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# The Empathy Mitigation: Empathy and its Impact on Pain Perception and Altruistic Motivation

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ABSTRACT

Empathy and its impact on pain perception has been studied narrowly with the focus being on participants receiving empathy during a pain procedure. This study reversed the focus and ran a standard cold pressor test (CPT) in the context of an empathy frame structured to elicit an empathic response for others from participants. It was hypothesized that the group receiving the empathic frame would have longer CPT times due to alterations in pain perception from empathy activation and these subjects' self-reported state-trait empathy level would positively correlate with the increased times. A total of 85 subjects participated with a control group of 43 and an experimental group of 42. State-trait empathy did not correlate with elongated CPT times, but between group CPT times were compared using an independent-samples *t*-test and it was found that the notably longer experimental group CPT times were statistically significant ($P < .05$).

The Empathy Mitigation: Empathy and its Impact on Pain Perception and Altruistic Motivation

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For the one who calls me by name.

And to my family, for always calming the oncoming catastrophizing. For pushing me to achieve more than I could have ever hoped to achieve on my own. For raising me with tenacity and fostering an environment of independent thinking, shaping me into the woman I am today. I will never be able to express how honored I am to be a part of our family.

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# CHAPTER I

# INTRODUCTION AND REVIEW OF LITERATURE

## Overview of Study

The complex psychological constructs that drive human behavior have a profound impact on every individual. Empathy is one of these constructs. As a species that emphasizes community, the ability to recognize and respond appropriately to others is imperative. Over the last two decades, research has begun to explore the importance of understanding how empathy works psychologically as well as physiologically. The correlates of empathy continue to grow as research expands, and its importance and impact on relationship building is growing clearer.

Two correlates that have been linked to empathy and were of acute interest for this study are pain and altruism. Pain is a complex concept and has roots in both physiological and psychological processes, which may be manipulated through varying methods (Lamm, Decety, & Singer, 2011; Loeser & Treede, 2008). Altruism is often correlated with elevated levels of empathy (Burks, Youll, & Durtschi, 2012) and has a marked impact on everyday decisions (Dibou, 2012). The willingness to endure pain for a stranger could be considered a substantial and radical act of altruism. It is hypothesized that this decision to endure for others is predicated by the degree of empathy an individual possesses. Exploring these intricate relationships begins with first understanding each piece individually.

## Empathy

Attempting to define empathy has ultimately led psychologists to publish multiple conflicting interpretations. Some researchers have sought to differentiate empathy from ‘compassion’ or ‘concern’ (Beaumont & Martin 2016; Klimecki, Leiberg, Ricard, & Singer, 2014; Strauss et al., 2016). In fact, some psychologists remark that “there are probably nearly as many definitions of empathy as people working on this topic” (de Vignemont & Singer, 2006, p. 435). For this study, the construct of empathy was defined as the ability to experience affective response that is more consistent with another person’s situation than one’s own situation (Hoffman, 2000). The degree to which an individual is proficient in or aware of these capabilities is measured on a continuous scale (Totan, Dogan, & Sapmaz, 2012). Impacting the awareness of these capabilities is the idea of ‘empathic choice,’ which questions whether making an empathically driven decision is entirely controlled by an individual or is, in part, involuntary.

This experiment was directly influenced by the concept of empathic choice. Individuals in the study were given the option to alter their behavior for the betterment of strangers. In this study, it was hypothesized that altruistic sacrifice would be indicative of their self-reported level of empathy. There are two subgroups of empathic response choice, “those processes of empathy that simply happen to people and those that people can consciously and intentionally produce” (Hodges & Wegner, 1997, p. 311).

# Empathic Choice

## Controlled Empathy

Intentionally produced or ‘controlled’ empathic responses are those that center on the conscious act of perspective taking (Cojuharenco & Sguera, 2015). Recalling events that bear a resemblance to the situation another is facing or choosing to bar such thoughts are believed to be behaviors involved in perspective production and perspective suppression (Hodges & Wegner, 1997). Studies have begun to establish that choosing to take on an alternate perspective may impact the brain’s physiology. The experimental procedure for this study sought to observe a correlation produced, in part, by the response of perspective taking.

## Perspective Taking

There has been evidence that through targeted efforts empathic responses may be manipulated and amplified. Shared-substrate, or simulation models of emotion recognition, theorize that the ability to recognize and process emotions displayed by others is in part, reliant upon the internal processes that simulate emotional states within one’s self that are congruent (Heberlein & Atkinson, 2009). This describes the idea behind perspective taking. Perspective taking has long been communicated through the iconic idiom ‘taking a walk in someone else’s shoes.’ Neuroscience has shown that perspective taking has a substantial impact on an individual’s neural circuit activation patterns (Decety, Chen, Harenski, & Kiehl, 2013; Hynes, Baird, & Grafton, 2006). This indicates that a compassionate response, or ‘empathy put into action,’ could be substantially magnified due to the process of perspective taking (Boyatzis & McKee, 2005, Decety & Hodges, 2006). Theoretically, this response could be evoked regardless, but be of a weaker constitution. However, with the elicited activation of additional parts of the brain due to perspective taking, the empathic and compassionate response could be magnified, and the level to which the response is magnified could be altered through purposeful practice (Batson, Early, & Salvarini, 1997; Van Lange, 2008).

Recent studies have successfully trained the brain's empathic response patterns, therefore increasing the controlled empathic response, by using neurofeedback exercises that utilize perspective taking. Consistent with this proposed hypothesis, participants successfully acquired volitional control over parts of the brain associated with empathic response during neurofeedback training sessions (Berman, Horovitz, & Hallett, 2013; Caria et al., 2007, 2010). This, in short, demonstrates that neurofeedback training seems to strengthen empathic responses, and this training meaningfully alters functional connectivity in the brain. Additionally, this self-regulation and altered functional connectivity was found in post-test studies to be maintained despite a significant time gap (Veit et al., 2012; Yao et al., 2016).

**Automatic Empathy**

Those responses that simply happen, or are 'automatic,' are usually considered more emotionally driven empathic responses and have begun to be mapped using brain imaging software in recent research (Cameron, Spring, & Todd, 2017; Hodges & Wegner, 1997). Concepts, not just empathy (Bargh, 1984) but those such as hostility (Carver, Ganellen, Forming, & Chambers, 1983) and competitiveness (Neuberg, 1988), displayed an increased arousal level with subtle priming experiments. Though they were not consciously aware of a stimuli's presence or its intended influence, studies revealed that background stimuli’s correlation with the individual’s altered performance was statistically significant (Bargh, 1994).

When empathy was studied in correlation to psychopathy, often identified by the inability to experience empathy, results indicated that the neurological circuits activated during the exercise varied between the psychopathy group and the control group. Substantially lower neural circuit activity in subjects with psychopathy and higher levels of activity in the control group posed the idea that this physiological inability may contribute to a psychopath’s lack of feeling empathy. However, the original hypothesis was incorrect in its assumption that there would be no neurological activity in the psychopathy group. Though it was substantially less than the control group comprised of average individuals, there was still notable activity within the insula, a section of the brain now thought to play a significant role in arousing empathy (Cesario, Corker, & Jelinek, 2013; Decety et al., 2013; Pfabigan et al., 2015). This research supports the idea that there is an automaticity to empathy, as subjects still demonstrated neural activity despite the fact they themselves reported feeling no empathy. With the bypassing of the cognitive processes involved with evoking these constructs, there may then be an involuntary component to empathic response.

Neural imaging demonstrates that there are differentiated patterns of brain activity during automatic and controlled empathic responses. Their influence when working together is stronger and may impact an individual’s subsequent response exponentially (Cameron et al., 2017). Controlled and automatic empathy are two contributing concepts that form the ‘dual concept theory of empathy,’ which is becoming more widely accepted

(Cialdini et al., 1987; Eisenberg & Strayer, 1987; Głaz, 2015; Pfabigan et al., 2015; Yeo, Ang, Loh, Fu, & Karre*,* 2011).

## Cognitive and Emotional Empathy

Cognitive and emotional empathy work both collectively and individually (Jordan, Amir, & Bloom, 2016). Cognitive empathy is defined as the ability to recognize others' mental states. It is a cognitive process that allows an observer to recognize why, within the context, the evoked emotional response occurred (Dziobek et al., 2011). For example, the ability to recognize why an individual who has been standing in line for a substantial period of time has become increasingly agitated would be attributed to cognitive empathic ability. This type of empathy is closely linked to controlled empathy and perspective taking, as willful cognition is required for the process of perspective taking.

In contrast, emotional empathy is the ability to experience the feelings of others in a vicarious fashion. For example, if someone begins to cry, and an uninvolved observer begins to become teary-eyed or cry themselves, it is assumed this response is due to the emotional display of another (Hodges & Biswas-Diener, 2007). Emotional empathy has been said to be an automatic response, "it happens *to* us, rather than us *doing* it" (Thomas, 2013, p. 1). This assumption of automaticity refers back to the theory of empathic choice and the automatic component proposed in its paradigm.

For this study, the measure used to discern a subject's level of empathy was a self-report scale whose items measured both emotional and cognitive empathy for a combined empathy score. When presented with the experimental condition, it was hypothesized that an increase in altruistic willingness would be demonstrated by an increase in task times. This increase would be attributed to the subject experiencing both automatic and controlled empathy, which would have motivated them to act altruistically. Therefore, the extent to which they were able to use perspective taking would, in part, impact their task performance. Their self-reported levels of empathy, combining both emotional and cognitive, would positively correlate with an increase in task times. In general, empathy has a marked impact on cognitively and emotionally driven responses and constructs as seen through correlation studies.

## Correlates of Empathy

### General

Empathy is considered commonplace in everyday social interactions, a driving factor in the decided response to other's cognitive and emotional states (Cialdini et al., 1987; Masten, Morelli, & Eisenberger*,* 2011). It has also been shown that empathy can cause an impact that promotes prosocial behaviors (Barraza & Zak 2009; Hurter, Paloyelis, Williams, & Fotopoulou, 2014; Lumley et al., 2011; Meyer et al., 2012). In contrast, decreased levels of empathic ability is considered a key contributor in evaluating schizophrenia and measuring autism (Hoffmann, Koehne, Steinbeis, Dziobek, & Singer, 2016; Horan et al., 2015; Pulvers, Schroeder, Limas, & Zhu, 2014). Furthermore, empathy has been positively correlated with the trait of resilience; it has been used in reinforcement learning; and it has been used in job candidate selection (Mathad, Pradhan, & Radjesh, 2017; Sabina, 2016; Schwenck et al., 2017).

### Altruism

The empathy-altruism hypothesis states that when an individual experiences empathy for another, they will come to that person's aid regardless if they gain from it or not (Persson & Kajonius, 2016). Furthermore, experimental research suggests that people are readily prepared to aid in decreasing the distress and suffering of others, frequently at a considerable cost to themselves, when empathy is substantially triggered (Batson et al., 1981, 1991, 1997, 1998). In consequence of these facts, it could be posited that an individual with a greater level of empathy would be more likely to experience an altruistic activation within an empathically driven situational context.

### Pain

Empathy has also been linked to the complex concept of pain. Studies have indicated that subjects who were put through pain experiments while receiving an empathic response from another person reported their pain at a lower intensity during the experimentation (Goldstein, Shamay-Tsoory, Yellinek, & Weissman-Fogel, 2016; Hurter et al., 2014). This study will also investigate the relationship between empathy and its impact on pain.

## Pain

### Defining Pain

The subcommittee on taxonomy of the International Association for the Study of Pain defines pain as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage,” (Loeser et al., 2008, p. 473). Nociceptors in the body are responsible for the ability to recognize damaging or potentially damaging stimuli (Barker, Cicchetti, & Neal, 2012). Bottom-up nociceptors send signals from the point of perceived pain, “the bottom,” up through the body to multiple areas of the brain, “the up,” to be interpreted (McCaffery, Pasero, & McCaffery, 1999). It has been theorized that the interpretation of these signals and the subsequent experience of pain is a multidimensional experience that has affective-motivational, sensory-discriminative, emotional, and behavioral components (Mordeniz, 2016). The influence of these contributing factors and the subsequent interpretation of these bottom-up signals has been termed as 'pain perception,' (Woo, Buhle, & Wager, 2015). Due to the complex nature of pain interpretation and the intricacy of the human brain, the direct relationship beginning with bottom-up nociceptors and it is theorized that the ultimate interpretation is influenced by mitigating factors

One theory suggests that through the process of cognition, pain perceptions can be altered and the physical intensity of pain perceived as less intense. Physiologically, this is done through the alteration of neural networks, a cluster of interconnected neurons whose activation outlines an identifiable linear pathway (Barker et al., 2012) that have recently been linked to pain perception (Heberlein et al., 2009). A meta-analysis run on studies that investigated neural networks involved in the direct experience of pain were able to support their posited hypotheses (Buhle et al., 2014). Neural networks were found to be formed in similar structures in all human subjects and were consistent across studies and countries (Lamm et al., 2011). The discovery of this similarity allows for a congruent investigation of neural networks and a consistent understanding of how the brain processes the state of pain. In consequence, how the experience of pain can be altered due to the presence of other stimuli and the activation of additional neural networks was then explored (Bastiaansen, Thioux, & Keysers, 2009; Caria, Sitaram, Veit, Begliomini, & Birbaumer, 2010). It was discovered that one way to cognitively impact the perception of pain is through the process of 'self-regulation' (Rangel, Camerer, & Montague, 2008).

**Self-Regulation**

Self-regulation is defined as “changing the way one thinks about a stimulus in order to change its affective impact,” (Buhle et al., 2014, p. 2981). Meta-analysis results revealed that, generally, cognitive coping strategies were found to be more effective in alleviating pain when compared to a non-treatment expectancy control groups (Fernandez & Turk, 1989). Current theories about the cognitive regulation of pain and emotion suggest that shifts in cognitive context act to modify primary affective processes, effectively ‘turning up’ or ‘turning down’ bottom-up nociceptive and affective signals in the brain (Buhle et al., 2014; Ochsner, Silvers, & Buhle. 2012).

Neuroimaging studies reveal that while pain is influenced by both cognitive self-regulation and noxious input, these processes are mediated by two distinctly different brain systems. The intensity of the noxious stimulus and its impact were mediated by the neurologic pain signature (NPS) and the effects of self-regulation were mediated by a fronto-striatal pathway connecting nucleus accumbens and ventromedial prefrontal cortex mediates (NAc-vmPFC). These pathways have been shown to be vital in the emotional and pain regulation process, in a range of contexts, but did not seem to respond to changes in the actual stimulus intensity (Hashmi et al., 2013; Rangel et al., 2008; Wager, Davidson, Hughes, Lindquist, & Ochsner, 2008; Woo et al., 2015). In short, the NAc-vmPFC pathway demonstrated no discernable change when the intensity of the stimuli was lowered or raised, leading researchers to believe that changes in the actual stimulus did not significantly influence the NAc-vmPFC pathway. This lack of influence indicates there may be an autonomy to cognitive processing and stimulus processing.

Consequently, regardless of a noxious stimuli's severity, cognitive processing could still impact pain perception in a substantial way.

The discovery of this lack of impact that a noxious stimulus has on the NAc-vmPFC pathway encourages a line of inquiry focusing on what types of cognitive correlates impact pain perception to the greatest extent and how they may be activated. The experimental procedure for this study modeled concepts of this strategy in hopes of altering task performance. Correlations between control groups and experimental groups in studies that sought to alter pain perception have been found to be significant (Fowler, Rasinski, Geers, Helfer, & France, 2011).

**Correlates of Pain**

Research has confirmed that cognitive motivated stimuli presented before or during a pain procedure impacts subjects to such an extent that when comparing the control group and experimental group, there was a notable and significant difference. Both the reported intensity of pain and measured infliction times have been reduced or increased depending on the pain perception manipulation. These correlates include, but are not limited to, challenging social norms statements, safety cues by viewing a picture of a loved one, and religious beliefs linked stimuli (Geers et al., 2015; Howick et al., 2016; Hurter et al., 2014; Jegindø, Vase, Jegindø, Geertz, 2013; Kökönyei, Urban, Reinhardt, Jozan, & Demetrovics, 2014; Müller, 2012; Fowler et al., 2011). Additionally, experimentation has found psychopathy to have a positive correlation between increased pain tolerance and elevated levels of psychopathy traits. This trait, as mentioned in the Empathic Choice subsection, has been linked to abnormal cognitive functioning and found to correlate with pain perception significantly (Brislin, Buchman-Schmitt, Joiner,

& Patrick, 2016; Pulvers et al., 2014; Yeo et al., 2011). Discerning whether empathy correlates with pain will be the main focus of this study, explored through experimentation.

## Present Study and Research Objectives

### Empathy and Pain

Recently, an amassing number of fMRI studies have revealed prominent similarities in the neural circuits involved in processing both first-hand pain experiences and second-hand experiences of observing other individuals in pain. This could be due, in part, to the recently corroborated findings that pain networks have significant overlap with empathic networks (for meta-analysis, see Jackson, Rainville, & Decety, 2006). This overlap allows the human brain to more easily understand the experience of pain and emphasize with another in pain. With these findings, the theoretical accounts which place shared neural representations at the root of the human ability to understand others and their ability to experience intersubjectivity, have been supported (Lamm et al., 2011). This close relationship between empathy and pain could theoretically be used to alter pain perception, which this study sought to corroborate.

### Empathy for Friends vs. Strangers

Studies suggest that experiencing empathy for a friend or loved one in pain differs from experiencing empathy for a stranger in pain (Jackson, Meltzoff, & Decety, 2005; Meyer et al., 2013; Mitchell, Macrae, & Banaji, 2006). Theories posit that the relationship an observer has with the individual experiencing social or physical pain can act as a moderator for which neural mechanisms are recruited to experience empathy for that person's suffering (DeWall, MacDonald, & Webster, 2010). It is not an issue of recognition of distress, as self-reports indicated that individuals were aware of the stranger's social distress but they shared more negative emotions, empathizing, with their friends than with an unknown subject (Meyer et al., 2013). In addition, studies indicate that viewing pictures of a loved one has a significant impact on reported pain intensity (Eisenberger et al., 2011; Master et al., 2009; Younger, Aron, Parke, Chatterjee, Mackey, 2010). This study utilized visual stimuli by using pictures of strangers as a focal point during the pain exercise.

## The Objectives of this Study

The relationship between empathy and pain reduction has been explored through experimentation of subjects receiving empathy from others while receiving a painful stimulus (Goldstein et al., 2016; Hurter et al., 2014). This indicates that empathy has the potential to impact a subject's reactivity to pain during a standard Cold Pressor Test (CPT). This study sought to test the hypothesis that experiencing empathy for another person while experiencing a painful stimulus would have similar analgesic effects that receiving empathy from others has shown to have in other studies.

The concept of experiencing empathy for another, ultimately having an analgesic effect, explores the idea that empathic concern for strangers can activate an altruistically driven response. This, in turn, would significantly impact a person's pain perception. The impact on pain perception was measured by observing CPT times, demonstrating an individual's willingness to take more pain for unknown teammates. Their measured level of empathy was hypothesized to be indicative of their altruistically driven willingness and demonstrated as an alteration in their pain perception. With the knowledge that the individual's willingness to take pain would reduce the amount of pain another would need to experience, their motivation for elongating their CPT time would increase. It was hypothesized that when influencing the subject's pain perception by attempting to arouse their empathic perceptive taking mechanisms, those with higher measured levels of empathy would positively correlate with their measured CPT time.

Exploring the theoretical relationship between empathy, altruism, and pain has implications in multiple areas of study. By being able to correlate these concepts, research into chronic pain management may be furthered. Furthermore, expanding on research into the impact the human psyche may have on pain perception continues to examine the link between the psychological processes and physiological processes which links directly to disorders featuring somatic symptoms. This set of disorders has only recently begun to gain traction in the research field. With merely a fledgling understanding of their progression and course and what treatments may improve a patience's condition, further exploration is paramount (Comer, 2016).

# CHAPTER II

# METHODS

## Participants

Participants were at least 18 years of age and were from the undergraduate student body of Abilene Christian University. They were recruited out of undergraduate psychology courses. A total of 85 participants successfully completed the study, 42 of which were randomly assigned to the experimental group while the remaining 43 were randomly assigned to the control group. Of those 85, 70 were female and 15 male. 87.1% were white/Caucasian, 8.2% African American, and 4.7% Asian in descent.

## Measures

### Cold Pressor Test

The Cold Pressor Test (CPT) is a standard physiological measure in which a subject submerges their non-dominant hand in ice cold water, measured between 4°C to 6°C, until the pain becomes intolerable. This study includes an uncommunicated time cap set at four and a half minutes (Koenig et al., 2014). Multiple evaluations validate the reliability of the CPT, with consistent performance across studies (Fasano et al., 1996; Koenig et al., 2014; Mitchell et al., 2004). For this experiment, a three-liter double-walled stainless steel ice bucket was filled with ice water, measured temperature staying within the 4°C to 6°C range. It was placed on a stand directly next to the subject's non-dominant hand. Once the subject submerged their hand in the ice water the experimenter began a stopwatch. Once the subject removed their hand, the stopwatch was stopped and their time recorded.

**Basic Empathy Scale**

Empathy was measured using the Basic Empathy Scale (BES) (Jolliffe & Farrington, 2004). The BES is a self-report instrument with a five-point Likert scale (‘strongly disagree,’ ‘disagree,’ ‘neither agree nor disagree,’ ‘agree,’ ‘strongly agree’) that is comprised of three subscales. One subscale measures ‘cognitive empathy,’ the ability to recognize other’s mental states, and is comprised of nine items (e.g., “I can often understand how people are feeling even before they tell me”). ‘Affective empathy,’ the ability to experience the feelings of others in a vicarious fashion, is measured on another subscale and is comprised of 11 items (e.g., “After being with a friend who is sad about something, I usually feel sad”). Both comprise ‘total empathy’ with an overall number of 20 items. The overall reliability of the BES was measured at $\alpha = 0.87$ (Jolliffe & Farrington, 2004). Since its inception, the BES has been translated into multiple languages and found to be valid in each reconstruction (Anastácio, Vagos, Nobre-Lima, Rijo, & Jolliffe, 2016; Bensalah, Stefaniak, Carre, & Besche-Richard, 2016; Heynen, Van der Helm, Stams, & Korebrits, 2016; Noelia, Luis, Darrick, & Carmen, 2014; Villadangos, Errasti, Amigo, Jolliffe, & Garcia-Cueto, 2017; You, Lee, & Lee 2017). The full BES is in Appendix G.

## Procedure

Participants were given the full informed consent in addition to a brief medical questionnaire to rule out any potentially dangerous or data compromising conditions (Appendix F) before experimentation began. Once completed, the experimenter reviewed their signed consent forms and answered any additional questions. The subject was then escorted into a designated office space and seated at a desk in front of a computer. Each subject was then asked to complete a paper copy of the BES and a general demographic questionnaire (Appendix B). Those in the control group were told what the CPT test would consist of upon completion of the questionnaires. It was explained that the purpose of the study was to explore the impact that visual stimuli had upon pain tolerance. For the duration of the CPT, the computer showcased a picture of a mountainous background as the control visual stimulus, located in Appendix E.

Those in the experimental group were shown a file on the computer screen which displayed an array of head shot photographs (from the shoulders up). The array displayed an assortment of photographs of their classmates to ensure some photos would be familiar, and some individuals outside of the university were used so there would be some that are unfamiliar. It was then explained that the study's goal was to measure group dynamics and pain perception. For standardization, it is directly addressed in experimenter script, as seen in the excerpt below.

> The purpose of this experiment is to assess team dynamics and how pain is perceived. To do this, we will be grouping people into teams of three. The goal of the team effort is to record and assess how long each team member can hold their hand in the cold water and see if the set goal of 25 minutes can be reached. Each member of the team will come in at different times and will have no required contact with one another after the test is complete ('Script,' located in Appendix C).

Participants were told that they would get the unique opportunity to choose their additional two teammates to complete the group of three. With the goal of this study being to explore empathy activation and altruistic motivation for strangers, they were told to choose two teammates that were completely unknown to them and that one had to be male and one had to be female. Once the individual selected two teammates, the computer screen was modified so that half displayed their male team mate and the other half displayed their female teammate.

Subjects were then told that their actions would positively impact their teammates and that their willingness to alter their behavior would result in less pain for others. This was the empathic framing narrative that was hypothesized to influence the activation of the subject's cognitive perspective taking ability and emotional empathic response:

> As the first person in your group, the longer you are able to hold your hand in, the *less* time the other two people in your group will need to hold their hands in. Essentially, the more pain you take, the less pain the others will need to take ('Script,' located in Appendix C).

Subjects were asked to "please keep your teammates in mind and look at their pictures during the test" ('Script,' located in Appendix C). In order to account for the possible mitigating factor of distraction due to the visual stimulus and to measure pain patterns, both the control and experimental group were instructed to rate their pain level on a standard visual analog scale (VAS) every 15 seconds by pointing to where on the scale their pain ranked. Once they indicated their level of pain, the experimenter would mark on their own subject-specific VAS where the participant pointed. This scale, located in Appendix D, was a line labeled 0 to 100 where individuals indicated their current rate of pain with 0 being no pain at all and 100 being the worst pain imaginable.

When the subjects in the experimental group fully submerged their hand, the experimenter began a stopwatch, and after the first 15 seconds, they began the beeping interval timer that was used to remind the subject to report their pain level. The experimenter marked down all pain levels indicated on their own subject specific VAS. Once the subject removed their hand from the water, the experimenter halted the stopwatch and noted the time displayed as the subject's final CPT time. The subject was then given a towel and asked to indicate their thoughts throughout the test. After verbal confirmation that the subject had recovered, they were thanked for their participation and were free to leave.

CHAPTER III

RESULTS

**Comparison of Groups**

Prior to hypothesis testing the groups were compared by gender and BES scores to assess group equivalence and rule out possible confounds. Descriptive statistics can be found in Table 1.

Table 1

*Comparison of Groups*

| Group: | Females | Basic Empathy Scale Score | |
|---|---|---|---|
| | | M | SD |
| Control | 81.4% | 41.14 | 8.79 |
| Experimental | 83.3% | 40.29 | 11.63 |

**Average Duration and Max-Out Time Across Conditions**

The average length of the CPT for all 85 participants was 178.43 seconds (SD = 98.19) with a 270 second max-out time. Overall, 49.2% of participants reached the max-out time. Of the 42 subjects that maxed out on time, 64.3% were within the experimental group, indicating that a participant in the experimental group would reach maximum time nearly twice as often compared to those the control group (Table 2). This is consistent with the experimental predictions that those exposed to the empathy frame would persist longer in the CPT.

Table 2

*Frequency Table for Max-Out Time Cases by Group*

| Group: | Frequency | Percent |
|---|---|---|
| Control | 15 | 35.7% |
| Experimental | 27 | 64.3% |

*Note:* $\chi 2$ (1) = 7.35, p < .01

**The Effect of an Empathy Frame on CPT Times**

It was hypothesized that with the introduction of an empathic frame to the experimental group, CPT times would be significantly higher than those in the control group. An independent-samples *t*-test was run on the grouping variable consisting of the control and experimental group and each subject's CPT time. Descriptive and inferential statistics can be found in Table 3. As shown, the data supported the original prediction. As shown, those in the experimental group averaged an additional 58.11 seconds longer during the CPT when compared to the control group.

Table 3

*t-test Results Comparing Cold Pressor Times by Group*

| Group: | N | Mean | SD | df | t-value | p-value |
|---|---|---|---|---|---|---|
| Control | 43 | 149.72 | 95.73 | 83 | 2.84 | .006 |
| Experimental | 42 | 207.83 | 92.83 | | | |

**Additional Analyses**

**Peak Pain Rating**

In addition to overall CPT time, it was hypothesized that the empathy frame would alter pain perception for those within the experimental group. It was predicted that the introduction of an empathy frame would produce an analgesic effect and subjects would experience less intense pain during the procedure. Participants were instructed to rate their pain on a scale of 0 to 100 every 15 seconds, and their highest rate of pain was recorded as their 'peak pain rating.'

An independent-samples *t*-test was run on the averages of the peak pain ratings for the experimental and control groups. Inferential and descriptive statistics are located in Table 4. After comparison, it was found that there was no significant difference in peak pain rating reported between groups. Therefore, pain perception, as measured by peak pain rating, was unaltered by the empathy frame, inconsistent with the original hypothesis.

**Persistent Time after Peak Pain Rating**

Beyond CPT time and peak pain rating, how long a subject remained with their hand submerged after reporting peak pain was recorded and marked as 'time persisted.' An independent-samples *t*-test was run on time persisted for each group, and results can be found in Table 4. As seen, those in the experimental group remained with their hands submerged for significantly longer than those in the control group. Given the prior analysis with peak pain ratings, it appears that this 44 seconds of difference in persistence is not due to reduced pain intensity felt by the experimental group, as differences in peak pain ratings between groups were non-significant. This suggests that persistence was increased by the empathy frame, a willingness to endure pain on behalf of others. This further supports the original hypothesis that an individual enduring pain with an empathy frame would demonstrate altered behavior.

Table 4

*Means for Max Pain Rating and Seconds Persisting by Group*

| Group: | Max Pain Rating | Seconds Persisting Past Max Pain |
|---|---|---|
| Control | | |
| Mean | 58.14 | 40.12 |
| SD | 22.72 | 62.85 |
| Experimental | | |
| Mean | 61.29 | 82.14 |
| SD | 22.35 | 78.14 |

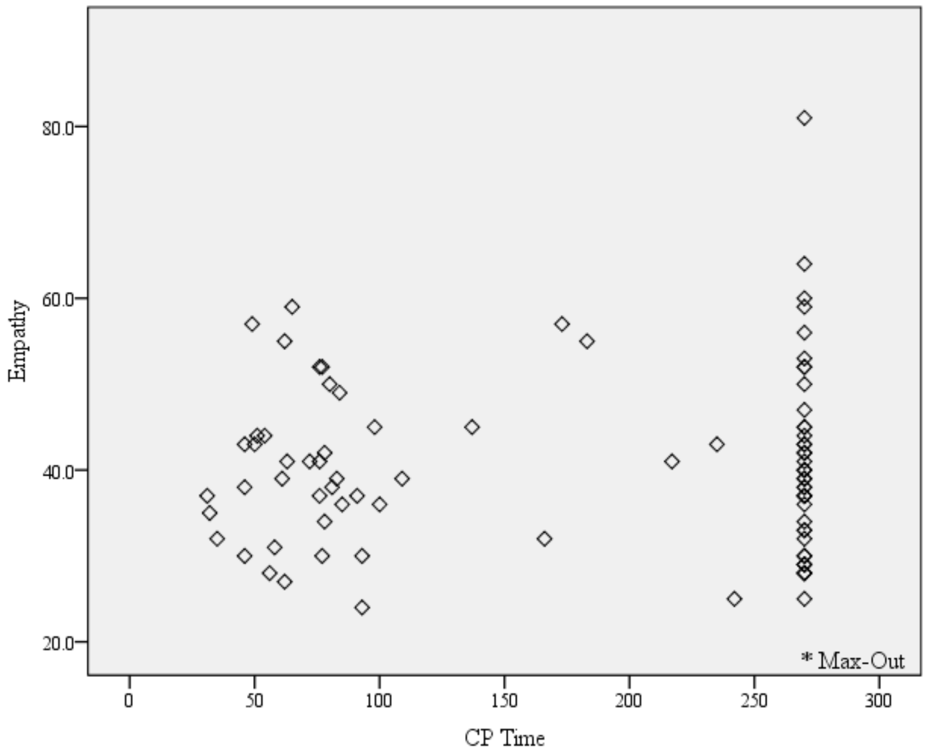
*Note*: Max Pain Rating: $t(83) = 1.64$, $p > .05$. Seconds Persisting Past Max Pain: $t(83) = 2.74$, $p = .008$.

**Empathy and CPT Time**

Self-reported state-trait levels of empathy were originally hypothesized to be a predictive characteristic for longer CPT times within the experimental group. It was predicted that those who had higher levels of empathy would react more strongly to the empathic framing and therefore remain with their hands in longer, yielding greater CPT times. To test this, a correlation between self-reported empathy levels, assessed by the BES, and CPT times for the experimental group was run. The BES scores for all participants were averaged at 40.718 with a standard deviation of 10.241. The scatter plot for BES score and CPT time can be found in Figure 1. It was found that the relationship was non-significant ($r = .05$, $p > .05$). This would indicate that a subject's level of self-reported empathy did not impact their performance or their willingness to take pain for their teammates. In sum, the CPT differences observed between the groups appeared to be due to the experimental manipulation (empathy framing) rather than the personal attributes of the participants (trait empathy).

Figure 1

*Empathy and CP Time Scatter Plot*



CHAPTER IV

DISCUSSION

## Overview

Research into the operations and correlates of empathy have yielded conflicting and often disputed results. One of the more common definitions of empathy is the ability to experience an affective response that is more consistent with another person's situation than one's own situation (Hoffman, 2000). This hypothesis also bisects the use of empathy into two parts, creating the 'dual concept theory of empathy' (Cialdini et al., 1987). Cognitive empathy is defined as the ability to recognize other's mental states. It is a cognitive process that allows an observer to recognize why, within the context, the evoked emotional response occurred (Dziobek et al., 2011). In contrast, emotional empathy is the ability to experience the feelings of others in a vicarious fashion. Emotional empathy has been said to be an automatic response, "it happens to us, rather than us doing it" (Thomas, 2013, p. 1).

Tightly linked to cognitive empathy is the idea of controlled empathy and its subsequent consequence 'perspective taking.' Recalling events that bear a resemblance to a situation another is facing or choosing to bar such thoughts are believed to be behaviors involved in the use or disuse of perspective taking- perspective production and perspective suppression (Hodges & Wegner, 1997). In contrast, emotional empathy is tightly linked with the phenomenon of 'automatic empathy.' Those responses that simply happen, or are 'automatic,' are usually considered more emotionally driven empathic responses (Cameron et al., 2017; Hodges & Wegner, 1997). Both of these influences have seemed to impact behavioral decisions and patterns when faced with a situation that engages these areas of the psyche (Cesario et al., 2013; Cialdini et al., 1987; Decety et al., 2013; Eisenberg & Strayer, 1987; Głaz, 2015; Yeo et al., 2011). Strong correlates of empathy include altruism and pain perception (Goldstein et al., 2016; Hurter et al., 2014).

The empathy-altruism hypothesis states that when an individual experiences empathy for another, they will come to that person's aid regardless if they gain from it or not (Persson, et al., 2016). Furthermore, experimental research suggests that people are readily prepared to aid in decreasing the distress and suffering of others, frequently at a considerable cost to themselves, when empathy is substantially triggered (Batson et al., 1981, 1991, 1995, 1997, 1998, 2001). In consequence of these facts, it was hypothesized that an individual with a greater level of empathy would be more likely to experience an altruistic activation within an empathy driven situational context.

Pain perception is theorized to be the interpretation of signals sent to the brain and the influence of contributing factors (i.e., affective-motivational, sensory-discriminative, emotional, and behavioral components) on that interpretation (Woo et al., 2015). One theory suggests that through the process of cognition, pain perceptions can be altered and the physical intensity of pain perceived as less intense (Barker et al., Buhle et al., 2014; 2012; Heberlein et al., 2009; Lamm et al., 2011). It was discovered that one way to cognitively impact the perception of pain is through the process of 'self-regulation' (Rangel et al., 2008). Self-regulation is defined as "changing the way one thinks about a stimulus in order to change its affective impact" (Buhle et al., 2014, p. 2981). This type of manipulation is what shaped the procedure for this study.

The goal of the present study was to examine the associations between pain perception, pain tolerance, altruism, and empathy in an experimental design. The concept of experiencing empathy for another ultimately having an analgesic effect suggests that empathic concern for strangers can activate an altruistically driven response. This in turn, could impact a person's pain perception. In this study, the impact on pain perception was measured by observing CPT times, demonstrating an individual's willing to take more pain for unknown teammates. It was predicted that those exposed to the empathy framing would experience less pain and persist longer in the CPT. In addition, it was hypothesized that when influencing subject's pain perception by attempting to arouse their empathic perceptive taking mechanisms, those with higher measured levels of empathy would positively correlate with their measured CPT time.

Overall, the experimental predictions were partly supported. First, the procedure for the experimental group was consistent with the hypothesis, as it elicited a difference between groups. The hypothesis that an empathically framed scenario would elicit longer CPT times was supported by the data. In addition, while averages of peak pain reported were found to be non-significant between control and experimental groups, the experimental group remained with their hands submerged for significantly longer after indicating their highest pain rating. Lastly, the correlation between self-reported empathy and CPT times in the experimental group was found to be non-significant, suggesting that the experimental manipulation, rather than trait empathy, is what significantly increased CPT times.

**Implications**

The study of pain has been of great interest in recent years (Woo et al., 2015). Better understanding the process by which pain is perceived and altered could have impacts in pain management for chronic pain suffers. Studies show that over 100 million Americans suffer with some form of chronic pain condition (NIH Interagency Pain Research Coordinating Committee, 2016). Leading research has begun to explore a more varied approach to treating chronic cases (Simon & Collins, 2017). By exploring the scope of cognitive perspective taking and self-regulation, steps can be taken for more in-depth exploration of the brain systems used in managing pain and the brains own analgesic capacities.

This would also be applicable to acute pain in combat and life-threatening situations. Continued research into alterations of pain perception and the relevant methods to improve that process could lead to better coping strategies. Individuals in work fields that have a real possibility of bodily injury such as firefighters, police officers, or even soldiers, may have reason for cognitive self-regulation training for dealing with on the job injuries. With the ability to decrease pain sensitivity, not only would they be able to perform their responsibilities, but they may also become more likely to carry on after an injury in their line of work.

This type of restructuring could also be practical in clinical therapy settings. The true effectiveness of cognitive-behavioral therapy (CBT) (Leichsenring & Steinert, 2017) has been under scrutiny in recent years. Supporting the hypothesis that cognitive processes do indeed have an impact on behavior would be a step in lending the practice credibility. In order to develop a supportable therapy regimen for managing both physical and emotional pain with patients, research must first demonstrate the strength of the correlation between cognitive processes and pain. In the same vein, it would allow for better treatment for disorders that have physical implications caused by psychological defects, such as somatic symptom disorders.

Somatic symptom disorders are a controversial topic in the psychological community (Mayou, Kirmayer, Simon, Kroenke, & Sharp, 2005). While greatly accepted in certain parts of the world, western society has yet to embrace fully this set of conditions, spurring further research into the topic. Studies like these that deal with a physical stimulus mitigated by a cognitive element are vital for research into disorders with somatic symptoms.

This study sought to explore the relationship between the physical and the mental. In some ways, this experiment failed. Without the ability to observe changes in neural activity or other physical alterations during the procedure, all results are subjective. However, it is experimental designs like this, looking for changes in behavior and performance due to a state-trait, which will further research. This applies to questions of trauma recovery as well. What makes one person more or less likely to cope with the strains of trauma? How much weight do personality and state-trait factors truly have in recovery times?

One study positively correlated levels of social skill with increased rates of reported pain when looking at photos of painful situations (Tanaka, Nishi Osumi, & Morioka, 2017). This study made the connection that those with higher social skills were likely to have higher levels of empathy and that empathy may have mitigated their sensitivity to those painful images. This study's results of non-significant differences between groups for max pain felt and a non-significant relationship between max pain and self-reported state-trait levels of empathy would suggest that empathy as a mitigating factor would be false.

The next step is to then find a mitigating factor present in both studies, within the same sphere as social skills and empathy. Social pressures may be an option for this mitigating factor. The fear of judgment could be a contributing factor in both cases. Those who scored higher in regard to social skills would be more acutely aware of social judgment and calibrate their answers accordingly. Similarly, with the presence of an experimenter in the room for this experiment, a participant may have assumed if they took their hands out too soon, they would be looked at negatively. Going forward, automation or a completely anonymous approach may be best to eliminate this possible confound.

While this set of data does not appear to indicate that it was the empathic component of the frame that was impactful for the intensity of pain felt, it did seem to motivate an individual's willingness to carry on despite the intensity of pain felt. This could lead into a line of inquiry about the correlation of empathy and resiliency. Resiliency is defined as "the ability to positively adjust to difficult times. Resilience is the ability to cope successfully despite adversity" (Earvolino-Ramirez, 2007, p. 14). While having an abundance of empathy for an abundance of situations and individuals has been correlated to burn out within the medical profession (Perrella, 2017) in certain situations, it may be possible that it has the opposite effect.

In this case, though state-trait empathy may not have been terribly impactful, general levels of empathy were high. That ability to enact perspective taking may have worked in tandem with their preexisting resiliency, leading to longer CPT times. The relationship between empathy and resiliency is not one thoroughly explored due to the opposing direction of their focus. While empathy is directed outward to others, resiliency is focused more inwardly, centering on the self. Despite this opposition, this connection is one that should be explored. Moving forward in research may require a closer look at individuals with high levels of resiliency and empathy as well as experimentations centered on these concepts.

While the original hypothesis that state-trait self-reported empathy levels would positively correlate with longer cold pressor times was not supported by the data, there was a significant observable difference in CPT performance between the control and experimental group. Without the mitigating factor of state-trait empathy the question becomes what caused those in the experimental group to perform superior than those in the control group? It is established that those engaging in a CPT test framed with an empathic narrative outperformed those with a simple stimuli background. However, the reasoning for the empathic motivation of sparing teammates additional pain is not supported, due to a person's empathic self-report being non-significant ($p < .05$). Moving forward in this hypothesis means taking into account the failures and limitations of this study.

## Limitations

The first consideration is that the framing for the experimental group caused an increase in performance for a reason aside from the empathic bent. For instance, the control group had a much briefer explanation while the experimental group received a much lengthier and urging dialogue. Though a past study framing the CPT as a challenge did not yield results (Pulvers et al., 2014), perhaps the introduction of teammates activated a competitive drive as opposed to an empathic one. Additionally, the possibility of social pressures to perform and possible judgment from experimenter could have impacted an individual's performance.

The sample size of 85 participants was far from varied. With over 80% being Caucasian and female, there lacks a confidence of generalizability. Along the same vein, females have been classically thought to be more empathic than males (Mestre, Samper, Frias, Tur, 2009). With the population being made up of majority proclaimed Christian (99%) and majority female could account for the average BES score of 40.72 with a standard deviation of 11.6, with 20 being perfect empathy and 80 meaning a severe deficit in empathy. A more varied sample size may have markedly impacted results. Another confound would be any experimenter bias. Though scripts were given to lend uniformity to the procedural delivery, confirmatory bias could have played a subconscious role.

The CPT itself was flawed for this hypothesis and experimentation. With a 49.2% max-out rate alterations to the CPT would be recommended. Though the water was kept within the normal bounds, 4°C to 6°C (Fasano et al., 1996; Koenig et al., 2014; Mitchell et al., 2006) studies have used colder temperatures as well as water movement (Pulvers et al., 2014). The action of water circulation seems to yield lower CPT times in various alternative studies (Brislin, et al., 2016). Additionally, these alternatives utilized variations of the traditional CPT that when applied to this study, could have yielded better results (Porcelli, 2017). The lack of movement for the duration of a participant's submerged status could contribute to such a high rate of max-out times.

## Conclusion

Though the original hypotheses were not entirely supported, there was success in the experimental procedure. Further investigation would be required to uncover what exactly the motivation was for carrying on after peak pain rating was indicated and why the experimental group's performance was superior to the control groups. Possibilities as to mitigating factors range from challenge acceptance to social pressures. Regardless, the relationship to empathy and pain perception has been investigated further through the completion of the study, and its results will hopefully spur on curiosity, leading to future experimentation.

REFERENCES


Anastácio, S., Vagos, P., Nobre-Lima, L., Rijo, D., & Jolliffe, D. (2016). The Portuguese version of the Basic Empathy Scale (BES): Dimensionality and measurement invariance in a community adolescent sample. *European Journal of Developmental Psychology*, *13*(5), 614-623. doi:10.1080/17405629.2016.1167681

Bargh, J. A. (1984). Automatic and conscious processing of social information. In R. J. Wyer, T. K. Srull, R. J. Wyer, T. K. Srull (Eds.), *Handbook of social cognition, Vol 3* (pp. 1-43). Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers.

Bargh, J. A. (1994). The four horsemen of automaticity: Awareness, intention, efficiency, and control in social cognition. In R. J. Wyer, T. K. Srull, R. J. Wyer, T. K. Srull (Eds.) , *Handbook of social cognition: Basic processes; Applications, Vols. 1-2, 2nd ed* (pp. 1-40). Hillsdale, NJ, US: Lawrence Erlbaum Associates, Inc.

Barker, R. A., Cicchetti, F., & Neal, M. J. (2012). *Neuroanatomy and neuroscience at a glance*. Chichester: Wiley-Blackwell.

Barraza, J. A. and Zak, P. J. (2009), Empathy toward strangers triggers oxytocin release and subsequent generosity. *Annals of the New York Academy of Sciences*, 1167: 182–189. doi:10.1111/j.1749-6632.2009.04504.x

Bastiaansen, J. J., Thioux, M., & Keysers, C. (2009). Evidence for mirror systems in emotions. *Philosophical Transactions: Biological Sciences*, (1528). 2391. doi:10.1098/rstb.2009.0058

Batson, C. D., Early, S., and Salvarini, G. (1997). Perspective taking: Imagining how another feels versus imagining how you would feel. *Pers. Soc. Psychol. Bull*. 23, 751–758. 10.1177/0146167297237008.

Batson, C. D. (1991). The altruism question: Toward a social psychological answer. Hillsdale, NJ: Erlbaum, Inc.

Batson, C. D. (1997). Self-other merging and the empathy-altruism hypothesis: Reply to Neuberg et al. (1997). *Journal of Personality and Social Psychology*, 73, 517–522. doi:10.1037/0022-3514.73.3.517

Batson, C. D. (1998). Altruism and prosocial behavior. In Gilbert, D. T., Fiske, S. T., & Lindzey, G. (Eds.), *The handbook of social psychology* (pp. 282–316). New York: McGraw-Hill.

Batson, C. D., & Ahmad, N. (2001). Empathy-induced altruism in a prisoner's dilemma II: What if the target of empathy has defected? *European Journal of Social Psychology*, 31, 25–36. http://ezproxy.acu.edu:4656/eds/pdfviewer/pdfviewer?vid=8&sid=5a52795b-baa8-45d9-a24a-ece8275bdf01%40sessionmgr101

Batson, C. D., Batson, J. G., Todd, R. M., Brummett, B. H., Shaw, L. L., & Aldeguer, C. M. (1995). Empathy and the collective good: Caring for one of the others in a social dilemma. *Journal of Personality and Social Psychology*, 68, 619 – 631. doi: 10.1037/0022-3514.68.4.619

Batson, C. D., Duncun, B. D., Ackerman, P., Buckley, T., & Birch, K. (1981). Is empathic emotion a source of altruistic motivation? *Journal of Personality and Social Psychology*, 40, 290 –302.

http://ezproxy.acu.edu:4656/eds/pdfviewer/pdfviewer?vid=14&sid=5a52795b-baa8-45d9-a24a-ece8275bdf01%40sessionmgr101

Beaumont, E., & Martin, C. H. (2016). Heightening levels of compassion towards self and others through use of compassionate mind training. *British Journal of Midwifery*, *24*(11), 777-786. http://ezproxy.acu.edu:4656/eds/pdfviewer/pdfviewer?vid=18&sid=5a52795b-baa8-45d9-a24a-ece8275bdf01%40sessionmgr101

Bensalah, L., Stefaniak, N., Carre, A., & Besche-Richard, C. (2016). The Basic Empathy Scale adapted to French middle childhood: Structure and development of empathy. *Behavior Research Methods*, *48*(4), 1410-1420. doi: 10.3758/s13428-015-0650-8

Berman, B.D., Horovitz, S.G., Hallett, M., 2013. Modulation of functionally localized right insular cortex activity using real-time fMRI-based neurofeedback. Front. Hum. *Neurosci*. 7, 638. doi: 10.3389/fnhum.2013.00638/full

Boyatzis, R. E., McKee, A., & Harvard Graduate School of Business Administration Boston, M. (2005). *Resonant leadership: Renewing yourself and connecting with others through mindfulness, hope, and compassion*. Boston, Mass.

Brislin, S. J., Buchman-Schmitt, J. M., Joiner, T. E., & Patrick, C. J. (2016). 'Do unto others'? Distinct psychopathy facets predict reduced perception and tolerance of pain. *Personality Disorders: Theory, Research, and Treatment,* 7(3), 240-246. doi:10.1037/per0000180

Buhle, J. T., Silvers, J. A., Wager, T. D., Lopez, R., Onyemekwu, C., Kober, H., & Ochsner, K. N. (2014). Cognitive reappraisal of emotion: A meta-analysis of human neuroimaging studies. *Cerebral Cortex (Cary)*, *24*(11), 2981-2990. http://ezproxy.acu.edu:2552/10.1093/cercor/bht154

Burks, D. J., Youll, L. K., & Durtschi, J. P. (2012). The empathy-altruism association and its relevance to health care professionals. *Social Behavior & Personality: An International Journal*, *40*(3), 395-400. doi:10.2224/sbp.2012.40.3.395

Cameron, C. D., Spring, V. L., & Todd, A. R. (2017). The empathy impulse: A multinomial model of intentional and unintentional empathy for pain. *Emotion*, *17*(3), 395-411. doi:10.1037/emo0000266

Caria, A., Veit, R., Sitaram, R., Lotze, M., Weiskopf, N., Grodd, W., Birbaumer, N., 2007. Regulation of anterior insular cortex activity using real-time fMRI. *NeuroImage* 35, 1238–1246. doi: 10.1016/j.neuroimage.2007.01.018

Caria, A., Sitaram, R., Veit, R., Begliomini, C., Birbaumer, N., 2010. Volitional control of insula activity modulates the response to aversive stimuli. A real-time functional magnetic resonance study. Biol. *Psychiatry* 68, 425–432. doi: 10.1016/j.biopsych.2010.04.020

Carver, C. S., Ganellen, R. J., Froming, W. J., & Chambers, W. (1983). Modeling: An analysis in terms of category accessibility. *Journal Of Experimental Social Psychology*, *19*(5), 403-421. doi:10.1016/0022-1031(83)90019-7

Cesario, J., Corker, K. S., & Jelinek, S. (2013). A self-regulatory framework for message framing. *Journal of Experimental Social Psychology*, 49238-249. doi:10.1016/j.jesp.2012.10.014

Cialdini, R. B., Schaller, M., Houlihan, D., Arps, K., Fultz, J., & Beaman, A. L. (1987). Empathy-based helping: Is it selflessly or selfishly motivated? *Journal of*

*Personality & Social Psychology*, 52(4), 749-758. http://ezproxy.acu.edu:4656/eds/pdfviewer/pdfviewer?vid=29&sid=5a52795b-baa8-45d9-a24a-ece8275bdf01%40sessionmgr101

Cojuharenco, I., & Sguera, F. (2015). When empathic concern and perspective taking matter for ethical judgment: The role of time hurriedness. *Journal of Business Ethics*, *130*(3), 717-725. doi:10.1007/s10551-014-2259-8

Comer, R. J. (2016). *Fundamentals of abnormal psychology*. New York: Worth Macmillan Learning.

de Vignemont, F., & Singer, T. (2006). The empathic brain: How, when and why? *Trends in Cognitive Sciences*, 10, 435– 441. http://dx.doi.org/ 10.1016/j.tics.2006.08.008

Decety, J., and Hodges, S. D. (2006). “A social cognitive neuroscience model of human empathy,” in *Bridging Social Psychology: benefits of Transdisciplinary Approaches*, ed P. A. M. van Lange (Mahwah, NJ: Lawrence Erlbaum Associates), 103–109. Accession Number: 2007-03952-000

Decety, J., Chen, C., Harenski, C., & Kiehl, K. A. (2013). An fMRI study of affective perspective taking in individuals with psychopathy: Imagining another in pain does not evoke empathy. *Frontiers in Human Neuroscience*, *7*489. doi:10.3389/fnhum.2013.00489

DeWall, C.N., MacDonald, G., Webster, et al. (2010). Tylenol reduces social pain: Behavioral and neural evidence. *Psychological Science*, 21, 931–7. http://dx.doi.org/10.1037/a0020938

Dibou, T. (2012). Thinking about altruism. *Studies of Changing Societies: Comparative & Interdisciplinary Focus*, *2*(4), 4-28.

Dziobek, I., Preißler, S., Grozdanovic, Z., Heuser, I., Heekeren, H. R., & Roepke, S. (2011). Neuronal correlates of altered empathy and social cognition in borderline personality disorder. *Neuroimage*, *57*539-548. doi:10.1016/j.neuroimage.2011.05.005

Earvolino-Ramirez , M.( 2007 ). Resilience: A concept analysis. Nursing Forum, 42 (2), 73 – 82.

Eisenberg, N., & Strayer, J. (1987). *Empathy and its development*. New York, NY, US: Cambridge University Press.

Eisenberger, N. I., Master, S. L., Inagaki, T. K., Taylor, S. E., Shirinyan, D., Lieberman, M. D., & Naliboff, B. D. (2011). Attachment figures activate a safety signal-related neural region and reduce pain experience. *Proceedings of the National Academy of Sciences of the United States of America*, (28). 11721.

Fasano, M. L., Sand, T., Brubakk, A. O., Kruszewski, P., Bordini, C., & Sjaastad, O. (1996). Reproducibility of the cold pressor test: studies in normal subjects. *Clinical Autonomic Research: Official Journal Of The Clinical Autonomic Research Society*, *6*(5), 249-253.

Fernandez, E., & Turk, D. C. (1989). The utility of cognitive coping strategies for altering pain perception: A meta-analysis. *Pain (03043959)*, *38*(2), 123-135. doi:10.1016/0304-3959(89)90230-3

Fowler, S., Rasinski, H., Geers, A., Helfer, S., & France, C. (2011). Concept priming and pain: An experimental approach to understanding gender roles in sex-related pain differences. Journal Of Behavioral Medicine, 34(2), 139-147.

Geers, A. L., Fowler, S. L., Wellman, J. A., Helfer, S. G., Close, S., & France, C. R. (2015). Prior experience with a pain stimulus as a predictor of placebo analgesia. *Journal of Behavioral Medicine*, 38(1), 136-142. doi:10.1007/s10865-014-9586-1

Głaz, S. (2015). The importance of terminal values and religious experience of God's presence and God's absence in the lives of university students with various levels of empathy. *Journal Of Religion & Health*, *54*(3), 1052-1067. doi:10.1007/s10943-014-9884-5

Goldstein, P., Shamay-Tsoory, S. G., Yellinek, S., & Weissman-Fogel, I. (2016). Original report: Empathy predicts an experimental pain reduction during touch. *Journal of Pain,* 171049-1057. doi:10.1016/j.jpain.2016.06.007

Hashmi, J. A., Baliki, M. N., Huang, L., Baria, A. T., Torbey, S., Hermann, K. M., & ... Apkarian, A. V. (2013). Shape shifting pain: Chronification of back pain shifts brain representation from nociceptive to emotional circuits. *Brain: A Journal of Neurology*, *136*(9), 2751-2768. doi:10.1093/brain/awt211

Heberlein, A. S., & Atkinson, A. P. (2009). Neuroscientific evidence for simulation and shared substrates in emotion recognition: Beyond faces. *Emotion Review*, *1*(2), 162-177. doi:10.1177/1754073908100441

Heynen, E. E., Van der Helm, G. P., Stams, G. M., & Korebrits, A. M. (2016). Measuring empathy in a German youth prison: A validation of the German version of the Basic Empathy Scale (BES) in a sample of incarcerated juvenile offenders. *Journal of Forensic Psychology Practice*, *16*(5), 336-346. doi:10.1080/15228932.2016.1219217

Hodges, S. D., & Biswas-Diener, R. (2007). Balancing the empathy expense account: Strategies for regulating empathic response. In T. F. D. Farrow & P. W. R. Woodruff (Eds.), *Empathy in mental illness and health* (pp. 389-407). Cambridge, UK: Cambridge University Press.

Hodges, S. D., & Wegner, D. M. (1997). Automatic and controlled empathy. In W. Ickes (Ed.), *Empathic accuracy* (pp. 311–339). New York, NY: Guilford Press.

Hoffman, M. L. (2000). Empathy and moral development: implications for caring and justice. *Cambridge*: Cambridge Univ Press

Hoffmann, F., Koehne, S., Steinbeis, N., Dziobek, I., & Singer, T. (2016). Preserved self-other distinction during empathy in autism is linked to network integrity of right supramarginal gyrus. *Journal of Autism & Developmental Disorders*, *46*(2), 637-648.

Horan, W. P., Reise, S. P., Kern, R. S., Lee, J., Penn, D. L., & Green, M. F. (2015). Structure and correlates of self-reported empathy in schizophrenia. *Journal of Psychiatric Research*, *66-67*60-66. doi:10.1016/j.jpsychires.2015.04.016

Howick, J., Fanshawe, T. R., Mebius, A., Bishop, F., van Osch, M., van Dulmen, S., & ... Mistiaen, P. (2016). 28: Positive “framing” as a powerful medication for pain: A meta-analysis of randomized trials. *European Journal of Integrative Medicine,* 8(Supplement 1), 57-58. doi:10.1016/j.eujim.2016.08.136

Hurter, S., Paloyelis, Y., de C. Williams, A. C., & Fotopoulou, A. (2014). Original report: Partners' empathy increases pain ratings: Effects of perceived empathy and attachment style on pain report and display. *Journal of Pain*, 15934-944. doi:10.1016/j.jpain.2014.06.004

Hynes, C.A., Baird, A.A., Grafton, S.T. (2006). Differential role of the orbital frontal lobe in emotional versus cognitive perspective-taking. *Neuropsychologia*, 44, 374–83

Jackson, P. L., Meltzoff, A. N., & Decety, J. (2005). How do we perceive the pain of others? A window into the neural processes involved in empathy. *Neuroimage*, *24*771-779. doi:10.1016/j.neuroimage.2004.09.006

Jackson, P. L., Rainville, P., & Decety, J. (2006). To what extent do we share the pain of others? Insight from the neural bases of pain empathy. *Pain*, *125*, 5–9

Jegindø, E. E., Vase, L., Jegindø, J., & Geertz, A. W. (2013). Pain and sacrifice: experience and modulation of pain in a religious piercing ritual. International Journal For The Psychology Of Religion, 23(3), 171-187. doi:10.1080/10508619.2012.759065

Jolliffe, D., & Farrington, D. P. (2006). Development and validation of the Basic Empathy Scale. *Journal Of Adolescence*, *29*589-611. doi:10.1016/j.adolescence.2005.08.010

Jordan, M. R., Amir, D., & Bloom, P. (2016). Are empathy and concern psychologically distinct? *Emotion*, *16*(8), 1107-1116. doi:10.1037/emo0000228

Klimecki, O. M., Leiberg, S., Ricard, M., & Singer, T. (2014). Differential pattern of functional brain plasticity after compassion and empathy training. *Social Cognitive & Affective Neuroscience*, *9*(6), 873-879.

Koenig, J., Jarczok, M. N., Ellis, R. J., Bach, C., Thayer, J. F., & Hillecke, T. K. (2014). Two-week test-retest stability of the cold pressor task procedure at two different temperatures as a measure of pain threshold and tolerance. *Pain Practice*, *14*(3), E126-E135.

Kökönyei, G., Urbán, R., Reinhardt, M., Józan, A., & Demetrovics, Z. (2014). The difficulties in emotion regulation scale: factor structure in chronic pain patients. Journal of Clinical *Psychology*, 70(6), 589-600. doi:10.1002/jclp.22036

Lamm, C., Decety, J., & Singer, T. (2011). Meta-analytic evidence for common and distinct neural networks associated with directly experienced pain and empathy for pain. *Neuroimage*, *54*2492-2502. doi:10.1016/j.neuroimage.2010.10.014

Leichsenring, F., & Steinert, C. (2017, September 21). Is cognitive behavioral therapy the gold standard for psychotherapy? Retrieved October 1, 2017, from http://jamanetwork.com/journals/jama/fullarticle/2654783

Loeser J.D., Treede R.D. The Kyoto protocol of IASP Basic Pain Terminology. *Pain* 2008; 137 (3): 473-477.

Lumley, M. A., Cohen, J. L., Borszcz, G. S., Cano, A., Radcliffe, A. M., Porter, L. S., & ... Keefe, F. J. (2011). Pain and emotion: a biopsychosocial review of recent research. *Journal of Clinical Psychology*, 67(9), 942-968. doi:10.1002/jclp.20816

Masten, C. L., Morelli, S. A., & Eisenberger, N. I. (2011). An fMRI investigation of empathy for 'social pain' and subsequent prosocial behavior. *Neuroimage*, 55381-388. doi:10.1016/j.neuroimage.2010.11.060

Master, S. L., Eisenberger, N. I., Taylor, S. E., Naliboff, B. D., Shirinyan, D., & Lieberman, M. D. (2009). A picture's worth: partner photographs reduce experimentally induced pain. *Psychological Science*, (11). 1316.

Mathad, M. D., Pradhan, B., & Radjesh, S. K. (2017). Correlates and predictors of resilience among baccalaureate nursing students. *Journal of Clinical & Diagnostic Research*, *11*(2), 5-8. doi:10.7860/JCDR/2017/24442.9352

Mayou R, Kirmayer LJ, Simon G, Kroenke K, Sharpe M. Somatoform disorders: time for a new approach in DSM-V. Am J Psychiatry 2005; 162: 847–55. doi: https://doi.org/10.1176/appi.ajp.162.5.847

McCaffery, M., Pasero, C. L., & McCaffery, M. p. (1999). Pain clinical manual.

Mestre, M. V., Samper, P., Frías, M. D.,C & Tur, A. M. (2009). Are women more empathetic than men? A longitudinal study in adolescence. *The Spanish Journal Of Psychology*, *12*(1), 76-83. doi:10.1017/S1138741600001499

Meyer, M. L., Masten, C. L., Ma, Y., Wang, C., Shi, Z., Eisenberger, N. I., & Han, S. (2013). Empathy for the social suffering of friends and strangers recruits distinct patterns of brain activation*. Social Cognitive & Affective Neuroscience*, 8(4), 446-454.

Mitchell, J. P., Macrae, C. N., & Banaji, M. R. (2006). Article: dissociable medial prefrontal contributions to judgments of similar and dissimilar others. *Neuron*, *50*655-663. doi:10.1016/j.neuron.2006.03.040

Mordeniz, C. (2016). Pain Perception within Consciousness. *Neuroquantology*, 14(2), 439-446. doi:10.14704/nq.2016.14.2.957

Müller, M. (2012). Will it hurt less if I believe I can control it? Influence of actual and perceived control on perceived pain intensity in healthy male individuals: a randomized controlled study. *Journal of Behavioral Medicine*, 35(5), 529-537.

National Institutes of Health Interagency Pain Research Coordinating Committee. (2016). National pain strategy: a comprehensive population health-level strategy for pain. Retrieved from https://iprcc.nih.gov/docs/HHSNational_Pain_Strategy.pdf

Neuberg, S. L. (1988). Behavioral implications of information presented outside of conscious awareness: The effect of subliminal presentation of trait information on behavior in the Prisoner's Dilemma Game. *Social Cognition*, *6*(3), 207-230. doi:10.1521/soco.1988.6.3.207

Noelia, e., Luis J, F., Darrick, e., & Carmen, e. (2014). Assessing children's empathy through a Spanish adaptation of the Basic Empathy Scale: Parent's and child's report forms. *Frontiers in Psychology, Vol 5 (2014)*, doi:10.3389/fpsyg.2014.01438/full

Ochsner, K., Silvers, J., & Buhle, J. (2012). Functional imaging studies of emotion regulation: a synthetic review and evolving model of the cognitive control of emotion. *Annals Of The New York Academy Of Sciences*, *1251*(1), E1-E24. doi:10.1111/j.1749-6632.2012.06751.x

Perrella, A. (2017). Standing in quicksand: The triad of 'perspective-empathy-resiliency' in medical education. *Medical Education*, *51*(3), 241-243. doi:10.1111/medu.13215

Persson, B. N., & Kajonius, P. J. (2016). Empathy and universal values explicated by the empathy-altruism hypothesis. *The Journal Of Social Psychology*, *156*(6), 610-619. doi:10.1080/00224545.2016.1152212

Pfabigan, D. M., Seidel, E., Wucherer, A. M., Keckeis, K., Derntl, B., & Lamm, C. (2015). Affective empathy differs in male violent offenders with high- and low-trait psychopathy. *Journal of Personality Disorders*, *29*(1), 42-61. doi:10.1521/pedi_2014_28_145

Porcelli, A. J. (2014). An alternative to the traditional cold pressor test: The cold pressor arm wrap. *Journal Of Visualized Experiments: Jove*, (83), e50849. doi:10.3791/50849

Pulvers, K., Schroeder, J., Limas, E., & Zhu, S. (2014). Computer-delivered social norm message increases pain tolerance. *Annals of Behavioral Medicine*, 47(3), 316-324. doi:10.1007/s12160-013-9547-x

Rangel A, Camerer C, Montague PR (2008) A framework for studying the neurobiology of value-based decision making. Nat Rev *Neurosci* 9: 545–556.

Sabina, K. (2016). Materialism, empathy and willingness to help as correlates of university and faculty selection. *Journal of Education Culture And Society, Vol 2016, Iss 2, Pp 20-32 (2016)*, (2), 20. doi:10.15503/jecs20162.20.32

Schwenck, C., Ciaramidaro, A., Selivanova, M., Tournay, J., Freitag, C. M., & Siniatchkin, M. (2017). Research report: Neural correlates of affective empathy and reinforcement learning in boys with conduct problems: fMRI evidence from a gambling task. *Behavioural Brain Research*, *320*75-84. doi:10.1016/j.bbr.2016.11.037

Simon, A. U., & Collins, C. R. (2017). Lifestyle redesign® for chronic pain management: a retrospective clinical efficacy study. *American Journal Of Occupational Therapy*, *71*(4), 1-7. doi:10.5014/ajot.2017.025502

Strauss, C., Lever Taylor, B., Gu, J., Kuyken, W., Baer, R., Jones, F., & Cavanagh, K. (2016). Review: What is compassion and how can we measure it? A review of definitions and measures. *Clinical Psychology Review*, *47*15-27. doi:10.1016/j.cpr.2016.05.004

Tanaka, Y., Nishi, Y., Osumi, M., & Morioka, S. (2017). Uncovering the influence of social skills and psychosociological factors on pain sensitivity using structural equation modeling. *Journal Of Pain Research, Vol Volume 10, Pp 2223-2231 (2017)*, 2223.

Thomas, C. A. (2013, July 19). Emotional empathy and cognitive empathy. Retrieved April 21, 2017, from http://blog.teleosleaders.com/2013/07/19/emotional-empathy-and-cognitive-empathy/#_edn5

Totan, T., Dogan, T., & Sapmaz, F. (2012). The Toronto empathy questionnaire: evaluation of psychometric properties among Turkish university students. *Eurasian Journal of Educational Research*, (46), 179-198. http://www.eric.ed.gov/contentdelivery/servlet/ERICServlet?accno=EJ1057315

Van Lange, P. A. M. (2008). Does empathy triggers only altruistic motivation: How about selflessness and justice. *Emotion* 8, 766–774. doi: 10.1037/a0013967

Veit, R., Singh, V., Sitaram, R., Caria, A., Rauss, K., Birbaumer, N., 2012. Using real-time fMRI to learn voluntary regulation of the anterior insula in the presence of threat-related stimuli. *Soc. Cogn. Affect. Neurosci*. 7, 623–634.

http://ezproxy.acu.edu:4655/eds/pdfviewer/pdfviewer?vid=13&sid=a7eb7a4c-e79d-4cfb-b576-cabbc2ea473a%40sessionmgr4008

Villadangos, M., Errasti, J., Amigo, I., Jolliffe, D., & García-Cueto, E. (2016). Characteristics of empathy in young people measured by the Spanish validation of the Basic Empathy Scale. *Psicothema* , *28* (3), 323-329. doi: 10.7334 / psicothema2016.6

Wager T.D., Davidson M.L., Hughes B.L., Lindquist M.A., Ochsner K.N. (2008) Prefrontal-subcortical pathways mediating successful emotion regulation. *Neuron* 59: 1037–1050. doi: 10.1016/j.neuron.2008.09.006

Woo, C., Roy, M., Buhle, J. T., & Wager, T. D. (2015). Distinct brain systems mediate the effects of nociceptive input and self-regulation on pain. *Plos Biology*, *13*(1), 1-14. doi:10.1371/journal.pbio.1002036

Yao, S., Becker, B., Geng, Y., Zhao, Z., Xu, X., Zhao, W., & ... Kendrick, K. M. (2016). Voluntary control of anterior insula and its functional connections is feedback-independent and increases pain empathy. *Neuroimage*, *130*230-240. doi:10.1016/j.neuroimage.2016.02.035

Yeo, L. S., Ang, R. P., Loh, S., Fu, K. J., & Karre, J. K. (2011). The role of affective and cognitive empathy in physical, verbal, and indirect aggression of a Singaporean sample of boys. *Journal of Psycholo*gy, 145(4), 313-330. doi:10.1080/00223980.2011.568986

You, S., Lee, J., & Lee, Y. (2017). Validation of basic empathy scale: Exploring a Korean version. *Current Psychology: A Journal For Diverse Perspectives On Diverse Psychological Issues*, doi:10.1007/s12144-016-9554-8

Younger, J., Aron, A., Parke, S., Chatterjee, N., & Mackey, S. (2010). Viewing pictures of a romantic partner reduces experimental pain: involvement of neural reward systems. *Plos ONE*, *5*(10), 1-7. doi:10.1371/journal.pone.0013309

APPENDIX A

Institutional Review Board Approval Letter

ABILENE CHRISTIAN UNIVERSITY

*Educating Students for Christian Service and Leadership Throughout the World*

**Office of Research and Sponsored Programs**
320 Hardin Administration Building, ACU Box 29103, Abilene, Texas 79699-9103
325-674-2885

6/22/2017

Amanda Daly

Department of Psychology

ACU Box 28011

Abilene Christian University

Dear Ms. Daly:

On behalf of the Institutional Review Board, I am pleased to inform you that your project titled The Empathy Mitigation: Empathy and its impact on pain perception and altruistic motivation:

was approved by expedited review (46.110(b)(1) category 7 ) on 6/22/2017 for a period of one year (IRB # 17-051 ). The expiration date for this study is 6/22/2017 . If you intend to continue the study beyond this date, please submit the Continuing Review Form at least 30 days, but no more than 45 days, prior to the expiration date. Upon completion of this study, please submit the Inactivation Request Form within 30 days of study completion.

If you wish to make **any** changes to this study, including but not limited to changes in study personnel, number of participants recruited, changes to the consent form or process, and/or changes in overall methodology, please complete the Study Amendment Request Form.

If any problems develop with the study, including any unanticipated events that may change the risk profile of your study or if there were any unapproved changes in your protocol, please inform the Office of Research and Sponsored Programs and the IRB promptly using the Unanticipated Events/Noncompliance Form.

I wish you well with your work.

Sincerely,

Megan Roth

Megan Roth, Ph.D.
Director of Research and Sponsored Programs

APPENDIX B

Demographic Sheet

**Subject #:** ______________________________ **Date**:

____________________________

**Age** (in years): ___________

**Sex** (circle one): M F

**Your dominant hand is your** (circle one): Right hand Left hand

**Reason for Participation:**

__________________________________________________

**Academic Major**: ___________________________

**Religious affiliation** (circle one):

Atheist/Agnostic

Buddhist

Christian (Specific fellowship: ___________________)

Hindu

Jewish

Muslim

Other (Please specify: _____________________)

**Race** (circle one): White/Caucasian

Black/African American

Asian

American Indian/Alaskan Native

Native Hawaiian/Pacific Islander

**Ethnicity** (circle one): Hispanic

Non-Hispanic

Native Hawaiian/Pacific Islander

**Place of Birth** (Pleas indicate): United States City: _________ State: _______

Mexico City: _________

Canada City: _________

Other: Country: ___________ City: __________

Office Use Only: EX

APPENDIX C

Script

*Experimental Group:*

**Experimenter**: Thank you for agreeing to participate in our research project. The purpose of this experiment is to assess team dynamics and how pain is perceived. To do this, we will be grouping people into teams of three. The goal of the team effort is to record and assess how long each team member can hold their hands in the cold water and see if the set goal of 25 minutes can be reached. Each member of the team will come in at different times and will have no required contact with one another after the test is complete. As you are the fourth participant in the rotation, you get the unique opportunity to choose your own group members. Each member you choose will come in at a later time this next week or the week after. They will be told that they have been chosen to be in a group and shown your photo and your other teammate’s photo. They will not be told who chose the group, but will be informed one of you has already complete the task.

On the computer screen in front of you, there is a collection of photos, each individual shown will be experiencing the same test you are about to. Please look through and find two people, one male and one female that you do not know or even recognize. These will be your teammates. As the first person in your group, the longer you are able to hold your hand in, the *less* time the other two people in your group will need to hold their hands in. Essentially, the more pain you take, the less pain the others will need to take.

When you have selected the first person on your team, please double click on their picture, and then minimize that picture before selecting your other team mate. Once you have found your second teammate, please double click on their picture and minimize it. Let me know when you are done and I will expand both pictures on the screen. Please keep your team mates in mind and look at their pictures during the test.

Let's get started, please move to the chair behind you. *[GESTURE TO CHAIR NEXT TO THE CPT TEST].*

*Control Group:*

**Experimenter**: Thank you for agreeing to participate in our research project. The purpose of this experiment is to assess if visual stimuli impacts pain perception. On the screen in front of you there is a nature background and we ask that you keep this picture in mind and look at it throughout the test.

*Both Groups:*

**Experimenter**: Basically all the 'cold pressor test' consists of is sticking your hand, up to your wrist, in ice cold water *[POINT TO THE BOWL OF ICE WATER]*. We ask that every fifteen seconds you give a visual indication of how painful it is by pointing with the non-submerged hand to where on the scale your pain rates. There will be a small beeping sound to remind you to indicate where on the scale your pain rates. It will sound like this *[PLAY BEEPING SOUND ONCE].*

The scale is measured from 0, which means no pain at all, to 100, which indicates you are feeling the worst pain imaginable *[SHOW THEM THE VISUAL ANALOG SCALE]*. You can pull your hand out at any time or when you feel the pain is too much. Go ahead and have a seat right here *[GESTURE TO CHAIR]*.

*{Allow subject to get situated, finding a comfortable position in the chair. Remain standing and begin to prepare: check and record the ambient temperature, water temperature, and ensure you have a blank visual analog scale prepared for yourself that you will be marking, and that the subject's analog scale is within reach of the non-dominant hand that they will indicate with}*

*{Make final preparations: have towel nearby for end of test, have their hand laying near the ice bowl, and prepare stopwatch and interval timer}*

**Experimenter**: After you take your hand out, go ahead and use this towel to dry off *[INDICATE TO THE TOWEL YOU PLACED ON THE TABLE THEIR HAND IS RESTING ON]*. You can take a few minutes to recover and after that you will head back to the psychology lobby where you filled out your paperwork. We'll have a few questions for you and time to give feedback on the experience, and then you'll be good to go. Do you have any questions I can answer?

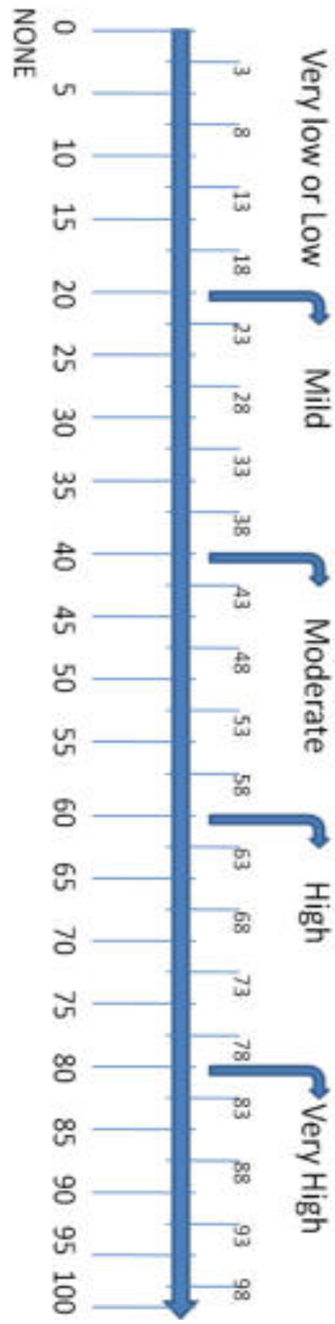
*{Answer any questions they have}*

Whenever you are ready, go ahead and submerge your hand in the water next to you.

*{WHEN SUBJECT SUBMERGES THEIR HAND BEGIN STOPWATCH AND AFTER THE FIRST FIFTEEN SECONDS START THE INTERVEL TIMER}*

APPENDIX D

Visual Analog Scale



APPENDIX E

Control Visual Stimulus

APPENDIX F

Medical Questionnaire

Below is a copy of the brief medical questions that will check for any preexisting conditions that may be negatively impacted due to the CPT or that will alter the experimental outcome.

Name: _______________                    Date: _______________

| ***Please answer all of the following questions honestly*** | **Circle one** | |
|---|---|---|
| *Do you have a history of fainting spells or seizures?* | YES | NO |
| *Do you have a history of circulatory problems?* | YES | NO |
| *Have you ever had surgery on your non-dominant hand?* | YES | NO |
| *Do you have a history of numbness in your non-dominant hand?* | YES | NO |
| *Do you have a history of pain in your non-dominant hand?* | YES | NO |
| *Have you been diagnosed or are currently being treated for hyperthyroidism or hypothyroidism?* | YES | NO |
| *Have you been diagnosed with or have a history of a chronic pain condition?* | YES | NO |
| *Are you currently on any pain medication, or have taken an over the counter pain supplement in the past 48 hours?* | YES | NO |
| *Do you feel there are any medical concerns that would make you ineligible for this study (e.g. pregnant)* | YES | NO |
| | | |

## APPENDIX G

### Basic Empathy Scale

(20 items)

Rate each statement on a 5-point scale with 1=strongly agree and 5=strongly disagree.

1. My friends' emotions don't affect me much ____________________________

2. After being with a friend who is sad about something, I usually feel sad ______

3. I can understand my friend's happiness when they do well at something _______

4. I get frightened when I watch characters in a good scary movie __________

5. I get caught up in other people's feelings easily _______________________

6. I find it hard to know when my friends are frightened ___________________

7. I don't become sad when I see other people crying _____________________

8. Other people's feeling don't bother me at all ___________________________

9. When someone is feeling 'down' I can usually understand how they feel ______

10. I can usually work out when my friends are scared ______________________

11. I often become sad when watching sad things on TV or in films ____________

12. I can often understand how people are feeling even before they tell me_______

13. Seeing a person who has been angered has no effect on my feelings_________

14. I can usually work out when people are cheerful________________________

15. I tend to feel scared when I am with friends who are afraid_______________

16. I can usually realize quickly when a friend is angry _____________________

17. I often get swept up in my friends' feelings____________________________

18. My friend's unhappiness doesn't make me feel anything__________________

19. I am not usually aware of my friends' feelings__________________________

20. I have trouble figuring out when my friends are happy____________________