

**COPING IS COMPLICATED: EXAMINING THE ROLES OF COPING
STRATEGIES AND PAIN SELF-EFFICACY FOR BLACK VETERANS
WITH CHRONIC PAIN**

by

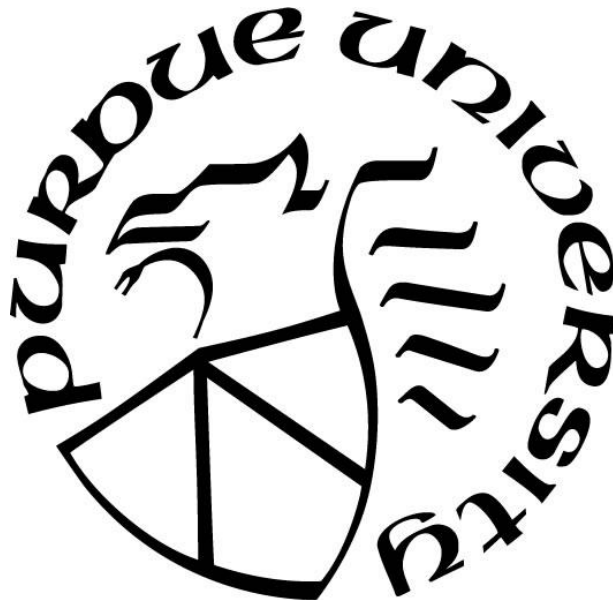
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ABSTRACT

Black patients with chronic pain routinely receive insufficient pain management, which contributes to myriad worse outcomes. This inadequate care stems from various factors, including systemic marginalization, provider bias, and patient-level factors. The present study focused on two patient factors: pain self-efficacy and coping strategies. It explored whether the relationship of pain intensity and pain interference was explained by active (less interference) and passive (greater interference) coping strategies, and it investigated if pain self-efficacy strengthened or weakened these mediating relationships. As part of a larger study, Black veterans with chronic pain completed measures assessing pain interference, coping strategies, and self-efficacy. Simple mediation analyses indicated that the relationship between pain intensity and interference was mediated by passive, but not active, coping. Higher pain intensity predicted greater passive coping, which led to worse pain interference. A parallel mediation analysis affirmed this mediating effect when controlling for active coping. Moderated mediation analyses found that pain self-efficacy moderated the mediating effect of passive, but not active, coping. Participants with lower (vs. higher) pain self-efficacy used more passive coping (in absolute terms) across pain intensity levels, but those with higher (vs. lower) self-efficacy experienced greater increases in their passive coping as their pain intensity increased. A parallel moderated mediation analysis affirmed this moderated mediation effect when controlling for active coping. These results suggest that passive coping is a possible mechanism by which pain intensity leads to interference among Black veterans with chronic pain, and that self-efficacy modulates this effect. Future research should replicate these results in other patient samples, investigate other possible moderators (e.g., PTSD), and design interventions to reduce the use of passive coping strategies while simultaneously increasing pain self-efficacy.

INTRODUCTION

Beyond the unpleasantness of the sensation, chronic pain has substantial effects for the lives of people who suffer from it. Chronic pain interferes with physical, cognitive, social, and emotional functioning, which have considerable downstream effects, including sleep disturbances, anxiety, depression, and substance use disorders (Arola et al., 2010; Barry et al., 2013; Karayannis et al., 2017; Nigol & Di Benedetto, 2020; Ryan & McGuire, 2016). People from various marginalized demographics, particularly racialized groups like Black Americans, often bear the brunt of these burdens. They experience greater pain intensity, greater susceptibility for certain pain conditions (e.g., sickle cell disease), higher pain interference across functional domains, greater exposure to conditions associated with pain (e.g., homelessness, trauma), and greater incidence of other problems related to pain (e.g., depression) (Craig et al., 2020; Green et al., 2003b; McCracken et al., 2001; Meghani et al., 2012; Saastamoinen et al., 2005). Moreover, their pain tends to be under-researched, with lower rates of participant sampling from these communities, less funding, and fewer scholarly publications (Green et al., 2003a; Farooq et al., 2020; Oh et al., 2015).

To address the treatment disparities for Black patients with chronic pain, research has focused on both sides of the patient-provider dyad and on healthcare systems as a whole. On a systems level, Black patients have low access to preventative medicine, specialists, and healthcare in general, and these problems also exist for pain management specifically (Fiscella et al., 2000; Varkey et al., 2009). The care that they are able to access tends to be underfunded and undersupplied. Providers often have difficulty providing high quality care and procuring other external resources (e.g., specialist referrals) for their Black patients (Bach et al., 2004; Varkey et

al., 2009). When analgesics are prescribed, Black patients may still find difficulty in managing their pain, as pharmacies in predominantly Black (vs. non-Black) neighborhoods are less likely to sufficiently stock opioid analgesics to meet their needs (Cintron & Morrison, 2006).

Within the context of their individual healthcare encounters, providers exhibit biased judgments and deliver insufficient pain management for Black patients with chronic pain. They consistently underestimate pain severity for Black patients and exhibit a lower likelihood of screening for and recording their pain reports in medical records (Anderson et al., 2000; Burgess et al., 2013; Cintron & Morrison, 2006; Hausmann et al., 2013; Staton et al., 2007). This has significant consequences, as providers under-prescribe opioid analgesics to Black patients and generally undertreat their pain, a pattern which persists even after controlling for socioeconomic status, reported pain intensity, age, gender, hospital location, injury status, and other factors (Anderson et al., 2000; Badreldin et al., 2019; Cintron & Morrison, 2006; Ghoshal et al., 2020; Goyal et al., 2015; Joynt et al., 2013; Kennel et al., 2019; Ly, 2019; Mafi et al., 2013; Meghani et al., 2012; Todd et al., 2000). Black patients are also less likely to be recommended for radiography and diagnostic testing, surgical procedures, or referrals to pain specialists, exercise therapy, and other non-medication healthcare for pain (Carey & Garrett, 2003; Cavanaugh & Rauh, 2021; Hausmann et al., 2013; Schulman et al., 1999; Wang et al., 2015).

While it is multifactorial, these inaccuracies and inadequacies in pain management partially arise from erroneous beliefs and stereotypes about Black patients held by their providers. White medical interns and residents were found to maintain a variety of myths about biological differences in racialized groups (e.g., skin thickness, bone density, nerve ending sensitivity), leading them to underestimate pain intensity and provide inaccurate treatment recommendations for Black patients (Hoffman et al., 2016). Similarly, physician residents and

fellows believed that Black patients were less sensitive to pain and judged them as being likelier to suffer adverse events (e.g., accidental overdose) and to misuse, abuse, and/or divert their medications (Hirsh et al., 2020). These erroneous beliefs and judgements likely extend beyond trainees to licensed clinicians of various specialties and help account for undertreatment for Black patients. For example, providers were more likely to subject Black (vs. White) patients to urine drug screens, restrict early prescription refills, and prescribe naloxone (to reverse opioid overdose) when prescribing opioids, despite substantial evidence that Black patients are less likely than White patients to misuse or abuse prescription opioid medications or to die of opioid overdose (Becker et al., 2011; Campbell et al., 2018; Hausmann et al., 2013; Jayawardhana et al., 2019; Johnson-Jennings et al., 2020; Madden & Qeadan 2020; Pouget et al., 2018).

Black patients' experiences of discrimination from their providers exacerbate pain and further complicate its management. Instances of daily and lifetime discrimination have been associated with greater pain severity and interference for Black patients, which extend to discriminatory experiences in healthcare (Boring et al., 2021; Burgess et al., 2009; Edwards, 2008). Biased judgments and insufficient medical treatment for Black patients can create mistrust of their providers and in receiving healthcare in general (Armstrong et al., 2013; Benkert et al., 2009; Brown et al., 2023; Doescher et al., 2000; Halbert et al., 2009; Hibbard et al., 2008; Wachterman et al., 2015; Zhang et al., 2020). Discrimination and mistrust can cause Black patients to be more reticent to disclose information to providers (including details about their pain experience) and otherwise disrupt patient-provider communication (Brown et al., 2023; Sutton et al., 2019; Tekeste et al., 2019; Thorpe et al., 2022). For example, Beach et al. (2011) found that physicians exhibited more dominant communication styles with Black (vs. White)

patients, and these differences were associated with Black patients speaking less during their clinical visits compared to their White patient counterparts.

Experiences of discrimination and marginalization are major contributors to reduced and less effective communication between providers and Black patients with chronic pain, but these communication issues may be complicated by other factors. Of note, Black patients commonly report valuing stoicism in the face of pain, which they demonstrate by reducing expressions of their pain experience (e.g., verbalizing their pain to others) (Anderson et al., 2002; Bakhshaie et al., 2022; Black & Woods-Giscombé, 2012; Hsieh et al., 2010; Im, 2008; Meghani & Houldin, 2007). Stoicism can be counterproductive to effective pain management if it delays Black patients from reporting their pain or seeking care until it is severe (Anderson et al., 2000; Anderson et al., 2002; Booker et al., 2020). Anderson et al., (2002) found that 82% of Black respondents would only pursue professional help once their pain intensity reached 10 out of 10. This aligns with other research that Black (vs. White) patients are more likely to utilize hospital emergency department services for pain (Green et al., 2004).

When Black patients do seek medical assistance, they frequently underutilize pain medications and surgical options (Anderson et al., 2002; Figaro et al., 2005; Meghani & Keane, 2007). By under-utilizing medications and electing to delay or forgo other treatments, Black patients may be unintentionally reinforcing provider bias against them, including the underestimation of their pain intensity and insufficient pain management. Providers may interpret Black patients reducing, declining, or delaying treatments as signs that Black patients are experiencing less pain and therefore do not require as much intervention (Anderson et al., 2000; Burgess et al., 2013; Cintron & Morrison, 2006; Hausmann et al., 2013; Staton et al.,

2007). Black patients are thereby left with fewer healthcare encounters, less information, and fewer resources for managing pain.

The insufficiency of the healthcare and pain management received by Black patients likely has a negative effect upon their pain self-efficacy — the confidence that one can manage their pain, perform various activities (including communicating with their healthcare providers), and function despite having pain (Martinez-Calderon et al., 2018; Varela & Van Asselt, 2022). Pain self-efficacy is negatively correlated with pain intensity, as patients with greater self-efficacy report lower pain intensity (Costa et al., 2011; Lynch et al., 2007; Martinez-Calderon et al., 2020c; Pedrero-Martin et al., 2021). Lower pain self-efficacy for Black patients is associated with higher pain severity across pain conditions, including cancer, lupus, sickle cell disease, and arthritis (Adegbola, 2015; Allen et al., 2010; Drenkard et al., 2022; Somers et al., 2012; Vilardaga et al., 2022). Black patients with chronic pain tend to report lower pain self-efficacy as a group, which may translate into less effective communication with their providers, less engagement with healthcare, and overall worse management of their chronic pain (Allen et al., 2010; Jones et al., 2008; Orhan et al., 2018). That is to say, Black patients may pursue fewer avenues to manage their pain (e.g., through consulting with a healthcare professional) if they lack the confidence that these efforts will be effective or if they are concerned about their engagement in pain management contributing to negative consequences (e.g., prescription medications leading to substance use disorders). Lane, Barnes, and Fritz (2024) found that pain self-efficacy mediated the relationship between race (Black vs. White) and pain severity, suggesting that pain self-efficacy may partially explain racial disparities in pain experience.

Beyond pain intensity, self-efficacy has a bidirectional, negative relationship with pain interference. Higher self-efficacy predicts lower interference, and lower interference predicts

higher self-efficacy (Archer et al., 2012; Brister et al., 2006; de Moraes Vieira et al., 2014; Geyh et al., 2012; Lefebvre et al., 1999; Nicholas, 2007; Pang et al., 2009; Stephens et al., 2016). This relationship of self-efficacy and pain interference holds for Black patients with chronic pain (Allen et al., 2010; Baker et al., 2016; Drenkard et al., 2022; Vilardaga et al., 2022). For patients with chronic pain in general, self-efficacy has been found to mediate the relationships of pain intensity with disability and interference, respectively (Costa et al., 2011; Martinez-Calderon et al., 2020a; Ryum & Stiles, 2023).

Self-efficacy also seems to be a mechanism of change in pain treatment. Two separate studies found that self-efficacy mediated the relationships of intensive interdisciplinary treatment programs and cognitive behavioral therapy (CBT) with pain intensity and with interference, respectively (Schumann et al., 2022; Turner et al., 2007). Thus, self-efficacy appears to have roles in pain perception and interference for Black patients with chronic pain and patients with chronic pain in general. Self-efficacy may buffer the relationship between pain and dysfunction, though further research is necessary to elucidate the exact roles and mechanisms of self-efficacy.

One method by which self-efficacy may buffer the effects of pain is by its relationship to how people manage their own pain. The coping strategies used to manage pain experience are numerous and range from ignoring pain, to catastrophizing about it, to using medication, to exercising and stretching, to seeking help from others (Meints et al., 2016). In many studies, self-efficacy has been positively correlated with active coping strategies (e.g., exercise and stretching, diverting attention) and negatively correlated with passive strategies (e.g., catastrophizing, resting, using medication) (Brown & Nicassio, 1987; Cheng et al., 2018; Hirata et al., 2021; Pedrero-Martin et al., 2021; Strahl et al., 2000; Turner et al., 2005). That is, people who have higher self-efficacy may choose more active coping strategies because their greater confidence in

self-management of their pain means they are more willing to engage in these strategies that require higher levels of physical and cognitive activity. Conversely, those who are lower in self-efficacy may utilize more passive strategies because they have less confidence that they can perform active strategies in light of their pain and/or doubt that those strategies would be effective for them. Du et al. (2018) found that self-efficacy predicted active, but not passive, coping, with active coping acting as a mediator between self-efficacy and quality of life. Higher self-efficacy predicted greater use of active coping strategies, which was then associated with better quality of life.

The results of other research sometimes conflict with these patterns. Some studies have found that many (though not all) active or passive coping strategies were not significantly correlated with self-efficacy and one study even found that higher levels of self-efficacy predicted greater use of certain passive coping strategies (i.e., opioid medication use and resting) (Brister et al., 2006; Jensen et al., 1991; Nicholas, 2007). The contradictions introduced by these findings may be due to the inconsistent manner of measuring self-efficacy between studies and the fact that some were conducted before the development of formal, psychometrically-sound measures of self-efficacy (Brister et al., 2006; Jensen et al., 1991; Nicholas, 2007).

Research on psychological interventions for pain provides some insight into the apparent contradictions in the self-efficacy—coping strategies relationship. For example, a randomized controlled trial (RCT) of a CBT intervention for chronic pain found that self-efficacy moderated the relationship between treatment group and pain intensity. Post-treatment pain reductions in the CBT group were greater for patients with higher levels of self-efficacy (Litt et al., 2010). In another RCT, self-efficacy moderated the relationship between a pain coping skills intervention and pain intensity (Lawford et al., 2018). Higher pain self-efficacy was associated with greater

reductions in pain intensity after the intervention, compared to physical therapy and educational material groups.

Self-efficacy also moderated the relationships of coping strategies and changes in depression and anxiety, respectively, during a pain management program (Lowe et al., 2008). For patients whose self-efficacy increased, reductions in avoidant coping (a form of passive coping) predicted decreased anxiety symptoms, and increases in acceptance-resignation coping predicted decreased depression symptoms. These studies provide evidence that self-efficacy is an important moderator, particularly in regard to its effects for coping strategies, but more research is needed.

As with self-efficacy, pain intensity and interference have mixed associations with pain coping. Some studies find greater pain intensity and interference to each be associated with increased use of any coping strategy, while others indicate that this holds only for emotion-focused coping (e.g., catastrophizing, seeking support from others) or resting and other forms of passive coping (Bakhshaie et al., 2022; Geisser et al., 1999; Geyh et al., 2012; Hanley et al., 2008; Hastie et al., 2005; Osborne et al., 2007). Indicative of a bidirectional relationship, the use of specific coping strategies or types of strategies also predicts changes in pain intensity and interference. Persisting in tasks and exercising (both active coping strategies) predicted less pain interference; catastrophizing, guarding, and other forms of passive coping predicted greater pain interference; and asking for assistance and resting (both passive coping strategies) predicted both greater pain intensity and interference (Engel et al., 2000; Nieto et al., 2012; Osborne et al., 2007; Raichle et al., 2007; Tan et al., 2005). Emotion-focused coping, which encompasses different forms active and passive coping (e.g., reinterpreting pain vs catastrophizing,

respectively), predicted worse pain severity and interference for patients with arthritis (Allen et al., 2010).

For Black patients with chronic pain, much of the research in this area of pain intensity, pain interference, and coping strategies has been conducted in the context of racial differences, that is, between-group comparisons of Black and White patients. This exemplifies how the literature has been traditionally more focused on racial disparities and differences than being dedicated to accurately reflecting the unique chronic pain experience of Black patients. A meta-analysis found that Black (vs. White) individuals tended to use more coping strategies overall and were also more likely to use passive, emotion-focused, problem-focused, and cognitive coping strategies (Meints et al., 2016). Amongst the research specifically conducted to assess Black patients' lived experiences, pain self-efficacy (amongst other factors) predicted lower pain intensity and interference, while coping strategies (mostly passive strategies) predicted worse pain intensity and interference (Tan et al., 2005).

Other research has found that emotion-focused coping mediates the relationship between race and pain outcomes (Allen et al., 2010; Bakhshaie et al., 2022). For example, one study found that Black (vs. White) patients with osteoarthritis used more emotion-focused coping strategies, which was then associated with worse pain intensity (race → emotion-focused coping → pain intensity) and poorer functioning (race → emotion-focused coping → functioning) (Allen et al., 2010). It may be that higher pain intensity and greater pain interference (partially driven by the systems- and provider-level discrimination and marginalization) contribute to greater use of any coping strategy by Black individuals with chronic pain and, conversely, that the specific kinds of strategies they use may inadvertently worsen their pain intensity and interference. (Aroke et al., 2020; Cano et al., 2006; Day & Thorn, 2010; Parmelee et al., 2012;

Riley III et al., 2002; Yang et al., 2022). This does not appear to have been tested anywhere in the literature thus far.

For all patients with chronic pain, these findings indicate that active coping strategies may improve pain intensity and interference, while passive coping strategies may worsen them. However, they do not speak to the relative strengths of active vs. passive coping on pain outcomes – that is, whether the improvements from engaging in active strategies are stronger or weaker than the worsening effects of passive strategies (Engel et al., 2000; Hanley et al., 2008; Nieto et al., 2012; Osborne et al., 2007; Raichle et al., 2007). Geisser et al. (1999) proposed that higher functioning people with chronic pain thrive not because they use active coping strategies, but rather because they forego passive coping strategies. Their model posits that passive coping may bear stronger influence on worsening pain intensity, interference, and overall functioning than any benefits from active coping. Thus, refraining from passive coping would ostensibly provide greater benefit than increasing active coping.

Some research has supported this model. Patients with various forms of chronic pain (e.g., osteoarthritis, temporomandibular pain) engaged in more passive than active coping and the net effect was greater pain intensity, pain interference, depressive symptoms, and other negative outcomes (Perrot et al., 2008; Reissmann et al., 2012; Snow-Turek et al., 1996). Tan et al. (2011) found that the relationship was more nuanced. Passive coping strategies (vs. active coping) had stronger relationships with pain interference and depression (with more passive coping predicting worse interference and depression), but only active coping predicted pain intensity (i.e., higher intensity). Research comparing active vs. passive coping strategies in the same statistical models could test their relative effects and reconcile results across the existing literature.

Further informing on these insights into pain and individual coping strategies, pain catastrophizing (as a form of passive coping) has demonstrated complex relationships with pain intensity, interference, and self-efficacy. Pain catastrophizing was shown to mediate the relationship between pain intensity and pain interference (Ryum & Stiles, 2023). Higher pain intensity was associated with greater catastrophizing, which then predicted greater functional interference. In several studies, self-efficacy was negatively associated with pain catastrophizing (Hirata et al., 2021; Pedrero-Martin et al., 2021; Somers et al., 2012). Self-efficacy also acted as a moderator between pain intensity and pain catastrophizing (Cheng et al., 2018). Greater pain intensity predicted more use of pain catastrophizing, but the strength of this relationship was significantly reduced for patients with higher (vs. lower) levels of self-efficacy. These findings indicate that pain catastrophizing and other coping strategies may help explain how self-efficacy buffers the relationship between pain intensity and pain interference. Coping strategies may act as mediating mechanisms between pain intensity and pain interference, and a person's level of self-efficacy may moderate the strengths of these relationships, depending on the type of coping strategy used. Again, more research is needed to explore their respective roles and interactions.

CURRENT STUDY

The current study aimed to increase understanding of the interrelationships between pain intensity, pain interference, coping strategies, and self-efficacy for Black patients with chronic pain. As part of a pragmatic randomized controlled trial (**C**ommunication and Activation in **P**ain to **E**nhance **R**elationships and **T**reat Pain with **E**quity or COOPERATE), Black veterans with chronic musculoskeletal pain were recruited to assess the effectiveness of a health coaching intervention to increase patient activation and improve communication with their providers (Matthias et al., 2022a; Matthias et al., 2022b; Matthias et al., 2024). Amongst other assessments, they completed psychometrically-sound measures of pain intensity, pain interference, coping strategies, and self-efficacy. I used baseline data from these assessments to evaluate the mediating roles of active and passive coping strategies and the moderating effects of self-efficacy in the relationship between pain intensity and pain interference.

First, I hypothesized that pain intensity would be positively associated with pain interference, such that higher intensity would be correlated with greater interference (H1). Secondly, I hypothesized that this association between pain intensity and interference would be mediated by participants' use of coping strategies (H2). Pain intensity would be associated with the use of coping strategies, both active and passive. Greater use of active strategies would be associated with less pain interference (pain intensity → active coping → less interference) and greater use of passive strategies would be associated with more pain interference (pain intensity → passive coping → more interference) (Figures 1, 2, & 3). Thirdly, I hypothesized that pain self-efficacy would moderate the effects of coping strategies (H3). Higher self-efficacy would enhance the benefits of active coping in mitigating pain interference and lower self-efficacy

would reinforce the effects of passive coping in worsening it. Participants who reported higher self-efficacy would use more active coping and therefore experience less interference and, conversely, those who reported lower self-efficacy would use more passive strategies and experience worse interference (Figures 4, 5, & 6).

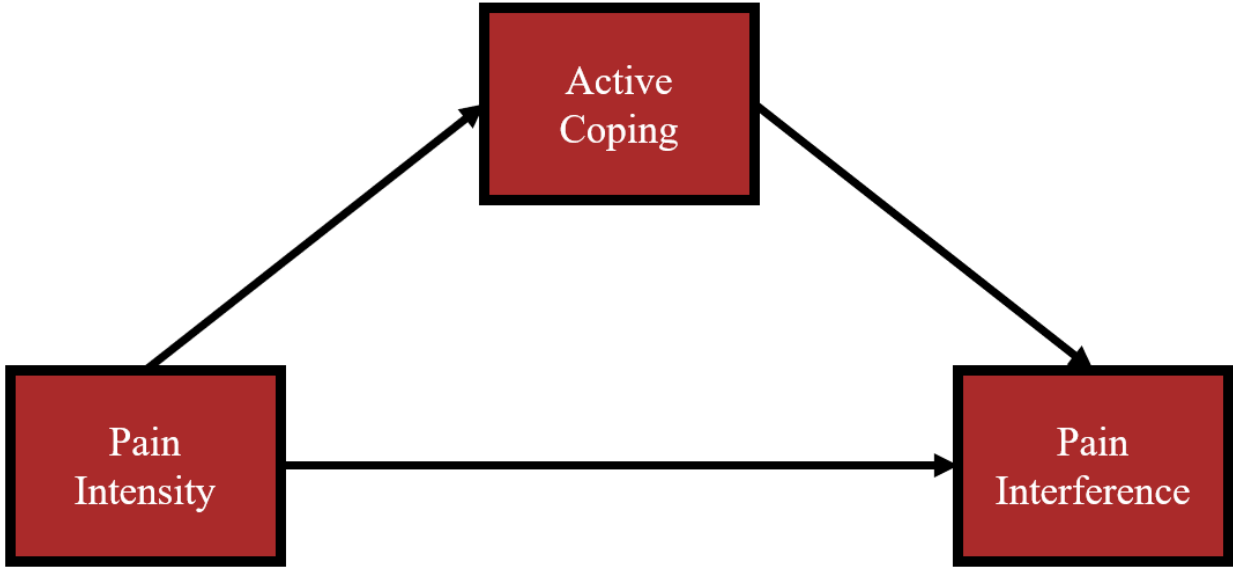


Figure 1. Simple mediation model: The relationship between pain intensity and pain interference mediated by active coping strategies

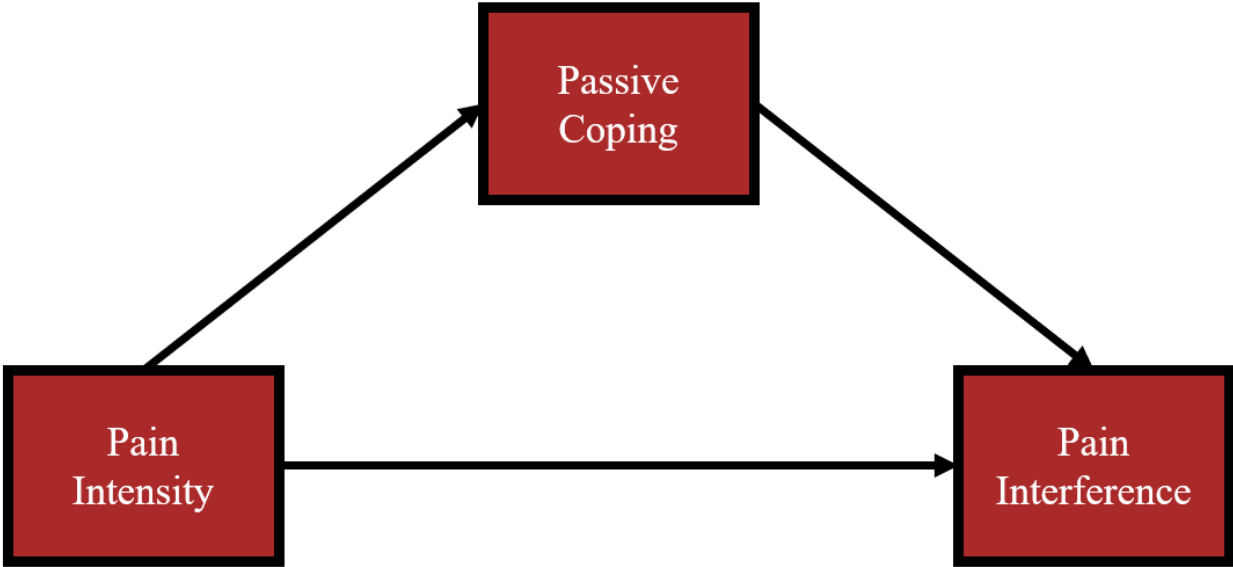


Figure 2. Simple mediation model: The relationship between pain intensity and pain interference mediated by passive coping strategies

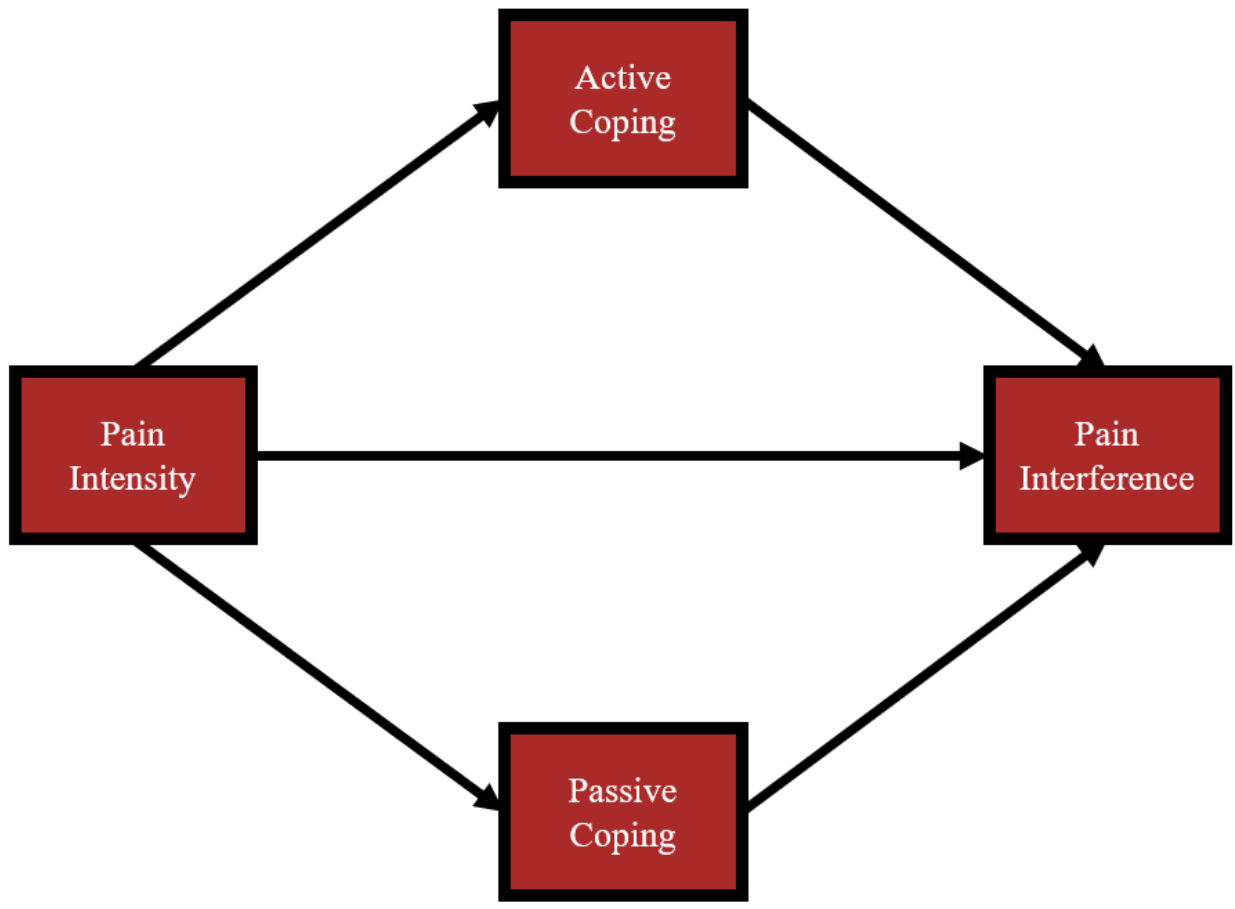


Figure 3. Parallel mediation model: The relationship between pain intensity and pain interference mediated by active and passive coping strategies

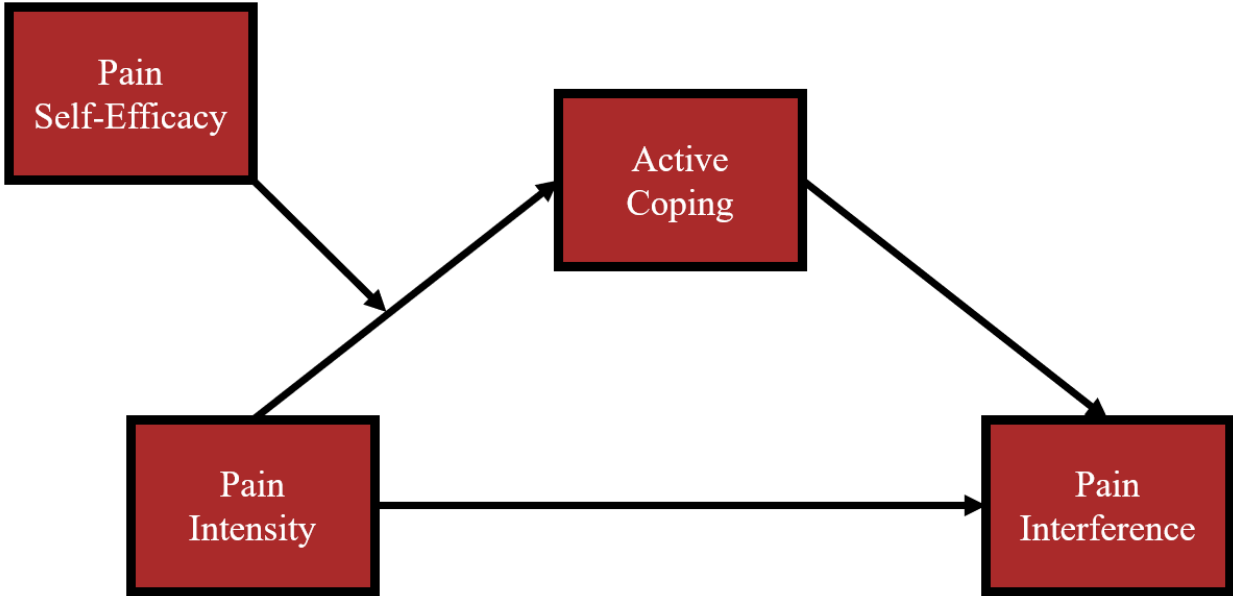


Figure 4. Moderated mediation model: Pain self-efficacy moderating the mediating effect of active coping strategies on the relationship between pain intensity and pain interference

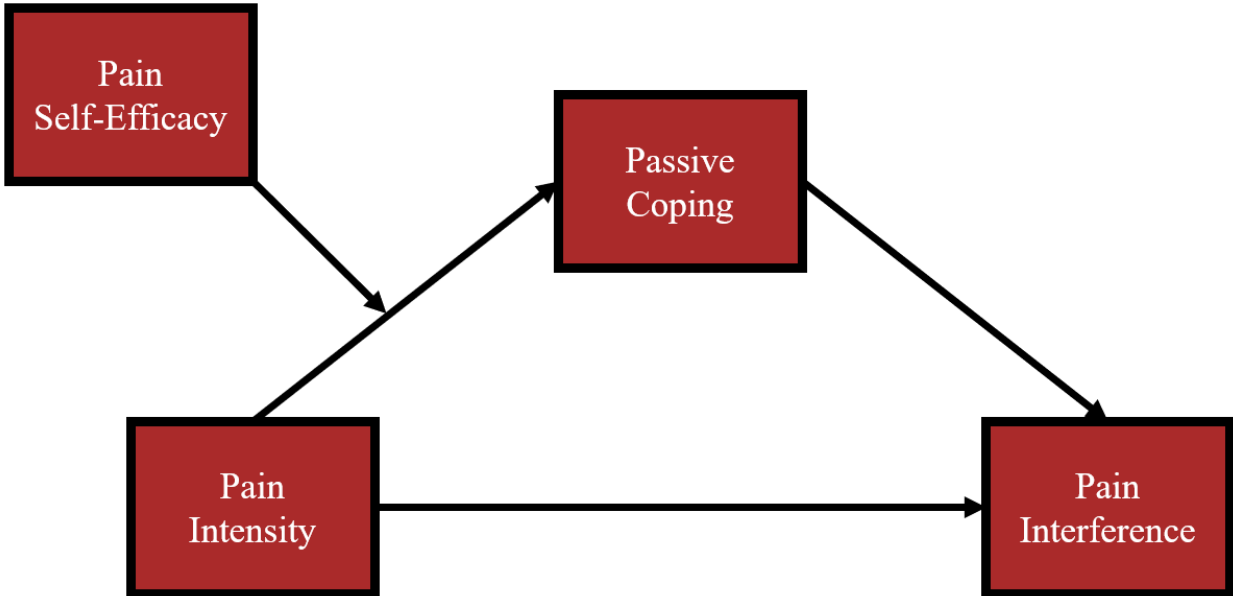


Figure 5. Moderated mediation model: Pain self-efficacy moderating the mediating effect of passive coping strategies on the relationship between pain intensity and pain interference

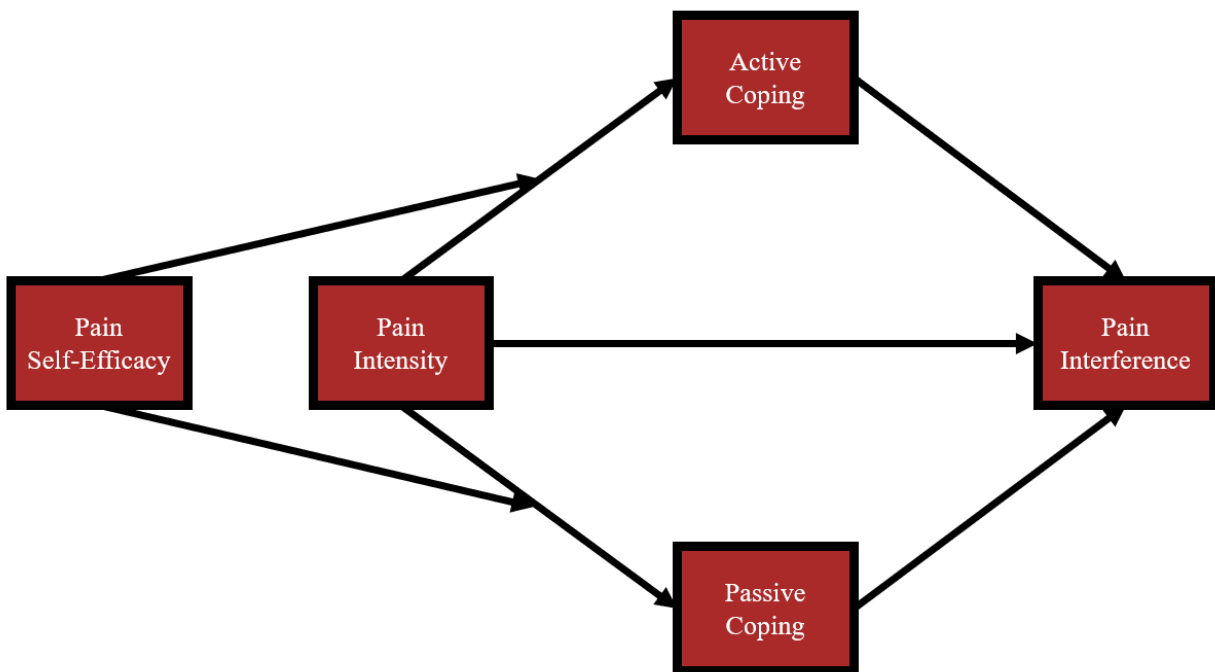


Figure 6. Moderated mediation model: Pain self-efficacy moderating the mediating effects of active and passive coping strategies on the relationship between pain intensity and pain interference

METHODS

Participants

Participants for this study were 250 Black Veterans with chronic musculoskeletal pain who were recruited through the Richard L. Roudebush Veterans' Administration Medical Center for the COOPERATE trial (Matthias et al., 2022a; Matthias et al., 2022b; Matthias et al., 2024). Veterans were eligible to participate if they (1) were Black or African American and (2) had chronic pain (i.e., for three months or longer) in their lower back, cervical spine, hips, knees, shoulders, and/or other extremities. Veterans were excluded if, upon review of their VA electronic medical record, they were determined to (1) have ever been diagnosed with a psychotic disorder, (2) currently meet criteria for a substance use disorder, or (3) have a severe medical condition(s) which would interfere with participation (e.g., heart failure). Veterans were also excluded if, on their eligibility screening questionnaire, they indicated (1) current, active suicidal ideations and/or (2) severe speaking or hearing impairments.

Measures

Pain Intensity and Interference

The Brief Pain Inventory (BPI) is an 11-item measure assessing pain intensity and pain interference over the prior 24 hours (Cleeland & Ryan, 1991). Pain intensity was assessed by four items, three concerning pain intensity at its worst, least, and average over the prior 24 hours (respectively) and one at the moment the measure was completed, using an 11-point scale of 0 ("No pain") to 10 ("Pain as bad as you can imagine"). Averaging the scores from these four items yielded the pain intensity score. Pain interference was assessed by seven items (using an

11-point scale of 0 (“Does not interfere”) to 10 (“Completely interferes”) of the degree of interference in the following functional domains: general activity, mood, walking ability, normal work (both outside the home and housework), relationships with other people, sleep, and enjoyment in life. Averaging the scores from these seven items yielded the pain interference score.

The BPI has demonstrated good internal consistency (Cronbach’s alpha = .7 to .88) with non-malignant chronic pain in general and musculoskeletal pain specifically (Cleeland & Ryan, 1991; Keller et al., 2004; Tan et al., 2004). The BPI is also moderately to strongly correlated ($r = .4$ to $.74$) to other measures (e.g., SF-36 Bodily Pain; Roland-Morris Disability Questionnaire) of pain intensity and pain-related disability (Keller et al., 2004; Tan et al., 2004).

Coping Strategies

Pain coping was measured by the 14-item version of the Coping Strategies Questionnaire (CSQ). It is derived from the longer, 42-item Coping Strategies Questionnaire, in which participants rate each item in terms of both frequency and effectiveness in coping with pain (Riley III & Robinson, 1997). The shorter version asks only for ratings of frequency using a scale of 0 (“Never do”) to 6 (“Always do”) (Jensen et al., 2003). The original CSQ items assess seven types of coping strategies: diverting attention, ignoring sensations, catastrophizing, reinterpreting pain, coping self-statements, hoping and praying, and increasing behavior activities (Jones et al., 2008; Riddle & Jensen, 2013). The 14-item version represents the seven strategies with two items each from the longer version (Jensen et al., 2003; Jones et al., 2008; Riddle & Jensen, 2013). The longer version has high internal consistency (coefficient alpha = .71-.85) and moderate test-retest reliability ($\kappa = 0.54$) (Main & Waddell, 1991; Rosenstiel &

Keefe, 1983). The shorter version is strongly correlated with the longer version, with individual correlations for each coping strategy across the two measures ranging from 0.72 to 0.96 (Jensen et al., 2003). In the current study, the internal consistency of the CSQ was .81 for the total scale, .84 for the active coping subscale, and .63 for the passive coping subscale.

Pain Self-Efficacy

Self-efficacy was measured using the Pain Self-Efficacy Questionnaire (PSEQ). The PSEQ is a 10-item measure assessing one's confidence in their ability to do a variety of activities (e.g., socializing, accomplishing life goals, enjoying life) despite having pain (Nicholas, 2007). It uses a 7-point scale for each item, ranging from 0 ("Not at all confident") to 6 ("Completely confident"). The PSEQ has high internal consistency (Cronbach's alpha = .92) and strong test-retest reliability ($r = .73$ from baseline to three months) (Miles et al., 2011; Nicholas, 2007; Tonkin, 2008).

Procedures

As part of the COOPERATE trial, all participants completed a series of baseline measures (including the BPI, CSQ, and PSEQ) before being randomized to one of two conditions, either a health coaching intervention or a control condition (Matthias et al., 2022a; Matthias et al., 2022b; Matthias et al., 2024). The health coaching intervention consisted of six phone sessions (four weekly sessions and then two once-monthly booster sessions) delivered via telephone over the course of 12 weeks. These sessions centered on teaching skills in (1) goal clarification and prioritization and (2) communication with their providers. The control condition was intended to control for attention and occurred at the same frequency as the coaching sessions. It involved phone calls with a researcher to ask participants questions related to pain,

self-management activities, and between-call updates. Participants completed post-intervention measures at 3, 6, and 9 months after baseline. The current study examined baseline data collapsed across all participants prior to randomization.

Analyses

Hypothesis 1

To test my first hypothesis that greater pain intensity was associated with greater pain interference I used a correlational analysis (i.e., Pearson r coefficient) through SPSS 23.0 (IBM Corp., 2017). I inferred significant results if the p -value was less than 0.05 and used Cohen's (1988) guidelines for interpreting small ($r = .1$), medium ($r = .3$), and large ($r = .5$) correlations.

Hypothesis 2

To test my second hypothesis that using active vs. passive coping strategies would mediate the relationship between pain intensity (independent variable) and pain interference (dependent variable), I first categorized the items on the CSQ into active and passive coping strategies based on established criteria (Hastie et al., 2004; Meints et al., 2016; Snow-Turek et al., 1996). The active strategies include diverting attention, ignoring sensations, reinterpreting pain, coping self-statements, and increasing behavior activities, while the passive strategies include catastrophizing and hoping and praying. The scores from the items were summed to obtain total active and passive coping scores, respectively, for each participant. As active coping is composed of ten items (with a maximum combined score of 60) and passive coping is composed four items (with a maximum combined score of 24), the total active and passive coping scores for every participant were each converted to Z-scores, respectively, to account for these differences in measurement and allow for more direct comparisons.

Then, I used the method defined by Preacher & Hayes (2008) for Hayes' PROCESS macro with model 4 for SPSS (Hayes, 2017; IBM Corp., 2017). This procedure was used three times, once for the simple mediating effect of active coping strategies (Figure 1), once for the simple mediating effect of passive coping strategies (Figure 2), and then for a parallel mediation that incorporated both active and passive coping strategies simultaneously (Figure 3). Using the separate simple mediation analyses (i.e., Figures 1 & 2) allowed for examining the full mediating effects of active (pain intensity → active coping → pain interference) and passive coping strategies (pain intensity → passive coping → pain interference) individually. Using the parallel mediation allowed for examining the indirect effects of each type of coping strategy while controlling for the other strategy (i.e., the effect of pain severity on pain interference *through* active coping while controlling for passive coping, and the effect of passive coping strategies while controlling for active strategies, respectively). The parallel mediation analysis also allowed me to statistically test the relative strengths of the mediating effects for active vs. passive coping strategies.

The method for all three analyses was a bootstrapping mediation procedure with 10,000 resamples, which generated regression coefficients and 95% confidence intervals (CIs). These coefficients and 95% CIs were produced for pain severity predicting the use of active (path a in Figure 1 and path a₁ in Figure 3) and passive coping strategies (path a in Figure 2 and path a₂ in Figure 3) and for active coping (path b in Figure 1 and path b₁ in Figure 5) and passive coping (path b in Figure 2 and path b₂ in Figure 3) predicting pain interference. The bootstrapping procedure also created estimates of the coefficients and 95% CIs for the mediating effects of active coping strategies (pain intensity → active coping → pain interference; path ab in Figure 1

and path a_1b_1 in Figure 3) and passive coping strategies (pain intensity → passive coping → pain interference; path ab in Figure 2 and path a_2b_2 in Figure 3).

For the parallel mediation model only, the procedure compared the relative strengths of the two mediation paths (i.e., active vs. passive coping) in the same model by adding (if they have different signs) or subtracting (if they have the same sign) the values of their coefficients and then generating a new bootstrapped 95% CI (Coutts & Hayes, 2022). For all models, the procedure provided estimates of the coefficients and 95% CIs for their total effects (i.e., the pain intensity → pain interference relationship when including all paths) and their direct effects (i.e., the pain intensity → pain interference relationship when controlling for active coping, passive coping, or both). Each path and the overall indirect (i.e., mediating) effects were considered to be significant if their 95% CIs did not contain zero. That is, active and/or passive coping were deemed to significantly mediate the relationship between pain intensity and pain interference if their 95% CIs do not contain zero in their respective models.

Hypothesis 3

To test my third hypothesis, that pain self-efficacy moderated the mediating effects of active and passive coping on the relationship between pain intensity (independent variable) and pain interference (dependent variable), I used the procedure described by Preacher, Rucker, & Hayes (2007) for SPSS and model 7 (Hayes, 2017; IBM Corp., 2017). Similar to the mediation models, I performed this procedure three times, once each for pain self-efficacy moderating the individual mediation effects of active (Figure 4) and passive (Figure 5) coping strategies and then a third time for moderating both paths in the parallel mediation model (Figure 6). Using the separate moderated mediation analyses (i.e., Figures 4 & 5) allowed me to examine the

individual moderation effects of pain self-efficacy on active and passive coping strategies, respectively. For the moderated parallel mediation, this analysis allowed for examining the conditional effects of self-efficacy on each type of coping strategy simultaneously while controlling for the other strategy type (i.e., self-efficacy moderating the mediating effect of active coping strategies on the pain severity → pain interference relationship while controlling for passive coping, and self-efficacy moderating the mediating effect of passive coping while controlling for active coping, respectively).

This moderated mediation procedure was used for all three analyses and generated regression coefficients and bootstrapped 95% CIs similar to the analyses without moderators, but with the addition of coefficients and 95% CIs for the interaction terms between the moderator (pain self-efficacy) and mediators (active and passive coping) (Figures 4, 5, and 6, respectively). The procedure also generated an index of moderated mediation for each analysis with regression coefficients and bootstrapped 95% CIs. These indices quantify the relationship between the moderator and mediators and are significant if their 95% CIs do not contain zero (Hayes, 2015). If significant, the procedure probes at different levels (the mean and one standard deviation above and below it) of the moderator to determine if and how the mediation effect depends on (i.e., increases or decreases) a given level of the moderator. In other words, if the 95% CIs do not contain zero, the mediating effects of active and/or passive coping strategies on the pain intensity → pain interference relationship are significantly affected by the level of pain self-efficacy. If significant, I tested how those mediating relationships of active and/or passive coping increased or decreased depending on the level of pain self-efficacy.

RESULTS

Sample Demographic Characteristics

Of the 250 Black veterans included in this study, 43 (17.2%) identified as female and 207 (82.8%) identified as male. Most (n = 247, 98.8%) participants identified as “Not Hispanic or Latinx.” The mean age of the sample was 60.97 (SD = 9.98) years. For marital status, most of the sample was currently married (n = 102, 40.8%) or divorced (n = 82, 32.8%). In terms of education, most (n = 150, 60%) completed some college or 2-year degree (n = 69, 27.6%) or received a 4-year (n = 233, 20.4%) or post-graduate (n = 30, 12%) degree. Most participants (n = 69, 93.2%) were currently employed (n = 108, 43.2%), retired (n = 83, 33.2%), or unable to work due to health or disability (n = 42, 16.8%). Sample characteristics are further detailed in Table 1.

Table 1. Sample demographics

Age	Mean (SD)	60.97 (9.98)
Sex	Female	43 (17.2%)
	Male	207 (82.8%)
Ethnicity	Hispanic or Latinx	3 (1.2%)
	Not Hispanic or Latinx	247 (98.8%)
Marital Status	Married	102 (40.8%)
	Member of an Unmarried Couple	7 (2.8%)
	Divorced	82 (32.8%)
	Widowed	14 (5.6%)
	Separated	11 (4.4%)
	Never Married	34 (13.6%)
Education	High School Diploma, GED, or Less	66 (26.4%)
	Technical Trade or Business School	34 (13.6%)
	2-year Degree or Some College	69 (27.6%)
	4-year College Degree	51 (20.4%)
	Post-Graduate Degree	30 (12%)
Employment	Employed	108 (43.2%)
	Retired	83 (33.2%)
	Student	2 (0.8%)
	Out of work for less than 1 year	5 (2.0%)
	Out of work for more than 1 year	5 (2.0%)
	Unable to work due to health or disability	42 (16.8%)
	Other	5 (2.0%)

Sample Pain Measures

Participants reported a mean pain intensity of 5.54 (out of 10, SD = 1.92), a mean pain interference of 5.50 (out of 10, SD = 2.50), and a mean pain self-efficacy score of 3.66 (out of 6, SD = 1.29). See Table 2. In terms of coping strategies, they reported significantly greater use of passive coping strategies (Mean = 3.44 SD = 1.40) than active coping strategies (Mean = 2.63 SD = 1.25), $t(249) = -7.957, p < .001$. See Table 3.

Table 2. Pain-related Measures

	Mean (SD)
Pain Intensity	5.54 (1.92)
Pain Interference	5.50 (2.50)
Pain Self-Efficacy	3.66 (1.29)

Table 3. Coping Strategies Questionnaire

Total Coping			Active Coping			Passive Coping			Active vs. Passive	
α	M	SD	α	M	SD	α	M	SD	t	p
.81	2.86	1.08	.84	2.63	1.25	.63	3.44	1.40	-7.957	< 0.001

α = Cronbach's alpha; M = Mean; SD = Standard deviation

Hypothesis 1

The results of a Pearson r correlational analysis indicated that there was a strong, positive correlation ($r = .687, p < .01$) between participants' ratings of their pain intensity and pain interference, which supported my first hypothesis that they would be positively correlated. See Table 4 for further correlational results of the pain measures.

Table 4. Correlations

Variable	1. Pain Intensity	2. Pain Interference	3. Active Coping	4. Passive Coping	5. PSEQ
1. Pain Intensity	—				
2. Pain Interference	.687**	—			
3. Active Coping	.205**	.100	—		
4. Passive Coping	.427**	.467**	.279**	—	
5. PSEQ	-.285**	-.491**	.301**	-.300**	—

** $p < .01$

Hypothesis 2

I conducted a simple mediation analysis to determine if active coping strategies mediated the relationship between pain intensity and pain interference. There was a significant effect of pain intensity on the use of active coping strategies (path a; $b = .11, p < .01$), but the effect of active coping strategies on pain interference was not significant (path b; $b = -.11, p = .37$). The indirect effect of pain intensity on pain interference through active coping strategies was also not significant (path ab; $b = -.01, 95\% \text{ CI: } [-.04199, .01368]$). Both the direct (path c'; $b = .91, p < .01$) and total (path c; $b = .90, p < .01$) effects of pain intensity on pain interference were significant. See Table 5 and Figure 7 for detailed results. These results did not support my second hypothesis that higher pain intensity would predict greater use of active coping strategies, which would then be associated with less pain interference.

Table 5. Results of simple mediation for active coping.

Path	<i>b</i>	SE	β	<i>t</i>	<i>P</i>	95% CI
Pain Intensity → Active Coping (a)	.11	.03	.20	3.30	<.01	.04303, .17068
Active Coping → Pain Interference (b)	-.11	.12	-.04	-.90	.37	-.33870, .12628
Pain Intensity → Pain Interference (c' = Direct Effect)	.91	.06	.70	14.74	<.01	.78585, 1.02829
Pain Intensity → Pain Interference (c = Total Effect)	.90	.06	.69	14.88	<.01	.77713, 1.01433
Indirect Effect (ab)	-.01	.01	-.01			-.04199, .01368

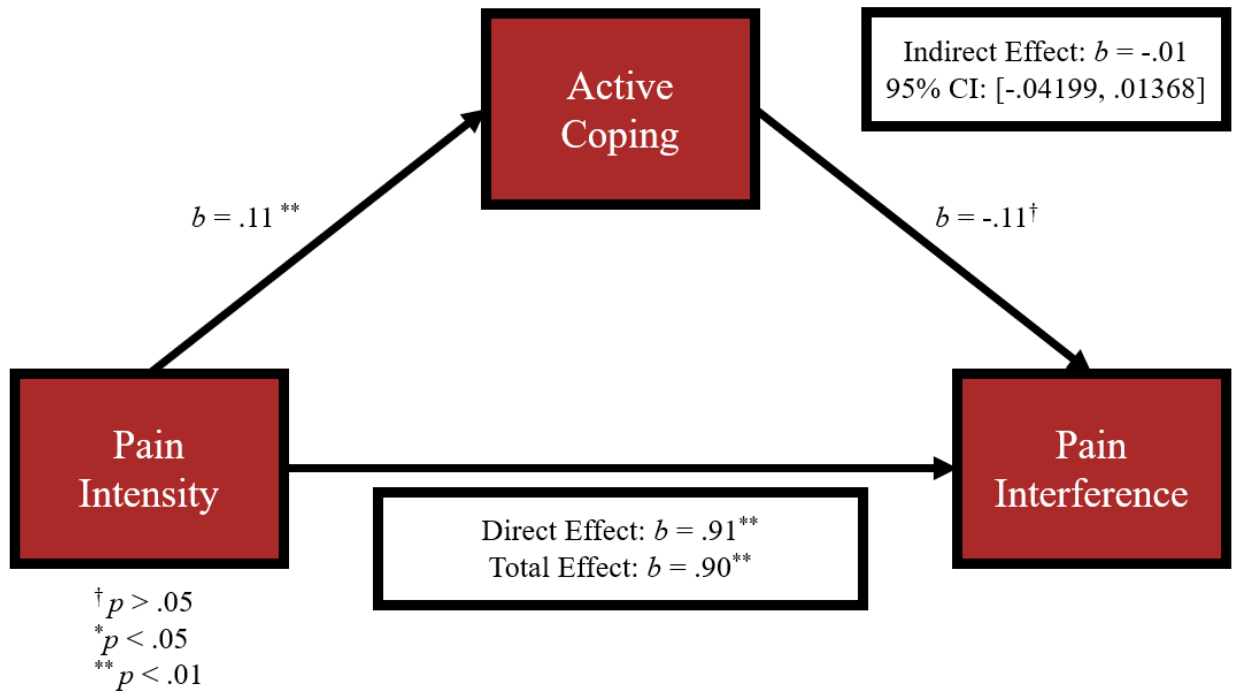


Figure 7. Results of simple mediation model: The relationship between pain intensity and pain interference was not mediated by active coping strategies

I conducted a simple mediation analysis to determine if passive coping strategies mediated the relationship between pain intensity and pain interference. There was a significant effect of pain intensity on the use of passive coping strategies (path a; $b = .22, p < .01$) and a significant effect of passive coping strategies on pain interference (path b; $b = .53, p < .01$). The indirect effect of pain intensity on pain interference through passive coping strategies was also significant (path ab; $b = .12, 95\% \text{ CI: } [.05391, .19472]$). Higher pain intensity was associated with more engagement in passive coping strategies, which was then associated with worse pain interference. Both the direct (path c'; $b = .78, p < .01$) and total (path c; $b = .90, p < .01$) effects of pain intensity on pain interference were significant. See Table 6 and Figure 8 for detailed results. These results supported my second hypothesis that higher pain intensity would predict greater use of passive coping strategies, which would then be associated with more pain interference.

Table 6. Results of simple mediation for passive coping.

Path	<i>b</i>	SE	β	<i>t</i>	<i>P</i>	95% CI
Pain Intensity → Passive Coping (a)	.22	.03	.43	7.44	<.01	.16383, .28174
Passive Coping → Pain Interference (b)	.53	.12	.21	4.30	<.01	.28774, .77406
Pain Intensity → Pain Interference (c' = Direct Effect)	.78	.06	.60	12.08	<.01	.65066, .90423
Pain Intensity → Pain Interference (c = Total Effect)	.90	.06	.69	14.88	<.01	.77713, 1.01433
Indirect Effect (ab)	.12	.04	.09			.05391, .19472

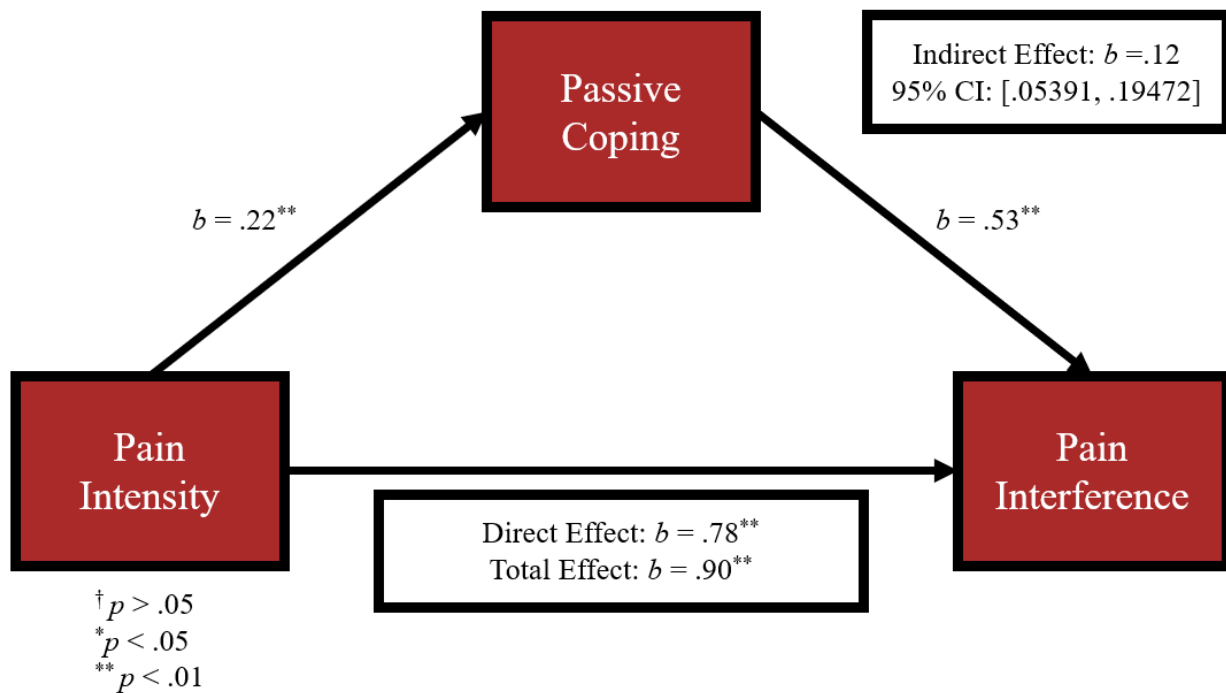


Figure 8. Results of simple mediation model: The relationship between pain intensity and pain interference was mediated by passive coping strategies

A parallel mediation analysis was conducted to simultaneously examine the indirect effects of active and passive coping strategies. There was a significant effect of pain intensity on the use of active coping strategies (path a; $b = .11, p < .01$), but the effect of active coping strategies on pain interference was not significant (path b; $b = -.22, p = .06$). The indirect effect of pain intensity on pain interference through active coping strategies (while holding passive coping strategies constant) was not significant (path a_1b_1 ; $b = -.02, 95\% \text{ CI: } [-.05684, .00150]$). There was a significant effect of pain intensity on the use of passive coping strategies (path a; $b = .22, p < .01$) and of passive coping strategies on pain interference (path b; $b = .58, p < .01$). The indirect effect of pain intensity on pain interference through passive coping strategies (while holding active coping strategies constant) was significant (path a_2b_2 ; $b = .13, 95\% \text{ CI: } [.06253, .21319]$). These results supported my second hypothesis that, when holding active coping strategies constant, higher pain intensity was associated with more engagement in passive coping strategies, which was then associated with worse pain interference.

The contrast of the specific indirect effects of active and passive coping was significant ($a_1b_1 + a_2b_2$; $b = .11, 95\% \text{ CI: } [.03811, .18720]$). This indicated that the indirect effect of passive coping strategies was significantly larger than the indirect effect of active coping strategies when accounting for both mediators simultaneously. The direct effect of pain intensity on pain interference while holding both active and passive coping strategies constant was significant (path c' ; $b = .79, p < .01$), as was the total effect of pain intensity on pain interference (path c; $b = .90, p < .01$). See Table 7 and Figure 9 for detailed results. Similar to the simple mediation analyses, these results partially supported my second hypothesis through the passive coping strategies mediation path, but did not support it through the active coping strategies path.

Table 7. Results of parallel mediation for active and passive coping.

Path	<i>b</i>	SE	β	<i>t</i>	<i>P</i>	95% CI
Pain Intensity → Active Coping (a ₁)	.11	.03	.20	3.30	<.01	.04303, .17068
Active Coping → Pain Interference (b ₁)	-.22	.12	-.09	-1.92	.06	-.45173, .00595
Pain Intensity → Passive Coping (a ₂)	.22	.03	.43	7.44	<.01	.16383, .28174
Passive Coping → Pain Interference (b ₂)	.58	.13	.23	4.64	<.01	.33542, .83090
Pain Intensity → Pain Interference (c' = Direct Effect)	.79	.06	.61	12.27	<.01	.66290, .91634
Pain Intensity → Pain Interference (c = Total Effect)	.90	.06	.69	14.88	<.01	.77713, 1.01433
Indirect Effect – Active Coping (a ₁ b ₁)	-.02	.02	-.02			-.05684, .00150
Indirect Effect – Passive Coping (a ₂ b ₂)	.13	.04	.10			.06253, .21319
Contrast (a ₁ b ₁ + a ₂ b ₂)	.11	.04	.08			.03811, .18720

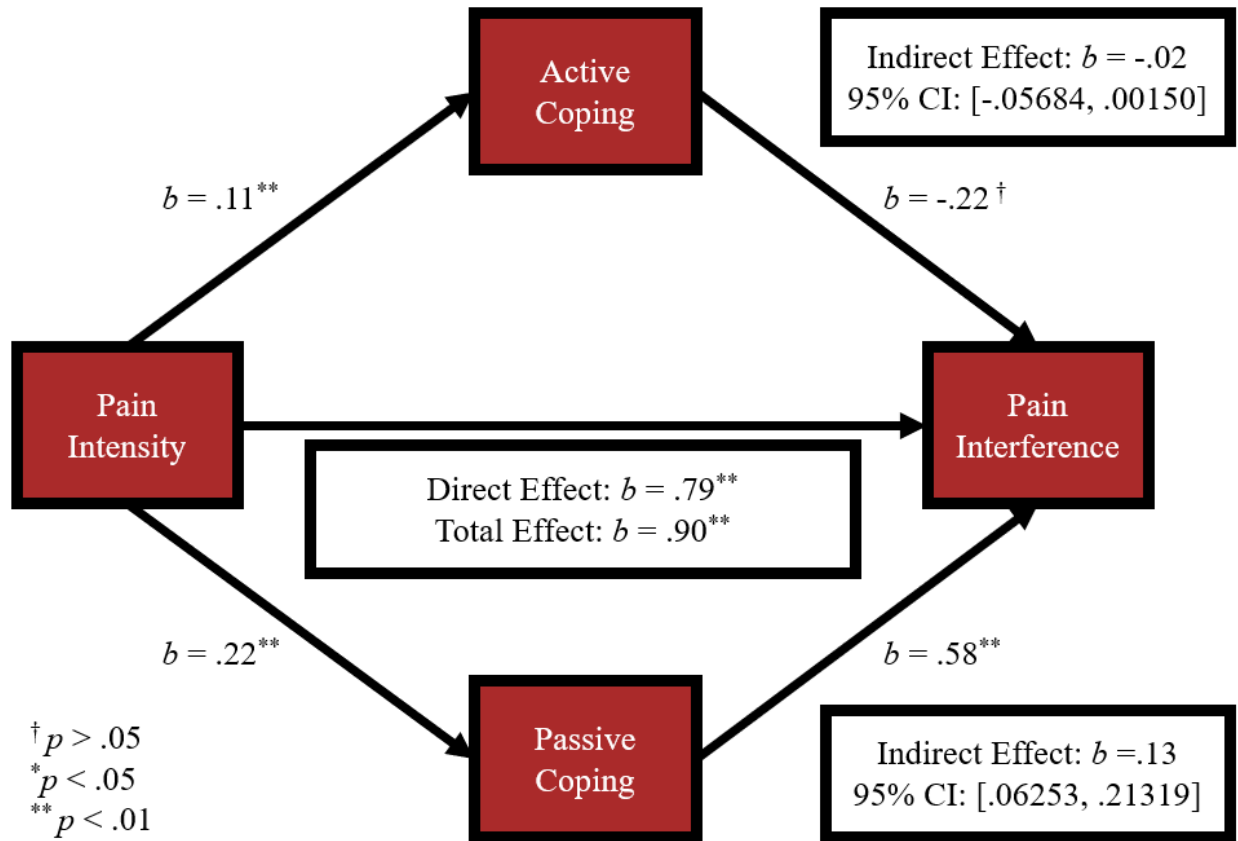


Figure 9. Results of parallel mediation model: The relationship between pain intensity and pain interference was mediated by passive, but not active, coping strategies

Hypothesis 3

A moderated mediation analysis was conducted to determine if pain self-efficacy moderated the mediating effect of active coping strategies (pain intensity → active coping strategies → pain interference). The index of moderated mediation was not significant (index = -.01, 95% CI: [-.02411, .00765]). This suggested that the indirect effect of active coping strategies was not moderated by pain self-efficacy, which did not support my third hypothesis. See Table 8 and Figures 10 & 11 for detailed results.

Table 8. Results of moderated mediation for active coping.

Path	<i>b</i>	SE	<i>t</i>	<i>p</i>	95% CI
Pain Intensity → Active Coping	-.06	.09	-.67	.50	-.24421, .11968
PSEQ → Active Coping	-.03	.14	-.23	.81	-.30009, .23620
Pain Intensity x PSEQ → Active Coping	.06	.02	2.61	.01	.01442, .10274
Active Coping → Pain Interference	-.11	.12	-.90	.37	-.33870, .12628
Direct Effect	.91	.06	14.74	<.01	.78585, 1.02829
Index of Moderated Mediation					
	Index	SE			95% CI
PSEQ	-.01	.01			-.02411, .00765
Conditional Indirect Effect					
Moderator Level	PSEQ	SE	SE		95% CI
-1SD	2.37	-.01	.01		-.03629, .01091
Mean	3.66	-.02	.02		-.05727, .01951
+1SD	4.95	-.02	.03		-.08413, .02896

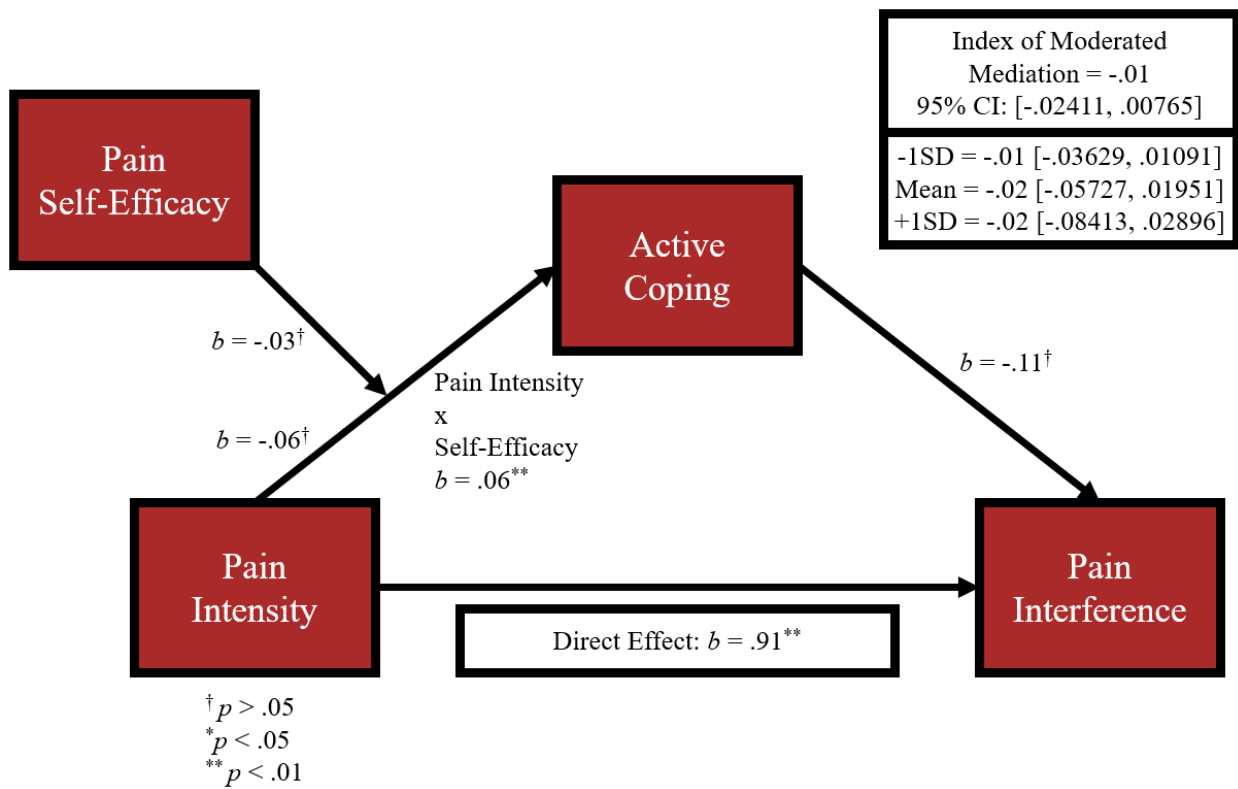


Figure 10. Results of moderated mediation model: Pain self-efficacy did not moderate the mediating effect of active coping strategies on the relationship between pain intensity and pain interference

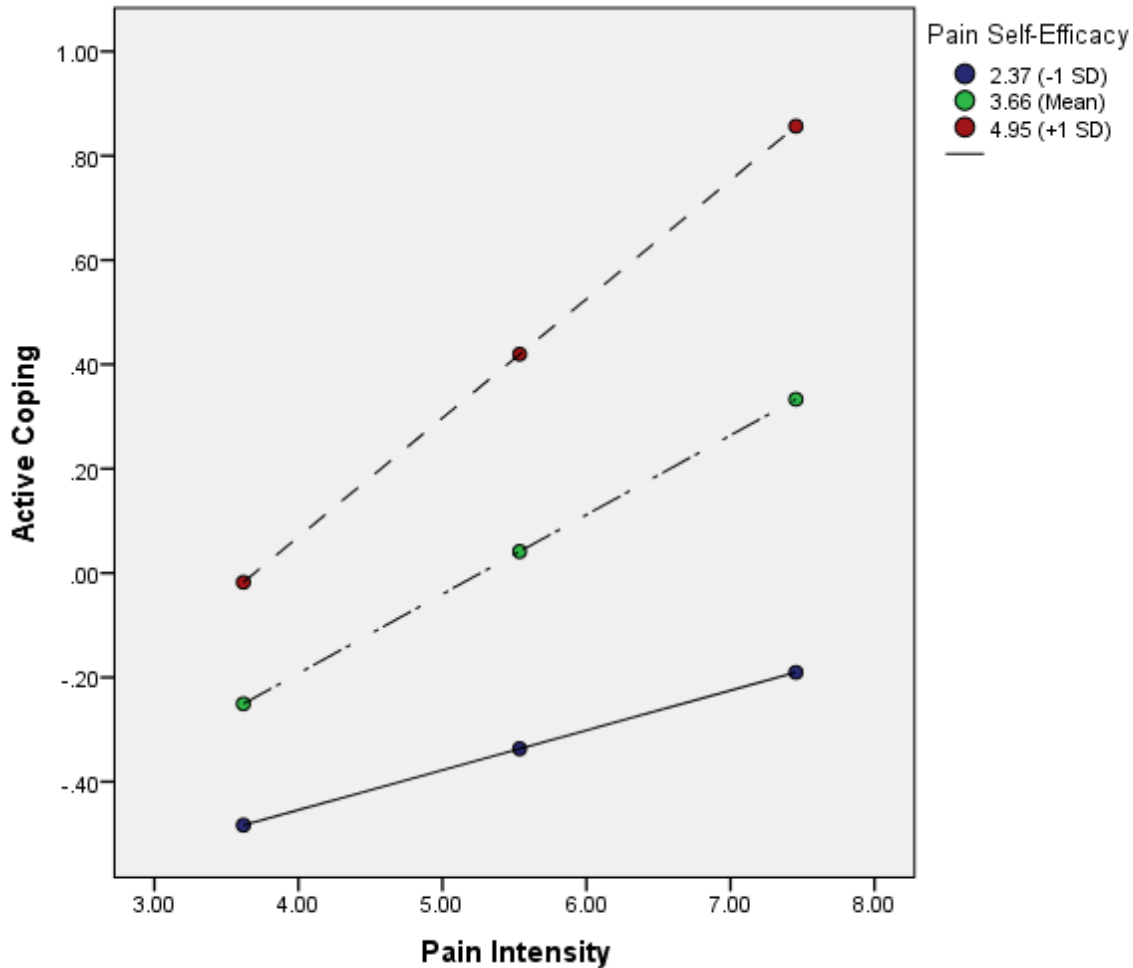


Figure 11. Visualization of pain self-efficacy moderating the relationship between pain intensity and active coping.

I conducted a moderated mediation analysis to determine if pain self-efficacy moderated the mediating effect of passive coping strategies (pain intensity → passive coping strategies → pain interference). The index of moderated mediation was significant (index = .02, 95% CI: [.00023, .05239]). Probes at the mean (PSEQ = 3.66; $b = .10$, 95% CI: [.04352, .16340]) and one standard deviation (SD) above (PSEQ = 4.95; $b = .13$, 95% CI: [.05680, .20954]) and below (PSEQ = 2.37; $b = .07$, 95% CI: [.01484, .13619]) were all significant. Compared to higher pain self-efficacy (mean and +1SD), lower pain self-efficacy (-1SD) was associated with more

engagement in passive coping strategies at every level of pain intensity. However, the direction of the moderated-mediation effect was opposite of what I initially predicted. Higher pain intensity predicted greater use of passive coping strategies, which was then associated with greater pain interference, and this mediation effect was stronger for those participants with higher (vs. lower) pain self-efficacy. See Table 9 and Figures 12 & 13 for detailed results.

Table 9. Results of moderated mediation for passive coping.

Path	<i>b</i>	SE	<i>t</i>	<i>p</i>	95% CI
Pain Intensity → Passive Coping	.03	.09	.37	.71	-.14588, .21275
PSEQ → Passive Coping	-.39	.13	-2.88	<.01	-.65026, -.12171
Pain Intensity x PSEQ → Passive Coping	.04	.02	1.87	.06	-.00216, .08489
Passive Coping → Pain Interference	.53	.12	4.30	<.01	.28774, .77406
Direct Effect	.78	.06	12.08	<.01	.65066, .90423
Index of Moderated Mediation					
	Index	SE			95% CI
PSEQ	.02	.01			.00023, .05239
Conditional Indirect Effect					
Moderator Level	PSEQ	SE	SE		95% CI
-1SD	2.37	.07	.03		.01484, .13619
Mean	3.66	.10	.03		.04352, .16340
+1SD	4.95	.13	.04		.05680, .20954

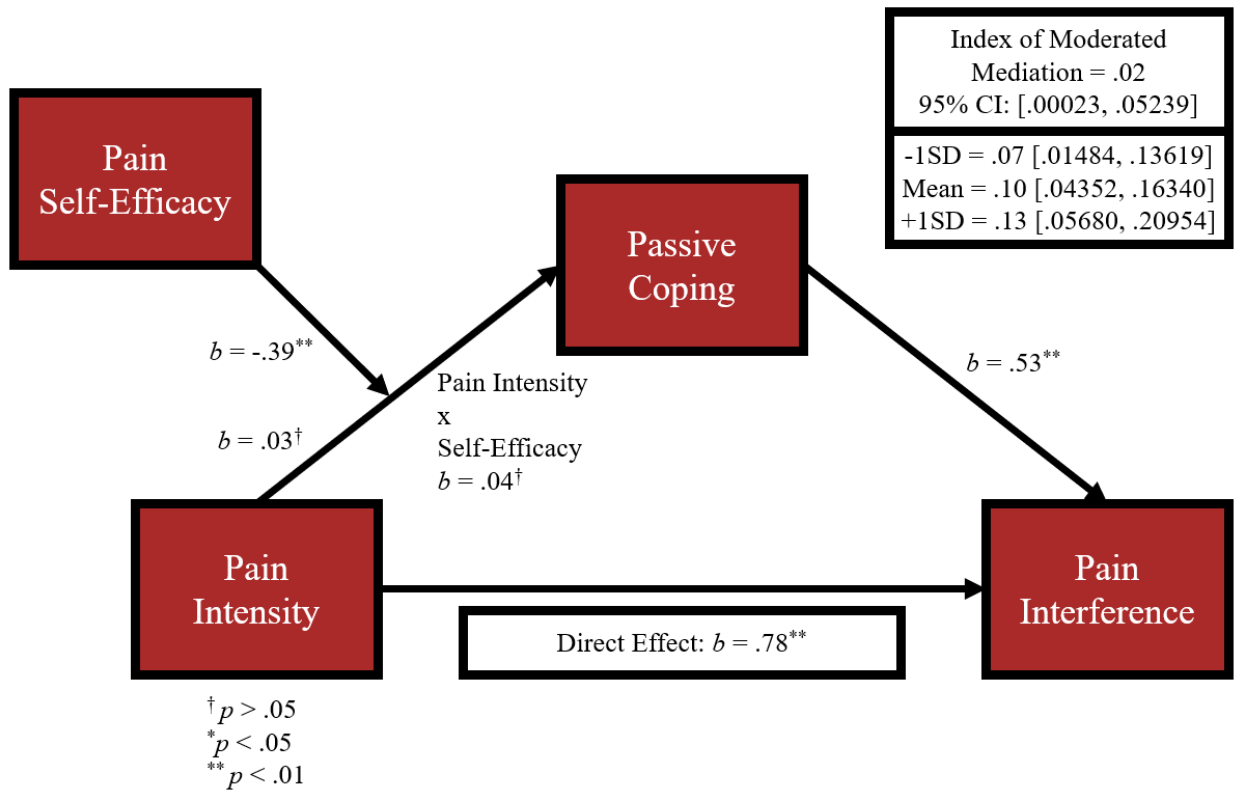


Figure 12. Results of moderated mediation model: Pain self-efficacy moderated the mediating effect of passive coping strategies on the relationship between pain intensity and pain interference

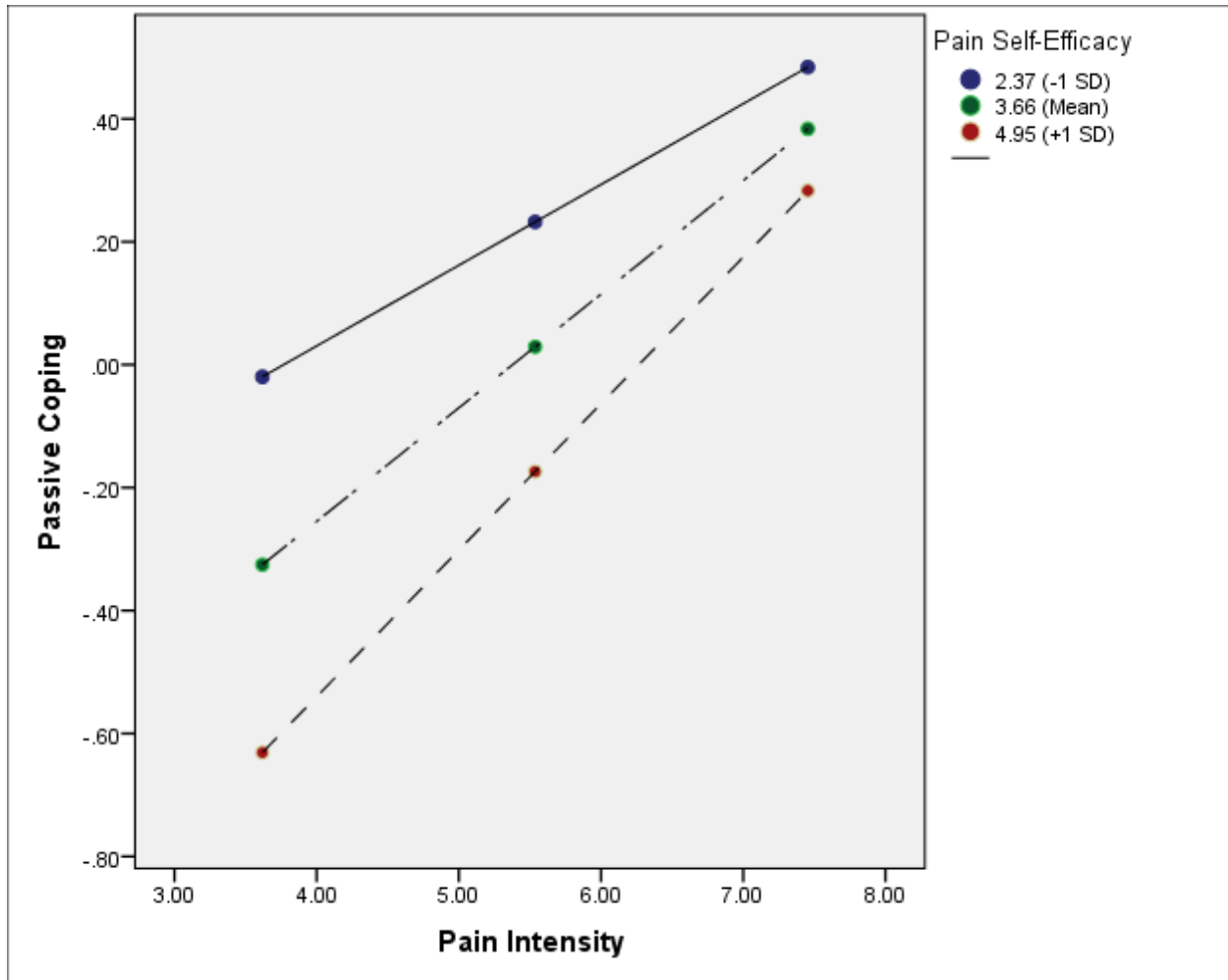


Figure 13. Visualization of pain self-efficacy moderating the relationship between pain intensity and passive coping.

I conducted a moderated parallel mediation analysis to determine if pain self-efficacy moderated the mediating effects of active coping strategies (pain intensity → active coping strategies → pain intensity) and passive coping strategies (pain intensity → passive coping strategies → pain intensity) in the same model, while holding the other path constant (i.e., active coping when controlling for passive coping and passive coping when controlling for active coping). The index of moderated mediation was significant for passive coping (when controlling for active coping) (index = .02, 95% CI: [.00023, .05239]), but not for active coping (when

controlling for passive coping). For the passive coping path, probes at the mean (PSEQ = 3.66; $b = .10$, 95% CI: [.04938, .18051]) and one standard deviation (SD) above (PSEQ = 4.95; $b = .14$, 95% CI: [.06440, .23031]) and below (PSEQ = 2.37; $b = .07$, 95% CI: [.01515, .15070]) were all significant. Consistent with the previous moderated mediation analysis for passive coping, but when controlling for the use of active coping strategies, lower pain self-efficacy (-1SD) was associated with more engagement in passive coping strategies at every level of pain intensity compared to higher pain self-efficacy (mean and +1SD). However, the direction of the moderated-mediation effect was again the opposite of what I initially predicted. When controlling for active coping, higher pain intensity predicted greater use of passive coping strategies, which was then associated with greater pain interference, and this mediation effect was stronger for those participants with higher (vs. lower) pain self-efficacy. See Table 10 and Figures 14, 15, and 16 for detailed results.

Table 10. Results of moderated mediation for active and passive coping.

Path	<i>b</i>	SE	<i>t</i>	<i>p</i>	95% CI
Pain Intensity → Active Coping	-.06	.09	-.67	.50	-.24421, .11968
PSEQ → Active Coping	-.03	.14	-.23	.81	-.30009, .23620
Pain Intensity x PSEQ → Active Coping	.06	.02	2.61	<.01	.01442, .10274
Active Coping → Pain Interference	-.22	.12	-1.92	.06	-.45173, .00595
Pain Intensity → Passive Coping	.03	.09	.37	.71	-.14588, .21275
PSEQ → Passive Coping	-.39	.13	-2.88	<.01	-.65026, -.12171
Pain Intensity x PSEQ → Passive Coping	.04	.02	1.87	.06	-.00216, .08489
Passive Coping → Pain Interference	.58	.13	4.64	<.01	.33542, .83090
Direct Effect	.79	.06	12.27	<.01	.66290, .91634
Index of Moderated Mediation (Active)					
	Index	SE			95% CI
PSEQ	-.01	.01			-.03408, .00084
Moderator Level	PSEQ	Conditional Indirect Effect	SE		95% CI
-1SD	2.37	-.02	.01		-.05222, .00421
Mean	3.66	-.03	.02		-.07691, .00181
+SD1	4.95	-.05	.03		-.11113, .00277
Index of Moderated Mediation (Passive)					
	Index	SE			95% CI
PSEQ	.02	.01			.00032, .05767
Moderator Level	PSEQ	Conditional Indirect Effect	SE		95% CI
-1SD	2.37	.08	.03		.01515, .15070
Mean	3.66	.11	.03		.04938, .18051
+SD1	4.95	.14	.04		.06440, .23031

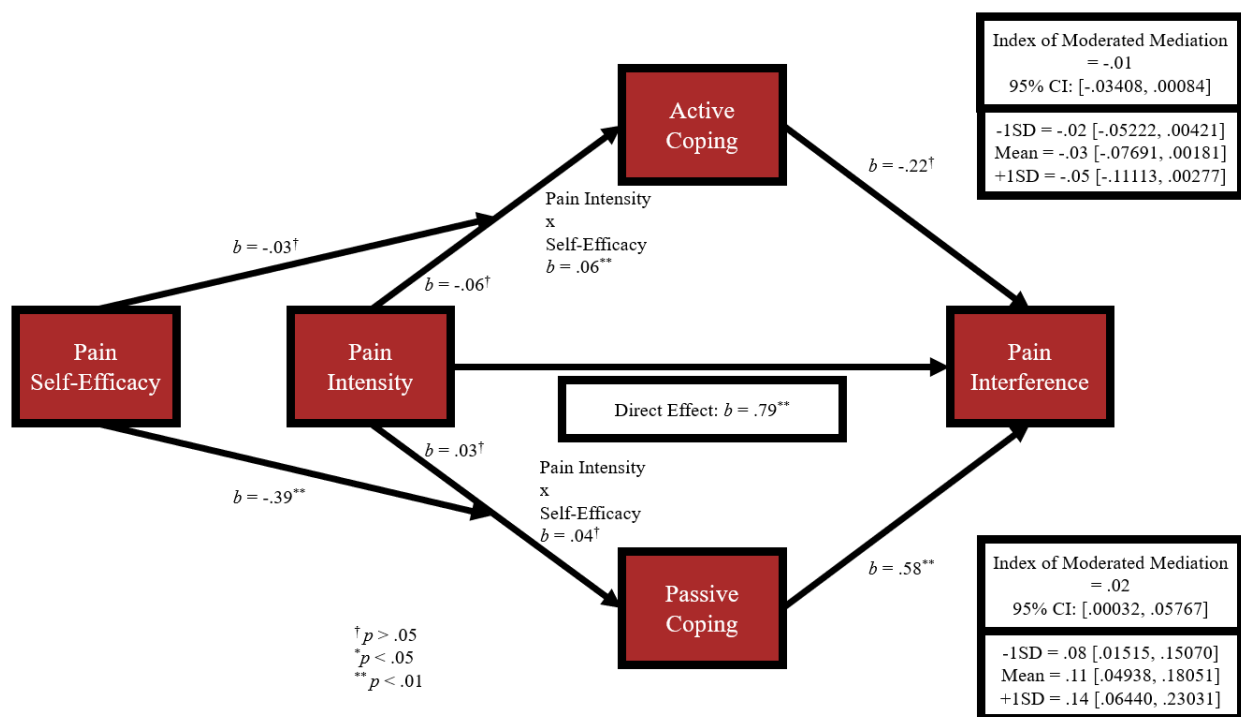


Figure 14. Results of moderated mediation model: Pain self-efficacy moderated the mediating effect of passive, but not active, coping strategies on the relationship between pain intensity and pain interference

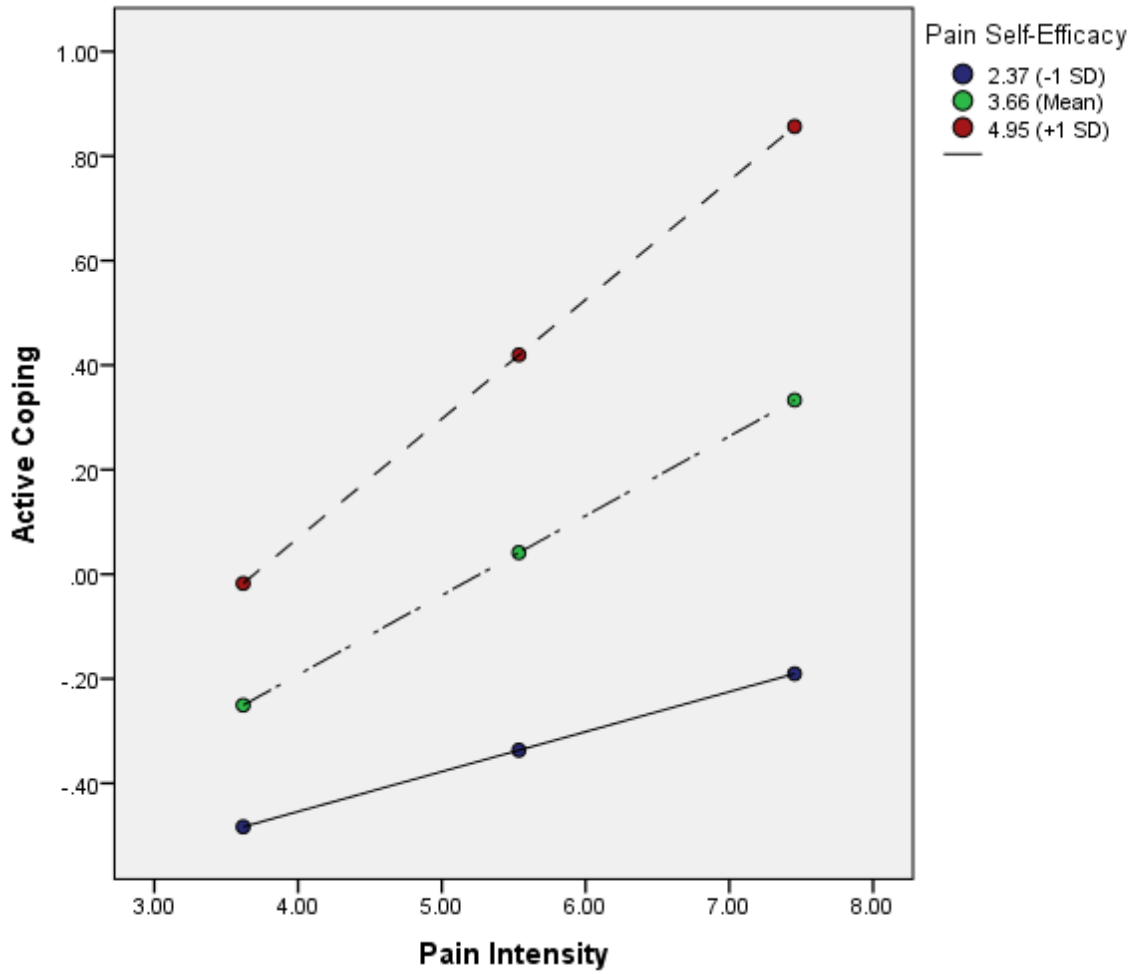


Figure 15. Visualization of pain self-efficacy moderating the relationship between pain intensity and active coping, while controlling for passive coping.

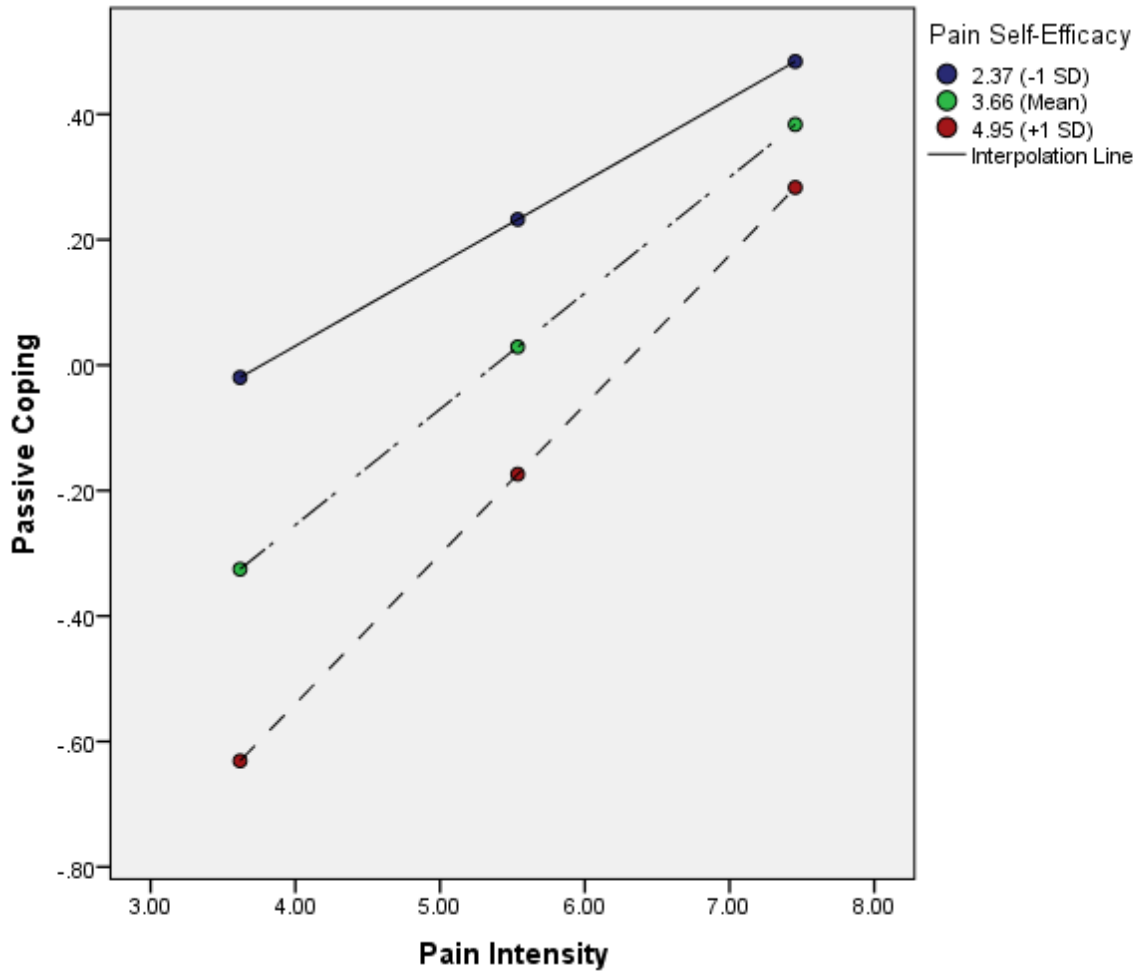


Figure 16. Visualization of pain self-efficacy moderating the relationship between pain intensity and passive coping, while controlling for active coping.

DISCUSSION

The current study investigated the roles of coping strategies and pain self-efficacy in the pain intensity—pain interference relationship for Black veterans with chronic pain. The greater the pain intensity experienced by the participants, the more they used passive coping strategies, which was then associated with worse pain interference. Additionally, pain self-efficacy moderated (i.e., strengthened) the mediating effect of passive coping – both separately and when controlling for the effects of active coping. Contrarily, active coping strategies did not have significant relationships with pain intensity, interference, or self-efficacy.

For participants in this study, higher pain intensity was associated with greater pain interference. These results supported my first hypothesis that there would be a positive correlation between pain intensity and pain interference. These results also aligned with existing studies on this relationship and specifically for Black patients with chronic pain (Boggero et al., 2015; Eslami et al., 2016; Jensen et al., 2017; Pedrero-Martin et al., 2021; Shafshak & Elnemr, 2021). Confirming this relationship for Black patients is particularly important due to research into their pain experience being understudied (Farooq et al., 2020; Green et al., 2003a; Oh et al., 2015).

Hypothesis 2, that active and passive coping strategies would mediate the pain intensity—pain interference relationship, was partially supported. Higher pain intensity was associated with greater passive coping, which was associated with worse pain interference. This held in a parallel mediation when controlling for active coping. My results align with prior research that has found connections between passive coping and pain intensity and interference (Allen et al., 2010; Bakhshaie et al., 2022; Engel et al., 2000; Geisser et al., 1999; Geyh et al.,

2012; Hanley et al., 2008; Hastie et al., 2005; Nieto et al., 2012; Osborne et al., 2007; Raichle et al., 2007; Tan et al., 2005). My results add to the literature for Black patients and substantiate passive coping as a mechanism of the pain intensity—pain interference relationship (Allen et al., 2010; Aroke et al., 2020; Bakhshaie et al., 2022; Day & Thorn, 2010; Meints et al., 2016; Parmelee et al., 2012; Riley III et al., 2002; Tan et al., 2005; Yang et al., 2022).

Contrary to Hypothesis 2, active coping did not mediate the pain intensity—pain interference relationship. The lack of significant findings for active coping as a mediator diverges from the research literature. While I found that higher pain intensity predicted greater use of active coping, these strategies did not predict less pain interference. Extant studies (separately) found that active coping was associated with higher pain intensity and less pain interference (Allen et al., 2010; Engel et al., 2000; Nieto et al., 2012; Osborne et al., 2007; Raichle et al., 2007; Tan et al., 2005). This suggests that there are circumstances and populations in which these relationships do not hold, such as with the current study's Black veteran sample.

The significant mediation results for passive, but not active, coping partially resulted from the relative differences in the strength of their relationships with pain intensity. Pain intensity was positively correlated with active and passive coping strategies, but the link with passive coping appeared stronger. Indeed, t-tests revealed that participants reported significantly greater use of passive coping strategies than active ones. This comported with existing literature that Black patients tend to use more passive coping strategies, including catastrophizing and prayer (Edwards et al., 2005; Meints et al., 2016; Tan et al., 2005).

The question then becomes: why did pain intensity have a stronger relationship with passive coping than active coping? Chronic pain is often secondary to disease or injury, which may result in physical disabilities and limitations that make activity more difficult (Ehde et al.,

2003; Verbunt, Smeets, & Wittink, 2010). Many active coping strategies (e.g., exercise) may be more difficult for patients with physical disabilities/limitations, leaving them more reliant on passive strategies that are less physically demanding (Cratsenberg et al., 2015; Jacobs & Nash, 2004; Tweedy et al., 2017). Veterans, like those of my sample, are more likely to have physical disabilities/limitations than non-veterans (Holder, 2016). Adding to physical disabilities/limitations, the pain sensation itself may create fear of movement (i.e., kinesiophobia) (Luque-Suarez et al., 2019; Rainville et al., 2011). Participants may have feared that attempts to cope using active strategies could worsen their pain, further deteriorate their underlying pain condition, and/or cause greater loss of functioning. These fears may strengthen the association between pain and passive coping.

Fear of movement and its association with coping may arise from appraisals about the meaning of one's pain. One conceptualization of pain appraisals is of pain as threats vs. harms vs. challenges (Jackson et al., 2014b; Thorn & Dixon, 2007). Pain can be evaluated as a threat to the individual, that pain intensity will worsen, which may overwhelm one's ability to cope with it. Relatedly, pain can be perceived to cause tissue damage/harm and/or some tangible disability/loss. Contrarily, pain can be viewed as a challenge to be overcome; it is a test and an opportunity for growth, advancement, or gain/profit (Jackson et al., 2014b; Ramírez-Maestre et al., 2008; Thorn & Dixon, 2007; Unruh et al., 1999).

In clinical research on patients with chronic pain in general, threat and harm/loss appraisals were associated with increased passive coping and reduced active coping, while challenge appraisals were associated with increased active coping and reduced passive coping (Jackson et al., 2014b; Ramírez-Maestre et al., 2008; Unruh et al., 1999). For Black patients with chronic pain, the existing literature is mixed. Some clinical research of patients with chronic pain

has found that Black (vs. White) patients are more likely to hold harm and threat appraisals, while other research fails to find any racial differences (Kissi et al., 2024; Tan et al., 2005). In research on pain-free individuals, Black (vs. White) participants reported higher harm and threat appraisals during a cold pressor pain task (Forsythe et al., 2011). Thus, my participants possibly appraised their chronic pain more as threats/harms/losses, which led to a stronger relationship with passive (vs. active) coping strategies.

Instead of the challenge (active coping) vs. threat/damage/harm (passive coping) dichotomy, Gandhi & Schweinhardt (2017) proposed an alternative perspective on appraisals. They assert that individuals attempting to cope with pain (both acute and chronic) unconsciously appraise individual and situational factors, including pros and cons of coping strategies. If pain is viewed as escapable or resolvable, they focus on external factors and address pain directly using active coping, including temporarily enduring (e.g., necessary medical procedures) or eliminating (e.g., exercise to strengthen the body) pain or engaging in distractions. On the other hand, pain viewed as unavoidable leads to an inward focus and passive coping to manage the affective and cognitive facets of pain. Gandhi & Schweinhardt (2017) do not categorize every potential coping strategy, leaving it uncertain whether given strategies are active vs. passive and focused internally vs. externally. For example, engaging in healthcare to obtain medication could be conceptualized as both external, active coping (e.g., assertive communication with providers) and internal, passive coping (i.e., medication to manage internal pain experiences).

Despite this ambiguity, catastrophizing and hope & prayer are indeed forms of passive coping within their framework (Esteve et al., 2007; Gandhi & Schweinhardt, 2017; Hughes et al., 2017). Gandhi & Schweinhardt (2017) argue that passive coping is not inherently maladaptive, but rather may be adaptive or maladaptive depending on the context. For instance, resting could

be adaptive if it is in service to improve functioning (e.g., periodic breaks to avoid overextending oneself at work), but could be maladaptive if used excessively/inappropriately, leading to reduced functioning (e.g., deconditioning caused by excessive resting) (Murphy et al., 2022). Supporting this theory, certain passive coping strategies are integrated into evidence-based care for chronic pain, such as resting as a pacing strategy in cognitive behavioral therapy for chronic pain (CBT-CP) (Murphy et al., 2022).

Gandhi & Schweinhardt's (2017) theory offers a rich explanation for pain coping, yet it appears to contradict research findings that associate active coping strategies with better outcomes and passive strategies with worse ones (e.g., pain intensity and pain interference) (Allen et al., 2010; Engel et al., 2000; Kuzu et al., 2022; Lagas et al., 2021; Nieto et al., 2012; Osborne et al., 2007; Raichle et al., 2007; Tan et al., 2005). These findings are likely why active coping is often referred to synonymously as adaptive coping and passive coping as maladaptive coping (Finan et al., 2011; Kruijff et al., 2019; Geisser et al., 1999). Reconciling these viewpoints requires considering the multiple forms and full context of pain coping.

To illustrate, prayer is common amongst Black individuals with chronic pain and it is often regarded as passive, maladaptive coping (e.g., praying for God to remove pain) (Ang et al., 2002; Meints et al., 2016; Meints et al., 2018). Contrarily, prayer can be more active, such as praying for strength to endure pain (Meints et al., 2016; Meints et al., 2018). Prayer can be adaptive by context, such as prayer within a church increasing socialization (O'Connell-Edwards et al., 2009). The prayer-focused item on the CSQ version used in the current study is phrased in a more passive manner (i.e., "I pray for the pain to stop") and was related to worse pain interference. Had this item been phrased more adaptively, prayer may have been associated with less pain interference (Dedeli & Kaptan, 2013; Wachholtz, Pearce, & Koenig, 2007).

Much like prayer, catastrophizing is frequently characterized as inherently passive and maladaptive, but this is not necessarily always the case (Hanley et al., 2008; Keefe et al., 1989; Malfliet et al., 2017; Quartana et al., 2009; Simic et al., 2024; Tan et al., 2011; Taylor et al., 2017). Yes, the rumination and distress of catastrophizing can contribute to negative outcomes (e.g., depression, anxiety), but it can also be adaptive (Montoro & Galvez-Sánchez, 2022; Glette et al., 2021; Sturgeon & Zautra, 2012). Under the communal coping model, catastrophizing can be a method of obtaining social support and assistance through increased pain behaviors (e.g., limping) and verbal expressions of catastrophizing thoughts (Keefe et al., 2000; Sullivan et al., 2001; Sullivan et al., 2000). Catastrophizing as implicit and/or explicit attempts to obtain social support and assistance can be adaptive or maladaptive depending on the context (Sullivan, 2012). With acute pain, catastrophizing may be adaptive to obtain aid for the source of pain, which facilitates healing and possibly prevents the development of chronic pain. In chronic pain, catastrophizing may be maladaptive and reduce functioning (e.g., reduced social expectations of activity leading to a deconditioning cycle) (Sullivan et al., 2000; Sullivan, 2012).

This approach of viewing catastrophizing through a lens of solicitousness and social support appears to run counter to Black individuals with chronic pain valuing stoicism in response to pain (Anderson et al., 2002; Bakhshaie et al., 2022; Black & Woods-Giscombé, 2012; Hsieh et al., 2010; Im, 2008; Meghani & Houldin, 2007). If Black individuals prefer stoic responses and reduced external expressions of pain, one would think that they would catastrophize less. Indeed, stoicism is associated with self-reliance and eschewing assistance from others in managing pain, which are both linked to worse outcomes (e.g., poorer mental health) (Chambers et al., 2016a; Chambers et al., 2016b; Gerdes & Levant, 2018). Stoic individuals minimize expressions of pain and prioritize self-management (Anderson et al., 2002;

Bakhshaie et al., 2022; Black & Woods-Giscombé, 2012; Chambers et al., 2016a; Chambers et al., 2016b; Gerdes & Levant, 2018). Thus, stoic individuals may focus on internal, passive coping strategies that are not as readily observable to others as active pain behaviors and expressions of pain-related emotions are (Gandhi & Schweinhardt, 2017). Moreover, if my participants appraised their pain as unavoidable and unresolvable, then this would have also focused their efforts on passive coping strategies, rather than active coping.

Instead, catastrophizing (particularly its helplessness facet) and passive coping in general may be explained by Black individuals' lived experiences of discrimination and history of pain management (Broman et al., 2000; Craner et al., 2016; Meints et al., 2016; Sullivan et al., 1995). Repeated instances of discrimination (including in healthcare) and failed attempts to manage chronic pain on their own may lead Black patients to view these types of experiences as outside of their control and influence. Veterans have unique experiences of discrimination and difficulties with self-management of pain (Hammer et al., 2020; Hirudayaraj & Clay, 2019; Keeling et al., 2018). These cumulative experiences may create an external locus of control and learned helplessness, as Black veteran patients become skeptical that future attempts to self-manage their pain will be successful (Broman et al., 2000; Jia & Jackson, 2016; Seville & Robinson, 2000). Feeling helpless and that pain management is outside their control, Black veteran patients may rely more on passive coping strategies.

Appraisal theories may shed more light on this perspective and the lack of significant mediation by active coping strategies. Engaging in passive coping strategies may allow Black veterans with chronic pain to manage the internal thoughts and emotions associated with pain, as well as their feelings of helplessness and lack of control driven by discrimination and negative experiences with pain management (Broman et al., 2000; Gandhi & Schweinhardt, 2017;

Hammer et al., 2020; Hirudayaraj & Clay, 2019; Keeling et al., 2018; Meints et al., 2016).

Moreover, helplessness and an external locus of control may cause them to view pain as inescapable and unresolvable, leading them to deemphasize active coping strategies in response to their pain sensations (Gandhi & Schweinhardt, 2017).

These explanations for the mediation results are based on the relationships between pain intensity and active or passive coping strategies, respectively. Other explanations for my results arise from the effects of active and passive coping strategies on pain interference (i.e., the b-paths in each model). In line with the theory from Geisser et al. (1999), it may be that passive coping strategies exert substantially more influence in exacerbating pain interference than active coping strategies do in relieving or minimizing it.

Just as physical functioning may help explain the relationship between pain intensity and coping strategies, it may affect the coping strategies—pain interference relationship. If passive coping leads to decreased physical activity, individuals with chronic pain may lose muscle mass, cardiovascular endurance, and experience other effects of physical deconditioning, leading to pain interference (Janssen et al., 2022; O’Sullivan, 2005; Samwel et al., 2006; Shirkey et al., 2010; Sturgeon, 2014; Werneke et al., 2009). As deconditioning worsens, they may experience worsening fatigue and pain intensity, which can reinforce fear of movement, increase passive coping, and accelerate deconditioning (Luque-Suarez et al., 2019; O’Sullivan, 2005; Rainville et al., 2011; Samwel et al., 2006; Werneke et al., 2009).

Alternatively, learned helplessness and an external locus of control may lead Black patients to be skeptical of how successful they will be when engaging in active coping (Jia & Jackson, 2016; Seville & Robinson, 2000). They may reduce their efforts and frequency of using these active coping strategies, leading to insufficient practice to build the skills and confidence

necessary for these strategies to be effective (Karp et al., 2016; Wang et al., 2021). They are left to cope with strategies at which they feel skilled, even if those strategies are passive and/or maladaptive. Black patients may choose prayer as a more familiar and culturally relevant coping strategy for pain (Edwards et al., 2005; Meints et al., 2016; Tan et al., 2005).

Turning now to Hypothesis 3, that pain self-efficacy would moderate the mediating effects of active and passive coping strategies, the results did not support this hypothesis. Contrary to my hypothesis that lower pain self-efficacy would be associated with greater passive coping, the opposite occurred. Pain self-efficacy strengthened the mediating effect of passive coping, such that participants with higher (vs. lower) self-efficacy experienced larger relative increases in their passive coping as pain intensity increased, which were then associated with greater pain interference. Also conflicting with my third hypothesis, pain self-efficacy did not moderate the indirect effect of active coping.

That there was a significant moderating effect of pain self-efficacy for passive coping strategies is consistent with existing literature that has found self-efficacy to be related to pain intensity for patients with chronic pain in general and Black patients specifically (Adegbola, 2015; Allen et al., 2010; Costa et al., 2011; Drenkard et al., 2022; Lynch, Kashikar-Zuck, Goldschneider, & Jones, 2007; Martinez-Calderon et al., 2020c; Pedrero-Martin et al., 2021; Somers et al., 2012; Vilardaga et al., 2022). My results also affirm existing research that self-efficacy is related to passive coping, but they conflict with much of the research on the direction of that relationship, as well as conflicting with research that has found similar relationships for self-efficacy and active coping (Brister et al., 2006; Brown & Nicassio, 1987; Cheng et al., 2018; Hirata et al., 2021; Jensen et al., 1991; Nicholas, 2007; Pedrero-Martin et al., 2021; Strahl et al., 2000; Turner et al., 2005). The moderated mediation effect of self-efficacy was novel, with only

one recent study assessing the moderating effect of self-efficacy on the pain intensity—catastrophizing relationship (Kardash et al., 2024).

One potential cause for the lack of a significant moderation effect for pain self-efficacy on active coping strategies may be insufficient pain self-efficacy. It could be that there is a real effect of pain self-efficacy on the pain intensity—active coping relationship, but the levels of self-efficacy reported by these participants were too low to demonstrate a significant effect (i.e., a mediating effect may only exist at higher levels of self-efficacy). Several studies have found higher pain self-efficacy than that reported in the current sample, while others have found lower or similar levels, but none of these assessed the relationship of self-efficacy to coping strategies (Adachi et al., 2014; Asghari & Nicholas, 2009; Bot et al., 2013; Chiarotto et al., 2018.; Di Pietro et al., 2014; Kortlever et al., 2015; Macedo et al., 2012; Maughan & Lewis, 2010). Moreover, many of these studies were conducted in other countries with linguistic and cultural differences that may confound direct comparisons. Thus, it is unclear whether my sample's pain self-efficacy was meaningfully different than those of these other studies. Even if there were similar levels of pain self-efficacy, it may be that my unique sample required more self-efficacy than others for a significant moderation effect.

Insufficient pain self-efficacy may have several origins. Physical disabilities may contribute to lower pain self-efficacy through perceptions that their overall functioning is limited (e.g., inability to manage pain due to limited range of motion from spinal fusion) (Buck et al., 2010; Ogwumike & Musa, 2019). Alternatively, both Black patients and veterans with chronic pain may exhibit lower pain self-efficacy as a result of discrimination and ineffective healthcare to manage their pain (Allen et al., 2010; Benedict et al., 2020; Hammer et al., 2020; Hirudayaraj & Clay, 2019; Jones et al., 2008; Keeling et al., 2018; Orhan et al., 2018; Outcalt et al., 2014).

By virtue of the current sample being Black veterans, they may have even lower self-efficacy than patients with chronic pain who only belong to one of these groups, though the exact effects of this intersectionality are unclear.

Contrarily, the current study may have accurately found that no real moderated mediation effect exists for active coping strategies. Pain self-efficacy may not actually matter for active coping, regardless of the level of self-efficacy. The lack of a real effect may also be a function of the specific active coping strategies assessed by this version of the CSQ, which features mostly internal, cognitive active coping strategies (e.g., ignoring sensations). These specific strategies may not be affected by self-efficacy, but other, more physically-demanding strategies (e.g., exercise) may have a stronger relationship with self-efficacy.

While the active coping moderated mediation was insignificant, the mediating effect of passive coping strategies did depend on pain self-efficacy. Pain appraisals help explain the mediating effects, but their relevance to pain self-efficacy as a moderating factor is less clear. Threat and harm appraisals appear associated with lower self-efficacy for managing pain, while challenge appraisals are associated with higher self-efficacy (Jackson et al., 2014a; Thorn & Dixon 2007). These relationships hold for both research with patients with chronic pain and in research using healthy participants during acute pain induction (Chen & Jackson 2019; Ellis et al., 2017; Jackson et al., 2014a; Thorn & Dixon 2007).

If greater pain self-efficacy is associated with challenge appraisals, which are linked to less passive coping, it is unclear why pain self-efficacy would strengthen the effect of the passive coping mediation in the current study. One would assume that greater pain self-efficacy would have a weakening effect for passive coping (Brown & Nicassio, 1987; Cheng et al., 2018; Hirata et al., 2021; Pedrero-Martin et al., 2021; Strahl et al., 2000; Turner et al., 2005). That is,

appraising one's pain as challenges should result in a tendency towards greater pain self-efficacy, both of which should lead to less passive coping and less pain interference. Instead, greater self-efficacy was linked to greater increases in passive coping and then worse interference. Therefore, threat vs. harm vs. challenge appraisals seem less helpful in explaining my moderated mediation results.

Alternatively, the results may reflect relative differences in the use of coping strategies at lower pain intensity levels and the effect of increasing pain intensity on diminishing these differences. If lower pain intensity is considered a "starting point" from which pain intensity builds (e.g., with overexertion), participants with higher pain self-efficacy may use more active coping strategies and fewer passive ones when they experience lower pain because they feel more confident in controlling their pain and possibly that they can escape from or resolve it (Gandhi & Schweinhardt, 2017). As their pain intensity progressively increases, they may view their pain as less and less controllable and thereby reduce their active coping in favor of more passive coping that allows for internally managing their pain experience (Gandhi & Schweinhardt, 2017).

Conversely, participants with lower self-efficacy are already using substantially more passive coping strategies at lower pain intensities than their high-self-efficacy counterparts, which is consistent with prior research (Cheng et al., 2018; Hirata et al., 2021; Pedrero-Martin et al., 2021; Strahl et al., 2000). Those with lower self-efficacy experienced smaller increases in their passive coping as their pain increased because they were already using passive coping at higher rates and were possibly closer to a ceiling effect of passive coping. This ceiling effect may be a function of the debilitating nature of pain (e.g., a person doubled over in pain and unable to do much of anything else), preventing increased coping of any kind (active or passive)

beyond a certain pain intensity. It could also arise from participants believing that passive coping had diminishing returns as pain intensity increased.

Even if high pain self-efficacy was associated with increased passive coping as pain intensity increased in the current study, my findings indicate that self-efficacy may be beneficial at lower pain intensity through being associated with more active coping. The pain literature often views self-efficacy positively in this manner, with it being associated with improved pain outcomes, but it may not always be beneficial (Costa et al., 2011; Lynch et al., 2007; Martinez-Calderon et al., 2020c; Pedrero-Martin et al., 2021). Increasing self-efficacy is not always helpful and, in some cases, too much self-efficacy can be counterproductive, especially when it results in overconfidence, which leads individuals to overestimate their own abilities and their probability of success (Moore & Healy, 2008). For example, overconfidence by healthcare providers has been theorized as one explanation for misdiagnosis of pain and other symptoms (Berner & Graber, 2008; Little & Wu, 2021). From the perspective of those experiencing pain, one study with pain-free participants undergoing a cold pressor task found that false positive feedback about their pain tolerance compared to others appeared to increase their confidence in the task but without any corresponding improvements in actual performance (Chen et al., 2023).

A similar phenomenon may occur with chronic pain, in that high self-efficacy contributes to highly confident, yet ineffective coping (e.g., choosing coping strategies that are less effective or in which the individual is less skilled). It is not clear if and how this overconfidence effect explained my results and more research is necessary to study this effect's roles in pain coping and pain self-efficacy. More generally, additional research is necessary to investigate my novel moderation findings, as they may provide additional treatment targets through modifying coping strategies and self-efficacy.

LIMITATIONS

Though these results provide insight into the wider population of Black veterans with chronic pain, extrapolating the results to other populations is more qualified. Veterans are a unique population, prizing masculinity and emotional strength, while devaluing and stigmatizing perceived vulnerability and weakness (Ouimette et al., 2011; Richards, Goetter, Wojtowicz, & Simon, M., 2016). Stigmatization of physical and mental health discourages them from seeking assistance in managing their health issues, leaving veterans to cope with their chronic pain differently from non-veterans (Elnitsky et al., 2013; Ouimette et al., 2011; Richards et al., 2016).

Utilizing healthcare through the VA system similarly presents difficulties in extending the results to non-veterans. VA facilities frequently offer multimodal pain management (e.g., medications, psychotherapy, physical therapy, yoga), which may impact their pain, coping, and self-efficacy (Leonard et al., 2021; Martinez-Calderon et al., 2020b; Simmonds et al., 2015). Non-veteran populations may not have access to the same services or to the same extent to which veterans do, making direct comparisons difficult.

Despite the benefits, variability in receiving care at different VA facilities complicates generalizing my results to all veterans. Pain management services can be inconsistent across VA facilities, including limited access and longer wait times at rural and community-based outpatient clinics compared to larger VA hospitals (Driscoll et al., 2018; Leonard et al., 2021; Simmonds et al., 2015). Barriers to accessing services also arise from transportation difficulties, level of service connection, and other individual patient issues (Becker et al., 2017; Driscoll et al., 2018; Fried et al., 2015; Leonard et al., 2021; Murdoch et al., 2003). There could be systematic

differences for veterans depending on personal circumstances and the VA facility at which they receive their pain management, which then impacts pain self-efficacy, coping, etc.

Beyond veteran status, all participants in my sample were Black patients with chronic pain in the US, which may limit generalizability to other racial groups and other Black patient populations. There are well-documented differences in pain intensity, interference, coping and other relevant variables between Black and White patients with chronic pain (Barry et al., 2017; Meints et al., 2019; Meints et al., 2016; Yang et al., 2022). These are partially attributable to the racial discrimination and marginalization (including as part of receiving healthcare) experienced by Black patients and which may be absent from or different than that experienced by other groups (Boring et al., 2021; Brown et al., 2023; Burgess et al., 2009; Edwards, 2008; Meints et al., 2016; Sutton et al., 2019; Tekeste et al., 2019; Thorpe et al., 2022). Policy (e.g., education and public health) and cultural (e.g., pain attributions and coping styles) differences between countries may complicate generalizing my results to other Black patients around the world (Genêt et al., 2009; Kahere et al., 2022; Igwesi-Chidobe et al., 2017; Nchako et al., 2018; Sharma et al., 2020; Tsetseri et al., 2024; Van Vuuren et al., 2006). Even amongst those living in the US, Black patients with chronic pain from divergent backgrounds (e.g., born and raised American citizens vs. first-generation immigrants and refugees) may differ substantially in various important ways (e.g., spiritual views of disease and chronic pain) that influence coping and other factors relevant to the current study (Craig et al., 2020; Omenka et al., 2020).

Other limitations to this study were related to how the variables were measured. While the BPI, CSQ, and PSEQ appear to be psychometrically sound for patients with chronic pain in general, none of them were developed for Black patients with chronic pain or veterans in mind, necessitating caution when interpreting the results (Cleeland & Ryan, 1991; Jensen et al., 2003;

Jones et al., 2008; Nicholas, 2007; Riddle & Jensen, 2013; Riley III & Robinson, 1997). For example, the content validity of the BPI interference items may not fully capture the unique ways that pain interferes with functioning for Black patients with chronic pain. Moreover, the instructions for these measures are phrased somewhat vaguely (e.g., the CSQ's "when you feel pain") and could have been interchangeably interpreted by respondents as transient, state-like experiences or stable, trait-like dispositions. This ambiguous phrasing allows for different conceptualizations of the relationships between these variables and potentially different interpretations of my results.

Separate from state vs. trait issues, the current measures may introduce other validity issues. The CSQ version used for the current study may be inherently limited based on its length and how different coping strategies are framed. For example, prayer is assessed by a single item, which is phrased in a passive and maladaptive way. This presents multiple issues, particularly in insinuating that prayer to cope with pain and passive coping in general are inherently maladaptive (with the corollary that active strategies are inherently adaptive) when this is not necessarily the case (Gandhi & Schweinhardt, 2017; Meints et al., 2016; Meints et al., 2018). For Black patients specifically, this may not reflect the unique ways in which they use prayer as a coping strategy, which could include more active forms (e.g., praying for strength to persevere). Psychometrically, a single item may parsimoniously assess a given construct in a brief manner in the interests of time and resources, but it does so at the cost of validity, reliability, measurement error, etc. (Fuchs & Diamantopoulos, 2009).

Validity issues exist in the relationships between measures as well. There are close similarities between several items on the BPI, CSQ, and PSEQ (e.g., the CSQ item related to "chores and projects" vs. the BPI item pertaining to "normal work" vs. the PSEQ concerning

“household chores”). The relationships between scores on these measures can be artificially inflated (or deflated) by the semantic and conceptual overlap in these items, as opposed to the more mechanistic relationship between these measures that I originally proposed. Relatedly, the two CSQ items for catastrophizing are identical to two items from the Pain Catastrophizing Scale (PCS) and solely draw from its helplessness factor, ignoring the rumination and magnification factors (Sullivan et al., 1995). Therefore, it may be more accurate to say that helplessness was assessed by the CSQ instead of catastrophizing. As helplessness can be viewed as the lack of self-efficacy, this creates a similar problem to the overlapping items between measures and possibly accounts for the significant moderated mediation for passive coping.

The suboptimal internal consistency of the CSQ’s passive coping items indicated concerns for its reliability and thereby potentially impacted the validity of my results as well. Amongst its numerous effects, lower internal consistency may have limited the precision of my results and increased measurement error, which could have attenuated the strength of the relationships in my mediation and moderated mediation models (Tavakol & Dennick, 2011; VanderWeele et al., 2012). The lower internal consistency could be due to the hope & prayer and catastrophizing items measuring separate constructs and not a singular passive coping one (Tavakol & Dennick, 2011). This could explain why my moderated mediation analyses conflicted with existing literature on the relationship between pain self-efficacy and passive coping. It is possible that pain self-efficacy interacts with individual coping strategies differently and grouping them together into a single passive coping composite obscures these nuanced relationships. Alternatively, it may be that the items in this version of the CSQ are part of the same latent passive coping construct, but that there were too few items to measure it here, which then created a ceiling on their internal consistency (Tavakol & Dennick, 2011). Including

additional items from these two types of passive coping strategies or from other forms of passive coping could increase their reliability.

It is also important to note that the index of moderated mediation was small, the confidence interval was wide (compared to the index), and the lower bound was close to zero. These create uncertainty about the true magnitude and significance of my moderated mediation effects. The complexity of the moderated mediation models may mean that the significant results were actually due to statistical noise (Cheung & Lau, 2017; Hayes, 2015). Collectively, these suggest that the moderated mediation effect for passive coping was illusory and the result of statistical confounds, rather than being a counterintuitive, unpredicted real effect.

IMPLICATIONS AND FUTURE DIRECTIONS

Clinical

The current study has tangible implications for clinical practice in chronic pain management. In line with Geisser et al. (1999), the current findings suggest that passive coping bears a stronger influence on pain interference than active coping. Therefore, clinicians may prioritize interventions to reduce passive coping. Many existing psychological therapies like CBT-CP already incorporate interventions to improve active coping while teaching skills that address unhelpful, pain-related cognitions and emotions; CBT-CP could easily be shifted to focus on the latter (Murphy et al., 2022). A clinician providing CBT-CP could leverage this research to focus more on cognitive restructuring of catastrophizing thoughts that pain sensations mean that their pain and health are worsening (i.e., magnification) and deemphasize session content focused on collaboratively planning a schedule of enjoyable activities and other active coping strategies.

Psychotherapies being optimized to reduce passive coping would also need to be culturally sensitive to the needs and perspectives of Black patients with chronic pain. Neglecting their lived experiences could further marginalize Black patients, reduce their engagement in treatment, and exacerbate maladaptive forms of passive coping and pain interference (Armstrong et al., 2013; Benkert et al., 2009; Brown et al., 2023; Doescher et al., 2000; Halbert et al., 2009; Hibbard et al., 2008; Sutton et al., 2019; Tekeste et al., 2019; Thorpe et al., 2022). In particular, it would be crucial to avoid stigmatizing or pathologizing prayer and other culturally relevant coping strategies. Providers could help patients conceptualize these practices in less passive forms (e.g., prayers for endurance) and/or possibly more active forms (e.g., increased

engagement in their religious community) (Baastrup et al., 2016; Edwards et al., 2005; Gandhi & Schweinhardt, 2017; Meints et al., 2016; Meints et al., 2018; Tan et al., 2005).

Beyond minimizing passive coping strategies, the current study suggests that pain management programs may benefit from addressing patient pain self-efficacy. Exercise, various forms of psychological therapy, and combinations of interventions have all been shown to improve pain self-efficacy for patients with chronic pain (Martinez-Calderon et al., 2020b). These interventions may ultimately be effective methods of reducing pain interference through minimizing the negative impact of passive coping strategies. My results suggest focusing resources to improve pain self-efficacy onto patients with lower pain intensity. Providers may be most effective by initially assessing both pain intensity and self-efficacy and targeting interventions to those patients with low self-efficacy. Medications, PT, and other treatments could help decrease pain intensity so that interventions to improve self-efficacy can be more effective. Patients who have high pain intensity and/or high self-efficacy may receive less benefit and therefore may be better suited to interventions focused on reducing passive coping directly.

Research

The results of the current study are also relevant for future research. The same methodology could be replicated in other populations to test whether the relationships found are unique to Black veterans or if they extend to other populations. Of note, replicating this study with non-veteran Black patients could help elucidate the role of veteran status and VA healthcare in my results. A replication and comparison to a similar White veteran chronic pain sample could shed light on the role of race in pain coping and self-efficacy.

Though replications would be beneficial, they would still result in correlational data and lack strong causal inferences. One way to attain stronger inferences and assess the clinical implications of active vs. passive coping strategies would be to incorporate randomization and other experimental practices in psychotherapy research. For example, one RCT of CBT-CP found that reductions in catastrophizing and cognitions related to restricting activity predicted post-treatment improvements in disability but not pain intensity, while changes in any form of active coping were not significant predictors of pain-related outcomes (Heutink et al., 2013). This study compared CBT to a waitlist control, which limited inferences comparing active vs. passive coping. A future clinical trial could add to this research by randomly assigning patients to different versions of CBT-CP, specifically only increasing active coping vs. only reducing passive coping (Gilpin et al., 2017; Murphy et al., 2022).

Future research has the opportunity to ameliorate the limitations of the measures themselves. Measures specifically developed for or adapted to Black and veteran populations could reduce the impact of bias and other psychometric issues. There may be coping strategies that are more common or unique to Black patients that are not accounted for by existing measures, such as folk healing practices (e.g., herbal remedies) (Baker et al., 2008; Pillay, van Zyl, & Blackbeard, 2014; Robinson-Lane et al., 2022).

In addition to adapting them for Black patients and veterans, future research into these measures could address general psychometric and conceptual issues. The CSQ and other measures of pain coping could benefit from incorporating adaptive and maladaptive behaviors of each category of coping. To address the state vs. trait confounding, each measure could have more explicit instructions to delineate whether it is assessing the construct(s) in state- or trait-like manners. Future studies could also have respondents document their pain coping strategies and

their effectiveness as they engage in them (e.g., ecological momentary assessment) (May et al., 2018; Rogers et al., 2024; Villegas et al., 2021).

Clarifying other mediating mechanisms and moderators of the pain intensity → interference relationship would also be beneficial. A replication and extension of the current study could benefit from assessing pain appraisals directly and analyzing whether they are mediators between pain intensity and active or passive coping, respectively (Jackson et al., 2014b; Thorn & Dixon, 2007). This could test for serial mediation effects: greater pain intensity → more challenge appraisals → more active coping → less pain interference & greater pain intensity → more threat & harm appraisals → more passive coping → greater pain interference.

In terms of moderators, experiences of racial discrimination may be of particular importance for this population. Individuals use coping strategies to manage discriminatory distress, which are often similar to those strategies they use for coping with pain (e.g., seeking social support, distraction) (Jacob et al., 2023; Schmitt et al., 2014). When attempting to cope with pain, individuals who have previously experienced discrimination may employ strategies that were previously successful and/or about which they feel more confident. Alternatively, if previous attempts to use active coping for discrimination were unsuccessful (e.g., coworkers or friends being skeptical about experiences of discrimination), they may be demoralized and utilize passive coping strategies for chronic pain.

CONCLUSION

In summary, the findings of the current study indicate that the use of passive coping strategies is likely a mechanism helping account for the relationship between pain intensity and pain interference for Black veterans with chronic pain. The findings also suggest the role of pain self-efficacy as a moderating factor that weakens the negative effects of passive coping. Future research should investigate these relationships in more controlled studies, assess pain coping strategies and other constructs differently, and replicate the paradigm with other populations (e.g., non-veterans). This may contribute to interventions that improve functioning by targeting coping strategies and pain self-efficacy.

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APPENDIX A: MEASURES

Brief Pain Inventory

These next set of questions are about your pain. Please rate how often you experience your pain on a scale ranging from 0 to 10, with 0 meaning no pain and 10 meaning pain as bad as you can imagine.

	0-----10 <i>No Pain</i> <i>Pain as bad as you can imagine</i>										
BPI 1) Please rate your pain by circling the one number that best describes your pain at its <u>worst</u> in the last 24 hours.	0	1	2	3	4	5	6	7	8	9	10
BPI 2) Please rate your pain by circling the one number that best describes your pain at its <u>least</u> in the last 24 hours.	0	1	2	3	4	5	6	7	8	9	10
BPI 3) Please rate your pain by circling the one number that best describes your pain on the <u>average</u> .	0	1	2	3	4	5	6	7	8	9	10
BPI 4) Please rate your pain by circling the one number that tells how much pain you have <u>right now</u> .	0	1	2	3	4	5	6	7	8	9	10

The following questions ask you to describe how, during the **last 24 hours**, pain has interfered with various things on a "0 to 10" scale, where 0 is "does not interfere" and 10 is "completely interferes"

In the last 24 hours, has pain interfered with your:

In the last 24 hours, has pain interfered with your:	0-----10 <i>Does not Interfere</i> <i>Completely interferes</i>										
BPI 5) General activity	0	1	2	3	4	5	6	7	8	9	10
BPI 6) Mood	0	1	2	3	4	5	6	7	8	9	10
BPI 7) Walking ability	0	1	2	3	4	5	6	7	8	9	10
BPI 8) Normal work (includes both outside the home and housework)	0	1	2	3	4	5	6	7	8	9	10
BPI 9) Relationships with other people	0	1	2	3	4	5	6	7	8	9	10
BPI 10) Sleep	0	1	2	3	4	5	6	7	8	9	10
BPI 11) Enjoyment of life	0	1	2	3	4	5	6	7	8	9	10

Measure 1: The Brief Pain Inventory (BPI)

Coping Strategies Questionnaire (CSQ)

Below is a list of things people have reported doing when they feel pain. For each activity, please indicate how much you engage in that activity when you feel pain. Rate how often you do the activity on a scale ranging from 0 to 6, with 0 meaning you never do that when you are experiencing pain and 6 meaning you always do it when you are experiencing pain. Use the numbers in between to describe variations between these extremes.

	When I feel pain...	0 -----3-----6						
		Never do	Sometimes do			Always do		
CSQ 1)	I think of things I enjoy doing	0	1	2	3	4	5	6
CSQ 2)	I just think of it as some other sensation, such as numbness	0	1	2	3	4	5	6
CSQ 3)	It's terrible and I feel it's never going to get any better	0	1	2	3	4	5	6
CSQ 4)	I don't pay any attention to it	0	1	2	3	4	5	6
CSQ 5)	I pray for the pain to stop	0	1	2	3	4	5	6
CSQ 6)	I tell myself I can't let the pain stand in the way of what I have to do	0	1	2	3	4	5	6
CSQ 7)	I do something active, like household chores or projects	0	1	2	3	4	5	6
CSQ 8)	I replay in my mind pleasant experiences in the past	0	1	2	3	4	5	6
CSQ 9)	I pretend it is not a part of me	0	1	2	3	4	5	6
CSQ 10)	I feel I can't stand it anymore	0	1	2	3	4	5	6
CSQ 11)	I ignore it	0	1	2	3	4	5	6
CSQ 12)	I try to think ahead, what everything will be like after I've gotten rid of the pain	0	1	2	3	4	5	6
CSQ 13)	I see it as a challenge and don't let it bother me	0	1	2	3	4	5	6
CSQ 14)	I do something I enjoy, such as watching TV or listening to music	0	1	2	3	4	5	6

Measure 2: The Coping Strategies Questionnaire (14-item version)

Pain Self-Efficacy Questionnaire (PSEQ)

Please rate how confident you are that you can do the following things at the present time, **despite the pain**. Please circle one number for each item, where 0 is not at all confident at all and 6 is completely confident.

Remember, this is not asking whether or not you have been doing these things, but rather **how confident you are that you can do them at the present time, despite the pain**.

	I am confident that:	<i>0-----6</i> <i>Not at all</i> <i>Completely</i> <i>Confident</i> <i>Confident</i>						
PSEQ 1)	I can enjoy things, despite pain.	0	1	2	3	4	5	6
PSEQ 2)	I can do most of the household chores (e.g. tidying-up, washing dishes, etc.).	0	1	2	3	4	5	6
PSEQ 3)	I can socialize with my friends or family members as often as I used to do, despite the pain.	0	1	2	3	4	5	6
PSEQ 4)	I can cope with my pain in most situations.	0	1	2	3	4	5	6
PSEQ 5)	I can do some form of work, despite the pain. ("Work" includes housework, paid and unpaid work)	0	1	2	3	4	5	6
PSEQ 6)	I can still do many of the things I enjoy doing, such as hobbies or leisure activity, despite pain.	0	1	2	3	4	5	6
PSEQ 7)	I can cope with pain without medication.	0	1	2	3	4	5	6
PSEQ 8)	I can still accomplish most of my goals in life, despite pain.	0	1	2	3	4	5	6
PSEQ 9)	I can live a normal lifestyle, despite the pain.	0	1	2	3	4	5	6
PSEQ 10)	I can gradually become more active, despite pain.	0	1	2	3	4	5	6

Measure 3: The Pain Self-Efficacy Questionnaire (PSEQ)