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Does Empathy Promote Emotion Regulation In The Context Of Pain? An Experimental Investigation

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DOES EMPATHY PROMOTE EMOTION REGULATION IN THE CONTEXT OF PAIN? AN EXPERIMENTAL INVESTIGATION

by

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DEDICATION

I would like to dedicate this work to my family - Mom, Dad and Pauline, Steven and Julia, and my Danny - who have always supported me, encouraged me, and pushed me to do my best work and to achieve great things. I would not have been able to accomplish this project or my doctoral degree without them.

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CHAPTER 1

INTRODUCTION

While a great deal of research has been dedicated to individual or intrapersonal aspects of pain (e.g., psychological symptoms, disability), other researchers have taken a different approach and have focused on the social context, to understand how relationships affect pain duration, impairment, and distress, and vice versa. Many gains have been made in this area, and we are beginning to understand how people who have pain can be affected by important people around them (e.g., their doctor or spouse). A question that remains unanswered is how loved ones can best help a person with pain. For instance, how are they supposed to react to the person when he/she is in pain? The purpose of this study is to help answer that question, by determining how observers' empathic behaviors impact a person's pain and emotions, as well as what factors predict the delivery of empathic behaviors. Empathic behaviors are the focus since research is beginning to demonstrate that they are an important part of healthy emotion regulation in people with pain, affecting both individual and couple well-being.

The Social Context of Pain

Pain occurs in a social context. Romantic relationships are especially pertinent because they are the central relationships for most adults. Indeed, marital satisfaction and spouses' behaviors are related to pain in couples with chronic pain (Leonard, Cano, & Johansen, 2006). Multiple studies have demonstrated that other people can affect one's pain; for instance, people with pain express their pain differently depending on whether their spouse is present or observing versus when the spouse is absent (Block, Kremer, & Gaylor, 1980; Lousberg, Schmidt, & Groenman, 1992; Paulsen & Altmaier,

1995) or depending on other characteristics of their spouse (Schwartz, Jensen, & Romano, 2005; Turk, Kerns, & Rosenberg, 1992). Both operant and empathy models of chronic pain postulate that social and environmental factors contribute to maintaining pain and pain behaviors (Fordyce, 1976; Turk, Meichenbaum, & Genest, 1983), but in very different ways.

The operant model of chronic pain. The operant model (Fordyce, 1976) is based on behaviorist and learning theories: pain is a subjective experience that cannot be directly measured. What can be observed are pain behaviors such as grimacing, limping, or talking about one's pain. Spouses' responses to these behaviors then reinforce or punish them (e.g., by providing help or attention, or by criticizing). As a result, a spouse who is trying to be helpful may actually reinforce pain behaviors, increasing the likelihood of their expression in the future and, over time, greater disability. This reinforcement has been named "spouse solicitous behaviors" or "solicitousness". To date, the operant model has been the most common perspective for studying the social context of pain. Romano and colleagues confirmed some of the operant model's tenets with a number of observational studies. Couples in which one member had a chronic pain condition were compared to pain-free control couples. Participants were videotaped in the laboratory doing a series of routine household activities: sweeping the floor, changing bed sheets, bundling newspapers, and carrying fire logs across the room. Preliminary analyses revealed that the people with pain showed higher rates of overt nonverbal and verbal pain behaviors, and their spouses showed more solicitous behaviors, compared to control couples (Romano et al., 1991). Furthermore, the authors found that solicitous spouse behaviors preceded and followed

these pain behaviors more often in the pain couples than in the control couples (Romano et al., 1992). When they examined additional pain adjustment variables, they found that the sequence of spouse solicitousness in response to a nonverbal pain behavior was a significant predictor of physical dysfunction, but only in more depressed people with pain (Romano et al., 1995). Finally, another study with similar methodology confirmed earlier findings: partner solicitous responses to pain behaviors were significantly positively associated with the rate of the pain behaviors, while negative partner responses (e.g., disapproval, displeasure, arguments) were inversely associated with pain behavior rates (Romano, Jensen, Turner, Good, & Hops, 2000).

Criticisms of the operant model. Romano's studies are invaluable as they provided the first evidence using observational data that solicitous spouses can impact pain and disability in people with chronic pain. Many other researchers have found a positive relationship between spouse solicitousness and pain and pain behaviors (Flor, Kerns, & Turk, 1987; Lousberg et al., 1992; Turk et al., 1992); however, these studies were not without limitations, including a reliance on self-reports. After reviewing current studies of chronic pain couple interactions (including Romano and colleagues' aforementioned studies), Newton-John (2002) raised two primary criticisms of the field: the first issue is that the operationalization of the construct of solicitousness is flawed, and the second, larger issue, is that the behavioral model alone appears to be insufficient to account for the complexity of chronic pain couples' interactions.

One of the main problems with operationalization of solicitousness has to do with the most commonly-used measure of this construct, the Multidimensional Pain Inventory (MPI; Kerns, Turk, & Rudy, 1985). There are only three categories of spouse responses

assessed: punishing/negative, distracting, and solicitous. This implies that these three are the only available or important types of spouse behaviors; it also implies that they are all mutually exclusive. Another important issue is that these behaviors are thought to have reinforcement value, but that may not be true because the consequences of these behaviors are not subsequently assessed. Though many researchers appear to operate under these assumptions, there are ample studies which demonstrate that they are untenable. Several studies, including the initial validation study of the instrument, demonstrated significant positive correlations between some or all of the scales (Cano, Barterian, & Heller, 2008; Kerns et al., 1985; Williamson, Robinson, & Melamed, 1997). Alternatively, Schwartz and colleagues (2005) did attempt to assess a greater variety of spouse responses to a person with pain's behaviors with their Spouse Response Inventory, which has the person with pain report on the frequency of spouse responses to pain and well behaviors; however, there are still many more behaviors possible that cannot be assessed with survey measures. Other methods (i.e., observational ones) are necessary to capture the richness of couple interactions. In contrast to the pain field, other couples observational coding systems typically observe more numerous and varied behaviors, such as the Couples Interaction Coding System (Gottman, 1979; eight codes for verbal behaviors alone) and the Category System for Partner Interaction (Hahlweg et al, 1984; 26 verbal and nonverbal behavior codes). Newton-John and Williams (2006) delineated 12 kinds of spouse responses to pain, including a new “hostile-solicitous” response where the spouse behaves in an aggressive or irritated manner while also attempting to relieve pain or distress. Clearly, there are an

abundance of possible spouse behaviors towards people with pain (and vice versa), but only three are typically operationalized and studied.

The second issue with operant studies is the second conclusion of Newton-John's (2002) review: the operant model alone cannot account for the complexity of the interactions of couples with pain (see also Cano & Williams, 2010). In fact, not all of the data are consistent with the operant model's predictions. For instance, greater spouse punishment of pain behaviors would be expected to relate to less frequent pain behaviors. Numerous studies have failed to find this expected relationship between these constructs. Instead, the opposite relationship has been found in many instances. Schwartz and colleagues (2005) found that angry, irritated, and frustrated spouse responses to pain behaviors were actually associated with more frequent self-reported pain behaviors, as well as with greater depression in the person with pain. Papas, Robinson, and Riley (2001) reported that, in couples with spouses who were high in punishment but low in solicitousness and distracting responses, the people with pain reported the greatest scores on measures of pain, interference, and depression, and the lowest scores on activity. Similarly, both Burns, Johnson, Mahoney, Devine, and Pawl (1996) and Schwartz, Slater, and Birchler (1996) reported significant positive correlations between spouse punishing responses to pain behaviors and pain intensity, functional impairment, and psychosocial impairment.

Together, these studies suggest that what researchers are calling punishment appears to be related to a higher frequency of pain behaviors, greater pain, and greater psychological distress, which is contrary to the operant model's predictions. The actual punishment items on the MPI all include expressing negative affect (e.g., irritation,

frustration, and anger); since this negative affect does not appear to be functioning in an operant manner, it may be more appropriate to conceptualize it as an emotional response that adversely affects the emotion regulation of the person with pain. In addition, Newton-John and Williams (2006) found that when spouses provided help or offered to help people in pain (i.e., they were solicitous and not "punishing"), the recipients still reported experiencing several negative emotions, including feeling guilty, useless, and burdensome. Thus, there are two issues for the behavioral model: first, the operant measures of "punishment" may be mislabeled, and could be better conceptualized as negative affect responses; and second, there are additional emotional reactions that are not being measured or accounted for.

Based on the non-patient social psychology and romantic relationships research, emotions and emotion regulation are important facets of couples' interactions (Gottman & Notarius, 2000). This finding has been supported in the few preliminary studies of chronic pain couples' emotional interactions (Cano et al., 2008; Johansen & Cano, 2007; Newton-John & Williams, 2006). One type of response that facilitates emotion regulation is empathy. Using an empathy, intimacy, and emotion regulation perspective presents an alternate way of thinking about pain couples' interactions.

To sum, there is currently a very narrow view of spouse responding to people with pain that likely does not represent the diverse behaviors partners enact towards each other. Even though, to date, studies of pain couples have been predominantly completed from a behaviorist perspective, focused on solicitousness, in the current study I will eschew solicitousness and instead, I will examine pain couples' interactions from an emotion and intimacy-based perspective. Integrating cognitive and emotional

variables into studies of pain couples appears to be a necessary step in fully understanding these couples' functioning and interactions, as the behavioral model has been regarded as insufficient to do so.

Empathy

Empathy is a construct that is considered central to understanding interpersonal relationships. Interestingly, "empathy" itself has been difficult to define and measure. According to Davis (1983), empathy refers to "the reactions of one individual to the observed experiences of another" (p. 113). More specifically, he asserted that empathy is a set of attitudes and tendencies, two of which have been consistently integrated into current definitions of empathy: perspective taking (i.e., a cognitive tendency to adopt the point of view of others) and empathic concern (i.e., an affective tendency to experience feelings of compassion and sympathy for others). In general, there is also broad agreement on a third component of empathy, that of emotion regulation (see below) (Decety & Jackson, 2006). Similarly, Batson (2009) identified a set of eight cognitive and affective psychological states that are all described as *empathy*. He argued that they are all stand-alone and conceptually distinct. Some of these states include: knowing another person's internal state; matching the neural responses of that person; and feeling for another person who is suffering.

Decety and Jackson (2006) emphasized that experiencing empathy does not imply that one will act or feel impelled to act in a certain way. Though not all researchers agree on whether behavioral reactions are inherently part of empathy, it is generally accepted that, at the very least, empathy can motivate various behaviors in observers (Batson, 2009; Goubert et al., 2005), such as empathic listening and validating (Cano et

al., 2008; Cano & Williams, 2010). Goubert and colleagues (2005) provided a comprehensive perspective to define empathy as: “a sense of knowing the experience of another person with cognitive, affective and behavioral components”. I will be using Goubert’s definition of empathy throughout this study. This model also emphasizes how both “top-down” processes (characteristics of the observer and their experiences) and “bottom-up” processes (characteristics of the incoming stimulus, such as facial expressions, pain behaviors) influence empathy.

Empathic responding is distinct from solicitousness. Some may argue that empathy and solicitousness are essentially the same thing, just as punishing spouse responses may be related to emotional non-support; however, there are fundamental theoretical differences between the concepts: primarily, empathy is not considered to reinforce maladaptive behaviors (e.g., pain behaviors) in models of interpersonal relationships. Rather, it has emotion regulation and intimacy functions. An exploratory factor analysis of chronic pain spouse behaviors by Cano and colleagues (2008) illustrated how empathic responding and solicitousness are independent. The results indicated that solicitous and distracting spouse responses loaded on the same dimension, whereas spouse validation (an empathic response), spouse invalidation (a non-empathic response), and spouse punishing responses (which, as discussed, may actually reflect spouse negative affect) loaded on a separate dimension. They interpreted the first factor as “Solicitousness” and the second factor as “Nonempathic Responding” and proposed that solicitousness may be pain-specific support (i.e., instrumental support), whereas empathy is a more broad, emotion regulation and intimacy-enhancing response.

Further evidence for the separation of solicitousness and empathy comes from Newton-John and Williams (2006). These authors conducted a qualitative study of spouse responses which delineated 12 kinds of spouse responses, including two novel ones. In this study, pain couples were presented with 14 written vignettes portraying everyday situations (e.g., doing chores, visiting friends) involving a person with chronic pain and his or her spouse. In each scenario, the person engages in pain behavior. The spouses were asked how they would respond in relevant vignettes, and the people with pain were asked how their spouse would respond and also how that response would make them feel. The affective reactions of the people with pain were coded as positive, neutral, or negative. The most frequently rated positive responses included encourage task persistence, observe only, and problem-solve. In contrast, providing help (i.e., solicitousness) was rated as the fourth most frequent negatively rated spouse behavior, with the most frequent negative ones being hostile solicitousness and expressing frustration (i.e., punishing/negative responses). One important conclusion that can be drawn from this study is how emotional support is distinct from solicitousness. Indeed, solicitousness may be emotionally supportive (e.g., offering to help), emotionally neutral, or emotionally negative/punishing (e.g., hostile solicitousness). This suggests that emotional support (and thus, empathy) may actually be orthogonal to solicitousness; studying empathy in pain couples is an important avenue to explore given the extensive body of research demonstrating that it is a key variable in enhancing interpersonal interactions and romantic relationships. Understanding why and how empathy can benefit couples with pain is an essential step that needs to be completed before we can practically apply this theory to improving peoples' lives.

While there are numerous pain studies of solicitousness, there are far fewer pain studies of emotional support behaviors like empathic responding. The current study will help to address this gap in the literature. I will focus on observable empathic behaviors (e.g. acknowledging another's experience with respect, expressing understanding of their feelings, and providing comfort) towards a romantic partner who is experiencing experimentally-induced pain. A discussion about emotion regulation and intimacy theories helps to set the stage for how empathy is particularly influential for pain in couples.

Emotion regulation and intimacy theories. Couples-based emotion regulation and intimacy theories posit that an individual's behaviors affect the emotion regulation of the self and of the partner (Fruzzetti & Iverson, 2006; Reis & Shaver, 1988). Emotion regulation is the process by which we influence which emotions we have, and how and when we experience and express them (Gross, 1998). Emotional dysregulation occurs when a person cannot accept an emotional experience successfully and cannot change it effectively (Fruzzetti & Iverson, 2004). Empathic responses promote successful emotion regulation by helping a person to process stressful or aversive stimuli.

The interpersonal process model of intimacy (Reis & Shaver, 1988) states that intimacy develops through interactions in which one person's self-disclosures are received with listening and empathy by another person. Different types of self-disclosures are proposed to differentially build intimacy; more personal information (e.g., desires, emotions) should build intimacy more than facts will (e.g., biographical data). The listener can also enhance intimacy by responding empathically and with validation, beyond just listening. In support of this model, self-disclosure of emotions, partner

responses, and empathy predict intimacy and relationship satisfaction (Laurenceau, Barrett, & Pietromonaco, 1998; Mitchell et al., 2008). Thus, empathy increases trust and closeness between partners.

Emotion regulation and intimacy theories of relationships can be applied to couples with pain to provide a reinterpretation of verbal communications about pain. In contrast to the operant model, in which expressions and discussions of pain are seen as "pain behaviors" that should be reduced (Fordyce, 1976; Romano et al., 1991), an alternative conceptualization views expressions of pain as self-disclosures that present an opportunity for increased understanding and intimacy between partners (Cano & Williams, 2010), transforming an unpleasant situation into a relationship-enhancing one, thus promoting good emotion regulation. Brown, Sheffield, Leary, and Robinson (2003) similarly proposed that supportive others may lessen pain by decreasing the threat or stress of a situation, by decreasing negative affect, or by increasing positive affect. There is research evidence to support the link between empathy and emotion regulation in pain couples. For instance, Cano and colleagues (2008) found that greater observed spouse empathic responses was related to higher marital satisfaction in both partners of chronic pain couples, and suggested that empathic interactions contributed to healthy emotion regulation within the couple. Other researchers demonstrated that when people with pain perceived their spouses to have a greater tendency to respond empathically, they reported fewer depressive symptoms (Fekete, Stephens, Mickelson, & Druley, 2007). Unfortunately, current widely-used measures of spouse responses (described above; Multidimensional Pain Inventory; Spouse Response Inventory) do not assess empathic responding. In the current study, I will focus on observed empathic responses

provided by partners to see how they affect pain and pain tolerance during an acute pain task.

Experimentally Manipulating Empathy

An objective of this study is to experimentally manipulate empathy during a pain-inducing task. In the empathy literature, researchers have demonstrated that empathy can indeed be experimentally manipulated. Batson, Early, and Salvarani (1997) conducted an elegant study of how perspective-taking contributes to empathic feelings and motivations. They noted that experiencing empathy for others requires a degree of perspective-taking, though there are different ways to do so. Under the cover story of listening to a pilot episode of a radio show, participants were randomly assigned to one of three perspective-taking conditions while listening to an interview with a struggling university student who recently lost her parents. In the first condition, the objective condition, participants were told to remain objective and detached while listening; in the imagine-other condition, participants were instructed to imagine how the person being interview feels; and in the imagine-self condition, participants were instructed to concentrate on imagining on how they themselves would feel in that situation. Participants in both “imagine” conditions reported feeling more empathy than did participants in the objective conditions, with no difference between the two imagine conditions. However, the imagine-self condition was distinct as those participants rated their own personal distress as higher. In the imagine-other condition, participants instead reported distress that was primarily felt for the interviewee.

The differences in distress between self- and other-oriented perspectives have been replicated using a variety of different outcome measures, including self-report,

behavioral, and neuroimaging techniques. Using the same conditions and instructions to participants while they viewed painful images in a PET scanner, Ruby and Decety (2004) demonstrated that taking the self- and other-oriented perspectives resulted in some overlapping neural activation, but also some distinct activity consistent with personal distress versus other-oriented distress. Several other research groups have found concordant results using functional magnetic resonance imaging (for a review, see Lamm, Decety, & Singer, 2011). Lamm, Porges, Cacioppo, and Decety (2008) found that each of the two ways of perspective-taking were also related to specific facial responses. Finally, Batson and colleagues (2003) demonstrated that imagining how another person felt resulted in increased altruistic, moral actions towards that person.

Empathy theories provide an explanation for why self- and other-oriented perspective taking have different effects on observers' distress and actions. Specifically, there are two affective reactions that observers may experience when witnessing a person in pain or distress, each with their own behavioral motivations. Observers may experience self-oriented reactions such as unpleasant feelings of personal anxiety and distress, which results in a corresponding self-oriented motivation to avoid/escape this distress. Conversely, observers may experience other-oriented reactions (feeling *for* the other person), including sympathy and compassion, which results in an altruistic, other-oriented motivation to help that person and relieve their distress. Thus, feelings of personal distress inhibit empathic responding by motivating observers to help and protect themselves, rather than to help and protect others in distress (Batson, 2009). The current study will seek to confirm the principle that observers who experience greater personal distress at the sight of another in pain should be less able to respond

to that person empathically during an acute pain task, using an experimental manipulation to increase empathy. In addition, the impact of these empathic behaviors on the person in pain will be evaluated.

Experimental Studies of Acute Pain

One methodology for studying chronic pain is to experimentally induce acute pain in pain-free participants (i.e., experimental pain). Acute pain differs from chronic pain mainly in persistence and duration; it is short-term, whereas chronic pain is more long-term. Experimental induction of pain is useful in understanding clinical pain conditions because it allows for greater control and internal validity. When studying people with clinical pain conditions, there are several potential confounds that may skew results, for instance, nature and severity of the pain condition; pain duration; co-morbid mental disorders (e.g., depression), age, and medication use. In addition, clinical studies are often correlational by nature and no causal conclusions can be drawn from them. Experimentally inducing pain in pain-free laboratory participants allows researchers to assess and quantify participants' responses to standardized stimuli (e.g., location, duration, and intensity of the pain) and environmental conditions. Variables of interest can be controlled for and/or systematically manipulated in order to test causal hypotheses. This type of research has many applications, from learning about the sensory and perceptual aspects of pain to understanding the social and coping aspects of pain. It is worth noting that this information can also be extended to understanding acute pain (e.g., acute pain caused by medical procedures, post-surgical pain).

There are several ways to experimentally induce acute pain. Some of the most common tools include pressure (e.g., a tight blood pressure cuff around the arm, or

pressure on a finger), electric shock, noxious thermal stimuli, and cold pressor (i.e., submerging one's hand into a bin of near-freezing water). Various researchers have used these tools to study acute pain in both people with pain and in pain-free participants (for a review, see Edens & Gil, 1995) and they have found that these methods are reliable, valid, and safe ways of studying pain in a highly controlled manner. Commonly used outcome measures include self-reported pain severity, pain tolerance (the upper-limit of pain at which point the subject requests stimulus termination or self-terminates it), and physiological measures (e.g., heart rate, skin conductance, blood pressure). The current study will use a cold pressor task to induce pain, described in greater detail below. There have been very few dyadic pain experiments, and the results are mixed regarding whether or not empathy and social support are beneficial for pain and well-being.

After reviewing correlational data that social support was related to lower pain, Brown and colleagues (2003) conducted a dismantling study in order to identify which aspects of social support were key. Dyads who were either friends or strangers completed the cold pressor task in one of four conditions: passive support (observer was present in the room but not allowed to speak or make eye contact); active support (encouraged to support the pain participant as much as possible); interaction support (engaged in as much or a little interaction as they liked); and an alone condition. Overall, participants in the active and passive support conditions reported less pain than participants in the interaction and alone conditions, regardless of whether they were with a friend or a stranger. Thus, the presence of another person was one factor related to social support, but type of support mattered as well. The authors suggested that

negative remarks may have occurred in the interaction condition, which eroded the potential benefits of having a companion present, though they could not make firm conclusions given that they did not measure negative gestures or comments.

It is possible that the pain participants' perceptions of observers' behaviors are more important than the actual behaviors themselves. Sambo, Howard, Kopelman, Williams, and Fotopoulou (2010) did a more focused study on whether pain participants' "perceived empathy" from observers was related to pain ratings during a noxious thermal stimulus, and whether attachment style was a factor. Pain participants were either alone or paired with an observer (a research confederate) and told that the observer had "high" empathy for them or "low" empathy for them. Observers never directly interacted with pain participants during the task. Even though the authors predicted that "high empathy" condition would lead to decreased pain ratings and physiological responses, the main effect of social context on pain ratings was nonsignificant. There were, however, significantly lower skin conductance responses and lower heart rate responses in the "high-" and "low-" empathy groups compared to the alone condition, suggesting that mere presence of an observer attenuated physiological arousal in the pain participant. This effect was moderated by attachment style, suggesting that interpersonal variables also play a role in the empathy-pain connection.

In contrast, other researchers have found that empathy was not associated with better outcomes, or even with poorer outcomes. McClelland and McCubbin (2008) found that the presence of a friend may have beneficial or deleterious effects on pain, depending on the participant's gender. The authors administered cold pressor pain to

participants who were alone versus in the same room as a same-sex friend, though friends were facing away from each other and they were specifically instructed to not talk, touch, look at each other, or interact in any way. Men who were with a friend reported less pain compared to men who were alone; but women who were with a friend reported greater pain than women who were alone. The strict limits on interactions obviously limit the amount of empathy conveyed between friends in this study. Indeed, none of these studies directly measured empathy or empathic behaviors, though they do support the notion that neither the presence of another person nor distraction is sufficient to promote successful emotion regulation.

In sum, studies show that the presence of an observer, specific behaviors of an observer, and perceptions of an observer can affect physiological responses, self-reported pain, and pain tolerance during an acute pain task. However, it remains unclear how, and for whom, observers help reduce pain and increase pain tolerance. The current study will use an experimental paradigm to determine whether empathic behaviors performed by an observer result in improved emotion regulation, and thus, improved pain and pain tolerance. Contrary to previous studies on pain and dyads, I will be directly manipulating and measuring empathic feelings and behaviors in romantic partners. In addition, I will assess additional variables that might mediate or moderate the relationship between empathy and pain. The results will provide novel evidence about how partners' interactions affect pain.

Variables that Affect Pain and Empathy

While empathy and pain may be directly related, there are other variables that might affect these associations. For instance, there are several characteristics of the

person with pain, such as catastrophizing and expectations of support, that may explain the associations between empathic responses and pain.

Pain catastrophizing – a cognitive process that increases pain. Although it is hypothesized that observed empathy will be related to lower pain and higher pain tolerance, clinical and experimental studies exist where social support and empathy were related to *poorer* pain-related outcomes (Chambers, Craig, & Bennett, 2002; T. Jackson et al., 2005). These authors have suggested that empathy may inadvertently maintain a person's focus on pain, resulting in greater distress, especially when the person is already predisposed to do so. This predisposition to focus on pain may be construed as catastrophizing, which is defined as an "exaggerated negative mental set brought to bear during actual or anticipated painful experience" (Sullivan et al., 2001).

Pain catastrophizing has also been conceptualized as a cognitive process by which pain interrupts, distracts, and demands attention (Eccleston & Crombez, 1999). As a result, successful coping may be seen as "efficient recovery from interruption by pain by the fast switching of attention away from pain and back to the interrupted task" (p. 362). People who tend to catastrophize have greater difficulty suppressing or diverting their attention away from pain-related thoughts, and thus, they have greater difficulty successfully coping with pain.

Greater catastrophizing has been consistently linked to greater pain (Flor, Behle, & Birbaumer, 1993; Keefe, Brown, Wallston, & Caldwell, 1989; Sullivan & D'eon, 1990), pain behaviors (Keefe et al., 2000; Sullivan, Tripp, & Santor, 2000), and disability (Martin et al., 1996; Robinson et al., 1997; Sullivan, Stanish, Waite, Sullivan, & Tripp, 1998). Thus, catastrophizing is an important construct to assess in this study as it has

clear relations to pain coping and adjustment. In people who catastrophize, an empathic observer may maintain one's attention on pain and pain-related thoughts, further compromising successful coping.

Pain catastrophizing has classically been assessed as a trait-like variable, but recent research has also measured pain catastrophizing during specific tasks (i.e., as a state-like variable). Indeed, some have demonstrated that catastrophizing can be manipulated by providing various instructions to participants before a pain task (Jackson et al., 2005; Severeijns, van den Hout, & Vlaeyen, 2005; Spanos, Stam, & Brazil, 1981), thereby demonstrating that catastrophizing can be assessed as a state variable. In the current study, cold pressor-specific (state-like) pain catastrophizing will be assessed. Although trait-like and state-like pain catastrophizing are likely to be positively related, catastrophizing about the cold pressor task is more likely to relate to increased personal distress and poorer pain and pain tolerance during the task.

Variables that affect empathic behaviors. If empathic behaviors significantly affect pain, then it is important to understand the factors that affect observers' empathic behaviors, with the ultimate goal of learning how to improve couples' interactions so that they can better help each other cope with pain.

Observer catastrophizing. Observers can catastrophize about pain they witness in others. Similar to pain catastrophizing in pain participants, this involves an exaggerated, negative focus on pain and is related to greater psychological distress (Cano, Leonard, & Franz, 2005). Indeed, as previously discussed, personal distress at seeing another person's pain inhibits empathic responding because it motivates a self-oriented reaction to escape distress, rather than an other-oriented reaction to aid the

other person (Batson, 2009). Cano and colleagues (2005) proposed that a high-catastrophizing spouse may be unable to meet their pain partner's intimacy needs because he/she is focused on pain, distress, and helplessness; in contrast, low-catastrophizing spouses are likely to be better able to empathize, validate, and reassure their partners. Leonard and Cano (2006) confirmed that, in spouses of people with chronic pain, greater catastrophizing was related to greater personal distress (as depressive symptoms). Further, Cano, Leong, Williams, May, and Lutz (2012) found that spouses' helplessness catastrophizing and anxiety were both positively related to responding in an invalidating (non-empathic) manner to their partners' expressions of pain-related distress during a discussion. They did not find any associations between these variables and validating responses. Thus, in a live, acute pain situation, observers who catastrophize in the presence of a partner experiencing pain may report greater personal distress and may demonstrate less empathy to their partners in pain. Yet, this hypothesis has not been tested in the literature.

Solicitude. Another individual difference variable in people with chronic pain has been *solicitude*, or *support entitlement*; which is the extent to which people with pain feel entitled to more pain-related support or attention from close others. Ironically, it appears that a greater tendency to expect social support from others is related to receiving lower levels of support. Cano, Leong, Heller, and Lutz (2009) found that pain catastrophizing was positively related to support entitlement. Further, among people with chronic pain with lower levels of support entitlement, catastrophizing was associated with greater solicitous spouse responses. In contrast, in people with chronic pain with higher levels of support entitlement, catastrophizing was related to greater

punishing and invalidating spouse responses. They reasoned that greater feelings of entitlement might be conveyed in a way that makes providing support feel like a chore or an unfair demand to the spouse. In the current study, it was expected that support entitlement would be likewise off-putting to observers and would interact with catastrophizing to produce similar results: low-solicitude pain participants that engaged in a great deal of catastrophizing about the cold pressor task would receive greater empathic responses from observers, and high-solicitude participants that engaged in a great deal in catastrophizing about the cold pressor task would receive less empathic responses from observers.

***Stoicism*.** In order for an observer to perceive and empathize with pain, the person experiencing the pain must behave in some way that expresses his/her pain to others. Individuals differ in stoicism, which is the degree to which they will endure pain without displaying their feelings and without complaints. Stoicism can be conceptualized as an attitude or belief about how one should behave in the face of pain (Yong, Gibson, Horne, & Helme, 2001). Stoicism may prevent observers' empathic responses in two ways: people who experience pain and who are stoic provide less information to observers about the severity of pain they experience (i.e., bottom-up processes; (Goubert et al., 2005); secondly, observers who value stoicism may be less empathic to their partners' complaints and expressions of pain.

Current Study and Hypotheses

The purpose of this study was to determine the effects of observers' empathic behaviors on the pain participant during a dyadic acute pain task (the cold pressor task, described below). Using an experimental manipulation similar to Batson's procedure to

promote empathic feelings and behaviors in one group of observers (the “empathy” group), I examined the extent to which empathic responses affected pain severity and pain tolerance during the cold pressor task. Despite an abundance of research on empathy and on pain, few studies have examined how they are related (i.e., how empathy affects pain) or which factors predict the empathic behaviors of observers.

In light of emotion regulation and intimacy theories (Fruzzetti & Iverson, 2006; Reis & Shaver, 1988), as well as the current literature on chronic pain couples’ affective interactions (Brown et al., 2003; Patrick & D'Eon, 1996), I hypothesized that pain participants in the empathy group would report lower pain and would demonstrate greater pain tolerance than the pain participants in the control group (Hypothesis #1). In the empathy group, pain participants were expected to be better able to successfully regulate their emotions as a result of the observers’ empathic behaviors. These empathic behaviors may help transform an aversive situation (i.e., the painful cold pressor task) into an intimacy-building situation with increased mutual understanding between partners. I hypothesized that these between-groups differences in pain and pain tolerance would be explained by the pain participants feeling better understood by their partners (Hypothesis #2).

Based on previous research, there may be variables that affect how empathy and the pain variables are related. I predicted that pain participants who catastrophized more during the task and received empathy from the observers would report greater pain and demonstrate reduced pain tolerance, compared to pain participants who did not catastrophize during the task (Hypothesis #3), because empathy may have exacerbated their already-present over-focus on the pain and possible catastrophic

consequences (Jackson, 2007). In this case, empathy may have promoted emotion dysregulation.

In addition to examining the association between empathy and pain, I also examined variables that may have affected observers' empathic behaviors towards the pain participant. One was the observer's level of catastrophizing about the pain participant's pain: I predicted that, in observers, higher catastrophizing would be related to lower empathy, and that the association between catastrophizing and empathy would be accounted for by observer personal distress (Hypothesis #4).

Another variable that may have affected observer empathy was the pain participant's feelings of entitlement to support (i.e., solicitude); this has previously been found to result in lower levels of support, presumably because it is off-putting to the supporter. I predicted that pain participant catastrophizing about the task would interact with support entitlement, such that high support entitlement participants that were high in catastrophizing would receive less empathy from observers, while the opposite would be found in low-support entitlement participants that were high in catastrophizing (Hypothesis #5).

Finally, stoicism in the face of pain may be related to lower empathy. Little research has been done on stoicism attitudes and how they relate to behavioral expressions of pain and to observers' responses. I predicted that pain participants' stoicism attitudes would be inversely related to their pain severity ratings, as well as inversely related to observers' empathic feelings and empathic behaviors. Additionally, I predicted that both observer and pain participant stoicism would interact with experimental group in predicting observers' empathic feelings, and validating and

invalidating behaviors. For instance, an observer high in stoicism may not have responded to the empathy manipulation because of their attitudes (Hypothesis #6).

Conducting this study in a pain-free (i.e., non-clinical) sample can inform future work done on people with chronic pain and their spouses. For example, the findings may inform different couples' intervention strategies (e.g., empathy training, emotion regulation, reducing support entitlement). The results can also be applied to learn about how dyadic interactions affect acute pain (e.g., post-surgical pain). This study on affective interactions is important because a strictly behavioral model of chronic pain has been deemed insufficient for capturing the complexity of how chronic pain affects individuals and couples. In addition, inherent in operant models is the argument that empathy for pain may reinforce (and thus, worsen) pain. This study will explore the alternative, that empathy may actually be related to better pain outcomes. This study is also novel, as very few *dyadic* cold pressor studies have been conducted, and among those that exist, none examined observed empathic behaviors towards the pain participant.

This study employed the cold pressor task, one of the most common methodologies for experimentally inducing pain. Initially used by Hines and Brown (1932) to study blood pressure and vasomotor reactions, the cold pressor task involves submerging one hand into water that is kept very cold (4-5°C, originally). The increase in blood pressure that quickly follows hand submersion was the basis for calling it the “cold pressor” test. It was not until 1943 when Wolf and Hardy conceptualized it as a pain task and attempted to describe and understand the pain that occurred. Since then, norms have been reported based on a large sample of over 600 men and women

(Walsh, Schoenfeld, Ramamurthy, & Hoffman, 1989) and the cold pressor task has been used in hundreds of studies of adults, and also in many with children. Compared to other means of inducing experimental pain, the cold pressor allows the pain participant greater control over exposure to the stimulus, as they submerge and withdraw their hand from the water. The pain quickly dissipates after the hand is removed. In addition, as von Baeyer, Piira, Chambers, Trapanotto and Zeltzer (2005) pointed out, the experience of cold-induced pain is a familiar and seemingly more benign stimulus compared to other experimental procedures (e.g., electric shock); people can commonly be exposed to the experience, for example, by holding an ice cube or by swimming in a cold lake. To date, the cold pressor task has been the most commonly used methodology for studying experimental pain in dyads (Brown et al., 2003; Jackson, Huang, Chen, & Phillips, 2009; McClelland & McCubbin, 2008).

CHAPTER 2

METHOD

Participants and Procedure

Participants.

The initial sample included 134 young adult romantic couples. Couples were recruited through the Wayne State University (WSU) Psychology Department Research Participation System. In order to participate, at least one person from each couple was required to be an undergraduate student at WSU that was enrolled in a psychology class. WSU students were compensated for their involvement with extra credit in their class; participants who were not current WSU psychology students were compensated with $10. Couples were not eligible to participate if either partner had conditions that might affect blood circulation, such as Reynaud's Disease, or diabetes. Couples were also excluded if either partner had any chronic pain condition. It is not known how many couples were unable to participate due to these two exclusionary criteria because they would have self-selected themselves out of the study when reading the description online, before signing up to participate. The person who completed the cold pressor task will henceforth be referred to as the "pain participant", whereas the other participant will be referred to as the "observer".

Following completion of the data collection, six couples were removed from the data set because of validity concerns raised by the experimenters who ran the participants. For four couples, the experimenters strongly felt that the participants were not a legitimate romantic couple, based on their behaviors during the study (e.g., one person thanked the other for participating and asked to confirm their name and phone

number during a time when the experimenter was not present but the video camera was still recording). For the remaining two couples, the pain participant indicated that they understood the instructions for the cold pressor task, but when the task began, they did not follow the directions (e.g., they put their hand in the water early, or removed it after every beep and did not state pain ratings). The remaining sample consisted of 128 romantic couples; 63 couples in the control group, and 65 couples in the experimental group.

With regard to demographics, women comprised 52% (*n* = 66) of the pain participants and 50% (*n* = 64) of the observers. The pain participants self-reported their ethnicity as follows: approximately 42% (*n* = 54) Caucasian; 26% (*n* = 33) African American; 12% (*n* = 15) Arab, 7% (*n* = 9) Hispanic/Latino; 6% (*n* = 8) Asian; and 7% (*n* = 9) as "Other". The distribution was generally similar for observers (Caucasian 39%, *n* = 50; African American 28%, *n* = 36; 13% Arab, *n* = 17; Asian 7%, *n* = 9; Hispanic/Latino 2%, *n* = 2; Other 11%, *n* = 14). The mean age of pain participants was 22.21 years (*SD* = 5.47), similar to the mean age of observers (*M* = 22.03, *SD* = 5.66). On average, both pain participants and observers had completed some college (*M* = 14.28, *SD* = 1.59; *M* = 14.38, *SD* = 1.53, respectively). Relationship duration was highly variable, and ranged from 1 month to 14 years, with an average of 25.19 months (*SD* = 25.10). Two of the couples (1.6%) were in same-sex relationships.

Procedure.

Wayne State University Institutional Review Board approval was obtained prior to participation. Participants were recruited through the online Psychology Department Research Participation System at WSU, where they signed up for the study.

Participants and their romantic partners came to the Relationships and Health lab in the Simons building. Before they were allowed to proceed, they were asked if either person had chronic pain, blood circulation problems, or diabetes. One couple left at this point and did not participate in any data collection. All other participants responded with no, and proceeded by washing their hands on the way back to the lab space. Written informed consent was obtained from each partner and any questions regarding confidentiality or the study protocol were answered. Couples were unknowingly assigned to the experimental (empathy) or control group via a pre-determined randomized block design. Additionally, whether the male or female partner was the pain participant was determined in the same randomized block design. For same-sex couples, the experimenter flipped a coin to decide which person would be assigned the role of pain participant, and which person would be assigned the role of observer.

Figure 1 depicts the procedure that pain participants and observers followed. Both partners completed the demographics questionnaire, the Interpersonal Reactivity Index for Couples, and the Pain Attitudes Questionnaire (Revised) in separate rooms. The last page of the survey packet had written instructions specific to the participant/group. At this point, participants were informed who would be completing the cold pressor task and who would be observing, based on the instructions: the instructions to the pain participant always read, “Soon, you will do the cold water task. For this task you will put your hand into a bin of very cold water, 6 degrees Celsius, which is equivalent to 43 degrees Fahrenheit. While this task might cause some pain, it is temporary and will end shortly after you remove your hand from the bin. You are allowed to remove your hand at any time during the task. Please wait for additional

instructions from the experimenter." The instructions to the observers varied by experimental group, which constitutes the study's experimental manipulation.

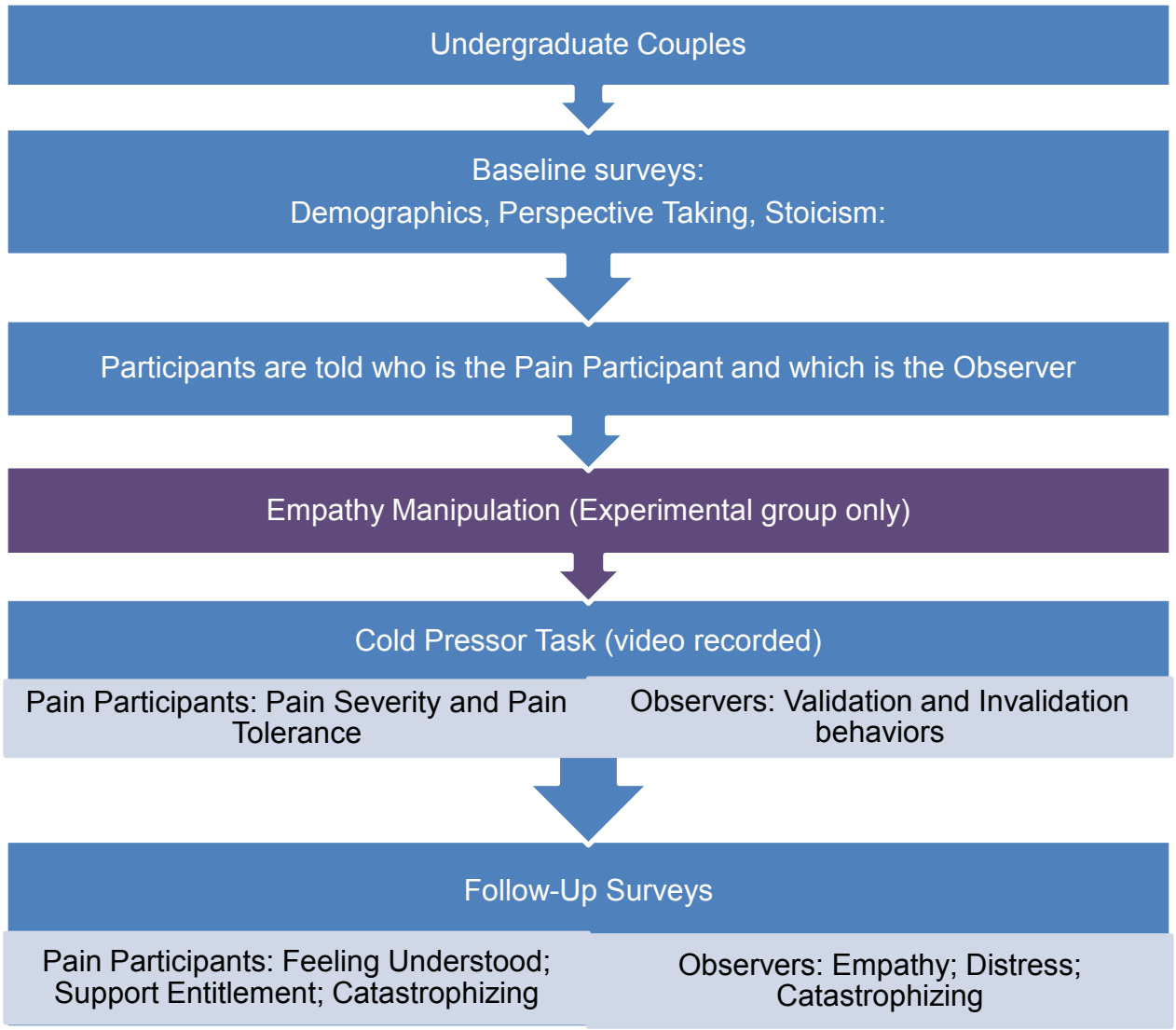

Figure 1: *Study Procedures and Measures*

Experimental manipulation. In the control group, the instructions to the observer were similar to the ones the pain participant received: "Soon, your partner will do the cold water task. You may interact with your partner as much or as little as you like. Your partner will put his/her hand into a bin of very cold water, 6 degrees Celsius,

which is equivalent to 43 degrees Fahrenheit. While this task may cause some pain, it is temporary and will end shortly after he or she removes his/her hand from the bin. Please wait for additional instructions from the experimenter." In the experimental group, the instructions to the observer included the instructions given to the control observers, with one additional paragraph, the manipulation: “During the task, please try to imagine how your partner feels about what is happening. Concentrate on how your partner feels while doing the painful cold water task and how he/she is affected by it. Imagine your partner’s emotional response as he/she experiences the pain.” For all participants in all conditions, the experimenter asked each person to repeat back the instructions on this page to ensure they read this last page of instructions. Participants who did not demonstrate a full understanding of the instructions were told to read them again and then describe them to the experimenter. All participants were able to adequately describe the instructions and were allowed to proceed to the next stage of the study.

The couple was then brought together into the observation room, where the cold pressor machine was located. The pain participant was asked to sit with their non-dominant hand next to the bin, and to remove any jewelry from that hand. He or she also used hand sanitizer. The observer was seated on the other side of the cold pressor machine, close enough to touch the pain participant. The experimenter repeated the cold pressor instructions to both participants, including the instruction that they could interact "as much or as little as they liked" during the task. The pain participant held his/her hand in a bucket of room temperature water for one minute while listening to the instructions to ensure all pain participants' hands were exposed to the same

temperature before beginning the pain task. Both participants were given the opportunity to ask any questions. Then, the pain participant was asked to repeat back the instructions for the cold pressor task and the experimenter corrected any misconceptions. All pain participants were able to verbally describe their instructions for the next part of the study; however, as described in the *Participants* section, two couples were subsequently excluded because the pain participants grossly deviated from study procedures while they were completing the cold pressor task.

For the pain task, the experimenter pressed “play” on a cassette tape player before leaving the room. On the tape, the pain participant was reminded to submerge his/her hand after the first tone is heard, and to rate his/her pain aloud at every subsequent tone on the pain severity scale. Observers were free to behave however they chose during this time. The experimenter observed the interaction in the video room to time the duration of submersion, to record pain ratings, and to ensure participants were following the instructions. After four minutes as indicated on a Sportline© stopwatch, the experimenter instructed participants to withdraw their hand from the container (if they had not already done so), and to dry their hand with a towel.

The pain participant remained in that room while the observer was brought into a separate room. As depicted in Figure 1, couples completed additional survey measures: pain participants completed the Interaction Record Form, Pain Catastrophizing Scale, and the Survey of Pain Attitudes, while observers completed the Pain Catastrophizing Scale – Spouse edition, and Emotional Reaction Questionnaire. Partners were brought together again and debriefed. They were informed about the random assignment to control and experimental groups, the manipulation, and the expected results of the

study. All participants were provided with their compensation and escorted out of the laboratory.

Materials

Figure 1 depicts all measures that participants completed during the study, and when they were completed.

Baseline measures.

Empathic concern and perspective taking: *Interpersonal Reactivity Index for Couples (IRIC).* The IRIC (Péloquin & Lafontaine, 2010) is a 13-item self-report measure of general empathy partners have in their romantic relationship. Scores on the IRIC were intended to be used as a baseline measure of empathy in both partners. The IRIC was adapted from the Interpersonal Reactivity Index (Davis, 1980). Pain participants and observers each rated how well each statement describes them on a scale from 0 (“Does not describe me well”) to 4 (“Describes me very well”). The IRIC has two subscales, Empathic Concern and Perspective Taking (Appendix B). The Empathic Concern subscales had poor reliability in both pain participants (Cronbach's α = 0.59) and observers (Cronbach's α = 0.46). Deleting items would not have increased the internal consistency to acceptable levels, and so, the Empathic Concern subscale was not included in any subsequent analyses. The Perspective Taking subscales had better reliability, with Cronbach's α = 0.79 in both pain participants and observers. This subscale was included in the analyses.

Stoicism: *Pain Attitudes Questionnaire – Revised (PAQ-R)*. The PAQ-R (Yong, Bell, Workman, & Gibson, 2003) is a 24-item self-report measure of pain-related stoicism (14 items) and cautiousness (10 items). In the current study, the 14 stoicism

items were used to assess attitudes regarding how expressive one should be when experiencing pain (Appendix C). All study participants rated their agreement with each statement on a 5-point scale from 1 ("Strongly Agree") to 5 ("Strongly Disagree"). The reliability of the stoicism items was excellent in both pain participants and observers (Cronbach's α = 0.90 for both).

Measures during the cold pressor task.

Cold pressor equipment. In the current study, a cold pressor machine was assembled using a Techne© brand Flow Dip Cooler (model RU-200), Thermoregulator (model TE-10D), and stainless steel bath. Water from the bath flows through the flow dip cooler, which extracts the heat. The thermoregulator circulates the water and safely controls the temperature of the liquid in the bath within precise limits. The thermoregulator was set to 6°C, equivalent to 43°F.

Pain severity. Pain participants rated their pain aloud repeatedly on a scale from 0 (“No pain”) to 10 (“Extreme pain”) during the cold pressor task. The experimenter recorded the ratings (Appendix D). For the first minute of submersion, they rated their pain every 10 seconds; following that, they rated their pain every 20 seconds, until they withdrew their hand or until 4 minutes (total) passed. Attrition during the cold pressor task caused a reduction in sample size and power for analyses that involved pain severity. For participants who did not finish the task, missing pain ratings were treated as missing data and the data points were replaced with the mean of the pain severity rating for that group at that time point. This is a conservative way of replacing data which maintains the same group mean for each time point. Pain severity has been measured in several ways in previous studies that used the cold pressor task.

Researchers often collect pain severity ratings at multiple time points, as was the case in the current study. Common measures of pain severity include the average rating across all time points and the maximum (peak) pain rating achieved. In the current study, both of these indices of pain severity were analyzed. The overall mean pain severity score was 6.49 (*SD* = 1.27) in the control group and 5.79 (*SD* = 1.47) in the empathy group. Peak pain was highly skewed, where 36.7% (*n* = 47) of the pain participants reached a maximum pain rating of 10. Thus, peak pain was dichotomized to reflect whether or not the person ever reached a pain rating of 10.

Pain tolerance. Pain tolerance was assessed as the number of seconds from the time when the pain participant submerged his/her hand in the cold water bath until the point when he/she removed it. If the participant persisted until the end of the task, four minutes was recorded as the time. There was a fairly even split between participants who completed the full four minutes (45%, *n* = 58) and those who did not (55%, *n* = 70). Thus, pain tolerance was dichotomized to reflect whether or not the person completed the full 4 minutes.

Observers' empathic behaviors. We created a manual to code empathic and nonempathic behaviors during the cold pressor task. The manual was based on Fruzzetti's Validation and Invalidation Behavior Coding System (2001). The VIBCS was developed from an emotion regulation perspective of couples' interactions (Fruzzetti & Iverson, 2006). Observers were rated on two dimensions: validation (empathic responses, such as reflective statements) and invalidation (nonempathic responses, such as putting the other person down). The original VIBCS involves coding both of these dimensions on a scale from 1 (no validation or invalidation) to 7 (only validation or

invalidation). Specific behaviors are not counted or coded; rather, this is a global measure of an interaction. In the current study, the scale was adapted to range from 0 ("Not at all Validating/Invalidating") to 3 ("Greatly Validating/Invalidating") for ease of coding and increased reliability (Appendix J). Examples of validation include, “Does it hurt?” and “It makes sense that you would feel that way.” In contrast, invalidation examples include ignoring the pain participant and, “It’s only cold water, you’re exaggerating how much it hurts”. Nonverbal behavioral indicators of validation/empathy (e.g., rubbing one's partner’s shoulder) and invalidation (e.g., rolling one’s eyes at the other’s pain complaints) were also considered. It was important to assess both empathic and nonempathic responses, given that nonempathic responses have been strongly linked to poorer relationship quality and depression in both pain and non-patient populations, even more so than empathic responses have been (Gottman, Coan, Carrere, & Swanson, 1998; Papas et al., 2001). In addition, pain researchers have postulated that nonempathic responses may affect pain, though this has not been tested in observational dyadic research (Brown et al., 2003). Thus, an advantage of using a system similar to the VIBCS is that the presence of both empathic and nonempathic responses was assessed.

Initially, eight undergraduate raters were trained in the empathy coding method. Training sessions consisted of five weeks of instruction in basic couples observational issues, review of the coding manual, in-session and practice coding from a previous study, and demonstrating agreement with other coders. Following training, weekly coding meetings were held to discuss ambiguous situations and any discrepancies in coding. Coders were blind to the couples’ experimental condition and survey responses.

Coders viewed each interaction twice. During the first viewing, coders would get an impression of the style of interaction, including baseline facial expressions and personal styles of interacting. During the second viewing, coders focused on rating the observer's empathic and nonempathic behaviors. Coders were allowed to watch the videos as many times as necessary to make confident coding decisions.

Following training, the two raters who demonstrated the greatest reliability were selected to proceed with coding. One person was deemed the primary coder, who coded 100% of the video recorded interactions, with the exception of the participants she ran herself. The other person was the secondary coder, who coded a randomly selected subset of videos, plus the ones which the primary coder could not rate. Coders did not know which couples were being coded multiple times. In the end, 49% of the video recordings were coded by both raters, with excellent inter-reliability across measures of reliability for both validation (Cronbach's $\alpha = 0.94$, Spearman's $\rho = 0.89$) and invalidation (Cronbach's $\alpha = 0.92$, Spearman's $\rho = 0.82$).

Post-cold pressor task measures: Pain Participants.

Feelings of being understood during the task: Interaction Record Form – Intimacy (IRF). Pain participants completed the IRF (Prager & Buhrmester, 1998) following the cold pressor task. This form asks a person to rate his/her own behaviors, as well as a partner's behavior, following an interaction in order to measure how understood each partner felt during the interaction. Pain participants rated how well each of the 17 statements described the interaction on a scale from 1 ("Not at all true of this interaction") to 4 ("Very true of this interaction"). A factor analysis of the IRF demonstrated three factors: Affective Tone, Self-Disclosure, and

Listening/Understanding. Perceptions of feeling listened to/understood were used (3 items), in addition to four items which were added to this scale: "I felt validated/accepted/cared for/understood by my partner during this interaction" (Appendix E). The Cronbach's α for the seven "listened to/felt understood" items was; 0.81 in the control group, and 0.87 in the empathy group.

Pain participant catastrophizing: Pain Catastrophizing Scale (PCS). Pain participants completed an adapted version of the PCS (Sullivan, Bishop, & Pivik, 1995), a 13-item self-report measure of catastrophizing. On the original PCS, participants are instructed to reflect on painful experiences in general and to rate the degree to which they experience each of the 13 thoughts and feelings on a 5-point scale from 0 (“Not at all”) to 4 (“All the time”). On the current adaptation, pain participants were instructed to reflect on specific catastrophizing during the recently-completed cold pressor task with 14 items. There are three dimensions assessed: magnification, rumination, and helplessness. Only total scores were used (Appendix F). The reliability of the PCS was acceptable in both the control group (Cronbach's α = 0.86) and the empathy group (Cronbach's α = 0.90).

Support entitlement: Survey of Pain Attitudes (SOPA). Pain participants completed the Solicitude subscale of the SOPA (Jensen, Turner, Romano, & Lawler, 1994), a 57-item self-report measure of agreement with various pain-related beliefs on a 5-point scale from 0 (“This is very untrue for me”) to 4 (“This is very true for me”). Only the six Solicitude items were used in this study, and the wording was slightly altered to reflect beliefs during the cold pressor task. This scale was used to assess pain participants' attitudes about the observers’ responsibilities to provide pain-related

support during the task (Appendix H). The reliability of the Solicitude subscale was acceptable in both the control group (Cronbach's α = 0.84) and the empathy group (Cronbach's α = 0.79).

Post-cold pressor task measures: Observers.

Observer catastrophizing: Pain Catastrophizing Scale - Significant Other Version (PCS-S). Observers completed an adapted version of the PCS-S (Cano et al., 2005), a measure adapted from the PCS to assess significant others' castastrophizing about their partners' pain, using similar items on the same scale. In the current study's adaptation, observers were instructed to report their catastrophizing during the recently-completed cold pressor task. There are three dimensions assessed on the measure: magnification, rumination, and helplessness. Only total scores were used (Appendix G), with a Cronbach's α of 0.84 in the control group and 0.89 in the empathy group.

Empathy and distress: Emotional Reaction Questionnaire (ERQ). Observers were given a list of 14 adjectives that were rated on a 1 to 7 scale that assesses empathy and personal distress (Batson et al., 1997). Specifically, six adjectives are related to the empathy factor (e.g., sympathetic, compassionate) and eight adjectives are related to the distress factor (e.g., alarmed, worried). On Part 1, participants rated how much they had experienced that emotion during the cold pressor task. Part 2 was designed to assess the nature of any distress that was reported in Part 1. Participants are asked to separately indicate the degree, on a 1 ("not at all") to 9 ("extremely") scale, that they experienced the eight distress items personally, versus for their partner (Appendix I). The scores for each part were averaged to result in one overall score for empathy, general distress, self-oriented distress, and other-oriented distress.

Cronbach's α was excellent for all four of these subscales in both control and empathy group (ranging from 0.91 to 0.96).

CHAPTER 3

RESULTS

Data Cleaning and Management

Prior to conducting analyses, data were screened for accuracy of input, non-random missing data, univariate and multivariate outliers, and parametric assumptions. The Statistical Package for the Social Sciences (SPSS) versions 20 and 21 software was used to conduct all analyses. Baseline measures were screened as ungrouped data, then all data collected after the manipulation were screened as grouped (control and experimental groups). Very little (under 3%) data were missing, and pattern was found to be "missing completely at random" (Little, 1988). Missing data were replaced using mean substitution. Four univariate outliers were found, and no multivariate outliers were found. Additionally, one variable was significantly negatively skewed: pain participant stoicism (Z_{skew} = -2.59, p < .01). Normality was restored by bringing univariate outliers in to the next most extreme score on the scale, and by using a square root transformation. Analyses were run on the raw scores and on the transformed data, and no differences were found. Thus, the untransformed scores were used for all analyses for ease of interpretation.

Manipulation Checks

It was expected that observers in the empathy group would exhibit greater empathic behaviors towards the pain participant than observers in the control group. Observers in the experimental group reported feeling greater empathy toward their partners immediately after the completion of the cold pressor task (M = 5.35, SD = 1.27) than did those in the control group (M = 4.84, SD = 1.43), F(1,126) = 4.54, p = .04). In

addition, pain participants in the empathy group reported feeling more understood (M = 22.73, SD = 4.44) by their partners than did those in the control group (M = 21.12, SD = 4.24), $F(1,126) = 4.37$, $p = .04$. However, there was no significant difference in observer validation behaviors across groups ($p > .05$), nor was there was any significant difference in observer invalidation behaviors across groups ($p > .05$), suggesting that the manipulation was successful in promoting perceptions of empathy but that it did not translate into behavioral differences as operationalized in the current study.

It was expected that observers in the experimental group would also report greater other-oriented distress, which has been shown to reliably increase along with empathic feelings (Batson et al., 1997). There was no significant difference in other-oriented distress between the empathy group (M = 3.94, SD = 2.35) and the control group (M = 4.29, SD = 2.32), $F(1,126) = 0.72$, $p = .40$.

Preliminary analyses

ANOVAs were conducted to examine between-groups differences on all study variables (see Table 1).

Table 1: *Descriptive Statistics and Between-Groups Differences on All Study Variables*

Variable	Control		Empathy			
	Mean	SD	Mean	SD	F	p
Pain participants						
Perspective Taking (IRIC)	16.52	4.10	16.46	4.87	0.006	.94
Stoicism (PAQ-R)	46.97	11.47	47.95	8.94	0.29	.59
Mean Pain Severity	6.49	1.27	5.79	1.47	8.32	.005
Solicitude (SOPA)	9.04	5.72	8.35	5.32	0.50	.48
Catastrophizing (PCS)	39.90	21.74	38.72	24.17	0.08	.77
Feeling Understood (IRF)	21.12	4.24	22.73	4.44	4.37	.04
Observers						
Perspective Taking (IRIC)	15.89	4.06	16.35	4.49	0.37	.55
Stoicism (PAQ-R)	45.82	11.14	45.76	9.72	0.001	.98
Validation	1.11	0.72	1.25	0.66	1.22	.27
Invalidation	1.38	0.79	1.22	0.72	1.54	.22
Catastrophizing (PCS-S)	50.46	21.38	54.90	25.45	1.14	.29
Empathic feelings (ERQ)	4.84	1.43	5.35	1.27	4.53	.04
Self-Oriented Distress (ERQ)	3.60	2.08	3.72	2.26	0.09	.76
Other-Oriented Distress (ERQ)	4.29	2.32	3.94	2.35	0.72	.40

Note: *df* for all ANOVAs was (1,126).

In addition to those differences described in the manipulation checks section, pain participants in the empathy group reported significantly lower average pain during the cold pressor task than the pain participants in the control group (see below). Otherwise, there were no other differences in measures across groups. Pearson correlations among variables were also calculated using the overall sample, for descriptive purposes, to examine the relationships between the independent and dependent variables, and to screen for potential covariates (see Table 2). Both observer perspective-taking and pain participant stoicism were baseline variables that were significantly correlated with several of the outcome variables. Subsequent analyses were conducted including them as covariates. Although they were often significant covariates, the overall results were the same as when they were not included. Thus, for

simplicity of presentation and interpretation of the study findings, the analyses presented below did not include any covariates.

Table 2: *Correlations among all Continuous Study Variables in the Overall Sample*

	PT-O	STOIC-P	STOIC-O	Pain-P	VAL-O	INV-O	SOPA-P	IRF-P	CAT-P	CAT-O	EMP-O	Self-Distr-O	Other-Distr-O
PT-P	.14	.08	.14	-.04	.05	-.12	-.12	.28**	-.06	.17	.10	.11	.08
PT-O	--	.23**	-.03	-.31**	.22*	-.18*	-.29**	.23**	-.12	.24**	.36**	.22*	.15
STOIC-P		--	-.33**	-.30**	.17	-.11	-.29**	.07	-.39**	.13	.27**	.15	.04
STOIC-O			--	.03	-.40**	.08	.29**	-.06	.03	-.22*	-.27**	-.07	-.05
Pain-P				--	-.14	.23**	.39**	-.15	.52**	.21*	-.13	.15	.23**
VAL-O					--	-.30**	-.35**	.24**	-.12	.28**	.38**	.12	.11
INV-O						--	.30**	-.18*	.01	-.15	-.13	-.14	-.09
SOPA-P							--	-.40**	.40**	-.17	-.36**	-.06	.04
IRF-P								--	-.15	.27**	.35**	.21*	.14
CAT-P									--	.23**	-.02	.20*	.25**
CAT-O										--	.63**	.74**	.71**
EMP-O											--	.52**	.51**
Self-Distr-O												--	.86**

PT-P = Pain Participant Perspective Taking
PT-O = Observer Perspective Taking
STOIC-P = Pain Participant Stoicism
STOIC-O = Observer Stoicism
Pain-P = Mean Pain Severity
VAL-O = Observer Validation Behaviors
INV-O = Observer Invalidation Behaviors
SOPA-P = Pain Participant Support Entitlement
IRF-P = Pain Participants Feeling Understood
CAT-P = Pain Participant Catastrophizing
CAT-O = Observer Catastrophizing
EMP-O = Observer Empathy
Self-Distr-O = Observer Self-Oriented Distress
Other-Distr-O = Observer Other-Oriented Distress
N = 128
*$p < .05$. **$p < .01$

Main Analyses

Hypothesis 1. I hypothesized that pain participants in the empathy group would report lower pain and would demonstrate greater pain tolerance during the cold pressor task, than the pain participants in the control group. Multiple pain severity ratings were

collected throughout the pain task; the average rating across all time points for each person was calculated for each participant's mean pain severity score. The maximum (peak) pain rating achieved by each participant was also analyzed, but was dichotomized to reflect whether the pain participant ever reported a pain rating of 10 (37%, *n* = 47) or not (61%, *n* = 78). An ANOVA was conducted to compare mean pain severity between the control and experimental (empathy) groups, to determine whether the perspective-taking manipulation was related to lower pain severity. This part of hypothesis 1 was supported. The average pain severity rating was significantly lower in the empathy group (*M* = 5.79, *SD* = 1.47) than it was in the control group (*M* = 6.49, *SD* = 1.27), $F(1,126) = 8.31$, $p < .01$, a medium effect (Cohen's *d* = 0.51). Additionally, looking at raw data with no replacement, the mean pain ratings in the empathy group were significantly lower than the control group at several time points after the first minute of the cold pressor task (*p*s < .05; see Figure 2).

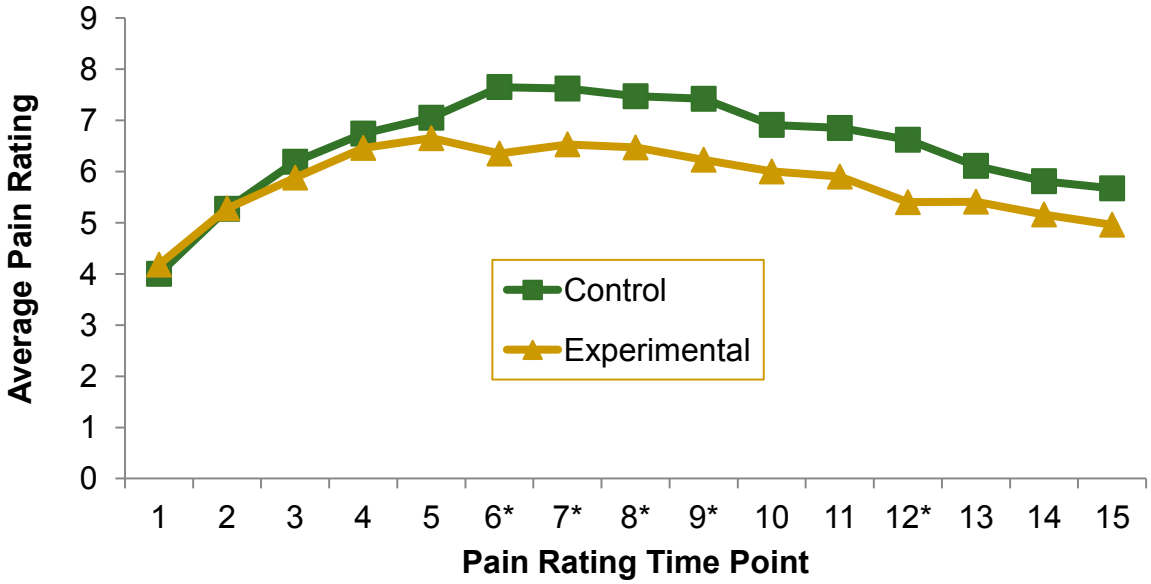

Figure 2: Raw Data of Mean Pain Severity Rating at each Time Measurement Point, by Experimental Group
Note: *indicates significant between-groups difference

Other aspects of hypothesis 1 were not supported. A chi-square test was conducted to determine whether or not the number of people who reached a peak pain rating of 10 varied by experimental group. The test was not significant, $\chi^2(1, n = 125) = 0.15$, $p > .05$, indicating that the number of people who reached a peak pain rating of 10 did not differ across control and experimental groups (see Table 3).

Table 3: *Frequency of Pain Participants who Reached a Pain Rating of 10 or not, by Experimental Group*

Peak10?	Control	Empathy	Total
No	37	41	78
Yes	24	23	47
Total	61	64	125

Pain tolerance, measured as the length of time the pain participant was willing to endure the cold pressor task, was dichotomized into whether or not the person finished the task because close to half of the sample (45%) completed the full four minutes (see Table 4). A chi-square test was not significant; thus, the number of people who finished the task did not vary by experimental group, $\chi^2(1, n = 128) = 0.27$, $p > .05$. Among the people who did not finish the task, there were no significant differences in task duration (Control $M = 70.36$, $SD = 59.00$; Empathy $M = 59.54$, $SD = 47.76$), $F(1,68) = 0.12$, $p = .09$.

Table 4: *Frequency of Pain Participants who Completed the Full 4 min of the Pain Task, by Experimental Group*

Finish?	Control	Empathy	Total
No	33	37	70
Yes	30	28	58
Total	63	65	128

Hypothesis 2. I hypothesized that between-groups differences in pain severity and pain tolerance would be explained by the pain participants feeling better understood by their partners. Since no significant between-groups difference in pain tolerance was found, only pain severity was analyzed. Initially, a mediation analysis was planned; however, the timing of the measures rendered this strategy inappropriate; pain severity ratings were collected, and then pain participants reported on how much they felt understood afterwards. In other words, the mediator was measured after the dependent variable was, even though the constructs themselves may have co-occurred. Instead, to determine whether the between-groups difference in pain severity could be explained by the pain participants feeling more understood by their partners during the interaction, an analysis of covariance (ANCOVA) was conducted. The between-groups difference in pain severity was tested, controlling for pain participants' report of feeling understood. It was expected that the effect of group would become nonsignificant when feeling understood was covaried out. The covariate was not significant (p = .22), and pain severity ratings still differed significantly by group ($F(1,128) = 6.85$, p = .01), with greater pain reported in participants in the control group. The strength of the relationship between group and pain was small-to-medium, with partial η^2 = .05. Thus, pain participants' feeling understood did not explain the between-groups differences in pain during the task and this hypothesis was not supported.

Additional analyses were conducted to examine the extent to which feeling understood might be related to pain severity and pain tolerance in the overall sample of participants. When examining the entire sample, pain participants' feeling understood was not significantly correlated with mean pain severity (Table 2) or with whether or not

the person completed the entire 4 minute task (r_{pb} = .13, p = .16). Greater feelings of being understood was significantly correlated with a lower likelihood of reaching a peak pain rating of 10 (r_{pb} = -.20, p = .03), regardless of group membership.

Hypothesis 3. It was predicted that pain participants who catastrophized more during the task and who were observed as receiving more empathy from observers would report greater pain and demonstrate reduced pain tolerance, compared to pain participants who did not catastrophize and received empathy. In order to test this moderation hypothesis, a hierarchical regression was conducted. Continuous predictors were first centered prior to entering into the regression equation. The first step of the equation included observer empathic/validation behaviors (from the VIBCS codes) and pain participant self-reported catastrophizing in predicting mean pain severity, which tested the main effects. The two-way interaction between empathic behaviors and catastrophizing was then entered in the second step of the equation. The results of this moderation analysis are presented in Table 5. Together, the two predictors and the interaction term explained 29% of the variance (p < .001). At the first step, the main effect of validation was not significant, but the main effect of pain participant catastrophizing was significant (β = .51, t = 6.58, p < .001). The interaction term was not significant, indicating that catastrophizing did not moderate the relationship between validation and pain.

Table 5: *Summary of Hierarchical Regressions for Observer Validation and Pain Participant Catastrophizing, and their Interaction in Predicting Pain Severity*

	R^2	ΔR^2	F_Δ (df1,df2)	β	t
Step 1	.27**	.27**	23.41 (2,125)**		
Validation				-.08	-1.04
Pain Catastrophizing				.51**	6.58**
Step 2	.29**	.02	3.30 (1,124)		
Validation X Pain Catastrophizing				.14	1.82

N = 128

*p < .05; **p < .01

The data analysis plan was to repeat similar statistical tests, but now using peak pain and pain tolerance as dependent variables; however, both of these variables were dichotomized, and so logistic regression analysis was the more appropriate analysis. A logistic regression analysis was performed to test the moderation with pain tolerance (i.e., whether or not the person finished the task) as the outcome, with two predictors: empathic behaviors and catastrophizing. The predictors were entered in the first step of the equation, then the two-way interaction between empathic behaviors and catastrophizing was then entered in the second step of the equation. A test of the full model with all three predictors (2 main effects and one interaction effect) against a constant-only model was statistically significant, $\chi^2(3, n = 128) = 46.66$, $p < .001$. The only significant variable was the main effect of pain catastrophizing. Odds ratios with 95% confidence intervals are presented in Table 6. The more pain participants catastrophized, the less likely they were to complete the task. Another logistic regression analysis was completed with the same predictors but now using peak pain (i.e., whether or not the person ever reached a pain rating of 10 during the task) as the outcome. The overall model was statistically significant $\chi^2(3, n = 128) = 34.91$, $p < .001$. Greater catastrophizing was related to a greater likelihood of reaching a pain rating of

10 at some point during the task (Table 6). Neither validation nor the interaction terms were significant predictors. Thus, catastrophizing did not moderate the relationship between validation and pain tolerance, or the relationship between validation and peak pain severity. Rather, it was a main effect for both outcomes. Overall, this hypothesis was not supported.

Table 6: *Logistic Regressions, with Observer Validation, Pain Participant Pain Catastrophizing, and the Interaction between them Predicting Pain Tolerance and Peak Pain*

	Dependent Variable					
	Pain Tolerance – Did they finish the task?			Peak Pain – Did they reach a rating of 10?		
Predictor	Odds Ratio	95% C.I	p	Odds Ratio	95% C.I	p
Observer Validation	1.66	0.87 – 3.14	.12	1.09	0.59 – 2.01	.79
Pain Catastrophizing	0.94	0.91 – 0.96	< .001	1.06	1.03 – 1.08	< .001
Validation x Pain Catastrophizing	1.03	0.99 – 1.07	.17	1.00	0.97 – 1.04	.89

Note: *N* = 128 for both analyses.

Similar moderation analyses were then conducted with invalidating/nonempathic behaviors. It was predicted that catastrophizing would also interact with invalidation, such that pain participants who catastrophized more during the task and received invalidation from the observers would report greater pain severity, compared to pain participants who did not catastrophize and received invalidation. Using the same multiple regression approach described above, invalidation and pain participant catastrophizing were significant main effects, but the interaction term between them was nonsignificant (see Table 7). Catastrophizing did not moderate the relationship between invalidation and pain. Together, the two predictors and interaction term explained 32% of the variance in pain severity ($p < .001$).

Table 7: *Summary of Hierarchical Regressions for Observer Invalidation and Pain Participant Catastrophizing, and their Interaction in Predicting Pain Severity*

	R^2	ΔR^2	F_Δ (df1,df2)	β	t
Step 1	.32**	.32**	28.96 (2,125)**		
Invalidation				.22**	3.04**
Pain Catastrophizing				.52**	6.96**
Step 2	.32**	.006	1.09 (1,124)		
Invalidation X Pain Catastrophizing				-.08	-1.04

N = 128

*p < .05; **p < .01

Again, because pain tolerance and peak pain were dichotomized, logistic regression had to be used instead of linear regression for the next set of analyses. A logistic regression analysis was performed to test whether pain catastrophizing moderated the relationship between invalidation and pain tolerance (i.e., whether or not the person finished the task). The predictors were entered in the first step of the equation, then the two-way interaction between invalidation and catastrophizing was entered in the second step of the equation. A test of the full model with all three predictors (2 main effects and one interaction effect) against a constant-only model was statistically significant $\chi^2(3, n = 128) = 58.51$, $p < .001$. While both predictors were significant, the interaction term was not. Greater invalidation was related to a greater likelihood of finishing the task, whereas greater catastrophizing was associated with a lower likelihood of finishing the task (Table 8). Another logistic regression analysis was completed with the same predictors but now using peak pain as the outcome. The overall model was statistically significant $\chi^2(3, n = 128) = 42.94$, $p < .001$. Both predictors were significant but the interaction term was not; greater invalidation and catastrophizing were both related to a greater likelihood of reaching a pain rating of 10 at some point during the task (Table 8). Thus, catastrophizing did not moderate the

relationship between invalidation and pain tolerance, or the relationship between invalidation and pain severity. Overall, this hypothesis was not supported.

Table 8: *Logistic Regressions, with Observer Invalidation, Pain Participant Pain Catastrophizing, and the Interaction between them, Predicting Pain Tolerance and Peak Pain*

	Dependent Variable					
	Pain Tolerance – Did they finish the task?			Peak Pain – Did they reach a rating of 10?		
Predictor	Odds Ratio	95% C.I	P	Odds Ratio	95% C.I	p
Observer Invalidation	3.09	1.52 – 6.29	.002	2.45	1.28 – 4.70	.007
Pain Catastrophizing	0.93	0.90 – 0.95	< .001	1.06	1.04 – 1.09	< .001
Invalidation x Pain Catastrophizing	0.98	0.95 – 1.02	.36	1.00	0.97 – 1.03	.83

Note: *N* = 128 for both analyses.

In sum, pain participants' pain catastrophizing and observers' invalidation, but not validation, were both positively related to pain severity and pain tolerance. Pain catastrophizing did not interact with observer behaviors during the task to moderate the relationships between validation and invalidation, and pain severity or pain tolerance.

Additional analyses explored whether group membership interacted with these variables (i.e., a three-way interaction between group, observer behaviors, and pain catastrophizing). The three-way interaction between group, validation, and pain catastrophizing was not significant, nor was the three-way interaction between group, invalidation, and pain catastrophizing (*p*s > .05).

Hypothesis 4. I predicted that, in observers, higher pain catastrophizing would be related to less empathic behaviors, and that the association between pain catastrophizing and empathic behaviors would be accounted for by observer personal distress. A mediation analysis was conducted to test this hypothesis. Hierarchical regressions were run with validation as the dependent variable. Continuous predictors

were first centered prior to entering into the regression equations. Indirect effects were estimated using bootstrapping with 2000 resamples (Preacher & Hayes, 2008). Observer catastrophizing was related to *greater* observer validation (r = .28, β = .28, t = 3.30, p = .001), the opposite of what was expected. Despite this unexpected finding, the mediation analysis was still completed. The mediator, personal distress, was not a significant predictor of the outcome, observers' empathic behaviors. The 95% confidence interval of the bootstrapped estimate of the indirect effect ranged from -0.01 to 0.002. Because zero was included in this confidence interval, the indirect effect was not significantly different from zero (p > .05). Thus, the relationship between observers' pain catastrophizing and empathic behaviors was not mediated by their feelings of personal distress, and this hypothesis was not supported (Figure 3). In contrast, including observers' personal distress strengthened the association between catastrophizing and validation. The pattern of findings suggests classical suppression (Cohen, Cohen, West, & Aiken, 2002), which means that the relationships between observers' pain catastrophizing and their personal distress was hiding/suppressing their real relationships with observers' validation behaviors.

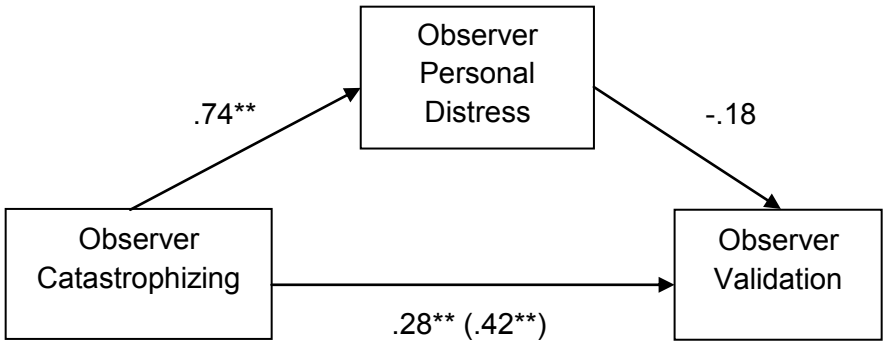

Figure 3: *Observer Personal Distress Does Not Explain the Relationship Between Catastrophizing and Validation*

Standardized regression coefficients for the relationship between observer catastrophizing and validation behaviors as mediated by personal distress. The standardized regression coefficient between catastrophizing and validation controlling for personal distress is in parentheses, and is consistent with classical suppression. **p< .01

Additional analyses were conducted using measures of other forms of distress - general distress, and distress for the other person - as mediators for the positive relationship between observer catastrophizing and validation. Nether analysis resulted in significant indirect effects (p > .05). Other-oriented distress was another mediator which strengthened the association between catastrophizing and validation, which again was consistent with classical suppression. Observers' invalidation behaviors were also considered as a potential outcome, but because invalidation was not significantly correlated with any of observer catastrophizing, general distress, self-oriented distress, or other-oriented distress (refer back to Table 2), it was not examined further in these analyses.

Hypothesis 5. I predicted that pain participant catastrophizing about the task would interact with support entitlement, such that participants who believed they were entitled to greater support and who were high in catastrophizing would receive less

empathic behaviors from observers, while the opposite would be found in low-support entitlement participants that were high in catastrophizing. The analyses involved testing a two-way interaction of two continuous variables, similar to Hypothesis 3, above. First, continuous predictors were centered and a hierarchical regression was conducted. The first step of the equation included catastrophizing and support entitlement to predict observer empathic behaviors. Greater support entitlement was associated with observers' "lesser" use of validation as observed by raters. The two-way interaction between catastrophizing and support entitlement was then entered in the second step of the equation. While support entitlement was a significant predictor of empathic behaviors, neither pain participant catastrophizing nor the interaction term between them were significant (see Table 9).

Table 9: *Hierarchical Regressions Predicting Observers' Validating and Invalidating Behaviors from Pain Participant Catastrophizing and Support Entitlement*

	R^2	ΔR^2	F_Δ (df1,df2)	β	t
Predicting Validation					
Step 1	.12**	.12**	8.54 (2,125)**		
Pain Catastrophizing				.02	0.19
Support Entitlement				-.35**	-3.86**
Step 2	.13**	.006	0.84 (1,124)		
Pain Catastrophizing X Support Entitlement				.08	0.92
Predicting Invalidation					
Step 1	.11**	.11**	7.55 (2,125)**		
Pain Catastrophizing				-.14	-1.49
Support Entitlement				.36**	3.89**
Step 2	.11**	.00	0.001 (1,124)		
Pain Catastrophizing X Support Entitlement				-.002	-0.02

N = 128

*p < .05; **p < .01

Similar analyses were conducted with nonempathic (invalidating) behaviors as the dependent variable. Again, these hypotheses were more exploratory given the dearth of research on invalidating behaviors. I expected that, among those pain participants with high support entitlement, higher catastrophizing would be related to more nonempathic observer responses. Among those with low support entitlement, I expected that catastrophizing would not be related to nonempathic responses. Only the main effect of support entitlement was significant, such that greater support entitlement was associated with greater invalidation behaviors by observers (Table 9).

Hypothesis 6. I predicted that both observer and pain participant stoicism would interact with experimental group in predicting observers' empathic feelings, and validating and invalidating behaviors. Multiple regressions were used to test these moderations. First, the relationships between group and pain participant stoicism in predicting empathic feelings/validation/invalidation were examined. While there were main effects of group and pain participant stoicism in predicting observers' empathic feelings, contrary to my prediction, the two-way interaction effect was not significant (Table 10). Being in the experimental group and greater pain participant stoicism were both associated with greater observer empathic feelings. Re-doing the analyses using validation and invalidation as outcome variables, no main effects or interactions were significant (*p*s > .05).

Next, the relationships between group and observer stoicism in predicting empathic feelings/validation/invalidation were examined. Similarly, group and observer stoicism were significant main effects in predicting observers' empathic feelings, but the two-way interaction effect was not significant. Again, being in the experimental group

was associated with greater observer empathic feelings, but greater observer stoicism was associated with less observer empathic feelings. Using validating behaviors as the outcome, there was a main effect for observer stoicism, however, again, experimental group did not significantly moderate this relationship (Table 10). The main effect indicates that greater observer stoicism was related to less validation behaviors. Using invalidation as the outcome variable, neither the main effects, nor the interaction term were significant ($p > .05$).

Table 10: *Hierarchical Regressions Predicting Observers' Empathic Feelings, and Validating Behaviors from Stoicism and Experimental Group*

	R^2	ΔR^2	F_Δ (df1,df2)	β	t
DV = Empathic Feelings	.10**	.10**	7.08 (2,125)**		
Step 1					
Group				.17*	2.04*
Pain Participant Stoicism				.26**	3.05**
Step 2	.10**	.003	0.40 (1,124)		
Group x Pain Participant Stoicism				.16	0.63
DV = Empathic Feelings					
Step 1	.11**	.11**	7.66 (2,125)		
Group				.19*	2.20*
Observer Stoicism				-.27**	-3.23**
Step 2	.12**	.008	1.10 (1,124)		
Group x Observer Stoicism				.27	1.05
DV = Validation					
Step 1	.17**	.17**	12.62 (2,125)		
Group				.10	1.19
Observer Stoicism				-.40**	-4.88**
Step 2	.002	.17**	0.32 (1,124)		
Group x Observer Stoicism				-.14	-0.56

N = 128
*$p < .05$; **$p < .01$

Exploratory Analyses: Gender differences

In addition to differences across experimental groups, data were analyzed for differences across pain participant gender. In both the acute and chronic pain literature, women consistently demonstrate poorer adjustment to pain, such as greater pain severity, physiological responses, and disability (Keefe et al., 2000; Reidy, Dimmick, MacDonald, & Zeichner, 2009). Additionally, previous research has noted gender differences in empathic feelings and behaviors (Rueckert & Naybar, 2008). ANOVAs were conducted to examine pain participant gender differences in the continuous study variables (Table 11). Female pain participants reported greater average pain, catastrophizing, and support entitlement, and lower stoicism, compared to male pain participants.

Table 11: *Exploratory Analyses – Gender Differences on All Study Variables*

Variable	Female Pain Participants		Male Pain Participants			
	Mean	SD	Mean	SD	F	p
Pain Participants						
Perspective Taking	16.50	4.43	16.48	4.59	0.00	.98
Overall Mean Pain Severity	6.44	1.42	5.81	1.34	6.51	.01
Feeling Understood	21.79	4.72	22.10	4.06	0.15	.70
Catastrophizing	45.97	24.61	32.21	18.69	-3.24†	.001
Support Entitlement	10.68	5.85	6.58	4.24	-3.91†	< .001
Stoicism	42.46	9.72	52.79	7.83	43.46	< .001
	Female Observers		Male Observers			
	Mean	SD	Mean	SD	F	p
Observers						
Perspective Taking	17.09	3.90	15.16	4.44	6.84	.01
Validation	1.39	0.66	0.97	0.67	13.01	< .001
Invalidation	1.30	0.71	1.30	0.81	0.00	1.00
Empathic Feelings	5.63	1.04	4.56	1.46	-4.42†	< .001
Distress	3.34	1.62	2.75	1.45	4.78	.03
Personal Distress	4.02	2.31	3.30	1.96	3.59	.06
Other-Oriented Distress	4.44	2.34	3.77	2.29	2.68	.10
Catastrophizing	60.05	22.10	45.38	22.80	13.683	< .001
Stoicism	41.57	11.39	50.01	7.24	-4.23†	< .001

Note: 66 female pain participants and 62 male pain participants; 64 female observers and 64 male observers; *df* for all F-tests is (1,126)
†Homogeneity of variance assumption violated; Mann-Whitney U test conducted and z-score is presented

There were also gender differences in the observer variables. Female observers were observed to be more validating during the pain task, and they also reported greater average empathic feelings, general distress, and catastrophizing. Chi-square analyses were conducted to determine if pain participant gender was related to whether or not pain participants reached a peak pain rating of 10, and whether or not the pain participant completed the full 4 minutes of the cold pressor task. Both tests were nonsignificant, indicating that the number of people who reached a peak pain rating of 10 ($\chi^2(1, n = 128) = 1.50$, $p = .22$) and the number of people who finished the task ($\chi^2(1, n = 128) = 3.04$, $p = .08$) were both equal across male and female pain participants.

Gender was explored as a moderator between the independent and dependent variables in the study's main hypotheses, for the overall study sample. One significant interaction was found between observer catastrophizing and observer gender in predicting observers' empathic feelings. Examination of the simple slopes revealed that, in both male and female observers, greater catastrophizing predicted greater empathic feelings; in male observers, however, the relationship was significantly stronger (see Figure 4). The main effects were also significant in this analysis. Gender did not significantly modify the relationship between any of the other study variables in the overall sample.

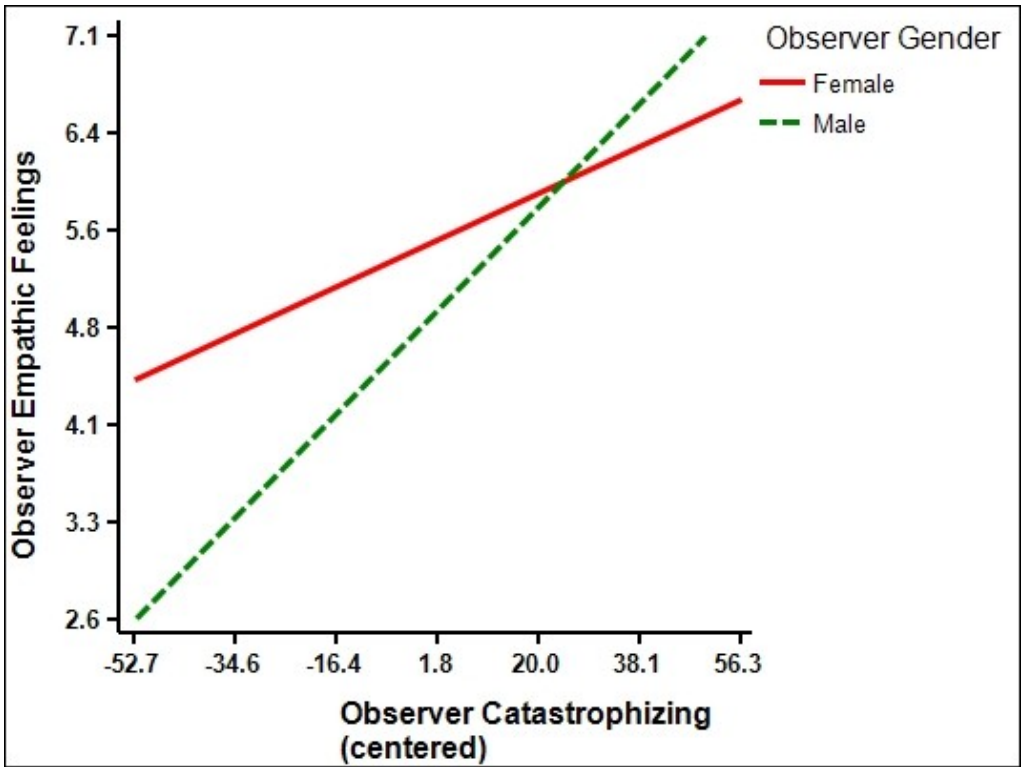

Figure 4: *The Relationship Between Empathic Feelings and Catastrophizing was Stronger in Male Observers than it was in Female Observers*

Given the numerous gender differences in mean levels of the independent and dependent variables, gender was explored as a moderator for the relationships between experimental groups and the dependent variables (pain, empathy feelings, feeling understood, and validation and invalidation behaviors). No significant moderation was found. Gender was also explored as a moderator for the relationships between experimental groups and other study independent variables (stoicism, catastrophizing, support entitlement). Again, no significant moderation was found.

CHAPTER 4

DISCUSSION

The purpose of this study was to determine whether experimentally manipulating observers' empathic feelings would ameliorate their romantic partner's pain experience, specifically, resulting in lower pain severity and greater pain tolerance. This study addresses discrepancies between the operant model's predictions and findings in pain research. Operant models predict that receiving empathy would reinforce pain behaviors and result in worse pain and pain behaviors, whereas ignoring pain behaviors would extinguish pain behaviors over time. In contrast, intimacy models predict that empathy promotes successful emotion regulation, greater intimacy, and less pain and distress. Non-empathic (e.g., punishing) behaviors have the opposite effect of increasing emotional dysregulation and interpersonal distance. Very few studies have examined acute pain in romantic couples or dyads (Brown et al., 2003; McClelland & McCubbin, 2008; Sambo et al., 2010), and none have incorporated a behavioral empathy induction manipulation. The main findings from this study provide new information regarding the impact empathy has on the pain experience, and support intimacy models of pain. I also examined factors in both pain participants and observers that predicted observers' empathic feelings and their delivery of empathic behaviors.

Can Empathy be Experimentally Manipulated?

There are multiple findings in this study which indicate that empathy was influenced by the experimental manipulation. Observers in the empathy group, who received a simple perspective-taking instruction, reported feeling more empathic towards their partners immediately after the completion of the cold pressor task,

compared to the observers in the control group. These results are consistent with previous studies that have also influenced empathic feelings successfully (Batson et al., 1997; Lamm et al., 2011; Ruby & Decety, 2004). Pain participants were also affected by the empathy manipulation: those in the empathy group reported feeling better understood by their partners immediately after the pain task, than the pain participants in the control group. These results suggest that the observers in the empathy group not only felt more empathic, but that they also conveyed their empathic feelings to the pain participants, who in turn reported feeling more understood.

Surprisingly, the empathy manipulation did not affect empathic behaviors observed during the cold pressor task. That is, there were no between-groups differences in objectively rated validation or invalidation behaviors. Thus, it appears that observers conveyed their empathic feelings to the pain participants in some unknown, unmeasured manner. The social support literature lends one explanation for the unexpected finding of participants feeling more understood in the empathy group with no observable increase in empathic behaviors. Though there is a well-established positive effect of social support, i.e., a positive relationship between perceptions of social support availability and better adjustment to stressful life events, there is also an abundance of studies that document that actually receiving support often has a null or an adverse effect (for a review, see Bolger, Zuckerman, & Kessler, 2000). To resolve this discrepancy, Bolger and colleagues posited that supportive interactions are likely to be most beneficial when they are accomplished without being visible to the recipient. Support may be "invisible" if the supporter acts so smoothly that the recipient is aware of the act but does not consciously recognize it as supportive. An example of this may

involve commenting on something positive about the recipient, unrelated to current issue. Additionally, the authors posited that there may be supportive acts that neither the provider nor recipient would themselves code as "support", which are indeed supportive, though they admit that this type of support may not be possible to identify objectively. Researchers have found evidence for invisible support, which predicts lower anxiety and depression in response to stressors (Bolger & Amarel, 2007; Bolger et al., 2000; Howland & Simpson, 2010). Invisible support behaviors may have been present, and may have helped pain participants in the empathy group feel more understood, but they would not have been captured with either the invalidation or validation codes used in this study. It is also possible that couples each have unique communication styles, which were then affected by the empathy manipulation. Pain participants may have been able to notice changes in the observers' empathic behaviors, based on their relationship history, that were not salient or visible to objective raters.

Another unexpected finding was that observers in the empathy group did not report greater distress for their partner. This specific type of distress has been shown to accompany empathic feelings towards a person who is in distress (Batson et al., 1997). In the overall sample, observers' empathic feelings were positively related to their feelings of other-oriented distress. In the empathy group, one factor may have mitigated how distressed observers became for their partners: the verbal ratings of pain severity. Pain participants in the empathy group reported lower pain, overall, which may have prevented observers in this group from becoming more distressed for them, despite having greater empathic feelings. Thus, to sum, there is evidence that empathy was

manipulated in the empathy group, but the consequences (i.e., observable behaviors and feelings of distress) of greater empathy were not affected as I hypothesized.

Stoicism, but not Observer Catastrophizing, Predicted Lower Empathic Feelings and Behaviors

Stoicism. My hypotheses that stoicism would moderate how empathic feelings and behaviors were affected by the experimental manipulation (i.e., how they were related to experimental group) were not supported. Additionally, the main effects between pain participant or observer stoicism and empathic feelings/behaviors were only partially consistent with my predictions. As expected, observers who reported greater stoic beliefs reported feeling less empathy towards the pain participant, and were coded as being less validating during the pain task. This finding is consistent with pain and empathy models which conceptualize observers' stoicism attitudes as a top-down process (i.e., the observer's knowledge and other dispositions) which hinder empathic feelings and behaviors (Goubert et al., 2005). Regarding pain participant stoicism, it was not related to observers' validating behaviors. A surprising finding was that pain participants who had stronger stoic attitudes had partners who reported feeling more empathy towards them after the pain task. This was not because pain participants with stoic attitudes were reporting higher pain ratings; rather, greater pain participant stoicism was related to lower pain ratings. The opposite relationship between pain participant stoicism and observer empathy was expected because those who are stoic provide less information to observers about the severity of pain or distress they experience (i.e., bottom-up processes), leaving observers less to empathize with. Interestingly, greater pain participant stoicism was also related to greater observer

perspective-taking (a measure of empathy). Both of these measures were collected at the onset of the study before any manipulation or pain task had occurred. These findings suggest that the positive relationship between pain participant's stoic attitudes and their partners' empathic feelings after the pain task may be a continuation of the existing paradigm in the relationship, or it could be that a person with a stoic partner has learned to "read into" more subtle or alternative cues about the person's inner experiences. Another way of interpreting this collection of findings about observer and pain participant stoicism is that the observers' own stoic attitudes were more influential, predicting both their empathic feelings and behaviors; the pain participants' stoicism predicted only observer feelings, and not observer behaviors.

Observer catastrophizing. My hypothesis that observer catastrophizing would be inversely related to validation was not supported; in fact, the opposite relationship was found. Additionally, observer catastrophizing was positively related to personal distress, but personal distress was unrelated to validation behaviors, indicating that personal distress did not mediate this relationship. These findings contradict theory and empirical findings of catastrophizing. Cano and colleagues (2005) proposed that a spouse who catastrophizes may be unable to meet their pain partner's intimacy needs because he/she is focused on pain, distress, and helplessness; in contrast, low-catastrophizing spouses may be better able to empathize, validate, and reassure their partners. Leonard and Cano (2006) confirmed that, in spouses of people with chronic pain, greater catastrophizing was related to greater depressive symptoms (a form of distress), but they did not examine empathic behaviors. Cano and colleagues (2012) found that spouses' catastrophizing and anxiety were both positively related to

responding with invalidation to their partners' expressions of pain-related distress during a discussion. In the current study, observers' catastrophizing was also strongly positively related to other-oriented distress and empathic feelings. Thus, in this study, observers' catastrophizing and personal distress did not interfere with their empathic feelings and behaviors, likely because it co-occurred with other-oriented distress which positively affects those factors. It is also possible that observers who catastrophized were attempting to alleviate their partners' and their own distress by validating them.

Observer Empathy Reduced Pain but not Pain Tolerance

Pain participants in the empathy group reported lower pain across several time points than those in the control group. This finding is consistent with emotion regulation and intimacy theories that view empathy as facilitating successful emotion regulation. As discussed, observers in the empathy group reported greater empathic feelings, but did not behaviorally manifest differences in validating/invalidating behaviors as defined by our coding system. It is, however, believed that observers in the empathy group did behave in meaningfully different ways than those in the control group, which caused reductions in pain participants' pain. The findings are consistent with previous research by Shenk and Fruzzetti (2011), who found that participants who were exposed to a stressor (in their study, mental mathematics) plus invalidating responses from the experimenter, experienced significantly higher levels of negative affect, heart rate, and skin conductance over time, when compared to participants exposed to validating experimenter responses. They concluded that validating responses minimized the effects of the stressor, and that validating responses promote emotion regulation in two ways: first, they minimize the frequency, intensity, and duration of negative affect,

making successful emotion regulation more likely; and second, they promote more disclosures of emotional states, which facilitates experiencing of an emotion, and provides more opportunities to learn skills for regulating them. The current study extends this model to beyond emotion regulation and autonomic activity to include lower pain as an outcome of validating responses.

Empathy may reduce pain by increasing the pain participant's acceptance of pain. Observer validating responses convey acceptance of another person's experience, and encourage the individual to accept and experience it, themselves. Within the chronic pain literature, there is research that indicates that greater acceptance of pain is associated with less pain, disability, depression, and pain-related anxiety (McCracken & Eccleston, 2003). In fact, these authors' data suggest that acceptance may have more utility than active coping does, for adjustment to chronic pain. Coping efforts may fail, bringing discouragement, frustration, and worsened problems; additionally, coping with an uncontrollable situation such as pain may be setting oneself up for failure. In contrast, acceptance of pain may increase one's general sense of self-control, in addition to decreasing fear and maladaptive avoidance of pain. In the current study, pain participants' acceptance of pain was not measured, and so firm conclusions cannot be drawn on whether or not observer empathy encouraged acceptance, which then helped to reduce pain. This idea may be examined in future research by incorporating measures of acceptance in both pain participants and in observers.

The between-groups differences in pain were not explained by the pain participants simply feeling better listened to and understood by the observers, as was

hypothesized. An alternative explanation for the reduction in pain in the empathy group may be found in research which incorporates biological and psychological processes to link together pain and empathy. There is evidence that physical and social pain overlap in their underlying neural circuitry and brain chemistry (for a review, see Eisenberger, 2012). Examples of social pain include experiences when a relationship is threatened or lost, or when one is rejected or evaluated negatively. Evidence which supports this theory includes the fact that analgesics (including opioids and over-the-counter pain medications) relieve both physical pain as well as hurt feelings and indices of social distress, such as distress calls by infants when they are separated from their mothers. Additionally, experiences of social pain are related to activity in the brain in the same areas which are associated with the affective component of physical pain (namely, the dorsal anterior cingulated cortex and the anterior insula), findings which are supported by imaging and lesion studies. Though these studies typically focus on social rejection, they can be applied to the current study: observer empathy and empathic behaviors represent the opposite of social rejection: social support, caring, and acceptance. Thus, the positive relationship between social pain and physical pain may explain why, in the current study, greater empathy was related to lower physical pain. The findings are also consistent with previous studies which have found that either viewing a picture of or holding the hand of a loved one leads to reductions in self-reported pain, as well as reductions in pain-related neural activity (Master et al., 2009; Younger, Aron, Parke, Chatterjee, & Mackey, 2010), when compared to using a stranger or an object.

Despite the finding that participants in the empathy group reported lower pain, there was no difference in pain tolerance (i.e., reaching the end of the task or not)

between groups. My results conflict with previous research on empathy and pain tolerance. Linton and colleagues (2012) conducted a study similar where participants completed a pain task four times, and they received either invalidating or validating responses from the experimenter between trials. They found that participants in the validation group had more positive affect and less worry than those in the invalidation group, but they did not find differences in pain ratings across groups. After participants believed the study was complete, they were asked if they would endure one additional pain trial in order to aid the experimenter. More than twice as many participants in the validation group agreed to do another trial, as compared to the invalidation group, indicating that they were willing to tolerate additional pain. Differences in methodology may explain the discrepancies in the findings; for instance, in the Linton and colleagues (2012) study, the dyad consisted of a participant and a researcher, versus romantic partners in my study. Additionally, participants' pain may have resolved by the time they were asked to re-do the extra pain task. In contrast, participants in my study were not offered the opportunity to re-attempt the pain task, and so it is unknown whether or not they would have demonstrated increased willingness to tolerate pain in this manner after their pain had resolved. Finally, in the current study, tolerance needed to be dichotomized into whether or not the pain participant completed the task, restricting the range of possible outcomes. And so, while empathy did not affect whether or not the pain participant completed the entire 4 min of the task, further investigations need to be conducted to understand why this would have occurred concurrently with a reduced pain severity experience, and whether other indices of pain tolerance may have shown different results. It appears that empathy may not be a simple, positive influence on

pain; while it may reduce pain for people who are willing to endure a pain task, it may also encourage some people to escape their pain, rather than to persist. Indeed, there may be moderators which have yet to be determined, which will predict for whom and when empathy helps a person tolerate pain.

Pain Participant Catastrophizing and Observer Invalidation were Related to Pain and Pain Tolerance

Additional analyses were conducted to examine factors related to pain and pain tolerance in the overall sample of participants. My hypotheses that pain participant catastrophizing would interact with observer validation in predicting pain and pain tolerance were not supported. Instead, only catastrophizing was a main effect, predicting greater mean pain, greater peak pain, and lower pain tolerance. These findings are consistent with the research on catastrophizing, which describes people who tend to catastrophize as having greater difficulty suppressing or diverting their attention away from pain-related thoughts, thus, having greater difficulty successfully coping with pain (Eccleston & Crombez, 1999). The fact that pain catastrophizing did not moderate how validation was related to pain severity and tolerance, meant that my hypothesis that empathy may inadvertently maintain a person’s focus on pain, resulting in greater distress only when the person is already predisposed to do so, was not supported.

When similar analyses were conducted with observer invalidation as a predictor, there was no interaction between invalidation and pain participants' catastrophizing. Catastrophizing continued to have a main effect on mean pain, peak pain, and pain tolerance. Invalidation predicted greater mean and peak pain, which was expected, but

it also predicted greater pain tolerance, which was unexpected. As discussed, the positive relationship between invalidation and pain severity may be explained by overlapping neural structures and mechanisms between social and physical pain (Eisenberger, 2012). Indeed, invalidation in this study involved being socially rejected via punishment or ignoring by one's romantic partner, which appeared to exacerbate physical pain in the overall sample. It is less clear why invalidation was positively related to pain tolerance. Recall that invalidation behaviors were occurring at the same time that the pain participant completed the pain task; thus, the direction of the relationship between them is unclear at this point. Theoretically, it makes more sense for a longer pain tolerance relating to greater opportunities for invalidation, rather than invalidation motivating pain participants to persist in the task, especially given that invalidation predicted greater pain severity in this sample. Indeed, it appears that the observers may have been more invalidating at the end of the pain task than at the beginning, possibly because observers were experiencing their own anxiety or even annoyance with their partner (Cano et al., 2012) as the task went on. Though I used a global coding of invalidation that does not document when invalidating behaviors occurred, there were some indications in the data that invalidating responses were more likely to occur later in the task. For instance, the lowest possible rating of invalidation ("Not at all Invalidating") was only coded for 16 couples (out of 128), 12 of which did not last past the first minute of the task, and only three of which reached the end at 4 min. The highest possible rating of invalidation ("Greatly Invalidating") was only coded for seven couples; of these, four completed the entire 4 min pain task. These results parallel those of Cano and colleagues (2012) who found that spouses of people with pain expressed

invalidation after other strategies were attempted, suggesting that they became frustrated after repeated exposures to their spouse's distress about pain.

Exploratory Analyses: Gender as a Moderator

Exploratory analyses were conducted to determine whether gender moderated the relationships between the independent and dependent variables in the study's main hypotheses, for the overall study sample. A single significant interaction was found between observer catastrophizing and observer gender in predicting observers' empathic feelings. In both male and female observers, greater catastrophizing predicted greater empathic feelings, but the relationship was significantly stronger in male observers. This may be because women in the study had an overall higher baseline level of empathy than men (a finding consistent with the empathy literature, see Eisenberg & Lennon, 1983, for a review), and so it was not as strongly impacted by their catastrophizing. Gender did not significantly modify the relationship between any of the other study variables in the overall sample.

Strengths, Limitations, and Future Directions

This study had several strengths, including randomization to the empathy or control groups and multi-method, multi-rater assessments, including self-report and behavioral measures. There was evidence that the manipulation was successful in affecting both observers and the pain participants in the expected directions. These advantages bolster the conclusions made about the effects of the empathy manipulation on pain. Still, there are methodological constraints that are important to note. First, although experimentally inducing pain is a useful methodology with many advantages, there were some external validity limitations that must be considered. Experimental pain

procedures are inherently free from the complex social and environmental conditions in which chronic pain develops and prevails. Chronic pain is also associated with different suffering, interference, and meaning to people with pain, than experimentally induced pain in the laboratory. For instance, experimental pain is predictable; experimental participants are assured that no tissue damage is taking place; and they typically have control over when the stimulation stops. Clinical pain (both chronic and acute), in contrast, is often unpredictable, it may be associated with tissue damage, and it is usually outside of the person's control. Additionally, pain participants rated aloud how much pain they were experiencing at regular intervals, when observers were present, giving them information on the pain. In day-to-day experiences, observers have to rely on other cues to assess how much pain their partners are experiencing, such as facial expressions, statements of distress, paraverbalizations (e.g., grunts, sighs), or bodily movements such as stretching or limping. Observers may over- or under-estimate their partners' pain, depending on a variety of factors (Hadjistavropoulos et al., 2011), which could then affect their empathic feelings and responses. Together, these factors may reduce the generalizability of the findings for people with clinical pain conditions.

A second limitation involves the timing of the administration of the measures. During the pain task, many things were occurring simultaneously: pain participants were experiencing and reporting their pain, while the observers were experiencing and expressing empathy. Thus, it is possible that these factors had bidirectional relationships with each other, and the directions of the effects are difficult to elucidate. For example, though observer empathy affected pain (which can be inferred based on the experimental design), the pain ratings may have in turn affected the observers'

feelings of empathy. Additionally, many of the measures that were completed after the pain task were for constructs which occurred during the task, but could not be assessed at that time, including pain participants' feeling understood and catastrophizing, and observers' empathic feelings and catastrophizing. Though, theoretically, such thoughts and feelings were affecting the study participants during the pain task itself, it is contraindicated to analyze the follow-up surveys as predictors of something that occurred earlier on in the study. Because of this limitation, I was not able to conduct all of the mediation analyses that were planned. This may be somewhat addressed in future studies by incorporating some of the measures into the baseline data, and by repeating them after the task. This would allow me to compare changes in the constructs following the manipulation and/or the pain task, and also to control for baseline levels.

Third, there was some selection bias in the current study. Undergraduate participants were informed, before signing up, that either they or their partner would be completing a pain task as a part of the study. It is likely that some people who were highly fearful or aversive to pain would have self-selected themselves out from participating in the study. Still, we had a large range of responses to both pain severity and pain adjustment indices which do not suggest a problem with restriction of range on these measures.

Finally, a question remains about how observers' behaviors were manipulated. We did not find observable differences in their validating or invalidating (i.e., empathic or unempathic) behaviors, despite using a reliable and valid coding system, and also finding that pain participants were somehow affected by the observers. One possibility

is that couples have their own idiosyncratic communication styles, which were then affected by the empathy manipulation. The way in which they were affected, however, was not captured in the single episode of behavioral observation. Perhaps including a baseline conversation task would have allowed us to determine whether or not the empathy manipulation resulted in a change in VIBCS codes. Another way to collect this information may have been to ask the participants to qualitatively describe what their partner did during the task that was helpful/not helpful, supportive/hurtful, etc., at the end of the study. Finally, rather than using a global rating of validating and invalidating behaviors during the overall interaction, using a finer coding system to code individual behaviors may shed light on between-groups differences in the interactions. Another advantage of that strategy is that both longitudinal and sequential analyses could be completed on the data.

Continued work is needed to clarify how empathy, empathic behaviors, and pain relate to each other in a social context. Future studies can build upon this work by using different dyad groups (e.g., friends, strangers), or by adding experimental conditions. For instance, in my study, I had an empathy group and a control (neutral) group. It would be interesting to include an "empathy-reducing" manipulation, in an attempt to study the effects of nonempathic feelings and behaviors, specifically. Adding additional physiological measures such as heart rate or skin conductance, or even imaging, would also provide useful information in understanding the pain experience and the effects of empathy. Continued research in this area needs to be conducted to determine for whom empathy is most helpful, and how empathic feelings are communicated to a person who is in pain.

Clinical Implications and Conclusions

In the current study, a very brief empathy induction not only helped observers to feel more empathy, but it also helped their romantic partners to report less severe ratings of acute pain. Additionally, both pain participant and observer characteristics affected one's ability to cope with acute pain and to experience and express empathy. There are several clinical applications of this work. First and foremost, this study supports the notion that interventions can be aimed not only at the individual with pain, but also at his/her romantic partner. Such interventions affect the couple's feelings and interpersonal interactions, which then affect the experience of pain. Empathy was helpful and it was simple to induce, at least temporarily, without the need for lengthy training or therapy sessions. Romantic partners and other people, such as medical professionals, can easily be reminded to take the perspective of a person who has pain. This will increase their empathic feelings, which in turn, will facilitate the person in pain in regulating their pain experience. Doctor communication skills such as empathy have also been shown to improve adherence with treatment recommendations (Ong, de Haes, Hoos, & Lammes, 1995).

In the current study, we did not assess relationship satisfaction, and so we did not examine whether or not general relationship satisfaction was affected by the experimental manipulation. Couples who endure chronic pain often also experience declines in marital satisfaction (Leonard et al., 2006). Research in the marital literature has highlighted the importance of empathy and validation in promoting marital satisfaction (Gottman, 1979; Long, Angera, Carter, Nakamoto, & Kalso, 1999). Helping couples have more empathic feelings and interactions may not only help with their pain,

but may also concurrently increase their intimacy and relationship satisfaction. Another focus of attention for people who help or support individuals with pain is pain stoicism. More intense pain stoicism in the observers hindered their empathic feelings and behaviors towards their partners, who were experiencing pain. People with high stoicism may face greater risks for relationship distress, related to less empathic interactions towards a partner who is in pain. Additional research on pain stoicism would be beneficial in clarifying the clinical correlates and consequences of these attitudes.

The current findings suggest that social interactions concerning pain should be conceptualized from an intimacy process model of interaction (Cano & Williams, 2010). That is, empathy for a person in pain helps them in many domains, and may not simply reinforce maladaptive pain coping behaviors. Validation promotes intimacy between people, particularly in response to emotional self-disclosures (e.g., disclosures of distress and pain). In contrast, the operant model discourages these responses in order to avoid reinforcing pain and pain behaviors. The results support Newton-John's (2002) criticisms of using solicitousness alone to examine pain couples' interactions. The behavioral model of chronic pain is not sufficient to explain the findings in this study. I examined the consequences of observers' behaviors, and my findings did not indicate that validation had any positive reinforcement value, which supports the notion that validation and solicitousness are independent constructs. Invalidation (a form of punishment) was related to greater pain severity, while observers' empathic feelings were related to less severe pain. These data are more consistent with conceptualizing observer behaviors in terms of emotional valence, rather than in terms of reinforcement.

Observers provide emotional responses which help or hinder pain participants' emotion regulation.

This work represents a promising step towards practically enhancing both interventions and everyday interactions for individuals and couples who experience pain. In summary, a brief and simple empathy manipulation for observers helped their partners experience less pain and also feel better understood. The reduction in pain across experimental groups was comparable to the effect sizes of medications that are effective in treating acute and chronic low back pain (i.e., nonsteroidal anti-inflammatory drugs, acetaminophen, skeletal muscle relaxants, and tricyclic antidepressants; Chou & Huffman, 2007), with the "side effect" of helping the person feel better understood. This study's findings highlight the need to continue to investigate interpersonal factors and processes as a means to develop simple, safe, low-cost, and effective interventions for people who experience pain.

APPENDIX A

DEMOGRAPHICS

Answer Selection: Correct = ● Incorrect = ⊗ ✓ ⊖

1. Gender: Ⓕ Female
   Ⓜ Male

2. Age: ☐☐ years
   ⓪
   ① ①
   ② ②
   ③ ③
   ④ ④
   ⑤ ⑤
   ⑥ ⑥
   ⑦ ⑦
   ⑧ ⑧
   ⑨ ⑨

3. Do you identify as:

O	African American	O	Asian
O	Caucasian	O	Hispanic/Latino
O	Native American	O	Mixed
O	Arab	O	Other: _____

4. Indicate your **current/highest** level of education:

Elementary:	① ② ③ ④ ⑤ ⑥
Junior High:	⑦ ⑧ ⑨
Senior High:	⑩ ⑪ ⑫
College:	① ② ③ ④
Graduate School:	① ② ③ ④ +

5. Relationship Status:

   O Dating
   O Cohabitating
   O Engaged
   O Married

6. How long have you been together with your partner?

   ☐☐ years, ☐☐ months.

	⓪		⓪
①	①	①	①
②	②		②
③	③		③
④	④		④
⑤	⑤		⑤
⑥	⑥		⑥
⑦	⑦		⑦
⑧	⑧		⑧
⑨	⑨		⑨

7. Current employment status (check all that apply):
   O Student
   O Part-Time Employed
   O Full-Time Employed
   O Unemployed (not by choice)
   O Unemployed (by choice e.g., homemaker)
   O Disability
   O Retired
   O Worker's Compensation
   O Other: _____

APPENDIX B

INTERPERSONAL REACTIVITY INDEX FOR COUPLES (IRIC)

Instructions: The following statements inquire about your thoughts and feelings in a variety of situations occurring in your relationship with your partner. For each item, indicate how well it describes you by circling the appropriate number.

	Does *not* describe me well 0	1	2	3	Describes me very well 4
1. I often have tender, concerned feelings for my partner when he/she is less fortunate than me.	O	O	O	O	O
2. Sometimes I don't feel very sorry for my partner when he/she is having problems.	O	O	O	O	O
3. I try to look at my partner's side of a disagreement before I make a decision.	O	O	O	O	O
4. When I see my partner being taken advantage of, I feel kind of protective towards him/her.	O	O	O	O	O
5. I sometimes try to understand my partner better by imagining how things look from his/her perspective.	O	O	O	O	O
6. My partner's misfortunes do not usually disturb me a great deal.	O	O	O	O	O
7. If I'm sure I'm right about something, I don't waste much time listening to my partner's arguments.	O	O	O	O	O
8. When I see my partner being treated unfairly, I sometimes don't feel much pity for him/her.	O	O	O	O	O
9. I am often quite touched by things I see happen in my relationship.	O	O	O	O	O
10. In my relationship, I believe that there are two sides to every question and I try to look at them both.	O	O	O	O	O
11. In my relationship with my partner, I would describe myself as a pretty soft-hearted person.	O	O	O	O	O
12. When I'm upset at my partner, I usually try to "put myself in his/her shoes" for a while.	O	O	O	O	O
13. Before criticizing my partner, I try to imagine how I would feel if I were in his/her place.	O	O	O	O	O

APPENDIX C

PAIN ATTITUDES QUESTIONNAIRE, REVISED (PAQ-R)

Instructions: Rate how much you agree or disagree with each statement below.

	Strongly Disagree				Strongly Agree
1. When I am in pain I should keep it to myself.	O	O	O	O	O
2. I keep a 'stiff upper lip' when I am in pain.	O	O	O	O	O
3. I think I can tolerate more pain than other people.	O	O	O	O	O
4. I think I can control my pain better than other people.	O	O	O	O	O
5. I am seldom emotional about pain.	O	O	O	O	O
6. I do not see any good in complaining when I am in pain.	O	O	O	O	O
7. I go on as if nothing has happened when I am in pain.	O	O	O	O	O
8. I maintain my pride when I am in pain.	O	O	O	O	O
9. I have good control over my pain compared to others.	O	O	O	O	O
10. I make light of pain; I refuse to get too serious about it when in pain.	O	O	O	O	O
11. Relative to other people, I am not as emotional when in pain.	O	O	O	O	O
12. I get on with life despite being in pain.	O	O	O	O	O
13. I hide my pain from others.	O	O	O	O	O
14. I think I can endure more pain than other people.	O	O	O	O	O

APPENDIX D

PAIN SEVERITY RATINGS

Completed by Research Assistant

Participant puts his/her hand in the water:	No rating										
1. 10 seconds	0	1	2	3	4	5	6	7	8	9	10
2. 20 seconds	0	1	2	3	4	5	6	7	8	9	10
3. 30 seconds	0	1	2	3	4	5	6	7	8	9	10
4. 40 seconds	0	1	2	3	4	5	6	7	8	9	10
5. 50 seconds	0	1	2	3	4	5	6	7	8	9	10
6. 60 seconds (1 minute)	0	1	2	3	4	5	6	7	8	9	10
7. 1 minute, 20 seconds	0	1	2	3	4	5	6	7	8	9	10
8. 1 minute, 40 seconds	0	1	2	3	4	5	6	7	8	9	10
9. 2 minutes	0	1	2	3	4	5	6	7	8	9	10
10. 2 minutes, 20 seconds	0	1	2	3	4	5	6	7	8	9	10
11. 2 minutes, 40 seconds	0	1	2	3	4	5	6	7	8	9	10
12. 3 minutes	0	1	2	3	4	5	6	7	8	9	10
13. 3 minutes, 20 seconds	0	1	2	3	4	5	6	7	8	9	10
14. 3 minutes, 40 seconds	0	1	2	3	4	5	6	7	8	9	10
15. 4 minutes	0	1	2	3	4	5	6	7	8	9	10

Total Time: ☐☐☐ seconds.

0	0	0
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9

APPENDIX E

INTERACTION RECORD FORM, PAIN PARTICIPANT (IRF-P)

***Please indicate how true the following statements are, SPECIFIC TO THIS INTERACTION*:**	Not at all true	Not very true	Moderately true	Very true
1. I told my partner about my feelings or emotions.	O	O	O	O
2. My partner listened attentively during this interaction.	O	O	O	O
3. The interaction felt pleasant.	O	O	O	O
4. I shared something personal or private during this interaction.	O	O	O	O
5. I feel closer to my partner following this interaction.	O	O	O	O
6. I was critical of my partner.	O	O	O	O
7. I felt safe and comfortable opening up to my partner.	O	O	O	O
8. I feel more distant to my partner following this interaction.	O	O	O	O
9. My partner expressed positive feelings toward me.	O	O	O	O
10. During the interaction, I felt anxious, like I was walking on eggshells.	O	O	O	O
11. We quarreled during this interaction.	O	O	O	O
12. I expressed a need, wish, or want.	O	O	O	O
13. My partner was supportive and caring during the interaction.	O	O	O	O
14. This interaction felt intimate.	O	O	O	O
15. My partner understood me.	O	O	O	O
16. My partner was critical of me.	O	O	O	O
17. It was difficult for me to open up to my partner.	O	O	O	O
18. I felt validated by my partner during this interaction.	O	O	O	O
19. I felt accepted by my partner during this interaction.	O	O	O	O
20. I felt cared for by my partner during this interaction.	O	O	O	O
21. I felt understood by my partner during this interaction.	O	O	O	O

APPENDIX F

PAIN CATASTROPHIZING SCALE (PCS)

	No pain at all										A lot of pain
1. How much pain do you have at this moment?	0	1	2	3	4	5	6	7	8	9	10
2. How much pain did you have in general (average level of pain) during the task?	0	1	2	3	4	5	6	7	8	9	10
3. What was the worst pain you experienced during the task?	0	1	2	3	4	5	6	7	8	9	10

	Extremely Unpleasant										Extremely Pleasant
4. How unpleasant was the cold water task?	-5	-4	-3	-2	-1	0	1	2	3	4	5
	O	O	O	O	O	O	O	O	O	O	O

During the task, to what extent…	Not at all										Very Much
5. …did you keep thinking about how much pain the test caused?	0	1	2	3	4	5	6	7	8	9	10
6. …did you think that something serious might have happened because of the pain?	0	1	2	3	4	5	6	7	8	9	10
7. …did you think of other painful sensations or experiences?	0	1	2	3	4	5	6	7	8	9	10

During the task, to what extent…

8. …were you unable to stand doing the task, because of the pain?	I was definitely able to stand the pain	0	1	2	3	4	5	6	7	8	9	10	I definitely was *not* able to stand the pain
9. …did you think that there was *nothing you could do* to reduce the pain during the task?	I definitely thought there was something I could do	0	1	2	3	4	5	6	7	8	9	10	I definitely thought there was *nothing* I could do
10. …were you unable to keep the pain out of your mind?	I definitely was able to keep it out of my mind	0	1	2	3	4	5	6	7	8	9	10	I definitely was *not* able to keep it out of my mind

During the task, to what extent…	Not at all										Very much
11. …did you become afraid that the pain would get worse?	0	1	2	3	4	5	6	7	8	9	10
12. …did you experience the pain as awful and were overwhelmed by the pain?	0	1	2	3	4	5	6	7	8	9	10
13. …did you anxiously want the pain to go away?	0	1	2	3	4	5	6	7	8	9	10

	Not at all										Very much
14. How threatening do you consider the cold water task?	0	1	2	3	4	5	6	7	8	9	10

APPENDIX G

PAIN CATASTROPHIZING SCALE – SIGNIFICANT OTHER VERSION (PCS-S)

1. How much pain do you think your partner has at this moment?

⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

2. How much pain do you think your partner had in general (average level of pain) during the task?

⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

3. What was the worst pain that your partner experienced during the task?

⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

4. To what extent did your partner consider the task unpleasant?

⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

5. How threatening do you think your partner considers the cold water task?

⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

During the task, to what extent…

6. …did you keep thinking about how much the task hurt your partner?

⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

7. …did you think that something serious might have happened to your partner during the task because of the pain?

⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

8. … did you keep thinking about other painful situations or experiences?

⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

9. …were you unable to stand watching the task, because of your partner's pain?

⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

10. …did you think that there was nothing your partner could do to stop his/her pain during the task?

⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

11. ...were you not able to keep your partner's pain out of your mind?

0 1 2 3 4 5 6 7 8 9 10

12. …did you become afraid that the pain would get worse?

0 1 2 3 4 5 6 7 8 9 10

13. …did you experience observing the pain as awful and overwhelming?

0 1 2 3 4 5 6 7 8 9 10

14. …did you wish for your partner's pain to go away?

0 1 2 3 4 5 6 7 8 9 10

15. …did you want your partner to end his/her participation earlier?

0 1 2 3 4 5 6 7 8 9 10

16. …how threatening do you consider the cold water task?

0 1 2 3 4 5 6 7 8 9 10

APPENDIX H

SURVEY OF PAIN ATTITUDES (SOPA)

Instructions: Please indicate how much you agree with each of the following statements about your pain *during the cold water task* by using the following scale:

	Very untrue for me	Somewhat untrue for me	Neither true nor untrue for me (or does not apply)	Somewhat true for me	Very true for me
1. My partner did not understand how much pain I was in.	O	O	O	O	O
2. When I hurt, I wanted my partner to treat me better	O	O	O	O	O
3. When I was hurting, my partner should have treated me with care and concern.	O	O	O	O	O
4. It was the responsibility of my partner to help me when I felt pain.	O	O	O	O	O
5. My partner needs to learn to take better care of me when I am in pain.	O	O	O	O	O
6. I needed more tender loving care than I received when I was in pain.	O	O	O	O	O

APPENDIX I

EMOTIONAL REACTION QUESTIONNAIRE (ERQ)

Using the scale below, estimate to what extent each item describes your feelings during the cold water task by filling in the appropriate number.

	Not At All						Extremely
	1	2	3	4	5	6	7
1. Sympathetic	O	O	O	O	O	O	O
2. Softhearted	O	O	O	O	O	O	O
3. Warm	O	O	O	O	O	O	O
4. Compassionate	O	O	O	O	O	O	O
5. Tender	O	O	O	O	O	O	O
6. Moved	O	O	O	O	O	O	O
7. Alarmed	O	O	O	O	O	O	O
8. Grieved	O	O	O	O	O	O	O
9. Troubled	O	O	O	O	O	O	O
10. Distressed	O	O	O	O	O	O	O
11. Upset	O	O	O	O	O	O	O
12. Disturbed	O	O	O	O	O	O	O
13. Worried	O	O	O	O	O	O	O
14. Perturbed	O	O	O	O	O	O	O

You can feel *directly distressed*, as you might when you have a bad experience, and you can be *distressed for* someone else who has a bad experience, as when a person fails to succeed on a task or experiences pain. Each of these emotions may be described as distress, but they are different types of distress.

Please indicate the degree you felt the following reactions *directly*, as you might when you have a bad experience, during the cold water task:

	Not at All								Extremely
	1	2	3	4	5	6	7	8	9
1. Alarmed	O	O	O	O	O	O	O	O	O
2. Grieved	O	O	O	O	O	O	O	O	O
3. Troubled	O	O	O	O	O	O	O	O	O
4. Distressed	O	O	O	O	O	O	O	O	O
5. Upset	O	O	O	O	O	O	O	O	O
6. Disturbed	O	O	O	O	O	O	O	O	O
7. Worried	O	O	O	O	O	O	O	O	O
8. Perturbed	O	O	O	O	O	O	O	O	O

Now, please indicate the degree you felt the following reactions *for your partner* during the cold water task:

	Not at All								Extremely
	1	2	3	4	5	6	7	8	9
1. Alarmed	O	O	O	O	O	O	O	O	O
2. Grieved	O	O	O	O	O	O	O	O	O
3. Troubled	O	O	O	O	O	O	O	O	O
4. Distressed	O	O	O	O	O	O	O	O	O
5. Upset	O	O	O	O	O	O	O	O	O
6. Disturbed	O	O	O	O	O	O	O	O	O
7. Worried	O	O	O	O	O	O	O	O	O
8. Perturbed	O	O	O	O	O	O	O	O	O

APPENDIX J

VALIDATION AND INVALIDATION CODING SHEET

Couple #:_____ Rater initials:_____

Please provide ratings of the observer (not the cold pressor participant) by circling the appropriate number.

What is your assessment of the observer's **VALIDATION**?

0	1	2	3
Not at all Validating	Minimally Validating	Moderately Validating	Greatly Validating

Why did you give this rating?

What is your assessment of the observer's **INVALIDATION?**

0	1	2	3
Not at all Invalidating	Minimally Invalidating	Moderately Invalidating	Greatly Invalidating

Why did you give this rating?

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ABSTRACT

DOES EMPATHY PROMOTE EMOTION REGULATION IN THE CONTEXT OF PAIN? AN EXPERIMENTAL INVESTIGATION

by

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Advisor: Dr. Annmarie Cano

Major: Psychology (Clinical)

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The purpose of this study was to determine the extent to which a perspective-taking instruction would promote empathic behaviors in couples, resulting in better emotion regulation and greater pain tolerance during a cold pressor task. Based on empathy and intimacy theories, it was expected that observers who were instructed to take the perspective of their partner would feel and express more empathy, and that their partners would have better pain and pain tolerance compared to a control group. A sample of 128 undergraduate romantic couples participated where one partner was randomly assigned to complete the cold pressor task while the other partner sat close by and observed/interacted freely. Couples were first randomly assigned to: a) an empathy group in which observers were privately instructed to take the perspective of the pain participant (n = 65), or b) a control group in which observers received only a description of the task (n = 63). Trained raters coded empathic and nonempathic observer behaviors during the pain task. Despite the fact that observers in the empathy group reported feeling greater empathy and concern, they did not demonstrate greater

empathic behaviors during the task. Still, they communicated their empathy to pain participants, as pain participants in the empathy group reported both significantly lower pain severity and feeling more understood than did those in the control group. When collapsing across groups, pain participant catastrophizing and observer invalidation were related to greater pain severity, but in different ways. Observers with greater stoic beliefs felt and behaved less empathically. The results of this study support theories of couples emotion regulation and intimacy in conceptualizing pain couples' interpersonal interactions: empathy for pain is an intimacy-enhancing behavior which is related to improved pain. The empathy manipulation was simple, brief, and effective. Interventions for pain should aim to increase partners' empathic behaviors to support successful emotion regulation in the face of pain. These results can also be applied to other individuals who interact with people with pain, such as medical professionals.

AUTOBIOGRAPHICAL STATEMENT

Laura Leong was born and raised in Thornhill, Ontario, Canada. She has led a happy life which has been composed of a string of serendipitous events and occasions. After focusing on mathematics and science courses in high school, she enrolled at Queen's University as a Biology major. She was immediately drawn to the material in her Introduction to Psychology course and promptly switched majors (a fact that her Engineer father did not discover until he could not locate her name in the Convocation program in the Bachelor of Science section). While volunteering at the Sexual Assault Centre Kingston during her second year, she learned about sexual assault and abuse, legal issues, crisis intervention, and therapy. She was amazed by the counselors who were helping people recover from traumatic events, and she became eager to learn more about how these counselors succeeded at their work. As a result, she applied to Clinical Psychology programs and was fortunate to be accepted to Wayne State University (WSU), working with Dr. Annmarie Cano to conduct research on pain and interpersonal relationships.

As a graduate student, Laura developed and honed her interests in research, teaching, and clinical work. She was a practicum student for one year at the Center for Forensic Psychiatry, a state-run psychiatric hospital where she learned about the challenging but highly rewarding task of working with people who have severe mental illnesses and concurrent legal issues (e.g., after a successful Not Guilty by Reason of Insanity plea). For two years, she worked as a teaching assistant at the WSU Psychology Clinic, which included teaching and supervising junior graduate students in psychological assessment and therapy. For her pre-doctoral internship, she matched at the historic Saint Elizabeths Hospital in Washington, DC (formerly known as the Government Hospital for the Insane), which solidified her interest in pursuing a career in forensic psychology. Following graduation, she will move back home to Toronto and begin a post-doctoral position at the Ontario Shores Centre for Mental Health Sciences. She is looking forward to being closer to her family.

In her spare time, Laura enjoys cooking, traveling, trivia, games, obscure humor, reading, and 5-pin bowling.