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Coping Styles Effect on Stress and Psychological Well-being among Individuals with Chronic Pain

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Abstract

The current study aimed at investigating the effect of various coping mechanisms on the level of stress and psychological outcomes (depression and anxiety) among individuals with chronic pain. Ninety-four people with chronic pain completed a battery of tests regarding their perceived stress level, coping strategies of chronic pain, as well as psychological well-being in terms of depression and anxiety symptoms. Mediational analyses were conducted to test the mediating effect of various coping strategies on the relationship between stress and depression/anxiety. Results showed that among the four different groups of coping strategies, negative coping partially mediated between stress and depression, but not between stress and anxiety.

Keywords: Chronic pain; Coping; Depression; Anxiety

Introduction

A significant number of individuals experience a devastating chronic pain condition. The pain condition can be associated with a disease itself, or it can be the primary cause of the problem. Acute pain is considered a normal sensation resulting from the firing of neurons in the nervous system as a signal of a physiological insult. While acute pain often occurs when there is physiological damage to the body, chronic pain often lacks such physical evidence [1]. Chronic pain, therefore, can persist for days and perhaps for years after the curing of the disease. It may also be more challenging to cure as compared to acute pain. Bonica defined chronic pain as pain that persists past the normal time of healing [2]. Despite the controversial definitions of what constitutes "normal healing", in their most current definitions of chronic pain, the International Association for the Study of Pain [IASP] utilizes a three months cutoff to differentiate between acute and chronic pain for nonmalignant pain [1,3].

Chronic pain affects many individuals across the lifespan. It is estimated between 75 and 150 million Americans experience illnesses and injuries that result in chronic pain [4-6]. The 2011 IOM report stated that a total annual incremental cost of health ranges from $560 billion to $635 billion in the United States. This cost includes medical costs as well as economic costs that are related to the loss of wages and productivity at work [4]. In addition to the health care cost, and economic loss and burden, chronic pain has devastating impacts on the person who experiences it, among which are stresses, disability and decreased psychological well-being [7]. Chronic pain triggers many secondary pain-related challenges, such as job change or loss, marital strain, and social isolation [8,9]. In addition, chronic pain causes interference with daily tasks, which result in an increase in stress [10,11].

In a study conducted by Wilson individuals with chronic pain resulting from spinal cord injuries were examined in terms of the relationships among perceived stress, disability, interference, coping and support [11]. Results indicated that perceived stress alone accounted for 20% of depression among their participants. Mediational analysis further supported that perceived stress mediated the relationship between self-blame coping and depression [11]. In their structural equation modeling, Lee reported that interference in daily activities from the pain condition accounted for 47% of their daily stressors, and that interference alone accounted for 43% of variance for depression among individuals with chronic pain. More interestingly, an increased level of pain perception was found to predict a higher level of interference in daily activities (77%), and interference mediated the relationship between pain and depression [10].

Dealing with Stressors

Because chronic pain may not be rooted in any physiological damage that can be a target for medical treatment, health care providers, including psychologists and mental health counselors, are interested in the utility of psychological interventions to alleviate stress associated with chronic pain conditions. There are many theories in explaining the phenomenon of coping. One of the prominent models and conceptualization of coping is Lazarus and Folkman's Transactional Model of Stress and Coping [12]. This model contended that when faced with a stressor, an individual evaluates the significance and potential threat associated with it, the controllability of the stressors and the coping resources and options. The actual coping efforts then aim at regulating the problem that gives rise to outcomes of the coping process. Lazarus and Folkman further discussed that there are two primary coping efforts. One is emotional regulation, which is defined as strategies that aim at changing the way one thinks or feels about the stressful event. The second one is problem management, which is defined as strategies that are directed at changing the stressful event. Furthermore, Lazarus and Folkman suggested that there are dispositional coping styles that are generalized ways of behaving that can affect a person's emotional or functional reaction to a stressor.

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These dispositional coping styles are theorized to remain relatively stable across time and situations. They defined two types: optimism is defined as the tendency to have generalized positive expectancies for outcomes; while information seeking is defined as attentional styles that are vigilant versus those that involve avoidance [12].

Coping Dimensions

As an individual faces stressors, such as dealing with a chronic pain or health condition, one may use different coping mechanisms to deal with the adverse or stressful events. Although many coping styles have been identified in the literature, there is a lack of consensus in terms of the various dimensions that distinguish different coping strategies [13]. Further, researchers are not in agreement as to which orientation(s) is/are most valid and/or effective. Coping dimensions have included problem-versus emotion-focused coping, primary versus secondary control coping, cognitive versus behavioral coping, active versus passive coping, and self-focus versus relational focus [14,15]. For instance, an individual seeking psychotherapy support can be considered as active coping, (actively finding others to help), but can also be considered as problem-focused coping (seeking professionals for advice to resolve the problems) or even emotional-focused coping (seeking professionals to process the emotional aspect of the problem). Due to the complexity of how coping can be layered and extend beyond the individual level, other divisions of coping that encompass familial, organizational, institutional, communal, societal and cultural aspects, such as religious coping, social coping and psychological coping should be noted [7]. Despite the complexity of the many overlapping dimensions of coping, the following literature will provide a brief discussion of some of the common coping mechanisms in relation to adjustment.

Common Coping Strategies

Literature on coping and chronic pain has demonstrated the differential effects of different coping mechanisms; however, while some have been consistently found as effective, others remain less certain in terms of effectiveness. For instance, numerous studies have demonstrated that adaptive coping strategies such as distraction, positive thinking, and relaxation are associated with better adjustment [7,16,17]. Similarly, Compas, and researchers found that positive thinking, cognitive restructuring, acceptance, and distraction predicted lower levels of anxiety and depression symptoms and somatic complaints [14]. Coping styles such as catastrophizing, praying/hoping, avoiding and guarding have been considered as maladaptive that led to negative outcomes, including disability, depression, poor psychological adjustment, poor quality of life and reduced activities [7,10,11,16-19].

On the other hand, spirituality as a coping mechanism has been less consistent in the literature. For instance, Johnson discussed that greater spiritual well-being, including both beliefs about the role of faith in illness and meaning, peace and purpose in life, were associated with fewer symptoms of anxiety and depression [20]. Conversely, greater past negative religious experiences were associated with more symptoms of depression and anxiety. Rafferty, Billing and Mosack investigated the role of spirituality and health among individuals with chronic illness. In their mixed methods study, participants reported that the religion/spirituality conversations were positive, helpful and supportive [21]. However, Peres et al. discussed that the concept of praying/hoping denotes a passive attitude of waiting for a miracle to occur, or waiting for others to find a cure for the condition, which can be different from the active religiousness that may contribute positively to adjustment of chronic pain [7,22]. Furthermore, a meta-analysis of 49 studies reported that adopting religious coping (e.g., benevolent religious reappraisals, elaborative religious coping, seeking spiritual support) was correlated with positive outcomes including general growth, spiritual growth, positive affect, higher self-esteem, reduced depression, distress and anxiety [23].

Adjustment to Chronic Illness

Adjustment issues associated with a chronic condition or illness, such as chronic pain, can take many forms, including depression, anxiety, anger, quality of life, and illness symptoms [24-27]. Although studies have shown the positive effect of acceptance as an intervention for chronic pain patients, other complications may arise during the adjustment process [16]. For instance, patients may be optimistic or high in acceptance about their chronic pain conditions, yet they may still experience depression. What is interesting in social research is that complex variables can interact with each other and may affect a relationship differently under different circumstances. In addition to the fact that adjustment can be multi-faceted, strategies to modify such adjustment outcomes, such as acceptance, can have different effects on different adjustment outcomes via their unique mechanisms [16,28,29].

Although both depression and anxiety are commonly considered as similar negative adjustment outcomes and research substantiates their high correlations, it has also been well documented that they are distinctive constructs [30-34]. In the cognitive framework for understanding depression and anxiety, Beck's Cognitive-Content Specificity Approach explained that automatic thoughts of people with depression focused on themes of self-deprecation and negative attitudes about the world and the future (i.e., triad of self, world and future), and were often triggered by underlying depressogenic schemas organized around themes of loss, personal deficiency, worthlessness and hopelessness [35]. For people with anxiety, such automatic thoughts focused on anticipated future harm or danger, and were often triggered by schemas about danger, uncertainty and future threat [34]. In addition, based on the temporal aspect, people exhibiting anxiety tended to be future-oriented, while those who exhibit depression tend to be focused on the past [35-37]. Therefore, depending on whether an individual has depression or anxiety, there may be a differential treatment effect when using acceptance or other coping mechanism as a counseling strategy.

The purpose of the current study is to examine the mediating effects of four groups of coping strategies (negative coping, relational focused coping, self-focused coping, and existential coping) in affecting the relationship between perceived life stress and two psychological outcomes (i.e., depression and anxiety). First, a factor analysis was run to investigate the unique factors captured by the coping mechanisms measure (Brief-COPE). Then, a meditational analysis was conducted to determine whether the four coping strategies acted as a mediator on depressive symptoms among chronic pain patients. Similarly, mediating effects were tested for anxiety.

Methods

Participants

A total of 94 participants with a chronic pain condition participated in this study. Inclusion criteria included:

1) Age 19 years and older.

2) Currently diagnosed with chronic pain (persistent pain lasting for three months or longer, as defined by International Association for the Study of Pain [1,3].

3) Individuals who could understand and read English. No restrictions were placed in terms of types of the chronic pain conditions.

Table 1 reports the basic demographic among the 94 participants in the study. The mean age was 47.59 years old (*SD*=12.49), and about two third (72.3%; *n*=68) were female. In terms of marital status, half of the participants were currently married (52.1%; *n*=49). A majority of the participants identified themselves as Caucasians (78.7%; *n*=74). Thirty-three percent (*n*=31) of the participants reported having vocational training as their highest level of education, 29.8% (*n*=28) with bachelor degree, 24.5% (*n*=23) high school diploma. Regarding annual family income, 19.1% of the participants (*n*=18) reported that their total income was between US$70,000 and over, followed by 17% (*n*=17) under US$10,000 range, 12.8% (*n*=12) between US$30,000 and 40,000, 11.7% (*n*=11) between US$60,000 and 70,000 range, and 11.7% (*n*=11) between US$10,000 and 20,000 range. The majority of the participants identified their SES as middle class (41.5%; *n*=39), followed by lower middle class (27.7%; *n*=26), 16.0% (*n*=15) as below poverty, followed by 12.8% (*n*=12) as upper middle class. In terms of the employment status, the majority of the participants (33.0%; *n*=31) reported being currently unemployed, 20.2% (*n*=19) reported currently being employed full-time, 12.8% (*n*=12) reported having been retired, 9.6% (*n*=9) reported their employment status as disabled (i.e., disability being too severe to engage in any work-related activities).

Power analysis

An *a priori* power analysis was conducted. For regression analysis, a preset criterion of medium effect size (0.15), *p* value of 0.05, a power of 0.80, and with two predictors, the required sample size is 68. Therefore, the current sample size of 94 was deemed just adequate in terms of the power.

Procedures

Several local agencies and online support groups that serve patients with chronic pain were identified. A letter was sent to the clinical service providers asking their assistance in advertising the study to the patients. Patients were recruited from two local agencies and four online support groups. The four online resources were identified and the coordinators were approached informally via an e-mail to ask if they would allow an on-line advertisement and survey to be posted to solicit potential participants. Any website-specific approval required from those websites was asked and action was taken. Upon acceptance of this invitation, coordinators from those sites were asked to post a summary of recruitment advertisement in their respective electronic newsletter and websites.

Paper survey packets were made available to the clinical service providers. The packets were given to receptionists to distribute. If patients were interested in participating, they could:

1) Approach the lead psychologists or the practitioners and ask for a packet of survey.

2) Contact the principal investigator to clarify questions and to ask for a packet to be sent to them.

3) Access to the on-line survey through the link included on the flyer. Upon completion of the paper survey, participants mailed the paper version of the survey directly to the principal investigator with a self-addressed stamped envelope. In terms of the online version, an online flyer was posted at the various websites. Participants who were interested in completing the survey followed the instructions (web-link) on the online flyer and complete the survey online.

Measures

Stress

The global level of perceived stress of participants in this study was measured by the Perceived Stress Scale (PSS; Cohn, Kamararch and mermelstein) [38-40]. The PSS is a 14-item self-report questionnaire, and is rated on a 5-point Likert scale from 0 (*never*) to 4 (*very often*). The PSS had shown good stability with Cronabch's alpha reliability coefficients ranging from 0.84 to 0.86. Two-day test-retest reliability was found to be 0.85. The PSS was moderately correlated with related measures of the number of stressful life events (*s* =0.17 to 0.39) and the impact of certain life events (*s* = 0.24 to 0.49). Cohen et al. claimed that the PSS is more closely related to individuals' subjective appraisals about the stress level of a life-related event than their objective appraisals [40]. In this study, the total score of the scale was used for data analysis. Cronbach's alpha for the current study was 0.90.

Depression and anxiety

The Hospital Anxiety and Depression Scale (HADS; Zigmond and Snaith) is one of the widely used measures when assessing individuals' depression and anxiety occurring with physical pathology as two separate dimensions [39]. The HADS is a 14-item self-report questionnaire and is rated on a 4-point Likert scale from 0 (*not at all*) to 3 (*very often indeed*). The HADS showed an internal consistency with Cronbach's alpha values ranging from 0.68 to 0.93 for the anxiety scale and 0.67 to 0.90 for the depression scale. It also showed a test-retest reliability of *r*=0.85 [40]. In this study, both the subscale scores for depression and anxiety were used as a psychological outcome. Cronbach's alphas for the current study were 0.86 (Depression), 0.84 (Anxiety) and 0.90 for the total score.

Coping

In order to measure participants' coping strategies, the instrument, Brief COPE Carver was used [41]. Brief COPE is a short version of the COPE Inventory [42]. The COPE inventory was initially created with 60 items (4-point Likert scale) measuring respondents' preference of coping strategies. The Brief COPE is a 28 item questionnaire (4-point Likert scale) consisting of 14 different coping strategies. These 14 strategies include active coping, planning, positive reframing, acceptance, humor, religion, using emotional support, using instrumental support, self-distraction, denial, venting, substance, behavioral disengagement, and self-blame. Although the factor analysis conducted by Carver confirms these 14 different coping strategies, he suggested that the Brief COPE should be used with certain degrees of flexibility and tailored to the research needs [41]. In exploratory factor analysis was used to validate the data collected by the Brief COPE and to enhance the interpretability of the findings.

Data analysis

Statistical Package for Social Sciences (SPSS) version 18 was used for all statistical data analyses. Basic descriptive statistics were reported on percentages, mean and standard deviations as appropriate. Basic correlational analyses were used to identify any correlational relationships among studied variables. ANOVA and regression analyses were used to analyze any mediating effects of variables and to analyze the predictive strengths of variables to certain outcome variables.

Results

Exploratory factor analysis

The exploratory factor analysis (EFA) was conducted to handle

the data collected by the Brief COPE. The Kaiser-Meyer-Olkin (KMO) measure of adequacy of sample size for the factor analysis yielded a result of KMO=0.73, which, according to Field, is considered to be good. With the respect to Bartlett's test of sphericity, the analysis yielded a result of χ^2 (94)=1355.24, p<0.001, which also suggested the factor analysis is appropriate for the data. Due to the small sample size (n=94) and moderate correlations between items (ranging from 0.02 to 0.73) Varimax rotation was used for the EFA to maximize the interpretability of the data. Factors with Kaiser's eigenvalue greater than 1 were extracted. In addition, due to the constraint of small sample size and in order to enhance the data analysis consistency, two rules were used to drop factors and/or items:

1. Factors contain only two or fewer items.

2. The loading of the items is lower than 0.50. As a result, 17 items and four factors were retained for the final analysis. Factors were labeled through the discussion among authors of the current study, and they are negative coping, relational/external-focused coping, self-focused coping, and existential coping. Table 2 shows the loadings of items and its corresponded factors. The internal reliability was analyzed using Cronbach's alpha for each of the four factors and the results are 0.793, 0.778, 0.823, and 0.797 respectively. The Cronbach's alpha for the entire assessment after the deletion of 8 items is 0.814.

The mediational effect of coping on stress and depression and anxiety

Descriptive statistics: The current study involved the data collection concerning participants' perceived stress level, perceived psychological wellbeing (i.e., anxiety and depression), and coping strategy. Normality and linearity analyses were performed before any further statistical analysis was conducted. As a result, the values of skewness among targeted variables ranged from -0.35 to 0.30, which were considered to be appropriate for further analysis. The perceived stress level yielded a mean of 2.20 (SD=0.64), perceived anxiety yielded a mean of 1.48 (SD=0.68), and perceived depression yielded a mean of 1.27 (SD=0.66). Among four different types of coping strategies (i.e., negative coping, relational/external-focused coping, self-focused coping, and existential coping), the means were 2.10 (SD=0.68), 2.92 (SD=0.63), 2.63 (SD=0.73), and 2.39 (SD=0.90), respectively. See the Table 3 for descriptive statistics and correlatives of studied variables.

Mediation analysis: To answer the main research questions concerning the indirect effect of perceived stress on perceived psychological wellbeing via the coping strategy (i.e., mediation effect), multiple regression analyses were conducted. Specifically, four coping strategies (negative coping, relational/external-focused coping, self-focused coping, and existential coping) were individually tested for its mediation effect on two perceived psychological well-being subscales (i.e., anxiety and depression). Consequently, eight sets of analyses were conducted. In each set, as suggested by Baron and Kenny four conditions were tested: [43-45] a) the association of the perceived stress and perceived psychological wellbeing [45,46] b) the association of the perceived stress and the coping strategy, c) the association of the perceived stress and coping strategy combined to the perceived psychological wellbeing, and d) the indirect effect of the perceived stress on perceived psychological wellbeing via the coping strategy. The mediation effect is confirmed when all four conditions stand. Sobel test was used to measure the indirect effect of the mediator [46].

Regarding direct effects, the regression analyses of the perceived stress on perceived anxiety and perceived depression were significant with F (1, 92)=139.90, R^2=0.60, p=0.00, and F (1, 92)=95.03, R^2=0.51, p=0.00, respectively. Specifically, perceived stress yielded significant results predicting the perceived anxiety with a coefficient=0.41, SE=0.03, p=0.00 and perceived depression with a coefficient =0.36, SE=0.04, p=0.00. Examining the association between perceived stress and the coping strategies, four sets of regression analyses were conducted. Among four regressions, perceived stress only significantly associated with negative coping with F (1, 92)=48.73, R^2=0.35, p=0.00. The perceived stress was a significant predictor with coefficient =0.44, SE=0.01, p=0.00. Others such as relational/external-focused coping: F (1, 92)=0.14, R^2=0.00, p=0.71, self-focused coping: F (1, 92)=3.13, R^2=0.03, p=0.08, and existential coping: F (1, 92)=0.09, R^2=0.00, p=0.71 did not have significant results with the perceived stress. Due to the preceding insignificant results, only negative coping was examined further for the mediation effect.

Variables	*M*	*SD*	Percentage
Age	47.59	12.49	
Gender	--	--	Female: 72.3% (*n*=68)
	--	--	Male: 27.7% (*n*=26)
Marital Status	--	--	Married: 52.1% (*n*=49)
	--	--	Divorced: 17.0% (*n*=16)
	--	--	Never Married: 17.0% (*n*=16)
	--	--	Separated: 6.4% (*n*=6)
	--	--	Co-habituating: 5.3% (*n*=5)
	--	--	Engaged: 1.1% (*n*=1)
	--	--	Widowed: 1.1% (*n*=1)
Education	--	--	Elementary School: 1.1% (*n*=1)
	--	--	High School: 24.5% (*n*=23)
	--	--	Vocational Training: 33.0% (*n*=31)
	--	--	Bachelor: 29.8% (*n*=28)
	--	--	Masters: 7.4% (*n*=7)
	--	--	Doctoral Degree: 3.2% (*n*=3)
	--	--	Other: 1.1% (*n*=1)
Ethnicity	--	--	Caucasians: 78.7% (*n*=74)
	--	--	African Americans: 14.9% (*n*=14)
	--	--	Hispanic Americans: 3.2% (*n*=3)
	--	--	Asian Americans: 1.1% (*n*=1)
	--	--	Other: 2.1% (*n*=2)
Family Income	--	--	US$70,000 and over: 19.1% (*n*=18)
	--	--	US$60,000 - 70,000: 11.7% (*n*=11)
	--	--	US$50,000 - 60,000: 7.4% (*n*=7)
	--	--	US$40,000 - 50,000: 9.6% (*n*=9)
	--	--	US$30,000 - 40,000: 12.8% (*n*=12)
	--	--	US$20,000 - 30,000: 9.6% (*n*=9)
	--	--	US$10,000 - 20,000: 11.7% (*n*=11)
	--	--	Under $10,000: 18.0% (*n*=17)
SES	--	--	Below Poverty: 16.0% (*n*=15)
	--	--	Lower Middle Class: 27.7% (*n*=26)
	--	--	Middle Class: 41.5% (*n*=39)
	--	--	Upper Middle Class: 12.8% (*n*=12)
	--	--	Affluent: 2.1% (*n*=2)
Employment Status	--	--	Unemployed: 33.0% (*n*=31)
	--	--	Employed Full-Time: 20.2% (*n*=19)
	--	--	Retired: 12.8% (*n*=12)
	--	--	Disabled: 9.6% (*n*=9)
	--	--	Part-Time/Gradually Returning to Work: 8.5% (*n*=8)
	--	--	In Rehabilitation: 6.4% (*n*=6)
	--	--	Volunteering: 5.3% (*n*=5)
	--	--	Being Layoff: 2.1% (*n*=2)

Table 1: Demographic and studied variables (N=94).

Factors	Items	Loading
Negative coping	6) I've been giving up trying to deal with it.	0.771
	13) I've been criticizing myself.	0.773
	16) I've been giving up the attempt to cope.	0.747
	21) I've been expressing my negative feelings.	0.537
	26) I've been blaming myself for things that happened.	0.641
Relational-focused coping	5) I've been getting emotional support from others.	0.715
	10) I've been getting help and advice from other people.	0.884
	15) I've been getting comfort and understanding from someone	0.774
	23) I've been trying to get advice or help from other people about what to do.	0.705
Self-focused coping	2) I've been concentrating my efforts on doing something about the situation I'm in.	0.525
	7) I've been taking action to try to make the situation better.	0.560
	14) I've been trying to come up with a strategy about what to do.	0.815
	20) I've been accepting the reality of the fact that it has happened.	0.693
	25) I've been thinking hard about what steps to take.	0.669
Existential coping	17) I've been looking for something good in what is happening.	0.613
	22) I've been trying to find comfort in my religion or spiritual beliefs.	0.909
	27) I've been praying or meditating.	0.861

Table 2: Bivariate correlations among measures.

Variables	1	2	3	4	5	6	7	8	9	10	11	12
Gender	-											
Age	-0.15	-										
Education	0.04	0.31**	-									
Income	-0.04	0.12	0.34**	-								
SES	-0.03	0.23*	0.30**	0.61**	-							
Negative Coping	0.07	-0.29**	-0.24*	-0.13	-0.18	-						
Relational Coping	0.1	-0.03	0.11	-0.14	-0.04	0.03	-					
Self-Focused Coping	0.1	-0.02	0.22*	-0.03	-0.01	-0.04	0.49**	-				
Existential Coping	0.13	0.12	0.04	-0.12	-0.04	-0.01	0.33**	0.41**	-			
Stress	0.1	-0.24*	-0.33**	-0.25*	-0.26*	0.59**	-0.17	-0.04	-0.03	-		
Anxiety	-0.01	-0.25*	-0.36**	-0.21*	-0.11	0.52**	-0.06	-0.11	0.02	0.78**	-	
Depression	-0.16	-0.30**	-0.35**	-0.27**	-0.31**	0.57**	-0.19	-0.09	-0.20*	0.71**	0.68**	-
M	--	47.59	--	--	--	10.43	10.63	14.61	7.16	30.84	10.36	8.88
SD	--	12.49	--	--	--	3.57	3.08	3.15	2.7	9.02	4.78	4.6

Note: *N*=94.
** $p<0.01$ level (2-tailed).
* $p<0.05$ level (2-tailed).

Table 3: Exploratory factor analysis factor and item extraction.

Two regression analyses were conducted to evaluate the association between the combine of the perceived stress and negative coping and the perceived psychological wellbeing (i.e., anxiety and depression), and both yielded significant results with F (2, 91)=70.24, R^2=0.61, p=0.00 and F (2, 91)=54.04, R^2=0.54, p=0.00, respectively. Specifically, in the model with the perceived anxiety as an outcome variable, the perceived stress was a significant predictor (coefficient=0.39, SE=0.04, p=0.00), but was not the case for the negative coping (coefficient=0.52, SE=0.57, p=0.36). In the model with the perceived depression as an outcome variable, both the perceived stress (coefficient=0.29, SE=0.04, p=0.00) and negative coping (coefficient=1.56, SE=0.59, p=0.01) were significant predictors. Consequently, only the model incorporated perceived stress, negative coping and the perceived depression was further analyzed for indirect effect. The result of the indirect effect analysis showed a coefficient=0.07, bootstrap SE=0.03, 95% CI [0.01, 0.14] for negative coping on the perceived depression, which represented that there was a significant indirect effect. The Sobel test also yielded a significant result with coefficient=0.07, SE=0.03, p=0.01, which also confirmed the mediation effect. The kappa-squared index (k^2=0.16 CI [0.03, 0.30]) indicated a medium mediator effect. The detail of the statistical analyses can be found in Tables 4 and 5.

Discussion

This study aimed at investigating the mediating effects of four different types of coping mechanisms (i.e., negative coping, relational -focused coping, self-focused coping, and existential coping) in how they may affect the relationship between stress and two psychological outcomes, i.e., depression and anxiety that are commonly endorsed among individuals with chronic pain. The four groups of coping mechanisms were derived based on a factor analysis of the 14 different coping mechanisms measured by the Brief COPE. In order to reduce the 14 different coping mechanisms into higher order groups of coping for clearer conceptualization of the results, we utilized the empirical data from the participants to guide our analysis. A brief discussion of the factor analysis will be followed by the main discussion of the main research hypotheses.

Pertaining to the factor analysis, each of the authors reviewed the items, factor loadings as well as the meaningfulness of the items in relations to the specific groups of factors. Consensus was made that a total of four factors emerged with clear factor loading of each of the items in one of the four factors, except two items that were dropped.

The final four factors include:

1) Negative coping - The use of maladaptive methods in dealing with stressors.

2) Relational/external-focused coping - The use of methods that involve the individuals reaching out to others, whether it is for actual problem solving or emotional support.

3) Self-focused coping - The use of methods that involve the individual working things through him/herself, whether it is focusing, taking action on his/her own, or accepting the challenges.

4) Existential coping - Seeking comfort by praying, mediating, spirituality or finding meaning (Tables 2).

Stress and Adjustment

Results from this study showed that there were significant correlations between stress and anxiety (r=0.78) as well as stress and depression (r=0.71). Regression analyses further supported that stress alone predicted 51% and 60% of depression and anxiety respectively. This is consistent with the current literature indicating that having a chronic pain condition contributes additional stressors to an individual experiencing psychological strains [5-11,24].

Effect of Coping on Depression and Anxiety

In terms of the mediating effects of the various coping mechanisms in relation to stress and psychological outcomes, two significant trends were observed. Specifically for anxiety, none of the negative coping, relational coping, self-coping and existential coping mediated the relationship between stress and anxiety, although negative coping contributed significantly after controlling for stress. For depression, the formal sobel test showed negative coping was a significant partial mediator for the relationship between stress and depression but not the rest of the coping mechanisms. Our results also demonstrated anxiety and depression correlated significantly (r=0.68). The high correlation between anxiety and depression reported from our participants indicate that these two psychological constructs may not be substantially different as what the literature suggested [30-34,37]. This is imperative to keep in mind when investigating the differential effects of the different coping strategies.

Coping Strategy				
Negative Coping		***F***	***R²***	***p***
Direct Effect	Stress – Anxiety	139.90	0.60	0.00**
	Stress – Coping Strategy	48.73	0.35	0.00**
	Stress and Coping Strategy - Anxiety	70.23	0.61	0.00**
Indirect Effect (Sobel Test)	Stress – Coping Strategy - Anxiety	**Effect**	***SE***	***p***
		0.02	0.03	0.37
Relational/External-Focused Coping		***F***	***R²***	***P***
Direct Effect	Stress – Anxiety	139.90	0.60	0.00**
	Stress – Coping Strategy	0.14	0.00	0.71
	Stress and Coping Strategy - Anxiety	70.87	0.61	0.00**
Indirect Effect (Sobel Test)	Stress – Coping Strategy - Anxiety	**Effect**	***SE***	***p***
		0.00	0.00	0.81
Self-Focused Coping		***F***	***R²***	***P***
Direct Effect	Stress – Anxiety	139.90	0.60	0.00**
	Stress – Coping Strategy	0.3.13	0.03	0.08
	Stress and Coping Strategy - Anxiety	72.50	62	0.00**
Indirect Effect (Sobel Test)	Stress – Coping Strategy - Anxiety	**Effect**	***SE***	***p***
		0-.01	0.01	0.50
Existential Coping		***F***	***R²***	***P***
Direct Effect	Stress – Anxiety	139.90	0.60	0.00**
	Stress – Coping Strategy	0.09	0.00	0.77
	Stress and Coping Strategy - Anxiety	69.64	0.60	0.00**
Indirect Effect (Sobel Test)	Stress – Coping Strategy - Anxiety	**Effect**	***SE***	***p***
		-0.00	0.00	0.88
Note: *p<0.05. **p<0.01.				

Table 4: The mediation effect of the perceived stress on anxiety via coping strategy.

Coping Strategy				
Negative Coping		***F***	***R²***	***p***
Direct Effect	Stress – Depression	95.03	0.51	0.00*
	Stress – Coping Strategy	48.73	0.35	0.00**
	Stress and Coping Strategy - Depression	54.03	0.54	0.00**
Indirect Effect (Sobel Test)	Stress – Coping Strategy - Depression	**Effect**	***SE***	***p***
		0.07	0.03	0.01*
Relational/External-Focused Coping		***F***	***R²***	***p***
Direct Effect	Stress – Depression	95.03	0.51	0.00**
	Stress – Coping Strategy	0.14	0.00	0.71
	Stress and Coping Strategy - Depression	47.82	0.51	0.00**
Indirect Effect (Sobel Test)	Stress – Coping Strategy - Depression	**Effect**	***SE***	***p***
		0.00	0.00	0.81
Self-Focused Coping		**F**	**R²**	**P**
Direct Effect	Stress – Depression	95.03	0.51	0.00**
	Stress – Coping Strategy	0.3.13	0.03	0.08
	Stress and Coping Strategy - Depression	48.76	0.52	0.00**
Indirect Effect (Sobel Test)	Stress – Coping Strategy - Depression	**Effect**	***SE***	***p***
		0.01	0.01	0.34
Existential Coping		***F***	***R²***	***P***
Direct Effect	Stress – Depression	95.03	0.51	0.00**
	Stress – Coping Strategy	0.09	0.00	0.77
	Stress and Coping Strategy - Depression	53.67	0.54	0.00**
Indirect Effect (Sobel Test)	Stress – Coping Strategy – Depression	**Effect**	***SE***	***p***
		0.00	0.01	0.78
Note: *p<0.05. **p<0.01.				

Table 5: The mediation effect of the perceived stress on depression via coping strategy.

Maladaptive Coping

Our study consistently showed that maladaptive coping significantly correlated with stress, anxiety and depression, with rs ranging from 0.52 to 0.59. In addition, mediational analysis also supported that maladaptive coping partially mediated between stress and depression. Consistent with current literature, studies showed that negative coping affected one's adjustment. Specifically, individuals with chronic pain who used catastrophizing as a coping mechanism has been associated with higher levels of depression, lower levels of quality of life, and greater disability [7,12,13,47-49]. For instance, Esteve et al. reported that catastrophizing self-statements significantly influenced reported pain intensity and anxiety, resourcefulness beliefs and had a negative and significant influence on depression [16]. This highlights the fact that the presence of negative coping (despite not having positive coping) can be detrimental to one's health, mental health, quality of life and the worsening of one's disability and function.

Existential Coping

In our study, existential coping was inversely and significantly correlated with depression. This is similar to some of the emerging studies on the use of spirituality in exerting positive outlook on the reduction of anxiety and depression on individuals dealing with chronic illness. Spirituality as a coping method has gained more attention in the recent literature, especially for an individual with acquiring a chronic illness in finding meaning as a positive leeway to adjust to the adversities associated with it [15,20]. For instance, Johnson et al. indicated that greater spiritual well-being, including beliefs about how the role of faith plays in their illness, meaning, peace and purpose in life were related with fewer symptoms of anxiety, while greater past negative experiences with religion were associated with higher levels of anxiety and depression. However, mediational analysis did not support the positive effect of spirituality on one's depression and anxiety. It is possible the sample size contributed to the positive correlational trend but was not adequate to indicate a mediational effect. Furthermore, it is plausible that the existential coping items in this domain may not capture the essence of using spirituality as a coping mechanism.

Related to the concepts of spirituality in the sense of existentialism and accepting the chronic pain, we speculated the concept of acceptance may be another route to this method of existential coping. In another study, Lee et al. (under review) conducted a study that investigated how acceptance affected people with chronic pain [48]. Results supported that acceptance of one's chronic pain condition partially mediated the relationship between stress and depression. Previous research has also demonstrated the effectiveness of acceptance as a method of dealing with chronic pain [29,49-51]. Therefore, further investigation is warranted to understand in greater depth the relationship of acceptance, existentialism and spirituality. Consistently, researchers have shown both acceptance and coping are imperative in helping individuals with chronic pain to deal with the many challenges associated with their condition, thus enhancing a better quality of life. For instance, Esteve et al. found that acceptance of pain determined functional status and functional impairment, but coping measures had a significant influence on measures of emotional distress [16]. The authors suggested that both acceptance and control beliefs in coping are complimentary approaches.

Self and Relational Coping

In our study, both self-focused and relational-focused coping did not relate to stress, anxiety or depression, which may be inconsistent with current literature. This is likely due to several factors. Current literature continues to debate the differentiation and multi-dimensionality of coping. Relatedly, due to the lack of clarity of the differentiation, different studies may use different terms but may mean the same constructs of coping. For instance, self-focused and relational-coping strategies are shown to be useful in dealing with chronic pain, although studies may not label the type of coping as such [7,14]. In the current study, all items under the "relational coping" factor can be considered a type of support that the individual is actively taking actions to reduce the challenges associated with the condition, either emotionally or resolving the problems themselves ("I've been getting emotional support from others"; "I've been getting help and advice from other people"; "I've been getting comfort and understanding from someone"; and "I've been trying to get advice or help from other people about what to do".

By the same token, "I've been getting emotional support from others" and "I've been getting comfort and understanding from someone" can also be considered and emotional-focused coping. Such primary control engagement strategies as problem solving, emotional expression and emotional regulation Lazaurs and Folkman have been associated with positive adjustment outcomes [12,14]. Similarly, among the four items under "self-focused coping", "I've been concentrating my efforts on doing something about the situation I'm in" can be considered as cognitive coping. For example, positive thinking and cognitive restructuring are considered as secondary control engagement coping [12]. However, statements such as, "I've been taking action to try to make the situation better" and "I've been trying to come up with a strategy about what to do" can be considered as "problem-focused coping". These fall into primary control engagement strategies whereas, "I've been accepting the reality of the fact" can be considered as "acceptance" and is considered as secondary control engagement coping strategies. Therefore, emotional expression, emotional regulation (primary control engagement) as well as positive thinking, cognitive restructuring, acceptance and distraction (secondary control engagement) can all be considered as self-focused while problem solving (primary control engagement) and distraction (secondary control engagement) can be considered as relational-focused.

Compas et al.'s research, using structural equation modeling, supports our speculations regarding our results [14]. The study revealed that secondary control engagement coping predicted lower levels of anxiety and depression symptoms and somatic complaints, whereas, disengagement coping was related to higher levels of anxiety and depression and somatic complaints. This indicates that the beneficial aspects of self-focused or relational-focused coping are dependent on other dimensions [52]. Furthermore, another study by Agar-Wilson and Jackson indicated that emotional regulation coping among chronic pain individuals may affect different aspects of adjustment, thus supporting the complexity of coping strategies. In other words, the effectiveness of coping strategies may be context specific. Active attempts, such as problem-solving coping, seeking information or help from others work best for controllable stressors; however, these become harmful if the stressors are uncontrollable. In such cases, emotional-focused or self-focused coping (e.g., self and emotional regulation) predicted superior outcomes [53,54]. Banerjee et al. suggested that emotional regulation was associated with a higher quality of life and reduced negative affect, but did not improve pain-related disability. Therefore, the lack of clear dimensionality and how types of coping can contribute differently to different aspects of adjustment may explain the lack of significance in our study. Thus, further investigation of these complexities is warranted. In addition, the relatively small sample size of this study may explain the small variance. Thus, the lack of significant results should be interpreted cautiously.

Strengths and Limitations

This study investigated the effects of various coping strategies of chronic pain as a potential remedial tool to help individuals with chronic pain to achieve a positive psychological outcome. More specifically, it focused on whether four groups of coping mechanisms, as derived from the factor analysis of the coping measure, had any potential differential effect on depression and anxiety. Investigating a broad framework of coping mechanisms in affecting psychological outcome is strength, especially using participants' own data to conduct the factor analysis of the coping mechanism to guide the research questions. However, this study is not without limitations. First, the sample size was relatively small. With a larger sample size, it is plausible that that our non-significant may have had adequate power to show an effect.

Therefore, our results should be interpreted with caution until they have been confirmed with a larger sample size and replication studies. Second, while we chose instruments that are psychometrically sound in measuring the constructs of coping, our study could benefit from incorporating other constructs that assist in confirming the differential effects of depression and anxiety. Third, the construct of coping should further be investigated, especially how coping is conceptualized and how different coping mechanisms can work in various contexts in promoting better psychological adjustment. Finally, the temporal effect of coping can be better captured by using a longitudinal study design.

Research Implications

Building on the limitations discussed above, there are a few future research directions that would benefit from further investigation. A larger sample size with more refined constructs of measures that focus on the inter-relationships of such constructs would help further confirm or refute our hypothesis that the various groups of coping strategies studied here may have a differential effect on depression and anxiety. Those specific additional constructs can include but are not limited to the types of stress people face, their perception about such stress (threat, loss, past or future focused), hopelessness, positive affect, and negative affect. In fact, since it is shown the depression and anxiety may be a different manifestation resulting from coping, there may be other commonly measured psychological outcomes that may warrant additional studies (e.g., quality of life, life satisfaction, happiness, and marital satisfaction). Specifically, the measure of hopelessness, grief, loss, positive affect, negative affect, and perceived stress in terms of time orientation about stress (past, present and future) could help refine our research questions that may have a different outcome.

Relatedly, the construct of coping can use further investigation. In particular, the concept of spirituality and acceptance would warrant further investigation in terms of using specific valid measures to capture these constructs to confirm their impact on psychological adjustment. Furthermore, although the concepts of self-focused and relational-focused coping measured in this study did not show significant impact on depression or anxiety, it is imperative to conceptualize and investigate further. More importantly, given that the multi-dimensionality and the possible overlapping of a given coping mechanism, researchers should use caution in interpreting our findings to be non-significant. As shown in the literature, different coping strategies can work synergistically to enhance better psychological adjustment outcomes. Also, a longitudinal study would demonstrate whether there is a temporal effect of different coping strategies at different stages of adjustment. Lastly, investigating interventions targeting different coping strategies would provide stronger evidence in studying the mediating effect of such interventions.

Conclusion and Clinical Implications

Results from this study provided some findings that are clinically relevant. First, patients with chronic pain experienced stress both from the chronic condition or injury and from functional impairment resulting from it. Second, they experienced poor adjustment including elevated levels of depression and anxiety. Third, although self-focused coping, relational-focused coping and existential coping did not show significant impact on the psychological adjustment in this study, maladjustment coping did show a significant and detrimental impact on patients with chronic pain, especially in the manifestation of depression.

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