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Perception of Pain in Self and Others

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Abstract

Prior research shows that people who are in neutral emotional states underestimate the impact of emotional arousal on their own and others' behavior, an emotional empathy gap. I investigated empathy gaps in judgments of and behavior regarding painful experiences, for both oneself and another person. In two studies, participants completed a sample experience of a Cold Pressor Test (CPT), submerging their hand in ice-cold water for 0, 5, 30, or 90 seconds. Participants in Study 1 then predicted the pain they or others would feel during future CPTs of varying intervals (from 15-sec to 3-min) and indicated how much money they (or others) would have to be paid to complete each interval of a CPT. In study 2, participants made a series of behavioral decisions about completing a 2 minute CPT for $10. Study 1 provided evidence for both interpersonal (by comparing self and other ratings) and intrapersonal (by comparing 30-sec experience ratings and 0-sec experience ratings) empathy gaps in that participants rated a future CPT as more painful and requiring more compensation for themselves or when they had previously completed a 30-sec sample experience. In Study 2, participants who attempted a 90-second CPT sample experience were able to make more rational choices about a future CPT, demonstrating smaller intrapersonal empathy gaps after a highly salient pain experience. These results suggest that people experience emotional empathy gaps in predictions of pain and in their behavioral choices about a future painful experience.

Perception of Pain In Self and Others

Empathy gaps occur when people make judgments about a different affective state than the state they are currently in. The focus of this paper will be on 'cold' to 'hot' empathy gaps, which occur when people in a neutral or 'cold' emotional state underestimate how they would feel in a 'hot' emotional state, an affectively aroused state (i.e. mad, hungry or anxious etc.). For example, people who have just eaten would likely underestimate the impact of being hungry in the future because they are satiated in the present. Empathy gaps have been illustrated in many domains such as thirst (Van Boven & Loewenstein, 2003), fear (Van Boven, Loewenstein, & Dunning, 2005), hunger (Nordgreen, van der Pligt, & van Harreveld, 2007), embarrassment (Van Boven, Loewenstein, Welch, & Dunning, 2010), and addiction (Giordano et al., 2002).

In one demonstration of empathy gaps, Van Boven and Loewenstein (2003) recruited participants at a gym who were just beginning their work out or just ending their work out, asking them a set of questions about being lost in the woods without food or water. Participants were asked if lack of food or water would be more unpleasant to the stranded hikers and if the hikers likely regretted not bringing extra food or extra water. The participants who had just finished working out (and were likely in a 'hot' emotional state of thirst) said that lack of water would be more unpleasant and regrettable than participants who were just beginning their workout and were in a colder emotional state with regard to thirst. Pre-workout participants underestimated how they would feel if they were stranded and thirsty in the woods. This could have negative consequences if when packing for a hiking trip (in a cool, non-thirsty emotional state) a person makes a decision to bring less water due to the inability to appropriately simulate future feelings of thirst. It would be advantageous to be able to accurately predict one's judgments and behavior in an emotional situation and to be able to plan accordingly.

Degree of Exposure to an Emotional State

It is important to consider how prior exposure to an emotional state changes future judgments about that state. Minimal exposure to an emotional state likely has some impact on future judgments for that emotional state, over and above no exposure. On the other hand, more salient or extensive exposure to an emotional state may be necessary to significantly affect judgmental outcomes. I was interested in learning how the degree of exposure to an emotional state affects judgments and behaviors. A hiker who forgets to bring water on a 3-hour hike would be likely act differently on a future hike than a hiker who forgets to bring water on a 30-minute hike. The first experience of being without water for a 3-hour hike is more emotionally salient. I would hypothesize that the hiker who was without water for 3-hours would be more likely to bring water on a future hike because of a greater degree of exposure to the emotional state of thirst.

Why Is Understanding Pain Perception Important?

People are often required to make judgments and predictions about their own and others' physical pain. For example, when visiting the emergency room after breaking a bone one must accurately describe the pain when the injury happened, and describe current levels pain to a doctor in order to receive appropriate medical attention. Likewise, a doctor has to judge the pain of a patient in order to prescribe appropriate pain medication and proceed with the appropriate treatment. One is also required to make judgments about the future effects of pain, such as deciding whether or not to go skiing soon after breaking a bone. However, it is difficult to simulate feelings of pain when one is not in that state, making judgments about pain harder than they may seem. Another reason empathy gaps are of interest is because of their potential impact in the medical community. Doctors are usually in unemotional or 'cool' states when they treat

their patients. Empathy gaps could be one contributing factor to why pain medication is often under prescribed and doctors and patients disagree about their judgments of pain (Bernabei et al., 1998; Cleeland, 1998; Kenny, Trevorrow, Heard, & Faunce, 2006; Staton et al., 2007).

Past Research

Although empathy gaps have been demonstrated in many domains they have received less attention in the domain of pain perception (Loewenstein, 1996). One study by Read and Loewenstein (1999) has demonstrated empathy gaps in pain perception. In this study, some participants experienced a sample cold pressor test (submerging non-dominant hand in 32°F water) for 30-seconds while other participants did not experience the cold pressor test. This experience with the cold pressor test induced the 30-sec participants to be an affectively 'hot' state, while the 0-sec participants where in an affectively 'cold' state. Participants reported how much they would have to be paid ($1, $3, or $5) to complete a future cold pressor test ranging in length from 1 minute to 9 minutes, referred to as WTA ratings. Participants reported declining WTA (requiring more money to complete a cold pressor test) as the duration of the future cold pressor test increased, with 0-sec participants reporting greater WTA ratings. This suggests evidence of an intrapersonal empathy gaps because participants in a 'hot' affective state were better able to appreciate the future effect of a cold pressor test resulting in lower WTA ratings. Furthermore, past research has not looked directly at any behavioral decisions about a painful experience. Many behavioral decisions are made about pain, such as choosing a level of insurance coverage. When weighing the merits of future protection from health and pain risks empathy gaps could have an effect. These decisions are most often made before needing to use health insurance when one is healthy. It is not hard to imagine that one might underestimate the need for coverage because of a failure to appreciate the future effects of poor pain and health.

The Present Research

The goal of this research is to investigate empathy gaps in the domain of pain. I am interested in exploring the way people judge their own pain in comparison with the way they judge the pain of others. Additionally, I am interested in learning the effect of varying exposure to pain on judgments about pain. I set out to determine whether minimal exposure to pain can give people enough information to understand what a future painful experience will be like, or if it is necessary for them to have more extensive exposure to pain. Furthermore, this research also aims to look at behavioral choices around a painful experience and how exposure to pain affects these behavioral choices.

The goal of study one was to replicate and broaden the work of Read and Loewenstein (1999), by demonstrating interpersonal as well as intrapersonal empathy gaps. Additionally, I was interested in learning if having a minimal or more extensive experience with the painful task changes judgments about pain. To explore this, I varied experience with a painful task by having participants complete different samples of a pain experience and make judgments about themselves or another person. I hypothesized that the more exposure participants have about the painful task the more painful it will be judged to be. Thus, participants who have more extensive exposure to the painful task will judge a future task as more painful than participants who simply read a description of the painful task. I also predicted that one's own experience with the painful task would be judged to be more painful, and require more compensation, than the experience of another person.

The goal of study two was to further examine empathy gaps by investigating a behavioral paradigm for pain perception, in this case with regard to intrapersonal empathy gaps only. I hypothesized that I would find similar results as in study one, with participants rating that a

future painful experience would be more painful and would require more money in compensation if they had themselves had more extensive exposure to the painful task. In addition, I predicted that participants who had an experience that aligned more closely with the future judgment state would be more likely to make the behavioral choice to avoid the painful experience than participants who had a minimal sample.

Study One

Methods

Participants. The participants were 103 college students at the University of Colorado – Boulder (65 women, aged 18-32, 84% White, 1% Black, 8% Latino, 11% Asian, 2% Native American, 1% Other). They were drawn from a sample of students taking an introductory psychology course and they received course credit for their participation. Prior to the start of study one, the experimenter randomly assigned the order of the study conditions. Participants completed one of three cold pressor sample conditions (no sample, 5-seconds, or 30-seconds) and one of two target judgment conditions (self or other).

Cold Pressor Test. The equipment for this task was a 1-gallon cooler filled ¾ with ice and ¼ with water. The temperature was measured before every participant and was kept at an average of 32.89°F (SD=1.08). Additionally, a screw with a wing nut attached was glued to the bottom of the cooler. Participants were instructed to place their non-dominant hand in the ice-water for a specified period of time. While their hand was in the water, participants kept their hand moving (to prevent a heat barrier from building up) by twisting the wing nut at the bottom of the bucket. Past research has shown that the cold pressor test causes moderate pain, which increases the longer a person's hand is kept in the water (Mitchell, MacDonald & Brodie, 2004; Read and Loewenstein, 1999). On average, college students report that the cold pressor test

becomes “too painful to continue” after about a minute (Mitchell et al., 2004). All participants were given a one-page informational summary of the cold pressor test, which included text describing the procedure and a picture of a hand in a cold pressor bucket.

Pain Measures. The first measure was a visual analog pain scale, administered on a computer. This 100mm scale was anchored by ‘no pain’ (0) and ‘worst pain’ (100) (Gagliese, Weizblit, Ellis, & Chan, 2005; Herr, Spratt, Garand, & Li, 2007; Li, Liu, & Herr, 2007). Participants were first asked to rate how much pain they would feel after undergoing a future cold pressor task for 15-seconds. Participants indicated their future pain level on the scale and confirmed their answer by pressing ‘next’ on the computer. Participants then made the same ratings about cold pressor tests for time intervals between 15-seconds and 3-minutes, in 15-second intervals (15-seconds, 30-seconds, 45-seconds etc.).

After this set of questions participants completed a set of willingness to accept (WTA) questions. This measure was also completed on a computer. In this measure participants stated the lowest amount of money they would have to be paid to complete a cold pressor test for different periods of time. For example, a participant was asked “Please indicate the lowest amount of money you would accept to undertake the cold pressor test (hand in ice-water) for 15-seconds.” Participants then indicated an integer dollar amount between $1 and $9 that corresponded to the lowest amount of money they would accept. Participants could also indicate that they were ‘not willing at all’ to undertake the cold pressor test for any amount between $1 and $9 dollars, this was conservatively coded as $10. As with the pain scale, participants responded to these questions for time intervals between 15-seconds and 3-minutes, in 15-second intervals (15-seconds, 30-seconds, 45-seconds etc.).

Participants were told that the answers to the willingness to accept questions would be used to determine if they would do a cold pressor test later in the session. It was emphasized that these judgments had an impact on the immediate future and were not a judgment about an abstract future time. After completing the willingness to accept questions, the experimenter displayed the participants' responses on the computer screen and randomly drew one of the time money combinations. If the participant's responses indicated that they would be willing to do a cold pressor test for that time money combination then they were allowed to attempt a cold pressor test for that combination. Upon successful completion, participants earned the amount of money that was randomly drawn (up to $9). If instead, the participant's response indicating that they were unwilling to attempt a cold pressor for that combination they were not asked to do so.

Target for Judgment. Participants either completed the measures (pain scale and willingness to accept questions) about themselves or another person. Target judgment was a between subjects factor that was randomly assigned so that some participants answered questions about themselves while some participants answered questions about the other person. Participants received an informational sheet describing "another participant" in the study. The person depicted was white and matched to the participant's gender. The information sheet included information about the other participant's name, age, hometown, major and interests. The participants were told that this was another participant who had completed the study. However, this information was actually written by the researcher.

Procedure. After signing a consent form participants read the information about the "other person" and the information sheet about the cold pressor test. Participants then completed a sample experience of the cold pressor test, which varied by condition (no sample, 5-second, or 30-second). Following the cold pressor sample participants filled out the set of pain measures

described above about either themselves or the "other participant". Participants then had the option to attempt a cold pressor test dependant on their responses on the previous willingness to accept questions. When they finished, participants were thanked and debriefed. Participants who earned money in the cold pressor test were paid at this time (average payment $3.32, SD=3.48).

Results

My analytic approach involved estimating regression models within each participant. In these regressions, the participant's pain scale ratings and WTA ratings served as the criterion. Each rating was regressed on the cold pressor time intervals (15-seconds to 3-minutes, mean-deviated) looking at intercept, linear, and quadratic effects of time for each pain measure. These within-participant regression models yielded a series of partial regression coefficients or slopes that became the data on which I subsequently performed analyses of variance. More specifically, for each regression model (each pain measure), every participant had an intercept and two slopes that revealed the average rating/WTA and the linear and quadratic relationships between ratings/WTA and time interval. These intercepts and slopes were subsequently analyzed as a function of between-subject factors that differentiated between target (self vs. other) and prior cold pressor test experience (0-seconds, 5-seconds, or 30-seconds).

Pain Scale Ratings. Figure 1 displays the average pain scale ratings at each cold pressor time interval, by experience (0-seconds, 5-seconds, or 30-seconds) and target (self vs. other) condition. The main trend in this figure is the effect of increasing cold pressor time interval on pain scale ratings, with consistent increases in pain scale ratings with increasing cold pressor test interval (i.e. regardless of condition, participants said that as the length of the cold pressor test increased the pain associated with that test would also increase). This overall linear effect is significant $F(5,97) = 5.67$, $p<.0001$. The strength of this linear effect differed by cold pressor test

experience condition, $F(2,97) = 4.07$, $p<.02$. Further contrast coding revealed a significant difference in the linear slope between the 0-sec and 30-sec experience condition, $F(1,97) =8.02$, $p<.0056$. The target, $F(1,97) = .29$, $p<.59$, and the interaction of condition and target, $F(2,97) = .55$, $p<.58$ did not have an effect on the linear trend. As seen in Table 1, all of the intercept, linear, and quadratic effects of cold pressor test interval on pain scale ratings are significantly higher than zero, for all conditions and target. However, there were no differences in intercept $F(5,97)=1.80$, $p<.12$, or quadratic slopes $F(5,97)=1.32$, $p<.264$ among the sample or target conditions.

Willingness to Accept (WTA) Ratings. Figure 2 shows the average WTA judgment at each cold pressor test interval, by experience condition (0-seconds, 5-seconds, or 30-seconds) and target condition (self vs. other). Again, the clearest trend observed in this figure is the effect of increasing cold pressor test interval on WTA judgments, with consistent increases in WTA amount with increasing cold pressor test interval (i.e., regardless of condition, participants require more money to keep their hand in ice-water for longer periods of time). It is thus not surprising that all of the linear effects of cold pressor test interval on WTA are significantly higher than zero, for all conditions and targets (see Table 1), and the strength of this linear effect differs by cold pressor test experience, $F(2,97) = 6.24$, $p<.003$, but not by target, $F(1,97) = .04$,$p<.85$, or the interaction of experience and target, $F(1,97) = .81$, $p<.447$.

However, as suggested by the greater curve in some of the lines in Figure 2, there were differences among conditions in the quadratic effect of cold pressor test interval on WTA: Experience main effect, $F(2,97) = 5.75$, $p<.0044$; Target main effect, $F(1,97) = 9.49$, $p < .003$, and Experience*Target interaction, $F(2,97) = 4.86$, $p < .009$. Looking at the simple comparisons (Table 2), what is clear is that participants with more cold pressor test experience produced a

stronger quadratic effect (especially the 30-sec condition), and the quadratic effect was also stronger when participants made judgments for themselves than for another person.

There were also differences among conditions in the intercept, also clear in Figure 2. There was a main effect of experience, $F(2,97)=16.84$, $p<.0001$; a main effect of target, $F(1,97)=12.01$, $p<.0008$ and an experience by target interaction, $F(2,97)=3.27$, $p<.04$. This means that participants with more cold pressor test experience had higher overall WTA ratings, and that this effect was stronger for themselves than for another person.

Discussion

The results of study one provide some of the first evidence of an interpersonal empathy gap in pain perceptions. This was most clear in the measure of willingness to accept pain, in that participants rated a future cold pressor task as requiring more payment for themselves than for another person. The interpersonal empathy gap is most clearly seen in the shape of the slopes in Figure 2. The slopes of the self ratings are more quadratic, especially for the 30-second condition meaning that participants' ratings for themselves are higher more quickly than their ratings for another person. Additionally, these data conceptually replicate the work of Read and Loewenstein (1999) by demonstrating intrapersonal empathy gaps in pain perception by showing that participants in an affectively 'hot' state make lower WTA ratings. While these results are compelling, I wanted to expand this research into behavioral choices about pain. To achieve this in study two, it was necessary to focus on judgments about the self. I also chose to eliminate the 30-second sample and replace it with a 90-second sample in study two. I was interested to see the effects completing a sample cold pressor test that was very similar in length to the target cold pressor test. Additionally, we added a behavioral paradigm to examine the behavioral choices around a future cold pressor test.

Study Two

Methods

Participants. 120 subjects from the University of Colorado - Boulder subject pool (79 women, aged 18-24, 82% White, 1% Black, 9% Latino, 11% Asian, 1% Native American, 2% Other) were included in study two. Participants received course credit for their participation in the study. Prior to the start of study two, the experimenter randomly determined the order of the study conditions. Participants completed one of three cold pressor sample conditions (0-seconds, 5-seconds, or 90-seconds).

Cold Pressor Test. The same equipment and procedure was used for study two. All participants were given a one-page informational summary of the cold pressor test, which included text describing the procedure and a picture of a hand in a cold pressor bucket. Participants were randomly assigned to one of three sample conditions – 0-seconds, 5-seconds, or 90-seconds. Subjects in the 0-seconds and 5-seconds conditions spent 90-seconds and 85-seconds, respectively imagining what a cold pressor test would feel like while their hand was not submerged in cold water, so that all subjects spent 90-seconds experiencing a sample or imagining what a sample would feel like.

Pain Measures. Similar to study one, the first measure participants completed was a visual analog pain scale with 'no pain' and 'worst pain' as anchors. The only difference was that participants also made ratings about the pain induced by a 5-second cold pressor. So, in the second study participants were first asked to rate how much pain they would feel, by indicating with an 'X' on a line, from undergoing a cold pressor test for 5 seconds. This question was then asked in 15-second time increments following the first rating (5-seconds, 15-seconds, 30-seconds, 45-seconds, etc.) up to 3 minutes.

Participants next completed the same willingness to accept ratings as in study one, with two changes. First, participants indicated the lowest amount of money they would accept to undertake a cold pressor test for 5 seconds. The question was repeated in 15-second intervals following the first rating (5-seconds, 15-seconds, 30-seconds, 45-seconds, etc.) up to 3 minutes. Also differently from study one, participants could rate using $.50 money intervals and the scale was extended to $10, but participants could still state that they were 'not willing at all' for any time interval, coded conservatively as $11.

Participants completed both sets of questions on the computer after completing the sample cold pressor test experience. Participants were familiarized with the pain measures (pain ratings and willingness to accept (WTA) ratings) that they would be answering about the cold pressor test before completing a sample of the cold pressor test. Subjects viewed an example of both types of questions to assure their understanding. Also, participants only made judgments about themselves.

Behavioral Choices. After making all of their discomfort and WTA judgments, the participants were informed that the experimenter would randomly draw a time-money combination to determine the length of the cold pressor test and amount of money they could earn for completing the test. However, the drawing was set so that 2-minutes for $10 was always drawn. Participants were then given $10 in $1's from the researcher and asked if they would like to continue with the study, regardless of their WTA stated earlier. Any participant could exit early, return the $10, and end the study at that point. Those who chose to continue were asked to rate how much of the $10 they were willing to pay back to the experimenter to avoid completing the cold pressor test. The experimenter explained that after making a response, the experimenter would conduct another drawing in which one of the amounts participants might be willing to pay

back ($.50 to $10) would be drawn. If the drawn amount was equal to or less than the amount rated by the subject then they would pay the drawn amount, skip the cold pressor test and keep the rest of the money. Alternatively, if the drawn amount was greater than the amount rated by the subject they would have to attempt and complete the cold pressor test to keep their money. Participants indicated via a paper measure how much of the $10 they were willing to pay to the experimenter to avoid completing the 2-minute cold pressor test. The experimenter then conducted another drawing, which was set so that the experimenter always drew $6. After the drawing, subjects who rated less than $6 were informed that they would have to attempt the 2-minute cold pressor test to keep their money. However, they would have the opportunity to buy-out and pay $6 after 30-seconds of the test. Subjects began the test and after 30-seconds made the decision to either (a) pay $6 and end the test (b) continue on and attempt to finish the 2-minute test to keep $10.

Procedure. After providing their consent participants received information describing the cold pressor test and were familiarized with the pain measures. Next, they were randomly assigned to one of three sample conditions (0-seconds, 5-seconds, or 90-seconds). Following this sample, all participants completed both of the pain measures (pain scale and willingness to accept ratings). Participants then completed the series of behavioral choices and had the option to (a) exit early, (b) buy-out, (c) revise, or (d) complete a 2-minute cold pressor test for $10. Once these choices were complete, participants completed socio-demographic questions and were debriefed.

Results

Because the cold pressor test is a painful and aversive task, some of the participants assigned to the 90-sec sample experience condition were unable to complete the full sample.

Thus, the 90-sec sample was further split into two conditions - a 90-second complete condition and a 90-second partial condition. The latter condition was for participants who left their hand in the cold pressor test for less than the full 90-seconds (average time 46.25 sec, SD=19.67 sec). The results for study two are analyzed by looking at all four conditions, instead of the original three sample conditions.

Consistent with study one, my analytic approach involved estimating regression models within each participant for the pain ratings and WTA judgments, and then analyzing the resulting partial regression coefficients in one-factor between-subjects ANOVAs for the effect of experience condition (0-seconds, 5-seconds, 90-seconds complete, and 90-seconds partial).

As seen in Figure 3, the main trend is that regardless of condition participants show a linear increase in WTA judgments over time. In other words, as the length of a future cold pressor test increases, participants state that they require more money to complete that test. As seen in Table 3, all of the intercept, linear, and quadratic effects of cold pressor test interval on pain scale ratings are significantly higher than zero, for all conditions. However there were no significant differences in intercept, $F(3,111)= 0.20$, $p<.8972$; linear, $F(3,111)= 0.17$, $p<.9172$; or quadratic, $F(3,111) =0.56$, $p<.6403$, slopes between the four experience conditions. Similar non-significant patterns were found in the pain scale ratings, which are not displayed here.

Next, I looked at the behavioral decisions. Figure 4 illustrates the behavioral decisions as a survival curve. The main trend in this figure is that participants who completed the full 90-second sample completed the 2-minute cold pressor test at the highest rates and were less likely to use the other choices available. Participants who completed the 90-sec sample were more likely than participants in the other sample conditions to complete the full 2-minute cold pressor test and earn \$10, $X^2(3)=21.99$, $p<.0001$. Participants who had either a 0-sec or 5-sec sample

were far more likely to revise their decision during the cold pressor test, $X^2(3)=16.38,p<.0001$, leading them to experience both physical pain (avoided by the 90-sec partial participants) and the loss of $6 (avoided by the 90-sec complete participants). Participants who failed to complete the 90-sec sample were more likely to immediately exit the study, $X^2(3)=20.68,p<.0001$ than participants in the other conditions. See Table 4 for a complete breakdown of behavioral choices by sample condition.

Discussion

The results of study two provide additional evidence of intrapersonal empathy gaps, this time in behavioral choices. Participants who completed the full 90-second cold pressor sample were able to make more rational judgments (by maximizing the amount of money earned) about how they would fare at a future cold pressor test leading them to complete a 2-minute cold pressor test at higher rates. This seems to suggest that having a sample that is closely analogous to the target state (in this case only 30-seconds less) provides participants with more complete information about the painful experience allowing them to make more rational judgments about that experience. It is not obvious why the pain scale and WTA ratings did not replicate from study one. One reason this might have occurred was due to the fact that study one was run during the spring while study two was run in the fall. The valence of participants' feelings about cold weather during the fall as compared to the spring may have differed. This difference may have changed how participants made judgments about the cold pressor test. Since the procedure in both studies was nearly identical I cannot identify any other factors that may have contributed to why the pain scale and WTA ratings did not replicate.

General Discussion

These two studies provide more information about the effect of prior experience with a painful task on judgments of a future painful task. Interestingly, varying the length of experience that participants had with the cold pressor test had an effect on later judgments of pain (Study 1) and behavior (Study 2). Participants who were able to complete longer samples gained more information about what the painful experience was like leading them in study two to make more rational behavioral decisions about pain. These participants were able to better judge if they had the ability to complete a future test or not. There were only minor differences in the results of participants who had no sample (0-seconds) as compared to participants who had a 5-second sample. This seems to indicate that a short sample of a cold pressor test does not provide participants with much information about what a longer cold pressor test is actually like. From these data it seems that participants needed highly salient pain information (a 90-second sample) to make rational judgments about a future pain experience.

Interpersonal and intrapersonal empathy gaps were demonstrated in both studies. Study one provides some new evidence for interpersonal empathy gaps. Additionally, study one conceptually replicated the intrapersonal empathy gaps found in Read and Loewenstein (1999), while study two provides behavioral data that also demonstrates intrapersonal empathy gaps. There were significant effects of condition on interpersonal and intrapersonal empathy gaps indicating that participants experience with a painful experience is likely to affect how they perceive pain for both themselves and others. This is important since individuals vary widely in their prior knowledge of pain.

Looking at behavioral decisions provides us with some evidence as to how people make choices about a painful experience. Aspects of these choices can be seen as similar to buying

insurance, since participants could pay $6 to insure themselves against the cold pressor test. Most people are in an affectively cool state when they are purchasing insurance so they would be likely to experience similar empathy gaps and may choose a plan with less complete coverage because they are unable to appreciate what the future effects of a pain experience would be like. It is also interesting that the behavioral decisions (see Figure 4) show parallel patterns to the pain (see Figure 1) and WTA ratings (see Figure 2) in the grouping of 0-second and 5-second samples. The behavioral choices and pain ratings of the 0-second and 5-second participants are very similar, while the longer samples (30-seconds in study one, 90-seconds in study two) show different patterns. This makes clear the point that a small sample (5-seconds) of a painful experience does not give participants any further knowledge of the cold pressor test over and above no sample at all.

In study two, participants also had drastically different behavioral outcomes depending on if they had completed or failed the 90-second sample. It is interesting that this group who failed to complete the 90-second test were very different (completed the 2-minute test for $10 at lower rates, used the revision option) than the participants in the 0-second and 5-second condition. It seems that participants were hampered by the effect of failing a sample cold pressor test. Participants who fail to complete their sample experience are not very successful in maximizing the money they could earn. Completing a partial test however does make participants effective at avoiding a future painful experience.

A direction for future research in this area might lie in examining the mechanisms behind interpersonal and intrapersonal empathy gaps specifically in the domain of pain perception. This may help to demonstrate how interpersonal and intrapersonal empathy gaps are related. A future study could look at anchoring and adjustment effect looking to see if participants anchor on

judgments of how they would perceive the painful experience and then adjust for differences between themselves and the other person. It is advantageous to be able to appreciate the effect of a future emotion of pain when making judgments about pain or when faced with a behavioral choice such as buying insurance. Empathy gaps are important to study in the domain of pain because the ability to make accurate judgments about pain is vital in many everyday settings. Furthermore, important differences exist in the way pain is perceived based on the target of judgment (self or other) and depending on a person's previous experience with pain, both of which should be taken into consideration when making judgments about pain.

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Table 1

Study One – Mean Pain Scale Ratings by Experience and Target Condition

	Intercept	Linear	Quadratic
Self			
0-s (n=17)	73.38(24.74)*$_{a1}$	.3176(.1470)*$_{a1}$	-.0031(.0028)*$_{a1}$
5-s (n=17)	77.46(27.64)*$_{a1}$	.1741(.1965)*$_{a2}$	-.0023(.0020)*$_{a1}$
30-s (n=17)	90.18(19.16)*$_{a1}$	.1625(.2537)*$_{a2}$	-.0039(.0027)*$_{a1}$
Other			
0-s (n=17)	82.18(16.74)*$_{a1}$	.3046(.2162)*$_{a1}$	-.0045(.0034)*$_{a1}$
5-s (n=18)	84.16(16.88)*$_{a1}$	.2611(.1721)*$_{a1}$	-.0033(.0033)*$_{a1}$
30-s (n=17)	89.22(11.75)*$_{a1}$	.1566(.3034)*$_{a1}$	-.0033(.0013)*$_{a1}$

Note. * = Significantly different from zero, $p < .05$. Standard deviations appear in parentheses to the right of the means. Means with different letter subscripts differ significantly between target conditions, within experience conditions. Means with different number subscripts differ significantly between experience conditions, within target conditions.

Table 2

Study One – Mean WTA Ratings by Experience and Target Condition

	Intercept	Linear	Quadratic
Self			
0-s (n=17)	3.715 (1.654)*$_{a1}$	.0337 (.0149)*$_{a1}$	-.0000 (.0001)$_{a1}$
5-s (n=17)	5.832 (2.675)*$_{a2}$	.0359 (.0165)*$_{a1}$	-.0002 (.0002)*$_{a2}$
30-s (n=17)	8.068 (2.274)*$_{a3}$	.0419 (.0182)*$_{a1}$	-.0003 (.0002)*$_{a3}$^
Other			
0-s (n=17)	3.575 (1.213)*$_{a1}$	.0285 (.0127)*$_{a1}$	-.0000 (.0001)$_{a1}$
5-s (n=18)	4.377 (1.995)*$_{a1}$	.0351(.0129)*$_{a1}$	-.0000 (.0002)$_{b1}$
30-s (n=17)	5.264 (2.680)*$_{b1}$	.0462 (.0161)*$_{a2}$	-.0001 (.0003)$_{b1}$

Note. * = Significantly different from zero, $p < .05$, ^ = $p <. 06$. Standard deviations appear in parentheses to the right of the means. Means with different letter subscripts differ significantly between self & other within CPT condition. Means with different number subscripts differ significantly between CPT conditions, within target.

Table 3

Study Two – Mean WTA Ratings by Experience Condition

	Intercept	Linear	Quadratic
Self			
0-s (n=31)	6.164 (2.772)*$_1$	.0427 (.0199)*$_1$	-.0002 (.0002)*$_1$
5-s (n=30)	5.969 (2.969)*$_1$	.0415 (.0170)*$_1$	-.0001 (.0003)*$_1$
90-s partial (n=21)	6.131 (3.256)*$_1$	.0447 (.0192)*$_1$	-.0002 (.0003)*$_1$
90-s complete (n=38)	5.653 (2.984)*$_1$	.0415 (.0168)*$_1$	-.0002 (.0003)*$_1$

Note. * = Significantly different from zero, $p < .05$. Standard deviations appear in parentheses to the right of the means. Means with different number subscripts differ significantly between experience conditions

Table 4

Percentage of participants in Study 2 from total in condition who chose each behavior, by sample condition

Sample Condition	Ultimate Behavioral Choice				
	Exit - Pain 0 - Lost $10 - Gain $0	Buy-out - Pain 0 - Lost $6 - Gain $4	Revise - Pain 30s - Lost $6 - Gain $4	Drop-out - Pain 30s+ - Lost $10 - Gain $0	Finish Test - Pain 120s - Lost $0 - Gain $10
0-sec (n=31)	3% (1)	23% (7)	26% (8)	0%	48% (15)
5-sec (n=30)	10% (3)	17% (5)	33% (10)	0%	40% (12)
90-sec partial (n=21)	38% (8)	29% (6)	9% (2)	5% (1)	19% (4)
90-sec complete (n=38)	3% (1)	18% (7)	0%	0%	79% (30)

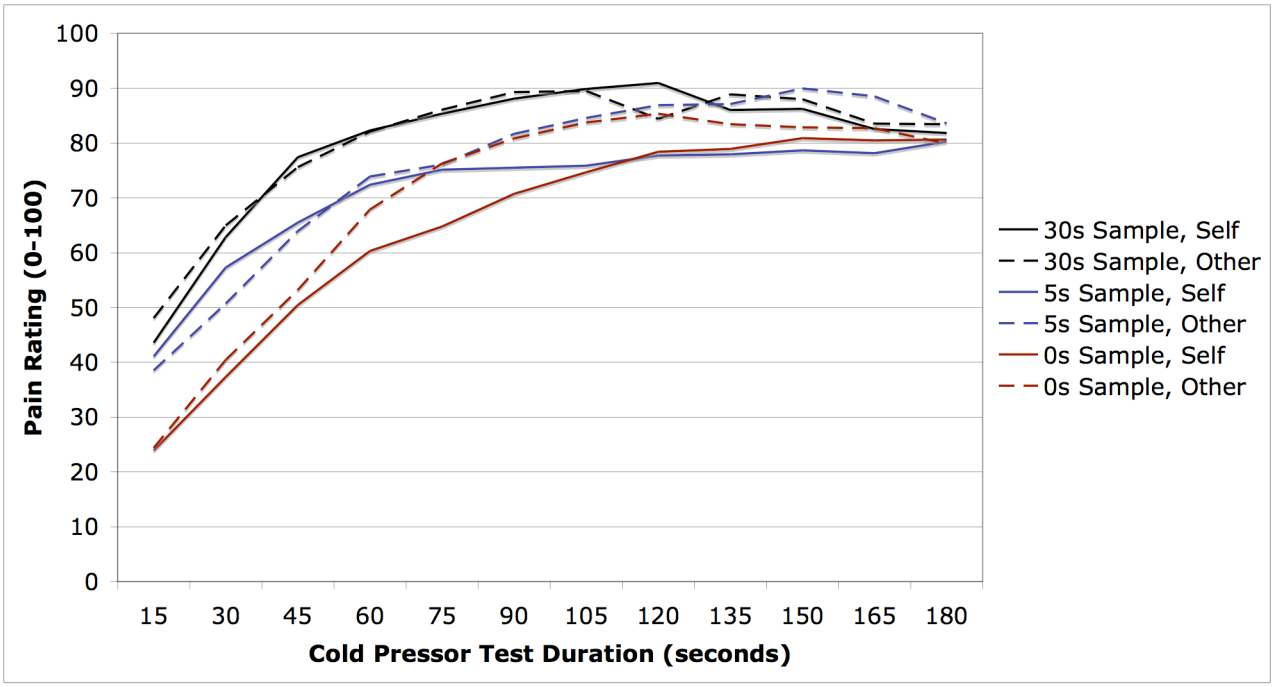

Figure 1. Study One – Pain Scale Judgments for Self and Other

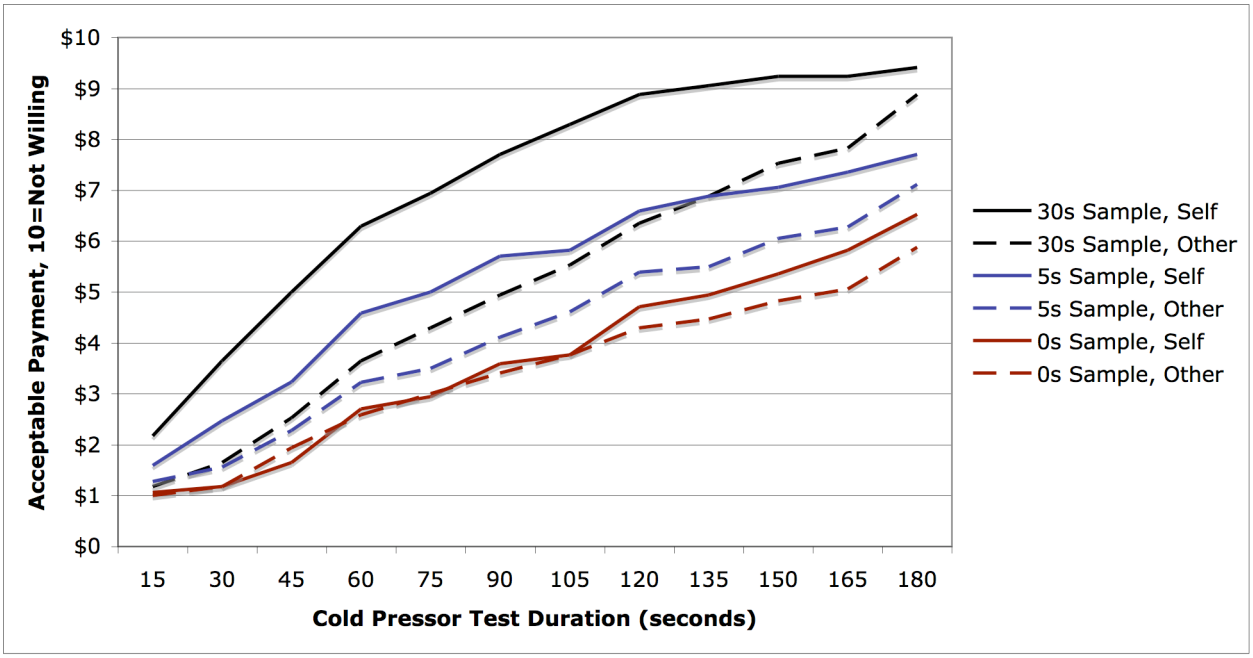

Figure 2. Study One – Willingness to Accept (WTA) Decisions for Self and Other

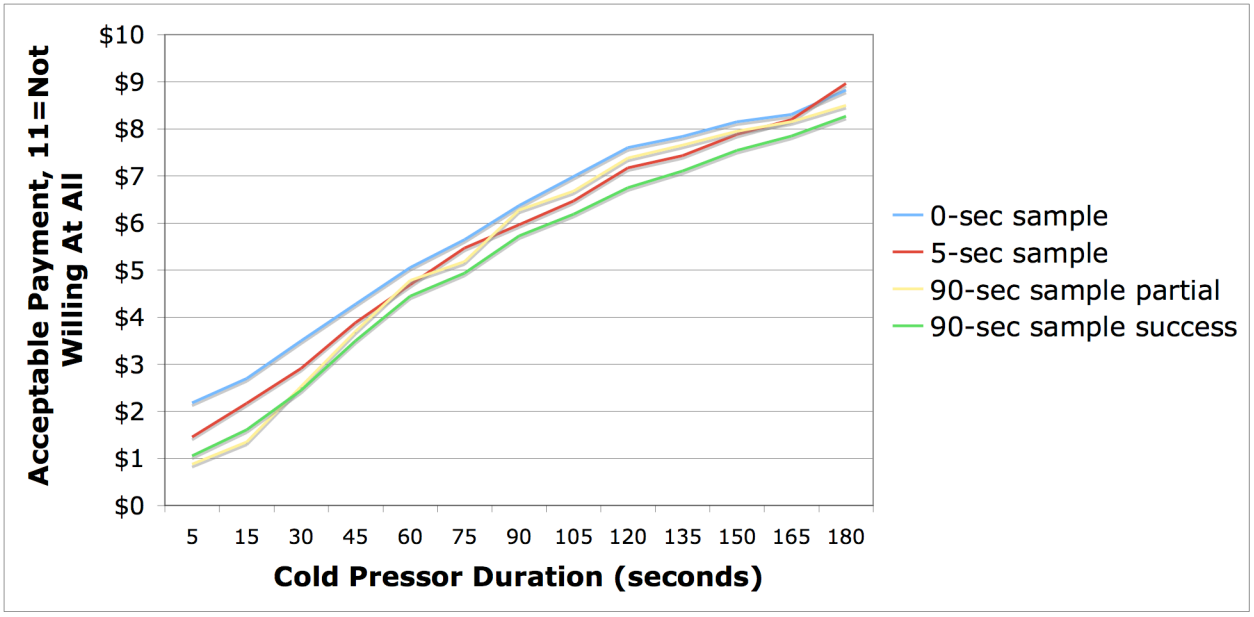

Figure 3. Study Two – Willingness to Accept (WTA) Decisions for Self

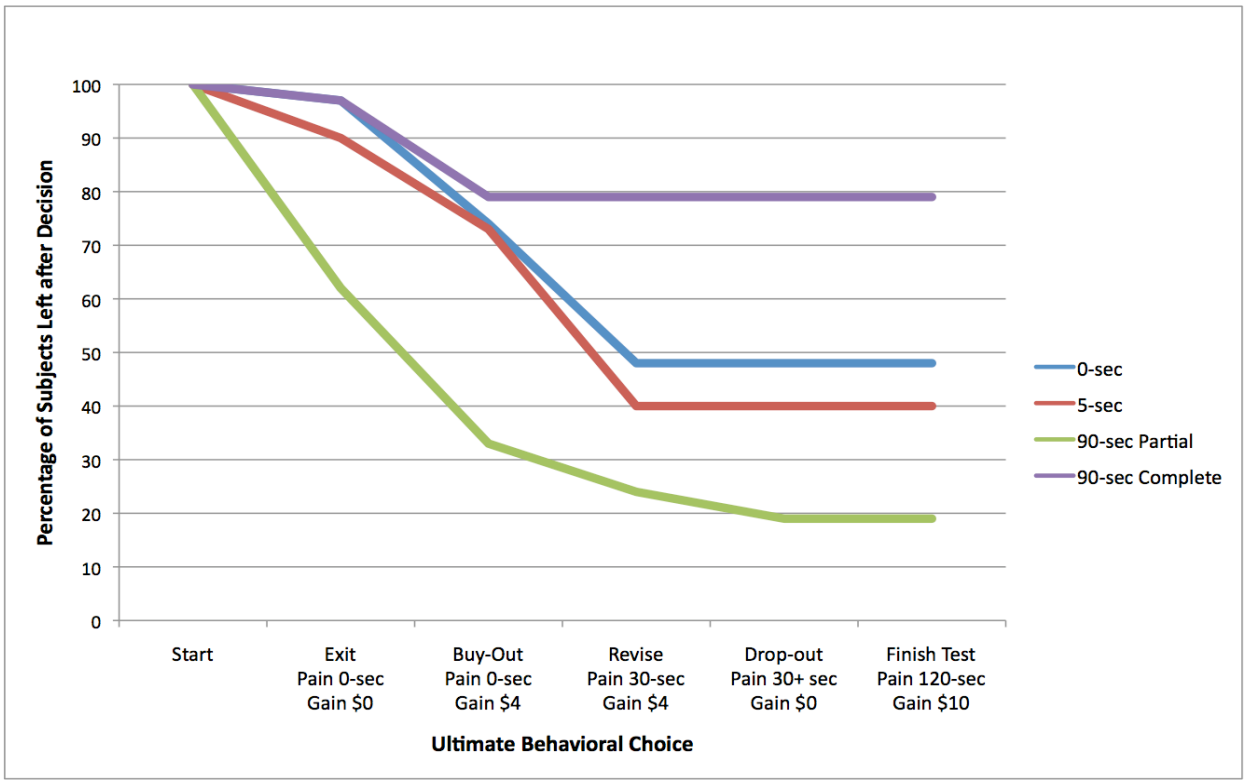

Figure 4. Study Two – Behavioral Decisions about a 2-minute Cold Pressor Test for $10