1-1-1999

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THE EFFECTS OF CATASTROPHIZING AND LABELING ON PAIN TOLERANCE, SENSATION, AND AFFECT

by

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Bachelor of Arts
Cornell University
1995

A thesis submitted in partial fulfillment
of the requirements for the

Master of Arts Degree
Department of Psychology
College of Liberal Arts

Graduate College
University of Nevada, Las Vegas
May 1999

UNLV

Thesis Approval

The Graduate College
University of Nevada, Las Vegas

April 21, 19 99

The Thesis prepared by

Otto Pedraza

Entitled

The Effects of Catastrophizing and Labeling on Pain Tolerance, Sensation, and Affect

is approved in partial fulfillment of the requirements for the degree of

Master of Arts in Psychology

Examination Committee Chair

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ABSTRACT

The Effects of Catastrophizing and Labeling on Pain Tolerance, Sensation, and Affect

by

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The present study examined the effects of labeling on pain tolerance, sensation, and affect for individuals who are high or low pain catastrophizers, as measured through the Pain Catastrophizing Scale (PCS). Participants completed the PCS and were randomly assigned to 1 of 3 labeling conditions: A maximizing, a minimizing, and a neutral label condition. All participants then took part in a cold-pressor test. The cold-pressor measure of pain tolerance, as well as visual analog scales of sensory and affective ratings of pain, provided the dependent measures. Participants also completed the Anxiety Sensitivity Index (ASI) and the Somatic Amplification Questionnaire (SAQ). Results indicated that high pain catastrophizers have significantly reduced pain tolerance, increased pain sensations, and increased pain unpleasantness compared with low pain catastrophizers. In addition, significant correlations were found between the dependent measures. Main effects for labeling, and interaction effects between pain catastrophizing and labeling, were not supported.

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ACKNOWLEDGMENTS

I would like to extend my sincerest gratitude to each of the thesis examination committee members. In particular, I would like to thank Dr. Rasmussen for the opportunity to use his research lab and Dr. Meana, who provided support, friendship, and thorough criticism at every step of the process. Thanks to all of you for your contributions to this study.

CHAPTER 1

INTRODUCTION

The study of both chronic and experimental pain has received increased attention over the past two decades, and yet there remains a relatively small amount of experimental investigation given the magnitude of the health problem directly associated with pain (Turk & Rudy, 1992). For example, over 500,000 Americans died from cancer in 1993, and it is estimated that as many as 70% may have died in unabated pain (Ferrell & Griffith, 1994). Hirsch and Liebert (1998) point out that pain is the "most prevalent health care problem, unequaled in incidence," and although difficult to calculate, many researchers have called attention to the growing costs associated with pain management (Ferrell & Griffith, 1994; Sullivan, Stanish, Waite, Sullivan, & Tripp, 1998; Turk & Rudy, 1992). For instance, the cost of back pain in the United States has been estimated to be 50 to 100 billion dollars every year (Frymoyer & Cats-Baril, 1991; Engel, Von Korff, & Katon, 1996). Similarly, although oral analgesics are the least costly route for analgesic administration, the cost may exceed $1,000 per month in high doses (Ferrell & Griffith, 1994).

Furthermore, the availability of pain relief is severely constrained by the present managed-care system. As Ferrel and Griffith (1994) state, "over 34 million people in the United States have no health insurance and an additional 80 million people are estimated to be significantly 'underinsured' if faced with a serious or chronic illness." Clearly,

there is increasing concern over the high prevalence of pain symptoms and disorders, as well as the costs associated with their treatment and management. One of the goals of pain treatment programs is to educate patients in the roles that emotions, behaviors, and attitudes play in the experience of pain (Deathe & Helmes, 1993). It therefore seems important to investigate factors that mediate the experience of pain and additional interventions that may be more cost-effective.

Engel et al. (1996) recommended the use of behavioral interventions that target dysfunction, pain persistence, and depression as a method of reducing health care utilization and preventing the rise of costs associated with the treatment of back pain. Turk and Rudy (1992) emphasized a cognitive-behavioral perspective in the treatment of chronic pain and thus focused on cognitive schemata, processes, and contents related to the patients' circumstances. Other researchers have focused on physiological mechanisms, motivational aspects, or psychogenic explanations that seek to provide additional interventions in the treatment of different types of pain. The hope is that with a better understanding of these mechanisms, we can intervene to both reduce the suffering of the patient as well as the economic and health care burden placed on our society.

Most investigators agree that pain is a complex phenomenon influenced by physiological and psychological dimensions (Hirsch & Liebert, 1998; Turk & Rudy, 1992). Nociception, defined as the process "related to the stimulation of specific receptors and capable of being experienced as pain" (Turk & Rudy, 1992) may well comprise the physiological dimension, while cognitive, sensory, and affective-motivational systems of pain may comprise the psychological dimension (Melzack & Casey, 1968; Price, Harkins, & Baker, 1987). Theoretically, to the extent that the

experience of pain is composed of these two dimensions, a reduction in the aversive quality of either of them should result in a reduction in the experience of pain. Thus, a psychological intervention targeted at a painful experience would be able to provide at least some reduction in the negative aspects of such an experience.

However, there is considerable disagreement regarding the extent to which many proposed psychological variables are present during a painful experience and the magnitude of their effect on such an experience. For example, Arntz and De Jong (1993) reviewed studies examining the relationship between experimentally induced anxiety and pain and concluded that there does not seem to be agreement concerning the effect of anxiety on pain. Some of the reviewed studies indicated that experimentally induced anxiety may increase the experience of pain, other studies found no clear evidence of such a relationship, and an additional group of studies suggested that anxiety helps to reduce the experience of pain. Other investigators have also commented on the controversy generated by theoretical and empirical studies that have attempted to clarify the relationship between anxiety and pain (e.g., Al Absi & Rokke, 1991). Clearly, more research is needed before we can make any definite conclusions regarding the relationship between anxiety and pain. In similar fashion, additional data is needed before we can fully understand the connection between specific psychological factors and the experience of pain.

Current research investigations are increasingly devoting attention to the cognitive and sensory-affective dimensions of chronic and experimental pain (Osman et al., 1997; Price et al., 1987). Attentional interference, negative self-statements, expectancies, and dichotomous thinking are some examples of cognitive mechanisms that have been the focus of past research studies. In particular, there has been a growth in the

number of empirical studies examining the role of catastrophizing in the experience of pain (Sullivan et al., 1998). This interest may be due in part to research findings which suggest that in the management of pain, it may be more effective to reduce the frequency of negative cognitive strategies as opposed to increasing the frequency of positive cognitive strategies (Turk & Rudy, 1992).

Sullivan et al. (1998) defined pain catastrophizing as an "exaggerated negative orientation toward pain stimuli," and suggested that it comprises three separate dimensions. The first dimension, "rumination," reflects the presence of "ruminative thoughts, worry, and an inability to inhibit pain-related thoughts;" the second dimension, "magnification," reflects the "magnification of the unpleasantness of pain situations and expectancies for negative outcomes;" and the third dimension, "helplessness," reflects the "inability to deal with painful situations" (Sullivan, Bishop, & Pivik, 1995; Sullivan et al., 1998). All three dimensions can be assessed through the Pain Catastrophizing Scale (PCS), which in addition yields a total pain catastrophizing score. Thus, to the extent that catastrophizing can be conceptualized as a negative cognitive strategy, a reduction in catastrophic thoughts about pain should provide an effective method for reducing pain intensity or unpleasantness.

Recent research findings suggest that individuals with a high frequency of catastrophic thoughts may engage in more pain-related thoughts, report greater pain intensity, and show decreased tolerance when exposed to a situation involving physical pain in an experimental setting (e.g., Sullivan et al., 1998). Specifically, the rumination factor of the Pain Catastrophizing Scale seems to be the strongest predictor of pain (Osman et al., 1997; Sullivan et al., 1995). For example, Sullivan and Neish (1998) examined the relationship between catastrophic thoughts and dental pain and suggested

that excessive attention and focus on pain sensations during a dental procedure led to increased pain. However, there exist relatively few studies that have examined the relationship between the rumination component of pain catastrophizing and the experience of pain. Given the possibility that rumination may be a clinically important cognitive factor in the prediction of pain, it seems essential to investigate its influence in individuals undergoing a painful experience.

Although research studies suggest that an individual's expectancies influence the experience of pain (Hirsch & Liebert, 1998), there do not seem to be many recent research studies that have focused on the use of labels as sources of expectancies and their possible influence on pain. In the previously mentioned study, participants were randomly assigned to three conditions: "Vasoconstriction pain", which would provide a maximizing painful label, "pain", which would provide a moderate painful label, and "discomfort", which would provide a minimizing painful label. Participants in the vasoconstriction pain condition had significantly shorter pain tolerance times than participants in the other two conditions, and participants in the pain condition had significantly shorter pain tolerance times than participants in the discomfort condition. Thus, results from this study indicate that specific labels attached to a pain situation directly affect pain tolerance. It therefore seems appropriate to further examine the role of labels in the experience of pain.

It seems that the experience of pain is necessarily influenced by cognitive factors related to the pain situation. Pain catastrophizing and the expectancies created by labeling are two of these factors and, although they have been researched independently, we do not clearly know the extent to which they may affect each other. For example: Can a minimizing pain label moderate the pain experience of a high pain catastrophizer

or does the catastrophizing cognitive style override any possible attenuators? The question has both theoretical and clinical significance. Theoretically, it is pertinent to investigate the extent to which cognitive styles are affected by environmental cues that create expectancies. Clinically, it seems germane to investigate ways in which we can intervene with chronic pain patients and patients undergoing painful medical or surgical procedures to enhance their ability to cope with their pain.

The question then becomes what aspects of the pain experience are of research interest. Pain tolerance has been the traditional measure of pain in an experimental setting and clearly an important one. Price et al. (1987) suggested that the assessment of pain would be more accurate when the sensory-affective dimensions are also measured. Hirsch and Liebert (1998) indicate that the sensory dimension comprises properties of pain such as intensity and location. The affective dimension reflects the emotions experienced during the painful situation. When higher ratings of pain sensation and affect indicate greater pain intensity and unpleasantness, such ratings should be inversely correlated with pain tolerance times. In other words, as the pain becomes more intense and unpleasant, individuals should show decreased tolerance to it. Additionally, it has been found that the affective dimension is lower than the sensory dimension when an individual participates in a brief experimental pain situation (Price et al., 1987). Chronic pain patients generally have higher ratings of pain affect than ratings of pain sensation. That is, experimentally induced painful situations are perceived to be more physically intense than emotionally unpleasant, whereas chronic pain is perceived to be more emotionally unpleasant than physically intense.

The present study will investigate the impact of both maximizing and minimizing labels on the experience of pain in individuals with high and low catastrophic thinking.

To the extent that high pain catastrophizers ruminate about the possible negative consequences related to a pain situation, their pain tolerance times should be significantly shorter than those of low pain catastrophizers. This hypothesis would be consistent with the findings by Sullivan and Neish (1998) involving dental pain. Additionally, to the extent that a maximizing label constitutes an increase in threatening information related to the pain situation, we would expect pain tolerance times to be shorter in a maximizing pain label condition than in a minimizing pain label condition.

But how do we expect pain catastrophizing and labeling to interact? It is hypothesized that high pain catastrophizers in a maximizing label condition will have increased focus on the pain stimulus and ruminate more about such a threat. Thus, their pain tolerance times should be significantly shorter than those of high pain catastrophizers in a minimizing label condition. Because a minimizing label should not provide any additional significant catastrophic information to ruminate about, it is hypothesized that those high pain catastrophizers in a minimizing label condition will have pain tolerance times that are not significantly different from those of high pain catastrophizers in a neutral label condition. In other words, the lack of additional threatening information provided by the minimizing label should not increase ruminative thoughts and, therefore, should not significantly decrease pain tolerance times. Clearly, both the rumination subscore and the pain catastrophizing total score of the PCS will have to be observed in order to properly examine these hypotheses.

It also seems that for those individuals who are low pain catastrophizers and, thus, tend not to ruminate, any significant differences between the labeling conditions could then be attributed to the effect of the label. So it is hypothesized that low pain catastrophizing individuals who expect to experience minor discomfort during a painful

situation, as indicated by a minimizing label, will show significantly greater tolerance to the pain than low pain catastrophizers who experience a maximizing label.

Sensory and affective ratings of pain are hypothesized to be inversely related to pain tolerance times for every condition being examined, so that as pain tolerance times increase, ratings of pain sensation and affect decrease. Additionally, because this study will consist of an experimental manipulation of a painful stimulus, it is expected that affective ratings will be significantly lower than sensory ratings.

Of additional interest to this researcher is the relationship between pain catastrophizing, anxiety sensitivity, and somatic amplification. Anxiety sensitivity has been defined as the fear of bodily sensations associated with anxiety (Peterson & Heilbronner, 1987; Taylor, 1995), and can be measured using the Anxiety Sensitivity Index (ASI). To the extent that anxiety sensitivity involves a misinterpretation of bodily sensations, it seems reasonable to assume that it involves a certain level of somatic awareness. Somatic amplification refers to a high level of somatic awareness and the tendency to focus and magnify a broad range of bodily sensations (Barsky, Goodson, Lane, & Cleary, 1988; Eccleston, Crombez, Aldrich, & Stannard, 1997). It has been suggested that there exists a relationship between somatic awareness and chronic pain (Eccleston et al., 1997). Barsky et al. (1988) also suggested that it is the amplification of somatic symptoms, as measured through the Somatic Amplification Questionnaire (SAQ), that has a significant role in the perception of physical discomfort. It is hypothesized that the rumination and magnification components of pain catastrophizing also involve a high degree of somatic awareness and the subsequent magnification of the possible consequences associated with bodily sensations. Therefore, it seems plausible to conclude that there should be a significant relationship between pain catastrophizing,

anxiety sensitivity, and somatic amplification due to their inherent theoretical focus on somatic awareness. To this end, the total scores of the PCS, ASI, and SAQ will be examined and a significant, positive correlation is expected.

Several studies have also focused on the gender differences involved in pain catastrophizing. This area has been of particular interest in the literature investigating factors that can explain the higher prevalence of pain disorders and complaints in women (Unruh, 1996). Women report lower pain tolerance than men in experimentally induced pain (Meana & Stewart, in press), and Sullivan et al. (1995) have shown that females score significantly higher in the Pain Catastrophizing Scale and in the rumination subscale than males. However, the extent to which gender, catastrophizing, and labeling interact with each other is not clear. Although the present study would be a suitable opportunity to examine such an interaction, sample size poses a constraint on the number of interactions that can be effectively tested.

For each of the stated hypotheses, the three dependent measures of pain tolerance, sensory rating, and affective rating will thus provide empirical information that will help to determine whether the experience of pain is better influenced by the amount of catastrophic thinking, the labels attached to the situation, or a specific type of interaction between them. This study will also examine the relationship between these measures and the rumination factor of the PCS. Additionally, the relationship between pain catastrophizing, anxiety sensitivity, and somatic amplification will be explored. The results of this study can therefore provide relevant information to assist in the design of more cost-effective and beneficial interventions aimed at minimizing the negative aspects of pain.

CHAPTER 2

METHOD

Participants

One hundred and twenty-one undergraduate students (49 males and 72 females) currently enrolled at the University of Nevada-Las Vegas participated in the study. Four additional participants had to be excluded from the study after reporting a medical condition. Participants were randomly assigned to one of three labeling conditions: A maximizing label condition ("vasoconstriction pain"), a minimizing label condition, ("minor discomfort"), and a neutral condition ("tolerance study"). Participants were recruited through the psychology subject pool and received credit for their introductory psychology course. Potential applicants made appointments by writing their names at the psychology research sign-up area and, according to the time and date, were asked to present themselves at the research lab located in room CBC-B139A. All participants were informed that they could withdraw from the study at any point in time without any negative consequences to them. The study was approved by the University of Nevada-Las Vegas Institutional Review Board Committee prior to any experimental manipulation.

Materials

After signing a consent form (see Appendix I), all participants selected for the study completed the Pain Catastrophizing Scale (PCS), the Anxiety Sensitivity Index (ASI), and the Somatic Amplification Questionnaire (SAQ) (see Appendices II, III, and IV, respectively). The PCS assesses the level of catastrophic thinking in pain-related situations, the ASI assesses the extent to which individuals believe that anxiety-related sensations can have harmful consequences, and the SAQ assesses sensitivity and vigilance to common somatic symptoms.

Similar to Crombez et al. (1998), participants were rated as high or low pain catastrophizers based on a median split of the total PCS score. The median score was 22 ($M = 21.50$, $SD = 9.18$). Participants were also rated as high or low pain ruminators based on a median split of the PCS rumination subscale scores. The median rumination score was 9 ($M = 8.98$, $SD = 4.03$).

All participants were asked to immerse their non-dominant hand in cold water. This procedure is called the cold-pressor test, and it is the most widely accepted method of inducing pain experimentally without any danger or injury to participants. None of the participants was allowed to keep their hand immersed for more than 5 minutes in order to reduce the possibility of harm. The apparatus consisted of a cooler filled entirely with cold water. Water temperature was maintained at approximately 2-4°C and measured continuously with a thermometer immersed in the cooler. Ice was added as needed in order to maintain the water at that temperature.

Participants also completed a sensory and an affective visual analog rating scale to provide information on pain intensity and unpleasantness (see Appendix V). Each visual analog scale measured 15.5 cm and had the following endpoints: "No sensation"

and "the most intense sensation imaginable" for the sensory scale, and "not bad at all" and "the most unpleasant feeling possible for me" for the affective scale. Higher ratings indicated increased sensation and unpleasantness, respectively.

Prior to the cold-pressor test, participants received a sheet with standardized instructions (see Appendix VI). The instructions informed participants to complete the SAQ and the ASI, as well as procedural information related to the cold-pressor test. The title on the instruction sheet stated: "Tolerance Study," "Minor discomfort tolerance study," or "Vasoconstriction pain tolerance study," and was given to participants according to the respective label condition to which they had been randomly assigned. The titles were printed with capitalized letters on 16-point bold font to emphasize the label condition.

Procedure

Six female research assistants served as experimenters. Potential participants were asked whether they had medical problems of any kind prior to the experimental session. Four participants who answered in the affirmative were excluded from the study, and received the appropriate credit for research participation. One hundred and twenty-one participants with no medical problems proceeded to complete the PCS. Upon completion, they were randomly assigned to one of the three labeling conditions and provided with the printed instructions.

Participants were then asked to immerse their non-dominant hand in the water "for as long as you possibly can", and to verbally report as soon as they felt any "pain sensations", if in the vasoconstriction pain condition, "discomfort sensations", if in the minor discomfort condition, or "sensations", if in the tolerance study condition. These

additional instructions were intended to reemphasize the presence of the label. Use of the non-dominant hand was intended to reduce any confounding effects created by blood flow to the dominant hand after completion of the PCS.

As soon as participants mentioned that they were beginning to feel the corresponding sensation, the threshold time was recorded. This was the amount of time between hand insertion and the start of physical sensations in the hand. Once the hand was removed from the water, the total time the hand was held in the water was recorded, and constituted the tolerance time. Participants then proceeded to complete the two visual analog scales. After completing the two scales, a debriefing session informed participants about the hypotheses involved in the study and they were given the opportunity to ask any questions (see Appendix VII).

Thus, four measures of the experience of pain were utilized: Pain threshold, the amount of time elapsed between hand insertion and the first verbal report of pain; pain tolerance, the total amount of time of hand insertion; pain sensation, a visual analog scale rating of pain intensity; and pain affect, a visual analog scale rating of unpleasantness.

CHAPTER 3

RESULTS

The PCS scores for males ($M = 20.63$, $SD = 7.86$) and females ($M = 22.08$, $SD = 9.98$) were somewhat higher than those reported by Sullivan et al. (1995) for 425 participants. Even though both studies used undergraduate students, it is possible that the difference in sample size may account for the variation in means.

The relationship between pain tolerance times ($M = 1$ min 23 s, $SD = 1$ min 24 s), sensory ratings ($M = 8.96$, $SD = 2.61$), and affective ratings ($M = 6.01$, $SD = 3.82$) was analyzed. Pain tolerance times were found to be inversely correlated with sensory ratings ($r = -.32$, $p < .01$) and affective ratings ($r = .-26$, $p < .01$). As the pain intensity and unpleasant feelings associated with the painful situation increased, tolerance to the pain decreased. Sensory ratings and affective ratings of pain were positively correlated with each other ($r = .66$, $p < .01$), suggesting that as the pain intensity increased, so did the unpleasant feelings associated with it. As hypothesized, affective ratings were significantly lower than sensory ratings ($t = 11.31$, $p < .01$), which supports previous findings suggesting that in studies involving experimentally induced pain, the painful experience is perceived to be significantly more intense than unpleasant.

Pain Tolerance

Table 1 displays the mean tolerance times in minutes and seconds for high and low catastrophizers in each of the label conditions. When we examine the mean tolerance times between high and low pain catastrophizers, we find that high pain catastrophizers had significantly shorter pain tolerance times than low pain catastrophizers ($F(1, 119) = 4.66$, $p < .05$). But when we examine mean tolerance times across each label condition, we find that high pain catastrophizers in the vasoconstriction pain label condition did not have the shortest tolerance times, as originally expected. Similarly, low catastrophizers did not have mean tolerance times for each label condition in the expected direction.

A 2 X 3 analysis of variance (ANOVA) was conducted with pain catastrophizing type and labeling as the between factors in order to examine the relationship among the two variables. There was a significant main effect for pain catastrophizing type ($F(1, 115) = 5.53$, $p < .05$), but not for labeling ($F(2, 115) = 1.34$, $p > .05$). The interaction between pain catastrophizing and labeling was also not significant ($F(2, 115) = 1.6$, $p > .05$).

If we examine the rumination component of the Pain Catastrophizing Scale (Table 2), we also find that high pain ruminators had significantly shorter pain tolerance times than low pain ruminators ($F(1, 119) = 3.92$, $p = .05$). But once again, high pain ruminators in the vasoconstriction pain condition had pain tolerance times similar to those of participants in the other two label conditions. Low pain ruminators had pain tolerance times for each label condition that were not in the expected direction.

A 2 X 3 ANOVA was conducted with rumination type and labeling as the between factors in order to examine the relationship between these two variables. This ANOVA was not significant ($F(5, 115) = 2.13$, $p = .067$). In that this result indicates a

possible trend toward significance, we could accept a main effect for rumination ($F(1, 115) = 4.75$, $p < .05$). The main effect for labeling ($F(2, 115) = 1.46$, $p > .05$) and the interaction effect between rumination and labeling ($F(2, 115) = 1.95$, $p > .05$) were not supported.

Sensory Ratings

Table 3 displays the mean pain sensory ratings for high and low catastrophizers in each of the label conditions. Results indicate that high pain catastrophizers had significantly higher pain sensory ratings than low pain catastrophizers ($F(1, 118) = 23.54$, $p < .01$). Nevertheless, when we examine mean sensory ratings across each label condition, we find results similar to those for pain tolerance times. High pain catastrophizers in the vasoconstriction pain label condition did not have the highest pain sensory ratings and low pain catastrophizers did not have mean sensory ratings for each label condition in the expected direction.

Again, a 2 X 3 ANOVA was conducted with pain catastrophizing type and labeling as the between factors in order to examine the relationship among the two variables with regard to sensory ratings. There was a significant main effect for pain catastrophizing type ($F(1, 114) = 25.67$, $p < .01$), but not for labeling ($F(2, 114) = 2.07$, $p > .05$). The interaction between pain catastrophizing and labeling was also not significant ($F(2, 114) = 1.75$, $p > .05$).

Examining the effect of rumination on pain sensory ratings (Table 4), we also find that high pain ruminators had significantly higher sensory ratings than low pain ruminators ($F(1, 118) = 7.96$, $p < .01$). Similar to the previous results, there was no apparent effect of the vasoconstriction pain label on the sensory ratings of high

catastrophizers, nor were the sensory ratings of low ruminators consistent with the expected directions according the label condition.

The 2 X 3 ANOVA with rumination type and labeling as the between factors indicates that there was a significant main effect for rumination type ($F(1, 114) = 8.74$, $p < .01$). However, there was no main effect for labeling ($F(2, 114) = 1.44$, $p > .05$), or for the interaction between rumination and labeling ($F(2, 114) = 0.51$, $p > .05$).

Affective Ratings

Similar analyses were conducted for affective ratings of pain as the dependent measure. Table 5 shows the mean affective ratings. We can see that high pain catastrophizers had significantly higher mean affective ratings than low pain catastrophizers ($F(1, 118) = 17.72$, $p < .01$). But once again the scores for high pain catastrophizers in the vasoconstriction pain label condition or for the low pain catastrophizers in each label condition did not follow the expected directions.

A 2 X 3 ANOVA showed that, once again, there was a significant main effect for pain catastrophizing type ($F(1, 114) = 17.86$, $p < .01$), but no significant main effect for labeling ($F(2, 114) = 0.43$, $p > .05$) or for the interaction between pain catastrophizing type and labeling ($F(2, 114) = 0.37$, $p > .05$).

As shown in Table 6, high pain ruminators scored significantly higher in mean pain affective ratings than low pain ruminators ($F(1, 118) = 6.16$, $p < .05$). Although high pain ruminators in the vasoconstriction pain label condition did have higher affective ratings than high pain ruminators in the other two label conditions, a 2 X 3 ANOVA failed to reach significance ($F(5, 114) = 1.85$, $p > .05$).

Relationship of PCS, ASI, and SAQ to Pain Measures

As previously stated, sensory and affective ratings were significantly correlated to each other. In addition, each one was significantly correlated to tolerance times in an inverse direction. The Anxiety Sensitivity Index ($M = 20.89$, $SD = 8.96$) was significantly correlated with tolerance times ($r = -.19$, $p < .05$), sensory ratings ($r = .32$, $p < .01$), and affective ratings ($r = .33$, $p < .01$). The Pain Catastrophizing Scale ($M = 21.50$, $SD = 9.18$) was significantly correlated with tolerance times ($r = -.22$, $p < .05$), sensory ratings ($r = .44$, $p < .01$), and affective ratings ($r = .38$, $p < .01$). Although the Somatic Amplification Questionnaire ($M = 30.11$, $SD = 6.03$) was not significantly correlated with tolerance times ($r = -.12$, $p > .05$), it was significantly correlated with sensory ratings ($r = .25$, $p < .01$) and affective ratings ($r = .33$, $p < .01$). Additionally, there were significant correlations between the PCS and ASI ($r = .59$, $p < .01$), PCS and SAQ ($r = .45$, $p < .01$), and ASI and SAQ ($r = .48$, $p < .01$).

Relationship of PCS Subscales to PCS, ASI, SAQ, and Pain Measures

As would be expected, the rumination subscale of the PCS was significantly correlated with the total PCS score ($r = .87$, $p < .01$). There was also a significant correlation between the rumination subscale and the ASI ($r = .46$, $p < .01$), and the rumination subscale and the SAQ ($r = .34$, $p < .01$). In addition, the rumination subscale was significantly correlated with pain tolerance times ($r = -.21$, $p < .05$), sensory ratings ($r = .35$, $p < .01$), and affective ratings ($r = .27$, $p < .01$).

The magnification subscale of the PCS was also significantly correlated with the total PCS score ($r = .72$, $p < .01$), as well as with the ASI ($r = .58$, $p < .01$), the SAQ ($r = .45$, $p < .01$), and sensory ratings ($r = .27$, $p < .01$). However, there was not a significant

correlation between the magnification subscale and pain tolerance times ($r = -.11$, $p > .05$), or with affective ratings ($r = .15$, $p > .05$).

The third subscale of the PCS, helplessness, also correlated significantly with the total PCS score ($r = .91$, $p < .01$). A significant relationship was also found between the helplessness subscale and the ASI ($r = .49$, $p < .01$), the SAQ ($r = .38$, $p < .01$), pain tolerance times ($r = -.21$, $p < .05$), sensory ratings ($r = .44$, $p < .01$), and affective ratings ($r = .46$, $p < .01$).

To examine which of the three PCS subscales was a better predictor of pain, a series of stepwise multiple regression analyses were conducted. Results showed that the rumination component was the only significant predictor of pain tolerance (standardized $\beta = -.21$, $t = -2.37$, $p < .05$), but not a predictor of sensory or affective ratings of pain, although the model accounted for only 5% of the variance. The helplessness component was the only significant predictor of sensory ratings (standardized $\beta = .44$, $t = 5.30$, $p < .01$) and affective ratings (standardized $\beta = .46$, $t = 5.59$, $p < .01$). It accounted for 19% of the variance associated with pain sensation, and 21% of the variance associated with pain affect, respectively.

Data of pain threshold time was obtained in order to emphasize the presence of a specific label for high and low pain catastrophizers, but was not analyzed[1].

[1] Upon additional review, it was thought that the prompt for "sensations" in the tolerance study label condition might have confounded the results obtained from the other two label conditions. Instructing participants to attend to "sensations" may have very well inadvertently prompted them to focus on any sensation, which could have included pain and discomfort.

CHAPTER 4

DISCUSSION

The dependent measures of pain tolerance time, sensory rating, and affective rating were examined for each of the two principal independent variables, pain catastrophizing type and label condition. The relationship between the three dependent measures indicated that, as expected, when a painful situation is experienced as increasingly intense and unpleasant, there is a significant reduction in the tolerance to the pain. Clinically, it is important to note that the inverse relationship held for both pain sensation and affect. Therefore, it seems appropriate to conclude that a reduction in either pain intensity or unpleasantness can result in increased tolerance to the pain. Although one component of a psychological dimension, it seems that pain sensation is influenced more by physiological mechanisms than pain affect. It seems possible that pain affect can be influenced more easily through psychological interventions. Thus, it seems likely that interventions that target pain affect and effectively reduce the unpleasant feelings associated with the painful experience can be successful in increasing tolerance to that specific pain.

Additionally, the hypothesis that affective ratings would be lower than sensory ratings was supported. This finding is consistent with prior studies which indicate that participants report lower affective ratings, as compared to sensory ratings, when confronting an experimentally induced painful situation. Similarly, participants report

higher affective ratings, as compared to sensory ratings, when confronting chronic pain situations. In a situation in which the individual knows that the pain will go away in a short time, that it poses no health threat, and that he or she has control over the pain situation (for example, in a controlled experiment), the pain is not perceived as unpleasant as that for an individual with chronic pain who knows that the painful experience will continue for a considerably longer period of time, may indicate serious physiological problems, and he or she has little or no control over it.

The measures of pain tolerance times and sensory-affective ratings provided support for the hypothesis that pain catastrophizing plays a central role in the experience of pain. Individuals who are high pain catastrophizers are significantly less tolerant to pain than low pain catastrophizers. Similarly, high pain catastrophizers experience the same painful situation as significantly more intense and unpleasant than low pain catastrophizers.

Additional analyses were conducted to examine the role of the rumination component of the PCS in the experience of pain. Since previous studies had found the rumination component to be a clinically relevant predictor of pain, it was hypothesized that the rumination subscore would also be significantly related to the measures of pain tolerance, sensation, and affect. Indeed, results showed that rumination does play a central role in the experience of pain. However, regression analyses indicate that it has predictive value only with regard to pain tolerance times. The helplessness component of the PCS seems to be a better predictor of the sensory-affective dimensions of pain.

So what do these findings tell us about the relationship between catastrophizing and pain? First of all, there is likely to be clinical benefit in the assessment of catastrophizing levels for individuals who are about to experience a painful situation.

Whenever possible, high pain catastrophizers should be identified and targeted for interventions prior to any painful situation in order to reduce the experience of pain. As previously stated, an intervention aimed at reducing the affective quality of the pain would seem to contribute to a decrease in the experience of pain. To the extent that high pain catastrophizers are going to have reduced tolerance to the pain, they should be the focus of interventions that can increase tolerance through a reduction in pain unpleasantness. It seems that cognitive-behavioral interventions provide the necessary theoretical concepts and techniques so that individuals can learn how to achieve such a reduction in negative pain affect.

Second, the findings from this study provide additional information about the theoretical processes through which catastrophizing may mediate the experience of pain. Defined as an exaggerated negative orientation toward pain, catastrophizing does seem to affect the experience of pain. But how exactly does this so-called exaggerated negative orientation produce such an effect? If we accept the suggestions that catastrophizing is indeed a three-factor construct, it seems that its different components affect the experience of pain in different ways. Excessive worry about pain and an inability to inhibit thoughts related to pain may specifically affect the tolerance to the pain. That is, rumination may affect pain tolerance. Additionally, it seems that the lack of an ability to deal and cope with a painful situation may specifically affect the sensory-affective dimensions of pain. That is, helplessness may affect perceived pain intensity and unpleasantness. It remains to be clarified which aspect of a painful experience is affected by the magnification component of pain catastrophizing.

The manipulation of specific labels in the present study failed to yield any significant results. Two explanations for this lack of significance may be proposed. The

first one, a methodological explanation, addresses the possibility that the presentation of the labels on the instruction sheet was inadequate and participants simply failed to take notice of the label. Maybe the labels need to be present in greater quantities throughout the study, or in such a manner that they catch the participants' attention. Additionally, it is possible that the semantic content of each label did not produce the desired expectancies in participants, although these labels produced an effect in the Hirsch and Liebert (1998) study. To rectify this in a future study, participants could complete a visual analog scale similar to the two used for the assessment of the sensory-affective dimensions of pain and report their level of anxiety after they have been exposed to the label condition. This would serve as a manipulation check. Thus, it would be expected that those in a vasoconstriction pain label condition would show greater anxiety scores than those in a minor discomfort label condition. The anxiety scores could be used as a direct measure of the effects of the label.

The second explanation is theoretical, and addresses the lack of empirical studies that have examined the influence of labels on the experience of pain. It is possible that label manipulations may not have a robust effect on the experience of pain. Hirsch and Liebert (1998) suggested that subtle, contextual cues in the environment, such as labels, might influence the experience of pain. The results from this study contradict that theoretical notion. In fact, the findings presented here would suggest that there could be a difference between different types of psychological variables and the subsequent experience of pain. It seems possible that more stable, trait-like psychological factors, such as catastrophizing, can have a more powerful effect on the experience of pain than temporary, situationally bound factors such as the expectancies created by labeling. One interesting scenario in which this hypothesis could be tested would be examining the

differences in the experience of pain for individuals high in trait-anxiety versus individuals with experimentally induced anxiety. Clearly, much more research needs to be done in this area before we can provide any definite answers.

The significant correlations between the Pain Catastrophizing Scale, the Anxiety Sensitivity Index, and the Somatic Amplification Questionnaire provided support for the hypothesis that there exists a common component to the three measures, and that this component may be related to somatic awareness. Further analyses of this relationship, although beyond the scope of the present study, could provide additional theoretical information that may assist us in the development of more beneficial interventions in the treatment and management of pain.

In summary, the present study examined the effects of catastrophizing and labeling on the experience of pain, as measured through tolerance times, sensory, and affective ratings. Results suggested that catastrophizing levels play an important role in the experience of pain. In addition, it is possible that different components of catastrophizing mediate the experience of pain through different cognitive mechanisms. No evidence was found for the effects of labels on pain, nor was there an interaction between catastrophizing and labeling. Theoretical explanations were provided which may lead to an increased understanding of the effects of qualitatively different psychological variables on the experience of pain.

The aim of this study was to provide information to assist in the development of more cost-effective interventions for pain. To that end, it seems that targeting individuals who are high pain catastrophizers and providing psychological interventions that may reduce the negative affect associated with the pain experience may result in greater

tolerance to painful situations. Hopefully, this can reduce the costs associated with pain management and treatment, as well as the negative consequences of living with pain.

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APPENDIX I

CONSENT FORM

CONSENT FORM

You have been asked to volunteer to take part in a research project that investigates the relationship between thoughts and temperature tolerance. Your participation will take approximately 30 minutes. You will be asked to fill out 3 questionnaires regarding some general thoughts and then you may be asked to immerse your hand in cold water. In the event that you are a UNLV student and are participating in this project for credit for a PSY 101 class, you will receive one hour of research credit.

The study is being conducted by Otto Pedraza, Department of Psychology, University of Nevada, Las Vegas, 4505 Maryland Parkway, Box 455030, Las Vegas, NV, (702-895-3305) as part of his Master's thesis project, and under the supervision of Dr. Marta Meana. Otto Pedraza is the primary researcher and can be contacted directly with any questions you may have about your participation in this project. Information on university policy and procedures for research participation can be obtained by contacting the Office of Sponsored Programs (702-895-1357).

There are unlikely to be any risks associated with your taking part in the study. In the event that something during the study causes you concern, Otto Pedraza (895-3305) will be available to discuss this with you. There will be no penalty for discontinuing participation in this study. The study will not benefit you specifically, but the information gathered will be used to potentially provide benefits within the health sciences. Your questionnaires will be only identified by code numbers. In any scientific publication that may arise out of this study, your anonymity will be guaranteed.

You may refuse to participate in the study or withdraw from the study at any time without penalty. You can refuse to answer any of the questions on the questionnaires.

I have been given a copy of this consent form to keep.

I have read and discussed the above information with the researcher and consent to participate.

_____ _____

Participant's Signature Date

_____ _____

Researcher's Signature Date

APPENDIX II

PAIN CATASTROPHIZING SCALE

PCS

Please reflect on past experiences involving pain and indicate the degree to which each of these 13 thoughts or feelings was present while experiencing the pain. Your answers can vary from 0 (not at all) to 4 (all the time).

	Not At All				All The Time
1. I worry all the time about whether the pain will end.	0	1	2	3	4
2. I feel I can't go on.	0	1	2	3	4
3. It's terrible and I think it's never going to get any better.	0	1	2	3	4
4. It's awful and I feel that it overwhelms me.	0	1	2	3	4
5. I feel I can't stand it anymore.	0	1	2	3	4
6. I become afraid that the pain may get worse.	0	1	2	3	4
7. I think of other painful experiences.	0	1	2	3	4
8. I anxiously want the pain to go away.	0	1	2	3	4
9. I can't seem to keep it out of my mind.	0	1	2	3	4
10. I keep thinking about how much it hurts.	0	1	2	3	4
11. I keep thinking about how badly I want the pain to stop.	0	1	2	3	4
12. There is nothing I can do to reduce the intensity of the pain.	0	1	2	3	4
13. I wonder whether something serious may happen.	0	1	2	3	4

APPENDIX III

ANXIETY SENSITIVITY INDEX

ASI

Respond to each item by circling one of the five corresponding phrases. Circle the phrase which best represents the extent to which you agree with the item. If any of the items concern something that is not part of your experience, (i.e., "It scares me when I feel shaky" for someone who has never trembled or had the "shakes") answer on the basis of how you expect you think you might feel if you had such an experience. Otherwise, answer all items on the basis of your own experience. Be careful to make only one choice for each item and please answer all items.

1. It is important to me not to appear nervous.

Very Little A Little Some Much Very Much

2. When I cannot keep my mind on a task, I worry that I might be going crazy.

Very Little A Little Some Much Very Much

3. It scares me when I feel "shaky" (trembling).

Very Little A Little Some Much Very Much

4. It scares me when I feel faint.

Very Little A Little Some Much Very Much

5. It is important to me to stay in control of my emotions.

Very Little A Little Some Much Very Much

6. It scares me when my heart beats rapidly.

Very Little A Little Some Much Very Much

7. It embarrasses me when my stomach growls.

Very Little A Little Some Much Very Much

8. It scares me when I am nauseous.

Very Little A Little Some Much Very Much

9. When I notice that my heart is beating rapidly, I worry that I might have a heart attack.

Very Little A Little Some Much Very Much

10. It scares me when I become short of breath.

Very Little A Little Some Much Very Much

11. When my stomach is upset, I worry that I might be seriously ill.

Very Little A Little Some Much Very Much

12. It scares me when I am unable to keep my mind on a task.

Very Little A Little Some Much Very Much

13. Other people notice when I feel shaky.

Very Little A Little Some Much Very Much

14. Unusual body sensations scare me.

Very Little A Little Some Much Very Much

15. When I am nervous, I worry that I might be mentally ill.

Very Little A Little Some Much Very Much

16. It scares me when I am nervous.

Very Little A Little Some Much Very Much

APPENDIX IV

SOMATIC AMPLIFICATION QUESTIONNAIRE

SAQ

Please indicate the degree to which each of the following statements is TRUE OF YOU in general. Circle your answer.

1 = Not At All True
2 = A Little Bit True
3 = Moderately True
4 = Quite A Bit True
5 = Extremely True

	Not At All True:	A Little Bit True:	Moderately True:	Quite A Bit True:	Extremely True:
1. When someone else coughs, it makes me cough too.	1	2	3	4	5
2. I can't stand smoke, smog, or pollutants in the air.	1	2	3	4	5
3. I am often aware of various things happening within my body.	1	2	3	4	5
4. When I bruise myself, it stays noticeable for a long time.	1	2	3	4	5
5. I sometimes can feel the blood flowing in my body.	1	2	3	4	5
6. Sudden loud noises really bother me.	1	2	3	4	5
7. I can sometimes hear my pulse or my heartbeat throbbing in my ear.	1	2	3	4	5
8. I hate to be too hot or too cold.	1	2	3	4	5

	Not At All True:	A Little Bit True:	Moderately True:	Quite A Bit True:	Extremely True:
9. I am quick to sense the hunger contractions in my stomach.	1	2	3	4	5
10. Even something minor, like an insect bite or a splinter, really bothers me.	1	2	3	4	5
11. I can't stand pain.	1	2	3	4	5

APPENDIX V

VISUAL ANALOG SCALES

VISUAL ANALOG SCALES

1. Sensory Rating:

Please place an X anywhere over the following scale, reflecting the physical sensation experienced during the cold-pressor procedure. Note that an X placed toward the left end indicates less sensation and an X toward the right indicates more sensation.

No Sensation — The Most Intense Sensation Imaginable

2. Affective Rating:

Please place an X anywhere over the following scale, reflecting the emotions experienced during the cold-pressor procedure. Note that an X placed toward the left end indicates less unpleasant emotion and an X toward the right indicates more unpleasant emotion.

Not Bad At All — The Most Unpleasant Feeling Possible For Me

APPENDIX VI

INSTRUCTIONS FOR PARTICIPANTS

INSTRUCTIONS FOR PARTICIPANTS

Tolerance Study

1) Please complete the ASI and SAQ questionnaires provided in this packet.

2) You will then be asked to immerse your non-dominant hand in cold water. In other words, if you are right-handed, please immerse your left hand. Similarly, if you are left-handed, please immerse your right hand.

3) Please keep your hand in the water for as long as you possibly can. Wait for the research assistant to indicate when you can begin.

4) After your hand has been in the water, tell the research assistant as soon as you feel any sensations in your immersed hand. But, remember, continue to keep the hand immersed for as long as you can.

5) Once you cannot keep the hand immersed any longer, remove it from the water. Keep in mind that this procedure is safe and you will not be harmed in any way.

6) Complete the sensory and affective rating scales and wait for any additional instructions from your research assistant.

INSTRUCTIONS FOR PARTICIPANTS

Minor Discomfort Tolerance Study

1) Please complete the ASI and SAQ questionnaires provided in this packet.

2) You will then be asked to immerse your non-dominant hand in cold water. In other words, if you are right-handed, please immerse your left hand. Similarly, if you are left-handed, please immerse your right hand.

3) Please keep your hand in the water for as long as you possibly can. Wait for the research assistant to indicate when you can begin.

4) After your hand has been in the water, tell the research assistant as soon as you feel any discomfort sensations in your immersed hand. But, remember, continue to keep the hand immersed for as long as you can.

5) Once you cannot keep the hand immersed any longer, remove it from the water. Keep in mind that this procedure is safe and you will not be harmed in any way.

6) Complete the sensory and affective rating scales and wait for any additional instructions from your research assistant.

INSTRUCTIONS FOR PARTICIPANTS

Vasoconstriction Pain Tolerance Study

1) Please complete the ASI and SAQ questionnaires provided in this packet.

2) You will then be asked to immerse your non-dominant hand in cold water. In other words, if you are right-handed, please immerse your left hand. Similarly, if you are left-handed, please immerse your right hand.

3) Please keep your hand in the water for as long as you possibly can. Wait for the research assistant to indicate when you can begin.

4) After your hand has been in the water, tell the research assistant as soon as you feel any painful sensations in your immersed hand. But, remember, continue to keep the hand immersed for as long as you can.

5) Once you cannot keep the hand immersed any longer, remove it from the water. Keep in mind that this procedure is safe and you will not be harmed in any way.

6) Complete the sensory and affective rating scales and wait for any additional instructions from your research assistant.

APPENDIX VII

DEBRIEFING FOR PARTICIPANTS

DEBRIEFING FOR PARTICIPANTS

Although the present study does examine the relationship between thoughts and water temperature, the main purpose is to explore the possible effects that labeling may have on pain tolerance for individuals with high or low catastrophic thinking. It is hypothesized that when individuals who are high catastrophizers encounter a label that maximizes the sensation of pain, the tolerance to the pain will decrease due to the ruminative aspects of catastrophizing. Within the methods of this study, it is hypothesized that for individuals who score in the upper half of the Pain Catastrophizing Scale distribution (high catastrophizers), the presentation of the label "Vasoconstriction Pain" will reduce the amount of time their hand is kept immersed in cold water. For those individuals who score in the lower half of the Pain Catastrophizing Scale distribution, it is hypothesized that the labels will significantly affect their tolerance to the pain, so that those in the "Vasoconstriction Pain" will have much less tolerance than those in the "Minor Discomfort" condition. This information was not provided to you at the beginning of the study because it could significantly affect the results.

Thank you for your time and interest in participating. Remember that you can contact Otto Pedraza at the address and phone number listed in the signed Consent Form if you later have any questions regarding this study.

APPENDIX VIII

TABLES

Table 1 Tolerance Time Means for Catastrophizing and Labeling

Tolerance Time

Catastrophizing	Label Condition	N	Mean	SD
High Catastrophizer	Vasoconstriction Pain	24	0:01:32	0:01:35
	Minor Discomfort	19	0:00:50	0:01:01
	Tolerance Study	19	0:00:53	0:00:54
	Total	62	0:01:07	0:01:16
Low Catastrophizer	Vasoconstriction Pain	14	0:01:40	0:01:17
	Minor Discomfort	21	0:02:04	0:01:37
	Tolerance Study	24	0:01:19	0:01:28
	Total	59	0:01:40	0:01:30
Total	Vasoconstriction Pain	38	0:01:35	0:01:28
	Minor Discomfort	40	0:01:29	0:01:29
	Tolerance Study	43	0:01:08	0:01:15
	Total	121	0:01:23	0:01:24

Table 2 Tolerance Time Means for Rumination and Labeling

Tolerance Time

Rumination Type	Label Condition	N	Mean	SD
High	Vasoconstriction Pain	19	0:01:12	0:01:11
	Minor Discomfort	24	0:01:04	0:01:09
	Tolerance Study	21	0:01:12	0:01:15
	Total	64	0:01:09	0:01:11
Low	Vasoconstriction Pain	19	0:01:58	0:01:39
	Minor Discomfort	16	0:02:05	0:01:44
	Tolerance Study	22	0:01:04	0:01:17
	Total	57	0:01:39	0:01:35
Total	Vasoconstriction Pain	38	0:01:35	0:01:28
	Minor Discomfort	40	0:01:29	0:01:29
	Tolerance Study	43	0:01:08	0:01:15
	Total	121	0:01:23	0:01:24

Table 3 Sensory Rating Means for Catastrophizing and Labeling

Sensory Rating

Catastrophizing	Label Condition	N	Mean	SD
High Catastrophizer	Vasoconstriction Pain	24	9.100	2.147
	Minor Discomfort	19	10.195	2.022
	Tolerance Study	18	11.000	1.971
	Total	61	10.002	2.175
Low Catastrophizer	Vasoconstriction Pain	14	8.071	2.378
	Minor Discomfort	21	7.386	2.624
	Tolerance Study	24	8.208	2.732
	Total	59	7.883	2.597
Total	Vasoconstriction Pain	38	8.721	2.260
	Minor Discomfort	40	8.720	2.727
	Tolerance Study	42	9.405	2.784
	Total	120	8.960	2.608

Table 4 Sensory Rating Means for Rumination and Labeling

Sensory Rating

Rumination Type	Label Condition	N	Mean	SD
High	Vasoconstriction Pain	19	9.284	2.223
	Minor Discomfort	24	9.538	2.602
	Tolerance Study	20	9.915	2.799
	Total	63	9.581	2.532
Low	Vasoconstriction Pain	19	8.158	2.209
	Minor Discomfort	16	7.494	2.505
	Tolerance Study	22	8.941	2.752
	Total	57	8.274	2.538
Total	Vasoconstriction Pain	38	8.721	2.260
	Minor Discomfort	40	8.720	2.727
	Tolerance Study	42	9.405	2.784
	Total	120	8.960	2.608

Table 5 Affective Rating Means for Catastrophizing and Labeling

Affective Rating

Catastrophizing	Label Condition	N	Mean	SD
High Catastrophizer	Vasoconstriction Pain	24	6.621	3.583
	Minor Discomfort	19	7.732	3.825
	Tolerance Study	18	7.939	3.663
	Total	61	7.356	3.671
Low Catastrophizer	Vasoconstriction Pain	14	4.607	3.485
	Minor Discomfort	21	4.376	3.358
	Tolerance Study	24	4.813	3.691
	Total	59	4.608	3.471
Total	Vasoconstriction Pain	38	5.879	3.635
	Minor Discomfort	40	5.970	3.926
	Tolerance Study	42	6.152	3.957
	Total	120	6.005	3.817

Table 6 Affective Rating Means for Rumination and Labeling

Affective Rating

Rumination Type	Label Condition	N	Mean	SD
High	Vasoconstriction Pain	19	7.484	3.383
	Minor Discomfort	24	6.646	4.016
	Tolerance Study	20	6.455	3.635
	Total	63	6.838	3.680
Low	Vasoconstriction Pain	19	4.274	3.207
	Minor Discomfort	16	4.956	3.678
	Tolerance Study	22	5.877	4.295
	Total	57	5.084	3.784
Total	Vasoconstriction Pain	38	5.879	3.635
	Minor Discomfort	40	5.970	3.926
	Tolerance Study	42	6.152	3.957
	Total	120	6.005	3.817

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