

**Reduction of fear arousal in young adults with speech anxiety  
through elicitation of positive emotions**

by

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**Abstract**

A research study was conducted to examine Fredrickson's Broaden-and-build theory of positive emotions in a speech anxious sample of undergraduate students. Experimental elicitation of positive emotions has previously been shown to speed cardiovascular recovery, increase attention, and broaden thought-action repertoires compared to elicitation of negative or neutral emotions (Fredrickson et al., 2000). 88 undergraduate students were selected from a screening process based on their reported speech anxiety on the Personal Report of Confidence as a Speaker (PRCS). Students who reported low or high speech anxiety completed an anxiety provoking task and were subsequently exposed to either a neutral emotion condition ("Pipes" film) or one of two positive emotion conditions ("Puppy" film or thinking of a happy memory task). Fredrickson's theory was not supported since results showed no differences in cardiovascular recovery, thought-action repertoires, or global thinking for either groups or conditions. However, differences were found on broadened scope of attention on a modified Stroop task where the low anxiety group responded faster to threat words in the neutral and happy memory conditions than after viewing a positive film. Results of the study are discussed in light of attribution theory of emotion and previous studies on the effects of positive emotions.

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## Introduction

In the past decade, the role of positive emotions in adjustment and coping with adversity has gained increased attention. Prior to these developments, most developmental and clinical research focused on negative emotions and maladjustment and the effects of positive emotions were largely unexplored (Fredrickson, 1998). Recently, various researchers have started investigating the relationship between positive affect on psychological and physical well-being so that the possible beneficial effects of experiencing positive emotions might be explored (Pressman & Cohen, 2005). It has been suggested that increased positive affect is associated with enhanced function of the immune system (Knapp et al., 1992) and health-promoting behaviors that reduce stress (Pressman & Cohen, 2005; Salovey, Rothman, Detweiler, & Steward, 2000). It has even been proposed that positive emotions not only help the person feel good in the moment, but also lead to an upward spiral of positive emotions in the future, broaden thought-action repertoires, expand the scope of attention, and result in a rapid restorative effect following the elicitation of negative emotions (Fredrickson & Branigan, 2005; Fredrickson & Joiner, 2002).

The tendency to show positive emotions following difficult situations has been shown to characterize resilient individuals (e.g., Tugade & Fredrickson, 2004). While examining the effects of positive emotions on recovery from negative emotional arousal in clinical populations would be of great importance, such studies have not yet been conducted. Such demonstrations would be especially important for individuals with anxiety disorders since previous studies have repeatedly demonstrated faster reductions of anxiety or fear through elicitation of positive emotions in normal populations (e.g., Fredrickson & Levenson, 1998; Fredrickson, Mancuso, Branigan, & Tugade, 2000). The present study examined whether elicitation of positive emotions allowed clinically speech anxious individuals to recover quickly and broaden their scope of attention and thought-action repertoires. The study also sought to determine whether such effects differed based on the mode of affect elicitation (active and personal elicitation of positive emotions vs. passive elicitation). If successful, it was reasoned that such positive emotion elicitation might help anxious individuals learn better how to regulate their emotions and broaden their thinking in anxiety provoking situations where they may have to perform under pressure.

### *Definition of emotion*

Although consensus has not been reached in the field about what constitutes “emotion” and “emotion regulation” (Cole, Martin, & Dennis, 2004; Thompson, 1994), several authors have attempted to define these concepts operationally. Emotions have been defined as biologically endowed processes that allow for a quick appraisal of situations and appropriate responses in order to maintain favorable or terminate unfavorable conditions (Cole et al., 2004). The nature of the appraisal determines the quality or the valence of the emotion (negative or positive) and the degree of the appraisal determines the magnitude of the emotional response (duration and intensity) (Campos, Frankel, & Camras, 2004). Discrete emotions have also been shown to have distinct patterns of cardiovascular arousal where it is possible to distinguish between fear, anger, joy, and other basic emotions (Christie & Friedman, 2004; Waldstein et al., 2000).

When positive and negative emotions are differentiated categorically, negative emotions are generally defined as emotional states that are intrinsically unpleasant and negative, such as fear, anxiety, pain, anger, sadness, and disgust (Cicchetti & Hesse, 1982). Most negative emotions seem to have obvious adaptive value through their ability to initiate specific actions tendencies (Frijda, 1986; Fredrickson et al., 2000). Thus, emotions such as fear or anger are associated with behaviors and certain physiological changes that can save the individual when he or she is in danger (fight-or-flight response). A typical fight-or-flight response might include physiological changes such as accelerated heart rate, increased blood flow to skeletal muscles, and behavioral changes such as shaking, running, and increased vigilance (Lovallo, 2005).

Positive emotions, on the other hand, are emotional states that are naturally rewarding and pleasant, such as joy, contentment, interest, love, happiness, and pride (Fredrickson, 2001). Positive emotions tend to lead to more nonspecific action tendencies (e.g., enhanced attention, approach, etc.) compared to specific action tendencies that characterize negative emotions (e.g., retreat, fight, narrowing of attention on threat, etc.) (Derryberry & Tucker, 1994; Fredrickson & Branigan, 2005; Fredrickson et al., 2000). In addition, positive emotions seem to be characterized by less distinct patterns of autonomic reactivity, especially in comparison to negative emotions. Some studies have demonstrated a lack of autonomic reactivity when positive emotions are elicited (Fredrickson et al., 2000), especially if the

elicitation of emotion is passive, such as watching a film or reading a story (Pressman & Cohen, 2005). Other studies suggest different cardiovascular responses, such as heart rate increases, especially if the mode of elicitation is more active or personally relevant (e.g., Neumann & Waldstein, 2001; Waldstein et al., 2000), like describing a memory of an emotionally charged event.

Therefore, positive emotions are more difficult to measure than negative emotions since observable changes in behavior and physiology may be limited and variable. The adaptive value of positive emotions is also less apparent due to the lack of specific action tendencies and autonomic reactivity. However, it has been suggested that positive emotions seem to be of equal importance for survival just as negative emotions. Positive emotions seem to play an important role in allowing individuals to enhance their social resources and support, expand attention, facilitate exploration, and broaden behavioral repertoires to afford new opportunities. Positive emotions thus play an important role in an individual's development (Fredrickson, 1998; Pressman & Cohen, 2005).

### *Emotion regulation*

In everyday life, emotions are constantly being managed and modified to increase social and biological adaptation. This goal-directed process called emotion regulation is generally triggered by emotional arousal in an attempt to modify or maintain emotional experiences and manifestation in behavior (Campos et al., 2004; Eisenberg & Spinrad, 2004). Emotion regulation can involve a change or maintenance of any aspect of emotional arousal, such as physiological and neurological activation, cognitive appraisal, and attention processes. Such processes are responsible for monitoring, evaluating, and modifying emotional reactions and can lead to a change in an activated emotion, including a change in intensity, valence, or the time course of the emotion (Thompson, 1994).

Although people are often unaware of it, most use emotion regulation strategies when they need to manage their emotional state due to environmental circumstances or their own well-being. For example, when faced with a life threatening situation that requires hiding from a dangerous individual or keeping perfectly still while being trapped on a fragile mountain cliff, a person needs to be able to regulate their emotional response and inhibit the typical fight-or-flight response elicited by fear. According to Gross (1998) emotion regulation

strategies may be differentiated into five categories: Situation selection, situation modification, attentional deployment, cognitive change, or response modulation. The first four are antecedent-focused strategies where the goal is to change the course or prevent certain emotions from being elicited by either avoiding certain situations, changing the situation so that the person will not experience undesirable emotions, changing the focus of attention away from aversive stimuli, or changing the person's interpretation of the situation. Response modulation is, on the other hand, aimed at changing the emotional response itself, whether it is behavioral, experiential, or physiological. Studies have shown considerable variability and individual differences in how people try to regulate their mood states, both depending on gender and intensity of emotional arousal. For example, people report seeking out others, engaging in pleasant activities, distracting themselves, using drugs, being alone, and other techniques as ways to manage their mood (Langens & Mörth, 2003; Thayer, Newman, & McClain, 1994).

Intentional elicitation of positive emotions to manage arousal in difficult situations may be viewed as an emotion regulation strategy (Fredrickson, 1998). According to Gross (1998) this strategy might be viewed as response modulation since the emotional response is already being experienced and the goal of eliciting positive emotions is to modulate that response. It appears that individuals who are able to elicit positive emotions through positive appraisal, problem-focused coping, or by engaging in pleasant activities are more resilient when faced with adversity and negative events (Fredrickson & Joiner, 2002; Fredrickson & Levenson, 1998; Pressman & Cohen, 2005; Tugade & Fredrickson, 2004). For example, using humor as a way to manage life stressors has been found to be associated with reduced mood problems (Martin & Lefcourt, 1983). However, individuals who are less adept at regulating their emotions and repairing their mood states in the aftermath of negative life events are more likely to experience various symptoms of psychopathology, such as depression (Garnefski et al., 2004) and anxiety (Turk et al., 2005). Thus, the ability to intentionally elicit a positive mood state seems to be associated with increased resilience and faster recovery from negative emotions.

### *The Broaden-and-Build Theory of positive emotions*

The broaden-and-build theory of positive emotions (Fredrickson, 1998) focuses on the power of positive emotions to build an individual's personal resources and resilience through expansion of their thought-action repertoires. Evidence suggests that when people experience negative emotions, their focus of attention and thought-action repertoires narrow (e.g., Derryberry & Tucker, 1994; Fredrickson & Branigan, 2005). This process may allow for quick decision making in a threatening situation, such as the fight-or-flight response (Fredrickson, 2001). In fact, narrowing the focus of attention and limiting behavioral repertoires following negative emotions has previously been noted in theoretical models and empirical research on anxiety disorders (e.g., Clark & Wells, 1995; Rapee & Heimberg, 1997). For instance, individuals who suffer from social anxiety disorder demonstrate increased vigilance and devote excessive attentional resources on potential social threat cues and thus frequently demonstrate behavioral avoidance of social situations (Turk, Heimberg, & Hope, 2001).

Positive emotions have been shown to have the opposite effect. According to the broaden-and-build theory, positive emotions broaden the focus of attention and thought-action repertoires, resulting in increased physical, intellectual, and social resources (Fredrickson, 1998; Fredrickson & Branigan, 2005). The experience of positive emotions seems to elicit enhanced creativity, problem-solving abilities, and intellectual capacity. For instance, Fredrickson (1998) noted that joy is frequently elicited through play. Through play, individuals are thought to acquire skills and build relationships that increase resilience and buffer them psychologically at a later time when resilience is needed and the emotion itself has long passed. In a similar fashion, Fredrickson proposes that interest leads to enhancement of intellectual capacity through exploration and attempting challenging tasks. Through broadened thought-action repertoires, positive emotions lead to development of new actions and ways of thinking and thus build physical, social, and psychological resources.

In fact, several studies have shown that elicitation of positive emotions facilitates problem solving and enhances creative thinking. For example, Isen, Daubman, and Nowicki (1987) presented people with a difficult task that required them to discover an implicit solution. Results indicated that participants arrived more quickly and more frequently at the correct solution when positive affect had previously been elicited, compared to participants

who experienced negative or neutral affect. In a similar fashion, it has been demonstrated that enhanced attention and increased creativity in thinking of activities to perform occurred after watching films which elicit positive emotions (amusement and contentment). In one study, participants who viewed the positive films demonstrated enhanced attention by being able to solve a global processing task more readily than participants who viewed neutral or negative films (Fredrickson & Branigan, 2005). On the other hand, negative emotions such as anxiety have been found to predict poor cognitive performance, such as problem solving, memory, creativity, and learning (e.g., Christianson, 1992; Cox, 1997; Eysenck & Calvo, 1992; Hadwin et al., 2005).

Increased psychological resilience has also been shown to be associated with positive emotion. Recent studies indicate that psychologically resilient individuals are better able to find positive meaning in negative life events than less resilient people (e.g. Tugade & Fredrickson, 2004). In addition, it seems that positive emotions may mediate this relationship and through increased endurance, optimism, and resilience the benefits of positive emotions on physical and psychological well-being become apparent (Salovey et al., 2000). These findings suggest that resilient individuals are able to view negative events in a positive light because they experience higher levels of positive emotions (Tugade & Fredrickson, 2004: Study 3). Positive affect has also been shown to predict broad-minded coping over a 5-week period (Fredrickson & Joiner, 2002). However, specific research findings should be interpreted with caution since they are often based on non-experimental and short-term longitudinal correlational data. It is therefore difficult to conclude at this point in time whether positive emotions are the driving force of increased resilience or a fortunate by-product. Despite these limitations, the evidence seems to suggest that a reciprocal relationship exists between positive affect and resilience, leading to an “upward spiral toward emotional well-being” (Fredrickson & Joiner, 2002, p.172).

### *The “undoing” hypothesis*

One implication of the broaden-and-build theory is the undoing hypothesis of positive emotions. Based on evidence suggesting that positive emotions are associated with increased resilience and may act as a buffer from psychological stress (e.g., Fredrickson & Levenson, 1998: Study 2; Tugade & Fredrickson, 2004), Fredrickson and her colleagues have

hypothesized that positive emotions can undo cardiovascular activation, allowing a person to physically recover more quickly than after experiencing negative emotions. Positive emotions would therefore have the opposite effect of negative emotions which have been shown to produce prolonged activation of the cardiovascular system (Brosschot & Thayer, 2003) and usually cause greater increases in heart rate, with the exception of disgust (Levenson, Ekman, & Friesen, 1990). This differential pattern of cardiovascular activation for positive and negative emotions has been found in various emotion elicitation procedures, such as watching films, reading stories, thinking of past events, and through emotional facial configurations (Christie & Friedman, 2004; Ekman, Levenson, & Friesen, 1983; Levenson et al., 1990; Neumann & Waldstein, 2001; Prkachin et al., 1999).

In an innovative study intended to examine the effect of positive emotions on cardiovascular recovery (Fredrickson et al., 2000), participants were asked to prepare a speech that would later be evaluated by peers. Due to the limited preparation time that was given, subjects experienced negative affect (anxiety) and increased cardiovascular activity. Instead of actually giving a speech, participants subsequently viewed one of four films designed to elicit either amusement, contentment, sadness, or a neutral state. Results indicated that the films intended to elicit positive emotions (amusement and contentment) helped participants return to their baseline levels of autonomic activity (heart rate, pulse transmission to ear and finger, and finger pulse amplitude) faster than films intended to elicit sadness or a neutral state. These findings suggest that positive emotions have unique power in helping people recover from negative events, both at the psychological and the physiological level. The power of positive emotions seems to be above and beyond merely eliciting interest or replacing negative emotions. Rather, they serve to “repair” negative emotions in a more effective manner than a neutral state or other negative emotions (Fredrickson & Levenson, 1998; Fredrickson et al., 2000). Such effects have been shown to be consistent across gender and different ethnic groups (e.g., Fredrickson et al., 2000).

#### *Anxiety disorders and the possible value of positive emotions*

Recent studies indicate that individuals who suffer from anxiety disorders experience emotions differently than others and demonstrate poor ability to regulate these emotions. For example, individuals with generalized anxiety disorder have been identified as experiencing

emotions more intensely, being more expressive of negative emotions, being confused about what emotions they are experiencing, and having difficulty repairing negative mood states compared to non-anxious people (Turk et al., 2005). When folks with anxiety disorders experience intense emotions they tend to view such experiences as unacceptable and respond by trying to avoid or to suppress their emotions (Campbell-Sills, Barlow, Brown, & Hofmann, 2006). Similarly, socially anxious individuals have been shown to experience fewer positive events and less positive affect on days when they are feeling especially anxious and attempting to suppress their negative emotions (Kashdan & Steger, 2006). Enhancing people's ability to elicit positive emotions should theoretically allow them to regulate their emotions better when they do experience such intense negative emotions. In addition, elicitation of positive emotions should allow them to build resources to adapt to future situations which elicit intense anxiety and other negative emotions.

Increased cardiovascular activation has also been demonstrated for many anxiety disorders, especially in the autonomic system. Friedman and Thayer (1998) observed that people with panic disorder experienced a larger change in heart rate in response to a cold face stress task compared to non-anxious controls. Davidson and colleagues (2000) found that socially phobic individuals had significantly higher heart rates than controls while preparing to make a speech. Moreover, Cook and colleagues (1988) showed a strong activation of autonomic responses through imaginary exposure of the feared object or situation for people with specific phobias. For people with anxiety disorders, their fear becomes evident in changes in the cardiovascular system when placed in anxiety provoking situations.

In addition to increased autonomic activity, anxious individuals frequently demonstrate narrowing of attention (Luu, Tucker, & Derryberry, 1998). For example, studies have shown that people with anxiety disorders become hypervigilant when faced with a situation they consider threatening. Phobic individuals quickly turn their attention to fear-relevant stimuli (Mathews & MacLeod, 1985; Pflugshaupt et al., 2005), those with panic disorder are hypersensitive to changes in their heartbeat (Ehlers & Breuer, 1996), and socially anxious individuals tend to be hypervigilant in social situations (Bögels & Mansell, 2004). In one study that specifically examined attention among socially anxious individuals, results indicated that these participants showed increased self-focused attention on physiological

symptoms of their anxiety and decreased external attention in feared social situations (Mansell, Clarke, & Ehlers, 2003).

Modified Stroop color-naming tasks have proven useful to examine the effects of emotions on attention bias and cognitive processes. When anxious individuals are presented with words that reflect their fears their response time to the stimulus words typically increases. Studies have shown that socially anxious individuals demonstrate longer color-naming latencies when the words involve a social threat (e.g., embarrassed, boring, stupid, etc.; Hope, Rapee, Heimberg, & Dombek, 1990), individuals with panic disorder show longer latencies to physical threat words (e.g., fatal, illness, hospital, etc.; Hope et al., 1990), patients with OCD have longer latencies to contamination-related words (e.g., dirt; Foa, Ilai, McCarthy, & Shoyer, 1993), and individuals who have PTSD from motor-vehicle accidents show specific response latencies to accident-related words (e.g., wreck, trapped, etc.; Beck et al., 2001).

These findings on increased autonomic activity and narrowing of attention indicate that elicitation of positive emotions might serve as a powerful coping strategy for individuals with anxiety disorders. According to the undoing hypothesis and the broaden-and-build theory, anxious individuals should be able to undo the physiological response to anxiety faster through the elicitation of positive emotions and broaden the scope of their attention. Through broadened attention, socially phobic people would be able to obtain important social cues in the environment which they may typically miss, individuals with specific phobia may obtain information in feared situations that are crucial for their reconstructive learning, and people who struggle with frequent panic attacks might be able to direct their attention away from their heartbeat and other physiological sensations and thus prevent escalation of a full panic attack.

#### *Active and passive regulation strategies*

In many of the studies on positive emotions, the method of affect elicitation has been relatively passive such as watching a film (e.g., Fredrickson & Levenson, 1998; Fredrickson & Branigan, 2000). Although research has indicated that emotion elicitation through films is a safe, effective, and standardized way of eliciting discrete emotions (e.g., Gross & Levenson, 1995), a more active and personal approach might render even more powerful results.

Lang (1979) proposed in his bio-informational processing theory that vivid mental imagery has special links to emotions and would therefore result in greater physiological arousal and certain overt behavioral expressions than would the simple verbal description of feared situations. This would be especially powerful if people were encouraged to focus on specific sensory experiences that were part of the experience, such as smells, sounds, and sights. Research has supported this theory and shown that mental imagery elicits more powerful reactions than verbal descriptions alone of emotionally laden events (e.g., Holmes & Mathews, 2005; Pressman & Cohen, 2005), especially if the events are personal and the individual is encouraged to focus on emotions and sensory experiences (Yogo, Hama, Yogo, & Matsuyama, 1995). In addition, people report that visual imagery of pleasant events is more vivid and easier for them to focus on than imagery of negative events (Prkachin et al., 1999).

Studies on repressive coping have also indicated that suppressors (people who frequently ignore negative stimuli) are more likely to elicit happy thoughts or memories to cope with negative situations compared to non-suppressors (more anxious individuals) (Boden & Baumeister, 1997), especially if faced with a strong threat (Langens & Mörth, 2003). While suppression of emotions, whether negative or positive may have some short-term benefits, studies have shown associations between suppression and various cardiovascular diseases and poor immune functioning (Salovey et al., 2000). Suppression is therefore not encouraged as an emotion regulation strategy, but this technique of eliciting positive emotions seems to work temporarily in reducing negative affect and it would therefore be of interest to examine these effects on the cardiovascular system.

Due to these findings on differential effects of films and visual imagery on emotional experiences, it is of interest to examine whether positive emotions elicited through recall of happy personal memories renders more powerful “undoing” effects on the autonomic system and broadening of attention and thought-action repertoires than passively watching an entertaining film clip after being exposed to an anxiety provoking event. Furthermore, assuming that eliciting positive emotions through remembering a happy personal event is more readily available than an entertaining film clip, such an active coping strategy should be more practical and transportable for anxious individuals when faced with difficult situations than the passive strategy of watching an entertaining film.

### *Current study with speech anxious individuals*

The purpose of the current study was to examine the effect of positive emotions on fear arousal in a sample of speech anxious individuals. The previously described study by Fredrickson and colleagues (2000) was used as the base study and her findings were planned to be replicated and extended. Speech anxious individuals were considered the most appropriate group to replicate and extend that particular study to a clinical group since the anxiety provoking task involved delivering a speech and the purpose of the study was to carefully replicate the effects obtained in the previous study with a clinical sample.

Specifically, speech anxiety has been defined as maladaptive cognitive and physiological reactions to the environment resulting in impaired public speaking skills (Fremouw & Breitenstein, 1990). Fear of public speaking has been found to be one of the most prevalent fears in both community (Stein, Walker, & Ford, 1996) and clinical samples of socially phobic adults (APA, 1994; Holt, Heimberg, Hope, & Liebowitz, 1992) and children (Beidel, Turner, & Morris, 1999). High speech anxiety has been found to be associated with limited educational and employment opportunities (e.g., Stein et al., 1996) and can therefore impair these individuals' quality of life. As such speech anxiety is one of the most common symptoms of social anxiety disorder (APA, 1994). Although speech anxiety may be one symptom of social anxiety, individuals with severe speech anxiety do not necessarily have social anxiety disorder. However, similar to socially anxious individuals, physical symptoms and maladaptive cognitions frequently characterize people with speech anxiety. For example, anticipatory anxiety before making a speech typically leads to increased autonomic activity such as increased heart rate and galvanic skin response (Davidson, Marshall, Tomarken, & Henriques, 2000; Fredrickson et al., 2000; Paul, 1966). In addition, maladaptive cognitions such as fear of negative evaluation and prediction of poor performance frequently emerge among people with high speech anxiety (Cho, Smits, & Telch, 2004).

In the current study, high and low speech anxious individuals were randomly assigned to one of three conditions: Watching a neutral film, watching an amusing film, or recollecting a personal happy memory after being asked to prepare a speech in a short amount of time (anxiety eliciting event). The differential impact of watching a neutral versus a positive film on the speed of cardiovascular recovery was compared, as well as passively eliciting positive

emotions (watching amusing film) versus actively eliciting personal positive emotions (recollecting happy memory).

### *Hypotheses*

In general, it was expected that the results of the study would demonstrate faster cardiovascular recovery and broadened attention and thought-action repertoires among participants when positive emotions were elicited after the anxiety provoking event (preparing speech) compared to neutral emotions. Main effects were predicted for cardiovascular recovery, attention, and thought-action repertoires, depending on mode of elicitation. It was expected that heart rate would decrease and reach baseline levels quicker when participants were asked to recollect a happy memory as opposed to watching a film, whether neutral or positive. It was also expected that compared to the neutral film condition, all individuals watching the positive film would show faster cardiovascular recovery compared to individuals watching the neutral film. In addition, the scope of attention and thought-action repertoires was expected to expand the most when participants were asked to recollect a happy memory but should expand the least when neutral emotions were elicited. Changes in attention were measured using a modified Stroop task, where it was expected that individuals experiencing positive emotions would show the fastest response time, compared to individuals exposed to the neutral condition after the speech preparation phase. Thought-action repertoires and broadened thinking were measured through an assessment of how many activities each participant could think of doing based on how they were feeling and how easily they were able to process visual stimuli in global terms.

Main effects were also predicted for high and low speech anxiety groups. It was anticipated that the low anxious individuals would demonstrate faster cardiovascular recovery time and increased scope of attention and thought-action repertoires in all conditions compared to the highly anxious individuals. It was also predicted that the highly anxious individuals would take longer to reach baseline levels of heart rate and show decreased levels of attention and thought-action repertoires compared to the group with low speech anxiety in all conditions. This effect would most likely result from the high anxious group having a stronger anxiety response to the speech preparation task. Despite taking longer to recover, compared to the low anxiety group, this study was intended to demonstrate the power of

positive emotion elicitation in reducing discomfort after an anxiety provoking task, even for a group of people with high levels of speech anxiety. As such, the study served as a replication of Frederickson's seminal research with a clinical sample. In addition, differences in the ability to creatively think under pressure were assessed through asking participants to write down at the end of the study everything they had planned to say if they had been asked to deliver the speech. It was expected that the socially anxious group would think of fewer statements to make compared to the low anxiety groups, consistent with research on social anxiety or speech anxiety and verbal dysfluency under pressure (e.g., Lewin, McNeil, & Lipson, 1996).

Moreover, the study sought to demonstrate whether a personal active approach to elicit positive emotions was more powerful than passively watching a positive film, even for a group that was highly anxious. The second purpose of the study was therefore to demonstrate that a more active and personal approach to eliciting positive emotions was more powerful than passive methods. Such findings would have important implications for teaching anxious individuals practical emotion regulation strategies in stressful situations using their own resources and memories.

## **Method**

### *Participants*

103 undergraduate students enrolled in psychology courses at a major southeastern university in the United States participated in the current study. Participants were identified through a large on-line screening process after completing selected surveys and were subsequently invited to participate in the second phase of the study which was conducted in a laboratory setting. All participants who participated in the on-line study received 1 extra credit point to use in their psychology courses, and participants who participated in phase II received an additional 2 points. Participants in phase II were eligible to enter their name into a raffle for \$20 Amazon gift cards drawn intermittently throughout the semester.

Of the approximately 1200 students who responded to the on-line surveys during two consecutive semesters, 375 met criteria to participate in the second phase based on their responses to the Personal Report of Confidence as a Speaker, a measure of public speaking anxiety (PRCS; Paul, 1966), and they were all invited in for the experiment. Students who

scored below 1 standard deviation of the published mean ( $M = 14.24$ ;  $SD = 7.76$ ; Phillips, Jones, Rieger, & Snell, 1997) were considered to experience little or no anxiety in public speaking situations ( $< 6.48 =$  low anxiety group) whereas those who scored above 1 standard deviation of the mean ( $> 22 =$  high anxiety group) were expected to become highly anxious when speaking in front of others. Since the anxiety induction in the current study entailed preparing a talk that might be recorded and shown to other students, these two groups were considered an appropriate sample to test the study hypotheses.

Of the 103 participants (age range =18-26;  $M = 19.34$ ;  $SD = 1.6$ ), 30 were male (67% Caucasian, 10% African American, 17% Asian, and 6% Other) and 73 were female (74% Caucasian, 5% African American, 5% Hispanic, 12% Asian, and 4% Other). Participants included 46 students with high speech anxiety (14 males, 32 females) and 57 students with low speech anxiety (16 males, 41 females). Upon entering the laboratory, participants were randomly assigned to one of three experimental conditions, stratified by their level of anxiety and gender.

For various reasons, data from only 88 of the 103 participants (39 high speech anxious (11 males, 28 females) and 49 low speech anxious (16 males, 33 females) was complete enough to be included in the analyses. Of the 15 non-participants, 2 people served as pilot subjects, 1 person misunderstood the directions and the manipulation in the experiment, 1 person broke down crying during a positive emotion elicitation (due to tragic events and personal loss), and data from 11 people had to be discarded due to equipment malfunction or unusual patterns of physiological activity. In addition, 1 person did not return to baseline levels of heart rate at the end of the experiment. However, in order to include her in the analyses she was assigned the maximum recovery time obtained in the sample. Thus, all analyses were based on data collected from these 88 students who were randomly assigned to one of the three experimental conditions (positive film:  $n = 30$ , neutral film:  $n = 29$ , and happy memory:  $n = 29$ ).

## *Measures*

### Phase I – On-line screening stage

In addition to demographic information (age, gender, ethnicity and grade point average), participants in the online screening phase were asked to complete the following questionnaires:

*Personal Report of Confidence as a Speaker (PRCS; Paul, 1966; Appendix A):* A 30-item true-false questionnaire regarding cognitive, physiological, and behavioral symptoms experienced during public speaking (e.g., “I am in constant fear of forgetting my speech”). The measure has adequate internal consistency ( $\alpha = .91$ ) and has shown good convergent validity with other measures of communication anxiety (Daly, 1978). Scores range from 0-30. Normative studies on this questionnaire in a college sample have revealed an overall mean of approximately 14 points and a standard deviation of approximately 7 (Phillips et al., 1997). In the current study, a high internal consistency was obtained for the PRCS ( $\alpha = .97$ ).

*Beck's Depression Inventory-II (BDI-II; Beck, Steer, & Brown; Appendix A):* To assess for possible mood and adjustment problems among participants, the BDI-II, a 21-item measure of depressive symptoms among adults and adolescents, was administered as part of the on-line survey. Each question on the BDI-II has four response options ranging from low to high severity of symptoms. Items include questions regarding sleeping difficulties, guilt, suicidal thoughts, crying, and other symptoms of depression. Scores range from 1-63, where scores below 13 indicate normal functioning but scores above 20 indicate moderate to severe depression (above 29). The questionnaire has good internal consistency ( $\alpha = .92$ ), which was also obtained in the current sample ( $\alpha = .92$ ).

*Beck's Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer; Appendix A):* A 21-item questionnaire on subjective, somatic, and panic related symptoms of anxiety. The respondent answers how much she or he has been bothered by the described symptoms of anxiety for the past month on a four-point scale. Scores range from 0-54, where scores below 21 indicate low anxiety while scores above 36 indicate severe anxiety. The scale has high internal consistency ( $\alpha = .92$ ) and test-retest reliability ( $r = .75$ ) (Beck et al., 1988). In the current sample, adequate internal consistency was obtained ( $\alpha = .92$ ).

*Social Phobia and Anxiety Inventory (SPAI; Turner, Beidel, Dancu, & Stanley, 1989):* This questionnaire contains two subscales, one on social phobia and one on agoraphobia. The

social phobia subscale is 32 items and assesses cognitive, behavioral, and physiological symptoms of social anxiety in adults. The total score for the scale is calculated and 32 points are subtracted from the outcome to make it possible to obtain a total score of 0. The maximum score on the social phobia subscale is 192. The agoraphobia subscale contains 13 items and the maximum score is 78 (after subtracting 13 from total score). Assessment of agoraphobia is included in the social phobia questionnaire because physiological symptoms attributed to social phobia and avoidance of social situations are often better accounted for by agoraphobia. In order to calculate a clinical score on the SPAI it is necessary to subtract the score on the social phobia scale from the score on the agoraphobia scale. A recommended clinical cutoff score is 80 for a diagnosis of social anxiety disorder (Turner et al., 1989).

Both the social phobia and agoraphobia scales have good internal consistency (alpha = .96 for social phobia, alpha = .85 for agoraphobia) and have shown good test-retest reliability ( $r = .86$ ) (Turner et al., 1989). This study revealed similar internal consistency for both scales (alpha = .98 for social phobia, alpha = .88 for agoraphobia).

*Happy memory (Appendix A):* Participants were asked to briefly describe one of their happiest personal memories. They were asked to describe a specific memory of an event or a time in their lives when they felt particularly happy. This information was obtained to prompt those participants who were assigned to the happy memory experimental condition in phase II. A similar procedure was used in a study of coping where participants were asked to write about their happiest memory (Boden & Baumeister, 1997).

*Vividness of Visual Imagery Questionnaire (VVIQ; Marks, 1972; Appendix A):* This questionnaire assesses a person's ability to visualize scenes in the mind's eye. It consists of 4 scenarios with 4 sub-scenes (16 items total) which people rate on a five-point scale as to how well they are able to visualize the particular images. The measure has been shown to be reliable and alpha coefficients have ranged from .86 to .94 in various studies (Richardson, 1994). Marks (1986) has also shown that the measure corresponds with differential EEG patterns of activation for vivid imagers and non-vivid imagers, where folks with vivid imagery showed symmetrical activation patterns in the frontal, temporal, and parietal lobes while the non-vivid imagers showed activation mainly in the right frontal cortex (see Richardson, 1994). In the current study, an adequate internal consistency was obtained (alpha = .87).

*Affective Control Scale (ACS; Williams, Chambless, & Ahrens, 1997; Appendix A):* This questionnaire assesses fear of experiencing emotions and perceived emotional control. It contains 42 items that participants answer on a 7 point Likert scale (0 = Very strongly disagree; 7 = Very strongly agree). Fear and control of experiencing anger, depression, anxiety, and positive affect are assessed on separate scales. The questionnaire is internally consistent (alpha = .94) and has adequate test-retest reliability (r = .78). In the current study, internal consistency of alpha = .96 was obtained.

*Positive and Negative Affective Scale (PANAS; Watson, Clark, & Tellegen, 1988; Appendix A):* This questionnaire is intended to measure negative and positive emotions over the past days, weeks, months, or in general. People rate various positive and negative emotions (enthusiastic, interested, upset, guilty, etc.) on a 5-point Likert scale (1 = not at all; 5 = extremely). In the current study, participants were asked to rate how they feel in general and no specific time frame was indicated. This version of the measure has revealed high internal consistency (alpha = .87 - .88), for negative and positive factors respectively and test-retest reliability (r = .68 - .71). An internal consistency of alpha = .88 was obtained in the current study for both factors.

## Phase II: Experimental stage

Participants who were selected for phase II of the study were asked to complete the following measures in the laboratory setting:

*Anxiety Disorders Interview Schedule IV - Client (ADIS-IV; Brown, DiNardo, & Barlow, 1994):* The social phobia module from the ADIS interview was administered in this study. Since speech anxiety is highly correlated with social anxiety (e.g., Cho et al., 2004; Cook et al., 1988) it was informative to examine whether participants in the study met diagnostic criteria for social anxiety disorder for descriptive purposes. The ADIS is a semi-structured diagnostic interview which allows clinicians to evaluate symptoms and severity of various anxiety disorders based on DSM-IV criteria. Clinician's ratings range from 0-8, where 0 indicates no diagnosis, 1-3 indicates sub-clinical diagnoses, and above 4 indicates clinical diagnoses of social phobia. Reliability of diagnosis (alpha = .77) and discriminant validity have been shown to be good (Grisham, Brown, & Campbell, 2004).

*Physiological screening questions (Appendix B):* Participants were asked questions regarding smoking habits, food and drink intake, and amount of sleep and exercise on the day of the study. It was important to obtain such information to establish the validity of the physiological measures obtained during the experiment. Most participants reported they had not engaged in any of these activities the day of their participation. An examination of their responses failed to show sufficient variability regarding these behaviors and, as a result, their responses were not controlled for in the analyses.

### Experimental measures

*Global-local visual processing task (GVP; Kimchi & Palmer, 1982; Appendix B):* This task was used in a study by Fredrickson and Branigan (2005) to assess broadening of attention after elicitation of positive emotions. This paper-and-pencil task requires participants to examine 24 sets of geometrical figures. Each set includes one standard figure and two comparison figures. The participant is asked to select the comparison figure they think most resembles the standard figure. Only 8 of the 24 sets are actual test items; the others are filler items. Total scores thus range from 0-8 and depend on whether participants select the global comparison figure (contains geometrical figures which are assembled as a whole to look like the standard figure = 1 point) or the local comparison figure (contains geometrical figures that individually resemble elements of the standard figure = 0 points). Studies have indicated that a selection of the local comparison figure is linked with narrower scope of attention (Derryberry & Tucker, 1994; Fredrickson & Branigan, 2005). Internal reliability of this measure has been shown to be adequate ( $\alpha = .84$ ; Fredrickson & Branigan, 2005). In the current study an internal reliability of  $\alpha = .81$  was obtained.

*Modified Stroop Task (Appendix B):* An emotional Stroop color naming task which includes social threat related words (e.g., embarrassed, stupid, failure) and non-threatening words (e.g., specialize, network) were used to assess scope of attention and bias to threat. Participants were asked to respond as quickly as possible by pressing the computer key that matched the color of the words presented to them. Before the actual test, participants completed a practice trial of 8 words. The test itself was based on a study by Hope and colleagues (1990) on social anxiety and responses to social threat words. Social threat words were considered most appropriate given the close relationship of speech anxiety with social

anxiety in general (e.g., Holt et al., 1992). The social threat words were presented randomly on 20 trials (10 words, each word repeated twice) in between 20 trials of non-threatening words of equal frequency. The words were presented in either green, red, blue, or yellow letters through a Direct RT program (Empirisoft) and response time was recorded in milliseconds.

*Twenty Statements Test (Appendix B):* To examine broadening of thought-action repertoires, Fredrickson's Twenty Statements Test (Fredrickson & Branigan, 2005; Kuhn & McPartland, 1954) was administered during the experimental task. In this paper-and-pencil test, participants were asked to list all the things they would like to do at that moment based on how they were feeling after the film they had seen, or in this study, after thinking of their happy memory. They were provided with 20 blank lines that start with "I would like to \_\_\_\_\_".

*Statements for speech (Appendix B):* Participants were also asked to write down whatever they had prepared to say during the speech preparation phase about why "they are a good friend." This measure was obtained to assess how much material participants were able to collect and be ready to present under time pressure and while experiencing the state anxiety.

*Description of happy memory (Appendix B):* Participants who were assigned to the happy memory condition were asked to briefly describe their happy memory in writing and provide some details about their visualization to make it as vivid as possible for the experimenter. This was done in order to rate how positive their memory was and to increase engagement during the visualization task since they knew from the outset that they would have to write about the memory at the end of the study. Two undergraduate assistants independently rated the happiness of the memory on a 9-point scale (0-8) (see Appendix C). Their ratings were significantly correlated,  $r = .68$ ;  $p < .01$ .

*Manipulation check and report of emotion during study (Appendix B):* To examine whether the experimental manipulation had the intended effect, participants were asked to rate how anxious they felt while preparing the speech, how interesting the films or their memory was, and what emotion they felt while watching the film or thinking of the memory and how intense it was (joy, sadness, neutral, or fear) on a 9 point Likert scale (0-8). To check on the speech manipulation, participants were asked at the end of the study to rate on a

similar 9 point scale how likely they thought it was that they might actually have to give a speech.

### *Apparatus and stimuli*

*Films:* Two films were used for two of the experimental conditions. The amusing film, “Puppy,” shows a small dog playing with a flower. It has been used in previous studies and been shown to consistently elicit a positive emotion (amusement, see Fredrickson & Levenson, 1998). The neutral film is a video clip of a Windows screensaver called “Pipes” which shows colorful pipes slowly forming into an elaborate figure. This film was thought to be compatible to the neutral film “Sticks” (also a screensaver) used in the original studies by Fredrickson and reportedly elicited no specific emotions (see Fredrickson & Levenson, 1998). Both films were relatively brief (100 seconds) and were presented without sound.

*Anxiety induction (Appendix C):* As in the original study by Fredrickson and colleagues (2000), each participant was told that after being connected to the physiological measuring equipment they would be given 60 seconds by the computer to prepare a 3-minute speech on a to-be-determined topic. They were told that the speech would be recorded and later evaluated by students in another study. In order to be recorded they were asked to remain seated but to face the camera which was attached to the ceiling in the right corner of the room (each participant was shown the camera). The participants were also told that there was a 50% chance that the computer would select them to actually deliver their speech. They were told that if they were not selected, a film clip would begin on the computer screen or they would be given directions for a new task. If this occurred, the participants knew they did not have to deliver the speech. In reality, no participant was asked to deliver the speech.

*Experimental software:* The experimental stimuli and some dependent measures (directions for speech, films, and questions regarding the films) were presented through Medialab, an experimental software (Empirisoft, New York, NY) on a PC computer. The Stroop task was presented through DirectRT, an experimental software designed to capture accurate response time in milliseconds (Empirisoft, New York, NY).

*ECG Equipment:* To measure cardiovascular activity, continuous recordings were made using an ECG system (James Long Company, Albany, NY) along with data analysis software (Dataq). The resolution on the computer system was one millisecond for measures

of time and one millivolt for measures of amplitude. Second by second changes in heart rate were reported through the software and the sample rate was 1000 Hz. Three disposable electrodes were placed on the participant's chest. Two electrodes (negative and positive) were placed axially on the right and left rib and the third was placed on the sternum just below the collarbone in the center of the chest. The electrodes were connected to a preamplifier which was connected to a computer displaying and storing ECG data. Event markers were created in the data file through an audio tone sent from the Medialab program to the ECG system. Only heart rate was collected in this study; no other physiological measures were obtained.

### *Procedure*

The study was introduced to undergraduate psychology students and screening of possible participants was conducted on-line through the SONA system. Students completed the PRCS, BDI, BAI, SPAI, VIVQ, ACS, PANAS and described their happy memory online after consenting to participate (Appendix D). Participants who scored above the cutoff score for high speech anxiety (22) and those who score below the cutoff score for low speech anxiety (6) on the PRCS were invited to participate in phase II in the laboratory. Phase II was briefly introduced to participants before they decided whether to make an appointment or not. They were told they might be asked to complete various tasks such as answer questions about themselves, solve simple tasks, possibly give a short talk and watch films all while their physiological responses were being measured.

Upon arrival in the laboratory, the experimenter reviewed the procedure briefly with participants and obtained their additional consent before proceeding. If participants had been randomly assigned to the happy memory condition, the experimenter told them that at some point during the experiment they might be asked to think of a happy memory and instructed them to think of the one they endorsed on-line (experimenter reminded the participant which particular memory this was). The participant was encouraged to think about the memory as vividly as possible, such as any people, places, smells, sights, and sounds that were involved in the event (Appendix C). The participants were told that if they were asked to think of a memory they would later be asked to write about their thoughts and were therefore encouraged to actively engage in the visualization process. In addition, each participant was instructed to either keep their eyes closed or open, whichever helped them visualize better.

Each person was interviewed and tested individually in a quiet laboratory room. After explaining the procedure, the experimenter asked the participant to provide information regarding food intake, amount of sleep, and amount of caffeine consumed that day and then conducted a 10-15 minute semi-structured interview for social anxiety (Social Phobia module of the ADIS-IV). Next, the participant was connected to the ECG system by placing three electrodes on himself. After a 3-minute adaptation period to the physiological equipment, the participant was given further instructions about the study. The participant was asked to sit still and watch and respond to the directions presented on the computer screen in front of them. Baseline levels of cardiovascular activity were obtained for the next 2 minutes while the participant relaxed alone in the room.

After the baseline period, participants received directions on the computer to prepare a short speech on “Why are you a good friend?” and were given 60 seconds to do so (Appendix C). This speech preparation task was followed by a randomly assigned film clip (Puppy or Pipes) or the happy memory elicitation, each for 100 seconds. The film or the memory elicitation was followed by a 5-minute recovery period when the participant sat still and looked at a blank computer screen. After the recovery period, participants were asked to rate their anxiety, amusement, interest, and other emotions (Appendix B) during the speech preparation task and during the film / memory elicitation (0-8 scale).

Finally, participants were asked to complete several dependent measures intended to capture thought-action repertoires and scope of attention. Participants were asked to complete the Global-Local Visual Processing Task and the Twenty Statements Test in a random order. They were then asked to complete the Stroop task on the computer. The participants were then asked to record what they had intended to say if they had been asked to deliver the speech. Moreover, participants who were assigned to the happy memory condition were asked to briefly describe in some detail their thoughts and visualizations during the memory elicitation. Finally, all participants were asked to complete the manipulation check question regarding how strongly they believed they might have to give the speech. Upon completion of all study measures, debriefing occurred where the experimenter explained to the participants that they were never expected to deliver a speech but that the deception was necessary to induce sufficient levels of anxiety. The experimental session lasted approximately 60-90 minutes.

### *Data analyses*

To examine how quickly participants recovered with regard to cardiovascular activity, heart rate during baseline and heart rate during the recovery phase were obtained. Baseline levels of heart rate for each participant were calculated as the confidence interval of the mean heart rate during the last minute of baseline, plus and minus one standard deviation of that mean. Recovery period was calculated as the time it took each participant to reach their baseline levels of cardiac activity from the end of the speech preparation phase and stay within those boundaries (both upper and lower limit) for at least 5 of 6 consecutive seconds. This analytic strategy was adapted from Fredrickson and colleagues (1998, 2000).

## **Results**

### *Descriptive analyses of the sample*

Prior to testing the main hypotheses of the study, means and standard deviations were calculated for all the screening measures (PRCS, BDI, BAI, SPAI, VVIQ, ACS, and PANAS) for the total sample and the low and high speech anxiety groups separately. In addition, clinician's ratings based on the social phobia module of the ADIS-IV were compared for the two different groups. Effect sizes were calculated using Cohen's  $d$  (Cohen, 1992) for the various results. A  $d = .20$  was considered a small effect,  $d = .50$  a medium effect, and  $d = .80$  a large effect. Cramer's  $V$  was considered the most appropriate statistic to calculate the effect size for chi-square analyses (Berry, Johnston, & Mielke, 2006).

As anticipated, results indicated that on all measures except the VVIQ, the high anxiety group scored significantly higher than the low anxiety group. For the PRCS the high anxiety group was expected to score higher than the low anxiety group ( $F(1, 87) = 2814$ ;  $p < .001$ ;  $d = 1.1$ ) since the groups were formed based on whether participants scored in the high or low range on this measure. The findings showed that participants in the high anxiety group also reported more depressive symptoms (BDI),  $F(1, 87) = 13.22$ ;  $p < .001$ ;  $d = .75$ , higher general anxiety symptoms (BAI),  $F(1, 87) = 10.35$ ;  $p < .05$ ;  $d = .67$ , higher social anxiety (SPAI total score),  $F(1, 87) = 78.94$ ;  $p < .001$ ;  $d = 11.96$ , and were significantly more likely to meet diagnostic criteria for social anxiety disorder on the ADIS interview,  $\chi^2(1, N = 88) = 26.94$ ;  $p < .001$ ;  $\phi_c = .55$ . Similarly, 36% of the high anxiety group scored above the clinical cut-off score (80 points) for social anxiety disorder on the SPAI while no individual

in the low anxiety group met this criterion. However, no significant differences were noted for high and low anxious participants in their ability to vividly visualize images (VVVIQ),  $F(1, 86) = 3.22$ ;  $p > .05$ .

Regarding emotional control and experience of positive and negative emotions, results for the Affective Control Scale (ACS) and Positive and Negative Affect Schedule (PANAS) were examined and compared for the two groups. On the ACS, the high anxiety group reported more fear and worry about experiencing anger,  $F(1, 85) = 10.03$ ;  $p < .05$ ;  $d = .69$ , depression,  $F(1, 85) = 9.13$ ;  $p < .05$ ;  $d = .67$ , anxiety,  $F(1, 85) = 32.20$ ;  $p < .001$ ;  $d = 1.23$ , and positive affect,  $F(1, 85) = 10.16$ ;  $p < .05$ ;  $d = .70$ . On the PANAS, the high anxiety group reported experiencing negative emotions more often,  $F(1, 87) = 17.23$ ;  $p < .001$ ;  $d = .88$ , and positive emotions less often,  $F(1, 87) = 18.72$ ;  $p < .001$ ;  $d = .94$ . According to these results, the speech anxious group not only experiences positive emotions significantly less often than the low anxiety group, but they also fear experiencing these emotions for fear of losing control of their emotions once they are activated.

#### *Possible effects of the Virginia Tech shootings of April 16th*

The majority of the data for this study was collected before the tragic shooting events on the Virginia Tech campus on April 16, 2007. However, 19 % of the experimental sample completed the on-line surveys and participated in the laboratory tasks after these events had occurred. Therefore, it was possible that their psychological state and responses to the experimental manipulations might be different from the 81% of the sample who completed the measures prior to this event. Due to the fact that more highly speech anxious students were invited into the experiment after the shootings (because of uneven group membership) it was not considered appropriate to compare the questionnaire data for the experimental high and low speech anxious samples who participated before and after April 16<sup>th</sup> (because of the biased sampling). Rather, analyses were conducted on the sample of 714 students who participated in the on-line study during the spring semester only. The students who participated during the spring semester before ( $n = 510$ ) and after ( $n = 204$ ) the shootings were compared in terms of their speech anxiety (PRCS), depression symptoms (BDI), and anxiety symptoms (BAI). Results indicated that there were no significant differences in speech anxiety,  $F(1, 712) = .16$ ;  $p > .05$ , or depressive symptoms,  $F(1, 711) = 1.73$ ;  $p > .05$ .

However, a significant difference emerged in anxiety symptoms where the group of students who participated after the shootings reported more fear of dying, fear of losing control, nervousness, heart pounding, dizziness, and other such symptoms than the group participating before the event,  $F(1, 712) = 14.58; p < .001; d = 3.07$ . For the experimental measures, the high and low anxiety students who participated in the experiment after the shootings ( $n = 17$ ) demonstrated no differences in their physiological recovery rate independent of condition,  $F(1, 16) = 2.13; p > .05$ , and no differences on response time on the Stroop task,  $F(1, 16) = .01; p > .05$ . Moreover, neither did the groups that participated before the shootings ( $n = 71$ ) show any differences,  $F(1, 70) = .10; p > .05$  (for physiological recovery) and  $F(1, 70) = .01; p > .05$  (for Stroop performance). Thus, results from the experimental phase are considered valid and the data do not seem to be adversely affected by the shooting event.

### *Manipulation checks*

To verify that the experimental manipulation used to induce anxiety (the speech preparation task) had the intended effect and that the cover story was plausible, various manipulation checks were conducted throughout the study. First, participants rated on a 0-8 point scale at the end of the experiment how strongly they believed they might have to give the speech. Results of the manipulation check revealed that participants believed this story ( $M = 5.7; SD = 1.5$ ) and no differences emerged for the low and the high anxiety groups,  $F(1, 87) = 2.63; p > .05$ .

Second, participants reported their emotions on a 0-8 point scale after the speech preparation phase. Results indicated that fear and anxiety were the most commonly reported emotions during the speech preparation phase (see Figure 1). This was especially true for the high anxiety group who rated both fear ( $F(1, 87) = 66.82; p < .001; d = 1.71$ ) and anxiety ( $F(1, 87) = 44.44; p < .001; d = 1.41$ ) significantly higher than the low anxiety group (see Figure 2 and 3). On the other hand, the low anxiety group reported experiencing mostly positive emotions during this phase of the study. The low anxiety group reported experiencing interest ( $F(1, 87) = 46.02; p < .001; d = 1.48$ ), amusement ( $F(1, 87) = 25.33; d = 1$ ), and happiness ( $F(1, 87) = 29.99; p < .001; d = 1.21$ ) significantly more than the high anxiety group (see Figures 2 and 3). Thus, it is evident that the experimental manipulation elicited anxiety during the study, especially so for the high anxiety group.

Finally, independent coders rated how positive the description of the happy memory was for each participant who was assigned to that particular condition. Results indicated that the memories reported were relatively happy ( $M = 5.5$ ;  $SD = 1.74$ ; see Table 4); however, no significant difference emerged for the low and high anxiety groups,  $F(1, 87) = .005$ ;  $p > .05$ .

#### *Emotion report for experimental conditions*

In addition to reporting their emotions during the speech preparation task, participants reported their emotions after watching the films or thinking of a happy memory. Overall, the experimental stimuli elicited the intended emotions (see Table 2). For instance, while watching the Puppy film which was supposed to elicit positive emotions, participants mainly reported happiness, contentment, and amusement. The film Pipes, which was intended to elicit no emotions or at least relatively neutral ones, was unexpectedly rated rather positively by participants (interest, contentment, and amusement). However, these ratings were lower than those for the Puppy film and the Happy memory conditions. Overall, the happy memory condition elicited significantly stronger positive emotions (e.g., happiness, contentment, interest, and amusement) compared to the other two conditions (significance values ranging from  $F(1, 87) = 21.55$ ;  $p < .001$ ;  $d = .63$  to  $F(1, 87) = 68.68$ ;  $p < .001$ ;  $d = 1.27$ ).

#### *Results of cardiovascular activity*

Before testing the hypotheses of the study regarding length of recovery based on anxiety levels and experimental emotion elicitation, heart rate means were calculated for the total sample and the low and high anxiety groups separately (see Table 2). A repeated measures analysis of variance was conducted for heart rate changes during each phase of the study for the two groups and the three conditions. Significant differences emerged in heart rate across the experimental phases, independent of condition or anxiety group,  $F(3, 85) = 66.10$ ;  $p < .001$  (see Figure 4). Heart rate increased from baseline to the speech preparation phase indicating that the manipulation of the study worked to induce a significant increase in heart rate. Heart rate decreased again when participants were in the film or happy memory phase, and increased again when they reached the recovery phase. Unexpectedly, however, no differences emerged for the low and high anxiety groups,  $F(2, 86) = .92$ ;  $p > .05$ , or for the experimental conditions,  $F(1, 87) = .51$ ;  $p > .05$ . This indicates that both groups experienced the same physiological arousal in response to the speech preparation task, despite the low

anxiety group reporting less anxiety and fear on the emotion reports than the high anxiety group (see Table 2). However, interaction effects for heart rate and condition were found to be significant,  $F(6, 82) = 2.58$ ;  $p < .05$ . The groups exposed to the positive and neutral emotion films showed a significant decrease in heart rate during the film and an increase during the recovery phase. The happy memory group however did not show the same changes in heart rate and remained stable into the recovery phase (see Table 3).

One of the main purposes of this study was to determine whether participants recovered more quickly from an anxiety producing event when positive emotions were elicited, especially based on personal memories, and whether this effect would emerge even for those participants who were highly anxious. Descriptive analyses of heart rate recovery time indicated that the mean cardiovascular recovery time for the total sample independent of group or condition was 30.05 seconds (see Table 4). This recovery time was comparable to that reported by Fredrickson et al. (2000), where the mean duration of cardiovascular recovery was 30.08 seconds.

To examine the effects of positive emotion elicitation on high and low anxiety for faster cardiovascular recovery, a 2 (level of anxiety)  $\times$  3 (condition) ANOVA was calculated with a Bonferroni adjustment for Type I error ( $\alpha = .0375$ ), as suggested by Fredrickson and Levenson (1998). Level of anxiety was set as the fixed factor, experimental condition was set as the random factor, and ability for visual imagery (total score on VVIQ) was set as a covariate. Results indicated non-significant main effects for levels of anxiety, where no differences in recovery time emerged for the low and high anxiety groups after the anxiety producing event independent of condition,  $F(2, 86) = .23$ ;  $p > .0375$  (see Table 4 and Figure 5).

Main effects were also hypothesized for experimental condition where the happy memory group was expected to recover most quickly, followed by the group exposed to the Puppy film and then the group shown the Sticks film, which was expected to recover the slowest. Again, results revealed no differences for experimental conditions: all groups independent of anxiety levels recovered just as quickly after the anxiety producing event whether they were exposed to the Happy memory, Puppy film, or the neutral Sticks film,  $F(2, 86) = 1.920$ ;  $p > .0375$  (see Table 4). Interaction effects for group and experimental condition were not significant,  $F(2, 86) = .18$ ,  $p > .0375$ .

### *Results for broadened thought-action repertoires and global thinking*

The experimental elicitation of positive emotions was not only expected to help participants recover in terms of cardiovascular activity, but also to help them broaden their thought-action repertoires and global thinking. Two measures intended to capture this pattern of thinking were administered: the Global-local visual processing task (GVP) and the Twenty statements test (TST). Separate ANOVA's were calculated to examine the effects of the experimental conditions on performance on the GVP and the TST tests for the low and high anxiety groups. Results indicated non-significant main effects for condition,  $F(2, 86) = .26$ ;  $p > .05$ , and anxiety levels,  $F(1, 87) = .02$ ;  $p > .05$ , on the GVP task. Interaction effects were also non-significant,  $F(2, 86) = 2.30$ ;  $p > .05$ .

On the Twenty statements test, similar results were obtained. Non-significant main effects were observed for experimental condition,  $F(2, 86) = .32$ ;  $p > .05$ , and anxiety levels,  $F(1, 87) = .47$ ;  $p > .05$ . Interaction effects were non-significant,  $F(2, 86) = 1.21$ ;  $p > .05$  (see Table 4). These findings indicate that despite positive emotions being elicited, both low and high anxiety individuals did not report any more activities they would like to engage in compared to people exposed to the neutral film.

### *Results for hypervigilance and attention*

In addition to broadened thought-action repertoires, positive emotions were expected to affect scope of attention and hypervigilance to threat. On the Stroop color naming task, participants were expected to respond faster and more accurately to the social threat words compared to the neutral words after experiencing positive emotions. Repeated measures analysis was performed where each participant's response times to the threat and the control words were compared while mistakes made on the tests served as a covariate. Results indicated non-significant main effects for word type on the Stroop task (threat vs. neutral words), independent of condition and anxiety levels,  $F(1, 87) = .53$ ;  $p > .05$ . However, significant 3-way interaction effects emerged for anxiety level by experimental condition by type of Stroop word. Simple effects analyses indicated that the low anxiety group responded significantly slower to the threat than the control words after being exposed to the positive film, but little difference emerged for the neutral or the happy memory,  $F(2, 47) = 3.12$ ;  $p = .05$  (see Figure 6 and Table 4 for means). However, no interaction effects were observed for

the high anxiety group,  $F(2, 37) = 1.24$ ;  $p > .05$ . Thus, no difference emerged in response time to threat and control words for the high anxiety group after being exposed to the various experimental conditions.

#### *Results for creativity flexibility of thought*

At the end of the experiment, each participant was asked to write down what they had prepared to say during the speech preparation phase. Although creativity was not measured directly in this study, this procedure was considered an appropriate way to assess how easily people were able to focus on the topic at hand and prepare to do well on the task, despite being under considerable time pressure to do so. Because the speech preparation period occurred before the experimental manipulation, statistical differences were only calculated for the high and low anxiety groups and not for the experimental conditions. Results revealed a difference between the groups, where the highly anxious group thought of significantly fewer things to say for their speech than the low anxiety group,  $F(1, 87) = 12.33$ ;  $p < .01$ ;  $d = .76$  (see Table 4).

### **Discussion**

The purpose of this study was to determine whether using positive emotions to reduce the effects of negative emotions could be a viable emotion regulation strategy for a speech anxious sample. It was expected that such a strategy would not only result in faster cardiovascular recovery after an anxiety provoking event, but also help the participants increase their scope of attention, thought-action repertoires, and flexibility of thought. Not only would such effects demonstrate the power of positive emotions but also allow anxious individuals to engage in this emotion regulation process in stressful situations, especially if merely thinking of a happy memory could bring about these effects. The study was a replication and extension of Fredrickson's research on the Broaden-and-build theory and the Undoing hypothesis of cardiovascular recovery. In summary, the main hypotheses of the study were not supported and the effects of positive emotions generally did not differ from the effects of a neutral emotional state for the low and high anxiety groups.

### *Findings on the power of positive emotions*

Results of the study showed that positive emotions, whether elicited through observing a film or thinking of a happy memory, did not speed cardiovascular recovery after the speech preparation phase. This finding was surprising given previous studies that have shown the unique power of positive emotions in reducing cardiovascular recovery (e.g., Fredrickson & Levenson, 1998). It was also surprising that, contrary to the hypothesized superiority of the happy memory elicitation in speeding cardiovascular recovery, the happy memory group had the highest mean for recovery time. Although this difference was not significant, this finding was in the opposite direction from what was predicted since the happy memory participants were expected to recover the fastest. Although unexpected, it is possible that the active elicitation of positive emotions, such as thinking of a happy memory, caused greater increases in heart rate than the more passive approach of simply watching a film. It may be the case that a counterbalance effect occurred in which participants who thought of their happy memory while recovering from the speech preparation experienced increased heart rate due to the excitement induced by their pleasant thoughts. In fact, personal emotion elicitation has been found to increase cardiovascular activity in some studies (e.g., Yogo et al., 1995) whereas passive elicitation, such as viewing a film, demonstrates little or no cardiovascular change (Fredrickson et al., 2000; Pressman & Cohen, 2005). Thus, it is possible that even though participants who were asked to think of a happy memory were in fact recovering from the anxiety provoking event, their positive emotions caused an increase in heart rate. Thus, it may have looked as though they were recovering slower than the groups exposed to the films.

Another factor that might help account for the fact that that participants in this study did not respond to the experimental manipulation as in previous studies where the Broaden and build theory and the Undoing hypothesis have been tested is that this study included two extreme groups with regard to anxiety. It is possible that for these groups, experiencing positive emotions was not a powerful way of recovering after an anxiety provoking event. For example, the high anxiety group reported experiencing positive emotions less often in daily life than the low anxiety group on the PANAS during the screening and when they did experience positive emotions they reported that it scared them, according to the ACS. Thus, letting go and allowing themselves to experience positive emotions during the experimental

elicitation may have raised their anxiety levels again and thus adversely affected their recovery time. However, since their recovery rate was similar to the low anxiety group it seems more plausible that the experimental manipulation simply did not have the intended effect on their cardiovascular recovery rate.

The lack of difference in speed of cardiovascular recovery between the neutral emotion elicitation and the positive emotion conditions was contradictory to Fredrickson's findings (2000). Since this study was a replication and extension of Fredrickson's work and similar stimuli, physiological equipment, and procedure were used, these results were unexpected. It is however possible that in the current study, participants simply enjoyed the screensaver film "Pipes" more than in the neutral film in the original studies, "Sticks." In fact, the mean report of amusement in the current study was 2.26 while participants in one previous study rated the film "Sticks" 1.5 on the amusement rating scale (Fredrickson & Levenson, 1998). To increase the difference between the positive emotion conditions, a more neutral film might be used in future studies, or even a film that elicits sadness, since sadness has been shown to cause prolonged cardiovascular activation (Fredrickson & Levenson, 1998). However, the purpose of using a neutral film was to compare the effects of eliciting positive emotions compared to not engaging in any specific strategy to regulate emotions or become caught up in their catastrophic thoughts, which might realistically reflect the response of an anxious person in a real-life stressful situation if the person cannot escape. The act of watching a neutral film may, on the other hand, may have allowed the individuals to be distracted from the source of their anxiety, thus allowing them to recover as quickly as in the other conditions.

Analyses on the other dependent measures in the study revealed similar results as the cardiovascular recovery data. Participants did not demonstrate broadened thought action repertoires on the TST test or enhanced global thinking on the GVP test after experiencing positive emotions as compared to the control group. These findings are overall in contradiction to Fredrickson's results where positive films were found to elicit enhanced global thinking and increased action urges compared to neutral or negative films (Fredrickson & Branigan, 2005). However, different films were used to elicit positive emotions in the Fredrickson study (Penguins and Nature) than in the current study (Puppy), and the effects of both positive films were combined against the neutral film and the negative films in the

original study. It is therefore possible that the manipulation was simply stronger and the sample size larger in Fredrickson's study than in the current study, since the effects of the positive films (2 groups; n = 50) were pooled together against the two negative emotion film groups (n = 50) in the analyses for that particular study (Fredrickson & Branigan, 2005). Again it would be informative to compare the positive emotion conditions to negative emotion conditions (films eliciting anger and fear) to examine effects on recovery after an anxiety provoking event with regard to global processing and thought-action repertoires.

Although disappointing and in contradiction to the original hypotheses, the fact that no differences emerged between the three different conditions in terms of cardiovascular recovery, thought-action repertoires, or global thinking indicates that individuals can recover after an anxiety provoking event by engaging in some activity whether it entails watching a film or thinking of a happy memory. It is possible that simply distracting participants away from the anxiety provoking event is sufficient to calm them down. To examine this explanation a second control group that would simply do nothing after the speech preparation task would need to be tested. Another possibility is that the relief of discovering that they did not have to deliver the speech was sufficient to calm them down, independent of what activity they engaged in afterwards. It would however be difficult to test this hypothesis by having people actually deliver the speech because multiple new variables (e.g., continued cardiovascular activity due to anxiety) would be introduced and experimental control would be compromised. It would have been interesting however to examine the effects of the films and the happy memory while people still thought they might have to do the speech. Then the emotion regulation would have occurred during the anxiety provoking preparation phase and results might have revealed whether positive emotions helped people deal with their heightened arousal in a stressful situation.

#### *Findings on speech anxiety*

Just as cardiovascular recovery did not differ for the various experimental conditions, the low and high speech anxious individuals took equally long to recover after the speech preparation phase. The average recovery time for both groups corresponded with the results of the original study by Fredrickson and colleagues (2000) with a non-anxious sample of college students, suggesting that the manipulation worked in the same way. In addition, both

groups seemed to respond similarly to the prospect of making a speech based on their heart rate increases from baseline to the speech preparation phase. This finding was intriguing given that one group reported high anxiety about public speaking on the PRCS during the screening while the other group reported little or no fear of such situations.

An interesting disconnect emerged for self-reported emotions and physiological activity for the low and high speech anxious groups. Despite showing identical increases in heart rate when preparing their speech, the high anxiety group reported experiencing anxiety and fear while the low anxiety group mainly reported contentment, interest, and happiness (see Table 3). This finding becomes more understandable however when viewed in terms of attribution of emotion. According to the two-factor theory of emotion, people determine their emotions and attribute their undifferentiated physiological arousal based on information they have and the situation they are in (Gilovich, Keltner, & Nisbett, 2006). In a classic study by Schacter and Singer (1962), individuals attributed physiological arousal from a stimulant they had previously been injected with to anger if an angry person was in their presence and euphoria if a joyful individual was present. In the current study it seems that despite both groups feeling cardiovascular arousal, the high anxiety group attributed this arousal to anxiety knowing that they were fearful of public speaking situations while the low anxiety group may have attributed their arousal to the excitement and entertainment of engaging in a challenging task. This contradictory finding also maps onto the theory of internal allocation of attention (Mansell, Clarke, & Ehlers, 2003) where socially anxious people tend to focus on changes in cardiovascular activity and attribute such changes to their anxiety.

Results of the modified Stroop task also revealed interesting findings. The high speech anxious group did not show hypervigilance to the threat words in any of the three experimental conditions. This was surprising given previous research wherein such threat words have been shown to affect response speed among anxious individuals, specifically when the words tap into their catastrophic thoughts (e.g., Beck et al., 2001; Foa et al., 1993). It is possible that all the experimental conditions, given that they all seemed to elicit positive emotions to some extent, simply allowed the highly anxious participants to expand their scope of attention and reduce their hypervigilance to the threat words and thus no differences emerged for the different words. The low anxiety group on the other hand responded significantly slower to the threat words in the positive film condition. It seems that this group

that was not expected to be affected by the threat words, showed reduced scope of attention after watching the Puppy film. This finding was contrary to the hypotheses of the study and difficult to interpret. The finding should be cross-validated in future studies to determine its robustness.

Overall, the fact that the high anxious group recovered as quickly as the low anxiety group in terms of cardiovascular activity was a positive finding. This suggests that despite being highly anxious about public speaking situations, this group recovered just as readily as the group reporting low anxiety. Whether their recovery was due to the experimental manipulation of eliciting positive emotions, even through a neutral film, or through their own way of regulating their emotions, they recovered quickly after the anxiety provoking event. It is also possible that these two extreme groups responded differently to the manipulations of the study compared to the sample Fredrickson used in her studies (1998; 2000) where anxiety levels were unknown and probably consisted of people who were normally distributed in reference to anxiety. In future studies it would be worthwhile to not only compare the extreme anxiety groups but also examine a group scoring in the middle range of anxiety because the effects of positive emotion elicitation might be different for this group.

One possibility for the lack of difference between the two groups in terms of heart rate recovery and the main hypotheses is that the PRCS was not a good enough measure to identify people who would become highly anxious during the experimental procedure. Although reporting fear of speaking in front of others, it is possible that the high anxious group did not consider speaking in front of a camera and allowing other students to view the recording later as intimidating as speaking in front of a “live” audience. Their cardiovascular responses may therefore not have been as great as they might have been while preparing a speech to deliver in front of a “live” audience. The other possibility is that the low anxiety group experienced considerable cardiovascular arousal and did therefore not differ from the highly anxious group, except in their attribution of this arousal and reported emotions during the speech preparation phase. The only way to examine these possibilities in future studies is to add an experimental condition where both groups are told they are preparing a speech to deliver in front of a live audience.

### *Limitations and future direction*

Although various interesting findings emerged, the current study has several limitations that should be addressed in future studies. First, the experimental sample was based on undergraduate students who completed on-line surveys and decided to participate in the experimental phase when invited to do so. It is possible that those individuals who experience high levels of anxiety about public speaking avoided participating in the experiment. The number of subjects in this experiment was also somewhat smaller than in Fredrickson's original work (1998). The high anxiety group consisted of only 12-14 subjects in each experimental condition while in Frederickson's original study 15 subjects were exposed to each condition. However, in this study, small power does not seem to have been the issue since significance values were far from statistical significance and a few more subjects would not have resulted in statistical significance.

Many of the measures and stimuli used in the study were adapted from previous studies examining the power of positive emotions (e.g., Fredrickson et al., 2000; Fredrickson & Branigan, 2005). For future research it might be beneficial to modify and improve some of the measures. For example, some participants were confused while completing the Twenty Statements Test. They were instructed to write as many activities they could think of based on the emotion they experienced while watching the film or thinking of their happy memory. Participants were not asked what particular emotion they were reporting on and if this particular emotion was not part of the ten emotions on the emotion report then there was no way for the experimenter to know what particular emotion they were thinking of (e.g., boredom as one participant verbally reported afterwards). In addition, it is possible that the activities they reported were intended to bring them out of this particular emotional state, especially if the emotional state was negative (e.g., boredom or restlessness). Therefore, in future studies, participants should be asked what emotion they are reporting on for the TST test and whether the activities they report are intended to maintain or bring them out of this particular emotional state.

Finally, another limitation of this study is the lack of more measures of cardiovascular activity. In the current study, the equipment available only allowed for measurement of heart rate and not blood pressure (systolic and diastolic) or pulse transmissions to the finger and ear as in previous studies (e.g., Fredrickson & Branigan, 2000). An index of parasympathetic

activity such as heart rate variability would have been informative to obtain especially since parasympathetic activity has mainly been associated with autonomic flexibility and emotion regulation (e.g., Friedman & Thayer, 1998; Porges, 1995).

### *Conclusion*

The current study adds to the growing literature of the impact of positive emotions. While continuation of research on negative emotions is important, the shifting focus to positive emotions is a welcome change, especially in the field of clinical psychology. The findings of this study show that even though individuals are highly anxious they can recover as quickly as those with little anxiety after a stressful situation. However, contrary to previous findings (Fredrickson et al., 1998), it does not seem to matter whether this recovery occurs after being exposed to a neutral film (although rated somewhat positively) or experiencing positive emotions after watching a film or thinking of happy memories.

The continued search for effective emotion regulation strategies for anxious populations continues. In future studies, the present methodology should be modified and extended to further examine the possible value of elicitation of positive emotions for anxious individuals. Until then, the effects of positive emotions on cardiovascular recovery, thought-action repertoires, scope of attention, and flexibility of thought remain to be examined more conclusively.

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## **Appendix A**

### **Phase I: Screening measures**

## Demographic Questions

(All personal information will be kept strictly confidential, will not be released to anyone outside of the current project except as required for safety or legal issues, and shall be destroyed at the conclusion of this investigation)

**Date:** \_\_\_\_\_

**Name:** \_\_\_\_\_

**Age:** \_\_\_\_\_ **Date of Birth:** \_\_\_\_\_ **Sex:** \_\_\_ Female \_\_\_ Male

**Race:** \_\_\_ Caucasian \_\_\_ Hispanic \_\_\_ Other: \_\_\_\_\_  
\_\_\_ African American \_\_\_ Asian

**E-mail:** \_\_\_\_\_

**Telephone number:** \_\_\_\_\_

**What is your GPA?** \_\_\_\_\_

## Personal Report of Confidence as a Speaker (PRCS)

Paul, 1966

This instrument is composed of 30 items regarding your feelings of confidence as a speaker. After each question there is a “true” and a “false.” Try to decide whether “true” or “false” most represents your feelings associated with your most recent speech, then put a circle around the “true” or “false.” Remember that this information is completely confidential. Work quickly and don’t spend much time on any one question. We want your first impression on this questionnaire. Go ahead, work quickly, and answer every question.

- |   |   |   |
|---|---|---|
| 1. I look forward to an opportunity to speak in public.   | T | F |
| 2. My hands tremble when I try to handle objects on the platform.                                 | T | F |
| 3. I am in constant fear of forgetting my speech.   | T | F |
| 4. Audiences seem friendly when I address them.   | T | F |
| 5. While preparing a speech I am in a constant state of anxiety.                                  | T | F |
| 6. At the conclusion of a speech I feel that I have had a pleasant experience.                    | T | F |
| 7. I dislike to use my body and voice expressively.   | T | F |
| 8. My thoughts become confused and jumbled when I speak before an audience.                       | T | F |
| 9. I have no fear of facing an audience.  | T | F |
| 10. Although I am nervous just before getting up I soon forget my fears and enjoy the experience. | T | F |
| 11. I face the prospect of making a speech with complete confidence.                              | T | F |
| 12. I feel that I am in complete possession of myself while speaking.                             | T | F |
| 13. I prefer to have notes on the platform in case I forget my speech.                            | T | F |
| 14. I like to observe the reactions of my audience to my speech.                                  | T | F |
| 15. Although I talk fluently with friends, I am at a loss for words on the platform.              | T | F |

- |   |   |   |
|---|---|---|
| 16. I feel relaxed and comfortable while speaking.  | T | F |
| 17. Although I do not enjoy speaking in public I do not particularly dread it.                  | T | F |
| 18. I always avoid talking in public if possible.   | T | F |
| 19. The faces of my audience are blurred when I look at them.                                   | T | F |
| 20. I feel disgusted with myself after trying to address a group of people.                     | T | F |
| 21. I enjoy preparing a talk.   | T | F |
| 22. My mind is clear when I face an audience  | T | F |
| 23. I am fairly fluent.   | T | F |
| 24. I perspire and tremble just before getting up to speak.                                     | T | F |
| 25. My posture feels strained and unnatural.  | T | F |
| 26. I am fearful and tense all the while I am speaking before a group of people.                | T | F |
| 27. I find the prospect of speaking mildly pleasant.  | T | F |
| 28. It is difficult for me to calmly search my mind for the right words to express my thoughts. | T | F |
| 29. I am terrified at the thought of speaking before a group of people.                         | T | F |
| 30. I have a feeling of alertness in facing an audience.  | T | F |

## Beck Depression Inventory

Choose one statement from among the group of four statements in each question that best describes how you have been feeling during the **past few days**. Circle the number beside your choice.

1	<p><b>0</b> I do not feel sad.  <b>1</b> I feel sad much of the time.  <b>2</b> I am sad all the time.  <b>3</b> I am so sad or unhappy that I can't stand it.</p>	8	<p><b>0</b> I don't criticize or blame myself more than usual.  <b>1</b> I am more critical of myself than I used to be.  <b>2</b> I criticize myself for all of my faults.  <b>3</b> I blame myself for everything bad that happens.</p>
2	<p><b>0</b> I am not discouraged about my future.  <b>1</b> I feel more discouraged about my future than I used to be.  <b>2</b> I do not expect things to work out for me.  <b>3</b> I feel my future is hopeless and will only get worse.</p>	9	<p><b>0</b> I don't have any thoughts about killing myself.  <b>1</b> I have thoughts about killing myself, but I would not carry them out.  <b>2</b> I would like to kill myself.  <b>3</b> I would kill myself if I had the chance.</p>
3	<p><b>0</b> I do not feel like a failure.  <b>1</b> I feel I have failed more than I should have.  <b>2</b> As I look back, I see a lot of failures.  <b>3</b> I feel I am a total failure as a person.</p>	10	<p><b>0</b> I don't cry any more than I used to.  <b>1</b> I cry more than I used to.  <b>2</b> I cry over every little thing.  <b>3</b> I feel like crying, but I can't.</p>
4	<p><b>0</b> I get as much pleasure as I ever did from the things I enjoy.  <b>1</b> I don't enjoy things as much as I used to.  <b>2</b> I get very little pleasure from the things I used to enjoy.  <b>3</b> I can't get any pleasure from the things I used to enjoy.</p>	11	<p><b>0</b> I am no more restless or wound up than usual.  <b>1</b> I feel more restless or wound up than usual.  <b>2</b> I am so restless or agitated that it's hard to stay still.  <b>3</b> I am so restless or agitated that I have to keep moving or doing something.</p>
5	<p><b>0</b> I don't feel particularly guilty.  <b>1</b> I feel guilty over many things I have done or should have done.  <b>2</b> I feel quite guilty most of the time.  <b>3</b> I feel guilty all of the time.</p>	12	<p><b>0</b> I have not lost interest in other people or activities.  <b>1</b> I am less interested in other people or things than before.  <b>2</b> I have lost most of my interest in other people or things.  <b>3</b> It's hard to get interested in anything.</p>
6	<p><b>0</b> I don't feel I am being punished.  <b>1</b> I feel I may be punished.  <b>2</b> I expect to be punished.  <b>3</b> I feel I am being punished.</p>	13	<p><b>0</b> I make decisions about as well as ever.  <b>1</b> I find it more difficult to make decisions than usual.  <b>2</b> I have much greater difficulty in making decisions than I used to.  <b>3</b> I have trouble making any decisions.</p>
7	<p><b>0</b> I feel the same about myself as ever.  <b>1</b> I have lost confidence in myself.  <b>2</b> I am disappointed in myself.  <b>3</b> I dislike myself.</p>	14	<p><b>0</b> I do not feel I am worthless.  <b>1</b> I don't consider myself as worthwhile and useful as I used to.  <b>2</b> I feel more worthless as compared to other people.  <b>3</b> I feel utterly worthless.</p>

15	<p><b>0</b> I have as much energy as ever.  <b>1</b> I have less energy than I used to have.  <b>2</b> I don't have enough energy to do very much.  <b>3</b> I don't have enough energy to do anything.</p>		
16	<p><b>0</b> I have not experienced any change in my sleeping pattern.</p> <hr/> <p><b>1a</b> I sleep somewhat more than usual.  <b>1b</b> I sleep somewhat less than usual.</p> <hr/> <p><b>2a</b> I sleep a lot more than usual.  <b>2b</b> I sleep a lot less than usual.</p> <hr/> <p><b>3a</b> I sleep most of the day.  <b>3b</b> I wake up 1-2 hours early and can't get back to sleep.</p>	19	<p><b>0</b> I can concentrate as well as ever.  <b>1</b> I can't concentrate as well as usual.  <b>2</b> It's hard to keep my mind on anything for very long.  <b>3</b> I find I can't concentrate on anything.</p>
17	<p><b>0</b> I am no more irritable than usual.  <b>1</b> I am more irritable than usual.  <b>2</b> I am much more irritable than usual.  <b>3</b> I am irritable all the time.</p>	20	<p><b>0</b> I am no more tired or fatigued than usual.  <b>1</b> I get more tired or fatigued more easily than usual.  <b>2</b> I am too tired or fatigued to do a lot of the things I used to do.  <b>3</b> I am too tired or fatigued to do most of the things I used to do.</p>
18	<p><b>0</b> I have not experienced any change in my appetite.</p> <hr/> <p><b>1a</b> My appetite is somewhat less than usual.  <b>1b</b> My appetite is somewhat greater than usual.</p> <hr/> <p><b>2a</b> My appetite is much less than before.  <b>2b</b> My appetite is much greater than usual.</p> <hr/> <p><b>3a</b> I have no appetite at all.  <b>3b</b> I crave food all the time.</p>	21	<p><b>0</b> I have not noticed any recent change in my interest in sex.  <b>1</b> I am less interested in sex than I used to be.  <b>2</b> I much less interested in sex now.  <b>3</b> I have lost interest in sex completely.</p>

**Beck Anxiety Inventory**

Below is a list of common symptoms of anxiety. Please carefully read each item in the list. Indicate how much you have been bothered by that symptom during the past month, including today, by circling the number in the corresponding space in the column next to each symptom.

	Not At All	Mildly but it didn't bother me much.	Moderately - it wasn't pleasant at times	Severely – it bothered me a lot
Numbness or tingling	0	1	2	3
Feeling hot	0	1	2	3
Wobbliness in legs	0	1	2	3
Unable to relax	0	1	2	3
Fear of worst happening	0	1	2	3
Dizzy or lightheaded	0	1	2	3
Heart pounding/racing	0	1	2	3
Unsteady	0	1	2	3
Terrified or afraid	0	1	2	3
Nervous	0	1	2	3
Feeling of choking	0	1	2	3
Hands trembling	0	1	2	3
Shaky / unsteady	0	1	2	3
Fear of losing control	0	1	2	3
Difficulty in breathing	0	1	2	3
Fear of dying	0	1	2	3
Scared	0	1	2	3
Indigestion	0	1	2	3
Faint / lightheaded	0	1	2	3
Face flushed	0	1	2	3
Hot/cold sweats	0	1	2	3
<b>Column Sum</b>				

## Happy Memory

Select and briefly describe (only a few sentences) one of your happiest memory. This memory can be from any time in your life when you felt particularly content and happy.

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## Vividness of visual imagery questionnaire

(Marks, 1972)

Visual imagery refers to the ability to visualize, that is, the ability to form mental pictures, or to "see in the mind's eye". Marked individual differences have been found in the strength and clarity of reported visual imagery and these differences are of considerable psychological interest.

The aim of this test is to determine the vividness of your visual imagery. The items of the test will possibly bring certain images to your mind. You are asked to rate the vividness of each image by reference to the 5-point scale given below. For example, if your image is "vague and dim" then give it a rating of 4. After each item write the appropriate number in the box provided. The first box is for an image obtained with your eyes open and the second box is for an image obtained with your eyes closed. Before you turn to the items on the next page, familiarize yourself with the different categories on the rating scale. Throughout the test, refer to the rating scale when judging the vividness of each image. Try to do each item separately, independent of how you may have done other items.

Complete all items for images obtained with the eyes open and then return to the beginning of the questionnaire and rate the image obtained for each item with your eyes closed. Try and give your "eyes closed" rating independently of the "eyes open" rating. The two ratings for a given item may not in all cases be the same.

### Rating Scale

The image aroused by an item might be:

Perfectly clear and as vivid as normal vision	rating 1
Clear and reasonably vivid	rating 1
Moderately clear and vivid	rating 3
Vague and dim	rating 4
No image at all, you only "know" that you are thinking of an object	rating 5

.....

In answering items 1 to 4, think of some relative or friend whom you frequently see (but who is not with you at present) and consider carefully the picture that comes before your mind's eye.

- 1 The exact contour of face, head,

- shoulders and body.
- 2 Characteristic poses of head, attitudes of body etc.
  - 3 The precise carriage, length of step, etc. in walking.
  - 4 The different colours worn in some familiar clothes.
- 

Visualize the rising sun. Consider carefully the picture that comes before your mind's eye.

- 5 The sun is rising above the horizon into a hazy sky
  - 6 The sky clears and surrounds the sun with blueness
  - 7 Clouds. A storm blows up, with flashes of lightening
  - 8 A rainbow appears
- 

Think of the front of a shop which you often go to. Consider the picture that comes before your mind's eye.

- 9 The overall appearance of the shop from the opposite side of the road
  - 10 A window display including colours, shape and details of individual items for sale.
  - 11 You are near the entrance. The colour, shape and details of the door.
  - 12 You enter the shop and go to the counter. The counter assistant serves you. Money changes hands.
-

Finally, think of a country scene which involves trees, mountains and a lake.  
Consider the picture that comes before your mind's eye.

- 13 The contours of the landscape
- 14 The colour and shape of the trees
- 15 The colour and shape of the lake
- 16 A strong wind blows on the tree and on  
the lake causing waves

### Positive and Negative Affect Schedule (PANAS)

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you generally feel this way, that is how you feel on average. Use the following scale to record your answers.

1	2	3	4	5
Very slightly or not at all	A little	Moderately	Quite a bit	Extremely
_____ interested			_____ irritable	
_____ distressed			_____ alert	
_____ excited			_____ ashamed	
_____ upset			_____ inspired	
_____ strong			_____ nervous	
_____ guilty			_____ determined	
_____ scared			_____ attentive	
_____ hostile			_____ jittery	
_____ enthusiastic			_____ active	
_____ proud			_____ afraid	

## **Appendix B**

### **Phase II: Experimental questionnaires and stimuli**

## Physiological Measures Screening Questionnaire

Subject # \_\_\_\_\_

1. Have you eaten today? Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, what did you eat and how much?

\_\_\_\_\_

If yes, what time did you last eat? \_\_\_\_\_

2. Have you consumed any drinks with caffeine, such as coffee, tea, Coke or Pepsi, or other soda with caffeine today? Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, how much did you drink today? \_\_\_\_\_

What time and day did you last drink caffeine? \_\_\_\_\_

3. How many hours of sleep did you get last night? \_\_\_\_\_

4. Have you exercised vigorously or done any other activity that would raise your heart rate in the last four hours? Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, please describe the activity \_\_\_\_\_

If yes, what time did you last do this activity? \_\_\_\_\_

5. Do you exercise regularly? Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, what type of exercise do you do? \_\_\_\_\_

If yes, how often do you exercise each week? \_\_\_\_\_

6. Do you smoke or chew tobacco? Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, when was the last time? \_\_\_\_\_

## **Modified Stroop Task**

### Social threat words

1. Embarrassed
2. Stupid
3. Failure
4. Inferior
5. Boring
6. Foolish
7. Criticized
8. Shameful
9. Inadequate
10. Ridiculous

### Control Words

1. Specialized
2. Insert
3. Network
4. Obsidian
5. Metric
6. Portion
7. Narratives
8. Softened
9. Imperative
10. Democratic

### Twenty Statements Test – For film

Think about how you felt while watching the film. Take a moment to imagine being in a situation yourself in which that particular feeling would arise. Concentrate on all the emotion you would feel and live it as vividly and as deeply as possible. *Given this feeling*, please *list* all the things you would like to do *right now*. Just do as many as you can think of.

1. I would like to \_\_\_\_\_

2. I would like to \_\_\_\_\_

3. I would like to \_\_\_\_\_

4. I would like to \_\_\_\_\_

5. I would like to \_\_\_\_\_

6. I would like to \_\_\_\_\_

7. I would like to \_\_\_\_\_

8. I would like to \_\_\_\_\_

9. I would like to \_\_\_\_\_

10. I would like to \_\_\_\_\_

11. I would like to \_\_\_\_\_

12. I would like to \_\_\_\_\_

13. I would like to \_\_\_\_\_

14. I would like to \_\_\_\_\_

15. I would like to \_\_\_\_\_

16. I would like to \_\_\_\_\_

17. I would like to \_\_\_\_\_

18. I would like to \_\_\_\_\_

19. I would like to \_\_\_\_\_

20. I would like to \_\_\_\_\_

### **Twenty Statements Test – For memory elicitation**

Think about how you felt while thinking of your happy memory. Take a moment to imagine being in a situation yourself in which that particular feeling would arise. Concentrate on all the emotion you would feel and live it as vividly and as deeply as possible. *Given this feeling*, please *list* all the things you would like to do *right now*. Just do as many as you can think of.

1. I would like to \_\_\_\_\_

2. I would like to \_\_\_\_\_

3. I would like to \_\_\_\_\_

4. I would like to \_\_\_\_\_

5. I would like to \_\_\_\_\_

6. I would like to \_\_\_\_\_

7. I would like to \_\_\_\_\_

8. I would like to \_\_\_\_\_

9. I would like to \_\_\_\_\_

10. I would like to \_\_\_\_\_

11. I would like to \_\_\_\_\_

12. I would like to \_\_\_\_\_

13. I would like to \_\_\_\_\_

14. I would like to \_\_\_\_\_

15. I would like to \_\_\_\_\_

16. I would like to \_\_\_\_\_

17. I would like to \_\_\_\_\_

18. I would like to \_\_\_\_\_

19. I would like to \_\_\_\_\_

20. I would like to \_\_\_\_\_

### Emotion Report – for speech preparation

Please report how much, if any, of the following emotions you experienced while preparing your speech.

#### Amusement

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8  
None                      A little bit                      Some                      Quite a bit                      A great deal

#### Anger

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8  
None                      A little bit                      Some                      Quite a bit                      A great deal

#### Disgust

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8  
None                      A little bit                      Some                      Quite a bit                      A great deal

#### Fear

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8  
None                      A little bit                      Some                      Quite a bit                      A great deal

#### Interest

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8  
None                      A little bit                      Some                      Quite a bit                      A great deal

#### Contentment

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8  
None                      A little bit                      Some                      Quite a bit                      A great deal

#### Anxiety

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8  
None                      A little bit                      Some                      Quite a bit                      A great deal

#### Sadness

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8  
None                      A little bit                      Some                      Quite a bit                      A great deal

#### Serenity

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8  
None                      A little bit                      Some                      Quite a bit                      A great deal

#### Happiness

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8

None                      A little bit                      Some                      Quite a bit                      A great deal

### Emotion Report – for films

Please report how much, if any, of the following emotions you experienced while watching the film.

#### Amusement

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8  
None                      A little bit                      Some                      Quite a bit                      A great deal

#### Anger

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8  
None                      A little bit                      Some                      Quite a bit                      A great deal

#### Disgust

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8  
None                      A little bit                      Some                      Quite a bit                      A great deal

#### Fear

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8  
None                      A little bit                      Some                      Quite a bit                      A great deal

#### Interest

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8  
None                      A little bit                      Some                      Quite a bit                      A great deal

#### Contentment

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8  
None                      A little bit                      Some                      Quite a bit                      A great deal

#### Anxiety

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8  
None                      A little bit                      Some                      Quite a bit                      A great deal

#### Sadness

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8  
None                      A little bit                      Some                      Quite a bit                      A great deal

#### Serenity

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8  
None                      A little bit                      Some                      Quite a bit                      A great deal

#### Happiness

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8

None                      A little bit                      Some                      Quite a bit                      A great deal

### Emotion Report – for happy memory

Please report how much, if any, of the following emotions you experienced while thinking of your happy memory.

#### Amusement

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8  
None                      A little bit                      Some                      Quite a bit                      A great deal

#### Anger

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8  
None                      A little bit                      Some                      Quite a bit                      A great deal

#### Disgust

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8  
None                      A little bit                      Some                      Quite a bit                      A great deal

#### Fear

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8  
None                      A little bit                      Some                      Quite a bit                      A great deal

#### Interest

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8  
None                      A little bit                      Some                      Quite a bit                      A great deal

#### Contentment

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8  
None                      A little bit                      Some                      Quite a bit                      A great deal

#### Anxiety

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8  
None                      A little bit                      Some                      Quite a bit                      A great deal

#### Sadness

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8  
None                      A little bit                      Some                      Quite a bit                      A great deal

#### Serenity

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8  
None                      A little bit                      Some                      Quite a bit                      A great deal

#### Happiness

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8



### Statements for speech

Please take a minute to write down some things that you would have liked to say in your speech on why you are good friend.

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
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- \_\_\_\_\_
- \_\_\_\_\_

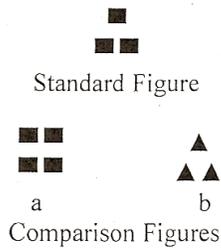
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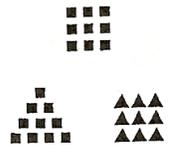
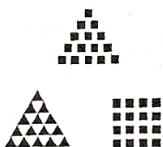
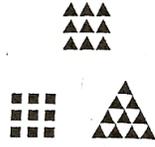
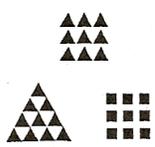
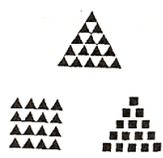
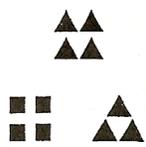
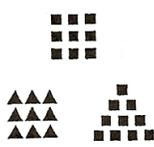
On the following scale, please indicate how much you believed that you might actually have to give a speech during this study.

0 ----- 1 ----- 2 ----- 3 ----- 4 ----- 5 ----- 6 ----- 7 ----- 8  
None            A little bit            Some            Quite a bit            A great deal

### Visual processing task

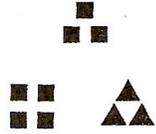
Please examine these figures. Circle one of the comparison figures (a or b) within each box that you think most resembles the standard figure (the figure that is above the comparison figures). Please give your immediate and spontaneous impression. There are no right or wrong answers.



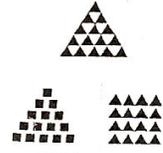
1.		2.	
3.		4.	
5.		6.	
7.		8.	

<p>9.</p>	<p>10.</p>
<p>11.</p>	<p>12.</p>
<p>13.</p>	<p>14.</p>
<p>15.</p>	<p>16.</p>
<p>17.</p>	<p>18.</p>
<p>19.</p>	<p>20.</p>

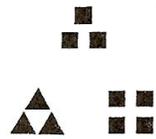
21.



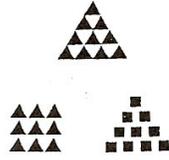
22.



23.



24.



## **Appendix C**

### **Directions for anxiety induction and happy memory condition**

## **Speech Task**

Please prepare a 3-minute speech about why you are a good friend. You will be given 60 seconds to prepare it. The speech will be recorded and later evaluated by students in another study. There is a 50% chance that the computer will select you to give your speech. If it does not select you, a film clip will begin on the computer screen for you to observe or you will be given instructions for another task.

### **Directions for happy memory elicitation**

Please take a moment and think about one of your happiest memory (the one you have previously indicated to the experimenter). Close your eyes and try to visualize the event in detail. Think about where you were, who was there, what was going on, and sights, sounds, and smells that you experienced. At the end of the study you'll be asked to write about your memory so please try to think about it as vividly as you can.

## Happy memory coding scale

0 – Not happy at all. Events described are somewhat sad or bad

1

2 – A little happy. Overall neutral events being described. Events that you would not feel particularly happy about.

3

4 – Somewhat happy. Individual describes a happy event in a somewhat neutral and impersonal manner. But events are still happy.

5

6 – Pretty happy. Person describes events that were personal and meaningful to him / her and generally pretty happy. Person describes a situation that includes important people in his / her life

7

8 – Very happy. Events described are very personal and exhilarating. When reading the descriptions you can visualize the event and “experience” the emotions the person is describing. Person even uses positive emotions words in their description.

**Appendix D**  
**Consent and debriefing forms**

**Consent form – Online study**  
**VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY**

**Informed Consent for Participants in  
Research Projects Involving Human Subjects**

**Title of Project:** Reduction of fear arousal in young adults with speech anxiety through elicitation of positive emotions

**Investigators:** Dagmar Hannesdottir, M.S., & Thomas Ollendick, Ph.D.

**I. The Purpose of the Research**

The purpose of Phase I of this study is to examine the relation among a variety of variables related to emotions, emotion control, and anxiety.

**II. Procedure and Duration of Participation**

You will be asked to complete several self-report questionnaires on-line. These questionnaires involve you answering questions about sadness, anxiety regarding speech and social situations, and emotional control. Filling out these questionnaires should take about 1 hour.

**III. Risks**

Participation in this study is not expected to have risks, other than those associated with filling out questionnaires about your self. If you report certain levels of fear of public speaking, you will be invited to participate in a laboratory assessment (Phase II). You are under no obligation to participate in Phase II, however.

**IV. Benefits of this study**

While you will gain no personal benefits from your participation, the information gathered in this study will aid us understand the relationship between certain emotions and emotional control.

**V. Extent of Anonymity and Confidentiality**

All the information that you provide will be confidential and access to your data will be restricted to the primary investigators. Your data, along with that of others, will be stored in a secure location. Your student ID number will be collected to assign you extra credit. This information will be encrypted and will not be part of your data file. At no time will your information be released without your permission. However, if you indicate that you want to hurt yourself or others we are bound by law to report that information to the appropriate authorities in order to keep you safe. If you choose to seek further mental health services, please understand that you are responsible for the cost of those services.

**VI. Compensation**

For your participation in this study, you will receive the equivalent of one hour extra credit in any one course that offers extra credit for participation in psychological experiments. Contact your course instructor regarding alternative means of obtaining extra credit. If your course does not offer extra credit, you should understand that no compensation is provided.

**VII. Freedom to Withdraw**

You are free to withdraw from the study any time you choose by closing the web page. If you choose to withdraw you will not be penalized by losing extra credit hours.

**VIII. Approval of Research**

This research project has been approved, as required, by the Institutional Review Board for Research Involving Human Subjects at Virginia Tech, as well as the Human Subjects Committee of the Department of Psychology.

## **Consent form – Experimental phase (phase II)**

### **VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY**

#### **Informed Consent for Participants in Research Projects Involving Human Subjects**

**Title of Project: Reduction of fear arousal in young adults with speech anxiety through elicitation of positive emotions**

**Investigators: Dagmar Hannesdóttir, M.S., & Thomas Ollendick, Ph.D.**

#### **II. The Purpose of the Research**

Recent research suggests that elicitation of certain emotions helps people recover more quickly after an anxiety producing event. The purpose of Phase II of this study is to examine the effect of emotions on cardiovascular recovery and attention in response to an anxiety provoking event.

#### **II. Procedure and Duration of Participation**

You will be asked to complete a structured clinical interview, as well as a questionnaire about your feelings, a short computer task, and a few short writing tasks. You might also be asked to give a short speech, view a film clip, or think about a happy personal memory. While you complete these tasks (short speech, watching film clip, or thinking about memory) you will be videotaped. However, your clinical interview will not be videotaped. During this time you will be fitted with non-invasive, adhesive electrodes in order to measure your heart rate. This study is expected to take approximately 1 hour and 30 minutes of your time.

#### **III. Risks**

Participation in this study is expected to have only minimal risks. During the study, you may be asked to do something that could make you feel somewhat anxious and uncomfortable (e.g. talk in front of a video camera). You do not have to answer any questions or discuss any topics that make you feel uneasy nor will you ever be asked to anything you do not want to do. You may stop participating in this study at any time if you are too uncomfortable.

#### **IV. Benefits of this study**

While you will gain no personal benefits from your participation, the information gathered in this study will aid us in understanding how eliciting certain emotions can help people recover from anxiety provoking experiences.

#### **V. Extent of Anonymity and Confidentiality**

All the information that you provide will be confidential and access to your data will be restricted to the primary investigators. Your data, along with that of others, will be stored in a secure location. Your student ID number will be collected to assign you extra credit. This information will be encrypted and will not be part of your data file. The video recordings will be coded by two trained undergraduate research assistants and the videotapes will be kept in a locked office at all times. All video recordings will be erased at the end of the study. At no time will your information be released without your permission. However, if you indicate that you want to hurt yourself or others we are bound by law to report that information to the appropriate authorities in order to keep you safe. If you

choose to seek further mental health services, please understand that you are responsible for the cost of those services.

**VI. Compensation**

For your participation in this study, you will receive the equivalent of two hours of extra credit in any one course that offers extra credit for participation in psychological experiments. Contact your course instructor regarding alternative means of obtaining extra credit. If your course does not offer extra credit, you should understand that no compensation is provided.

**VII. Freedom to Withdraw**

You are free to withdraw from the study any time you choose by telling the experimenter you want to stop. If you choose to withdraw you will not be penalized by losing extra credit hours.

**VIII. Approval of Research**

This research project has been approved, as required, by the Institutional Review Board for Research Involving Human Subjects at Virginia Tech, as well as the Human Subjects Committee of the Department of Psychology.

\_\_\_\_\_ IRB Approval Date

\_\_\_\_\_ Approval Expiration Date

**IX. Participant's Responsibilities**

I voluntarily agree to participate in this study. I have the following responsibility: To complete the questionnaires, interview, and computer tasks honestly and to the best of my ability.

**X. Participant's Permission**

I have read and understand the Informed Consent and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent for participation in this project:

\_\_\_\_\_ Date: \_\_\_\_\_  
Subject signature

\_\_\_\_\_ Date: \_\_\_\_\_  
Witness

Should I have any pertinent questions about this research or its conduct, and research subjects' rights, I may contact:

- |   |                 |
|---|-----------------|
| <b>Thomas H. Ollendick, Ph.D.</b><br>Primary Researcher   | <b>231-6451</b> |
| <b>Dagmar Hannesdottir, M.S.</b><br>Co-researcher   | <b>231-3514</b> |
| <b>David Harrison, Ph.D.</b><br>Chair, Human Subjects Committee   | <b>231-6581</b> |
| <b>David M. Moore, Ph.D.</b><br>Chair, Institutional Review Board<br>Office of the Research Compliance<br>Research and Graduate Studies | <b>231-4991</b> |



**Table 1**

Means and standard deviations for screening measures and results of diagnostic interview.

	<b>Total sample (N=88) M (SD)</b>	<b>Low speech anxiety (n=49) M (SD)</b>	<b>High speech anxiety (n=39) M (SD)</b>
<b>PRCS</b>	13.03 (10.14)	4.26 (1.54)	24.28 (2.03)**
<b>BDI</b>	9.53 (9.12)	6.62 (6.39)	13.26 (10.69)**
<b>BAI</b>	9.20 (9.33)	6.53 (7.46)	12.62 (10.42)*
<b>SPAI</b>			
Total score	44.92 (31.80)	25.41 (2.55)	69.44 (4.54)**
Social phobia	63.19 (38.03)	38.02 (2.86)	94.81 (4.97)**
Agoraphobia	18.44 (11.09)	12.93 (1.00)	25.37 (1.83)**
<b>VIVQ</b>	31.92 (9.16)	30.43 (7.97)	33.95 (10.33)
<b>ADIS-IV: Social phobia</b>			
Clinician rating (0-8)	2.28 (2.28)	.88 (1.37)	4.08 (1.94)**
Number meeting diagnostic criteria	27	4	23**
<b>ACS</b>			
Anger	26.72 (7.98)	24.47 (7.43)	29.70 (7.79)*
Depression	25.51 (11.02)	22.53 (11.20)	29.46 (9.56)*
Anxiety	43.62 (14.46)	37.05 (12.05)	52.33 (12.77)**
Positive affect	37.27 (9.94)	34.45 (9.91)	41.01 (8.79)*
<b>PANAS</b>			
Positive	32.68 (7.05)	35.32 (6.86)	29.36 (5.83)**
Negative	20.91 (6.88)	18.41 (5.52)	24.04 (7.20)**

\*p&lt;.05 PRCS = Personal Report of Confidence as a Speaker BDI = Beck's depression inventory BAI = Beck's anxiety inventory

\*\*p&lt;.001 SPAI = Social phobia and anxiety inventory VIVQ = Vividness of visual imagery Questionnaire

ADIS-IV = Anxiety disorders interview schedule – IV ACS = Affective Control Scale PANAS = Positive and Negative Affect Schedule

**Table 2**

Means and standard deviations for emotion reports completed for the speech preparation phase and the film or memory conditions.

	<b>Total sample (N=88) M (SD)</b>	<b>Low anxiety (n=49) M (SD)</b>	<b>High anxiety (n=39) M (SD)</b>
<b>Emotions during speech preparation</b>			
Amusement	1.41 (1.69)	2.12 (1.51)	.51 (1.47)
Anger	.47 (1.17)	.12 (.44)	.90 (1.60)
Disgust	.40 (.95)	0 (0)	.90 (1.27)
Fear	2.92 (2.47)	1.47 (1.49)	4.74 (2.26)
Interest	2.41 (1.83)	3.37 (1.65)	1.21 (1.24)
Contentment	1.75 (1.76)	2.55 (1.83)	.74 (1.02)
Anxiety	3.43 (2.61)	2.08 (1.89)	5.13 (2.40)
Sadness	.035 (1.07)	.10 (.37)	.67 (1.51)
Serenity	1.07 (1.56)	1.65 (1.84)	.33 (.53)
Happiness	1.76 (1.98)	2.65 (2.08)	.64 (1.09)
<b>Emotions during positive film</b>			
Amusement	3.7 (1.53)	3.76 (1.56)	3.62 (1.56)
Anger	.13 (.57)	.24 (.75)	0 (0)
Disgust	.30 (.79)	.29 (.77)	.31 (.85)
Fear	.10 (.40)	0 (0)	.23 (.60)
Interest	3.23 (1.48)	3.47 (1.42)	2.9 (1.55)
Contentment	3.77 (1.91)	3.59 (2.00)	4.0 (1.83)
Anxiety	.30 (.70)	.18 (.53)	.46 (.88)
Sadness	.47 (.94)	.47 (.94)	.46 (.97)
Serenity	2.63 (1.92)	2.76 (1.79)	2.46 (2.15)
Happiness	4.13 (1.93)	4.29 (2.02)	3.92 (1.85)
<b>Emotions during neutral film</b>			
Amusement	2.24 (1.66)	2.06 (1.39)	2.46 (1.98)
Anger	.04 (.19)	0 (0)	.08 (.28)
Disgust	.04 (.19)	0 (0)	.08 (.28)
Fear	.28 (.84)	.19 (.54)	.38 (1.12)
Interest	2.69 (2.22)	2.25 (2.08)	3.23 (2.35)
Contentment	2.24 (2.26)	1.94 (2.46)	2.62 (2.02)
Anxiety	.41 (.68)	.44 (.73)	.38 (.65)
Sadness	.07 (.26)	.06 (.25)	.08 (.28)
Serenity	1.72 (1.85)	1.69 (1.78)	1.77 (2.01)
Happiness	1.79 (1.82)	1.63 (1.67)	2.0 (2.04)

**Emotions during  
happy memory**

Amusement	5.28 (2.05)	5.67 (1.68)	4.77 (2.45)
Anger	.41 (.95)	.33 (.72)	.54 (1.20)
Disgust	.14 (.35)	.27 (.46)	0 (0)
Fear	.89 (1.45)	.33 (.62)	1.54 (1.85)
Interest	5.83 (1.67)	5.73 (1.62)	5.85 (1.82)
Contentment	6.45 (1.68)	6.27 (1.62)	6.69 (1.84)
Anxiety	.89 (1.71)	.47 (.64)	1.38 (2.36)
Sadness	.46 (.88)	.53 (.99)	.38 (.77)
Serenity	4.90 (2.32)	5.4 (2.10)	4.15 (2.48)
Happiness	7.14 (1.43)	7.6 (.63)	6.62 (1.94)

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**Table 3**

Means and standard deviations for heart rate during each experimental phase.

<b>Heart rate means</b>	<b>Experimental phase</b>			
	<b>Baseline</b>	<b>Speech prep.</b>	<b>Film / memory</b>	<b>Recovery</b>
<b>Low anxiety group</b>				
Positive film	77.92 (13.06)	86.52 (13.54)	75.27 (12.95)	78.29 (13.76)
Neutral film	80.37 (8.10)	87.16 (8.72)	76.81 (8.87)	80.41 (8.10)
Happy memory	80.86 (12.35)	90.06 (9.44)	79.23 (12.38)	79.74 (12.14)
<b>High anxiety group</b>				
Positive film	78.31 (12.43)	89.18 (12.47)	75.11 (13.35)	78.91 (12.29)
Neutral film	81.55 (11.75)	87.68 (11.56)	79.17 (11.93)	81.79 (12.0)
Happy memory	82.42 (12.60)	94.20 (12.36)	82.41 (13.27)	82.71 (11.27)

**Table 4**

Means and standard deviations for the experimental measures.

	<b>Total sample (N=88) M (SD)</b>	<b>Low speech anxiety (n=49) M (SD)</b>	<b>High speech anxiety (n=39) M (SD)</b>
<b>Length of cardiovascular recovery</b>			
All conditions	30.05 (33.37)	30.35 (33.92)	29.69 (33.10)
Positive film	27.83 (34.87)	28.41 (36.08)	27.08 (34.68)
Neutral film	28.17 (33.60)	25.88 (30.12)	31.00 (38.52)
Happy memory	34.24 (32.31)	36.88 (36.25)	31.00 (27.79)
<b>Happiness of story</b>	5.5 (1.74)	5.60 (.45)	5.56 (.38)
<b>GVP: Number correct</b>			
All conditions	4.38 (2.61)	4.21 (2.64)	4.36 (2.60)
Positive film	4.47 (2.36)	4.56 (2.40)	4.36 (2.41)
Neutral film	3.89 (2.83)	4.44 (3.05)	3.17 (2.44)
Happy memory	4.45 (2.68)	3.63 (2.50)	5.46 (2.63)
<b>TST: Number of activities</b>			
All conditions	9.95 (4.28)	10.29 (4.36)	9.54 (4.19)
Positive film	9.87 (4.37)	10.82 (4.94)	8.71 (3.38)
Neutral film	9.43 (4.39)	8.88 (3.96)	10.17 (4.99)
Happy memory	10.55 (4.14)	11.13 (3.98)	9.85 (4.38)
<b>Stroop reaction time</b>			
<b>Social threat words</b>			
All conditions	704 (127)	693 (129)	716 (124)
Positive film	722 (136)	711 (136)	737 (141)
Neutral film	703 (127)	683 (123)	727 (133)
Happy memory	685 (118)	685 (135)	685 (99)
<b>Control words</b>			
All conditions	704 (126)	685 (127)	729 (121)
Positive film	717 (140)	678 (117)	769 (154)
Neutral film	707 (121)	701 (133)	714 (110)
Happy memory	688 (117)	677 (138)	703 (86)
<b>Number of statements for speech</b>	8.41 (3.57)	9.53 (3.66)	7.00 (2.94)**

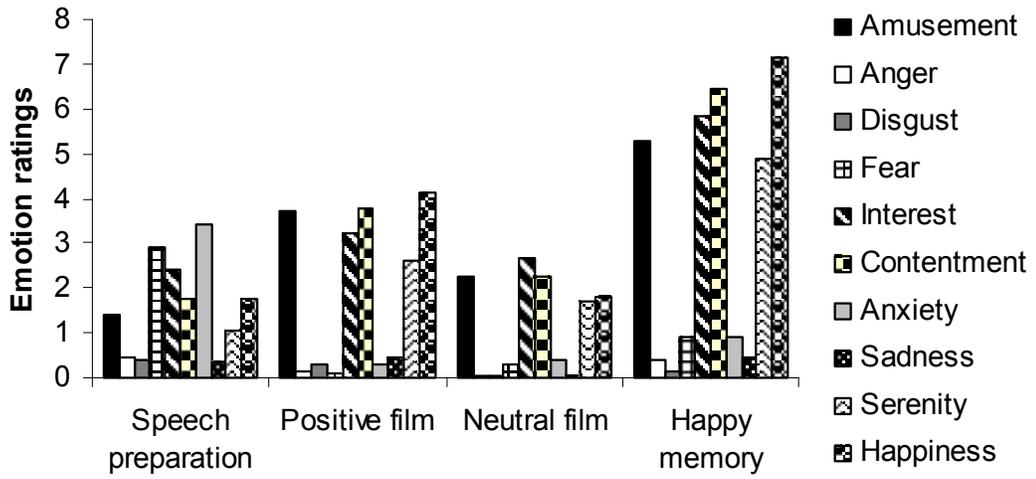
GVP = Global-local visual processing task

TST = Twenty statements test

\*\* p&lt;.01

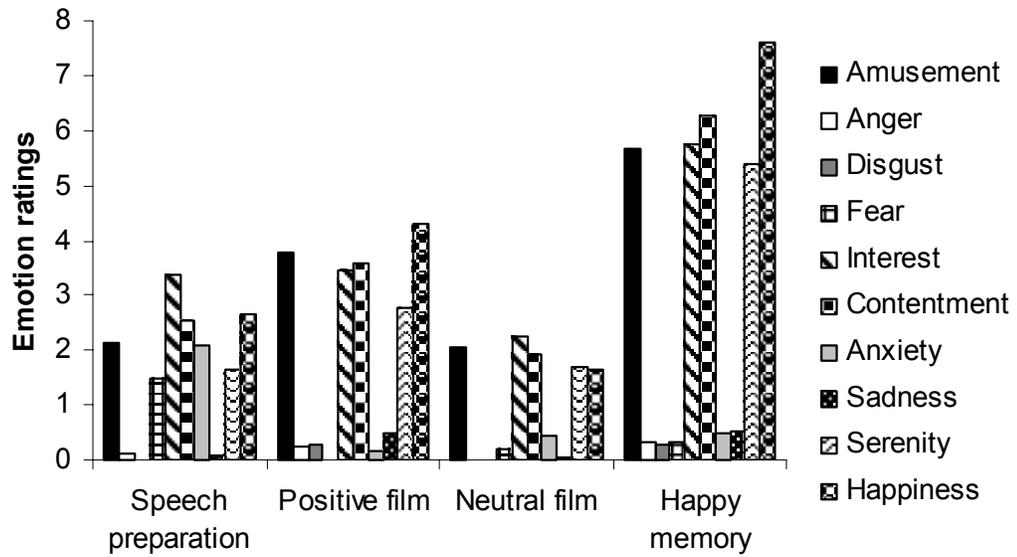
**Figure 1**

Emotion report for the total sample during different phases of the experiment



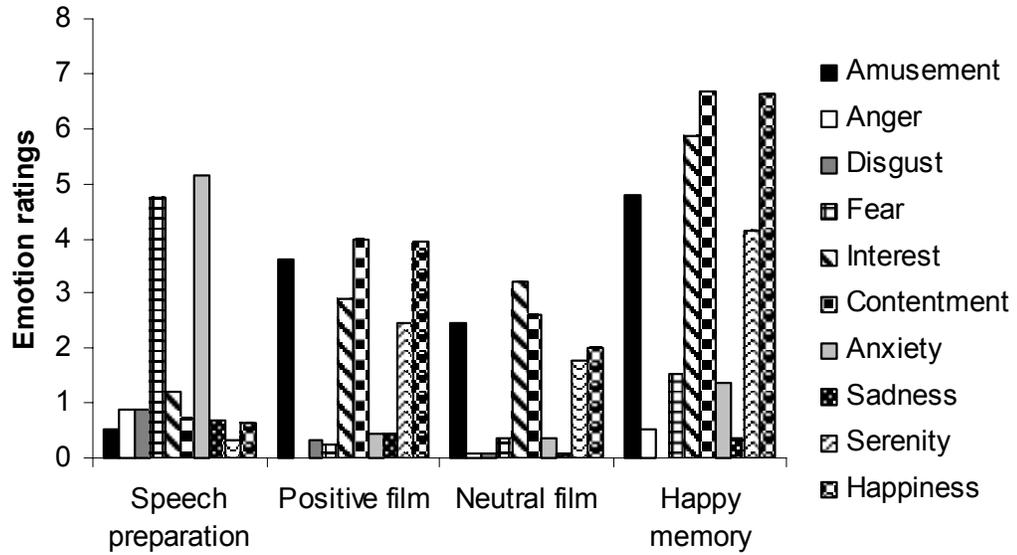
**Figure 2**

Emotion report for the low anxiety group during different phases of the experiment



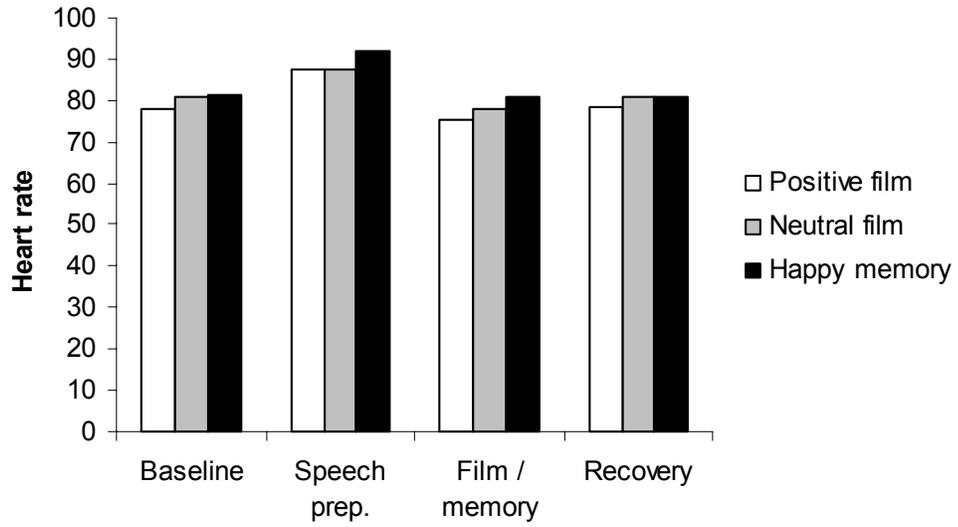
**Figure 3**

Emotion report for the high anxiety group during different phases of the experiment



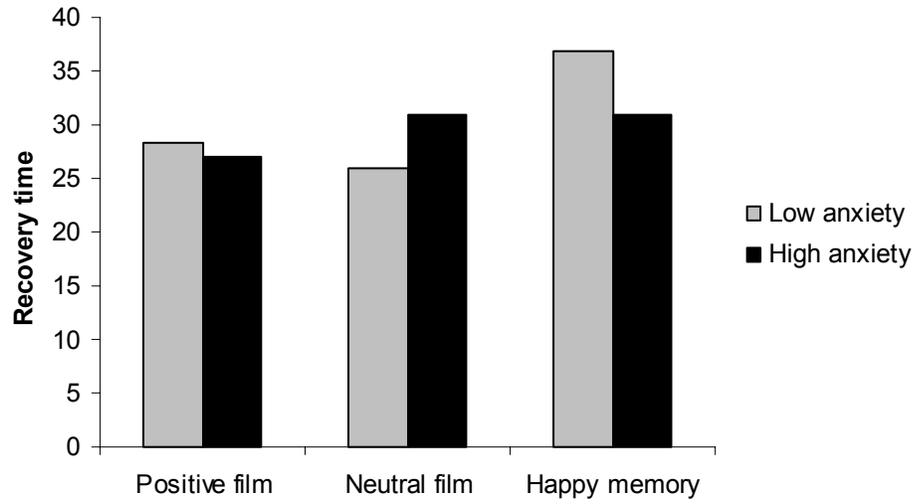
**Figure 4**

Heart rate changes across experimental phases for the different conditions



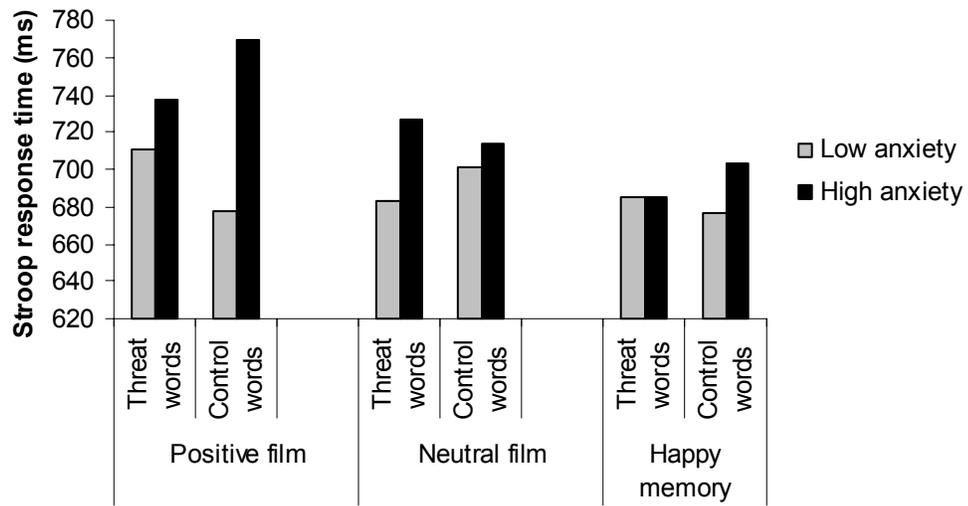
**Figure 5**

Heart rate recovery time for high and low anxiety groups depending on experimental conditions.



**Figure 6**

Response times on the emotional Stroop task for social anxiety.



## CURRICULUM VITAE

### PERSONAL INFORMATION

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Name: Dagmar Kristín Hannesdóttir  
Work Address: Child Study Center  
Suite 207, 460 Turner Street  
Collegiate Square  
Blacksburg, VA 24060  
Work Number: 540-231-3514  
E-mail: dkh@vt.edu

### WORK EXPERIENCE

---

2007 – 2008 **Center for Child Health Services (Midstod heilsuverndar barna)**

A clinical internship site where I assess and provide treatment for children age 3

8 years with various developmental, behavioral, and emotional problems.

2006 – 2007 **Virginia Tech: Psychology Department**

Taught an undergraduate class in social psychology during the summer of 2006 and will teach a class on psychological disorders of children in the fall of 2006.

2005 - 2006 **Virginia Tech: Child Study Center – Assessment Clinic**

During one academic year, I worked on the Assessment Clinic assessing psychological functioning and academic ability of clinically referred children and adolescents. I administered and scored intelligence tests, academic achievement tests, and various instruments to assess psychological functioning, as well as writing comprehensive clinical reports on each child.

2005 **The University Hospital: Department of Adolescent and Child Psychiatry (Barna og Unglingageðdeild Landspítalans-BUGL)**

I worked for 8 weeks on an externship in clinical psychology at the University Hospital in Iceland. I worked independently as a psychologist under the guidance of a licensed clinical psychologist. I met with child and adolescent clients in the outpatient section of the hospital with various problems in the realm of anxiety and other disorders.

2004 - 2006 **Virginia Tech: Child Study Center – Phobia Project**

I have worked as an assessor on the NIMH funded Child and Adolescent Phobia Project since January 2004. This entails interviewing either children or their parents about the child's phobia and other anxiety disorders to evaluate the need for treatment or efficacy of treatment.

2006 - 2007 **Virginia Tech: Psychology Department**

I have taught three different undergraduate courses over the past year: Social Psychology (PSYC 2084), Psychological Disorders of Children (PSYC 3034), and Developmental Psychology (PSYC 2034). I was the main instructor for these courses which included all organization for the class, selection of materials and assignments, teaching, and grading.

2003 **The University Hospital: Department of Adolescent and Child Psychiatry (Barna og Unglingageðdeild Landspítalans-BUGL)**

I worked as a counsellor at the Child Psychiatric Ward from January 2003 until July 2003. The job entailed providing social support, designing treatment programs, conducting adventure groups, and more for the children residing in the ward.

2002- 2003 **Department of Psychology – University of Iceland**

During the fall semester of 2002 I worked as an assistant teacher in a course intended for first year undergraduate students in psychology. The main subject of the course is the philosophical foundations of psychology. During the spring I graded and composed exams for an undergraduate course in developmental psychology.

*Supervisors:* Professor Ólafur Páll Jónsson, Ph.D. and Sigurdur J. Grétarsson, Ph.D.

2002 **Leikskólinn Ásar - preschool**

Behavior modification trainer for a child with autism and working according to the Ivar Lovaas method of behavior modification for autistic children.

*Supervisor:* Ágústa Arnardóttir, Preschool director.

2002 **The University Hospital: Department of Adolescent and Child Psychiatry (Barna og Unglingageðdeild Landspítalans-BUGL)**

I worked as a counselor at the Adolescent Psychiatric Ward the summer of 2002. The job entailed providing social support, listening and assisting the adolescents with various assignments for group therapy, which I co-facilitated.

*Supervisor:* Vilborg G. Guðnadóttir, R.N. Adolescent Department Manager.

2001 **National Educational Research Institute (Námsmatsstofnun)**

A research assistant in the processing of data from a national reading survey.

*Supervisor:* Professor Einar Guðmundsson, Phil.dr.

2001 **Leikskólinn Seljakot – preschool**

Worked as a preschool teacher in the department for three to six year old children. Through the job I got to know children's normal social, cognitive, language and physical development.

*Supervisor:* Sigríður K. Jónsdóttir, Preschool director.

2001 **National Educational Research Institute and The University of Iceland**

A research assistant in the standardization of WIPPSI-R intelligence test for preschool children. I administered the TOLD-2 language development test for over fifty 5-year-old children. This was a joint project of the University of Iceland and the National Educational Research Institute.

*Supervisors:* Professor Einar Guðmundsson, Phil.dr.  
Guðrún Ásgeirsdóttir, Cand.psych.

**EDUCATION AND RESEARCH PROJECTS:**

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2005 – 2006 **Childhood Outcome Study**

Conducted a follow-up study of a sample of children which had been participating in a longitudinal study since the age of 8 months. 20 9-year-old children and their parents completed a diagnostic interview, self-reports, and behavioral tasks intended to measure anxiety. The results of the study were compared to EEG and temperament measures from the 8 months and 4 years of age.

2003 - 2005 **Virginia Tech: Psychology Department**

*Thesis:* Social skills among socially anxious children in Iceland.

*Advisor:* Thomas H. Ollendick

I obtained a Master of Science degree in Psychology in May 2005 after successfully defending my thesis. My specialty area is Clinical Child Psychology and my main research focus is social anxiety and other anxiety disorders among children and adolescents. The study for my thesis was conducted in January 2005 among 10-14 year old students at a public school in Iceland. In November 2005 I was admitted to the doctoral program.

1999 - 2002 **The University of Iceland, Department of Psychology**

*Thesis:* Cognitive behavioral Treatment for Children: The effects of Development on Treatment Efficacy.

*Supervisors:* Sigurður J. Grétarsson, Ph.D. from the University of Utah and Urður Njarðvík, Ph.D. from Louisiana State University.

I received my Baccalaureus Artium degree in June 2002 and was honored for obtaining the highest grade point average in the history of the department of psychology.

## **PUBLISHED WORKS**

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### *Chapters*

Ollendick, T.H., & Hannesdóttir, D.K. (2007). Separation anxiety and panic disorder in children and adolescents. In L.G. Öst (Ed.), *Kognitiv beteendeterapi inom barn- och ungdomspsykiatrin (submitted for publication)*.

### *Papers*

Hannesdóttir, D.K., & Ollendick, T.H. (2007). Social cognition and social anxiety among Icelandic schoolchildren. *Child and Family Behavior Therapy (accepted for publication)*.

Hannesdóttir, D.K., & Ollendick, T.H. (2007). The role of emotion regulation in the treatment of child anxiety disorders. *Clinical Child and Family Psychology Review (accepted for publication)*

### *Posters*

Doxie, J., Hannesdóttir, D. K., & Ollendick, T. H. (2006). The effect of over-protection on the relationship between parent and child anxiety disorders. *Poster presented at the 26<sup>th</sup> annual convention of ADAA, Miami.*

Doxie, J., Hannesdóttir, D.K., Bell, M.A., Ollendick, T.H., & Whitmore, M.J. (2007). A longitudinal study of frontal asymmetries and affect adjustment. *Poster presented at the biennial convention of SRCD, Boston.*

Hannesdóttir, D. K., (2001, November 17<sup>th</sup>). „Getur 3ja ára dóttir mín verið með kvíða frá fæðingu. *Lesbók Morgunblaðsins*, page 11. (This article addressed young children's anxieties. It was published in the local newspaper as well as on the University of Iceland's Science Web, [www.visindavefur.hi.is](http://www.visindavefur.hi.is)).

Hannesdóttir, D. K., Doxie, J., & Ollendick, T. H. (2006). Childhood behavioral inhibition as a predictor of anxiety: Moderation effects of parental psychopathology. *Poster presented at the 26th annual convention of ADAA, Miami.*

Hannesdóttir, D. K. & Ollendick, T.H. (2005). Social anxiety and social skills among children and adolescents in Iceland. *Poster presented at the 39<sup>th</sup> annual convention of AABT, Washington, D.C.*

Hannesdóttir, D. K. & Ollendick, T. H.. (2006). Cognitive Distortion or a Social Skills

Deficit? Evaluations of Socially Anxious Children's Social Skills. *Poster presented at the 26th annual convention of ADAA, Miami.*

Hannesdóttir, D. K., & Ollendick, T.H. (2006). Do Children with Separation Anxiety Have Higher Anxiety Sensitivity than Children with other Anxiety Disorders? *Poster accepted to be presented at the 40<sup>th</sup> annual meeting of ABCT, Chicago.*

Hannesdóttir, D. K., Whitmore, M. J., Davis, T. E., & Ollendick, T. H. (2004). Behavioral inhibition and performance on a behavioral avoidance task among children with specific phobias. *Poster presented at the 38<sup>th</sup> annual convention of AABT, New Orleans.*

Ollendick, T. H., Sirbu, C., Chelf, M., Whitmore, M. J., Hannesdottir, D. K., & Öst, L.G. (2005). Treatment sensitivity of the behavioral avoidance test (BAT) for specific phobias in children. *Poster presented at the 39<sup>th</sup> annual convention of AABT, Washington, D.C.*

Sirbu, C., Chelf, M., Hannesdóttir, D. K., Whitmore, M. J., Ollendick, T. H., & Öst, L.G. (2005). Relationships between vagal tone, self-efficacy, and danger beliefs in children with specific phobias. *Poster presented at the 39<sup>th</sup> annual convention of AABT, Washington, D.C.*

Wright, H., Hannesdóttir, D.K., Ollendick, T.H. (2006). The Fear Survey Schedule: A Predictor of Performance on the Behavioral Avoidance Task. *Poster accepted to be presented at the 40<sup>th</sup> annual meeting of ABCT, Chicago.*

## **HONORS**

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**2006** Graduate Student Travel Award (\$216)

**2006** Scholarship for research from the Memorial Fund of Margrét Björgólfsdóttir (\$2300)

**2005** Clinical Child Research Fund Award at VT (\$625) for research

**2004** Clinical Child Research Fund Award at VT (\$500) for thesis research

**2004** Graduate School Research Award at VT (\$300) for thesis research

**2003** Thor Thors Scholarship from the American-Scandinavian Institute

**2003** Fulbright Scholarship

**2002** Highest grade point average in the Department of Psychology at the University of Iceland.

## **OTHER EXPERIENCE**

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2005 Conducted a part of a workshop on anxiety disorders along with two other colleagues (MESA workshop in Christiansburg, VA).

2004 Advanced Open Water Diver Certification from PADI –USA.

- 2003 Self Defense Course for Staff of Psychiatric Wards – University Hospital of Iceland.
- 2003 Open Water Diver Certification from PADI – Iceland.
- 2002 General Record Examination (GRE) at the Fulbright Institute, Reykjavík.  
Scores: Verbal = 510 Quantitative = 680 Analytical = 740
- 2002 International English Examination (TOEFL) at the Fulbright Institute, Reykjavík.  
Total score: 287
- 2002 Behavior Modification for Autistic Children Workshop: Consisted of three distinct courses on autism and behavioral modification at The State Diagnostic and Counselling Center.

## REFERENCES

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[tho@vt.edu](mailto:tho@vt.edu)

Professor of Psychology, Virginia

Sigurður J. Grétarsson  
Iceland  
[sig@hi.is](mailto:sig@hi.is)

Professor of Psychology, University of

Urður Njarðvík  
[urturnja@landspitali.is](mailto:urturnja@landspitali.is)

Clinical Child Psychologist at BUGL