The Effectiveness of a Hope Intervention in Coping with Cold Pressor Pain

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Abstract

Hope has been correlated with greater pain tolerance and thresholds and less reported pain severity. The present study investigated the effectiveness of a brief hope-based intervention involving guided imagery and skills instruction aimed at enhancing pain coping skills among university students performing the cold pressor task. The intervention resulted in increased hope among females and increased pain tolerance in all participants. The intervention did not affect pain threshold and resulted in marginally increased pain severity. Thus, this intervention facilitates better pain tolerance without necessarily changing the experience of the pain. Implications for practice and future research are discussed.

COMPETING INTERESTS: None declared.

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- *coping*
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- *pain*
- *pain management*
- *positive psychology*

THE GATE Control Model (Melzack & Wall, 1965) describes pain as a multidimensional phenomenon wherein the sensory-physical, motivational-affective, and cognitive-evaluative components of pain are integrated. Consistent with this model, pain has been related to affect (e.g. Kvaal & Patodia, 2000), pain catastrophization (e.g. Jacobsen & Butler, 1996), and social desirability (a motivational factor; e.g. Deshields, Tait, Gfeller, & Chibnall, 1995). Accordingly, cognitive-behavioral (e.g. Turk, Meichenbaum, & Genest, 1983) and relaxation strategies (e.g. Lambert, 1996; Liossi & Hatira, 1999) have been used to treat pain. However, other cognitive processes such as hope may also be effective intervention targets.

Hope theory incorporates three components: goals (i.e. significant short- or long-term targets of mental actions); pathways thinking (i.e. ability to generate multiple routes to reach goals); and agency (i.e. ability to initiate and sustain motivation to reach goals; Snyder, 1994a, 1994b, 1996, 2000, 2002). Pathways and agency thoughts jointly determine how and when people attempt to pursue goals or disengage from goal pursuits. Although outcomes (i.e. successes or setbacks) may temporarily increase or decrease pathways and agency thinking and, thus, affect state hope levels (Snyder et al., 1996), people have trait-like hope levels that transcend specific situations (Snyder et al., 1991).

Higher hope has been related to better pain management in arthritis (Laird, 1992), fibromyalgia (Affleck & Tennen, 1996; Tennen & Affleck, 1999), and car accident injuries (Elliot & Kurylo, 2000). Furthermore, Snyder et al. (2005) found that high-hope university students evidenced higher pain thresholds, higher pain tolerance, and lower reported pain severity on a cold pressor task (CPT). In the context of pain, hope may promote the search for alternative goals (e.g. minimizing pain) or new routes to existing goals, as well as enhance motivation and self-efficacy (Snyder, 1998).

Given these findings, we aimed to develop an intervention to increase hope thereby increasing pain tolerance and pain threshold (Phillips & Gatchel, 2000) and decreasing pain severity among university students performing the CPT. The development of this intervention was informed by previous interventions manipulating hope in clinical populations and university students (e.g. Curry & Maniar, 2003, 2004; Lopez, Floyd, Ulven, & Snyder, 2000; Snyder et al., 2000). Also, the documented relationships of affect, pain catastrophization, self-presentation, demographic variables (e.g. Tsao et al., 2004), and experimenter gender (e.g. Kallai, Barke, & Voss, 2004) to pain coping as well as the theoretical and empirical associations between these psychological variables and hope (Snyder et al., 1991) suggest that these factors may be important moderators in the relationship between condition assignment and pain experience. Thus, it was hypothesized that: (1) the intervention would result in increased pain tolerance, higher pain threshold, and lower pain severity ratings; and (2) these outcomes would be moderated by demographic variables, experimenter gender, affect, pain catastrophization, and self-presentation.

Method

Research participants

Participants were university students scoring below the median score on the Trait Hope Scale-Revised (Shorey et al., 2007) during mass-screening. Given the goal of this study to experimentally manipulate (increase) hope, we selected low-hope participants to prevent a ceiling effect from masking intervention effects.

Pain tolerance apparatus

The CPT was administered using a bin of ice water (45.72 cm x 20.32 cm x 25.40 cm). Ice was localized on one side of the divided bin and a pump continuously circulated the water to maintain a temperature of 0° Celsius.

Measures

The Trait Hope Scale-Revised (HSR; Shorey et al., 2007) is an 18-item measure yielding a total score (range 1–8) and three subscale scores (goals, pathways, agency). Items (e.g. 'I go after goals that are difficult and challenging', 'I'm good at coming up with new ways to solve problems', 'I'm successful at getting what I want') are rated on an eight-point scale. The HSR has shown test–retest reliability ranging from .55 to .78 over a two- to 10-week time interval (Shorey et al., 2007). Relative to the original (Snyder et al., 1991), the HSR includes a goals subscale and is a stronger predictor of self-efficacy, psychological distress, and well-being but is not related to performance goals, hypercompetitiveness, or pessimism. Although each component is empirically distinct, the subscales are highly correlated. Given the aims of this study, we examined total HSR scores (observed $\alpha = .86$).

The Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) is a 20-item measure of two independent yet moderately negatively correlated dimensions of affect—Positive Affect (PA) and Negative Affect (NA). NA is correlated with anxiety, depression, and psychological distress; PA demonstrates moderate inverse relationships to these factors and is related to other measures of positive emotionality. Observed $\alpha = .88$ and .82 for PA and NA, respectively.

The Pain Catastrophizing Scale-State Form (PCS; Sullivan, Bishop, & Pivik, 1995) is a five-point measure assessing the degree to which one experienced each of 13 thoughts or feelings during past painful experiences. PCS scores have been associated with depression, anxiety, negative affect, and fear of pain. Observed $\alpha = .90$.

The Self-Presentation Scale-Short Form (SPS; Roth, Snyder, & Pace, 1986) is a 20-item measure of the propensity to attribute positive characteristics to the self (SPS-Attributive) and to deny negative characteristics (SPS-Repudiative). SPS-Repudiative is related to self-consciousness and depression; SPS-Attributive is related to self-esteem and depression. Observed $\alpha = .54$ and .44 for SPS-Attributive and SPS-Repudiative, respectively.

Interventions

Hope intervention The intervention (average duration of 15 minutes, 56 seconds) consisted of four parts:

1. Guided imagery. The participant was asked to think of a goal he/she wanted to achieve, how they built motivation and strategies to achieve the goal, and how this experience might aid in future goal pursuits.
2. Dialogue. The experimenter asked the participant about the situation recalled during (1), why the goal was important, how he/she planned and sustained motivation to reach the goal, and how this might prepare him/her for future goals.
3. Strategies instruction. The experimenter provided the participant with a list of strategies to enhance goal-directed thinking, pathways thinking, and agency.
4. Worksheet. The worksheet instructed the participant to write about another experience in pursuing goals, list positive self-talk statements and strategies for the CPT, and estimate his/her pain tolerance time.

Control condition Participants were instructed to read a home organization book for 15 minutes.

Procedure

Ethical approval for the current study was obtained from the University of Kansas Institutional Review Board. After soliciting participation via email and participants appearing for their scheduled appointments, participants were randomly assigned to the hope intervention or control condition. Next, participants completed the demographics questionnaire, PANAS, SPS, and PCS. Experimenter 1 then delivered either the intervention or control manipulation. Afterward, participants completed the HSR. Then, experimenter 2 (unaware of condition assignment) instructed the participant to immerse his/her non-dominant hand in the bin of ice water. Self-report of pain onset (i.e. pain threshold) and withdrawal from the CPT (i.e. pain tolerance) were recorded via stopwatch. Unbeknownst to participants, time was limited to 300 seconds.

Results

Of the 1630 students who completed mass-testing, 810 were eligible, 212 agreed to participate, 38 failed to attend testing, and two were excluded for medical reasons (i.e. arthritis, circulatory problems). Of the 172 participants comprising the final sample (Hope-Males $n = 27$; Hope-Females $n = 62$; Control-Males $n = 31$; Control-Females $n = 52$), 88.95 percent were white, and 90.70 percent were college freshmen or sophomores (age $M = 19.17$; SD = 2.02). The average annual family household income was $78,820 (SD = $56,470). The average HSR score for the study sample was 5.10 (SD = .58). Baseline HSR scores were related to NA, SPS-Repudiative, and PCS scores ($r = –.21$, $p = .005$; $r = .36$, $p < .001$; $r = –.16$, $p < .05$, respectively).

Study hypotheses

Change in hope A 2 (intervention v. control) x 2 (participant: male v. female) repeated-measures (mass-testing, post-intervention) MANCOVA was used to test the effectiveness of the intervention on hope. Age, household income, experimenter 1 gender, and PA, NA, SPS-Attributive, SPS-Repudiative, and PCS scores were entered as potential covariates. A backwards stepwise approach was used to eliminate those that did not contribute significantly to the model. PA and SPS-Repudiative scores remained in the model as covariates (Wilks' lambda = .915, $F(1, 166) = 15.35$, $p < .001$; Wilks' lambda = .977, $F(1, 166) = 3.97$, $p < .05$, respectively).

Condition assignment accounted for a significant amount of variance in change in hope (Wilks' lambda = .957, $F(1, 166) = 7.45$, $p < .01$). The tests of within-subjects contrasts showed the expected time x condition interaction ($F(1, 166) = 7.45$, $p < .01$, $Eta^2 = .042$, Hope-$Time_1$: $M = 5.08$, SD = .07; Hope-$Time_2$: $M = 5.63$, SD = .08; Control-$Time_1$: $M = 5.11$, SD = .07; Control-$Time_2$: $M = 5.39$, SD = .08). There was also a significant condition x gender interaction effect ($F(1, 166) = 3.94$, $p < .05$, $Eta^2 = .023$). Post-hoc comparisons using Tukey's *HSD* statistic showed that women in the hope condition reported a significantly greater increase in hope than those in the control condition. Men showed an increase in hope regardless of condition assignment.

Pain A 2 (intervention v. control) x 2 (participant: male v. female) MANCOVA was used to test the effect of the hope intervention on pain tolerance, threshold, and severity. In addition to the aforementioned covariates, water temperature and experimenter 2 gender were entered as potential covariates. The main effects of age, PCS scores, and water temperature contributed significantly to the model (Wilks' lambda = .905, $F(4, 160) = 4.22$, $p < .01$; Wilks' lambda = .857, $F(4, 160) = 6.69$, $p < .001$; Wilks' lambda = .933, $F(4, 160) = 3.39$, $p = .01$, respectively) and, thus, were included as covariates. An interaction effect of participant gender x experimenter 2 gender on the set of dependent variables was also significant (Wilks' lambda = .927, $F(4, 160) = 3.17$, $p < .05$), with post-hoc analyses indicating that men (but not women) tolerated the CPT longer when it was administered by a female experimenter. Thus, experimenter 2 gender and the interaction of participant gender x experimenter 2 gender were included as covariates.

Condition (Wilks' lambda = .840, $F(4, 160) = 7.61$, $p < .001$) accounted for a significant amount of variance in the set of dependent variables. Significant differences were found for pain tolerance, such that men tolerated pain longer than women ($F(1, 163) = 4.35$, $p < .05$, $Eta^2 = .027$, Male: $M = 138.26$, SD = 13.00; Female: $M = 104.68$, SD = 9.14) and participants receiving the intervention tolerated pain longer than control condition participants ($F(1, 163) = 13.88$, $p < .001$, $Eta^2 = .095$, Hope: $M = 151.16$, SD = 11.40; Control: $M = 91.78$, SD = 10.95). No significant condition, gender, or condition x gender effects were found related to pain threshold or severity. However, marginally more pain was reported by females v. males ($F(1, 163) = 3.14$, $p = .08$, $Eta^2 = .019$, Male: $M = 5.31$, SD = .24; Female: $M = 5.83$, SD = .17) and intervention participants v. control participants ($F(1, 163) = 2.94$, $p = .09$, $Eta^2 = .019$, Hope: $M = 5.82$, SD = .21; Control: $M = 5.32$, SD = .20).

Discussion

This study was the first to document the effectiveness of a brief hope-based intervention in enhancing hope and pain tolerance. The intervention produced a more robust effect on pain tolerance than on HSR scores, perhaps because the intervention was specific to pain management and the HSR measures hope more generally. Contrary to expectations, receiving the hope intervention resulted in a marginally significant increase in pain severity,[1] suggesting perhaps that the intervention primed participants to attend to the pain or that pain tolerance is not contingent on a less intense sensory experience of pain.

The effect of the intervention on hope, which was fairly small ($Eta^2 = .023$), appeared to be specific to women. However, the change in hope for women in the intervention was similar in magnitude (1 SD) to the difference between depressed and non-depressed individuals (Snyder et al., 1991). Moreover, the effect of the intervention on pain tolerance was more robust for women than for men. Thus, a statistically small change in hope may be clinically meaningful.

Men's hopefulness ratings increased from baseline to post-intervention regardless of receiving the intervention. However, men receiving the intervention demonstrated a greater increase in hope (albeit not statistically significant). This might suggest that the small number of men decreased power to detect differences between conditions.

The present study has important limitations. The use of an experimental pain induction method and university-based sample with relatively low hope may limit generalizability and relevance to clinical populations. Moreover, the control condition did not include the nonspecific components of the intervention (e.g. experimenter interaction), limiting our ability to attribute intervention effects to specific techniques. Also, the mechanisms by which the intervention drove better pain tolerance remain unclear. Thus, future research might examine the process by which this intervention was successful, the utility of each intervention component, and the effects of this intervention on clinical populations as well as those of all levels of hope.

The present findings suggest that attending to psychological factors such as hope may have clinical utility among patients in pain. Clinicians might consider facilitating hope-consistent processes (e.g. reminding patients about overcoming past painful experiences, helping patients plan around pain, realistic goal-setting). Moreover, this research might provide clinicians with specific intervention targets that might be beneficial in treating pain.

Note

1. The findings regarding pain tolerance and severity should be interpreted cautiously. The effect of the intervention on pain severity was not robust, and contrary to between-group differences, bivariate analyses indicated a negative correlation between pain severity and pain tolerance.

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