DOES CHRONIC PAIN AND PAIN SENSITIVITY INFLUENCE'S ONE'S AFFECTIVE EXPERIENCE OF SOCIAL AND PHYSICAL PAIN?

by

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ABSTRACT

DOES CHRONIC PAIN AND PAIN SENSITIVITY INFLUENCE'S ONE'S AFFECTIVE EXPERIENCE OF SOCIAL AND PHYSICAL PAIN?

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Pain Overlap Theory (Eisenberger, Jarcho, Lieberman, & Naliboff, 2006) suggests that the affective experience of physical and social pain share the same phenomenological and neurocognitive correlates (MacDonald & Kingsbury, 2006). An important question is how individual differences in pain experiences in one domain (e.g., physical pain) influences pain experiences in other domains (e.g., social). Chronic physical pain is thought to be associated with changes in physiological and psychological processes linked with pain unpleasantness. For example, chronic physical pain is thought to sensitize individuals to potential harm to the point that the individual may attempt to avoid (or even overreact to) manageable situations (Sharp & Harvey, 2001). If Pain Overlap Theory is correct, persons who are more sensitive to one type of pain (e.g., social) should be more sensitive to the other type of pain (e.g., physical). The study was

conducted in three phases. Phases one (prescreening) and two involved online questionnaires. Phase three had the participants (N = 162) come to the laboratory for a study they thought was examining how mental visualization versus face-to-face social interactions influenced sensory perception. Although it was anticipated that persons who experience chronic social pain or those who have greater sensitivity to social distress would report lower pain tolerance to physical pain, results did not support this hypothesis. It was also expected that persons who experience chronic physical pain or who report greater pain sensitivity would react more adversely to ostracism via a virtual ball-tossing game called Cyberball. The results once again did not support the hypothesis. Finally, it was expected that persons who were ostracized would report a reduction in physical pain tolerance from pre- to post- assessments compared to participants who were not ostracized or who were "included". Furthermore, this effect would be exacerbated for persons who experience chronic pain or who report greater pain sensitivity (regardless of the pain domain). Results did not support this hypothesis. Supplementary analyses indicated that the present study may have possible restriction of range problems by excluding victims and individuals experiencing chronic pain from participating.

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CHAPTER 1

INTRODUCTION

Few people would argue that the loss of a loved one or betrayal by a close friend is painful. Indeed, when social ties are broken or damaged, an individual will often experience social pain, an emotional response to the real or perceived devaluation of desired relationships (Eisenberger & Lieberman, 2005; Leary & Springer, 2001; MacDonald & Leary, 2005). Unlike group inclusion, which strengthens the social bond an individual has with one or more peers, group exclusion not only reduces the social tie between that individual and his or her peers, but also can influence mental health outcomes (Rook, 1984).

A number of interpersonal situations such as death of a loved one, abandonment, rejection, exclusion from a group, being turned down for a date, having a friend move to a different city, and forgotten birthdays can cause an individual to experience social pain (Baumeister & Leary, 1995; Leary & Springer, 2001; MacDonald & Leary, 2005; Picket & Gardner, 2005). Interestingly, people often use physical pain expressions such as "hurt feelings," "sinking inner pain" (Leary & Springer, 2001), "broken heart," "slap in the face," "homesickness," and "crushed" (MacDonald & Leary, 2005) to describe socially painful experiences. Conversely, terms that would describe sources of physical pain, have been used to describe positive social experiences such as "having a crush on someone" (MacDonald & Leary, 2005).

Research involving social pain has shown that people tend to use such physical pain descriptors to identify one's *hurt feelings* (Leary & Springer, 2001). So what does it mean when an individual says their feelings are hurt? Hurt is a negative (i.e., damaging, disturbing, or stressful) experience that is counterproductive to one's existence or wellbeing (L'Abate, 1997). The words that come closest to describing such an encompassing emotion are *wounded* and *pained*, but even these words describe an emotional state using physical pain descriptors. It appears that individuals have created no unique way to describe emotional, social pain (e.g., hurt feelings) experiences without the aid of physical pain descriptors (MacDonald & Leary, 2005).

1.1 Pain Overlap Theory

Although physical pain descriptors provide preliminary evidence that the affective experience of social and physical pain may be similar, recent research has begun to look for a potential overlap in neurological and biological systems when experiencing pain, whether it is social or physical in nature. The belief that there are shared neural mechanism(s) between social pain and physical pain has become known as *Pain Overlap Theory* (Eisenberger, Jarcho, Lieberman, & Naliboff, 2006; Eisenberger & Lieberman, 2005; MacDonald & Leary, 2005; Panksepp, 2005).

Physical pain has been defined by the International Association for the Study of Pain Task Force on Taxonomy (1994) as "an unpleasant and emotional experience associated with actual or potential tissue damage, or described in terms of such damage" (p. 210). Physical pain is also thought to be comprised of two distinct components: pain sensation and pain affect (Craig & Dostrovsky, 1999; MacDonald & Leary, 2005; Price,

2000). Pain sensation is responsible for the information regarding the intensity and location of the physical damage (e.g., burn, abrasion, or a cut) and consists of the pathway from the dorsal horn of the spinal cord to the dorsocaudal medulla allowing the brain to process the experience (Rainville, 2002). Pain affect, on the other hand, involves the unpleasant emotional feelings associated with the pain experience (e.g., distress or fear), as well as the emotions associated with future sensations (e.g., "suffering"). Social pain is unique in that it is thought to comprise only the affective component of pain (Eisenberger & Lieberman, 2005; MacDonald & Leary, 2005; Price, 2000). As such, for the purpose of this study I will focus on the relationship between the affective component(s) of physical and social pain.

If *Pain Overlap Theory* is correct, an individual's sensitivity to social pain should influence their sensitivity to physical pain and vice versa. As such, individuals who are experiencing chronic physical pain or who report greater pain sensitivity should react more adversely to ostracism than persons who are less sensitive to pain. Conversely, persons who are chronically victimized or who are more sensitive to social situations should report lower physical pain tolerance.

1.2 Evolutionary Reasoning for Shared Components

The relationship between social and physical pain systems is thought to serve as an evolutionary function in human development (MacDonald & Leary, 2005). That is, the infant's need for nourishment and protection from predators brought the need for social connection. The shared system assists in evaluating negative effects on survival and that there needs to be a system in place to monitor the distance from the individual to their

caregiver (Eisenberger & Lieberman, 2005). A feeling of pain and an attempt to assuage such an experience ensues when the distance exceeds the comfort level (e.g., social exclusion; Eisenberger & Lieberman, 2005; A. Williams, 2002). The distance does not necessarily have to be physical in nature. The perception of psychological distance can also have aversive effects on individuals. Psychological distancing can result from any social situation that involves rejection, exclusion, ostracism, or any social situation in which the individual feels unimportant and distant from whom they perceive to be important (Eisenberger & Lieberman, 2005; Leary, 2005).

A basic human need is thought to be the need to belong (Baumeister & Leary, 1995). That is, there appears to be a need to create and sustain social interactions for reproductive benefits, raising offspring, and survival, thereby making group inclusion a critical aspect for an animal's survival (Baumeister & Leary, 1995; DeWall & Baumeister, 2006; Leary, 2005; MacDonald, Kingsbury, & Shaw, 2005; Williams & Zadro, 2005). An individual would be inclined to form interpersonal relationships because groups are able to provide reproductive opportunities, hunt and share food, help defend against predators, as well as tend to each others offspring. Perhaps one of the consequences of evolution's response to social connectedness is that it may have resulted in the individual's best interest to form and preserve social bonds (Baumeister & Leary, 1995; Eisenberger & Lieberman, 2004), or what social psychologists term "need to belong."

1.3 Neurological Support for Pain Overlap Theory

Additional support for Pain Overlap Theory lies in neurological research. Specifically, studies using positron emission tomography (PET) or functional magnetic resonance imaging (fMRI) techniques have found that the anterior cingulate cortex (ACC), insular cortex (IC), prefrontal cortex (PFC), thalamus, and cerebellum are associated with the acute affective experience of physical pain (Bushnell & Apkarian, 2006). Researchers have found the affective component of physical pain can act independently from the pain sensation mechanism. In other words, feelings of pain can occur without the presence of physical damage. Perhaps more interestingly, the affective component has been observed to activate the same painful feelings as social pain (MacDonald, 2007).

For example, Hofbrauer, Rainville, Duncan, and Bushnell (2001) recently published a study in which they were able to have participants dissociate their pain sensation and pain affect by means of hypnotic suggestions. The hypnotic suggestions were designed in a way to vary pain intensity or pain unpleasantness. Results indicated that a relationship between the ACC and pain unpleasantness exists when the pain affect condition was manipulated, independent of the pain sensation component. Rainville (2002) also found the ACC to be a critical area involved in subjective feelings of pain unpleasantness as well as the PFC (Lieberman et al., 2004).

Reinforcing the notion that the ACC is active in both physical and social pain experiences is Gray and McNaughton's (2000) research on defense system mechanisms (e.g., the fight-or-flight approach). A network of structures (e.g., the midbrain

periaqueductal (PAG), the medial hippocampus, the amygdala, and the ACC) in the brain exists and cooperates with one another in a way that controls the defense system. Specifically, the PAG receives input from the ACC (Craig & Dostrovsky, 1999; Gray & McNaughton, 2000; MacDonald, Kingsbury, & Shaw, 2005) during the social or physical pain experience.

In a study involving participants experiencing social exclusion (Eisenberger, Lieberman, & Williams, 2003), activation in the ACC was found. Additionally, the right ventral PFC was associated with a decrease in distress after an exclusion experience. Eisenberger and colleagues go on to summarize their study on social exclusion as showing "patterns of activations very similar to those found in studies of physical pain" (p. 291). Furthermore, research led by Price (2000) has found that social distress activates neural regions in the dorsal ACC. As such, it is thought that pain unpleasantness engages brain regions concerned with reflection and rumination over past and present feelings of pain. Research suggests that the affective experience of physical and social pain share the same phenomenological and neurocognitive correlates advancing the pain overlap theory (Eisenberger, Jarcho, Lieberman, & Naliboff, 2006; Eisenberger & Lieberman, 2004). Lending support for physical and social pain relying on some of the same phenomenology came from a study conducted by Eisenberger et al. (2004), which revealed individuals who ranked higher on sensitivity to physical pain reported experiencing greater social pain as a result of being excluded. In other words, "sensitivity to one type of distressing experience is directly related to sensitivity to the other" (p. 5; Eisenberger, Jarcho, Lieberman, & Naliboff, 2006; Eisenberger & Lieberman, 2004).

Moreover, the same brain regions associated with the emotional experience of physical pain are also associated with the emotional experience of social pain (Eisenberger, Lieberman, & Williams, 2003).

In addition to the social and physical pain overlap in the neurological systems, Panksepp has found an overlap in the neuroendocrine system. Specifically, Panksepp (1988) found that opiate-based drugs not only alleviate physical pain, but reduce social pain in both animals and humans. Low doses of morphine, for example, have shown a reduction of distress in isolated rat pups (Carden & Hofer, 1990), guinea pigs (Herman & Panksepp, 1978), and primates (Kalin, Shelton, & Barksdale, 1988). Lending more support to the pain overlap theory was the Nemoto et al. (2003) study which found that antidepressants not only lower an individual's anxiety or depression, but have subsequently alleviated the effects of physical pain. Finally, DeWall, MacDonald, Webster, Tice and Baumeister (2007) have found that just two small daily doses of acetaminophen reduced hurt feelings over time compared to a placebo that showed no significant results.

1.4 Numbing Hypothesis

Although there is much support for an increase in pain sensitivity as a result of social and physical pain experiences, it is important to mention that an alternative explanation for the effect of pain overlap exists. Rather than pain sensitivity increasing, some research suggests both animals (MacDonald & Leary, 2005) and humans (Baumeister, Brewer, Tice, & Twenge, 2007; DeWall & Baumeister, 2006) lose sensitivity after being excluded (e.g., numbness hypothesis). According to the numbing

hypothesis, an individual who receives a physical injury should be able to continue functioning without the interference of that physical pain ailment due to the release of opioids within the body (Baumeister, Brewer, Tice, & Twenge, 2007). For example, the *immediate* numbness suppresses sensitivity from increasing long enough to allow an injured animal to escape from its predator. Once the animal is safe, the numbness will begin to subside and the animal will start to feel hurt. Research also shows a similar reaction for social pain (Baumeister, Brewer, Tice, & Twenge, 2007; DeWall & Baumeister, 2006; MacDonald & Leary, 2005). That is, an individual may experience numbness as an immediate result of a painful event, however, long-term or chronic pain should lead to greater sensitivity over time.

Further research is needed to examine if the defense system in charge of numbing the pain works for all individuals. For instance, those individuals who are chronically victimized or those experiencing chronic physical pain symptoms would tend to overtax the resources responsible for alleviating the pain. If this defense system becomes depleted, individuals should become more sensitize to potential harm (Kristenson, Erikson, Sluiter, Starke, & Ursin, 2004). Under allostasis, the autonomic nervous system, the cardiovascular and immune systems are able to protect the body by adapting to stress, however, McEwen (1998) found that sustained activation of a stressor results in allostatic load. Allostatic load is the wear and tear that results from managing the prolonged stressor which may lead to relatively permanent changes in these systems. When overexposure of the stimuli occurs and the usual counterregulation system fails, other defensive systems will respond to the stimuli. For example, if cortisol secretion cannot

increase as a result of stress, secretion of inflammatory cytokines will increase instead (McEwen, 1998).

1.5 Individual Differences in Reactions to Pain

Physical and social pain may overlap, but not everyone responds to the affective experience of pain in comparable ways. Therefore, current theory and research should examine *how* individual differences in pain experiences in one domain (e.g., physical pain) influence pain experiences in other domains. Second, it is also important to understand *why* some individuals are more pain sensitive compared to others. One explanation may be due to individual differences in sensitivity to pain (e.g., dread of future interactions, rejection sensitivity, hurt proneness, pain catastrophizing, and need to belong). Another plausible reason may reflect individual differences in pain histories. For example, prior pain experience may cause individuals to experience future pain episodes differently. That is, an individual who receives stitches for the first time may be more bothered than someone who is receiving stitches for a second time. Conversely, someone who has had a negative experience with stitches may be more upset with receiving stitches than someone who has had no experience with stitches.

With regards to negative social pain experiences, an individual who experiences being left out of a group for the first time may react differently than someone who has been excluded repeatedly before. In summary, some individuals may be constitutionally more sensitive to pain than others (e.g., pain catastrophizing, hurt proneness). An individual's history of pain may also influence one's current reactions to a painful experience. More specifically, one who has experienced chronic pain may be more

sensitive to current pain experiences than persons who do not have a chronic history of pain. On the other hand, individuals may develop a "thicker skin" in reaction to pain episodes than do other people.

1.6 Dread of Future Interactions

Building on the notion that there are individual differences in reactions to negative social pain experiences is the idea that certain individuals dread continued interactions with members of the group that have excluded them (Geller, Goodstein, Silver, Sternberg, 1974). Geller, Goodstein, Silver and Sternberg (1974) found excluded individuals feel a sense of powerlessness when ignored because he or she was not in a position to control the situation, rather they could only react to it. If given the opportunity, these individuals would choose to leave the social situation to which they were being excluded. It is expected that individuals who have been excluded would report higher dread of interaction scores compared to those individuals who were in the nonexclusion or social inclusion conditions.

1.7 Chronic Pain

One important individual difference involves how chronic pain influences reactions to current pain episodes. Given the overlap between the affective experience of social and physical pain, examining research on chronic physical pain may clarify how prolonged social pain, namely chronic exclusion or bullying from others, may influence reactions to current painful events. Overall, pain is a much needed survival tool because it assists individuals with escaping and avoiding harm on a daily basis (Baliki, et al., 2006; Melzack & Wall, 1982). In other words, the idea of pain is a positive concept as it serves

as a check and balance on an individual's life. On the other hand, pain is considered harmful when it overwhelms and interferes with an individual on a continuous basis.

Living with persistent pain (e.g., chronic pain) is believed to change physiological and psychological processes associated with pain unpleasantness (Baliki et al., 2006; Price, 2000). Chronic pain begins to alter an individual's day to day outlook as well as future expectations, thereby causing the individual to become more sensitive to *potential harm* and attempt to avoid (or even overreact) any kind of situation (e.g., manageable or not). This perception of potential harm causes chronic pain sufferers to often avoid activities that they believe might increase pain (Sharp & Harvey, 2001).

Research has shown that chronic pain causes sensitization to both social pain and physical pain. Social pain sufferers (i.e., rejection-sensitive individuals) become vulnerable to pain due to chronic activation of perceived social threat (MacDonald, Kingsbury, & Shaw, 2005). Those who frequently experience physical pain are more prone to the expectation and fear of pain (Vlaeyen & Linton, 2000) and are more likely to experience anxiety and panic disorders (McWilliams, Cox, & Enns, 2003). Additionally, individuals regularly experiencing physical pain are more apt to becoming more sensitive to future pain, compared to those that are not expecting pain (Berkowitz & Thome, 1987).

1.8 Rejection Sensitivity

Another potentially important individual difference involving the affective experience of pain involves rejection sensitivity. People who overreact, readily perceive, and anxiously expect rejection are considered to be rejection sensitive people (Downey & Feldman,

1996). Reaction to such perceived rejection includes hostility, anxiety, emotional withdrawal, and jealousy (Baumeister & Leary, 1995; Downey & Feldman, 1996). It is believed that rejection sensitivity originates in childhood rejection experiences. Specifically, when the child's needs were met by rejection from their caretaker, children developed an insecure working model (e.g., doubt and anxiety) about whether others rejected or accepted and supported them. Having an insecure working model may cause the individual to question their chances of maintaining a close relationship (Downey & Feldman, 1996) and to behave in ways that elicit rejection from others (Downey, Freitas, Michaelis, & Khouri, 1998). As such, it was anticipated that persons who ranked higher on rejection sensitivity would react more adversely to both physical and social pain experiences.

1.9 Catastrophizing Pain

In addition to rejection sensitivity, some individuals are thought to catastrophize their pain experiences more than others. That is, some individuals may be more sensitive to pain regardless of their pain histories. Pain catastophizing occurs as a result of amplifying or inflating the veracity of the pain sensations (Sharp and Harvey, 2001; Sullivan et al., 2001). A sense of helplessness exists among pain catastrophizers. Pain catastrophizers put themselves in a perpetual cycle to experience intense pain, disability, and emotional distress by seeking out and attending to threatening pain cues thereby increasing their pain experience (Berkowitz & Thome, 1987; Sharp & Harvey, 2001; Sullivan et al., 2001). Since individuals who are ranked high on pain catastrophizing attend to threatening pain cues, which in turn increase their pain experience, I anticipated that

persons ranked higher on this dimension would be more adversely affected by both social and physical pain experiences than persons lower on pain catastrophizing.

1.10 Hurt Proneness

Another important difference to consider is how easily a person's feelings are hurt. An individual's feelings can be hurt in a number of ways such as being teased, betrayed, recipient of thoughtless remarks, or publicly humiliated. It is essential to study how an individual can feel hurt because hurt feelings have been associated with maladaptive behaviors (Leary & Springer, 2001). For example, due to the implication of having one's feelings hurt, individuals may try to avoid situations in which they may fear hurt experiences. It was anticipated that persons who ranked higher on hurt proneness would react more negatively to both social and physical pain.

1.10 Need to Belong

Finally, although persons are thought to have a basic, innate need to belong (nBelong) to social groups, there are probably wide individual differences in the desire to belong to groups (Baumeister & Leary, 1995). That is, some individuals may be very sensitive to their belongingness status whereas other individuals may not care as much about how well they belong to the groups around them. Specifically, people with a high nBelong are more motivated to form positive affective relationships with others unlike individuals who have a low need to belong (Baumeister & Leary, 1995). In recent research on social interactions, individuals assessed as high on nBelong experienced more negative affect than persons lower in nBelong during social exclusion situations (Waldrip, 2007) and reported greater threatened belongingness (Knack et al., 2007). Additionally, individuals

ranked high on nBelong also showed greater insula activity when excluded compared to persons lower on nBelong (Knack et al., 2007).

1.11 Present Study

The present study was a replication and extension of Eisenberger, Jarcho, Lieberman, and Naliboff's (2006) study that examined the overlap of social and physical pain with a few important additions and modifications. First, the current study examined pre- and post-Cyberball physical pain thresholds and tolerances so that a difference in heat threshold/tolerance could be examined. Secondly, the current study did not take a heat stimuli measure during any part of the Cyberball interaction as to remove any possible confounds associated with this overlap. That is, participants should concentrate strictly on their respective condition (i.e., social inclusion, nonexclusion, or exclusion) or the heat stimuli. For example, persons who were excluded reported a lower pain tolerance in the Eisenberger et al. (2006) study. This lowered tolerance to physical pain could be due to having experienced exclusion. Conversely, it could be due to having a lower cognitive load than those in the inclusion condition (who are required to throw the ball to others).

For the present study, participants were placed into one of three conditions: social inclusion, nonexclusion, and exclusion. Previous research using Cyberball (Williams, Cheung, and Choi, 2000) has primarily compared inclusion to two types of exclusion. In overt exclusion studies, participants are included in the interaction at the onset, however, as the interaction continues, the participant quickly becomes ignored. The other types of exclusion studies involve what researchers call "non-inclusion" situations. Non-inclusion conditions occur when participants are forewarned that they will be excluded. For

example, participants are informed that they can only watch the other players interact due to technical difficulties in connecting with them (Eisenberger et al., 2006). In addition to studying the effects of different exclusion conditions on individuals like the Eisenberg et al. (2006) study, it is equally important to focus on the different types of inclusion that people may encounter. What makes studying differences in inclusion conditions difficult is the degree of ambiguity to how inclusion is actually defined. That is, inclusion conditions are typically operationalized as having the participant receive the ball an "equal" number of throws. However, as the number of confederates increases, this "equal number" can be ambiguous to the participant.

Thirdly, unlike the Eisenberger et al. (2006) study which only used two confederates, the present study used three confederates to better test the sensitivity hypotheses. For example, with three partners, a participant would only receive the ball 25% of the time. Is that inclusion or simply nonexclusion? This ambiguous situation can also be interpreted differently depending on the participant's level of pain sensitivity. For example, persons higher on pain sensitivity may react more negative to this ambiguous condition (*nonexclusion*) than persons in a clear-cut, nonambiguous inclusion condition (*social inclusion*). Furthermore, what is defined as the *social inclusion* condition occurs when the participant receives the ball a significant amount of the time (e.g., at least 50% of the time as compared to the other "participants").

Since the participant interacted with three other players for this experiment, the participant who received 25% of the ball tosses was considered to be in the *nonexclusion* condition. Previous research has shown persons who were chronically victimized reacted

more negatively in this condition than did persons that were not chronically victimized (e.g., Usher, Waldrip, & Jensen-Campbell, 2007). Finally, the *exclusion condition* involved participants receiving the ball significantly less than the other "participants" (e.g., received the ball a few times and did not receive the ball for the remainder of the game; approximately 2% of the ball tosses were directed toward the participant).

Finally, my study differentiated from the Eisenberger et al. study (2006) in that I specifically examined important individual differences that have been associated with pain differences in past research (i.e., pain catastrophizing, rejection sensitivity, hurt proneness, and having a history of chronic pain). Studying these individual differences increased our understanding of how painful experiences in different domains (social vs. physical pain) may overlap.

If Pain Overlap Theory is correct, an individual's sensitivity to social pain should influence their sensitivity to physical pain and vice versa. Specifically, I hypothesized that persons who are experiencing chronic social pain (e.g., victims of exclusion) would report lower pain tolerance to physical pain (Hypothesis 1). Secondly, it was expected that individuals who experienced chronic physical pain or who reported greater pain sensitivity would react more adversely to ostracism via a virtual ball-tossing game called Cyberball (Hypothesis 2). Thirdly, I predicted that persons who are ostracized would report a reduction in physical pain tolerance from pre- to post- assessments compared to participants who were not ostracized or who were "included" (Hypothesis 3). Finally, this reduction in physical pain tolerance would be exacerbated for persons who experienced chronic pain or who reported greater pain sensitivity (Hypothesis 4).

CHAPTER 2

METHOD

2.1 Participants

A total of 162 (55 male and 107 female) undergraduate students from The University of Texas at Arlington (UT Arlington) participated in this study. Of the 162, only 2 did not have adequate data to analyze. One participant (i.e., male) did not complete phase 3 due to a response on the Experiment Readiness Questionnaire and the other participant (i.e., female) chose not to answer the questionnaires in phase 2. The number of participants was selected based on previous findings in our lab (e.g., Waldrip, 2007) and by power analysis (Cohen, 1988). A minimum of 150 participants were needed for a power of .70 to detect correlations of .35.

Participants were at least 18 years of age (M = 21.21, SD = 6.17) at the time of study and ranged from 18 to 58. To determine ethnicity and socioeconomic status, all participants completed a demographic questionnaire as part of their prescreening. The racial composition of the present sample was 36.3% White/Anglo-American, 20.0% Black/African American, 21.3% Asian, 15.6% Latino/Hispanic, and 4.4% Other. In addition, 68.1% of the participants reported English as the primary language spoken at home, 7.5% reported Spanish as their primary language, 6.3% said Vietnamese and 12.5% said Other (i.e., German, Malayalam, Igbo). The undergraduates participated in this study as part of their research fulfillment requirement in their Introductory to

Psychology class or received extra credit through their upper-level psychology courses.

2.2 Materials

2.2.1. Health Prescreening

2.2.1.1 Experiment Readiness Questionnaire (ERQ)

The ERQ is a measure consisting of 14 yes or no questions that assesses the participant's health (e.g., "Do you frequently have pains in your heart and chest?") (Pool, Schwegler, Theodore, & Fuchs, 2007). The questionnaire is designed to identify participants who may not be acceptable to participate in a physical pain task due to prior health concerns. Participants must answer no to the first 10 questions to be considered fit for the study (see Appendix A).

2.2.2. Chronic Pain Measures

2.2.2.1 Modified Children Social Experiences Questionnaire Self Report (CSEQ-SR).

The modified CSEQ-SR measures age appropriate peer relationships in college students, specifically victimization (Crick & Grotpeter, 1996). The CSEQ is a five-point Likert scale questionnaire (1 = never, 5 = always) that consists of 18 questions that include three subscales: overt victimization (e.g., "How often do you get pushed or shoved by one of your peers on campus?"), relational victimization (e.g., "How often does a classmate tell lies and/or spread rumors about you to make others not like you anymore?"), and being the recipient of a prosocial behavior (e.g., "How often does someone help you when you need help?"). The CSEQ-SR score is computed by summing all the responses within the respective subscale. In the present sample, being the recipient

of prosocial behavior and relational victimization subscales had a high reliability (see Table 2.1). The overt victimization subscale had a relatively low reliability (see Table 2.1).

2.2.2.2 Direct and Indirect Aggression Scale – Victim Version (DIAS)

The DIAS - victim version is a five-point Likert scale questionnaire (0 = Never, 4 = very often) that measures victimization of physical aggression (e.g., "How often are you kicked by other people?"), verbal aggression (e.g., "How often are you insulted by other people?"), and indirect aggression (e.g., "How often do other people say bad things behind your back?") (Österman, Björkqvist, Lagerspetz, Kaukiainen, Huesmann, & Fraczek, 1994). The DIAS score is computed by summing all the responses within the respective subscale. All three subscales (i.e., victim of physical aggression, victim of verbal aggression, and victim of indirect aggression) had a high reliability in the current sample (see Table 2.1).

2.2.2.3 Physical Pain Disability Questionnaire (PDQ)

The revised version of the PDQ uses a five-point Likert scale to measure the participant's generalized chronic pain experiences. The PDQ assesses the function/disability of a participant affected by pain by asking questions such as, "Does your pain interfere with your normal work inside and outside the home?", "Does your pain interfere with your ability to stand up?", and "Do you now feel more depressed, tensed, or anxious than before your pain began?" (Gatchel, Mayer, & Theodore, 2006). The PDQ score is computed by summing the responses to statements 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, and 19 and then dividing by 16. The PDQ had a high

reliability (see Table 2.1).

Table 2.1 Descriptive Statistics and Reliability Estimates for Individual Difference Measures

Variable/ Scale Name	Mean	Standard Deviation	Actual Range	Possible Range	Skewness	Kurtosis	Alpha
Chronic Pain Measures							
Physical Victimization	0.19	0.29	0-1.71	0-4	2.29	6.78	0.74
Verbal Victimization	0.69	0.55	0-2.80	0-4	1.02	1.50	0.80
Indirect Victimization	0.61	0.51	0-2.90	0-4	1.29	2.11	0.90
Overt Victimization	1.29	0.37	1-3	1-5	2.02	5.45	0.69
Relational Victimization	1.49	0.49	1-3	1-5	1.09	0.58	0.77
Average Victimization	0.00	0.81	2-13.41	2-22	1.50	2.96	0.90
Recipient of Prosocial Behavior	3.86	0.60	2-5	1-5	-0.28	-0.02	0.78
Pain Disability	1.55	0.52	1-4	1-5	1.47	1.70	0.92

Table 2.1 - *Continued*

Variable/ Scale Name	Mean	Standard Deviation	Actual Range	Possible Range	Skewness	Kurtosis	Alpha
Pain Sensitivity Measures							
Rejection Sensitivity	10.54	2.61	4-18	1-30	-0.14	0.05	0.83
Need to Belong	32.82	6.72	13-50	10-50	-0.19	0.04	0.81
Hurt	17.05	4.57	8-29	6-30	0.32	0.11	0.78
Proneness							
Rumination (PCS)	5.31	4.29	0-16	0-16	0.41	-0.71	0.89
Magnification (PCS)	2.48	2.49	0-12	0-12	1.14	1.09	0.70
Helplessness (PCS)	4.11	4.28	0-23	0-24	1.73	3.99	0.86
Pain	11.90	9.95	0-50	0-52	1.02	1.40	0.92
Catastrophizing Total (PCS)							

2.2.3 Pain Sensitivity Measures

2.2.3.1 Rejection Sensitivity Questionnaire (RSQ)

The RSQ is a measure consisting of 18 hypothetical interpersonal situations that are representative of what young adults may encounter (e.g., "You ask your parents to come to an occasion important to you."). The RSQ assesses rejection sensitivity (Downey & Feldman, 1996). Each situation creates a scenario in which the participant answers

how he/she feels (e.g., “How concerned or anxious would you be over whether or not the person would want to lend you his/her notes?”) in addition to being asked how they believe the other person will respond (e.g., “I would expect the other person to respond willingly to give me his/her notes.”). First, the RSQ scores are computed by reverse scoring the level of acceptance expectancy. Next, the rejection sensitivity response of each question is calculated by multiplying the rejection concern by the acceptance expectancy. Finally, average the scores across the 18 items. The RSQ in this study had a high reliability in the present sample (see Table 2.1).

2.2.3.2 Need to Belong (nBelong)

The nBelong scale is comprised of 10 items on a five-point Likert-type scale (1 = strongly disagree, 5 = strongly agree) (Leary, Kelly, Cottrell, & Schreindorfer, 2007). The nBelong measures an individual’s desire for group interaction (e.g., “It bothers me a great deal when I am not included in other people's plans.”). Scores can range from 10 – 50, with the higher showing the participant having a higher need to belong (Leary, Kelly, Cottrell, & Schreindorfer, 2007)**.** The nBelong is first computed by reverse scoring 1, 3, and 7 and then summing all the responses. In the current sample, the nBelong had a high internal reliability (see Table 2.1).

2.2.3.3. Hurt Proneness Score (HPS)

The Hurt Proneness scale assesses how easily an individual’s feelings are hurt on a five-point Likert scale (Leary & Springer, 2001). Participants indicate the degree to which each sentence best describes themselves (1 = not at all a characteristic of me, 5 = extremely characteristic of me). The Hurt Proneness score is computed by first

reverse coding statements 3, 4, and 6 and then summing all the responses. The Hurt Proneness scale had a high reliability in the present sample (see Table 2.1).

2.2.3.4 Pain Catastrophizing Scale (PCS)

The PCS assesses the cognitive responses to pain (Sullivan, Bishop, & Pivik, 1995). Participants are instructed to use a five-point Likert rating (0 = not at all and 4 = all the time) to answer 13 questions on their thoughts and feelings of past painful experiences. The PCS is comprised of three components that include rumination (e.g., "I keep thinking about how badly I want the pain to stop"), magnification (e.g., "I wonder whether something serious may happen"), and helplessness (e.g., "I feel I can't go on"). The score is computed by summing each response within the respective subscale. In the current sample, the rumination subscale found to have had a high reliability as well as the magnification and helplessness subscales (see Table 2.1). With all the subscales combined, the PCS was found to have a high reliability (see Table 2.1).

2.2.4. Experimental Measures

2.2.4.1 21-Box Numerical Descriptor Scale

The 21-box numerical descriptor scale measures the participant's physical pain perception to the heat stimulus (Gracely, McGrath, & Dubner, 1978). Subjects rate their pain experience using a 21-point Likert scale (0 = neutral, 20 = unbearable).

2.2.4.2 Cyberball Questionnaire version 2

Cyberball questionnaire version 2 contains 31 five-point (1 = not at all, 5 = extremely) Likert items that assesses the participant's feelings of exclusion during the game (i.e., a manipulation check). It also measures the participant's level of threatened

needs during Cyberball, which include belonging (e.g., "I felt poorly accepted by the other participants"), control (e.g., "I felt that I was able to throw the ball as often as I wanted during the game"), self-esteem (e.g., "During the Cyberball game, I felt good about myself"), and meaningful existence (e.g., "I felt that my performance [e.g., catching the ball, deciding whom to throw the ball to] had some effect on the direction of the game") (Zadro, Williams, & Richardson, 2004). Each need was assessed using a five-point Likert scale (1 = not at all, 5 = extremely). The Cyberball Questionnaire scores are first computed by reverse scoring items 5, 6, 7, 8, 9, 11, 15, 16, 17, 18, and 19. Scores are then computed by summing the scores within each of the four subscales. The psychological needs were found to have a high reliability with αs = .92, .85, .87, and .68 (belongingness, self-esteem, meaningful existence, and control, respectively). The Cyberball Questionnaire also included mood items that had a high reliability with αs = .92 and .87 (positive mood and negative mood, respectively) as well as a rumination scale that also had a high reliability (α = .93). The total threatened needs scale had a high reliability with α = .91.

2.2.4.3 Wong-Baker Scale

The Wong-Baker FACES measures the current pain that the participant is feeling by asking the participant to answer a five-point Likert scale (1 = no hurt, 5 = hurts worst). Participants chose which facial expression best represented the pain sensitivity they felt.

2.2.4.4 Dread of Future Interaction Scale

The Dread of Future Interaction Scale measures the participant's fear of potential interaction with one of the supposed participants. The measurement consists of 10 questions (e.g., "I think the interaction with the other participant will be awkward and uncomfortable") on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). MacDonald and Leary (2005) report the affective component of physical pain serves as a guide that individuals use to avoid threats to their physical wellbeing. It is therefore thought that ignored individuals will dread future interactions with those that appear as threatening. The DQ score is computed by first reverse scoring statements 1, 2, 4, 6, 7, and 8 then summing all the responses. In the current sample, the Dread of Future Interaction Scale was found to have a high reliability with $\alpha = .84$.

2.2.4.5 Locus of Control (LoC)

The LoC was collected as a control measure and assesses the extent to which the participant believes he or she can control the events that affect them. The LoC was used as a covariate in order to determine if the participant's responses to the social (e.g., Cyberball interaction) and physical (e.g., thermode) stimuli were contributed to his or her belief that they controlled the events within the experiment. The measure consists of 29 questions in which the participant has to select one of two statements that best reflect their ideology (e.g., "The idea that teachers are unfair to students is nonsense" versus "Most students don't realize the extent to which their grades are influenced by accidental happenings"). Scores can range from 0 – 23, with the higher score reflecting an external locus of control (e.g., event's outcomes are placed on others, fate or chance).

Individuals who score low on the LoC measure demonstrate an internal locus of control (e.g., believe their behavior and actions affect the outcomes of events) (Rotter, 1975). The LoC score is computed first by recoding items 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 15, 16, 17, 18, 20, 21, 22, 23, 25, 26, 28, and 29 and then summing all the responses. The LoC measure had a relatively low reliability in the present sample ($\alpha = .67$).

2.2.4.6 Cyberball (the program)

Cyberball (version 3; K. Williams, 2004) is a virtual ball-tossing game which allows researchers to manipulate scenarios in which the amount of ball tosses a participant receives is already predetermined. The intent of the program is to stimulate feelings of different interaction scenarios (i.e., nonexclusion, social inclusion or social exclusion; Williams, Cheung, & Choi, 2000). During the Cyberball experience, participants will see three pictures of what they believe to be other participants; however, the pictures are actually computerized confederates. The Cyberball experience is controlled by the researchers (i.e., the number of ball tosses the participant receives) through several settings. One of the settings will be nonexclusion, which will give the participant 25% of balls thrown to him or her. In the past, this was labeled as inclusion. However, receiving the ball only 25% of the time is ambiguous and can be interpreted as either inclusion or exclusion. The super inclusion setting will give the participant the ball more frequently than to the other "participants" to create a situation of unambiguous inclusion/acceptance (i.e., 50% of the throws). Another setting (i.e., social exclusion) will enable the participant to receive a limited amount of ball tosses (i.e., 2% of the ball tosses will be directed toward the participant) and then the participant will not receive the ball

from the other participants for the remainder of the game.

2.3 Procedure

This study involved three phases. The initial phase had participants answer prescreening questions through the Experiment Management System (Sona System; Fidler, 1997). Potential participants answered demographic questions (e.g., ethnicity and socioeconomic status) and the pain prescreening Experiment Readiness Questionnaire (ERQ).

In phase II, participants took part in an online study entitled "Who Am I?" By completing the online questionnaires, the participant was giving their consent to participate in the study via the Internet. The online surveys were used in several studies and took approximately 60 minutes to complete. For this study, participants answered the CSEQ, DIAS, PDQ, RSQ, nBelong, PCS, and Hurt-Proneness questionnaires to assess chronic pain and pain sensitivity. Additional surveys were included for use in several other Cyberball studies. At the conclusion of the online study, participants received information about counseling services at UT Arlington since answering pain questions may have caused the individual to feel poorly about themselves. Participants who completed the online survey were eligible to participate in the final phase which had them appear in the laboratory. Participants did not know that the "Who Am I?" study was associated with the following experimental task. Through the Sona System, the experimenter was able to make the study automatically visible for sign-ups for all participants who qualified for the experimental phase (e.g., passed the health prescreening and participated in "Who Am I?").

In phase III, participants were run individually in the laboratory. Participants were told that the experimenter was interested in mental visualization versus face-to-face interaction and its influence on mild physical discomforts. Additionally, participants were told the experimenter was interested in measuring the participant's response to thermal and cold stimulation on their skin. Participants were then asked to sign a consent form for phase III. At this time, the experimenter took a digital picture of the participant and informed him or her that the picture was to be used during the Cyberball "interaction".

Participants then answered the same ERQ that was in the prescreening phase to confirm that they did not develop any condition that would exclude them from participating. The participant was also given the LoC. While the participant was answering the ERQ and the LoC, the experimenter or assistant excused him/herself to go "upload" the participant's picture. Sex of the experimenters was recorded to control for any possible sex of experimenter influences (Wise, Price, Myers, Heft, & Robinson, 2002). However, previous research had found that the participant's report of pain tolerance is independent of the experimenter's sex (Feine, Bushnell, Miron, & Duncan, 1991; Otto & Dougher, 1985). In addition, the researchers wore a white laboratory coat while interacting with participants to eliminate possible gender cues (Feine, Bushnell, Miron, & Duncan, 1991).

Once the ERQ and the LoC were completed, participants were introduced to the Pathway Pain & Sensory Evaluation System, which is an FDA-approved Peltier device (Medoc, Ltd.). This device enables researchers to control heat output on a 1.25 in. x 1.25 in. thermode attached to the volar forearm of the participant to determine pain

threshold/tolerance (Gracely, McGrath, & Dubner, 1978). The stimulus started at 86 ˚F, which was considered the "baseline" temperature. The stimulus then increased 0.9 ˚F/s until the participant reached their pain threshold (e.g., the participant first felt the heat stimuli), or their pain tolerance (e.g., the stimulus was more painful than he or she desired). Once the participant's threshold or tolerance was reached, he or she would press a button that immediately activated the stimulus to return to 86 ˚F. The stimulus did not exceed 131 ˚F.

Participants were familiarized with Gracely, McGrath, and Dubner's (1978) 21-box numerical descriptor scale in order for them to make their judgment of the painfulness of the stimulus. The participant's pain threshold (i.e., when they first noticed pain from the heat) was then assessed. The participant was asked to rate the heat experience. Afterwards, the participant's tolerance (i.e., maximum pain he or she could endure) to the heat stimuli was measured. The participant was asked to rate the feeling of the stimuli once they had elected to stop the heat increase. Upon completion of the threshold and tolerance readings, the participant was instructed to partake in a virtual ball-tossing game called Cyberball with three other "participants" in the building via the Internet (Williams, Cheung, & Choi, 2000). What the participant was unaware of was that the three other participants were actually computer-generated confederates. The pictures of the other three "participants" on the screen were pictures of research assistants and matched that of the participant's sex. The confederate's ethnicity was somewhat ambiguous to rule out ethnicity effects. The participant was instructed that the other "participants" were able to see their photo as he or she could see theirs.

The experimenter then read the directions on the computer screen aloud while the participant followed along. The participant was instructed that they could toss the ball to any individual. When another "participant" threw the ball to the actual participant, the participant automatically caught the ball without any effort on his or her part. Specifically, the directions read were as follows:

> In the upcoming experiment, we test the effects of practicing mental visualization on task performance. Thus, we need you to practice your mental visualization skills. We have found that the best way to do this is to have you play an online ball tossing game with other participants who are logged on at the same time.
>
> In a few moments, you will be playing a ball tossing game with other students over our network. The game is very simple. When the ball is tossed to you, simply click on the picture of the player you want to throw it to. When the game is over, the experimenter will give you additional instructions.
>
> What is important is not your ball tossing performance, but that you ***MENTALLY VISUALIZE*** the entire experience. Imagine what the others look like. What sort of people are they? Where are you playing? Is it warm and sunny or cold and rainy? Create in your mind a complete mental picture of what might be going on if you were playing this game in real life. (Zadro, Williams, & Richardson, 2004)

After reading the directions, the experimenter asked the participant to explain what was being asked of him or her. When the participant was ready to begin Cyberball, the experimenter used a cellular telephone to call the other experimenters that were supposedly in other parts of the building to verify if the other "participants" were ready. The purpose of the telephone call was to build a stronger case that there were in fact other participants playing the game.

Participants were randomly assigned to one of three conditions: nonexclusion, social inclusion, or social exclusion. The nonexclusion condition was what is typically

considered to be inclusion. However, there is a degree of ambiguity to this condition. That is, it can be interpreted as inclusion or exclusion given they only receive the ball 25% of the time. This condition allows the participant to receive the ball an equal number of times compared to the other "participants" (Williams, Cheung & Choi, 2000). Since there were four participants playing Cyberball, 25% of the ball tosses received was considered nonexclusion. In the social inclusion condition, the participant received the ball a significant amount of the time (i.e., at least 50% of the time as compared to the other "participants"). In other words, there was no ambiguity about being included in the game. Finally, in the social exclusion condition, participants received the ball significantly less than the other "participants" (i.e., 2% of the ball tosses will be thrown to the participant). For the social exclusion condition, we configured the Cyberball game so that the computerized confederates would throw the ball to the participant for the first two trials and after those trials, the confederates would never toss the ball back to the participant. This created a sense of exclusion for the participant in that they knew the game worked since they were thrown the ball in the beginning, but the other "participants" chose to ignore him or her. All three conditions lasted approximately 2.5 minutes.

Following the Cyberball game, participants took part in another thermal pain task. As before, the pain task involved the same procedure that the participants completed prior to playing Cyberball. That is, the participant was instructed to rate their pain experience using the 21-box descriptor scale while the thermode increased 0.9 ˚F/s for both trials (e.g., threshold and tolerance). After the threshold and tolerance measures, participants

were given the Wong-Baker FACES and Cyberball Questionnaire version 2 to complete. As participants were finishing the last questionnaire, they were then reminded that they would participate in a cold presser task with one of the other three "participants". Once the participant was informed of this, they were handed the Dread of Future Interaction questionnaire to complete while the experimenter excused him or herself to prepare for the "next task." After participants completed the questionnaires, the participants were debriefed. Debriefing involved: informing the participant about the true nature of the experiment, answering any remaining questions, distributing the UT Arlington counseling information, and thanking the participants for their time. Phase III of the experiment lasted approximately 40 minutes.

CHAPTER 3

RESULTS

3.1 Overview of Analyses

The purpose of this thesis was to examine the effects of chronic pain and pain sensitivity on the affective experience of both social and physical pain. Reactions to pain were assessed using (1) self-reported distress and pain; (2) self-reported threatened needs; (3) dread of future interaction; and (4) pain thresholds/changes in pain thresholds.

3.2 Manipulation Check

A one-way ANOVA was performed to determine the extent to which participants experienced inclusion (e.g., "To what extent were you included by the other participants during the game?") by examining the differences between the three conditions (i.e., nonexclusion, social inclusion, and exclusion). As anticipated, significant differences were found among the three groups, $F(2, 155) = 197.51$, $p = < .001$. Post hoc pair-wise comparisons with a Bonferroni correction revealed that participants in the exclusion condition ($M = 2.94$, $SD = 1.12$) felt significantly more excluded than the participants in either the nonexclusion condition ($M = 6.95$, $SD = 1.66$) or the social inclusion condition ($M = 8.08$, $SD = 1.26$). Additionally, the social inclusion participants felt significantly more included than the nonexclusion participants. (See Figure 3.1 for a graph of the means.)

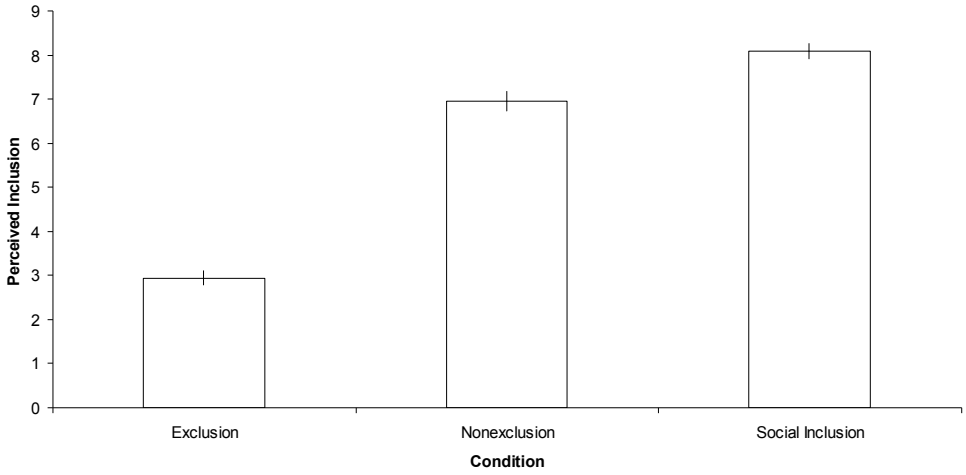


Figure 3.1 The Extent to Which Participant's Felt Included (means)

A one-way ANOVA was also performed to determine the extent to which the participants thought they were involved (i.e., "What percentage of throws did you receive?"). Participants in all three conditions perceived significantly different amounts of ball throws, $F(2, 157) = 113.15$, $p = < .001$. Specifically, the participants in the social inclusion condition ($M = 42.87$, $SD = 18.45$) reported a higher percentage of ball throws than the participants in both the nonexclusion ($M = 22.35$, $SD = 7.71$) and the exclusion conditions ($M = 8.29$, $SD = 4.37$). The participants in the nonexclusion condition reported more ball throws than the participants in the excluded condition. (See Figure 3.2 for a graph of the means.) In summary, the exclusion-inclusion manipulation worked. Socially included participants felt significantly more accepted than nonexcluded participants did. In addition, nonexcluded participants felt more accepted than excluded participants did.

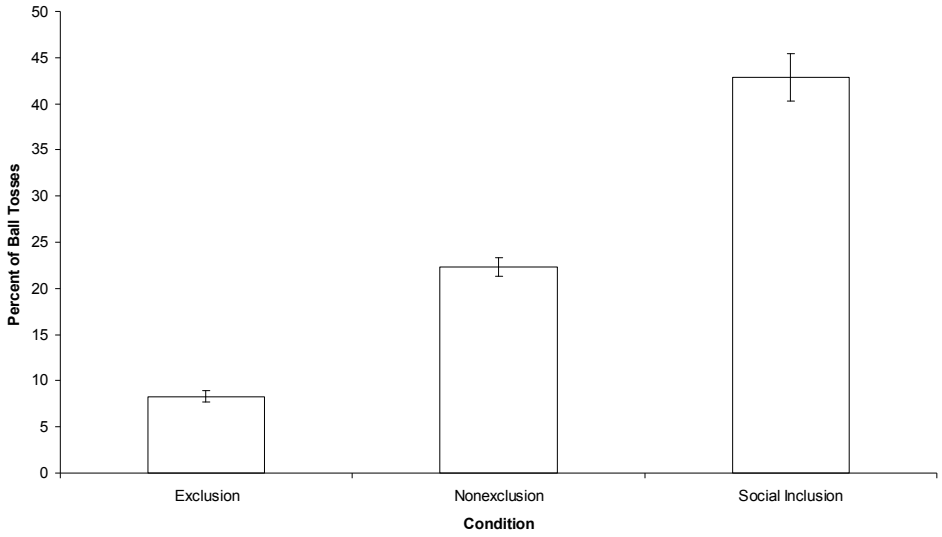


Figure 3.2 The Participant's Perceived Ball Tosses (means)

3.3 Descriptive Statistics

Descriptive statistics were calculated for measures of chronic pain and pain sensitivity (e.g., the DIAS, the HP, the RSQ, the CSEQ, and the PDQ) (see Table 2.1) as well as for threatened needs and the dread of future questionnaire (e.g., the TNS, and the DQ; see Table 3.1).

Table 3.1 Descriptive Statistics and Reliability Estimates for Experimental Measures

Variable/ Scale Name	Mean	Standard Deviation	Actual Range	Possible Range	Skewness	Kurtosis	Alpha
Threatened Needs Scale							
Belongingness	11.73	5.60	5-25	5-25	0.71	-0.62	0.92
Self-Esteem	12.39	4.03	5-24	5-25	0.46	-0.20	0.85
Meaningful Existence	15.45	5.19	6-30	6-30	0.71	-0.05	0.87
Control	12.78	3.84	4-20	4-20	0.04	-0.82	0.68
Total	52.35	16.78	24-93	20-100	0.57	-0.59	0.91
Positive Mood	13.60	3.79	4-20	4-20	-0.33	-0.58	0.92
Negative Mood	7.41	3.51	5-19	5-25	1.57	1.46	0.87
Rumination	4.20	2.84	2-10	2-10	0.91	-0.69	0.93
Dread of Future Interactions							
Total	25.01	5.79	10-44	10-50	0.28	0.60	0.84
Locus of Control							
Total	9.51	3.50	1-20	1-23	0.23	0.06	0.67

Next, correlation analyses were conducted to examine the interrelationship between victimization and self-reported pain measures (see Table 3.2). Several of the pain measures were significantly correlated. For example, scores on the physical and indirect victimization subscales of the DIAS were positively correlated with the Pain

Catastrophizing Scale, r = .20 and .18, respectively. Given their high inter-relationships (i.e., rs = 0.69 – 0.90; see Table 2.1), all five dimensions (e.g., physical, verbal, indirect, overt, and relational) of victimization were standardized and these z-scores for each dimension were averaged into an overall victimization measure. I analyzed the overall victimization score as well as each subscale separately. The average victimization score was positively related to the Pain Disability Questionnaire, r = 0.40, and two of the subscales of the PCS (e.g., magnification and learned helplessness), r = 0.19 and 0.18, respectively.

Table 3.2 Correlations between Social and Physical Self-report Measures of Pain

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Victimization												
Physical (I)	-	0.57**	0.49**	0.65**	0.55**	0.80**	0.41**	0.21**	0.20*	0.17*	0.20**	0.10
N	160	160	160	160	160	160	140	160	160	160	154	159
Verbal (II)		-	0.71**	0.50**	0.53**	0.82**	0.25**	0.18*	0.14	0.12	0.14	0.08
N		160	160	160	160	160	140	160	160	160	154	159
Indirect (III)			-	0.36**	0.67**	0.80**	0.32**	0.19*	0.17*	0.14	0.18*	0.13
N			160	160	160	160	140	160	160	160	154	159
Overt (IV)				-	0.66**	0.78**	0.35**	0.06	0.12	0.01	0.05	0.02
N				160	160	160	140	160	160	160	154	159
Relational (V)					-	0.84**	0.32**	0.12	0.11	0.05	0.06	0.17*
N					160	160	140	160	160	160	154	159
Average Victimization Score (VI)						-	0.40**	0.19*	0.18*	0.12	0.16	0.12
N						160	140	160	160	160	154	159
Pain Disability (VII)							-	0.34**	0.36**	0.26**	0.35**	0.12
N							140	140	140	140	137	139
PCS												
Magnification (VIII)								-	0.69**	0.64**	0.83**	.11

Table 3.2 – *Continued*

N	160	160	160	154	159
Helplessness (IX)		-	0.74**	0.93*	0.13
N		160	160	154	159
Rumination (X)			-	0.92**	0.21**
N			160	154	159
Total (XI)				-	0.17*
N				154	153
Hurt Proneness (XII)					-
N					159

* Correlation is significant at the 0.05 level
** Correlation is significant at the 0.01 level

Correlation analyses were also conducted to examine the interrelationship among the dependent measures (see Table 3.3). Several of the individual's psychological needs (i.e., self-esteem, control, meaningful existence, belongingness) were significantly correlated. For example, all the threatened needs subscales were positively correlated with the Dread of Future Interaction scale, $r = 0.47, 0.40, 0.37, 0.40$, respectively.

Table 3.3 Correlations between Dependent Measures

	I	II	III	IV	V	VI	VII	VIII	IX	X
TNS Total (I)	-	0.87**	0.82**	0.94**	0.93**	0.45**	-0.03	0.07	-0.15	0.01
N	160	160	160	160	160	159	160	160	160	160
TNS Self-esteem (II)		-	0.63**	0.79**	0.73**	0.47**	-0.06	0.08	-0.14	0.02
N		160	160	160	160	159	160	160	160	160
TNS Control (III)			-	0.69**	0.70**	0.40**	-0.06	0.08	-0.13	-0.04
N			160	160	160	159	160	160	160	160
TNS Meaningful Existence (IV)				-	0.86**	0.37**	-0.02	0.02	-0.13	0.02
N				160	160	159	160	160	160	160
TNS Belongingness (V)					-	0.40**	0.02	0.08	-0.13	0.02
N					160	159	160	160	160	160
Dread of Future Interaction (VI)						-	-0.01	0.12	-0.14	-0.06
N						159	159	159	159	159
Changes in Pain Sensitivity (VII) (Self-report Tolerance)							-	-0.01	0.16*	-0.02
N							160	160	160	160
Changes in Pain Sensitivity (VIII) (Self-report Threshold)								-	-0.21**	0.10

Table 3.3 - *Continued*

N	160	160	160
Changes in Pain Sensitivity (IX) (Medoc Tolerance)		-	0.06
N		160	160
Changes in Pain Sensitivity (X) (Medoc Threshold)			-
N			160

* Correlation is significant at the 0.05 level
** Correlation is significant at the 0.01 level

3.4 Main Hypotheses

The last set of correlations examined the interrelationships between the independent and dependent measures (see Table 3.4). A few of the measures were indeed correlated. For example, the Pain Catastrophizing subscale, Magnification, was positively correlated with the Dread of Future Interaction scale, $r = 0.19$. (See Table 3.4 for additional correlations.) Next, moderated multiple regression analysis (MMR; Aiken & West, 1991) was used to examine the overlap between physical and social pain. In addition, MMR was used to examine whether certain personality charteristics exacerbated the effect of being excluded from the group. In other words, I anticipated that persons who were experiencing chronic pain or who were more sensitive to pain would be especially harmed by exclusion.

All individual difference pain measures were treated as continuous variables. Post hoc analyses for significant interactions followed the procedures outlined by Aiken and West (1991). During the first step of the MMR, physical pain measures and the unweighted effects codes for inclusion/exclusion were entered (Aiken & West, 1991, pp. 127-130). In order to compare the groups by condition, I also used three sets of effect codes; each set of codes resulted in a different condition serving as the comparison group. For example, when the exclusion condition was the comparison group a 1 was given to the nonexclusion group and a 0 given to the social inclusion condition. When the social inclusion group was being compared to the exclusion condition, the nonexclusion condition was coded as 0 and the social condition was given 1.

Table 3.4 *Correlations between Independent and Dependent Measures*

	TNS Total	TNS Self-esteem	TNS Control	TNS Meaningful Existence	TNS Belonging	Dread of Future Interaction	Change in Medoc Tolerance	Change in Medoc Threshold	Threshold Self-report	Tolerance Self-report	Changes in Self-report Tolerance	Changes in Self-report Threshold
Victimization												
Physical	0.05	0.04	-0.03	0.09	0.07	0.03	0.03	0.04	-0.10	-0.07	0.12	0.05
N	160	160	160	160	160	159	160	160	160	160	160	160
Verbal	0.03	0.07	-0.02	0.03	0.02	0.04	0.00	0.07	-0.03	0.10	-0.03	0.01
N	160	160	160	160	160	159	160	160	160	160	160	160
Indirect	0.03	0.06	0.03	0.01	0.00	0.14	-0.07	0.09	-0.07	0.09	-0.07	0.00
N	160	160	160	160	160	159	160	160	160	160	160	160
Overt	0.06	0.10	0.00	0.08	0.03	0.06	-0.10	-0.06	-0.10	-0.06	0.00	0.08
N	160	160	160	160	160	159	160	160	160	160	160	160
Relational	-0.01	0.02	-0.01	-0.02	-0.03	0.08	-0.10	-0.10	-0.04	0.05	-0.10	0.08
N	160	160	160	160	160	159	160	160	160	160	160	160
Average Victimization	0.04	0.08	-0.01	0.05	0.02	0.08	-0.04	0.03	-0.09	0.03	0.00	0.05
N	160	160	160	160	160	159	160	160	160	160	160	160
Pain Disability	-0.06	-0.03	-0.09	-0.05	-0.06	-0.04	-0.02	-0.05	0.02	-0.06	-0.01	0.01
N	140	140	140	140	140	139	140	140	140	140	140	140
PCS Magnification	0.11	0.13	0.01	0.12	0.13	0.19*	-0.09	-0.06	0.01	-0.07	-0.06	-0.03
N	160	160	160	160	160	159	160	160	160	160	160	160
PCS Helplessness	0.14	0.09	-0.01	0.17*	0.19*	0.07	-0.07	-0.08	0.21**	-0.08	-0.11	-0.07
N	160	160	160	160	160	159	160	160	160	160	160	160
PCS Rumination	0.10	0.03	-0.02	0.13	0.17*	0.07	-0.10	-0.07	0.11	-0.02	-0.05	-0.04
N	160	160	160	160	160	159	160	160	160	160	160	160
PCS Total	0.12	0.08	-0.01	0.15	0.18*	0.11	-0.08	-0.06	0.15	-0.07	-0.08	-0.07

Table 3.4 - *Continued*

N	154	154	154	154	154	153	154	154	154	154	154	154
Hurt Proneness	0.12	0.17*	0.13	0.12	0.05	0.12	0.14	-0.21**	0.17*	0.05	-0.01	0.10
N	159	159	159	159	159	158	159	159	159	159	159	159

* Correlation is significant at the 0.05 level
** Correlation is significant at the 0.01 level

Additionally, when the nonexclusion group was the comparison, a 1 was either given to the excluded group or the social inclusion group, depending on which condition was involved. Three separate MMR analyses were run, allowing the different conditions to serve as the comparison group in each analysis. On the second step, all interaction terms were entered.

Dependent measures that were reported were psychological distress, threatened needs and changes in pain sensitivity. Changes in pain thresholds were assessed by regressing the post Cyberball score onto the baseline score (Appelbaum & McCall, 1983). Changes in pain sensitivity were assessed using the 21-Box Numerical Descriptor Scale (i.e., pain tolerance and pain threshold ratings) as well as the use of the thermode that assessed the difference in temperature levels (i.e., pre- and post- Cyberball).

3.4.1. Does Peer Victimization Influence Physical Pain Tolerance (Hypothesis 1a)?

First, it was anticipated that persons who are experiencing chronic social pain would exhibit a lower pain tolerance to physical pain (as assessed by baseline self-report and baseline behavioral measures of pain tolerance and threshold). To assess chronic social pain I examined each of the five dimensions of peer victimization separately as well as consolidating the victimization measures into one measure. These dimensions included overt, relational, indirect, physical, and verbal victimization. Upon running MMR, it became evident that persons who were experiencing peer victimization did not significantly exhibit a lower pain tolerance to physical pain (as assessed by both the baseline and post-experimental measures of pain tolerance). See Table 3.5 for *F* values and effect sizes. Indeed, the effect size was approximately zero, suggesting that the null

effects were not necessarily due to a power issue.

Table 3.5 F Values and Effect Sizes for Chronic Social Pain Measures to Physical Pain at Baseline

	Tolerance	
Chronic Social Pain	**Self-report**	**Medoc**
CSEQ		
Overt	$F(1, 158) = 0.62$, *ns,* $r^2 = 0.00$	$F(1, 158) = 1.43$, *ns,* $r^2 = 0.00$
Relational	$F(1, 158) = 0.41$, *ns,* $r^2 = 0.00$	$F(1, 158) = 1.75$, *ns ,* $r^2 = 0.01$
DIAS		
Physical	$F(1, 158) = 0.71$, *ns,* $r^2 = 0.00$	$F(1, 158) = 0.16$, *ns,* $r^2 = 0.00$
Verbal	$F(1, 158) = 1.47$, *ns,* $r^2 = 0.00$	$F(1, 158) = 2.74$, *ns,* $r^2 = 0.02$
Indirect	$F(1, 158) = 1.25$, *ns,* $r^2 = 0.01$	$F(1, 158) = 0.01$, *ns ,* $r^2 = 0.00$
Average	$F(1, 158) = 0.11$, *ns,* $r^2 = 0.00$	$F(1, 158) = 0.07$, *ns,* $r^2 = 0.00$

	Threshold	
Chronic Social Pain	**Self-report**	**Medoc**
CSEQ		
Overt	$F(1, 158) = 1.73$, *ns,* $r^2 = 0.01$	$F(1, 158) = 2.21$, *ns,* $r^2 = 0.01$
Relational	$F(1, 158) = 0.29$, *ns,* $r^2 = 0.00$	$F(1, 158) = 0.00$, *ns ,* $r^2 = 0.00$
DIAS		
Physical	$F(1, 158) = 1.59$, *ns,* $r^2 = 0.01$	$F(1, 158) = 0.80$, *ns,* $r^2 = 0.01$
Verbal	$F(1, 158) = 0.17$, *ns,* $r^2 = 0.00$	$F(1, 158) = 0.13$, *ns,* $r^2 = 0.00$
Indirect	$F(1, 158) = 0.69$, *ns,* $r^2 = 0.00$	$F(1, 158) = 0.73$, *ns ,* $r^2 = 0.00$
Average	$F(1, 158) = 1.16$, *ns,* $r^2 = 0.01$	$F(1, 158) = 0.00$, *ns,* $r^2 = 0.00$

3.4.2. Does Social Pain Sensitivity Influence Physical Pain Tolerance (Hypothesis 1b)?

It was also expected that persons who reported greater hurt proneness and rejection sensitivity would exhibit lower pain tolerance to physical pain. Again, baseline measures of pain were used as the dependent measures. Although significant correlations existed between hurt proneness and the individual's baseline tolerance (Medoc reading), a Moderated Multiple Regression revealed persons who reported greater hurt feelings did not exhibit lower pain tolerance to physcial pain for either the self-report, $F(1, 157) = .01$, *ns*, or the thermode measure, $F(1, 157) = 3.00$, *ns*. Additionally, persons who anxiously expect rejection did not exhibit lower pain tolerance to physical pain for either the self-report, $F(1, 139) = .10$, *ns*, or the thermode measure, $F(1, 139) = .01$, *ns*. See Table 3.6 for additional correlations.

Table 3.6 Correlations between Social Pain Sensitivity and Physical Pain Tolerance

	I	II	III	IV	V	VI	VII	VIII
Rejection Sensitivity (I)	-	0.34**	-0.06	-0.11	-0.04	-0.10	0.03	-0.01
N	141	140	141	141	141	141	141	141
Hurt Proneness (II)		-	0.05	-0.28**	0.04	-0.17**	-0.01	0.14
N		159	159	159	159	159	159	159
Baseline Tolerance								
Self-report (III)			-	0.21**	0.92**	0.19*	0.00	0.02
N			160	160	160	160	160	160
Medoc (IV)				-	0.21**	0.85**	0.11	0.14
N				160	160	160	160	159
Post Tolerance								
Self-report (V)					-	0.26**	0.40**	0.09
N					160	160	160	160
Medoc (VI)						-	0.18*	0.53**
N						160	160	160
Change in Tolerance								
Self-report (VII)							-	0.16*
N							160	160
Medoc (VIII)								-
N								160

* Correlation is significant at the 0.05 level
** Correlation is significant at the 0.01 level

3.4.3. Does Chronic Physical Pain or Greater Pain Sensitivity Influence Sensitivity to both Social and Physical Pain (Hypothesis 2)?

Next, I examined whether persons who are experiencing chronic physical pain or greater pain sensitivity (e.g., lower pain threshold, pain catastrophizing, self-reported chronic pain) would react more adversely to both physical pain and ostracism via Cyberball. Dependent measures of social pain included self-reported threatened needs and dread of future interaction. Dependent measures of physical pain included self-reported and Medoc meaures of pain threshold and sensitivity.

3.4.3.1 Social Behavior

First, I examined whether physical pain influenced reported threatened needs. Given their high inter-relationships (i.e., *r*s = 0.63 – 0.94; see Table 3.1), all four dimensions (e.g., feelings of belonging, control, self-esteem, and meaningful existence) of threatened needs were collapsed into an overall social pain measure. A moderated multiple regression revealed conditions significantly predicted an individual's threatened needs. Specifically, individuals in the excluded condition had higher threatened needs than individuals in either the nonexclusion or social inclusion conditions (see Table 3.7). Pain catastrophizing and pain disability did not significantly predict threatened needs (see Table 3.7). Furthermore, there was no evidence of a condition X pain catastrophizing interaction (see Table 3.7). However, there was a significant pain disability X condition interaction. Specifically, when the participant was excluded, pain disability significantly predicted threatened needs. However, pain disability did not predict threatened needs when the participant was nonexcluded or included. (see Figure 3.3). The data supported the numbing hypothesis; persons with higher pain disabilty reported lower threatened

needs after being excluded.

Table 3.7 Summary of Regression Analysis for Variables as a Predictor of Threatened Needs

	Threatened Needs		
Variables	*B*	*SE B*	*sr²*
Condition_unweighted1	-5.04*	1.23	0.10
Condition_unweighted2	-12.59*	1.24	0.41
PCS	0.13	0.09	0.01
Interaction1_PCS[a]	-0.04	0.14	0.00
Interaction2_PCS[b]	-0.14	0.13	0.01
Condition_unweighted1	-5.25*	1.28	0.11
Condition_unweighted2	-12.28*	1.31	0.39
PDQ	-9.42	1.76	0.00
Interaction1_PDQ[a]	6.33**	2.50	0.05
Interaction2_PDQ[b]	1.52	2.44	0.00
Condition_unweighted1	-5.51*	1.20	0.11
Condition_unweighted2	-12.45*	1.23	0.40
Self-report Threshold	0.25	0.87	0.00
Interaction1_Self-report Threshold[a]	-0.34	1.27	0.00
Interaction2_Self-report Threshold[b]	1.15	1.59	0.00

[a] Interaction between variable & unweighted effects codes comparing exclusion to nonexclusion
[b] Interaction between variable & unweighted effects codes comparing exclusion to social inclusion
* $p < .001$
** $p < .05$

Table 3.8 Summary of Regression Analysis for Variables as a Predictor of Dread of Future Interactions

	Dread of Future Interaction		
Variables	*B*	*SE B*	*sr²*
Condition_unweighted1	0.57	0.65	0.01
Condition_unweighted2	-1.13	0.65	0.02
PCS	0.06	0.05	0.01
Interaction1_PCS[a]	-0.15**	0.07	0.03
Interaction2_PCS[b]	0.06	0.07	0.07
Condition_unweighted1	-0.26	0.68	0.11
Condition_unweighted2	-1.29	0.69	0.03
PDQ	-0.39	0.93	0.00
Interaction1_PDQ[a]	-1.29	1.37	0.66
Interaction2_PDQ[b]	1.43	1.34	0.01
Condition_unweighted1	-0.80	0.45	0.01
Condition_unweighted2	-1.09	0.64	0.02
Self-report Threshold	0.60	0.45	0.01
Interaction1_Self-report Threshold[a]	-0.57	0.66	0.00
Interaction2_Self-report Threshold[b]	-0.06	0.82	0.00

[a] Interaction between variable & unweighted effects codes comparing exclusion to nonexclusion
[b] Interaction between variable & unweighted effects codes comparing exclusion to social inclusion
* $p < .001$
** $p < .05$

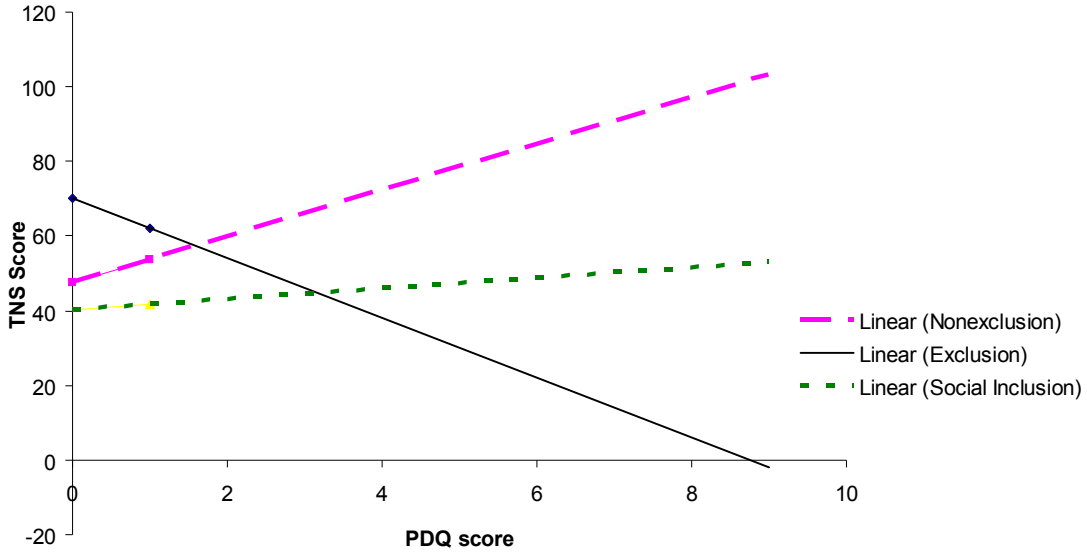


Figure 3.3 Condition and PDQ Score as a Predictor of TNS

A moderated multiple regression revealed pain catastrophizing, pain disability, and conditions alone did not significantly predict an individual's dread of future interaction (see Table 3.8). However, there was a marginal significant pain catastrophizing X condition interaction, $F(2, 147) = 2.44$, $p = .09$. Specifically, persons higher on pain catastrophizing reported higher levels of dread when they were excluded, $r = 0.24$, $p = .09$. There was no relation between pain catastrophizing and dread of future interaction for the nonexcluded and the socially included conditions (rs = -0.18, 0.17, *ns*). In addition, the relationship between pain catastrophizing and dread was significantly different for the exclusion condition ($r = 0.24$) versus the nonexclusion ($r = -0.18$) condition, $z = 2.05$, $p < .05$. The nonexclusion condition was also marginally different from the social inclusion condition, $z = -1.70$, $p = .08$. Exclusion did not differ from

inclusion, z = .35, *ns*.

3.4.3.2 Pain Behavior

The model that included pain disability and condition did not significantly predict the individual's baseline Medoc tolerance, $F(3, 136) = .10$, *ns* nor the individual's self-report pain tolerance, $F(3, 136) = .30$, *ns*. Additionally, the model that included the individual's cognitive responses to past painful experiences and whether or not he or she was excluded, not excluded or socially included did not significantly predict either the self-report tolerance to pain at baseline, $F(3, 150) = 1.59$, *ns* nor the individual's Medoc pain tolerance score, at baseline $F(3, 150) = .19$, *ns*.

Finally, there were no significant interactions between Medoc pain threshold scores and conditions for threatened needs, self-report tolerance, and Medoc tolerance. Results also revealed no main effect or interaction for the self-report threshold scores as a predictor of TNS scores (see Table 3.9). However, the model that included self-report threshold scores and conditions did significantly predict TNS scores, $F(3, 156) = 74.23$, $p < .001$. Specifically, individuals in the excluded condition had higher threatened needs than individuals in either the nonexclusion or social inclusion conditions (see Table 3.8).

The model that included self-report threshold and condition significantly predicted Medoc tolerance scores, $F(3, 156) = 2.75$, $p < .05$. Specifically, self-report threshold scores predicted Medoc tolerance scores, $t(159) = -2.62$, $p < .01$. People who reported the threshold temperature hurting "a little" tended to stop the pain stimulus at a higher temperature; whereas those who reported the threshold temperature hurting "a lot" tended to stop the pain stimulus at a lower temperature. However, the experimental conditions

did not significantly predict Medoc tolerance scores. Lastly, there was no evidence of a self-reported threshold X condition interaction for Medoc tolerance score, $F(3, 156) = .14$, *ns*.

The model that included pain disability and condition significantly predicted the individual's current pain that he or she was feeling based on selecting the facial expression that best illustrates their current pain sensitivity, $F(3, 136) = 3.10$, $p < .05$. Specifically, the conditions significantly predicted how the individual would respond to the Wong-Baker task, $F(5, 134) = 2.37$, $p < .05$. Participants reported greater pain in the excluded condition ($M = 0.65$, $SD = 0.91$) than participants in the social inclusion condition ($M = 0.27$, $SD = 0.53$), $t = -2.05$, $p < .04$. There was no difference between the excluded and nonexcluded conditions (Ms = 0.65, 0.40, SDs = 0.91, 0.64), $t = -0.97$, *ns*. However, there was no pain disability or pain disability main effect, $t = 0.57$, *ns*. There was no pain disability X condition interaction, $F(2, 134) = 1.26$, *ns*. However, I examined the influence of pain disability on FACES separately by condition. In the social inclusion condition, participants who reported greater pain disability chose a more negative face, $r = .31$. In the nonexclusion and exclusion conditions, there was no relationship between pain disabiltiy and the choice of FACES, rs = 0.01, -0.08. When examining the scatter plot (see Figure 3.4), it appears that social pain creates a ceiling effect. That is, all individuals are likely to choose a more painful face.

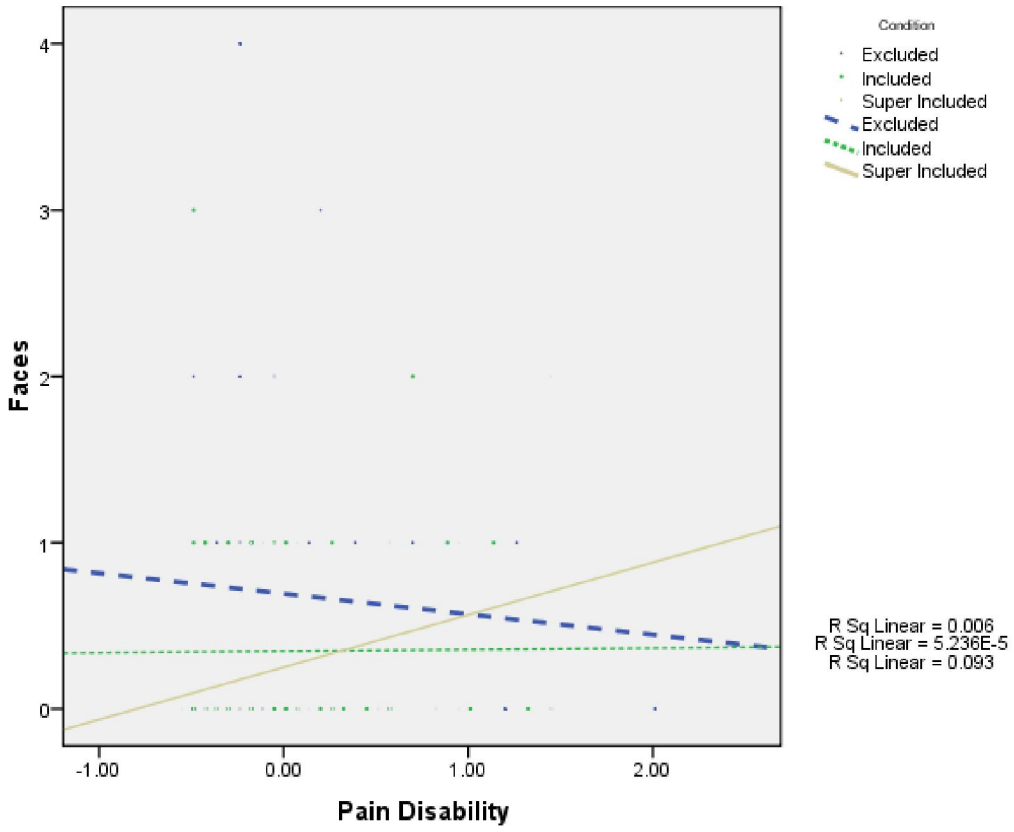


Figure 3.4 Condition and PDQ Score as a Predictor of Faces (i.e., felt pain)

Next, I examined the influence of pain catastrophizing on self-reported FACES. The overall model was significant, $F(5, 148) = 2.55$. There was an overall condition effect, $F(2, 147) = 2.36$, $p = 0.10$. As before, participants reported greater pain in the excluded condition than participants in the social inclusion condition. There was no main effect ($t = 0.87$, *ns*) or interaction involving pain catastrophizing ($F(2, 148) = 2.12$, $p = .12$). Given that interactions require more power to detect effects, I again examined the influence of pain catastrophizing on FACES separately by condition. None of the correlations were significnalty different from 0, *r*s = 0.05, -0.13, 0.11, respectively for

exclusion, nonexclusion, and social inclusion. It should be noted that the trend is for a stronger positive correlation between catastrophizing and FACES in the superinclusion condition. In summary, there was no convincing evidence that chronic physical pain or physical pain sensitvity influenced senstivity to both social and physical pain.

3.4.4. Does Social Pain Influence Physical Pain Tolerance (Hypothesis 3)?

Thirdly, it was expected that persons who were ostracized would report a reduction in physical pain tolerance from pre- to post- assessments compared to participants who were not ostracized or who were "included". In addition, differences in the reduction of pain tolerance would be correlated with reported distress and threatened needs. That is, persons who report greater distress and threatened needs should show the greatest reduction in pain tolerance. First, a repeated measures ANOVA for condition was performed with pain tolerance as the repeated measure. Second, a measure of changes in pain tolerance was created by regressing the post pain tolerance scores onto the baseline pain tolerance scores (Appelbaum & McCall, 1983). These scores were then correlated with distress and threatened needs[1].

The participant's pain tolerance, as assessed by the Medoc machine, was significantly higher after the participant played Cyberball ($M = 44.38$, $SD = 0.30$) than before participant played Cyberball ($M = 43.65$, $SD = 0.28$); $F(1, 157) = 20.78$, $p < .001$. There was no significant main effect of condition, $F(2, 157) = .08$, *ns* nor was there a significant interaction between condition and Medoc pain tolerance, $F(2, 157) = .65$, *ns*.

The participant's self-report pain tolerance was significant between pre- and post-

[1] Locus of Control and Smoking were examined as covariates. They had no effect on the models and were dropped from subsequent analyses.

assessments $F(1, 157) = 24.80$, $p < .001$. Specifically, self-reported pain tolerance was higher after playing Cyberball ($M = 11.21$, $SD = .40$) than before participant played Cyberball ($M = 10.40$, $SD = .37$). There was no main effect for condition, $F(2, 157) = 1.48$, *ns*. Additionally, there was no interaction between the self-report on pain tolerance and condition, $F(2, 157) = .21$, *ns*.

The threatened needs total and self-report distress were significantly correlated, $r = 0.46$, $p < .001$. There were no other significant correlations. Specifically, self-report pain tolerance was not significantly correlated with threatened needs ($r = -.03$, *ns*) nor with reported distress ($r = -0.91$, *ns*). Additionally, Medoc pain tolerance was not significantly correlated with threatened needs nor distress (rs = -0.12, -0.09) respectively.

In summary, there was no evidence that social pain influenced pain tolerance. Perhaps more surprising, I did not replicate Eisenberger et al.'s (2004) findings. That is, there was no effect of condition on changes in pain tolerance and threshold. I only found participants had higher pain tolerances on the second trial, suggesting possible practice effects.

3.4.5. Will the Reduction in Physical Pain Tolerance be Exacerbated for Persons Who are Experiencing Chronic Pain or Who Report Greater Pain Sensitivity (Hypothesis 4)?

Finally, it was predicted that the reduction in physical pain tolerance would be exacerbated for persons who are experiencing chronic pain or who report greater pain sensitivity. This was examined in two ways. First, a general linear repeated measures model was used with changes in pain tolerance as the repeated measure. Individual difference measures were still treated as continuous. Second, a MMR was used with the measure of changes in pain tolerance (i.e., self-report and Medoc) from Hypothesis 3 as a

dependent variable.

Pain sensitivity and chronic pain experienced by participants did not significantly predict change in either the self-report pain tolerance task or the participant's tolerance assessed by the Medoc machine (see Table 3.9). Additionally, there was no evidence of either a condition X pain catastrophizing interaction or a pain disability X condition interaction (see Table 3.9). In summary, no evidence was found to support chronic pain or pain sensitivity as a predictor of changes to ones physical pain tolerance.

Table 3.9 Summary of Regression Analysis for Variables as a Predictor of Changes in Pain Tolerance

Self-Report

Variables	*B*	*SE B*	sr^2
Condition_unweighted1	-0.10	0.12	0.01
Condition_unweighted2	0.04	0.12	0.00
PCS	-0.01	0.01	0.01
Interaction1_PCS[a]	-0.02	0.01	0.02
Interaction2_PCS[b]	0.01	0.01	0.01
Condition_unweighted1	-0.07	0.12	0.00
Condition_unweighted2	-0.01	0.12	0.00
PDQ	-0.02	0.18	0.00
Interaction1_PDQ[a]	-0.39	0.25	0.02
Interaction2_PDQ[b]	0.19	0.24	0.00

Medoc

Variables	*B*	*SE B*	sr^2
Condition_unweighted1	0.01	0.11	0.00
Condition_unweighted2	0.11	0.12	0.01
PCS	-0.01	0.01	0.01
Interaction1_PCS[a]	0.01	0.01	0.00
Interaction2_PCS[b]	0.02	0.01	0.01
Condition_unweighted1	-0.04	0.11	0.00
Condition_unweighted2	0.10	0.12	0.01
PDQ	-0.04	0.16	0.00
Interaction1_PDQ[a]	0.10	0.23	0.00
Interaction2_PDQ[b]	-0.12	0.23	0.00

[a] Interaction between variable & unweighted effects codes comparing exclusion to nonexclusion
[b] Interaction between variable & unweighted effects codes comparing exclusion to social inclusion

3.5. Supplementary Analysis

Although it was anticipated that persons who experience chronic social pain or those who had greater sensitivity to social distress would report lower pain tolerance to physical pain, results did not support this hypothesis. Additionally, it was expected that persons who experience chronic physical pain or who report greater pain sensitivity would react more adversely to ostracism. However, the results did not support this belief either. Finally, it was expected that persons who were ostracized would report a reduction in physical pain tolerance from pre- to post- assessments compared to participants who were not ostracized or who were "included"; this effect would be exacerbated for persons who experience chronic pain or who report greater pain sensitivity (regardless of the pain domain). Results did not support this expectation. To further understand possible reasons why the hypotheses were not supported, additional analyses were conducted. Specifically, I wanted to examine the prescreening measures to determine whether I had a restriction of range issue. That is, persons who are in pain may have medical conditions (associated with pain) that excluded them from participation. In addition, persons who are in either social or physical pain may avoid situations that involve pain.

3.5.1 Does Serious Health Problems Predict Self-reported Victimization (Supplementary 1)?

The Experiment Readiness Questionnaire (ERQ), which served as a prescreening measure for serious health problems, may have influenced who participated in the present study. That is, those who have a history of poor health and physical pain symptoms (i.e., previous heart trouble, dizziness, high blood pressure) may be more victimized. As such, the individuals with the most extreme levels of peer victimization may have been

excluded from the study. Individuals who answered yes to at least one of the first 10 items on the ERQ were not allowed to participate in the present study. Therefore, I wanted to know if any of the items in the ERQ predicted an individual's total victimization. Question 6 (e.g., "Are you over age 65 and not accustomed to vigorous exercise?") and question 8 (e.g., "Have you had a myocardial infarction/heart attack?") were not included in the analyses due to a response of "no" from the entire sample for both questions. A series of individual t-tests were performed in order to determine whether items on the ERQ significantly predicted victimization scores.

Whether or not an individual reported having frequent heart/chest pain (question 2) or feelings of dizziness (question 3) on the ERQ significantly predicted victimization scores (see Table 3.10). Specifically, those who responded "yes" to having frequent heart and chest pains reported significantly higher levels of victimization than those who did not report having such pains in their heart and chest. Individuals who responded "no" to having severe dizziness reported significantly less levels of victimization than those who did report feelings of dizziness. Responses to having high blood pressure (question 4) or having a joint problem such as arthritis (question 5) only reported marginal differences in levels of victimization (see Table 3.10). Responses to the remaining ERQ items (i.e., having heart trouble, pregnancy status, having heart surgery or a stroke) did not significantly predict levels of victimization (see Table 3.10). In summary, the most victimized individuals were excluded in the present study due to health problems thereby potentially creating a restriction of range issue.

Table 3.10 Summary of T-tests for Health History as a Predictor of an Individual's Total Victimization Score

Variables	Answered				t	df	p
	Yes		No				
	M	*SD*	*M*	*SD*			
Ever had heart and chest pains	0.49	1.12	0.04	0.81	-4.28	92.21	0.001***
Ever had heart trouble	0.18	0.98	-0.01	0.84	-1.79	1172	0.080
Ever felt faint or severe dizziness	0.31	1.12	-0.03	0.82	-2.76	95.82	0.007**
Ever had high blood pressure	0.20	0.97	-0.02	0.84	-2.35	1172	0.019*
Ever had arthritis aggravated by exercise	0.22	1.13	-0.01	0.83	-1.68	70.33	0.097
Currently Pregnant	-0.27	0.67	0.00	0.85	1.05	1172	0.292
Ever had heart surgery	-0.48	0.41	0.00	0.85	1.14	1172	0.258
Ever had a stroke	-0.27	0.53	0.00	0.85	0.63	1172	0.527

* $p < .05$
** $p < .01$
*** $p < .001$

3.5.2 Does Pain Disability and Pain Catastrophizing Predict Victimization in the Larger Sample (Supplementary 2)?

In addition to how individuals responded to the ERQ, it is believed that other factors may have played a role in whether or not an individual participated in the present study. Sharp and Harvey (2001) have suggested individuals who perceive potential harm often avoid activities that they believe might increase pain. For that reason certain victimized individuals may have chosen not to participate in the present study. Therefore, are the responses to the Pain Catastrophizing Scale (PCS) or the Pain Disability Questionnaire (PDQ) a predictor of levels of victimization? In order to determine if there was a relationship between physical pain and levels of victimization a series of individual regressions were performed. See Table 3.11.

Table 3.11 Summary of Regression Analysis for Physical Pain Variables as a Predictor of an Individual's Total Victimization Score

Variables	*B*	*SE B*	sr^2
Regression 1			
Pain Catastrophizing Subscales			
Rumination	0.05*	0.01	0.05
Magnification	0.12*	0.01	0.14
Helplessness	0.07*	0.01	0.14
Regression 2			
Pain Catastrophizing Scale Total	0.03*	0.00	0.12
Regression 3			
PDQ	0.71*	0.04	0.23

* $p < .001$

Responses to the overall PCS significantly predicted levels of victimization (see Table 3.11). Additionally, each of the three subscales (pain rumination, pain magnification, and helplessness) significantly predicted levels of victimization. For example, individuals who scored higher on the pain rumination subscale reported significantly higher levels of victimization than those who did not have high scores on rumination. Finally, responses on the PDQ significantly predicted levels of victimization.

In summary, pain catastrophizing and pain disability did predict peer victimization in the larger sample. In addition, the magnitude of the relation between pain catastrophizing and victimization was larger in the overall sample ($r = 0.37$, N = 1016) than in the experimental sample ($r = 0.16$, N = 154), $z = -2.53$, $p < .01$. However, the magnitude of the relation between pain disability and victimization was similar in both samples (rs = 0.48, 0.40, for overall and experimental samples respectively), $z = -1.16$, *ns*.

3.5.3 Did the Overall Sample and Experimental Sample Differ on Levels of Victimization and Pain (Supplementary 3)?

Participants in the current study may genuinely be low on victimization since highly victimized individuals tend to refrain from activities that may cause physical harm. Secondly, as the results for supplementary research question 1 indicate, victimized individuals are also prohibited from participating in the study due to their increased likelihood of health problems. Both of these situations could cause a restriction of range issue which would help explain why the hypotheses were not supported. As a result, did the sample in the current study score lower on victimization as compared to the general sample (e.g., the Who Am I? study)? An independent samples t-test was conducted

comparing those in the current study (N = 160) and those in the Who Am I? study (N = 1,013) on levels of reported victimization. Those who did not participate in the present study did report higher victimization scores (M = 0.04, SD = 0.88) than those who participated in the present study (M = -0.23, SD = 0.61), $t(275.35) = -4.81$, $p < .001$.

In addition to comparing victimization levels between those who did and did not participate in the present study, I wanted to examine if pain disability and pain rumination levels would be different between those who did or did not participate in the current study compared to the participants in the general sample. Another independent samples t-test was conducted comparing those in the present study with those in the Who Am I? study on levels of reported pain disability. Those who did not participate in the present study did report higher levels of pain disability (M = 1.65, SD = 0.59) than those who participated in the present study (M = 1.52, SD = 0.51), $t(232.34) = -2.91$, $p < .01$. Lastly, an independent samples t-test was used to compare those in the present sample with those in the Who Am I? study on reported levels of pain rumination. There were no significant differences between the present sample (M = 9.33, SD = 4.28) and the overall sample (M = 8.94, SD = 4.29), $t(1171) = 1.08$, *ns*. Specifically, there were not any differences between the samples regarding how often each individual thinks about their pain.

There were only 23 victims in the current sample based on cluster analysis[2]. To examine whether the proportion of victims to nonvictims was the same in this sample

[2] Cluster analyses and MMR yielded the same results in the present study. Of the 23 victims in the present study, 8 were in the exclusion condition, 9 in the nonexclusion condition, and 6 were in the social inclusion condition.

compared to the larger sample (Who Am I?), I conducted a chi-square test. Indeed, the proportions were not equal, chi-square (1) = 8.08, $p < .01$. In the larger sample, 25% reported being victims compared to only 14% of the experimental sample. In addition, the victims in the experimental sample reported significantly lower levels of victimization ($M = 0.88$, $SD = 0.56$) than victims who were not in the current experimental study ($M = 1.23$, $SD = 0.87$), $t(32.67) = 2.67$, $p < .01$. There were no differences in victimization levels for nonvictims who were or who were not in the sample $t(899) = 1.76$, *ns* (Ms = -0.42, -0.35, SDs = 0.37, 0.40).

CHAPTER 4

DISCUSSION

The primary goal of the present study was to demonstrate a relationship between the affective experience of physical and social pain. This was examined in a couple of ways. First, this study examined an individual's sensitivity to both social and physical pain. Secondly, the current study sought to determine how individual differences in pain experiences in one domain (e.g., social pain) would influence pain experiences in other domains (e.g., physical). According to Pain Overlap Theory, an individual's sensitivity to social pain should influence their sensitivity to physical pain and vice versa. As a result, it was expected that persons experiencing chronic social pain (e.g., peer victimization) would report a reduction in physical pain tolerance from pre- to post- assessments. Additionally, it was hypothesized that those who reported greater hurt proneness (i.e., how he or she felt about being teased) and rejection sensitivity (i.e., how concerned or anxious one felt asking parents for money) would exhibit lower tolerance to physical pain.

The present study also examined how temporary experiences of social pain influenced physical pain tolerance. Specifically, it was predicted that persons who were ostracized would report a reduction in physical pain tolerance from pre- to post-assessments compared to participants who were not ostracized or who were "included". Furthermore, it was predicted those who reported greater distress and threatened needs

would show the greatest reduction in pain tolerance.

In addition to examining different types of social pain influences on physical pain, the affects of chronic physical pain on both current physical pain experiences and on social behavior were studied. It was expected that persons who experienced chronic physical pain or greater pain sensitivity would react more adversely to the heat stimuli (e.g., physical pain) as well as being ostracized (e.g., social pain) via Cyberball. Lastly, it was hypothesized that the reduction in physical pain tolerance would be exacerbated for persons who experienced chronic pain or who reported greater pain sensitivity.

Results indicated persons who experienced peer victimization, reported greater hurt feelings, or anxiously anticipated rejection did not significantly demonstrate a lower tolerance to physical pain as originally predicted. Although the tolerance levels to physical pain did not decrease, results from the Wong-Baker task did lend some support for conditions as a predictor of an individual's perceived pain sensitivity. Specifically, those who were in the excluded condition significantly reported greater felt pain than participants in the social inclusion condition. This significant finding suggests individuals can experience a change in pain sensitivity (i.e., greater pain) as a result of a social pain situation (i.e., being excluded in Cyberball). However, the results did not show a significant difference between the excluded and nonexcluded conditions. Furthermore, there was no encouraging data to support either chronic physical pain or physical pain sensitivity as an influence to social and physical pain. Lastly, contrary to Eisenberger et al.'s (2004) findings, the current results yielded no evidence for social pain as an influence on pain threshold or tolerance.

As a result, three supplimentary analyses were conducted in order to try to understand why there was not any support for Pain Overlap Theory. Upon closer examination, it was believed that there may not have been enough victims who participated in the present study. Therefore, the three supplimentary questions centered around a possible restriction of range issue. Did having a history of health problems predict victimization and thereby exclude victimized individual's from participating? Did pain disability and pain catastrophizing predict victimization in the larger sample (e.g., Who Am I?)? Lastly, did the larger study and the present one differ on levels of pain and victimization? It appeared that the prescreening measure excluded most of the victimized individuals from particiapting due to having a history of health problems. Most victims answered "yes" to at least one question that prohibited him or her from phase 3.

Indeed, supplementary analyses indicated a restriction of range was present in the current study. Had more victimized individuals participated in the present study, results may have offered support for the Pain Overlap Theory. For starters, the larger study reported a higher percentage of victims compared to the present sample and was able to show chronic physical pain to be a predictor of peer victimization which the present study was unable to accomplish. Additionally, pain catastrophizing and pain disability were not only a predictor of peer victimization in the larger sample, but also had a higher relationship between the two than in the experimental sample.

As noted earlier, research suggests numbing occurs as a defensive mechanism for individuals who experience a physical pain ailment (Baumeister, Brewer, Tice, & Twenge, 2007) or a severed social bond (i.e., exclusion; DeWall & Baumeister, 2006).

More specifically, an individual enters into a state of cognitive deconstruction (e.g., lethargy, thoughts of meaninglessness, emotional numbness) which allows an individual's current emotional system to act abnormally in response to such pain. Based on the same belief that there is a common physiological foundation between social and physical pain as Pain Overlap Theory suggests, the numbing hypothesis posits "excluded people should become numb to physical pain, and the physical numbness should be related to emotional insensitivity" (p. 3, DeWall & Baumeister, 2006). As with this study, individuals with a higher pain disability reported lower threatened needs after being excluded.

4.1. Future Directions

It is believed that one of the reasons the current study could not support the Pain Overlap Theory may have been in the design of the experiment. First, the current study may have discouraged chronic pain sufferers from participating in what he or she may have interpreted as a "pain" study. The present study used negative connotations (i.e., pain, sensory, temperature perception) within the study's description and had asked individuals to abstain from taking any pain medication (i.e., Tylenol, Advil, Ibuprofen) 24 hours before phase 3. As Sharp & Harvey's (2001) research suggests, chronic pain sufferers tend to avoid activities that they believe might increase pain. Therefore, future research in pain overlap should refrain from using such negative connotations in the study's description. Additionally, rather than prohibit pain medication users from participating, future studies should consider being more lenient on the screening by allowing such users to participate, but covary them out during the analyses.

Another potential oversight in the design which may have attributed to not finding support for the main hypotheses lies in the prescreening measure. The current study was an attempt to replicate Eisenberger et al.'s (2004) findings; however, a different screening measure was used in the present study. Perhaps the Experimental Readiness Questionnaire (ERQ) was too stringent and another method for screening potential participants should be considered as a prescreening measure. After all, the results of the supplementary analyses showed those who had a history of poor health (i.e., previous heart trouble, dizziness, high blood pressure) were more victimized than the participants in the present sample, but due to a response on the ERQ (e.g., answered yes to at least one of the first 10 items) were not allowed to participate in the present study. Had the prescreening measure from the Eisenberg et al. (2004) study been used, the present study would have allowed more victimized people to participate and thereby may have had similar results as the Eisenberger et al.'s (2004) study.

The design of the study may not have been the only factor in the loss of potential victimized individuals. Participants had a choice of two other studies after they completed Phase 2 (i.e., Who Am I?). The potential participant was prohibited from signing up for more than one experiment related to the Who Am I? study. The other two studies may have appeared more appealing to the subject pool (i.e., participant given more credit, better sign-up time options, and interesting tasks) compared to the present study. Perhaps if the current study was not solely dependent on the psychology department's subject pool and competing for participants, more socially and physically pained individuals may have participated.

Lastly, Baumeister, Brewer, Tice, and Twenge (2007) suggest individuals lose sensitivity after being excluded rather than become more sensitive as the present study predicted. The numbing hypothesis states that an immediate numbness buffers sensitivity from increasing just long enough to allow an individual to escape actual or perceived harm (DeWall & Baumeister, 2006). What future research should examine is how long the numbness buffers sensitivity. What exactly is this critical period of time that individuals are able to lower their sensitivity as a reaction to perceived threat? The current study administered the pain threshold/tolerance perception task immediately following the online interaction, however, if the numbing hypothesis is correct, future studies should postpone administering a sensitivity measure until the numbing dissipates.

Even with these limitations, the outcome of the present study contributes to the current research on the relationship between social and physical pain. For example, correlations between physical pain and social pain were found. An individual's average victimization score (i.e., combination of physical, verbal, indirect, overt and relational victimization experiences) were positively correlated with the individual's pain disability (i.e., how a person can function as a result of pain). However, one must be careful to infer causation. Perhaps a person who cannot take care of himself (e.g., inability to bathe or dress) could receive derogatory remarks associated with their pain (i.e., verbal and indirect victimization). Or possibly an individual's inability to sit or stand because of their pain may solicit the idea that they cannot do anything which in turn could lead to being excluded in future social events. In short, disabled individuals may have a higher tendency to lose, or avoid making, friends due to their inability to function normally

compared to non-disabled individuals. This would then increase their chances to experience victimization.

Additionally, positive correlations were found between an individual's pain catastrophizing score (i.e., the cognitive response to pain) and how easily an individual's feelings were hurt. Again, causation has not been definitely determined in this study. It is equally possible that those who constantly complain about their physical ailments to others may sever relationships either intentionally or unintentionally. For example, an individual who is known for complaining about the slightest ailment to the point that others are annoyed would probably not receive an invitation to socialize in future interactions (i.e., indirect aggression). This could lead to having the catastrophizer's feeling hurt. Despite the issues of causality, these findings along with the results of the supplementary analyses show promise for future studies in pain overlap research.

APPENDIX A

MEASURES

Ethnicity and Socioeconomic Status (SES)

1. What best reflects or represents your gender?

    a. Male b. Female

2. How old are you? (BIRTHDATE) _____

3. What best reflects or represents your racial or ethnic background?

    a. **American Indian or Alaskan Native-** A person having origins in any of the original peoples of North America or South America (including Central America), and who maintains a tribal affiliation or community attachment.

    b. **Asian**- A person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam.

    c. **Black or African American** – A person having origins in any of the black racial groups of Africa. Terms such as "Haitian" or "Negro" can be used in addition to "Black or African American".

    d. **Native Hawaiian or Other Pacific Islander** – A person having origins in any of the original peoples of Hawaii, Guam, Somoa, or other Pacific Islands.

    e. **White/Anglo-American**- A person having origins in any of the peoples of Europe, North Africa, or the Middle East.

f. **Hispanic or Latino**- A person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin.

g. **Other/Multiracial**

4. Which of the following best describes your father's (or legal guardian's) level of education?

a. No high school diploma or GED

b. A high school diploma or GED

c. Some college or university education but no degree

d. A two-year degree from a community college or university

e. A four-year (bachelor's) degree from a college or university

f. A master's degree from a college or university

g. A doctoral (Ph.d) degree from a college or university

5. Which of the following best describes your mother's (or legal guardian's) level of education? [If you already answered with respect to your legal guardian in the item above, you may skip this item.]

a. No high school diploma or GED

b. A high school diploma or GED

c. Some college or university education but no degree

d. A two-year degree from a community college or university

e. A four-year (bachelor's) degree from a college or university

f. A master's degree from a college or university

g. A doctoral (Ph.d) degree from a college or university

Experiment Readiness Questionnaire (ERQ)

Name: _____ Date: _____

For most people, participation in this experiment should not pose any problem or hazard. This questionnaire has been designed to identify the small number of adults for whom participating in this experiment might be inappropriate or those who should have medical advice before participating.

Common sense is your best guide in answering these few questions. Please read them carefully and check the □YES or NO opposite the question if it applies to you.

YES	NO	
□	□	1. Has your doctor ever said that you have heart trouble?
□	□	2. Do you frequently have pains in your heart and chest?
□	□	3. Do you often feel faint or have spells of severe dizziness?
□	□	4. Has a doctor ever said that your blood pressure was too high?
□	□	5. Has your doctor ever told you that you have a bone or joint problem such as arthritis that has been aggravated by exercise, or might be made worse with exercise?
□	□	6. Are you over age 65 and not accustomed to vigorous exercise?
□	□	7. Are you pregnant?
□	□	8. Have you had a myocardial infarction/heart attack?
□	□	9. Have you had heart surgery (bypass, valve, angioplasty, pacemaker/implantable defibrillator, or other surgery related to your heart)?
□	□	10. Have you had a stroke?
□	□	11. Have you taken any painkiller (prescription or non-prescription) in the last 24 hours?
□	□	12. Do you smoke tobacco products?
□	□	13. Are you taking any antidepressant medications?

YES NO

□ □ 14. Have you had any of the following symptoms within the last six months (please check all that apply)?

____ chest pain/discomfort
____ rapid heart rates at rest
____ dizziness or fainting
____ swollen feet or ankles
____ carpal tunnel syndrome
____ severe shortness of breath at rest or with usual activities
____ "palpitations" or "skipped beats" in your heart

The information contained in this document will be treated as privileged and confidential. It will not be released or revealed to any person except the primary investigators (Dr. Jensen-Campbell, Marc Gomez).

I understand that accurate information about my health history is required to determine if I am qualified to participate in this study. I declare that the information provided on this Questionnaire is true and accurate to the best of my information, knowledge, and belief.

Signature: _____ Date: _____

Questionnaire reviewed by: _____ Date: _____

Rejection Sensitivity Questionnaire (RSQ)

Each of the items below describes things college students sometimes ask of other people. Please imagine that you are in each situation. You will be asked to answer the following questions:

1) How concerned or anxious would you be about how the other person would respond?
2) How do you think the other person would be likely to respond?

You ask someone in class if you can borrow his/her notes.

1. How concerned or anxious would you be over whether or not the person would want to lend you his/her notes?

very unconcerned very concerned
A B C D E

2. I would expect that the person would willingly give me his/her notes.

very unlikely very likely
A B C D E

You ask your boyfriend/girlfriend to move in with you.

3. How concerned or anxious would you be over whether or not he/she also would want to move in with you?

very unconcerned very concerned
A B C D E

4. I would expect that he/she would want to move in with me.

very unlikely very likely
A B C D E

You ask your parents for help in deciding what programs to apply to.

5. How concerned or anxious would you be over whether or not your parents would want to help you?

very unconcerned very concerned
A B C D E

6. I would expect that they would want to help me.

very unlikely very likely
A B C D E

You ask someone you don't know well out on a date.

7. How concerned or anxious would you be over whether or not the person would want to go out with you?

very unconcerned very concerned
A B C D E

8. I would expect that the person would want to go out on a date with me.

very unlikely very likely
A B C D E

Your boyfriend/girlfriend has plans to go out with friends tonight, but you really want to spend the evening with him/her, and you tell him/her so.

9. How concerned or anxious would you be over whether or not your boyfriend/girlfriend would decide to stay in?

very unconcerned very concerned
A B C D E

10. I would expect that he/she would willingly choose to stay in with me.

very unlikely very likely
A B C D E

You ask your parents for extra money to cover living expenses.

11. How concerned or anxious would you be over whether or not your parents would help you out?

very unconcerned very concerned
A B C D E

12. I would expect that my parents would not mind helping me out.

very unlikely very likely
A B C D E

After class, you tell your professor that you have been having some trouble with a section of the course and ask if he/she can give you some extra help.

13. How concerned or anxious would you be over whether or not your professor would want to help you out?

very unconcerned very concerned
A B C D E

14. I would expect that the professor would want to help me.

very unlikely very likely

A B C D E

You approach a close friend to talk after doing or saying something that seriously upset him/her.

15. How concerned or anxious would you be over whether or not your friend would want to talk with you?

very unconcerned very concerned

A B C D E

16. I would expect that he/she would want to talk with me to try to work things out.

very unlikely very likely

A B C D E

You ask someone in one of your classes to coffee.

17. How concerned or anxious would you be over whether or not the person would want to go?

very unconcerned very concerned

A B C D E

18. I would expect that he/she would want to go with me.

very unlikely very likely

A B C D E

After graduation you can't find a job and you ask your parents if you can live at home for a while.

19. How concerned or anxious would you be over whether or not your parents would want you to come home?

very unconcerned very concerned

A B C D E

20. I would expect that I would be welcome at home.

very unlikely very likely

A B C D E

You ask your friend to go on vacation with you over Spring Break.

21. How concerned or anxious would you be over whether or not your friend would want to go with you?

very unconcerned very concerned
A B C D E

22. I would expect that he/she would want to go with me.

very unlikely very likely
A B C D E

You call your boyfriend/girlfriend after a bitter argument and tell him/her you want to see him/her.

23. How concerned or anxious would you be over whether or not your boyfriend/girlfriend would want to see you?

very unconcerned very concerned
A B C D E

24. I would expect that he/she would want to see me.

very unlikely very likely
A B C D E

You ask a friend if you can borrow something of his/hers.

25. How concerned or anxious would you be over whether or not your friend would want to loan it to you?

very unconcerned very concerned
A B C D E

26. I would expect that he/she would willingly loan me it.

very unlikely very likely
A B C D E

You ask your parents to come to an occasion important to you.

27. How concerned or anxious would you be over whether or not your parents would want to come?

very unconcerned very concerned
A B C D E

28. I would expect that they would want to come.

very unlikely very likely

A B C D E

You ask a friend to do you a big favor.

29. How concerned or anxious would you be over whether or not your friend would want to help you out?

very unconcerned very concerned

A B C D E

30. I would expect that he/she would willingly agree to help me out.

very unlikely very likely

A B C D E

You ask your boyfriend/girlfriend if he/she really loves you.

31. How concerned or anxious would you be over whether or not your boyfriend/girlfriend would say yes?

very unconcerned very concerned

A B C D E

32. I would expect that he/she would answer yes sincerely.

very unlikely very likely

A B C D E

You go to a party and notice someone on the other side of the room, and then you ask them to dance.

33. How concerned would you be over whether or not the person would want to dance with you?

very unconcerned very concerned

A B C D E

34. I would expect that he/she would want to dance with me.

very unlikely very likely

A B C D E

You ask your boyfriend/girlfriend to come home to meet your parents.

35. How concerned would you be about whether or not your boyfriend/girlfriend would want to meet your parents?

very unconcerned very concerned

A B C D E

36. I would expect that he/she would want to meet my parents.

very unlikely very likely

A B C D E

The Need to Belong Scale (nBelong)

Instructions: For each of the statements below, indicate the degree to which you agree or disagree with the statement by writing a number in the space beside the question using the scale below:

1 = Strongly disagree
2 = Moderately disagree
3 = Neither agree nor disagree
4 = Moderately agree
5 = Strongly agree

_____ 1. If other people don't seem to accept me, I don't let it bother me.

_____ 2. I try hard not to do things that will make other people avoid or reject me.

_____ 3. I seldom worry about whether other people care about me.

_____ 4. I need to feel that there are people I can turn to in times of need.

_____ 5. I want other people to accept me.

_____ 6. I do not like being alone.

_____ 7. Being apart from my friends for long periods of time does not bother me.

_____ 8. I have a strong need to belong.

_____ 9. It bothers me a great deal when I am not included in other people's plans.

____ 10. My feelings are easily hurt when I feel that others do not accept me.

Hurt-Proneness Scale

Please rate the degree to which each statement is true or characteristic of you on a 5-point scale, where 1= not at all, 2= slightly, 3= moderately, 4= very, and 5= extremely characteristic of me.

1. _____ My feelings are hurt easily.

2. _____ I am a sensitive person.

3. _____ I am "thick-skinned."

4. _____ I take criticism well.

5. _____ Being teased hurts my feelings.

6. _____ I rarely feel hurt by what other people do or say to me.

Pain Catastrophizing Scale (PCS)

Everyone experiences painful situations at some point in their lives. Such experiences may include headaches, tooth pain, joint pain, or muscle pain. People are often exposed to situations that may cause pain such as illness, injury, dental procedures or surgery.

We are interested in the types of thoughts and feelings that you have when you are in pain. Listed below are thirteen statements describing different thoughts and feelings that may be associated with pain. Using the following scale, please indicate the degree to which you have these thoughts and feelings when you are experiencing pain.

0: not at all 1: to a slight degree 2: to a moderate degree 3: to a great degree 4: all the time

When I'm in pain…

1) _____ I worry all the time about whether the pain will end.
2) _____ I feel I can't go on.
3) _____ It terrible and I think it's never going to get any better.
4) _____ It's awful and I feel that it overwhelms me.
5) _____ I feel I can't stand it anymore.
6) _____ I become afraid that the pain will get worse.
7) _____ I keep thinking of other painful events.
8) _____ I anxiously want the pain to go away.
9) _____ I can't seem to keep it out of my mind.
10) ____ I keep thinking about how much it hurts.
11) ____ I keep thinking about how badly I want the pain to stop.
12) ____ There's nothing I can do to reduce the intensity of the pain.
13) ____ I wonder whether something serious may happen.

Modified Children Social Experiences Questionnaire – Self Report (CSEQ-SR)

THINGS THAT HAPPEN TO ME

DIRECTIONS: Here is a list of things that sometimes happen to kids your age at school. How often do they happen to you at school?

EXAMPLE:

A. How often do you drive to campus?

1 NEVER	2 ALMOST NEVER	3 SOMETIMES	4 ALMOST ALL THE TIME	5 ALL THE TIME

B. How often do you attend class?

1 NEVER	2 ALMOST NEVER	3 SOMETIMES	4 ALMOST ALL THE TIME	5 ALL THE TIME

---

1. How often does another person give you help when you need it?

1 NEVER	2 ALMOST NEVER	3 SOMETIMES	4 ALMOST ALL THE TIME	5 ALL THE TIME

2. How often does another person hit, slap, or punch you?

1 NEVER	2 ALMOST NEVER	3 SOMETIMES	4 ALMOST ALL THE TIME	5 ALL THE TIME

3. How often are you intentionally excluded from participating in group activities?

1 NEVER	2 ALMOST NEVER	3 SOMETIMES	4 ALMOST ALL THE TIME	5 ALL THE TIME

4. How often does another person yell at you and call you demeaning names?

1 NEVER	2 ALMOST NEVER	3 SOMETIMES	4 ALMOST ALL THE TIME	5 ALL THE TIME

5. How often does another person try to cheer you up when you feel sad or upset?

1 NEVER	2 ALMOST NEVER	3 SOMETIMES	4 ALMOST ALL THE TIME	5 ALL THE TIME

6. How often does another person who is angry with you seek revenge by excluding you from their group?

1 NEVER	2 ALMOST NEVER	3 SOMETIMES	4 ALMOST ALL THE TIME	5 ALL THE TIME

7. How often do you get pushed or shoved by another person?

1 NEVER	2 ALMOST NEVER	3 SOMETIMES	4 ALMOST ALL THE TIME	5 ALL THE TIME

8. How often does another person do something that makes you feel happy?

1 NEVER	2 ALMOST NEVER	3 SOMETIMES	4 ALMOST ALL THE TIME	5 ALL THE TIME

9. How often does another person tell lies and/or spread rumors about you to make others not like you anymore?

1 NEVER	2 ALMOST NEVER	3 SOMETIMES	4 ALMOST ALL THE TIME	5 ALL THE TIME

10. How often are you involved in a confrontation in which another person kicks you or pulls your hair?

1 NEVER	2 ALMOST NEVER	3 SOMETIMES	4 ALMOST ALL THE TIME	5 ALL THE TIME

11. How often does another person threaten to exclude or ignore you unless you do what they want you to do?

1 NEVER	2 ALMOST NEVER	3 SOMETIMES	4 ALMOST ALL THE TIME	5 ALL THE TIME

12. How often does another person say something positive to you?

1 NEVER	2 ALMOST NEVER	3 SOMETIMES	4 ALMOST ALL THE TIME	5 ALL THE TIME

13. How often does another person try to keep others from liking you by making insulting or judgmental remarks about you?

1 NEVER	2 ALMOST NEVER	3 SOMETIMES	4 ALMOST ALL THE TIME	5 ALL THE TIME

14. How often does another person threaten to physically harm you if you don't do what they want you to do?

1 NEVER	2 ALMOST NEVER	3 SOMETIMES	4 ALMOST ALL THE TIME	5 ALL THE TIME

15. How often do other people let you know that they care about you?

1 NEVER	2 ALMOST NEVER	3 SOMETIMES	4 ALMOST ALL THE TIME	5 ALL THE TIME

16. How often are you the victim of "cyberbullying"? (i.e., derogatory or false information about you posted on Facebook, Myspace, websites, or blogs; cruel e-mails; etc.)

1 NEVER	2 ALMOST NEVER	3 SOMETIMES	4 ALMOST ALL THE TIME	5 ALL THE TIME

17. How often do you feel you are in physical danger due to an overly aggressive driver? (i.e., being a victim of "road rage")

1 NEVER	2 ALMOST NEVER	3 SOMETIMES	4 ALMOST ALL THE TIME	5 ALL THE TIME

18. How often does someone hold open a door, or hold the elevator, for you?

1 NEVER	2 ALMOST NEVER	3 SOMETIMES	4 ALMOST ALL THE TIME	5 ALL THE TIME

Direct and Indirect Aggression Scales – Victim Version (DIAS)

How do other people act toward you when they have problems with or get angry with you? Answer each question by choosing the answer that seems to most closely describe how others behave toward you, using the scale below:

0 = Never
1 = Seldom
2 = Sometimes
3 = Quite often
4 = Very often

1. How often are you hit by other people?

2. How often are you shut out of a group by other people?

3. How often do other people yell at or argue with you?

4. How often do other people become friends with another person as a kind of revenge?

5. How often are you kicked by other people?

6. How often are you ignored by other people?

7. How often are you insulted by other people?

8. How often do other people who are angry with you gossip about you?

9. How often are you tripped by other people?

10. How often do other people tell bad or false stories about you?

11. How often do other people say that they are going to hurt you?

12. How often do other people plan secretly to bother you?

13. How often do other people shove you?

14. How often do other people say bad things behind your back?

15. How often do other people call you names?

16. How often do people tell others, "Let's not be with him/her!"?

17. How often do other people take things from you?

18. How often do other people tell your secrets to a third person?

19. How often are you teased by other people?

20. How often do other people write notes where you are criticized?

21. How often are you pushed down to the ground by other people?

22. How often do other people criticize your hair or clothing?

23. How often do other people pull at you?

24. How often do other people who are angry with you try to get others to dislike you?

Physical Pain Disability Questionnaire – Revised (PDQ - revised)

This questionnaire asks for your view about how any physical pain you may experience interferes with how you function in everyday activities at this time.

1. What type of pain do you typically have? (list all that apply)

   _____

2. Where do you typically feel the pain? (list all that apply)

   _____

3. How do you typically cope with your pain? (list all that apply)

   _____

4. How often do you experience physical pain?

1 Never	2 Almost Never	3 Sometimes	4 Almost all the time	5 All the time

5. Does your pain interfere with your normal work inside and outside the home?

1 Work normally	2 Almost work normally	3 Sometimes	4 Almost unable to work at all	5 Unable to Work at all

6. Does your pain interfere with personal care (such as bathing, dressing, etc.)?

1 Take care of myself completely	2 Almost able to take care of myself completely	3 Sometimes	4 Almost need help with all my personal care	5 Need help with all my personal care

7. Does your pain interfere with your traveling?

1 Travel anywhere I like	2 Almost able to travel anywhere I like	3 Sometimes	4 Almost cannot travel at all	5 Cannot travel at all

8. Does your pain interfere with your ability to sit or stand?

1	2	3	4	5
No problems	Almost no problems	Sometimes	Almost cannot do it at all	Cannot do it at all

9. Does your pain interfere with your ability to lift overhead, grasp objects, or reach for things?

1	2	3	4	5
No problems	Almost no problems	Sometimes	Almost cannot do it at all	Cannot do it at all

10. Does your pain interfere with your ability to bend, stoop, or lift objects off the floor?

1	2	3	4	5
No problems	Almost no problems	Sometimes	Almost cannot do it at all	Cannot do it at all

11. Does your pain interfere with your ability to walk or run?

1	2	3	4	5
No problems	Almost no problems	Sometimes	Almost cannot do it at all	Cannot do it at all

12. Is your income less since your pain began?

1	2	3	4	5
No decrease	Almost no decrease	Sometimes	Almost no income at all	No income at all

13. Do you have to take medication to control your pain?

1	2	3	4	5
No pain medication needed	Almost no pain medication needed	Sometimes	Almost taking pain medication throughout the day	Taking pain medication throughout the day

14. Does your pain force you to see doctors much more often than before your pain began?

1	2	3	4	5
Never see doctors	Almost never see doctors	Sometimes	Almost see doctors weekly	See doctors weekly

15. Does your pain interfere with your ability to see the people who are important to you as much as you would like?

1	2	3	4	5
No problems	Almost no problems	Sometimes	Almost never see them	Never see them

16. Does your pain interfere with recreational activities and hobbies that are important to you?

1	2	3	4	5
No problem	Almost never a problem	Sometimes	Almost a problem	Cannot do at all

17. Do you need the help of your family and friends to complete everyday tasks (including both work inside and outside the home) because of your pain?

1	2	3	4	5
Never need help	Almost never need help	Sometimes	Almost need help all the time	Need help all the time

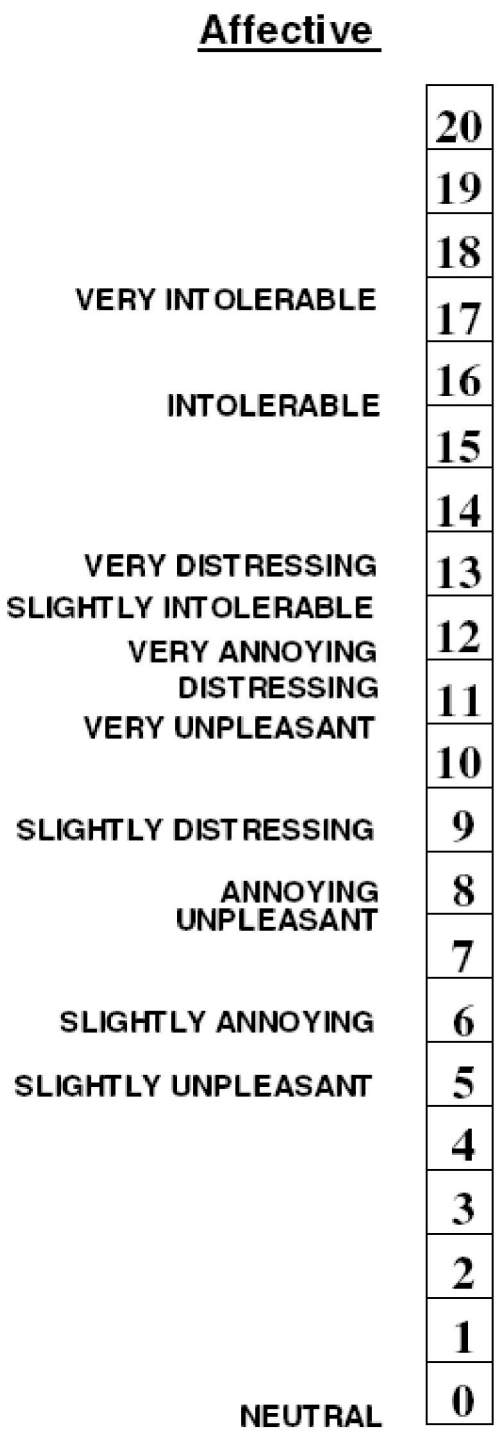
18. Do you now feel more depressed, tensed, or anxious than before your pain began?

1	2	3	4	5
No depression/tension	Almost no depression/tension	Sometimes	Almost severe depression/tension	Severe depression/tension

19. Are there emotional problems caused by your pain that interfere with your family, social, or work activities?

1	2	3	4	5
No problems	Almost no problems	Sometimes	Almost severe problems	Severe problems

21-Box Numerical Descriptor Scale



Cyberball Questionnaire Version 2

1. To what extent were you included by the other participants during the game?

_____

1 2 3 4 5 6 7 8 9

Rejected Accepted

*For each question, please circle the number to the right that best represents the **feelings** you were experiencing **during** the game.*	**Not at all**				**Extremely**
I felt "disconnected"	1	2	3	4	5
I felt rejected	1	2	3	4	5
I felt like an outsider	1	2	3	4	5
I felt I belonged to the group	1	2	3	4	5
I felt the other players interacted with me a lot	1	2	3	4	5
I felt good about myself	1	2	3	4	5
My self-esteem was high	1	2	3	4	5
I felt liked	1	2	3	4	5
I felt insecure	1	2	3	4	5
I felt satisfied	1	2	3	4	5
I felt invisible	1	2	3	4	5
I felt meaningless	1	2	3	4	5
I felt non-existent	1	2	3	4	5
I felt important	1	2	3	4	5
I felt useful	1	2	3	4	5
I felt powerful	1	2	3	4	5
I felt I had control over the course of the game	1	2	3	4	5
I felt I had the ability to significantly alter events	1	2	3	4	5
I felt I was unable to influence the action of others	1	2	3	4	5
I felt the other players decided everything	1	2	3	4	5
Good	1	2	3	4	5
Bad	1	2	3	4	5
Friendly	1	2	3	4	5
Unfriendly	1	2	3	4	5
Angry	1	2	3	4	5
Pleasant	1	2	3	4	5
Happy	1	2	3	4	5
Sad	1	2	3	4	5
Distressed	1	2	3	4	5
*For the next three questions, please circle the number to the right (or fill in the blank) that best represents the **thoughts** you had **during** the game.*					
I was ignored	1	2	3	4	5
I was excluded	1	2	3	4	5

Assuming that the ball should be thrown to each person equally (33% if three people; 25% if four people),
What percent of throws were thrown to you? _____

Wong-Baker FACES Pain Measurement

0	1	2	3	4	5
No Hurt	Hurts Little Bit	Hurts Little More	Hurts Even More	Hurts Whole Lot	Hurts Worst

Dread of Future Interactions Questionnaire (DQ)

Directions: Indicate the degree to which each statement is true of how you feel at this time using this 5-point scale.

1 Strongly disagree
2 Disagree
3 Neither disagree nor agree
4 Agree
5 Strongly agree

1. I look forward to interacting with the other participant in the face-to-face experimental task.
2. Interacting with the other participant should be fun and easy.
3. I would prefer not to interact with the other participant.
4. The interaction with the other participant will be interesting.
5. I am feeling anxious about interacting with the other participant.
6. I am excited about meeting the other participant.
7. I believe the other participant will like meeting me.
8. I think I will get along great with the other participant.
9. I think the interaction with the other participant will be awkward and uncomfortable.
10. I am feeling nervous about the face-to-face interaction.

Locus of Control (LoC)

Please circle the corresponding letter that best describes your beliefs.

1. a. Children get into trouble because their parents punish them too much.
1. b. The trouble with most children nowadays is that their parents are too easy with them.

2. a. Many of the unhappy things in people's lives are partly due to bad luck.
2. b. People's misfortunes result from the mistakes they make.

3. a. One of the major reasons why we have wars is because people don't take enough interest in politics.
3. b. There will always be wars, no matter how hard people try to prevent them.

4. a. In the long run people get the respect they deserve in this world.
4. b. Unfortunately, an individual's worth often passes unrecognized no matter how hard he or she tries.

5. a. The idea that teachers are unfair to students is nonsense.
5. b. Most students don't realize the extent to which their grades are influenced by accidental happenings.

6. a. Without the right breaks, one cannot be an effective leader.
6. b. Capable people who fail to become leaders have not taken advantage of their opportunities.

7. a. No matter how hard you try, some people just don't like you.
7. b. People who can't get others to like them don't understand how to get along with others.

8. a. Heredity plays a major role in determining one's personality.
8. b. It is one's experiences in life which determine what they're like.

9. a. I have often found that what is going to happen will happen.
9. b. Trusting fate has never turned out as well for me as making a decision to take a definite course of action.

10. a. In the case of the well prepared student there is rarely, if ever, such a thing as an unfair test.
10. b. Many times, exam questions tend to be so unrelated to course work that studying is really useless.

11. a. Becoming a success is a matter of hard work; luck has little or nothing to do with it.
11. b. Getting a good job depends mainly on being in the right place at the right time.

12. a. The average citizen can have an influence in government decisions.
12. b. This world is run by the few people in power and there is not much the little guy can do about it.

13. a. When I make plans, I am almost certain that I can make them work.
13. b. It is not always wise to plan too far ahead because many things turn out to be a matter of good or bad fortune anyhow.

14. a. There are certain people who are just no good.
14. b. There is some good in everybody.

15. a. In my case getting what I want has little or nothing to do with luck.
15. b. Many times we might just as well decide what to do by flipping a coin.

16. a. Who gets to be the boss often depends on who is lucky enough to be in the right place first.
16. b. Getting people to do the right thing depends on ability – luck has little or nothing to do with it.

17. a. As far as world affairs are concerned, most of us are the victims of forces we can neither understand, nor control.
17. b. By taking an active part in political and social affairs the people can control world events.

18. a. Most people don't realize the extent to which their lives are controlled by accidental happenings.
18. b. There really is no such thing as "luck".

19. a. One should always be willing to admit mistakes.
19. b. It is usually best to cover up one's mistakes.

20. a. It is hard to know whether or not a person really likes you.
20. b. How many friends you have depends upon how nice a person you are.

21. a. In the long run, the bad things that happen to us are balanced by the good ones.
21. b. Most misfortunes are the result of lack of ability, ignorance, laziness, or all three.

22. a. With enough effort we can wipe out political corruption.
22. b. It is difficult for people to have much control over the things politicians do in office.

23. a. Sometimes I can't understand how teachers arrive at the grades they give.
23. b. There is a direct connection between how hard I study and the grades I get.

24. a. A good leader expects people to decide for themselves what they should do.
24. b. A good leader makes it clear to everybody what their jobs are.

25. a. Many times I feel that I have little influence over the things that happen to me.
25. b. It is impossible for me to believe that chance or luck plays an important role in my life.

26. a. People are lonely because they don't try to be friendly.
26. b. There's not much use in trying too hard to please people; if they like you, they like you.

27. a. There is too much emphasis on athletics in high school.
27. b. Team sports are an excellent way to build character.

28. a. What happens to me is my own doing.
28. b. Sometimes I feel that I don't have enough control over the direction my life is taking.

29. a. Most of the time I can't understand why politicians behave the way they do.
29. b. In the long run the people are responsible for bad government on a national as well as on a local level.

APPENDIX B

COUNSELING FORM

UTA Counseling Services Department

Thank you for your participation. Participating in a study that asks questions about the pain you are experiencing may highlight emotional, behavioral, or relationship problems that you might want to discuss with a professional. Information about obtaining individual and group counseling at the University of Texas at Arlington is provided below. Counseling Services are free to UTA students.

Contact Information:
Box 19156
216 Davis Hall
(817) 272-3671
www.uta.edu/caacs/counseling

Hours of Operation:
8:00 am – 7:00 pm (M,Th)
8:00 am – 5:00 pm (T,W,F)

Individual Counseling:
A student can meet with a counselor for personal, emotional, behavioral, or relationship problems. Students also often seek personal counseling when they are having difficulties adjusting to college or juggling obligations (like attending college while working or raising a family). Counseling sessions are made by appointment, or a student may meet with the walk-in counselor without an appointment on a first-come, first-served basis. Each counselor has his or her own counseling approach and style. The counseling goal is to help you resolve your concerns and reach your goals in the pursuit of more satisfying, fulfilling life circumstances. UTA Counseling Services generally adheres to short-term, goal-oriented counseling approaches. The exact type of assistance you receive will be based on a collaboration between your counselor and yourself. Individuals will be informed when counseling services are unable to provide the services you require. In such cases, they will assist you as much as possible in the referral process so that you can get in touch with someone who can meet your needs. Counseling Services are free to UTA students.

Group Counseling:
Many students may benefit from various forms of group counseling. In the past, Counseling Services has been able to offer groups focusing on intensive relaxation training techniques, women and self-esteem, and general group counseling. General group counseling is often helpful for people who experience relationship problems, high social anxiety, depression, and a variety of other concerns.

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BIOGRAPHICAL INFORMATION

Marcos Gómez completed his undergraduate work at The University of Texas in Arlington, Texas. Additionally, he is earning a masters of science degree at the same university before pursuing a career in the private sector. His research interest includes social and cultural constructs (e.g., interactions, effects of victimization, etc). Outside of the academic arena, his interests include running, cycling and international travel.