

Original Research Reports

Childhood Abuse and the Experience of Pain in Adulthood: The Mediating Effects of PTSD and Emotion Dysregulation on Pain Levels and Pain-Related Functional Impairment

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Background: Previous findings suggest a relationship between childhood abuse and pain-related conditions. It is yet to be determined whether adult posttraumatic stress disorder (PTSD) symptoms may mediate the association between the experience of childhood abuse and reported pain in adulthood. **Objective:** We sought to determine if emotion dysregulation may also play a role in mediating PTSD and pain levels. **Methods:** We examined subjects ($N = 814$) recruited from the primary care clinics of an urban public hospital as part of an National Institute of Mental Health-funded study of trauma-related risk and resilience. We evaluated childhood abuse with the Childhood Trauma Questionnaire, PTSD symptoms with the PTSD Symptom Severity scale, and emotional dysregulation with the Emotion Dysregulation Scale. Pain and functional limitations of pain were assessed through self-report.

Results: We found that both childhood abuse and

current PTSD symptoms predicted higher levels of reported pain. Childhood abuse, PTSD symptoms, and emotion dysregulation all predicted higher levels of functional impairment related to pain. Using the Sobel method and bootstrapping techniques and controlling for current level of negative affect, we found that PTSD fully mediated the effect of childhood abuse on pain level and pain-related limitations; emotion dysregulation partially mediated the effect of PTSD symptoms in predicting higher levels of pain-related limitations. **Conclusions:** Although causality cannot be determined in the present study, these findings suggest that PTSD may serve as the pathway between exposure to childhood abuse and the development of pain-related conditions in adulthood, and that emotion dysregulation is a significant factor in understanding how PTSD relates to specific pain-related functional impairment.

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INTRODUCTION

Pain is one of the most frequent reasons for which individuals seek medical care, and it represents a serious medical problem.¹ An area of particular interest in recent years has been in the relationship between pain and psychologic disorders.² Although the majority of this research has focused on the

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relation between depression and long-term pain, recent evidence suggests an important link between pain and anxiety disorders, particularly posttraumatic stress disorder (PTSD).^{3,4}

PTSD is associated with increased reporting of pain conditions and lower reported quality of life among individuals experiencing pain.^{5,6} The rates of long-term pain in PTSD populations are high. A recent study of male veterans⁷ found that 66% of veterans presenting for VA PTSD treatment had an already established, physician-diagnosed long-term pain condition. This is consistent with prior research showing high rates of pain conditions present among both veteran and civilian populations with PTSD.^{4,8,9} Further research indicates that individuals with co-occurring pain and PTSD show higher levels of disability and life interference as compared with individuals with only pain or PTSD alone.^{10,11}

The co-morbidity between PTSD and pain syndromes suggests the possibility of shared vulnerability pathways¹² and the potential mutual maintenance of symptoms.¹³ This was well documented in a recent review of the relevant literature.¹⁴ Bosco et al.¹⁵ also suggest that it is a long-term fear-avoidance cycle found in both PTSD and long-term pain that leads to this mutual maintenance of symptoms. To make progress in our understanding and treatment of co-morbid PTSD and pain conditions, it is critical to examine psychologic and behavioral processes that may play a role in the development or exacerbation of their shared relationship.

The capacity to effectively regulate negative affective states is likely an independent process underlying the relationship of co-occurring PTSD and pain. The inability to regulate or manage intense negative emotions, often referred to as emotional dysregulation, plays an important role in PTSD.¹⁶ Researchers have already found strong associations between negative affect and pain. In a longitudinal study of young adults, Breslau et al.¹⁷ found that negative emotionality predicted risk of migraine headaches developing among female participants. Experimental research supports this, showing that negative mood induction can decrease in-laboratory pain tolerance and increase reported levels of pain.¹⁸

Although emotion dysregulation is certainly related to negative emotionality, it is a distinct construct that affects many psychiatric conditions on its own and should be considered an important

transdiagnostic target for intervention in the treatment of psychopathology.¹⁶ The specific deficits related to emotional awareness, understanding, and regulation strategies that encompass emotion dysregulation appear to provide us with relevant clinical information beyond the presence of high levels of negative emotional states alone. Recent research¹⁶ examined the independent roles of negative affect and emotion dysregulation in relation to psychiatric conditions and found that even after accounting for negative affect, emotion dysregulation was significantly related to higher levels of PTSD, depression, and substance abuse symptoms.

Childhood abuse is an additional risk factor for the development of both PTSD and pain in adulthood. The relationship between childhood abuse and risk for the development of PTSD is already well established.^{19,20} Evidence of associations between childhood abuse and adult health problems, including long-term pain, is also growing.^{21,22} A recent meta-analysis²³ found substantial evidence for childhood abuse as a risk factor for the development of pain conditions in adulthood. Past research has shown that both PTSD symptoms and emotional dysregulation may mediate the relationship between early childhood trauma exposure and risk for adult psychopathology,^{24–26} and it is possible that both PTSD and emotional dysregulation may also act as mediating variables in the association between childhood abuse and adult pain levels.

The goal of this study is to examine the potential relationship among these variables in a highly traumatized, economically-disadvantaged population. Specifically, the current study explores how childhood abuse, PTSD symptoms, and emotion dysregulation are related to (1) reported pain levels and (2) functional limitations due to pain.

METHOD

Procedure

Participants were drawn from an National Institute of Mental Health-funded study of risk factors for the development of PTSD in a low socioeconomic, primarily African American urban population. Participants were recruited from waiting rooms in the gynecology and primary care medical (nonpsychiatric) clinics at Grady Memorial Hospital, a publicly-funded

hospital in Atlanta, GA. We did not narrow our recruitment to specific selection criteria, but approached any individual in the waiting room. To be eligible for participation, subjects had to be at least 18 years old, not actively psychotic, and able to give informed consent. After signing the informed consent approved by the Emory Institutional Review Board, an initial interview was administered with questionnaires regarding trauma history, PTSD symptoms, and psychological variables. Trained research assistants administered this interview, which took 45–75 minutes to complete (duration largely dependent on participant's trauma history and symptoms). Subjective reports of pain were obtained during a secondary phase of the study in which a subset of screened participants participated.

Participants

The sample consisted of 814 individuals, with 65% women. The subjects were all adult (>18 years; median age of 41 years) and primarily African American (92.5%). The remainder of the racial composition was as follows: white (4.3%), mixed/other (2.3%), and Hispanic or Latino (3.7%). The sample was predominately poor, with 78.9% of individuals unemployed and 71% coming from households with a monthly income of less than \$1000. Most participants were medical patients (>80%). All participants in the study reported at least 1 traumatic event and 75% of participants reported experiencing at least 2 traumas in their lifetime. Only a subset of participants reported childhood abuse or neglect. Based on Childhood Trauma Questionnaire data, 45.3% reported moderate or severe childhood abuse (21.4% physical abuse, 26.9% sexual abuse, 19.8% emotional abuse, 16.4% emotional neglect, and 16.1% physical neglect).

Measures

Childhood Trauma Questionnaire: The Childhood Trauma Questionnaire²⁷ is a 25-item, brief, reliable, and valid self-report instrument assessing sexual, physical, emotional abuse, and neglect in childhood. Researchers created a continuous variable to account for reported rates of moderate-to-severe emotional, physical, and sexual abuse, as well as emotional and physical neglect. Higher scores on the measure indicated higher levels of reported abuse.

Modified PTSD Symptom Scale (PSS): The PSS^{28,29} is a psychometrically valid 17-item self-report measure assessing frequency of PTSD symptoms over the prior 2 weeks. It distinguishes among re-experiencing, avoidance, and hyperarousal symptom clusters of PTSD. The PSS was used as a continuous outcome measure of PTSD symptom severity.

Emotion Dysregulation Scale: The Emotion Dysregulation Scale¹⁶ is a 24-item self-report scale adapted from the clinician-rated Affect Regulation and Experience Q-sort Questionnaire. Items are scored on a 7-point Likert scale and assess domains of emotional experiences (e.g., “Emotions overwhelm me”), cognition (e.g., “When I'm upset, I feel all alone in the world”), and behavior (e.g., “When my emotions are strong, I often make bad decisions”). The internal consistency of the scale is high ($\alpha = 0.97$).

Short Form (36) Health Survey: The Short Form-36 Health Survey Questionnaire is a widely validated self-report measure of pain and other health domains.³⁰ For the present study, we utilized questions that assess self-reported current pain ratings: (1) to what degree the participant has experienced bodily pain in the past 4 weeks on a scale from 1 (*none*) to 6 (*severe*) (mean = 3.31, SD = 1.52) and (2) how much bodily pain interfered with functioning in the past 4 weeks on a scale from 1 (*none*) to 5 (*extremely interfering*) (mean = 2.49, SD = 1.40).

Positive and Negative Affect Schedule: It is a well-validated self-report measure of general mood state.³¹ Participants were asked to rate on a 5-point Likert scale their general experiences with 20 emotional adjectives, 10 describing positive emotional states (e.g., excited and proud) and 10 describing negative emotional states (e.g., distressed and irritable). Analyses for this study focused on the negative affect portion of the scale.

Data Analysis

The overall analytic approach was to examine the predictive utility of childhood abuse, current PTSD symptoms, and emotion dysregulation on reported pain levels and functional limitations due to pain using SPSS software. We examined the distributions of all key predictor and outcome variables. The PTSD, childhood abuse, emotion dysregulation, negative affect, and pain-related functional limitations variables were positively skewed, and the self-reported

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bodily pain variable was negatively skewed. However, the level of skewness (range: -0.11 to 1.01), as well as the level of kurtosis (range: -1.2 to 0.51), fell within acceptable parameters for the sample size.³² Descriptive statistics were computed and bivariate correlations among variables were described. Predictor variables were scaled on a 0–10 scale for ease of interpretation and comparison of coefficients. Hierarchical linear regressions were utilized to examine the unique predictive value of childhood abuse and PTSD symptoms in estimating pain levels and functional limitations due to pain. Then, the predictive value of emotion dysregulation, over and above PTSD symptoms and childhood abuse, was evaluated. Mediation analyses were performed with INDIRECT³³ of SPSS, which allows for the examination of the mediating effects of a variable conditional on the effects of other variables in the model. Bootstrapping with 95% confidence intervals was utilized to determine significance of mediation effects. Bootstrapping is a preferred method for interpreting mediation analyses because it does not assume that sampling distributions of the indirect effects are normally distributed.³³ Age, sex, race, education level, and negative affect were included as co-variables in all analyses.

RESULTS

To determine the extent of association among our predictor variables and pain variables, we first calculated Pearson correlation coefficients. As shown in Table 1, all variables of interest were significantly correlated with each other ($p < 0.01$). Self-reported pain level and functional limitations due to pain were highly correlated at $r_{814} = 0.74$ ($p < 0.001$). Correlations of the predictor variables with pain level and functional

limitations ranged from $r_{(814)} = 0.15$ – 0.28 ($p < 0.01$) and $r_{(814)} = 0.13$ – 0.29 ($p < 0.01$), respectively.

We then conducted a series of linear regressions to examine the unique and combined associations of childhood trauma, PTSD symptoms, and emotion dysregulation ratings with variation in pain level and functional limitations due to pain. Although the selected predictor variables were significantly correlated, relationships were not large enough to create concerns about multicollinearity or variance inflation within a regression model (VIF values ranged from 1.09 to 1.95).³⁴ In each regression, age, sex, race, education level, and negative affect were entered in the first step of the model; this was done to control for demographic variations and overlap between negative affect and our predictor variables.

Regression Analyses for PTSD Symptoms and Emotion Dysregulation

As shown in Tables 2 and 3, childhood abuse was significantly predictive of both pain level and functional limitations due to pain ($\beta = 0.08$, $p < 0.05$ and $\beta = .08$, $p < 0.05$, respectively). When PSS score was entered into the models, childhood abuse was no longer significant and only PTSD symptoms predicted pain level and functional limitations due to pain ($\beta = 0.22$, $p < 0.001$ and $\beta = 0.22$, $p < 0.001$, respectively). For pain, emotion dysregulation was not a significant predictor over PTSD symptoms ($\beta = 0.01$, $p = 0.97$); PSS score remained significant ($\beta = 0.22$, $p < 0.001$). For functional limitations due to pain, emotion dysregulation was a significant predictor above and beyond PTSD symptoms ($\beta = 0.11$, $p < 0.001$; Table 3). In the final step with emotion dysregulation, PTSD symptoms remained significantly predictive of functional limitations, although the coefficient decreased suggesting a partial mediation effect ($\beta = 0.19$,

TABLE 1. Bivariate Correlations for Variables of Interest

	Pain	Limitations from pain	Negative affect	Child abuse	PTSD symptoms	Emotion dysregulation
Pain						
Limitations from pain	0.74					
Negative affect	0.23	0.22				
Child abuse	0.15	0.13	0.32			
PTSD symptoms	0.28	0.29	0.53	0.40		
Emotion dysregulation	0.21	0.27	0.62	0.31	0.58	

All correlations are significant at $p < 0.01$.

TABLE 2. Hierarchical Linear Regression Predicting Pain Level as a Result of Pain from Childhood Abuse and Adult PTSD Symptoms

	Std. β	T	p	R	R^2 change	F change	p Change
Predicting reported pain level							
Step 1				0.36	13	24.01	<0.001 [†]
Age	0.29	8.61	<0.001				
Sex	0.06	1.83	0.07				
Race	-0.02	-0.54	0.59				
Education level	-0.04	-1.03	0.30				
Negative affect	0.22	6.64	<0.001				
Step 2				0.37	0.01	5.48	0.02*
Child abuse	0.08	2.34	0.02				
Step 3				0.41	0.03	29.94	<0.001 [†]
Child abuse	0.03	0.71	0.28				
PTSD symptoms	0.22	5.47	<0.001				
Step 4				0.41	0.00	0.01	0.97
Child abuse	0.03	0.70	0.48				
PTSD symptoms	0.24	5.95	<0.001				
Emotion dysregulation	0.01	0.04	0.97				

Age, sex, race, education, and negative affect were controlled.

* $p \leq 0.05$.

[†] $p \leq 0.01$.

$p < 0.001$). In both models, age was predictive of higher reported pain and functional limitations ($\beta = 0.31$, $t = 9.03$, $p < 0.001$ and $\beta = 0.27$, $t = 7.93$, $p < 0.001$, respectively).

Mediation Analyses

Following the guidelines of Preacher and Hayes,³³ we used Sobel and bootstrapping techniques to

TABLE 3. Hierarchical Linear Regression Predicting Functional Limitations as a Result of Pain from Childhood Abuse and Adult PTSD Symptoms

	Std. β	T	p	R	R^2 change	F change	p Change
Predicting pain-related limits							
Step 1				0.35	0.12	22.00	<0.001 [†]
Age	0.27	7.93	<0.001				
Sex	0.02	0.66	0.51				
Race	-0.04	-1.29	0.20				
Education level	-0.04	-1.25	0.21				
Negative affect	0.23	6.72	<0.001				
Step 2				0.36	0.01	4.08	0.04*
Child abuse	0.07	2.02	0.04				
Step 3				0.40	0.03	30.53	<0.001 [†]
Child abuse	0.01	0.35	0.73				
PTSD symptoms	0.22	5.53	<0.001				
Step 4				0.41	0.01	6.06	0.01 [†]
Child abuse	0.01	0.19	0.85				
PTSD symptoms	0.19	4.32	<0.001				
Emotion dysregulation	0.11	2.46	0.01				

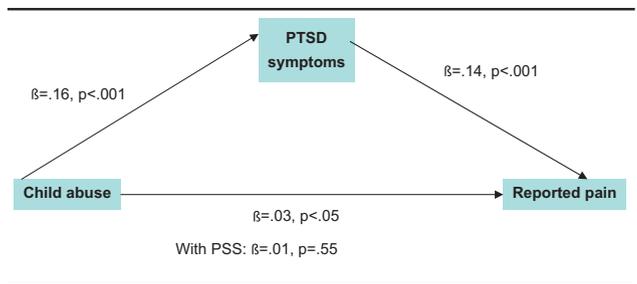
Age, sex, race, education, and negative affect were controlled.

* $p \leq 0.05$.

[†] $p \leq 0.01$.

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FIGURE 1. The Full Mediating Effect of Adult PTSD Symptoms on the Relation Between Childhood Abuse and Reported Pain Level. Age, Sex, Race, Education Level, and Negative Affect at Time of Assessment were Controlled.



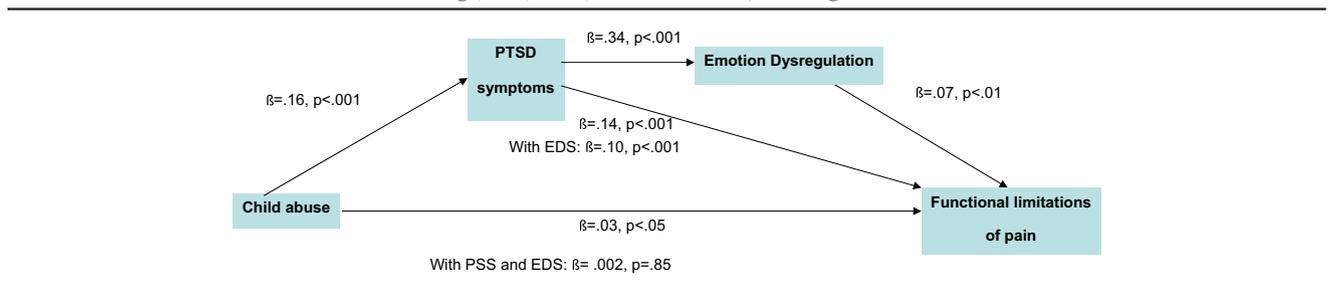
formally test for mediation effects among our variables. We again included age, sex, race, education level, and negative affect as control variables. We first formally tested for the mediation effects of PTSD on the association between childhood abuse and reported pain level. As expected based on regression findings, there was a significant full mediation effect of PTSD ($F = 24.26, p < 0.001$, bias-corrected 95% confidence interval: 0.01–0.03). These results are depicted in Figure 1. Then, we formally tested for the mediation effects of PTSD and emotion dysregulation. We found a full mediation effect of PTSD on the association between childhood abuse and functional limitations due to pain ($F = 19.56, p < 0.001$, 95% confidence interval: –0.01–0.03). However, because the regression analyses suggested a partial mediation effect of emotion dysregulation on the relation of PTSD with functional limitations, we ran an additional indirect model to determine whether this mediation was significant. As shown in Figure 2, emotion dysregulation score did partially mediate the relation between PTSD symptoms and functional limitations of pain ($F = 22.98, p < 0.001$, 95% confidence interval: 0.01–0.04).

DISCUSSION

The findings from this study suggest that current PTSD symptoms contribute to the connections between exposure to childhood abuse and both current reported pain and current pain-related limitations within this sample of highly traumatized, economically disadvantaged adults. We examined the independent effects of childhood abuse and current PTSD symptoms on these pain variables, finding that current PTSD symptoms fully mediated the relationship between higher levels of reported childhood abuse and higher levels of pain as well as pain-related limitations. This finding suggests that adult symptoms of PTSD may serve as a pathway through which the relationship between childhood abuse and adult pain manifests.

The present data extend earlier findings in both veteran and civilian populations^{8,9} by examining the role of emotion in the association between PTSD symptoms and pain. Our data point to the importance of emotion dysregulation in predicting higher levels of pain-related impairment even after accounting for the contribution of childhood abuse, PTSD, and negative affect. Although our data do not show that emotion dysregulation has an effect on reported levels of pain, greater difficulty with emotion regulation appears to contribute to the relationship between pain and impaired ability to manage daily tasks within this sample. It makes sense that difficulty regulating emotions in the presence of high levels of pain could affect pain-related functioning. Other research has shown that individuals who are able to adaptively regulate and manage emotions tend to be healthier.³⁵ There is also evidence that cognitive-behavioral interventions among individuals with arthritis help improve pain management.³⁶ However, to our knowledge, no

FIGURE 2. The Mediating Effects of Adult PTSD Symptoms and Emotion Dysregulation on the Relation Between Childhood Abuse and Functional Limitations of Pain. Age, Sex, Race, Education Level, and Negative Affect at Time of Assessment were Controlled.



prior studies have shown this distinction in which emotional dysregulation predicts not pain levels per se but rather the effect of pain on adaptive functioning. This distinction may be similar to the distinction between negative affect and emotional dysregulation previously discussed [e.g., in Ref. 16], in that the difficulty of managing and regulating high levels of negative affect that reflects emotion dysregulation may end up having more negative, long-term consequences than simply the presence of negative affect alone.

This result is particularly important when considering the long-term effects of pain-related conditions on individuals' lives. These effects emerge not only through the physical and emotional toll of the condition, but also by affecting whether someone can hold down a job, manage household duties, and continue to engage in leisure activities. Research has already shown that the presence of PTSD symptoms is associated with greater life interference among individuals with pain conditions,^{10,11} and our findings suggest that emotion regulation difficulties may be in part driving this effect. Because there is currently no cure for long-term pain, it becomes particularly critical in the treatment of pain conditions to help patients maintain as much normalcy in life and promote active engagement in as many areas as possible. Identification of specific factors that may impede individuals from functioning in the presence of pain then allows for interventions that can target such factors, thus having a larger effect on improving individuals' quality of life. Several psychologic interventions, such as dialectical behavior therapy³⁷ and mindfulness-based therapies³⁸ have already shown effectiveness in increasing the capacity to regulate emotions with a focus on enhancing patient's emotion regulation strategies through enhanced awareness of affective states. These treatments may also be effective in decreasing the potential negative effect of pain on daily adaptive functioning, and it would be beneficial in future studies to evaluate whether enhancing emotion regulation strategies also has a positive effect on functioning among individuals with physical pain. It is noteworthy that prior research has pointed to attachment security as a factor contributing to both the ability to regulate emotional responsiveness and to the ability to cope with pain.^{39,40} Future research should further address this topic as researchers continue to explore how these variables interact to affect

functioning. Additionally, future research in this area should use measures of emotion dysregulation, which capture a broad range of emotion regulation strategies (e.g., the difficulties in emotion regulation scale) to help us understand whether there are specific aspects of emotion regulation that may be particularly important to target.

Several study limitations are worth noting. First, given the cross-sectional nature of this study and the use of retrospective reports, we cannot make assertions about causality or time of onset for PTSD symptoms, pain, or pain-related functional impairment. Prospective, longitudinal studies are required to examine the temporal onset of PTSD symptomatology and pain symptoms. It is possible that pain symptoms preceded the onset of PTSD symptoms and emotion dysregulation, and therefore should serve as a predictor rather than outcome variable. However, previous longitudinal research showing the presence of psychologic difficulties before the onset of long-term pain conditions led us to formulate our model. Additionally, pain ratings utilized in the study were based on only 2 variables and were current (prior 4 weeks), which does not allow us to accurately differentiate between short-term and long-term pain and limits the conclusions that can be drawn from present findings. Further research in this area should be done to determine these relationships when long-term pain conditions are examined, as this will be a critical next step in understanding the role of emotion dysregulation in pain-related impairment. Relatedly, it would be extremely useful to measure medical conditions in addition to pain to help tease apart how PTSD and emotion dysregulation relate to pain and pain-related limitations independent of medical conditions. Unfortunately, we did not have data on current or past medical conditions within our sample and therefore cannot make any assertions regarding how medical illness load may have influenced the associations described in this study. Also, the small effect sizes we observed limit the extent of conclusions that can be drawn from this study. Another limitation is that our sample was largely low income and African American, and although we suspect that these effects are general, we do not yet have the data to demonstrate whether these same findings would be present in other populations. However, this weakness is counterbalanced by the public health importance of studying these variables in an often under-researched and

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underserved population with such high rates of trauma exposure, as well as mental and physical health problems. Finally, as the co-morbidity between pain syndromes and depression has been widely analyzed in the literature, and its co-morbidity with PTSD has been largely ignored, we chose to focus on this component of trauma-related sequelae. However, work examining interactions between PTSD, substance abuse, depression, and other potential trauma-related psychopathology is underway and should further aid in our understanding of the complex relationship between trauma, psychiatric symptomology, and pain syndromes.

CONCLUSION

The association between childhood abuse, PTSD symptoms, and reported physical pain provides further evidence that trauma and trauma-related conditions may affect pain syndromes and the need for increased awareness of such associations in

civilian medical populations. PTSD symptoms are not only associated with higher pain levels but also with lower levels of functioning as a result of pain, therefore further influencing overall functioning and quality of life among these individuals. Notably, emotion dysregulation appears to play a role in the relationship between PTSD symptoms and functional limitations due to pain. Our data suggest that a focus on emotion regulation strategies in the treatment of PTSD symptoms within medical populations may likely improve management of pain syndromes through addressing issues related to pain-related functional limitations.

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