

10-31-2021

How Indonesians Cope with Chronic Pain: Does Seeking Help and Comfort from God Work?

Muthmainah Mufidah Gozan

Faculty of Psychology, Universitas Indonesia, muthmainah.mufidah81@ui.ac.id

Sali Rahadi Asih

Faculty of Psychology, Universitas Indonesia, sali.rahadi@ui.ac.id

Follow this and additional works at: <https://scholarhub.ui.ac.id/proust>

Recommended Citation

Gozan, Muthmainah Mufidah and Asih, Sali Rahadi (2021) "How Indonesians Cope with Chronic Pain: Does Seeking Help and Comfort from God Work?," *Psychological Research on Urban Society*: Vol. 4: No. 2, Article 4.

DOI: 10.7454/proust.v4i2.110

Available at: <https://scholarhub.ui.ac.id/proust/vol4/iss2/4>

This Original Research Paper is brought to you for free and open access by UI Scholars Hub. It has been accepted for inclusion in Psychological Research on Urban Society by an authorized editor of UI Scholars Hub.

How Indonesians Cope with Chronic Pain: Does Seeking Help and Comfort from God Work?

Psychological Research
on Urban Society
2021, Vol. 4(2): 38-51
© The Author(s) 2021
DOI: [10.7454/proust.v4i2.110](https://doi.org/10.7454/proust.v4i2.110)
proust.ui.ac.id

Muthmainah Mufidah Gozan^{1*}, Sali Rahadi Asih¹

Received: December 21st, 2020
Revision Accepted: October 17th, 2021

¹Faculty of Psychology, Universitas Indonesia

Abstract

Chronic pain is a significant health problem in many countries including Indonesia, with high prevalence and the possibility to increase in the future. Individuals experiencing chronic pain elicit cognitive and behavioral responses, including pain catastrophizing which can cause high pain interference. Effective coping ability can help reduce the impact of pain catastrophizing on pain interference. Previous research focused on emotion-focused and problem-focused coping in dealing with chronic pain. However, Indonesia as a country with a strong influence from religious values and practices encourages the exploration of positive religious coping. A part of a longitudinal study on psychological factors in chronic pain development, this study aimed to examine the moderating role of three coping styles on pain catastrophizing and pain interference associations. Results from 368 participants male and female with chronic pain showed that positive religious coping and problem-focused coping significantly moderated the effects of pain catastrophizing on pain interference. Seeking help from God helped individuals deal with chronic pain problems, as well as actively resolving difficulties. The use of these two coping styles in the Indonesian population can be useful for managing chronic pain.

Keywords

Pain Catastrophizing, Pain Interference, Positive Religious Coping, Emotion-focused Coping, Problem-focused Coping

A high prevalence of pain problems is found in Asian countries, where between 61 and 90% of the adult to elderly population were likely to experience pain problems (Zaki & Hairi, 2015). Based on the Indonesian General Health Research or Riset Kesehatan Dasar (Riskesdas, 2018), pain problems are a major feature in joint diseases, such as osteoarthritis, pain due to gout, and rheumatoid arthritis. Based on this research, the prevalence of joint disease in 2018 was around 7.30%. If the total population of Indone-

sia is estimated at 250 million, it means that more than 18 million Indonesians experienced pain, and most of the total population are at a productive age (25–40 years). This could be debilitating as pain problems compromise work productivity, such as work attendance and job performance (van Leeuwen, Blyth, March, Nicholas & Cousins, 2006). In line with this, the condition of pain in several parts of the body, especially the neck, back, and shoulders tend to cause workers to become easily tired and hampers their work (van Leeuwen, Blyth, March, Nicholas, & Cousins, 2006; Daneshmandi, Choobineh, Ghaem, Alhamd, & Fakherpour, 2017) thus affecting the overall quality of life and work performance.

Pain problems are predicted to increase in population terms in the near future (Zaki & Hairi, 2015), mainly due to changing lifestyles.

Corresponding Author:

Sali Rahadi Asih

Faculty of Psychology, Universitas Indonesia
Kampus Baru UI, Depok, West Java – 16424

Email: sali.rahadi@ui.ac.id

ORCID ID: <https://orcid.org/0000-0002-9377-3605>

Senba and Kami (2017) explained that the sedentary lifestyle, especially in urban areas, contributes to the emergence of pain, especially chronic pain. Del Giorno, Frumento, Varrassi, Paladini, and Coaccioli (2017) stated that living in an urban area is one of the most significant predictors of chronic pain problems. The fast-paced environments and multiple stressors of living in urban areas contribute to a higher level of pain. Increases in stressors from psychosocial factors and the environment have also been reported to create a hypersensitive stress response over time, which has the potential to affect and increase chronic pain (Maly & Vallerand, 2018). Sarla (2019) explained that the development and high use of technology for work, social interaction, and entertainment has also increased the possibility of pain problems. Pain problems in the neck, back, arms, and hands were predicted to have increased sharply due to sitting or a stiff position of the body for a long time while using technology (Sarla, 2019; Edwards et al., 2016; Njis et al., 2020). The greater need to use technology for higher education and work tasks in urban populations has increased the potential for physical inactivity which may contribute to the emergence of chronic pain (David et al., 2021; Torsheim et al., 2010).

Pain is a sensation felt by all people, which can function as a survival mechanism. It gives signs that a potential danger or problem may occur (Lumley & Schubiner, 2019). Pain is an unpleasant sensory and emotional experience associated with tissue damage or potential tissue damage (International Association for the Study of Pain [IASP], 2017). Pain is divided into two groups based on its duration, that is, acute pain (less than three months) and chronic pain (more than three months). Acute pain makes individuals more likely to be anxious, have negative thoughts, and experience disturbance in doing the activities of everyday life. Meanwhile, in chronic pain, the various negative effects are generally worse (Turk, Wilson, & Swanson, 2012) and carry a higher risk of experiencing other problems, both in terms of health and daily activities compared to individuals with acute pain. In most chronic pain problems, treatment and management take a long time and it is difficult for the individual to recover completely. This makes individuals with chronic pain considered in medical terms to be in a more difficult

and severe condition than individuals with acute pain (Ambrose & Golightly, 2015; Dysvik & Furnes, 2018). Individuals with chronic pain were most likely to experience psychological discomfort (Svanberg et al., 2017). Stress, fatigue, fear, worry, avoidance, catastrophization were the most relevant emotional distress, and also could lead to psychological problems such as anxiety and depression among people with chronic pain (Russell & Park, 2018). According to Reis et al. (2019), chronic pain also affects perception, attention, and sleep in daily life. This includes how they view themselves, their focus, and their ability to handle the pain (Leung, 2012). There is also a strong tendency to engage in thoughts concerning their pain and getting caught in a vicious circle of fear of pain, avoidance and hyper-vigilance, and disability (Basten-Günther, Peters, & Lautenbacher, 2019). Therefore, this research focused on the psychological aspects of chronic pain problems.

Chronic pain has a broad effect on various aspects of an individual's life (Reitsma, Tranmer, Buchanan, & Vandenkerkhof, 2011). On the health aspect, hypertension, asthma, and diabetes were more likely to arise in individuals with chronic pain (Mäntyselkä, Turunen, Ahonen, & Kumpusalo, 2003) as well as a decrease in muscle strength and the strength of the immune system (Gatchel et al., 2007). In social areas, individuals tend to be limited in leisure activities and social contact with other individuals (Goldberg & McGee, 2011) which leads to decreased involvement in family activities and problems in their roles (Dueñas, Ojeda, Salazar, Mico, & Failde, 2016). Chronic pain is also considered to be a complex problem as it affects financial aspects, such as paying medical bills, and perhaps not being able to work or gain income (Reitsma, Tranmer, Buchanan, & Vandenkerkhof, 2011). Even though urban areas have easier access to the health care system, financial problems still arise especially due to higher payment for health care. People who live in urban areas but with low levels of socioeconomic status were reported to have more negative experiences of pain (Maly & Vallerand, 2018).

Hirsh, Bockow, and Jensen (2011) found that chronic pain problems interfere with daily activities, mood, work, sleep, mobility, and relationships, elements described as pain interfer-

ence. Amtmann et al. (2010) explained that pain interference is the degree to which pain limits or interferes with individuals' physical, mental, and social activities. Individuals with high pain interference have the potential to experience several psychological problems. Various negative emotions such as sadness, fear, anxiety, and worry are generally felt when chronic pain interferes with various aspects of functioning. The existence of obstacles and difficulties makes them tend to have negative effects (Park & Sonny, 2010) and were found to be related to psychological disorders such as anxiety, insomnia, and depression (Arola, Nicholls, Mallen, & Thomas, 2010).

While experiencing chronic pain, individuals tend to assess their ability to deal with or tolerate their pain (Leung, 2012). Sullivan, Bishop, and Pirik (1995) explained this concept through the term pain catastrophizing, an exaggerated view of pain, feelings of helplessness when experiencing pain, and a person's inability to prevent bad thoughts about pain before, during, and after the pain experience. Miró, Raichle, Carter, et al. (2009) stated that pain catastrophizing is one of the important factors that influence individual functioning. Catastrophic thinking plays a role in increasing daily difficulties and stress. Hirsh, Bockow, and Jensen (2010) also found the link between pain catastrophizing and pain interference, where individuals with high pain catastrophizing tendencies continuously focused on the sensation of pain and an attendant negative evaluation, so that their functioning is further hampered. The higher the number of complaints and negative views on the ability to tolerate pain, the more the individual will feel the pain and disability. Based on these, the existence of coping strategies that can affect the impact of pain catastrophizing on pain interference is needed.

Folkman and Lazarus (1984) described two types of coping, emotion-focused coping (EFC) and problem-focused coping (PFC). Emotion-focused coping focuses on managing negative emotions that are felt in stressful situations (Dysvik, Natvig, Eikeland, & Lindstrøm, 2005). Meanwhile, problem-focused coping (PFC) focuses on finding alternative solutions in dealing with stressors and changes. When individuals use emotion-focused coping by trying to manage negative emotions due to pain, the emer-

gence of more positive emotions and conditions occurs and affects the negative thoughts related to pain, including pain catastrophizing (Sturgeon & Zautra, 2013). Individuals who managed their emotions tend to have a broader view of pain and the ability to manage it. This could reduce the tendency to narrow-minded thinking in pain catastrophizing (Algoe & Fredrickson, 2011), thereby minimizing the obstacles encountered in carrying out various activities (Sturgeon & Zautra, 2013). Meanwhile, in problem-focused coping, Sturgeon and Zautra (2013) explained that focusing on solutions to overcome the pain problem could lead to the ability to see and identify potential resources to reduce the chronic pain condition. It broadens the individual's way of thinking about the pain, helps them to be more flexible, more resilient in responding to the pain, and narrows the effect of pain catastrophizing. Biccheri, Roussiau, and Mambet-Doué (2016) noted that this coping style focused on making individuals active, and this encouraged productivity, self-maintenance, and perceiving difficulties as challenges, rather than a hindrance. From these explanations, both emotion-focused and problem-focused coping are moderators, reducing the impact of pain catastrophizing on pain interference.

Previous research was mostly done in the Western culture that focused on emotion-focused and problem-focused coping as effective coping strategies in dealing with chronic pain. However, Indonesia as a country imbued with religious values and practices encourages the exploration of positive religious coping. Referring to Rochmawati, Wiechula, and Cameron (2017), religious practices both individually and in groups are quite common in Indonesian society, including when someone has a disease or a health problem. These religious practices include prayers, playing music or singing religious songs, reading holy books and lectures, and making donations to religious communities, orphans, or poorer people (Permana, 2018; Marchira, Supriyanto, Soewadi, & Good, 2016). As stress and work pressures become inevitable through living in urban areas, Pandey and Singh (2019) found that intense religious practices buffer the negative psychological effects, especially for people in countries with strong cultural backgrounds such as Indonesia. Religious practices became a habit and helped people

form a strong connection with their support system. Boles (2012) also stated that people living in urban areas with health problems such as diabetes and other pains, have greater self-efficacy and showed improvement in their health when engaging in religious belief activities. From these explanations, it can be seen that it is important to consider the role of religious and spiritual elements in coping with chronic pain, that is, positive religious coping, in the Indonesian population, especially the urban population. Based on Pargament, Feuille, and Burdzy (2011), positive religious coping focuses on the perception that God and/or spiritual forces will help to deal with stressors, including pain stressors. Harris et al. (2018) explained that when individuals face challenges, individuals with positive religious coping find meaning in unpleasant situations. The individual believes that God's power is at work in making them strong facing the challenges caused by pain. This makes the impact of the negative impacts of pain catastrophizing on pain interference decrease.

This study aimed to examine the moderating role of two types of coping developed by Lazarus, namely emotion-focused and problem-focused coping, as well as a type of coping that was considered affinitive to the Indonesian society background, that is, positive religious coping, on pain catastrophizing and pain interference association in the Indonesian chronic pain population.

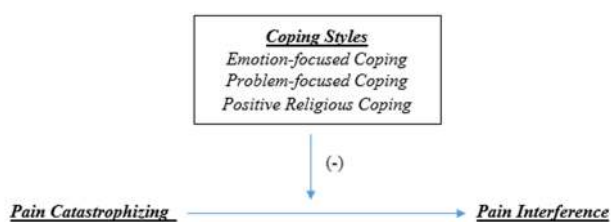


Figure 1

The Conceptual Model of Coping Styles as a Moderator in Pain Catastrophizing Effects on Pain Interference

Method

Participants

The inclusion criteria for the research participants were Indonesian, aged 18 years and above

with reported chronic pain (pain that lasts or recurs for more than three months). Type of chronic pain included headache, back pain, and muscle pain. We adopted the non-probability sampling method in the form of convenience sampling. Participants were recruited from two clinics: Klinik Surya Medika Kendal and Klinik Pratama Bunga Asih, and through online platforms. For almost two months participants were gathered to complete the questionnaire. The total number of participants was 368, with 73.6% female, a mean age of 35 years, and 64.9% were employed (office workers from 9 to 5 o'clock such as public sector workers, private-sector workers, and civil servants).

Measures

Pain Interference. Pain Interference was assessed using the 6-item Patient-Reported Outcome Measurement Information System (PROMIS) Pain Interference Short Form 6a. This measurement was developed by Amtmann et al. (2010) measuring the consequences of pain in various aspects of life. Individuals are asked to respond to how disturbing or affecting the pain they feel is in various activities and aspects of their life using a scale of 0 (not at all) to 4 (very disturbing) during the preceding 7 days. The total score that an individual may get is 0–24, where the higher the score obtained indicates the more disturbed or affected various aspects of the individual's life due to the pain experienced. In this study, the α coefficient was 0.93.

Pain Catastrophizing. Pain catastrophizing was assessed using the 13-item Pain Catastrophizing Scale (PCS) developed by Sullivan, Bishop, & Pivik (1995). It measures the catastrophizing tendency to deal with the pain experience. The measure uses a five-point Likert scale (0 = not at all to 4 = always) with total scores ranging from 0 to 52. Higher scores in this instrument reflect greater degrees of pain catastrophizing. In this study, the α coefficient for PCS was 0.94.

Emotion-focused and Problem-focused Coping. Emotion- and problem-focused coping were both dimensions derived from Carver's (1997) The Brief COPE questionnaire. The questionnaire used in this research was adapted to the Indonesian language and used a Likert scale of 1

(Never) to 4 (Always). The emotion-focused coping consists of 14 items (e.g., I've been getting emotional support from others) with a maximum score of 56. The emotion-focused coping dimensions focused on assessing an individual's way of dealing with stress by targeting and lowering the emotional pressure people felt. It consists of seven sub-dimensions, namely acceptance, humor, religion, venting, using emotional support, positive reframing, and self-blame. The α coefficient in this study for emotion-focused coping was 0.74. The problem-focused coping consists of 6 items (e.g., I've been taking action to try to make the situation better) and has a maximum score of 32. The problem-focused dimensions focused on measuring how people cope with stressful situations by finding alternative solutions and actions. The measurement consists of three sub-dimensions, namely active coping, planning, and using instrumental support. The α coefficient in this study for problem-focused coping was 0.75.

Positive Religious Coping. Positive religious coping was measured using the positive religious coping scale in The Brief RCOPE by Pargament, Feuille, dan Burdzy (2011) and adapted to the Indonesian language. The Cronbach's alpha for this study was 0.86. The measurement for the positive scale consists of 7 items (e.g., sought God's love and care) measuring strategies using a religious approach, believing that God will help the person dealing with major life stressors. This instrument used a four-point Likert scale ranging from 1 ("not at all") to 4 ("a great deal") and scores can range from a minimum of 7 to a maximum of 28. Positive religious coping has 5 dimensions, namely find meaning, gain control, gain comfort and closeness to God, gain intimacy with others, and achieve a life transformation.

Procedure

This study was approved by the Ethical Review Board of the Faculty of Psychology in the University of Indonesia and all participants agreed to the informed consent before the assessment began. This study was a part of a longitudinal study on psychological factors in chronic pain development. During the longitudinal study, participants completed questionnaires at four

points: At enrollment, 1-month follow-up, 2-month follow-up, and 3-month follow-up. This study focused on data collected at the first intake (enrollment). All questionnaires were completed through the online platform Google Forms. Participants completed questionnaires about their pain intensity, pain interference level, pain catastrophizing tendency, emotion-focused coping, problem-focused coping, positive religious coping, and other psychological factors used in the longitudinal research such as resilience, quality of life, anxiety, insomnia, and depressive symptoms. A total of two hundred randomized participants received a Rp 50,000.00 (Approximately \$3.5) reward afterward.

Data Analysis

Analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 25.0 for Windows. The Hayes' PROCESS macro was used to perform the moderated analysis (Hayes, 2017). The statistical significance levels for analyses used in this study were 0.05 and two-tailed. Descriptive analyses were conducted for sociodemographic variables and study measures. Means and standard deviations were calculated for continuous variables (age and study measures), as well as percentages for categorical variables (gender, age group, and education). Moderation process analysis was the highlight of this study. Moderation was performed to see the moderation effect of each emotion-focused, problem-focused, and positive religious coping on pain catastrophizing and pain interference associations. Pain intensity, gender, age, and negative religious coping were used as covariates in this process.

Results

Participants' Characteristics. Based on Table 1, of the total of 368 participants, most were female (73.6%), aged 18–35 years old (58.4%), married (57.9%), Muslim (87.5%), had an undergraduate degree (48.7%), and were employees (64.9%). Most of the participants reported a moderate pain intensity level and had chronic pain in their lower back area, muscle pain, and headache.

Pain Interference, Pain Catastrophizing, and Coping Styles. The average score for pain inter-

Table 1. Participants' Characteristics

	N	%
Gender		
Female	271	73.6
Male	97	26.4
Age		
18-35 years old (young adult)	215	58.4
36-55 years old (middle adult)	127	34.5
56-73 years (late adult-elderly)	26	7.1
Education		
High School and below	25	6.8
Undergraduate Degree	179	48.7
Postgraduate	164	44.6
Marital Status		
Married	213	57.9
Single	114	31
Divorced	23	4.9
Job		
Student	46	12.5
Employee	239	64.9
Housewife	66	17.9
Unemployed	17	4.6
Religion		
Islam	322	87.5
Christian	26	7.1
Catholic	12	3.3
Hindu	4	1.1
Buddha	3	0.8
Others	1	0.3
Pain Area*		
Back Pain	284	77.2
Hand & Feet Muscle	337	91.6
Headache	266	72.3
Pain Intensity		
Low	94	25.5
Moderate	206	56
High	68	18.5

*Each participant may experience chronic pain in more than one area of the body

Table 2. Score Range, Mean, and Standard Deviation of Pain Interference, Pain Catastrophizing, and Coping Styles

	Score Range	M	SD
Pain Interference	0-24	16.77	6.58
Pain Catastrophizing	0-52	26.52	12.28
Rumination	0-16	9.69	4.45
Magnification	0-12	6.58	3.65
Helplessness	0-24	10.3	6.17
Emotion-focused Coping	14-56	41.08	5.96
Positive reframing	2-8	6.72	1.26
Acceptance	2-8	6.88	1.14
Turning to religion	2-8	6.92	1.31
Emotional support	2-8	6	1.81
Venting	2-8	5.15	1.26
Humor	2-8	4.62	1.85
Self-blame	2-8	4.77	1.73
Problem-focused Coping	6-36	19.07	3.34
Active coping	2-8	6.83	1.27
Planning	2-8	6.41	1.33
Seeking instrumental support	2-8	5.81	1.65
Positive Religious Coping	7-28	25.67	2.87
Find meaning	1-4	3.74	0.5
Gain control	1-4	3.64	0.58
Gain comfort and closeness to God	2-8	7.33	0.94
Intimacy with others and closeness with God	1-4	3.4	0.73
Life Transformation	2-8	7.51	0.84

Note: Score range = Possible score

ference was 16.77 from the maximum score of 24, indicating the pain felt by the participants was quite disturbing in carrying out daily activities. As for pain catastrophizing, the mean score was 26.52 and this falls into the moderate category (20-30). It showed that the tendency to have negative and exaggerated views of pain including the inability to endure the pain was medium. Likewise, for each dimension in pain

Table 3. Coping Styles as a Moderator in Pain Catastrophizing Effects on Pain Interference

	Coeff b	Std.Error	T	p	LICI	ULCI
Model 1. Emotion-focused Coping						
1. Pain Catastrophizing	0.301	0.328	9.176	0.000	0.236	0.366
2. Emotion-focused Coping	0.251	0.216	1.158	0.247	-0.175	0.677
3. Pain Catastrophizing x Emotion-focused Coping	-0.292	0.732	-0.399	0.689	-0.732	0.147
Model 2. Problem-focused Coping						
1. Pain catastrophizing	0.290	0.310	9.380	0.000	0.937	0.318
2. Problem-focused Coping	-0.122	0.971	-1.261	0.028	-0.680	-0.313
3. Pain Catastrophizing x Problem-focused Coping	-0.507	0.245	-2.062	0.039	-0.230	-0.991
Model 3. Positive Religious Coping						
1. Pain catastrophizing	0.282	0.032	8.768	0.000	0.218	0.345
2. Positive Religious Coping	-0.104	0.148	-1.740	0.048	-0.870	-0.395
3. Pain Catastrophizing x Positive Religious Coping	-0.630	0.550	-1.884	0.046	-0.455	-0.718

catastrophizing. The rumination, magnification, and helplessness dimensions in each mean score were moderate.

Regarding coping styles, Table 2 showed that in emotion-focused coping, participants showed an average score of 41.08, with a maximum possible score of 56, indicating the high tendency to use emotion-focused coping. It means that participants tend to focus on managing their emotions when experiencing pain problems. Comparing the components in emotion-focused coping, it can be seen that participants displayed the highest average score on the turning to the religion component, while the lowest on the humor component. In problem-focused coping, the mean score was 19.07 from the maximum possible score of 36, indicating the use of problem-focused coping (focus on finding alternative solutions for the problem) was moderate. It appears that the component in problem-focused coping with the highest average score was active coping, while the lowest was seeking instrumental support component. In the last type of coping, which is positive religious coping, it can be seen that the average score was high, with a mean score of 25.67 from the maximum possible score of 28. This showed that there was a high tendency for participants to use positive religious coping (trying to get closer and seek help from God while facing chronic pain problems). In positive religious coping,

each constituent component also appears to have a high average score, each was close to the maximum possible score for each component.

Moderation Analysis Results. Based on Table 3, Model 1 described emotion-focused coping as a moderator in pain catastrophizing effects on pain interference. The moderation model was significant; pain catastrophizing and emotion-focused coping explained 37.6% of the variance in pain interference, $F(6, 352) = 35.378$, $p = 0.000$. There is a significant main effect of pain catastrophizing on pain interference ($b = 0.301$, $SE = 0.032$, $t = 9.176$, $p = 0.000$) but no significant effect of emotion-focused coping on pain interference ($b = 0.251$, $SE = 0.216$, $t = 1.158$, $p = 0.247$). There was also no significant interaction effect between pain catastrophizing and emotion-focused coping on pain interference ($b = -0.292$, $SE = 0.732$, $t = -0.399$, $p = 0.689$), indicating emotion-focused coping does not moderate the effect of pain catastrophizing on pain interference. Regarding the covariates, pain intensity has a significant effect on pain interference ($b = 0.221$, $p = 0.000$) but none was found for age ($b = -0.070$, $p = 0.208$) or gender ($b = -0.031$, $p = 0.089$).

Model 2 described problem-focused coping as a moderator in pain catastrophizing effects on pain interference (Table 3). The moderation model was significant, pain catastrophizing and problem-focused coping explained 38.1% of the

variance in pain interference, $F(6, 352) = 36.221$, $p = 0.000$. There was a significant main effect of pain catastrophizing on pain interference ($b = 0.290$, $SE = 0.31$, $t = 9.38$, $p = 0.000$), the higher a person's pain catastrophizing, the higher the pain interference. The result also showed that there was a significant main effect of problem-focused coping on pain interference ($b = -0.122$, $SE = 0.971$, $t = -1.261$, $p = 0.028$), the higher the problem-focused coping, the lower the pain interference. Pain catastrophizing was the stronger predictor of pain interference compared to problem-focused coping. The result showed that there was a significant interaction effect between pain catastrophizing and problem-focused coping on pain interference ($b = -0.507$, $SE = 0.245$, $t = -2.062$, $p = 0.039$), where problem-focused coping moderates the effect of pain catastrophizing against pain interference. (See the interaction in graph in Figure 2.) Regarding the covariates, pain intensity ($b = 0.0216$, $p = 0.000$) and gender ($b = -0.036$, $p = 0.038$) had significant effect on pain interference but age ($b = -0.058$, $p = 0.274$) did not have a significant effect on pain interference.

Model 3 described positive religious coping as a moderator in pain catastrophizing effects on pain interference (Table 3). The moderation model was significant; pain catastrophizing and positive religious coping explained 38.2% of the variance in pain interference, $F(7, 351) = 31.08$, $p = 0.000$. There was a significant main effect of pain catastrophizing on pain interference ($b = 0.282$, $SE = 0.03$, $t = 8.768$, $p = 0.000$), the higher a person's pain catastrophizing, the higher the pain interference. Results also showed that there was a significant effect of positive religious coping on pain interference ($b = -0.104$, $SE = 0.148$, $t = -0.74$, $p = 0.048$); the higher the positive religious coping, the lower the pain interference. Pain catastrophizing was a stronger predictor of pain interference than positive religious coping. Regarding the interaction effect, there was a significant interaction effect between pain catastrophizing and positive religious coping on pain interference ($b = -0.630$, $SE = 0.55$, $t = -1.88$, $p = 0.046$), where positive religious coping moderates the effect of pain catastrophizing on pain interference. (See below the interaction chart (Chart 2).) In terms of covariates, pain intensity ($b = 0.0213$, $p = 0.000$) and gender ($b = -0.035$, $p = 0.046$) had a significant effect on pain interfer-

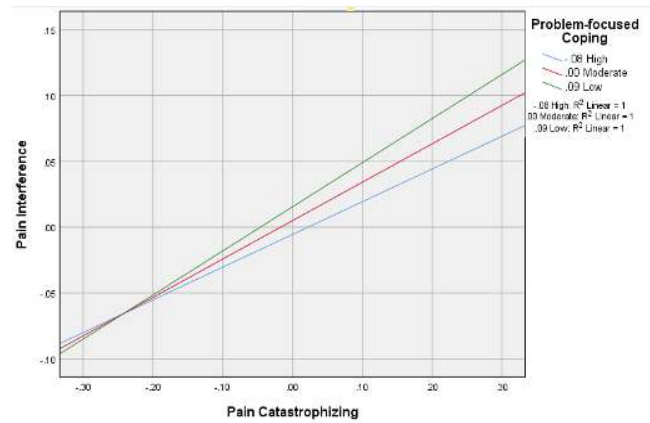


Figure 2. Problem-focused Coping and Pain Catastrophizing Interaction on Pain Interference

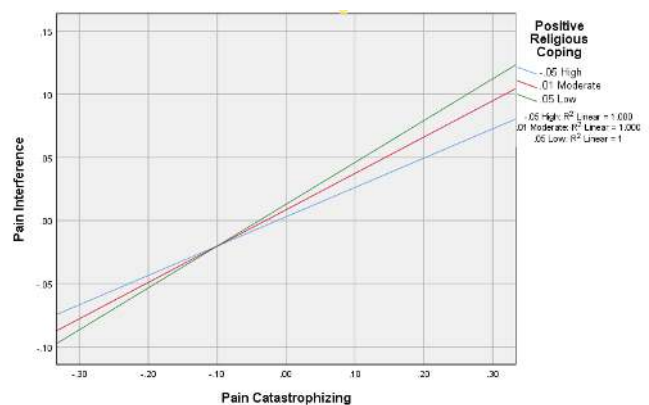


Figure 3. Positive Religious Coping and Pain Catastrophizing's Interaction on Pain Interference

ence. However, negative religious coping ($b = -0.069$, $p = 0.242$,) and age ($b = -0.001$, $p = 0.166$) did not have a significant effect on pain interference.

Discussion

The results showed that problem-focused coping moderated the effect of pain catastrophizing on pain interference. This result is in line with Bozo et al. (2018) who found that problem-focused coping played a role in protecting negative psychological effects in individuals with chronic pain. Problem-focused coping could reduce the negative thoughts, an over-occupation with one's condition, or excessive worrying in the chronic pain experience. According to Raichle, Hanley, Jensen, and Cardenas (2007), problem-focused coping creates the view that the person has the resources and ability to handle the pain problem. This, then, can reduce the cat-

astrophic thoughts of being unable to manage pain. Even though living in urban areas increased the potential of physical inactivity, Andrews, Strong, and Meredith (2012) explained that problem-focused coping encourages the emergence of various active behaviors to reduce pain as well as active actions in daily life so that individuals can adapt and find solutions to the pain problems that hinder them. Finkelstein-Fox and Park (2019) explained that problem-focused coping is a type of coping that focuses on a main goal or goals, thus making individuals exert various efforts to achieve them. It also encourages individuals to focus on things that can be done rather than on negative things. Thus, the individual reduces the perception of limitations or obstacles due to chronic pain.

The results of this study also showed that positive religious coping moderated the impact of pain catastrophizing on pain interference. This result is in line with Hatefi, Tarjoman, and Borji (2019) who revealed that the use of positive religious coping plays a role in reducing various negative responses to pain. Individuals who draw closer and surrender to God in the face of pain generate feelings of relief and release from burdens. Living in urban settings increases the level of stress and burnout (Maly & Vallerand, 2018), so it leads to a greater need to release the burden and pain through positive religious coping. Frenkel and Swartz (2017) explained that chronic pain is often experienced as disabling, affecting people's ability to work, and their perception of their place in the fast-paced urban life. However, when people believe that there are things beyond their control, leaving some of the burdens to God brings more peace as well as acceptance of the condition and decreases the negative perception of pain experienced (Tarjoman & Borji, 2019).

The novelty of the result in this research is the effect of religious coping and emotion-focused coping in the Indonesian chronic pain population. Previous research found that both problem-focused coping and emotion-focused coping affect pain-related problems (Sturgeon & Zautra, 2013; Wilson, 2014; Bozo et al., 2018; Finkelstein-Fox & Park, 2019; Boersma et al., 2019). However, in the Indonesian population, it was found that problem-focused coping and religious coping were the two coping strategies affecting the pain-related problems, such as pain

catastrophizing and pain interference. This study showed that practical tasks or solutions and surrender to God or other spiritual beings were considered more effective in helping people with chronic pain problems in Indonesia, rather than focusing on their emotions. Surrendering and letting God or other spiritual beings help their problems leads to emotional comfort and peace, rather than trying to control and manage their emotions as is the case in emotion-focused coping.

Referring to Rochmawati, Wiechula, and Cameron (2017), when someone has a disease, it is quite common for Indonesians to carry out various religious practices. These various practices were considered to bring a feeling of calm and comfort. When a person is in an unpleasant condition such as experiencing chronic disease and feels that they do not have sufficient resources to overcome difficulties, the individual tends to seek help and get closer to familiar things that are comfortable and safe (Nuraini et al., 2018). Religious practices such as praying or reading holy books during sickness are quite common in Indonesian society, so, when experiencing difficulties such as chronic pain, there is a tendency for Indonesian people to use this type of coping (positive religious coping) in difficult situations. The collective pattern in Indonesian society such as praying together or gathering for religious recitation, and depending on God who is considered to have greater power, encourages the perception of being able to get through the pain problems (Rochmawati, Wiechula, & Cameron, 2017). From these explanations, it can be seen that positive religious coping is effective in reducing catastrophic thinking and can help face challenges or limitations due to chronic pain in the Indonesian population.

In contrast to problem-focused and positive religious coping, the result showed that emotion-focused coping did not moderate the impact of pain catastrophizing on pain interference. Ong, Zautra, and Reid (2010) explained that the effects of emotion-focused coping were generally indirect. Individuals who can manage their emotions and create positive emotions in stressful conditions will be able to display a more positive attitude towards these unpleasant situations. When the condition has been experienced more positively, then individuals can think

more broadly and think of alternative solutions to solve the problems or obstacles faced. This illustrates that the effects of emotion-focused coping do not directly target negative or catastrophic thoughts or address obstacle problems due to pain. However, the presence of emotion-focused coping tries to manage negative emotions that result from catastrophic thinking, so that later, individuals can find solutions to overcome them. Even though emotions have been managed, certain actions are still needed to be able to overcome the chronic pain problem. From this, it can be seen that it does not lower the interference caused by the pain. This explanation contributes to the insignificant effect of emotion-focused coping moderation.

There are several limitations to this study. First, the samples taken were mostly done online. Offline data gathering was limited, only at three health clinics with a much smaller number of participants than online, and it did not include hospitals where chronic pain patients were generally more easily found and needed help. Second, data collection began before the COVID-19 virus pandemic broke out and continued until the current pandemic; this led to the possibility of differences in the psychological conditions experienced by participants in the completion process. Information regarding the effects of COVID-19 that participants might experience was not reviewed further in this study. Third, this study focuses on quantitative data collection. Further exploration of the pain experienced, including those related to each research variable, can be useful to provide additional data in this study. Next, the participants of this research were mostly from Java Island—this research did not cover all regions of Indonesia. A broader survey of the Indonesian region can be considered for further research as well as measuring and identifying the difference in every region, especially about the effect of religious coping. Each region could have a different influence deriving from their religious belief or activities. Finally, this study is limited to a population of individuals with chronic pain in the head, muscles in hands and feet, and lower back area, in the Indonesian population, so it cannot be generalized to other chronic pain problems or other populations.

Conclusions

Problem-focused and positive religious coping is effective in reducing the impact of pain catastrophizing on pain interference, while this does not apply to emotion-focused coping. For psychology practitioners, problem-focused and positive religious coping can be used in helping individuals with chronic pain problems in Indonesia. Individuals who display symptoms or problems such as catastrophic, negative, excessive, or exaggerated thinking due to their chronic pain problems can be assisted by the process of planning, actively seeking solutions and alternatives, or seeking information from other parties. This can minimize the pain catastrophizing impact on the limitations or barriers they face due to pain. Likewise, the process of creating meaning from the problems, understanding that there are things beyond human control, efforts to get closer to God, or trying various religious practices, can be used in treating individuals with pain catastrophizing symptoms, thereby helping them reduce their pain interference.

Declaration of Conflicting Interest. The authors declare no conflicting interest to the authorship and/or the publication of the manuscript.

Acknowledgment. We want to express our appreciation to our research team for their dedication and support. Lathifah Hanum for the constructive discussion and feedbacks, Fariza Nur Shabrina, Khusnul Norma, and Afini Wirasenjaya for their helpful assistance in data gathering.

Funding. This research was supported by the Ministry of Research, Technology & Higher Education of Indonesia through its “Penelitian Dasar Unggulan Perguruan Tinggi” program with grant number NKB-2831/UN2.RST/HKP.05.00/2020. The views and opinions conveyed in this article are those of authors and do not necessarily reflect those of the Ministry of Research, Technology & Higher Education of Indonesia. The Ministry of Research, Technology & Higher Education of Indonesia had no role in the data gathering, analysis, or decision in publishing or preparing this manuscript.

References

- Algoe, S. B., & Fredrickson, B. L. (2011). Emotional fitness and the movement of affective science from lab to field. *American Psychologist*, 66(1), 35-42. <https://doi.org/10.1037/a0021720>
- Ambrose, K. R., & Golightly, Y. M. (2015). Physical exercise as non-pharmacological treatment of chronic pain: why and when. *Best Practice & Research Clinical Rheumatology*, 29(1), 120-130. <https://doi.org/10.1016/j.berh.2015.04.022>
- Amtmann, D., Cook, K. F., Jensen, M. P., Chen, W. H., Choi, S., Revicki, D., ... & Lai, J. S. (2010). Development of a PROMIS item bank to measure pain interference. *Pain*, 150(1), 173-182. <https://doi.org/10.1016/j.pain.2010.04.025>
- Andrews, N. E., Strong, J., & Meredith, P. J. (2012). Activity pacing, avoidance, endurance, and associations with patient functioning in chronic pain: a systematic review and meta-analysis. *Archives of Physical Medicine and Rehabilitation*, 93(11), 2109-2121. <https://doi.org/10.1016/j.apmr.2012.05.029>
- Arola, H. M., Nicholls, E., Mallen, C., & Thomas, E. (2010). Self-reported pain interference and symptoms of anxiety and depression in community-dwelling older adults: can a temporal relationship be determined? *European Journal of Pain*, 14(9), 966-971. <https://doi.org/10.1016/j.ejpain.2010.02.012>
- Baetz, M., & Bowen, R. (2008). Chronic pain and fatigue: Associations with religion and spirituality. *Pain Research and Management*, 13(5), 383-388. <https://doi.org/10.1155/2008/263751>
- Basten-Günther, J., Peters, M., & Lautenbacher, S. (2019). Optimism and the experience of pain: a systematic review. *Behavioral Medicine*, 45(4), 323-339. <https://doi.org/10.1080/08964289.2018.1517242>
- Biccheri, E., Roussiau, N., & Mambet-Doué, C. (2016). Fibromyalgia, spirituality, coping and quality of life. *Journal of Religion and Health*, 55(4), 1189-1197. <https://doi.org/10.1007/s10943-016-0216-9>
- Boersma, K., Södermark, M., Hesser, H., Flink, I. K., Gerdle, B., & Linton, S. J. (2019). Efficacy of a transdiagnostic emotion-focused exposure treatment for chronic pain patients with comorbid anxiety and depression: a randomized controlled trial. *Pain*, 160(8), 1708. <https://doi.org/10.1097/j.pain.0000000000001575>
- Boles, T. A. (2012). The role of religious coping styles in diabetes control among urban african americans (Order No. 3521008). Available from ProQuest Dissertations & Theses Global. (1034408325). Retrieved from <https://www.proquest.com/dissertations-theses/role-religious-coping-styles-diabetes-control/docview/1034408325/session?accountid=17242>
- Bozo, Ö., Demirtepe-Saygılı, D., Güneş, S., Çenesiz, G. Z., & Baysan, A. (2018). Does problem focused coping buffer the effects of trait anxiety on depressive symptoms of chronic urticaria patients? *The Journal of General Psychology*, 145(1), 64-78. <https://doi.org/10.1080/00221309.2017.1420622>
- Carver, C. S. (1997). You want to measure coping but your protocol's too long: Consider the brief cope. *International Journal of Behavioral Medicine*, 4(1), 92. https://doi.org/10.1207/s15327558ijbm0401_6
- Daneshmandi, H., Choobineh, A. R., Ghaem, H., Alhamd, M., & Fakhripour, A. (2017). The effect of musculoskeletal problems on fatigue and productivity of office personnel: a cross-sectional study. *Journal of Preventive Medicine and Hygiene*, 58(3), E252.
- David, D., Giannini, C., Chiarelli, F., & Mohn, A. (2021). Text Neck Syndrome in Children and Adolescents. *International Journal of Environmental Research and Public Health*, 18(4), 1565. <https://doi.org/10.3390/ijerph18041565>
- Del Giorno, R., Frumento, P., Varrassi, G., Paladini, A., & Coaccioli, S. (2017). Assessment of chronic pain and access to pain therapy: a cross-sectional population-based study. *Journal of Pain Research*, 10, 2577. <https://doi.org/10.2147/JPR.S136292>
- Dueñas, M., Ojeda, B., Salazar, A., Mico, J. A., & Failde, I. (2016). A review of chronic pain impact on patients, their social environment and the health care system. *Journal of Pain Research*, 9, 457. <https://doi.org/10.2147/JPR.S105892>
- Dysvik, E., & Furnes, B. (2018). Living a mean-

- ingful life with chronic pain—further follow-up. *Clinical Case Reports*, 6(5), 896. <https://doi.org/10.1002/ccr3.1487>
- Dysvik, E., Natvig, G. K., Eikeland, O. J., & Lindstrøm, T. C. (2005). Coping with chronic pain. *International Journal of Nursing Studies*, 42(3), 297-305. <https://doi.org/10.1016/j.ijnurstu.2004.06.009>
- Edwards, R. R., Cahalan, C., Mensing, G., Smith, M., & Haythornthwaite, J. A. (2011). Pain, catastrophizing, and depression in the rheumatic diseases. *Nature Reviews Rheumatology*, 7(4), 216. <https://doi.org/10.1038/nrrheum.2011.2>
- Finkelstein-Fox, L., & Park, C. L. (2019). Controlling goodness-of-fit and chronic illness: a systematic review of the literature. *Health psychology review*, 13(2), 137-162. <https://doi.org/10.1080/17437199.2018.1560229>
- Folkman, S., & Lazarus, R. S. (1984). Stress, appraisal, and coping (pp. 150-153). New York: Springer Publishing Company.
- Frenkel, L., & Swartz, L. (2017). Chronic pain as a human rights issue: setting an agenda for preventative action. *Global health action*, 10(1), 1348691. <https://doi.org/10.1080/16549716.2017.1348691>
- Gatchel, R. J., Peng, Y. B., Peters, M. L., Fuchs, P. N., & Turk, D. C. (2007). The biopsychosocial approach to chronic pain: scientific advances and future directions. *Psychological Bulletin*, 133(4), 581. <https://doi.org/10.1037/0033-2909.133.4.581>
- Glover-Graf, N. M., Marini, I., Baker, J., & Buck, T. (2007). Religious and spiritual beliefs and practices of persons with chronic pain. *Rehabilitation Counseling Bulletin*, 51(1), 21-33. <https://doi.org/10.1177/00343552070510010501>
- Goldberg, D. S., & McGee, S. J. (2011). Pain as a global public health priority. *BMC Public Health*, 11(1), 770. doi: 10.1186/1471-2458-11-770
- Hatefi, M., Tarjoman, A., & Borji, M. (2019). Do religious coping and attachment to god affect perceived pain? Study of the elderly with chronic back pain in Iran. *Journal of Religion and Health*, 58(2), 465-475. <https://doi.org/10.1007/s10943-018-00756-9>
- Harris, J. I., Usset, T., Krause, L., Schill, D., Reuer, B., Donahue, R., & Park, C. L. (2018). Spiritual/religious distress is associated with pain catastrophizing and interference in veterans with chronic pain. *Pain Medicine*, 19(4), 757-763. <https://doi.org/10.1093/pm/pnx225>
- Hirsh, A. T., Bockow, T. B., & Jensen, M. P. (2011). Catastrophizing, pain, and pain interference in individuals with disabilities. *American Journal of Physical Medicine & Rehabilitation/ Association of Academic Physiatrists*, 90(9), 713. <https://doi.org/10.1097/PHM.0b013e31822409b2>
- Jensen, M. P., Moore, M. R., Bockow, T. B., Ehde, D. M., & Engel, J. M. (2011). Psychosocial factors and adjustment to chronic pain in persons with physical disabilities: a systematic review. *Archives of physical medicine and rehabilitation*, 92(1), 146-160. <https://doi.org/10.1016/j.apmr.2010.09.021>
- Leung, L. (2012). Pain catastrophizing: an updated review. *Indian Journal of Psychological Medicine*, 34(3), 204. doi: 10.4103/0253-7176.106012
- Lumley, M. A., & Schubiner, H. (2019). Psychological therapy for centralized pain: an integrative assessment and treatment model. *Psychosomatic medicine*, 81(2), 114. <https://doi.org/10.1097/PSY.0000000000000654>
- Maly, A., & Vallerand, A. H. (2018). Neighborhood, socioeconomic, and racial influence on chronic pain. *Pain Management Nursing*, 19(1), 14-22. <https://doi.org/10.1016/j.pmn.2017.11.004>
- Marchira, C. R., Supriyanto, I., Subandi, Soewadi, & Good, B. J. (2016). The association between duration of untreated psychosis in first psychotic episode patients and help seeking behaviors in Jogjakarta, Indonesia. *International Journal of Culture and Mental Health*, 9(2), 120-126. <https://doi.org/10.1080/17542863.2015.1103276>
- Merskey, H. & Bogduk, N. (eds.) (1994) Part III: Pain Terms, A Current List with Definitions and Notes on Usage, Classification of Chronic Pain, Second Edition, IASP Task Force on Taxonomy. Seattle: IASP Press.
- Miró, J., Raichle, K. A., Carter, G. T., O'Brien, S. A., Abresch, R. T., McDonald, C. M., & Jensen, M. P. (2009). Impact of biopsychosocial factors on chronic pain in persons with myotonic and facioscapulohumeral muscular

- dystrophy. *American Journal of Hospice and Palliative Medicine*[®], 26(4), 308-319. <https://doi.org/10.1177/1049909109335146>
- Mäntyselkä, P. T., Turunen, J. H., Ahonen, R. S., & Kumpusalo, E. A. (2003). Chronic pain and poor self-rated health. *Jama*, 290(18), 2435-2442. <https://doi.org/10.1001/jama.290.18.2435>
- Nijs, J., D'Hondt, E., Clarys, P., Deliëns, T., Polli, A., Malfliet, A., ... & Ickmans, K. (2020). Lifestyle and chronic pain across the lifespan: an inconvenient truth? *PM&R*, 12(4), 410-419. <https://doi.org/10.1002/pmrj.12244>
- Nuraini, T., Andrijono, A., Irawaty, D., Umar, J., & Gayatri, D. (2018). Spirituality-focused palliative care to improve Indonesian breast cancer patient comfort. *Indian journal of palliative care*, 24(2), 196. https://doi.org/10.4103/IJPC.IJPC_5_18
- Ong, A. D., Zautra, A. J., & Reid, M. C. (2010). Psychological resilience predicts decreases in pain catastrophizing through positive emotions. *Psychology and aging*, 25(3), 516. <https://doi.org/10.1037/a0019384>
- Pandey, J., & Singh, M. (2019). Positive religious coping as a mechanism for enhancing job satisfaction and reducing work-family conflict: a moderated mediation analysis. *Journal of Management, Spirituality & Religion*, 16(3), 314-338. <https://doi.org/10.1080/14766086.2019.1596829>
- Pargament, K., Feuille, M., & Burdzy, D. (2011). The Brief RCOPE: Current psychometric status of a short measure of religious coping. *Religions*, 2(1), 51-76. <https://doi.org/10.3390/rel2010051>
- Park, S. H., & Sonty, N. (2010). Positive affect mediates the relationship between pain-related coping efficacy and interference in social functioning. *The Journal of Pain*, 11(12), 1267-1273. <https://doi.org/10.1016/j.jpain.2010.02.023>
- Permana, I. (2018). How Religiosity and/or Spirituality Might Influence Self-Care in Diabetes Management: A Structured Review. *Bangladesh Journal of Medical Science*, 17(2), 185-193. <https://doi.org/10.3329/bjms.v17i2.35869>
- Raichle, K. A., Hanley, M., Jensen, M. P., & Cardenas, D. D. (2007). Cognitions, coping, and social environment predict adjustment to pain in spinal cord injury. *The Journal of Pain*, 8(9), 718-729. <https://doi.org/10.1016/j.jpain.2007.05.006>
- Reitsma, M. L., Tranmer, J. E., Buchanan, D. M., & Vandenkerkhof, E. G. (2011). The prevalence of chronic pain and pain-related interference in the Canadian population from 1994 to 2008. *Chronic Dis Inj Can*, 31(4), 157-164.
- Reis, F., Guimarães, F., Nogueira, L. C., Meziat-Filho, N., Sanchez, T. A., & Wideman, T. (2019). Association between pain drawing and psychological factors in musculoskeletal chronic pain: A systematic review. *Physiotherapy theory and practice*, 35(6), 533-542. <https://doi.org/10.1080/09593985.2018.1455122>
- Riley, K. E., & Park, C. L. (2014). Problem-focused vs. meaning-focused coping as mediators of the appraisal-adjustment relationship in chronic stressors. *Journal of Social and Clinical Psychology*, 33(7), 587-611. <https://doi.org/10.1521/jscp.2014.33.7.587>
- Riset Kesehatan Dasar. (2018) Hasil Riset Utama Riskesdas 2018. Jakarta: Kementerian Kesehatan RI.
- Rochmawati, E., Wiechula, R., & Cameron, K. (2018). Centrality of spirituality/religion in the culture of palliative care service in Indonesia: An ethnographic study. *Nursing & health sciences*, 20(2), 231-237. <https://doi.org/10.1111/nhs.12407>
- Russell, B. S., & Park, C. L. (2018). The role of emotion regulation in chronic pain self-management. *Topics in Pain Management*, 33(6), 1-10. <https://doi.org/10.1016/j.jpsychores.2018.02.002>
- Sarla, G. S. (2019). Excessive use of electronic gadgets: health effects. *The Egyptian Journal of Internal Medicine*, 31(4), 408. https://doi.org/10.4103/ejim.ejim_56_19
- Senba, E., & Kami, K. (2017). A new aspect of chronic pain as a lifestyle-related disease. *Neurobiology of pain*, 1, 6-15. <https://doi.org/10.1016/j.ynpai.2017.04.003>
- Sturgeon, J. A., & Zautra, A. J. (2013). Psychological resilience, pain catastrophizing, and positive emotions: perspectives on comprehensive modeling of individual pain adaptation. *Current pain and headache reports*, 17(3), 317. <https://doi.org/10.1007/s11916-012-0317-4>

- Sullivan, M. J. L., Bishop, S. R., & Pirik, J. (1995). The pain catastrophizing scale: Development and validation. *Psychological Assessment*, 7, 524-532. <https://doi.org/10.4103/0253-7176.106012>
- Torsheim, T., Eriksson, L., Schnohr, C. W., Hansen, F., Bjarnason, T., & Välimaa, R. (2010). Screen-based activities and physical complaints among adolescents from the Nordic countries. *BMC Public Health*, 10(1), 324. <https://doi.org/10.1186/1471-2458-10-324>
- Turk, D. C., Wilson, H. D., & Swanson, K. S. (2012). Psychological and physiological bases of chronic pain. In A. Baum, T. A. Revenson, & J. Singer (Eds.), *Handbook of health psychology* (pp. 149-174). Psychology Press.
- Van Leeuwen, M. T., Blyth, F. M., March, L. M., Nicholas, M. K., & Cousins, M. J. (2006). Chronic pain and reduced work effectiveness: the hidden cost to Australian employers. *European Journal of Pain*, 10(2), 161-161. <https://doi.org/10.1016/j.ejpain.2005.02.007>
- Wilson, M. (2014). Integrating the concept of pain interference into pain management. *Pain Management Nursing*, 15(2), 499-505. <https://doi.org/10.1016/j.pmn.2011.06.004>
- Zaki, L. R. M., & Hairi, N. N. (2015). A systematic review of the prevalence and measurement of chronic pain in Asian adults. *Pain Management Nursing*, 16(3), 440-452. <https://doi.org/10.1016/j.pmn.2014.08.012>