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Developing a Structural Model of Pain Perception based on Early Maladaptive Schemata Mediated by Cognitive Emotion Regulation in People with Chronic Pain

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Abstract: Chronic pain affects the type of thinking, function and feeling of the individual and causes various limitations in the person's life. This study aimed at developing a structural model of pain perception based on early maladaptive schemata mediated by emotion regulation in people with chronic pain. Method: The research method was descriptive correlation and the statistical population included all patients who referred to pain clinics in Tehran in 2020 from which 300 people (175 females and 125 males) were selected by convenience sampling method. They responded to the Granfsky and Craig (2006) Cognitive Emotion Regulation Questionnaires, Young's Early maladaptive Schema (1991), and the Visual Pain Scale. The research data were analyzed by structural equation modelling and hierarchical regression analysis. Findings showed that 1) Direct path coefficient between maladaptive schema and negative (β =0.559) and positive (β =-0.333) emotion regulation strategies was significant (P<.01). 2) The direct path coefficient between the maladaptive schema and pain perception was significant (P<.01). 3) The direct path coefficient between negative emotion regulation strategies and pain perception (β =0.107) was not significant (P>0.5), but the direct path coefficient between positive strategies for negative emotion regulation and pain perception (β =-0.115) was significant (P<.05). It was also found that the moderating role of gender in the relationship between negative and positive emotion regulation strategies with pain perception was not significant (P>.05. 4) The indirect path coefficient between maladaptive schemata and pain perception in patients with chronic pain was significant (β =.098, P<.01). Conclusion: People's tendency to use positive or negative cognitive emotion regulation strategies can be a determining factor in the relationship between maladaptive schemata and chronic pain perception.

Keywords: Perception pain, Maladaptive schemata, Cognitive emotional regulation, Chronic

Introduction

Pain is the body's adaptive and natural response to actual and potential injuries that lead to its protection (Mackey & Kao, 2019); However, chronic pain with a specific pathology usually worsens over time with changes throughout the nervous system (Elder et al., 2012) and may last for more than three months (Pitcher et al., 2019) An increase in the burden of chronic pain diseases is one of the biggest challenges for health systems around the world in the 21st century. Asadi Majareh and Sepehrian Azar (2018) stated in a study that more than 1.5 milliards people throughout the World suffer from chronic pain that reduces a person's ability to work and make a living. Therefore, if this pain and the problems associated with it are not well perceived, it will cause depression and anxiety and the quality of life of people will be further damaged; consequently, their physical and mental well-being is impaired (Wang et al., 2021). So research on the psychological causes of this disorder can be effective in reducing the damage caused by it (Abdolghadery et al., 2014).

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Studies consider different psychological components to be effective in the amount of perception of pain: pain intensity (Yazdi-Ravandi et al., 2013), cortical hyperactivity and change in pain processing mechanism (Yazdi-Ravandi et al., 2013), dopaminergic receptor function (Wang et al., 2021), deficiency in self-control and stressful events (Hinze et al., 2021), prevalence of anxiety disorders (Gatchel et al., 2007), sleep disorders (Stroemel-Scheder et al., 2020), interpersonal interactions (Mansourifar et al., 2021), behavioral activation system (Samari, 2021); personality traits (Naylor et al., 2017), resilience (Yazdi-Ravandi et al., 2013), and emotional states (Gilam et al., 2020).

Most of the changes in quality of life in patients with chronic pain can be due to difficulty in identifying emotions and emotional dysregulation (Ebrahimi et al., 2017) since emotional and cognitive variables can account for perception of pain in patients with chronic pain (Asadi Majareh & Sepehrian Azar, 2018; Mostafaie et al., 2017; Parra-Delgado & Latorre-Postigo, 2013). In fact, pain stimuli that cause reaction in a large cortical network such as the cingulate sensory areas as well as the forehead and frontal areas (Tobimatsu, 2021) can be influence by emotion-related areas that in men, according to applied magnetic imaging, include internal pre-frontal cortex, internal, anterior cingulate cortex, frontal pole, and medial-dorsal nucleus of thalamus; and in women, include bilateral amygdale areas, hippocamp, and back midbrain areas such as pre-ventral gray/spinal cord colliculus and whitish brain areas (Filkowski et al., 2017).

By acquiring emotion regulation skills, individuals can achieve the desired result while monitoring, evaluating and correcting emotional reactions by controlling the intensity and time of emotion (Shafiei et al., 2016). They are able to recognize emotion in themselves and others (including positive emotions (positive refocusing, positive reappraisal, perspective putting into, refocus on planning and acceptance) and negative emotions (self-blame, other-blame, rumination, and catastrophizing)), became aware of its effectiveness, and can respond appropriately to it (Gross, 2001). According to what has been said, emotions range from happiness to boredom. Positive emotions are qualitatively different from negative emotions; positive emotions lead to more adaptive strategies and different external and environmental supports; but negative emotions, by calling for stereotyped responses, provide the ground for distraction and attention to internalized concerns. Therefore, the internal stimulus takes precedence (Bahrami et al., 2017).

Passive strategies such as self-criticism (blaming oneself for pain), extreme generalization (believing that pain will not end and ruin other aspects of personal life), catastrophizing (exaggerating the severity of pain) are associated with feeling more pain (Golabi et al., 2020). In fact, negative emotion (through cognitive emotion regulation mechanisms) affects the amount of perception of pain. In this way, emotional alexithymia creates external orientation of cognitions in patients with chronic pain by creating limited visual processing. Thus, patients find it difficult to identify and describe their emotions, as well as to distinguish between them, and instead of accurately identifying and describing emotions (emotion regulation), they externalize them, albeit they occur in different ways (such as chronic pain) (Pahlevan et al., 2019). The results of research indicate that maladaptive emotion regulation strategies such as rumination, catastrophizing and self-blame can be associated with physical complaints (Garnefski &

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Kraaij, 2006b; Rezaee & Fath, 2020). This is while adaptive emotion regulation strategies lead to a decrease in anxiety and pain intensity in patients (Yazdanfar et al., 2020). Therefore, people with the ability to cope effectively with negative emotions, instead of experiencing anxiety (Grégoire et al., 2015), by adjusting and controlling their emotions, will be able to modify emotional activation in a wide range of situations that have positive effects in reducing pain and emotional distress (Gilam et al., 2020; Srisopa et al., 2021).

With the evocation of schemata, it is possible to experience high levels of emotions and feelings (Sepehri & Kiani, 2020). Schemata are basic variables that have high explanatory power because many cognitive processes affect coping strategies and patients' lifestyles. Early maladaptive schemata are cognitive and emotional patterns of self-harm that are formed in the early stages of development and continue throughout life (Young et al., 2006). They originate from the child's early life experiences, emotional temperament, and core emotional needs that shape a person's perception of himself/herself, the world, and others. However, early problems and injuries have profound effects on a child's emotional development, emotional issues, and mental health outcomes (Michalek et al., 2021). Activation of early maladaptive schemata also causes the person to negatively evaluate and interpret events and consider their environmental stimuli as threatening, which can lead to experiencing a wide range of negative and disturbing emotions (Besharat et al., 2017).

Early maladaptive schemata have a positive relationship with maladaptive cognitive emotion regulation strategies and a negative relationship with adaptive cognitive emotion regulation strategies (Ariavand, 2019; Balsamo et al., 2015; Salmanzadeh Daz Miri, 2017; Shajari, 2018). In this regard, it was stated in another study that early maladaptive schemata with the mediating role of difficulty in emotion regulation can play a significant role in the prevalence of anxiety symptoms (Khani et al., 2020). These two variables can also intensify the components of psychological distress (anxiety, stress and depression) in the individual (Shajari, 2018) and thereby, increase the amount of perception of pain in patients with chronic pain (Haj Hosseinpour, 2018). The schemata of emotional deprivation, obedience, abandonment and inhibition of the areas of disconnection / rejection, other directedness and areas of over vigilance and inhibition are important determinants of chronic pain (Heshmati, 2016; Nabipour, 2019; Zabihollahzadeh et al., 2019; Zarei Todeshki, 2018). These domains predict different dimensions of pain (Hosseini et al., 2015) so that the schemata of obedience and abandonment can explain emotional pain, and deprivation and inhibition schemata are able to explain neuropathic pain. Also, deprivation schema and obedience and inhibition schemata are able to predict continuous pain and diverse pain (Heshmati, 2016). Therefore, therapeutic methods can have important practical implications in secondary interventions and preventive measures, so that the results of some research indicate that cognitive emotion regulation skills are effective in preventing the activation of negative spontaneous thoughts (Salmanzadeh Daz Miri, 2017). Moreover, schema therapy is effective in preventing the consequences of pain in people with chronic pain (NeshatDoost et al., 2020; Sobhani Fard, 2018).

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In the study by Abdolghadery et al. (2014), it has been pointed out that psychological variables usually have a more effective role than biomedical or biochemical factors in perception of pain because they change the pain from acute to chronic. Salomons et al. (2014) also found that difficulty in regulating emotion causes problems in interpersonal relationships, social functioning, and mental and physical health (such as chronic pain). Some patients with chronic pain focus on their pain and think negatively about their situation. Thus, they suffer emotionally from both inside and outside of their thoughts, and the recurrent patterns of unsuccessful conflict with pain are established in a way that limits their function (McCracken & Keogh, 2009). Therefore, understanding the underlying processes of emotional regulation and cognitive variables in disorders associated with pathological concerns such as chronic pain can have many clinical applications and affect the improvement and development of treatments and therapeutic decisions and policies to improve the painful condition because having diseases with chronic pain due to creating debilitating conditions along with financial losses, overshadows the performance of the person in various aspects of the person's life, including personal, social and occupational, etc. Therefore, investigating the direct and indirect role of related variables can be useful.

Emotions are evoked as mediating factors, depending on the conditions and situations, and lead to a change in the direction of attention, and activate the cognitive evaluation system in the individual and contribute to a series of behavioral and physiological responses. Studies have shown that on one hand, strategies of cognitive regulation of emotion are affected by maladaptive schemata (Balsamo et al., 2015), and on the other hand, they affect perception of pain (Ebrahimi et al., 2017; Yazdanfar et al., 2020). But no previous study has referred to the mediating role of this variable in the relationship between maladaptive schema and perception of pain. This is while dysfunctional cognitive and emotional patterns (early maladaptive schemata) can complicate the process of controlling and managing emotions, a process that is considered a key variable in long-term adaptation to pain since it includes a set of processes that wants the individual to perform well in order to achieve his/her goals by controlling, evaluating or even changing emotional reactions (Linton & Fruzzetti, 2014).

Today, due to the increasing number of patients with chronic pain disorders and the abundance of their problems and the low volume of studies conducted in the country in this regard, the importance of such research can be realized since this type of research causes that via timely referral of patients with chronic pain by general practitioners, a suitable ground is provided for reducing the level of perception of pain in them. With a view to this, the present study sought to investigate the structural model to determine the relationship between maladaptive schemata in the formation of chronic pain mediated by emotion regulation strategies.

Material and Methods

This research was applied research in terms of purpose and was based on descriptive-survey data collection method. In terms of correlation research method, it was a structural equation research. The statistical population of the present study included all patients who referred to pain clinics in Tehran in 2020. Criteria for entry of subjects were having a diagnosis of chronic pain disorder, absence of

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psychiatric diseases, and interest in participating in research. Criteria for excluding the subjects were not having any of the entry criteria and not answering some parts of the questionnaires. Kline (1998)divides structural equation patterns into three types namely, simple, slightly complex, and complex, the sample size in simple patterns is less than 100, in slightly complex patterns, between 100 and 200, and in complex patterns, more than 200. In this study, a sample size of 300 was selected who were selected by available sampling method. The procedure of data collection was as follows: preparing a list of pain clinics and psychiatric offices related to pain, and random selection of several centers (Ehya, Pieke Ravanshenasi, Roshana, Rahe Sabz etc.) from among the centers on the list. After identifying the centers, they were referred to. After talking to the heads of the clinics or office secretaries about the purpose of the research, their consent was obtained to conduct research in that center. The secretaries were explained to ask the following questions from the patients when they referred to the clinics: Have they felt chronic pain in the last few weeks? If yes, the purpose of the research was explained to them. After taking their consent, questionnaires were given to them. To observe ethical issues, they were told that there is no obligation to write their name and surname. However, they were asked to answer all the questions of the questionnaires and not to hesitate to contact the examiner if there was any ambiguity in the question. Thus, the questionnaires were administered to participants. To analyze the data, the data were entered into SPSS22 and Amos22 to conduct descriptive and inferential statistics after examining the assumptions (correlation (Pearson correlation coefficient)), linearity analysis (variance inflation factor and tolerance factor), confirmatory factor analysis of the study questionnaires), path analysis was used in the form of structural equation modeling by examining the fit indices of the model.

Garnefski Cognitive Emotion Regulation Questionnaire (CERQ): it is an 18-item tool that measures cognitive emotion regulation strategies in response to life-threatening and stressful events in a five-point Likert scale. In this questionnaire, a higher score indicates more use of that cognitive strategy. Cognitive emotion regulation strategies in this questionnaire can be divided into 2 general categories: adaptive strategies (perspective development, positive refocus, positive reassessment, acceptance and refocus on planning) and non-adaptive strategies (self-blame, blaming others, rumination, and catastrophizing. Questionnaire designers extracted 9 factors (two items for each subscale) by performing factor analysis using principal components method. The results of test-retest reliability calculation showed that cognitive coping strategies are relatively stable. The results of examining the internal consistency of this scale with Cronbach's alpha coefficient in general was reported to be 0.80 (Garnefski & Kraaij, 2006a). For the purpose of this study, Cronbach' s Alpha reliability indices of the scale for adaptive and non-adaptive strategies were found to be 0.87 and 0.75, respectively. Also, in examining the validity of the structure by confirmatory factor analysis, it was shown that the two-factor model has an acceptable fit index.

Young Incompatible Schema Questionnaire (SQ): In its short form, it is a 75-item tool that provides a 6-point Likert scale based on 15 subscales (each consisting of 5 items) to obtain information about the

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relationship between the individual and the environment that causes mental distress and negative automatic thoughts. This scale has been designed in 5 domains 1) Schemas of disconnection and rejection (abandonment and instability, emotional deprivation, disability, social isolation and alienation, mistrust / abuse) 2) Schemas of impaired autonomy and self-government (vulnerability to harm, undeveloped/enmeshed self, dependence / incompetence), 3) Schemas of impaired limits (entitlement/grandiosity, restraint, and insufficient self-discipline), 4) Schemas of other directedness (obedience, self-sacrifice, subjugation), 5) Schemas of over vigilance / inhibition (emotional inhibition, extreme fault-finding / unrelenting standards). The high score in this questionnaire indicates a higher level of maladaptive schemas in the individual (Divandari et al., 2009). Schmidt et al. (1995) reported Cronbach' s Alpha reliability of the subscales in a range from 0.50 to 0.82. This questionnaire has a high correlation with the scales of psychological distress and personality disorders (Lotfi, 2006). In an Iranian study, the reliability of this questionnaire by Cronbach's alpha method for 5 domains was estimated between 0.68 to 0.80 (Albkel, 2016). In the present study, the reliability of this questionnaire by Cronbach's alpha method for 5 domains was estimated between 0.59 to 0.89. Moreover, through examining its validity by means of confirmatory factor analysis, it was shown that the fit index of the model is desirable.

Visual Assessment Pain (VAS): This scale is generally used to determine the severity of pain in patients. This instrument is a 10-point scale with the left side (zero indicates no pain) and the right side (10 indicates the most severe pain). A score of 1-3 indicates mild pain, 4-7 indicates moderate pain, and 8-10 indicates severe pain (Mendelson & Selwood, 1981). Therefore, the subject is asked to determine the intensity of his/her pain on the line by choosing a number between zero and 10 (Hawker et al., 2011). In an Iranian study, the convergent validity of McGill Pain Questionnaire with Visual Pain Scale was measured, and a correlation of 0.827 at the significance level of 0.01 indicated the convergent validity of this scale (Moradifar, 2013).

Results

The results of demographic information indicate that among 300 subjects, 175 (58.3%) were female and the rest 125 (41.7%) were male. It was also found that in the sample group 108 people (36%) between 26 and 35 years old, 81 people (27%) between 36 to 46 years old, 51 people (17%) over 25 years old, 28 people (9.3%) between 46 and 55 years old and 32 people (10.7%) over 55 years old.

According to Table 1, it was shown that in descriptive statistics, the research variables of mean, median and mode values are close to each other, which shows the normality of scores. Of course, that skewness and kurtosis values are in a range from (-2) to (+2) also confirms normality of data.

The assumption of non-co-linearity between the research data was examined with the values of tolerance coefficient and variance inflation factor. The obtained values for variance inflation factor for positive and negative emotion regulation strategies and maladaptive schemata were 0.6, 0.736 and 0.742. Moreover, the obtained tolerance coefficients were 1.666, 1.358, and 1.349. Accordingly, the

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assumption of non-co-linearity between the data of the present study was met because the tolerance coefficient is more than 0.1 and the value of variance inflation factor is less than 10.

Table 1. Descriptive Statistics

		Mean	Median	Mode	SD	Skewness	Kurtosis
Maladaptive schemas	emotional deprivation	14.25	13	5	6.74	0.355	-0.847
	abandonment	15.72	15	10	6.55	0.43	0.667
	abuse	13.79	13	6	5.63	0.3639	0.149
	alienation	12.36	11	6	0.966	0.962	0.275
	deficiency	9.75	8	5	5.39	1.44	2
	defeated	11.20	10	5	5.85	1.12	0.741
	dependence	9.53	9	5	4.11	1.21	2
	vulnerability to harm	12.69	12	9	6	0.683	-0.222
	enmeshed	11.81	10	5	6.26	1.21	1.13
	obedience	12.62	12	5	5.88	0.628	-0.034
	Self-sacrifice	18.76	19	17	6.07	0.021	-0.962
	Emotional inhibition	1.82	13	5	6.52	0.385	-0.669
	unrelenting standards	20.45	20	21	6.04	-0.469	-0.496
	entitlement	16.68	17	17	5.83	0.02	-0.691
	restraint	15.17	15	10	5.41	0.327	-0.302
	total	208.63	202	135	58.79	0.598	0.580
	Negative emotion regulation strategy	22.56	21	21	6.17	0.451	-0.161
	Positive emotion regulation strategy	29.14	29	29	7.21	-0.214	0.211
	Perception of pain	8.09	8	6	1.80	0.068	-0.958

Table 2. Model fit indices

Fit indices	X^2	X^2/DF	CFI	GFI	AGFI	RMSEA
Values	324.19	3.85	0.91	0.90	0.89	0.08
Acceptable cut of points	-	< 5	< 0.90	< 0.90	< 0.80	< 0.10

According to the results of Table 2, the model fit is estimated to be optimal. The results of the path coefficients are listed in Table 3.

Table 3**.** Total, direct and indirect path coefficients

Path		B	S. E.	β	sig
Total	Maladaptive schemata - positive emotion regulation	-0.56	0.06	-0.33	0.001
	Maladaptive schemata - negative emotion regulation	0.81	0.05	0.55	0.001
	Maladaptive schemata - perception of pain	0.21	0.04	0.51	0.001
	Positive emotion regulation - perception of pain	-0.03	0.06	-0.11	0.043
	negative emotion regulation - perception of pain	0.03	0.06	0.10	0.043
direct	Maladaptive schemata - positive emotion regulation	-0.57	0.06	-0.33	0.001
	Maladaptive schemata - negative emotion regulation	0.81	0.05	0.56	0.001
	Maladaptive schemata - perception of pain	0.18	0.06	0.41	0.001
	Positive emotion regulation - perception of pain	-0.03	0.06	-0.11	0.043
	negative emotion regulation - perception of pain	0.03	0.06	0.10	0.063
Indirect	Maladaptive schemata to perception of pain through positive emotion regulation	0.04	0.03	0.09	0.003

According to Table 3, mediator of positive and negative emotion regulation strategies: indirect path coefficient between maladaptive schemata (P = .098, P <.01β) and perception of pain was significant in

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individuals with chronic pain, thus, maladaptive schemata, through the mediating role of emotion regulation strategies (positive and negative), affect the perception of pain in people with chronic pain. However, considering that in the path of the direct coefficients, the path between negative emotion regulation and perception of pain was not significant, it is clear that when applying two mediators simultaneously, only the effects of positive emotion regulation strategies can mediate the relationship between maladaptive schema and chronic pain of perception. Table 4 examines the role of gender moderator in the relationship between emotion regulation strategies and perception of pain.

Table 4. Regression summary

Negative emotion regulation strategy	Model	R^2	R	F	p	Model	B	SE	β	T	p
	1	0.15	0.39	53.55	0.001	Constant	1.4	0.37	-	3.71	0.001
						Negative emotion regulation	0.11	0.06	0.39	7.31	0.001
	2	0.155	0.39	26.82	0.001	Constant	0.139	0.37	-	3.7	0.001
						positive emotion regulation	0.11	0.02	0.37	5.66	0.001
						emotion Negative* gender	0.004	0.009	0.03	0.47	0.001
Positive emotion regulation strategy	Model	R^2	R	F	p	Model	B	SE	β	T	p
	1	0.09	0.30	30.59	0.001	Constant	6.13	0.42	-	15.04	0.001
	2	0.097	0.31	15.54		Positive emotion regulation	-0.06	0.017	-0.34	4.94	0.001
						emotion Positive* gender	0.006	0.007	0.059	0.84	0.001

Hierarchical regression analysis was used to investigate the moderating role of gender in the relationship between chronic perception of pain and emotion regulation strategies. Accordingly, the R^2 value of the chronic perception of pain value showed a small increase from model 1 to model 2. It was also found that in the first model, the effect sizes (β) of each of the negative and positive strategies of emotion regulation on perception of pain were 0.393 and -0.307, respectively. In the second model, the effect sizes (β) of each of the negative and positive strategies of emotion regulation on perception of pain were 37.375 and -0.342, respectively. Moreover, in the second model, the moderating role of gender in the relationship between negative (β = .032, T = .479) and positive emotion regulation strategies (β = .059, T = .845) and perception of pain was not significant (P> .05). Therefore, gender does not have a moderating effect on this relationship.

Discussion

According to the aim of this study (i.e., developing a structural model of perception of pain based on early maladaptive schemas mediated by emotion regulation in people with chronic pain), according to the results, it was found that the direct path coefficient between maladaptive schemas and perception of

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pain was significant. This finding is consistent with the results of the studies by Zarei Todeshki (2018), Heshmati (2016), and Nabipour (2019) who showed that early maladaptive schemas are important determinants of chronic perception of pain in patients. In justifying this result, it can be said that in Lazarous and Folkman model, individual variables such as schemas affect a person's interaction with a painful stimulus. According to this model, maladaptive schemas in interaction with negative life events and by creating cognitive vulnerability, prepare patients with chronic pain for dysfunctional attitudes, helplessness and mental disorders. This model also shows that on one hand, chronic pain and its stressful stimuli, which are interpreted as negative life events, activate maladaptive schemas, and on the other hand, people with pain have schemas about themselves as patients with pain that greatly affects their final adaptation to their disease, because schemas go against the goal of pain self-management and lead to disability. According to the neural network model, it was also found that the body itself is composed of a neural network of specific neural impulse patterns that are specific to each individual and shape the pain experience. This network communicates with the peripheral nervous system and is connected to the cognitive structures of the brain, such as the schema; According to this model, when experiencing pain, previously acquired knowledge such as self-schemas and pain schemas and personality-based assessment processes interact with sources of stress, disrupting the return to vital balance, exacerbating stress and resulting in different responses to stress related to pain. Based on what has been said, it is clear that these schemas have a great impact on the patient's adaptation to pain and even cause or exacerbate pain.

Based on other findings of the study, it was found that the direct path coefficient between maladaptive schemas and cognitive emotion regulation strategies was significant. These results are somewhat consistent with the research of Zabihollahzadeh et al. (2019) and Balsamo et al. (2015) who showed that there is a relationship between early maladaptive psych constructs and difficulty in cognitive emotion regulation. Explaining these results, it can be said that emotional processes of individuals are exposed to their cognitive effects, so that a person's complex behaviors are subject to the interactions of his cognitive and emotional processes, and biological neural theories about the bilateral interactions of cognition and emotion will not be complete without considering the underlying mechanisms showing the effect of cognitive processing on emotional processing. On the other hand, early maladaptive schemas can activate negative spontaneous thoughts in the individual by distorting information about the relationship between the individual and the environment; These thoughts eventually lead to abnormal cognitive attitudes and processes. In fact, these structures, using self-sustaining processes, protect the individual against the intense and helpless emotions that arise mainly from the arousal and initiation of a schema. In this way, people make themselves resistant to change and maintain the negative content of their schemas, and as a result, a wide range of problems and inefficiencies in various areas can be created. Therefore, it can be acknowledged that people using adaptive schemas have a better ability to regulate emotion in an adaptive way and cope with stress, because when faced with stressful events in life, they are less likely to have psychological or physical problems, in other words, psychological

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factors (such as active maladaptive schemas and difficulty in regulating emotion) are involved in causing the disease and its severe symptoms. Thus, by using adaptive emotional and coping strategies, psychological vulnerability and severity of symptoms (chronic pain) can be reduced.

Based on other findings of the study, it was found that the coefficient of direct path between positive strategies of cognitive regulation of emotion and perception of pain was significant. These results are consistent with the studies by Asadi Majareh and Sepehrian Azar (2018), Sadeghi Mazidi (2014), Yazdanfar et al. (2020), and Krishnan et al. (2016) who showed that emotional and cognitive variables are able to explain perception of pain in patients with chronic pain. Explaining the results, it can be said that since by definition, pain is an unpleasant sensory and emotional experience that is associated with negative emotions, then how a person regulates emotion can be related to the severity of the pain and their adaptation so that cognitive emotion regulation strategies help the person to regulate his / her emotions by influencing the correction of people's cognitions and focusing them on destructive emotions. In other words, by identifying and correcting one's cognitive distortions, the person prevents the occurrence of destructive emotions and in this way, exercises better control over one's thoughts and emotions. In fact, misinterpretations can be corrected, negative self-talks can be guided, irrational patterns of dysfunctional thinking and cognition can be corrected to enable the person to manage chronic pain in a more desirable way by launching effective and adaptive coping responses and controlling negative emotions, through emotion regulation in an adaptive manner. In this way, people with chronic pain, by regulating their emotions through the relationship between pain and emotion, are able to prevent information bias that leads to the experience of negative emotions, and adapt more effectively to their disease. In this regard, Hamilton has suggested that individuals' capacity for self-regulation of their emotions may be the key difference in their tolerance of pain through which individuals can separate the pain experience from pain emotional reactions. However, as investigated in this study through the moderating role of gender, this difference may not be related to the individual's gender, but it be related to the components and psychological beliefs of the individual.

Based on other findings of the study, it was found that the indirect path coefficient (mediated by emotion regulation strategies) was significant in the relationship between maladaptive schemas and perception of pain. No research was found in this regard, but these results are somewhat in line with the research of Shajari (2018), Salmanzadeh Daz Miri (2017), Michalek et al. (2021), Ariavand (2019) and Srisopa et al. (2021), which showed that one the one hand emotion regulation strategies and on the other hand, early life problems and injuries play a role in people's perception of pain.

Explaining the results, it can be said that schemas are cognitive and emotional patterns of self-harm that are formed in the early stages of a person's development, continue throughout life and are used as a framework for information processing by which people make sense of the concept of life. Therefore, some people create some maladaptive schemas in order to deal with problems and negative events. This causes the person to evaluate and interpret environmental events and stimuli in a negative way, consider them threatening and experience a wide range of negative and annoying emotions. These dysfunctional cognitive and emotional patterns (early maladaptive schemas) make the process of controlling and

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managing emotions difficult (difficulty in regulating emotions) and pave the way for the formation or continuation of individual problems and issues. According to the mentioned studies, people who use more negative emotion regulation strategies are more prone to use suppression of emotions and unwanted thoughts, so they have less tolerance and more perception of pain because they try to increase the severity of their physical pain and mental suffering in this way. Maladaptive emotions reduce emotion regulation, so they perceive pain for a longer period of time with greater intensity. But positive emotion regulation strategies allow for more appropriate and efficient performance (Linton & Fruzzetti, 2014).

As stated, emotional regulation can be considered a key variable in long-term coping with pain because it involves a set of processes that control, evaluate, or even change emotional responses so that the person has a proper performance in order to achieve his/her goals. Thus, people with chronic pain can adapt to their illness to respond to stressful events by modifying information processing and using positive emotion regulation strategies, as these strategies moderate the unpleasant emotional state caused by pain. Also, as mentioned earlier, different cognitive and emotional patterns can affect the severity and persistence of pain. In the meantime, maladaptive schemas are able to have a long-term and significant effect on (life) due to the decisive role they play in people's emotional reactions to life situations. Therefore, difficulty in regulating emotion and using non-adaptive strategies of this construct can be a mediator in the application and effect of cognitions, distortions and long-standing schemas of the individual for chronic pain.

Conclusion

In general, the results of the present study showed that maladaptive schemas that are formed in the early stages of child development through the mediation of positive and negative emotion regulation strategies indirectly affect the level of perception of pain of individuals with chronic pain. In this regard, negative emotion regulation strategies, which have been used more by maladaptive schemas, subsequently increase the level of (chronic) perception of pain (only in the role of mediator). This is while the use of positive emotion regulation strategies, which is increased by using schemas in a more adaptive manner, can reduce the level of perception of pain in patients with chronic pain.

Limitations of the study

Limitations of the study included lack of control over demographic variables such as age, social and economic factors that make the generalizability of the findings cautious. Another limitation was the unfavorable physical and sometimes psychological condition of the patients during the study period. Pain is one of the components that has a cultural burden (the degree of tolerance and reaction to it is different), so because this study was conducted in Tehran, the generalization of its results to other cultures should be done with caution. Due to the limitations raised, to increase the generalizability of the results, it is suggested that in future research, this research procedure be conducted in different regions and countries. Given that the focus for the treatment of chronic pain is more on the biological

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aspect while psychological factors play a role in maintaining the disease; in an interactive plan, physicians active in the field of pain together with psychologists can help patients with chronic pain by timely referral of patients and their use of a comprehensive treatment model. On the other hand, due to the harmful effects of maladaptive schemas that are formed in the early stages of development and affect a person's performance in adulthood, it is suggested that effective interactive methods as well as methods of dealing with schemas (schema therapy) be taught to reduce negative consequences such as mental-physical problems.

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