The Effects of Negative Self-Image on the Late Positive Potential in Individuals with High

Social Anxiety

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Abstract

Social Anxiety Disorder (SAD) is characterized by excessive fear of social situations that can result in avoidance in these situations. Additionally, individuals with SAD will show information processing biases when interpreting social information. One way to study these information processing biases is with event related potentials (ERP). Studies have shown that individuals with SAD will show early attentional vigilance to facial cues by increasing attentional resources when viewing angry faces. Additionally, some studies have shown that attentional biases extend to later processing, as well. Individuals with SAD will show increased processing of all faces, regardless of emotional state. This study uses the Late Positive Potential (LPP) to evaluate potential attentional biases held by individuals with SAD when creating neutral and negative self-images. Sixty-eight participants were recruited and separated into high and low social anxiety groups. Participants were instructed that they would be given a speech. Then participants were randomized to conditions that either attempted to increase anticipation anxiety or not. Following this, participants listened to audio recordings that were either neutral (e.g. sitting in a classroom) or threatening (e.g. being embarrassed publicly) and were asked to imagine themselves in the described scenario. Contrary to previous research, we found that the LPP was elicited for both the neutral and threatening scenarios. Additionally, we found no group differences between the low socially anxious group and the high socially anxious group. Finally, anticipation of a speech had no influence on the elicitation of the LPP. These results suggest that the effects of negative self-imagery may have similar effects on individuals with high and low social anxiety. Additionally, they also suggest that the audio recordings used in this study may not have been effective, as suggested by the similar LPP between neutral and threatening scenarios.

Introduction

Social Anxiety Disorder (SAD) is characterized by excessive fear and avoidance of social situations that impairs daily life. These individuals have a strong fear of negative evaluation and anxiety surrounding social situations and performances (APA, 2013). Additionally, these individuals display attentional biases, such as difficulties interpreting and retaining information, as well as maintaining a negative self-image. Heimberg, Brozovich, and Rapee (2010) and Clark and Wells (1995) both developed models of Social Anxiety that describe these attentional biases and the mechanisms in which the disorder is maintained.

Heimberg et al. (2010) developed a model of SAD that captures both the cognitive and behavioral components of the disorder. This cognitive behavioral model incorporates imagery, cognitive processes, post-event processing, and behavioral components of SAD. Individuals with SAD will experience anxiety in the presence of a perceived audience, and they will begin to assume that those in the audience will think negatively of them. The perceived audience does not have to be a true audience, like when giving a speech, the audience can include strangers on the street. If those with SAD perceive they are being evaluated, they will experience negative symptoms. Individuals with SAD often search for cues that may provide information on how they might be perceived by this audience. They will try to imagine how they might look to other people and they will monitor their physiology to assess how well the social interaction is going. Thus, complex tasks that involve a social component are likely to be harder for those with SAD because this performance monitoring is taking up attentional resources.

According to the model, the tendency for individuals with SAD to judge others as overly critical and judge their own performance as poor can cause them to estimate the probability of negative evaluation and consequences as high. As a result, individuals with SAD may experience

behavioral, cognitive, and physical symptoms of anxiety during a social situation. The behavioral

symptoms include avoidance or escape of the situation, either by physically fleeing or

disassociating from the situation by avoiding eye contact or standing outside the crowd.

Cognitively, they will experience internal negative dialogue due to their flawed evaluation of

their performance, as well as reduced attentional control. Finally, when those with SAD

experience anxiety, they will show physical signs such as blushing, muscle twitching, and

sweating. These symptoms will contribute to their mental representation because they believe

these symptoms to be extremely visible and will warrant a negative evaluation. Thus, an

important aspect of the cognitive behavioral model is how the social cues and mental

representation exist in a positive feedback loop. As those with SAD look for cues in their

performance, they are often confronted with cues that are indirect and ambiguous and they are

likely to interpret these cues as negative. Therefore, they will believe they are doing a poor job,

and this contributes to their poor mental image of themselves. Finally, this negative

representation will further reinforce the detection of negative evaluations, as well as their

anxiety. The final aspect of the cognitive behavioral model is the act of post-event processing, or

the tendency for individuals with SAD to ruminate on past encounters. More specifically, when

remembering past social events, they will remember neutral events as negative and negative

events as extremely negative, thus playing into their self-image and maintaining their social

anxiety (Heimberg, Brozovich, & Rapee, 2010). Clark and Wells (1995) cognitive model of

Social Anxiety describes this rumination in more detail. Additionally, they also describe how

anticipatory anxiety might contribute to the maintenance of the disorder. When those with SAD

are anticipating a future social event, they will focus on past failures and imagine future negative

situations that may happen. Thus, when those with SAD finally enter the social event, they will

have higher anxiety and direct their attention inward to evaluate their performance. Additionally, they will engage in negative self-imagery and predict poorer future performance. These social anxiety models suggest that the negative self-imagery experienced by those with SAD during anticipation and during the social event is a key factor in the maintenance of the disorder.

Social Anxiety Disorder is characterized by potential cognitive biases, therefore a great way to evaluate the timing of these biases is through electroencephalogram (EEG) and event-related potentials (ERP). Due to their ability to measure information processing biases at specific time points, ERPs are a useful tool in the study of anxiety disorders (Amodio, Bartholow, & Ito, 2013; Cohen, 2011; Ibanez et al., 2012; Luck, 2012). Early ERP's, like the P1 and P2, measure early unconscious processing of stimuli. Many early ERP studies have shown that SAD displays early information processing biases early in attention. Such that those with SAD will display biases to all faces regardless of expression (Mühlberger et al., 2009; Rossignol, Campanella, Bissot, & Philippot, 2013; Rossignol, Campanella, et al., 2012; Rossignol, Philippot, Bissot, Rigoulot, & Campanella, 2012). Additionally, Mueller and colleagues (2009) found that individuals with high social anxiety will display hypervigilance to negative faces followed by avoidance of these faces. Furthermore, those with SAD will show increased attention to deviant and angry faces when compared to healthy controls (Hagemann, Straube, & Schulz, 2016; Rossignol, Campanella, et al., 2012). However, in these studies, faces were the primary target of attention. When faces are not the primary target of evaluation, those with SAD will show decreased attention to facial cues, suggesting that those with SAD will shift their attention away from social information (Rossignol, Fisch, Maurage, Joassin, & Philippot, 2013).

Although much research has examined early ERPs within SAD, later ERPs in the context of social anxiety has been studied insufficiently. The Late Positive Potential (LPP) is one of

these later ERP that has little research regarding its relationship to social anxiety. The LPP is related to the conscious processing of threatening stimuli and begins 300-400 ms after the stimulus (Cuthbert, Schupp, Bradley, Birbaumer, & Lang, 2000). Grant and colleagues (2015) conducted a study with individuals classified as high worriers and low worries. They had participants view neutral or threatening images and told them there would be a test at the end of the study. They found that high worriers had a smaller difference in the LPP between threatening and neutral images, suggesting that high worriers had increased processing of neutral images or decreased processing of threatening images. Mühlberger and colleagues (2009) displayed artificial and neutral faces to those with high and low social anxiety. They found that those with social anxiety had similar LPP's in response to neutral and angry faces, but those with low social anxiety had larger LPP's to neutral faces. Finally, Schmitz and colleagues (2012) had participants complete a modified dot probe task with faces that either had direct eye gaze or averted eye gaze. They found that those with high social anxiety had increased LPP's to averted eye gaze. Results from these studies suggest that those with social anxiety experience information processing biases at later stages, especially when evaluating potentially ambiguous stimuli as indicated by the increased LPP's to both neutral and angry faces and averted eye gaze.

Another interesting use of the LPP, is its ability to be elicited by emotional stimuli without the use of visual information. MacNamara (2018) found that the LPP can be generated to negative imagery without any visual stimuli. Participants listened to audio recordings and were asked to imagine themselves in those scenarios. They found the LPP to be increased during the later time window when participants imagined themselves in negative scenarios. This study used these same methods to examine how social anxiety might influence the LPP when imaging the self in negative scenarios.

The current study aimed to remedy the gap in literature concerning the LPP and social anxiety and further clarify how social anxiety might modify this ERP. We were interested in how social anxiety might influence the ability to create and process neutral and negative self-images, as well as how anticipatory anxiety might modulate this by including the deception of a speech. The LPP was used to evaluate the conscious processing of these negative and neutral images. We expected the LPP to be enhanced during the creation of negative self-images and those with high social anxiety would show increased LPP response. Furthermore, the anticipation of a speech would further increase these responses.

Methods

Participants

In this study, undergraduates were recruited from a large midwestern university. Participants completed the Social Interaction Anxiety Scale and were sorted into two groups based on their score. Those who scored in the extreme ends of social anxiety concerns were recruited and grouped as either high social anxiety (HSA) or low social anxiety (LSA) based on a previous study (Judah, 2016). A total of 68 participants were recruited for the study based on a larger study.

Measures

The Social Interaction Anxiety Scale (SIAS; Mattick & Clark, 1998) is a 20-item self-report questionnaire that uses a 4-point Likert type scale with 0 meaning not at all characteristic or true of me and 4 meaning extremely characteristic or true of me. Total scores can range from 0 to 80. The questionnaire contains questions that measure the severity of fears concerning

general social situations. The SIAS has good internal consistency (Cronbach's-α = 0.93) and convergent validity.

After every scenario, participants were asked to rate the valence and arousal of the image that they imagined. Additionally, after participants were informed about the speech, their anxiety levels were measured and again after completion of the manipulation to induce anticipatory anxiety. Furthermore, at the conclusion of the manipulation, participants were asked how much they thought about the upcoming social situation.

Procedures

After participants completed the SIAS, electrodes were placed on the scalp. Before competition of the first task, participants were told they would be giving a speech at the end of the study to a panel of researchers that would evaluate them on their social skills. Following this, they completed a manipulation check that asked them about their current mood. Participants then completed either a task that aimed to increase their anticipation anxiety or a control manipulation. In the anticipation manipulation, participants were asked to imagine themselves giving the speech, as well as to imagine the worst thing that could possibly happen during the speech. In the control condition participants were asked to imagine various scenarios (i.e. visualize the layout of a typical classroom). Following this, participants completed another questionnaire that asked about their current mood and how much they thought about the upcoming speech. Then participants completed the final task. This task had participants listen to audio recordings and they were asked to imagine themselves in the scenarios described, either neutral or threatening. The neutral scenarios described everyday scenarios, like brushing their teeth. The threatening scenarios asked participants to imagine themselves in aversive or anxious

situations, like performing poorly in a social situation. The threatening recordings were modified

from Hinrichsen and Clark (2003), and neutral recordings were used from Nolen-Hoeksema and

Morrow (1993). Participants filled out the mood questionnaire again and then were informed that

they would not have to give a speech. Then, they filled out the final questionnaire that asked how

much they believed they would be giving a speech.

Electrophysiological Measures

EEG data were collected using the BIOPAC Systems MP150 Hardware and

AcqKnowledge recording software from nine electrodes (F3/4, Fz, C3/4, P3/4, Pz). Data were

sampled at 250 Hz with a bandpass filter of .1 - 35 Hz. Electrodes were placed underneath the

left eye, as well as on the outer corner of each eye to measure eye movements. Impedance levels

were all below 10 kΩ. In this study, the LPP was measured at the Pz electrode. Heart rate was

also measured with the BIOPAC Systems MP150 Hardware and AcqKnowledge recording

software for the entirety of the tasks.

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Results

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The results from this study were analyzed using a mixed model ANOVA, 2 Group (HSA,

LSA) x 2 Manipulation (Anticipation, Relaxed) x 2 Time (Baseline, Post-manipulation). There

were no significant within-subjects effects. Social anxiety was found to have a significant main

effect between subjects, $F(1, 64) = 36.94$, $p < .001$, $\eta_p^2 = 0.366$, such that those in the HSA

group rated their anxiety higher on average ($M = 5.465$, $SE = .395$) than those in the LSA group

($M = 2.481$, $SE = .292$). However, there were no significant main effects or interaction effects

found for heart rate, such that heart rate did not differ throughout the experiment nor between the

HSA and LSA groups.

Manipulation checks were evaluated with a 2 Group (HSA, LSA) x 2 Manipulation (Anticipation, Relaxed) ANOVA. The prompt, "How much did you think about the prompts during the manipulation?" had no significant effects such that both groups thought about the prompts equally during the anticipation period. The prompt, "How much did you think about the upcoming social interaction during the manipulation?" had a significant main effect for social anxiety $F(1, 64) = 4.644$, $p = .035$, $\eta_p^2 = 0.068$, such that those with high social anxiety ($M = 5.983$, $SE = .427$) stated they thought more about the upcoming social situation than those with low social anxiety ($M = 4.838$, $SE = .316$). Additionally, there was a main effect for manipulation $F(1, 64) = 20.782$, $p < .001$, $\eta_p^2 = 0.245$, such that those in the anticipatory manipulation ($M = 6.621$, $SE = .372$) thought about the upcoming social situation more than those in the relaxation condition ($M = 4.199$, $SE = .380$). Finally, the prompt, "How much did you believe that you were going to give a speech?" had no significant effects. Across all groups and manipulations, participants equally believed that they would be giving a speech.

The effects on the LPP were evaluated using a 2 Group (High Social Anxiety, Low Social Anxiety) x 2 Manipulation (Anticipation, Relaxed) x 2 Self-imagery (Neutral, Threat) mixed ANOVA. There were no main effects found for Group, Manipulation, or Self-imagery. Additionally, there were no interaction effects found between Group, Manipulation, and Self-imagery $F(1, 64) = .414$, $p = .522$.

Discussion

Our hypothesis that the LPP would be increased for negative self-imagery in those with high social anxiety was not supported, nor was our hypothesis that anticipation anxiety would increase the LPP response. In this study, we were able to generate an LPP in response to imagined scenarios without visual stimuli as did MacNamara (2018). However, we found no

significant differences between neutral and negative scenarios, nor between those with high social anxiety and those with low social anxiety.

Ng and Abbott (2016) studied individuals with social anxiety and how negative self-images may affect their performance in giving a speech. Participants were either primed with a negative or positive self-image and then were instructed to hold this image while they gave a speech. Those that held a negative self-image during the speech experienced higher levels of anxiety and focused more on themselves. However, there were no group differences such that those with high and low social anxiety both experienced these effects. Makkar and Grisham (2011) conducted a similar study and found the same results. In a review by Ng, Abbott, and Hunt (2014), they evaluated the role of self-imagery in social anxiety and found that negative self-imagery will have adverse effects on anxiety and negative thoughts, but these effects are not limited to those with social anxiety, they will show the same effects with healthy controls. Thus, this is a likely explanation for the lack of difference in the LPP found in this study between those with high social anxiety and low social anxiety. It is likely that negative self-imagery affects the attention equally between those with high social anxiety and those with low social anxiety.

The fact that we did not find differences in the LPP between the neutral and negative scenarios is contrary to previous research. However, this could be due to the nature of the scenarios. The negative scenarios ranged from social situations to life-threatening situations. Thus, it is possible that differences in personal reactions to these scenarios could have affected attention in distinct ways. Future research should examine the LPP to homogenous scenarios to examine the effects of different types of scenarios on conscious attention.

Limitations

This study only evaluated non-clinical individuals. It is possible that the high social anxious individuals do not reflect clinically socially anxious individuals. However, due to the availability of subjects through the university, non-clinically anxious subjects were used. Additionally, there is always error associated when using self-report measures as there can be biases associated with these questionnaires. Future studies may want to use diagnostic criteria to form the high and low social anxiety groups.

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