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Predictors of Trauma Symptomatology in Hospitalized Trauma Patients

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ABSTRACT

Introduction: Traumatic injury and its impact on psychological functioning is a major public health problem. In the United States, injury accounts for over 150,000 deaths and 3 million non-fatal injuries per year. Sustaining a traumatic injury increases risk of developing posttraumatic stress symptoms (PTSS), such as negative alterations in cognitions and mood and marked alterations in arousal and reactivity. The current study sought to understand what demographic, clinical, and psychological factors are associated with PTSS in patients following hospitalization for acute physical injury.

Methods: Adults admitted to a Level 1 Trauma Center (N = 141) completed measures assessing resiliency, sense of coherence, traumatic event history, and PTSS during and post-admission. Additional data was extracted via the electronic medical record.

Results: Age, gender, injury severity (ISS), toxicology, resilience (BRS), sense of coherence (SOC), and trauma history (LEC-5) appeared to be closely related to the presence of trauma symptoms. Specifically, sense of coherence was inversely related to presence of trauma symptomology more than any other factor.

Discussion: Overall, these findings support the utility of assessing such factors in the wake of traumatic injury as early identification is vital to early intervention to mitigate distress and improve psychosocial functioning.

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Introduction

Psychological trauma is a mounting health concern for patients who are medically hospitalized. Each year, more than two million individuals in the United States are hospitalized for traumatic physical injuries [1]. These injuries include motor vehicle collisions, assaults (e.g., gun-shot wounds, stabbings), and falls. Some studies suggest that roughly 70% of individuals will experience some type of traumatic event including abuse, assault, accident, or natural disaster in their lifetime [2].

Diagnosed post-traumatic stress disorder (PTSD) must meet criteria of the DSM-V with symptomatology that includes hypervigilance, intrusive thoughts, avoidance of distressing stimuli, persistent negative mood, lasting longer than one month [3]. Research supports that patients who have symptoms of PTSD, generalized anxiety disorder, and panic disorder have more contact with the medical care system through their primary care physician, emergency room, or non-psychiatric hospitalizations [4]. Fletcher et al. [5] completed a review of the literature to understand medically hospitalized patients who have PTSD symptoms. They summarize that there is no

accurate data to quantify how often hospitalized patients have trauma exacerbations or how bothersome these exacerbations might be to patients. They postulate a general approach that includes recognition, collaboration with mental health supports, and individualized care for the patient. They suggest changes that can be made in the hospital to reduce triggers or trauma exacerbations, such as avoiding overnight vitals to reduce awakenings, silencing alarms on medical equipment, and playing soft music to limit hallway noise.

The hallmark work by Van de kolk [6] on trauma and memory illustrates that traumatic memories are difficult to study as they cannot be “recreated” in a laboratory. He notes that if trauma is defined as an unavoidable stressful event that overwhelms an individual’s coping mechanisms, then their study can only be successful in retrospective reports or post-hoc observations. However, we also know that individuals’ memories, even of traumatic events, can change over time [7]. Thus, gathering information as close to the trauma as possible might illicit more accurate information. Due to both logistical and ethical challenges, few studies are carried out in the period directly

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following trauma exposure. Our understanding of salient phenomena that occur following trauma, and any subsequent impact on later pathology, is rather limited. One group that may permit easier exploration of trauma experience are those whose traumatic injuries result in hospitalization. These individuals interact with healthcare providers shortly following trauma exposure, and there is opportunity to participate in research studies.

The association between traumatic injury and increased risk for negative sequelae such as chronic pain, sleep problems [8], substance use [9], and psychological distress, including posttraumatic stress disorder [10] has been clearly established. According to Rhee et al. [11], in 2013 eighteen percent of new and existing disability claims were due to injury. Because traumatic injury disproportionately affects a younger population, the associated costs of lost working years, lost productivity, and medical costs account for more than \$450 billion. Further, the mortality rates for individuals who sustain trauma injuries has been increasing in recent years and accounted for almost 150,000 deaths in 2014 alone [1]. Of those individuals who survive traumatic injury, up to forty-two percent meet criteria for PTSD [10]. This indicates that many individuals who experience trauma do not develop symptoms that meet this threshold. What accounts for these differences remain unclear. Some risk factors have been identified including prior trauma experiences [12,13], history of physical or sexual violence, bereavement, adverse childhood experiences [14], history of mental health symptoms [15], low cognitive ability [16], impulsivity [17], and age [18]. Joseph and colleagues [18] also identified age, namely when individuals were less than 45 years old at the time of traumatic injury, as a risk factor for the development of PTSD.

There is research to suggest that an individual's immediate reaction to trauma may significantly predict their later outcomes. In a sample of 83 individuals who had sustained a medical trauma, Mellman and colleagues found that heightened arousal occurring directly after the trauma was the most salient predictor of PTSD at a six-month follow-up. This is consistent with research by Booker and colleagues [19] who found that early trauma narratives can predict long term symptoms of PTSD and depression. Objective measures of injury severity such as injury severity scores (ISS) may be less directly predictive of risk associated with posttraumatic stress compared to more subjective interpretations of injury [20]. However, it appears likely that the impact of ISS on posttraumatic stress may be mediated by more subjective appraisals of accident severity [21]. Similarly, protective factors have been identified including social support and family cohesion [13], female gender identity [22], higher education experiences [23], psychological flexibility [12], resilience [24], and sense of coherence [25].

Sense of coherence (SOC) is part of Aaron Antonovsky's self-described salutogenic model to explain how individuals' life view impacts their overall health [26]. Salutogenesis is a paradigm for health-promoting factors that lead an individual to experience a better quality of life and help explain "why some people, regardless of major stressful situations and severe hardships, stay healthy while others do not" [27].

According to Antonovsky, this is based on SOC, which includes adjustment to stress, flexibility, and ability to use general resistance resources (GRR) [27]. SOC, for example, is comprised of "comprehensibility, manageability, and meaningfulness" and GRRs resource that facilitate ability to cope include "...money, intelligence, self-esteem, preventative health orientation, social support and cultural capital" [27]. These factors are thought to predict health outcomes and evidence has supported their utility in impacting quality of life [25].

Despite these known and postulated risk and protective factors, there is currently no standard of care for the screening and treatment of individuals immediately following traumatic exposure [28]. The American College of Surgeons recently updated guidelines to ensure all patients admitted to a level 1 trauma center engage in mental health screening [29]. However, few studies have incorporated risk and protective factors concurrently when evaluating outcomes associated with trauma. This is problematic given recent literature [30,31] which suggests that early intervention can function to prevent the development of symptoms significant enough to meet diagnostic threshold for PTSD. Rothbaum and colleagues [30] provided three one-hour prolonged exposure sessions to individuals in the emergency department following a traumatic injury and found that such intervention significantly reduced posttraumatic stress reactions and overall depression at four- and twelve-week follow-up sessions. The gap in the literature is how to effectively assess risk and ultimately identify patients who are at risk, making it challenging to understand which individuals be most likely to benefit from these preventative interventions. The current study seeks to identify relevant risk and protective factors that predict outcomes which are fundamentally associated with trauma. Specifically, we hypothesized that age, gender, injury severity (Injury Severity Score), substance use (toxicology), resilience (Brief Resilience Scale), sense of coherence (Sense of Coherence Scale-13), and prior trauma experiences (Life Events Checklist) would significantly predict posttraumatic stress as evidenced by scores on the Posttraumatic Check List (PCL-5).

Methods

Recruitment

Participants were identified if they were listed on the trauma service list within the electronic medical record. Inclusion criteria was the following: pt having sustained a traumatic injury, aged between the 18 and 70 years, English speaking, and a Glasgow Coma Scale (GCS) of 15. Individuals were approached within 14 days of admission. Patients were excluded if they were unable to consent, were younger than 18 years or older than 70 years, and prisoners (i.e., those currently facing incarceration post-discharge).

Procedure

All procedures were consistent with the HealthCare Systems Institutional Review Board (IRB) requirements. Research staff entered patient rooms and assessed the current mental status of patients. Patients were provided with a brief description of the trauma study; if interested, they received additional information including the purpose, duration, confidentiality,

and voluntary nature of the study. Patients who consented to participate reviewed informed consent with research staff and then completed measures. Consented participants completed paper hard-copies of materials including the demographics form, Brief Resilience Scale (BRS), Life Events Checklist for DSM-5 (LEC-5), PTSD Checklist for DSM-5 (PCL-5), and Sense of Coherence Scale (SOC-13) which were later entered into a centralized document and REDCap database. Data integrity was verified at multiple time points by several members of the study team. Data was analyzed using the Statistical Package for Social Sciences (SPSS).

Measures

Demographics Form

All participants completed a demographics form. In addition to age, gender, socioeconomic and marital status, items regarding mental health and substance use history were included.

Life Events Checklist and PTSD Checklist [32,33]

Two measures were used to assess for PTSD symptomatology in the current study; the Life Events Checklist (LEC-5) and the PTSD Checklist (PCL5). The LEC-5 is a self-report measure that consists of 17 items identifying various types of trauma history. Responses are based on a six-point nominal scale including “happened to me”, “witnessed it”, learned about it”, “part of my job”, “unsure”, and “not applicable”. Participants are able to check multiple responses; however, only responses including “happened to me” and “witnessed it” were summed in the current study to yield a Total Trauma Score. The PCL-5 is a 20-item self-report measure used to identify total trauma-related symptom severity across symptoms clusters (avoidance, arousal, re-experiencing, and negative cognitions and mood). Responses are rated according to a five-point Likert scale ranging from (0) not at all bothered by symptoms to (4) extremely bothered by symptoms.

Brief Resilience Scale [34]

The Brief Resilience Scale (BRS) is a six-item questionnaire used to assess resilience which the authors define as the ability to bounce back or recover from stress. Responses are based on a five-point Likert scale ranging from “strongly disagree” to “strongly agree” for items such as “I usually come through difficult times with little trouble.”

Sense of Coherence Scale [27]

The Sense of Coherence Scale is a 13-item self-report measure that assesses the construct of salutogenesis [26] which focuses on aspects of wellness such as coping and social support that predict health outcomes. Response alternatives are on a 7-point semantic scale to items such as “How often do you have feelings that you’re not sure you can keep under control?” ranging from 1 (very often) to 7 (very seldom or never). Higher SOC has been associated with generally better health outcomes. The SOC-13 is a shorter version of Antonovsky’s original 29-item Orientation to Life Questionnaire which included additional items measuring comprehensibility, manageability, and meaningfulness [35].

Results

In the current study, 169 participants were recruited from an academic medical center in New Jersey. The final sample consisted of 141 participants after removing 28 participants due to either missing data or ineligibility. This sample was largely male (n=100, 70.9%) white (n=82, 58.2%) and single (n=53, 38%). Regarding ethnicity, 12.8% (n = 18) identified as Hispanic/Latino. Many participants (n=61, 43.3%) had previous medical conditions including hypertension, diabetes, or cancer. Further, nearly half of the present sample (n=69, 48.9%) endorsed a previous psychiatric diagnosis such as depression or anxiety. Complete participant demographics are presented in Table 1.

Table 1: Selected Demographics.

	N	Percent	Mean	SD
Age	141		44.9	15.9
Gender				
Male	100	70.9		
Female	41	29.1		
Race				
White	82	58.2		
Black	30	21.3		
Multi-Racial	8	5.7		
Asian	2	1.4		
Native American	2	1.4		
Did not disclose	17	12.1		
Hispanic/Latina	18	12.8		
Non-Hispanic	123	87.2		
Education				
Some High School	15	10.6		
High School Diploma	47	33.3		
GED	5	3.6		
Some College	30	21.3		
College Degree	25	17.7		
Graduate Degree	8	5.7		
Did not disclose	11	7.8		
Household Income				
Less than \$20k	59	41.8		
\$20k to \$39k	13	9.2		
\$40k to \$59k	14	9.9		
\$60 to \$79k	19	13.5		
\$80 to \$100k	5	3.6		
Over \$100k	19	13.5		
Did not disclose	12	8.5		
Medical Conditions				
None	80	56.7		
Other	27	19.2		
Hypertension	17	12.1		
Diabetes	15	10.6		
Cancer	9	6.4		
Cardiovascular Disease	7	4.9		
Stroke	1	0.7		
Psychiatric Conditions				
None	72	51.1		
Anxiety	27	19.2		
Depression	26	18.4		
Bipolar Disorder	6	4.3		
Posttraumatic Stress Disorder	6	4.3		
Obsessive Compulsive Disorder	2	1.4		
Other Disorder	2	1.4		

On average, participants endorsed experiencing approximately 6 traumatic events over the course of their lives (M=5.7, SD=3.4). Total scores for posttraumatic stress (PCL-5) ranged from 0 to 79 (M=20.4, SD=17.4). Means and standard deviations for the seven predictive factors can be found in Table 2 below.

Table 2: Means and Stand Deviations for Non-dichotomous Predictor Variables.

	Mean	Std. Dev.
Age	44.9	15.9
ISS	10.0	7.1
BRS	3.0	0.3
SOC	64.1	13.7

As the present study is exploratory, univariate, bivariate, and multivariate relationships between all salient variables were visualized graphically. Figure 1 illustrates the bivariate relationship between trauma symptomology and lifetime trauma events with a clear positive correlation. The multivariate relationship between trauma symptoms, lifetime trauma events, and overall sense of coherence is shown in Figure 2. Sense of coherence is shown at relative low, moderate, and high levels. Figures 3 through 5 further expand upon the relationships seen in Figure 2 by visualizing each facet of sense of coherence (meaningfulness, manageability,

and comprehensibility respectively). While participants with varying levels of each facet appear to have attenuated trauma symptomology as number of lifetime events increases, the clear delineation is most apparent within the comprehensibility graph in Figure 5. Figure 6 presents the relationship between trauma symptomology, lifetime events, and resiliency at differing levels of sense of coherence.

This series of plots suggested complex relationships between sense of coherence (both as a total metric and split into subscales), lifetime experiences, resiliency, and PTSS symptomology. Specifically, participants with greater sense of coherence appeared to experience lower PTSS symptoms at similar levels of lifetime traumatic experiences. In fact, participants with higher comprehensibility scores appeared to experience lower overall PTSS symptomology than participants with lower comprehensibility scores regardless of number of lifetime traumatic events.

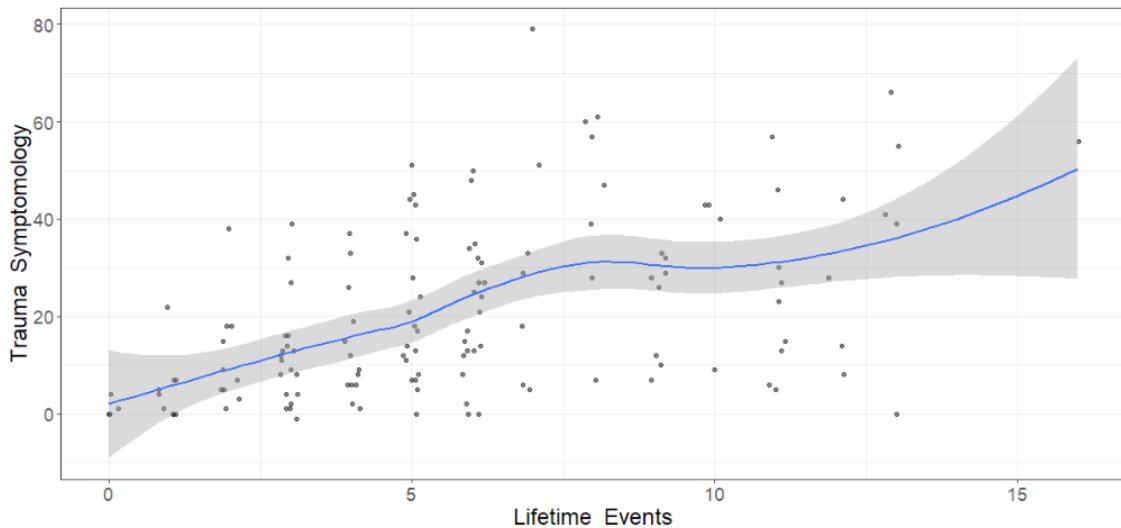


Figure 1: Bivariate Relationship between Trauma Symptomology and Lifetime Trauma Events.

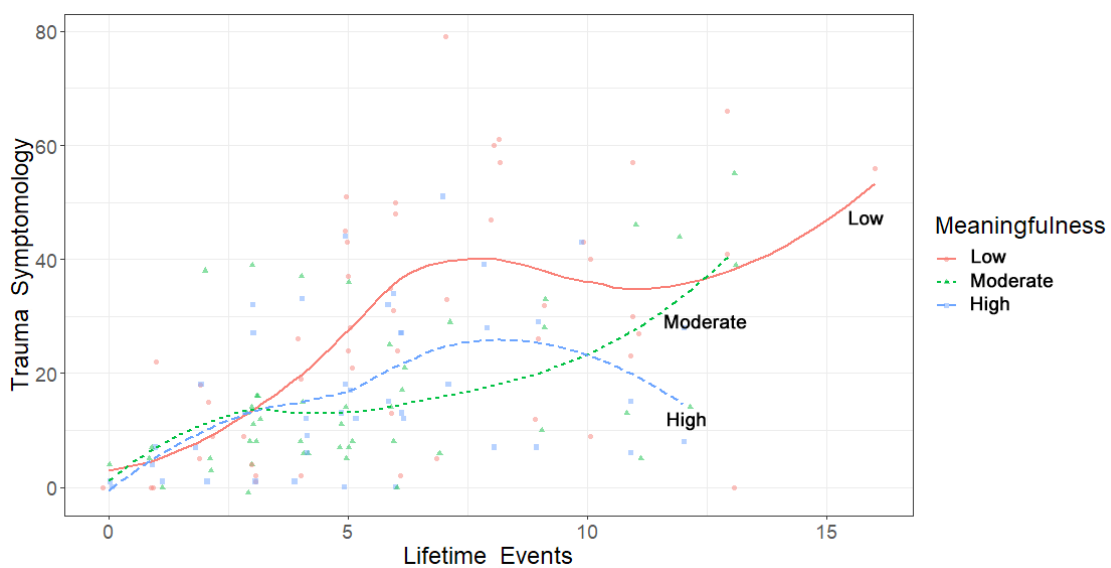


Figure 2: Relationship between Trauma Symptomology, Lifetime Trauma Events, and Sense of Coherence.

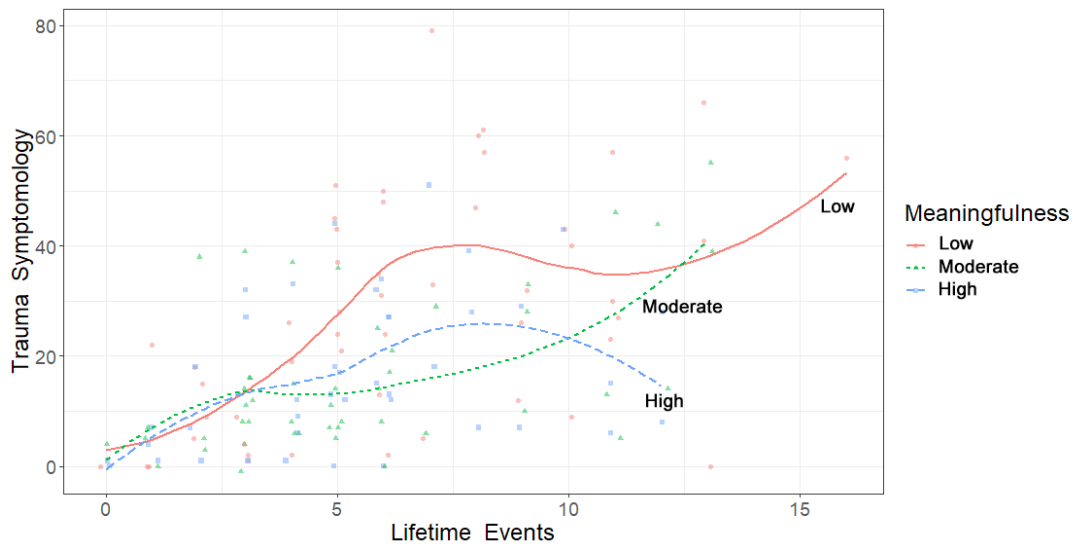


Figure 3: Relationship between Trauma Symptomatology, Lifetime Trauma Events, and Meaningfulness.

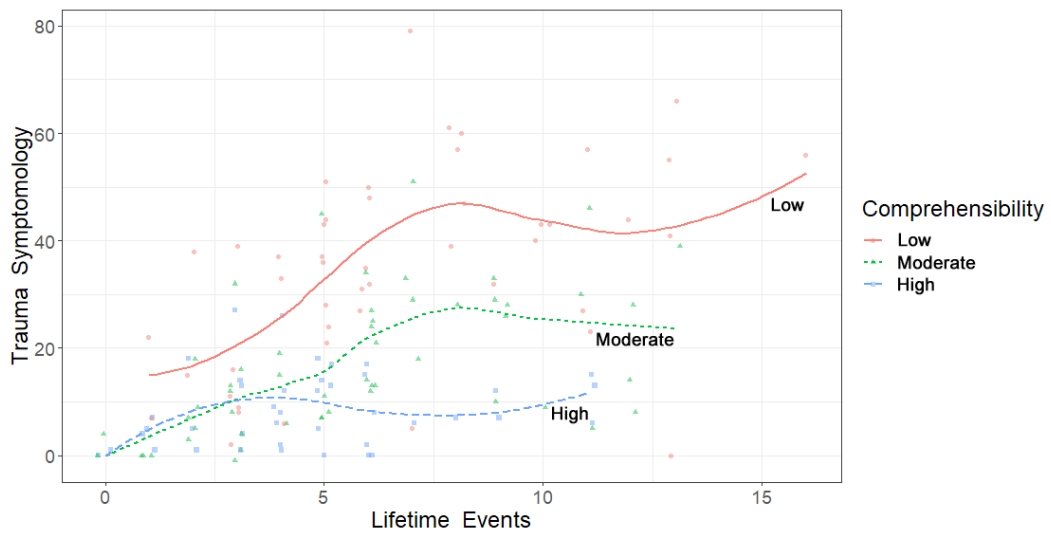


Figure 4: Relationship between Trauma Symptomatology, Lifetime Trauma Events, and Manageability.

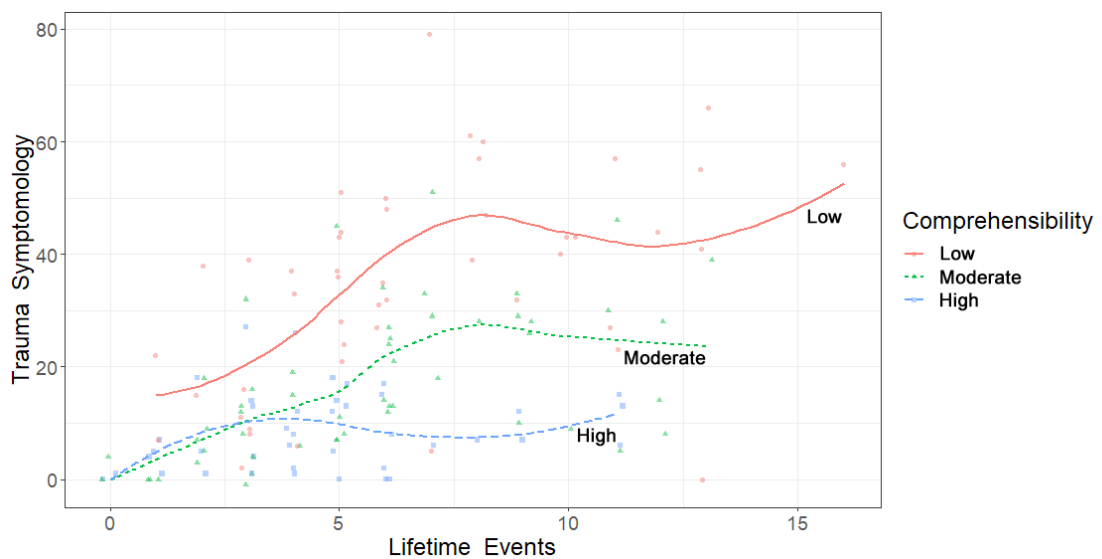


Figure 5: Relationship between Trauma Symptomatology, Lifetime Trauma Events, and Comprehensibility.

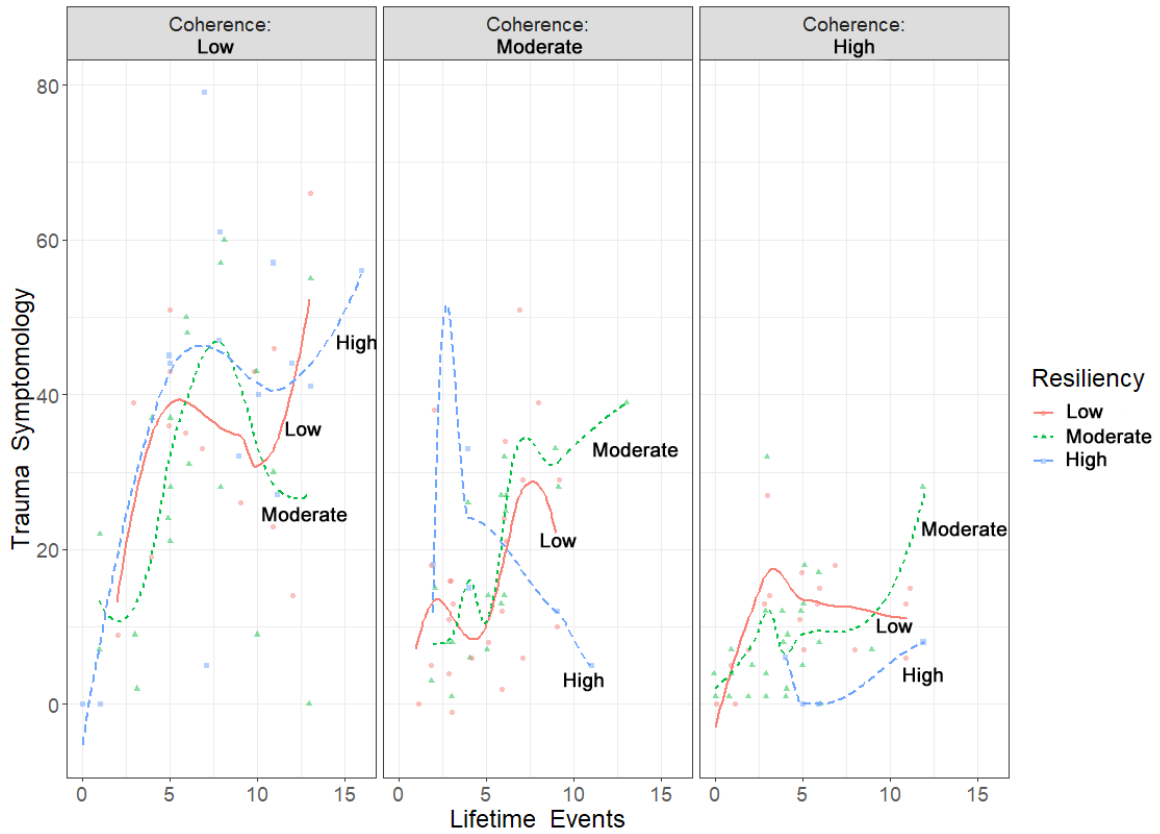


Figure 6: Relationship between Trauma Symptomology, Lifetime Trauma Events, and Resilience at Varying Levels of Sense of Coherence

Discussion

Implications

Understanding the individual factors which impact the emergence of PTSD symptomology represents a necessary foundation for developing interventions which reduce the incidence of negative long-term responses to trauma. It is likely that individuals respond differently to trauma experiences due to a wide variety of personal characteristics, many of which are nuanced and often difficult to directly assess. Further, responses in the periods immediately following trauma experiences may not always be inherently predictive of more durable responses. Therefore, determining which personal factors have the greatest or most stable impact on the development of PTSD will allow for more effective identification of individuals who would most benefit from additional support and intervention. In the current study, the factors which were most associated with PTSD symptom development were previous trauma experiences and an individual's sense of coherence. These aspects of personal experience and life view may fundamentally modulate how a person responds to a trauma experience and represents both their learning history as well as how they actively navigate and interpret their current experience. While substantial previous research has examined the role of resilience in responses to challenging experiences, in the present context, resilience was not found to be significantly associated with the development of PTSD symptoms.

As noted previously, sense of coherence (SOC) is an overall orientation where one believes that life events make sense and are understandable, that one has internal and external resources to manage difficult situations, and that one can find emotional meaning from challenges that they faced. Thus, the

three components of SOC are comprehensibility, manageability and meaningfulness. Despite Antonovsky's [36] belief of the indivisibility of these constructs, it seems notable in our findings that the comprehensibility component has the highest impact on the relationship with lower trauma symptoms. It may be that comprehensibility, the degree to which a person understands and makes sense of life events, may allow one to feel better able to face difficult life circumstances. As noted in Galletta et al. [37] healthcare professionals can empower patients and support strengthening of this SOC component by providing transparent and unambiguous communication about the event, medical status and prognosis; not providing false certainty; and encouraging patients to reflect on stressors surrounding health issues. If patients can sufficiently understand the immediate situation, they may be better able to identify and utilize resources that they have to understand and cope with difficult life events. As noted in Super et al. [38] medical teams can also encourage patients to reflect upon, or pay attention to, their understanding of the events at hand rather than focusing on potential future difficulties as this may ultimately support greater comprehensibility of the immediate event. This understanding coupled with additional psychological intervention post-event can support medical patients with increasing their SOC by empowering and reflecting upon traumatic events. It is possible that sense of coherence captures a number of both individual and personal systems-level factors (i.e., social/familial support) which modulate the role of resilience in this relationship such that the relative impact of resilience on trauma symptomology varies differently depending on sense of coherence.

Limitations

There are several limitations with the present study. All subjects had been admitted to the medical hospital, indicating that their injuries were severe enough to illicit inpatient medical care. There are over 30 million individuals discharged per year from hospital Emergency Rooms [39]. Thus, our sample represents only those with more significant injuries. Participants were recruited regardless of the type of their traumatic injury; therefore, participants may have been injured in an accidental fall, motor vehicle collision, workplace accident, or any myriad of other mechanisms. It is therefore possible that different traumatic injuries have varied characteristics which are not captured in the present study. As PTSD symptomology includes symptoms such as responses to environmental stimuli, it may be that an individual would respond differentially depending upon the nature of their injury. Additionally, the construct of sense of coherence may not be fully captured using an abbreviated measure, and additional nuance may result in a stronger relationship with PTSD symptomology development. Further, there is limited temporal information in the present study and causative conclusions long-term impact of any specific traumatic event on development of trauma symptomology cannot be drawn. A final limitation is the characteristics of the sample, although there is modest variability across demographic categories, the sample is largely White, single, and has a high school education. Any of these identities may be impacting the observed relationships in ways which are not apparent.

Future Directions

The current study suggests that both an individual's previous trauma experiences and their ability to understand, manage, and find meaning in their life and the world around them has a substantial influence on the development of trauma symptoms following a trauma event. These factors can be assessed by medical providers through brief survey instruments during their existing screening and history-taking. This would enhance providers' ability to allocate resources and direct care in a manner that more effectively benefits both the individual and the broader medical system. For medical systems with integrated psychology or other mental health services, a streamlined referral process would allow for proactive connection with appropriate support and therefore potentially mitigate the long-term negative impact of trauma on these individuals. Additionally, gaining a better understanding of the factors which represent vulnerability or protection to PTSD development is a fundamental step in developing appropriate evidence-based interventions. These considerations are critical when discussing eventual implementation of any integrated program and would allow for mental health providers to target individuals who would most benefit.

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References

- Centers for Disease Control and Prevention. Web-based injury statistics query and reporting system WISQARS. 2016.
- Sidran Institute. Traumatic stress education & advocacy: Post traumatic stress disorder fact sheet. 2016.
- American Psychiatric Association. Diagnostic and statistical manual of mental disorders (5th ed). 2013.
- Fogarty CT, Sharma S, Chetty VK, Culpepper L. Mental health conditions are associated with increased health care utilization among urban family medicine patients. *J Am Board Fam Med.* 2008; 21(5): 398-407.
- Fletcher KE, Steinbach S, Lewis F, Hendricks M, Kwan B. Hospitalized Medical Patients With Posttraumatic Stress Disorder (PTSD): Review of the Literature and a Roadmap for Improved Care. *J Hosp Med.* 2021; 16(1): 38-43.
- Van der Kolk BA. Trauma and memory. *Psychiatry and Clinical Neurosciences.* 1998; 52: 52-64.
- Wessel I, De Kooy PV, Merckelbach H. Differential recall of central and peripheral details of emotional slides is not a stable phenomenon. *Memory.* 2000; 8(2): 95-109.
- Kobayashi I, Sledjeski EM, Spoonster E, Fallon WF, Delahanty DL. Effects of early nightmares on the development of sleep disturbances in motor vehicle accident victims: Effects of Nightmares on Sleep Disturbances. *J Trauma Stress.* 2008; 21(6): 548-555.
- Kearns NT, Powers MB, Jackson WT, Elliott TR, Ryan T. Posttraumatic stress disorder symptom clusters and substance use among patients with upper limb amputations due to traumatic injury. *Disabil Rehabil.* 2019; 41(26): 3157-3164.
- O'Donnell ML, Creamer M, Bryant RA, Schnyder U, Shalev A. Posttraumatic Disorders Following Injury: Assessment and Other Methodological Considerations. *Psychological Knowledge in Court.* 2006; 70-84.
- Rhee P, Joseph B, Pandit V, Aziz H, Vercruyse G, et al. Increasing Trauma Deaths in the United States. *Ann Surg.* 2014; 260(1): 13-21.
- Dutra SJ, Sadeh N. Psychological flexibility mitigates effects of PTSD symptoms and negative urgency on aggressive behavior in trauma-exposed veterans. *Personal Disord.* 2018; 9(4): 315-323.
- Vogt DS, Dutra L, Reardon A, Zisseron R, Miller MW. Assessment of trauma, posttraumatic stress disorder and related mental health outcomes. American Psychological Association. 2011.
- Felitti VJ, Anda RF, Nordenberg D, Williamson DF, Spitz AM, et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. *Am J Prev Med.* 1998; 14(4): 245-258.
- DiGangi JA, Gomez D, Mendoza L, Jason LA, Keys CB, et al. Pretrauma risk factors for posttraumatic stress disorder: A systematic review of the literature. *Clin Psychol Rev.* 2013; 33(6): 728-744.
- Koenen KC, Moffitt TE, Poulton R, Martin J, Caspi A. Early childhood factors associated with the development of post-traumatic stress disorder: results from a longitudinal birth cohort. *Psychol Med.* 2007; 37(2): 181-192.
- Park C, Frazier P, Tennen H, Mills M, Tomich P. Prospective risk factors for subsequent exposure to potentially traumatic events. *Anxiety Stress Coping.* 2013; 26(3): 254-269.
- Joseph NM, Benedick A, Flanagan CD, Breslin MA, Vallier HA. Risk Factors for Posttraumatic Stress Disorder in Acute Trauma Patients. *J Orthop Trauma.* 2021; 35(6): 209-215.

19. Booker JA, Graci ME, Hudak LA, Jovanovic T, Rothbaum BO, et al. Narratives in the Immediate Aftermath of Traumatic Injury: Markers of Ongoing Depressive and Posttraumatic Stress Disorder Symptoms. *J Trauma Stress*. 2018; 31(2): 273-285.
20. Gabert-Quillen CA, Fallon W, Delahanty DL. PTSD after Traumatic Injury: An Investigation of the Impact of Injury Severity and Peritraumatic Moderators. *J Health Psychol*. 2011; 16(4): 678-687.
21. Moergeli H, Wittmann L, Schnyder U. Quality of Life after Traumatic Injury: A Latent Trajectory Modeling Approach. *Psychother Psychosom*. 2012; 81(5): 305-311.
22. Sattler DN, Boyd B, Kirsch J. Trauma-exposed firefighters: Relationships among posttraumatic growth, posttraumatic stress, resource availability, coping and critical incident stress debriefing experience. *Stress Health*. 2014; 30(5): 356-365.
23. Carlson EB, Palmieri PA, Field NP, Dalenberg CJ, Macia KS, et al. Contributions of risk and protective factors to prediction of psychological symptoms after traumatic experiences. *Compr Psychiatry*. 2016; 69: 106-115.
24. deRoos-Cassini TA, Mancini AD, Rusch MD, Bonanno GA. Psychopathology and resilience following traumatic injury: A latent growth mixture model analysis. *Rehabil Psychol*. 2010; 55(1): 1-11.
25. Eriksson M, Lindstrom B. Antonovsky's sense of coherence scale and its relation with quality of life: a systematic review. *J Epidemiol Community Health*. 2007; 61(11): 938-944.
26. Antonovsky A. The salutogenic model as a theory to guide health promotion. *Heapro*. 1996; 11(1): 11-18.
27. Eriksson M, Lindstrom B. Validity of Antonovsky's sense of coherence scale: a systematic review. *J Epidemiol Community Health*. 2005; 59(6): 460-466.
28. deRoos-Cassini TA, Hunt JC, Geier TJ, Warren AM, Ruggiero KJ, et al. Screening and treating hospitalized trauma survivors for posttraumatic stress disorder and depression. *J Trauma Acute Care Surg*. 2019; 87(2): 440-450.
29. American College of Surgeons Trauma Programs Best Practice Guidelines, Screening and Intervention for Mental health Disorders and Substance Use and Misuse in the Acute trauma Patient. 2002.
30. Rothbaum BO, Kearns MC, Price M, Malcoun E, Davis M, et al. Early Intervention May Prevent the Development of Posttraumatic Stress Disorder: A Randomized Pilot Civilian Study with Modified Prolonged Exposure. *Biol Psychiatry*. 2012; 72(11): 957-963.
31. Zatzick D, Jurkovich G, Heagerty P, Russo J, Darnell D, et al. Stepped Collaborative Care Targeting Posttraumatic Stress Disorder Symptoms and Comorbidity for US Trauma Care Systems: A Randomized Clinical Trial. *JAMA Surg*. 2021; 156(5): 430-474.
32. Weathers FW, Blake DD, Schnurr PP, Kaloupek DG, Marx BP, et al. Life Events Checklist for DSM-5 (LEC-5). 2013.
33. Weathers FW, Litz BT, Keane TM, Palmieri PA, Marx BP, et al. The PTSD Checklist for DSM-5 (PCL-5). 2013.
34. Smith BW, Dalen J, Wiggins K, Tooley E, Christopher P, et al. The brief resilience scale: assessing the ability to bounce back. *Int J Behav Med*. 2008; 15(3): 194-200.
35. Eriksson M, Mittelmark MB. The Sense of Coherence and Its Measurement. *The Handbook of Salutogenesis*. Springer. 2016.
36. Antonovsky A. The sense of coherence: development of a research instrument. *Newsletter research report*. 1983; 11-22.
37. Galletta M, Cherchi M, Cocco A, Lai G, Manca V, et al. Sense of coherence and physical health-related quality of life in Italian chronic patients: the mediating role of the mental component. *BMJ Open*. 2019; 9(9): e030001.
38. Super S, Wagemakers MAE, Picavet HSJ, Verkooijen KT, Koelen MA. Strengthening sense of coherence: opportunities for theory building in health promotion. *Health Promot Int*. 2016; 31(4): 869-878.
39. DiMaggio CJ, Avraham JB, Lee DC, Frangos SG, Wall SP. The epidemiology of emergency department trauma discharges in the United States. *Acad Emerg Med*. 2017; 24(10): 1244-1256.