

# Psychological Trauma Exposure and Pain-Related Outcomes Among People with Chronic Low Back Pain: Moderated Mediation by Thought Suppression and Social Constraints

Sheri E. Pegram, MA<sup>1</sup> · Mark A. Lumley, PhD<sup>1</sup> · Matthew J. Jasinski, MA<sup>1</sup> · John W. Burns, PhD<sup>2</sup>

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Chronic low back pain (CLBP) affects approximately one third of adults in the USA [1] and impacts the three core adjustment or outcome domains: pain, physical functioning, and emotional functioning [2]. Although CLBP is influenced by biological, psychological, and social factors, the experience of psychologically traumatic life events appears to be a particularly potent risk factor for increased pain intensity, interference, and depression [3]. The mechanisms linking trauma exposure to these pain-related outcomes, however, are not clear. This study examined two related but distinct cognitive and social mechanisms through which traumatic life events might affect pain adjustment in people with CLBP: thought suppression and social constraints.

Exposure to a traumatic event commonly results in intrusive thoughts, that is, uncontrollable and distressing cognitions about the event. Intrusive thoughts appear to arise from attempts to inhibit or suppress memories and emotions related to the traumatic event and contribute to the development and persistence of negative emotions and physical symptoms [4]. Wegner's ironic process model accounts for the influence of thought suppression on symptoms. Thought suppression paradoxically increases the accessibility of the thoughts, resulting in increased rumination and distress [4, 5]. Thought suppression has been shown to predict psychopathology among

trauma-exposed people, beyond the influence of coping strategies and emotion regulation [6]. More generally, cognitive-affective avoidance strategies, including thought suppression, contribute to pain. For example, compared to healthy controls, patients with chronic pelvic pain have higher levels not only of traumatic experiences such as abuse but also of emotion and thought suppression [7].

Confronting—rather than inhibiting or suppressing—memories of trauma is crucial for facilitating emotional processing of the event and its eventual resolution [8]. However, the ironic process model does not consider the crucial role played by the social environment. The social cognitive processing model explains how characteristics of one's social environment influence the processing and expression of intrusive thoughts [9]. Specifically, social environments can exacerbate or attenuate the effects of trauma on symptoms. Those environments that support and encourage disclosure rather than inhibition facilitate trauma recovery by affirming and validating thoughts and feelings, promoting insight into trauma-related thoughts, providing coping advice, and reducing distress and arousal [10, 11]. That is, social environments that encourage emotional expression and disclosure can both reduce thought suppression and attenuate its deleterious effects on symptoms.

Unfortunately, many trauma-exposed individuals experience high levels of social constraints, that is, reactions from others that minimize the person's problems or discourage the sharing or expression of troubling thoughts, feelings, and events [12]. The experience of social constraints against disclosure is associated with an array of deleterious outcomes, such as perceived stress, depressive symptoms, poorer health perceptions, and somatic complaints including pain [9–11]. According to the social-cognitive processing model, heightened social constraints may not only contribute to the tendency to suppress thoughts, but may be particularly pernicious for

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✉ Mark A. Lumley  
mlumley@wayne.edu

<sup>1</sup> Department of Psychology, Wayne State University, 5057 Woodward Ave, Detroit, MI 48202, USA

<sup>2</sup> Rush University, 600 S Paulina St, Chicago, IL 60612, USA

people who tend to engage in thought suppression about trauma because it forces them to inhibit disclosure or expression, thereby further impeding cognitive processing of the event. Several studies provide support for the moderating effect of social constraints on the association between intrusive thoughts and symptoms. In two bereaved samples, intrusive thoughts were positively associated with depressive symptoms, but only among individuals with relatively high levels of social constraints [9, 10].

The goal of this study was to examine cognitive and social mechanisms through which traumatic life events are associated with pain-related outcomes (pain severity, pain interference, and depressive symptoms) among people with CLBP. We hypothesized that greater exposure to traumatic life events would be associated with suppression of intrusive thoughts, which in turn would be associated with poorer pain-related outcomes. Further, we hypothesized that the strength of the indirect effects of traumatic life events on pain-related outcomes through thought suppression would vary across different levels of social constraints. Specifically, we expected that greater suppression of intrusive thoughts following trauma would worsen pain-related outcomes under conditions of high social constraints.

## Method

### Participants

Participants were 292 adults with CLBP recruited from local pain clinics in Detroit and Chicago metropolitan areas. Phone screening followed by physician confirmation was conducted to ensure participants met the inclusion criterion of lower back musculoskeletal pain for at least 6 months. Participants were excluded if they reported a serious medical illness (e.g., uncontrolled hypertension, cardiac disease); use of beta-blocker medication; current substance dependence; an autoimmune disorder; or a psychotic or bipolar disorder. The sample was 55 % female ( $n = 160$ ), averaged 47.24 years old ( $SD = 11.25$ ), and was 62 % African-American ( $n = 180$ ), 34 % Caucasian ( $n = 100$ ), and 4 % other ( $n = 12$ ). Over half (53 %) of participants were unemployed, 23 % were employed full-time, 10 % were retired, 8 % were employed part-time, and 3 % were students; 38 % received social security disability, 2 % received worker's compensation, and 9 % received some other forms of disability. Pain duration ranged from 6 months to 52.50 years ( $M = 11.19$  years,  $SD = 9.83$ ).

### Procedure

After the phone screening, eligible participants were sent a medical information release packet to be completed by their physician. Once medical diagnosis and study criteria were

confirmed, participants had a laboratory session where they completed an IRB-approved consent form and completed study measures. Participants were compensated for their time.

### Measures

We used the Life-Stressor Checklist-Revised [13] to assess lifetime exposure to 30 events that potentially meet DSM-IV criteria for traumatic events leading to PTSD. Suppression of intrusive thoughts was assessed with the 15-item White Bear Suppression Inventory ([4];  $\alpha = .91$ ). The 15-item General Social Constraints Scale ([14];  $\alpha = .93$ ) assessed the frequency that participants experienced environmental and social constraints from family or friends over emotional expression and disclosure during the past month. Pain severity was assessed with the 3-item pain severity subscale of the Multidimensional Pain Inventory (MPI; [15];  $\alpha = .84$ ). The 9-item pain interference subscale of the MPI ([15];  $\alpha = .93$ ) was used to assess the extent to which patient's pain has interfered with daily activities, such as going to work and engaging in recreational activities. Finally, depressive symptoms were assessed with the 21-item Beck Depression Inventory-II ([16];  $\alpha = .90$ ).

## Results

### Descriptive and Bivariate Analyses

Descriptive statistics on study measures are presented in Table 1. Participants averaged approximately nine traumatic life events, and all but four participants reported at least one event. The most common events reported were unexpected death of someone close to them (59.9 %), witnessing a serious accident (58.6 %), serious financial problems (55.5 %), death

**Table 1** Means, standard deviations, and bivariate correlations for study variables ( $N = 292$ )

	1	2	3	4	5	6
1. Traumatic life events	–					
2. Thought suppression	.21***	–				
3. Social constraints	.21***	.45***	–			
4. Pain severity	.14*	.19**	.17**	–		
5. Pain interference	.16**	.17**	.18**	.77***	–	
6. Depressive symptoms	.31***	.52***	.40***	.41***	.45***	–
Mean	8.87	46.53	19.38	4.11	4.08	15.23
Standard deviation	4.70	13.01	10.85	1.28	1.43	9.48
Range	0–25	15–75	0–45	0–6	0–6	0–44

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

of someone close to them (not including unexpected deaths; 54.8 %), and a serious accident or accident-related injury (51 %). Other events included witnessing domestic violence (36.7 %), time in jail (32.3 %), emotional abuse or neglect (31.8 %), serious disaster (27.4 %), adult physical abuse (26.6 %), childhood physical abuse (19.8 %), childhood forced sexual contact (18.4 %), adult forced sex (13.7 %), adult forced sexual contact (12.4 %), and childhood forced sex (9.7 %). As hypothesized, bivariate correlations (Table 1) revealed that frequency of traumatic life events was positively related to thought suppression, social constraints, and all three pain-related outcomes. Similarly, thought suppression and social constraints were positively related to all pain outcomes and were positively related to each other, sharing about 20 % of their variance.

**Moderated Mediation Analyses**

The PROCESS macro ([17]; model 14) tested a series of moderated mediation models, examining conditional indirect effects, that is, whether social constraints moderated thought suppression’s mediational relationship between traumatic life events and pain-related outcomes. To test for the significance of effects, we obtained 95 % bias-corrected bootstrapped confidence intervals based on 1000 bootstrapped samples. Several demographic variables were considered as potential covariates (i.e., age, gender, race, education), but none were significantly related to both traumatic life events and pain-related outcomes; thus, no covariates were included.

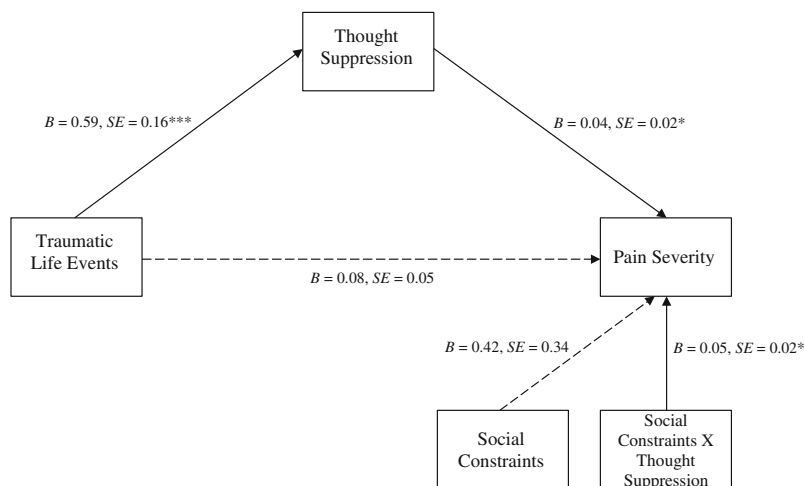
**Pain Severity** As shown in Fig. 1, the overall moderated mediation model was significantly related to pain severity, accounting for 7.2 % of its variance. Experiencing more

traumatic life events was associated with greater thought suppression, which was associated with greater pain severity. The hypothesized interaction between thought suppression and social constraints was statistically significant. That is, there was a significant positive relationship between thought suppression and pain severity for individuals who reported more social constraints. Probing the interaction indicated that the conditional indirect effect was significant at the mean and 1 SD above the mean for social constraints, but not at 1 SD below the mean. Thus, the hypothesis was supported for pain severity.

**Pain Interference** Results of the moderated mediation model are presented in Electronic Supplementary Material 1 (Figure 2). The model was significantly associated with pain interference and accounted for 7 % of its variance. Trauma was significantly positively associated with thought suppression and pain interference. Thought suppression did not have a significant main effect on pain interference, but it interacted with social constraints in predicting pain interference. In addition, the indirect effect was conditional based on levels of social constraints. Specifically, traumatic life events were indirectly associated with pain interference only for people with high social constraints. Thus, the hypothesis was supported for pain interference.

**Depressive Symptoms** Results of the model predicting depressive symptoms can be seen in Electronic Supplementary Material 2 (Figure 3). The model was significantly related to depressive symptoms, accounting for 34 % of its variance. Traumatic life events, thought suppression, and social constraints all had significant main effects on depressive symptoms. Further, there was a significant indirect effect:

**Fig. 1** Moderated mediation of thought suppression on pain severity ( $N = 292$ )



Note. Unstandardized coefficients and standard errors are provided. \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .  $R^2 = .07$ ,  $F(4,287) = 5.58$ ,  $p < .001$ . Index of moderated-mediation = 0.03,  $SE = 0.02$ , 95% CI (.01, .07). The conditional indirect effect is statistically significant at the mean ( $B = 0.02$ ,  $SE = 0.01$ , CI[.00, .06]) and 1 SD above the mean for social constraints ( $B = 0.05$ ,  $SE = 0.02$ , CI[.01, .09]).

experiencing more traumatic life events was significantly related to greater thought suppression, which in turn was significantly related to more depressive symptoms. Contrary to the hypothesis, thought suppression did not interact with social constraints in predicting depressive symptoms, and the indirect effect was not conditional. That is, thought suppression mediated the relationship between traumatic life events and depressive symptoms regardless of levels of social constraints.

## Discussion

Our sample of people with CLBP had experienced multiple potentially traumatic events, most commonly the deaths of loved ones, serious accidents, and various types of abuse. Consistent with previous literature, we found that greater trauma exposure was related to greater pain severity, pain interference, and depressive symptoms. This study advances the literature by clarifying cognitive and social mechanisms by which traumatic events may influence these pain-related outcomes [8]. Specifically, both the suppression of intrusive thoughts and the experience of social constraints appear to link trauma with pain outcomes.

Experiencing more traumatic life events was associated with greater suppression of intrusive thoughts, which in turn was associated with greater pain severity, pain interference, and depressive symptoms. Both theory and research support the harmful effects of suppressing one's thoughts and feelings about stressful or traumatic events [5, 8]. Active suppression rather than expression prolongs and exacerbates the psychological and physiological reactions to trauma by increasing cognitive intrusions, activating the sympathetic nervous system, impairing mood, and interfering with adaptive interpersonal relationships [8]. Our findings build on existing research and theory by suggesting that avoidant strategies, such as thought suppression, impede emotional processing and contribute to pain-related outcomes [5, 8].

The experience of social constraints also played a role in the trauma/pain outcome link. For pain severity and pain interference, social constraints moderated thought suppression's effects, such that high levels of thought suppression combined with high levels of social constraints were associated with greater pain severity and interference. These results suggest that social constraints on expression play a key role in determining the extent to which thought suppression contributes to pain outcomes after trauma. Further, these findings are consistent with the social cognitive processing model of adjustment to trauma, which suggests disclosure to other people following a traumatic event buffers the harmful effects of intrusive thoughts and facilitates trauma resolution and predicts less psychological distress and pain [9]. In addition, the positive association between social constraints and thought suppression is consistent with previous research [12]. It appears

that high social constraints on disclosure may both contribute to and exacerbate the harmful effects of thought suppression. For instance, people whose social environments discourage the sharing of one's difficulties and emotions may have fewer options for coping with stressors and, therefore, rely more heavily on avoidance coping strategies, such as thought suppression, to deal with stressful events [12].

Very similar models were found for the prediction of pain severity and interference, probably because these two measures had substantial overlap in this sample. In contrast, the model predicting depressive symptoms was different. Social constraints did not moderate thought suppression's mediation between trauma and depressive symptoms; rather, traumatic life events, thought suppression, and social constraints were independently related to depressive symptoms. Overall, the model explained much more variance in depressive symptoms than it explained in pain severity and interference, perhaps because depression is a subjective state that is more tightly linked to one's experience of trauma and negative cognitive and social experiences than are pain and interference. It appears that the effects of trauma, thought suppression, and social constraints on depressive symptoms are so strong that they are not limited to specific conditions (e.g., high social constraints only).

These findings have potentially important clinical implications. The assessment of lifetime trauma is important among patients with chronic pain, but perhaps more important is assessing how patients cognitively and socially deal with their trauma. Patients who engage in thought suppression, or who experience their social environments as discouraging their sharing or disclosure, appear to be at greatest risk for poorer pain-related outcomes. Pain-related outcomes might be improved by interventions that support the expression of trauma-related thoughts and feelings. Interpersonal or social interventions might be of value not only to reverse the harmful effects of social constraints on pain but also to overcome the tendency to engage in thought suppression. Interventions that help family members of people with chronic pain facilitate their disclosures related to trauma should also be tested.

This study has several limitations. It was cross-sectional, which limits interpretations of causality. It is plausible, for instance, that pain influences both social constraints and thought suppression. Our measure of trauma exposure reflected the experience of lifetime events, which reduces concern somewhat about temporal ordering related to stress, but future studies would benefit from using longitudinal designs. In addition, we studied only people with CLBP, and our sample was often socioeconomically disadvantaged and primarily African-American. Generalization to other samples needs to be tested.

In conclusion, this "proof of concept" study adds to the trauma, emotion, and chronic pain literature by suggesting a theoretical model by which the experience of potentially

traumatic events throughout one's life affects pain-related outcomes. Suppressing thoughts after trauma exposure may contribute to pain, and the combination of high social constraints against disclosing one's trauma and suppressing one's thoughts can be particularly deleterious. Attention to the experience of trauma as well as how patients respond cognitively and socially to trauma might illuminate drivers of patients' pain, interference, and depression, and open new venues for intervention.

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#### Compliance with Ethical Standards

**Conflict of Interest** Authors' Statement of Conflict of Interest and Adherence to Ethical Standards Authors Pegram, Lumley, Jasinski, and Burns declare that they have no conflict of interest. All procedures, including the informed consent process, were conducted in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000.

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