The Effects of Chronic Physical Pain on Empathy

by

Jillian Thrall

A Thesis Presented in Partial Fulfillment
of the Requirements for the Degree
Master of Science

Approved April 2017 by the
Graduate Supervisory Committee:

Mary H. Burleson, Chair
Nicole A. Roberts
Kristin Mickelson

ARIZONA STATE UNIVERSITY

May 2017
ABSTRACT

Physical pain and social pain are two types of pain humans experience. Physical pain is defined as any pain experienced upon bodily injury, whereas social pain is defined as the pain experienced upon social injury when social relationships are threatened, damaged or lost (Eisenberger & Lieberman, 2004). Both physical and social pain can be experienced as acute or chronic, acute lasting for up to three months, and chronic lasting for more than three to six months. Studies on acute and chronic social pain have shown that social pain leads to less empathy. The Pain Overlap Theory suggests that social pain and physical pain share similar neural networks and underlying processes. If social pain and physical pain overlap in the brain, then it would be expected to see a similar reduction in empathy when experiencing acute and chronic physical pain. Therefore, it was hypothesized that those who suffer from chronic physical pain will be less empathetic overall, and they will be less empathetic to others in physical pain and social pain.
TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>LIST OF TABLES</th>
<th>iv</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHAPTER</td>
<td></td>
</tr>
<tr>
<td>1 INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>Overview</td>
<td>1</td>
</tr>
<tr>
<td>Potential Contributions</td>
<td>2</td>
</tr>
<tr>
<td>Organization</td>
<td>2</td>
</tr>
<tr>
<td>2 BACKGROUND INFORMATION</td>
<td>4</td>
</tr>
<tr>
<td>Pain Overlap Theory</td>
<td>5</td>
</tr>
<tr>
<td>Empathy</td>
<td>10</td>
</tr>
<tr>
<td>Current Study</td>
<td>13</td>
</tr>
<tr>
<td>3 METHODS</td>
<td>15</td>
</tr>
<tr>
<td>Participants</td>
<td>15</td>
</tr>
<tr>
<td>Procedure</td>
<td>16</td>
</tr>
<tr>
<td>Measures</td>
<td>16</td>
</tr>
<tr>
<td>4 RESULTS</td>
<td>19</td>
</tr>
<tr>
<td>Preliminary Analyses</td>
<td>19</td>
</tr>
<tr>
<td>Hypothesis Tests</td>
<td>20</td>
</tr>
<tr>
<td>Post Hoc Exploratory Analyses</td>
<td>23</td>
</tr>
<tr>
<td>5 DISCUSSION</td>
<td>24</td>
</tr>
<tr>
<td>Limitations and Future Research</td>
<td>26</td>
</tr>
</tbody>
</table>
REFERENCES ..............................................................................................................28

APPENDIX

A STUDY QUESTIONNAIRE .....................................................................................31
LIST OF TABLES

Table                                                                 Page

1. Means and Standard Deviations for Study Variables as a Function of Gender.....19

CHAPTER 1: INTRODUCTION

Acute pain and chronic pain are conditions affecting millions of people worldwide. Acute pain is a normal physiological response associated with tissue damage that lasts upward of three to six months (Carr & Goudas, 1999). It is short duration and gradually resolves as the injured tissue heals. Examples of acute pain include a sprained ankle or small paper cut. Chronic pain is any pain that persists after an injury has healed, lasts longer than three to six months; can become worse over time; and can reoccur intermittently (Carr & Goudas, 1999). Examples of conditions that cause chronic pain are constant migraines, arthritis, and fibromyalgia. Chronic pain is a major health problem and one of the most common reasons people seek medical care (Johannes, Le, Zhou, Johnston & Dworkin, 2010), and is prevalent among one-third of the U.S. adult population. Furthermore, studies have shown that the prevalence of chronic pain is higher for females than males, that pain increases with age, and that lower socioeconomic status (SES) is typically associated with more pain (Johannes et al., 2010).

Chronic pain can have psychological effects. Researchers Henne, Morrissey and Conlon (2015) have shown chronic pain to be related to an increase in depression and anxiety symptoms and that its sufferers are likely to have difficulties with emotional connectedness in close relationships. Persistent pain sufferers have better emotional and physical outcomes when given support by family and friends (Henne et al., 2015).

However, physical pain is not the only kind of pain we can experience. We also “feel” social pain, defined as the heartbreak or sadness we experience from being socially excluded or rejected by another. Social exclusion can have negative consequences for a
person’s physical and psychological well-being (DeWall & Baumeister, 2006). Furthermore, it threatens the human motivation for strong and stable relationships.

Many cultures around the world use the same language such as “hurt” and “wounded” to describe the outcomes of both physical damage and social rejection. People who experience social pain respond with emotional numbness, just as the body goes numb to physical pain (MacDonald & Leary, 2005). These findings have led researchers to investigate the similarities between the two types of pain and how they may interact.

Current research on the parallels between physical and social pain focuses largely on acute pain that is induced in a lab setting by using a cold pressor task, thermal heat stimulation, or finger prick, and how this pain is influenced by social rejection. Unfortunately, there is not as much research with chronic pain sufferers, particularly with respect to social pain. Furthermore, this population is an important group to study because chronic pain is an uncontrollable stressor, with which a “normal” population does not have to cope. This added stress could have large effects on their lives in many ways, potentially influencing any relationship between physical and social pain. Therefore, the current research will contribute to the growing research in this area, especially in chronic pain populations, and will help to further understand what effects chronic pain has on our emotions and daily living.

First, this paper will introduce important background research, including information on the Pain Overlap Theory and our empathy towards others. It will then address the current research study, including the hypotheses, methods, results and
discussion of the findings. Finally, a summary of the information will discuss what the present research means to the chronic pain population.
Although they are similar in some ways, the experiences of physical pain and social pain can be clearly distinguished from each other. The sensory aspect of physical pain emerges from the perception of a stimulus including identifying its spatial location (Iannetti, Salomons, Moayedi, Mouraux, & Davis, 2013). This painful perception arises from activity within the nociceptive system of the somatosensory system, including the insular regions of the cortex (Iannetti et al., 2013). This is in contrast to the emotionally distressing aspect of pain, which stems from activity in the affective sensory system, activated in the dorsal anterior cingulate cortex (dACC) (Eisenberger & Lieberman, 2004).

**Inducing physical pain in the laboratory.** A common method is the cold pressor task. The cold pressor task is a cardiovascular test that has a participant immerse his or her hand into an ice water bucket. This test measures the changes in blood pressure and heart rate. Pain threshold and pain tolerance can also be obtained from a cold pressor task by seeing how long a participant can hold his or her hand in the cold water. Another common method is inducing pain by using a pressure algometer. The algometer applies pressure to participants’ index finger on their dominant hand. The algometer collects data on pain threshold, which has the participant say “now” when they first feel pain due to pressure, and pain tolerance, by having the participant say “stop” when the pain becomes too unbearable to continue.

**Inducing social pain in the laboratory.** Cyberball is an online program that allows researchers to create interactive scenarios using a ball tossing game. The
participant tosses the ball with computerized confederates, in which the confederates include or exclude the participant at any time. The purpose of the game is to induce feelings of social pain by exclusion (Williams & Jarvis, 2006). Another method that is commonly used is false feedback (e.g., telling people something ostensibly true about their personality that predicts social rejection in their future), or memory recall of a socially painful experience such as a time of rejection or exclusion.

**Pain Overlap Theory**

The Pain Overlap Theory suggests that social pain and physical pain share the same neurological systems (Eisenberger & Lieberman, 2004). From an evolutionary perspective, physical pain is used to alert a person to physical danger or harm. Social rejection may have been a threat to physical survival, and thus social pain would be activated the same way physical pain would.

Research using this framework has shown that a network of brain regions, including the dorsal anterior cingulate (dACC) and the anterior insula (AI), are activated during aversive physical pain, the affective or “distressing” component, and that activity in these regions also corresponds with feelings of social rejection (Kross, Berman, Mischel, Smith, & Wager, 2011). Patients who undergo cingulotomies, which are lesions to the ACC to treat chronic physical pain, are still able to feel pain, but report that it no longer bothers them. Furthermore, the ACC is involved in distress vocalizations in mammals. These vocalizations are emitted when young animals are separated from caregivers, signaling social distress or “social pain.” Ablating the ACC in monkeys reduces distress vocalizations while other vocalizations remain intact. This evidence
highlights the role of the ACC in affective rather than the sensory component of physical pain (Eisenberger & Lieberman, 2004).

Methods to reduce one type of pain can reduce the other type as well (Chen, Poon & DeWall, 2014). For example, increased social support is associated with reducing social pain as well as physical pain during cancer, following heart surgery, and during child birth. Furthermore, opiate-based drugs effective in reducing physical pain, also reduce social pain in humans; and antidepressants used to treat social stressors such as anxiety and depression also alleviate physical pain (Eisenberger & Lieberman, 2004).

It has been shown that those who experience physical pain experience social pain more easily and frequently (Eisenberger & Lieberman, 2004). In a study by Chen and colleagues (2014), researchers investigated the hypothesis that inducing feelings of physical pain would lead participants to feel socially excluded. Participants were randomly assigned to one of two groups, pain by putting their hand in an ice bath, or no pain, while simultaneously playing a computerized game where they were either included or excluded. Interestingly, researchers found that the participants who experienced physical pain while playing the interactive game felt more socially excluded, even when they were in the included condition, than those experiencing no pain. They also reported lower satisfaction of belonging, self-esteem, control, and meaningful existence (Chen, Poon & DeWall, 2014). These feelings are common following an experience of social pain.

However, one criticism of the Pain Overlap theory is that it doesn’t account for potential overlap in somatosensory brain areas. Some studies have shown that while
affective pain regions are activated during social pain, brain regions such as the operculo-insular region and the dorsal posterior insula, which are activated during the sensory representations of physical pain, are not activated during social pain (Kross et al., 2011). For example, a quantitative meta-analysis failed to support the claim that social pain operates on the same neural pain matrix as physical pain (Cacioppo et al., 2013). Furthermore, Iannetti and colleagues’ fMRI data distinctly identifies differences of neural activation during social and physical pain experiences (Iannetti et al., 2013).

Kross and colleagues proposed that when experiences of social rejection are powerful enough, the brain regions involved in both the affective and sensory components of physical pain both will be activated (Kross et al., 2011). To test their theory, the researchers recruited participants who had just recently experienced an unwanted emotional relationship break-up. They believe this experience is more powerful than the social pain induction techniques used in previous studies, such as the Cyberball game. Participants were involved in two functional magnetic resonance imaging (fMRI) scans during a social rejection task and a physical pain task.

In the social pain task, participants completed trials in which they were shown a picture of their ex-partner and thought about their rejection experience, or they were shown a picture of a same-sex friend while thinking about a positive experience with that person. In the physical pain task, participants experienced noxious thermal stimulation (hot) or non-noxious stimulation (warm) on their arm. Participants self-reported distress levels for each task. They reported greater distress in viewing the ex-partner and receiving the hot stimulation trials compared to the friend and warm stimulation tasks.
The reported distress levels were equivalent in the social rejection and pain tasks, suggesting that there was no difference in the subjective intensity between the two (Kross et al., 2011). The fMRI results showed that both the social rejection task and the pain task had overlapping increases in activity in the thalamus and right parietal opercular/insular cortex-brain regions that are normally activated during physical pain.

These results demonstrate that social rejection and physical pain are similar in that they are both distressing and they share common activity in both affective and somatosensory brain systems (Kross et al., 2011). The researchers conclude that distress elicited in response to intense social rejection may represent a distinct emotional experience that is also associated with physical pain (Kross et al., 2011). Therefore, these data add further to the evidence supporting the Pain Overlap Theory, suggesting that social rejection and physical pain share similar neural networks, and may be similar processes.

Moreover, research has shown that separation from caregivers and isolation results in decreased sensitivity to physical pain and that these threats to belongingness appear to activate neural mechanisms associated with physical pain and regulation of pain (Nelson & Panskepp, 1998). DeWall & Baumeister (2006) suggest that the body when in physical pain can create analgesia that reduces the experience of pain. Much like the body responds to painful physical injury, and perhaps by the same physiological means, both physical sensation and emotion reactivity become dulled due to social exclusion. If people respond to social rejection with emotional insensitivity, this temporary shutdown of the emotion system might be beneficial in terms of immediately reducing a person’s
suffering (DeWall & Baumeister, 2006). Therefore, DeWall and Baumeister tested the theory that social exclusion would reduce sensitivity to both physical and emotional pain by activating the body’s pain relief system.

In Experiment 1, participants were assigned to one of three conditions, which included a future of social rejection, a future of belonging, or a control group. In the rejection condition, participants were told that results of a fake personality test indicated that they were likely to end up alone with a lot of failed relationships. The belonging group received feedback that their personality would lead to a future with several meaningful and lasting relationships. The control group received no feedback to their personality test. In Experiment 2, a misfortune group was added, in which participants were told that they would have many accidents in their futures. This group was added to provide a control for receiving negative or unpleasant feedback.

In Experiment 1 and 2, researchers tested the hypothesis that social pain would reduce physical pain sensitivity. The researchers confirmed their hypothesis by finding that participants who were in the social pain (rejected) group showed higher pain thresholds and pain tolerance compared to their own baseline scores. Furthermore, those in the rejected group also showed less sensitivity to the physical pain task compared to the accepted, no feedback, and misfortune group. Therefore, the researchers concluded that people become less sensitive to physical pain as their ability to belong is compromised.

In Experiment 3, researchers tested to see whether social pain induced emotional insensitivity. They believe that if so, then it would be difficult to imagine having strong
feelings during affective forecasting. Affective forecasting involves simulating emotional reactions to future events (DeWall & Baumeister, 2006). They believed that not only would present feelings become numb to social pain, but so would future emotions. Participants were told to describe how they believed they would feel in response to a positive event (their football team beating its big rival), and a negative event (their football team losing to its big rival). Researchers found results consistent with Experiments 1 and 2, such that the socially excluded group, compared to the control groups, again showed reduced physical pain sensitivity. Furthermore, the excluded group reported weaker forecast emotional reactions, such as less happiness to the positive event, and less sadness to the negative event, compared to the other groups. Therefore, the participants responded to social pain with both physical numbness (reduced pain sensitivity), and emotional numbness (predicting less intense future emotions).

**Empathy**

Empathy is an often-used term, but remains ill-defined. Some definitions of empathy include the ability to understand and share the feelings of another, being able to accurately perceive another’s current feelings and their meaning, and borrowing the feelings of another in order to understand that person. Empathy is essential to forming and sustaining interpersonal relationships with those around us. Research has shown that women tend to score higher than males on self-reported measures of empathy (Schulte-Ruther, Markowitsch, Shah, Fink, & Piefke, 2008), that empathy scores increase with age in an inverse U-shaped function across the life-span, such that middle-aged adults score higher on empathy than young adults or older adults (O’Brien, Konrath, Gruhn, & Hagen,
2012), and that lower SES is associated with more empathy (Kraus, Piff, Mendoza-Denton, Rheinschmidt, & Keltner, 2012). It has been shown that watching others in physical pain activates the same brain regions involved in the direct experience of pain (Singer et al., 2004). Theoretically, activation in one’s own brain regions in response to another in pain helps to generate our own physiological and sensory experiences allowing us to better understand the others’ feelings (Singer et al., 2004).

Beeney and colleagues wanted to extend this further by using fMRI to examine the extent to which we “feel” others’ social pain. Their study included 20 participants; 10 were women. Each participant brought a matched sex friend. The authors collected fMRI data from the participants while they watched as their accompanying friends were included and then excluded in a Cyberball game. The results showed that when participants watched their friends being rejected, brain regions including the dACC, the anterior insula, and the prefrontal cortex were activated. Just as seeing someone in physical pain, seeing someone in social pain activates the brain regions involved in the actual experience of social pain. They also found activation in the cerebellum, inferior frontal gyrus and superior temporal sulcus, which are all regions previously found to be involved in empathic responses (Beeney et al., 2011). Furthermore, they found that the strength of the relationship between a participant and his or her friend was positively related to activation in these same areas. Thus, the authors determined that empathy is not a fixed, trait-like response, but is in fact a fluid response, governed by closeness to the other person (Beeney et al, 2011). Therefore, knowing someone better allows us to have a greater empathic response to them.
Just as food is a basic need for survival, social bonds are too a basic need. Since social pain is a threat to our basic social needs and our relationships, it would be expected that those experiencing social pain would do everything they could to repair the threatened relationships. Given that empathy enhances relationships, this implies that those in social pain might be more empathic towards others. Interestingly, these are not the findings. Socially rejected people show an increase in aggressive behaviors toward others (Buckley, Winkel, & Leary, 2004) and tend to behave less prosocially than non-rejected people (Twenge, Baumeister, DeWall, Ciarocco, & Bartels, 2007). One theory for these actions is that exclusion leads to a defensive state of cognitive deconstruction, marked by low levels of meaningful thought, emotion, and self-awareness (Baumeister, 1990). This deconstructed state may offer socially rejected people a temporary relief from feeling pain or distress accompanying threats to belongingness (Twenge, Catanese, & Baumeister, 2003).

In the aforementioned DeWall & Baumeister study (2006), for Experiment 4, researchers hypothesized that if the emotion system does in fact promote less prosocial behavior in response to social exclusion, then those in social pain should be less capable of empathy. For this experiment, along with the physical pain task, participants were asked to read a vignette in which another person described experiencing social pain (a relationship breakup), and then to report how empathetic they felt towards the person in the vignette experiencing social pain. As before, those in the future rejected group had an increase in pain threshold and tolerance. Furthermore, the socially rejected group reported feeling less empathy towards the author of the vignette compared to the socially
accepted, no-feedback, and control groups. This provided further evidence that the emotion system causes emotional and physical numbness in response to social pain.

One limitation to Experiment 4 was that participants were asked to empathize towards another in social pain while experiencing social pain themselves, as generated by false personality feedback. The researchers believe this might have reminded participants of their own recent social exclusion. Participants therefore may have refused to empathize with the author of the vignette. Therefore, for Experiment 5, participants were asked to read another vignette and rate their empathy towards someone experiencing physical pain (broken leg). In this experiment, instead of the fake personality task, participants were induced to experience social pain by recalling a memory of and writing about a time they were rejected, a time they felt accepted, or what they did the previous day (control). As before, researchers found that those who recalled and wrote about a time they felt rejected reported feeling less empathy towards the author of the vignette than did the accepted and control groups.

In the DeWall & Baumeister study, acute social pain was being tested. Chronic social pain would include situations such as long-term loneliness or homelessness. Beadle and colleagues have found that greater ratings of loneliness were inversely related to empathy scores, in that, more loneliness predicted lower empathy towards others. (Beadle, Brown, Keady, Tranel, & Sergio, 2012). In other words, both acute and chronic social pain have been associated with less trait and state empathy scores.

**Current Study**
For the present study, if we consider the Pain Overlap Theory, and believing that social pain and physical pain share the same neural networks, we would assume that emotional responses while experiencing social or physical pain would be very similar. Therefore, if both acute and chronic social pain predict less empathy, we would assume that acute and chronic physical pain would predict less empathy as well. Based on the previous studies, particularly, the DeWall & Baumeister study (2006) involving social pain and empathy, we wanted to see if this theory would hold true if the participants were experiencing physical pain instead of social pain. We wanted to see if those in pain would be empathetic to others in general, to others also experiencing physical pain, and finally, to others in social pain. Based on the results of previous studies of chronic physical pain, we hypothesized that, after controlling for gender, age, and SES, participants who reported either greater average physical pain (as an indicator of chronic physical pain) or greater pain at the time of survey completion would 1) exhibit lower trait empathy, especially empathic concern 2) report less empathy for another person experiencing physical pain, and 3) report less empathy for another person experiencing social pain. We also expected that those reporting greater loneliness (as an indicator of chronic social pain) would report a similar pattern of responses.
CHAPTER 3: METHODOLOGY

Participants

Participants for the current study were undergraduate students from Arizona State University, who were recruited to participate in a survey investigating the relationship between chronic pain and empathy towards others. The final sample included 160 students whose ages ranged from 18 to 72 years, with a mean age of 24.78, and a standard deviation of 7.55. Of the total sample, 124 (77.5%) participants were female and 36 (22.5%) were male. For the highest level of education, 62.6% reported having some college, 25.8% had an associate’s degree, 4.9% had a bachelor’s degree, 4.3% reported having less than college, and less than 1% reported having either trade or business school or some postgraduate college. Furthermore, 94.4% participants were born in the U.S. Most participants were Caucasian/White/European (75.5%), while 24.5% reported other (including 10.4% mixed, 6% Asian or Asian American, 6% African or African American, 1.8% Native American or Alaskan Native, 1.8% Arab or Arab American, and 1.2% Native Hawaiian or other Pacific Islander), with 20% of participants reporting being of Hispanic ethnicity.

With regard to relationship status, 61.5% of participants reported being in a relationship, with 27.3% not cohabitating, 19.9% cohabitating, and 14.3% reported being married. The majority (22.7%) household income was $30,000-$49,000, and the majority reported their financial status as having enough money for basic needs and usually some extra for savings or special purchases (65.8%), with 78.3% reported being employed either part-time or full-time. Regarding general health, 51.6% reported having
very good health, 23.6% reported fair health, 22.4% reported having excellent health, and 2.5% reported having poor health. Furthermore, 92 (57.5%) participants reported having physical pain over and above everyday pain within the last month.

**Procedure**

All procedures were approved by the Institutional Review Board of Arizona State University, and were carried out in line with APA ethical guidelines. Participants completed the online survey administered through a secure website, Qualtrics, and received credit toward their psychology course research requirements.

**Measures**

To be sure participants did not know what we were testing, we added a variety of different questionnaires. Each questionnaire was added according to theory and research related to either empathy or pain. First, demographics of participants, including: age, gender, place of birth, racial identity, education, current health rating, employment, socioeconomic status, income, and relationship status were collected. Participants then completed the scales described below (see Appendix A for copies of the scales).

**Wisconsin Brief Pain.** The Wisconsin Brief Pain questionnaire assesses the amount of pain respondents have, where the pain occurs, and ratings of how much pain they experience by having participants rate on a scale from 0 (no pain) to 10 (worst pain imaginable) (Daut, Cleelan & Flanery, 1983). We also included words that participants could indicate to describe the pain they experience (“torturing”, “blinding”), which were taken from the McGill Pain Questionnaire.
**Interpersonal Reactivity Index.** The IRI was used to assess overall empathy. Participants used a scale from 0 to 4: “*does not describe me well, somewhat does not describe me, neutral, somewhat describes me, describes me very well*”, to rate their thoughts and feelings in different situations. The IRI is made up of four separate subscales, including perspective-taking (e.g., “I try to look at everybody’s side of a disagreement before I make a decision”), empathic concern (e.g., “I often have tender, concerned feelings for people less fortunate than me”), personal distress (e.g., “In emergency situations, I feel apprehensive and ill-at-ease”), and fantasy (e.g., “I really get involved with the feelings of the characters in a novel”) (Davis, 1980). Reliability analysis yielded a Cronbach’s alpha score of .82.

**UCLA Loneliness Scale.** The UCLA Loneliness Scale has participants rate the extent to which they relate to a set of statements, (e.g., How often do you feel alone?” How often do you feel left out?”), rating on a scale from 1 to 4: “*never, rarely, sometimes, or always*” (Russell, 1996). Reliability analysis yielded a Cronbach’s alpha score of .90.

**Social Pain/Physical Pain Empathy Vignettes.** To assess empathy towards others in social pain and physical pain we used vignettes that DeWall and colleagues used in their paper, but changed them to read from an Arizona State University student’s perspective and made them gender-neutral (DeWall & Baumeister, 2006). We also had them think of a memorable time where they felt left out or excluded before reading the passages. The physical pain vignette read:
Two days ago I broke my leg playing intramural sports. I’ve been playing on the same intramural team for the past three years and I’m upset that my season has been cut short. I’m experiencing pain because of my injury. I’m also having a tough time getting around campus, as there are lots of hills and stairs that make it hard to use my crutches on. The parking people won’t let me get a handicapped permit because they said my injury was only temporary. I’ve been real down. It’s all I think about.

The social pain vignette read:

Two days ago I broke up with my significant other. We’ve been going together since our junior year in high school and have been really close, and it’s been great being at ASU together. I thought they felt the same, but things have changed. Now, they want to date other people. They say they still care a lot about me, but they don’t want to be tied down to just one person. I’ve been real down. It’s all I think about. My friends all tell me that I’ll meet other people and they say that all I need is for something good to happen to cheer me up. I guess they’re right, but so far that hasn’t happened.

After reading each vignette, participants rated how sympathetic, warm, compassionate, soft-hearted, and tender they felt towards the author of the passage based on a scale ranging from 1 to 7: “feel not at all, neutral, feel strongly.” Reliability analyses yielded a Cronbach’s alpha score of .92 for social pain empathy, and .94 for physical pain empathy.
CHAPTER 4: DATA ANALYSES AND RESULTS

Preliminary Analyses

Gender means and standard deviations for the study variables are shown in Table 1. Analyses of variance revealed significant gender differences for SES, IRI overall, and the empathic concern and personal distress subscales of the IRI. Males reported greater SES than females, $F(1, 155) = 3.92, p = .05$. Females had more overall empathy (IRI) than males, $F(1, 153) = 10.14, p = .002$, greater empathic concern, $F(1, 156) = 4.75, p = .03$, and greater personal distress, $F(1, 156) = 14.41, p < .001$ than males.

Table 1

<table>
<thead>
<tr>
<th>Means and Standard Deviations by Gender for Study Variables</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
</tr>
<tr>
<td>Age</td>
<td>24.80</td>
<td>6.12</td>
</tr>
<tr>
<td>SES</td>
<td>$3.80_a$</td>
<td>1.48</td>
</tr>
<tr>
<td>Loneliness</td>
<td>2.32</td>
<td>.63</td>
</tr>
<tr>
<td>Pain now</td>
<td>3.20</td>
<td>2.30</td>
</tr>
<tr>
<td>Pain on average</td>
<td>4.50</td>
<td>2.12</td>
</tr>
<tr>
<td>Pain at its worst</td>
<td>5.90</td>
<td>2.47</td>
</tr>
<tr>
<td>IRI average</td>
<td>$2.87_a$</td>
<td>.53</td>
</tr>
<tr>
<td>IRI perspective-taking</td>
<td>3.29</td>
<td>.72</td>
</tr>
<tr>
<td>IRI empathic concern</td>
<td>$3.04_a$</td>
<td>.82</td>
</tr>
<tr>
<td>IRI personal distress</td>
<td>$1.76_a$</td>
<td>.59</td>
</tr>
<tr>
<td>IRI fantasy</td>
<td>3.39</td>
<td>1.01</td>
</tr>
<tr>
<td>Physical pain empathy</td>
<td>3.88</td>
<td>1.98</td>
</tr>
<tr>
<td>Social pain empathy</td>
<td>3.72</td>
<td>1.07</td>
</tr>
</tbody>
</table>

Note. $N = 92-155$. IRI = Interpersonal Reactivity Index. Means with different subscripts are significantly different, $p < .05$
Correlations among the study variables are shown in Table 2. The expected negative relationship between age, gender, and SES was shown. SES was also negatively related to the perspective-taking subscale. Also, as expected, the pain variables were all positively correlated to each other. Furthermore, we found the expected pattern of relationships between the four IRI subscales, apart from the non-significant relationship between the fantasy and personal distress subscales. State empathy for physical pain and social pain, primarily assessing empathic concern, were highly positively correlated with each other. They were also significantly related to average IRI and its four subscales, except for two non-significant relationships: personal distress was not related to empathy for social pain, nor was perspective-taking related to empathy for physical pain. Unexpectedly, loneliness was not shown to be related to empathy overall, and was in fact positively correlated with the personal distress subscale.

The correlations also showed that greater average pain ratings were associated with less perspective-taking empathy, and that those with higher ratings of current physical pain reported less trait empathy, specifically empathic concern. Average pain ratings and pain ratings at time of survey completion were not related to reports of current state empathy for those in physical or social pain.

**Hypothesis Tests**

Age, gender, and SES were added as covariates in regression analyses to further investigate significant relationships between perspective-taking and average pain, and between empathic concern and pain at survey completion. Controlling for all covariates,
average pain over the past month significantly predicted perspective-taking empathy such that greater average pain predicted less perspective-taking, $B = -.064, SE(B) = .031, \beta = -.196, p = .040$. No other variables predicted perspective-taking empathy. The full model accounted for 12% of the variance.

Controlling for all covariates, current pain significantly predicted empathic concern such that greater pain predicted less empathic concern, $B = -.068, SE(B) = .027, \beta = -.229, p = .014$. Gender also significantly predicted empathic concern; females were more empathetic than males, $B = .626, SE(B) = .175, \beta = .330, p = .001$. Neither age nor SES were significant predictors of empathic concern. The full model accounted for 26% of the variance.
Table 2

Means, Standard Deviations, and Pearson Correlations for Study Variables

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Gender</td>
<td>2.74</td>
<td>2.53</td>
<td>-0.00</td>
<td>-0.16</td>
<td>-0.03</td>
<td>-0.04</td>
<td>-0.01</td>
<td>0.13</td>
<td>0.25</td>
<td>0.06</td>
<td>0.17</td>
<td>0.29</td>
<td>0.08</td>
<td>0.11</td>
<td>0.13</td>
</tr>
<tr>
<td>2) Age</td>
<td>3.97</td>
<td>2.27</td>
<td>-0.23</td>
<td>-0.02</td>
<td>0.12</td>
<td>0.13</td>
<td>0.15</td>
<td>0.02</td>
<td>0.04</td>
<td>0.06</td>
<td>-0.05</td>
<td>0.01</td>
<td>0.08</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>3) SES</td>
<td>5.61</td>
<td>2.62</td>
<td>-0.12</td>
<td>-0.03</td>
<td>-0.18</td>
<td>-0.08</td>
<td>-0.11</td>
<td>-0.22</td>
<td>-0.02</td>
<td>-0.13</td>
<td>0.05</td>
<td>-0.03</td>
<td>-0.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4) Loneliness</td>
<td>3.36</td>
<td>0.47</td>
<td>-0.01</td>
<td>0.03</td>
<td>-0.08</td>
<td>0.10</td>
<td>-0.02</td>
<td>-0.12</td>
<td>0.25</td>
<td>0.10</td>
<td>-0.03</td>
<td>-0.07</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5) Pain Average</td>
<td>3.64</td>
<td>0.69</td>
<td>-</td>
<td>0.64</td>
<td>0.78</td>
<td>0.11</td>
<td>-0.18</td>
<td>-0.07</td>
<td>0.06</td>
<td>-0.04</td>
<td>-0.01</td>
<td>0.04</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6) Pain Now</td>
<td>3.87</td>
<td>0.76</td>
<td>-</td>
<td>0.60</td>
<td>0.18</td>
<td>0.14</td>
<td>-0.23</td>
<td>0.08</td>
<td>-0.10</td>
<td>-0.07</td>
<td>-0.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7) Pain at its Worst</td>
<td>2.49</td>
<td>0.81</td>
<td>-</td>
<td>-0.04</td>
<td>-0.10</td>
<td>-0.03</td>
<td>-0.02</td>
<td>0.06</td>
<td>0.02</td>
<td>0.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8) IRI Average</td>
<td>3.47</td>
<td>0.86</td>
<td>-</td>
<td>0.53</td>
<td>0.72</td>
<td>0.45</td>
<td>0.71</td>
<td>0.48</td>
<td>0.47</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9) IRI Perspective-Taking</td>
<td>4.99</td>
<td>1.51</td>
<td>-</td>
<td>0.36</td>
<td>0.22</td>
<td>0.25</td>
<td>0.08</td>
<td>0.23</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10) IRI Empathic Concern</td>
<td>4.97</td>
<td>1.35</td>
<td>-</td>
<td>0.14</td>
<td>0.28</td>
<td>0.51</td>
<td>0.54</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11) IRI Personal Distress</td>
<td>2.32</td>
<td>0.49</td>
<td>-</td>
<td>0.10</td>
<td>0.26</td>
<td>0.08</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12) IRI Fantasy</td>
<td>1.78</td>
<td>0.42</td>
<td>-</td>
<td>0.32</td>
<td>0.33</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13) Physical Pain Empathy</td>
<td>24.78</td>
<td>7.55</td>
<td>-</td>
<td>0.58</td>
<td>0.58</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14) Social Pain Empathy</td>
<td>3.40</td>
<td>1.41</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Ns range from 92 to 155. IRI = Interpersonal Reactivity Index, a measure of four aspects of empathy. *p < .05. **p < .01.
Post Hoc Exploratory Analysis

We examined whether the relation between current pain ratings and empathic concern scores would vary as a function of gender. A hierarchical regression was performed in which current pain ratings and gender (coded: males = 1, females = 2) were entered at Step 1, and a variable reflecting their interaction was entered at Step 2. As expected, at Step 1 of the analysis, main effects for pain and gender emerged, such that higher levels of pain were associated with less empathic concern, $B = -.07$, $SE(B) = .03$, $t(110) = -2.59$, $p = .01$, and females had higher empathic concern, $B = .62$, $SE(B) = .17$, $t(110) = 3.75$, $p < .01$. At Step 2, the main effects were qualified by a marginally significant pain x gender interaction, $B = .11$, $SE(B) = .06$, $t(109) = 1.78$, $p = .08$. The significance of the interaction term was confirmed by the marginally significant increase in the proportion of variability in empathic concern accounted for when moving from Step 1 to Step 2 of the model, $\Delta R^2 = .02$, $F(1, 109) = 3.17$, $p = .08$. Simple slope analyses revealed that for males, greater current pain ratings corresponded with lower levels of empathic concern, $B = -.37$, $SE = .13$, $t(109) = -2.84$, $p < .001$. For females, pain ratings and empathic concern were unrelated. These findings provide preliminary evidence that gender moderates the relation between current pain ratings and empathic concern.
CHAPTER 5: DISCUSSION

Previous research has shown that being in acute social pain leads to less empathic feelings for others, and that chronic social pain is associated with less empathic feelings for others. If we consider the Pain Overlap Theory to think about chronic pain populations, we would expect the same results, that is, being in chronic pain would be associated with less empathy for others. Given earlier findings suggesting that chronic pain and empathy are higher for females than males, that pain and empathy increase with age, and that lower socioeconomic status is typically associated with more pain and empathy (Johannes et al., 2010; Schulte-Ruther et al., 2008; O’Brien, et al., 2012; Kraus et al., 2012), we added these three variables as covariates in our hypothesis tests. For the current study, we found that greater current pain predicted lower levels of empathic concern, whereas female gender predicted greater empathic concern. The empathic concern subscale assesses participant’s emotional reactions to the negative experiences of others, and inquires about their feelings of warmth, compassion, and concern for others (Davis, 1980). These findings on acute pain supported the hypothesis that those in acute physical pain report less empathy for others.

Additionally, we found that greater pain on average predicted less perspective-taking. The perspective-taking subscale assesses spontaneous attempts to adopt the perspectives of other people and see things from their point of view (1980). Based on the results, if participants’ ratings of chronic physical pain increase, then their perspective-taking empathy may decrease. The other two empathy subscales, fantasy and personal distress, were not correlated with any aspect of pain.
Furthermore, empathic responses to neither the social pain nor the physical pain vignettes were correlated with any pain measure. This is a surprising finding because the scales were very highly correlated with the empathic concern subscale and they assessed similar aspects of empathy. On the other hand, these vignettes assess “state” empathy (empathy at the current time), rather than a self-perceived trait. Thus, if physical pain does influence empathy, it may be the case that neither current nor average pain level was salient enough to influence state empathy.

Our post hoc exploratory regression analyses showed that the relationship between pain ratings and empathy scores varied by gender. There was a strong relationship between physical pain and empathy scores for males, such that the more current pain they reported, the lower their empathic concern scores; whereas no relationship was seen in females.

One possible theory for these findings is that men and women differ in gender roles. Characteristics of female gender roles typically involve affection, kindness, nurturance, and interpersonal sensitivity; whereas characteristics of male gender roles typically involve assertion, control, and confidence (Newport, 2001). Furthermore, females tend to be more expressive than males (Broverman, Vogel, Broverman, Clarkson & Rosenkrantz, 1972). Males may feel like they can’t show or express physically or verbally when they are in pain. Males may also have a smaller support group compared to females when dealing with pain. Therefore, males may not know how to properly cope with these combined effects and thus it may be one possible reason their empathy scores are more affected by greater pain than females.
Although we did not find loneliness to be related to overall empathy, we found it to be related with the personal distress subscale. The personal distress subscale measures "self-oriented" feelings of personal anxiety and unease in tense interpersonal settings (Davis, 1980). It may be the case then that feelings of loneliness could be the result of difficulties with interpersonal relationships, thus anxiety in these situations would increase.

**Limitations/Future Directions**

There are a few limitations to this study which could have affected the results. The most consequential limitation was probably the fact that our sample was not drawn from a chronic pain population. The average pain score for feelings of pain at its worst was only 5.61 on a scale from zero to 10, which is not a high score; and scores for the other two pain indicators were even lower. This could potentially mean that the pain was not strong enough to have an effect on empathy. Therefore, in the future, it would be important to run this study with a larger sample of chronic pain participants recruited from a chronic pain support group, a chronic pain clinic, or from hospitals with participants who report greater pain scores such as an 8 or higher to investigate whether more intense pain has a stronger relationship with empathy.

Another future direction could include researchers measuring pain and empathy scores at multiple waves in a longitudinal study. This research would determine whether an increase in pain preceded a decrease in empathy or vice versa. Furthermore, researchers could induce acute physical pain in the laboratory to explore the effects on state empathy.

**Conclusions**
Our results add information to the chronic and acute physical pain literature. Chronic physical pain on average was related with the perspective-taking empathy subscale and acute physical pain was related to the empathic concern subscale. Specifically, these results add to the literature regarding the Pain Overlap Theory. It has previously been shown that acute social pain predicts less state empathy, and the current results show that acute physical pain may also be linked to state empathy. Current findings also suggest that chronic physical pain may be related to people’s perceptions of themselves as empathetic individuals. This further suggests shared characteristics between social and physical pain.

Millions of people are affected by physical pain. It is a growing medical issue that needs to be addressed. Therefore, it is important to keep studying chronic physical pain populations to gain a better understanding of the effects of chronic physical pain. One aspect in particular that needs more research is how chronic physical pain affects the emotional system, specifically its capacity for empathy. As noted above, chronic pain is associated with less emotional connection in close relationships (Henne et al., 2015). Our results suggest that perspective-taking empathy is weaker in those with higher average pain. Given the importance of empathy for emotional closeness and successful relationships, our findings may help to explain this phenomenon.
REFERENCES


between persistent pain, psychological distress and emotional connectedness. *Psychology, Health & Medicine, 20*(6), 710-719.


for pain involves the affective but not sensory components of pain. *Science*, 303(5661), 1157-1162. DOI: 10.1126/science.1093535


APPENDIX A

STUDY QUESTIONNAIRE
Wisconsin Brief Pain Questionnaire


Please answer each question to the best of your ability.

1. Throughout our lives, most of us have had pain from time to time (such as minor headaches, sprains, and toothaches). We are interested in finding out if you have had pain other than these everyday kinds of pain in the last month.

   Yes  No

IF YES:

2. How long have you had your pain for?

3. What is the cause of your pain (e.g. fibromyalgia)? If unknown, what do you believe to be the cause of your pain? (e.g. playing sports, working out)

4. Select from this list (all that apply), where your pain occurs:

   Head/Neck  Back
   Shoulder/Arm  Hands
   Stomach  Leg/Knee
   Feet/Ankle  Other:

5. Please rate your pain by selecting the one number that best describes your pain at its worst in the last month.

   (10 being so severe as to prohibit all activity; the worst pain you can imagine).

   No pain  0  1  2  3  4  5  6  7  8  9  10  Pain as bad as you can imagine

6. Please rate your pain by selecting the one number that best describes your pain on the average.

   (10 being so severe as to prohibit all activity; the worst pain you can imagine).

   No pain  0  1  2  3  4  5  6  7  8  9  10  Pain as bad as you can imagine

7. Please rate your pain by selecting the one number that tells how much pain you have right now.

   (10 being so severe as to prohibit all activity; the worst pain you can imagine).

   No pain  0  1  2  3  4  5  6  7  8  9  10  Pain as bad as you can imagine

8. What treatment or medication are you receiving for your pain?

9. How much relief do pain treatments or medications provide? (Please select the one percentage that shows how much relief you have).

   No relief  0%  10%  20%  30%  40%  50%  60%  70%  80%  90%  100%  Complete relief

10. Suppose you were telling someone how your pain feels. What words would you use to describe your pain? Select all that apply.

   Wretched, blinding, annoying, troublesome, miserable, intense, unbearable, spreading, radiating, penetrating, piercing, tight, numb, drawing, squeezing, tearing, cool, cold, freezing, nagging, nauseating, agonizing, dreadful, torturing, other?

11. How does your pain change over time?
12. During the past week, how much did the state of your health, including any pain, interfere with the following things? (0 – not at all, 1 – a little bit, 2 – moderately, 3 – quite a bit, 4 – extremely)

<table>
<thead>
<tr>
<th>Mood</th>
<th>Relations with others</th>
<th>Walking ability</th>
<th>Sleep</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal work (both outside the home and housework)</td>
<td>Enjoyment of life</td>
<td>Other:</td>
<td></td>
</tr>
</tbody>
</table>

**Interpersonal Reactivity Index**


The following statements inquire about your thoughts and feelings in a variety of situations. For each item, indicate how well it describes you by choosing the appropriate number on the scale: 0, 1, 2, 3, or 4. When you have decided on your answer, fill in the letter next to the item number. READ EACH ITEM CAREFULLY BEFORE RESPONDING. Answer as honestly as you can. Thank you.

<table>
<thead>
<tr>
<th>Does not describe me well at all</th>
<th>Describes me very well</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

1. I daydream and fantasize, with some regularity, about things that might happen to me.
2. I often have tender, concerned feelings for people less fortunate than me.
3. I sometimes find it difficult to see things for the “other guy’s” point of view.
4. Sometimes I don’t feel very sorry for other people when they are having problems.
5. I really get involved with the feelings of the characters in a novel.
7. I am usually objective when I watch a movie or play, and I don’t often get completely caught up in it.
8. I try to look at everybody’s side of a disagreement before I make a decision.
9. When I see someone being taken advantage of, I feel kind of protective towards them.
10. I sometimes feel helpless when I am in the middle of a very emotional situation.
11. I sometimes try to understand my friends better by imagining how things look from their perspective.
12. Becoming extremely involved in a good book or movie is somewhat rare for me.
13. When I see someone get hurt, I tend to remain calm.
14. Other people’s misfortunes do not usually disturb me a great deal.
15. If I’m sure I’m right about something, I don’t waste much time listening to other people’s arguments.
16. After seeing a play or movie, I have felt as though I were one of the characters.
17. Being in a tense emotional situation scares me.
18. When I see someone being treated unfairly, I sometimes don’t feel very much pity for them.
19. I am usually pretty effective in dealing with emergencies.
20. I am quite often touched by things that I see happen.
21. I believe that there are two sides to every question and try to look at them both.
22. I would describe myself as a pretty soft-hearted person.
23. When I watch a good movie, I can very easily put myself in the place of a leading character.
24. I tend to lose control during emergencies.
25. When I’m upset at someone, I usually try to “put myself in his shoes” for a while.
26. When I am reading an interesting story or novel, I imagine how I would feel if the events in the story were happening to me.
27. When I see someone who badly needs help in an emergency, I go to pieces.
28. Before criticizing somebody, I try to imagine how I would feel if I were in their place.

**UCLA Loneliness**


The following statements describe how people sometimes feel. For each statement, please indicate how often you feel the way described by selecting a number.

<table>
<thead>
<tr>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

1. How often do you feel that you are “in tune” with the people around you?
2. How often do you feel that you lack companionship?
3. How often do you feel that there is no one you can turn to?
4. How often do you feel alone?
5. How often do you feel part of a group of friends?
6. How often do you feel that you have a lot in common with the people around you?
7. How often do you feel that you are no longer close to anyone?
8. How often do you feel that your interests and ideas are not shared by those around you?
9. How often do you feel outgoing and friendly?
10. How often do you feel close to people?
11. How often do you feel left out?
12. How often do you feel that your relationships with others are not meaningful?
13. How often do you feel that no one really knows you well?
14. How often do you feel isolated from others?
15. How often do you feel you can find companionship when you want it?
16. How often do you feel that there are people who really understand you?
17. How often do you feel shy?
18. How often do you feel that people are around you but not with you?
19. How often do you feel that there are people you can talk to?
20. How often do you feel that there are people you can turn to?

Social Pain and Physical Pain Empathy


Participant receives following instructions:

“Think of a time when you felt that others did not want to be in your company and when you did not feel a strong sense of belongingness with another person or group. Nearly everyone has experienced such an experience more than Once. Please choose an especially important and memorable event, and think about it until I give you the next instruction.”

<Participant thinks about event for * minutes>

“Please read this short passage about a college student you don’t know:”

Two days ago I broke my leg playing intramural sports. I’ve been playing on the same intramural team for the past three years and I’m upset that my season has been cut short. I’m experiencing pain because of my injury. I’m also having a tough time getting around campus, as there are lots of hills and stairs that make it hard to use my crutches on. The parking people won’t let me get a handicapped permit because they said my injury was only temporary. I’ve been real down. It’s all I think about.

“Please read this short passage about a college student you don’t know:”

Two days ago I broke up with my (girlfriend) boyfriend. We’ve been going together since our junior year in high school and have been really close, and it’s been great being at ASU together. I thought (s)he felt the same, but things have changed. Now, (s)he wants to date other people. (S)He says (s)he still cares a lot about me, but (s)he doesn’t want to be tied down to just one person. I’ve been real down. It’s all I think about. My friends all tell me that I’ll meet other (girls) guys and they say that all I need is for something good to happen to cheer me up. I guess they’re right, but so far that hasn’t happened.
Use the following scale to rate how you feel toward this author:

<table>
<thead>
<tr>
<th>Feel not at all…</th>
<th>Neutral</th>
<th>Feel strongly…</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Sympathetic
2. Warm
3. Compassionate
4. Soft-hearted
5. Tender