Biased Interpretations of Emotional Faces During Public Speaking:

A Vicious Circle for Public Speaking Anxiety?

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Abstract

There is evidence to suggest that anxiety involves biased attention towards threatening faces. This research suggests that this bias in attention may also contribute to a negative misinterpretation of audience cues during public speaking, which may create a self-fulfilling prophecy for nervous speakers. Participants rated the approval ratings of matrices of emotional faces (i.e. audiences) during fifteen 30-second videotaped public speaking trials. Five types of audiences were used, each representing a different level of approval. The audiences were displayed to participants for 1000ms at the 15 second mark of each 30-second speech. Participants high in state anxiety (as measured before the experiment) and public speaking anxiety rated the simulated audience matrices as more disapproving than participants with low anxiety levels. Also, participants with high levels of public speaking anxiety had more missing data (i.e. more missed presentations of the audience matrices) than people with low levels of anxiety. It is proposed that the amygdala and the hormone cortisol play a pivotal role in these attentional biases.

Just about everybody experiences a certain amount of anxiety when speaking or performing in front of others. For many people, public speaking anxiety is a highly emotional experience, especially when the audience responds in a negative way. Pertaub, Slater and Barker (2001) interviewed participants when speaking in front of virtual (i.e. computer generated) audience. They found that many participants reported feeling nervous, upset and frustrated with the audience when they received negative responses – i.e. when the audience was not paying attention and/or crossing their arms in disagreement – even though the audience was computer-generated. There is some evidence that suggests that a person's emotional state can influence how a person interpret cues from the audience (Gilboa-Schectman, Presburger, Marom & Hermesh, 2005) which can, in turn, influence a person's level of anxiety (Daly & Buss 1984; MacIntyre, Thivierge and MacDonald, 1997). Thus, this research will examine the rapid processing of emotionally salient audience characteristics during public speaking situations.

In perhaps the most oft cited statistic about public speaking anxiety, people fear public speaking more than they fear death; that is to say, 41% of respondents rated public speaking as their top fear, in comparison to the 19% of people who rated death as their top fear (Wallechinsky, 1977). Jackson and Latane (1981) found that speaking in front of an audience was one of the most anxiety-inducing experiences that a person can experience, even higher than writing a final exam. Though terrifying for many, it is important to note that public speaking anxiety does vary in degree, and most people will agree that even experienced public speakers experience a certain level of excitement (Daly & Buss, 1984).

Public speaking anxiety can be aggravated by many factors, such as not enough time to prepare, negative audience reactions, unexpected disruptions, and lack of experience (Daly & Buss, 1984). Another consistent predictor of public speaking anxiety is self-perception of

competence (Ayres, 1986; MacIntyre & MacDonald, 1998). In other words, when a person feels incompetent, their level of speech anxiety increases. Public speaking anxiety should not be viewed as merely an individual difference or situational occurrence, however. Public speaking anxiety is a consequence of how the audience is responding to the speech and those responses interact with the speaker's expectations and individual predispositions towards anxiety.

Public Speaking Anxiety and the Audience

How the speaker interprets the audience plays a critical role in maintaining public speaking anxiety. If people interpret the audience to be pleasant and/or familiar, they are likely to feel more comfortable than when speaking to an unpleasant and/or unfamiliar audience (MacIntyre & Thivierge, 1995; Mackinnon, MacInnis & MacIntyre, 2006). Other audience characteristics that can influence public speaking anxiety are interest, evaluation and responsiveness; the most anxiety-inducing audience would be perceived to be uninterested in the subject matter, unresponsive nonverbally, and formally evaluating the speaker (MacIntyre, Thivierge and MacDonald, 1997). It is important to note that in many cases, it is the perception of the audience that is important. Ayres (1986) argues that stage fright increases when a person thinks that he or she doesn't meet the audience's expectations. In other words, when people think their competence level is below what they believe the audience expects, they get stage fright, regardless of what the audience *really* expects. A person’s self-perception of competence is not a static thing, however. Self-perception during public speaking involves input from both the speaker’s internal state and audience reactions; the interaction between the two can result in a feedback loop which may become a self-fulfilling prophecy when the anxiety cycle begins. Savitsky and Gilovich (2003) argue that one contributing factor to speech anxiety is the illusion of transparency; people believe that their internal states (i.e. their anxiety, in this case) are more

apparent to other people than is really the case. They argue that this feeling of emotional transparency creates a vicious circle while public speaking, "if public speakers are prone to an illusion of transparency, their anxiety can become self-perpetuating" (Savitsky & Gilovich, 2003).

Daly, Vangelisti & Lawrence (1989) suggest that public speaking anxiety involves increased self focus. With this heightened focus on the self, it becomes more difficult to focus on cues from the audience, and without feedback from the audience, it becomes difficult to adjust one's speech appropriately. Perhaps one of the most important – and most efficiently processed – of these audience cues are facial expressions. For this reason, and because of the highly emotional nature of anxiety, emotion theory can help to explain some of the key elements of public speaking anxiety. Emotion is a complex phenomenon involving a number of interrelated processes, which can involve evolutionary, arousal-based, cognitive and social factors (Cornelius, 1996). However, because this study deals with the recognition of "basic" facial expressions during public speaking situations, evolutionary theories of emotion are of particular interest.

Evolutionary Theories of Emotion

Evolutionary theories of emotion focus on universal expressions of emotion, and this approach is most commonly associated with researchers such as Paul Ekman, David Matsumoto and Carroll Izard. In essence, this approach assumes that emotions cannot be understood outside the evolutionary history and their survival value for the both the individual and the species (Cornelius, 1996). In *The Expression of the Emotions in Man and Animals*, Darwin (1872) compared the facial expressions of animals – particularly primates – to the facial expressions of humans. After as thorough an investigation as was possible at the time, Darwin concluded that

emotional expressions can be understood in terms of three principles (Chevalier-Skolnikoff, 1973, pp 13-14). (1) Darwin's *principle of serviceable associate habits* states that consciously preformed behaviours originally necessary to survival become unconsciously associated with certain states of mind, so that these states of mind tend to be preformed automatically in appropriate situations (such as feeling frightened when a situation where fleeing is appropriate). (2) *The principle of antithesis* states that opposite states of mind, will have opposite external reactions (i.e. an angry dog raises his ears, opens eyes wide and snarls, while a submissive dog bows, lowers his ears and his eyes become less wide). Finally, (3) *the principle of the direct action of the nervous system* is that the excited nervous system acts involuntarily on the body (i.e. when someone hits us, we can't help but get angry for a moment).

Though Darwin's (1872) research provides a starting point for this theory of emotion, a great deal more research has been conducted in the area in the past 130 years. In particular, the idea of universal or “basic” facial expressions has been of interest to some researchers because of its congruence with evolutionary theory. Moreover, by mapping out these basic emotions, researchers have an objective measure of facial expressions that can generalize to all cultures. Ekman identified 6 different emotions that he claims are cultural universals: happiness, sadness, anger, fear, disgust and surprise (Ekman & Friesen, 1971). More recently, the emotion of contempt – which is a sense of moral superiority – has been defended as a seventh universal emotion (Matsumoto & Ekman, 2004). Though they share a similar approach to the question of basic emotions, not all researchers agree with Ekman's list of emotions,. Carroll Izard (1977) postulates 10 basic emotions and Robert Plutchik (1980) argues that there are 8 "primary emotions." Though researchers cannot always agree on which emotions should be on the list of cultural universals, their core argument is the same in all cases. The essential argument is that if

particular facial expressions can be recognized in all cultures – including small scale societies – than they represent a basic emotion that is "hardwired" in humans due to a similar evolutionary heritage.

In one of the first empirical studies on a small-scale society, Ekman and Friesen (1971) traveled to New Guinea to study a preliterate people called the Fore. Ekman and Friesen showed pictures of Westerners making each of the 6 different emotions that Ekman claims are universal. Even though this culture had minimal to no contact with the Western world, their accuracy rates on emotional faces far exceeded what one would expect purely by chance. Moreover, when Ekman and Friesen asked people in New Guinea to make a facial expression based on stories told to them (which were translated so that they would represent each of the 6 basic emotions) people in Western culture had had little difficulty in recognizing the emotions displayed in the facial expressions. One caveat to this particular study was that members of the Fore rarely distinguished between fear and surprise – which suggests that there are some cultural differences in the processing and labeling of emotional stimuli – causing the findings on those emotions to be lower than expected.

Based on this study, and a number of subsequent studies, Ekman and Friesen (1976) developed standardized pictures of faces which display their theorized universal emotions. The first set of 110 black and white pictures is called Pictures of Facial Affect (POFA), and they have been widely used in the study of basic emotions[1]. More recently, a set of color photos called Japanese and Caucasian Facial Expressions of Emotion (JACFEE) have been developed by Matsumoto and Ekman (1988) and they have been found both to be reliable and have a high level of agreement cross-culturally (Biel et al, 1997).

Research: Anxiety and Facial Recognition

Despite the acknowledged role of audience feedback in public speaking anxiety, not much work has been done on the recognition of facial displays of basic emotions during a speech. One of the few studies to examine this topic was a study by Vrana and Gross (2004). In this experiment, participants were split into two groups: the highest 10% on the Public Report of Confidence as a Speaker scale were placed into the "high fear" group, while the lowest 10% on that scale were placed into the "low fear" group. By measuring corrugator (angry face muscle movement) and zygomaticus (happy face muscle movement) EMGs, Vrana and Gross found that the high fear group was more likely to mimic anger expressions and less likely to smile in response joy expressions[2].

Skin conductance and heart rate of participants was also measured as a physiological measure of autonomic nervous system responding. Before interpreting Vrana and Gross's results, it is important to note that "Generally, aversive pictures elicit greater heart rate deceleration than positive pictures (Lang et al., 1993), except when the material is truly phobic to the viewer." (pg 65). To phrase another way, for stimuli that are not truly phobic or aversive (like pictures of faces) low autonomic arousal indicates greater attention than high autonomic arousal. Thus, for the same reason, low skin conductance levels are indicative of increased attention. Overall, Vrana and Gross (2005) found that the high fear group had greater heart deceleration in response to anger and neutral expressions when compared to joy expressions, indicating that there is the high fear group is paying more attention to the angry and neutral faces, than to the joy faces. Also, the high fear group had less skin conductance than the low fear group for neutral and joy faces, though there appears to be no difference for angry faces. Thus, it appears that people highly anxious about speaking in public are biased towards attending to negative facial expressions.

Little work has been done on facial expressions and public speaking anxiety specifically. However, it seems reasonable that attention biases for emotional faces studied in a more general anxiety literature could apply to public speaking anxiety. Some research conducted by Bradley, Mogg, Falla and Hamilton (1998), suggests that trait anxiety is associated with enhanced selective attention to threatening faces. Bradley et al displayed threatening, happy and neutral faces to participants for 500ms and 1250ms. Immediately after the face was displayed, they displayed a dot probe (either .. or :) and measured reaction time to identify the type of dot probe. They used reaction time on this task as a measure of attentional bias. They found that people high in trait anxiety had faster reaction times when threatening faces were displayed first, and that people high in dysphoria had lower reaction times when happy faces were displayed. Bradley et al's (1998) results for the 500ms display were significant, but the results found at 1250ms were not. Further research by Bradley, Mogg and Millar (2000) suggested that there is enhanced vigilance for threat with medium to high levels of state anxiety as well. Using the same dot probe detection task, reaction times for threatening faces were found to be faster for people experiencing medium to high levels of state anxiety. It is also important to note that there was no difference between medium and high levels of state anxiety, which indicates that there is a threshold effect for attentional biases when rising from low to medium levels of state anxiety.

There are also biases towards threatening faces found when people are identifying faces in crowds. Hansen and Hansen (1988) found that angry faces are more quickly recognized in crowds than both happy and neutral faces, and that it took less time to recognize the presence or absence of angry faces in happy crowds than happy faces in angry crowds. Moreover, research conducted by Gilboa-Schectman, Presburger, Marom and Hermesh (2005) found results which suggest that social anxiety is associated with a harsher evaluation of facial displays of crowds

containing predominately negative facial expressions, as well as faster processing of negative facial stimuli. 3x3 matricies of facial expressions were displayed for 2500ms as an experimental measure of a crowd. People with generalized social phobia (the participants in Gilboa-Schetman et al's 2005 research) rated the matrices as less approving overall as well as taking longer to make that decision than control groups.

These research findings suggest that anxiety is related to some sort of perceptual bias towards threatening faces in the recognition of facial expressions of emotion. Given that elevated levels of anxiety result in both increased attention and faster reaction times with threatening faces, this implicates an underlying brain mechanism linking the fear response and the recognition of threatening faces.

Neurobiology of Facial Recognition

There is some evidence that the amygdalae[3] – two small, almond shaped structures in the brain – play a key role in the evaluation of threatening events and the production of defensive responses (LeDoux, 1994). In other words, the amygdalae play a key role in both a person's response to fear, and their interpretation of threatening stimuli in the environment. It is important to note, however, that the interpretation of facial expressions involves many different brain areas; the amygdalae are not merely dedicated to the interpretation of threatening faces. The function the amygdalae *do* have is to play an important, and very specialized role in the evaluation emotional meaning (Kalat, 2004, pg 380).

Kosaka et al (2003) used a fMRI scan on participants while they identified pictures of faces. In this study, the amygdalae showed greater activation to unknown rather than known faces.[4] Moreover, their results suggested that the right amygdala is associated with face processing, while the left amygdala is associated with information with a negative valance. The

bilateral fusiform gyrus was activated in all face recognition tasks, suggesting that it plays an important role overall in the face recognition process. The prosterior cingulate cortex plays a reciprocal role with the amygdalae by assessing the familiarity of a person. It also seems to play a role in encoding and retrieving certain types of memories about faces. While Kosaka et al's (2003) research provides an initial orienting towards the function of the amygdalae, -- we now know that they (1) have increased activation for unknown faces, (2) are associated with both face processing and (3) negatively valenced information – the results of this study are not yet specific enough to draw definite conclusions.

In another fMRI experiment conducted by Williams et al (2004), the activity of the amygdala and fusiform gyrus was examined under the condition of 'binocular suppression,' which further elucidates the function of the amygdala. Binocular suppression entails presenting a different image to each eye (in this case, a face and a house) but through the use of colored lenses, only one image is consciously perceived at any given time. Fusiform gyrus activity – the area of the brain commonly associated with face perception (Kalat, 2004, pg 169-171) – is reduced or absent when the face is not visually perceived. However, the amygdalae showed activation even in absence of perceptual stimuli. Another unusual finding in this study is that even happy faces activated the amygdalae when the faces were presented below conscious awareness through the use of coloured filters. It appears then, that the amygdalae are highly efficient at rating the valence of faces; however, when emotional information from faces is presented subconsciously, processing by the amygdalae may lack specificity. It would appear that the evolutionary value of detection without recognition of valence lies in the rapid assessment of a potential threat (like an angry face). With this fast, subcortical processing first, it is a sort of early warning system that brings our attention to facial expressions that deviate from

neutral expressions. Detailed emotional processing, under less time pressure, can be done later by higher cognitive functions in the brain. Moreover, it is important to note that the amygdalae *can* distinguish valence when presented under normal (i.e. consciously perceived) circumstances.

It has been argued that there are two pathways to the amygalae, (1) a fast, subcortical path that involves only a rough evaluation of emotional significance and (2) a slower, cognitive pathway that provides a more refined analysis of the emotion (Williams et al, 2004). In a review of current research on the amygalae, Phelps and Ledoux (2005) point out, however, that fMRI studies on the amygdalae do not necessarily provide conclusive evidence for a subcortical pathway to the amygdalae. They do agree, however, that the *action* of the amygdalae tends to be automatic, and below our level of awareness. Even if a subcortical route to the amygdalae does exist, it is better to not to categorize these pathways in an "either/or" classification for typical, real-life situations. Researchers can use subliminal stimuli (such as Williams et al, 2004) to activate only the subcortical pathway of the amygdalae. However, most stimuli naturally occurring in the environment are consciously perceived to some extent. Thus, the evaluation of most threatening stimuli will involve both pathways; an initial orienting to a face occurs when it is gauged to have some sort of significance, and a more refined analysis allows a person to orient his or her behaviour appropriately.

In public speaking anxiety the amygdalae play a potentially important role in threat detection, and it stands to reason that they are activated when a public speaker notices negative facial expressions in the audience. It seems plausible then, that people who experience high levels of public speaking anxiety are more sensitive to threat; that is to say, their amygdalae detect threats more readily than other people (though whether this is due to an individual difference in reactivity or due to the unique context created by public speaking situations is open

to debate). This increased reactivity to threat may have an effect on hormone levels in the body as well. It is important to note that the amygdalae do more than simply detect threats; the amygdala's initial orienting to an emotionally salient stimulus, whether positive or negative, activates the body's stress response (Merali et al, 1998). The stress response involves the release of a variety of adrenal hormones; however, one hormone that is particularly relevant to the physiological changes in the body during the stress response is cortisol.

Cortisol and Speech Anxiety

Cortisol is an adrenal hormone that elevates blood sugar, enhances metabolism, and is often referred to as the "stress hormone" by researchers (Kottak, 2004, pg 369). There is evidence that public speaking anxiety involves heightened levels of cortisol. Roberts, Sawyer and Behnke (2005) found that cortisol levels, as measured in saliva, tend to increase as state anxiety increases. This lends support to the idea that salivary cortisol levels can be used as one biological measure of speech anxiety. As an addendum, however, cortisol levels tended to decline consistently over the course of a 40 minute speech[5]. In another study, Van Honk et al (2000) found that cortisol levels significantly increased in subjects showing selective attention towards angry faces (even during subliminal presentations) and that cortisol levels decreased when people *avoided* the angry faces. To explain this, Van Honk et al (2000) conceptualize cortisol as an individual difference measure of reactivity to faces. Thus, even from a biological perspective, it is possible associate speech anxiety – which has been associated with high cortisol levels (Roberts et al, 2005) – with increased attention for angry faces.

These findings are congruent with the proposed neural underpinnings for increased attention to angry faces. The amygdala is indirectly involved in the synthesis of cortisol. The amygdala detects a potential threat, and triggers the hypothalamic-pituitary-adrenal (HPA)

pathway to secrete cortisol as part of the stress response (Merali et al, 1998). People high in public speaking anxiety are especially sensitive to potential threats, becoming more likely to invoke the stress response. Thus, the sensitivity to threatening faces can be conceptualized as based on increased cortisol levels brought on by hypervigilance in the amygdala's threat detection system.

Research Questions and Hypotheses

There are three main hypotheses for this research:

Because of hypervigilance in the amygdala's threat detection system brought on by anxiety, people will pay more attention to angry faces in the audience and will process those faces more quickly. As a result, they will be more likely to remember seeing angry faces than other faces.

H1: as anxiety increases, participants will perceive less approval from the simulated audience

To measure this we plan to simulate the audience with 3x3 matrices of faces, which will be constructed in a similar fashion to Gilboa-Schetman et al's (2005) procedure. The presentation of the faces will occur very quickly, while the participants are speaking. Because of this, participants may not notice the display at all during some trials. At very high levels of anxiety, people will become highly self-focused. Therefore,

H2: as public speaking anxiety increases, so will the number of misses. Misses are defined as failing to notice the presentation of the audience matrix during a speaking trial.

Also, measures of state anxiety may change from the pre-test to the post-test. Previous findings have found that for people who begin with high levels of anxiety, state anxiety decreases from the pre-test to the post test (MacIntyre & Thivierge, 1997). However, because angry faces will be displayed to speakers regardless of the speaker's speech quality and anxiety level it is unlikely that these findings will be replicated. If anything, the impromptu nature of the

speeches (Witt & Behnke, 2006), and the disapproving audience matrices (MacIntyre & MacDonald, 1998) will likely increase the level of anxiety. Participants high in anxiety, however, will likely experience a threshold effect; it may not be possible for their anxiety to increase any higher than it already is. Thus,

H3: State anxiety will increase from pre-test to post test for participants low in initial anxiety, but there will be no change for participants high in initial anxiety.

Finally, we cannot assume that people come to the lab with the same cortisol levels or amygdala reactivity because of uncontrollable events in their lives that day, prior to coming to the lab. We must therefore assess the effect of mood states and control for it statistically. Initial mood will be examined, and any extreme outliers will be removed from the sample.

Method

Participants

Participants (N = 50) included students from introductory psychology courses; 40% (N = 20) were male, and 60% (N = 30) were female. 93.9% of the sample fell between ages 18-23. Also, 86% (N = 43) of the sample was right-handed. With permission from the instructor, voluntary sign up sheets were distributed in classrooms to recruit participants to come to the lab at a time that was mutually convenient.

Materials

Apparatus

A JVC GR-D32 Mini DV camcorder was used in lieu of using a live audience, because a live audience is both difficult to control experimentally and coordinate logistically for this experiment. The camcorder was connected to a Pentium 4 2.00 GHz computer with 256mb of RAM under windows XP. The stimuli were displayed on a 19" monitor using Microsoft

PowerPoint. Live video feed of the participants' speech was displayed on a 13" television viewable by both the researcher and the participants. Randomization of stimuli was done using a random sequence generator from www.random.org.

POMS-SF

The Profile of Mood States (POMS) measures mood disturbance both as a total score, and on 6 subscales: Fatigue-Inertia (α = .750), Vigor-Activity (α = .848), Tension-Anxiety (α = .706), Depression-Dejection (α = .778), Anger-Hostility (α = .869), and Confusion-Bewilderment (α = .606) (McNair, Lorr & Doppleman, 1971). The directions read as follows: "Describe how you feel right now by checking one space after each of the words listed below." Participants are asked to rate words such as "tense" or "sad" on a 5-item likert scale, ranging from "not at all" to "extremely."

The POMS-SF is a shortened, 37-item version of the original Profile of Mood States as suggested by Shacham (1983). The reliability of this scale has been found to be comparable to the original scale on all subscales, with the original reliabilities ranging from .803 to .907 (Curran, Andtrykowski & Studts, 1995).

Public Speaking Anxiety (α = .891)

This 6-item measure (MacIntyre & Gardner, 1993) uses a 7-point likert scale, ranging from "strongly agree" to "strongly disagree," to evaluate the level of public speaking anxiety the participant normally experiences. Three items are positively worded, and 3 items are negatively worded. A sample item would be "I have no fear giving a speech."

JACFEE and JACNeuF

The pictures of facial expressions came from Matsumoto and Ekman's Japanese and Caucasian Facial Expression of Emotion (JACFEE) and Japanese and Caucasian Neutral Faces

(JACNeuF) (Matsumoto & Ekman, 1988). The JACFEE consists 56 photos, involving variety of different people (half of each gender). There are 7 types of pictures, one for each of Ekman's seven universal emotions: happiness, sadness, anger, fear, disgust, surprise and contempt. The JACNeuF also consists of 56 pictures, only this time, all the faces have neutral expressions. All 8 angry faces and all 8 happy faces will be taken from the JACFEE as well as 8 neutral faces (one for each person) from JACNeuF.

Audience Matrices

Fifteen matrices of facial expressions – each varying in the degree of social approval – were created from the JACFEE and JACNeuF to represent an "audience" according to the procedure outlined by Gilboa-Schetman et al (2005). Five types of audiences will be constructed: extremely approving (EA), moderately approving (MA), neither approving or disapproving (balanced), moderately disapproving (MD), and extremely disapproving (ED). The different matrices will be constructed so that the differences between the number of enjoyment and angry faces for each of the five categories will be 4, 2, 0, -2, -4 respectively. However, the JACFEE only has pictures for 8 different people – as opposed to the 9 people from Gilboa-Schetman et al (2005) stimuli – so the middle picture in the matrix was left blank, except for a fixation point (+) in the middle of the screen. The EA audience contained 5 enjoyment, 1 angry and 2 neutral faces while the MA audience contained 3 enjoyment, 1 angry and 4 neutral faces. The balanced audience contained 3 enjoyment, 3 angry and 2 neutral faces. The MD audience contained 3 angry, 1 enjoyment and 4 neutral faces while the ED audience contained 5 angry, 1 positive and 2 neutral face. Equal numbers of men and women expressing each emotion (i.e. enjoyment and anger) were used. Three different matrices, varying in the location of the emotional faces will be

constructed for each type of audience. There was a facial expression by a different person in each square of the matrix.

Note that both the MD and the MA audiences have a high number of neutral faces (4 out of 8 faces were neutral). Because of the high ratio of neutral faces to emotional faces, it is not expected that they will be related to higher levels of anxiety; however, they are included as "filler" categories to balance the scale. Without these filler categories, the different audience types would be too easily discernable to the participants.

Shortened State Anxiety Scale (Pre, $\alpha = .900$; Post, $\alpha = .882$)

A 5-item version of the STAI state anxiety scale (Spielberger, Gorsuch, & Lushene, 1970) was used to assess participants' perceived anxiety before and after giving their set of speeches. Two items are positive, and two items are negative, all of which are rated on a 7-point Likert scale ranging from "strong agreement" to "strong disagreement." Scores on the negative items will be reversed, so that high scores will indicate high state anxiety. An example item is "I feel tense." Verb tenses on the items will be changed to the past tense when the scale is administered after the speeches. (i.e. "I *felt* tense").

Audience Approval Ratings

The participants rated the audiences after each speaking trial on a 5-item likert scale. The scale ranges from 1 to 5 which indicates a range from "extremely disapproving" (1) to "extremely approving" (5). The 5-point likert scale was indicated visually on the lectern in front of the participants, and each participant indicated his or her choice verbally between each trial, which was recorded by the researcher.

Procedure

Before the experiment began, participants were informed that public speaking in front of a camera is a part of the experiment. Participants were fully informed and signed the consent form before continuing. Once informed, only one participant felt too uncomfortable speaking in front of a camera, and decided not to participate in the experiment. After signing the consent form, participants filled out a short survey consisting of the POMS-SF, the 6-item PSA questionnaire and the 5-item STAI before moving on to the public speaking portion of the experiment.

In order to simulate a public speaking situation without the possible confound of different micro-momentary behaviours of actual audience members which would be impossible to control with the necessary precision, (i.e. very rapid facial displays of audience members in reaction to the speaker are unlikely to be uniform) participants were asked to speak in front of a simulated audience. Subjects were videotaped for the duration of the public speaking portion of the experiment.[6] In addition, the video camera was connected to a television, which faced the participant as they spoke. They could see themselves speaking on the television in real-time.

After spending some time adjusting the camera so that the participant is fully visible in the monitor, the experimenter gave the following instructions:

> *"This is the public speaking portion of the experiment which involves fifteen 30-second trials. I will give you a topic on which to speak, and you will have up to 5 seconds to gather your thoughts before speaking on the topic for 30 seconds. I am going to videotape you during this part of the experiment in order and may analyze parts of your speech during data analysis. Please note that only the researchers directly involved in this experiment will see this tape.*

While you are speaking, at around the 15 second mark, I am going to flash a group of nine faces on the computer screen in front of you. Imagine that those faces are your audience. This will happen very quickly, and you may not be able to see the faces in much detail before they disappear. After 30 seconds is up I will say "stop", At that point, I want you to rate how approving the audience was overall. Please rate the audience on the scale that is in front of you based on the emotions showing on their faces.

If you feel that you cannot talk about a particular topic, please say "pass", and I will provide you with another one. You have five passes. Also, you may quit the experiment at any time, for any reason, without penalty. Now, before we begin, are there any questions about the procedure?"

Topics were asked in a random order for each participant. An example of a speaking topic would be "How is Canada different from the United States?" (please see Appendix A for a complete list of topics). A fixation point was placed on the screen while the participants were speaking to direct their eyes to the appropriate part of the screen. Fifteen seconds after the participant begins to speak, one of the audience matrices was presented to the participant for 1000ms. The subject continued speaking after seeing the faces for another 15 seconds. Audience matrices were presented in a random order for each participant.

After 30 seconds has elapsed, inform the participant that their time on this topic is over, and ask them the following question:

"Imagine that those faces were your audience. Rate how approving the audience was of your speech based on the emotions showing on their faces. You can use the scale on the lectern in front of you. If you did not see the faces at all, please say so."

After two or three practice trials, the instructions may be shortened to something like "stop, what is your rating." The participants repeated this process until all 15 audiences were presented. When all the public speaking situations were completed, the participants were asked to fill out the State Anxiety scale and a demographics page. To conclude the experiment, the participant was given the option to delete the video made of them during the experiment if they did not want it viewed again later by researchers. No participants requested that their video be deleted.

Results

The main analysis of this research focused on differences in perceived approval from three types of audiences (extremely disapproving [ED], balanced [BAL], and extremely approving [EA]) as predicted by different measures of anxiety (public speaking anxiety, pre state anxiety and post state anxiety). See endnotes for an analysis of the MD and MA audience[7]. Two anxiety groups were formed for each measure of anxiety. A median split was conducted on each anxiety measure, placing half the sample in one group (high anxiety) and half in another group (low anxiety) for each measure. To test whether or not anxiety influenced perceived approval from the audience, three 2x3 between-within subjects ANOVAs were conducted, each using the repeated measure of audience type (ED, BAL & EA) and the between-subjects factor of anxiety group (high vs low anxiety). Effect size estimates (partial eta squared, η^2) are presented for each significant effect. The subscales on the Profile of Mood States were converted to z-scores, and all participants with any score higher than 3.9 (N = 1) were considered extreme outliers (as suggested by Tabachnick & Findell, 1989) and were removed from the analyses. There were three trials for each audience type. As with any research, missing data presents a problem. Fortunately, only one person had more than one piece of missing data for the approval ratings.

Thus, in order to account for missing data on the approval ratings, the mean rating for each type of audience was computed based on how many trials were actually completed (i.e. leaving the approval ratings ranging between 1 and 5).

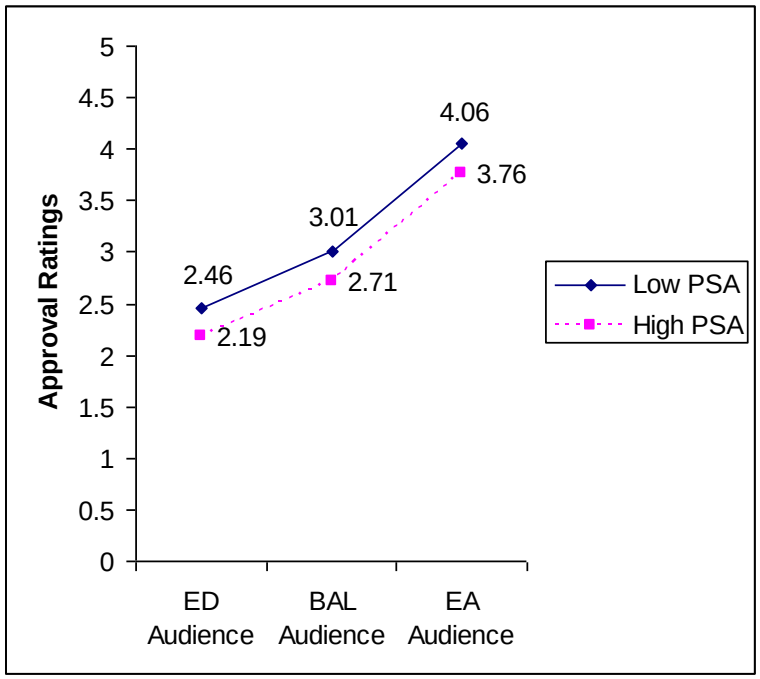
For the analysis (N = 48) involving public speaking anxiety, Mauchly's test for sphericity was not significant, W = .995, $\chi 2$ = .230, p = .892, so sphericity can be assumed. Also, Levene's test was conducted on the ED audience (F(1,46) = 1.31, p = .259), the BAL audience F(1,46) = 7.79, p = .008, and the EA audience (F(1,46) = 0.92, p = .343), showing that homogeneity of variances can be assumed for the EA and ED audiences. Also, though Levene's test was significant for the BAL audience, the ratio between the variances was less than 3:1, so the ANOVA procedure should be robust to this violation (Tabachnick & Findell, 1989). The perceived audience approval showed a main effect for audience type, F(2,92) = 102.14, p < .0005, η^2 = .689, and anxiety group F(1,46) = 8.288, p = .006, η^2 = .153. The interaction effect was nonsignificant, F(2,92) = .010, p = .990 (See table 1 for means, and chart 1 for a graphical demonstration).

For the analysis involving the pre-speech ratings of state anxiety, Mauchly's test for sphericity was not significant, W = .994, $\chi 2$ = .259, p = .878, so sphericity can be assumed. Again, Levene's test was nonsignificant for the ED audience (F(1,46) = 0.01, p = .942), the BAL audience F(1,46) = 2.76, p = .103, and the EA audience (F(1,46) = 0.23, p = .635), showing that homogeneity of variances can be assumed. The perceived audience approval showed a main effect for audience type, F(2,92) = 92.71, p < .0005, η^2 = .668, and anxiety group F(1,46) = 4.75, p = .03, η^2 = .094. The interaction effect was nonsignificant, F(2,92) = 0.08, p = .922 (see table 1 for means).

Table 1: Change in Perceived Audience Approval by Anxiety Group and Audience Type

	ED Audience Mean (s.d.)	BAL Audience Mean (s.d.)	EA Audience Mean (s.d.)	Overall Mean (s.d)	Main Effect for Audience Type?	Main Effect for Anxiety?
High Public Speaking Anxiety	2.18 (0.12)	2.71 (0.12)	3.76 (0.10)	2.88 (0.07)	Yes	Yes
Low Public Speaking Anxiety	2.46 (0.13)	3.01 (0.13)	4.06 (0.11)	3.18 (0.07)	Yes	Yes
High Pre-speech State Anxiety	2.27 (0.13)	2.75 (0.12)	3.78 (0.10)	2.93 (0.08)	Yes	Yes
Low Pre-speech State Anxiety	2.49 (0.15)	2.97 (0.13)	4.08 (0.11)	3.18 (0.09)	Yes	Yes
High Post-speech State Anxiety	2.29 (0.14)	2.77 (0.12)	3.96 (0.10)	3.01 (0.08)	Yes	No
Low Post - speech State Anxiety	2.44 (0.14)	2.96 (0.13)	3.86 (0.11)	3.09 (0.08)	Yes	No

Chart 1: Change in Perceived Audience Approval by PSA Group and Audience Type



For the analysis involving the post-speech ratings of state anxiety, Mauchly's test for sphericity was not significant, W = .990, $\chi 2$ = .483, p = .785, so sphericity can be assumed. Also, Levene's test was nonsignificant for the ED audience (F(1,46) = 3.88, p = .06), the BAL audience F(1,46) = 2.14, p = .150, and the EA audience (F(1,46) = 0.83, p = .368), showing that homogeneity of variances can be assumed. The perceived audience approval showed a main effect for audience type, F(2,94) = 97.45, p < .0005, η^2 = .675. However, the main effect for anxiety group, F(1,47) = 0.49, p = .487, and the interaction effect F(2,94) = 0.96, p = .39, were nonsignificant (see table 1 for means).

Next, the relationship of public speaking anxiety to the number of misses (i.e. more missed trials) was examined. With this data, participants were coded as either 1 (miss) or 0 (no misses). The one participant who had 2 misses was coded 1.. Three 2x2 chi squares were conducted using the miss group, and each of the three anxiety groupings. People who were in the high public speaking anxiety group were significantly more likely to have a missed trial than those in the low anxiety group, $\chi 2$(1,48) = 11.27, p = .001 (See table 2 for detailed results). There was no significant relationship between number of misses and pre-speech state anxiety, $\chi 2$(1,48) = 1.89, p = .17, or post-speech state anxiety, $\chi 2$(1,48) = .032, p = .86.

This study also examined how each participant's state anxiety changed over the course of the experiment. Participants rated their state anxiety lower before their mini-speeches (M = 15.96, SD = 6.44) than when they gave a retrospective account of their state anxiety during the mini-speeches (M = 19.71, SD = 7.78), t(47) = -4.15, p < .0005. In order to further test how anxiety changed over time, a 2x2 between-within subjects ANOVA was conducted with time as the repeated measure (pre-test versus post-test) and pre-speech anxiety group as the between subjects factor. (high anxiety vs low anxiety). Levene's test was nonsignificant for the pre-test

Table 2: Chi Square of Public Speaking Anxiety Split and Presence of Missed Trials

	Low PSA	High PSA	Total
No misses	Count: 20 Expected count: 14.4 % within miss: 66.7% % within psa group: 87.0%	Count: 10 Expected count: 15.6 % within miss: 33.3% % within psa group: 40.0%	Count: 30 Expected count: 30 % within miss: 100% % within psa group: 62.5%
At least 1 miss	Count: 3 Expected count: 8.6 % within miss: 16.7% % within psa group: 13.0%	Count: 15 Expected count: 9.4 % within miss: 83.3% % within psa group: 60.0%	Count: 18 Expected count: 18 % within miss: 100% % within psa group: 37.5%
Total	Count: 23 Expected count: 23 % within miss: 47.9% % within psa group: 100%	Count: 25 Expected count: 25 % within miss: 52.1% % within psa group: 100%	Count: 48 Expected count: 48 % within miss: 100% % within psa group: 100%

($F(1,47) = 0.04$, $p = .85$) and the post test ($F(1,47) = 1.56$, $p = .22$) so equal variances can be assumed. A main effect was found for time, $F(1,47) = 17.09$, $p < .0005$, $\eta^2 = .267$, anxiety group, $F(1,47) = 42.84$, $p < .0005$, $\eta^2 = .477$, and for the interaction, $F(1,47) = 6.74$, $p = .13$, $\eta^2 = .125$. The interaction effect shows that people who began with low levels of state anxiety, got more anxious over time, while people who began with high levels of anxiety stayed at about the same level over time. (see table 3 and chart 2).

Finally, in addition to the expected findings, sex differences on all measures anxiety were also observed; in general, females had significantly more anxiety than males (See table 4).

Discussion

The primary hypothesis of this research was supported. Participants with high public speaking anxiety rated the simulated audience matrices as less approving than participants with low anxiety. Previous research has suggested that angry faces are perceived more quickly and efficiently than other types of faces when a person is anxious (Vrana and Gross, 2004; Bradley, Mogg and Millar, 2000). Because angry faces are processed faster than other emotional faces, anxious speakers would be more likely to remember those faces after a relatively quick (1000ms) display of a group of facial expressions. Thus, the approval ratings were rated lower because participants perceived and remembered more angry faces than other types of faces. Similar findings were found for pre-speech ratings of state anxiety; participants who began the experiment with high levels of state anxiety also rated the simulated audience matrices as less approving. However, no relationship was found between approval ratings and the post-speech measures of state anxiety (i.e. retrospective accounts of their anxiety during the mini-speeches). Overall, public speaking anxiety serves as the best predictor of this effect out of the anxiety measures used in this study.

Table 3: Post Hoc Tests: Changes in State Anxiety Over Time by Anxiety Group

	Pre-test Mean	Post-Test Mean	Tukey's HSD (Post Hoc)
Low Anxiety Group	9.76	15.86	6.30**
High Anxiety Group	20.89	22.29	1.66

Chart 2: Changes in State Anxiety Over Time by Anxiety Group

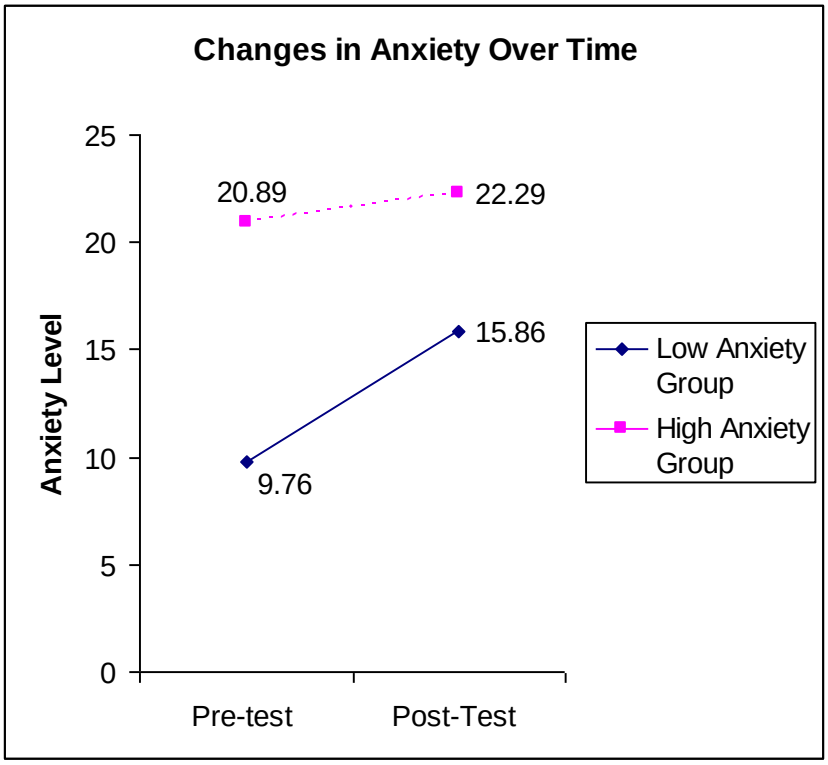


Table 4: Sex Differences in Anxiety

	Mean for No Misses (s.d.)	Mean for Miss group(s.d.)	Number of Participants	t Value (df)	Significance Level
Public Speaking Anxiety	23.26 (8.12)	29.17 (8.92)	Male = 19 Female = 29	t(46) = -2.32	.025
Pre-speech State Anxiety	13.00 (5.77)	17.73 (6.25)	Male = 18 Female = 30	t(46) = -2.61	.012
Post-speech State Anxiety	16.50 (6.66)	21.73 (7.73)	Male = 19 Female = 30	t(47) = -2.43	.019

As a caveat to this finding, the lowered approval ratings for audiences by the anxious group were not observed when viewing the moderately approving or the moderately disapproving audiences. These audiences differed from the other types of audiences in that there was a high proportion of neutral faces (4 out of 8 were neutral). This suggests that anxiety results in a specific bias in the processing of emotional faces that does not occur with neutral faces. A participant corroborated this notion with the following comment: "The angry and happy faces stick out more. I can only notice the neutral faces when they are almost all neutral faces." This is consistent with the proposed neurological underpinnings of this effect. The left amygdala is responsible for the identification of the valence of emotional faces and does not appear to be activated when viewing neutral faces (Kosaka et al, 2003). Thus, an audience of predominately neutral faces should not show the same effect as an audience with more emotional faces. There is also evidence that biased attention to angry faces results in higher levels of cortisol (Van Honk et al, 2000). From an adaptive point of view, it is more important that a person quickly identifies the extremes of emotion (such as anger or enjoyment) rather than neutral faces. When a person's body is going through the stress response and is flooded with hormones, there is no reason to focus on the neutral faces because they likely have no bearing on the stress-inducing situation. Also, because the stimuli were presented so quickly, participants likely saw only a portion of the faces each time. With the high number of neutral faces in these stimuli, there was a high probability that many of the faces seen were neutral, eliminating the effect for anxiety. It would appear then, that neutral faces are not viewed as more disapproving during anxiety, as much as there is simply a focused attention on the negative emotional faces.

Many participants commented that they were not sure how approving the faces were after they were displayed. Participants were encouraged to guess, even if they were not sure. The

results suggest that participants were actually much more accurate at rating the approval of the audience matrices than they professed, as seen in the main effect for audience approval. This lends credence to the idea that facial processing of emotional faces is very much an automatic, or unconscious process. This is congruent with the current conception of unconscious processing in the amygdale and fusiform gyrus during emotional face recognition (Kosaka et al, 2003).

In summary, emotional face recognition appears to be a separate process from other types of stimuli recognition, and higher levels of anxiety results a greater attendance to potential threats. During public speaking then, anxiety becomes a vicious self-reinforcing cycle. The heightened bodily arousal associated with the stress response creates a propensity to focus on the threatening facial expressions. By focusing on the threatening faces, the speaker is led to believe that the audience is less approving of his or her speech than is actually the case. The perception that the audience is unpleasant or disapproving results in higher public speaking anxiety (MacIntyre & Thivierge, 1995; Mackinnon, MacInnis & MacIntyre, 2006). In this sense, public speaking anxiety is self-perpetuating in that heightened anxiety creates the perception that the audience is unpleasant, which in turn increases anxiety.

Anxiety and Missed Trials

The second hypothesis of this study was also supported; participants high in public speaking anxiety were more likely to miss the presentation of the audience matrix than participants low in anxiety. Public speaking anxiety often creates an intense self-focus, which results in the speaker ignoring cues from the environment (Daly, Vangelisti & Lawrence, 1989). This is another way that anxiety is perpetuated during a speech. Because of their self-focus, anxious speakers miss many of the important cues from the audience that tell them if they are doing well or not. As a result, they are unable to adjust their speech appropriately based on the

audience's reactions. This compounds with the findings of anxiety and face recognition. Anxiety causes the disapproving faces to become more salient, and perceived more quickly. Speakers are missing many of the important cues from the audience due to increased self-focus, but when they *do* notice faces in the audience, they are more likely pay selective attention to the negative faces because those faces are processed more quickly than other types of faces.

Changes in State Anxiety from Pre-test to Post-test

Speakers who began with low levels of anxiety saw an increase in their anxiety from pre-test to post test. However, speakers who had high levels of state anxiety to begin with had no such change in their anxiety levels over time. MacIntyre and MacDonald (1998) found the opposite effect; highly anxious speakers rated state anxiety lower at the end of the speech than they rated it before their speech and vice versa. In general, the literature on public speaking anxiety suggests that anxious participants habituate to their anxiety after repeated exposure (Behnke & Sawyer, 2004). However, anxiety will only decline over time when the speaker is receiving positive, nonthreatening cues from the audience. With unpleasant reactions from the audience, it is not possible for a person to habituate to their anxiety; in essence, their fear becomes a reality. The current research demonstrates the limits of previous research which assumes anxiety will reliably decline over time. By more closely examining the dynamic interplay between the expectations of speaker and the reactions from the audience during public speaking, a more complex picture of public speaking anxiety is presented.

Ayres (1986) has suggested that anxiety results from a feeling that one will not meet the audience's expectations during a speech. So, participants who began the experiment with high levels of anxiety expect to generate negative reactions in the audience while participants with low levels of anxiety at the beginning of the experiment expected to generate pleasant reactions

in the audience. The interaction effect (i.e. that the high anxiety group's anxiety did not change over time, while the low anxiety group's anxiety *increased* over time) is most likely a reflection of the methodology involved in this experiment. It is possible that the audience matrices influenced the participants' level of anxiety. Given that negative responses from virtual audiences have been shown to elicit nervousness from participants (Pertaub, Slater and Barker, 2001) it seems reasonable to assume that the audience matrices had some effect on participants while they were speaking. In fact, many participants stuttered and lost their train of thought when the pictures were flashed to them, which suggests that they are somehow impacting the speaker.

All participants received a mixture of disapproving and approving audiences. Because the audience matrices were displayed randomly, participants would receive audiences that did not necessarily coincide with how well their speech was going. Because the low anxiety group expected to generate positive reactions, but instead got a mix of positive and negative reactions, their anxiety increased over time. In contrast, the high anxiety group expected to generate negative reactions, and the mixed reaction they did get was close to what they would expect (remember, the high anxiety group will also notice more angry faces and rate approval lower because of their high anxiety), so their anxiety did not change over time.

How do we reduce anxiety?

If a negative feedback circle is contributing to the maintenance of public speaking anxiety during a speaking situation, the practical question is: how do we reduce a person’s level of anxiety? This research does not directly address this question, but rather presents a model by which public speaking anxiety is maintained during a speech. It is important to note, however, that current methods of alleviating public speaking anxiety are congruent with this model. By reducing the anxiety present at the beginning of the speech, a biased interpretation of cues from

the audience does not take place, so any treatment that focuses on the reduction of anticipatory public speaking anxiety should be successful at eliminating these perceptual biases during a speech.

The predominant model for alleviating public speaking anxiety in the literature today is that of habituation and sensitization; in essence, confidence is built by beginning with easy speaking tasks and gradually moving on to more difficult ones (Behnke & Sawyer, 2004; Witt & Behnke, 2006). This is the premise behind most introductory public speaking courses. For extremely debilitating cases of public speaking anxiety, exposure therapy or cognitive-behavioral techniques are typically used (see Powell, 2004 for an introduction to this topic).[8] Exposure therapy is a method of reducing anxiety that allows a person to confront a feared object or situation (in this case public speaking) in a safe environment, for an extended period of time, allowing the person to habituate to the stimulus (Behnke & Sawyer, 2004). This treatment is a form of counter-conditioning. If the public speaking situation is not accompanied by the negative consequences (such as an unpleasant audience) for a long time, anxiety will become lower with increased exposure. Recent evidence also suggests that the nature of the speech assignment can influence anxiety; Witt & Behnke (2006) suggest that starting students on easier speaking assignments (such as reading off a manuscript) before moving on to more difficult assignments (such as an impromptu speech) will have a significant effect on reducing anxiety, in a treatment they call *instructional therapy.*

Limitations and Further Research

There are a number of limitations to this study. Public speaking anxiety is not a static thing. It ebbs and flows as the subject matter changes and as the audience responds to the speech. Pubic speaking anxiety is a complex interaction between the individual qualities of the speaker

and the reactions from the audience. Because anxiety was measured only before and after the speeches, there is no way to analyze the dynamic changes in anxiety across trials. Another limitation is that the faces used for disapproving audience members (i.e. angry faces) may not have been representative of most public speaking situations. Most speakers are afraid that the audience will be bored or uninterested, not angry, so it remains to be seen if this effect will hold true in those situations as well. Also, because of the small sample size, it was not possible to analyze how the approval rating of the audience may have changed by trial or by type of speaking topic. These effects were controlled for by randomizing the questions and order of presentation, but it was not possible to analyze if different speaking topics created more anxiety. Finally, speakers spoke in short 30-second intervals on each topic, and then stopped to answer questions. This deviates from a normal public speaking situation; most times, a person speaks for a longer period of time, without interruption, so the procedure used may not be entirely representative of an actual speaking situation.

Future research could address these limitations in a number of ways. In a later study, it would be beneficial to reduce the number of trials, but to increase the length of time a person speaks uninterrupted on a topic (perhaps to a length between 1 and 3 minutes). Levels of anxiety could be assessed after each trial in a similar manner to the approval ratings so that anxiety could be analyzed over a wider variety of times. Other types of disapproving faces could be used, such as boredom or contempt, which might better reflect a typical audience's reaction. Any differences in anxiety across speaking topics would likely be due to differing levels of speaking competence on a given topic, given that perceived competence has been shown to be positively correlated with PSA (MacIntyre & MacDonald, 1998). Thus, future research could assess speaking

competence as a variable directly after each speech in order to see the dynamic change in speaking competence across questions.

Conclusion

This research has shown that high levels of public speaking anxiety can change dynamically based on the interaction between the qualities of the individual and the relationship with the audience. Participants who are high in anxiety may become more self-focused during public speaking, noticing fewer cues from the audience. The few cues that *are* perceived tend to be the negative audience reactions. Moreover, participants who are lower in initial anxiety can become more anxious when the audience responds in an unpleasant way. These results reinforce the notion that human behaviour is rarely the sole result of either biology or the social situation, but rather a complex interaction between individual differences and the outer environment.

Endnotes

[1] A search with google scholar (scholar.google.com) found that this picture set was cited 411 times.

[2] Note that micromomentary mimicry of facial expressions occurs within half a second of seeing an emotional face, and is an automatic response in humans. Dimberg, Thunberg & Grunedal (2002) found that the muscle movements associated with joy and anger facial expressions occur even when participants are explicitly told to frown at a joyful face.

[3] What I am referring to as "the amygdala" in this paper really refers to a series of nuclei in the brain called the "amygdaloid complex." For simplicities sake, I will use the words "amygdala" (singular) or “amygdalae” (plural) to refer to the entire series of nuclei in this area.

[4] Since the amygdala is associated with threat detection, this finding makes sense evolutionarily, because strangers are more likely to be a threat than people we recognize.

[5] This is consistent with MacIntyre and Thiverge's (1998) finding that state anxiety is higher before the speech than after.

[6] The videotapes are of less importance than the actual process of videotaping (which helps simulate a public speaking situation). I have chosen to actually videotape participants, instead of simply pretending to videotape to avoid unnecessary deception of participants.

[7] Analyses were conducted using the "filler" audience types (moderately approving and moderately disapproving) as well, though it was not expected that there would be an effect for anxiety. These results are not included in the main results section for the sake of clarity. When a 2x2 split-plot ANOVA (N = 49) was conducted using the public speaking anxiety (high vs low) and audience type (MD and MA), the main effect for audience type was significant ($F(1,47) = 88.28$, $p < .0005$, $\eta^2 = .653$), but the main effect for anxiety ($F(1,47) = 0.13$, $p = .72$, $\eta^2 = .003$)

and the interaction effect ($F(1,47) = 0.05$, $p = .83$, $\eta^2 = .001$) were nonsignificant. Similar results were found for pre-state anxiety ($N = 49$) with a main effect for audience type, $F(1,47) = 83.84$, $p < .0005$, $\eta^2 = .641$, no main effect for anxiety, $F(1,47) = 1.60$, $p = .21$, $\eta^2 = .033$ and no interaction, $F(1,47) = 1.08$, $p = .31$, $\eta^2 = .022$. Again, the results were similar for the post-state anxiety measure ($N = 50$), with a main effect for audience type, $F(1,47) = 85.99$, $p < .0005$, $\eta^2 = .642$, no main effect for anxiety $F(1,47) = 0.003$, $p = .96$, $\eta^2 = .000$, and no interaction $F(1,47) = 0.45$, $p = .51$, $\eta^2 = .009$.

[8] There are a number of other treatments possible; cognitive and behavioral techniques are simply among the most common. Success has been observed with, meditation, hypnosis, medication, virtual reality therapy and biofeedback as well as any combination of these things to treat debilitating performance anxiety (Powell, 2004).

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Appendix A: Public Speaking Questions

1. Discuss the purpose of the Student's Union at this university.
2. Describe what you think constitutes good study habits.
3. Do you think that the addition of the new store was a good addition to the university? Why or why not?
4. Describe some of the material you are learning in any of your courses.
5. Describe some of the TV shows you watch or have watched in the past.
6. How is Canada different from the United States?
7. Discuss some of the ways the telephone changed the world.
8. What are some of the differences between men and women, if any?
9. What is the proper way to recycle?
10. What is one of your favorite movies, and why do you like it so much?
11. Describe what kinds of music you listen to or what kinds of music you dislike.
12. What is the purpose of the Canadian government?
13. What is the most interesting course you are taking this year, and why?
14. What sorts of things should you do to prepare for a job interview?
15. Do you vote? Why or why not?
16. What is your favorite holiday, and why?
17. What are your favorite foods?
18. Describe an historic place. That place can be anywhere in the world.
19. Talk about a magazine article or book that you read recently.
20. Talk about the impact that computers have had on the world.

Appendix B: Pretest

Consent Form

Your participation in this study is strictly voluntary and will have no effect on your course mark or on your academic standing at Cape Breton University. You may choose to quit this study at any time or refuse to answer any of the questions, without penalty. The experiment consists of three sections, each with its own set of instructions. We ask that you follow the instructions carefully.

In this study you will be first given a pretest which asks about your current mood and thoughts about public speaking. Afterwards, you will be videotaped while asked to speak about various topics in 30 second intervals. While you are speaking, you will be shown pictures of human faces very quickly. After each 30 second interval, I will ask you to rate the faces you saw. Finally, after fifteen 30 second speeches, I will ask you to fill out a short post-test consisting of mostly demographic information.

All of your responses are anonymous and confidential and at no time will you be asked to provide your name. Videotapes may be analyzed at a later date. However, please note that only the researchers involved in this study will have access to your responses, and the videotape of your speeches. At the end of the experiment, you will be given the names and contact information for the researchers involved in this study, as well as the Dean of Research at Cape Breton U. We encourage you to contact any of the researchers if you have any questions, or for the results of the completed study. If you choose to participate please place an X on the line below.

_____

POMS-SF

Note: Feeling items were randomized when the test was given.
Directions: Describe HOW YOU FEEL RIGHT NOW by checking one space after each of the words listed below.

FEELING	Not at all	A little	Moderately	Quite a bit	Extremely
Unhappy	1	2	3	4	5
Sad	1	2	3	4	5
Blue	1	2	3	4	5
Hopeless	1	2	3	4	5
Discouraged	1	2	3	4	5
Miserable	1	2	3	4	5
Helpless	1	2	3	4	5
Worthless	1	2	3	4	5
Lively	1	2	3	4	5
Active	1	2	3	4	5
Energetic	1	2	3	4	5
Cheerful	1	2	3	4	5
Full of pep	1	2	3	4	5
Vigorous	1	2	3	4	5
Confused	1	2	3	4	5
Unable to concentrate	1	2	3	4	5
Bewildered	1	2	3	4	5
Forgetful	1	2	3	4	5
Uncertain about things	1	2	3	4	5
Tense	1	2	3	4	5
On edge	1	2	3	4	5
Uneasy	1	2	3	4	5
Restless	1	2	3	4	5
Nervous	1	2	3	4	5
Anxious	1	2	3	4	5
Angry	1	2	3	4	5
Peeved	1	2	3	4	5
Annoyed	1	2	3	4	5
Resentful	1	2	3	4	5
Bitter	1	2	3	4	5
Furious	1	2	3	4	5
Worn out	1	2	3	4	5
Fatigued	1	2	3	4	5
Exhausted	1	2	3	4	5
Weary	1	2	3	4	5
Bushed	1	2	3	4	5

6-item Public Speaking Anxiety

The following question is asking about your feelings about public speaking. Please describe how you feel IN GENERAL about speaking in public. Please indicate a number between 1 and 7 on the blanks provided.

Strongly disagree 1—2—3—4—5—6—7 strongly agree

1 = strong disagreement
2= moderate disagreement
3 = mild disagreement
4 = neither agree not disagree
5= mild agreement
6= moderate agreement
7 = strong agreement

_____1. I have no fear giving a speech
_____2. Certain parts of my body feel very tense and rigid while giving a speech
_____3. I feel very relaxed while giving a speech
_____4. My thoughts become confused and jumbled when I am giving a speech
_____5. I face the prospect of giving a speech with confidence
_____6. While giving a speech I get so nervous I forget facts I really know

State Anxiety

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement, then circle the appropriate number to indicate HOW YOU FEEL RIGHT NOW, that is, at this moment. There are no right or wrong answers. Do not spend too much time on any one statement, but give the answer which seems to describe your present feelings best.

	strongly disagree	moderately disagree	mildly disagree	neither agree not disagree	mildly agree	moderately agree	strongly agree
I feel tense	1	2	3	4	5	6	7
I feel calm	1	2	3	4	5	6	7
I feel relaxed	1	2	3	4	5	6	7
I feel at ease	1	2	3	4	5	6	7
I feel jittery	1	2	3	4	5	6	7

Appendix C: Post Test

State Anxiety

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement, then circle the appropriate number to indicate how you felt WHILE SPEAKING IN FRONT OF THE CAMERA. There are no right or wrong answers. Do not spend too much time on any one statement, but give the answer which seems to describe your present feelings best.

	strongly disagree	moderately disagree	mildly disagree	neither agree not disagree	mildly agree	moderately agree	strongly agree
I felt tense	1	2	3	4	5	6	7
I felt calm	1	2	3	4	5	6	7
I felt relaxed	1	2	3	4	5	6	7
I felt at ease	1	2	3	4	5	6	7
I felt jittery	1	2	3	4	5	6	7

Demographics

Sex:
___Male
___Female
___Other

Age: _____

University Major: _____

Ethnicity: (i.e. Where your ancestors were born)
___European
___African
___Asian
___First Nations
___Other

Which hand do you use to write with?
___Right
___Left
___Both

How often have you spoken in public before? (Check one)
___Never
___Once or twice
___3-5 times
___5-10 times
___more than 10 times

I would be pleased to read any comments you have on the questionnaires or the study:

Comments

Appendix D: Given to the Participant

Your participation is greatly appreciated. Without your participation, this worthwhile research could never take place. For a copy of the results, or any other questions you may have, feel free to contact any of the researchers named below.

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If you have any questions about the ethics of this research, please contact:

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