Cognitive Bias Measurement and Social Anxiety Disorder: Correlating Self-Report Data and Attentional Bias.

Andreas Savva

Handledare: Per Carlbring
C-UPPSATS, PSYKOLOGI III –VETENSKAPLIG UNDERSÖKNING, HT14

STOCKHOLMS UNIVERSITET
PSYKOLOGISKA INSTITUTIONEN

COGNITIVE BIAS MEASUREMENT AND SOCIAL ANXIETY DISORDER: CORRELATING SELF-REPORT DATA AND ATTENTIONAL BIAS.

Andreas Savva

Social anxiety disorder (SAD) and cognitive bias are theoretically connected in cognitive behavioural therapeutic (CBT) models. Previous research using the visual dot probe paradigm showed SAD sometimes correlating with attentional bias and sometimes not. The purpose of this inquiry was to correlate self-report data about social phobia from participants diagnosed with SAD, with measurements of their attentional bias. Secondary data of 154 participants were used. Their results from the Liebowitz social anxiety scale (LSAS-SR) in addition to supplementary scales were correlated with results from a program that measured positive and negative attentional bias. Results showed no significant correlation for neither positive nor negative attentional bias and LSAS-SR. Positive correlations were observed for the generalised anxiety disorder (GAD7) score and the bias from images in the Neutral-Negative combination and between the patient health questionnaire (PHQ9) and the image bias in the Positive-Negative stimuli combination. The unreliability of the dot probe paradigm and home based internet delivery are discussed to explain the lack of correlations between LSAS-SR and attentional bias.

One of the terms central for the current inquiry is social phobia, also known as social anxiety disorder (SAD). Amongst its central features is the characterization of the individual as; "fearful or anxious about or avoidant of social interactions and situations that involve the possibility of being scrutinized" (DSM 5 page 171, 2013). Previous research suggests that even with a narrow definition of SAD the number of people that would match the description is substantial in the majority of societies (Furmark, 2002). Moreover the lifetime prevalence of SAD in "western societies" is claimed to be 12.1% and 16.6% worldwide (Baxter, Scott, Vos & Whiteford, 2013; Kessler et al., 2005). Kessler and colleagues (2005) claim that disorders of the anxiety class are amongst the most prevalent of classes with an occurrence rate of 28.8%. It has been demonstrated that in the United States of America alone, an investigation by the national comorbidity survey replication (NCS-R) demonstrated a 14.0% incidence frequency of both modest and grave cases of SAD. Furthermore Kessler (2005) argues that although SAD is the most prevalent of common mental disorders –with mood disorder being the second most widespread- the proportion which is rated as serious ranks lower than other disorders.

Perhaps the relatively high prevalence rate of the disorder would imply an equivalently high rate of treatment. In all actuality the assessed rate of people suffering from SAD seeking treatment is considered to be ranging from 20.0% to 40.0% (Issakidis & Andrews, 2002; Wang et al, 2005). Suffering from the symptoms has a negative impact on various aspects of the individual's social life (Rapaport, Clary, Fayyad & Endicott, 2005). What is more, the low treatment rate raises the obvious problem of its clarification. Boettcher and colleagues (2014) maintain that the question has a double explanation. Firstly, part of the clarification rests in the lack of various facilities able to

treat such symptoms. Secondly there is a probable albeit relevant difficulty for SAD suffering patients, namely; the fear of interaction with a therapist viz. face to face interaction (Boettcher et al., 2014). The explanation can be further enhanced by bearing in mind a third variable viz. that SAD is considered a rather chronic disorder in both men and women (Yonkers, Bruce, Dyck, & Keller, 2003). These issues are demonstrating some of the problems that could potentially be addressed through internet based intervention, it can be a solution for example for both the lack of facilities as well as fear of face to face interaction. Finally, Internet based tools can also be a valuable asset in both the detection and treatment of SAD (Carlbring et al., 2007).

Of equal interest however is that not all partakers in Internet based SAD self-help treatment obtain significant benefit from it. Indeed data from controlled trials suggest that a considerable part of participants partaking in SAD-related Internet based intervention fail to achieve significant results. In addition, positive results are more difficult to obtain when Internet based tools are used with some studies failing to produce significant effects when applying training procedures to subjects with SAD via Internet (Amir, Beard, Burns & Bomyea, 2009; Berger et al., 2011; Boettcher, Berger, & Renneberg, 2012b; Carlbring et al., 2012). But what theoretical basis allows for the combination of SAD and cognitive bias modification? To answer this question another central term needs introduction. Cognitive behavioural therapy (CBT) is the contextualizing basis. González-Prendes and Resko (2012) argue that CBT axiomatically accepts that the person's cognitions have a fundamental role in both maintaining and developing said person's responses to various life events. The CBT theoretical basis of Internet self-help initiatives is based on the model of Clark and Wells (1995) which in turn has a focus on avoidance, safety behaviour, negative though and self-focused attention (Boettcher et al. 2014). Evidence of positive CBT effect demonstrated reduced hypervigilance in SAD suffering patients as well as overall effectiveness towards curation of SAD symptoms (Fedoroff & Taylor, 2001; Matthews, May, Mogg & Eysenk, 1990; Taylor, 1996).

What is of particular interest however is the focus that cognitive models allow on biases. Specifically; the relationship between biases in attention -also known as attentional biases- and levels of anxiety. This has been demonstrated before with a study that had subjects train their attentional bias away from threatening stimuli (MacLeod et al., 2002). The study concluded that subjects who trained to consciously focus their attention away from threatening stimuli had a weakened emotional response to the stimuli that followed afterwards (MacLeod et al., 2002). The crucial point to be made here is that any biases in attention processes are considered to have a fundamental part to play in the maintenance of SAD (Rapee & Heimberg, 1997). To further expand on the subject; previous studies as for example Mogg and Bradley (2002) concluded that highly anxious individuals are faster to respond to stimuli that are potentially threatening because attention is automatically captured by the threat cues.

Dissimilarity between having a bias towards threat cues and bias away from threat cues has been confirmed in the past (Cisler & Koster 2010; Dalgleish et al., 2001). The distinction is made between: a. hypervigilance to threat prompts (understood as a bias of attention towards something potentially hostile) and b. avoidance to threat cues (understood as a bias of attention away from something potentially hostile). In a study

that made use of these concepts; Mogg and colleagues (2004) concluded that anxiety and fear are understood to reflect separate aversive motivational systems that in turn stand for diverse patterns of cognitive bias. A question that rises here is whether the existence of hypervigilance bias in a subject automatically means the exclusion of avoidance bias and vice versa. To answer this question, some further submersion into the relationship of attentional biases and social anxiety disorder is required.

A conclusion that Bogels and Mansell (2004) drew when they inquired into various experimental studies was that the response to social threats in paradigms is of brief vigilance and prolonged avoidance. What this conclusion entails is the essence of the hypervigilance-avoidance hypothesis. Moreover, it answers the question stated above by demonstrating that hypervigilance and avoidance biases are to be understood as sequential. Additionally the same researchers inquired of the relationship between attention processes and social anxiety, they concluded that attentional processes and change in social phobia is indeed related. Supplementary confirmation for the hypervigilance-avoidance hypothesis was provided by Pflugshaupt and colleagues (2005) who via eye movement analysis of people with spider-phobia concluded that spider-phobics are: a. faster to detect a spider, b. fixated closer to spiders in the preliminary search stage, c. later fixated away from spiders. Thus the vigilance-avoidance hypothesis states that hypervigilance is followed by avoidance to stimuli that potentially carry a threat (Mogg, Bradley, de Bono & Painter, 1997). In a social context, a subject enters the room and detects an angry gaze, this is in turn identified as potentially threatening. The appraisal persists as threatening since the subject avoids repeating the contact needed to reappraise. In general attentional bias studies use a rather similar basis for their measurement of bias, typically the simultaneous presentation of two parallel placed stimuli (either threatening or non-threatening) for a short amount of time after which they disappear and in the position of one of the stimuli there appears a probe which the user is asked to click or type (Rapee et al., 2013).

The method with the widest usage is the emotional Stroop task which has consistently provided evidence of association between social phobia and attentional bias relating to socially threatening stimuli (Bogels & Mansell, 2004). Nevertheless evidence gathered from paradigms with word based stimuli have provided positive yet rather tentative support for the hypothesis, this allowed Bogels and Mansell (2004) the deduction that paradigms with more realistic stimuli (like images of faces) tend to produce evidence of a more sustained avoidance towards social threatening stimuli. Another method that is used is the dot probe paradigm. Through the dot probe paradigm at presentation times of 500ms where participants were shown either a neutral or threatening cue after which the bias was measured, a study concluded that highly anxious individuals demonstrated an attention bias after the presentation of a neutral prime but not after a threatening prime and vice versa for low anxious individuals (Helfinstein, White, Bar-Haim & Fox, 2008).

However the above dealt with hypervigilance i.e. the propensity to seek for threats in the milieu of the individual, here it is relevant to consider studies that discuss the attentional avoidance of threatening social cues. Research that dealt with this was conducted by Vassilopoulos (1999) through the usage of the dot probe paradigm using word pairings that were presented in both 200 milliseconds as well as in 500. The study demonstrated evidence supporting attentional avoidance of socially threatening cues.

Furthermore the reduction of attentional avoidance had as an effect the change in anxiety symptoms (Legerstee et al., 2010). From this, the conclusion that biased attention processes are vulnerable to CBT techniques can be drawn. Additionally; changes in attentional avoidance are related with changes in the clinical condition of the subject (Boettcher et al., 2014).

The present study

This inquiry uses participants gathered as part of a twelve month long research project called Challenger from the University of Stockholm. These participants (that were already diagnosed with SAD) were presented with two stimuli simultaneously either two pictures of faces or two words which was followed by a probe in the place of one of the two stimuli. The response time of the participant was measured and that measurement indicates whether the individual has a bias or not. To explain; if it is the case that the participant responds faster to a probe that replaces a threatening stimuli compared to a neutral one then this would suggest a bias, specifically an attentional bias towards threatening cues. If it is then the case that the participant responds faster to the neutral probe then this suggest an avoidance bias.

The primary purpose of this study is to correlate positive and negative attentional bias with the results from the Liebowitz social anxiety scale (LSAS-SR). The secondary purpose is to correlate positive and negative attentional bias with the results from the Quality of Life Inventory scale (QOLI), the mini Social Phobia Inventory (MSPIN), the General Anxiety Disorder scale (GAD7), the Patient Health Questionnaire scale (PHQ9) and finally the Brunnsviken Brief Quality of Life Inventory (BBQ). The tertiary purpose is to control for any difference between the various combinations of stimuli (positive/negative/neutral or word/image) and the results from the scales. The first hypothesis is that the results from both avoidance and hypervigilance bias will correlate positively with the LSAS-SR results. The second hypothesis is that positive correlations will be observed for all of the questionnaires. The third hypothesis is that word stimuli and image stimuli will not correlate with the questionnaire results differently.

Method

Participants

A total of 209 participants were provided for this inquiry out of which; a. 42 (23.33%) were excluded for not participating in/completing the bias assessment, b. 6 (2.85%) were excluded for not noting their age, c. 1 (0.47%) excluded due to low certainty of the bias measurement (29.16% certainty). Thus a total of 154 participants were used for this inquiry, with an average age 34.8 years old (SD=12.72).

Participants had the following inclusion criteria applied; 1, minimum age of eighteen 2, to have fulfilled the SAD diagnostic criteria according to DSM-IV (APA, 2000) 3, no suicidal ideation 4, at the time the bias was measured the score of the participant had to have a higher than 75% correct response rate 5, free of psychological treatment for the duration of the study 6, if the participant was on prescribed medication for anxiety/depression, said prescription had to be constant for 3 months before the start of the study 7, access to the Internet and computer 8, being a Swedish resident. Participants that were receiving psychological treatment, received medication (for at

least the last three months) or were diagnosed as having a high suicide risk were excluded. High suicide risk was understood as scoring over two or three on the relevant question on the PHQ9 scale.

Table 1. *Characteristics of Participants*

		Total	Age	
	N	%	Mean	SD
Male	34	22.1	34.39	12.37
Female	119	77.9	34.89	12.88

Apparature and Material

The Liebowitz social anxiety scale (LSAS-SR) (Liebowitz, 1987; Baker, Heinrichs, Kim & Hofmann, 2002) is not only one of the most commonly used measuring tools for SAD, it has also been shown to be both a reliable and valid instrument (Heimberg et al., 1999). Here the self-rate version is used. The scale provides a list of various situations and the possibility to rate that situation in fear and avoidance. Each of these fear and avoidance measurements is graded from 0 to 3. The total score of the scale is then provided showing fear and avoidance of various social situations. LSAS-SR has shown excellent internal consistency, high convergent and high discriminant validity as well as good test-retest reliability (Fresco et al., 2001). A cut off score over 30 is used to denote the existence of SAD in a patient (Mennin et al., 2002).

The Quality of Life Inventory (QOLI) (Frisch, Cornell, Villanueva & Retzlaff, 1992) has a total of thirty two questions which cover sixteen areas of life. The individual reports his/her perception of the quality of his/her life, not on the prevalence of symptoms. It is defined by Frisch (2004) to be a domain-based measuring tool that calculates life satisfaction/quality of life. It is written in a simple language and takes approximately 5 minutes to complete. There are seventeen areas of life that the scale focuses on to measure life satisfaction which include, amongst others; overall health, economic situation, socialization/network, leisure activity, society and so on (Lindner, Andersson, Ost & Carlbring, 2013). The respondent rates their perception of their satisfaction (from 0 denoting not at all important to 4 denoting to extremely important) which is combined with an answer that regards their satisfaction with the relevant question (-3 denoting very dissatisfied to 3 denoting very satisfied). The score used is a composite of the overall satisfaction of the individual in the inspected areas of life measured by the scale. Previous studies have shown Cronbach's alpha fluctuating from 0.77 – 0.89 and reliability from test-retest: r= 0.80 – 0.91 which is considered high. Previous research has also confirmed the validity of the QOLI in the clinical context (Frisch, Cornell & Villanueva, 1992).

The Brunnsviken Brief Quality of Life Inventory (BBQ) is a twelve item self-report questionnaire which is based on QOLI (Frisch, Cornell & Villanueva, 1992). The questionnaire measures the individual's perception of both the importance as well as the experience of enjoyment. The ratings ranges from zero to four where they correspond to "don't agree at all" to "agree completely" respectively. Questions relevant to amongst other themes leisure time, creativity, life-view, learning, friendship and so on are asked. In total there are six various areas of life that are examined. The participant notes not

only his/hers satisfaction with a certain area but also just how important that area is to their life.

General Anxiety Disorder 7 Item Scale (GAD7) (Spitzer, Kroenke, Williams & Lowe, 2006) is a self-reporting seven item scale that is used to diagnose/screen general anxiety disorder. Spiltzer and colleagues (2006) have showed that GAD-7 is a valid instrument for screening of general anxiety disorder (GAD), with good internal consistency (Cronbach's alpha = 0.92). When the sum score of the questionnaire is gathered any score higher than 8 is suggesting the presence of anxiety disorder in the participant (Lowe, Decker & Muller, 2008). The GAD7 has been shown to correlate with disability measures as well as specific anxiety in a study that demonstrated the validity of the scale (Ruiz et al., 2011).

Patient Health Questionnaire (PHQ9) (Kroenke & Spitzer, 2002) which is considered a valid tool in the context of clinical application (Spiltzer, Kroenke, Williams & Lowe, 2006). It is considered to have good internal reliability (Cronbach´s alpha = 0.89) and test-retest reliability as well as good validity (Martin, Rief, Klaiberg & Braehler, 2006). It is a tool that focuses on depression related understanding of health, it uses the definition of depression from the DSM-IV. A score of under 4 is considered of minimal depression, a score of 5-9 is mild and from 10 and on the categories are moderate, moderately severe (15-19) and severe accordingly (20-27) (Kroenke, Spiltzer & Williams, 2001).

A mini version of the Social Phobia Inventory (MSPIN) (Connor et al., 2001) with three questions with answers ranging from 1 (not true at all) to 5 (very true). It is based on the 17-item self-administered Social Phobia Inventory (SPIN). Mini SPIN has been shown to be an efficient tool in diagnosing the presence of generalised social anxiety disorder (GSAD) with very high efficiency and has also been demonstrated to have good validity as a screening tool for SAD (de Lima Osório, Crippa & Loureiro, 2007). A cut-off score of 6 is used to identify GSAD (Connor et al. 2001). Further supplementary questions apropos experience with treatment, age, gender, prescribed medication and so on are used in line with previous research (Boettcher, Andersson & Carlbring 2013). The outcome measures used in the trial have been shown to have good psychometric properties when administered via the Internet (Lindner, Andersson, Öst & Carlbring, 2013; Ritterband et al., 2009). There are additionally three questions regarding social phobia asked, this happened when the participant was redirected to the website that hosts the flash based software that measures bias. The program presented to the participant first a trial version of the test which consists of 10 trials. When that was completed the actual cognitive bias measuring program consisting of 96 trials followed automatically.

Table 2. *Summarization of the questionnaire results.*

	LSAS	MSPIN	GAD7	PHQ9	QOLI	BBQ
Average Score	75.34	8.72	8.22	8.808	.46	32.18
SD	19.18	2.44	4.72	4.93	9.23	5.48
Cronbach's alpha	0.92	0.72	0.86	0.87	0.75	0.74

The flash based program presents a blank white screen (#FFFFFF) in full screen mode followed by a black fixation cross (+) that is presented for 500ms. When the cross disappears two stimuli vertically cascaded are presented. The stimuli are either a pair of words or faces. In each case one stimulus has a different emotional valence than the other, note that when faces are presented the person pictured is the same. The three possible combinations for the stimuli are; positive-neutral, positive–negative, or neutral-negative all presented equal times during a trial. After the stimuli disappear a probe appears either in the position of the upper or the lower previously displayed stimulus. The probe will be a left (<) or right arrow (>) in Arial size 16, black font colour which remains printed on the screen until the equivalent key is pressed. The process is presented in Figure 1. Issues relating to screen resolution and distance are discussed later in the text. The stimuli consisted of 62 male faces and 62 female ones expressing either; happiness as positive, neutral as neutral, or disgust as negative. There are 333 words with 111 for each of the positive, neutral and negative categories. The participator was instructed to click the relevant arrow on the keyboard as fast as possible

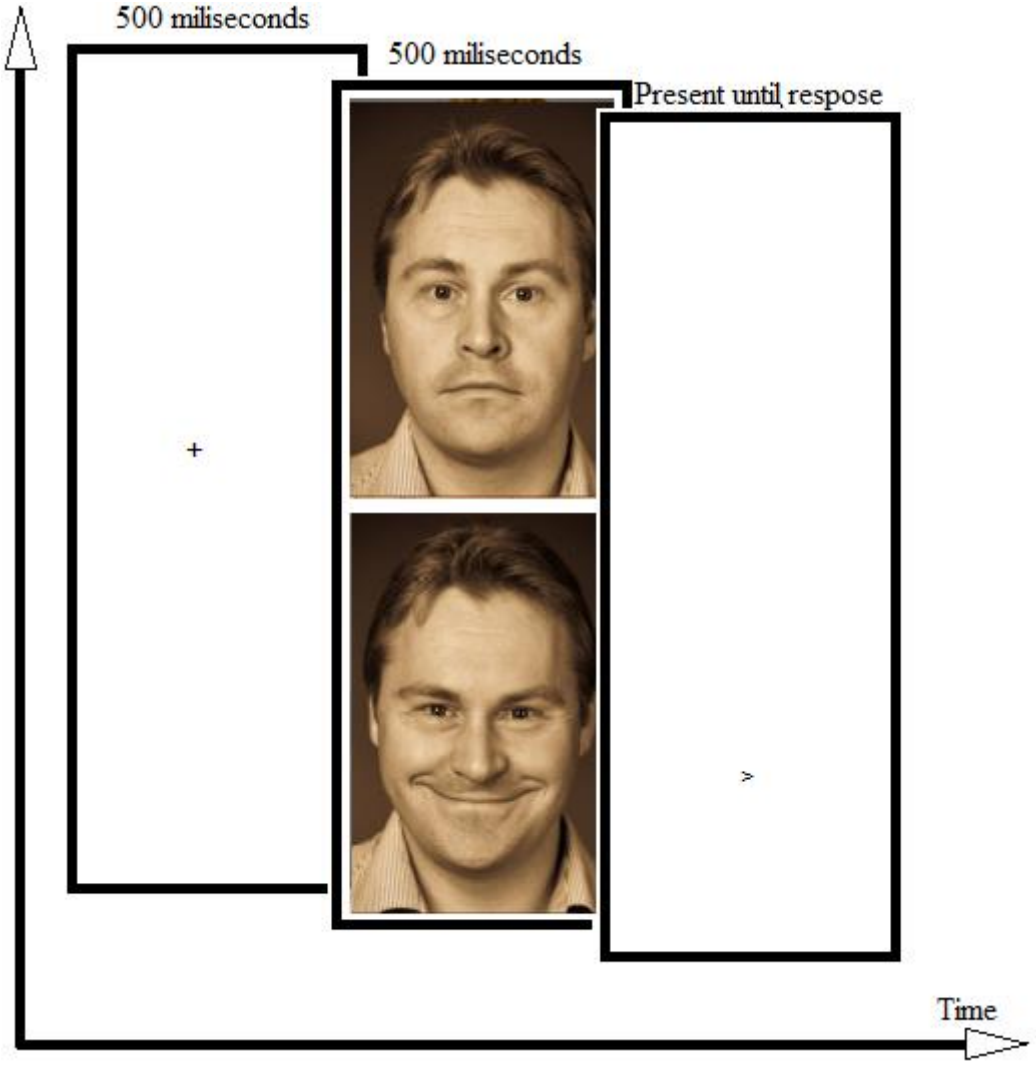

Figure 1. *Presentation of the bias measuring process example.*

while simultaneously avoiding errors (Boettcher, Andersson & Carlbring, 2013). When the click is made the next set of stimuli appear and so on until all 96 trials have been

presented once each. It should also be noted that the faces used for the trial version are dissimilar to those used in the actual measurement of bias.

Procedure

The participant received a link to the study which provided access to the surveys. When the participant completed these questionnaires he/she was presented with a link that redirected him/her to another website where the bias measuring program is hosted. The participant was informed that the program only functions on computers and that tablets/phones are to be avoided for proper software functionality. The participant answered three further questions relating to social phobia and the flash based software commenced first with a trial and then with the actual measuring procedure.

Data Processing

All analysis was done in IBM SPSS Statistics 22. For each of the various questionnaires a variable was created that summarized the total score of each participant's answers. More details can be seen in Table 2. Through the SPSS Syntax the attentional bias was calculated from reactions times of each participant. First the bias measuring software measured the reaction times towards more positive cues and towards negative cues respectively. The reaction times for the various combinations of either neutral/negative/positive words or faces as well the various combinations of trials i.e. neutral-negative, neutral-positive, negative-positive. When these reaction times are measured reaction times that were either equal or shorter than 200 milliseconds as well as reaction times equal and over 2000 milliseconds are excluded, the normal distribution of the data is demonstrated in Table 2. To measure attention bias, the difference in reaction time to neutral cues and reaction times towards negative cues (in both cases the average) is either a positive or a negative number. If it is positive then there is a bias towards threat, if negative then there is a bias away from threat. The total bias measurements were separated into two distinct variables, one having positive values and the other negative. Variables for neutral-negative, neutral-positive, and negative-positive for both words and images were created. Bivariate correlations were calculated (Pearson correlations) for all the variables and the results from the questionnaires.

Table 3. *Reaction times for words or faces in various cue combinations*

		Neutral-Negative Trials		Neutral-Positive Trials		Negative – Positive Trials	
		Negative Cues	Neutral Cues	Neutral Cues	Positive Cues	Negative Cues	Positive Cues
Words	Average Response Time (ms)	735.51	733.99	728.79	729.74	736.60	733.48
	SD	207.84	206.88	203.16	202.92	207.01	214.06
Faces	Average Response Time (ms)	734.21	733.87	729.03	726.31	732.66	731.61
	SD	205.11	202.67	197.36	195.01	200.85	203.01

Results

The average response time in the bias measurement was 736.08ms (SD = 147.66) for the combined measurement of both negative and positive attentional biases. The total measurements of positive attentional bias (N=87) had an average score of 18.78 (SD=16.25) and the negative attentional bias (N=72) average score of -17.35 (SD=15.05).

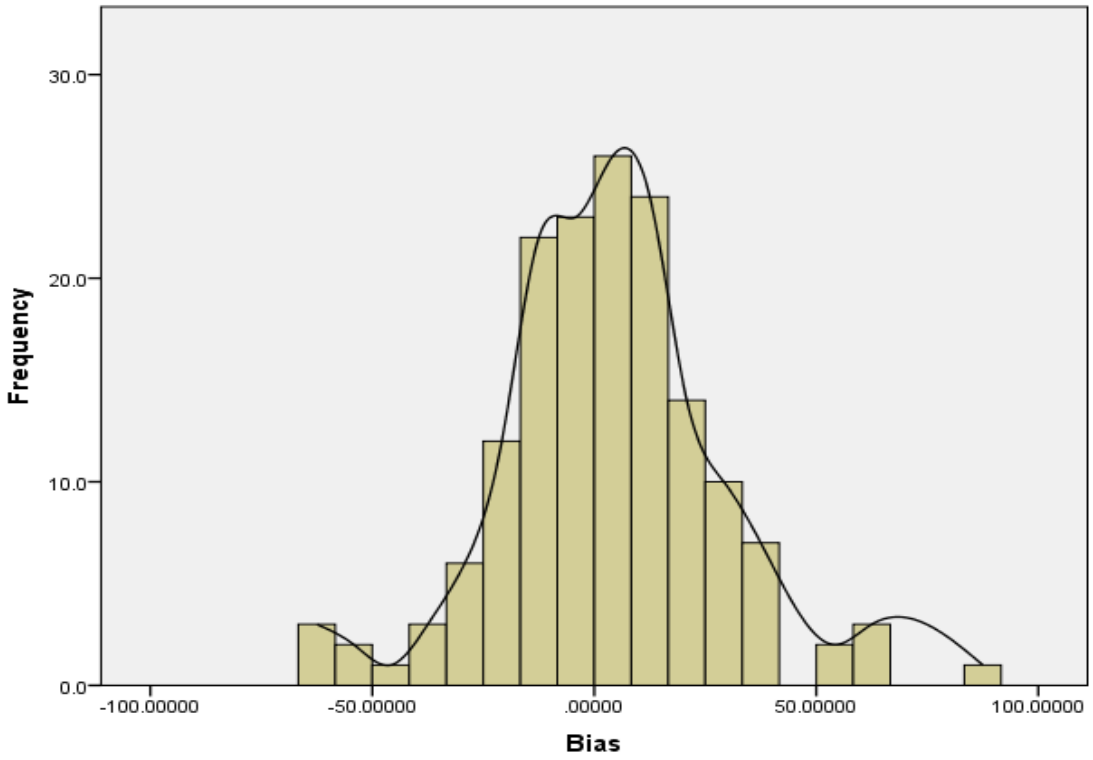

Figure 2. *Distribution of normality for bias measurements.*

The average response time towards more positive cues, both words and faces, was 732.40ms (SD=209.98) and towards more negative cues was 733.63ms (SD=206.02). Measurements of Cronbach's alpha were also performed for the all the used questionnaires. The results from the Cronbach's alpha analysis are shown in Table 2. The results from the correlation analysis for both positive and negative bias are summarized in Table 4.

Table 4. *Results from the correlation analysis of Bias and questionnaires.*

		LSAS	MSPIN	GAD7	PHQ9	QOLI	BBQ
Positive Bias	Correlation Coefficient (r)	0.089	0.072	0.012	0.003	0.046	-0.064
	Significance (p)	0.424	0.523	0.913	0.976	0.682	0.565
Negative Bias	Correlation Coefficient (r)	0.138	0.095	0.169	0.180	0.075	0.010
	Significance (p)	0.252	0.429	0.159	0.134	0.534	0.934

No significant correlation was observed neither for positive nor negative bias and any of the results on the questionnaires. Finally; with the Pearson correlation significant results for GAD7 score and the bias measured from images in the Neutral-Negative combination (r=0.18, p=0.02) as well as a positive significant correlation between PHQ9 and the image bias in the Positive-Negative combination (r=0.15, p=0.04) were obtained.

Discussion

The purpose of this inquiry was to correlate self-report data about social phobia from the Liebowitz social anxiety scale (LSAS-SR), the Quality of Life Inventory scale (QOLI), the mini Social Phobia Inventory (MSPIN, the General Anxiety Disorder scale (GAD7), the Patient Health Questionnaire scale (PHQ9) and finally the Brunnsviken Brief Quality of Life Inventory (BBQ) from participants diagnosed with SAD with measurements of their attentional bias. In detail; the primary purpose aimed at calculating a correlation between LSAS-SR and positive/negative attentional bias, the hypothesis was that a significant positive correlation would be observed. Contrary to the first hypothesis, the findings demonstrate no significant correlation between LSAS-SR results and positive/negative attentional bias. With regards to the rest of the questionnaires; no significant correlations and even a negative (insignificant) one between positive bias and BBQ (r=-0.06, p=0.56), contradiction the second hypothesis. With regards to the tertiary purpose that aimed at controlling for any difference in the questionnaire results from the various possible combinations of stimuli; no significant correlations were observed when gender, age or combined bias measures were controlled for.

The third hypothesis was also contradicted by the findings, the positive correlations that were found were between an attentional bias that is observed when either Neutral-Negative or Positive-Negative image stimuli (faces in this case) are presented. This bias correlates positively with generalized anxiety disorder (GAD7) and the overall health of a patient (PHQ9). The positive correlations that were observed have the presentation of negative stimuli as the common denominator, images in both cases. What exactly do these positive correlations mean?

There are three possible explanations for these results, either it is the case that there is no correlation, or the results are a consequence of the specific data gathered, or the tools used to measure it are not up to the task. Some previous research suggests the opposite; a study by Waters, Mogg, Bradley and Pine (2011) published results that correlate attention bias scores in highly anxious individuals with SAD. Indeed their participants demonstrated an attention bias for angry faces which correlated with SCAS-P results. In the same article the authors concluded that attention bias may be a characteristic not limited to social phobia but generalized in high levels of clinical anxiety in general. In a sense perhaps the positive correlation with the GAD7 could be explained alongside their conclusion. The limitations of the dot probe paradigm are discussed later in the text, first some considerations on the relevant sample. There were 119 women and 34 men that partook in this survey, the fact that there were so many more women could yield problems since there could theoretically be a gender specific issue that went undetected.

Rapee and colleagues (2013) correlating attentional bias and SAD via Internet based training, claimed that the incorporation of a home-based dot probe paradigm based CBM procedure into a treatment procedure for SAD failed to show benefits additional to therapy. In their paper they suggested that CBM could potentially be proven useful in the maintenance of the collected benefits of CBT if it is conducted after the completion of treatment. This finding from Rapee and colleagues (2013) could be an answer to the first explanation of the findings of this inquiry i.e. that there is a possible correlation between SAD and attentional bias.

Further support for the first explanation is found in studies that report that when participants underwent attentional modification they were found to have substantial difference with regards to social anxiety, even with reports that attentional bias itself was reduced (Amir et al., 2009). Amir and colleagues (2009) reported that participants that received attentional training disengaged more easily from social threat cues than participants that did not receive any training. The crucial point to be made here is that these positive results are collected from a study that used attentional modification but in the disengagement sense. Bar-Haim (2010) argues that partakers in attentional bias treatments are not receiving value related attentional bias training but rather they get improved control over their attention process, this could mean that the decrease in SAD could be attributed to better control of the attentional process. They also drew the conclusion that Internet-based attention trainings as a standalone intervention method for the treatment of SAD is not recommended. However the inclusion of it in CBT might be of use (Boetcher, Berger & Renneberg, 2011). Thus the lack of correlations for this inquiry can here be linked to a both the fact that studies that found positive results used disengagement and not positive/negative attentional bias.

There are studies that previously failed to produce positive effects when Internet based training for attentional bias was used. One explanation that is offered is that in a laboratory setting the expectation of a positive result is fostered in the participant which in turn might be a promoting factor in self-rated improvement change (Boetcher et al., 2011, Neubauer et al., 2012). There is evidence that explicit instruction on the training's rationale may increase outcome of attentional bias training (Hayes, Hirsch, Krebs & Matthews, 2010). This could explain the positive findings of studies that measured the change in bias in participants that underwent some form treatment. Similarly the lack of correlations between the self-report scales and the Internet based attentional bias measurement of this inquiry could be explained by the lack of a laboratory setting and explicit instruction.

It is important to note that one limitation that is common to all the Internet based studies that are refereed here, including this inquiry, is the impossibility to control for variables such as the distance of the user to the computer monitor, the resolution and size of the monitor, interruptions and so forth. Neubauer and colleagues (2012) mention that the probability to be interrupted when at home during the partaking in the various bias measuring tasks is considerably higher than when in laboratory setting. However they report no difference in completion times or error rates from comparison of laboratory participants and home ones. Another element that is of relevance; there is a possibility that participants that have performed the various tasks at home have not been as

stimulated as much as they would have in a laboratory. Specifically the arousal levels of participants are likely to be lower when at home compared to when in a laboratory setting especially for individuals suffering from SAD due to social interaction with the staff (Boettcher et al., 2011; Neubauer et al., 2012).

There is another potential element that questions the effectiveness of attention training delivered outside a laboratory setting. This has to do with the activation of negative schemata when the participant is to focus attention towards neutral cues (Neubauer et al., 2012). The measurement of bias can be influenced not only by the laboratory setting but the mood state as well (Bar-Haim et al., 2007) as well as Amir, Najmi and Morrison (2009) claim, the diminishment of bias during the actual measurement of it. Carlbring and colleagues (2012) have shown that Internet based attention training is a potentially useful tool in the SAD context, they also stress that Internet based intervention is simply an area where more research is required.

A study by Labuschagne and colleagues (2011) found that in individuals diagnosed with generalized social anxiety disorder (GSAD) there are associations between cortical hyperactivity to negative non-threatening cues (and not positive ones). As mentioned above the common denominator in the positive correlations that were observed in this inquiry is the negative cue. This is theoretically sound since the threatening stimuli receives the attention of the individual, it creates perhaps heightened attention that requires focus more than the positive cue. However socially anxious individuals are slower to process and detect cues (Rossignol et al., 2013). These findings can help explain why this inquiry produced significant correlations for the stimuli in the Neutral-Negative and Positive-Negative combination and not for the Neutral-Positive one.

Trials that used CBT face to face suggest that attentional bias that is measured before the treatment begins did not predict worst results in the CBT intervention (Price et al., 2011). However, in face to face measuring of attentional bias the assessing has not been proven to be particularly good (Dear, Sharpe, Nicholas, & Refshauge, 2011). Furthermore the fact of the matter is that the reliability of Internet based attention bias assessment renders the interpretation of the results quite problematic, one might even argue that the failure to demonstrate a correlation between attention bias and SAD or results from any other scale might be due to failure to assess attention bias. Perhaps future studies should aim at examining the reliability of the dot probe paradigm in Internet delivery to measure attentional bias as previous studies recommend (Boetcher et al., 2014).

Another possible explanation for the lack of correlations in this inquiry could be related to the dot probe paradigm. Previous studies making use of the dot probe paradigm have questioned its reliability. Price and colleagues (2014) question the dot probe paradigm and provide an array of examples of studies that failed to achieve positive results via its usage, these studies had participants from a plethora of backgrounds ranging from – amongst others- healthy users (Schmukle, 2005; Staugaard, 2009), substance users (Ataya et al., 2012) and participants with both high and low scores on SAD scales (Waechter, Nelson, Wright, Hyatt, & Oakman, 2013). For this inquiry the dot probe paradigm presented simultaneously two stimuli horizontally. There is evidence to suggest that using only bottom placement of the dot probe paradigm has been producing

better results, it has even been suggested that future studies should make use of the dot-bottom trials (Price et al., 2014). The reliability of the dot probe paradigm could also be potentially enhanced when it is used in repeated assessments, Price and colleagues (2004) define repeated as anything equal or over five trials, however no participant in this inquiry did the task over five times.

The possibility of not using the dot probe paradigm exists as well. Research could alternatively revolve around the concept of disengagement from cues instead of the attention towards or away from threatening stimuli. The results relating to research concerning anxiety vary when disengagement versus attention towards stimuli are compared (Neubaruer et al., 2012). So called threat incongruent trials replace the probe with a neutral item in the neutral-non neutral combination. Threat congruent trials are those that replace the probe with a threat-full item in a neutral/non-neutral combination. Price and colleagues (2014) explain that higher score measured on the aforementioned trials can mean either that the participant's attention was oriented easier to non-neutral stimuli or that disengagement from non-neutral items was more difficult. Another method suggest that the comparison of reaction times from incongruent trials were neutral/non-neutral combinations are presented and trials presenting neutral/neutral combinations (Koster, Crombez, Verschuere, & De Houwer, 2004). Price and colleagues (2014) argue that this alternate method might address difficulty in disengagement from non-neutral stimulus which is relevant for incongruent trials unlike neutral/neutral combinations in trials.

Perhaps the measuring of bias via the reaction time is problematic. The visual and cognitive processing of threatening stimuli and the allocation of attentional bias instead of reaction time is an alternative to measurement of reaction time. The problem with reaction time based measurements are their weakness to irrelevant factors such as the time to select a response or the delay in registration of a response due to any impression in pressing the relevant button (Price et al., 2014). It should be noted that there is no significant difference from studies that used the dot probe task and the emotional Stroop task in the moderation of bias specificity (Pergamin-Hight et al., 2015). The reasoning behind the lack of difference is attributed to different cognitive processes i.e. the dot probe relates to spatial-visual attention whereas the Stroop effect relates to threat-relevant interference (Pergamin-Hight et al., 2015).

There is data that suggest that the dot probe paradigm has low retest-reliability questioning its use for repeated assessments (Schmukle, 2005). One reasoning behind the reliability issue is attributed to the possible inability of the dot probe tasks to differentiate between facilitated attention and issues in disengagement from threat cues. The possibly observed slower response time could be attributed to the presence of threat cues which led some researches to question the effectiveness of Internet based attention training for SAD based on self-report (Mogg, Holmes, Garner, & Bradley, 2008). There are further issues such as self-reporting problems that might be of use to mention. The fact that all the data gathered by the questionnaires are self-reports is vulnerable to every criticism of their objectivity.

In future studies an alternative to reaction time measurement could be eye tracking. Measuring the movement of the gaze from stimuli and calculation a pattern could

provide information on any attentional bias. Eye tracking can be used alongside dot probe paradigms. However even when some of the issues above are solved, like repeated measurement or calculation congruent and incongruent reaction times to bottom only the dot probe paradigm still remains problematic and the reliability does not raise enough for psychometric studies (Price et al., 2014). Attentional bias is not to be understood exclusively by problems in reaction times or mechanisms of attention, Pergamin-Hight and colleagues (2015) add that there are associations between attentional bias and specific content themes that influence attention when threats are processed.

To conclude; there seems to be a correlation between the Negative cues and generalized anxiety, this is in turn explained by the idea that people suffering from anxiety are prone to notice negative or threatening cues. The dot probe paradigm might not be problem free, and even if many of the above concerns are covered there still might be work to be done in order for it to be a reliably tool. Perhaps the answer lies in its combination with another method such as eye tracking. Finally; Internet based detection of SAD and bias and work towards the hypervigilance-avoidance hypothesis through the dot probe paradigm and eye tracking technology holds great potential for both the detection and treatment of anxiety disorders.

References

American Psychiatric Association: *Diagnostic and Statistical Manual of Mental Disorders: DSM-4 - Text Revision*. (4th Ed.). (2000). Washington, DC, USA: American Psychiatric Association.

American Psychiatric Association: *Diagnostic and Statistical Manual of Mental Disorders: DSM-5*. (5th Ed.). (2013). Washington, D.C, USA: American Psychiatric Association.

Amir, N., Beard, C., Burns, M. and Bomyea, J. (2009). Attention modification program in individuals with generalized anxiety disorder. *Journal of Abnormal Psychology*, 118(1), pp.28-33.

Amir, N., Beard, C., Taylor, C., Klumpp, H., Elias, J., Burns, M., & Chen, X. (2009). Attention training in individuals with generalized social phobia: A randomized controlled trial. *Journal of Consulting and Clinical Psychology*, 961-973.

Amir, N., Najmi, S., & Morrison, A. (2009). Attenuation of attention bias in obsessive-compulsive disorder. *Behaviour Research and Therapy*, 47(2), 153-157.

Ataya, A., Adams, S., Mullings, E., Cooper, R., Attwood, A., & Munafò, M. (2012). Internal reliability of measures of substance-related cognitive bias. *Drug and Alcohol Dependence*, 148-151.

Baker, S., Heinrichs, N., Kim, H., & Hofmann, S. (2002). The Liebowitz social anxiety scale as a self-report instrument: a preliminary psychometric analysis. *Behaviour Research and Therapy*, *40*(6), 701-715. doi:10.1016/s0005-7967(01)00060-2

Bar-Haim, Y. (2010). Research Review: attention bias modification (ABM): a novel treatment for anxiety disorders. *Journal of Child Psychology and Psychiatry*, 51, 859–870. Doi: 10.1111/j.1469-7610.2010.02251.x

Baxter, A., Scott, K., Vos, T., & Whiteford, H. (2013). Global prevalence of anxiety disorders: A systematic review and meta-regression. *Psychological Medicine*, 897-910.

Berger, T., Caspar, F., Richardson, R., Kneubühler, B., Sutter, D., & Andersson, G. (2011). Internet-based Treatment of Social Phobia: A Randomized Controlled Trial Comparing Unguided with Two Types of Guided Self-help. *Behaviour Research and Therapy*, 158-169.

Boettcher J, Andersson G., & Carlbring P (2013). Combining attention training with cognitive-behaviour therapy in Internet-based self-help for social anxiety: study protocol for a randomized controlled trial. *Trials* 2013, 14, 68.

Boettcher, J., Berger, T., & Renneberg, B. (2011). Internet-Based Attention Training for Social Anxiety: A Randomized Controlled Trial. *Cognitive Therapy and Research*, 522-536.

Boettcher, J., Renneberg, B., & Berger, T. (2013). Patient Expectations in Internet-Based Self-Help for Social Anxiety. *Cognitive Behaviour Therapy*, 203-214.

Boettcher, J., Hasselrot, J., Sund, E., Andersson, G., & Carlbring, P. (2014). Combining Attention Training with Internet-Based Cognitive-Behavioural Self-Help for Social Anxiety: A Randomised Controlled Trial. *Cognitive Behaviour Therapy*, 34-48.

Bogels, S., & Mansell, W. (2004). Attention Processes in the Maintenance and Treatment of Social Phobia: Hypervigilance, Avoidance and Self-focused Attention. *Clinical Psychology Review*, 827-856.

Carlbring, P., Apelstrand, M., Sehlin, H., Amir, N., Rousseau, A., Hofmann, S., & Andersson, G. (2012). Internet-delivered attention bias modification training in individuals with social anxiety disorder - a double blind randomized controlled trial. *BMC Psychiatry*, 6-66.

Carlbring, P., Gunnarsdottir, M., Hedensjo, L., Andersson, G., Ekselius, L., & Furmark, T. (2007). Treatment of Social Phobia: Randomised Trial Of Internet-delivered Cognitive-behavioural Therapy with Telephone Support. *The British Journal of Psychiatry*, 123-128.

Cisler, J., & Koster, E. (2010). Mechanisms of attentional biases towards threat in anxiety disorders: An integrative review. *Clinical Psychology Review*, 203-216.

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

Connor, K., Kobak, K., Churchill, L., Katzelnick, D., & Davidson, J. (2001). Mini-SPIN: A Brief Screening Assessment for Generalized Social Anxiety Disorder. *Depression and Anxiety*, 14, 137-140.

Dalgleish, T., Moradi, A., Taghavi, M., Neshat-Doost, H., & Yule, W. (2001). An Experimental Investigation of Hypervigilance for Threat in Children and Adolescents with Post-traumatic Stress Disorder. *Psychological Medicine*, 31, 541-547.

de Lima Osório, F., Crippa, J., & Loureiro, S. (2007). A study of the discriminative validity of a screening tool (MINI-SPIN) for social anxiety disorder applied to Brazilian university students. *European Psychiatry*, *22*(4), 239-243. doi:10.1016/j.eurpsy.2007.01.003

Dear B.F., Sharpe L., Nicholas M.K., & Refshauge K. (2011). The psychometric properties of the dot-probe paradigm when used in pain-related attentional bias research. *The Journal of Pain*, 12, 1247–1254.

Fedoroff, I., & Taylor, S. (2001). Psychological and Pharmacological Treatments of Social Phobia: A Meta-Analysis. *Journal of Clinical Psychopharmacology,* 311-324.

Fresco, D. M., Coles, M. E., Heimberg, R. G., Leibowitz, M. R., Hami, S., Stein, M. B., & Goetz, D. (2001). The Liebowitz Social Anxiety Scale: A comparison of the psychometric properties of self-report and clinician-administered formats. *Psychological Medicine, 31*(6), 1025-1035. Doi: 10.1017/S0033291701004056

Frisch, M. B. (1994). *Quality of life inventory manual and treatment guide*. Minneapolis, MN: NCS Pearson and Pearson Assessments.

Frisch, M. B., Cornell, J., & Villanueva, M. (1992). Clinical validation of the Quality of Life Inventory: A measure of life satisfaction for use in treatment planning and outcome assessment. *Psychological Assessment*, *4*(1), 92-101.

Frisch, M., Cornell, J., Villanueva, M., & Retzlaff, P. (1992). Clinical validation of the Quality of Life Inventory. A measure of life satisfaction for use in treatment planning and outcome assessment. *Psychological Assessment*, *4*(1), 92-101. doi:10.1037//1040-3590.4.1.92

Furmark, T. (2002). Social phobia: overview of community surveys. *Acta Psychiatrica Scandinavica*, 105 (2), 84–93. Doi: 10.1034/j.1600-0447.2002.1r103.x

González-Prendes, A., & Resko, S. (2012). Cognitive-behavioural theory. In S. Ringel, & J. Brandell (Eds.), *Trauma: Contemporary directions in theory, practice, and research*. 14-41. Thousand Oaks, CA: SAGE Publications, Inc. doi: http://dx.doi.org/10.4135/9781452230597.n2

Hallion L.S., & Ruscio A.M. (2011). A metaanalysis of the effect of cognitive bias modification on anxiety and depression. *Psychological Bulletin*, 137, 940–958.

Hayes, S., Hirsch, C., Krebs, G., & Mathews, A. (2010). The effects of modifying interpretation bias on worry in generalized anxiety disorder. *Behaviour Research and Therapy,* 171-178.

Helfinstein, S., White, L., Bar-Haim, Y., & Fox, N. (2008). Affective primes suppress attention bias to threat in socially anxious individuals. *Behaviour Research and Therapy*, 799-810.

Issakidis C., & Andrews G. (2002). Service utilisation for anxiety in an Australian community sample. *Social Psychiatry and Psychiatric Epidemiology*, 37(4), 153–163.

Joels, M., Pu, Z., Wiegert, O., Oitzl, M., & Krugers, H. (2006). Learning Under Stress: How Does It Work? *Trends in Cognitive Sciences,* 152-158.

Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR., & Walters EE. (2005). Lifetime Prevalence and Age-of-Onset Distributions of DSM-IV Disorders in the National Comorbidity Survey Replication. *Archive of General Psychiatry,* 62(6), 593-602. doi:10.1001/archpsyc.62.6.593.

Kessler, R. (2005). Prevalence, Severity, and Comorbidity of 12-Month DSM-IV Disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry,* 617-627.

Koster, E., Crombez, G., Verschuere, B., & De Houwer, J. (2004). Selective Attention to Threat in the Dot Probe Paradigm: Differentiating Vigilance and Difficulty to Disengage. *Behavior Research and Therapy*, 1183-1192.

Kroenke, K., & Spitzer, R. (2002). The PHQ-9: A New Depression Diagnostic and Severity Measure. *Psychiatric Annals*, *32*(9), 509-515. doi:10.3928/0048-5713-20020901-06

Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2001). The PHQ-9: Validity of a Brief Depression Severity Measure. *Journal of General Internal Medicine*, 16(9), 606–613. doi:10.1046/j.1525-1497.2001.016009606.x

Labuschagne, I., Phan, K., Wood, A., Angstadt, M., Chua, P., Heinrichs, M., Stout J. C., & Nathan, P. (2011). Medial frontal hyperactivity to sad faces in generalized social anxiety disorder and modulation by oxytocin. *The International Journal of Neuropsychopharmacology*, 883-896.

Legerstee, J., Tulen, J., Dierckx, B., Treffers, P., Verhulst, F., & Utens, E. (2010). CBT for childhood anxiety disorders: Differential changes in selective attention between treatment responders and non-responders. *Journal of Child Psychology and Psychiatry*, 162-172.

Liebowitz, Michael R (1987). Social phobia. *Modern Problems of Pharmacopsychiatry*, 22, 141-173.

Lindner, P., Andersson, G., Öst, L.-G., & Carlbring, P. (2013). Validation of the Internet-administered Quality of Life Inventory (QOLI) in different psychiatric conditions. Cognitive Behaviour Therapy, 42, 315-327. doi: 10.1080/16506073.2013.806584

Lowe B., Decker O., Muller S., Brahler E., Schellberg D., Herzog W., & Herzberg PY. (2008). Validation and standardization of the Generalized Anxiety Disorder Screener (GAD-7) in the general population. *Medical care*, 46 (3), 266-274. PMID: 18388841

Macleod, C., Rutherford, E., Campbell, L., Ebsworthy, G., & Holker, L. (2002). Selective attention and emotional vulnerability: Assessing the causal basis of their association through the experimental manipulation of attentional bias. *Journal of Abnormal Psychology*, 107-123.

Martin, A., Rief, W., Klaiberg, A., & Braehler, E. (2006). Validity of the Brief Patient Health Questionnaire Mood Scale (PHQ-9) in the general population. *General Hospital Psychiatry*, *28*(1), 71-77. doi:10.1016/j.genhosppsych.2005.07.003

Mathews, A., May, J., Mogg, K., & Eysenck, M. (1990). Attentional Bias in Anxiety: Selective Search or Defective Filtering? *Journal of Abnormal Psychology*, 166-173.
Mattick, R., & Clarke, J. (1998). Development and validation of measures of social phobia scrutiny fear and social interaction anxiety. *Behaviour Research and Therapy*, *36*(4), 455-470. doi:10.1016/s0005-7967(97)10031-6

Mennin, D. S., Fresco, D. M., Heimberg, R. G., Schneier, F. R., Davies, S. O., & Liebowitz, M.R. (2002). Screening for social anxiety disorder in the clinical setting: using the Liebowitz Social Anxiety Scale. *Journal of anxiety disorders*, 16 (6), 661-673.

Mogg, K., & Bradley, B. (2002). Selective orienting of attention to masked threat faces in social anxiety. *Behaviour Research and Therapy*, 1403-1414.

Mogg, K., Bradley, B., De Bono, J., & Painter, M. (1997). Time Course of Attentional Bias for Threat Information in Non-clinical Anxiety. *Behaviour Research and Therapy*, 297-303.

Mogg, K., Bradley, B., Miles, F., & Dixon, R. (2004). BRIEF REPORT Time course of attentional bias for threat scenes: Testing the vigilance-avoidance hypothesis. *Cognition & Emotion*, 689-700.

Mogg, K., Garner, M., & Bradley, B. (2006). Anxiety and orienting of gaze to angry and fearful faces. *Biological Psychology*, 163-169.

Mogg, K., Holmes, A., Garner, M., & Bradley, B. (2008). Effects of threat cues on attentional shifting, disengagement and response slowing in anxious individuals. *Behaviour Research and Therapy*, *46*(5), 656-667. doi:10.1016/j.brat.2008.02.011

Neubauer, K., von Auer, M., Murray, E., Petermann, F., Helbig-Lang, S., & Gerlach, A. (2012). Internet-delivered attention modification training as a treatment for social phobia: A randomized controlled trial. Behaviour Research And Therapy, 51(2), 87-97. doi:10.1016/j.brat.2012.10.006

Pergamin-Hight, L., Naim, R., Bakermans-Kranenburg, M., van IJzendoorn, M., & Bar-Haim, Y. (2015). Content specificity of attention bias to threat in anxiety disorders: A meta-analysis. *Clinical Psychology Review*, *35*, 10-18. doi:10.1016/j.cpr.2014.10.005

Pflugshaupt, T., Mosimann, U., Wartburg, R., Schmitt, W., Nyffeler, T., & Müri, R. (2005). Hypervigilance–avoidance pattern in spider phobia. *Journal of Anxiety Disorders*, *19*(1), 105-116. doi:10.1016/j.janxdis.2003.12.002

Price, M., Tone, E., & Anderson, P. (2011). Vigilant and avoidant attention biases as predictors of response to cognitive behavioural therapy for social phobia. *Depression and Anxiety*, *28*(4), 349-353. doi:10.1002/da.20791

Price, R., Kuckertz, J., Siegle, G., Ladouceur, C., Silk, J., & Ryan, N. et al. (2014). Empirical Recommendations for Improving the Stability of the Dot-Probe Task in Clinical Research. *Psychological Assessment*. doi:10.1037/pas0000036

Rapaport, M., Clary, C., Fayyad, R., & Endicott, J. (2005). Quality-of-Life Impairment in Depressive and Anxiety Disorders. *AJP*, *162*(6), 1171-1178. doi:10.1176/appi.ajp.162.6.1171

Rapee, R., & Heimberg, R. (1997). A cognitive-behavioural model of anxiety in social phobia. *Behaviour Research and Therapy*, *35*(8), 741-756. doi:10.1016/s0005-7967(97)00022-3

Rapee, R., MacLeod, C., Carpenter, L., Gaston, J., Frei, J., Peters, L., & Baillie, A. (2013). Integrating cognitive bias modification into a standard cognitive behavioural treatment package for social phobia: A randomized controlled trial. *Behaviour Research and Therapy*, *51*(4-5), 207-215. doi:10.1016/j.brat.2013.01.005

Ritterband, L., Thorndike, F., Gonder-Frederick, L., Magee, J., Bailey, E., Saylor, D., & Morin, C. (2009). Efficacy of an Internet-Based Behavioral Intervention for Adults with Insomnia. *Arch Gen Psychiatry*, *66*(7), 692. doi:10.1001/archgenpsychiatry.2009.66

Rossignol, M., Fisch, S., Maurage, P., Joassin, F., & Philippot, P. (2013). Reduced Processing of Facial and Postural Cues in Social Anxiety: Insights from Electrophysiology. *Plos ONE*, 8(9), e75234. doi:10.1371/journal.pone.0075234

Ruiz, M., Zamorano, E., García-Campayo, J., Pardo, A., Freire, O., & Rejas, J. (2011). Validity of the GAD-7 scale as an outcome measure of disability in patients with generalized anxiety disorders in primary care. *Journal Of Affective Disorders*, *128*(3), 277-286. doi:10.1016/j.jad.2010.07.010

Rytwinski, N., Fresco, D., Heimberg, R., Coles, M., Liebowitz, M., & Cissell, S. et al. (2009). Screening for social anxiety disorder with the self-report version of the Liebowitz Social Anxiety Scale. *Depression and Anxiety*, *26*(1), 34-38. doi:10.1002/da.20503

Schmukle, S. (2005). Unreliability of the dot probe task. *European Journal of Personality*, *19*(7), 595-605. doi:10.1002/per.554

Staugaard, S. R. (2009). Reliability of two versions of the dot-probe task using photographic faces. *Psychology Science Quarterly*, 51(3), 339-350.

Spitzer, R., Kroenke, K., Williams, J., & Löwe, B. (2006). A Brief Measure for Assessing Generalized Anxiety Disorder: The GAD-7. *Archives of Internal Medicine*, 166(10), 1092. doi:10.1001/archinte.166.10.1092

Taylor, S. (1996). Meta-analysis of cognitive-behavioural treatments for social phobia. *Journal Of Behaviour Therapy And Experimental Psychiatry*, 27(1), 1-9. doi:10.1016/0005-7916(95)00058-5

Vassilopoulos, S. (1999). Social Anxiety and the Vigilance-Avoidance Pattern of Attentional Processing. *Behavioural and Cognitive Psychotherapy*, *33*(1), 13-24. doi:10.1017/s1352465804001730

Waechter, S., Nelson, A., Wright, C., Hyatt, A., & Oakman, J. (2013). Measuring Attentional Bias to Threat: Reliability of Dot Probe and Eye Movement Indices. *Cognitive Therapy and Research*, *38*(3), 313-333. doi:10.1007/s10608-013-9588-2

Wang, P., Berglund, P., Olfson, M., Pincus, H., Wells, K., & Kessler, R. (2005). Failure and Delay in Initial Treatment Contact after First Onset of Mental Disorders in the National Comorbidity Survey Replication. *Arch Gen Psychiatry*, *62*(6), 603. doi:10.1001/archpsyc.62.6.603

Waters, A., Mogg, K., Bradley, B., & Pine, D. (2011). Attention Bias for Angry Faces in Children with Social Phobia. *Journal of Experimental Psychopathology*, *2*(4), 475-489. doi:10.5127/jep.018111

Yonkers, K., Bruce, S., Dyck, I., & Keller, M. (2003). Chronicity, Relapse, and Illness; Course of panic disorder, social phobia, and generalized anxiety disorder: Findings in men and women from 8 years of follow-up. *Depression and Anxiety*, *17*(3), 173-179. doi:10.1002/da.10106