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Chronic Pain Experience According to the Transactional Stress and Coping Model: Associations between Different Pain Measures and Health Outcomes

Transaksiyonel Stres ve Başetme Modeline Göre Kronik Ağrı Yaşantısı: Farklı Ağrı Ölçümleri ve Sağlık Sonuçları Arasındaki İlişkiler

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ABSTRACT

According to Lazarus and Folkman's Transactional Stress and Coping Model, chronic pain is defined as a source of stress. The model emphasizes the interaction between the person and the environment and focuses on primary (pain severity and/or frequency) and secondary appraisals (pain and/or discomfort from pain) when examining the effects of a stressor on a person's life. In this study, chronic pain was defined as a type of stress and pain stress was measured in three different ways: unidimensional pain stress (primary appraisal only), multidimensional pain stress (sum of both primary and secondary appraisals), and transactional pain stress (product of both primary and secondary appraisals). The aim of the study was to examine the relationships between the three different pain stress measures and the outcome variables of pain-related disability, negative mood and daily activity level. The study was conducted with 167 individuals with different types of chronic pain. Sociodemographic Characteristics and Pain Information Form, Visual Analog Scale, West Haven Yale Multidimensional Pain Inventory and Life Changes Questionnaire were used as data collection tools. The results of the study showed that there were significant relationships between unidimensional pain stress and disability and negative mood ($r(1,167) = 0.33$; 0.36, respectively); multidimensional pain stress and disability and negative mood ($r(1,167) = 0.51$; 0.38, respectively); transactional pain stress and disability, negative mood ($r(1,167) = 0.43$; 0.37, respectively) and daily activity ($r(1,167) = -0.24$). The results indicate the significance of new measures in the assessment of pain experience.
Keywords: Chronic pain, pain stress, pain disability, daily activities

ÖZ

Lazarus ve Folkman'ın Transaksiyonel Stres ve Başa Çıkma Modeli'ne göre kronik ağrı bir stres kaynağı olarak tanımlanmaktadır. Model, kişi ve çevre arasındaki etkileşime vurgu yapmakta ve bir stres kaynağının kişinin yaşamındaki etkilerini incelerken birincil (ağrı şiddeti ve/veya sıklığı) ve ikincil değerlendirmelere (ağrıdan duyulan acı ve/veya rahatsızlık) odaklanmaktadır. Bu çalışmada kronik ağrı, bir stres türü olarak tanımlanmış ve ağrı stresi üç farklı şekilde ölçülmüştür: tek boyutlu ağrı stresi (sadece birincil değerlendirme), çok boyutlu ağrı stresi (hem birincil hem ikincil değerlendirmelerin toplamı), transaksiyonel ağrı stresi (hem birincil hem ikincil değerlendirmelerin çarpımı). Çalışmanın amacı, üç farklı ağrı stresi ölçümü ile sonuç değişkenler olan ağrıya bağlı engellilik, olumsuz duygudurum ve günlük aktivite düzeyi arasındaki ilişkileri incelemektir. Çalışma farklı türlerden kronik ağrı yaşantısı olan 167 kişiyle yürütülmüştür. Veri toplama araçları olarak Sosyodemografik Özellikler ve Ağrı Bilgi Formu, Görsel Analog Skalası, West Haven Yale Çok Boyutlu Ağrı Envanteri ve Yaşam Değişimleri Anketi kullanılmıştır. Çalışmanın sonuçlarında tek boyutlu ağrı stresi ile engellilik ve olumsuz duygudurum (sırasıyla; $r(1,167) = 0.33$; 0.36); çok boyutlu ağrı stresi ile engellilik ve olumsuz duygudurum (sırasıyla; $r(1,167) = 0.51$; 0.38); transaksiyonel ağrı stresi ile engellilik, olumsuz duygudurum (sırasıyla; $r(1,167) = 0.43$; 0.37) ve günlük aktivite ($r(1,167)=-0.24$) arasında anlamlı düzeyde ilişkilerin olduğu görülmektedir. Sonuçlar, ağrı deneyiminin değerlendirilmesinde yeni ölçümlerin önemine işaret etmektedir.
Anahtar sözcükler: Kronik ağrı, ağrı stresi, ağrıya bağlı engellilik, günlük aktiviteler

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Introduction

Pain is defined as an "unpleasant sensory and emotional experience due to an existing or potential tissue damage" by the International Association for the Study of Pain (Merskey 1994). Pain not associated with an acute illness or accident and persists for at least three months or recurs following periods of no pain experience is considered chronic pain (Treede et al. 2015). Chronic pain negatively affects many areas of people's lives, including physical and psychological well-being, work life, family system, and relationships with the social environment (Closs et al. 2009, Ojeda et al. 2014, Dueñas et al. 2016). Patients also experience economic difficulties due to increased health costs, decreased productivity, missed days of work, and turnover (Langley et al. 2010, Dansie and Turk 2013). All these challenging processes may cause an increase in expectations for relief from pain, and patients may distance themselves from adapting to the pain experience. Acute pain, which often signals potential tissue damage, is relieved or treated by biomedical methods (e.g., painkillers) (Lumley et al. 2011). Compared to acute pain, however, chronic pain is much more complex, and methods aimed at reducing pain are not functional in the long term (Nesse and Ellsworth 2009). For example, resting, limiting daily activities, and using painkillers, which may help reduce pain for someone experiencing acute pain, may make it difficult for chronic pain patients to adapt to pain. The current approaches emphasize that the stimulation of different brain regions causes pain to explain the pain experience with the concept of a pain matrix (Liossi and Howard 2016). This concept suggests that pain is a personalized process that depends on physical stimulation and consists of cognitive assessments and pain-oriented reactions (Tracey and Mantyh 2007). Consistent with this knowledge, a multidisciplinary approach is being adopted in treating chronic pain, and patients are aiming to adapt to pain (Şen et al. 2019). Accordingly, instead of eliminating pain, treatment focuses on managing pain, which has become a chronic source of stress, and reducing the negative impact of pain on life (Lazarus and Folkman 1984, Lazarus 2006, Matthieu and Ivanoff 2006).

In the chronic pain literature, pain experience is often considered an outcome variable (Keefe et al. 2004, Peters 2015). These studies mostly measure pain as severity and explore the factors that exacerbate and reduce pain severity. However, according to one of the critical models of health psychology, Lazarus and Folkman's (1984) Transactional Stress and Coping Model (Transactional model), chronic pain is regarded as a stress source like many challenging life situations. The model suggests that the impact of a stressor on a person's life depends on the interaction between the person and the stressor. During this interaction, the person confronted with the stressor undergoes a primary appraisal process. At this stage, the person evaluates the type of stressor they face. Afterward, in the secondary appraisal process, the person evaluates what they can do in the presence of the stressor and the discomfort/strain they experience (Lazarus and Folkman 1984). Given this information, it is possible to understand how chronic pain affects a person's life by understanding pain's primary and secondary appraisals. Primary appraisals regarding chronic pain experience correspond to information about pain, such as the frequency and severity of pain. In contrast, secondary appraisals correspond to appraisals about oneself, such as discomfort, emotional strain, and pain experienced by the person in the face of pain. Moreover, as mentioned above, pain is a sensory and emotional experience (Merskey 1994). Consistent with this information, primary appraisals in the transactional model overlap with the sensory dimension, and secondary appraisals overlap with the emotional dimension. However, one of the most important challenges of the model in practice is assessing the stress sources. This study aims to present new suggestions for measuring pain based on the approach of the transactional model. To this end, different measures of pain stress were developed in line with the literature, and the relationships between these measures and health outcomes (pain-related disability, mood, and daily activity) were investigated.

The most commonly used method for assessing pain is the measurement of pain severity for the last week based on self-report (Haefeli and Elfering 2006, Salamon et al. 2014, Booker and Herr 2016). Measurement of pain severity over the last week, which is the most traditional assessment method, provides considerable information about the person's pain experience. However, assessing pain with a single item and only in terms of severity is often insufficient to understand how the person experiences pain and the effects of pain in life (von Baeyer 2006, Salaffi et al. 2015, Fillingim et al. 2016, Puntillo and Naidu 2018). From the perspective of the transactional model (Lazarus and Folkman 1984), pain severity refers to the primary appraisal and does not provide information on secondary appraisals. However, the personal reactions (secondary appraisals) of people who report similar pain severity may differ. When we examine how primary and secondary appraisal scores are analyzed in the relevant literature per the transactional model, we come across two proposals regarding the sum or product of primary and secondary appraisals. In the first of these, Kerns et al. (1985) suggest measuring pain severity and pain as a sum to assess pain stress. Experiencing chronic pain results in feelings of hopelessness and burnout for many people, and suffering from pain reflects the emotional challenges of the patients. The authors also criticize the retrospective measurement of pain severity over the last week and suggest the need to

measure the pain level at the interview (Kerns et al. 1985). Measuring pain during the interview is an ideal method to avoid recall biases. Pain measurement during the interview is expected to provide more insight into the person's pain experience than retrospective pain measurement. In this direction, pain severity, a subscale of the West Haven Yale Multidimensional Pain Inventory, which was adapted into Turkish by Cetin et al. (2016), measures the pain experience as the sum of both the pain severity including more than one time (pain experienced during the interview and pain experienced in the last week) and the suffering from pain. The two-time pain severity measurement provides information on primary appraisals, while the pain experienced provides information on secondary appraisals. Thus, in the present study, one of the pain stress measures based on the transactional model was constructed accordingly. The pain stress measure calculated this way was labeled multidimensional pain stress.

In Vagg and Spielberger's (1998) review study on the measurement of stress based on the transactional model, the frequency of the event and the level of discomfort related to the event came to the forefront in the stress measurement. In some recent studies, the frequency of the situation and the level of discomfort related to the situation are focused simultaneously in measuring stress (Türetgen et al. 2012). The transactional model suggests that the frequency of the situation refers to primary appraisals, and the level of discomfort corresponds to secondary appraisals. Lately, measurement of the discomfort level related to pain, which corresponds to secondary appraisals, has been suggested to examine the effects of the pain experience (Lumley et al. 2011, Fillingim et al. 2016). For example, Lumley et al. (2011), in their study examining the relationship between pain and emotion, emphasized the need to measure emotional processes when evaluating pain experience. In the study, the authors distinguish between emotional processes and states and point out that the relationships between pain and emotional states (e.g., depression, anxiety, anger) have been repeatedly examined in the literature. However, the emotional processes related to pain have not been sufficiently addressed. The level of pain-related discomfort can be an example of emotional processes. Especially in chronic pain, it is observed that people become increasingly sensitive to their pain, which does not decrease with treatment. They also have an emotional experience of pain (Lumley et al. 2011). In addition, some recent studies point to the importance of measuring pain severity and frequency together (Salamon et al. 2014). In a study by Salamon et al. (2014) examining the effects of the pain experience, physical functioning was predicted better when pain severity and frequency were considered together compared to pain severity alone.s the second pain stress measure based on the transactional model, pain severity, pain frequency and level of discomfort from pain were calculated as a product. Pain severity and frequency correspond to primary appraisals, while the level of discomfort from pain corresponds to secondary appraisals. The pain stress measure calculated this way was labeled transactional pain stress.

While recommendations for different measurement methods in pain assessment are on the rise within the chronic pain literature, more studies need to examine which pain assessment method shows a stronger relationship with pain outcomes (e.g., Salamon et al. 2014). However, different pain measures (e.g., pain severity, pain frequency, pain-related discomfort, or pain experienced) may show a stronger relationship with health outcomes. In this study, chronic pain experience was defined as a source of stress, and pain stress was assessed in three different ways based on the recommendations of the transactional model and the proposals regarding the measurement of pain experience in existing research:

1. Unidimensional pain stress: One-time pain severity in the last week (corresponds only to primary appraisals per the transactional model)
2. Multidimensional pain stress: The sum of two-time pain severity (the level of pain experienced both in the past week and at the time of the interview) and the pain experienced (corresponding to both primary and secondary appraisals per the transactional model)
3. Transactional pain stress: The product of pain severity, pain frequency, and pain discomfort level (corresponding to both primary and secondary appraisals in the transactional model)

The second and third measures, which reflect the transactional model assessed in the current study, are expected to show more robust relationships with the health outcomes measured in the study (pain-related disability, negative mood, and activity level) compared to the first measure.

Pain-related disability, the most frequently examined variable among pain-related health outcomes, corresponds to the physical, psychological, and social changes that occur in a person's life with the experience of pain. Many pain patients state that their physical movements have decreased due to pain, that they cannot participate in the activities they used to participate in, and that their relationships and social lives are negatively affected (Closs et al. 2009, Ojeda et al. 2014, Dueñas et al. 2016). Pain patient studies emphasize that the level of pain-

related disability increases with increasing pain severity (Asghari et al. 2008, Jones et al. 2008, Ferreira et al. 2010, Stefane et al. 2013, Bean et al. 2014, Garbi et al. 2014, Häuser et al. 2014, Lee et al. 2015, Puente et al. 2015). The results of a large-scale study among women diagnosed with fibromyalgia syndrome (Jones et al. 2008) revealed that more than 60% of patients had difficulty in carrying out daily activities such as walking, climbing stairs, or doing housework, and 25% had difficulty in maintaining personal needs (such as bathing). Moreover, pain-related disability is one of the leading reasons why pain patients seek treatment. For example, a review of studies with chronic low back pain patients (Ferreira et al. 2010) indicates that people with high pain-related disabilities are eight times more likely to engage in help-seeking behavior than those with low disability. Therefore, pain-related disability level appears to have a significant role in the health outcomes of chronic pain patients. In this respect, the first of the health outcomes addressed in the current study is the level of pain-related disability.

Chronic pain also poses a risk for emotional stress, and many studies have examined the relationship between pain and emotional stress (Arola et al. 2010, Lerman et al. 2015, Lami et al. 2018, Ayonrinde et al. 2020). For example, in a study conducted with 428 people with different types of chronic pain, depression, and anxiety symptoms increased as the severity of pain increased (Lerman et al. 2015). Similarly, in a study among young people with chronic abdominal pain, increased pain has a significant role in causing increased levels of emotional stress (Ayonrinde et al. 2020). In summary, the studies on the subject highlight the relationship between pain experience and negative mood and that negative mood intensifies as the severity of pain rises. Thus, the second of the health outcomes measured in the current study was the level of negative mood. It is noteworthy that the relationship between pain and health outcomes is mainly focused on negative health outcomes such as disability and emotional stress (Arola et al. 2010, Lerman et al. 2015, Lami et al. 2018). On the other hand, despite not being an obstacle, daily activity level, which is an essential component of life satisfaction, is reduced in chronic pain patients (Azevedo et al. 2012). According to The International Classification of Functioning, Disability, and Health (ICF), disability and daily activities are evaluated separately, and maintaining daily activities is considered a prerequisite for being healthy (WHO 2001). Daily activities consist of four domains: those pursued inside the home, those pursued outside the home, those pursued away from home, and social activities. The World Health Organization (WHO 1946) defines health as "a state of complete physical, psychological, and social well-being, not merely the absence of disease or disability." According to this definition, to improve health, it is necessary to focus on positive health behaviors that affect well-being. In this context, daily activity level was included in the current study as a positive health outcome.

Several variables may affect the associations between measures of pain stress and health outcomes. One variable highlighted in pain-related negative outcomes is life stress, and as life stress increases, pain-related negative outcomes also increase (Ghosh and Sharma 2010, Zeng et al. 2016, Generaal et al. 2017). Therefore, it is necessary to control life stress when examining the relationships between pain experience as a source of stress and health outcomes. In addition, some studies suggest that pain-related variables such as pain duration and sociodemographic variables such as age, gender, and socioeconomic level may affect the outcomes (Azevedo et al. 2012, Lerman et al. 2015, Houde et al. 2016, Suman et al. 2017). Hence, the current study planned to control variables such as life stress, age, pain duration, perceived income level, education level, and gender while examining the relationships between pain stress measures and health outcomes. In line with all this information, the research questions are addressed as follows:

1. Which of the unidimensional, multidimensional, and transactional pain stress measures demonstrates a stronger relationship with the level of pain-related disability when life stress, age, pain duration, perceived income level, education level, and gender are controlled?
2. Which of the unidimensional, multidimensional, and transactional pain stress measures shows a stronger relationship with the level of negative mood when life stress, age, pain duration, perceived income level, education level, and gender are controlled?
3. Which unidimensional, multidimensional, and transactional pain stress measures show a stronger relationship with daily activity level when life stress, age, pain duration, perceived income level, education level, and gender are controlled?

Method

Sample

The population of the study consisted of people diagnosed with chronic pain, and the sample of the study

consisted of chronic pain patients between the ages of 18 and 76 (mean 47.11; SD 12.75) who were being treated in different outpatient clinics of Istanbul University Department of Physical Medicine and Rehabilitation. Data collection was performed in the outpatient clinics while the patients were awaiting their doctor's appointments in different outpatient clinics. The diagnosis of the participants' diseases was established by the physicians practicing in the hospital (e.g., rheumatologists, internal medicine specialists, physical therapists), and the patients were asked about the disease for which they were being followed up and the time they received a diagnosis for chronic pain. Volunteers from Istanbul University psychology department students were involved in the study's data collection process. When the participants had difficulty filling out the scales independently, the students read and fill in the scales. The study took approximately 30 minutes with each participant. The inclusion criteria were having pain for at least three months, being at least a primary school graduate, and being 18 or older. The exclusion criteria were experiencing a psychiatric process that could negatively affect the study during data collection (e.g., having difficulty responding due to negative mood) and having attention or perception problems that would prevent data collection (e.g., expressing that they did not understand the questions read to them). The results of the power analysis (g power) suggested that the study should be conducted with at least 107 participants for a significance level of .80 power <.05. The completion of the scales was incomplete with three people due to the negative mood they experienced, with two people because of attention problems and difficulty in understanding the questions, and with five people who did not want to continue after starting the interview.

Consequently, the data of 10 people could not be included in the analysis. The study was conducted with 167 people diagnosed with various types of chronic pain, such as rheumatoid arthritis (RA), osteoporosis, osteoarthritis, fibromyalgia syndrome (FMS), headache, and low back pain. Diagnoses other than FMS, RA, and low back pain, which constituted the majority in terms of number, were grouped under the heading of other pain. Information on the sociodemographic characteristics of the participants is presented in Table 1.

Table 1. Frequency distributions of sociodemographic and pain characteristics of the participants

Variables (N= 167)		**N**	**%**
Gender	Female	142	85
	Male	25	15
Disease diagnosis	FMS	57	34.1
	Lower Back Pain	24	14.4
	RA	13	7.8
	Other Pain Types	73	43.7
Education status	Primary School	60	35.9
	Middle School	26	15.6
	High School	43	25.7
	University	34	20.4
	Postgraduate	4	2.4
Perceived income level	Low	26	15.6
	Middle	111	66.4
	Good.	29	17.4
	Very good	1	0.6
Marital status	Married	134	80.2
	Single	24	14.4
	Divorced	9	5.4
Medication	Yes.	120	71.9
	No	47	28.1
Social security	Yes.	161	96.4
	No	6	3.6
Chronic disease in the family	Yes.	115	68.9
	No	52	31.1
Family history of mental illness	Yes.	44	26.3
	No	123	73.7
Family history of pain	Yes.	109	65.3
	No	58	34.7
Health status	Good.	35	21
	Average	87	52.1
	Poor	45	26.9

FMS: Fibromyalgia Sendrom, RA: Romatoid Artirit

Procedure

Before initiating the data collection process, the approval of the ethics committee dated 08.01.2018 and numbered 149677 was obtained from Istanbul University Social and Human Sciences Research Ethics Committee. Then, the patients who applied to the outpatient clinics of Istanbul University Department of Physical Medicine and Rehabilitation were approached. Patients were informed about the study and their consent to participate in the study was obtained. Then measures were administede to the participants.

Measures

The following scales were used to assess control variables, measures of pain stress (unidimensional pain stress, multidimensional pain stress, transactional pain stress), and health outcomes (pain-related disability, negative mood, and daily activity).

Sociodemographic Characteristics and Pain Information Form

The researchers developed this form to obtain information about the participant's age, gender, perceived income level, education level, marital status, history of illness and psychopathology, and characteristics related to their pain. In addition, pain frequency (how often did you experience pain when you think about the last month (between 1-5)) and discomfort level (how much the pain you experienced last month bothered you (between 1-5)), which are components of transactional pain stress, were questioned in this form. Since chronic pain is characterized by recurring pain following periods of no pain experience in some patients (Treede et al. 2015), the frequency of pain and the level of discomfort related to this frequency were measured over a more extended period.

Life Experiences Survey (LES)

The original form of the scale was developed by Sarason et al. (1978) and adapted into Turkish by Aytar (1985). The scale consists of 57 situations that may be a source of stress in people's life. First, the respondents are expected to mark the life events they have experienced in the last six months. Then, they are asked to assess these events on a seven-point Likert scale ranging from -3 (very negative) to +3 (very positive). A higher score on the scale indicates less stress as the perception of life changes increases positively. In this study, the LES, which was used to control life stress while examining the effects of stress caused by chronic pain, was utilized as a total score. Cronbach Alpha internal consistency coefficient of the scale was calculated as .60.

Visual Analog Scale (VAS)

The Visual Analog Scale developed by Bryant (1993) is widely used to assess pain severity. The scale has the number "0 (no pain at all)" at one end and "10 (the most severe pain possible)" at the other end, and the person is asked to evaluate between a range of 0 and 10 by thinking about the pain experienced in the last week. The present study used the VAS to assess unidimensional pain distress and as a component of transactional pain distress.

West Haven Yale Multidimensional Pain Inventory (WHMWPI)

The WVMWPI was developed based on the cognitive behavioral model to assess cognitive, emotional and behavioral aspects of pain (Andreu et al. 2006, Kerns et al. 1985). The scale consists of 52 items and three dimensions (12 sub-dimensions): "pain experience", " responses of significant other" and "daily activity". The "pain experience" dimension comprises five sub-dimensions: "pain severity"; " pain interference"; "support and self control"; " pain perception"and "negative mood". The "daily activities" dimension consists of four sub-dimensions: " household chores", " outdoor works", "activities away from home" and "social activities" (Kerns et al. 1985). The questions in the inventory are evaluated on a seven-point Likert scale ranging from 0 (never/never) to 6 (extremely/very often). The Cronbach Alpha internal consistency values of the scale, which was adapted into Turkish with 520 patients diagnosed with cancer, were calculated as .85 for "pain experience" and .83 for "daily activities" (Cetin et al. 2016). In the current study, the "pain interference" subscale was used to assess pain-related disability; the "negative mood" subscale was used to assess negative emotions; and the "daily activity" subscale was used to assess everyday activity level. In addition, the "pain severity" subscale, which includes the questions "indicate your present level of pain on the scale", "how severe has the pain been since last week", "how much suffering do you feel because of your pain", was used to assess multidimensional pain stress. The internal consistency coefficients of the scale in this study were calculated as .77 for the whole scale, .80 for pain severity, .82 for pain effects, .71 for negative thinking and .79 for daily activity.

Statistical Analysis

The relationships between the research variables were analyzed by Pearson Product Moment Correlation Invariance Coefficient Analysis. In the correlation analysis, variables that demonstrated a significant ($p < .05$) association with the outcome variables were included in the regression analysis. The predictive effect of pain stress measures on pain-related disability, negative mood, and daily activity level was examined with Linear Multiple Hierarchical Stepwise Regression Analysis. During the hierarchical regression analysis, the control variables of life stress, age, pain duration, perceived income level, education level and gender were included in the first block, and the predictor variables of unidimensional pain stress, multidimensional pain stress and transactional pain stress were included in the second block. Hierarchical regression analyses were conducted separately for pain-related disability, negative mood and daily activity.

Results

In this study, three different measures of pain experience as a source of stress were used. In line with the aim of the study, analyses were conducted to determine the pain stress measure that was most correlated with pain-related disability, negative mood and change in daily activity levels. First, the correlations between the research variables were examined. Table 2 displays data on the relationship between the research variables and descriptive statistics values. In addition, details of the minimum, maximum, mean and standard deviation values of pain stress measurements are presented in Table 3.

Table 2. Associations between research variables

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1. Age	1	-.07	-.00	-.12	.25***	.13	-.05	-.01	-.00	-.29***	-.25***	.12
2. Gender		1	.06	-.03	-.00	.22**	-.28***	-.23**	-.19*	-.18*	-.16*	-.11
3. Education			1	-.17*	.03	.20**	-.13	-.19*	-.15	-.20**	-.15*	.23**
4. Income				1	.11	.01	.09	.10	.08	.02	-.08	-.17*
5. Duration					1	.06	-.09	-.19*	-.08	-.04	.01	.05
6. Life Stress						1	-.23**	-.24**	-.25**	-.41***	-.44***	.17*
7. MDPS							1	.69***	.76***	.51***	.38***	-.08
8. TPS								1	.79***	.43***	.37***	-.24**
9. UDPS									1	.33***	.36***	-.15*
10. Obstacle										1	.52***	-.18*
11. Negative Mood											1	-.22**
12. Activity												1

LS. Life Stress, MDPS. Multidimensional Pain Stress, TPS. Transactional Pain Stress, UDPS. Unidimensional Pain Stress, . Gender was coded as a dummy variable and included in the analysis (1. Female; 2. Male). Education and income variables were included in the analysis as ordinal variables. An increase in these variables indicates an increase in the level of education and income.
*p<0.05, **p<0.01, ***p<0.001

Table 2 illustrates that the relationships between the outcome variables of the study, which are pain-related disability, negative mood and daily activity level, and the control variables, which are life stress, age and education level, come to the forefront. There is a negative correlation between life stress and pain-related disability and negative mood ($r(1,167) = -0.41$; -0.44 $p<0.001$, respectively). As the life stress perceived by chronic pain patients decreases, both pain-related disability and negative mood levels decrease. Similarly, there is a negative and significant correlation between age and pain-related disability and negative mood ($r(1,167) = -0.29$; -0.25 $p<0.001$, respectively). As age increases, both disability and negative mood decrease. There were also significant correlations between education level and pain-related disability and daily activity level (respectively; $r(1,167) = -0.20$; 0.23 $p<0.01$); as the education level increases, disability decreases and daily activity level increases. The correlations between pain-related disability, negative mood and daily activity and other control variables were not significant ($p>.05$). When the correlations between measures of pain stress and health outcomes were examined, there were significant correlations between unidimensional pain stress and disability and negative mood (respectively; $r(1,167) = 0.33$; 0.36 $p<0.001$); multidimensional pain stress and disability and negative mood (respectively; $r(1,167) = 0.51$; 0.38 $p<0.001$); transactional pain stress and disability, negative mood (respectively; $r(1,167) = 0.43$; 0.37 $p<0.001$) and daily activity ($r(1,167) = -0.24$; $p<0.01$).

Table 3. Minimum, maximum, mean and standard deviation values for pain stress measurements				
Measures	**Min**	**Max**	**Mean**	**S.D.**
Unidimensional Pain Stress (UDPS)	0	10	6.61	2.46
Multidimensional Pain Stress (MDPS)	0	18	12.07	4.04
Transactional Pain Stress (TPS)	0	250	117.67	75.29

UDPS measurement: Measured with VAS. Rate the pain you have experienced in the last week on a scale from 0 (no pain at all) to 10 (most severe pain possible**). MDPS measurement**: "Indicate your current pain on the scale (0-6)" + "How severe is your pain since last week (0-6)" + "How much pain do you feel because of your pain (0-6)" For example, if the person rated his/her current pain as 5, the pain he/she experienced during the last week as 2 and the pain he/she experienced due to pain as 6, the multidimensional pain stress score is calculated as 5+2+6, which is 13. **TPS measurement:** Rate the pain you have experienced in the last week on a scale from 0 (no pain at all) to 10 (the most severe pain possible) X How often you have experienced pain when you think about the last month (between 1-5) X How much the pain you have experienced in the last month has bothered you (between 1-5). For example, if the respondent rates the intensity of pain as 5, the frequency of pain as 5 and the level of discomfort as 5, he/she receives 125 points as 5x5x5..

Hierarchical regression analysis was performed for each health outcome to further examine the relationships between the health outcomes and the variables that were significantly correlated in the correlation analysis. The aim was to examine the variables explaining the change in each outcome variable. The outcomes associated with pain-related disability, negative mood and daily activity are presented in Table 4, Table 5 and Table 6 respectively.

Table 4. Regression analysis on the level of disability due to pain					
	ΔR2	**F**	**Beta**	**B**	**t**
Total	.40				
Life stress	.17	33.572***	-.268	-.344	-4.190***
Age	.05	23.673***	-.230	-.217	-3.748***
Education	.01	17.495***	-.098	-1.995	-1.572
MDPS	.17	28.064***	.422	1.266	6.727***

MDPS: Multidimensional Pain Stress ***p<0.001

As seen in Table 4, 17% of the change in the level of disability due to pain is related to life stress, 5% to age and 1% to educational level. When life stress, age and educational level are controlled, multi-dimensional pain stress explains approximately 17% of the change in the level of disability related to pain. Life stress, age, education level and multidimensional pain stress together explain 40% of the disability level.

Table 5. Regression analysis for negative mood level					
	ΔR^2	***F***	***Beta***	***B***	***t***
Total	.31				
Life stress	.19	39.578***	-.344	-.174	.000***
Age	.03	24.574***	-.187	-.069	.005**
MDPS	.08	25.624***	.309	.364	.000***

MDPS: Multidimensional Pain Stress **p<0.01, ***p<0.001

Table 5 shows that 19% of the change in participants' negative mood is related to life stress and 3% to age. When multidimensional pain stress is included in the equation, 31% of the change in negative mood is accounted for. In other words, multidimensional pain stress alone is responsible for approximately 9% of the variance in mood.

Table 6. Regression analysis for daily activity level					
	ΔR^2	***F***	***Beta***	***B***	***t***
Total	.09				
Education	. 05	10.460***	.206	5.442	.007**
TPS	.04	9.386***	-.213	-.044	.006**

TPS. Transactional pain stress, *p<0.05, **p<0.01, ***p<0.001

Finally, as seen in Table 6, 5% of the change in daily activity level is associated with education level among the control variables and 4% with transactional pain stress among the pain stress measures. These results indicate that among the pain stress measures, the change in pain-related disability and negative mood is only associated with multidimensional pain stress, while the change in daily activity level is only associated with transactional pain stress. Unidimensional pain stress, one of the pain stress measures, does not seem to have a significant relationship with the change in health outcomes.

Discussion

For this study, the relationships between three different pain stress measures taken for chronic pain, which is a type of stress according to the transactional model, and the health outcomes of pain-related disability, negative mood, and daily activity level were examined. In this study, firstly, regarding control variables, life stress was associated with 17% of the change in pain-related disability and 19% of the change in a negative mood. Our results suggest that as life stress increases, pain-related disability increases, and mood worsens. These findings are consistent with studies examining the relationships between life stress and pain-related disability and mood in chronic pain patients (Ullrich et al. 2005, Smith et al. 2010, Homann et al. 2012). For example, in a study conducted with FMS patients, disability and depressive mood increased with heightened perceived stress (Homann et al. 2012).

Similarly, another study on women with FMS indicated that perceived stress levels had a negative role in physical and psychological health (Smith et al. 2010). Due to the negative impact of the stress perceived by chronic pain patients in their lives, some studies focus on the idea that chronic pain patients have more stress sources, and they compare healthy control group and chronic pain patients regarding life stress (Feuerstein et al. 1985, Ghosh and Sharma 2010). One of these studies compared chronic pain patients with healthy controls for the frequency and consequences of stressful life events (Ghosh and Sharma 2010). The study's results suggested that chronic pain patients did not have a higher frequency of stressful life events in the last year than the healthy control group, but they were more negatively affected by these life events. This finding may indicate the importance of stress perception and managing stress effectively. Indeed, some interventions for chronic pain patients aim to improve stress management skills (Cherkin et al. 2016, Rosenzweig et al. 2010). Mindfulness-oriented stress reduction therapy conducted with 133 chronic pain patients reduced patients' stress levels and pain-related disability levels (Rosenzweig et al. 2010). When the results of the current study are evaluated along with existing research, it can be argued that as the life stress perceived by chronic pain patients increases, their physical difficulties, such as pain-related disability, and psychological difficulties, such as negative mood, increase. Therefore, with interventions to manage life stress, it may be possible to manage the negative effects of pain when people develop effective coping strategies with stressors in life.

Age, another control variable, was associated with 5% of the change in pain-related disability and 3% of the change in negative mood. The level of pain-related disability and negative mood decreases with increasing age. In other words, being younger in chronic pain patients is associated with experiencing more deterioration in both physical and psychological health. Different studies support the negative relationship between age and disability in chronic pain patients (Asghari et al. 2008, Houde et al. 2016, Stephens et al. 2016). Houde et al. (2016) examined whether the relationship between pain severity and pain-related disability in people with chronic low back pain differed in young and elderly patients. The study results showed that although the level of disability increased with increasing pain severity in both groups, this association was more robust, especially in younger patients. One explanation for the higher level of pain-related disability in younger patients may be age-related expectations. With age, there is already a decrease in many activities of people, and health expectations also differ (Gignac et al. 2006). Many people perceive various disease symptoms as a natural consequence of aging and assume they do not require treatment. In a study on osteoarthritis patients' perceptions regarding the disease's symptoms, older individuals were more likely to perceive osteoarthritis symptoms as a natural consequence of aging compared to middle-aged individuals. On the contrary, the middle-aged group attributed conditions such as withdrawal from social life, decreased social roles, and inability to continue daily activities to their disease (Gignac et al. 2006).

Although not in the chronic pain group, many studies support the negative relationship between age and negative mood (Charles and Piazza 2009, Shallcross et al. 2013). One of these studies examined the relationship between age and anxiety, sadness and anger, and the mediating role of acceptance of negative emotions in this relationship (Shallcross et al. 2013). The study revealed that acceptance of negative situations increased with increasing age, and thus negative emotions decreased. The relationships between age and negative emotions can be interpreted similarly for chronic pain patients in the current study. People suffering from chronic pain, a source of stress, might gain more acceptance of their pain as time passes. This relation may be a possible explanation for the diminishing of negative emotions with increasing age. In this respect, it may be useful to measure patients' age-related expectations and pain acceptance levels in future studies.

Another control variable that significantly correlated with health outcomes in the present study was the level of education. Education level is associated with 1% of the change in pain-related disability and 5% of the change in daily activity. As the education level increases, disability due to pain decreases, and daily activity increases. Education level was significantly associated with physical health outcomes but not with mood. Studies in the

literature support the positive role of education level in predicting pain outcomes (Roth and Geisser 2002, Asghari et al. 2008, Day and Thorn 2010). In a study examining the role of educational level in pain-related health outcomes of chronic pain patients, educational level was not associated with changes in a negative mood. However, it was significantly associated with pain-related disability (Roth and Geisser 2002). In that study, perceiving pain as a threat fully mediated the relationship between educational level and pain-related disability. As education levels decrease, people use avoidance behavior, a passive coping method, more in the face of pain that they perceive as a threat. Thus, their level of disability increases (Roth and Geisser 2002). Therefore, patients may need more information about managing chronic pain, particularly as the level of education decreases. In addition, as the level of education increases, people are expected to participate more in activities outside the home and in social life. A more detailed examination of the relationship between educational level and pain perceptions may enrich the existing knowledge in future studies.

When multidimensional and transactional pain stress were included in the context of the main questions of the study, it was observed that the relationship between health outcomes and unidimensional pain stress was insignificant. On the other hand, multidimensional pain stress showed the most significant relationship between pain-related disability and negative mood. In contrast, transactional pain stress showed the most significant relationship with daily activity level. No study in the literature examines the relationships between different pain stress measures and health outcomes as in this study. Therefore, while the present study's findings provide a unique contribution to the literature, it is challenging to consider the results in their entirety. Studies examining the relationship between pain and various health outcomes measure pain only with the severity dimension corresponding to primary appraisals according to the Transactional Stress and Coping Model. The results of such studies suggest that as pain severity increases, pain-related disability increases and mood worsens (Asghari et al. 2008, Jones et al. 2008, Stefane et al. 2013, Bean et al. 2014, Häuser et al. 2014, Lee et al. 2015, Puente et al. 2015,). A study with FMS patients reported that disability and emotional stress levels increased as the pain severity of the participants increased (Häuser et al. 2014).

Similarly, another study involving 144 female FMS patients yielded that as pain severity measured by a single item increased, negative mood and pain-related disability levels increased (Puente et al. 2015). Although there is a significant relationship between pain severity measured by a single item and disability and negative mood in the studies, the correlations are weak. Single-item pain severity accounted for 4% of the change in pain-related disability (Stefane et al. 2013) in a study on the relationship between pain severity, life satisfaction, and disability level in patients with chronic low back pain. In the present study, although unidimensional pain stress showed significant associations with health outcomes, this significant association was lost in regression analyses that included other pain stress measures. Multidimensional pain stress remained associated with 17% of pain-related disabilities and 8% of negative moods.

The multidimensional pain distress measure assesses the suffering from the pain and pain during the interview, as opposed to the traditional single-item measure of pain severity. In particular, the suffering component accompanying pain provides information about what pain means to the person and covers the secondary appraisal in the transactional model. Thus, this measure better represents pain stress, consistent with the recommendations for measuring pain-related emotions (Lazarus and Folkman 1984, Lumley et al. 2011). On the other hand, measuring the pain severity during the interview can also contribute to assessing pain stress. With the growing use of electronic diary methods in recent years, the use of more accurate methods in pain assessment is becoming widespread (Stinson et al. 2011, Stinson et al. 2013). In future studies, measuring daily primary and secondary appraisals for pain, especially the diary technique, may provide an effective method for assessing pain stress.

Many intervention programs for chronic pain patients focus on reducing the severity of pain. However, it is seen that interventions aiming to reduce pain severity do not consistently achieve the desired change (Tan et al. 2011). When patients focus on reducing pain instead of continuing to live despite it, their medication use increases. Unfortunately, they express dissatisfaction with the medications at anticipated rates (Collins et al. 2000, Nicholas et al. 2006). Besides, some medications are related to avoidance behaviors that negatively affect pain management (Nicholas et al. 2006). In that case, patients may continue to perceive the presence of pain as a threat and resort to methods that may prevent the occurrence of pain. Considering pain reduction as the treatment goal may lead to ignoring cognitive assessments that play a role in pain outcomes. In the current study, the prominence of the relationship between multidimensional pain stress and health outcomes points to the importance of pain severity and appraisals accompanying pain. The Transactional Stress and Coping Model (Lazarus and Folkman 1984) defines stress as an interaction between the environment and the individual and underlines that the individual undergoes an appraisal after encountering the stressor. Especially in the secondary appraisal process, the individual focuses on what they can do. Functional cognitions are critical for

developing effective coping skills for pain. For instance, catastrophizing pain, common in chronic pain patients, complicates adaptation to pain.

Catastrophizing is the repetitive recall of negative thoughts or images related to pain. Several studies point to the effect of pain catastrophizing during pain management on pain outcomes (Somers et al. 2009, Varallo et al. 2020, Varallo et al. 2021). Somers et al. (2009), in their study among people with a diagnosis of osteoarthritis, pointed out that as the catastrophizing of pain increased, both physical and psychological difficulties increased. In a meta-analysis study, pain catastrophizing was identified as one of the prominent psychological variables in pain adaptation, and its relationship with pain-related disability was highlighted (Martinez-Calderon et al. 2019). Indeed, when people think that pain will be very challenging and that they will not be able to cope with it, they may start to avoid many activities, and this avoidance can exacerbate the negative impact of pain on their lives. Therefore, it is recommended that treatments for chronic pain patients should focus not only on reducing pain severity but also on improving functional cognitions that affect pain adaptation.

Pain-related disability and negative mood are among the variables targeted to be reduced in terms of health outcomes. In the current study, the highest correlation was observed between increased daily activity level, the health outcome targeted to be, and transactional pain stress, one of the measures. As transactional pain stress increased, the daily activities of patients declined significantly. Although there is no pain stress measure similar to the transactional pain stress measure measured in this study in the literature, studies are emphasizing the importance of pain frequency along with pain severity (Denkinger et al. 2014, Salamon et al. 2014) and the level of pain discomfort corresponding to secondary appraisals for health outcomes (Salaffi et al. 2015, Fillingim et al. 2016, Puntillo et al. 2018). Accordingly, this study is the first known to measure the components of pain severity, frequency, and discomfort, which measure both primary and secondary appraisals in chronic pain patients.

Moreover, it is noteworthy that pain stress, measured as transactional pain stress, was only associated with activity level among health outcomes. This finding suggests that patients may have different expectations about activity level, which is intended to be increased in contrast to disability and negative mood, which are targeted to be reduced during treatments. Many pain patients state that they expect pain to cease to exist to continue their routine activities. In other words, regarding activity level, not only pain severity but also pain frequency and discomfort may become more critical. This expectation, which also includes a decrease in the frequency of pain, seems prohibitive in adapting to a chronic stress condition. Pain acceptance has been a prominent variable in pain management in recent years (McCracken and Eccleston 2005, Esteve et al. 2007, Ahlstrand et al. 2017, Varallo et al. 2021). For chronic pain patients, continuing daily routines in the presence of pain require a new adaptation process and pain acceptance. However, it should be kept in mind that in this study, transactional pain stress and change in activity level were only weakly correlated.

When the results of the present study are considered together, the unidimensional pain stress (single-item pain severity measure), the most widely used pain stress measure in the literature, fails to be effective compared to the multidimensional and transactional pain stress measures used in the present study. This failure points to the necessity of going beyond the measurement of severity alone in measuring pain. In particular, multidimensional pain stress measures show the most robust relationship with the negative outcome variables of pain-related disability and negative mood among pain stress measures. The fact that the multidimensional pain stress measure includes a measure of the emotional process associated with pain (suffering from pain) may have a particular effect on negative health outcomes. In contrast, the inclusion of pain frequency and pain discomfort in the transactional pain stress measure has a more determinant role for routine activities (independent of pain). Considering this information together, it is recommended that future studies should include these components in pain stress measurements and examine the relationships with different outcome variables. Although there are new recommendations in the literature regarding pain appraisal, a limited number of studies address the relationship between different pain measures and health outcomes. The findings from the current study suggest that measuring pain with primary and secondary appraisals may be important in the relationship with health outcomes. In particular, the inclusion of secondary appraisals indicates that the experience of chronic pain is a condition that needs to be adapted to rather than changed. Although primary appraisals, such as pain severity or frequency, do not differ, a decrease in secondary appraisals (such as discomfort and pain sensation), which include one's reactions to pain, may also be beneficial in pain management.

In addition to these new contributions, the study has some limitations. First, it is known that the relationships between pain stress and health outcomes may be reciprocal. For this reason, the study's cross-sectional nature makes it difficult to understand these reciprocal relationships. It is impossible to establish a cause-and-effect

relationship in cross-sectional studies that provide information about the relationships between variables. The fact that all measurements are based on self-report is another limitation of the study. Although self-report-based pain measurement is the most reliable method because it is an individual-specific experience, physical measurements are also crucial for pain assessment. Including physiological measurements evaluating individuals' pain sensitivity in future studies may enrich the data on pain measurement. While calculating transactional pain, stress, pain frequency, and discomfort level were measured for the last month, and pain severity was measured for the last week. Using the most commonly used pain severity assessment to calculate the transactional measure was deemed appropriate.

Meanwhile, a one-month measurement was preferred as a more extended time interval to understand the frequency of pain (McCracken and Eccleston 2005). However, in future studies, measuring pain severity, frequency, and discomfort level in the same period may be more appropriate. Other study limitations include that most of the sample consisted of women. Most of these people were reached from the algology outpatient clinic in the Department of Physical Medicine and Rehabilitation at Istanbul University. This situation caused most of the sample to consist of fibromyalgia syndrome, low back pain, and rheumatoid arthritis patients. On the other hand, the number of participants in these pain groups does not allow for intergroup comparisons. In future studies, it is recommended that the sample be expanded to compare disease groups and examine gender differences.

Conclusion

The study results provide critical recommendations for clinicians, physicians, and researchers working with chronic pain. Measurement of secondary appraisals of pain in assessing pain experience suggests that people are not passive in the face of pain. Especially in the clinical setting, measuring primary appraisals such as pain severity and secondary appraisal components of pain will expand the field of intervention. This situation emphasizes that the effect of pain on patients is composed of personal evaluations, just as the transactional model suggests. Accordingly, forming functional cognitions about pain may also facilitate pain adaptation. In addition, the prominence of different pain-related components according to the targeted outcome variable enriches the intervention areas. Interventions can be planned to reduce the suffering accompanying pain to reduce pain-related disability and negative mood.

Meanwhile, steps can be taken to reduce the discomfort accompanying pain and dysfunctional expectations regarding pain frequency to increase patients' daily activities. In this direction, while creating treatment modalities, it may be helpful to conceptualize pain as a stress with its primary and secondary components and improve the patient's ability to manage it. Finally, in future studies, assessing pain at different times may facilitate a clearer understanding of patients' pain severity. Utilizing the diary method in this assessment and recording pain severity daily for a certain period may help prevent recall-based errors..

References

Ahlstrand I, Vaz S, Falkmer T, Thyberg I, Björk M (2017) Self-efficacy and pain acceptance as mediators of the relationship between pain and performance of valued life activities in women and men with rheumatoid arthritis. Clin Rehabil, 31:824-834.

Andreu Y, Galdon MJ, Durá E, Ferrando M et al. (2006) An examination of the psychometric structure of the Multidimensional Pain Inventory in temporomandibular disorder patients: a confirmatory factor analysis. Head Face Med, 2:48.

Arola HM, 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? Eur J Pain, 14:966-971.

Asghari A, Julaeiha S, Godarsi M (2008) Disability and depression in patients with chronic pain: pain or pain-related beliefs? Arch Iran Med, 11:263-269.

Ayonrinde OT, Ayonrinde OA, Adams LA, Sanfilippo FM, O'Sullivan TA, Robinson M et al. (2020) The relationship between abdominal pain and emotional wellbeing in children and adolescents in the Raine Study. Sci Rep, 10:1-11.

Aytar G (1985) Life events, depression and anxiety in an university population (Uzmanlık tezi). İstanbul, Boğaziçi Üniversitesi.

Azevedo LF, Costa-Pereira A, Mendonça L, Dias CC, Castro-Lopes JM (2012) Epidemiology of chronic pain: a population-based nationwide study on its prevalence, characteristics and associated disability in Portugal. J Pain, 13:773-783.

Bean DJ, Johnson MH, Kydd RR (2014) Relationships between psychological factors, pain, and disability in complex regional pain syndrome and low back pain. Clin J Pain, 30:647-653.

Booker SQ, Herr KA (2016) Assessment and measurement of pain in adults in later life. Clin Geriatr Med, 32:677-692.

Bryant RA (1993) Memory for pain and affect in chronic pain patients. Pain, 54:347-351.

Cetin AA, Bektas H, Ozdogan M (2016) The West Haven Yale Multidimensional Pain Inventory: Reliability and validity of the Turkish version in individuals with cancer. Euro J Oncol Nurs, 20:1-9.

Charles ST, Piazza JR (2009) Age differences in affective well-being: Context matters. Soc Pers Psychol Compass, 3:711-724.

Cherkin DC, Sherman KJ, Balderson BH, Cook AJ, Anderson ML, Hawkes RJ et al. (2016) Effect of mindfulness-based stress reduction vs cognitive behavioral therapy or usual care on back pain and functional limitations in adults with chronic low back pain: a randomized clinical trial. JAMA, 315:1240-1249.

Closs SJ, Staples V, Reid I, Bennett MI, Briggs M (2009) The impact of neuropathic pain on relationships. J Adv Nurs, 65:402-411.

Collins SL, Moore RA, McQuay HJ, Wiffen P (2000) Antidepressants and anticonvulsants for diabetic neuropathy and postherpetic neuralgia: a quantitative systematic review. J Pain Symptom Manage, 20:449-458.

Dansie EJ, Turk DC (2013) Assessment of patients with chronic pain. Br J Anaesth, 111:19-25.

Day MA, Thorn BE (2010) The relationship of demographic and psychosocial variables to pain-related outcomes in a rural chronic pain population. Pain, 151:467-474.

Denkinger MD, Lukas A, Nikolaus T, Peter R, Franke S, ActiFE Study Group (2014) Multisite pain, pain frequency and pain severity are associated with depression in older adults: results from the ActiFE Ulm study. Age Ageing, 43:510-514.

Dueñas M, Ojeda B, Salazar A, Mico JA, Failde I (2016) A review of chronic pain impact on patients, their social environment and the health care system. J Pain Res, 9:457-467.

Esteve R, Ramírez-Maestre C, López-Martínez AE (2007) Adjustment to chronic pain: the role of pain acceptance, coping strategies, and pain-related cognitions. Ann Behav Med, 33:179-188.

Ferreira ML, Machado G, Latimer J, Maher C, Ferreira PH, Smeets RJ (2010) Factors defining care-seeking in low back pain–a meta-analysis of population based surveys. Eur J Pain, 14:747-e7.

Feuerstein M, Sult S, Houle M (1985) Environmental stressors and chronic low back pain: life events, family and work environment. Pain, 22:295-307.

Fillingim RB, Loeser JD, Baron R, Edwards RR (2016) Assessment of chronic pain: domains, methods, and mechanisms. J Pain, 17:T10-T20.

Garbi MDOSS, Hortense P, Gomez RRF, Silva TDCRD, Castanho ACF, Sousa FAEF (2014) Pain intensity, disability and depression in individuals with chronic back pain. Rev Lat Am Enfermagem, 22:569-575.

Generaal E, Vogelzangs N, Macfarlane GJ, Geenen R, Smit JH, de Geus EJ et al. (2017) Biological stress systems, adverse life events, and the improvement of chronic multisite musculoskeletal pain across a 6-year follow-up. J Pain, 18:155-165.

Ghosh SN, Sharma T (2010) Life events stress and chronic pain. Psychol Stud, 55: 46-51.

Gignac MA, Davis AM, Hawker G, Wright JG, Mahomed N, Fortin PR et al. (2006) "What do you expect? You're just getting older": a comparison of perceived osteoarthritis-related and aging-related health experiences in middle-and older-age adults. Arthritis Care Res (Hoboken), 55:905-912.

Haefeli M, Elfering A (2006) Pain assessment. Eur Spine J, 15:S17-S24.

Häuser W, Brähler E, Wolfe F, Henningsen P (2014) Patient Health Questionnaire 15 as a generic measure of severity in fibromyalgia syndrome: surveys with patients of three different settings. J Psychosom Res, 76:307-311.

Homann D, Stefanello JMF, Góes SM, Breda CA, Paiva EDS, Leite N (2012) Stress perception and depressive symptoms: functionality and impact on the quality of life of women with fibromyalgia. Rev Bras Reumatol, 52:324-330.

Houde F, Cabana F, Léonard G (2016) Does age affect the relationship between pain and disability? A descriptive study in individuals suffering from chronic low back pain. J Geriatr Phys Ther, 39:140-145.

Jones J, Rutledge DN, Jones KD, Matallana L, Rooks DS (2008) Self-assessed physical function levels of women with fibromyalgia: a national survey. Womens Health Issues, 18:406-412.

Keefe FJ, Rumble ME, Scipio CD, Giordano LA, Perri LM (2004) Psychological aspects of persistent pain: current state of the science. J Pain, 5:195-211.

Kerns RD, Turk DC, Rudy TE (1985) The West Haven-Yale Multidimensional Pain İnventory (WHYMPI). Pain, 23:345-356.

Lami MJ, Martínez MP, Miró E, Sánchez AI, Guzmán MA (2018) Catastrophizing, acceptance, and coping as mediators between pain and emotional distress and disability in fibromyalgia. J Clin Psychol Med Settings, 25:80-92.

Langley P, Müller-Schwefe G, Nicolaou A, Liedgens H, Pergolizzi J, Varrassi G (2010) The societal impact of pain in the European Union: health-related quality of life and healthcare resource utilization. J Med Econ, 13:571-581.

Lazarus RS (2006) Stress and emotion: A new synthesis. New York, Springer.

Lazarus RS, Folkman S (1984) Stress, Appraisal, and Coping. New York, Springer

Lee H, Hübscher M, Moseley GL, Kamper SJ, Traeger AC, Mansell G et al. (2015) How does pain lead to disability? A systematic review and meta-analysis of mediation studies in people with back and neck pain. Pain, 156:988-997.

Lerman SF, Rudich Z, Brill S, Shalev H, Shahar G (2015) Longitudinal associations between depression, anxiety, pain, and pain-related disability in chronic pain patients. Psychosom Med, 77:333-341.

Liossi C, Howard RF (2016) Pediatric chronic pain: biopsychosocial assessment and formulation. Pediatrics, 138:e20160331.

Lumley MA, Cohen JL, Borszcz GS, Cano A, Radcliffe AM, Porter LS et al. (2011) Pain and emotion: a biopsychosocial review of recent research. J Clin Psychol, 67:942-968.

Martinez-Calderon J, Jensen MP, Morales-Asencio JM, Luque-Suarez A (2019) Pain catastrophizing and function in individuals with chronic musculoskeletal pain. Clin J Pain, 35:279-293.

McCracken LM, Eccleston C (2005) A prospective study of acceptance of pain and patient functioning with chronic pain. Pain, 118:164-169.

Matthieu MM, Ivanoff A (2006) Using stress, appraisal, and coping theories in clinical practice: Assessments of coping strategies after disasters. Brief Treat Cris Interv, 6:337-348.

Merskey H (1994) Pain terms: a current list with definitions and notes on usage. In Classification of Chronic Pain, 2nd ed. 209-214. Seattle, IASP Press.

Nesse RM, Ellsworth PC (2009) Evolution, emotions, and emotional disorders. Am Psychol, 64:129-139.

Nicholas MK, Molloy AR, Brooker C (2006) Using opioids with persisting noncancer pain: a biopsychosocial perspective. Clin J Pain, 22:137-146.

Ojeda B, Salazar A, Dueñas M, Torres LM, Micó JA, Failde I (2014) The impact of chronic pain: the perspective of patients, relatives, and caregivers. Fam Syst Health, 32:399-407.

Peters ML (2015) Emotional and cognitive influences on pain experience. Mod Trends Pharmacopsychiatr, 30:138-152.

Puente CP, Furlong LV, Gallardo CÉ, Méndez MC, Cruz DB, Fernández-de-Las-Peñas C (2015) Self-efficacy and affect as mediators between pain dimensions and emotional symptoms and functional limitation in women with fibromyalgia. Pain Manage Nurs, 16:60-68.

Puntillo K, Naidu RK (2018) Measurement of chronic pain and opioid use evaluation in community-based persons with serious illnesses. J Palliat Med, 21:43-51.

Rosenzweig S, Greeson JM, Reibel DK, Green JS, Jasser SA, Beasley D (2010) Mindfulness-based stress reduction for chronic pain conditions: variation in treatment outcomes and role of home meditation practice. J Psychosom Res, 68:29-36.

Roth RS, Geisser ME (2002) Educational achievement and chronic pain disability: mediating role of pain-related cognitions. Clin J Pain, 18:286-296.

Salaffi F, Sarzi-Puttini P, Atzeni F (2015) How to measure chronic pain: new concepts. Best Pract Res Clin Rheumatol, 29:164-186.

Salamon KS, Davies WH, Fuentes MR, Weisman SJ, Hainsworth KR (2014) The pain frequency-severity-duration scale as a measure of pain: preliminary validation in a pediatric chronic pain sample. Pain Res Treat, 2014:653592.

Sarason IG, Johnson JH, Siegel JM (1978) Assessing the impact of life changes: development of the Life Experiences Survey. J Consult Clin Psycho, 46:932-946.

Shallcross AJ, Ford BQ, Floerke VA, Mauss IB (2013) Getting better with age: the relationship between age, acceptance, and negative affect. J Pers Soc Psychol, 104:734-749.

Smith BW, Papp ZZ, Tooley EM, Montague EQ, Robinson AE, Cosper CJ (2010) Traumatic events, perceived stress and health in women with fibromyalgia and healthy controls. Stress Health, 26:83-93.

Somers TJ, Keefe FJ, Pells JJ, Dixon KE, Waters SJ, Riordan PA et al. (2009) Pain catastrophizing and pain-related fear in osteoarthritis patients: relationships to pain and disability. J Pain Symptom Manage, 37:863-872.

Stefane T, Santos AMD, Marinovic A, Hortense P (2013) Chronic low back pain: pain intensity, disability and quality of life. Acta Paul Enferm, 26:14-20.

Stephens HE, Lehman E, Raheja D, Yang C, Walsh S, Simmons Z (2016) The role of mental health and self-efficacy in the pain experience of patients with amyotrophic lateral sclerosis. Amyotroph Lateral Scler Frontotemporal Degener, 17:206-212.

Stinson JN, Huguet A, McGrath P, Rosenbloom B, Soobiah C, White M et al. (2013) A qualitative review of the psychometric properties and feasibility of electronic headache diaries for children and adults: where we are and where we need to go. Pain Res Manag, 18:142-152.

Stinson JN, Stevens BJ, Feldman BM, Streiner DL, McGrath PJ, Dupuis A et al. (2011) Using an electronic pain diary to better understand pain in children and adolescents with arthritis. Pain Manag, 1:127-137.

Suman A, Bostick GP, Schaafsma FG, Anema JR, Gross DP (2017) Associations between measures of socio-economic status, beliefs about back pain, and exposure to a mass media campaign to improve back beliefs. BMC Public Health, 17:504.

Şen ET, Hocaoğlu A, Berk ÖS (2019) Group psychotherapy with fibromyalgia patients: A systematic review. Arch Rheumatol, 34:476-491.

Tan G, Teo I, Anderson KO, Jensen MP (2011) Adaptive versus maladaptive coping and beliefs and their relation to chronic pain adjustment. Clin J Pain, 27:769-774.

Tracey I, Mantyh PW (2007) The cerebral signature for pain perception and its modulation. Neuron, 55:377-391.

Treede RD, Rief W, Barke A, Aziz Q, Bennett MI, Benoliel R et al. (2015) A classification of chronic pain for ICD-11. Pain, 156:1003-1007.

Türetgen IÖ, Berk ÖS, Basbug G, Unsal P (2012) The development of the Job Stressor Appraisal Scale as part of the Job Stress Battery. Eur J Psychol Assess, 28:147-153.

Ullrich PM, Turner JA, Ciol M, Berger R (2005) Stress is associated with subsequent pain and disability among men with nonbacterial prostatitis/pelvic pain. Ann Behav Med, 30:112-118.

WHO (1946). Preamble to the Constitution of World Health

Organization as adopted by the International Health Conference. New York, World Health Organization

WHO (2001) International Classification of Functioning, Disability and Health (ICF). Geneva, World Health Organization.

Vagg PR, Spielberger CD (1998) Occupational stress: measuring job pressure and organizational support in the workplace. J Occup Health Psychol, 3:294-305.

Varallo G, Giusti EM, Scarpina F, Cattivelli R, Capodaglio P, Castelnuovo G (2020) The association of kinesiophobia and pain catastrophizing with pain-related disability and pain intensity in obesity and chronic lower-back pain. Brain Sci, 11:1-8.

Varallo G, Scarpina F, Giusti EM, Suso-Ribera C, Cattivelli R, Guerrini Usubini A et al. (2021) The role of pain catastrophizing and pain acceptance in performance-based and self-reported physical functioning in individuals with fibromyalgia and obesity. J Pers Med, 11:810.

von Baeyer CL (2006) Children's self-reports of pain intensity: scale selection, limitations and interpretation. Pain Res Manag, 11:157-162.

Zeng F, Sun X, Yang B, Fu X (2016) Life events, anxiety, social support, personality, and alexithymia in female patients with chronic pain: A path analysis. Asia Pac Psychiatry, 8:44-50.

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