# EMOTIONAL RESPONSIVITY IN PEOPLE HIGH AND LOW IN TRAIT POSITIVE AFFECT

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IN TRAIT POSITIVE AFFECT

Stacia N. Gessner for the Master of Arts Degree

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ABSTRACT

Previous research has shown that individuals who report high levels of Trait Positive Affect (TPA) experience better mental and physical health outcomes than individuals low in TPA. The current study examined emotional responsivity in forty-five undergraduates who scored either high or low in trait positive affect. Participants' reactions to emotional stimuli were assessed in two phases, a startle testing phase in which affective modulation of startle was assessed while participants viewed emotional pictures, and a picture rating phase in which participants rated the pictures on dimensions of valence and arousal. Affective modulation of startle results revealed that for the high TPA group, emotional responses were significantly stronger to negative pictures compared to neutral or positive pictures. In contrast, those in the low TPA group responded equally to the three picture types. Results for the picture-rating phase revealed that the high TPA group rated negative pictures as more arousing than the low TPA group, but all other ratings were comparable between the groups. Overall, the results of this study indicate that people with high trait positive affect display a heightened emotional reaction to negative stimuli, as seen by self-rated arousal and affective modulation of startle. These results suggest several directions for future research that may further increase understanding of the protective nature of trait positive affect.

*Keywords:* trait positive affect, startle modulation, emotional responding

APPROVAL PAGE

The faculty listed below, appointed by the Dean of the College of Arts and Sciences have examined a thesis titled "Emotional Responsivity in People High and Low in Trait Positive Affect," presented by Stacia N. Gessner, candidate for the Master of Arts degree, and certify in their opinion it is worth of acceptance.

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# CHAPTER 1

# INTRODUCTION

Emotion influences all aspects of our lives. At the most basic level, emotions serve to protect us from harm or lead us to success. Emotions such as fear propel us away from danger while desire inspires us to move toward success.

Psychologists have conducted hundreds of studies over the past century on the causes and consequences of different emotional states, with the majority of this research focused on negative emotions. For example, individuals with trait negative affect (TNA; e.g. depression) have been shown to display cognitive consequences such as greater recall of negative memories, negative words, and stressful events (Denny & Hunt, 1992; Lemogne et al., 2006). Also, children who experience negative events such as verbal or physical abuse are more likely to be diagnosed with a disorder such as depression, alcoholism, or personality disorder in adulthood, all of which are characterized by TNA (Dube, Felitti, Dong, Giles & Anda, 2003; Herman, Perry & van der Kolk, 1989; Ogata et al., 1990).

Studies showing the negative consequences of negative emotion led some researchers to question whether there might be corresponding positive effects of positive emotions. This question led to a movement called Positive Psychology (Diener, 1984; Diener, Emmons, Larson, & Griffith, 1985; Diener, Sapyta, & Suh, 1998; Ryff & Singer, 1996; Seligman & Csikszentmihalyi, 2000). Positive Psychology focuses on why people are happy and how happiness can be increased (Diener, 2009; Diener, et al., 1998; Ryff & Singer, 1996; Seligman & Csikszentmihalyi, 2000). Seligman (Seligman & Csikszentmihalyi, 2000) credits Rogers (1951), Maslow (1954, 1962), and Erikson (1963, 1982) for the beginnings of this movement. In 2000, the American Psychological Association (APA) released a special issue of the American Psychologist devoted to Positive Psychology, edited by Martin Seligman and Mihaly Csikszentmihalyi, accenting the importance of this new field.

Research spurred by the positive psychology movement suggests that people who are happy benefit from being so. Individuals who are happy, and display higher levels of trait positive affect (TPA), report more satisfying relationships (Harker & Keltner, 2001), have overall lower Minnesota Multiphasic Personality Inventory scores (MMPI; Diener & Seligman, 2002; indicative of less psychopathology), have greater recall for positive events (Seidlitz & Diener, 1993), and exhibit a positive outlook even when faced with adversity (Ruch, 1997; Ruch & Kohler, 1999). There is also a growing body of research suggesting there may be long-term health benefits of TPA. For example, individuals with a high level of TPA have been found to live longer (Danner, Snowdon, & Friesen, 2001), to be less susceptible to contracting viruses (Cohen, Alper, Doyle, Treanor, & Turner, 2006; Cohen, Doyle, Turner, Alper, & Skoner, 2003; Janicki-Deverts, Cohen, Doyle, Turner, & Treanor, 2007), to experience greater skin barrier recovery following injury (Robles, Brooks, & Pressman, 2009) and to show a greater antibody response to vaccine (Marsland, Cohen, Rabin, & Manuck, 2006).

One potential reason for the positive outcomes of TPA may be a cognitive bias. Cognitive bias is the tendency for an individual to be predisposed to be particularly sensitive to stimuli of a specific valence. Forgas (1995) developed the affect infusion model (AIM) to explain this phenomenon. Forgas (2002) suggests our moods affect our perceptions and these perceptions impact our everyday life. The AIM explains the influences of mood on perceptions of incoming stimuli and the subsequent impact on behavior. Individuals who are angry are more likely to recall having met other angry individuals (Bower, 1981). Individuals with positive mood are better able to recognize the genuineness of facial expressions (i.e., positive, negative or neutral in expression, than those with negative mood (Forgas & East, 2008). Similarly, individuals who are primed with a sad or happy mood show bias to expressions that are similar to the mood they are experiencing, but not incongruent moods (Schmid & Mast, 2010). Individuals with depression, who have an enduring negative mood (TNA), experience less happiness than normal controls (Rottenberg, Gross, & Gotlib, 2005). In contrast, individuals who have enduring positive moods (TPA) smile more often (Ruch, 1997; Ruch & Kohler, 1999). Overall, these studies indicate that individuals with TPA are more likely than individuals with TNA to identify, remember and respond to the positive experiences that they encounter.

Individuals with TPA potentially benefit from this mood-associated cognitive bias because this bias may strengthen an individual's ability for dealing with life's challenges. Gallo and Matthews (2003) use previous literature to show how individuals with positive mood bias experience differing effects of life challenges. These authors use the term Reserve Capacity to describe the combination of positive affect or optimism, self-esteem, and interpersonal supports. In testing the Reserve Capacity Model and how it affects health in women, Matthews, Raikkonen, Gallo, and Kuller (2008) suggest that low Reserve Capacity (low positive affect or optimism, low self-esteem, and fewer interpersonal supports) has a negative effect on health over time. Through this study, it is suggested that individuals high in reserve capacity (individuals high in positive affect, high in self-esteem, and with a greater amount of interpersonal supports) experience better long-term outcomes for health. Similarly in a review by Pressman and Cohen (2005) that examines high TPA, found that it was positively correlated with interpersonal supports and behaviors like better adherence to medical regimens and sleep. Due to this positive bias, it is possible that these individuals high in positive affect are taking better care of themselves and therefore experiencing better health outcomes.

Overall, this proposed cognitive bias/reserve capacity explanation for why people with TPA experience a wide array of positive long-term outcomes, is based on the assumption that individuals with TPA have a unique pattern of short-term or "in the moment" reactions when faced with emotional stimuli. This pattern of responses may reflect better coping behaviors and adaptive physiological responses (Pressman & Cohen, 2005). However, very little research to date has focused on specific short-term emotional reactions in individuals with TPA. Therefore, the purpose of the current study is to investigate short-term, "in the moment" emotional reactions of people with TPA in order to address the following questions: Do people with high TPA respond more positively to positive stimuli than people low in TPA? Do these individuals high in TPA respond less negatively to negative stimuli when compared to individuals low in TPA? If a unique pattern of response can be observed "in the moment" to emotional stimuli in individuals with TPA, the results will lay a foundation for future research to determine links between patterns of immediate emotional response and long-term positive outcomes of TPA.

# CHAPTER 2

# LITERATURE REVIEW

## State and Trait Positive Affect

There are varied opinions as to what happiness actually is and what the resulting constructs are, which makes happiness difficult to measure. Ryan and Deci (2001) propose that the most well known views of happiness include two forms, hedonic and eudaimonic. The hedonic form of happiness refers to the overall extent of individuals' positive and pleasurable experiences. Hedonic happiness is more commonly referred to as subjective well-being. The eudaimonic form of happiness refers to living a life that involves more than pleasure seeking and suggests that happiness comes from self-actualization. In this definition of eudaimonic happiness, a happy individual fully realizes his/her potential, flourishes in his/her environment, and has good relationships. Eudaimonic happiness is more commonly referred to as psychological well-being. Most current measures of happiness assess these types of happiness and focus on the person's current emotional state as opposed to the person's more long-term disposition (Diener, 2009; Ryan & Deci, 2001).

For example, Edward Diener, who has done extensive research in the field of Positive Psychology, developed a widely used measure of hedonic happiness. Diener's Satisfaction with Life Scale (SWLS) asks the individual to integrate all events, both positive and negative that have occurred over his or her lifetime (Diener, et al., 1985). This survey asks people to rate the culmination of their life's experiences given all that they have experienced and is considered a measure of state happiness.

Similarly, the most widely used measure of psychological well-being, developed by Ryff and Keyes (1995), is a survey that identifies six components that describe an individual's psychological well-being at a given point in time (i.e., assesses state rather than trait well-being). The six components that this survey explores are: self-acceptance, environmental mastery, positive relations, individual life purpose, personal growth, and autonomy.

Other measures of happiness also exist. For example, Lyorbimirsky and Lepper (1999) developed the Subjective Happiness Scale (SHS), which is a four-item scale stating the overall happiness of an individual at a given moment in time, and the Quality of Life Inventory (QOLI) by Frisch, Cornell, Villanueva, and Retzlaff (1992), which measures current life satisfaction. However, these also measure only a person's current state of happiness and not their more long-term disposition. Personality measures also do not seem to capture TPA, while extraversion has been shown to predict positive affect (Hepburn & Eyesenck, 1989; Stafford, Ng, Moore, & Bard, 2008) it appears to be indicative of state positive affect, not TPA.

One of the most popular ways to measure the trait aspect of happiness is with the Positive and Negative Affect Scale (PANAS; Watson, Clark & Tellegen, 1988). This scale measures both positive and negative affect simultaneously, and depending on the directions given will assess it in the moment, over the last week, month, year, or in general.

Ruch, Kohler, and Thriel (1996) developed the State and Trait Cheerfulness Index (STCI) to assess the state and trait of cheerfulness, seriousness and bad mood. A subset of the questions on this survey ask about a person's disposition and how she/he typically responds in given situations rather than asking how a person is feeling in the moment. Those questions provide an index of positive affect as a trait. The Trait Cheerfulness Index is the measure that will be used in the current study.

**TPA and Health**

There is a growing body of medical literature investigating the link between TPA and better health. In 2003, Cohen et al. examined individuals for susceptibility to rhinovirus after being assessed for TPA prior to exposure of the virus. TPA was measured at baseline and by daily phone calls prior to the study. Researchers measured TPA by having participants rate positive and negative adjectives such as lively, cheerful, happy; or negative words such as sad, angry, unhappy on a five-point scale. They would then sum the ratings from all positive words for a TPA score and all negative words for TNA score. These daily scores for TPA and TNA were then averaged for each participant. Results of this experiment revealed that individuals who have greater TPA displayed lower percentages of cold infection (as measured by objective and subjective criteria). In a follow-up experiment these researchers controlled for social and cognitive factors associated with TPA (Cohen et al., 2006) and assessed TPA by using the method mentioned previously. Participants provided demographic variables and completed the following surveys: the Mastery Scale, the Life Orientation Test, Rosenberg Self-Esteem Scale, the Life Engagement Test and the Goldberg Big Five Questionnaire. They also underwent a similar procedure of exposure and provided viral cultures at the end of the experiment. Consistent with Cohen et al. (2003), results indicated that individuals displaying higher TPA were less susceptible to developing a cold or flu after exposure and quarantine, this remained true even when controlling for age, race, sex, years of education, prechallenge antibody level, BMI, season, virus type and TNA.

Janicki-Deverts et al. (2006) exposed research participants to cold and flu viruses in order to examine cytokine production compared to affect. Current research suggests that cytokine production is associated with signs of sickness (such as fatigue and mucous). These researchers wanted to see if cytokine production was associated with an increase in negative affect and a decrease in positive affect. The same screening method for daily affect (TPA and TNA) was used as in the previous studies. Participants who were exposed to the cold virus were quarantined in a hotel one day before exposure and five days after exposure. Participants who were exposed to the flu virus were quarantined in a hotel one day before exposure and six days after exposure. For each day of the quarantine, participants were given a physical, symptoms of illness were assessed, cytokine assays were taken and participants completed aforementioned mood measurements. Viral cultures were collected to assess cytokine response associated with the viruses that the participants were exposed to. The results demonstrated that greater production of cytokines was associated with reduced TPA. No association was displayed between cytokines and TNA.

Similar work was done with a college population to examine how TPA impacted response to vaccination for hepatitis B (Marsland et al., 2006). Eighty-one students were given the hepatitis B vaccine over the course of nine months. Five months after the first phase of vaccination, participants came to the lab to have blood drawn. At the same time the blood was taken, individuals were given surveys to complete and return to the lab within the week. The researchers used subscales from multiple surveys to create this 88-item survey. Questions were taken from the Profile of Mood States, Affect Scale, Goldberg's Big-5 Factor scales, Larsen and Diener Circumplex and Mackay Circumplex to create this survey. Items were about positive and negative affect, extraversion, optimism, depression, and health behaviors of the participants. The survey asked individuals to rate themselves on how a trait was "true of themselves" when compared to someone of a similar age and sex on a scale of 0 (not accurate) to 4 (extremely accurate). This scale included 9 positive and 9 negative mood adjectives that had been used in previous research. Individual information that was controlled for included sex, age, body mass index and depression as defined by the Beck Depression Inventory. Optimism (as defined by the Life Orientation Test) and extraversion (as defined by a modified version of Goldberg's Big-5 Factor Scale) were also controlled.

As a sole predictor, higher TPA was associated with greater antibody response post vaccination (Marsland et al., 2006). No significant association was evidenced by TNA ($b = -.19$, $SD = .31$, $p < .54$) when entered as a predictor for antibody response in addition to TPA. TPA was associated with lower antibody response in those exercising less, but not when they exercised for longer periods of time. These researchers concluded that while individuals high in TPA had a greater response to the vaccine, individuals low in TPA who reported greater physical activity had similar response to the vaccine, and suggest that this could be a protective factor for those low in positive affect (PA).

A more recent study investigated how TPA can aid an individual "in the moment." This was investigated by incorporating skin disruption with either a no stress, stress or stress with support condition (Robles, et al., 2009). The outermost layer of the skin defends us from microbes, prevents water loss, protects from ultraviolet rays as well as keeping the skin intact when damaged. In order to see how stress and TPA impacted healing, participants' dominant inner forearm was stressed with cellophane tape. Before applying the scotch tape, baseline levels of transepidermal water loss were assessed. Strips of cellophane tape were applied to the forearm for either a maximum of 51 strips or when transepidermal water loss was elevated to 20 $g/m^2$. Skin was measured at one hour, an hour and a half, and two hours post tape stripping. Participants began by completing the PANAS before having the tape applied. Following the tape procedure, participants were separated into different conditions. Participants in the no stress condition ($n$ = 13) read an article alone and silently before reading for 10 minutes into a tape recorder. Participants in the stress ($n$ = 20) and stress plus support ($n$ =27) condition were given instructions for a 5-minute speech and a 5-minute mental arithmetic task. Participants in the stress plus support condition were supported by a confederate for 10 minutes of preparation. Participants in both stress conditions performed the speech in front of a harassing audience and were videotaped.

Analysis of the recovery rates between conditions suggested that individuals in the stress condition who were high in TPA had a significantly higher recovery rate from the skin disruptions (Robles, et al., 2009) when compared to individuals in the no stress condition (with high and low positive affect) and individuals in the stress and low positive affect condition. Participants low in TPA and participants high in TPA in the no stress condition did not differ in recovery rate and were both faster than those low in TPA and in the stress condition. The authors propose that those high in TPA undergoing stress have protective factors that help them in stressful situations. Additionally they suggest that the skin recovery differences in this study could relate to other biological processes in the body that may differ between high and low TPA individuals.

Not all research has supported a positive association between TPA and health benefits. Data from a longitudinal study initiated by L.M Terman in 1921 were used to look at the association between certain personality factors in childhood and later health and longevity (Friedman, et al., 1993). Terman and associates gathered data on bright children in the Terman Life-Cycle Study. This study is based on information collected from parents and teachers of children involved in the project. The children were rated on a 13-point scale of how much the child possessed the trait in question, with a total of 25 personality traits assessed by either the mother or father and the teacher of the child. Questions about the child's activity were also assessed. Six dimensions were created from this original questionnaire to represent common personality traits and predictors. They are as follows: Sociability (for Extraversion-Surgency; $\alpha = .65$), High motivation-self-esteem (for emotional stability versus neuroticism; $\alpha = .71$), Conscientiousness-Social Dependability (for Conscientiousness; $\alpha= .76$), optimism – sense of humor (for cheerfulness; $\alpha= .52$), High Energy (for physical energy; $\alpha = .43$), and Permanency of moods (for emotional stability; single item). The final sample was predominantly white and middle class, with a final sample of 1,178 students (513 female). Students were followed from approximately age 11 and after in 5 to 10 year intervals.

Hazard regressions were used to assess survival analysis of these participants (Friedman, et al., 1993). Results from the study suggest that conscientiousness ($\beta = -.26$) predicts longevity and cheerfulness ($\beta= .21$) reduces longevity. Females were found to outlive males, however the link between conscientiousness and longevity was not as clear when looking just at the female part of the sample. While the results are compelling and suggests something different than other studies presented here, the reliability of the cheerfulness measure was inadequate at $\alpha = .52$, while other reliabilities were acceptable (higher than .7), and one measure had only one question. These measures were constructed from existing data to attempt to mimic measures that have better reliability and validity that were not available at the time that the project began. However, the sample is unique due to the specificity to adolescents and length of time that they were followed. It would be interesting to know if cross sectional studies would show similar findings with adolescents, young adult, and adult populations.

Recently, in a review of literature of TPA and heath related studies, Cohen & Pressman (2006) discuss the fact that the associations between TPA and health are not always clear. On the positive side, the authors point to literature on morbidity, symptoms and pain exhibiting benefits for TPA. Populations of older adults living in a community also show benefits, but not enough research has been done to draw conclusions from other populations. However, another review also highlights literature that shows negative benefits from high positive affect, such as institutionalized older individuals who showed negative rates of mortality with high positive affect and chronic or terminal patients who had extreme rates of positive affect or showing that too much positive affect relative to negative affect was associated with lower rates of survival (Pressman & Cohen, 2005). These authors indicate that the way positive affect is measured may actually be confounded with good health when participants endorse adjectives such as "energetic", "full of pep" or "vigorous". Lastly the authors highlight how so little of this literature is experimental in nature, and discuss the variability in the methods used by researchers to define and measure TPA. The authors conclude that much of this research does not aid in determining if or how TPA benefits health.

**Reserve Capacity Model**

One reason that individuals with TPA experience positive health outcomes may be an ability to protect themselves against adverse events that is due to their positive cognitive bias. In a study by Matthews, et al., (2008) women with low socioeconomic status (SES) were demonstrated to have insufficient resources and suffer adverse health outcomes as a result. These researchers call these resources "Reserve Capacity." In this study, Reserve Capacity is defined as the combination of dispositional optimism, interpersonal support, social support and self-esteem for this study. A random sample of 541 women was recruited from licensed drivers in Pennsylvania. These women were examined at entry into the study and every three years, with 432 women giving measurements for twelve years. These women supplied both physical and psychosocial measures. Physical measurements consisted of weight and waist measurement, blood pressure, and blood was drawn to test glucose and cholesterol. These measurements were taken in order to detect risk factors associated with metabolic syndrome, which is associated with Type II diabetes and coronary disease. Measures of depression, tension, and anger were also taken. Measures of optimism, interpersonal support and self-esteem were given to represent the constructs underlying the Reserve Capacity of the participant. The results of this study suggest the following interaction between the positive aspects of Reserve Capacity, negative emotion and SES: individuals with lower SES displayed lower levels of Reserve Capacity that in turn led to an increase of negative emotion and the development of the metabolic syndrome. Having reserve capacity or positive affect combined with interpersonal support and self-esteem appears to aid individuals against developing metabolic syndrome.

## Cognitive mood bias

One potential explanation for why TPA could result in greater Reserve Capacity is cognitive mood bias. Research has shown that mood can influence memory as well as responses to stimuli. Forgas (1995) developed the Affect Infusion Model (AIM) to explain the influences of mood in regards to how an individual processes incoming stimuli and the effect mood has on subsequent behavior. The model suggests four methods of cognitive processing when individuals assess incoming stimuli. The four are: *direct access* (remembering a similar experience), *motivated processing* (based on a predetermined goal), *heuristic*, and *substantive*. Forgas (1995) categorizes the last two methods as "high affect strategies" (p. 47) that occur when a perceived event is not familiar to the individual. In these situations, the individual has to process the event by using judgments or carefully deliberate all aspects of the novel event. Mood has been shown to influence attention, encoding and retrieval of cognitive information, leveraging an individual's final reaction. The main exception to this rule is prior motivation, which leverages the individual's reaction to the previous motivated outcome. This theory further explains mood-congruent bias in reacting to in-the-moment stimuli.

In a preliminary study designed to test the AIM model using a college age population, 96 students (48 females) were exposed to negative (car accidents) or positive (humorous cartoons) pictures left on empty library tables (Forgas, 1998). Students were allowed to examine the pictures before being approached by a confederate who would ask them for paper politely or impolitely. Immediately after the confederate asked for the paper, the student was debriefed by another researcher and asked to rate his/her reaction to the request, their current mood, and how compliant they were to the confederate's request. Analysis showed that participants in a negative mood were likely to assess the requests more negatively than participants reporting a positive mood. When examining interactions of mood and politeness of request, polite requests were found to have decreased effect on mood, where impolite requests showed increased effects on mood.

In the main study, 144 college students, 50% female, participated in a similar experiment (Fargas, 1998). Participants were randomly assigned to one of three mood induction groups. The groups were a control, where the participant read an information sheet from the library, positive, where the participant read a humorous story, and negative, where the participant read a story about a death from cancer. Once the participant had the opportunity to read the planted material, a confederate approached the participant and asked politely for paper, or asked for paper in a neutral style ["Sorry, would you have 1 (or 10) sheet(s) of paper?"], or asked for the paper impolitely. In each condition, the confederate would also ask for a high or low amount of paper.

After the confederate had approached the participant and made the request, a researcher approached the participant and debriefed them (Fargas, 1998). The researcher then asked the participant to recall and write down the request. Next the researcher asked the participant to rate the request on imposition, politeness, if the request was unusual or common, and if it was aggressive. The participant also rated the confederate on the following: likability, friendliness, timid/boldness, politeness, and self-confidence. Lastly, the researcher asked the participant for their current mood, mood after the incident and participant compliance to the request. Analysis showed that participants in the negative mood condition evaluated the requests with increased negativity compared to controls. Participants who reported positive mood were more lenient when evaluating their experience.

Gray et al. (2006) experimented with mood bias in bipolar patients who were diagnosed as being either manic or depressed compared to matched controls in order to see how well these participants correctly identified emotional facial expressions. The Hamilton Depression Scale (HAM-D) assessed for depression and the severity of it if present, the Core Depression Scale (CDS) assessed biological measures of depression, and the Beck Depression Inventory (BDI) was utilized to assess depression intensity of depression if present. Mania was assessed using a self-report scale, the Altman Self-Rating Mania scale (ASRM). All participants viewed an interactive computer program that used standardized Ekman faces in an animated movie that would morph between two separate facial expressions. Participants first identified the final emotional expression. The participant was then asked to choose the exact moment that they could identify the emotional expression by selecting an individual frame of the movie. Individuals who were described as bipolar depressed showed mood congruent bias for negative facial expressions and a decreased sensitivity to positive facial expression as opposed to controls. In contrast, individuals who were described as bipolar manic showed a trend of increased sensitivity to emotional facial expressions when compared to controls, but the difference was not found to be significant.

Together, the studies on mood bias above suggest that positive mood states affect cognitive responses to incoming stimuli. There is also a large literature suggesting that positive mood affects physiological responses to incoming stimuli.

Tomarken, Davidson, Wheeler and Doss (1992) used electroencephalography (EEG) in combination with the Positive Affect Negative Affect Schedule (PANAS-GEN, a survey of positive/negative affect in an individual) to see if individual differences in affect were associated with different brain activity. Ninety women ranging from 17 to 21 years of age participated in two experimental sessions that were roughly three weeks apart. In the first session, participants completed the Positive and Negative Affect Schedule (PANAS-GEN), and EEG was recorded. In this first session, participants were instructed to close and open their eyes for an equal amount of time for eight one-minute resting baseline measurements. In the second session, these same participants again had eight resting baselines followed by nine film clips designed to elicit disgust, fear, and moderate to high levels of happiness. The results showed that individuals with higher levels of left mid-frontal activity showed higher levels of positive affect with the PANAS-GEN.

Urry et al. (2004) performed a similar study using a group of adults ranging in age from 57-60 years of age. The results revealed higher levels of eudaimonic well-being (as described in the PWB survey) with greater left frontal activation, as evidenced by EEG during a resting state.

Together, these studies show a relationship between brain activity and positive affect in that positive affect was found to be associated with left mid-frontal activation found in resting EEG. These findings suggest that there may be a physiological difference between individuals reporting high and low levels of trait positive affect.

In another attempt to see if there are biological correlates of well-being, Ryff, et al. (2006) had 135 female participants ranging in age from 61-91 years of age complete surveys and provide biological samples. The PWB (for eudaimonic well-being), and PANAS (for hedonic well-being and negative affect), depressive symptoms, trait anxiety, and trait anger were assessed using surveys. Next, the participant's blood, urine, salivary and cardiovascular function were measured. All urine, blood, and saliva were analyzed for cortisol, epinephrine and norepinephrine. The result of this study showed that subsets of eudaemonic happiness, specifically positive relationships, personal growth, and purpose, were associated with biological markers of health and not measures of ill-being (anxiety, negative affect, etc.).

The studies mentioned above describe both cognitive and physiological responses associated with TPA, providing evidence that these individuals respond differently from others when experiencing stimuli in their environment.

**Measuring emotional responses using the Affective Modulation of Startle Paradigm**

The Affective Modulation of Startle Paradigm is a technique used to measure emotional responding while participants are exposed to emotional stimuli. Using this technique, a brief, loud noise burst is presented while participants view positive and negative pictures. The size of the eyeblink elicited by the noise burst has been related to the emotion elicited by the picture being viewed at the time the eyeblink is elicited (Lang, Bradley, & Cuthbert, 1990). Generally, a startle eyeblink elicited during negative picture viewing displays greater amplitude when compared to neutral picture viewing, while a startle eyeblink elicited during positive picture viewing displays smaller amplitude when compared to neutral picture viewing. This technique has been tested with different populations (for example, individuals with depression (Mneimne, McDermut, & Powers, 2008; Sloan & Sandt, 2010), PTSD (McTeague et al., 2009), anxiety (Ray, et al., 2009; Larson, Nitschke, & Davidson, 2007; Kaviani, et al., 2004), and autism spectrum disorder (Dichter, Benning, Holtzclaw, and Bodfish, 2010), with distinct patterns of eyeblink response observed when compared to controls, suggesting differences in emotional responding within these conditions. Researchers also have utilized the Affective Modulation of Startle Paradigm to assess momentary emotional responding in people with TNA. Examples of these studies are described below.

Mneimne, et al. (2008) compared affective modulation of startle in an undergraduate population of 16 individuals scoring above 11 on the BDI, and 50 individuals scoring below. In the first stage of the experiment, participants viewed 21 pictures that were divided equally into pleasant, neutral and unpleasant. Participants were asked to rate the images as happy, neutral or unhappy. In the second part of the experiment, the participants wore headphones and viewed 42 pictures, 21 of these were novel with an equal number of pleasant, neutral and unpleasant pictures. In the last part of the experiment, the participants rated all pictures that were previously presented. Results of this experiment revealed that participants with low BDI scores (those that were not considered depressed) showed the typical pattern of startle response with startle eyeblinks largest during the viewing of negative pictures and smallest during the viewing of positive pictures when compared to the neutral picture condition. In contrast individuals scoring above 11 on the BDI showed a decreased response while viewing negative pictures and an increased response to positive pictures when compared to participants with low BDI scores when compared to neutral pictures.

Lang and McTeague (2008) conducted a study in which the Anxiety Disorders Interview Schedule was used to divide participants into groups of: specific phobia, social phobia, panic disorder with agoraphobia (PDA), and generalized anxiety disorder (GAD), and matched controls. The participants listened to scripts involving animal, human, or social threats. Participants were instructed to listen to the scripts and imagine what was being described in them. As participants imagined each of the scripts a loud white noise burst was presented to elicit a startle eyeblink response. Individuals with specific phobias and social phobias showed a heightened startle eyeblink response while imagining the fearful stimuli in comparison to controls, suggesting that they were reacting to those stimuli more strongly than controls. In contrast, participants diagnosed with PDA and GAD displayed a blunted startle eyeblink response while imagining the fearful stimuli compared to controls, suggesting that they were reacting less strongly to those stimuli than controls.

McTeague et al. (2008, 2009) also recently published studies using patients diagnosed with social phobia or PTSD compared with a control group. These studies consisted of narratives that include aversive and neutral events with acoustic startle probes presented during the experiment. Participants listened to recordings of the narratives over headphones. Narratives were recorded using a female voice with low prosody. For individuals with social phobia startle eyeblink responses that were elicited while they read narratives about situations describing their personal fears were significantly larger than the eyeblinks elicited during the other narratives. In other conditions their responses were similar to control subjects. Similarly, for patients who experienced single trauma events and developed PTSD, eyeblink responses elicited during personal threat scenarios were significantly larger when compared to PTSD victims who had experienced multiple traumatic events.

Together, the studies described in this section provide evidence that participants with TNA respond to emotional stimuli differently than controls. The purpose of the current study is to utilize the startle eyeblink measure to investigate whether people with TPA also respond to emotional stimuli differently than controls. Specifically, the purpose of the current study is to test the following hypotheses about people with TPA.

**Hypotheses**

1. Participants possessing a high level of TPA, as indexed by a high score on the Trait Cheerfulness Index, will exhibit a stronger positive emotional response to positive stimuli, as indexed by affective modulation of startle, than will participants

possessing a low level of TPA (as indexed by a low score on the Trait Cheerfulness Index). Specifically, individuals with high TPA will have smaller eyeblink magnitude than those low in TPA while viewing positive pictures.

2. Participants possessing a high level of TPA, as indexed by a high score on the Trait Cheerfulness Index, will exhibit a weaker negative emotional response, as indexed by affective modulation of startle, to negative stimuli than will participants possessing a low level of TPA (as indexed by a low score on the Trait Cheerfulness Index). Specifically, individuals with high TPA will display smaller eyeblink magnitude than those low in TPA while viewing negative pictures.

# CHAPTER 3

# METHOD

## Participants

Participants were recruited from the undergraduate population from the University of Missouri-Kansas City (UMKC). Undergraduate students enrolled in psychology courses in which the instructor offered extra credit for research participation had the opportunity to register for the department's online subject pool. Participants were prescreened for Trait Positive Affect (TPA) by completing an online version of the (STCI-60). A total of 199 students completed the online survey (*M*=65.07, *SD*=8.83). Due to the lack of established norms for this measure, in order to gather a sample that would represent both the high and low end of the TPA continuum, students whose scores fell approximately one half of a standard deviation above or below the mean were invited to participate. After collecting STCI-60 data on 200 participants, we computed the mean and standard deviation, then selected the cutoff scores of 61 and 69 to use for the remainder of the study. Therefore, for the entire sample, students with scores greater than 69 or less than 61 on State and Trait Cheerfulness Index (STCI-60) were contacted via email and invited to participate in the laboratory portion of the study. Individuals with scores above 69 were considered high in TPA and those scoring less than 61 were considered low in TPA. Sixty participants completed the laboratory portion of the experiment using these parameters. Fifteen participants were excluded from final analyses because of unusable startle eyeblink data. The remaining sample consisted of 20 participants who had scores ≤ 60 and 25 who had scores ≥ 70. The STCI-60 scores for these final two groups were *M*=52.71 (*SD*=6.56) for the low TPA group, and *M*=74.19 (*SD*=2.76) for the high TPA group.

**Procedure**

The laboratory portion of the study consisted of two phases, a startle testing phase in which startle responses were recorded while participants viewed emotional pictures, and a picture rating phase in which participants rated the pictures on dimensions of valence and arousal. After participants entered the lab they were taken through the informed consent process, reminding them of their rights as a participant and that there would be no penalty for terminating the experiment early. After the participants had given informed consent, they were guided into a sound-attenuating chamber. Three electrodes were taped to the participant's skin, one on the left temple and two beneath the left eye over the orbicularis oculi to record EMG activity (Blumenthal, et al., 2005; Fridlund & Cacioppo, 1986; Stern, Ray & Quigley, 2001). For the startle testing phase, participants viewed a series of emotional pictures, and a startle-eliciting noise burst was presented during picture viewing for a subset of those pictures. The picture set contained negative (*n*=24), positive (*n*=24), and neutral (*n*=12) pictures from the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 1997). Each picture was presented for 5 seconds. Inter-trial intervals were randomized between 5 and 10 seconds with an average inter-trial interval of 7.5 seconds. A startle eliciting noise burst was presented during viewing of 2/3 of positive and negative valenced images, and ½ of the neutrally valenced images (18 of the 24 positive pictures, 18 of the 24 negative pictures, and 6 of the 12 neutral pictures). The startle eliciting noise burst, a 50 ms 105 dB SPL(A) white noise with a near instantaneous onset, was presented 3000 ms after emotional picture onset. The noise burst was presented through headphones as participants viewed the pictures on a 17" LCD computer monitor. The noise burst was only presented during picture stimuli. After completing the startle testing phase, participants were asked to view all of the emotional pictures again and provide a rating for each on valence and arousal. After completing the picture-rating phase, the electrodes were removed, any questions the participant had about the experiment were answered, and the participant was thanked for his/her participation and excused.

## Measures

**Eyeblink Startle**. The AcqKnowledge software, version 3.8.1 (Biopac Systems, 2004) was used for data acquisition with a BIOPAC MP150 bioamplifier (Biopac Systems, Inc., Camino Goleta, CA) using a sampling rate of 2000 Hz. Data were filtered online using a band pass filter (-3-dB low-pass cutoff frequency of 500 Hz and attenuation rate 20 dB per octave; -3-dB high-pass cutoff frequency of 10 Hz and attenuation rate 20 dB per octave). Data were amplified by a factor of 5000 and rectified online. Scoring was done with AcqKnowledge software following the recommendations of Blumenthal et al. (2005). Peak EMG activity was scored as the maximum EMG amplitude occurring 20-120 ms after stimulus onset, that was two standard deviations greater than baseline EMG activity. Baseline was considered as the 50 ms period prior to stimulus onset. If activity occurred in the 50 ms period prior to stimulus onset, the response for that trial was scored as invalid. If a response was not evident within the 20-120 ms time frame then the response was considered a no response trial.

**State and Trait Cheerfulness Index (STCI-60).** The STCI-60 assesses both state and trait cheerfulness. For the purpose of the current research, the trait cheerfulness score measured TPA. The behaviors that high scorers of this index display are increased cheerful mood, low thresholds for smiling and laughter, a composed view of adverse life circumstances, a broad range of elicitors for smiling and laughter, and a cheerful interaction style. This measure is strongly related to a genuine sense of humor and good mood, when compared to a similar measure (Ruch & Carrell, 1998). Four versions of this measure exist, but we will use the STCI-60 (standard form). The STCI-60 has a Cronbach's $\alpha = .93$ for both German and English speaking adults, and the test re-test reliability of the STCI-60 = .84 in a German-speaking sample (Ruch & Kohler, 1999). There are no published norms for this measure noting specific scores that indicate high or low trait cheerfulness.

**International Affective Picture System (IAPS).** The IAPS is a collection of emotionally evocative digitized images that were originally collected to study emotion and attention by researchers at University of Florida (Lang, et al., 1997) at the National Institute of Mental (NIMH) Center for the Study of Emotion and Attention (CSEA). The picture set includes pictures that are positive, (e.g. ice cream, money) negative, (e.g. accident victims, toilets, roaches) and neutral (e.g. chair, vase) in valence. These pictures have been normed with ratings of dominance, arousal, and positive/negative valence, and the ratings have been shown to exhibit both within- and between-subject reliability, $r = .94$ and $r = .94$, respectively (Lang, et al., 1997). Appendix A contains the official IAPS picture numbers used in this study.

**Ratings.** During the picture-rating phase of the study, participants were asked to rate each picture on two dimensions. First, they were asked to rate the picture on valence (how positive or negative they found the picture) on a scale of 1 – 9 (1 = negative, 5 = neutral, 9 = positive). They also rated the picture on how scary/exciting they found the picture on a scale of 1 – 9 (1= not scary/exciting, 5 = neutral, 9 = very scary/exciting).

**Data cleaning and scoring for startle eyeblink response.** Prior to analysis, startle eyeblink data were examined for trials that contained excessive noise, no response or invalid responses. Noise is present during all EMG recording, but excessive noise was defined as activity during baseline (50 ms period prior to stimulus onset), or during the 20-120ms period after stimulus presentation that was of the same level, making accurate scoring of eyeblink magnitude difficult. Trials that did not exhibit a change in EMG activity from baseline during the 20-120ms period after stimulus onset were considered a no response trial. Trials that contained increased EMG activity during the baseline 50ms, or with a response that occurred 0-20ms after presentation of stimulus were classified as an invalid trial and were also considered unusable data. Outlier responses were next identified and examined. Outlier responses were defined as responses greater than 2.5 standard deviations from the trial average. Individual outlier trials were marked invalid and removed from the dataset. Participants who had 50% of trials within a valence condition that consisted of either excessive noise during a trial, invalid response during a trial and/or no response were considered as unusable startle data. Participants matching the criteria described above were identified as having unusable startle data and were excluded (*N*=15).

CHAPTER 4

RESULTS

After data cleaning as described above, the final sample providing usable startle data consisted of forty-five participants, 20 in the low TPA group (male = 3) and the remainder in the high TPA group (male = 5). Table A provides demographic information for the final sample.

**Startle Eyeblink Magnitude**

We hypothesized that there would be a difference in the way that the high and low TPA groups responded to the valence conditions, specifically predicting that the high TPA group would exhibit a stronger positive emotional response to positive stimuli and weaker emotional responses to negative stimuli when compared to the low TPA group. To test for these hypothesized differences, startle eye blink amplitude data were submitted to a 2 (TPA Group: high TPA, low TPA) X 3 (Picture Valence: Positive, Negative, Neutral) mixed ANOVA, with group as a between subjects factor and valence as a within subjects factor. This ANOVA revealed a significant main effect of picture valence, $F(2,86)= 6.91$, $p=.002$, with $\eta^2=.14$, no significant main effect of group, $F(1, 43)=1.18$, $p=.28$, $\eta^2=.03$, and no significant group by valence interaction, $F(2,86)= 2.58$, $p=.1$, $\eta^2=.06$. (Please see Table B, for all means and *SD's*).

Because of our a priori predictions, and because there was no main effect or interaction involving the grouping variable, a series of independent samples t-tests were computed to test our hypotheses by comparing the eyeblink responses between groups for each valence condition.

Hypothesis One. We hypothesized that there would be a difference in the way that the high and low TPA groups responded to the positive valence conditions, specifically predicting that the high TPA group would exhibit a stronger positive emotional response to positive stimuli, as indexed by affective modulation of startle, when compared to the low TPA group. This would mean that startle eyeblink responses elicited during the viewing of positive pictures should be smaller in the high TPA group than in the low TPA group. Results of the independent samples t-tests revealed no significant difference between the high and low groups for responses elicited during positive picture viewing [$t$ (40.23) = -1.12, $p$ = .27].

Hypothesis Two. Our second hypothesis was that the high TPA group would exhibit a weaker negative emotional response to negative stimuli, as indexed by affective modulation of startle, when compared to participants possessing a low level of TPA. This would mean that startle eyeblink responses elicited during the viewing of negative pictures should be smaller in the high TPA group than in the low TPA group. Results of the independent samples t-tests revealed no significant difference between the high and low groups for responses elicited during postive picture viewing [$t$ (41.78) = -1.41, $p$ = .17].

To further explore the pattern of emotional responding to the different valence conditions within each TPA group, a one-way ANOVA examining the effects of valence was performed for each group separately. Results revealed no effect of valence for the low TPA group, $F(2, 38)= 1.09$, $p$=.35, $\eta^2$=.05, but the effect of valence was significant for the high TPA group, $F(2, 48) = 7.21$, $p$ =.007, $|^2$=.23. Within the high TPA group, paired $t$-tests revealed significant differences between the negative - neutral valence conditions and positive – negative valence conditions [$t(24)=3.15$, $p = .004$; $t(24) = -3.44$, $p = .002$ respectively], but not in the neutral - positive valence conditions [$t(24)= -1.76$, $p = .09$]. This pattern holds even with a Bonferroni correction of $p<.0167$.

**Subjective Ratings for Valence**

In order to determine if the low and high groups differed on valence ratings, a 2 groups (high TPA and low TPA) by 3 (positive, negative, and neutral valence condition) repeated measures ANOVA was performed. There was a main effect of valence, $F(2, 86) = 587.171$, $p = .001$, $\eta^2 = .93$, indicating that ratings given for negative, neutral, and positive pictures were different from one another. There was also a group by valence interaction, $F(2, 86) = 3.217$, $p =.052$, $\eta^2 =. 07$. To explore this interaction, independent t-tests were performed comparing the high and low groups for each valence condition. With Bonferroni correction for multiple t-tests, the critical alpha was set at .05/3 = .0167. The results of the *t*-tests revealed a non-significant difference between the groups in the negative valence condition, $t(43) = 2.28$, $p = .028$ and also in the positive [$t(43) = -1.375$, $p =.17$] and neutral valence conditions [$t(43) = .646$, $p =.52$]. Review of the means shows that the low TPA group tended to rate negative pictures less negatively than the high TPA group, although this difference did not reach the level of statistical significance with the Bonferonni correction in place (See Table C for all ratings means and *SD'*s).

**Subjective Ratings for Arousal**

To determine if high and low TPA groups differed in their arousal ratings of the pictures, a 2 (high and low TPA group) by 3 (positive, negative or neutral picture valence) repeated measures ANOVA was conducted. There was an interaction of group by picture valence, $F(2, 86) = 4.52$, $p = .015$, $\eta^2 = .10$. Independent *t*-tests were used to clarify this interaction. Significant group differences were observed in the negative valence condition [$t(43) = -2.63$, $p = .01$; Bonferroni corrected at $p < .0167$] but not in the neutral valence condition [$t(43) = 1.07$, $p = .29$] or positive valence condition [$t(43) = -2.28$, $p = .03$]. Interestingly, the low TPA group rated positive pictures as less arousing than the high TPA group and the low TPA group also rated the negative pictures as less arousing than the high TPA group did (See Table D for all arousal means and *SD's*).

# CHAPTER 5

# DISCUSSION

This research was performed to investigate whether individuals high in TPA would respond differently to emotional stimuli when compared to those low in TPA. Specifically, the investigation sought to test the hypothesis that people high in TPA, as indicated by their score on the STCI-60, would exhibit a stronger positive emotional response to positive stimuli as indexed by the affective modulation of startle when compared to people low in TPA. This hypothesis was not supported. There were no statistically significant differences between the high and low TPA groups in their emotional responses to positive pictures as indexed by startle eyeblink magnitude.

The second hypothesis tested was to determine if individuals high in TPA, as indicated by their score on the STCI-60, would exhibit a weaker negative emotional response when viewing negative stimuli as indexed by the affective modulation of startle when compared to individuals low in TPA. This hypothesis was also not supported. There were no statistically significant differences between the low and high TPA groups in their response to negative pictures as indexed by startle eyeblink magnitude.

Although neither hypothesis was supported, the results do provide evidence that the high and low TPA groups respond to emotional stimuli differently, though not in the way originally anticipated. The high TPA group displayed a significantly different pattern of emotional responding, as indexed by startle eyeblink responses, for the positive, negative, and neutral pictures than the low TPA group. Specifically, the high TPA group showed a larger emotional response to negative stimuli compared to both positive and neutral valenced stimuli. This suggests that those high in TPA discriminate between positively valenced stimuli and negatively valenced stimuli, and also discriminate between neutral compared to negatively valenced stimuli. In contrast, the low TPA group responded equally across all valence conditions, showing no significant differences in eyeblink response across picture valence.

The high and low TPA groups also differed significantly in their subjective arousal ratings of the differently valenced pictures. The high TPA group rated the negative stimuli as more arousing than the low TPA group.

The eyeblink magnitude and ratings data together suggest that those high in TPA are more reactive to negative stimuli. Although this is contrary to my a priori hypotheses, this pattern may still fit within the hypothesized "reserve capacity" framework. I originally hypothesized that the better health outcomes in people with high TPA may be due to those high in TPA being able to more fully experience positive stimuli, and build a reserve that accumulates from a pattern of heightened emotional responses to positive experiences and diminished emotional responses to negative experiences. In light of the results of this study, however, it may be that, rather than experiencing positive emotion to a greater degree, people with high TPA more readily recognize and react to negative experiences. This heightened reaction, as seen by the perceived and physical response (startle eyeblink response and arousal ratings) could lead to behavioral differences between those high and low in TPA that lead to the positive outcomes discussed earlier. This recognition of negative stimuli may lead individuals with high TPA to avoid them, and as a result, they may create safer and more positive environments for themselves, resulting in reduced probability of negative outcomes occurring. Chen and Bargh (1999) performed an experiment that suggested that people automatically use avoidance related muscle movements when viewing negatively valenced stimuli, and use approach muscle movements when presented with positively valenced stimuli. Is it possible that individuals with varying levels of TPA have different levels of this response? Specifically could individuals high in TPA having a more pronounced automatic response to negative stimuli and avoid them? Avoiding negatively related stimuli could cumulatively bring about a greater degree of positive outcomes over the lifetime of a high TPA individual. Alternatively, perhaps this greater differentiation is linked to an increased ability to regulate emotion that enables these individuals to better cope with aversive situations. These individuals may also be better prepared for future events for the same reason. Potentially, these are some actions and behaviors that these people might be employing that result in better overall long-term outcomes.

**Limitations**

This study has several limitations. The only demographic information collected from the participants was gender. There are other participant characteristics, such as ethnicity, age, medications, mental status, physical disorder, or stimulant use that could have influenced the patterns of eyeblink responses and ratings information in this study. For example, because measures of depression, or mood, were not included in this study, it is impossible to rule out the possibility that some of the participants in the low TPA group may have been depressed at the time they completed the survey or lab portion of the study. There is evidence in the literature that people with depression show a different pattern of affective modulation of startle than do non-depressed controls (Mneimne, et al., 2008; Sloan & Sandt, 2010). For example, individuals scoring high in depression measures generally display a decreased negative and positive emotional response when compared to individuals who do not score high in depression measures. Not knowing the current mood of our participants may also confound how the high and low groups interpreted the presented stimuli, as it has been shown that people reporting greater anxiety also have heightened emotional response to negatively valenced stimuli (Smith, Bradley, & Lang, 2005).

A second limitation of the current study is that only one measure of TPA was used. The use of different measures of TPA, along with the STCI-60, may have yielded different results when compared with eyeblink magnitude, ratings of valence and arousal, and provide more information about the different types of TPA that exist in current literature (e.g. psychological well-being and subjective well-being). It is possible that the trait of cheerfulness, our measure for TPA, does not accurately capture TPA, and a different measure may be more closely associated with the magnitude and ratings data between individuals who are high and low TPA. The current study is also limited in that only one physiological measure was used to index emotional reactivity. It is possible that adding other measures such as skin conductance (Mardaga & Hansenne, 2010), corrugator (Miller, Patrick, & Levenston, 2002), heart rate (Burriss, Powell, & White, 2007) or even postauricular startle response (Sloan & Sandt, 2010) could reveal differences in the pattern of emotional response that individuals high and low in TPA have when viewing different patterns of emotionally valenced stimuli that are not produced by the eyeblink modulation. For instance, recording corrugator muscle activity in this study could illustrate how individuals high in TPA are responding to negative stimuli when compared to those low in TPA. Also, the affective modulation of startle paradigm used in the current study would have been stronger by using an inter-trial interval startle eyeblink baseline (collecting startle eyeblink data when no emotionally eliciting stimuli are being presented). The extra presentation of the startle when no eliciting stimuli were present could be used to better understand the atypical pattern of neutral responses that were produced in this study. Lastly, the current study was limited because observed statistical power was low for some of the critical analyses. A greater number of participants would be necessary to be certain that no effect was present for our proposed hypotheses.

**Significance and Implications**

This study tested the hypotheses that individuals high in Trait Positive Affect (TPA) would exhibit increased emotional response to positive stimuli and decreased emotional response to negative stimuli when compared with individuals low in TPA. While the results did not support these hypotheses, startle magnitude response data indicated that individuals high in TPA were able to discriminate negatively valenced stimuli when compared to stimuli of neutral or positive valence as indexed by affective modulation of startle. However, the participants who were in the low TPA group did not show the same ability. Ratings of arousal suggest that individuals high in TPA perceive negative stimuli more negatively than the low TPA group.

One interpretation of this combination of results may be that individuals who have higher levels of (TPA) are more accurate at identifying negative stimuli and experience it more negatively. Further research using a strengthened affective modulation of startle paradigm as discussed previously (presentation of acoustic startle during inter-trial intervals) would be necessary to support this, along with additional measures of mood, depression, demographics and additional psychophysiological measures with an increased sample size.

In knowing how individuals high in TPA process negative events and how that impacts their subsequent behavior, interventions could be created to attempt to mimic this in individuals who are low in positive affect. If individuals with high TPA were found to have an increased emotional response to negative stimuli, then it would become important to further explore how these individuals cope with those heightened responses and respond to them in the moment. One question for this line of research would be, do individuals high in TPA move more rapidly into a positive emotional state after having a negative experience? Another question may be, how do individuals high in TPA cope with these negative experiences?

Overall, the results of the current study demonstrate that individuals who are higher in TPA react more strongly to negatively valenced stimuli when compared to positive and neutrally valenced stimuli while those low in TPA respond equally to all three valence categories . The data also demonstrate that individuals high in TPA rate the negatively valenced stimuli as more arousing than do individuals low in TPA. In order to further examine how individuals high in TPA discriminate negatively valenced stimuli, it would be helpful to investigate other physiological responses in high TPA individual that occur during exposure to negatively valenced stimuli. Specifically, corrugator EMG has often been used to examine emotional responding to negative stimuli, as have measures of heart rate. These measurements may provide greater insight into how high TPA individuals respond to emotional stimuli. Chen and Bargh (1999) suggest that individuals have specific muscle activity relating directly to positive and negative stimuli, is it possible that this muscle activity differs in people who are high in TPA and they have a stronger aversive response to negatively valenced stimuli? Another important avenue would be to explore how people high in TPA approach emotionally laden stimuli. Understanding the methods of emotional regulation in this population might also inform how these individuals respond and recover from emotional events. Alternately, because there are so many different ways to assess TPA, an exploration of different measures of TPA and their relationships to psychophysiological response patterns could shed light on the differences in emotional responding that exist in high and low TPA individuals. Given the results of this study there are several directions for future research that may be able to increase our understanding of the protective nature of TPA. Through further exploration and increased understanding of why high TPA individuals experience better health and mental health outcomes, interventions could be created to assist people who do not have high levels of this trait.

APPENDIX A
IAPS PICTURE NUMBERS USED IN STARTLE TESTING PHASE

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1050 | 1051 | 1300 | 1304 | 1321 | 1932 | 2045 | 2071 | 2075 | 2151 |
| 2311 | 2340 | 2352 | 2360 | 2550 | 2660 | 3000 | 3001 | 3010 | 3060 |
| 3069 | 3080 | 3500 | 4599 | 4626 | 5215 | 5260 | 5301 | 5600 | 5621 |
| 6230 | 6313 | 6350 | 6550 | 7001 | 7014 | 7026 | 7057 | 7061 | 7090 |
| 7150 | 7211 | 7224 | 7230 | 7235 | 7242 | 7270 | 7330 | 7460 | 7490 |
| 8179 | 8186 | 8370 | 9270 | 9301 | 9326 | 9340 | 9373 | 9560 | 9940 |

Table A

*Means, Standard Deviations, and gender, of low and high TPA groups.*

| Group | *N* | Male | Female | STCI-60 (TPA) | |
|---|---|---|---|---|---|
| | | | | *M* | *SD* |
| High TPA | 25 | 5 | 20 | 74.19 | 2.76 |
| Low TPA | 20 | 3 | 17 | 52.71 | 6.56 |

Table B

*Eyeblink Magnitude of Groups*

| Eyeblink Magnitude | *M* | *SD* | *p* |
|---|---|---|---|
| High Trait Positive Affect *n*=25 | | | |
| Negative | 354.9 | 198.1 | |
| Neutral | 286.5 | 155.4 | |
| Positive | 322.2 | 183.58 | |
| Low Trait Positive Affect *n*=21 | | | |
| Negative | 273.7 | 186.99 | |
| Neutral | 256.8 | 186.5 | |
| Positive | 259.3 | 189.9 | |
| Entire Group *N*=45 | | | .001 |
| Negative | 318.85 | 195.37 | |
| Neutral | 273.33 | 168.57 | |
| Positive | 294.31 | 186.97 | |

Table C

*Valence Ratings for groups*

| Valence Ratings | *M* | *SD* | *p* |
|---|---|---|---|
| High Trait Positive Affect *n*=24 | | | |
| Negative | 2.2 | 0.57 | |
| Neutral | 5.19 | 0.28 | |
| Positive | 7.3 | 0.76 | |
| Low Trait Positive Affect *n*=21 | | | |
| Negative | 2.58 | 0.56 | |
| Neutral | 5.3 | 0.77 | |
| Positive | 6.98 | 0.78 | |
| Entire Group *N*=45 | | | .000 |
| Negative | 2.37 | 0.59 | |
| Neutral | 5.24 | 0.55 | |
| Positive | 7.16 | 0.78 | |

Table D

*Arousal Ratings for Groups*

| Arousal Ratings | *M* | *SD* | *p* |
|---|---|---|---|
| High Trait Positive Affect *n*=24 | | | |
| Negative | 6.75 | 1.36 | |
| Neutral | 1.5 | 0.82 | |
| Positive | 4.73 | 1.81 | |
| Low Trait Positive Affect *n*=21 | | | |
| Negative | 5.77 | 1.08 | |
| Neutral | 1.8 | 1.06 | |
| Positive | 3.59 | 1.48 | |
| Entire Group *N*=45 | | | .003 |
| Negative | 6.32 | 1.33 | |
| Neutral | 1.63 | 0.93 | |
| Positive | 4.23 | 1.75 | |

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## VITA

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