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Cultural dimensions of individualism and collectivism and risk of opioid misuse: A test of Social Cognitive Theory

Shin Ye Kim[1] | Sung Yong Park[2] | Babetta Mathai[3] |
Jacob Daheim[4] | Christopher France[5] | Betsaida Delgado[4]

[1]Department of Counseling Psychology, University of Wisconsin-Madison, Madison, Wisconsin, USA

[2]Department of Psychology, Keimyung University, Daegu, South Korea

[3]Department of Clinical and Health Psychology, University of Florida Health Science Center, Gainesville, Florida, USA

[4]Department of Psychological Sciences, Texas Tech University, Lubbock, Texas, USA

[5]Department of Psychology, Ohio University, Athens, Ohio, USA

Correspondence
Shin Ye Kim, Department of Counseling Psychology, University of Wisconsin-Madison, 309 Education Bldg, 1000 Bascom Mall, Madison, WI 53706, USA.
Email: shinye.kim@wisc.edu

Abstract

Background: Despite the critical role social and cultural contexts play in pain experience, limited theoretical and empirical attention has been devoted to the interplay between social, cognitive, cultural, and psychological factors in chronic pain management and the risk of opioid misuse.

Methods: Using structural equation modeling, the present study tested the Social Cognitive Theory (SCT) of chronic pain management and risk of opioid misuse in the context of intraindividual cultural dimensions of individualism and collectivism among 316 ethnically diverse adults with chronic pain in the United States.

Results: Social cognitive predictors account for a significant amount of variance in pain dysfunction and risk of opioid misuse in adults with chronic pain. Satisfaction with pain support was positively associated with both greater pain acceptance and greater pain self-efficacy. Individualism was found to be positively associated with satisfaction with pain support, pain self-efficacy, and pain acceptance but negatively associated with the risk of opioid misuse.

Collectivism was positively associated with the risk of opioid misuse.

Conclusions: The study findings not only empirically support using SCT for adults with chronic pain, but also provide a more thorough conceptual framework that highlights the intracultural diversity and interplay among social, cognitive, and psychological factors that affect pain experience and the risk of opioid misuse among adults with chronic pain.

1 | INTRODUCTION

The US epidemic of opioid misuse has been a pervasive issue for more than 20 years, and as of 2016, it had claimed over 200,000 lives (Center for Disease Control, 2017). The risk of opioid misuse is especially salient for adults with chronic pain, as they consume more opioids than their peers with nonchronic pain (Blanco et al., 2016; McCabe et al., 2005). As America's costliest medical problem, chronic pain affects 100 million adults (Reid et al., 2015), and 21%–29% of people with chronic pain are reported to misuse their prescribed opioids (Vowles et al., 2015). Although the percentage is alarming, it is critical to note that chronic pain is a multidimensional health concern that affects people's physical, psychological, and social functioning (Edwards et al., 2016; Wideman et al., 2013), making each of these components important to consider within the *risk of opioid misuse* context. The chronic pain literature has historically emphasized biological factors, devoting less attention to psychological, social, and cultural factors (Edwards et al., 2016; Gaskin & Richard 2012). Similarly, public health initiatives on pain-related opioid misuse often focus on pharmaceuticals rather than the underlying psychosocial and cultural contributors.

Despite the critical role that cultural context plays in shaping pain experiences, limited theoretical and empirical attention has been devoted to potential cultural variations in the interplay among key psychosocial influences on chronic pain. Social Cognitive Theory (SCT; Bandura, 1986) is an influential conceptual framework often applied to the management of chronic health conditions, including chronic pain (Tougas et al., 2015). A central concept of SCT is triadic reciprocal determinism: behavior is understood as occurring in a social context with dynamic and reciprocal interactions among three factors—the individual, their environment, and their behavior (Bandura, 1986). With respect to the individual, pain self-efficacy and the positively related construct of pain acceptance have been repeatedly shown to be key cognitive influences on adaptation to chronic pain (Fish et al., 2013; Newton-John et al., 2014; Nicholas, 2007; Ruiz-Párraga & López-Martínez, 2014). With respect to the environment, the existence of pain-related social support, as well as satisfaction with such support, has been associated with lower pain intensity, less pain interference, and the reduced risk of unsanctioned opioid use, all of which promote a better quality of life (Bernardes et al., 2017; Cooper et al., 2018; Hoffman et al., 2013; Meghani & Knafl 2016; Roberts et al., 2015).

While a few studies have examined triadic relations among pain self-efficacy, acceptance, social support, and pain-related outcomes (Ryan & McGuire 2016), this interplay has not been examined within a cultural environmental context to date. Identifying the role that culture plays in human behavior is one of the more important, yet challenging, elements of SCT due to the cultural embeddedness of human functioning

(Bandura, 2002). One of the most widely used cultural dimension is the individualism–collectivism framework (Triandis, 1996), which provides information on how people have integrated themselves into society (focus on self vs. group cohesiveness). Indeed, the individualism–collectivism construct is "perhaps the most important dimension of cultural differences in social behavior across the diverse cultures of the world" (Triandis et al., 1988), as individualism and collectivism represent single dimensions that parsimoniously explain a large portion of the cultural impact (Kagitcibasi, 1997). According to SCT, an individual does not necessarily have primary control over external conditions and may look more broadly at the social and cultural environment to identify effective behaviors and beliefs (Bandura, 2001; Ng & Lucianetti, 2016). Social cognitive models assert that cultural influences, such as individualism and collectivism, shape efficacy beliefs and health-related outcomes as they provide supports, barriers, and learning experiences throughout one's life (Bandura, 2002; Brown & Lent, 2015). Thus, the individualism collectivism paradigm likely shapes pain self-efficacy, acceptance, social support, and pain-related outcomes. Previous literature suggests that individualism and collectivism contribute to differences in chronic pain experiences (Im, 2006; Im et al., 2009), substance use (Du et al., 2014), and other psychosocial and health outcomes (Kernahan et al., 2000; Scott et al., 2004). This literature, coupled with the documented impact of culture on human behavior, even within the SCT context (Bandura, 2002), is important to understand. How do these cultural factors of individualism and collectivism impact pain-related behaviors and outcomes? To address this important gap in the literature, the present study provides an initial test of a heuristic model of the interplay between social, cognitive, and cultural dimensions of individualism and collectivism in chronic pain. Theoretically framed by perspectives of the SCT and previous findings, we tested a model consisting of social cognitive, psychological, and cultural variables in the context of chronic pain and the risk of opioid misuse (Figure 1).

2 | METHOD

2.1 | Design

An online survey was used to reach a diverse sample of self-identified adults with chronic pain. Participants were asked to describe their pain and answer several standardized questionnaires that assessed their risk for opioid misuse, pain dysfunction, pain self-efficacy, pain acceptance, individualism, collectivism, and pain-related support.
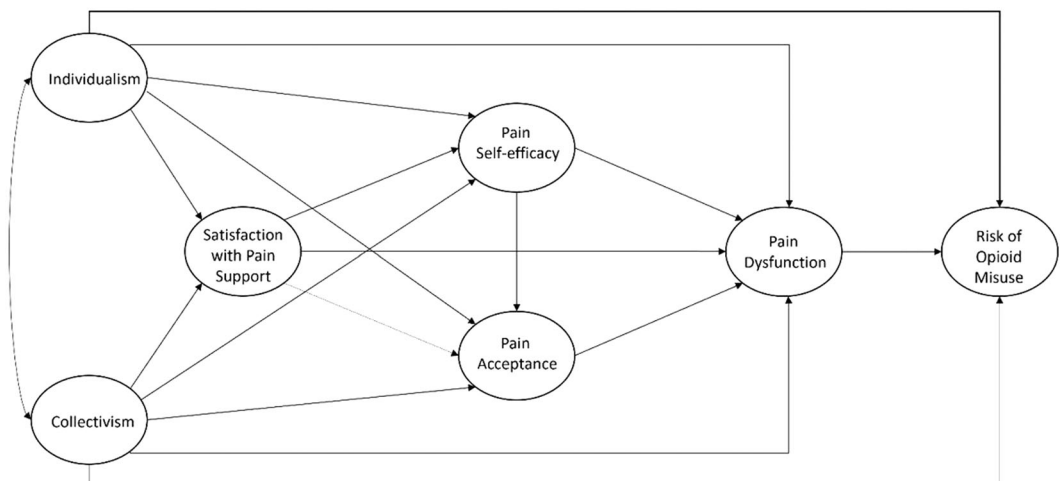

FIGURE 1 Hypothesized social cognitive pain model of risk of opioid misuse for chronic pain patients

2.2 | Procedures

After obtaining IRB approval, this study recruited participants using Amazon Mechanical Turk (MTurk), an online crowdsourcing platform. To be included, prospective participants were required to confirm that they (a) are adults with chronic pain, (b) currently reside in the United States, (c) experience pain on 4 or more days per week for at least 3 months, (d) report their usual pain intensity as at least a 4 on a 0–10 scale, and(e) had at least a 95% approval rating for their previous work on MTurk. The study was described to prospective participants as a survey on how individuals perceive and respond to physical discomfort. Participation was voluntary and anonymous. Informed consent was obtained at the beginning of the survey and each participant was paid $1 for its completion.

2.3 | Measures

2.3.1 | Satisfaction with pain support

To assess satisfaction with pain support, participants responded to the six-item Social Support and Pain Questionnaire (SSPQ; Van der Lugt et al., 2012). Item responses (e.g., "When I am in pain, I am satisfied with how much care I receive") were rated on a 5-point Likert scale (1 = *Very dissatisfied* to 5 = *Very satisfied*). The responses were averaged to derive an overall score, with a higher score indicating greater levels of satisfaction with their social support when in pain. In samples of adults with pain that included Chinese chronic pain adults, SSPQ scores had good convergent validity with general social support and good reliability (Cronbach's α = 0.70; He & Wang, 2017; Van der Lugt et al., 2012). Cronbach's α was 0.83 in the current study.

2.3.2 | Pain self-efficacy

Participants' pain self-efficacy was measured using the 10-item Pain Self-Efficacy Questionnaire (PSEQ; Nicholas, 2007). Participants indicated their level of confidence on a 6-point scale (1 = *Not at all confident* to 6 = *Completely confident*). Sample items included "I can enjoy things, despite the pain," as well as "I can cope with my pain in most situations." Item responses were averaged to derive an overall score with a higher score indicating stronger self-efficacy beliefs. In the original study, the PSEQ correlated negatively with the effect of pain on daily life, mood, and medications used (Nicholas, 2007). Among a sample with over 15% racial/ethnic minorities, the scale demonstrated excellent internal consistency (Cronbach's α = 0.95) with higher scores significantly correlate with character strengths and functionality (Graziosi et al., 2022). In another study with participants experiencing chronic lower back pain, the PSEQ yielded a Cronbach's α of 0.92 and good convergent validity with other types of self-efficacy (Mann et al., 2017). In the present study, items had a Cronbach's α of 0.89.

2.3.3 | Pain acceptance

Pain acceptance was measured using the 20-item Chronic Pain Acceptance Questionnaire (CPAQ; McCracken et al., 2004). Participants responded to items on a 7-point scale (1 = *Never true* to 7 = *Always true*). Item responses were summed to derive an overall score, with a higher score indicating greater acceptance of one's pain. CPAQ scores have been found to be negatively associated with pain interference, social support, depression, and daily functioning in samples of adults with chronic pain (McCracken et al., 2006; Rovner et al., 2015). Furthermore, CPAQ items yielded a Cronbach's α of 0.82, demonstrating good reliability (McCracken et al., 2006). Among an ethnically diverse sample (i.e., 8.8% African American, 6.9% Hispanic, 6.5% Asian American, and 1.2% Native American), the

scale demonstrated adequate reliability (α = 0.78–0.82; Gagnon et al., 2014). In the current study, Cronbach's α for CPAQ was 0.94, indicating excellent internal consistency.

2.3.4 | Pain dysfunction

Participant's pain dysfunction was assessed using the 6-item Pain Interference Item Short Form (PROMIS; Amtmann et al., 2010) and the four-item Pain Frequency, Intensity, and Burden Scale (P-FIBS; Dela Cruz et al., 2014). The PROMIS uses a 6-point scale (1 = *Not at all* to 6 = *Very much*) while the P-FIBS uses a 9-point scale (1 = *Never* to 9 = *Everyday*). Sample items included "How much did pain interfere with your enjoyment of life?" (PROMIS) and "How much did pain interfere with your daily life in the past week?" (P-FIBS). All item responses were summed to derive an overall score, with a higher score indicating greater pain dysfunction. PROMIS and P-FIBS scores have been found to be negatively associated with physical health and overall functioning during pain. The scale exhibited excellent internal consistency with Cronbach's α = 0.90 (Amtmann et al., 2010; Dela Cruz et al., 2014). Among an ethnically diverse sample (i.e., 19.6% Hispanic, 17.1% Asian/Pacific Islanders, 21% Black), the PROMIS's Pain Interference scale demonstrated excellent reliability with a Cronbach's α above 0.90 and low differential item functioning across diverse sociodemographic groups (Teresi et al., 2016). Similarly, among an ethnically diverse sample (i.e., 43% Black, 10% Hispanic, 4% Others), P-FIBS demonstrated excellent internal consistency (α = 0.90) with scores highly correlated with other measurements of pain and medication use (Dela Cruz et al., 2014). Cronbach's α for PROMIS and P-FIBS in the present sample was 0.84 and 0.79, respectively.

2.3.5 | Risk of opioid misuse

To assess the risk of opioid misuse, participants responded to the 14-item Screener & Opioid Assessment for Patients with Pain (SOAPP; Akbik et al., 2006). Participants indicated their level of agreement with the statements ("How often do you smoke a cigarette within an hour after you wake up?") on a 5-point Likert-type scale (1 = *Never* to 5 = *Very often*). Item responses were added together to obtain an overall score, with a higher score indicating a greater risk of opioid misuse. In samples of adults with pain, SOAPP scores were found to be positively associated with the use of prescription pain relievers, pain reliever dependence, pain interference, and aberrant drug behavior (Butler et al., 2008; Elander et al., 2014). The SOAPP also demonstrated good reliability in a sample of individuals with chronic pain (Cronbach's α = 0.88; Butler et al., 2008). SOAPP items yielded a Cronbach's α of 0.96 in the present study.

2.3.6 | Individualism and collectivism

Participants' levels of individualism and collectivism were assessed using the 16-item Individualism & Collectivism Scale (ICS; Triandis & Gelfand, 1998). The ICS assesses individualism and collectivism via two eight-item subscales, in which participants respond to items ("It is important that I do my job better than others") on a 9-point scale (1 = *Never/definitely no* to 9 = *Always/definitely yes*). Item responses were summed to derive individualism and collectivism scores, with higher scores for each subscale indicating greater individualistic or collectivistic tendencies. ICS items also yielded good internal consistency in the diverse sample (Triandis et al., 1988; Triandis & Gelfand, 1998). In the current study, Individualism and Collectivism yielded a Cronbach's α of 0.87 and 0.92, respectively.

2.3.7 | Control variables

To clarify the relations between the latent variables above, we controlled for age, gender, race, and pain intensity as covariates. Pain intensity was measured with a 10-point Likert item (*what was the usual intensity of your pain in the past week*).

2.3.8 | Item parceling and model retention criteria

To reduce the complexity of the model, we created item parcels as indicators of latent factors in the analysis using the average scores of subsets instead of individual items. The average scores of pain frequency, burden, and interference items were used to measure the latent construct of pain dysfunction. Each of the other seven latent constructs were indicated by the average scores of three parcels of two–seven items, using the item-to-balance approach presented by T. D. Little et al. (2002). For instance, items were first ranked based on their factor loadings (highest to lowest) derived from the principal axis factor analyses. In total, 20 indicators represented seven constructs tested in the model.

To assess model fit, three fit indices were used to supplement the χ^2 test, including the comparative fit index (CFI) as an incremental fit, standardized root-mean-square residual (SRMR) as an absolute fit index, and root-mean-square error of approximation (RMSEA) as an indicator of parsimonious fit. The adequacy of the model was evaluated using Hu and Bentler's (1999) two-joint criteria: CFI ≥ 0.96 and SRMR ≤ 0.09, or RMSEA ≤ 0.06 and SRMR ≤ 0.09. Models meeting either of the two-index joint criteria was deemed an excellent fit and was retained.

2.4 | Statistical analyses

The data was examined for missing cases, outliers, and overall distribution. Overall, there were 217 missing values across 76 items and 316 survey respondents, indicating a very low percentage (0.9%) in missing values. A nonsignificant Little's Missing Completely at Random (MCAR) test (R. J. A. Little & Rubin, 1987), χ^2 (4559) = 4564.320, p = 0.475, indicated a MAR or MCAR pattern. Full information maximum likelihood estimation was implemented to handle missing values, which has been shown to produce less biased parameter estimates and standard errors compared to other missing value handling methods (listwise or pairwise deletion) under the MAR or MCAR patterns (Muthén et al., 1987). Mardia's (1970) normalized coefficients of multivariate normality were statistically significant (p < 0.001), suggesting the absence of multivariate nonnormality in the data. Therefore, a maximum likelihood estimator with robust standard errors (using the MLR estimator in Mplus) and a mean adjusted statistic (Satorra–Bentler scaled chi-square; $S–B\ \chi^2$) were used to better approach χ^2 under nonnormality (Satorra & Bentler, 1994). All model variables fulfilled assumptions of univariate normality, with skewness and kurtosis values lower than ±1, except for risk of opioid misuse (kurtosis = −1.03). Next, variance inflation factors (VIF) and tolerance statistics were examined to assess multicollinearity within measured variables. As a results, the VIF ranges from 1.65 to 6.20, and the tolerance ranges from 0.16 to 0.61. Thus, we concluded that multicollinearity was not a serious issue in our data (Kline, 2011). All subsequent analyses were conducted in Mplus 8.0 (Muthén et al., 2016).

2.5 | Power analysis

Given the framework by MacCallum et al. (1996), minimum required sample size analyses using RMSEA as an unstandardized effect size were conducted based on a Type I error of 0.05 (one-tail), *df* of 152 for the hypothesized pain model, and 80% statistical power. As a small effect size (ϵ), a null value of ϵ_0 ≥ 0.06 was accepted because 0.06

is the cutoff value for model retention in this study. As a result, minimum required sample sizes under these conditions were 92 ($\mathcal{E}_1 = 0$), 95 ($\mathcal{E}_1 = 0.01$), 107 ($\mathcal{E}_1 = 0.02$), 134 ($\mathcal{E}_1 = 0.03$), 205 ($\mathcal{E}_1 = 0.04$), and 534 ($\mathcal{E}_1 = 0.05$). Thus, the current sample size of 316 participants provides adequate power to test the hypothesized latent structural model for all effect sizes except for the small one ($\mathcal{E}_1 = 0.05$).

3 | RESULTS

3.1 | Sample characteristics

Consistent with prior MTurk studies, a validity check was instilled through the inclusion of four attention-filter items throughout the survey (Please select "strongly agree"). Excluding the 1876 participants who failed to pass all four check items, a total of 475 individuals completed the survey. However, 147 people could not be included as they did not meet the established criteria for chronic pain (Dahlhamer et al., 2018; Vowles et al., 2018) that included experiencing pain 4 or more days per week for at least 3 months or more in which the pain's usual intensity was at least a 4 on a 0–10 scale. Finally, based on the recommendations given by Schlomer et al. (2010), six participants with more than 10% missing responses were removed from the analyses testing the hypothesized model.

These procedures resulted in a final sample of 316 participants (223 males, 93 females) with self-reported chronic pain who ranged in age from 20 to 75 years (M = 31.3, SD = 9.20, Mdn = 29.0). Because of missing demographic data, some subsequent percentages may not sum to 100%. Participants identified themselves as White (35.1%), Asian American (34.2%), African American (19.6%), Latinx (5.4%), American Indian/Alaska Native (4.1%), and multiracial (0.6%). In terms of relationship status, 47% reported as being *married*, approximately 20% reported as *currently in a relationship*, and 34% identified as *single*. Regarding employment status, 80.4% reported that they work full-time, 8.7% work part-time, 2.1% reported as retired, and 6.6% as unemployed.

The average pain intensity rating (0–10 scale, 10 = worst pain) for participants during the previous week was 7.55, and the pain episodes began 3 or more months ago for all participants. Seventy percent of participants reported consuming prescribed pain medicine within the past 30 days. Although not an inclusion criterion, this finding was not surprising given the high rates of analgesic use in the chronic pain population (Onishi et al., 2017). Participants stated that their use varied within the past 30 days, including once or twice (22.4%), approximately once a week (30.9%), more than once a week (30.9%), nearly every day (12.6%), and every day (3.1%). Of these, 13.9% reported using opioids not prescribed to them within the past 30 days.

3.2 | Testing the measurement model

To test the model shown in Figure 1, a two-step structural equation modeling approach was implemented. Step 1 involved examining the measurement portion of the model in which each of the 20 indicators loaded on their corresponding latent factors and all seven latent factors could covary freely with each other. The results showed satisfactory fit of the measurement model to the data: S–B χ^2 (149) = 249.044, $p < 0.001$; CFI = 0.977, SRMR = 0.029, RMSEA = 0.046 [0.036, 0.056]. As shown in Table 2, all standardized factor loadings were significant ($p < 0.001$) and ranged from 0.68 to 0.95. In addition, composite reliability (CR) and average variance extracted (AVE) were used to evaluate the reliability and convergent validity of the constructs. The CR coefficients (0.72–0.96) and AVE coefficients (0.57–0.89) of all constructs exceeded the cut-off values (0.7 and 0.5, respectively) recommended by Hair et al. (2010). These results provided initial evidence for the convergent validity of the indicators (Satorra & Bentler 2001). Regarding nomological validity, all latent variables were significantly correlated with each other ($p < 0.001$) in expected directions (Table 1). Thus, all indicators of latent variables

TABLE 1 Summary of intercorrelations, means, SDs, and ranges for scores on all variables

Variable	1	2	3	4	5	6	7	M	SD	Range
1. Satisfaction with pain support	1							3.60	0.72	1–5
2. Pain self-efficacy	0.53	1						4.33	0.84	1–6
3. Pain acceptance	0.62	0.70	1					4.85	0.96	1–7
4. Pain dysfunction	−0.39	−0.28	−0.57	1				3.24	0.92	-
5. Risk of opioid misuse	−0.43	−0.38	−0.58	0.48	1			2.94	1.07	1–5
6. Individualism	0.55	0.70	0.78	−0.45	−0.51	1		6.41	1.47	1–9
7. Collectivism	0.53	0.65	0.70	−0.39	−0.37	0.79	1	6.56	1.53	1–9

Note: Higher scores are indicative of more extreme responses in the direction of the latent variable. Pain dysfunction is a composite of pain frequency and burden (range = 1–9) and pain interference (range = 1–6). All values of correlation coefficients were significant ($p < 0.01$).

$n = 316$.

3.3 | Testing the structural model: The influence of individualism and collectivism

As depicted in Figure 1, Step 2 involved testing the hypothesized structural relations between the seven latent constructs, including the four covariates of age, gender, race, and pain intensity (not shown in Figure 1), which yielded good fit to the data, $S–B \chi^2$ (213) = 389.543, $p < 0.001$; CFI = 0.963, SRMR = 0.085, RMSEA = 0.051 [0.043, 0.059]. An alternative model containing a direct path from satisfaction with pain support to risk of opioid misuse was also tested. It also had an excellent fit to the data, $S–B \chi^2$ (212) = 385.746, $p < 0.001$; CFI = 0.964, SRMR = 0.083, RMSEA = 0.051 [0.043, 0.059]. Compared to the hypothesized model, the scaled difference chi-square test statistic, as proposed by Satorra and Bentler (2001), showed a nonsignificant difference between the hypothesized and alternative models, $S–B \chi^2_{diff}$ (1) = 3.5149, $p = 0.061$. Therefore, the more parsimonious model with the hypothesized structure was retained.

As shown in Figure 2, consistent with theoretical predictions, satisfaction with pain support was positively related to pain self-efficacy ($\beta = 0.18$, $p < 0.05$) and pain acceptance ($\beta = 0.24$, $p < 0.01$). Pain self-efficacy was positively related to pain acceptance ($\beta = 0.19$, $p < 0.05$) although pain acceptance was negatively related to pain dysfunction ($\beta = −0.76$, $p < 0.001$) while pain dysfunction was positively related to risk of opioid misuse ($\beta = 0.35$, $p < 0.001$). The findings regarding cultural orientations were partially grounded in theoretical relations. Individualism was positively associated with pain self-efficacy ($\beta = 0.62$, $p < 0.001$) and pain acceptance ($\beta = 0.53$, $p < 0.001$); individualism was negatively related to the risk of opioid misuse ($\beta = −0.41$, $p < 0.05$). As expected, the two exogenous cultural variables correlated significantly with each other ($r = 0.87$, $p < 0.001$).

Contrary to theoretical expectations, neither satisfaction with pain support nor individualism yielded significant paths to pain dysfunction; individualism was not significantly associated with satisfaction with pain support. Pain self-efficacy was positively related to pain dysfunction rather than the expected negative association, and collectivism was not related significantly to all hypothesized variables. The model accounted for 41.8%, 65.3%, 76.5%, 59%, and 56.6% of the variances in satisfaction with pain support, pain self-efficacy, pain acceptance, pain dysfunction, and risk of opioid misuse, respectively.

TABLE 2 Summary of factor loadings of observed variables for measurement model, CRs, AVEs, and internal consistency estimates

Variable	Factor loading	SE	CR	AVE	α
Satisfaction with pain support			0.827	0.614	0.83
Parcel 1	0.79	0.03			
Parcel 2	0.77	0.03			
Parcel 3	0.79	0.03			
Pain self-efficacy			0.900	0.750	0.89
Parcel 1	0.90	0.01			
Parcel 2	0.84	0.02			
Parcel 3	0.86	0.02			
Pain acceptance			0.943	0.847	0.94
Parcel 1	0.92	0.01			
Parcel 2	0.94	0.01			
Parcel 3	0.90	0.01			
Pain dysfunction			0.722	0.567	n/a
Pain frequency and burden	0.68	0.05			0.79
Pain interference	0.82	0.04			0.84
Risk of opioid misuse			0.961	0.892	0.96
Parcel 1	0.95	0.01			
Parcel 2	0.95	0.01			
Parcel 3	0.94	0.01			
Individualism			0.890	0.730	0.87
Parcel 1	0.86	0.02			
Parcel 2	0.85	0.02			
Parcel 3	0.85	0.02			
Collectivism			0.927	0.808	0.92
Parcel 1	0.90	0.02			
Parcel 2	0.91	0.01			
Parcel 3	0.89	0.02			

Note: All factor loadings are statistically significant at the $p < 0.01$ level.

Abbreviations: AVE, average variance extracted; CR, composite reliability.

3.4 | Significance of indirect effects on pain-related outcomes

To test the indirect effects associated with pain dysfunction and opioid use, 10,000 bootstrap random samples from the original data were generated to calculate indirect effect estimates, their standard errors, and bias-corrected 95% confidence intervals (CIs). As shown in Table 3, pain self-efficacy and acceptance mediated the link of satisfaction with pain support to pain dysfunction and the risk of opioid misuse. Next, we tested indirect effects to
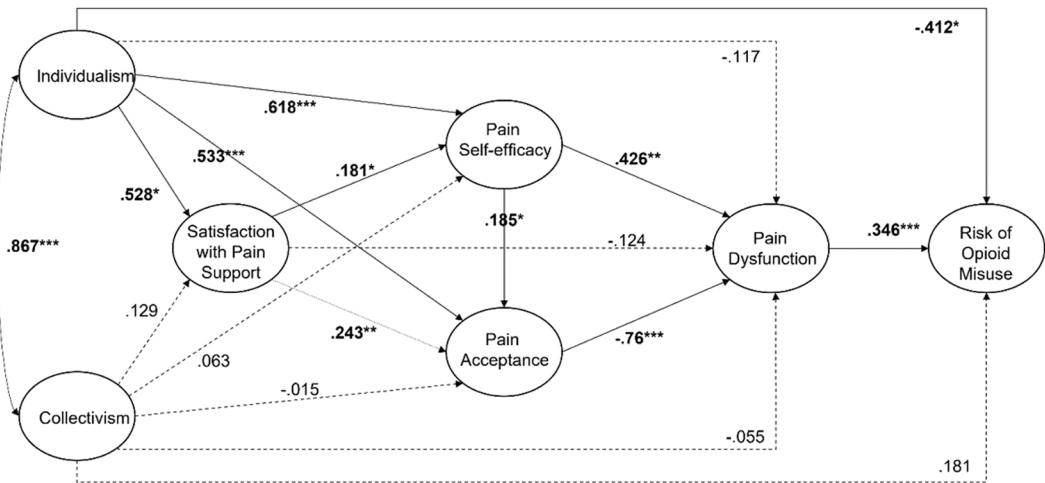
FIGURE 2 Social cognitive pain model of risk of opioid misuse for chronic pain patients. Solid lines represent significant paths, and dotted lines indicate nonsignificant paths. *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

facilitate an in-depth understanding of the relationships between cultural orientations and pain-related outcomes in the hypothesized model. As a result, individualism but not collectivism, had indirect effects on pain dysfunction through pain self-efficacy and the pathway that included satisfaction with pain support and self-efficacy. Likewise, pain acceptance mediated the relation between individualism and pain dysfunction while also representing another channel for satisfaction with pain support to exert its effects on pain dysfunction. Furthermore, the pain self-efficacy/pain acceptance link mediated the effect of individualism on pain dysfunction. Pain-related acceptance also mediated the effects of pain self-efficacy on pain dysfunction. The pattern of indirect effects on the risk of opioid misuse was shown to be the same as that for pain dysfunction. Only individualism had an indirect effect on the risk of opioid misuse, which was filtered by personal variables and its link to pain dysfunction. Inconsistent with the indirect effects on pain dysfunction, the mediating mechanisms in those pathways included satisfaction with pain support. Overall, the results revealed that social-cognitive predictors (e.g., satisfaction with pain support and self-efficacy) and the psychological variable of pain acceptance served primarily as mediators and supported the effects of cultural orientation (mostly individualism) on pain-related outcomes.

4 | DISCUSSION

The current study adds to SCT in the domain of chronic pain and risk of opioid misuse and extends it by simultaneously investigating social, cognitive, cultural, and psychological factors in a racially diverse sample of chronic pain patients in the United States. Generally, the tested model fit the data well and expands the chronic pain and risk of opioid misuse literature by highlighting relations among cultural dimensions of collectivism and individualism, pain-related support, pain self-efficacy, pain acceptance, pain dysfunction, and risk of opioid misuse among adults with chronic pain. Thus, it presents a useful framework for explaining the risk of opioid misuse among chronic pain patients.

One of the most interesting findings involves individualism and collectivism, pain variables, and risk of opioid misuse. Individualism was found to be positively associated with satisfaction with pain support, pain self-efficacy, and pain acceptance, but negatively associated with the risk of opioid misuse. This result is consistent with the existing literature that reports that highly individualistic adults tend to have greater willingness to seek out pain

TABLE 3 Bootstrap analysis of statistical significance of indirect effects

IV and mediator	DV	B (mean indirect effect)	SE of mean	95% CI mean indirect effect
IND- > PSE	DYSF	0.167	0.090	[0.043, 0.415]
IND- > ACCEPT	DYSF	−0.257	0.130	[−0.599, −0.097]
IND- > PSE- > ACCEPT	DYSF	−0.055	0.037	[−0.175, −0.010]
IND- > SUPPORT- > PSE	DYSF	0.026	0.025	[0.002, 0.123]
IND- > SUPPORT- > ACCEPT	DYSF	−0.062	0.040	[−0.192, −0.013]
SUPPORT- > PSE	DYSF	0.103	0.069	[0.010, 0.294]
SUPPORT- > ACCEPT	DYSF	−0.246	0.117	[−0.543, −0.071]
SUPPORT- > PSE- > ACCEPT	DYSF	−0.034	0.030	[−0.136, −0.002]
PSE- > ACCEPT	DYSF	−0.148	0.088	[−0.381, −0.019]
IND- > PSE- > DYSF	Opioid misuse	0.067	0.039	[0.014, 0.174]
IND- > ACCEPT- > DYSF	Opioid misuse	−0.103	0.058	[−0.252, −0.031]
IND- > PSE- > ACCEPT- > DYSF	Opioid misuse	−0.022	0.017	[−0.081, −0.003]
IND- > SUPPORT- > PSE- > DYSF	Opioid misuse	0.010	0.010	[0.001, 0.051]
IND- > SUPPORT- > ACCEPT- > DYSF	Opioid misuse	−0.025	0.019	[−0.090, −0.004]
SUPPORT- > PSE- > DYSF	Opioid misuse	0.041	0.030	[0.004, 0.131]
SUPPORT- > ACCEPT- > DYSF	Opioid misuse	−0.099	0.061	[−0.262, −0.019]
SUPPORT- > PSE- > ACCEPT- > DYSF	Opioid misuse	−0.014	0.014	[−0.066, −0.001]
PSE- > DYSF	Opioid misuse	0.181	0.078	[0.042, 0.353]
PSE- > ACCEPT- > DYSF	Opioid misuse	−0.059	0.043	[−0.186, −0.007]
ACCEPT- > DYSF	Opioid misuse	−0.300	0.135	[−0.616, −0.095]

Note: The 95% confidence intervals (CIs) that exclude zero refer to significant indirect effects ($p < 0.05$).

Abbreviations: ACCEPT, pain acceptance; DYSF, pain dysfunction; IND, individualism; Opioid misuse, risk of opioid misuse; PSE, pain self-efficacy; SUPPORT, satisfaction with pain-related support.

$n = 316$.

management strategies or formal treatment (Im, 2006; Im et al., 2009) and thus, engage in more adaptive pain coping, which leads to lower levels of opioid misuse risk. On the other hand, collectivism was not associated with satisfaction with pain support, pain self-efficacy, pain acceptance, or risk of opioid misuse. One potential question is whether personal identification with cultural identity is incongruent with the cultural orientation of where the person lives. Some literature supports the idea that congruency between a person's cultural orientation and the cultural orientation of the society in which the person lives has been associated with more positive mental and physical health outcomes (Caldwell-Harris & Aycicegi 2006; Johnson, 2007). As the present sample was recruited from the individualistically oriented United States, it is possible that those who identified with a more individualistic orientation would be more likely to have more positive outcomes. Exploring these relations in samples collected from collectivistic-oriented regions are important to confirm findings. However, it is noteworthy that other research suggests the influence of the collectivism–individualism paradigm remains largely consistent regardless of an individual's congruency (Lin et al., 2017; Oyserman & Lee, 2008), positing that findings should remain consistent

across cultures. Furthermore, these findings warrant additional studies because they could provide practical suggestions for designing effective interventions for adults with chronic pain with different cultural orientations.

Surprisingly, pain self-efficacy was also positively associated with pain dysfunction. This finding goes against a large body of research and theory that posits increased confidence in one's ability to complete necessary tasks while in pain (pain self-efficacy) is associated with reduced pain dysfunction, as individuals are more likely to engage in necessary treatment and coping strategies (Jackson et al., 2014). This counterintuitive finding could be a statistical anomaly as there is evidence of a suppression effect. That is, the zero-order correlations between pain self-efficacy and pain dysfunction revealed a negative association. However, in the final model, pain self-efficacy positively predicted pain dysfunction, indicating that as confidence in one's ability to cope with pain increased, the self-reported effect of the pain on daily functioning increased. In essence, the pain was noted as becoming worse. This effect was specifically noted when considering the indirect effect of individualism on pain dysfunction. In other words, when the final model accounted for individualism, pain self-efficacy and pain dysfunction became positively associated, indicating a suppression of the effect (Kline, 2011). Those who were high on individualism also reported higher levels of pain self-efficacy, which was also related to high pain dysfunction. Although this may seem counterintuitive, the characteristics of individualism might explain this result. People with greater levels of individualistic orientation are often thought to feel greater levels of autonomy and sense of control (Devins et al., 2009), which could extend to control over their pain. Taken together, it is possible that in some situations, pain self-efficacy may be a risk factor for pain dysfunction. However, it appears that high individualism may be a protective factor within the context of pain, specifically against the problematic nature of pain dysfunction (Devins et al., 2009), such that individuals can maintain high self-efficacy in spite of reporting high pain dysfunction. These counterintuitive findings and explanations highlight the need for further studies.

One of the theoretical objectives of this study was to apply SCT to chronic pain management and the risk of opioid misuse. Our results generally support previous studies linking social-cognitive variables to chronic pain management (Kalapurakkel et al., 2015) and the risk of opioid misuse (Cooper et al., 2018). To date, neither the roles of social supports and cultural orientation nor the link between pain dysfunction and the risk of opioid misuse has been thoroughly examined in both theoretical and empirical SCT literature. This study supports the inclusion of pain-related *social support* and *cultural orientation* as critical contextual factors when examining adults with chronic pain in a SCT framework, which points to the importance of intentional discussion of such factors when assessing and treating pain among adults with chronic pain with opioid use. In summary, the results of our study substantially expand the chronic pain management and opioid use literature by highlighting the interplay between critical social cognitive and cultural variables that are associated with adaptive psychological processes in pain management.

The present findings should be considered in light of several limitations. Although MTurk allowed us to reach a diverse sample of self-identified adults with chronic pain, the sample consisted mostly of young to middle-aged adults with chronic pain; the age group expected to be most familiar with online study recruitment. Due to this limitation, the relations found among cultural orientation, pain-related variables, and risk of opioid misuse may need to be re-examined in older populations to increase support for the associations. Furthermore, although the use of MTurk likely allowed us to sample diverse types of adults with chronic pain from different specialty clinics, we did not verify reported chronic pain diagnoses (Tompkins et al., 2016). An additional limitation is that while most of the scales used in this study were validated across diverse ethnic and racial groups, the risk of opioid misuse scale was used in studies with predominantly White samples (over 80%; Akbik et al., 2006). Notably, there are studies that did not include the racial/ethnic demographic makeup of the sample in pain studies using scales used in the current study. Future studies dedicated to examining and reporting the psychometric information of these scales among racially diverse people with chronic pain are urgently needed. Additionally, the cross-sectional nature of the study allowed us to analyze only correlational data; therefore, no causal or temporal associations could be drawn from the results. While more valid findings can be generated using longitudinal methodology, sequential mediation models are considered as a "low-cost" option for researchers who aim to maximize power with constraints on resources, time, and availability and generosity of research participants (Cain et al., 2018; Hayes, 2013, p.18). Future research

is needed to test alternative models to examine whether the direct and indirect effects in the current model are consistent with alternative order of variables. Lastly, data were also self-reported and retrospective, therefore, subject to recall bias.

Despite these limitations, the current study has notable strengths and implications for research and practice. Perhaps most importantly, this was the first study to test the SCT of pain dysfunction and the risk of opioid misuse in adults with chronic pain in the context of intraindividual cultural dimensions of individualism and collectivism. As such, the findings not only extend empirical support for using SCT in the pain and risk of opioid contexts, but also provide a more thorough conceptual framework that includes relevant cultural, social, cognitive, and psychological factors that influence adults with chronic pain. Using multiple mediation, we were able to investigate to what extent specific sociocognitive variables mediate the effect of individualism and collectivism on pain outcomes. Accordingly, the present study contributes to the development of culturally informed and theory-driven interventions that can be tailored to people with diverse intraindividual cultural orientations.

AUTHOR CONTRIBUTIONS

Shin Ye Kim, Sung Yong Park, and Christopher France contributed to the conception and design of the study. Shin Ye Kim and Sung Yong Park performed the analyses and interpreted the data. Shin Ye Kim, Sung Yong Park, Babetta Mathai, Jacob Daheim, Betsaida Delgado, Christopher France drafted the article. All authors discussed the results, commented on the manuscript, and approved the final version of the article.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

ETHICS STATEMENT

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

ORCID

Christopher France ![ID] http://orcid.org/0000-0002-4723-0247

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