, 2004). In the current sample the internal consistency of this measure was $\alpha = .88$ for the anxious attachment dimension and $\alpha = .72$ for the avoidant attachment dimension.

Other Variables.

Depression, Anxiety and Stress Scales (DASS-7). The 7 items assessing levels of depression were administered to participants (Lovibond, & Lovibond, 1995). Previous research has shown that symptoms of depression can influence attention (Armstrong & Olatunji, 2012; Sears, Thomas, LeHuquet, & Johnson, 2010), thus this measure was included in the current study to control for any effects of depression on attention biases. Participants were required to rate how much each item (e.g., “I felt I wasn’t worth much as a person”) applied to them on a 4 point scale from 0-*Did not apply to me at all* to 3-*Applied to me very much or most of the time*. The depression subscale has previously demonstrated good convergent validity (Lovibond, & Lovibond, 1995). Internal consistency in the current study for the depression scale is $\alpha = .91$.

Short Form Social Interaction Anxiety Scale (SIAS-6) and Social Phobia Scale (SPS-6). These measures were administered together and formed a 12 item measure assessing levels of social anxiety (Peters, Sunderland, Andrews, Rapee, & Mattick, 2012). Participants were required to rate items such as ‘I have difficulty making eye contact with others.’ on a 5 point scale ranging from 0-*Not at all characteristic or true of me* to 4-*Extremely characteristic or true of me*. Previous research shows that internal consistency and discriminant validity for both the SIAS-6 ($\alpha = .79$) and the SPS-6 ($\alpha = .85$) are good (Le Blanc et al., 2014). In the current sample, the SIAS-6 ($\alpha = .83$) and the SPS-6 ($\alpha = .90$) both had good to excellent internal consistency estimates, respectively.

Visual analogue scale (VAS). Participants completed a paper and pencil VAS at 3 time points during the session (before any prime, after the anxiety induction procedure, and after the attachment prime procedure) in order to check whether the priming was successful

by measuring state fluctuations in anxiety and feelings of attachment security during the session. Participants were instructed to “Rate how you currently feel right at this moment”. All items began with the stem “I currently feel” with two items measuring anxiety (calm, anxious) and 8 items measuring attachment security (comforted, secure, supported, safe, loved, protected, sheltered and unthreatened). Participants made their ratings on a 10 cm horizontal line with anchors at 0- *Not at all* and 100 -*Very much* and were instructed to place a vertical mark on the line to indicate how they currently feel. The responses provided on items relevant to state anxiety and state attachment were summed to provide two scores were calculated by summing the responses in millimetres to provide a total state anxiety and a total state attachment score. Higher scores on the state attachment total indicated more secure attachment and higher scores on the state anxiety measure indicated greater anxiety. The internal consistency for the anxiety scale was $\alpha = .84$ and for the attachment scale was $\alpha = .90$.

Procedure

All procedures were approved by the Macquarie University Human Research Ethics Committee and participants provided informed consent. Participants were randomly allocated to either the anxiety induction (instructions regarding a speech task) or no anxiety induction condition and to either the neutral, positive, or secure attachment priming condition resulting in a 2×3 design. For all participants, the study began with the completion of the VAS to obtain a baseline measure of state anxiety and state attachment security. All participants then completed the measures of trait anxiety (STAI-T), social anxiety (SIAS), and depression (DASS). The potential to perform a speech task was used in this study to induce feelings of anxiety in participants assigned to the anxiety induction condition. This procedure has been used in previous research to increase levels of anxiety in participants (Mansell, Ehlers, Clark, & Chen, 2002). Participants in the anxiety induction condition then received instructions that they will have to perform a 2 minute impromptu speech. They were told that they would be given a few minutes to prepare their speech prior to delivering it while being recorded. They

were informed that the speeches will be judged based on performance and content by senior academics in the faculty. They then went on to complete the STAI-S measure. Those in the no anxiety induction condition were not given any instructions regarding delivering a speech, rather they completed the STAI-S. All participants then completed the VAS followed by the attachment priming procedure (either neutral, positive, or secure). Lastly, all participants completed the eye-tracking task. On completion of the eye-tracking task, relevant participants were informed that they did not need to complete the impromptu speech.

Attachment Prime. The attachment priming procedure was adapted from Carnelley and Rowe (2007) and Mikulincer and Shaver (2001). Participants in the secure attachment condition were asked to “*Imagine yourself in a problematic situation that you cannot solve on your own, and imagine that you are surrounded by people who are sensitive and responsive to your distress, want to help you only because they love you and set aside other activities in order to assist you*”. In order to control for the possibility that the secure attachment prime may simply induce a positive mood, a positive affect condition, which did not include reference to attachment figures, was included. In the positive affect priming condition participants were instructed to “*Imagine yourself receiving a notice that you win a large amount of money in the national lottery, and imagine other students in your class hearing about this notice, approaching you, congratulating you and telling others about your good fortune*”. In the neutral priming condition the instructions were as follows “*Imagine yourself in a grocery store, on your own and buying products you need for your house, and imagine other persons who are also buying products, talking among themselves about daily issues, examining new brands and comparing different products*”. After each scenario was explained to the participant they were instructed to visualize the situation for a few minutes and afterward to write a brief description of what they had visualized. After the visualisation participants were asked to rate the vividness and clarity of their visualisation on a 7 point scale ranging from “not at all” to “very much”.

Eye-tracking task. Participants completed a passive viewing eye-tracking task comprised of 192 trials. Ninety six trials presented a threat-related stimulus (angry face) paired with a neutral stimulus, the remaining trials presented a positive stimulus (happy face) paired with a neutral stimulus. Each trial was presented for a total of 1500ms. Participants were instructed to look at the fixation cross when it was presented and once the stimuli were presented they were free to naturally view the faces. Emotional (happy and angry) and neutral facial stimuli were selected from the NimStim set of facial expressions (Tottenham et al., 2009). Each trial was preceded by a fixation cross displayed in the middle of the screen. A single trial consisted of a grayscale pair of faces (one emotional expression and one neutral expression of the same actor) displayed on the left hand side and right hand side of the screen. Trials used twelve different actors (6 female and 6 male) which were repeated 16 times on either the left or right hand side of the screen in counterbalanced order and all trials were randomly presented. Trials were presented using Tobii Studio Software and eye movement data was collected using a Tobii T120 eye-tracker. The sampling rate was set at 120Hz (gaze position was recorded every 8.3 ms) with a typical accuracy of $.5^\circ$ visual angle, using 9 calibration points. Participants were seated approximately 64 cm away from the screen.

Eye-tracking Data Analysis

Fixations were considered valid if a) they were greater than 100 ms in duration and b) participants' eyes were fixated on the center of the screen before the presentation of the stimuli. Fixations that did not meet the preceding criteria were excluded from further analysis. Eye movements where the pupil was occluded or the participant was looking off-screen were also excluded. During a typical trial in this passive viewing task, participants were able to scan both images freely, before making a fixation. Thus, to examine whether there is an initial bias to threat (vigilance in the two stage model), bias scores were calculated by dividing the number of trials where the first fixation was made toward the emotional face by the total number of trials with valid eye movements. For example, to determine the angry bias score,

the number of first fixations made toward the angry face was divided by the total number of trials in which valid eye movements were made toward either the angry or neutral face. The happy bias score was calculated in a similar manner. To examine the time course of attention, the 1500ms stimulus exposure time was segmented into three 500ms time intervals. To investigate whether there is avoidance of emotional stimuli at later stages of viewing, a bias score was calculated for each time interval by dividing the number of fixations on the emotional stimulus (either angry or happy) by the total number of fixations to the emotional and the neutral stimulus within each 0.5 second interval. Similar to the bias scores for the initial fixations, an angry and a happy bias score was calculated for each of the three time intervals. For all bias scores, scores greater than 0.5 are indicative of vigilance towards the emotional stimulus, and less than 0.5 are indicative of avoidance of the emotional stimulus (Gamble & Rapee, 2009).

Statistical Analysis

Linear mixed model analyses were conducted in order to examine the effects of anxiety and attachment style on the bias scores. This type of analysis was selected because it permitted the analysis of the anxious and avoidant attachment dimensions as continuous variables. Following the procedure recommended by West, Welch & Galecki, (2007), the model was first fitted with random intercepts. A second model was then fitted with random intercepts and random treatment effects. The final model fitted included heterogeneous residual variances. The models increase in complexity with each step. The model fit was compared using likelihood ratio tests.

Results

Descriptive Measures

Table 1 shows questionnaire data for participants in the anxiety induction condition and no anxiety induction condition. There were no significant differences between participants allocated to either condition in anxious $F(1, 70) = 0.20, p = .654, \eta^2 = .003$ or

avoidant $F(1, 70) = 1.49, p = .227, \eta^2 = .02$ attachment style, trait anxiety $F(1,70) = 0.10, p = .758, \eta^2 = .001$, depression $F(1, 70) = 0.18, p = .674, \eta^2 = .003$, or social anxiety symptoms SIAS-6: $F(1, 70) = 1.88, p = .175, \eta^2 = .03$, and SPS-6: $F(1, 70) = 0.002, p = .968, \eta^2 = .00002$, measured at baseline. The mean trait anxiety scores were somewhat higher than scores which are typical of university students (current study $M = 44.31$; normative sample $M = 37.62$) (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). There were significant differences, in state anxiety, between participants in the anxiety induction and no induction conditions, $F(1, 70) = 10.18, p = .002, \eta^2 = 0.13$. For the VAS measure of state anxiety, there were no significant differences between the anxiety induction and no induction conditions, at time 1 (measured at baseline), $t(70) = -1.00, p = .320, d = .24$. However, there were significant increases in state anxiety between conditions at time 2 (measured after the anxiety inducing task), $t(70) = -4.00, p < .001, d = .94$, and at time 3 (measured before the eye-tracking task), $t(70) = -2.23, p = .029, d = .53$.

<Insert Table 1>

Manipulation Check

Anxiety induction task. The effectiveness of the instructions regarding a speech task in inducing levels of anxiety can be evaluated in two ways. Firstly, levels of state anxiety (measured by the STAI-S) after participants received instructions about the speech task, were compared between the anxiety induction and no anxiety induction conditions. A one way between subjects ANCOVA was conducted to examine the state levels of anxiety between the anxiety induction and no anxiety induction conditions, while controlling for trait levels of anxiety. Those individuals in the anxiety induction condition had significantly higher levels of state anxiety as measured by the STAI-S than those in the no anxiety condition (controlling for trait anxiety), $F(1, 69) = 26.55, p < .001, \eta^2 = .28$, indicating that those who received the anxiety induction had increased levels of state anxiety compared to those who did not.

Secondly, to examine whether state anxiety levels increased after completion of the anxiety induction task, scores on the VAS anxiety measure at time 1 (before the anxiety inducing task) and at time 2 (after the anxiety inducing task) were analysed. A 2 (anxiety induction, no anxiety induction) \times (2) (time 1, time 2) mixed factorial ANOVA showed a significant interaction between VAS anxiety scores and anxiety condition. Those who received the anxiety induction showed increases in anxiety whereas those who did not showed decreases in their level of anxiety (controlling for trait anxiety), $F(1, 69) = 9.80, p = .003, \eta^2 = .12$. Planned comparisons reveal that in the no anxiety induction condition anxiety levels did not differ from time one to time two, $t(35) = 0.82, p = .419$. In contrast, the same comparisons in the anxiety condition revealed a significant increase in anxiety from time 1 (before the prime) to 2 (after the prime), $t(35) = -3.62, p = .001$. Overall, it appears that the instructions regarding preparation of a speech increased anxiety levels.

Attachment prime. Priming attachment style involves the experimental activation of cognitive representations of attachment security. Previous research has shown that once these cognitive representations are activated they can influence the processing of external cues and behaviours (Carnelley & Rowe, 2007; Dewitte & De Houwer, 2011). Thus, the attachment prime was included to order to increase feelings of attachment security. In order to examine the effect of the attachment prime on feelings of felt security, a 3 (secure prime, positive prime, neutral prime) \times (2) (time 2, time 3) mixed factorial ANOVA was conducted. The results indicate that there was no significant interaction between attachment prime condition and VAS attachment scores taken before and after the priming procedure (controlling for trait attachment scores measured by the ECR-R, at baseline), $F(2, 67) = 0.03, p = .967, \eta^2 = .001$. Therefore felt security for those in the secure priming condition did not significantly increase after the attachment prime compared to the neutral and positive priming conditions. Thus, it appears that the attachment prime failed. In order to examine the effect of attachment style on

attention, therefore, trait levels of attachment style, as measured by the ECR-R at baseline, rather than attachment priming condition, were used in all further analyses.

Vigilance for Threat

Descriptive statistics for angry and happy bias scores in each anxiety condition are presented in Table 2. A bias score of 0.5, indicates that the participant was neither vigilant nor avoidant. Thus, participants with a score of 0.5 indicate no bias. One-sample t-tests were conducted to determine whether bias scores for the threatening and positive images (regardless of anxiety or attachment condition) differed significantly from chance levels (0.5). Both bias scores were significantly greater than 0.5, thus the reported means for bias scores (see Table 2) are significantly different from chance levels (angry bias scores: $t(71) = 7.14$, $p < .001$; happy bias scores: $t(71) = 4.17$, $p < .001$), indicating attentional bias.

<Insert Table 2>

To examine whether the anxiety priming had an effect on the probability of initially fixating on the angry or the happy face, bias scores were entered into a $2 \times (2)$ mixed factorial ANOVA comparing the anxiety induction condition with the no anxiety induction condition (prime; between subjects) on the angry and happy bias scores (valence; within subjects). There was a significant main effect of valence, $F(1, 70) = 5.52$, $p = .022$, $\eta^2 = .07$, such that all participants were more vigilant for angry faces compared to happy faces regardless of their anxiety condition. The results indicate a non-significant interaction between anxiety condition and valence, $F(1, 70) = 0.04$, $p = .840$, $\eta^2 = .001$. Therefore, there were no significant differences in attention to happy or angry faces between anxiety conditions.

To examine whether attachment style had an effect on the relationship between the anxiety condition and the probability of initially fixating on the emotional stimulus, a linear mixed model analysis was conducted comparing the two anxiety conditions (anxiety induction vs. no anxiety induction) across stimulus valence (angry vs. happy) on attention bias scores

with trait anxiety (STAI-T)¹, depression (DASS-7), attachment anxiety (ECR-anxiety dimension) and attachment avoidance (ECR-avoidance dimension) as covariates. The previously mentioned categorical and continuous predictors were entered as fixed effects along with the interaction terms investigating the relationship between anxiety condition, attachment style, and valence. The model also includes a random effect associated with the intercept for each participant and a residual associated with each observation.

The assumption of normality was assessed for all variables in this analysis. The assumption of normality was violated for the depression independent variable, $D = .20, p < .001$. All other variables were normally distributed. Inspection of the normal and detrended Q-Q plots showed that the depression variable might have slight deviations from normality. Inspection of the depression variable boxplot revealed 6 individuals who scored above the extremely severe threshold for depression. Transforming this variable (square root) and conducting an outlier analysis (replacing outlier scores with the next highest score plus one) did not improve the distribution as the Kolmogorov Smirnov statistic remained significant. Therefore the following results should be interpreted in light of the fact that the assumption of normality has been violated. The scatterplot of standardised residuals against standardised predicted values indicate that the assumptions of linearity and homoscedasticity are met. No multivariate outliers were identified as the Mahalanobis distance did not exceed the critical χ^2 for $df = 6$ ($\alpha = .001$) of 22.46. Inspection of collinearity statistics for all predictors indicated all variance inflation factors (VIF) were less than 5.0 with relatively high tolerances thus indicating that multicollinearity would not interfere with the interpretation of the results.

Using procedures established by West, et al. (2007) the full model was fit with all possible fixed effects and relevant interactions. Importantly, the three-way interactions between anxiety condition, valence, and anxious attachment ($t(66) = -1.03, p = .308$) and anxiety condition, valence, and avoidant attachment ($t(66) = -0.86, p = .395$) were not

¹ Given that state anxiety and trait anxiety are correlated, in examining state anxiety, trait anxiety was controlled for to ensure that state anxiety scores were not just reflecting trait anxiety.

significant. Thus, attachment style did not moderate the relationship between anxiety condition, valence and attention bias scores. As part of the model reduction procedure recommended by West et al. (2007), these higher order interactions were removed from the model. Table 3 illustrates the linear mixed effects final model regression weights and significance levels for the anxiety induction condition, valence, trait anxiety, and attachment style in predicting attention bias, as represented by happy and angry bias scores. The final model accounts for 8.5% of the variance in attention bias scores ($\rho=.085$). There were significant main effects for the covariates trait anxiety, $t(64) = 2.27, p = .027$ and depression, $t(64) = -2.49, p = .015$. There was also a significant main effect of attachment avoidance on attention bias, $t(86.29) = -2.38, p = .020$, where high scorers on the attachment avoidance dimension were more likely to have lower bias scores (be less vigilant for both emotional stimuli). However, this was qualified by a significant interaction between attachment avoidance and anxiety condition, $t(64) = 2.38, p = .020$. To examine this interaction, a simple slopes analysis was conducted using estimated marginal means and Bonferroni adjustment. There were no significant differences in viewing emotional faces between anxiety conditions when attachment avoidance was low (one standard deviation below the mean), $t(64) = 1.17, p = .239$ or at the mean level of attachment avoidance, $t(64) = 0.08, p = .428$ (see Figure 1a.). However, a significant between group difference emerged for those participants who endorsed a high level of attachment avoidance, such that the participants in the anxiety induction condition were less vigilant for the emotional face than those in the no anxiety induction condition, regardless of valence, $t(64) = 2.27, p = .025$.

There was also a significant attachment anxiety by valence interaction, $t(68) = -2.01, p = .048$. A simple slopes analysis was conducted to further examine the interaction. The results showed that participants who endorsed low (one standard deviation below the mean) and average levels of attachment anxiety were more vigilant for angry faces than happy faces; $t(68) = 3.11, p = .003$ and $t(68) = 2.46, p = .020$, respectively (see Figure 1b.).

<Insert Table 3>

Time Course of Attention

A second mixed model analysis was conducted comparing the anxiety condition (anxiety induction vs. no anxiety induction) across time interval (0-500 ms, 500-1000 ms and 1000-1500 ms), and valence (angry vs. happy faces) on bias scores with trait anxiety (STAI-T), depression (DASS-7), attachment anxiety (ECR-anxiety dimension) and attachment avoidance (ECR-avoidance dimension) as covariates. The previously mentioned categorical and continuous predictors were entered as fixed effects along with the interaction terms investigating the relationship between time interval, anxiety condition, attachment style, and valence. The final model includes a random effect associated with the intercept and valence with heterogeneous residual variances.

As previously mentioned the independent variables were screened and met the assumption of normality except for the depression variable. Regarding the dependent variables in this analysis the assumption of normality was assessed separately for bias scores attained from each time interval. The Kolmogorov-Smirnov test for normality was significant for angry bias scores at time 3 (1000 to 1500 ms), $D = .09$, $p = .200$ and happy bias scores at time 1 (0-500 ms), $D = .11$, $p = .021$, time 2 (500 – 1000 ms), $D = .13$, $p = .003$ and time 3 (1000- 1500 ms), $D = .12$, $p = .009$. Thus there were significant deviations from normality for these particular dependent variables. For angry bias scores at time 1 and time 2 the distribution did not deviate significantly from a normal distribution, $D = .09$, $p = .200$; $D = .04$, $p = .200$ respectively. Inspection of the normal and detrended Q-Q plots showed that the dependent variable might have slight deviations from normality. Next the boxplots for these variables were inspected and univariate outliers were identified. Transformation of the data (reflect and either square root or log transformation) and changing the score of each outlier to the next highest score plus one unit was conducted on each dependent variable and the normality of the distribution did not improve the distributions. The Malhalanobis distance

exceeded the critical χ^2 for $df = 10$ ($\alpha = .001$) of 29.59 and one multivariate outlier was identified. Removal of this case improved the distribution of the dependent variables; however the assumption of normality for the depression variable was still violated. Therefore the following results should be interpreted in light of the fact that the assumption of normality has been violated. The scatterplot of standardised residuals against standardised predicted values indicate that the assumptions of linearity and homoscedasticity are met. Inspection of collinearity statistics for all predictors indicated all VIF statistics were less than 5.0 with relatively high tolerances thus indicating that multicollinearity would not interfere with the interpretation of the results. The mean attention bias scores for each time interval are shown in Table 4.

<Insert Table 4>

The three way interactions between anxiety induction condition, valence, and anxious attachment ($t(63.79) = -0.60, p = .549$) and anxiety induction condition, valence, and avoidant attachment ($t(63.79) = -0.72, p = .477$), were not significant. Thus, similarly to the previous analysis attachment style did not moderate the relationship between the anxiety induction condition, valence, and attention bias scores. Once again, these higher order interactions were removed from the final model, as part of the model reduction procedure recommended by West et al. (2007). Table 5 illustrates the linear mixed effects final model regression weights and significance levels for anxiety induction condition, stimulus valence, trait anxiety, attachment style, and time interval in predicting attention bias, as represented by happy and angry bias scores.

There were no significant main effects of time interval nor were there interactions between time interval and the attachment dimensions or anxiety induction condition. Trait anxiety significantly predicted attention bias scores, $t(58.39) = 2.48, p = .016$. The depression covariate approached significance, $t(58.39) = -1.97, p = .054$. The avoidance dimension of attachment significantly predicted attention bias scores, such that the more avoidantly

attached the individual, the less likely they were to attend to the emotional stimulus (either happy or angry), regardless of time interval and anxiety condition; $t(60.42) = -3.46, p = .001$. There was a non-significant main effect of anxiety condition, $t(60.13) = -1.57, p = .122$.

There was a significant interaction between attachment avoidance and anxiety condition, $t(58.39) = 2.68, p = .010$ (see Figure 2a.). Follow-up tests (using a simple slopes analysis) indicate that participants in the anxiety induction condition avoided attending to the emotional stimuli significantly more than those in the no anxiety induction condition only when attachment avoidance was high (one standard deviation above the mean), $t(62.03) = 2.73, p = .008$. These between group differences were not observed when attachment avoidance was low (one standard deviation below the mean), $t(62) = 1.11, p = .277$ or at the mean level, $t(62.76) = 1.15, p = .250$. There was also a significant valence by time interaction, $t(121.92) = 3.14, p = .002$ (see Figure 2b.). Follow-up tests indicate that all participants were more vigilant for angry faces than happy faces in the first time interval (0-500 ms), $t(128.48) = 2.11, p = .037$ and in the second (500-1000 ms), $t(68.23) = 2.21, p = .028$. There were no significant differences in viewing angry or happy faces in the third time interval, $t(124.58) = 0.56, p = .576$.

<Insert Table 5>

Discussion

The main aim of the present study was to establish that adult attachment style is an important individual difference to consider within the context of anxiety and attention biases. A secondary aim was to replicate previous findings regarding the independent effects of anxiety and attachment style on attention. Furthermore, we have examined both the initial stage of attention (initial bias) as well as the pattern of attention over time (time course of attention) in order to provide a comprehensive depiction of attention biases. Overall the results show that while attachment avoidance moderates the relationship between attention and anxiety, attachment anxiety does not have an effect. That is, regardless of anxiety, those

with high scores on the anxious attachment dimension were initially more avoidant of threatening stimuli, while those with high scores on the avoidant attachment dimension were more likely to avoid attending to emotional stimuli, both initially and over the entire stimulus presentation, when exposed to the anxiety induction. In relation to the vigilance-avoidance theory of attention, the results from the current study did not support the expected differences in attention biases. While there were no differences between those in the anxiety induction and no anxiety conditions in terms of initial bias towards threatening stimuli, there was a difference in viewing emotional stimuli over the entire stimulus presentation time. Specifically, those in the anxiety induction condition were less likely to fixate first on the emotional stimulus (angry and happy faces) than those in the no anxiety condition. The independent effects of attachment style however influenced the pattern of attention at both the initial stages and over time. Specifically, those with high levels of attachment anxiety initially avoided attending to the threatening relative to the positive stimulus while those with high levels of attachment avoidance were less likely to fixate on all emotional stimuli initially as well as over time.

In this study we have examined the nature of the relationship between adult attachment style, anxiety and attention in three distinct ways; firstly the relationship between anxiety and attention is discussed followed by the relationship between attachment style and attention and, finally, the findings regarding the influence of attachment on the relationship between anxiety and attention are discussed.

Firstly, the anxiety and attention specific hypothesis that individuals in the anxiety induction condition would be initially more vigilant for angry faces than those in the no anxiety condition was not supported. All participants were significantly more vigilant for angry faces compared to happy faces. Therefore this pattern of initial attention to threatening stimuli is not specific to anxious individuals, but appears to be a general pattern of viewing for all participants. While the current results do not provide support for the vigilance stage of

the vigilance-avoidance model of attentional biases in anxiety, they do however replicate previous findings reported by other researchers using eye-tracking technology (Gamble & Rapee, 2009; Garner, Mogg, & Bradley, 2006, Schofield, Inhoff, & Coles, 2013; Schofield et al., 2012).

Regarding the avoidance stage of processing, the vigilance-avoidance model of attention would predict that those who are in the anxiety condition would avoid attending to the threatening stimulus (i.e., the angry face), specifically they would be more likely to attend to the neutral stimulus. The current findings indicate that participants in the anxiety condition were less vigilant for emotional faces (both angry and happy) than those in the no anxiety condition. Thus, these findings do not support the proposed hypothesis as those in the anxiety condition attended less to emotional stimuli in general rather than attending less to the threatening stimulus specifically as the theory would predict. Furthermore, this pattern of viewing does not appear to represent avoidance given that all participants attended *more* to the emotional compared to the neutral stimulus. The findings also indicate that there was a difference in viewing happy versus angry faces (relative to neutral) over time, however it seems that all participants were more vigilant for angry faces early on during the stimulus presentation compared to later time intervals. These findings support those previously reported which have also failed to find a bias in attending to threatening stimuli over time in anxious participants (Gamble & Rapee, 2009).

Second, regarding attachment and attention, the findings offer mixed support for the previous literature. While attachment theory predicts that high scorers on the anxious attachment dimension will be hypervigilant to threat (Bowlby, 1982), the current findings appear to support those previously reported in demonstrating that anxiously attached individuals avoid attending to threatening information (Dewitte & De Houwer, 2008; Dewitte et al., 2007). The current results indicate that, irrespective of exposure to the anxiety induction, individuals who were high scorers on the anxious attachment dimension showed a

different pattern of initial attention bias than those who scored low to average on the anxious attachment dimension. In particular, those individuals who scored high on the anxious attachment dimension were more avoidant of angry faces than happy faces. While this pattern of viewing was evident when examining the initial attention bias, it was not maintained over time. Results regarding the avoidant attachment dimension, on the other hand, indicate that individuals who report high levels of attachment avoidance are more likely to avoid attending to emotional information (both happy and angry faces) in general, rather than angry faces specifically. Therefore the results regarding attachment anxiety and attention are in line with findings reported by previous studies indicating that those who report a high level of anxious attachment will avoid attending to threatening information, while the results regarding avoidant attachment demonstrate that these individuals are more likely to avoid attending to emotional stimuli in general rather than threat specific stimuli (Dewitte & De Houwer, 2008; Dewitte et al., 2007).

The final relationship regarding the hypothesis that attachment style, moderates the relationship between attention, and anxiety was partially supported. It seems that those who report high levels of avoidant attachment are more likely to avoid attending to the emotional stimulus across the entire stimulus presentation time when exposed to the anxiety induction than those in the no anxiety condition who also report high levels of attachment avoidance. There were no differences between the anxiety induction and no anxiety conditions in viewing emotional stimuli at low or average levels of attachment avoidance. While there was no significant interaction between anxiety condition, attachment avoidance and time it is important to note that the pattern of viewing (avoidance of emotional stimuli) was maintained throughout the stimulus presentation time. Thus there were no differences in patterns of viewing emotional stimuli from one time interval to the next. That is, it appears that the stimulus that participants fixated on initially is the stimulus that they spent most time viewing across the stimulus presentation. Avoidantly attached individuals who were exposed to the

anxiety induction were more likely to avoid initially fixating on the emotional stimuli regardless of whether they were threatening (angry) or positive (happy). In contrast, the results indicate that anxious attachment dimension did not moderate the relationship between anxiety and attention. These findings indicate that the relationship between anxiety and attention varies as a function of avoidant attachment when considering both the initial fixation made as well as the time course of attention, thus supporting the hypotheses. The current findings offer partial support for previous research studies that have demonstrated that avoidantly attached individuals will avoid attending to threatening stimuli specifically (Dewitte & De Houwer, 2008; Dewitte et al., 2007). The current study found that that these individuals are more likely to avoid attending to all emotional stimuli (both happy and angry faces), which is a similar finding to that of Zeijlmans van Emmichoven et al. (2003) who examined attachment and attention in a group of anxiety disordered patients and similarly found that insecure individuals were more likely to avoid processing emotional information in general.

While the current study replicates and extends previous findings regarding attachment style and attention, some findings regarding anxiety and attention were unexpected. The findings reported by Zeijlmans van Emmichoven and colleagues (2003) are extended as attachment style in the current research is operationalised as continuous dimensions rather than categories (classifying participants as secure or insecure based on median split) and a more robust method of measuring attention was used in the current study, thus allowing for a more detailed analysis of adult attachment style which aids in discriminating between the anxious and avoidant dimensions of attachment. Regarding attention, the use of eye-tracking technology provides the opportunity to measure attention over time rather than just a snapshot of attention which tasks such as the dot probe and Stroop tasks provide. One methodological limitation of the current study is that the attachment prime implemented was not effective in manipulating state attachment style. A possible reason for the prime failing may be that the

scenarios used were interpreted differently than intended by participants in the current study. Consequently we are unable to draw causal conclusions regarding the influence of attachment on attention biases. There is a discrepancy between the current findings, which failed to support a state anxiety linked bias in attention, and previous research (Armstrong & Olatunji, 2012; Asmundson & Stein, 1994; Mogg & Bradley, 2002), which has found that anxious participants will be initially vigilant to threat and following that will avoid attending to threatening stimuli (supporting the vigilance-avoidance theory) (Armstrong & Olatunji, 2012; Asmundson & Stein, 1994; Koster et al., 2005; Mogg & Bradley, 2002; Rohner, 2002). This difference may be due to methodological differences as well as limitations of the current study. One limitation of the current study is the use of a non-clinical sample to measure attention bias. Perhaps at the more extreme levels of anxiety seen in clinical samples, differences related to the valence of the stimulus (i.e., happy vs angry) may be evident. Another important methodological difference that may have led to the discrepancy in results could be the difference in experimental tasks (eye-tracking vs dot probe tasks) used to measure attention bias. Support for this claim is evident when considering the findings of previous studies that have used eye-tracking and also indicate the lack of an anxiety linked attention bias for the initial attention bias (Gamble & Rapee, 2009; Garner et al., 2006; Schofield et al., 2012; Waechter, Nelson, Wright, Hyatt, & Oakman, 2014) and the time course of attention (Gamble & Rapee, 2009; Quigley et al., 2012; Schofield et al., 2013; Waechter et al., 2014).

The current study is one of the first to examine the relationship between adult attachment style, anxiety, and attention. A key finding in this study was that an avoidant attachment style moderates the relationship between anxiety condition (based on levels of state anxiety) and attention bias. Specifically, the results have shown that those with higher levels of attachment avoidance in the anxiety induction condition were more likely to avoid attending to emotional stimuli in general compared to those with low and average levels of attachment avoidance.

Given that cognitive models of anxiety have implicated attention biases as important factors which can maintain symptoms of anxiety (Beck & Clark, 1997); and that the research examining attention and anxiety has produced inconsistent findings. Then the examination of the influence of individual difference variables, such as attachment style, on anxiety and attention biases is an important area requiring further investigation. While these results require replication in a clinical sample of anxious individuals, the current study offers preliminary support that adult attachment style is a relevant factor to examine within the context of anxiety and attention.

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Table 1

Mean, standard deviation and significance for self-report measures of anxiety, social anxiety, depression, and attachment style.

	Anxiety Induction		No Anxiety Induction		<i>p</i>
	<i>(n= 36)</i>		<i>(n= 36)</i>		
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
STAI-T	44.31	12.32	45.14	10.42	.758
STAI-S	39.39	11.17	31.81	8.86	.002
SIAS-6	6.72	4.61	5.25	4.51	.175
SPS-6	5.89	5.79	5.83	5.90	.968
DASS-7	4.36	4.88	4.83	4.60	.674
ECR- anxiety dimension	3.47	1.15	3.60	1.35	.654
ECR- avoidance dimension	3.78	1.10	3.48	0.98	.227
VAS-anxiety time 1	58.97	45.15	49.42	35.20	.320
VAS-anxiety time 2	81.44	39.19	44.31	39.53	< .001
VAS- anxiety time 3	65.69	43.46	43.36	41.46	.029

Note: For all measures higher scores are indicative of more extreme responding in the direction of the construct being assessed. STAI-T =State Trait Anxiety Inventory- Trait Version, STAI-S = State Trait Anxiety Inventory- State Version, SIAS-6 = Social Interaction Anxiety Scale- Short Form; SPS-6 = Social Phobia Scale- Short Form, DASS-7 = Depression, Anxiety & Stress Scales- depression subscale, ECR- anxiety dimension = Experiences in Close Relationships- attachment anxiety dimension, ECR-avoidance dimension = Experiences in Close Relationships- attachment avoidance dimension, VAS-anxiety = Visual Analogue Scales- anxiety measure.

Table 2

Mean and standard deviations for angry and happy bias scores in the anxiety induction and no anxiety induction conditions.

	Angry Bias Score		Happy Bias Score	
	M	SD	M	SD
Anxiety induction (n = 36)	0.57	0.11	0.55	0.12
No anxiety induction (n=36)	0.60	0.10	0.56	0.10

Table 3

Vigilance for threat: Final mixed effects model of predictors of attention bias

Variable	Estimate	SE	df	t	p
Intercept	.70	.08	82.71	8.33	< .001
Anxiety Condition	-.17	.09	66.89	-1.90	.061
Valence	.08	.06	68	1.32	.191
Trait Anxiety	.004	.002	64	2.27	.027
Depression	-.01	.003	64	-2.49	.015
Attachment Anxiety	-.001	.02	81.92	-.046	.963
Attachment Avoidance	-.04	.02	86.29	-2.38	.020
Anxiety Condition× Attachment Anxiety	.001	.02	64	0.07	.949
Anxiety Condition× Attachment Avoidance	.05	.02	64	2.38	.020
Anxiety Condition× Valence	.01	.03	68	0.39	.702
Valence× Attachment Anxiety	-.02	.01	68	-2.01	.048
Valence× Attachment Avoidance	.01	.01	68	0.51	.612

Table 4

Attention bias scores for participants by time interval (ms), anxiety condition and stimulus valence.

Time Interval	Anxiety Condition	Stimulus Valence	M	S.D.
0-500	No anxiety	Angry	.63	0.11
	induction	Happy	.60	0.09
	Anxiety	Angry	.61	0.12
	induction	Happy	.56	0.13
500-1000	No anxiety	Angry	.67	0.11
	induction	Happy	.64	0.09
	Anxiety	Angry	.61	0.15
	induction	Happy	.58	0.14
1000-1500	No anxiety	Angry	.59	0.14
	induction	Happy	.57	0.14
	Anxiety	Angry	.57	0.17
	induction	Happy	.57	0.14

Note: Bias scores are the number of fixations to the emotional (either happy or angry) stimulus divided by the total number of fixations to the emotional or neutral face in a particular time interval.

Table 5

Time course of attention: Final mixed effects model of predictors of attention bias

Variable	Estimate	SE	df	t	p
Intercept	.80	.10	61.56	8.32	<.001
Anxiety Condition ^a	-.17	.11	60.13	-1.57	.122
Valence ^b	-.02	.06	70.24	-0.35	.731
Time 1 ^c	-.01	.02	213.05	-0.49	.622
Time 2 ^c	-.01	.01	121.82	.848	.398
Trait Anxiety	.005	.002	58.39	2.47	.016
Depression	-.008	.004	58.39	-1.97	.054
Attachment Anxiety	.005	.02	60.38	0.30	.764
Attachment Avoidance	-.07	.02	60.42	-3.46	.001
Attachment Avoidance× Anxiety	.07	.03	58.39	2.68	.010
Condition					
Attachment Anxiety× Anxiety Condition	-.01	.02	58.39	-0.69	.496
Valence× Time	.04	.01	121.92	3.14	.002

^a 0= No anxiety induction; 1= anxiety induction (reference category).

^b 1=Angry valence; 2=Happy valence (reference category).

^c Time 1= 0-500 ms; Time 2= 500-1000 ms; Time 3= 1000-1500 ms (reference category).

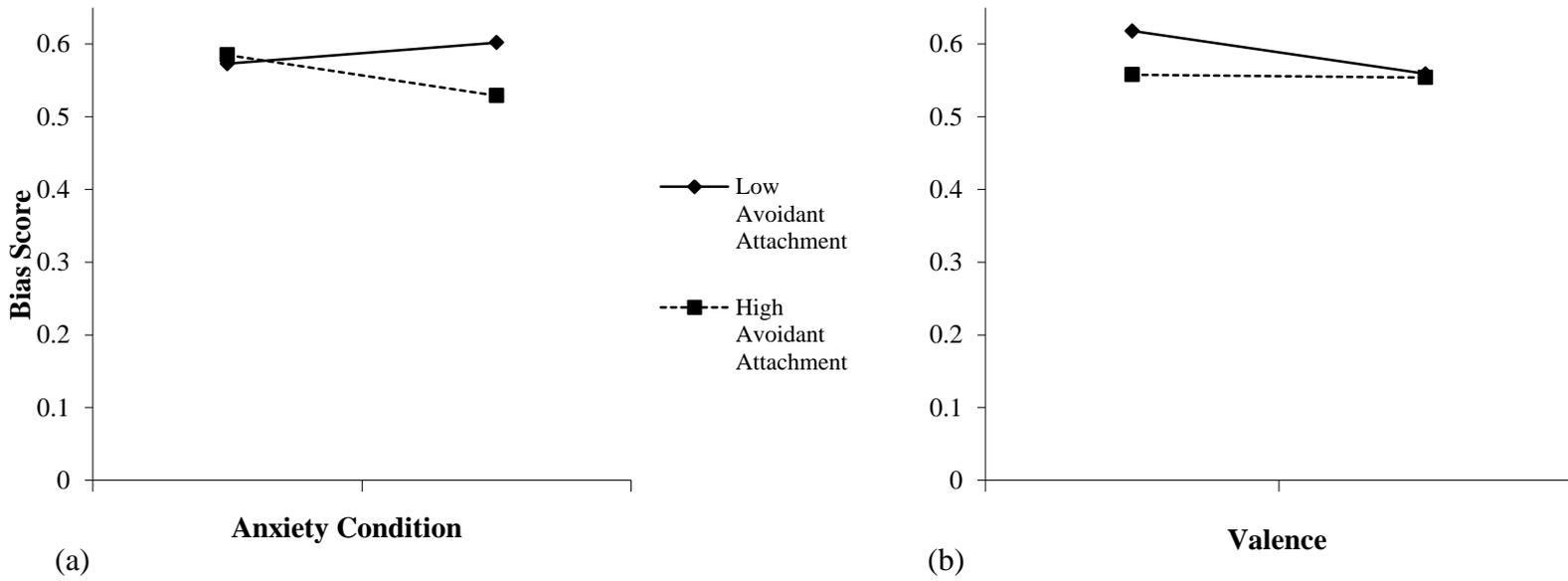


Figure 1. Results regarding initial attention bias. a) Significant interaction between attachment avoidance and anxiety condition. b) Significant interaction between attachment anxiety and valence of the stimulus.

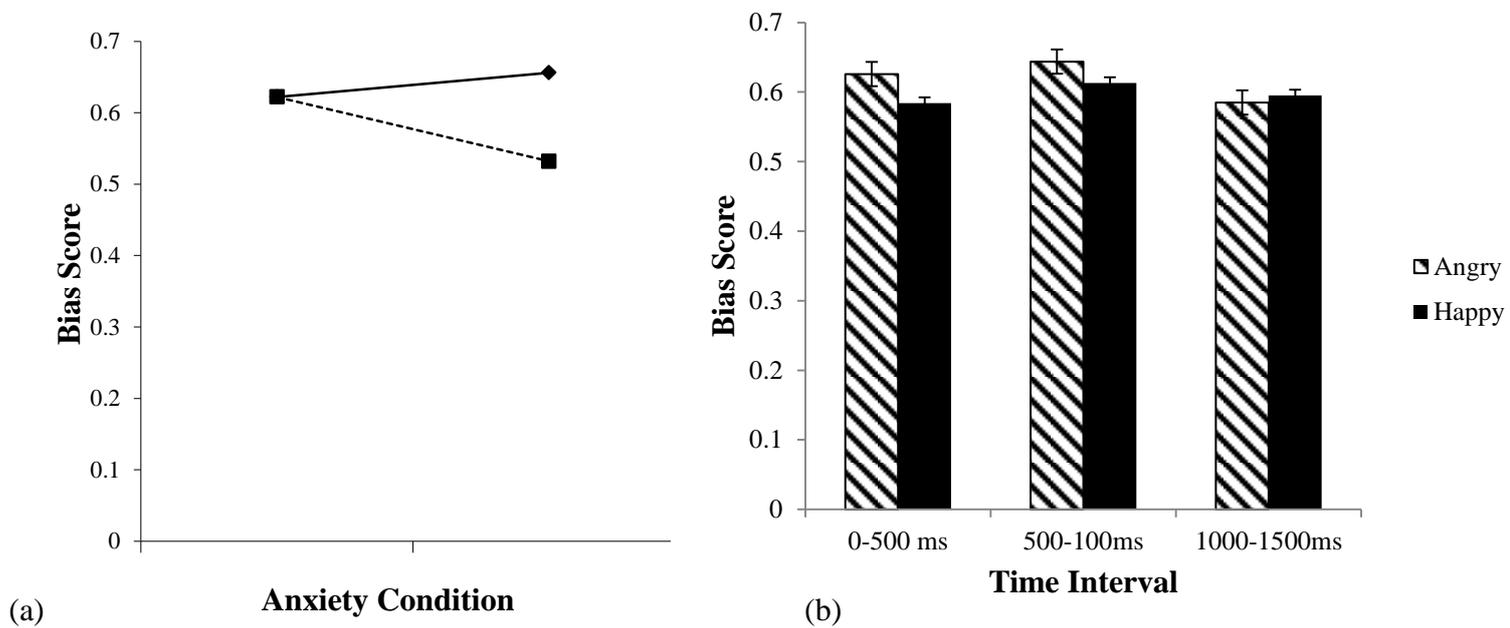


Figure 2. Results regarding time course of attention. a) Significant interaction between anxiety condition and attachment avoidance. b) Significant interaction between time interval and valence of the stimulus

The following chapter presents the paper entitled “Time course of attention in socially anxious individuals: Investigating the effects of adult attachment style”. Building on the previous chapter, this research study examines the time course of attention in order to understand the influence attention biases measured over time may have on social anxiety symptoms and, furthermore, whether attachment style is a moderator of this relationship. To address this research question, the proposals made by the CBT models of SAD regarding attention biases will be investigated (Clark & Wells, 1995; Rapee & Heimberg, 1997). Furthermore, we will compare the attention patterns of a clinical sample (diagnosed with SAD) to a non-clinical control sample.

Chapter 3

Time course of attention in socially anxious individuals: Investigating the effects of adult attachment style.

This chapter has been submitted for publication to Journal of Anxiety Disorders, and is presented in its submitted format.

Author contribution:

Ms. Yulisha Byrow was solely responsible for the design of the research, analysis and write-up of this paper. Dr. Nigel T.M. Chen provided eye-tracker data handling assistance. Dr. Peters provided statistical and research supervision

Time course of attention in socially anxious individuals: Investigating the effects of adult attachment style

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Abstract

Theoretical models of social anxiety propose that attention biases maintain symptoms of social anxiety. Research findings regarding attention biases and social anxiety have been mixed. Adult attachment style may influence attention bias and social anxiety, thus contributing to the mixed findings. This study aims to examine the time course of attention for individuals diagnosed with social anxiety disorder and to assess whether attachment style moderates this relationship. Ninety participants diagnosed with social anxiety disorder and 23 non-clinical control participants completed an eye-tracking task used to measure the time course of attention. The results showed that clinical participants avoided attending to emotional stimuli compared to those in the control group. Attachment style did not moderate this association, however anxious attachment was related to greater vigilance toward emotional compared to neutral stimuli. These results support the Clark and Wells (1995) proposal that socially anxious individuals avoid attending to emotional information.

Keywords: social anxiety; eye-tracking, attention bias

Time course of attention in socially anxious individuals: Investigating the effects of adult attachment style

1. Introduction

The two principal Cognitive Behavioural Therapy (CBT) models of Social Anxiety Disorder (SAD), developed by Clark and Wells (1995) and Rapee and Heimberg (1997), both propose that attention biases displayed by socially anxious individuals serve to maintain symptoms of SAD. Furthermore, both models acknowledge that a fear of negative evaluation is a central concern for those with SAD. Where the models differ, however, is in regard to the nature of the attention biases displayed by socially anxious individuals. The Clark and Wells (1995) model proposes that those with SAD, will avoid attending to emotional stimuli (such as stimuli that might indicate negative evaluation e.g., an audience member yawning during a speech), turning their attention resources inward instead toward internally generated sources of threat. This response is seen as maladaptive as it prevents individuals from gaining exposure to feared stimuli, thus preventing reappraisal and maintaining associations with harm (Mogg & Bradley, 1998). On the other hand, the Rapee and Heimberg (1997) model suggests that those with SAD will be excessively vigilant towards threatening stimuli. This increased attention towards threat suggests that these individuals are more likely to process negative information as opposed to positive or neutral information, thus maintaining their symptoms of SAD.

Attention biases have commonly been measured using either reaction time based tasks (e.g., the dot-probe task) or eye-tracking tasks. In the dot-probe task, participants are presented with an emotional (e.g., either happy or angry face) stimulus paired with a neutral stimulus. Participants are required to respond to a probe that replaces either the emotional or neutral face. If they are quicker at responding to probes that replace the emotional stimulus (e.g., angry face), then they are thought to be vigilant towards threat. Maintenance of attention

over time (time course of attention) in dot probe tasks is examined by presenting the stimulus for longer periods of time and examining responses to probes during these longer stimulus presentation times. For example, Mogg, Philippot, and Bradley (2004) examined the time course of attention in a clinical sample of socially anxious individuals using a dot probe task during which the trials were presented for either 500 msec (to examine initial attention biases) or 1250 msec (to examine maintenance of attention over time). The results show that, when stimuli are presented for 500 msec, the individuals with SAD were more vigilant for the angry faces than the happy or neutral faces when compared to a non-clinical control group, thus suggesting vigilance towards threat for socially anxious individuals. There were no differences between the clinical and control groups in attention to either emotional stimulus when presented for 1250 msec suggesting that there are no differences in the maintenance of attention towards threatening stimuli. Another study similarly found evidence for vigilance towards threat for participants with high levels of state anxiety; however, this vigilance was maintained across all stimulus presentation times (K. Mogg et al., 1997). Thus, the dot probe research provides support for the proposal made by Rapee and Heimberg (1997) that socially anxious individuals will be initially vigilant towards threat. However, the results are mixed with regard to the time course of attention. Support for the Clark and Wells (1995) proposal that socially anxious individuals will avoid attending to emotional stimuli has also been demonstrated. For example, Mansell, Clark, Ehlers, and Chen (1999) found that individuals with high levels of social anxiety symptoms were more likely to avoid attending to emotional stimuli in general compared to those with low social anxiety symptoms.

It is possible that mixed findings such as these may be reflective of the limitations of probe-based methods for examining the maintenance of attention over time. For instance, during a typical 500 or 1250 msec stimulus presentation, it is possible for multiple shifts of attention to occur. However, probe reaction time measures may only capture a snapshot of these nuanced attentional processes (Mogg et al., 2004).

Eye-tracking methods provide a more direct measure of attention over time by recording eye-movements made by participants while viewing stimuli. Garner, Mogg, and Bradley (2006) found that high socially anxious individuals were faster than control participants at orienting their attention towards emotional stimuli (negative and positive stimuli) in general. However, when examining the duration of fixations to stimuli, they found that high socially anxious participants fixated on the emotional stimuli significantly less than low anxious participants. This pattern of results suggests that socially anxious participants are initially vigilant to emotional stimuli (in line with the Rapee and Heimberg model), and when examining the amount of time spent viewing emotional faces over the entire stimulus presentation, they avoid attending to those stimuli (in line with the Clark and Wells model).

More recent studies using eye-tracking methodology have examined the time course of attention by dividing the entire stimulus presentation time into shorter time intervals or time bins. The fixation data are then examined with reference to the time interval in which the fixation occurs (Armstrong & Olatunji, 2012). This methodology provides a more detailed analysis of attention biases. For example, Buckner, Maner, and Schmidt (2010) examined the time course of attention in a non-clinical sample. The two second stimulus presentation time was segmented into four 500 msec time intervals. The findings suggest that higher levels of social anxiety symptoms were associated with longer fixation durations towards negative stimuli specifically (disgust faces) during the later stages of stimulus presentation. There was no association found between levels of social anxiety and attention towards happy faces (positive stimulus). These findings support the Rapee and Heimberg (1997) model which suggests social anxiety is associated with greater vigilance for threat i.e., specifically towards negative stimuli. In contrast, other studies have shown that socially anxious participants do not display a specific attention bias towards negative stimuli, rather these participants have demonstrated biases in attention which are related to emotional stimuli in general i.e., both positive and negative stimuli. For example, Schofield, Johnson, Inhoff, and Coles (2012)

examined the time course of attention in a non-clinical sample and found that higher levels of social anxiety symptoms were related to longer fixation durations towards the angry stimulus compared to the neutral stimulus throughout the entire stimulus presentation time and the happy relative to neutral stimulus for two out of the three time intervals that were created. Similarly, Wieser et al. (2009) examined the time course of attention in a non-clinical population and report that participants with high levels of fear of negative evaluation initially looked longer at the emotional faces (angry and happy) compared to the neutral and subsequently avoided attending to these stimuli later in the stimulus presentation time. More recently, Schofield et al. (2013) examined the time course of attention in a clinical sample of socially anxious individuals by segmenting the 1500 msec stimulus presentation time into thirty 50 msec time intervals. The results suggest that during the initial stages of the stimulus presentation time, both clinical (diagnosed with SAD) and non-clinical participants attended more to the emotional stimuli (angry and happy faces) than the neutral stimuli. Regarding the maintenance of attention over time, participants with SAD attended less to emotional faces, in particular happy faces, compared to the non-clinical control group (Schofield et al., 2013). In a recent study, Chen, Clarke, MacLeod, and Guastella (2012) report that there was an association between SAD and reduced attention to emotional stimuli in general. Thus, there are mixed findings with regard to the time course of attention in socially anxious participants. Firstly, studies have shown that socially anxious individuals display patterns of attention such as vigilance which supports the Rapee and Heimberg (1997) model (Schofield et al., 2012; Wieser et al., 2009) as well as avoidance supporting the Clark and Wells (1995) model (Schofield et al., 2013; Wieser et al., 2009). However, the majority of research studies using eye-tracking report that vigilance and/or avoidance has been demonstrated for emotional stimuli in general (both positive and negative) (Schofield et al., 2013, 2012; Wieser et al., 2009), rather than attention biases related specifically toward negative stimuli (Buckner et al.,

2010). These differences in findings may be due to differences in sample characteristics (e.g., clinical or non-clinical samples).

Regardless of the mixed findings regarding the attention pattern over the time course of stimulus presentation, an interesting finding from studies investigating the time course of attention using eye-tracking methods is that those with SAD display biases in attention that are relevant to both positive and negative stimuli. A recent update to the original Rapee and Heimberg model (1997), proposes that socially anxious individuals display a fear of negative evaluation as well as a fear of positive evaluation (Heimberg, Brozovich, & Rapee, 2010). Thus if positive and negative information can be interpreted as threatening by socially anxious individuals, then these individuals are likely to show an attentional bias related to both positive and negative stimuli. Thus it is important for future studies to firstly address, the pattern of attention towards both negative and positive stimuli made by those with SAD over the entire stimulus presentation time (time course of attention), similar to the methodology used by Schofield et al. (2013). Secondly, given the mixed findings previously described, it may also be informative to examine potential moderator variables that may influence the relationship between social anxiety and attention biases towards both positive and negative stimuli.

One potential moderator variable that may influence the relationship between social anxiety and attention biases may be adult attachment style. Adult attachment style is an extension of Bowlby's (1969) attachment theory regarding infants. It refers to internal working models which develop during infancy as a result of the bond formed between an infant and their primary caregiver. As adults, these working models are internalised and shape how adults react to, and respond in, romantic relationships and social interactions more broadly (Hazan & Shaver, 1987). Adult attachment style is measured, and can be described, using two dimensions: an anxious attachment dimension and an avoidant attachment dimension (Brennan et al., 1998). Those who score high on the anxious attachment dimension

are characteristically preoccupied with the availability and responsiveness of their attachment figure, while those who score low on this dimension are secure in terms of the availability and responsiveness of their attachment figure. Those who score high on the avoidance attachment dimension are uncomfortable being close to, and depending upon, others, while those who score low on this dimension are more comfortable relying on, and opening up to, others. Those who score low on both the anxious and avoidant attachment dimensions typically are described as having a secure attachment style (Brennan et al., 1998). Regarding the relationship between adult attachment style and attention bias the research in this area has used the dot probe task to measure attention bias and results have shown that those who score high on the dimensions of attachment anxiety and avoidance tend to avoid attending to threatening information (Dewitte & De Houwer, 2008; Dewitte et al., 2007). Similarly, Zeijlmans van Emmichoven, van Ijzendoorn, de Ruiter, and Brosschot (2003) examined the influence of adult attachment style on attention biases displayed by those diagnosed with SAD. They found that those diagnosed with SAD who endorsed a secure attachment style attended more toward threatening word stimuli on the Stroop task compared to both insecure clinical and non-clinical controls. Thus, the authors propose that those with a secure attachment style are more open to processing emotional information that is made relevant to them by their anxiety disorder, which in this case is threatening stimuli. (Zeijlmans van Emmichoven et al., 2003).

A recent study extends findings reported by Zeijlmans van Emmichoven et al. (2003) by investigating the influence of adult attachment style as a potential moderator of the relationship between anxiety and attention biases and has evaluated individuals' initial attention bias and the pattern of attention over time (time course of attention) (Byrow, Broeren, de Lissa & Peters, manuscript submitted for publication). This study was conducted using a non-clinical sample and has shown that those who scored high on the avoidance attachment dimension and were exposed to an anxiety inducing speech task were less vigilant

for both positive and negative stimuli over the entire stimulus presentation. This pattern of viewing was not apparent for those with a secure or anxious attachment style. Those who presented with an anxious attachment style were more likely to initially avoid attending to the negative relative to the positive stimulus. Thus, an avoidant attachment style appears to moderate the relationship between anxiety and attention bias, while an anxious attachment style independently predicts attention biases. This study was conducted using a non-clinical sample and relied on the use of a speech task to induce feelings of anxiety in the participants. Therefore this finding requires replication in a clinical sample of individuals who meet diagnostic criteria for SAD compared to a non-clinical (no diagnoses) control sample.

The current study aims to examine the time course of attention toward both negative and positive stimuli for individuals diagnosed with SAD and to assess whether adult attachment style is a moderator of this relationship.

1.2 Hypotheses

1. We expect that there will be no difference in orienting towards negative (angry) and positive (happy) stimuli for those individuals' diagnosed with SAD. If those with SAD display an avoidance of emotional stimuli over the entire stimulus presentation time compared to those without SAD this would offer support for the Clark and Wells (1995) model of social anxiety. However if they display greater vigilance to emotional stimuli during the initial stages of the stimulus presentation compared to those without SAD this would lend support to the Rapee and Heimberg (1997) model of SAD.
2. Those with an avoidant attachment style who also have a diagnosis of SAD will display avoidance of emotional information (both negative and positive) across the entire stimulus presentation compared to non-clinical controls as well as clinical participants with an anxious or secure attachment style.

3. Independent of a SAD diagnosis, those with an anxious attachment style, will exhibit a bias in initial orienting to negative stimuli (avoidance of negative stimuli relative to positive).

2. Method

2.1 Participants

This study was conducted as part of a larger research treatment trial. A total sample of 113 adults aged between 18 and 66 years old ($M= 30.93$, $SD= 9.94$) were recruited for this study. Ninety participants (43 females) were recruited for the clinical group if they met diagnostic criteria for SAD, as set out by the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV) and were seeking treatment for SAD at the Macquarie University Emotional Health Clinic. Twenty three participants (11 females) were recruited for the non-clinical control group via advertisements seeking general community members and undergraduate psychology students who described themselves as confident. These participants qualified for the control sample if they did not meet criteria for any mental health disorder as set out by the DSM-IV and were reimbursed \$60 for participation in this study.

2.2. Measures

2.2.1 The Anxiety Disorders Interview Schedule (ADIS-IV). (Di Nardo, Brown, Barlow, 1994). This semi-structured interview was administered to both the clinical and control participants in order to assess DSM-IV diagnoses. All interviews were conducted by postgraduate students in psychology and diagnoses were rated on a severity scale ranging from 0 to 8. A clinician severity rating of 4 or more on this scale suggests that the symptoms assessed are causing significant life interference. Previous research conducted in the same clinic has shown strong reliability for diagnosis of SAD and clinical severity ratings using these methods ($\kappa = 0.86$; $ICC = 0.85$) (Rapee, Gaston, & Abbott, 2009).

2.2.2 The Social Interaction Anxiety Scale (SIAS). (Mattick & Clarke, 1998). This 20 item self-report measure was used to assess social anxiety symptom severity. Participants are required to rate their fear of social interactions (e.g., “I am nervous mixing with people I don’t know well”) on a scale from 0 = *not at all characteristic or true of me* to 4 = *extremely characteristic or true of me*. In the current study this measure demonstrated good internal consistency ($\alpha = .90$).

2.2.3 Depression, Anxiety and Stress Scales (DASS-7). (Lovibond, & Lovibond, 1995). The depression subscale (7 items) of the DASS was administered in order to assess participants’ depression symptom severity. They were required to rate the extent to which each item (e.g., “I felt I wasn’t worth much as a person”) applied to them on a 4 point scale from 0 = *Did not apply to me at all* to 3 = *Applied to me very much or most of the time*. In the current study the internal consistency of this measure was good ($\alpha = .92$) and previous findings suggest this measure has demonstrated suitable convergent validity (Lovibond, & Lovibond, 1995).

2.2.4 Experiences in Close relationships- Revised (ECR-R). (Fraley, Waller, & Brennan, 2000). The ECR-R is a 36 item self-report measure used to assess adult attachment style. The instructions of this measure were adapted to assess the way in which participants respond in their close relationships in general rather than romantic relationships specifically. The ECR-R measures attachment style based on 2 dimensions with 18 items each assessing the attachment anxiety dimension (e.g., “I’m afraid I will lose the love of others”) and the attachment avoidance dimension (e.g., “I prefer not to show others how I feel deep down”). Higher scores on each dimension indicate a less secure attachment style. In the current study the internal consistency for each dimension was good (attachment anxiety dimension: $\alpha = .85$; attachment avoidance dimension: $\alpha = .83$) and previous research reports suitable discriminant and convergent validity (Sibley, Fischer, & Liu, 2005; Sibley & Liu, 2004).

2.3 Procedure

All study procedures were approved by the Macquarie University Human Research Ethics Committee. Participants completed the measure of attachment style, eye-tracking task, and the ADIS interview prior to completing measures of social anxiety and depression. All self-report measures were completed online. For the clinical group, all measures used in this study were collected at the time of the ADIS interview and prior to treatment for SAD.

2.3.1 Passive viewing eye tracking task. This task was used to measure attention biases and was developed with Tobii Studio software and administered using a Tobii T120eye tracker. The T120 measured binocular gaze using an unobtrusive pupil centre corneal reflection technique. Gaze was digitized at a rate of 120Hz with a typical accuracy of .5° visual angle, using 9 calibration points.

2.3.1.1 Stimuli. Participants were presented with 128 trials (64 angry-neutral and 64 happy-neutral trial types) consisting of grey-scale photographs of human faces displaying angry, happy, or neutral expressions. The stimuli used were selected from the NimStim Face Stimulus set (Tottenham et al., 2009). Each emotional picture (either happy or angry) was paired with a neutral picture of the same actor and represented a single trial. Each trial was preceded by a fixation cross presented in the center of a blank screen. The pictures were presented on the left hand side or right hand side of the eye tracker screen and the position of the neutral and emotional faces were counterbalanced such that each emotional and neutral picture appeared on the right and left side of the screen an equal number of times. There were an equal number of stimuli depicting male and female actors. Participants were instructed to look at the fixation cross when it was displayed and once the trial commenced were free to view the facial stimuli naturally.

2.3.1.2 Data analysis. Raw gaze samples were initially clean using a noise reduction filter (Stampe, 1993) and the interpolation of brief data gaps less than 75ms. Off screen gaze

samples and gaze samples where the pupil was occluded were removed. Fixations were defined as gaze samples held below a velocity threshold of 30°/s for a minimum duration of 100ms. Trials were included for analysis if participants' gaze was held at the centre of the screen (i.e. at the fixation cross) immediately prior to the stimulus pair onset. Following procedures established by Kalénine, Mirman, Middleton, and Buxbaum (2012), Mirman (2014), and Schofield et al. (2013), the complete presentation time (1500 msec) for each stimulus was broken into a sequence of 30 consecutive, 50 msec time bins. When a fixation occurred a value of 1 was assigned to the relevant time bin and if no fixation occurred during a particular time bin a value of 0 was assigned. For example, if a fixation toward the angry face occurred 200 msec after the stimulus onset and lasted for 500 msec, then a value of 0 was assigned to the time bins 1-4, a value of 1 to the time bins from 5-15, and a value of 0 for the remaining time bins. For each trial of each participant, the percentage of all fixations which occurred in a 50 msec time bin on a particular stimulus (happy, angry, or neutral) was recorded and this percentage was the dependent variable used in the analysis. The fixation data were then averaged over trial type (angry-neutral trial, happy-neutral trial), valence (emotional vs neutral stimulus), and time bin for each participant. Thus, for each participant a consecutive series of time bins from 1 to 30 for each type of trial (angry-neutral and happy-neutral) and valence (emotional and neutral) was created. Growth curve analysis was used to examine the percentage of fixations, made towards either angry or happy compared to neutral stimuli, from the onset until the end of the stimulus presentation (0-1500msec). While this is only the second study in the area of SAD and attention biases to use this methodology, similar methods are commonly used to examine cognitive processes over time in other studies (Kalénine et al., 2012; Mirman, 2014). The time course of the percentage of fixations was modelled using fourth-order (linear, quadratic, cubic, and quartic) orthogonal polynomials and the fixed effects of group (clinical and control group; between subjects variable), trial type (angry-neutral and happy-neutral trial; within subjects), valence (emotional and neutral

stimulus; within subjects), anxious attachment style, avoidant attachment style, and the interactions between them were entered. The model also included participant random effects and participant by trial type and valence random effects on all time terms. Models were fit using maximum-likelihood estimation and compared using the -2LL deviance statistic (-2 Log Likelihood) to determine which polynomial time terms to include in the final model. Following this approach, the effects of each time term (linear, quadratic, cubic and quartic) were included in the final model only if they significantly improved model fit.

3. Results

Participant characteristics and results from the self-report measures are presented in Table 1. There were no significant differences between the clinical and non-clinical control groups regarding gender, anxious attachment, or avoidant attachment style (all p 's > .05). Those in the clinical group were significantly older than those in the control group ($t(111) = 2.72, p = .008$). Participants in the clinical group had significantly higher levels of social anxiety ($t(111) = -13.98, p < .001$) and depression severity ($t(111) = -6.13, p < .001$) (based on scores from self-report measures) than those in the non-clinical control group.

Table 1

Differences in age, social anxiety, depression, anxious and, avoidant attachment style for Control and Clinical Groups.

	Control <i>M</i> (<i>SD</i>)	Clinical <i>M</i> (<i>SD</i>)	<i>t</i> (111)	<i>p</i>
Age	26.04 (11.06)	32.18 (9.29)	2.72	.008
Anxious attachment (ECR-R)	3.97 (0.39)	4.31 (1.01)	-1.59	.115
Avoidant Attachment (ECR-R)	4.47 (0.54)	4.71 (0.93)	-1.16	.250
Social Anxiety (SIAS)	7.35 (11.19)	55.29 (1.72)	-13.98	< .001
Depression (DASS)	2.30 (3.14)	9.31 (5.24)	-6.13	< .001

The growth curve analysis examined the percentage of fixations directed towards stimuli shown over the duration of the stimulus presentation time as a function of group (clinical and control group), trial type (angry-neutral and happy-neutral trial), valence (either happy or angry and neutral image), anxious attachment, and avoidant attachment style. The intercept ($\chi^2 (59) = 17793.35, p < .001$), linear ($\chi^2 (82) = 36.17, p = .040$), and quadratic ($\chi^2 (82) = 105.39, p < .001$) time terms significantly improved model fit while the cubic ($\chi^2 (82) = 0, p = 1.00$) and quartic ($\chi^2 (82) = 0, p = 1.00$) time terms did not improve model fit. Thus, the final model excluded the cubic and quartic time terms (see Table 2). The model was then run with the linear ($b = 77.47, SE = 37.00, t = 2.09, p = .036$) and quadratic ($b = -48.96, SE = 23.64, t =$

-2.07, $p = .038$) time terms only, both of which had a significant effect on the dependent variable (percentage of fixations which occurred towards stimuli). The significant linear term and quadratic term suggests that as time progresses the percentage of fixations also increases linearly but also the rate of fixating on the relevant stimulus increases, respectively.

Table 2

Results from tests comparing the effects of orthogonal polynomial time terms on model fit.

Term	Model Fit			
	-2 Log Likelihood	χ^2	df	p
Intercept	-47870	17793.35	59	<.001
Linear	-47852	36.17	82	.040
Quadratic	-47800	105.39	82	<.001
Cubic	-47856	0	82	1.00
Quartic	-47857	0	82	1.00

Note: Data represents the clinical and control groups.

Table 3 presents the results including the estimates, standard error, t , and p values of the growth curve analysis. There were no significant main effects of the trial type variable (angry-neutral and happy-neutral trials) or interactions involving this factor on any of the time terms (all p 's > .05). Thus, there were no differences observed in attention between the angry-neutral or happy-neutral trials. There were no significant main effects of group (clinical and non-clinical control) on any of the time terms, nor were there any significant effects of the interaction between group and the anxious or avoidant attachment variables on any time terms.

Table 3.

Results from the growth curve analysis.

Term	Estimate	SE	t value	p value
Linear time term	77.47	37.00	2.09	.036
Quadratic time term	-48.96	23.64	-2.07	.038
Group	6.76	11.08	0.61	.542
Linear time term× Group	19.65	37.00	0.53	.595
Quadratic time term× Group	-6.47	23.64	-0.27	.784
Trial Type	-0.46	2.79	-0.16	.869
Linear time term× Trial Type	-0.28	10.14	-0.03	.978
Quadratic time term× Trial Type	1.53	6.52	0.23	.815
Valence	6.39	2.79	2.29	.022
Linear time term× Valence	10.13	10.14	1.00	.318
Quadratic time term× Valence	-18.54	6.52	-2.84	.004
Anxious Attachment	-0.49	1.73	-0.28	.777
Linear time term× Anxious Attachment	-0.78	5.79	-0.14	.890
Quadratic time term× Anxious Attachment	-0.96	3.70	-0.26	.795
Avoidant Attachment	-0.61	1.28	-0.48	.632
Linear time term× Avoidant Attachment	-3.41	4.27	-0.80	.424
Quadratic time term× Avoidant Attachment	1.64	2.73	0.60	.547
Group× Valence	2.36	0.56	4.25	<.001
Linear time term× Group× Valence	4.58	2.02	2.27	.023
Quadratic time term× Group× Valence	-3.87	1.30	-2.98	.003
Group× Trial Type	0.004	0.56	0.006	.995
Linear time term× Group× Trial Type	-0.58	2.02	-0.29	.774
Quadratic time term× Group× Trial Type	-0.35	1.30	-0.27	.786
Trial Type× Valence	-0.03	2.79	-0.01	.991
Linear time term× Trial Type× Valence	-3.38	10.14	-0.33	.738
Quadratic time term× Trial Type× Valence	-7.21	6.52	-1.10	.269
Valence× Anxious Attachment	0.98	0.50	1.95	.052
Linear time term× Valence× Anxious Attachment	3.91	1.83	2.14	.032
Quadratic time term× Valence× Anxious Attachment	-0.84	1.18	-0.72	.474
Valence× Avoidant Attachment	-0.73	0.53	-1.36	.173
Linear time term× Valence× Avoidant Attachment	-3.61	1.94	-1.86	.063
Quadratic time term× Valence× Avoidant Attachment	0.38	1.25	0.30	.764
Trial Type× Anxious Attachment	0.006	0.50	0.01	.990
Linear time term× Trial Type× Anxious Attachment	0.02	1.83	0.01	.992
Quadratic time term× Trial Type× Anxious Attachment	-0.22	1.18	-0.19	.852
Trial Type× Avoidant Attachment	0.07	0.53	0.12	.901
Linear time term× Trial Type× Avoidant Attachment	-0.06	1.94	-0.03	.977
Quadratic time term× Trial Type× Avoidant Attachment	-0.28	1.25	-0.22	.824
Group× Anxious Attachment	-0.41	1.73	-0.24	.812
Linear time term× Group× Anxious Attachment	-2.00	5.79	-0.35	.729
Quadratic time term× Group× Anxious Attachment	-0.90	3.70	-0.24	.808
GroupSum× Avoidant Attachment	-1.11	1.28	-0.87	.387
Linear time term× Group× Avoidant Attachment	-2.62	4.27	-0.61	.539
Quadratic time term× Group× Avoidant Attachment	2.20	2.73	0.81	.420
Trial Type× Valence× Anxious Attachment	0.15	0.50	0.31	.759
Linear time term× Trial Type× Valence× Anxious Attachment	0.47	1.83	0.26	.796
Quadratic time term× Trial Type× Valence× Anxious Attachment	0.32	1.18	0.27	.786
Trial Type× Valence× Avoidant Attachment	-0.21	0.53	-0.39	.698
Linear time term× Trial Type× Valence× Avoidant Attachment	-0.92	1.94	-0.47	.635
Quadratic time term× Trial Type× Valence× Avoidant Attachment	0.51	1.25	0.41	.683
Group× Trial Type× Valence	0.26	0.56	0.47	.639
Linear time term× Group× Trial Type× Valence	0.20	2.02	0.10	.920
Quadratic time term× Group× Trial Type× Valence	-0.30	1.30	-0.23	.818

Note: Data represents the clinical and control groups. Significant *p* values are in bold.

There was a significant effect of valence on the intercept ($b= 6.39, SE= 2.79, t= 2.29, p= .022$) indicating an overall higher fixation proportion for the emotional (angry and happy) than the neutral stimuli. There was also a significant effect of valence on the quadratic term ($b= -18.54, SE= 6.52, t= -2.84, p= .004$) indicating that all participants were faster to initially fixate on the emotional compared to the neutral stimulus. In summary all participants were more vigilant for emotional stimuli in general than the neutral stimuli (see Figure 1).

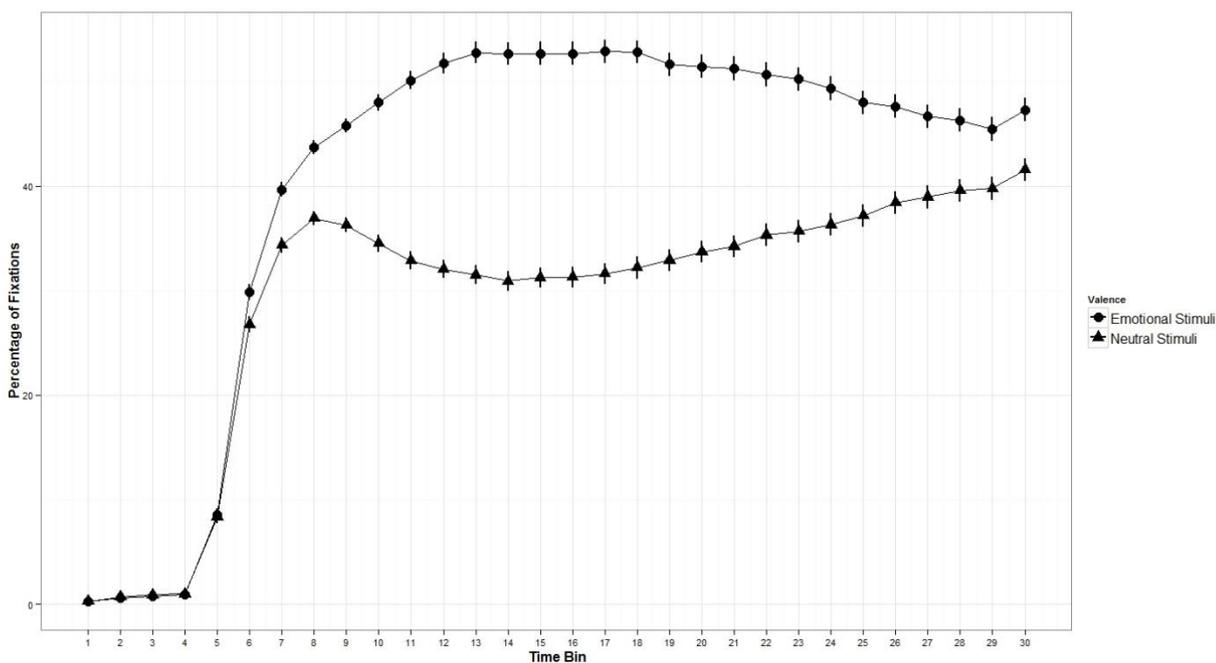


Figure 1. Graph depicting the significant effect of valence on the intercept.

The interaction between trial type (angry-neutral and happy-neutral trials), valence (emotional and neutral stimuli), and group (clinical and control) did not have any significant effects on any of the time terms (p 's > .05). Thus, there were no differences in attention to angry compared to happy stimuli between the clinical and control groups. However, the interaction between group and valence (emotional and neutral stimulus) had a significant effect on the intercept term ($b= 2.36, SE= 0.56, t= 4.25, p < .001$). Overall, those in the control group were more vigilant (had a higher percentage of fixations) for the emotional (both angry and happy) than the neutral stimuli compared to the clinical group. There was a significant

effect of the group and valence interaction on the linear term ($b= 4.58, SE= 2.02, t= 2.27, p= .023$), indicating that as the time intervals progressed, the percentage of fixations toward the emotional stimulus increased significantly more than for the neutral stimulus in the control group compared to the clinical group. The significant effect of the interaction on the quadratic term ($b= -3.87, SE= 1.30, t= -2.98, p= .003$) indicates that those in the control group were faster at initially fixating on the emotional stimuli than the neutral stimuli compared to those in the clinical group. In summary, those in the control group were more likely to fixate on the emotional stimuli than those in the clinical group who were more likely to fixate on the neutral stimulus than those in the non-clinical group (see Figure 2).

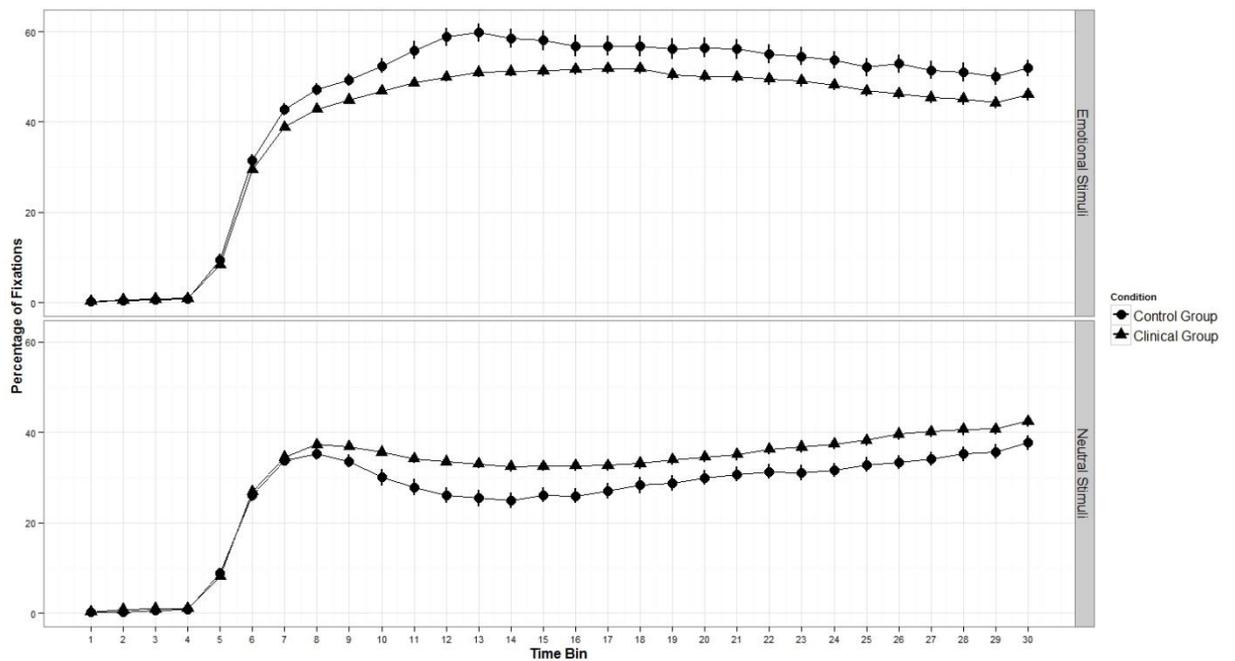


Figure 2. Graph depicting the significant interaction of group (clinical and control) and valence (emotional and neutral stimuli).

The interaction between valence, anxious attachment, and the intercept term approached significance ($b= 0.98, SE= 0.50, t= 1.95, p= .052$) and the linear term ($b= 3.91, SE= 1.83, t= 2.14, p= .032$). Thus, as anxious attachment levels increase (greater insecure attachment), overall participants have a higher percentage of fixations on the emotional compared to the neutral stimulus. Furthermore as time progresses and anxious attachment

levels increase, the percentage of fixations on the emotional stimulus increases compared to fixations made towards the neutral stimulus (see Figure 3).

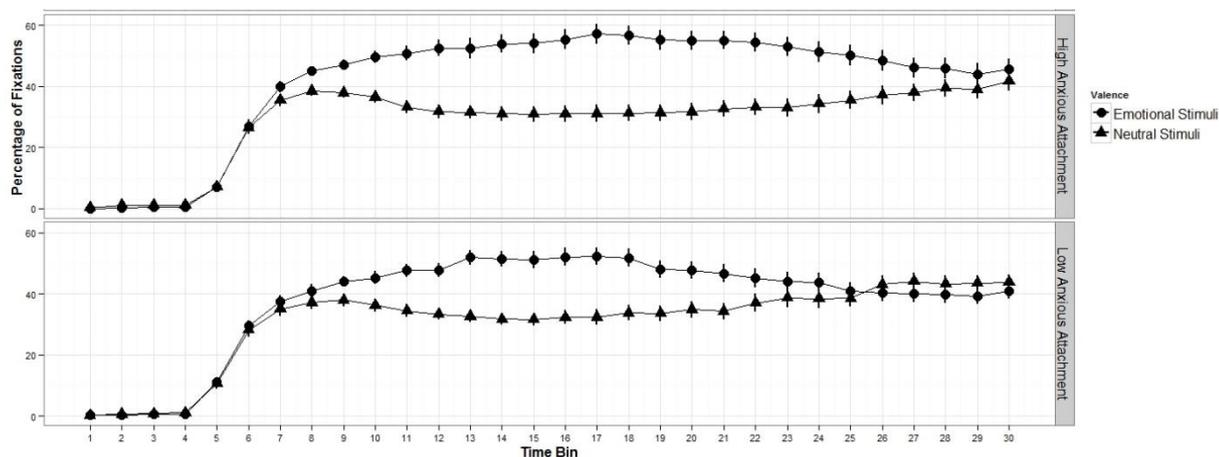


Figure 3. Graph depicting the significant interaction between valence and anxious attachment style. Anxious attachment categories were created (low and high) using the mean of the current sample plus one standard deviation (high) and minus one standard deviation (low).

4. Discussion

The results of the current study indicate that all participants, regardless of diagnostic status, were more vigilant for emotional (angry and happy) compared to the neutral stimuli. Those in the control group were more likely to fixate on the emotional stimuli than those in the clinical group and those in the clinical group were more likely to fixate on the neutral stimulus than those in the control group. Therefore, the clinical participants are more likely to avoid attending to emotional stimuli compared to those in the control group. Regarding attachment style, anxious attachment was related to a greater percentage of fixations on the emotional compared to the neutral stimulus. In the following paragraphs the primary hypotheses regarding attention biases in SAD will be discussed in relation to the time course of attention (initial biases and maintenance of attention over time). Subsequently the

secondary hypotheses related to the influence of attachment style on this relationship will be discussed

Since there was no significant interaction between the group (clinical vs. non-clinical), trial type (angry-neutral vs. happy-neutral trials), and valence (emotional vs. neutral stimulus) variables, there is no difference in attention towards angry and happy stimuli between the clinical and non-clinical groups. Rather the significant effect of valence on the intercept and quadratic terms suggest that all participants overall were more likely to fixate and faster to initially fixate on the emotional stimulus (happy and angry) compared to the neutral stimulus. Despite this similarity in attention to stimuli there were group differences in viewing the emotional compared to neutral stimuli. These group differences suggest that individuals with SAD were less likely to fixate on the emotional stimulus and more likely to fixate on the neutral stimulus compared to the non-clinical control group. Specifically, those in the control group overall displayed greater vigilance towards emotional stimuli, were faster at initially fixating on the emotional stimulus, and had a greater percentage of fixations towards the emotional stimulus as the stimulus presentation time progressed compared to those in the clinical group. Thus, in contrast to the proposal of Rapee and Heimberg (1997) that socially anxious participants are initially vigilant to threatening stimuli, in this study, it is the non-anxious participants who demonstrated vigilance for emotional stimuli. Taken together these results suggest that those with SAD do not differentially attend to positive and negative stimuli and are more likely to avoid attending to emotional stimuli in general than those who do not have SAD, thus supporting the primary hypothesis and the Clark and Wells (1995) CBT model of SAD. Furthermore this result is consistent with previous findings which have shown that socially anxious individuals avoid maintaining attention toward emotional stimuli (Chen et al., 2012; Chen, Thomas, Clarke, Hickie, & Guastella, 2015; Garner et al., 2006; Schofield et al., 2013; Schofield et al., 2012; Weeks, Howell, & Goldin, 2013; Wieser et al., 2009) and offers support for the Clark and Wells (1995) model of SAD.

The key finding from this study was that those in the clinical group were more likely avoid attending to emotional stimuli compared to those in the non-clinical control group. This finding supports the Clark and Wells (1995) model of SAD, which stipulates that those with SAD will avoid attending to emotional information. The avoidance of negative social information is maladaptive, prevents the individual from re-evaluating the situation and maintains their previously learned association with harm (Mogg & Bradley, 1998). . The results from the current study support those reported by (Chen et al. (2012) who found that those with SAD exhibited a lower total fixation time to emotional stimuli in general compared to a non-clinical control group. Similarly another study, on which the methodology for the current study was based, reports that participants with SAD attended less to emotional stimuli in general compared to a non-clinical control group (Schofield et al., 2013). Despite the growing evidence supporting the Clark and Wells (1995) proposal, there is also evidence which supports the specificity of a threat-related attention bias for socially anxious individuals. For example, some studies report that individuals who report either high trait social anxiety or clinical levels of social anxiety display an attention bias which is specifically related to negative stimuli (e.g., words or faces) (Mogg et al., 1997, 2004). Given that the studies supporting a threat specific attention bias utilised reaction time measures of attention (dot probe task) and it has been shown that dot probe and eye movement biases are not correlated, the discrepancy in these results could be due to differences in methodology (Waechter et al., 2013).

The current results offer mixed support for the hypotheses regarding attachment style. Based on our past research (Byrow, Broeren, de Lissa & Peters, manuscript submitted for publication), we expected that avoidant attachment style would moderate the relationship between SAD and attention, however no interactions involving group (clinical and control) and avoidant attachment had significant effects on any of the time terms. Thus, the current results do not support the proposed hypothesis, nor do they offer support for previous

findings, which have demonstrated that those who have a highly avoidant attachment style and were exposed to an anxiety inducing speech task were more likely to avoid attending to emotional stimuli across the stimulus presentation time (Byrow, Broeren, de Lissa & Peters, manuscript submitted for publication). The discrepancy in the findings between the current and previous study may be because the current study employed a sample of clinically diagnosed individuals with SAD while the previous study used a non-clinical sample of individuals who received an anxiety inducing speech task to increase levels of anxiety. A possible explanation could be that clinical levels of social anxiety symptoms may override any influence attachment style has on attention biases. The final hypothesis addressing the independent effects of anxious attachment style on attention bias was also partially supported. Based on findings from Byrow, Broeren, de Lissa and Peters (manuscript submitted for publication) we expected those with a highly anxious attachment style to display avoidance of threatening compared to positive stimuli during the initial stages of the stimulus presentation. In contrast, the current results have shown that individuals who score high on the anxious attachment dimension are more likely to attend to the emotional stimulus (angry or happy) across the entire stimulus presentation. The reason for the discrepancy in results could be due to differences in methods used to analyse the eye movement data. For example, the previous study examined initial biases in attention by examining the number of trials where the first fixation was made toward the emotional face by the total number of trials. The current study however examined attention biases over the entire stimulus presentation time. Furthermore the current study used a clinical sample, thus there is likely to be a higher proportion of anxiously attached participants (high scores on the anxious attachment dimension which represents greater attachment insecurity) than in the previous study.

The relatively small sample size recruited for the non-clinical control group is a methodological limitation of the current study that may have contributed to the contradictory findings between the current study and previous research conducted by the same authors

(Byrow, Broeren, de Lissa & Peters, manuscript submitted for publication). The analysis used in the current study is relatively novel, with only one other study using growth curve analysis to analyse the time course of attention in socially anxious individuals (Schofield et al., 2013). Although this method of analysis has commonly been used in cognitive psychology research (Kalénine et al., 2012), the current results require replication in a clinical sample of individuals with SAD. Furthermore, we employed a passive viewing task to measure attention biases. However, the visual world is comprised of a complex pattern of competing stimuli which individuals have the opportunity to attend to. Thus it will be informative for future studies to examine the time course of attention in a naturalistic setting which presents more than two competing stimuli. Given the advancements in technology this type of research is more attainable than it has been in the past and will lead to research findings that are more relevant to the real world.

Regarding attachment style the findings from the current study failed to support the notion that attachment style moderates the relationship between SAD and attention bias. However the current findings add to a growing body of literature, by examining the time course of attention the results support the Clark and Wells (1995) CBT model of SAD which proposes that as a result of focusing their attention inward, socially anxious individuals are more likely to avoid attending to external sources of information they perceive as threatening.

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The following chapter presents the paper entitled “The impact of adult attachment style on attention biases and treatment outcome in adults with social anxiety disorder” and seeks to establish the clinical relevance of attention biases associated with SAD. Specifically, this research study aims to extend the findings presented in chapters two and three by investigating, firstly, whether attention biases predict treatment outcome for those with SAD and, secondly, whether attachment style moderates this relationship.

Chapter 4

The impact of adult attachment style on attention biases and treatment outcome in adults with social anxiety disorder.

This chapter has been submitted for publication to Behaviour Research and Therapy, and is presented in its submitted format.

Author contribution:

Ms. Yulisha Byrow was solely responsible for the design of the research, analysis and write-up of this paper. Dr. Peters provided statistical and research supervision

The impact of adult attachment style on attention biases and treatment outcome in adults with social anxiety disorder.

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Abstract

Attention biases are considered important cognitive constructs that maintain symptoms of social anxiety disorder (SAD). Recent research examining the association between attention biases and treatment outcome has produced mixed findings. Adult attachment style is an individual characteristic which may influence the relationship between attention bias and SAD. Two separate eye-tracking tasks were used to measure vigilance towards and difficulty disengaging from threat. This longitudinal study examined the effects of attention biases on symptom severity in 54 socially anxious compared to 20 non-anxious adults. Changes in attention bias as a result of treatment and the effect of attention biases on treatment outcome was also assessed. Attachment style was examined as a potential moderator of these relationships. There were no differences in attention biases between the anxious and non-anxious groups. Those classified as avoidant of threat at pre-treatment became significantly more vigilant for threat and also had lower symptom levels at post-treatment than those classified as vigilant at pre-treatment. Attachment independently predicted treatment outcome and moderated the relationship between difficulty disengaging from threatening and neutral stimuli and treatment outcome. Findings suggest that pre-treatment differences in attention biases could have important implications for the treatment of socially anxious adults.

Keywords: attention bias; social anxiety; eye-tracking

The impact of adult attachment style on attention biases and treatment outcome in adults with social anxiety disorder.

Social anxiety disorder (SAD) is the second most common anxiety disorder which 8.4% of Australians and 13% of Americans will meet diagnostic criteria for at some point in their lives (Crome et al., 2014; Kessler, Petukhova, Sampson, Zaslavsky, & Wittchen, 2012). Typically, the central feature of SAD is the overwhelming concern of being judged negatively by others when in a social situation. To date the most effective psychological treatment for those diagnosed with SAD is cognitive behavioural therapy (CBT) (Heimberg, 2002; Rodebaugh et al., 2004). However, a recent meta-analysis examining the effectiveness of CBT treatment reports significant moderate effect sizes for those with social anxiety disorder compared to controls (Mayo-Wilson et al., 2014; Wersebe, Sijbrandij, & Cuijpers, 2013). In the Wersebe et al. (2013) meta-analysis, the effect sizes between studies varied from 0 to 1 which indicates a large variation in terms of effectiveness of CBT treatment for individuals with SAD. Research has turned to examining factors that predict better outcomes from CBT. Thus, the purpose of this study is to investigate one factor that may influence treatment outcome for those diagnosed with SAD, namely attention biases.

Attention biases have been implicated in the major CBT models of social anxiety. The Rapee and Heimberg (1997) CBT model of SAD proposes that attention biases adopted by socially anxious individuals work to maintain symptoms of SAD. They suggest that those with SAD are initially biased towards threat cues (e.g., someone yawning in the audience while the individual is giving a speech) and once threat is detected they have difficulty disengaging from threat. This attention bias towards threat is a maladaptive response of the attentional system that serves to maintain an individual's focus and later information processing towards external stimuli that can be interpreted as negative and thus reinforces the central concern of those with SAD - that they will be judged negatively by others. The first type of attention bias proposed by the Rapee and Heimberg model is the initial bias towards

threat which refers to the propensity for an individual to be initially vigilant towards threatening stimuli. Thus, the theory suggests that threatening or negative stimuli will capture the attention of a socially anxious individual. The second type of attention bias suggested by this model is difficulty disengaging from threat which suggests that once an individual has attended to a threatening stimulus they then have difficulty turning their attention away from the stimulus. Thus, a socially anxious individual facing a feared situation, (e.g., delivering a speech in front of an audience) will initially attend to those in the audience who display negative reactions such as yawning. Once the yawning individual has initially captured their attention they then have difficulty disengaging their attention from this individual. During this process the socially anxious individual has been far less attentive to positive or neutral stimuli. The two attention biases work together to reinforce the processing of negative information and underpin the belief that others will judge them negatively. A recent update to the Rapee and Heimberg model (Heimberg, Brozovich & Rapee, 2010) has incorporated research from Weeks, Heimberg, and Rodebaugh (2008) regarding the fear of positive evaluation. It seems that it is not just negative evaluation that is feared by those with SAD but rather the possibility of evaluation in general. Therefore positive evaluation is also feared as it may predict later negative evaluation (Weeks, Heimberg, Rodebaugh, & Norton, 2008; Weeks, Heimberg, & Rodebaugh, 2008).

Both initial vigilance to, and difficulty disengaging from, threatening stimuli have been widely investigated. The studies examining the initial stage of attention bias displayed by socially anxious individuals, vigilance, have involved presenting the individual with two emotionally competing stimuli simultaneously, for example either a happy or angry face paired with a neutral facial expression, and examining which stimulus was first fixated upon. This first fixation is typically measured by means of a key press, in the case of the dot probe task, or by directly recording which stimulus was fixated upon first, in the case of studies using eye-tracking methodology. If the participant fixates first on the angry face more often

than on the neutral face it can be said that they are vigilant towards threat. The findings from studies examining vigilance toward threat however are inconsistent. While some studies have found evidence that socially anxious individuals are initially vigilant towards threat (Asmundson & Stein, 1994; Mogg & Bradley, 2002; Shechner, et al., 2013), others have failed to do so (Garner, Mogg, & Bradley, 2006; Schofield, Inhoff, & Coles, 2013; Schofield, Johnson, Inhoff, & Coles, 2012; Wieser, Pauli, Weyers, Alpers, & Mühlberger, 2009).

The subsequent stage of attention bias displayed by the socially anxious, difficulty disengaging from threat, is assessed by examining the amount of time it takes a participant to disengage their attention from a threatening stimulus. The Rapee and Heimberg (1997) theory proposes that socially anxious participants will take longer to disengage from a threatening (e.g., an angry face) compared to a non-threatening (e.g., a neutral face) stimulus. Difficulty to disengage from threat is measured by examining the time taken to respond to a probe on an incongruent trial in the dot probe task. For example, an incongruent trial occurs when the probe appears on the opposite side of the screen to the threatening image. Thus, slower responses to this probe are indicative of difficulty disengaging from the threatening image. In eye-tracking studies difficulty disengaging from threat refers to the amount of time taken to look away from a threatening stimulus once it has been fixated on. There are relatively fewer research studies investigating this stage of attention bias in comparison to the vigilance stage, nevertheless, similar to the research on vigilance to threat, the research examining the difficulty disengaging from threat phenomena experienced by socially anxious individuals reports inconsistent findings. Some studies report that socially anxious individuals display difficulty disengaging their attention away from threatening stimuli (Amir, Elias, Klumpp, & Przeworski, 2003; Buckner, Maner, & Schmidt, 2010; Schofield et al., 2012) while others have found no evidence to support this particular attention bias (Niles, Mesri, Burklund, Lieberman, & Craske, 2013; Schofield et al., 2013).

More recently researchers have begun to examine the relationship between attention biases and CBT treatment for those with social anxiety disorder. This relationship is most likely not unidirectional but rather reciprocal in nature. On the one hand, there is the propensity for CBT treatment to influence attention biases. Findings from a review examining the effect of CBT on attention bias across various anxiety disorders (Tobon, Ouimet, and Dozois, 2011) showed that there was a treatment related reduction in bias towards threat. On the other hand, there is the impact of attention biases on CBT treatment outcome to consider. Morrison and Heimberg (2013), in a review of the literature, recommend that researchers should consider whether these biases predict treatment outcomes for those with SAD. Following these recommendations there has been a recent surge in research (e.g., Legerstee et al., 2009; Waters, Mogg, & Bradley, 2012) examining both changes in attention biases as a result of CBT treatment and whether attention biases predict CBT treatment outcome.

The literature examining the change in attention biases from pre- to post-treatment as well as the impact on treatment outcome has produced mixed findings. One of the first studies to examine change in attention biases as a result of CBT treatment for SAD, found that vigilance to threat decreased from pre- to post-treatment and this decrease was associated with better treatment outcomes (Pishyar, Harris, & Menzies, 2008). In contrast, Legerstee et al. (2010) found that CBT treatment responders showed a pre-treatment bias away from threat and report no significant bias, either avoidance or vigilance, to threat at post-treatment. More recently the notion of different subgroups of attention either those who are vigilant to threat as opposed to avoidant of threat at pre-treatment has been examined. Calamaras, Tone, and Anderson (2012) examined a clinical sample of socially anxious individuals and found that their participants formed two distinct groups based on the attention bias they displayed before treatment, a vigilant (those who are more likely to initially attend to a threatening stimulus) and an avoidant (those who are more likely to initially avoid attending to a threatening stimulus) group. They found that the avoidant group became significantly less avoidant of

threatening stimuli following CBT treatment for SAD. The vigilant group showed a trend towards becoming less vigilant to threat, however this was a non-significant trend. Similarly, Waters, Mogg, and Bradley (2012) report that those classified as avoidant of threat at pre-treatment became significantly more vigilant toward threat, while those classified as vigilant showed no significant differences following treatment. Contrary to findings reported by Legerstee et al. (2010) this pre-treatment bias towards threat (vigilant subtype) was associated with better CBT treatment outcomes (Price, Tone, & Anderson, 2011; Waters et al., 2012).

Thus, the research in this area is limited to a few studies that have reported mixed findings. It is important to acknowledge that the mixed findings may be due to methodological differences, as studies have differed in terms of examining children versus adults, the type of stimulus used (pictures rated as severely threatening versus angry faces) and the treatment outcome measures used (clinically significant reduction in symptoms versus diagnosis free). Given these inconsistent findings it is important to investigate whether attention bias predicts treatment outcome for those receiving CBT treatment for SAD. In addition, while research suggests that socially anxious adults display a difficulty to disengage from threatening stimuli, no study has examined the impact of this phenomenon on treatment outcome. Another important avenue to explore, which may also account for the previously described mixed findings, is the influence of individual differences on attention biases that may moderate the association with treatment outcome. Thus, the current study also examines an individual difference characteristic that might be involved in the interplay between social anxiety, attention bias, and treatment outcome; namely, adult attachment style.

Adult attachment style can be viewed as a potential moderator of the relationship between attention biases and social anxiety disorder. Adult attachment refers to the way adults approach their close personal relationships and can be measured and described using two dimensions: an anxious and an avoidant dimension (Bowlby, 1982; Brennan, Clark, & Shaver, 1998). Those who score high on the anxious attachment dimension tend to be overly

concerned about the availability and responsiveness of the attachment figure while low scorers tend to be more secure in the perceived responsiveness of the attachment figure. High scorers on the dimension of avoidant attachment tend to feel uncomfortable being close to others and relying or opening up to them while low scorers on this dimension are comfortable opening up to and relying on attachment figures. Typically a securely attached adult would score low on both the anxious and avoidant attachment dimensions (Brennan et al., 1998). Research findings examining both adult attachment styles and social anxiety reveal that those with SAD were more likely to endorse anxious and secure adult attachment styles (Eng et al., 2001; Manassis, Bradley, Goldberg, Hood, & Swinson, 1994). Those with an anxious attachment style reported more severe social anxiety, avoidance, greater depression, greater impairment and lower life satisfactions than those who reported a secure attachment style (Eng et al., 2001). When an individual perceives a situation as threatening the attachment system is activated and thus they are likely to exhibit these attachment related characteristics.

Attachment theory suggests that those with an anxious attachment style will be vigilant towards threat and those with an avoidant attachment style will be more likely to avoid threatening stimuli (Dewitte & De Houwer, 2008). Previous research offers partial support for this theory and has shown that those with both anxious and avoidant attachment styles exhibit an attention bias away from threatening stimuli. In a non-clinical sample of students who either received or did not receive a social anxiety prime, it was found that anxiously attached individuals were more likely to avoid attending to threatening relative to positive stimuli regardless of whether they were exposed to the anxiety prime or not. The avoidantly attached participants, however were more likely to avoid attending to emotional stimuli (either threatening or positive) only when exposed to the anxiety prime (Byrow, Broeren, de Lissa & Peters, manuscript submitted for publication). The latter result highlights that the activation of the attachment system, during a situation that may be perceived as social threat, can influence attention. We intend to extend these findings by examining the influence

of attachment style on the relationship between attention biases and social anxiety in a clinical population.

The current study has the overarching aim of investigating the relationship between attention biases displayed by anxious individuals and the influence of adult attachment style on this relationship. The overall aim can be broken up into 3 subsidiary aims.

Firstly, we aim to understand the nature of these biases in a clinical sample of socially anxious individuals prior to treatment and how these differ from those who do not have SAD. Adopting a theoretical perspective allows us to test the proposals made by the CBT models of social anxiety. Thus, we hypothesise that those diagnosed with social anxiety disorder will be more vigilant to threat than the non-anxious control group. Specifically, using eye-tracking methodology, clinically anxious individuals will have a higher proportion of first fixations on threatening stimuli (versus neutral stimuli) compared to the non-anxious control group. Regarding attachment style we propose that attachment will moderate the relationship between attention and anxiety, such that those in the clinical group who are more anxious and avoidantly attached will be more likely to avoid attending to threatening stimuli compared to the non-anxious control group. The models of social anxiety also propose that anxious individuals display a difficulty disengaging their attention from threatening stimuli. Using a novel task that has been adapted to measure this phenomenon, we hypothesise that those with social anxiety disorder will take longer to disengage their attention from threatening stimuli than from the happy and neutral stimuli, and that those with social anxiety disorder will take longer to disengage their attention from the threatening stimulus than the non-anxious control group. The hypotheses regarding attachment style aim to examine whether attachment will moderate this relationship. Specifically, those with an insecure attachment style will have longer disengagement times than those with a secure attachment style, thus exacerbating the effects of social anxiety on attention.

Secondly, we aim to understand how attention biases change following CBT treatment for social anxiety and how attachment moderates this relationship. Given the mixed findings in the literature regarding this question the following hypotheses are not directional. We hypothesise that participants with SAD who are classified as displaying either the vigilant or avoidant subtype of attention bias at pre-treatment will differentially change the direction of their bias after treatment e.g., those classified as the avoidant subtype may become more vigilant for threat while those classified as vigilant may not significantly change their attention bias (Calamaras, Tone, & Anderson, 2012; Waters et al., 2012). In terms of difficulty to disengage from threat, we hypothesise that socially anxious individuals will be quicker to disengage from threat following treatment as compared to before treatment. Furthermore, attachment style will moderate this change in attention bias, such that those with an avoidant or anxious attachment style will be less likely than those with a secure attachment style to show change in attention bias following CBT treatment for social anxiety as compared to before treatment.

Lastly, we aim to examine whether both the subtypes of attention and difficulty disengaging from threat displayed by socially anxious individuals before treatment will predict treatment outcome and whether this relationship varies as a function of adult attachment style.

Method

Participants

Clinical participants were recruited as part of a larger ongoing trial examining CBT treatment outcome for those diagnosed with SAD¹. Participants included in this study were 54 adults (29 male) aged between 18 and 66 years of age ($M=33.20$; $SD=9.84$) with a primary diagnosis of SAD. Participants in the final sample met the following selection criteria: (i)

¹ The sample used in the current study contains a subset of the sample examined in Chapter 3.

Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 2000) diagnosis of SAD as the main (or most interfering) disorder determined by a clinician severity rating on the Anxiety Disorders Interview Schedule-IV (ADIS-IV; Di Nardo, Brown, & Barlow, 1994); the absence of (ii) current active suicidal ideation; (iii) organic mental disorders such as developmental delay or schizophrenia; (iv) co-morbid psychotic disorders; (v) current, unmanaged substance dependence, and (vi) if taking medication for their anxiety, they must have been on a stable dose for at least 3 months.

Control participants consisted of undergraduate psychology students (who received course credit for their participation) and members of the general community (who were reimbursed up to \$60 for their participation). Participants were 22 adults (11 male) aged between 18 and 56 years of age ($M=26.41$; $SD=11.18$). All control participants were selected if they did not meet diagnostic criteria for any mental health disorder according to DSM-IV.

The diagnoses for the clinical and control participants were made by graduate psychology students experienced in the assessment of anxiety and ADIS-IV administration. The clinical severity of each disorder was rated using a 0 to 8 scale, where a score of 4 or more indicates clinically significant life interference caused by the diagnosis. The ADIS-IV was administered face to face in a semi-structured interview format. Following treatment for the clinical participants and during the second session for the control participants, the ADIS was re-administered and all previous diagnoses that they met criteria for at pre-treatment were reassessed. Previous research conducted in the same clinic has shown strong reliability for diagnosis of SAD and clinical severity ratings using these methods ($\kappa = 0.86$; $ICC = 0.85$) (R. M. Rapee, Gaston, & Abbott, 2009).

Measures

Anxiety symptoms. The Social Interaction Anxiety Scale (SIAS) (Mattick & Clarke, 1998) was used to measure social anxiety symptom severity. The SIAS is a 20 item self-report

measure where participants are required to rate fear of social interactions (e.g., “I am nervous mixing with people I don’t know well”) on a rating scale ranging from 0 (*not at all characteristic or true of me*) to 4 (*extremely characteristic or true of me*). Cronbach’s α in the present study was .92.

Depression symptoms. The 7 item depression subscale of the Depression, Anxiety and Stress Scales (DASS-7) was administered to assess depression severity (Lovibond, & Lovibond, 1995). Participants were required to rate the extent to which each item (e.g., “I felt I wasn’t worth much as a person”) applied to them on a 4 point scale from 0 ‘*Did not apply to me at all*’ to 3 ‘*Applied to me very much or most of the time*’. In the current study the internal consistency for the depression scale is good ($\alpha = .94$).

Adult attachment style. The Experiences in Close Relationships- Revised scale (ECR-R) (Fraley, Waller, & Brennan, 2000) was used to measure adult attachment style. This measure was adapted to emphasise close relationships in general rather than just romantic relationships. The measure consists of 36 items where participants are required to indicate their agreement to statements (e.g., “I prefer not to show others how I feel deep down”) on a 7 point rating scale ranging from 1 ‘*strongly disagree*’ to 7 ‘*strongly agree*’. ECR-R provides a measure of insecure adult attachment styles based on two continuous dimensions - attachment anxiety and attachment avoidance. Higher scores on each dimension indicate less secure attachment. In the current study the Cronbach’s α for the anxious attachment dimension was .91 and the avoidant attachment dimension was .92, thus indicating good internal consistency.

Attention Bias. Tasks measuring attention biases were developed with Tobii Studio software and administered using a Tobii T120X eye-tracker. The sampling rate was set at 120Hz (gaze position was recorded every 8.3 ms). Participants were seated approximately 64 cm away from the screen.

Assessing initial attention bias: stimuli. A passive viewing task was used to measure initial attention biases. The stimuli used in this task were drawn from a collection of photographs with actors displaying different facial expressions (NimStim set of facial expressions) (Tottenham et al., 2009). Participants were presented with 128 trials presented in two blocks (64 trials in each block). For half of the trials an angry-neutral face pair was presented and the other half a happy-neutral face pair was shown. The emotional face was shown either on the left or right hand side of the screen in counter balanced order and all trials were randomly presented. Stimuli were presented for 1500 msec.

Assessing initial attention bias: data analysis. Fixations were considered valid if a) they were greater than 100msec in duration and b) participants' eyes were fixated on the center of the screen before the presentation of the stimuli. Fixations that did not meet the preceding criteria were excluded from further analysis. Eye movements where the pupil was occluded or the participant was looking off-screen were also excluded. Following the method used by Gamble & Rapee (2009), vigilance toward threat was determined by calculating bias scores: the number of trials where the first fixation was made toward the emotional face was divided by the total number of trials with valid eye movements. For example, to determine the angry bias score, the number of first fixations made toward the angry face was divided by the total number of trials in which valid eye movements were made toward either the angry or neutral face. The happy bias score was calculated in a similar manner. Initial bias scores greater than 0.5 indicate vigilance, while scores lower than 0.5 indicate avoidance of the relevant stimulus. For example, if a participant obtained an angry bias score of 0.59 this would indicate that they are vigilant for angry stimuli.

Assessing difficulty to disengage (DDE): stimuli. The DDE task consisted of 120 trials. Each trial was preceded by a fixation cross and was composed of a photograph in the center of the screen selected from the NimStim set of facial expressions (Tottenham et al., 2009) with four crosses presented in the corners of the screen. For 30 of the 120 trials an

arrow appeared (cue) superimposed on the stimulus and pointing at one of the four crosses in the corners of the screen. Stimuli were presented for a total of 4000 msec. Participants were instructed to shift their attention to the cross that the cue was signaling when it appeared. The time taken for the cue to appear was randomised to be either 1500, 2000, 2500, or 3000 msec after the stimulus onset. The cross that the cue pointed to was also randomized to be either the top left, bottom left, top right, or bottom right corner (see Figure 1 for an example of a complete trial). Participants completed six practice trials to ensure their understanding of the task before commencing the first block of 60 trials followed by a second block of 60 trials.

Assessing DDE: data analysis. Eye movements where the pupil was occluded or the participant was looking off-screen were excluded from analysis. Difficulty to disengage (DDE) scores were calculated by averaging the amount of time taken for the participant to disengage from the stimulus once the cue was presented; i.e., the angry DDE score was the amount of time taken to disengage attention from the angry stimuli divided by the number of trials with valid eye movements. Similarly, DDE scores were calculated for happy and neutral stimuli. Low DDE scores indicate less difficulty to disengage and high DDE scores indicate greater difficulty to disengage from the relevant stimuli. A difference score was calculated for each emotional image type (angry and happy). This was done by subtracting the neutral DDE score from the emotional DDE score which resulted in two difference scores, an angry DDE score and a happy DDE score for each participant. This was done to control for overall differences in disengagement time thus using the time to disengage from the neutral image type as a baseline (similar to the analyses of Koster, Verschuere, Crombez, & Van Damme, 2005 and Sears, Thomas, LeHuquet, & Johnson, 2010).

<Insert Figure 1>

Procedure

Participants in the clinical group completed the self-report measures of anxiety and depressive symptoms online before attending an appointment to complete the ADIS-IV in a face to face interview format, the passive viewing task, and DDE task before commencing any treatment. This procedure was repeated approximately one month after a group CBT treatment program. The non-anxious control participants completed the same measures and attention tasks on two occasions approximately 6 weeks apart.

The enhanced CBT treatment program attended by clinical participants was developed by members in our center and has been shown to be effective in treating SAD (Rapee et al., 2009). Treatment groups consisted of a maximum of 8 clients who attended 12 weekly 2.5 hour sessions over a 12 week period. The sessions were led by two therapists who implemented the treatment protocol which addressed self-focused attention, cognitive restructuring, exposure to feared situations, safety behaviours, realistic appraisal and feedback of performance and core beliefs (Rapee, Gaston, & Abbott, 2009).

Results

Sample description

Of the 54 clinical participants included in this study, one participant did not complete the DDE task at pre-treatment, one participant did not complete the attachment style measure at pre-treatment, three did not complete the post-treatment attachment style measure and two participants failed to complete the post-treatment social anxiety and depression severity measures. Data imputation was conducted to account for the missing data, however the results for the analyses did not differ from those run on the original data set. Thus the following analyses are based on the original data set.

Table 1 shows the mean scores and standard deviations on self-report measures of attachment style, social anxiety, and depression severity for participants in the clinical and

non-anxious control groups. There were significant differences in age between the clinical ($M = 33.20$, $SD = 9.84$) and control groups ($M = 26.04$, $SD = 11.06$), $t(75) = -2.82$, $p = .006$. A significant reduction in mean scores from pre- to post-treatment on measures of attachment style, social anxiety, and depression symptom severity was observed for the clinical group. There were no differences in these measures from session 1 to session 2 for the non-anxious control group. Table 2 and 3 presents the mean scores and standard deviations for attention bias variables for the clinical and control groups at pre- and post-treatment. There were no significant differences in attention bias scores between session 1 and session 2 for the non-anxious control group or between pre- to post-treatment for the clinical group.

<Insert Table 1>

<Insert Table 2>

<Insert Table 3>

To examine whether the clinical and control groups were indeed different on initial levels of anxiety, a comparison between the mean pre-treatment scores on anxiety and depression revealed that the clinical group was more socially anxious ($t(74) = -14.99$, $p < .001$) and more depressed ($t(74) = -6.50$, $p < .001$) than the non-anxious control group. These differences were maintained following treatment as there were significant differences between clinical and control groups on measures of social anxiety severity ($t(72) = -6.63$, $p < .001$) and depression severity ($t(72) = -4.13$, $p < .001$) measured at post-treatment. Regarding attachment, the clinical group exhibited more insecure attachment styles as they endorsed higher scores on the anxious attachment dimension ($t(73) = -3.95$, $p < .001$) and the avoidant attachment dimension ($t(73) = -5.42$, $p < .001$) than those in the control group. However following treatment, differences between the clinical and control groups were maintained for the avoidant attachment dimension ($t(71) = -2.95$, $p = .004$) but not the anxious attachment dimension ($t(71) = -1.71$, $p = .092$).

A series of t-tests were conducted in order to examine differences between the clinical and non-anxious control groups on measures of attention biases. At pre-treatment there were no significant differences between clinical and control groups on the attention dependent variables regarding initial angry bias score ($t(74) = 1.63, p = .106$), initial happy bias score ($t(74) = 1.22, p = .225$), angry DDE score ($t(73) = 0.09, p = .928$), happy DDE score ($t(73) = -1.31, p = .194$) and neutral DDE score ($t(73) = -0.42, p = .678$). Similarly at post treatment there were no significant differences between groups for initial angry bias score ($t(74) = 1.29, p = .202$), initial happy bias score ($t(74) = 0.79, p = .431$), angry DDE score ($t(73) = -0.22, p = .827$), happy DDE score ($t(73) = 0.92, p = .361$) and neutral DDE score ($t(73) = 1.00, p = .319$).

Following the analyses conducted in previous studies to assess whether initial attention bias scores were significantly different from chance levels a series of one sample t-tests were conducted (Gamble & Rapee, 2009; Waechter, Nelson, Wright, Hyatt, & Oakman, 2013). The initial attention bias scores differed significantly from 0.5 for the control group at pre-treatment (initial angry bias score: $t(21) = 5.91, p < .001$; initial happy bias score: $t(21) = 3.90, p = .001$) and at post-treatment (initial angry bias score: $t(21) = 4.89, p < .001$; initial happy bias score: $t(21) = 3.74, p = .001$). Similarly these scores differed significantly from chance levels (0.5) for the clinical group at pre-treatment (initial angry bias score: $t(53) = 3.48, p = .001$; initial happy bias score: $t(53) = 3.13, p = .003$) and at post-treatment (initial angry bias score: $t(53) = 5.66, p < .001$; initial happy bias score: $t(53) = 3.78, p < .001$).

Pre-treatment attention bias differences between socially anxious and non-anxious participants

Initial attention bias. The following analyses were conducted to examine the differences in initial bias scores between the clinical and non-anxious control groups prior to treatment. The assumption of normality was violated for the clinical group pre-treatment angry bias score, $D = .934, p = .006$ and the happy bias score, $D = .955, p = .046$. Log

transformations of both variables improved the distribution as the Shapiro-Wilk statistic was not significant, angry bias score: $D = .968, p = .164$; happy bias score: $D = .980, p = .534$. The control group time 1 depression variable (DASS) was not normally distributed, $D = .284, p < .001$ and no transformations were able to establish normality for this variable. The time 1 attachment avoidance variable was not normally distributed, $D = .904, p = .036$. A reflect and square root transformation established normality, $D = .916, p = .062$. The pre-treatment angry DDE difference scores, $D = .955, p = .049$ in the clinical group and the time 1 happy DDE difference scores in the control group, $D = .891, p = .020$. No transformations were able to establish a normal distribution for the angry DDE variable; however one extreme outlier was identified. Using the Winsorizing technique for dealing with outliers this data value was recoded to the next highest value. This method resulted in a normal distribution for the pre-treatment angry DDE score, $D = .969, p = .687$. A log transformation was able to establish normality for the happy DDE variable, $D = .911, p = .050$. All other variables were normally distributed. All other assumptions were met.

A repeated measures analysis was conducted with valence (happy, angry) as the within subjects factor, group (control, clinical) as the between subjects factor and pre-treatment/time 1 depression, anxious attachment, and avoidant attachment style as covariates. The main effect of valence was not significant ($F(1, 68) = 1.60, p = .210$) indicating that there was no difference in initial attention bias between angry and happy stimuli. The interaction between valence and anxious attachment ($F(1, 68) = 0.15, p = .704$) or avoidant attachment ($F(1, 68) = 1.13, p = .292$) was not significant. Thus, the proportion of initial fixations on either happy or angry stimuli did not vary as a function of attachment style. There were no differences in initial attention bias scores for angry or happy stimuli between the clinical and control groups as the interaction between valence and group was not significant ($F(1, 68) = 0.20, p = .660$). Nor were there any significant interactions between valence, group and anxious ($F(1, 68) =$

0.58, $p = .448$) or avoidant ($F(1, 68) = 0.09, p = .770$) attachment style. Thus, attachment style did not moderate the relationship between condition and initial attention biases.

Difficulty to disengage. The following analysis was conducted to examine the differences in DDE scores between the clinical and non-anxious control groups prior to treatment. A repeated measures analysis was conducted with valence (angry and happy DDE difference scores) as the within subjects factor, group (control, clinical) as the between subjects factor and pre-treatment/time 1 depression, anxious attachment and avoidant attachment style as covariates. There was no significant difference in difficulty to disengage scores between the angry and happy stimuli ($F(1, 67) = 0.0003, p = .986$) or between the clinical and control group ($F(1, 67) = 0.52, p = .475$). Anxious ($F(1, 67) = 2.08, p = .154$) or avoidant ($F(1, 67) = 2.58, p = .113$) attachment style did not contribute to differences in DDE scores between the angry and happy stimuli. Anxious ($F(1, 67) = 0.54, p = .466$) and avoidant ($F(1, 67) = .51, p = .477$) attachment style did not moderate the relationship between group and difficulty to disengage from angry or happy stimuli.

The same analysis as previously described was run with the angry, happy and neutral DDE scores (valence) rather than the difference scores as the within subjects variable. The results were similar with the exception of a significant main effect of valence, $F(1, 67) = 18.54, p < .001$. Follow up tests using estimated marginal means and Bonferroni adjustment indicates that all participants had higher DDE scores for angry faces compared to happy faces, $t(67) = 20.75, p < .001$ and neutral faces, $t(67) = 58.15, p < .001$. Participants also had higher DDE scores for happy stimuli compared to neutral, $t(67) = 45.32, p < .001$.

Changes in attention biases between pre- and post-treatment

While there were no differences in attention biases between the clinical and control groups, there were individuals within each group that were either vigilant or avoidant of threat. Thus to examine the effects of treatment on attention biases the following analyses

were conducted using clinical participants only. The assumption of normality was violated for the post treatment angry DDE scores, $D = 940$, $p = .010$; neutral DDE scores, $D = .946$, $p = .019$ and angry bias score, $D = .940$, $p = .010$. All other post-treatment variables were normally distributed. Square root transformation of the variables improved the distribution as the Shapiro-Wilk statistics were non-significant (angry DDE score, $D = .968$, $p = .17$; neutral DDE score, $D = 959$, $p = .063$; angry bias score, $D = 958$, $p = .060$).

Initial attention bias. Following the procedure established in previous research, the initial bias scores were used to classify participants as either the vigilant attention subtype, if their initial attention bias score was greater than 0.5, or the avoidant attention subtype, if scores were less than 0.5 (Calamaras et al., 2012; Waters et al., 2012). To examine any changes for socially anxious participants in initial bias scores from pre- to post-treatment as well as whether attachment style moderates this relationship a linear mixed model analysis was conducted comparing the attention subtypes (either initially vigilant or avoidant of threat), across stimulus valence (angry or happy) and time (pre-treatment and post-treatment) on bias scores with attachment anxiety and attachment avoidance as continuous predictors. These predictors were entered as fixed effects with the interaction terms investigating the relationship between time, valence, attention subtype, and attachment style. The final model includes a random effect associated with the intercept with restricted maximum likelihood estimation.

<Insert Table 4>

The mean attention bias scores by time and attention subtype are displayed in Table 4. There were no significant main effects of either anxious ($F(1, 49) = 0.09$, $p = .767$) or avoidant ($F(1, 49) = 0.09$, $p = .762$) attachment style nor valence of the stimulus ($F(1, 155) = 0.23$, $p = .633$) on bias scores. There was a significant main effect of time, $F(1, 155) = 5.96$, $p = .016$. Overall participants were more vigilant for emotional stimuli (angry and happy)

relative to neutral stimuli at pre-treatment than post-treatment, $t(155) = 2.44, p = .016$. There was also a significant main effect of attention subtype, $F(1,49) = 13.08, p = .001$, with those who were vigilant to threat at pre-treatment displaying significantly higher bias scores than those who were avoidant of threatening stimuli at pre-treatment, $t(49) = 3.62, p = .001$. This indicates those individuals classified as the vigilant attention subtype were more vigilant for all emotional stimuli, both angry and happy, regardless of time. There was a significant interaction between valence and attention subtype, $F(1, 155) = 4.81, p = .030$. Follow-up tests using estimated marginal means and Bonferroni adjustment indicate that those in the vigilant attention subgroup were more vigilant for angry stimuli compared to the avoidant attention subgroup, $t(155) = 2.44, p = .016$. However no significant difference between the vigilant and avoidant attention subgroups was observed for happy stimuli, $t(155) = 1.94, p = .055$.

There was also a significant interaction between time and attention subtype, $F(1, 155) = 0.42, p = .026$. Follow-up tests indicate that individuals in the avoidant attention subgroup were significantly more vigilant for all emotional stimuli at post-treatment compared to pre-treatment, $t(155) = 2.77, p = .006$, however bias scores for those in the vigilant attention subgroup did not significantly change from pre- to post-treatment, $t(155) = 0.19, p = .852$.

Difficulty to disengage. The following analyses examine the change in DDE scores from pre to post treatment. The mean DDE scores are shown in Table 3. The linear mixed model analysis was conducted using the DDE difference scores. The final model for the DDE analyses includes a random effect associated with the intercept with restricted maximum likelihood estimation. There were no significant main effects or interactions for any of the independent variables entered in this analysis (all F 's < 0.77 ; all p 's $> .383$).

A second DDE linear mixed model analysis was conducted using the DDE scores for angry, happy and neutral stimuli. Similar to the analysis described above there were no

significant main effects or interactions for the independent variables entered in this analysis (all F 's < 1.84 ; all p 's $> .176$).

Prediction of treatment outcome

The following analyses were conducted using the clinical group only. The assumption of normality was assessed for all variables used in the following analysis. The assumption of normality was violated for the pre-treatment angry bias score, $D = .933$, $p = .007$. Log transformation of the angry bias score improved the distribution as the Shapiro-Wilk statistic was not significant, $D = .967$, $p = .174$. All other variables in this analysis were normally distributed. The assumption of normality was also violated for the pre-treatment angry DDE difference score, $D = .949$, $p = .032$. No transformations were able to establish a normal distribution; however one extreme outlier was identified. Using the Winsorizing technique for dealing with outliers this data value was recoded to the next highest value. This method resulted in a normal distribution for the pre-treatment angry DDE difference score, $D = .978$, $p = .423$. Therefore the following analyses use the transformed variables. All other assumptions were met.

To examine whether attention biases predict treatment outcome for those with SAD and whether adult attachment style moderates this relationship, two sets of hierarchical multiple regression analyses were conducted with post treatment social anxiety severity (treatment outcome) as the dependent variable. The first analysis examined the probability of initially fixating on either the angry or happy stimuli and included the pre-treatment angry bias score and the pre-treatment happy bias score as independent variables. The second set of analyses examined the amount of time taken to disengage (difficulty to disengage) from either the angry, happy, or neutral stimulus at pre-treatment as independent variables. All analyses included the pre-treatment variables addressing social anxiety severity, depression severity, anxious attachment, and avoidant attachment style. The pre-treatment social anxiety severity and depression variables were entered in step one. The attention and attachment variables

were entered in steps two and three, respectively and the interactions between variables in step four.

Initial attention bias. The regression statistics for the initial attention bias are presented in Table 5. In the first step of the hierarchical multiple regression, two predictors were entered: pre-treatment depression severity, and pre-treatment social anxiety severity. This model was statistically significant, $F(2, 48) = 9.13, p < .001$ and accounted for 27.5% of the variance in treatment outcome (post-treatment social anxiety severity). After introducing the attention variables (angry and happy bias scores) at step two the total variance explained by the model as a whole was 38.4% ($F(4, 46) = 7.18, p < .001$). The introduction of the attention variables explained an additional 10.9% of the variance in treatment outcome ($R^2 \text{ Change} = .11; F(2, 46) = 4.07, p = .024$). Neither the addition of the attachment variables in step three nor the interactions between attachment and attention variables in step 4 significantly contributed to variation in treatment outcome as the R^2 change was not significant, step three: $F(2, 44) = 0.001, p = .974$; step four: $F(5, 39) = 1.13, p = .362$. The final model accounted for 46.3% of the variance in treatment outcome and was statistically significant, $F(11, 39) = 3.06, p = .005$. In the final model only the pre-treatment bias towards angry faces remained a positive significant predictor of treatment outcome which uniquely explained 10.56% of the variation in treatment outcome ($\beta = .45, p = .009$).

<Insert Table 5>

Given that the previous analysis showed that change in attention biases from pre to post treatment differed based on attention subtype, an analysis was conducted to examine whether those classified as either vigilant or avoidant of threat at pre-treatment also differed in terms of treatment outcome. The same regression model as the previous analysis was implemented with the continuous scores angry bias scores and happy bias scores replaced by dichotomous groups angry attention subtype (avoidant or vigilant) and happy attention

subtype, respectively. The results of the final model were also similar with the exception of pre-treatment social anxiety severity which in this analysis remained significant in the final model, ($\beta = .42, p = .012$). The angry bias subtype at pre-treatment contributed significantly to treatment outcome (post-treatment social anxiety severity), ($\beta = .29, p = .036$), while the happy attention subtype did not, ($\beta = .01, p = .932$). In order to examine whether the different angry subtypes of attention differ in terms of treatment outcome estimated marginal means were used. The results show that those in the vigilant group had significantly higher social anxiety severity after treatment than those in the avoidant group, $t(40) = 2.30, p = .026$. At pre-treatment, however there were no significant differences in social anxiety symptom severity between the avoidant and vigilant attention subtypes, $t(52) = -0.76, p = .451$ (see Figure 2)

<Insert Figure 2>

Difficulty to disengage. The results of the regression analysis for DDE are presented in Table 6. For the second hierarchical multiple regression pre-treatment anxiety severity and pre-treatment depression were entered at step one. This resulted in a statistically significant model, $F(2, 47) = 9.01, p < .001$ which accounted for 27.7% of the variance in treatment outcome. At step two the attention variables (angry and happy DDE difference scores) were entered and resulted in a statistically significant model, $F(4, 45) = 6.50, p < .001$ which accounted for 8.9% of the variance in treatment outcome over and above those variables entered in step 1 (pre-treatment social anxiety severity and pre-treatment depression), $R^2 \text{ Change} = .089; F(2, 45) = 3.16, p = .052$. Entering the anxious and avoidant attachment variables and the interaction between them at step three resulted in a significant model, $F(87, 42) = 4.08, p = .002$ which explained an additional 3.9% of the variance in treatment outcome, however the change in R^2 was not significant, $F(3, 42) = 0.91, p = .445$. The final model included interactions between the attachment and attention variables and was significant, $F(11, 38) = 4.48, p < .001$. The addition of these variables accounted for an additional 16.0% of

the variance in treatment outcome and this change in R^2 was significant, $F(4, 38) = 3.50, p = .016$. The total amount of variance in treatment outcome accounted for by the final model was 56.5%. In this final step, the pre-treatment variables relating to the main effects of social anxiety severity, happy DDE scores, and the interaction between anxious and avoidant attachment were statistically significant with pre-treatment social anxiety severity contributing the most variance ($\beta = .41, p = .008$), followed by pre-treatment happy DDE scores ($\beta = .36, p = .011$) and the interaction between anxious and avoidant attachment ($\beta = -.27, p = .034$).

<Insert Table 6>

To investigate the nature of the interaction between attachment styles, simple slopes analyses examining the significant interactions using the MODPROBE procedure was conducted (Hayes & Matthes, 2009). The significant interaction between anxious and avoidant attachment style indicates that when anxious attachment is low there is no significant relationship between avoidant attachment and treatment outcome, $b = 2.68, 95\% \text{ CI } [-2.90, 8.25], t = -0.97, p = .337$. When anxious attachment is high the relationship between avoidant attachment style and treatment outcome approaches significance, $b = -4.98, 95\% \text{ CI } [-10.60, 0.64], t = -1.79, p = 0.081$ (see Figure 3).

<Insert Figure 3>

This analysis followed the same procedure used in the previous hierarchical regression analysis with the original DDE scores for angry, happy, and neutral stimuli rather than difference scores as the attention independent variables. The model summary results were the same as previously reported for the DDE difference scores, thus the results of the final model only will be presented.

The final model included the interactions between the attachment and attention variables which accounted for an additional 18.0% of the variation in treatment outcome and

this change in R^2 was significant, $F(6,35) = 2.55, p = .037$. The total amount of variance accounted for by the final model was 58.7% and was significant, $F(14, 35) = 3.50, p = .001$. In this final step, the pre-treatment variables relating to the main effects of social anxiety severity ($\beta = .45, p = .005$), happy DDE scores ($\beta = .35, p = .015$) and the interactions between anxious and avoidant attachment ($\beta = -.31, p = .021$), and neutral DDE scores and anxious attachment ($\beta = -.46, p = .006$) were all significant predictors of treatment outcome. The interaction between angry DDE scores and anxious attachment ($\beta = .35, p = .051$) approached significance. The most important predictor of treatment outcome is social anxiety severity which uniquely explained 10.56% of the variation in treatment outcome, followed by the interaction between neutral DDE scores and attachment anxiety which uniquely explained 10.05%, happy DDE scores (7.78%), interaction between anxious and avoidant attachment (6.92%) and the interaction between angry DDE scores and anxious attachment (4.80%).

Simple slopes analyses examining the significant interactions using the MODPROBE procedure were conducted (Hayes, & Matthes, 2009). The results concerning the significant interaction between anxious and avoidant attachment style replicate those previously reported, see Figure 3.

The interaction between angry DDE scores and anxious attachment style indicates that when anxious attachment style is low, there is a significant negative relationship between angry DDE scores and treatment outcome, $b = -140.53, 95\% \text{ CI } [-258.55, -22.52], t = -2.42, p = .021$. When anxious attachment is high, there is no significant relationship between angry DDE scores and treatment outcome, $b = 60.12, 95\% \text{ CI } [-55.03, 175.26], t = 1.06, p = .296$ (See Figure 4).

<Insert Figure 4>

For the significant interaction between neutral DDE scores and anxious attachment style, when anxious attachment scores are low, there is a non-significant relationship between

neutral DDE scores and treatment outcome, $b = 60.99$, 95% CI [-45.50, 167.49], $t = 1.16$, $p = .253$. When anxious attachment scores are high, there is a significant negative relationship between neutral DDE scores and treatment outcome, $b = -124.20$, 95% CI [-223.09, -25.30], $t = -2.55$, $p = .015$ (See Figure 5).

<Insert Figure 5>

Discussion

This research study aimed to investigate the relationship between attention biases and social anxiety as well as the influence adult attachment style has on this relationship. Initial analyses examined the differences between those diagnosed with SAD at pre-treatment and non-anxious participants. Contrary to expectations, there were no significant differences in the probability of initially fixating on or difficulty disengaging from either the angry or happy stimuli. In addition, all participants, regardless of group, found it more difficult to disengage from angry stimuli than from happy or neutral stimuli and all participants found it more difficult to disengage from happy stimuli than from neutral stimuli. While theoretical models of social anxiety predict attention biases such as vigilance to and difficulty to disengage from threat, the empirical findings have been inconsistent. The current results add to the findings of a number of other researchers who have used eye-tracking technology and found no difference between socially anxious and non-anxious individuals in initial attention biases (Garner et al., 2006; Schofield et al., 2013; Schofield et al., 2012; Wieser et al., 2009) or in difficulty disengaging from threat (Niles, Mesri, Burklund, Lieberman, & Craske, 2013; Schofield et al., 2013).

The second aim of this study was to examine how attention biases might change following treatment for SAD and whether attachment style moderates this relationship. As expected, the analysis examining changes in attention biases from pre- to post treatment indicate that initial biases in attention change following CBT treatment for SAD; however,

contrary to expectations, attachment style does not moderate this relationship. While the initial bias results at pre-treatment/time 1 indicate that all participants were significantly more likely to fixate on the emotional face (either happy or angry) first, the subtype of attention bias was also found to be important such that those who were classified as vigilant were significantly more likely to fixate first on the emotional stimulus compared to those who were classified as avoidant. In addition, there was a significant interaction between valence and attention subtype indicating that those in the vigilant attention group were significantly more vigilant for angry faces than for happy faces. The significant interaction between time and attention subtype revealed that those in the avoidant attention group became significantly more vigilant for all emotional stimuli from pre to post treatment while the probability of first fixating on either the happy or angry face did not change for the vigilant attention group. Thus the extent of change in attention biases after treatment is contingent upon whether the participants are initially biased toward (vigilant) or away from (avoidant) threat. Those who have an initial bias towards threat did not change their pattern of attention after treatment while those who were initially avoidant of threat became more vigilant for emotional stimuli after treatment. Previous studies have reported similar findings that those who show a pre-treatment bias away from threat tend to reduce their avoidance of threatening stimuli following CBT treatment and those classified as vigilant toward threat at pre-treatment showed no significant changes in attention following treatment (Calamaras et al., 2012; Waters et al., 2012). The pattern of results found for changes in initial bias following treatment were not found, however for the difficulty to disengage stage of attention biases where there were no significant changes from pre- to post treatment.

The final aim of this study was to investigate whether attention biases influence treatment outcome and whether attachment style moderates this relationship. Regarding the analyses examining whether initial attention biases predict treatment outcome, the results show that as the angry bias score at pre-treatment increases the post treatment social anxiety

severity increases. Thus those who have a greater probability of first fixating on the angry stimulus at pre-treatment (greater vigilance for threat) are more likely to have poorer treatment outcomes than those who tend to fixate on the neutral stimulus first. Attachment style did not moderate this relationship. With respect to the DDE difference scores, those who had greater difficulty disengaging from happy faces were significantly more likely to have higher severity scores at post treatment. Thus greater difficulty disengaging from happy stimuli predicts poorer treatment outcome. Attachment style did not moderate this relationship, however the interaction between anxious and avoidant attachment style did independently predict outcome. When anxious attachment is low there is no significant relationship between avoidant attachment and treatment outcome. When anxious attachment is high the relationship between avoidant attachment style and treatment outcome approaches significance. Similarly, the analysis regarding the original DDE scores showed that difficulty disengaging from happy stimuli predicted poorer treatment outcome. There was also a significant interaction between anxious attachment and avoidant attachment style. Where the results differ from the analysis implementing difference scores, is a close to significant interaction between angry DDE and anxious attachment style such that, when anxious attachment is low, there is a significant negative relationship between angry DDE scores and treatment outcome but when anxious attachment is high, there is no relationship between angry DDE scores and treatment outcome. The interaction between neutral DDE scores and anxious attachment style in predicting treatment outcome was also significant. When anxious attachment scores are low, there is no relationship between neutral DDE scores and treatment outcome, however, when anxious attachment scores are high, there is a significant negative relationship between neutral DDE scores and treatment outcome. This is an interesting finding, which may reflect that socially anxious individuals that are insecurely attached interpret the neutral stimulus as threatening. Those who are securely attached however do not seem to interpret the neutral stimulus in a negative way. Thus, examination of the initial

attention biases indicates that greater vigilance toward threat predicts poorer treatment outcome and attachment style does not moderate this relationship. The findings regarding difficulty to disengage, however, showed that greater difficulty disengaging from happy stimuli predicted poorer treatment outcome. Furthermore, an anxious attachment style moderated the relationship between difficulty disengaging from both neutral and angry stimuli and treatment outcome. Low scores on the anxious attachment dimension and longer disengagement times from angry stimuli predict better treatment outcome, while high scores on the anxious attachment dimension and longer disengagement times from neutral stimuli predict better treatment outcome.

Evidence supporting the theory that attention biases towards threatening stimuli is associated with maintaining symptoms of social anxiety proposed by the CBT models of social anxiety (Rapee & Heimberg, 1997) is drawn from the results examining the initial bias in attention (the probability of first fixating on the threatening compared to the neutral stimulus). One of the main findings of the present study, that change in attention bias from pre to post treatment varied depending on whether the participant was classified as either vigilant or avoidant, is particularly important when considering that these attention subtype groups also varied in relation to SAD symptom severity after treatment. Those who were classified as avoidant at pre-treatment were more likely to change their bias in attention than those who were classified as vigilant. Furthermore avoidance of threat at pre-treatment was associated with lower social anxiety symptom severity after treatment. The increase in vigilance to threat for those who were initially avoidant may be a result of the CBT treatment program which encourages clients not to avoid social situations which they find threatening. Thus, an increase in attention to threat alongside reduced social anxiety severity is likely to be a reflection of the increase in processing of threatening stimuli in a way that is adaptive, for example, using cognitive reappraisal techniques. Furthermore, CBT encourages exposure to feared stimuli and so the apparent attentional bias may be a correction of an avoidant tendency. Regarding

change in attention bias, the current findings support those reported by Waters et al. (2012) who found that children with an attention bias away from threat significantly increased their attention towards threat when measured at post-treatment. Regarding treatment outcome Legerstee et al. (2009, 2010) similarly found that treatment non-responders selectively attended towards threat while those who avoided threat had better treatment outcomes. However, contrary to the current findings both Price et al. (2011) and Waters et al. (2012) report that a bias towards threat was associated with better treatment outcomes. The discrepancy in the results may be a result of differences in methodology as the current study utilized eye-tracking technology while these previous studies employed the dot-probe task to measure biases in attention.

Previous research has exclusively examined the influence of an initial attention bias towards threat on treatment outcome for adults with SAD. In this study, we have extended the examination of attention biases to include the association between difficulty to disengage from stimuli and treatment outcome. The initial finding that difficulty disengaging from happy stimuli predicted poorer treatment outcome highlights that the nature of attention biases relevant to social anxiety disorder may not exclusively be related to threatening environmental stimuli. This finding offers support for recent conceptualizations of social anxiety that suggest socially anxious people fear both negative and positive evaluation. The second finding that difficulty disengaging from angry stimuli was also associated with treatment outcome for those with SAD when they scored low on the anxious attachment dimension (more secure) suggests that those who are more secure in terms of anxious attachment style were more likely to have better treatment outcomes when they took more time disengaging from the angry stimulus than when they were quicker to disengage from the angry stimulus. One might speculate that being securely attached allows participants to process stimuli which would otherwise be threatening, allowing for a better treatment outcome. A third finding regarding difficulty disengaging from neutral stimuli is that greater

difficulty disengaging from a neutral stimulus when anxious attachment style is high (insecure attachment) predicts better treatment outcome. Thus those who have a low anxious attachment style and are more securely attached perform better with treatment when they are more likely to have a longer disengagement time from the angry stimulus. However, when they are more insecurely attached (high anxious attachment) greater attention to the neutral stimulus predicts better treatment outcome. A potential limitation of the DDE task may be that it is difficult to discern whether participants were disengaging their attention from threat or engaging with the cue after a state of not paying attention. These results offer mixed support for the theory proposed by Rapee and Heimberg (1997). While the results support the notion that difficulty disengaging from threat has implications in terms of maintaining symptoms of SAD, it seems to be the case that the association between difficulty disengaging from stimuli and treatment outcome varies according to the individual's attachment style.

The findings for the current study have both theoretical and practical implications for future research examining biases in attention for those with SAD. Firstly, given the recent surge in studies examining the effects of attention bias modification (ABM) on social anxiety symptoms (e.g., Amir, Beard, Taylor, Klumpp, & Jason, 2009; Heeren, Reese, McNally, & Philippot, 2012; Kuckertz et al., 2014; Rapee et al., 2013), the results of the current study are particularly relevant. While some randomized controlled trials have found evidence that ABM can reduce anxious symptoms (Amir et al., 2009; Heeren et al., 2012; Schmidt, Richey, Buckner, & Timpano, 2009) others have failed to replicate these findings and have shown no significant effects of ABM on social anxiety symptoms (Bunnell, Beidel, & Mesa, 2013; Carlbring et al., 2012; Neubauer et al., 2013; Rapee et al., 2013). To reduce symptoms of social anxiety, current attention training programs are focused on training attention away from the threatening stimulus and towards the neutral stimulus (MacLeod & Mathews, 2012). Since those who were initially avoidant of threatening stimuli became more vigilant for threat after treatment, and being initially avoidant was related to better treatment outcomes, it raises the

question that perhaps it is not adaptive to train attention away from threat for everyone. Secondly, the current result that difficulty disengaging from happy stimuli is associated with poorer treatment outcome offers a potential extension to this paradigm. It suggests that it may be advantageous to also target training attention away from happy stimuli once they have initially fixated on the stimulus.

Taken together, these results highlight that the relationship between attention biases and SAD are likely to be more complex than previously thought. The current findings suggest that it is important to incorporate the general concept of individual differences, such as attachment style, that are relevant to attention biases and moderate the relationship with social anxiety symptoms. Thus, paying attention to individual differences in both attention biases and attachment style may allow for tailoring of ABM treatment for social anxiety in order to improve outcomes.

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Table 1

Mean Scores for Control and Clinical Groups on Self-report Measures of Social Anxiety, Depression and Attachment Style

	Control			Clinical						
	Time 1	Time 2	Significance			Pre-Treatment	Post-treatment	Significance		
			<i>df</i>	<i>t</i>	<i>p</i>			<i>df</i>	<i>t</i>	<i>p</i>
Social anxiety severity (SIAS)	16.59 (10.83)	17.27 (11.68)	21	-0.53	.605	57.54 (10.79)	40.94 (14.90)	51	8.99	<.001
Depression severity (DASS)	1.82 (2.15)	1.95 (2.06)	21	-0.28	.785	9.19 (5.12)	6.17 (4.59)	51	4.95	<.001
Anxious Attachment (ECR-R: anxiety dimension)	3.35 (1.13)	3.29 (1.20)	21	0.28	.781	4.36 (0.96)	3.79 (1.14)	49	3.44	.001
Avoidant Attachment (ECR-R: avoidance dimension)	3.41 (1.11)	3.53 (1.31)	21	-0.96	.350	4.74 (0.90)	4.30 (0.88)	49	4.00	<.001

Note: Results from paired samples t-test examining the difference in scores between pre-

treatment and post-treatment are presented in the significance column

Table 2

Mean (and Standard Deviation) Bias Scores Indicating the Probability of First Fixation on the Emotional Relative to the Neutral Stimulus.

	Initial Bias Scores									
	Control (n=22)					Clinical (n=54)				
	Time 1	Time 2	Significance			Pre-Treatment	Post-Treatment	Significance		
Image Valence	Bias Score	Bias Score	<i>df</i>	<i>t</i>	<i>p</i>	Bias Score	Bias Score	<i>df</i>	<i>t</i>	<i>p</i>
Angry	0.57 (0.06)	0.59 (0.08)	21	- 1.08	.29 2	0.54 (0.08)	0.56 (0.08)	53	- 1.99	.05 1
Happy	0.55 (0.07)	0.56 (0.07)	21	- 0.13	.89 8	0.53 (0.08)	0.54 (0.08)	53	- 0.68	.49 7

Note. Results from paired samples t-test examining the difference in scores between pre-treatment and post-treatment are presented in the significance column. Standard deviations are shown in parentheses. *p* values approaching significance are presented in bold.

Table 3

Mean (and Standard Deviation) Bias Scores Indicating the Mean Disengagement Time (milliseconds), and Mean Disengagement Time Relative to Neutral Images (milliseconds).

Control (n=22)										
Image	Time 1		Time 2		Significance					
	DDE Time (ms)	DDE D Score	DDE Time (ms)	DDE D Score	DDE Time (ms)			DDE D Score		
Valence					<i>df</i>	<i>t</i>	<i>p</i>	<i>df</i>	<i>t</i>	<i>p</i>
Angry	302.48 (83.03)	14.53 (86.46)	299.33 (8.93)	-5.59 (55.85)	21	0.15	.880	21	0.93	.364
Happy	277.10 (44.88)	-10.85 (69.14)	303.44 (93.72)	-1.48 (63.28)	21	-1.38	.183	21	-0.46	.654
Neutral	287.95 (64.26)	-	304.91 (100.08)	-	21	-1.12	.277	21	-	-
Clinical (n=54)										
Image	Pre-Treatment		Post-Treatment		Significance					
	DDE Time (ms)	DDE D Score	DDE Time (ms)	DDE D Score	DDE time			DDE D Score		
Valence					<i>df</i>	<i>t</i>	<i>p</i>	<i>df</i>	<i>t</i>	<i>p</i>
Angry	300.60 (81.61)	1.7 (78.96)	303.97 (75.93)	19.38 (82.91)	51	-0.46	.645	51	-1.26	.215
Happy	299.44 (74.24)	3.64 (78.45)	285.40 (69.66)	0.81 (68.83)	51	1.15	.254	51	0.03	.974
Neutral	295.80 (78.02)	-	284.59 (70.03)	-	51	0.93	.358	-	-	-

Note: Results from paired samples t-test examining the difference in scores between pre-treatment and post-treatment are presented in the significance column. Standard deviations are shown in parentheses. DDE time = the amount of time in milliseconds taken to disengage attention from the relevant stimulus. DDE D Score = the difference from neutral images calculated by subtracting the disengagement time from neutral images.

Table 4

Mean Bias Scores by Time and Attention Subtype.

Attention Subtype		Pre Treatment	Post Treatment
Avoidant	Angry	.47 (.02)	.52 (.02)
	Happy	.49 (.02)	.53 (.02)
Vigilant	Angry	.57 (.07)	.57 (.08)
	Happy	.54 (.08)	.55 (.07)

Note: Data represents the clinical group only. Standard deviations are shown in parentheses.

Table 5

*Hierarchical Multiple Regression Model for Initial Attention Bias Predicting Treatment**Outcome.*

Predictor	<i>R</i>	<i>R</i> ²	<i>R</i> ² <i>Change</i>	β	<i>SE</i>	<i>t</i>	<i>sr</i> ²
Step 1	.53	.28**	.28**				
Pre-treatment social anxiety severity				.27	0.24	1.56	.03
Pre-treatment depression severity				.13	0.48	0.79	.01
Step 2	.62	.38***	.11*				
Angry bias score				.45	37.95	2.77**	.11
Happy bias score				-.12	30.17	-0.76	.01
Step 3	.62	.39**	.001				
Anxious attachment				.01	2.55	0.06	.00005
Avoidant attachment				.13	2.51	0.86	.01
Step 4	.68	.46**	.08				
Anxious × avoidant attachment				-.01	2.10	-0.10	.0001
Angry Bias × anxious attachment				.09	51.81	0.59	.005
Angry Bias × avoidant attachment				-.17	51.32	-1.07	0.02
Happy Bias × anxious attachment				.004	36.32	0.03	.00002
Happy Bias × avoidant attachment				.27	43.05	1.91	.05

Note. Data represents the final step of the regression analysis. Statistical significance: * $p < .05$; ** $p < .01$; *** $p < .001$. N=51.

.05; ** $p < .01$; *** $p < .001$. N=51.

Table 6

Hierarchical Multiple Regression Model of DDE Scores Predicting Treatment Outcome.

	<i>R</i>	<i>R</i> ²	<i>R</i> ² Change	β	<i>SE</i>	<i>t</i>	<i>sr</i> ²
Step 1	.53	.28***					
Pre-treatment social anxiety severity				.41	0.20	2.79**	.09
Pre-treatment depression severity				.11	0.41	0.79	.007
Step 2	.61	.37***	.09				
Angry DDE score				-.18	24.90	-1.39	.02
Happy DDE score				.36	26.28	2.68*	.08
Step 3	.64	.41**	.04				
Anxious attachment				-.12	2.17	-0.86	.008
Avoidant attachment				-.08	2.15	-0.60	.004
Anxious \times avoidant attachment				-.27	1.87	-2.20*	.06
Step 4	.75	.57***	.16*				
Angry DDE \times anxious attachment				.21	39.96	1.56	.03
Angry DDE \times avoidant attachment				-.22	35.59	-1.57	.03
Happy DDE \times anxious attachment				.18	42.21	1.31	.02
Happy DDE \times avoidant attachment				.23	37.61	1.48	.03

Note. Data represents the final step of the regression analysis. Statistical significance: * $p < .05$;

** $p < .01$; *** $p < .001$. N=50.

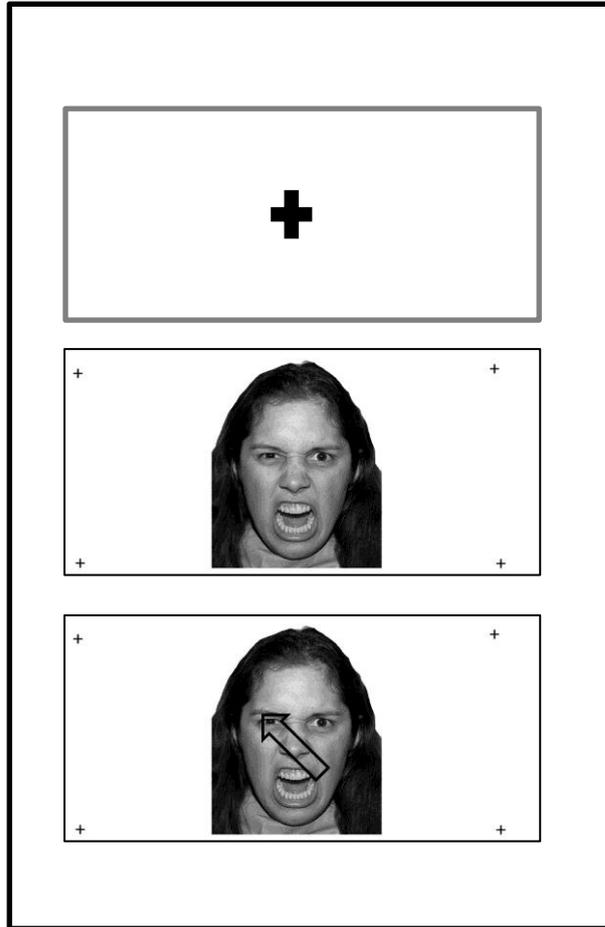


Figure 1. From the top panel to the bottom represents the progression of a difficulty to disengage trial when a cue is presented. Panel 1: The fixation cross was presented for 1000 msec. Panel 2: The time taken for the cue to appear was randomised to be 1500, 2000, 2500, or 3000 msec after the stimulus onset. Panel 3: Participants were instructed to shift their attention to the cross that the cue (arrow) was signaling when it appeared. The cross that the cue (arrow) pointed to was also randomized to be either the top left, bottom left, top right, or bottom right corner.

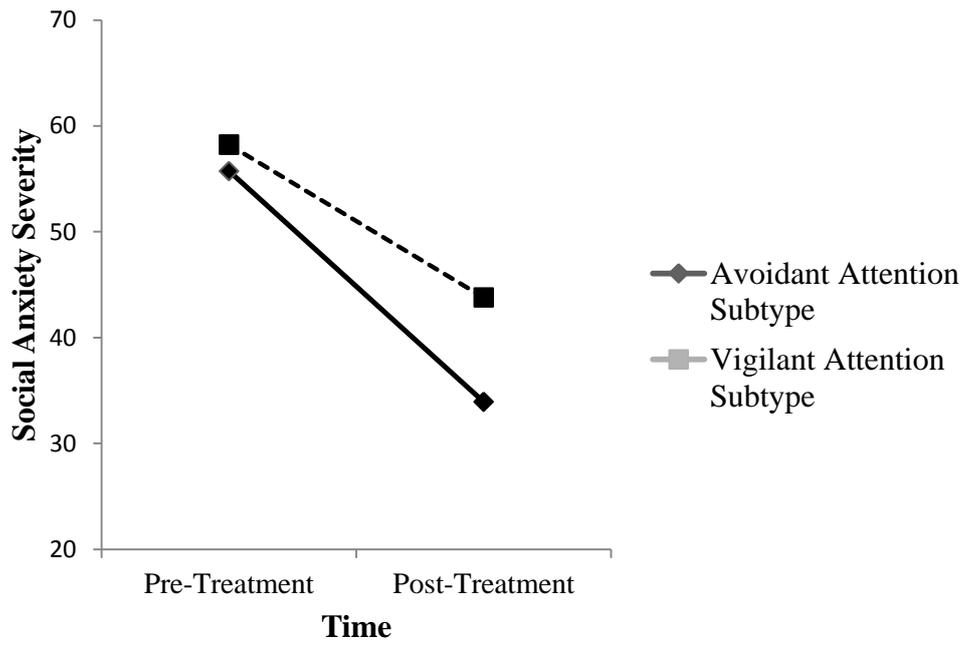


Figure 2. Change in social anxiety symptoms severity from pre- to post treatment (clinical group) for avoidant and vigilant attention (for the angry stimulus) subtypes.

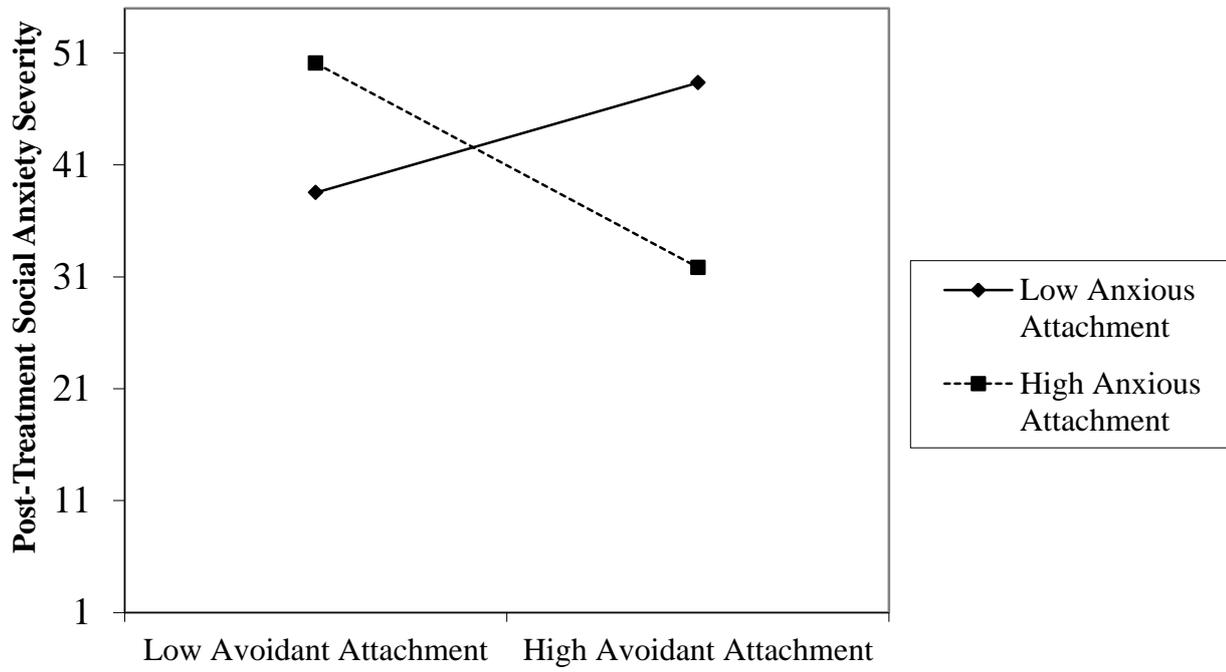


Figure 3. Predicting post-treatment social anxiety severity from the interaction between anxious and avoidant attachment style.

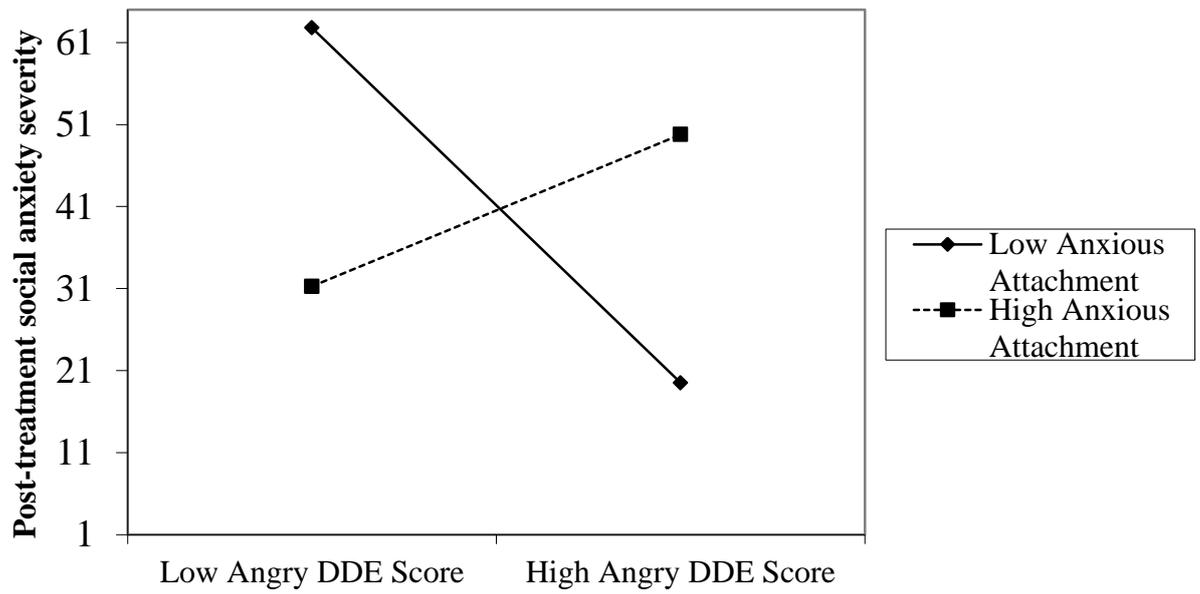


Figure 4. Predicting post-treatment social anxiety severity from the interaction between angry DDE scores and anxious attachment style.

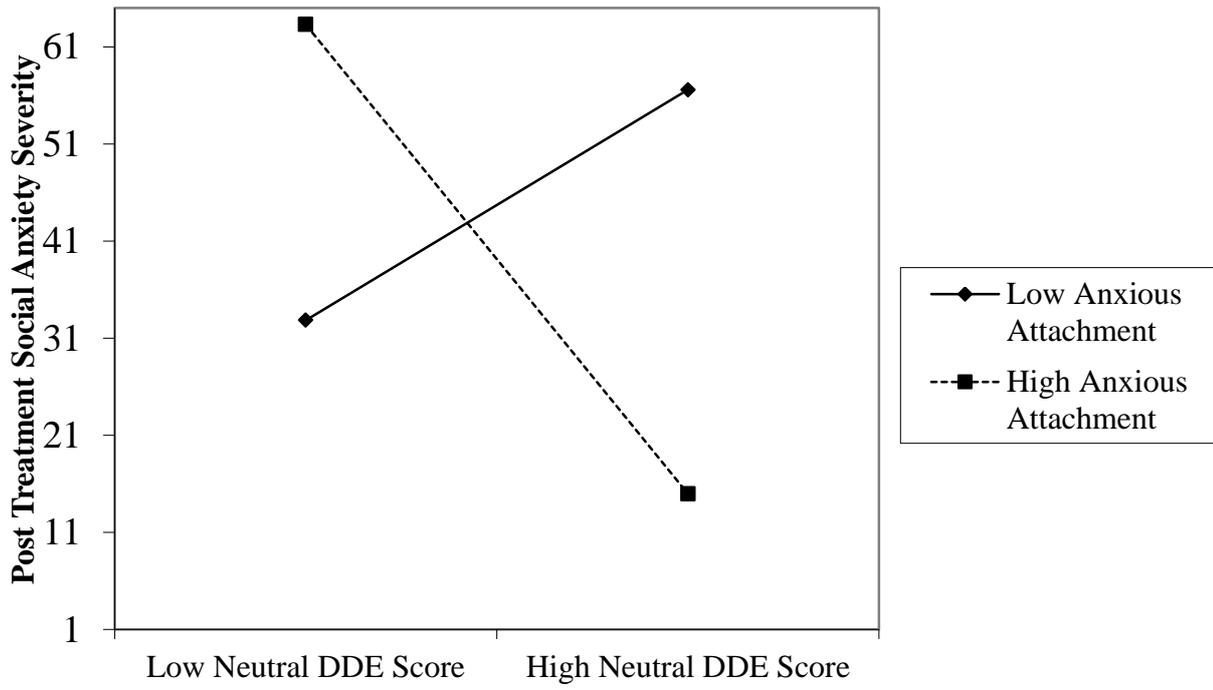


Figure 5. Predicting post-treatment social anxiety severity from the interaction between neutral DDE scores and anxious attachment style

The following chapter in this thesis represents a research study entitled “The role of therapeutic alliance and adult attachment in cognitive behavioural therapy for Social Anxiety Disorder”. This chapter aims to address a gap in the SAD literature by investigating the influence of adult attachment style on the therapeutic alliance and CBT treatment outcome. It extends from the previous chapters by examining a novel but important avenue that adult attachment style may influence treatment outcomes for these individuals.

Chapter 5

The role of therapeutic alliance and adult attachment in cognitive behavioural therapy for Social Anxiety Disorder.

This chapter has been submitted for publication to Depression and Anxiety, and is presented in its submitted format.

Author contribution:

Ms. Yulisha Byrow was solely responsible for the design of the research, analysis and write-up of this paper. Dr. Peters provided statistical and research supervision.

The role of therapeutic alliance and adult attachment in cognitive behavioural therapy for
Social Anxiety Disorder.

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Keywords: Social Anxiety, adult attachment, therapeutic alliance, treatment outcome.

Abstract

Background: Social anxiety disorder (SAD) is a highly prevalent mental health problem which causes significant life interference. The reported effectiveness of CBT for the treatment of SAD can vary greatly. Given the interpersonal difficulties faced by those with SAD, one potential source of variability in treatment outcome may be related to the quality of the relationship formed with their therapist or therapeutic alliance. Research shows that adult attachment style can influence the quality of therapeutic alliance. The current study investigates the influence of adult attachment style on the relationship between therapeutic alliance and treatment outcome for clients attending a group CBT program for SAD. This study is the first to examine how adult attachment style and therapeutic alliance influence treatment outcome for socially anxious individuals attending a group CBT program.

Methods: One hundred and nine clients seeking treatment for a primary diagnosis of SAD, as part of a larger randomised controlled trial, participated in this study. All participants in this study completed the same group CBT treatment program for SAD.

Results: The results indicate that therapeutic alliance does not mediate the relationship between attachment and treatment outcome. Rather the evidence suggests that therapeutic alliance is a significant predictor of treatment outcome over and above initial symptom severity and attachment style (anxious attachment) moderates this relationship.

Conclusion: These findings contribute to understanding the influence of attachment style on the relationship between therapeutic alliance and treatment outcome and can inform efforts to improve treatment for those with SAD.

The role of therapeutic alliance and adult attachment in cognitive behavioural therapy for Social Anxiety Disorder.

Social anxiety disorder is a prevalent disorder affecting approximately 8% of Australians and 13% of Americans.^[1,2] Those diagnosed with SAD are primarily concerned about being judged negatively by others and, thus, they develop high levels of fear and anxiety associated with social situations. As a result they can often avoid social situations, which is detrimental to their family relationships, social life, friendships, marriage, and romantic relationships, leading to significant life impairment.^[3,4] The most commonly utilised and effective treatment for SAD is cognitive behavioural therapy (CBT).^[5,6] However, results from a recent meta-analysis have shown that, while significantly efficacious, the effectiveness of CBT varies greatly from one study to the next.^[7] The high prevalence rate and significant life interference caused by this disorder suggests that examining factors contributing to variability in treatment outcomes is an important area requiring further investigation. Given the interpersonal difficulties faced by those with SAD, one potential source of variability in treatment outcome may be related to a therapeutic process variable, namely, the quality of the relationship formed with their therapist or therapeutic alliance.

Therapeutic alliance refers to the relationship between the client and therapist and is based upon their agreement on relevant tasks and goals related to treatment.^[8] Results from meta-analyses investigating a diverse range of mental health disorders indicate a significant relationship between therapeutic alliance and treatment outcome.^[9,10] Those clients who endorse a stronger therapeutic alliance generally have better treatment outcomes than those who rate the therapeutic alliance as weak.^[11]

Research findings suggest that specific client diagnoses and individual characteristics (e.g., personality traits) contribute to the therapeutic alliance-outcome relationship.^[12] Given

that clients with SAD are characteristically socially avoidant, sensitive to rejection or evaluation from others, and can also have poor social skills, it appears that the development of a good therapeutic alliance may be challenging for them.^[13] Nevertheless, research examining the effect of therapeutic alliance on aspects of CBT treatment for SAD indicate that a stronger therapeutic alliance is associated with more engagement with exposure sessions (a component of CBT treatment) and higher ratings of exposure sessions as beneficial.^[14] However, studies investigating the influence of alliance on treatment outcome for those with SAD specifically, have reported no significant effects of therapeutic alliance on treatment outcome.^[13,15] For example, in one study no evidence for a relationship between therapeutic alliance and treatment outcome for those attending a cognitive behavioural group therapy (CBT) program for SAD was found.^[13] Similarly, other findings suggest that there was a stronger therapeutic alliance in individual treatment than in group-CBT, but therapeutic alliance did not predict treatment outcome regardless of whether the treatment was delivered in a group or individually.^[15] Thus, it is possible for individuals with SAD to develop a good quality therapeutic alliance, however research does not support the idea that therapeutic alliance predicts treatment outcome for these individuals. The finding that therapeutic alliance does not predict treatment outcome for SAD is in contrast to the findings of previous studies examining the therapeutic alliance-outcome relationship within a diverse range of mental health problems.^[9,10] Following the proposal that individual characteristics of the client may influence the alliance-outcome relationship, the focus of the current paper is on an individual characteristic of SAD clients that may impact the therapeutic alliance – treatment outcome relationship; that is, attachment style.^[12]

Adult attachment style may be particularly relevant to the development of therapeutic alliance during treatment.^[16] Adult attachment style was proposed as a relevant therapeutic process variable, where he stressed the importance of the therapist providing a secure base

and safe haven from which the client can explore their world.^[17] Adult attachment style is measured on two dimensions; an anxiety and an avoidance dimension. Individuals who score high on the anxious attachment dimension tend to worry about the availability of the attachment figure, while those scoring high on the avoidance attachment dimension prefer not to rely on or open up to others. Typically, a secure adult is low on both of these dimensions.^[18] There is evidence that an avoidant attachment style is associated with a greater fear of humiliation during group therapy^[19] and a secure attachment style with a greater tendency toward self-disclosure.^[20] Given that there is an over-representation of insecurely attached individuals with SAD,^[21] and fear of humiliation is a particular concern for those with SAD, attachment style may prove to be an important variable to consider when examining the relationship between therapeutic alliance and treatment outcome for those with SAD.

Previous research has established that adult attachment style does influence therapeutic alliance in individual treatment. Attachment style predicted the strength of therapeutic alliance in a group of university students attending a university counselling centre and community members attending a university training clinic.^[22] Findings from meta-analyses indicate that greater attachment security is related to stronger therapeutic alliance and better treatment outcomes and greater attachment insecurity with weaker therapeutic alliance and poorer treatment outcomes.^[24,25] Previous findings suggest that therapeutic alliance partially mediates the relationship between attachment style and psychotherapeutic outcomes. Generally, they conclude that a client who is comfortable being close to and depending on others is more likely to show a reduction in symptom severity during treatment^[25].

Despite the influence of attachment style on interpersonal functioning and therapeutic alliance, the relationship between attachment style, therapeutic alliance, and treatment outcome has never been specifically examined for individuals with SAD. Thus it is possible that those diagnosed with SAD who also have an insecure attachment style may find a group CBT treatment program less beneficial because the development of a good therapeutic alliance may be inhibited.^[26] Alternatively, the effect of attachment style may work to influence treatment outcome indirectly, via therapeutic alliance.^[25]

The aim of the current research study is to investigate the influence of adult attachment style on the relationship between therapeutic alliance and treatment outcome for those clients attending a group CBT program for SAD. Given that some studies have found that therapeutic alliance is a mediator of the attachment and treatment outcome relationship, while others report that attachment is a moderator of the therapeutic alliance-outcome relationship, the current study will examine competing models: whether therapeutic alliance mediates or moderates the relationship between adult attachment style and treatment outcome.

Method

Participants

One hundred and nine participants (61 male and 48 female) completed a 12 week group CBT program for SAD¹. These participants were involved in a larger ongoing randomised controlled trial and were selected for the current study if they attended treatment between March, 2012 and August, 2014. Participants were included in the larger research trial if they a) had a primary social anxiety disorder diagnosis according to DSM-IV criteria, b) were over the age of 18 years, c) were not currently experiencing active suicidal ideation, psychosis, or an unmanaged substance abuse disorder, c) were not involved in any other SAD

¹ The participants examined in this study contain a subset of the sample used in Chapter 3.

treatment, d) were not currently taking any psychotropic medication or were on a stable dose of medication for a minimum of 3 months. The mean age of participants was 33.38 years ($SD = 9.68$).

Treatment

The 12 session group CBT program was based on the Rapee & Heimberg (1997) model of social anxiety disorder and included addressing self-focused attention, cognitive restructuring, exposure to feared situations, safety behaviours, realistic appraisal, and feedback of performance and core beliefs.^[28] Each group contained a maximum of 8 clients lead by two therapists. Clients attended 12 weekly 2.5 hour sessions.

Measures

Working Alliance Inventory (WAI). The WAI is a 36 item self-report measure of therapeutic alliance.^[30,31] The WAI has 3 subscales entitled Goals, Tasks, and Bond. The Goals subscale measures the extent to which the client and therapist are in agreement on therapeutic goals (e.g., “I am worried about the outcome of these sessions”). The Tasks subscale measures the agreement on tasks undertaken as a part of treatment (e.g., “My therapists and I agree about the things I will need to do to help improve my situation”). Finally the Bond subscale measures the interpersonal bond between the client and therapist (e.g., “I feel uncomfortable with my therapists”). Clients rate items on a 7 point scale ranging from 1 (*Never*) to 7 (*Always*). The Cronbach’s alpha for the WAI total score in the current sample was .94 and indicated good internal consistency. The internal consistency for the Bond ($\alpha = .83$), Tasks ($\alpha = .86$) and Goals ($\alpha = .86$) subscales were also acceptable.

Experiences in Close Relationships-revised (ECR-R). The ECR-R is a 36 item self-report measure of adult attachment style.^[31] The scale provides a measure of insecure attachment style based on two continuous dimensions: attachment anxiety (e.g., “I’m afraid

that I will lose the love of others”) and attachment avoidance (e.g., “I prefer not to show others how I feel deep down”). Lower scores on each dimension indicate greater attachment security. Each item is rated on a 7 point rating scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). In the current sample the Cronbach’s alpha for the avoidance dimension was .91 and the anxious dimension was .92, thus indicating good internal consistency.

Social Interaction Anxiety Scale (SIAS). The SIAS is a 20 item self-report measure of social anxiety symptom severity.^[32] Participants are required to rate their fear of social interactions (e.g., “I am nervous mixing with people I don’t know well”) on a rating scale ranging from 0 (*not at all characteristic or true of me*) to 4 (*extremely characteristic or true of me*). The Cronbach’s alpha in the current sample was .88 indicating good internal consistency.

Procedure

The study procedures were approved by the institutional ethics board and participants provided informed consent. All participants in this study completed the same group CBT treatment program. Participants completed the measure of adult attachment style (ECR-R) and social anxiety symptom severity (SIAS) before any CBT treatment for SAD. During the treatment program, before commencing session 4, participants confidentially completed the measure of therapeutic alliance (WAI). Approximately one month following the completion of the treatment program participants completed the social anxiety symptom measure (SIAS) again.

Data Analysis

All analyses were completed using SPSS (version 21.0) and the AMOS (Version 21.0) extension was used to conduct the mediation analysis.

First, the mediation of the relationship between attachment style and treatment outcome by therapeutic alliance is presented. The mediation analysis followed a two-step procedure^[33] where a measurement model is initially developed followed by the structural model. The mediation model contained two latent variables, namely, attachment style (defined by the ECR-R anxious and avoidant attachment observed variables), therapeutic alliance (defined by the Tasks, Goals, and Bond subscales of the WAI measure) and two observed variables, namely, social anxiety symptom severity at pre- (covariate) and post-treatment (outcome variable).

A hierarchical linear regression was conducted to examine whether attachment style moderates the effect of therapeutic alliance on treatment outcome. The outcome variable was post-treatment social anxiety symptom severity. All interaction terms in this analysis were created using the relevant mean centred variables. Therapeutic alliance, anxious and avoidant attachment, and the interactions between these variables were entered as predictors of treatment outcome. Finally, the pre-treatment social anxiety variable was entered as a covariate to control for baseline symptom severity. The results are presented using the WAI total score only because of the high correlation among the subscales of the WAI. Furthermore, the pattern of results was the same using each of the WAI subscales.

Results

The means, standard deviations, and intercorrelations of the SIAS, ECR-R and the WAI are listed in Table 1. Pre-treatment social anxiety severity had moderate, significant correlations with the anxious and avoidant attachment dimensions, however was not correlated with therapeutic alliance. Post-treatment social anxiety severity had weak but significant correlations with anxious and avoidant attachment as well as therapeutic alliance. Neither of the attachment dimensions were correlated with therapeutic alliance (see Table 1).

Therapeutic Alliance as a Mediator between Attachment and Treatment Outcome.

The fit indices of the measurement model indicated good model fit, $\chi^2 (12, N = 109) = 16.71, p = .16$; RMSEA = .06; CFI = .99). The mediation model (see Figure 1) showed that the effect of therapeutic alliance on post-treatment social anxiety severity (treatment outcome) was significant, $\beta = -.21, p = .006$. Neither the effect of attachment on therapeutic alliance $\beta = -.065, p = .587$ nor the direct effect of attachment on treatment outcome was significant, $\beta = .11, p = .554$. The mediation model examining the indirect effect of attachment style on treatment outcome via therapeutic alliance was not significant (standardised regression estimate of the indirect effect = .01, $p = .538$). Thus therapeutic alliance was not a significant mediator between adult attachment style and treatment outcome.

<Insert Figure 1>

Attachment Style as a Moderator of the Relationship between Therapeutic Alliance and Treatment Outcome.

A hierarchical multiple regression analysis was conducted to examine if therapeutic alliance predicts treatment outcome and whether attachment style is a moderator of this relationship².

In the first step, post-treatment social anxiety severity was regressed on pre-treatment social anxiety severity. This model was statistically significant ($F (1,107) = 58.13, p < .001$); pre-treatment social anxiety severity accounted for 35.2% of the variance in treatment outcome (Table 2). After entering therapeutic alliance, anxious and avoidant attachment style predictors in step 2, the total variance in post-treatment social anxiety severity explained by

² The assumption of normality was violated for avoidant attachment ($D = .62, p = .003$), pre-treatment social anxiety severity ($D = .95, p < .001$) and therapeutic alliance ($D = .98, p = .047$) independent variables. All other variables in this analysis were normally distributed. A reflect and square root transformation was conducted, as all three variables were negatively skewed, which improved the distribution (avoidant attachment: Shapiro-Wilks $D = .99, p = .756$; pre-treatment social anxiety severity: $D = .99, p = .973$; therapeutic alliance: $D = .99, p = .441$). All other assumptions were met.

the model was 42.6% ($F(4,104) = 19.31, p < .001$). Entering these predictors accounted for another 7.4% of the variance in treatment outcome ($R^2 \text{ Change} = .07; F(3, 104) = 4.48, p = .005$) (Table 2). In the final model three of the six predictors were statistically significant predictors of treatment outcome: pre-treatment social anxiety severity positively predicted treatment outcome ($\beta = .55, p < .001, sr^2 = .23$), therapeutic alliance negatively predicted treatment outcome ($\beta = -.27, p < .001, sr^2 = .07$), and the interaction between therapeutic alliance and anxious attachment style negatively predicted treatment outcome ($\beta = -.17, p = .049, sr^2 = .02$). The final model accounted for 44.9% of the total variance in treatment outcome ($F(6,102) = 13.86, p < .001$), however this was only an additional 2.3% of the variance accounted for by the predictors entered in step 2 of the model ($R^2 \text{ Change} = .02; F(2, 102) = 2.14, p = .123$) (Table 2).

<Insert Table 2>

A simple slopes analysis using the MODPROBE procedure was conducted to examine the significant interaction between anxious attachment and therapeutic alliance.^[34] The results indicate that when anxious attachment is high (insecurely attached) there is a significant negative relationship between therapeutic alliance and treatment outcome, $b = -3.26, 95\% \text{ CI} [-5.05, -1.48], t = -3.63, p < .001$. However, when anxious attachment is low there is a non-significant relationship between therapeutic alliance and treatment outcome, $b = -0.78, 95\% \text{ CI} [-2.31, 0.75], t = -1.02, p = .312$ (see Figure 2).

<Insert Figure 2>

Discussion

The current study examined the effects of attachment style and therapeutic alliance on treatment outcome among socially anxious individuals undergoing group CBT. The evidence

does not support the hypothesis that therapeutic alliance mediates the relationship between adult attachment style and treatment outcome. Rather, the evidence supports the hypothesis that therapeutic alliance is a significant independent predictor of treatment outcome for those attending a group CBT program for SAD and that adult attachment style is a moderator of this relationship. To begin with, the results from the hierarchical linear regression indicate that therapeutic alliance was a significant predictor of treatment outcome over and above symptom severity measured at pre-treatment. Previous research indicates that therapeutic alliance does not predict treatment outcome in either the individual^[15] or group CBT formats^[13,16] for those with SAD. However, meta-analyses examining a range of mental health problems indicate that therapeutic alliance is a significant predictor of treatment outcome. There is not a large body of research examining the relationship between therapeutic alliance and CBT outcomes for those with SAD specifically. The findings from the current study support those reported by studies examining therapeutic alliance and treatment outcome for a broad range of mental health problems rather than SAD specifically.

In the current study adult attachment style was identified as a potential client characteristic that is likely to influence the relationship between therapeutic alliance and treatment outcome. Contrary to previous findings and our hypothesis, the results have shown that the indirect effect of attachment style on treatment outcome by way of therapeutic alliance was not significant.^[25] The discrepancy in these findings may be due to the type of mental health disorder examined. For instance the current study focused solely on individuals with SAD completing a group CBT program, while previously individuals presenting with problems adjusting to university and more broadly family issues, anxiety, and depression, who attended a range of different treatments have been examined.^[25] Previous studies report that the therapeutic alliance-outcome relationship can operate in different ways depending on

the population.^[12] The current results indicate that for those with SAD, therapeutic alliance does not mediate the relationship between attachment style and CBT outcome.

Despite the lack of an indirect effect, the results show that adult attachment style moderates the relationship between therapeutic alliance and treatment outcome. However, it is important to note that the increment in R^2 was not significant, and thus should be interpreted with a degree of caution. For low scorers on the anxious attachment dimension (i.e., more securely attached individuals) there was no significant relationship between therapeutic alliance and treatment outcome. However, for those who scored high on the anxious attachment dimension (i.e., less securely attached individuals), a significant negative relationship between therapeutic alliance and treatment outcome emerged. Thus, it seems that the development of a good quality therapeutic alliance is able to counteract the interpersonal difficulties that face those who are insecurely attached and the quality of the alliance is particularly relevant when treating these individuals.

The importance of the findings presented here is clear when considering the clinical implications of this research. Firstly, the finding that therapeutic alliance is a significant predictor of treatment outcome in a group CBT treatment for SAD indicates that there is opportunity and utility in enhancing an effective therapeutic alliance for clients with SAD in a group setting. Secondly, the finding that anxious attachment style and therapeutic alliance interact to influence treatment outcome indicates development of a strong therapeutic alliance will be particularly important for enhancing treatment outcomes for those displaying an insecure attachment style. If attachment style was measured prior to commencing treatment for SAD we would be able to identify those clients who are at risk of not developing a strong therapeutic relationship (specifically high scorers on the anxious attachment dimension). Given that individuals' who score high on the anxious attachment dimension fear being

rejected and are concerned about the responsiveness of attachment figures, therapeutic alliance is an ideal therapeutic tool to deal with these maladaptive internal working models and facilitate treatment outcome.

One limitation of the current study is that the findings are only applicable to a group CBT treatment for SAD. Given that previous research has found differences in the quality of therapeutic alliance between group and individual CBT^[15], the current findings require replication in a sample attending individual CBT treatment for SAD.

The current study is the first to examine how adult attachment style and therapeutic alliance influence treatment outcome for socially anxious individuals attending a group CBT program. These findings can be encouraging for therapists as they show that the development of a good quality therapeutic alliance can enhance treatment outcomes, even for those who are insecurely attached.

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Table 1

Means and standard deviations of social anxiety symptoms, attachment style and therapeutic alliance.

	1	2	3	4	5	6	7	8
SIAS								
1.Pre-treatment								
2.Post-treatment	.62***							
ECR-R								
3.Anxious attachment	.46***	.36***						
4.Avoidant attachment	.45***	.25**	.37***					
WAI								
5.Overall alliance	-.08	-.25**	.04	-.10				
6.Therapeutic bond	-.13	.23*	.05	-.14	.91***			
7.Agreement on tasks	-.05	-.23*	.04	-.07	.94***	.78***		
8.Agreement on goals	-.05	-.23*	.02	-.06	.93***	.74***	.83***	
<i>M</i>	53.49	38.77	4.24	4.71	201.23	66.58	68.13	66.52
<i>SD</i>	14.22	14.86	1.14	1.05	26.63	9.73	9.38	9.69

Note. SIAS, Social Interaction Anxiety Scale; ECR-R, Experiences in Close Relationships- revised; WAI, Working Alliance Inventory. Statistical significance: * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 2

Hierarchical Multiple Regression Model Examining Therapeutic Alliance and Attachment Style as Predictors of Treatment Outcome.

	<i>R</i>	<i>R</i> ²	<i>R</i> ² <i>Change</i>	<i>B</i>	<i>SE</i>	β	<i>t</i>	<i>sr</i> ²
Step 1	.59	.35***	.35***					
Pre-treatment SAD severity				5.84	.77	.59	7.62***	.35
Step 2	.65	.43***	.07**					
Pre-treatment SAD severity				5.29	.84	.54	6.29***	.22
Alliance				-1.82	.56	-.24	-3.27**	.06
Anxious attachment				2.00	1.10	.15	1.83	.02
Avoidant attachment				-1.87	4.25	-.04	-0.44	.001
Step 3	.67	.45***	.02					
Pre-treatment SAD severity				5.44	.84	.55	6.47***	.23
Alliance				-2.02	0.56	-.27	-3.61***	.07
Anxious attachment				1.91	1.10	.15	1.74	.02
Avoidant attachment				-1.00	4.24	-.02	-0.24	.0003
Anxious attachment × Alliance				-1.09	.55	-.17	-1.99*	.02
Avoidant attachment × Alliance				3.17	2.34	.12	1.35	.01

Note. Statistical significance: * $p < .05$; ** $p < .01$; *** $p < .001$.

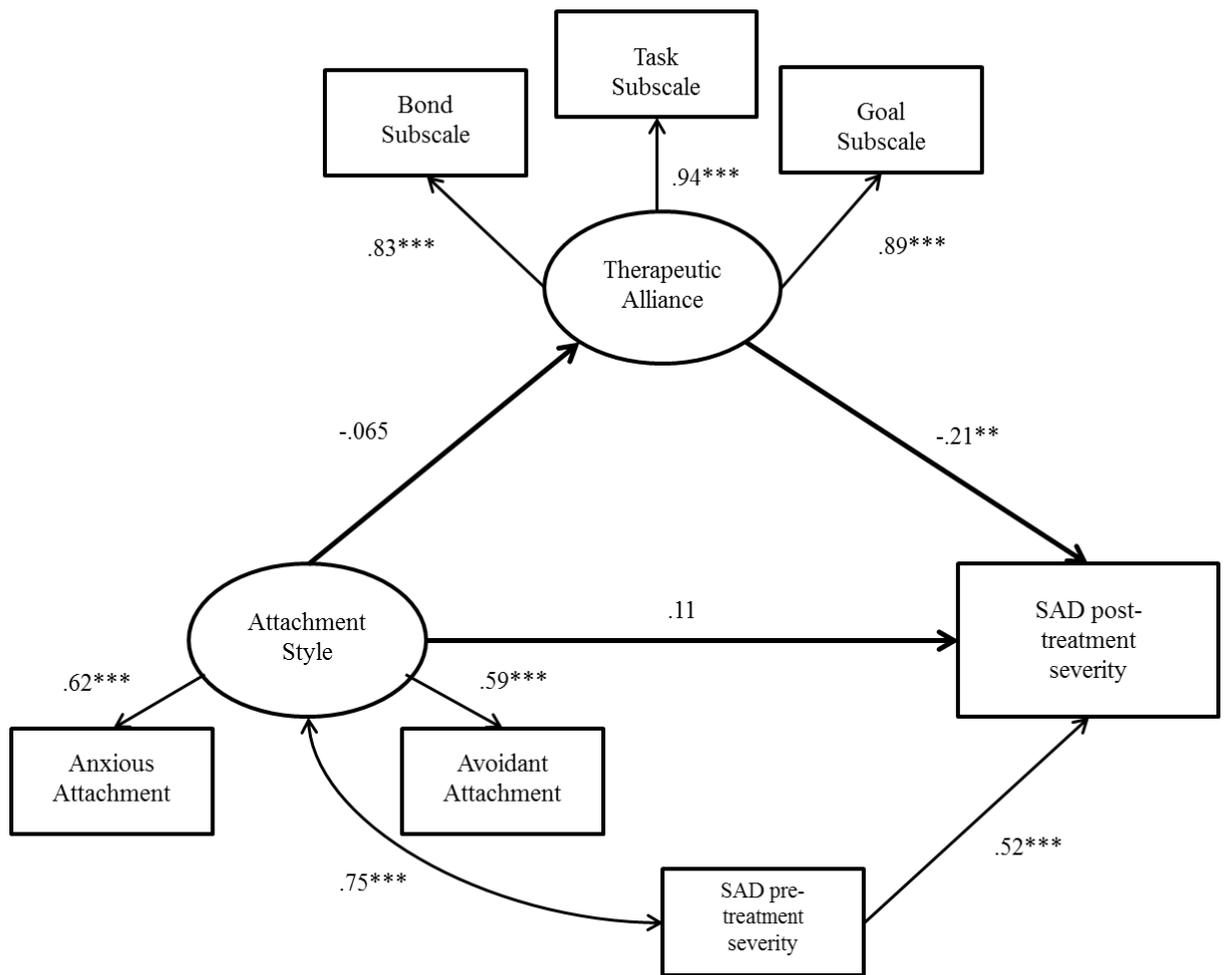


Figure 1. The mediation model examining the indirect effect of attachment style on treatment outcome via therapeutic alliance. Ovals represent latent variables and rectangles represent observed variables. The double headed arrow indicates that pre-treatment SAD severity and attachment style were allowed to be correlated in this model. Numerical values represent the standardised regression estimates for the relevant pathway. Statistical significance of the standardised regression estimates: * $p < .05$; ** $p < .01$; *** $p < .001$.

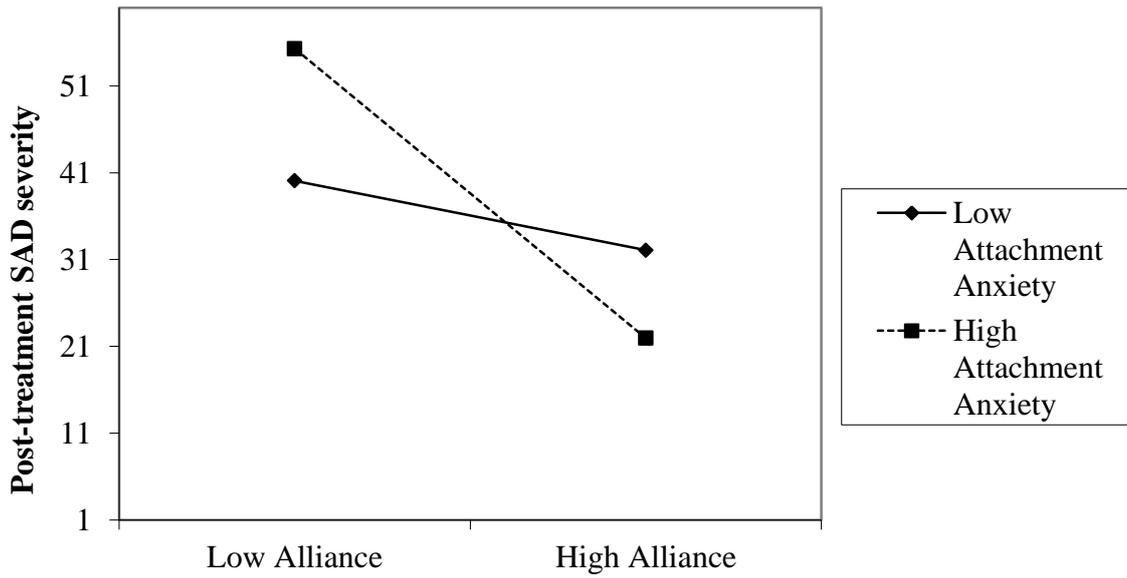


Figure 2. Interaction plot for therapeutic alliance and adult attachment style on treatment outcome (post-treatment social anxiety symptom severity). The relationship between therapeutic alliance and treatment outcome is significant when anxious attachment is high (insecurely attached) and non-significant when anxious attachment is low.

Chapter 6

General Discussion.

Overview

While cognitive behavioural therapy (CBT) is considered the most efficacious treatment for social anxiety disorder (SAD), with recent meta-analyses reporting moderate levels of effectiveness, there is still a significant proportion of individuals who may not respond to treatment or who are still substantially affected by SAD symptoms after treatment (Mayo-Wilson et al., 2014; Wersebe, Sijbrandij, & Cuijpers, 2013). These findings suggest that there is room for improvement in terms of the effectiveness of CBT in treating SAD. A potential opportunity to improve treatment outcomes for SAD rests with research that examines the influence of individual differences on factors that can maintain social anxiety disorder (SAD) and, consequently, impact treatment outcome. The current thesis sought to establish adult attachment style as an important factor that can influence treatment outcome for individuals with SAD by examining the influence of attachment style on two factors, namely attention biases and the therapeutic alliance, which previous research has shown can influence the maintenance of social anxiety symptoms and treatment outcome. In this final chapter the findings from studies one, two, and three regarding adult attachment style, attention biases, and social anxiety and the findings from study four regarding adult attachment, the therapeutic alliance, and treatment outcome will be discussed. Finally, a summary of the theoretical and clinical implications of these results, limitations of the current research, and recommendations for future research will be presented.

The influence of adult attachment style on attention biases and anxiety

The first factor we identified as important in terms of influencing SAD, as well as anxiety more generally, was attention bias. Study one aimed to establish that adult attachment style is a relevant factor to investigate within the context of the relationship between anxiety and attention biases. A secondary aim of this paper was to replicate previous findings

regarding the effects of anxiety and attachment style on attention biases. The vigilance-avoidance model of attention, which is applicable to anxiety in general and proposes that high anxious individuals will be initially vigilant towards threat and will subsequently avoid attending to threatening stimuli (Mogg & Bradley, 1998), was used as a theoretical framework for study one. A non-clinical sample of individuals who received an anxiety inducing speech task in order to increase levels of anxiety was employed to investigate the attention components of the vigilance-avoidance model: initial bias towards threat (vigilance) and the time course of attention (avoidance).

The primary aim regarding the influence of attachment style on attention biases was supported. The results showed that those with an avoidant attachment style, when exposed to the anxiety task, were more likely to avoid attending to emotional stimuli in general, both initially and over the entire stimulus presentation time, compared to individuals who were not exposed to the anxiety task. Importantly, these findings suggest that attachment style does moderate the relationship between attention biases and anxiety. The results further demonstrated that attachment style independently influences attention biases, as anxious attachment style (insecure attachment) predicted initial avoidance of threatening stimuli independent of whether participants were exposed to the anxiety task or not.

The second aim, regarding replicating previous findings observed in the anxiety literature, was not supported. The current results do not support the vigilance-avoidance pattern of attention for anxious individuals, as there were no differences in initial biases toward threat observed between individuals exposed to the anxiety induction task and those who were not. Interestingly, the results regarding the time course of attention showed that those in the anxiety induction condition were less vigilant for emotional stimuli in general across the entire stimulus presentation time compared to those in the no anxiety condition.

The first key finding from this study was that an avoidant attachment style moderates the relationship between attention biases and anxiety. The second was that exposure to the anxiety task did not predict a threat specific attention bias; rather exposure to the task was related to avoidance of emotional stimuli in general (both happy and angry faces). These findings, while preliminary, suggests that attachment style is an important individual difference variable that influences the relationship between anxiety and attention biases. However, this finding requires replication in a clinical sample of socially anxious individuals in order to better understand the influence of attachment style on attention biases in SAD.

The influence of adult attachment style on attention biases and Social Anxiety Disorder

The major CBT models of SAD have implicated attention biases as important cognitive factors, which are thought to maintain symptoms of social anxiety (Clark & Wells, 1995; Rapee & Heimberg, 1997). Despite the mixed findings that have been reported by the extant literature, attention biases have been emphasised as theoretically important as well as clinically relevant factors for individuals diagnosed with SAD. Given that Study one demonstrated that adult attachment style is a valid individual difference variable to consider within the context of attention biases and anxiety, studies two and three sought to extend these findings by investigating the nature of attention biases and the moderating effect of attachment style in a clinical sample of individuals diagnosed with SAD.

Study Two examined the time course of attention in a clinical sample of individuals diagnosed with SAD and the moderating effects of attachment style. Using the CBT models of SAD as a theoretical framework for this study, we aimed to examine whether results would support the proposal that socially anxious individuals will avoid attending to threatening information (Clark & Wells, 1995) or that these individuals would be initially vigilant towards threat, specifically negative stimuli (Rapee & Heimberg, 1997). The findings from

Study 2 indicate that individuals with SAD are more likely to avoid attending to emotional stimuli in general, thus providing support for the Clark and Wells (1995) model. Furthermore this finding partially supports previous results from Study one, which showed that individuals exposed to the anxiety task were less vigilant of emotional stimuli in general than those who were not exposed to the anxiety inducing task. It appears that the avoidance of emotional stimuli was more clearly observed in a clinical sample than in a non-clinical sample.

Regarding attachment style, the results from this study suggest that those with an anxious attachment style were more likely to attend to emotional stimuli in general across the entire stimulus presentation time, while an avoidant attachment style did not moderate the attention bias-social anxiety relationship. Thus, this finding does not support those reported in study one, which showed that individuals with an avoidant attachment style were more likely to avoid attending to emotional stimuli when exposed to an anxiety task. There are two potential reasons for the discrepancy in results reported in Study one and two. First, Study two examined a clinical population while a non-clinical sample was examined in Study one. Thus, the level of anxious attachment symptoms appears to be higher in the clinical (ECR $M = 4.31$) vs the non-clinical sample (ECR $M = 3.54$). Similarly, the clinical sample (SIAS $M = 55.29$) appeared to have more severe social anxiety symptoms than the non-clinical sample (SIAS $M = 5.985$). Perhaps the severity of attachment and social anxiety symptoms resulted in a clearer impact of attachment on anxiety in the clinical than in the non-clinical sample. Secondly, in Study one we examined the time course of attention by dividing the 1500msec stimulus presentation into three 500 msec time intervals and examined the first stimulus fixated in each of those time intervals, a procedure adapted from Gamble and Rapee (2009). Study two however, provided a more fine grained analysis of the time course of attention by examining fixations that occurred during thirty 50 msec time intervals (total stimulus presentation time was also 1500msec), a procedure adapted from more recent research

examining the time course of attention (Schofield, Inhoff, & Coles, 2013). Despite the slight difference in findings regarding the moderating effects of anxious and avoidant attachment style, the results from studies one and two have consistently shown that attachment style is a relevant individual difference variable to consider within the context of attention biases and anxiety in both a clinical and non-clinical sample.

The influence of adult attachment style on attention biases and treatment outcome

Having investigated the relationship between non-clinical anxiety, clinical social anxiety, and attention biases as well as the moderating effects of attachment style in studies one and two, study three sought to determine the clinical relevance of attention biases for a group CBT treatment for SAD. This study investigated the proposal by Rapee and Heimberg (1997) that socially anxious individuals will be initially vigilant towards threat and display a difficulty disengaging their attention from threatening stimuli.

Before discussing the findings from study three, it is necessary to review the measurement of attentional disengagement in the current study. In order to adequately measure the difficulty to disengage attention from threat, a novel task was developed for the current research based on recommendations made by Armstrong and Olatunji (2012). From a meta-analysis of eye-tracking literature regarding both depression and anxiety, Armstrong and Olatunji recommend that studies examining difficulty to disengage apply a task that requires participants to disengage their attention from a stimulus rather than the passive viewing eye-tracking task that has been used by the majority of studies examining this bias within the context of SAD. In this way, a more direct measure of attentional disengagement can provide greater insight into and more accurate measurement of this attentional component. For example, Sears, Thomas, LeHuquet, and Johnson (2010), to measure difficulty to disengage from stimuli in a depressed sample, employed a novel task which

required participants to turn their attention away from stimuli when a cue (arrow) appeared. Thus, they measured the amount of time taken for their participants to turn their attention away once the cue appeared as an indicator of difficulty to disengage. In order to incorporate the recommendations made by Armstrong and Olatunji (2012) the current study included an adaptation of the Sears et al. (2010) task that was specifically developed for this study and employed for the first time in a socially anxious population. Given the novel nature of this task, the analyses regarding difficulty to disengage examined two independent variables. The first analysis utilised a continuous measure of disengagement operationalised as the amount of time taken to disengage attention. The second analysis operationalised difficulty to disengage as a difference score, which was created by subtracting the time taken to disengage from neutral stimuli from time taken to disengage from each emotional stimulus (happy and angry faces).

Study Three sought to examine three important aims. Firstly, we aimed to demonstrate that attention biases, namely vigilance and difficulty disengaging from threat, differ between individuals with a diagnosis of SAD and a non-clinical control group and whether attachment style moderates the relationship between attention bias and SAD. Contrary to expectations, there were no differences in vigilance towards angry or happy faces or difficulty disengaging from these stimuli observed between the clinical and non-clinical control groups. Although significant differences between clinical and control groups have been reported previously (difficulty disengaging from threat: Amir, Elias, Klumpp, & Przeworski, 2003; vigilance to threat: Shechner et al., 2013b), similarly to the current study, many others have failed to report a significant difference between clinical and non-clinical control groups regarding vigilance towards threat (Chen, Clarke, Guastella, & Macleod, 2012; Schofield et al., 2013) and difficulty disengaging from threat (Niles, Mesri, Burklund, Lieberman, & Craske, 2013; Schofield, Johnson, Inhoff, & Coles, 2012). It is important to note that while differences

between anxious and non-anxious individuals regarding attention biases were not observed, it does not imply that these biases in attention do not exist and are not clinically or theoretically important in terms of maintaining SAD symptoms. An alternative explanation may be that particular biases in attention may be pre-existing and not necessarily specific to SAD, however when they occur within the context of SAD, they can then work against the individual by maintaining symptoms of social anxiety. Thus, the second and third aims of this study address these suggestions by examining attention biases within the context of treatment for SAD.

Secondly, in study three, we aimed to understand how attention biases for socially anxious individuals change with CBT treatment and whether attachment style moderates this relationship. This is an important preliminary step to consider before examining attention bias as a predictor of treatment outcome. For this analysis, attachment style did not moderate any changes in attention biases from pre- to post-treatment, therefore the following concerns the independent effects of treatment on changes in attention. Following procedures established by recent research (Calamaras, Tone, & Anderson, 2012; Waters, Mogg, & Bradley, 2012) participants within the clinical group were classified as either an avoidant or vigilant attention subtype, based on whether they were initially avoidant or vigilant of threat. In the current study, participants belonging to the non-clinical control group showed no significant changes in attention biases from Time one to Time two. However, participants in the clinical group who were classified as avoidant of threat became significantly more vigilant for emotional stimuli in general from pre- to post-treatment. Those who were classified as the vigilant attention subtype, however, did not show any changes in attention biases from pre- to post-treatment. Previous studies report similar findings that those who were initially avoidant became more vigilant for threat after treatment and those who were vigilant did not significantly change their attention bias (Calamaras et al., 2012; Waters et al., 2012). The

current finding that an increase in vigilance towards emotional stimuli (reduction of avoidance of threat), which occurred after treatment, suggests that these individuals may be processing these negative stimuli in a more adaptive way that may be a result of CBT treatment i.e., using cognitive reappraisal techniques. There were no significant changes in difficulty to disengage from threat from pre- to post-treatment. Ideally, these findings require replication in a clinical sample of individuals who have not received treatment i.e., a waitlist control sample, nevertheless, taken together these findings suggest that CBT treatment is able to alter attention biases and the attachment style of socially anxious individuals. Thus, the next step is to understand the influence of attachment style and attention biases on treatment outcome.

Finally, study 3 aimed to examine whether attention biases predict treatment outcome for individuals with SAD. The results indicate that those who were initially vigilant for threat (specifically towards the negative stimulus) at pre-treatment had poorer treatment outcomes compared to those who were not vigilant for threat. Attachment style had no effect on this relationship. Previous studies report similar findings that avoidance of threat at pre-treatment predicts better treatment outcomes (Legerstee et al., 2009, 2010), while other studies have shown that vigilance of threat at pre-treatment is related to better treatment outcomes (Price, Tone, & Anderson, 2011; Waters et al., 2012). This finding supports the Rapee and Heimberg (1997) model and suggests that vigilance for threat maintains symptoms of SAD.

The majority of research to date has exclusively examined initial biases in attention as a predictor of treatment outcome for SAD. Thus, the current study represents the first to examine difficulty to disengage from threat as a predictor of treatment outcome for adults with SAD. Regarding difficulty to disengage attention from stimuli, the results indicate that a difficulty to disengage from happy stimuli predicted poorer treatment outcomes. This finding

supports the fear of positive evaluation theory (Weeks, Heimberg, Rodebaugh, & Norton, 2008) as well as the findings reported in study one, which showed that non-clinical individuals exposed to an anxiety task showed biases in attention related to both positive and negative stimuli rather than negative stimuli specifically.

Regarding the influence of attachment style on difficulty to disengage from stimuli and treatment outcome, the results showed that attachment style did not moderate the relationship between difficulty to disengage from stimuli and treatment outcome, when representing difficulty to disengage using the previously described difference scores. However, the inclusion of the interactions between attachment style and difficulty to disengage accounted for a significant amount of variance in the final model. In order to clarify this finding, an analysis with difficulty to disengage scores operationalised as continuous variables was conducted and showed that an anxious attachment style significantly moderated the relationship between difficulty disengaging from angry and neutral stimuli and treatment outcome. This is an interesting finding, which suggests that more secure individuals (low scores on the anxious attachment dimension) have better treatment outcomes when they had greater difficulty disengaging their attention from angry stimuli, however those with an insecure attachment style (high scorers on the anxious attachment dimension) had better treatment outcomes when they displayed greater difficulty to disengage from neutral stimuli. Perhaps a secure attachment style allows individuals to process threatening stimuli in a more adaptive way, thus it is associated with better treatment outcomes. On the other hand for those with an insecure attachment style, it seems to be more adaptive for them to process neutral information, thus leading to better treatment outcomes.

Another noteworthy finding that emerged in this study was that the interaction between scores on the anxious and avoidant attachment dimensions predicted treatment

outcome independently of attention biases. When scores on the anxious attachment dimension were low there was no relationship between avoidant attachment style and treatment outcome. However, when anxious attachment scores were high (more insecure attachment), high scores on the avoidant attachment dimension had a negative impact on treatment outcome. Thus, it appears that attachment style not only moderates the relationship between difficulty to disengage from neutral and angry stimuli and treatment outcome, but independently contributes to treatment outcome as well.

The current study offers mixed support for the Rapee and Heimberg (1997) CBT model of SAD. On the one hand, the current findings support their suggestion that vigilance to threat, specifically negative stimuli, maintains symptoms of SAD. However, difficulty to disengage from positive stimuli predicted poorer treatment outcomes rather than their proposal that difficulty disengaging from negative stimuli will maintain symptoms of SAD. In particular, the finding that difficulty disengaging from a positive stimulus supports the fear of positive evaluation theory, that socially anxious individuals are fearful of evaluation in general rather than negative evaluation specifically. Furthermore, the results highlight that adult attachment style significantly moderates the relationship between difficulty disengaging from stimuli and treatment outcome.

Taken together the results from Studies One, Two, and Three suggest that adult attachment style is an important moderator of the relationship between attention biases and SAD. Regarding the relationship between SAD and attention biases exclusively, a finding worth noting from the current research program was that the only between group differences (clinical vs. non-clinical and anxiety induction vs. no anxiety induction) in attention biases were observed in relation to the avoidance of emotional stimuli in general. Specifically, individuals with SAD or those who were exposed to the anxiety task avoided attending to

emotional stimuli in general. This result provides support for the Clark and Wells (1995) CBT model of SAD, which suggests that socially anxious individuals will avoid attending to socially relevant stimuli. There were no between group differences observed in relation to vigilance towards threat or difficulty disengaging from threat, as proposed by Rapee and Heimberg (1997). However, it is also important to note that both initial vigilance towards threat and difficulty disengaging attention significantly predicted treatment outcome for socially anxious individuals; supporting Rapee and Heimberg's (1997) proposal that these attentional components maintain symptoms of SAD. Thus taken together, these results support Armstrong and Olatunji's (2012) suggestion that the proposals regarding attention biases, made by previous theoretical models, are not necessarily mutually exclusive and that, rather than solely examining between group differences in attention bias perhaps it might be beneficial to also examine attention in the context of treatment, for example, by examining changes in attention biases as a result of treatment as well as attention biases as a predictor of treatment outcome. In this way we are directly measuring how attention biases can differentially maintain symptoms of SAD.

The influence of adult attachment style on the therapeutic alliance and treatment outcome

A second important avenue by which attachment style can influence treatment outcome was identified as the therapeutic alliance. Study Four aimed to investigate the influence of attachment style on treatment outcome for socially anxious individuals by examining two competing models. The first approach taken was to investigate whether the therapeutic alliance mediates the relationship between attachment style and treatment outcome. This approach was based on findings by Byrd, Patterson, and Turchik (2010), who report that the therapeutic alliance partially mediates the relationship between attachment and treatment outcomes in a sample seeking treatment for a variety of mental health problems.

Given that this is the first study to examine this relationship, a competing model concerning attachment style as a moderator of the therapeutic alliance and treatment outcome relationship was also investigated. The results indicate that the therapeutic alliance is not a significant mediator of the attachment-treatment outcome relationship. However, attachment style was a significant moderator of the relationship between the therapeutic alliance and treatment outcome. For example, when individuals had scores indicating a secure attachment style, there was a non-significant relationship between the therapeutic alliance and treatment outcome. However, individuals had scores indicating insecure attachment (high anxious attachment scores), the high scores on therapeutic alliance predicted better treatment outcomes. These findings suggest that the development of a high quality therapeutic alliance is particularly important when treating insecurely attached individuals, in particular those with a high anxious attachment style.

Study Four also showed that the therapeutic alliance independently predicted treatment outcome over and above that of pre-treatment symptom severity. This result is consistent with the findings reported by studies examining attachment and treatment outcomes within the context of broader mental health problems (Diener & Monroe, 2011; Levy, Ellison, Scott, & Bernecker, 2011). However, when we consider the extant literature that examines the therapeutic alliance and treatment outcome within a sample of individuals with SAD, the results from Study four are inconsistent with previously reported findings (Mörtberg, 2014; Woody & Adessky, 2002). Thus, the current results support findings reported in studies which have examined a variety of mental health problems, rather than SAD specifically.

Theoretical Implications of the Current Findings

The findings from the first three studies presented in this thesis have implications for models examining attention biases and SAD, as well as psychopathology, and attachment

theory. The following section will discuss the theoretical implications of the current findings for CBT models of SAD and attachment theory, followed by the implications of the current findings for CBT treatment of SAD. Lastly, the limitations and recommendations for future research will be discussed.

Implications of the current findings for cognitive behavioural models of Social Anxiety Disorder

Theories regarding attention biases and anxiety, or SAD more specifically, have differed slightly in regard to the pattern of attention displayed by these individuals. For example, the vigilance-avoidance model of attention proposes that anxious individuals will be initially vigilant to, and subsequently avoidant of, threatening stimuli. The CBT model of SAD proposed by Rapee and Heimberg (1997) suggests that socially anxious individuals will be initially vigilant towards threat and subsequently display a difficulty disengaging from such stimuli. Despite these differences, these theories have one commonality; that these individuals will display an attentional bias in relation to negative stimuli specifically. Clark and Wells (1995), however propose that individuals with SAD will avoid attending to social cues when in an anxiety provoking situation, as a consequence of turning their attention resources inward on to internal sources of threat. Given that, study one established that individuals exposed to an anxiety task were less vigilant for emotional stimuli in general, compared to those who did not receive the anxiety inducing task, and study two found that individuals diagnosed with SAD were avoidant of emotional stimuli in general compared to a non-clinical control group, the findings of the current research provide support for the Clark and Wells (1995) CBT model of SAD. Study three showed that difficulty disengaging from happy stimuli predicted poorer treatment outcome for socially anxious individuals. This finding indicates that it is not just attention to negative stimuli that is important in maintaining symptoms of SAD, but rather attention biases related to positive stimuli are equally as

important, thus, providing support for the fear of positive evaluation theory proposed by Weeks et al. (2008), which suggests that those with SAD are fearful of evaluation in general. This research has been incorporated into an update and extension of the original Rapee and Heimberg model (1997) (Heimberg et al., 2010), which generally suggests a bias in interpretation of positive as well as negative stimuli. The current research program in combination with previous research suggests that the update specific to attention biases in SAD and positive stimuli is warranted.

Implications of the current findings for attachment theory

The attachment and psychopathology theory proposed by Ein-Dor and Doron (2015) suggests that an anxious attachment style, in combination with hypervigilance to threat, occurring within a chronically threatening environment leads to the development of anxiety disorders. This is the first attachment and psychopathology theory that directly implicates attachment style as an important factor influencing attention biases and anxiety symptoms. While the current findings cannot speak for anxiety disorders in general, these findings do have implications for SAD. Both the current research program and previous theory regarding SAD, generally support attention biases as a maintaining rather than causal factor of SAD. Thus, the current findings support the notion that an anxious attachment style influences the relationship between attention biases and the maintenance of social anxiety symptoms. Since the current research program has not explicitly examined the link between anxious attachment style, vigilance to threat, and anxiety symptoms prospectively we are unable to comment on the proposal that anxious attachment style in combination with hypervigilance to threat are causal risk factors for the development of anxiety disorders. Nevertheless, the findings from the current research program provide evidence in support of the proposal that attachment style influences the relationship between attention biases and social anxiety.

Clinical Implications of the Current Findings

Attention biases and Social Anxiety Disorder

Since the attention biases have been identified as important cognitive factors maintaining symptoms of social anxiety there has been a surge in research investigating the modification of attention biases as a treatment for SAD (e.g., Amir, Beard, Taylor, Klumpp, & Jason, 2009; Heeren, Reese, McNally, & Philippot, 2012; Kuckertz et al., 2014; Rapee et al., 2013). The findings from the current body of research have implications for using attention bias modification (ABM) as a treatment for SAD. To date these studies have used attention training techniques to train attention away from threat for socially anxious individuals (MacLeod & Mathews, 2012). There have been some randomized controlled trials which report that ABM is effective in reducing social anxiety symptoms (Amir et al., 2009; Buckner, Maner, & Schmidt, 2010; Heeren et al., 2012), however there have also been many studies which report no significant effects of ABM on symptoms of social anxiety (Bunnell, Beidel, & Mesa, 2013; Carlbring et al., 2012; Neubauer et al., 2013; Rapee et al., 2013). The findings from the current research questions the application of training attention away from threat (negative stimuli) exclusively, given that our findings suggest that attention to both positive and negative stimuli can adversely influence treatment outcome. Secondly, the current findings support that there are subtypes of attention biases inherent within a socially anxious population, i.e., where some individuals are more likely to avoid attending to negative stimuli and others are more vigilant towards negative stimuli. The final and, arguably, most important finding from this research program is that attachment style moderates the relationship between attention biases and social anxiety symptoms. Thus, training attention away from negative stimuli may not be adaptive for everyone and may have contributed to the mixed findings reported in the ABM for SAD literature.

Therapeutic alliance and Social Anxiety Disorder

Firstly, the finding that the therapeutic alliance is a significant predictor of treatment outcome highlights that, although CBT treatment protocols do not focus as intensely on the development of the therapeutic alliance as other psychotherapy disciplines, such as psychodynamic therapy, inherently a high quality therapeutic alliance is able to be developed during CBT. Secondly, the findings that an insecure attachment style was associated with greater severity of social anxiety symptoms at post-treatment and that an anxious attachment style moderates the relationship between the therapeutic alliance and treatment outcome, suggests that the development of a strong therapeutic alliance is particularly important for individuals with an insecure attachment style. Adult attachment style can be measured with relative efficiency given the availability of self-report questionnaires assessing anxious and avoidant dimensions of attachment. Thus, if clinicians were to evaluate a client's attachment style prior to commencing treatment, it may provide an indicator of those clients who are likely to experience difficulty forming a strong therapeutic alliance and have poorer treatment outcomes. Overall, the findings from the current research suggest that attachment style may be an important factor for identifying individuals prior to CBT treatment that may be at risk of not responding to treatment. Furthermore, the results provide an empirical basis for integrating principles from attachment theory into existing CBT practices. This may be particularly important for individuals who are insecurely attached.

Integrating attachment theory into psychotherapeutic interventions and techniques has mainly been implemented in treatments such as emotion-focused therapy, rather than CBT based treatment interventions. However, the theoretical proposal that attachment style can influence an individual's cognitions, behaviours, and emotions during times of distress or novel situations merges with CBT conceptualisations of anxiety disorders and SAD more specifically. There is a great degree of overlap in terms of the core deficits, interpersonal

difficulties in relationships, faced by socially anxious individuals and those with an insecure attachment style. Furthermore research evidence supports the idea that there is an overrepresentation of insecurely attached individuals, specifically anxious attachment style, within SAD populations (Eng et al., 2001). The findings from the current program of research in combination with previous studies (Eng et al., 2001) support the notion that greater attachment insecurity is associated with more severe symptoms of SAD. Addressing attachment insecurity has the potential to enhance CBT outcomes for those with SAD.

Myhr (2014) argues that attachment related schemas can influence behavioural exposure tasks conducted during routine CBT practice. She suggests that those with an avoidant attachment style are likely to avoid gathering evidence and processing of relevant information during exposure tasks. Thus, she recommends that, initially, therapists are present when clients conduct exposure tasks. In this way, therapists are able to assist clients in gathering alternative evidence that does not confirm their feared beliefs. Furthermore, it can help these clients learn that others can be helpful and trustworthy during times of distress. Alternatively, for the anxiously attached client, therapist-assisted exposure may be less beneficial. Myhr suggests that while these clients may be more likely to do the exposure task with the therapist present, it can be maladaptive as this client may become overly focused on the presence of the therapist. Because of this clients' reliance on others during times of distress, they may go as far as to attribute the success of the exposure task to the presence of the therapist. Thus, when anxiously attached individuals conduct exposure tasks independently it allows them to learn that their feared outcomes are unlikely but also that they are capable of relying upon themselves and coping during times of distress and anxiety. From these suggestions it appears that attachment style can subtly influence client behaviours during CBT. Thus, the identification of insecurely attached individuals and recognizing the

potential therapeutic challenges that arise from an insecure attachment style may improve CBT treatment outcomes.

Limitations of the Current Research and Recommendations for Future Research

The overall aim of the current thesis was to examine the influence of adult attachment style on factors that can maintain symptoms of SAD and on treatment outcome for SAD. While the results of this thesis have highlighted that attachment style does influence attention biases, the therapeutic alliance, and treatment outcome for socially anxious individuals, given the novelty of the research question, future research will need to replicate the current findings.

Study three examined pre- to post-treatment changes in attention biases, using a clinical sample of individuals diagnosed with SAD as well as a non-clinical control group. Findings from study three demonstrated that attention biases significantly changed from pre- to post-treatment for the clinical group, but not from time one to time two for the control group. Furthermore, the results from this study indicate that the severity of anxious and avoidant attachment styles significantly reduced from pre- to post-treatment for the clinical sample but did not significantly change for the control sample. However, future research would benefit from the inclusion of a clinical sample that did not attend treatment for SAD to allow for more definitive conclusions to be drawn regarding the effects of CBT treatment on changes in attention biases as well as attachment style. In this way, researchers could attribute any changes in attention or attachment directly to the treatment.

Study four examined the influence of attachment on the therapeutic alliance and treatment outcome for individuals attending a group CBT program for SAD. The clinical sample studied in the current research program attended a manualised group treatment for SAD. Thus, the implications of the findings from this study are applicable to this particular format of treatment. Future research would benefit from examining this research question in

individual treatment settings as well as examining clinical samples that may be attending treatment in a more naturalistic clinical setting.

Lastly, the current thesis investigated the effects of attachment style on one cognitive factor that has been implicated in maintaining symptoms of SAD, namely attention biases. Rapee and Heimberg (1997) have identified the biased processing of information as another cognitive factor that maintains symptoms of SAD. The investigation of the influence of attachment on information processing biases for those with SAD would be a promising line of study for future research. Furthermore, this line of research would provide further insight into the role of attachment style on factors that can maintain symptoms of SAD.

Conclusion

The current thesis represents the first examination of the influence of adult attachment style on attention biases, and treatment outcome for those with SAD. With previous research establishing that CBT is moderately effective in treating SAD, there is a need for research to investigate individual difference variables that may influence treatment outcome for socially anxious individuals. In doing so, we may be able to identify individuals who are less likely to respond to CBT treatment. The research findings from the current thesis, taken together, support the proposal that adult attachment style is an important individual difference variable that can influence both cognitive factors that can maintain symptoms of SAD (attention biases) as well as treatment outcome for socially anxious individuals.

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Appendix

Copy of final ethics approval letter

Dear Dr Peters,

Re: "The effects of adult attachment style on anxiety and attention" (Ethics Ref: 5201100821)

Thank you for your recent correspondence. Your response has addressed the issues raised by the Human Research Ethics Committee and you may now commence your research.

The following personnel are authorised to conduct this research:

Dr Lorna Peters (Chief Investigator/Supervisor)

Miss Yulisha Byrow (Co-Investigator)

NB. STUDENTS: IT IS YOUR RESPONSIBILITY TO KEEP A COPY OF THIS APPROVAL EMAIL TO SUBMIT WITH YOUR THESIS.

Please note the following standard requirements of approval:

1. The approval of this project is conditional upon your continuing compliance with the National Statement on Ethical Conduct in Human Research (2007).
2. Approval will be for a period of five (5) years subject to the provision of annual reports.

Your first progress report is due on.

If you complete the work earlier than you had planned you must submit a Final Report as soon as the work is completed. If the project has been discontinued or not commenced for any reason, you are also required to submit a Final Report for the project.

Progress reports and Final Reports are available at the following website:

http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics/forms

3. If the project has run for more than five (5) years you cannot renew approval for the project. You will need to complete and submit a Final Report and submit a new application for the project. (The five year limit on renewal of approvals allows the Committee to fully re-review research in an environment where legislation, guidelines and requirements are continually changing, for example, new child protection and privacy laws).

4. All amendments to the project must be reviewed and approved by the Committee before implementation. Please complete and submit a Request for Amendment Form available at the following website:

http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics/forms

5. Please notify the Committee immediately in the event of any adverse effects on participants or of any unforeseen events that affect the continued ethical acceptability of the project.

6. At all times you are responsible for the ethical conduct of your research in accordance with the guidelines established by the University.

This information is available at the following websites:

<http://www.mq.edu.au/policy/>

http://www.research.mq.edu.au/for/researchers/how_to_obtain_ethics_approval/human_research_ethics/policy

If you will be applying for or have applied for internal or external funding for the above project it is your responsibility to provide the Macquarie University's Research Grants Management Assistant with a copy of this email as soon as possible. Internal and External funding agencies will not be informed that you have final approval for your project and funds will not be released until the Research Grants Management Assistant has received a copy of this email.

If you need to provide a hard copy letter of Final Approval to an external organisation as evidence that you have Final Approval, please do not hesitate to contact the Ethics Secretariat at the address below.

Please retain a copy of this email as this is your official notification of final ethics approval.

Yours sincerely

Dr Karolyn White

Director of Research Ethics

Chair, Human Research Ethics Committee