The Power of Understanding: Felt Understanding and Perception of Pain, Slant, and Distance

Jamie Schiller

Distinguished Majors Thesis

University of Virginia

May 2011

Advisor: Shigehiro Oishi
Second Reader: Gerald Clore
Acknowledgments

I would like to extend my sincere thanks to a number of people without whom completing this project would not have been possible. First and foremost, I want to thank Professor Oishi for his endless guidance, support, and advice, not only on this project but since my first year at the University as my professor, major advisor, and finally thesis advisor. Thank you for sharing your depth of knowledge in the area of social psychology and inspiring me as both a student and a person. Professor Clore, thank you for your encouragement as my DMP peers and I embarked on a somewhat terrifying foray into our own research projects, and for so graciously agreeing to be my second reader. I would also like to thank the Proffitt perception lab for the use of their materials, as well as Xi Wang and Sharon Kim for sticking with me through two challenging semesters of data collection and entry. Last but certainly not least, I want to thank my family and friends for pushing me to participate in the DMP program and helping me both technically with editing and emotionally through the stress of writing a thesis in my fourth year.
Abstract
Social support plays an important role in well-being, and recent studies suggest one of its effects is to make the world appear generally rosier and less extreme. The present research examined the effect of felt understanding on basic modes of perception. Participants were 202 undergraduates, matched in same-sex pairs or alone (control condition). After an 8-minute face-to-face interaction, felt understanding was manipulated between partners, and they subsequently completed tasks gauging perception of pain, slant, and distance. As hypothesized, we found that participants who felt understood could endure a painful cold pressor task for longer, and perceived distances as shorter than those who felt misunderstood. Contrary to our hypothesis, among participants who completed the cold pressor task, those who felt understood reported experiencing more pain. Overall, our findings suggest felt understanding as a specific mediator of social support in its influence on perception.
The human experience is largely defined by our interactions with others. People are naturally driven toward developing relationships, due to the benefits they offer in terms of overcoming psychological and physical challenges throughout life (Berscheid, 2003). The relationships we seek are not superficial; as Baumeister and Leary (1995) theorized, frequent and positive social interaction is essential to fulfilling a fundamental human need to belong. Our drive to satisfy this need plays a key role in all human motivation and action, from creating incentives to reach out to strangers to influencing how difficult a task is perceived to be. Indeed, the support we derive from forging relationships has been pinpointed as the most important factor in the survival of our species (Berscheid, 2003). While social support theory is still in its infancy, a considerable body of research has already formed indicating the key role interpersonal relationships play in the way we interact with the world around us. The present study is aimed at further investigating the effect of social support on basic modes of perception.

Social support has been shown to influence the way we perceive nearly every aspect of our lives. Not only has social support been linked to physical health in more than 30 studies, a lack of such support appears detrimental enough to be considered a risk factor for mortality (House, Landis, & Umberson, 1988). When psychosocial resources (e.g. social support) are depleted, our capacity to think and reason suffers. For example, Baumeister, Twenge, and Nuss (2002) found that when participants received personality test feedback indicating they would end up alone in life (compared to feedback indicating either positive future social relationships or future misfortune in an unrelated domain), they exhibited impairments in speed, effort, and accuracy on cognitive tests of verbal reasoning and mathematical and spatial ability.
Social exclusion has also been shown to lead to self-defeating behavior. In another study with a similar single measure manipulation of personality test results, participants who believed they would be alone in the future were more likely to engage in self-defeating behaviors such as risk-taking and procrastination, and were less likely to make healthy life choices such as eating right, exercising, and pursuing information about their health status (Twenge, Catanese, & Baumeister, 2002). Furthermore, psychosocial resources determine both how people respond to negative events and how distressing they perceive the events to be. In a study investigating the effect of social support (operationalized by having participants imagine a former friend who had betrayed them, a particularly supportive social contact, or a neutral stranger) on perception of another’s distress, Harber, Einev-Cohen, and Lang (2008) found that participants with depleted psychosocial resources rated babies’ cries as more distressing. The authors concluded that people with sufficient psychosocial resources view the world more moderately, whereas those with depleted resources see the world as more extreme.

While these studies relied on priming participants without the presence of another individual, other studies have utilized actual interaction to manipulate social support in a manner more generalizable to everyday life. For example, Twenge, Catanese, and Baumeister (2003) employed a method where participants engaged in a structured conversation, and then received manipulated feedback indicating that either none or all of the other participants wanted to work with them on the subsequent task. Participants who felt socially excluded had slower reaction times on a computer task, tended to overestimate the duration of time intervals, and were more likely to agree with the statement “life is meaningless” than participants who felt included. In sum, we see that social support is an important determinant of well-being and that psychosocial resources impact both our perception of and interaction with the world. While some studies have
indicated that the supportive quality of social relationships is the major contributing factor to the above findings, further research is needed to determine exactly which features of social interaction are most important (House, Landis, & Umberson, 1988).

Our interpersonal relationships include a myriad of components: duration, intimacy, communication, trust, mutual respect and liking are just a few of the central elements of any relationship, and all affect the amount of social support we experience on a daily basis. With different operational definitions of social support encompassing so many variables, how do we know what is most responsible for making a relationship supportive? Determining potential mediators through which social support may impact our well-being and perception is thus an important precursor to successfully seeking the positive results of such support in everyday life. Many studies of social support compare the presence of a friend to that of a stranger, a disliked person, or no one at all, but have failed to tease apart the essence of these differences (Schnall, Harber, Stefanucci, & Proffitt, 2008; House, Landis, & Umberson, 1988; Master et al., 2009). In an effort to make this distinction, Brown, Sheffield, Leary, and Robinson (2003) conducted a study examining the effect of social support on acute pain. Using seven conditions (encompassing the relationship between participant and partner, participant gender, and support type) in a 2 x 2 x 3 randomized factorial design with an offset control group of participants with no partner, Brown et al. (2003) found that participants experienced less pain when they were with someone who offered support verbally, physically, or through their mere presence. In contrast, participants who were alone, engaged in a distracting interaction, or who felt evaluated by their partner experienced more pain. The researchers found familiarity to have no effect (i.e., as long as the partner was offering social support, it made no difference whether that person was a complete stranger or a close friend).
In addition to the notion that duration and overall closeness are the elements of our relationships that make us feel most supported (which does not appear to be the case), others have posited that it’s the effect social support has on our mood that leads to these positive outcomes. However, multiple studies examining the effects of social support on spatial perception, cognition, and perception of others’ distress have found that mood is not a mediating factor (Schnall et al., 2008; Harber, Einev-Cohen, & Lang, 2008; Baumeister et al., 2002). What is it about relationships, then, that makes them supportive? Theorized as a key component in the formation of successful relationships (Berscheid, 2003; Baumeister & Leary, 1995), another potential factor mediating the effect of social support on perception is felt understanding. The present study examines this possibility.

Felt understanding is defined as the feeling that one is accurately perceived, understood, appreciated, and cared for; in order for an individual to feel understood, they must express important aspects of the self to a partner who can both accurately recognize these aspects and effectively communicate this recognition back to the individual (Oishi, Krochik, & Akimoto, 2010). Felt understanding is best facilitated when relationship partners respond to and validate core features of one’s self-concept (Reis, 2007). Within the past five years, research on felt understanding has emerged to link social relationship outcomes and subjective well-being by identifying the mechanism through which social support impacts the way we perceive and interact with the world around us. Felt understanding appears to play a critical role in the development of close friendships and romantic relationships by providing a stable view of the self, and studies have shown it also creates rapport between strangers (Oishi et al., 2010; Reis, 2007). In a daily diary study, Lun, Kesebir, and Oishi (2008) found that people experienced fewer physical symptoms and reported being more satisfied with their lives when they felt
understood by others. Felt understanding was also identified as a major factor predicting the outcome of cross-cultural social interactions by Oishi, Koo, & Akimoto (2008), who were able to infer a causal direction from felt understanding to happiness. Conversely, feeling misunderstood has been shown to have negative motivational consequences (Lun, Oishi, Coan, Akimoto, & Miao, 2010). Given these links, the present study sought to explore the possible mediating role of felt understanding in the relation between social support and perception. Following the idea that people who feel understood see the world as a generally rosier place, we hypothesized that felt understanding will affect perception of pain and the physical world such that potentially negative experiences are perceived as less extreme. In order to test this broadly, the present study examined the effect of felt understanding on perception of pain, geographic slant, and distance.

**Felt Understanding and Pain Perception**

Numerous studies have indicated a correlation between social support and reduced levels of physical pain (see Zhou & Gao, 2008 for a review). While social support is considered a buffer against physical and psychological pain, social exclusion or rejection is seen as a threat and results in increased pain awareness (MacDonald & Leary, 2005). For example, Coan, Schaefer, and Davidson (2006) conducted a study of happily married women to test their subjective and neural responses to anticipation and administration of ankle shocks while alone or holding the hand of their spouse or a stranger. The researchers found that spousal hand-holding attenuated neural threat responses, and also reduced subjective ratings of unpleasantness, with the effects positively related to marriage quality. Similarly, Master et al. (2009) had female participants rate the intensity of pain experienced due to a thermal stimulus in seven conditions including holding a stress ball or the hand of their romantic partner or a stranger, or viewing a picture of their romantic partner, a stranger, a neutral object, or no image (the participant was
always physically alone; in the hand-holding conditions the partner’s hand was available through a curtain only and was not visible). Since participants had no opportunity to meet the stranger, the conditions involving a romantic partner were considered the only ones involving social support, and indeed Master et al. (2009) found that holding the hand of a romantic partner or even merely viewing their picture could reduce physical pain experienced due to a thermal stimulus.

In another study examining the effect of social support on acute pain, Brown et al. (2003) found that social support reduced self-reported pain on a cold pressor task (i.e., a task where participants had to immerse their hand into a bowl of ice water), while male participants reported less pain overall. Through comparison with both a no-support condition where participants were alone and a distraction condition where participants had the presence of an ‘other’ who interacted with them without offering support, Brown et al. (2003) were able to tease apart the reason another person’s presence can reduce pain and concluded that social support and not just physical presence accounted for this pain buffering effect. In terms of a more specific relationship between felt understanding and pain perception, Lun, Kesebir, & Oishi (2008) found that people reported less physical pain in their daily lives when they felt more understood by those around them. In the present study, we hypothesized that participants who felt understood would perceive pain during a cold pressor task as less extreme than those who felt misunderstood and would consequently be able to endure the pain for a longer period of time.

**Felt Understanding and Slant Perception**

In addition to affecting our perception of physical pain, social support has also been shown to impact our perception of slant (Schnall et al., 2008; Bhalla & Proffitt, 1999). “Slant” in this article refers to geographical slant, defined as slant “in relation to a fixed environmental
frame of reference,” such as the ground (Proffitt, Bhalla, Gossweiler, & Midgett, 1995). Whether viewed from the front or the side, in reality or virtual reality, people tend to significantly overestimate perceived slant in verbal judgments (Proffitt, Creem, & Zosh, 2001; Proffitt et al., 1995). The proposed reason for this tendency is that such overestimation is adaptive, since the way we view the world is intricately linked to how we might interact with it. For instance, the slant of a hill matters only insofar as a steeper hill will require more energy and resources to climb (Witt, Proffitt, & Epstein, 2004). Lending support to this hypothesis, Proffitt et al. (1995) found that exhaustion increased slant estimates for participants who were instructed to go on a tiring run that began and ended with verbal slant estimates (two hills were used as the start and end points for the runs, counterbalanced between participants; participants were not informed that these points would be hills). In addition, increasing the body’s energy resources through the ingestion of glucose supplements has been shown to decrease perceived hill slant (Schnall, Zadra, & Proffitt, 2010).

Furthermore, Bhalla and Proffitt (1999) found that hills also appeared steeper to participants encumbered by a heavy backpack (i.e., one filled with weights equivalent to between 1/6 and 1/5 of the participants’ body weight), and that female participants on average give greater verbal slant estimates than male participants. The authors concluded that conscious slant estimates are based on physiological action potential (i.e., physical ability to act on the environment), which they theorized might be similar to psychosocial action potential (i.e., the presence of social resources such as supportive others that would make it easier to act on the environment). Although there is some contention in the literature as to whether increased slant estimates while wearing a heavy backpack are due to physical encumbrance or the social demands of the experiment (i.e., participants giving higher verbal slant estimates because they
believed the purpose of the backpack was to increase their estimates, this distinction is beyond the scope of the present study; however, our hypotheses remain unaffected as social support would be expected to decrease slant estimates whether by increasing action potential or increasing ability to overcome demand characteristics (Durgin et al., 2009; Proffitt, 2009; Russell & Durgin, 2008).

In a study investigating the effects of social support on visual perception of slant, Schnall et al. (2008) hypothesized that visual perception is influenced by physical demands associated with intended actions (i.e., if we are more energized or have help, things seem easier; if we are exhausted or burdened, they seem harder). Using a quasi-experimental design where passersby walking either alone or in a pair were recruited as participants, Schnall et al. (2008) found that participants with a friend estimated slants to be less steep than those who were alone. In a follow-up laboratory study, participants who imagined a supportive friend estimated slants to be less steep than participants who imagined a neutral stranger or former friend who had betrayed them. The authors concluded that the amount of social support offered by a relationship determined the effect on visual perception, since the physical world should seem less demanding with sufficient psychosocial resources. While Schnall et al. (2008) have provided a strong foundation for research on the effect of social support on visual perception of slant, a major limitation of their quasi-experimental design is its inability to determine causality or identify a specific mediator (since the spontaneous friendship pairs likely varied widely in more ways than could be captured by the brief three-question manipulation check). The present study addresses these limitations through the use of random assignment to conditions and specific manipulation of only one relationship component: felt understanding. In the present study, we hypothesized
that participants who felt understood would perceive the slant of a hill as less steep than those who felt misunderstood.

**Felt Understanding and Distance Perception**

While no studies to our knowledge have explicitly examined the effect of social support on distance perception, it appears that the brain works to perceive slant and distance through comparable combinations of information (Witt et al., 2004). Such similarities in the way we process distance and slant information make it appear likely that Schnall et al. (2008)’s findings could be replicated with distance estimates. In a summary paper, Proffitt (2006) explicated the way the visual system works with the rest of the brain to create distance perception. Proffitt (2006) found that, akin to slant perception, distance perception combines a raw view of the physical world with non-visual factors such as current ability level, physical and emotional state, and intentions. In a follow-up to Bhalla and Proffitt’s (1999) study finding that hills appeared steeper to those wearing heavy backpack, Proffitt, Stefanucci, Banton, and Epstein (2003) used the same setup as their previous experiment but instead had participants estimate the distance between themselves and a cone. Adding to their prior research on slant perception, Proffitt et al. (2003) found that distance estimates also increased when participants were encumbered by a heavy backpack. Furthermore, Proffitt et al. (2003) conducted aftereffect experiments and found that participants were not able to infer from the procedure what the influence of the backpack was supposed to be; these findings lend additional support to the hypothesis that it is action potential, not demand characteristics of the experiment, that affect perception and subsequent estimates on tasks where participants are wearing a backpack.

In addition, studies have also suggested that social support may be important to our perception of time intervals and task difficulty. For instance, Twenge et al. (2003) had
participants engage in a structured conversation prior to receiving feedback that either none (social exclusion condition) or all (social inclusion condition) of the other participants wanted to work with them on the subsequent task. Participants in the social exclusion condition (i.e., those experiencing a noted lack of social support) overestimated the duration of time intervals and had slower reaction times on a computer task.

Taken together, these findings suggest that social support may play a similar role in distance perception as in slant perception. In the present study, we hypothesized that participants who felt understood would perceive distances as shorter, both in physical distance and in terms of walking time, than those who felt misunderstood.

Overview of the Present Study

The present study has two main purposes: first, to further bring together research on basic modes of perception with research on social support, and second, to suggest felt understanding as a specific mediator of social support in its influence on perception. While the literature generally supports the idea of perception being affected by action potential, few studies have been conducted to examine whether social support is, in fact, a key component of human action potential. In addition, while numerous studies have shown that social support affects the way we perceive and interact with the world, few have attempted to offer a specific mechanism. Relationships are incredibly complex and vary widely in content and quality; the present study proposes that since felt understanding is a critical element of any successful relationship, its manipulation alone should be enough to impact perception. Finally, while some studies have examined the effects of social support on one particular mode of perception (e.g. pain or slant perception), none have been as comprehensive as the present study.
Experiencing pain and implicitly estimating and making decisions about distances and slants are all a part of everyday life and together create a picture of how we perceive the world, so investigating them all at once is a sensible way to test the impact of felt understanding on perception. In the present study, we hypothesized that felt understanding will affect basic modes of perception such that potentially negative experiences are perceived as less extreme; specifically, we hypothesized that participants who felt understood, as compared to participants who felt misunderstood, would perceive pain during a cold pressor task as less extreme and would consequently be able to endure it for longer, and would also perceive the slant of a hill as less steep, and distances as shorter in terms of both physical distance and time required to traverse them. Furthermore, due to both previous findings and the general action-potential theory of perception whereby males tend to have greater physical abilities with which to undertake difficult tasks, we hypothesized gender differences such that male participants would perceive pain as less extreme (and would be able to endure the pain for longer), slant as less steep, and distances as shorter.

**Methods**

**Participants**

Participants were 202 undergraduate students at the University of Virginia. The sample consisted of 90 men (44.6%) and 112 women (55.4%) with a mean age of 18.89 (SD = 1.60). All participants had normal or corrected-to-normal vision and participated with a same-gender stranger or alone (control condition). Participants gave written informed consent and received partial course credit for their participation.
Materials and Procedure

Participants were seated at separate desks facing opposite directions on arrival and asked to read and sign the consent form, which indicated that they would be taking part in a study aimed at investigating the way people represent and navigate the environment within different social contexts. Participants then filled out the initial questionnaire independently. This questionnaire asked each participant to choose two from a list of 10 personality traits that described them most accurately and two that described them least accurately, in addition to a number of questions meant to assess personality traits, well-being, and basic demographic information. The questionnaire also measured frequency of mild, moderate, and strenuous exercise (i.e. “Considering a 7-day period, how many times on the average do you do the following kinds of exercise for more than 15 minutes during your free time?”) as well as an estimate of participants’ ability to run and do pushups to exhaustion (e.g. “If you were asked right now to do as many pushups as possible, how many do you think you would be able to do?”). We combined responses to the strenuous exercise, running ability, and pushup ability items to create a composite measure of physical fitness (Cronbach’s $\alpha = .65$). See Appendix A for the initial questionnaire.

After the questionnaires were completed and collected, participants were asked to move to a center table facing each other. Participants were told they would be given an opportunity to get to know each other, and had eight minutes to have an informal conversation to that end. During this time, the experimenter used the initial questionnaire to set up the study’s main manipulation: false impression sheets similar to those used by Oishi et al. (2008) and Lun et al. (2010). After the eight-minute conversation, participants were asked to return to their original seats and told that the remainder of the experiment was to be completed in relative silence (this
measure of “silence” was taken mainly to ensure that participants did not immediately discuss their impression sheets and become aware of the manipulation). Each participant was instructed to give their impression of the interaction partner by circling from a list of character traits the two most and two least descriptive of their partner. The experimenter then collected each impression sheet and appeared to swap them between participants, but in reality gave participants a previously prepared false impression sheet rather than the one their partner had filled out about them. These false impression sheets were manipulated based on condition such that participants received a sheet where the traits circled were the exact same ones they circled on the initial questionnaire when describing themselves (felt understanding condition) or the exact opposite (felt misunderstanding condition). Participants were then instructed to read through their “partner’s” impression sheet and fill out a post-interaction questionnaire (manipulation check) that asked them to rate how they felt about their interaction partner’s feedback on a Likert-type scale from 1 (not at all) to 7 (a lot) on a number of questions meant to gauge felt understanding and misunderstanding. See Appendix B for the impression sheet and post-interaction questionnaire. In order to test the effectiveness of the manipulation, we created new summary variables from the post-interaction questionnaire for overall felt understanding (items 1-4) and overall felt misunderstanding (items 5-9).

After the impression sheets and post-interaction questionnaires were collected, each participant completed a cold pressor task similar to that used by Brown et al. (2003) in order of participant number while their interaction partner remained in their original seat facing the opposite direction of the center table. Tap water was cooled with ice in a large bowl to a temperature approximately between 35 and 37 degrees Fahrenheit \((M = 35.68, SD = .66)\). Participants were instructed to fully submerge their non-dominant hand into the ice water for up
to three minutes, or as long as they could tolerate the pain. The duration participants could keep their hand in the ice water was timed using a stopwatch as a measure of task performance. For as long as participants had their hand in the ice water, they were instructed to rate the amount of pain they were experiencing every 30 seconds on a Likert-type scale from 1 (none) to 10 (extreme). See Appendix C for the pain scale. For the purposes of our analysis, self-reported pain at all time points was averaged to create a composite pain score ($M = 6.03$, $SD = 1.74$) for all participants who completed the cold pressor task.

Next, in order to test slant and distance perception, participants followed the experimenter outside and completed verbal hill slant and distance estimation tasks in order of participant number while their interaction partner sat on steps out of hearing distance and facing away from the hill. Participants stood at the base of a five degree hill used in previous studies by Bhalla & Proffitt (1999) and Proffitt et al. (1995). The total distance was marked by a small orange cone at the top of the hill. Participants were asked to give verbal responses that were recorded on paper by the experimenter. In order to study felt understanding in the same way social support has been examined in prior research, we followed Schnall et al.’s (2008) procedure by having participants wear a heavy backpack while they estimated hill slant and distance. The backpack was filled with textbooks approximating 20% of each participant’s body weight, consistent with Schnall et al. (2008) and Bhalla & Proffitt (1999). The addition of the backpack also served to increase the range of slant estimates, which was important when using a hill with such a small slant. Participants put on the backpack and were first instructed to think about the distance up the hill to the cone end-point, and then completed an imagined walking task (i.e., “When I say start, imagine that you have begun walking up the hill toward the cone,
and tell me ‘stop’ when you imagine having arrived at the cone.”). Participants were then asked to give a verbal estimate of the distance to the cone in feet and of the hill slant in degrees.

Next, participants returned to their original seats in lab and completed written distance estimation tasks where they estimated the distance to nearby landmarks (namely the Charlottesville Downtown Mall and Thomas Jefferson’s Monticello), along with how difficult it would be to walk to each landmark and how long the walk would take. See Appendix D for all written materials used during the slant and distance estimation tasks. As the distribution of the distance estimation variables (distance in miles and walking time in minutes) was highly skewed (Skewness for miles to Monticello = 6.10, Kurtosis = 45.85; Skewness for minutes to Monticello = 5.12, Kurtosis = 35.63; Skewness for miles to Downtown = 6.37, Kurtosis = 54.11; Skewness for minutes to Downtown = 4.37, Kurtosis = 27.51), we used the square root transformation to remove severe deviation from the normal distribution. We then standardized and averaged estimates for each variable (Cronbach’s α = .65). The skewness was removed once the data was transformed (M = .01, SD = .71; Skewness = 1.49, Kurtosis = 3.60), so we used the mean standardized distance estimate as a measure encompassing these distance estimation variables in the following analysis.

At the end of the study, participants were asked whether they had any questions or comments about the experiment (in order to gauge suspicion of the impression sheets) and were asked to sign a release after being informed about the use of false impression sheets. Participants in the control condition completed all tasks alone after filling out the initial questionnaire. Post-experiment debriefing suggested that 24 participants were suspicious of the manipulation; these participants were excluded from our analyses.
Results

Manipulation Check

The manipulation of felt understanding and misunderstanding was successful, as participants in the felt understanding condition indeed reported feeling more understood ($M = 5.82, SD = .81$) than participants in the felt misunderstanding condition ($M = 4.16, SD = 1.43$), $t(156) = 8.91, p = .001$. Likewise, participants in the felt understanding condition reported feeling less misunderstood ($M = 1.75, SD = .80$) than participants in the felt misunderstanding condition ($M = 3.18, SD = 1.36$), $t(156) = -7.93, p = .001$.

Main Analyses

Table 1 presents means and standard deviations for main dependent variables for all participants. We first examined the data as a whole, looking at performance on each task in turn. As physical fitness and gender were both highly correlated with participants’ performance on the cold pressor task, we included these variables in our analyses below.

Cold pressor task. We first examined whether the experimentally induced felt understanding or misunderstanding affected pain perception in the cold pressor task. Specifically, we conducted a multiple regression analysis, predicting the time in seconds participants could endure the cold pressor task pain from experimental condition (felt misunderstanding = -1; control = 0; felt understanding = +1), as well as participants’ fitness level and gender. Consistent with our hypothesis, we found a significant linear trend such that participants in the felt understanding condition were able to endure the cold pressor task for more seconds than those in the control condition, and those in the control condition for more seconds than participants in the felt misunderstanding condition, $B = 10.47, SE = 5.18, \beta = .14, t(171) = 2.02, p = .05$ (see Table 1 and Figure 1). Next, we examined the average self-reported pain of
participants who completed the cold pressor task. Contrary to our hypothesis, during the cold pressor task participants on average reported experiencing more pain in the felt understanding condition than in the felt misunderstanding condition, $B = .46$, $SE = .23$, $\beta = .14$, $t(93) = 2.28$, $p = .03$ (see Table 1 and Figure 2). These results indicate that despite having experienced more subjective pain, participants in the felt misunderstanding condition were able to endure the cold pressor task for a longer period of time than did participants in the felt understanding condition.

**Distance estimation tasks.** We next examined whether the experimentally induced feelings of understanding or misunderstanding affected perception on the distance estimation tasks, specifically how far participants perceived the distance of two local landmarks, Monticello and the Downtown mall. We conducted a multiple regression analysis, predicting the mean standardized distance estimation from experimental condition (felt misunderstanding = -1; control = 0; felt understanding = +1), as well as participants’ fitness level and gender. As hypothesized, we found a significant linear trend such that participants in the felt understanding condition perceived distances to be shorter than those in the control condition, and participants in the control condition perceived distances to be shorter than those in the misunderstanding condition, $B = -.128$, $SE = .06$, $\beta = -.16$, $t(171) = -2.10$, $p = .04$ (see Table 1 and Figure 3).

**Slant estimation task.** Next, we investigated the effect of experimentally induced feelings of understanding or misunderstanding on slant perception. We conducted a multiple regression analysis, predicting the hill slant in degrees from experimental condition (felt misunderstanding = -1; control = 0; felt understanding = +1), as well as participants’ fitness level and gender. Although the patterns of the results were consistent with the two other tasks, a linear trend did not reach significance, $B = -1.44$, $SE = 1.08$, $\beta = -.10$, $t(168) = -1.33$, $p = .19$ (see Table 1 and Figure 4).
Gender Differences

We hypothesized gender differences such that male participants would perceive pain as less extreme (and would be able to endure the pain for longer), slant as less steep, and distances as shorter. Consistent with our hypothesis, an independent t-test revealed that male participants were able to endure the pain of the cold pressor task for longer than female participants \((M_{\text{Male}} = 144.52, SD_{\text{Male}} = 54.81; M_{\text{Female}} = 100.58, SD_{\text{Female}} = 65.87; t(176) = -4.79, p = .001)\). In addition, male participants who completed the entire cold pressor task reported feeling less pain than did female participants \((M_{\text{Male}} = 5.80, SD_{\text{Male}} = 1.72; M_{\text{Female}} = 6.46, SD_{\text{Female}} = 1.71; t(95) = 1.99, p = .05)\). Finally, male participants perceived the hill to be less steep than did female participants \((M_{\text{Male}} = 20.64, SD_{\text{Male}} = 11.35; M_{\text{Female}} = 27.59, SD_{\text{Female}} = 13.55; t(171) = 3.63, p = .001)\). We examined the patterns of results for female and male participants separately to see whether there were gender-specific effects of felt understanding.

Female participants. Table 2 presents means and standard deviations for main dependent variables for female participants only. As hypothesized, we found a significant linear trend such that participants in the felt understanding condition were able to endure the cold pressor task for longer than those in the control condition, who in turn were able to endure the cold pressor task for longer than those in the felt misunderstanding condition, \(B = 16.20, SE = 7.02, \beta = .22, t(91) = 2.31, p = .02\) (see Table 2). Also as hypothesized, we found a significant linear trend such that participants in the felt understanding condition estimated slant as less steep than those in the control condition, who in turn estimated slant as less steep than those in the felt misunderstanding condition, \(B = -4.49, SE = 1.51, \beta = -.30, \tau(87) = -2.99, p = .004\) (see Table 2). Looking at only female participants, we found that average pain reported during the cold pressor task was no longer predicted by felt understanding, \(B = .18, SE = .34, \beta = .09, \tau(35) = .54, p = .

.59; the same was true for distance estimates, $B = -.14, SE = .09, \beta = -.16, t(92) = -1.54, p = .13$ (see Table 2).

**Male Participants.** Table 3 presents means and standard deviations for main dependent variables for male participants only. Contrary to our hypothesis, we found a significant linear trend such that participants in the felt understanding condition reported experiencing more pain during the cold pressor task than those in the control condition, who in turn reported experiencing more pain during the cold pressor task than those in the felt misunderstanding condition, $B = .63, SE = .25, \beta = .32, t(56) = 2.53, p = .01$ (see Table 3). Looking at only male participants, we found that performance on the cold pressor task was no longer predicted by felt understanding, $B = 2.00, SE = 6.90, \beta = .03, t(78) = .29, p = .77$; the same was true for distance estimates, $B = -.10, SE = .08, \beta = -.15, t(77) = -1.31, p = .19$ (see Table 3). In addition, we found a linear trend approaching significance indicating that hill slant perception was predicted by felt understanding for male participants, $B = 2.13, SE = 1.46, \beta = .16, t(77) = 1.46, p = .15$ (see Table 3).

**Discussion**

In the present study, we hypothesized effects of felt understanding on perception such that participants who felt understood would view potentially negative experiences as less extreme in the following ways: by perceiving pain as less extreme and being able to endure a painful cold pressor task for longer, by perceiving the slant of a hill to be less steep, and by perceiving distances to be shorter. Consistent with our hypothesis, participants who felt understood (as opposed to those who felt misunderstood, or who were in the control condition) could endure the cold pressor task for longer and perceived distances as shorter and slant as less steep. Contrary to our hypothesis, we found that among participants who completed the cold
pressor task, those who felt understood reported experiencing more pain. We also hypothesized and found gender differences such that male participants perceived pain as less extreme (and were able to endure the pain for longer) and perceived slant as less steep than did female participants. Due to these gender differences, we also investigated whether felt understanding had varying effects as a result of gender. We found that overall results for reported pain were driven by male participants, and that looking at female participants only there was no significant relationship between felt understanding and pain experienced during the cold pressor task. We also found that overall results for performance on the cold pressor task were driven by female participants, and that looking at male participants only there was no significant relationship between felt understanding and total time in ice during the cold pressor task. Finally, we found that female participants who felt understood perceived slant as less steep, while this effect was only marginal for male participants. We first examine potential explanations for our unexpected findings in regard to the cold pressor task, and then look at the slant and distance perception tasks in turn.

**Pain Perception in the Cold Pressor Task**

There are many possible reasons why we did not find a relationship between felt understanding and time in ice during the cold pressor task for male participants. Male participants were already more likely to complete the cold pressor task than were female participants, and it seems likely that the task appeared to be less difficult or pain-inducing for them. Indeed, most previous studies of pain have used only female participants (e.g. Coan, Schaefer, & Davidson, 2006; Master et al., 2009). However, as we also did not find a relationship between felt understanding and reported pain for female participants, it’s possible...
that other variables moderating felt understanding may have come into play in ways not
controlled for by the present study.

One such possibility is the interaction of different motivational reactions by participants
based on culture – the present study included participants of all cultural backgrounds, but
previous research has suggested that culture moderates felt understanding as well as the way this
understanding affects motivation (Lun et al., 2010; Oishi et al., 2008). For example, Asian
Americans are more likely to feel understood when their collective self is validated (e.g., through
understanding of group affiliation) and to withdraw when feeling misunderstood, while European
Americans are more likely to feel understood when their individual self is validated (e.g.,
through understanding of personal characteristics) and to become more persistent when feeling
misunderstood. As a result, it’s possible that such group differences here might have contributed
to a lack of overall differences in any one direction.

Different motivational outcomes of felt understanding for males and females likely also
exist. For example, during the cold pressor task it is possible that male participants in the
misunderstood condition might have become motivated to outwardly prove their masculinity and
strength to their male interaction partner. This same effect would not have been seen in the
distance and slant estimation tasks, however, because the estimates were made privately.
Investigating differences in the motivational outcomes of felt understanding was outside the
scope of the present study, but in the future a larger study aimed at exploring how the impact of
felt understanding on motivation varies between cultures and gender would be useful in both
clarifying the results and gauging the generalizability of the present findings. Looking at male
participants alone, we found additional unexpected results for the cold pressor task in the amount
of pain experienced.
Contrary to our hypothesis, among those who completed the cold pressor task, male participants who felt understood (as opposed to those who felt misunderstood or were in the control condition) reported experiencing more pain on average during the task. While previous studies of pain have generally used female participants, meaning that our findings are not in direct conflict with prior research, we did expect that male and female participants would both experience less pain when they felt understood. However, this study employed only a self-report measure to understand experienced pain, so there are many possible distortions. One possibility is that participants who felt understood were inclined to continue on in the task up to a higher pain threshold (i.e., it’s not that they experienced less pain and so lasted longer on the cold pressor task as we originally hypothesized, but that those who felt understood were able to continue enduring the pain despite how extreme it felt). Additionally, it’s possible that participants who felt misunderstood might be more inclined to rate their pain as less intense than it actually was, to avoid coming off as weak in the face of social rejection. Future studies might further investigate differences in pain ratings between male and female participants over a range of painful tasks with and without manipulation, and should also utilize physiological measures when comparing response to social support so that comparisons can be made to tease out the above possibilities. As with the cold pressor task, our findings with the other perception tasks also require further discussion in order to gain a complete understanding of their significance.

**Slant and Distance Perception Tasks**

Although the patterns of slant perception were consistent with our hypothesis, these results were statistically significant only among female participants, and were marginal overall and among male participants alone. While the findings generally suggest that there is indeed some effect of felt understanding on slant perception, there are a few possible reasons as to why
these effects weren’t more robust. In keeping with the action potential theory of perception (Bhalla & Proffitt, 1999), the most realistic slant estimates would have taken into account actual future plans to traverse the hill. However, in the present study it was made clear to participants that they would not actually be walking up the hill (often to their visible relief), so it’s possible that merely imagining in this particular case did not evoke the same action potential process. In addition, the hill we used was only five degrees and not very long, as this was the only hill in walking distance of the lab. While the hill had been used successfully in previous studies of slant estimation, it seems likely that the effect of felt understanding would be even more evident in a steeper hill that posed more of a challenge to traverse.

While previous researched looked only at slant perception, the present study also investigated the effect of social support on distance perception, and we found support for our hypothesis. The addition of this variable is important for expanding the scope of our knowledge of the modes of perception impacted by felt understanding. In particular, the distances estimated in this study were somewhat abstract; some participants were unsure where these locations were, and it is quite unlikely that any participants actually walked to them. Thus, these findings lend support to the idea that people who feel understood tend to see the world as a rosier, less extreme place in a more general sense. In the future, looking at additional realms where social support may affect perception will help to further generalize our findings. At the same time, future studies might also continue to investigate the effect of felt understanding on perception of more concrete distances, such as between two closer landmarks well-known to students of all years, to create a situation where participants are likely to have actual walking experience to each location separately but not frequently between them (e.g. from O-Hill to Beta Bridge). This research
would allow us to conclude whether felt understanding affects distance perception more when it occurs in our mind’s eye, or just as much in a very practical and immediate way.

Conclusion

While the results of the present study are a promising addition to the growing body of research on social support, in particular lending support to the mechanism of felt understanding, there were a number of limitations that might be corrected in the future to further strengthen the internal validity of our findings. First, while results indicated that small variations in ice water temperature and backpack weight did not have an effect, our stimuli ideally could have been more precise: automatically regulated water temperature for the cold pressor task, use of actual weights and exact measures to ensure that 20% of participants’ body weight was in the backpack, etc. In addition, the tasks in the present study required frequent interaction with the experimenter, which creates potential for some effect of social support to result from the mere presence of another person during the individual tasks. A final possibility is that other confounding variables had some impact on the results, for example participant experience with perception (perhaps due to a class on the subject) or repeated exposure to ice (perhaps due to a recent injury); future studies may question participants on these and other measures to attempt to further control for such variables.

Despite these uncertainties and limitations, we did find key instances of support for our overall hypothesis: with no other systematic differences between relationships, manipulation of felt understanding alone was enough to affect perception of distances and slants, and to enable people to endure pain for longer. Not only do these findings further bolster the literature touting the importance of social support in daily life, they contribute the critical point that felt understanding may mediate such support. Future research might incorporate the investigation of
felt understanding moderators, such as culture and residential mobility, as well as continue to examine differences in the effects of felt understanding between genders. Additionally, future research should focus on the effects of felt understanding on other modes of perception, as well as on task performance at both a high and low cognitive level. As the present research shows, felt understanding has noticeable effects on our perception; finding the extent of these effects will be an essential step in determining just how broadly applicable our findings are. For now, we emphasize that even these limited results have potential real-world applications.

Experience of social support is important for a number of positive life outcomes; the present research suggests that such support can affect our day-to-day perception. Furthermore, these effects were seen as a result of felt understanding created in less than 10 minutes, which suggests an even more relevant implication: it’s not necessary to spend years fostering close friendships in order to eke out social support’s positive effects; rather, seeking friendships that are validating and non-judgmental can create a sense of felt understanding even as these relationships have just begun to blossom. While research has long indicated that it’s quality and not quantity that counts when pursuing friendships, the results of the present study add another layer of specificity to that idea, suggesting that quality in particular domains of friendship (i.e., felt understanding) is what matters. We know other people have a profound impact on our daily lives, but the closer we come to figuring out exactly how others can have the most positive effect on us (and vice-versa), the more empowered we become to harness the potential of what has been called mankind’s greatest strength: other humans.

References


Appendix A
Please read the following personality descriptors, and circle **two words** that describe you **most** accurately.

Hardworking    Intelligent    Fun-Loving    Friendly    Stubborn
Cooperative    Relaxed    Leader    Emotional    Rational

Please read the following personality descriptors, and circle **two words** that describe you **least** accurately.

Hardworking    Intelligent    Fun-Loving    Friendly    Stubborn
Cooperative    Relaxed    Leader    Emotional    Rational

How would you describe the city/town you grew up? If you moved several times, answer for the city/town you spent the longest time before coming to UVA. Circle the appropriate number.

1. Large city (e.g., DC),
2. Suburb of a Large City (e.g., Reston),
3. Medium Size City (e.g., Richmond),
4. Suburb of a Medium Size City,
5. Small Town/Rural

List groups you belonged to in high school or now at UVA (e.g., sorority/fraternity, debate team, bible study, intramural basketball team, band, etc.). If you are not student, please list the groups you belong now or in the past that are (were) personally important to you.

•
•
•
•
•
•
•
Directions: Below are some personal statements that you may agree or disagree with. Please indicate the response that best fits you, using the 7-point scale below.

1. In most ways my life is close to my ideal.
2. The conditions of my life are excellent.
3. I am satisfied with my life.
4. So far I have gotten the important things I want in life.
5. If I could live my life over, I would change almost nothing.

Before each trait, please write a number indicating how accurately the trait describes you, using the following rating scale. Indicate how true each of the following terms is in describing you:

1 = Not at all true of me; I am almost never this way
2 = Mostly not true of me; I am rarely this way
3 = Neither true nor untrue of me, or I can’t decide
4 = Somewhat true of me; I am sometimes this way
5 = Very true of me; I am very often this way

____ 1. imaginative
____ 2. organized
____ 3. talkative
____ 4. sympathetic
____ 5. tense
____ 6. intelligent
____ 7. thorough
____ 8. assertive
____ 9. kind
____ 10. anxious
____ 11. original
____ 12. efficient
____ 13. active
____ 14. soft-hearted
____ 15. nervous
____ 16. insightful
____ 17. responsible
____ 18. energetic
____ 19. warm
____ 20. worrying
____ 21. clever
____ 22. practical
____ 23. outgoing
____ 24. generous
____ 25. self-pitying
Please read the defining characteristics of each value described below. Then, rank order these ten values from (1) the most important to (10) the least important.

26. **Power**: social power, authority, wealth, social recognition
27. **Achievement**: successful, capable, influential, ambitious
28. **Hedonism**: pleasure, enjoying life
29. **Stimulation**: a varied life, daring, exciting life
30. **Self-Direction**: independence, creativity, curious, freedom, choosing own goals
31. **Universalism**: equality, social justice, broad-minded, world at peace, harmony with nature
32. **Benevolence**: helpful, loyal, honest, responsible, true friendship, mature love
33. **Tradition**: respect for tradition, humble, devout, accepting my position in life
34. **Conformity**: self-restraint, polite, honoring parents, obedience
35. **Security**: social order, national security, family security, sense of belonging

Please answer the following questions about yourself.

1. Considering a 7-day period (a week) how many times on the average do you do the following kinds of exercise for more than 15 minutes during your free time?
   - Strenuous exercise (heart beats rapidly): number of times in week ______
   - Moderate exercise (not exhausting): number of times in week ______
   - Mild exercise (minimal effort): number of times in week ______

2. If you were asked right now to do as many pushups as possible, how many do you think you would be able to do?

3. If you were asked right now to jog as far as possible without stopping, how many miles do you think you would be able to run?

4. Please indicate how hungry you are right now by circling the appropriate number on the scale below:

   1  2  3  4  5  6  7

   I couldn’t eat another bite  Starving – I could eat a horse

5. Please circle your weight from one of the categories below:

   < 100 lbs  100 – 150 lbs  150 – 200 lbs  > 200 lbs
Below are demographic questions about you.

Age: ___  Sex: ___  Race (White, Black, Asian, Hispanic, etc): _________

Your Ethnic Heritage (e.g., Irish, Italian, etc.)

Mother’s side: __________________________; Father’s side: __________________________

Your religion: __________________________

Year in College: ________________________

If you are not born in the US, how long have you been in the U.S.? ______ years

What language is spoken at home? __________________________

Please list the city or town and state where you were born? __________________________

Please list any city or town and state or country to which you moved and the age when you moved there.

<table>
<thead>
<tr>
<th>Place</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix B

Impression Sheet

Your ID: __ __ __  Partner's ID: __________

Please read the following personality descriptors, and circle **two words** that describe your interaction partner **most** accurately.

Hardworking Intelligent Fun-Loving Friendly Stubborn
Cooperative Relaxed Leader Emotional Rational

Please read the following personality descriptors, and circle **two words** that describe your interaction partner **least** accurately.

Hardworking Intelligent Fun-Loving Friendly Stubborn
Cooperative Relaxed Leader Emotional Rational
Post-interaction Questionnaire

ID: __ __ __

Below are a series of questions regarding how you felt about your interaction partner’s feedback. Please answer these questions using the following scale.

1--------2--------3--------4--------5--------6--------7
Not at all       Somewhat       A lot

1. ___ Overall, how much do you feel that you were understood by the partner?
2. ___ Overall, how much do you feel that you were appreciated?
3. ___ Overall, how much do you feel that you were validated?
4. ___ Overall, how much do you feel that you were respected?
5. ___ Overall, how much do you feel that you were misunderstood?
6. ___ Overall, how much do you feel that you were ignored?
7. ___ Overall, how much do you feel that you were alienated?
8. ___ Overall, how much do you feel that you were judged?
9. ___ Overall, how much do you feel that you were misperceived?
10. ___ Overall, how much did you like the partner?
11. ___ Overall, how much did you dislike the partner?

12. ___ How happy are you feeling right now?
13. ___ How sad are you feeling right now?
14. ___ How pleasant are you feeling right now?
15. ___ How unpleasant are you feeling right now?
16. ___ How energetic are you feeling right now?
17. ___ How tired are you feeling right now?
18. ___ Overall, how accurate was his/her impression?
19. ___ To what degree was his/her impression about your personal self (e.g., your personality, abilities, and skills) accurate?
20. ___ To what degree was his/her impression about your collective self (e.g., your background, group membership) accurate?
Appendix C

Pain Scale

ID: __________

(30 seconds) How much pain are you feeling right now?

1----------2---------3-------4-------5-------6-------7-------8-------9-------10
None                                Extreme

(60 seconds) How much pain are you feeling right now?

1----------2---------3-------4-------5-------6-------7-------8-------9-------10
None                                Extreme

(90 seconds) How much pain are you feeling right now?

1----------2---------3-------4-------5-------6-------7-------8-------9-------10
None                                Extreme

(120 seconds) How much pain are you feeling right now?

1----------2---------3-------4-------5-------6-------7-------8-------9-------10
None                                Extreme

(150 seconds) How much pain are you feeling right now?

1----------2---------3-------4-------5-------6-------7-------8-------9-------10
None                                Extreme

(180 seconds) How much pain are you feeling right now?

1----------2---------3-------4-------5-------6-------7-------8-------9-------10
None                                Extreme
Appendix D

The Perception Task Outside Gilmer Hall (For Experimenter Only)

ID: __________

Hill

1. The imagined walking time  __________ seconds
2. The verbal estimate of the slope  __________ degree
3. The verbal estimate of the distance  __________ feet
The Distance Perception Questionnaire

ID: ____________

Now, please imagine walking up to Thomas Jefferson’s Monticello from here.
How long do you think it will take you to get to Monticello from here? _______ min
How far do you think Monticello is from here? _______ miles
How easy or difficult do you think it will be to walk to Monticello?

1---------2--------3--------4--------5--------6--------7--------8--------9--------10
Very Easy                        Extremely
                                Difficult

Now, please imagine walking to the Downtown mall from here.
How long do you think it will take you to get to the Downtown mall from here? _______ min
How far do you think the Downtown mall is from here? _______ miles
How easy or difficult do you think it will be to walk to the Downtown mall?

1---------2--------3--------4--------5--------6--------7--------8--------9--------10
Very Easy                        Extremely
                                Difficult
Table 1

Means (and Standard Deviations) for Felt Understanding on Main Dependent Variables

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Understanding</th>
<th>Control</th>
<th>Misunderstanding</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cold Pressor Task</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ave. Pain (1-10)*</td>
<td>6.63 (1.49)</td>
<td>5.57 (1.90)</td>
<td>5.63 (1.75)</td>
<td>6.03 (1.74)</td>
</tr>
<tr>
<td>Time in Ice (Sec.)*</td>
<td>128.83 (60.37)</td>
<td>120.70 (67.20)</td>
<td>112.42 (67.46)</td>
<td>120.83 (64.70)</td>
</tr>
<tr>
<td>% Completed</td>
<td>.56 (.50)</td>
<td>.53 (.51)</td>
<td>.46 (.50)</td>
<td>.52 (.50)</td>
</tr>
<tr>
<td><strong>Hill Tasks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Est. Walk Time (Sec.)</td>
<td>23.49 (9.83)</td>
<td>25.45 (9.97)</td>
<td>23.80 (8.60)</td>
<td>24.06 (9.39)</td>
</tr>
<tr>
<td>Est. Hill Slant (Degrees)</td>
<td>23.54 (11.30)</td>
<td>22.85 (12.96)</td>
<td>26.05 (14.56)</td>
<td>24.34 (13.00)</td>
</tr>
<tr>
<td>Est. Hill Distance (Feet)</td>
<td>127.82 (91.93)</td>
<td>104.69 (62.89)</td>
<td>127.40 (102.69)</td>
<td>122.31 (90.66)</td>
</tr>
<tr>
<td><strong>Monticello Tasks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Est. Walk Time (Min.)</td>
<td>148.29 (196.25)</td>
<td>129.35 (121.20)</td>
<td>189.00 (270.60)</td>
<td>159.25 (215.04)</td>
</tr>
<tr>
<td>Transformed Time</td>
<td>10.80 (5.66)</td>
<td>10.52 (4.37)</td>
<td>12.03 (6.70)</td>
<td>11.20 (5.83)</td>
</tr>
<tr>
<td>Est. Distance (Miles)</td>
<td>11.02 (20.93)</td>
<td>13.27 (13.02)</td>
<td>15.33 (23.25)</td>
<td>13.15 (20.37)</td>
</tr>
<tr>
<td>Transformed Dist.</td>
<td>2.87 (1.67)</td>
<td>3.29 (1.58)</td>
<td>3.43 (1.90)</td>
<td>3.18 (1.75)</td>
</tr>
<tr>
<td>Difficulty to Walk (1-10)</td>
<td>6.94 (2.14)</td>
<td>6.95 (2.12)</td>
<td>6.75 (2.28)</td>
<td>6.87 (2.18)</td>
</tr>
<tr>
<td><strong>Downtown Mall Tasks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Est. Walk Time (Min.)</td>
<td>49.10 (30.17)</td>
<td>47.30 (28.08)</td>
<td>55.30 (45.17)</td>
<td>51.00 (36.08)</td>
</tr>
<tr>
<td>Transformed Time</td>
<td>6.81 (1.67)</td>
<td>6.67 (1.68)</td>
<td>7.08 (2.28)</td>
<td>6.88 (1.92)</td>
</tr>
<tr>
<td>Est. Distance (Miles)</td>
<td>3.85 (3.85)</td>
<td>5.49 (5.91)</td>
<td>6.01 (9.52)</td>
<td>5.03 (6.68)</td>
</tr>
<tr>
<td>Transformed Dist.</td>
<td>1.89 (.54)</td>
<td>2.14 (.98)</td>
<td>2.16 (1.16)</td>
<td>2.05 (.92)</td>
</tr>
<tr>
<td>Difficulty to Walk (1-10)</td>
<td>4.44 (1.71)</td>
<td>4.40 (1.93)</td>
<td>4.02 (2.06)</td>
<td>4.27 (1.90)</td>
</tr>
<tr>
<td>Mean Standardized Distance Est.*</td>
<td>- .11 (.68)</td>
<td>-.01 (.59)</td>
<td>.14 (.80)</td>
<td>.01 (.71)</td>
</tr>
</tbody>
</table>

Note: Significant linear trends indicated at *p < .05
Table 2

Means (and Standard Deviations) for Felt Understanding on Main Dependent Variables,
Female Participants Only

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Understanding</th>
<th>Control</th>
<th>Misunderstanding</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cold Pressor Task</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ave. Pain (1-10)</td>
<td>6.68 (1.84)</td>
<td>6.00 (1.77)</td>
<td>6.40 (1.42)</td>
<td>6.46 (1.71)</td>
</tr>
<tr>
<td>Time in Ice (Sec.)*</td>
<td>117.21 (62.91)</td>
<td>96.05 (68.57)</td>
<td>82.71 (64.58)</td>
<td>100.58 (65.87)</td>
</tr>
<tr>
<td>% Completed</td>
<td>.48 (.51)</td>
<td>.35 (.49)</td>
<td>.26 (.45)</td>
<td>.38 (.49)</td>
</tr>
<tr>
<td><strong>Hill Tasks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Est. Walk Time (Sec.)</td>
<td>24.50 (9.89)</td>
<td>26.50 (10.04)</td>
<td>23.82 (8.27)</td>
<td>24.68 (9.31)</td>
</tr>
<tr>
<td>Est. Hill Slant (Degrees)*</td>
<td>23.82 (10.13)</td>
<td>26.55 (14.19)</td>
<td>32.41 (15.30)</td>
<td>27.59 (13.55)</td>
</tr>
<tr>
<td>Est. Hill Distance (Feet)</td>
<td>120.44 (109.55)</td>
<td>99.35 (70.27)</td>
<td>119.39 (119.17)</td>
<td>115.46 (105.52)</td>
</tr>
<tr>
<td><strong>Monticello Tasks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Est. Walk Time (Min.)</td>
<td>169.15 (244.50)</td>
<td>140.25 (81.77)</td>
<td>209.82 (347.78)</td>
<td>177.62 (264.49)</td>
</tr>
<tr>
<td>Transformed Time</td>
<td>11.24 (6.62)</td>
<td>11.31 (3.61)</td>
<td>12.31 (7.74)</td>
<td>11.64 (6.52)</td>
</tr>
<tr>
<td>Est. Distance (Miles)</td>
<td>13.05 (26.91)</td>
<td>16.88 (14.16)</td>
<td>18.35 (30.41)</td>
<td>15.75 (26.06)</td>
</tr>
<tr>
<td>Transformed Dist.</td>
<td>3.00 (2.03)</td>
<td>3.83 (1.53)</td>
<td>3.69 (2.21)</td>
<td>3.42 (2.02)</td>
</tr>
<tr>
<td>Difficulty to Walk (1-10)</td>
<td>6.85 (2.33)</td>
<td>7.50 (2.31)</td>
<td>7.26 (2.02)</td>
<td>7.14 (2.21)</td>
</tr>
<tr>
<td><strong>Downtown Mall Tasks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Est. Walk Time (Min.)</td>
<td>48.40 (34.03)</td>
<td>49.00 (33.43)</td>
<td>55.65 (55.49)</td>
<td>51.09 (42.48)</td>
</tr>
<tr>
<td>Transformed Time</td>
<td>6.72 (1.82)</td>
<td>6.76 (1.85)</td>
<td>7.02 (2.56)</td>
<td>6.84 (2.10)</td>
</tr>
<tr>
<td>Est. Distance (Miles)</td>
<td>3.63 (2.24)</td>
<td>6.82 (7.19)</td>
<td>7.27 (12.76)</td>
<td>5.61 (8.53)</td>
</tr>
<tr>
<td>Transformed Dist.</td>
<td>1.83 (.54)</td>
<td>2.36 (1.15)</td>
<td>2.27 (1.48)</td>
<td>2.10 (1.10)</td>
</tr>
<tr>
<td>Difficulty to Walk (1-10)</td>
<td>4.26 (1.81)</td>
<td>4.90 (2.02)</td>
<td>4.15 (2.15)</td>
<td>4.35 (1.98)</td>
</tr>
<tr>
<td>Mean Standardized Distance Est.</td>
<td>.02 (.72)</td>
<td>-.12 (.72)</td>
<td>.15 (.76)</td>
<td>.03 (.73)</td>
</tr>
</tbody>
</table>

Note: Significant linear trends indicated at *p < .05
Table 3

Means (and Standard Deviations) for Felt Understanding on Main Dependent Variables, Male Participants Only

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Understanding Mean (SD)</th>
<th>Control Mean (SD)</th>
<th>Misunderstanding Mean (SD)</th>
<th>Total Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cold Pressor Task</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ave. Pain (1-10)*</td>
<td>6.59 (1.04)</td>
<td>5.34 (1.99)</td>
<td>5.30 (1.80)</td>
<td>5.75 (1.72)</td>
</tr>
<tr>
<td>Time in Ice (Sec.)</td>
<td>145.66 (53.11)</td>
<td>145.35 (57.34)</td>
<td>143.03 (56.39)</td>
<td>144.52 (54.81)</td>
</tr>
<tr>
<td>% Completed</td>
<td>.69 (.47)</td>
<td>.70 (.47)</td>
<td>.67 (.48)</td>
<td>.68 (.47)</td>
</tr>
<tr>
<td><strong>Hill Tasks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Est. Walk Time (Sec.)</td>
<td>22.17 (9.76)</td>
<td>24.40 (10.06)</td>
<td>23.78 (9.07)</td>
<td>23.36 (9.49)</td>
</tr>
<tr>
<td>Est. Hill Slant (Degrees)</td>
<td>23.17 (12.85)</td>
<td>19.15 (10.69)</td>
<td>19.28 (10.19)</td>
<td>20.64 (11.35)</td>
</tr>
<tr>
<td>Est. Hill Distance (Feet)</td>
<td>137.48 (62.37)</td>
<td>110.03 (55.87)</td>
<td>135.91 (82.76)</td>
<td>130.08 (69.93)</td>
</tr>
<tr>
<td><strong>Monticello Tasks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Est. Walk Time (Min.)</td>
<td>118.79 (89.25)</td>
<td>118.45 (152.37)</td>
<td>166.88 (154.27)</td>
<td>137.70 (134.49)</td>
</tr>
<tr>
<td>Transformed Time</td>
<td>10.18 (3.96)</td>
<td>9.74 (4.98)</td>
<td>11.73 (5.50)</td>
<td>10.68 (4.89)</td>
</tr>
<tr>
<td>Est. Distance (Miles)</td>
<td>8.14 (5.53)</td>
<td>9.67 (10.96)</td>
<td>12.12 (11.31)</td>
<td>10.09 (9.59)</td>
</tr>
<tr>
<td>Transformed Dist.</td>
<td>2.69 (.96)</td>
<td>2.76 (1.47)</td>
<td>3.16 (1.49)</td>
<td>2.89 (1.32)</td>
</tr>
<tr>
<td>Difficulty to Walk (1-10)</td>
<td>7.07 (1.87)</td>
<td>6.40 (1.82)</td>
<td>6.19 (2.44)</td>
<td>6.56 (2.11)</td>
</tr>
<tr>
<td><strong>Downtown Mall Tasks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Est. Walk Time (Min.)</td>
<td>50.10 (24.04)</td>
<td>45.60 (22.24)</td>
<td>54.92 (31.61)</td>
<td>50.90 (26.85)</td>
</tr>
<tr>
<td>Transformed Time</td>
<td>6.93 (1.47)</td>
<td>6.58 (1.54)</td>
<td>7.15 (1.97)</td>
<td>6.93 (1.70)</td>
</tr>
<tr>
<td>Est. Distance (Miles)</td>
<td>4.14 (2.44)</td>
<td>4.16 (4.03)</td>
<td>4.67 (3.63)</td>
<td>4.36 (3.34)</td>
</tr>
<tr>
<td>Transformed Dist.</td>
<td>1.96 (.55)</td>
<td>1.91 (.73)</td>
<td>2.05 (.69)</td>
<td>1.99 (.65)</td>
</tr>
<tr>
<td>Difficulty to Walk (1-10)</td>
<td>4.69 (1.56)</td>
<td>3.90 (1.74)</td>
<td>3.87 (1.20)</td>
<td>4.17 (1.81)</td>
</tr>
<tr>
<td>Mean Standardized Distance Est.</td>
<td>-.07 (.46)</td>
<td>-.31 (.47)</td>
<td>-.01 (.67)</td>
<td>-.11 (.56)</td>
</tr>
</tbody>
</table>

Note: Significant linear trends indicated at *p < .05
Figure Captions

Figure 1. Time in ice during the cold pressor task in misunderstood, control, and understood conditions.

Figure 2. Average pain reported for all time points during the cold pressor task by participants who completed the task in misunderstood, control, and understood conditions.

Figure 3. Mean standardized distance estimates in misunderstood, control, and understood conditions.

Figure 4. Hill slant estimates in misunderstood, control, and understood conditions.
Average Pain Experienced During Cold Pressor
Task (1-10)

- Felt Misunderstanding
- Control
- Felt Understanding

Condition