Article

Examining Perceived Stress, Childhood Trauma and Interpersonal Trauma in Individuals With Drug Addiction

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Abstract

The investigation of psychosocial factors in relation to opiate addiction is limited and typically uses binary measures to assess how incidences of childhood trauma correlate with addiction. There has also been a lack of enquiry into how experiences of noninterpersonal versus interpersonal trauma may impact drug use addiction. In this regard, the current study utilized a novel measurement of interpersonal versus noninterpersonal lifetime trauma and a scale assessing severity of childhood

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trauma to examine how these factors may impact patients with opioid addiction. The interaction between these factors and current perceived stress was also examined. Thirty-six opioid-dependent individuals (recruited from the Drug Health Services and Opioid Treatment Program at the Royal Prince Alfred Hospital in Sydney, Australia) and 33 healthy controls completed the Childhood Maltreatment Questionnaire, Lifetime Trauma Survey, and Perceived Levels of Stress Scale. The patient group reported significantly greater childhood trauma severity, more incidences of lifetime trauma, and higher perceived stress than controls. Logistic regression analyses indicated that the severity of childhood trauma was more strongly associated with addiction status than perceived stress. A greater number of lifetime trauma incidence was the best predictor of addiction. Contrary to expectations, noninterpersonal lifetime trauma was a better predictor of addiction status than was interpersonal lifetime trauma. Results suggest that lifetime trauma and childhood trauma may play an important factor in opioid addiction over what can be accounted for by stress.

Keywords
Childhood trauma, interpersonal trauma, perceived stress, opioid addiction, substance abuse

Introduction

It is commonly accepted that stress in response to harmful or threatening events increases susceptibility to addiction, as evidenced by a large body of literature across many fields of study (Goeders, 2003; Sinha, 2008). The stress response occurs when one is faced with a threatening situation in which one lacks the appropriate coping skills that are necessary for stress regulation (Cohen, Gianaros, & Manuck, 2016). Such events activate the brain's stress and reward circuits simultaneously, thereby providing a common neural substrate that may enhance the experience and satisfaction of taking drugs, elevate cravings, increase self-administration, and heighten the risk of relapse after a period of abstinence (Constantinou et al., 2010; Furnari et al., 2015; Jaremko, Sterling, & Van Bockstaele, 2015; McKee et al., 2011; Sinha, 2001, 2008). Stress has also been shown to reduce executive self-control, evidenced by both neurobiological and behavioral data (Fields, Lange, Ramos, Thamotharan, & Rassu, 2014; Kimura et al., 2013; Li & Sinha, 2008; Sinha, 2008), thereby enabling drug use. Chronic stress is also a widely known risk factor for the development of drug addiction and relapse in vulnerable individuals, as sustained activation of stress pathways results in long-term physiological, emotional and behavioral changes (Cleck & Blendy, 2008; Sinha et al., 2011).

Trauma is defined as exposure to actual or threatened death, serious injury, or sexual violence, and can be experienced directly or by witnessing such an event (American Psychiatric Association, 2013). There is a plethora of evidence

supporting that exposure to early childhood and adolescent trauma is strongly associated with adult substance abuse, and may contribute as a risk factor for addiction later in life (Kendler et al., 2000; Molnar, Buka, & Kessler, 2001; Nelson et al., 2006; Sinha, 2001, 2008). Exposure to stress during childhood and adolescence may alter the development of brain regions responsible for regulating emotional and behavioral stress responses, decision-making, reward-behaviors, and impulsivity, including the prefrontal cortex (Blanco et al., 2015; Heinrichs, 2005; McCrory, De Brito, & Viding, 2012; Sinha, 2008). There may also be interactions between childhood trauma and a lack of parental or social support, maladaptive coping skills, and levels of daily stress that contribute to drug dependence later in life (Sinha, 2001).

Trauma experienced during adulthood is also associated with the risk of substance abuse. For example, individuals dependent on cocaine report significantly more types of lifetime trauma compared with community-matched samples (Afful, Strickland, Cottler, & Bierut, 2010). Additionally, research has also found that 60–70% of women enrolled in substance abuse treatment reported a history of partner violence (Lincoln, Liebschutz, Chernoff, Nguyen, & Amaro, 2006), for which substances may be used as a coping method (Miranda, Meyerson, Long, Marx, & Simpson, 2002). Recent physical or sexual assault has been associated with substance abuse relapse (Zweig, Yahner, & Rossman, 2012). There is also robust evidence for a relationship between combat-related posttraumatic stress disorder (PTSD) and subsequent substance abuse (Bremner, Southwick, Darnell, & Charney, 1996; Davis & Wood, 1999; McFall, Mackay, & Donovan, 1991; Seal et al., 2012). Furthermore, the comorbidity of PTSD and substance use disorder (SUD) is extraordinarily high (Brady, Back, & Coffey, 2004), particularly opioid addiction (Fareed et al., 2013). Traumatic events can induce chronic stress, as evidenced by PTSD (American Psychiatric Association, 2013; Reddy, 2013), for which drugs are often used to escape distressing emotions and traumatic memories (Brady et al., 2004). This hypothesis could be reasonably expanded to trauma survivors without a clinical diagnosis of PTSD, who may then begin to use drugs to cope with nontrauma-related distress in daily life, leading to a cycle of addiction (Bremner et al., 1996; Charney, Deutch, Krystal, Southwick, & Davis, 1993).

Types of trauma

Forbes et al. (2012) postulated that trauma be categorized into interpersonal trauma (e.g., assault or burglary) and noninterpersonal trauma in which the event was not directly connected to another person (e.g., illness or natural disasters). Interpersonal trauma can be further divided into subcategories based on whether the event involved a familiar person: nonintimate trauma (e.g., assault by a stranger) and intimate trauma (e.g., family violence). The vast majority of research on trauma in regard to addiction focuses on interpersonal traumas such

as childhood maltreatment, sexual assault, and domestic violence. Clear associations between these experiences and drug addiction illustrate the negative impact interpersonal trauma can cause. Several studies have demonstrated that across many populations, interpersonal trauma in particular is related to a range of psychiatric disorders, such as PTSD (Breslau, 2001; Forbes et al., 2012; Norris, 1992), anxiety and depression (Haldane & Nickerson, 2016), and eating disorders (Lejonclou, Nilsson, & Holmqvist, 2014). Assaultive traumas have also shown to be strongly related to the risk for major depressive disorder and panic attacks, as compared to noninterpersonal traumas (McCutcheon et al., 2010). However, the impact that interpersonal versus noninterpersonal trauma may have on the development of addiction has not been thoroughly explored.

Interpersonal trauma may violate assumptions about the predictability of other people, leading victims to feel their environment is unsafe due to potential human threat (Forbes et al., 2012, 2014). Interpersonal trauma has shown to negatively impact one's sense of personal agency, identity, self-worth, and ability to negotiate interpersonal boundaries (Brown, Kallivayalil, Mendelsohn, & Harvey, 2012). These perceptions may be detrimental to the belief in one's ability to manage everyday stressors and may lead to drug use as a coping strategy. In comparison, exposure to noninterpersonal trauma may not create a sense of human threat, which has been shown to be a primary factor in PTSD symptomology (Forbes et al., 2014). Trauma in general has been associated with a host of negative outcomes, including drug addiction. However, the existing literature on interpersonal versus noninterpersonal trauma points to something unique about experiencing a traumatic event involving another person that warrants further investigation.

The current study

The current study is the first to examine the relationships between different types and severity of trauma, current perceptions of stress, and addiction in an Australian cohort of opioid-dependent patients receiving opioid treatment. Opioids are of interest to this study as they have the power to mitigate hyperarousal symptoms associated with exposure to trauma due to their analgesic effects (Bremner et al., 1996; Stewart, Conrod, Pihl, & Dongier, 1999) and tend to be preferentially used by trauma survivors (Tull, Gratz, Aklin, & Lejuez, 2010). There has been considerably less research on opioid users, although this group tends to have experienced a greater number of traumas and are afflicted by higher rates of PTSD in comparison to users of other types of addictive substances (Lawson, Back, Hartwell, Maria, & Brady, 2013; Mills, Teesson, Ross, & Peters, 2006).

Many previous studies have been limited to checklists or structured interviews to establish a binary occurrence/nonoccurrence of adverse childhood events. The

current study sought to expand upon the literature by utilizing a self-report scale in order to assess the severity of different types of childhood trauma, expanding beyond maltreatment to include events such as the death of a family member or severe illness. Additionally, the interpersonal nature of trauma has not yet been investigated in regard to opioid addiction. In this regard, the current study utilized a novel measure of traumatic events based on interpersonal criteria in order to examine the relationship between different types of trauma and addiction.

It is hypothesized that opioid-dependent patients would report more childhood and lifetime trauma than a healthy control group and have a higher level of current perceived stress. The relationship between trauma, stress, and addiction was also analyzed to assess the extent that past trauma may predict addiction status beyond current stress levels. It is also hypothesized that trauma would better predict addiction status than perceived stress, particularly interpersonal trauma, as the literature has indicated that this type is closely related to psychiatric symptoms implicated in drug abuse (McCutcheon et al., 2010).

Method

Participants and procedure

Thirty-six participants with a history of opiate addiction were recruited from the Drug Health Services and Opioid Treatment Program at the Royal Prince Alfred Hospital in Sydney, Australia. All participants were currently being treated with opioid medication (methadone, buprenorphine, or suboxone). Eligibility criteria included: (1) a history of opiate addiction, (2) over 18 years of age, (3) English speaking, and (4) receiving opioid medication for the last 30 days. Individuals were excluded from participation if they (1) had a diagnosed psychiatric disorder or (2) were pregnant. Thirty-three healthy controls that did not have a history of opiate addiction were recruited via word of mouth from the community. Exclusion criteria included history of substance dependence or any other *DSM-IV* axis I disorders. The study was conducted in accordance with guidelines for the protection of human subjects established by the Declaration of Helsinki, approved by the Royal Prince Alfred Hospital Ethics Committee, and the Western Sydney Ethics Committee. All participants provided written informed consent before the initiation of testing.

Measures

Childhood trauma

To assess participant's history of childhood trauma, the Childhood Trauma Questionnaire-Short Form (CTQ-SF) (Bernstein et al., 1994) was administered.

The CTQ-SF is a 28 item self-report questionnaire assessing five types of childhood trauma: (1) emotional abuse, (2) physical abuse, (3) sexual abuse, (4) emotional neglect, and (5) physical neglect. Items are answered on a five-point Likert-type scale (0 = never true to 5 = very often true) in which affirmative answers are scored one point and tallied for each subgroup and across all items. Good internal consistency has been shown for each subscale ($a = 0.95$–0.63), as well as test–retest reliability ($a = 0.80$) (Bernstein et al., 1994).

Lifetime trauma

Participants were surveyed to determine if they had been exposed to 14 types of potentially traumatic events (PTEs) during their lifetime based on criteria determined by Forbes et al. (2012). A Lifetime Trauma Survey (LTS) was created for the purpose of this study, which comprised six items relating to noninterpersonal PTEs (e.g., diagnosis of a life threatening illness), three items relating to personal nonintimate PTEs (e.g., physical assault by a stranger), and five items relating to personal intimate PTEs (e.g., physical abuse perpetrated by a spouse or caregiver). Each affirmative answer was scored one point, which was tallied for each subgroup and across all items.

Perceived levels of stress

The Perceived Stress Scale (PSS) (Cohen, Kamarck, & Mermelstein, 1983) was used to measure the degree to which the participants appraised situations in their lives as unpredictable, uncontrollable, and overloaded during the previous month. The PSS is a self-report questionnaire comprising 10 items answered on a four-point Likert-type scale (0 = never to 4 = very often). Example items include "In the last month, how often have you felt that things were going your way"; and "In the last month, how often have you been upset because of something that happened unexpectedly." After reverse scoring four items, items are summed with greater scores indicating higher levels of perceived stress. The PSS has good internal consistency ($a = > 0.70$) and test–retest reliability ($a = > 0.70$) (Lee, 2012).

Results

Table 1 presents group the demographics of both patients and controls. The patient and control group did not significantly differ on age or education; however, there was a significant difference in gender between groups ($\chi^2 = 10.46$, $p < 0.001$). The mean scores for the CTQ-SF, LTS, and PSS (and all subscales) were higher in the patient group compared to controls. Kruskal–Wallis nonparametric analyses were employed to analyze differences in scores between groups (Table 2). Results revealed significant differences between median rank

Table 1. Demographic characteristics for patient and control groups.

	Patient group	Control group	Statistics	*p*
Age, mean (SD)	44.74 (9.39)	39.45 (14.85)	$t = 1.71$	0.092
Education, mean (SD)	2.08 (0.73)	2.27 (0.57)	$t = 1.06$	0.293
Gender (male), *n* (%)	27 (75%)	12 (36.4%)	$\chi^2 = 10.46$	0.001

Table 2. Means, standard deviations, and statistical results for differences between groups on CTQ-SF, LTS, and PSS.

	Patient group (N = 36)			Control group (N = 33)				
	Mean	SE	Median	Mean	SE	Median	χ^2	*p*
CTQ-SF total	62.64	4.50	57.50	34.10	1.57	31.00	24.73	0.001
Emotional abuse	13.00	1.11	11.50	7.42	0.63	5.00	15.22	0.001
Physical abuse	12.56	1.12	11.00	5.82	0.28	5.00	21.77	0.001
Sexual abuse	9.97	1.01	7.50	5.61	0.43	5.00	16.64	0.001
Emotional neglect	14.19	1.15	12.50	7.79	0.56	7.00	14.59	0.001
Physical neglect	11.08	0.97	9.00	6.64	0.45	5.00	15.61	0.001
LTS total	6.47	0.59	6.00	0.82	1.61	0.00	41.19	0.001
Noninterpersonal	2.53	0.30	2.00	0.39	0.17	0.00	30.22	0.001
Nonintimate interpersonal	1.69	0.16	2.00	0.24	0.10	0.00	34.26	0.001
Intimate interpersonal	2.25	0.27	2.00	0.21	0.08	0.00	32.23	0.001
Perceived Stress Scale	22.97	1.07	24.50	17.79	1.30	20.00	8.63	0.003

Note: CTQ-SF: Childhood Trauma Questionnaire – Short Form; LTS: Lifetime Trauma Survey.

scores for overall CTQ-SF ($\chi^2 = 24.73$, $p < 0.001$), overall LTS ($\chi^2 = 41.19$, $p < 0.001$), and the PSS ($\chi^2 = 8.63$, $p = 0.003$). Median rank scores for all subscales were also significant at the $p < 0.001$ level. Partial correlations showed that there was a significant positive relationship between scores on the PSS and all childhood and lifetime trauma subscales (all $p < 0.001$).

Hierarchical logistic regression analysis was employed to predict whether childhood trauma, lifetime trauma, and perceived stress are indicative of addiction (Table 3). Gender and PSS scores were entered into step 1, for which the model was statistically significant ($\chi^2(2) = 18.511$, $p < 0.001$) and accounted for 31.4% variance in group status. Male gender and PSS scores were statistically significant predictors of addiction ($B = -1.660$, Wald $= 8.683$, $p = 0.003$; $B = 0.107$, Wald $= 6.801$, $p = 0.009$, respectively). Total CTQ-SF scores were added to step 2 of the model which was statistically significant ($\chi^2(3) = 38.984$, $p < 0.001$), and accounted for 57.6% of the variance in addiction. Greater CTQ-

Table 3. Hierarchical logistic regression predicting group from LTS, CTQ-SF, and PSS.

								95% CI	
Step	Predictor	*B*	SE	Wald	*df*	*p*	Odds ratio	L	U
1	Gender (female)	−1.660	0.563	8.683	1	0.003	0.190	0.063	0.574
	PSS	0.107	0.041	6.801	1	0.009	1.113	1.027	1.206
2	Gender (female)	−1.661	0.694	5.725	1	0.017	0.190	0.049	0.741
	PSS	−0.009	0.051	0.031	1	0.861	0.991	0.896	1.096
	CTQ-SF total	0.100	0.031	10.438	1	0.001	1.106	1.040	1.175
3	Gender (female)	−2.076	1.077	3.716	1	0.054	0.125	0.015	1.035
	PSS	−0.002	0.073	0.001	1	0.975	0.998	0.865	1.151
	CTQ-SF total	0.072	0.042	3.026	1	0.082	1.075	0.991	1.166
	LTS total	0.865	0.244	12.511	1	<.001	2.374	1.470	3.834

CTQ-SF: Childhood Trauma Questionnaire – Short Form; LTS: Lifetime Trauma Survey; PSS: Perceived Stress Scale.

Table 4. K-fold cross-validation misclassification table.

	Observed (N = 69)	
Predicted	Control	Patient
Control	31	3
Patient	2	33

SF scores predicted addiction status ($B = 0.100$, Wald = 10.438, $p = 0.001$). When accounting for total CTQ-SF, the PSS was not a significant predictor of addiction status ($p = 0.861$). Total LTS score was included in step 4 in which the overall model was significant ($\chi^2(4) = 63.088$, $p < 0.001$) and accounted for 79.9% variance. Total LTS score was significant ($B = 0.865$, Wald = 12.511, $p < 0.001$), while all other variables became nonsignificant, indicating that taking gender into account, CTQ-SF and LTS scores, LTS was the best predictor of addiction status.

Conservative model estimates were developed to reduce overfitting in the final logistic regression model using k-fold cross-validation. We used a fivefold analysis because this method has been shown to work well to reduce bias in models (Molinaro, Simon, & Pfeiffer, 2005). We partitioned the data into five random subsamples of near-equal size, with four subsamples used for training the model and the fifth partition remaining as the test subsample. The logistic regression model was trained on the training folds to develop the most accurate model. This model was then tested on the full sample and can be seen in Table 4. The

Table 5. Logistic regression predicting group from gender, interpersonal trauma, and non-interpersonal trauma.

Predictor	*B*	SE	Wald	*df*	*p*	Odds ratio	95% CI	
							L	U
Gender (female)	−2.260	1.049	4.642	1	0.031	0.104	0.013	0.815
Interpersonal trauma	1.053	0.305	11.914	1	0.001	2.867	1.576	5.214
Noninterpersonal trauma	0.732	0.357	4.214	1	0.040	2.079	1.034	4.183

model had a .93 (95% CI: .84–.98) classification rate, with a sensitivity of .94 and a specificity of .92.

A second logistical regression analyses were conducted to examine which kind of lifetime trauma was most associated with addiction (Table 5). Intimate and nonintimate interpersonal trauma scores were combined. Results showed that taking gender into account, both interpersonal and noninterpersonal trauma significantly predicted addiction ($B = 1.053$, Wald $= 11.914$, $p = 0.001$; $B = .732$, Wald $= 4.214$, $p = 0.040$). A follow-up logistical regression revealed that noninterpersonal trauma and intimate interpersonal trauma were significantly associated with addiction ($B = 0.772$, Wald $= 4.452$, $p = 0.035$; $B = 1.803$, Wald $= 6.616$, $p = 0.010$; respectively); however, nonintimate interpersonal trauma was not ($p = 0.775$).

Discussion

Unlike previous research, our study implemented analyses of childhood trauma severity and interpersonal subtypes of traumatic events, which allowed for a more nuanced understanding of trauma and addiction. We found that patients reported significantly more severe psychical abuse, sexual abuse, emotional abuse, emotional neglect, and physical neglect. Patients also reported a greater number of both interpersonal (intimate and nonintimate) and noninterpersonal traumas than controls. Our results demonstrate that the severity of childhood trauma, incidents of lifetime trauma, and current experienced stress are higher in opioid-dependent patients than in healthy controls. These findings support evidence from previous studies examining characteristics of Australian opioid users which found that individuals experiencing a lifetime trauma reported more SUDs than those not exposed to trauma, and a greater number of traumatic events are strongly associated with having a SUD compared to those without (Mills et al., 2006). Further support has been found among opioid-dependent individuals reporting greater incidences of childhood maltreatment and neglect (Conroy, Degenhardt, Mattick, & Nelson, 2009).

Perceived stress was positively correlated with all types of childhood trauma. This is supported by rodent research in that maternal care in the first two weeks of life is associated with developmental differences in the hypothalamic–pituitary–adrenal (HPA) axis response to stress. In both humans and rodents, maternal care has shown to mediate the development of systems of the brain that serve to activate or inhibit the expression of behavioral and endocrine responses to stress (Caldji, Diorio, & Meaney, 2000; Pruessner, Champagne, Meaney, & Dagher, 2004). A history of childhood sexual abuse in particular has been associated with disordered HPA axis activity (Shenk, Noll, Putnam, & Trickett, 2010; Trickett, Noll, Susman, Shenk, & Putnam, 2010), abnormal cortisol levels (Trickett, Noll, & Putnam, 2011), as well as abnormalities in brain areas associated with fear response management, sensitivity to anxiety, and anticipation of fear (Blanco et al., 2015; McCrory et al., 2012). The results of the current study reflect these potential changes in childhood trauma survivors; however, due to the cross-sectional design, causality cannot be determined. Perceived stress was also positively correlated with intimate and nonintimate interpersonal trauma, as well as noninterpersonal trauma. These results demonstrate that all types of childhood and lifetime trauma are associated with greater current stress perceptions.

Logistical regression analyses revealed that the severity of childhood trauma better predicted opioid addiction than did perceived stress. Furthermore, when taking into account these two variables, lifetime trauma score showed the strongest association with addiction. This suggests that there may be a cumulative effect of childhood and adult trauma, which has been supported in the literature (Lloyd & Turner, 2003, 2008). These results also indicate that there may be other emotional and psychological impacts of trauma that contribute to the development of addiction. For example, potential consequences of childhood sexual abuse include feelings of powerlessness due to the control imbalance between child and adult (Finkelhor & Browne, 1985), and children experiencing maltreatment are more likely to develop perceptions of low competence, self-esteem, self-efficacy, and mastery over their environment (Turner, Finkelhor, & Ormrod, 2006, 2010; Turner, Shattuck, Finkelhor, & Hamby, 2017). These self-beliefs can persist into adulthood and disrupt coping efficacy or self-regulation, leading to use of substances as a way to manage negative emotions later in life (Wilson, Passik, Faude, Abrams, & Gordon, 1989). Women who have SUDs and experience domestic violence have reported low self-esteem and a lack of a sense of control of their relationships (Clements, Sabourin, & Spiby, 2004; Wingood, Diclemente, & Raj, 2000) and show improvements to self-efficacy and substance abuse after receiving support from domestic violence agencies (Bennett & Brien, 2007).

The gender differences reported in this study align with higher rates of illicit drug use and abuse in males (Substance Abuse and Mental Health Services Administration, 2014). However, there were considerably more males in the

patient group, which may account for the current results. Future studies are needed to investigate gender differences, as females appear to be equally likely to become addicted to opioids (Westermeyer & Boedicker, 2000), but may be more susceptible to the reinforcing effects of drugs (Lynch, Roth, & Carroll, 2002).

The path to addiction from trauma is clearly complex. It is possible that when substances are used at the time of trauma, addiction develops from repeated use, or the apparent success of this as a coping strategy may motivate drug use in the face of other adverse events (Brown & Wolfe, 1994). However, it is possible that adult traumas reported on the LTS were experienced as a result of addiction, such as causing a car accident while driving under the influence or contracting a serious illness from sharing needles. There is extensive evidence that substance abusers rate highly on psychological and behavioral indicators of impulsivity (Amlung, Vedelago, Acker, Balodis, & Mackillop, 2016; De Wit, 2008; Ersche, Turton, Pradhan, Bullmore, & Robbins, 2010; Johnson, Robert, Corrigan, & West, 1993). Furthermore, repeated opioid use has shown to alter neural stress pathways, making one more emotionally reactive to adverse events (Valverde & Maldonado, 2005; Zhou, Proudnikov, Yuferov, & Kreek, 2010). However, the design of the current study does not allow us to make any causal conclusions.

Unexpectedly, there was no substantial difference between incidents of interpersonal and noninterpersonal trauma in association with addiction status. This contrasts with evidence that interpersonal trauma is more closely linked to PTSD and other psychiatric symptomology associated with addiction (McCutcheon et al., 2010). Furthermore, when comparing noninterpersonal trauma with intimate and nonintimate interpersonal trauma, noninterpersonal trauma remained a good predictor of the patient group. Only incidences of nonintimate trauma failed to have a significant association with addiction status. These results may indicate that the personal nature of trauma does not necessarily have significant implications to opioid addiction. However, further investigation on interpersonal trauma, particularly in childhood, is needed. It has been observed that childhood victimization is directly related to changes in self-esteem and depression compared to nonvictimization adversity (Turner et al., 2006, 2010), which raises the possibility that childhood interpersonal trauma may play a particular role in the use of substances to ameliorate the results of these changes.

The study is limited by its small sample size, which may explain the lack of meaningful differences found between noninterpersonal and interpersonal trauma as they relate to opioid dependency. Future research is needed with larger sample sizes to further explore the validity of these findings. Additionally, the LTS calculates the number of trauma events experienced but does not assess the severity of trauma, which limits the interpretation of our results. Future studies should use scales in order to explore whether the severity and frequency of lifetime trauma impacts the risk of addiction. Further enquiry would also benefit from isolating childhood trauma from adult trauma, as the

LTS utilized in this study encompassed both. Finally, trauma reporting may have been influenced by the paper and pencil administration of the materials that were handed to the researcher. This was especially pertinent for the control group, as some participants were familiar with the researcher and may not want to disclose sensitive information.

The current study adds weight to extant literature regarding trauma among opioid-dependent individuals in the Australian population. This study was unique in that it assessed the separate contributions interpersonal and noninterpersonal trauma may have to opioid addiction. Furthermore, results suggest that opioid addiction cannot be fully explained by trauma related stress. Lifetime traumatic events and the severity of childhood trauma have an important role to play in the development and maintenance of addiction; however, longitudinal research is needed to further support this study's findings. Despite limitations, the findings have clinical implications in the assessment, diagnosis, and prevention of opioid addiction in the Australian setting in which opioid abuse is of significant concern.

Authors' Note

Data for this study are available from Dr. Ahmed Moustafa via email.

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References

Afful, S. E., Strickland, J. R., Cottler, L., & Bierut, L. J. (2010). Exposure to trauma: A comparison of cocaine-dependent cases and a community-matched sample. *Drug and Alcohol Dependence*, *112*(1), 46–53.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.

Amlung, M., Vedelago, L., Acker, J., Balodis, I., & Mackillop, J. (2016). Steep delay discounting and addictive behavior: A meta- analysis of continuous associations. *Addiction Review*, *112*(1), 51–62.

Bennett, L., & Brien, P. (2007). Effects of coordinated services for drug-abusing women who are victims of intimate partner violence. *Violence Against Women*, *13*(4), 395–411.

Bernstein, D. P., Fink, L., Handelsman, L., Foote, J., Lovejoy, M., Wenzel, K., & Ruggiero, J. (1994). Initial reliability and validity of a new retrospective measure of child abuse and neglect. *The American Journal of Psychiatry*, *151*(8), 1132–1136.

Blanco, L., Nydegger, L. A., Camarillo, G., Trinidad, D. R., Schramm, E., & Ames, S. L. (2015). Neurological changes in brain structure and functions among individuals with a history of childhood sexual abuse: A review. *Neuroscience and Biobehavioral Reviews*, *57*, 63–69.

Brady, K. T., Back, S. E., & Coffey, S. F. (2004). Substance abuse and posttraumatic stress disorder. *Current Directions in Psychological Science*, *13*(5), 206–209.

Bremner, J. D., Southwick, S. M., Darnell, A., & Charney, D. S. (1996). Chronic PTSD in Vietnam combat veterans: Course of illness and substance abuse. *The American Journal of Psychiatry*, *153*(3), 369–375.

Breslau, N. (2001). The epidemiology of posttraumatic stress disorder: What is the extent of the problem? *Journal of Clinical Psychiatry*, *62*(Supplement 17): 16–22.

Brown, P. J. & Wolfe, J. (1994). Substance abuse and post-traumatic stress disorder comorbidity. *Drug and Alcohol Dependence, 35*(1), 51–59.

Brown, N., Kallivayalil, D., Mendelsohn, M., & Harvey, M. (2012). Working the double edge: Unbraiding pathology and resiliency in the narratives of early-recovery trauma survivors. *Psychological Trauma: Theory, Research, Practice, and Policy*, *4*(1), 102–111.

Caldji, C., Diorio, J., & Meaney, M. J. (2000). Variations in maternal care in infancy regulate the development of stress reactivity. *Biological Psychiatry*, *48*(12), 1164–1174.

Charney, D. S., Deutch, A. Y., Krystal, J. H., Southwick, S. M., & Davis, M. (1993). Psychobiologic mechanisms of posttraumatic stress disorder. *Archives of General Psychiatry*, *50*(4), 294–305.

Cleck, J., & Blendy, J. (2008). Making a bad thing worse: Adverse effects of stress on drug addiction. *Journal of Clinical Investigation*, *118*(2), 454–461.

Clements, C., Sabourin, C., & Spiby, L. (2004). Dysphoria and hopelessness following battering: The role of perceived control, coping, and self-esteem. *Journal of Family Violence*, *19*(1), 25–36.

Cohen, S., Gianaros, P. J., & Manuck, S. B. (2016). A stage model of stress and disease. *Perspectives on Psychological Science*, *11*(4), 456–463.

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, *24*(4), 385–396.

Conroy, E., Degenhardt, L., Mattick, R. P., & Nelson, E. C. (2009). Child maltreatment as a risk factor for opioid dependence: Comparison of family characteristics and type and severity of child maltreatment with a matched control group. *Child Abuse and Neglect*, *33*(6), 343–352.

Constantinou, N., Morgan, C. J. A., Battistella, S., O'ryan, D., Davis, P., & Curran, H. V. (2010). Attentional bias, inhibitory control and acute stress in current and former opiate addicts. *Drug and Alcohol Dependence*, *109*(1), 220–225.

Davis, T. M., & Wood, P. S. (1999). Substance abuse and sexual trauma in a female veteran population. *Journal of Substance Abuse Treatment*, *16*(2), 123–127.

De Wit, H. (2008). Impulsivity as a determinant and consequence of drug use: A review of underlying processes. *Addiction Biology*, *14*(1), 22–31.

Ersche, K. D., Turton, A. J., Pradhan, S., Bullmore, E. T., & Robbins, T. W. (2010). Drug addiction endophenotypes: Impulsive versus sensation-seeking personality traits. *Biological Psychiatry*, *68*(8), 770–773.

Fareed, A., Eilender, P., Haber, M., Bremner, J., Whitfield, N., & Drexler, K. (2013). Co-morbid post traumatic stress disorder and opiate addiction: A literature review. *Journal of Addictive Diseases*, *32*(2), 168–179.

Fields, A. S., Lange, A. K., Ramos, A. A., Thamotharan, A. S., & Rassu, A. F. (2014). The relationship between stress and delay discounting: A meta-analytic review. *Behavioural Pharmacology*, *25*(5–6), 434–444.

Finkelhor, D., & Browne, A. (1985). The traumatic impact of child sexual abuse: A Conceptualization. *American Journal of Orthopsychiatry*, *55*(4), 530–541.

Forbes, D., Fletcher, S., Parslow, R., Phelps, A., Donnell, M., Bryant, R. A., & Creamer, M. (2012). Trauma at the hands of another: Longitudinal study of differences in the posttraumatic stress disorder symptom profile following interpersonal compared with noninterpersonal trauma. *Journal of Clinical Psychiatry*, *73*(3), 372–376.

Forbes, D., Lockwood, E., Phelps, A., Wade, D., Creamer, M., Bryant, R. A., & Donnell, M. (2014). Trauma at the hands of another: Distinguishing PTSD patterns following intimate and nonintimate interpersonal and noninterpersonal trauma in a nationally representative sample. *Journal of Clinical Psychiatry*, *75*(2), 147–153.

Furnari, M. A., Kowalczyk, W. J., Jobes, M. L., Phillips, K. A., Epstein, D., & Preston, K. L. (2015). Field evidence for stress-induced drug use. *Drug and Alcohol Dependence*, *156*, e75–e76.

Goeders, N. (2003). The impact of stress on addiction. *European Neuropsychopharmacology*, *13*(6), 435–441.

Haldane, J., & Nickerson, A. (2016). The impact of interpersonal and noninterpersonal trauma on psychological symptoms in refugees: The moderating role of gender and trauma type. *Journal of Traumatic Stress*, *29*(5), 457–465.

Heinrichs, S. C. (2005). Chapter 2.3 Behavioral consequences of altered corticotropin-releasing factor activation in brain: A functionalist view of affective neuroscience. *Techniques in the Behavioral and Neural Sciences*, *15*(1), 155–177.

Jaremko, K. M., Sterling, R. C., & Van Bockstaele, E. J. (2015). Psychological and physiological stress negatively impacts early engagement and retention of opioid-dependent individuals on methadone maintenance. *Journal of Substance Abuse Treatment*, *48*(1), 117–127.

Johnson, W. L. M., Robert, M., Corrigan, S. A., & West, J. A. (1993). Impulsive behavior and substance abuse. In W. G. J. McCown, J. L. Johnson & M. B. Shure (Eds), *The impulsive client: Theory research and development* (pp. 225–246). Washington, DC: American Psychological Association.

Kendler, K. S., Bulik, C. M., Silberg, J., Hettema, J. M., Myers, J., & Prescott, C. A. (2000). Childhood sexual abuse and adult psychiatric and substance use disorders in women: An epidemiological and cotwin control analysis. *Archives of General Psychiatry*, *57*(10), 953–959.

Kimura, K., Izawa, S., Sugaya, N., Ogawa, N., Yamada, K. C., Shirotsuki, K., & Hasegawa, T. (2013). The biological effects of acute psychosocial stress on delay discounting. *Psychoneuroendocrinology*, *38*(10), 2300–2308.

Lawson, K. M., Back, S. E., Hartwell, K. J., Maria, M. M. S., & Brady, K. T. (2013). A comparison of trauma profiles among individuals with prescription opioid, nicotine, or cocaine dependence. *American Journal on Addictions*, *22*(2), 127–131.

Lee, E.-H. (2012). Review of the psychometric evidence of the Perceived Stress Scale. *Asian Nursing Research*, *6*(4), 121–127.

Lejonclou, A., Nilsson, D., & Holmqvist, R. (2014). Variants of potentially traumatizing life events in eating disorder patients. *Psychological Trauma: Theory, Research, Practice, and Policy*, *6*(6), 661–667.

Li, C.-S. R., & Sinha, R. (2008). Inhibitory control and emotional stress regulation: Neuroimaging evidence for frontal-limbic dysfunction in psycho-stimulant addiction. *Neuroscience and Biobehavioral Reviews*, *32*(3), 581–597.

Lincoln, A. K., Liebschutz, J. M., Chernoff, M., Nguyen, D., & Amaro, H. (2006). Brief screening for co-occurring disorders among women entering substance abuse treatment. *Substance Abuse Treatment, Prevention, and Policy*, *1*, 26–26.

Lloyd, D. A., & Turner, R. J. (2003). Cumulative adversity and posttraumatic stress disorder: Evidence from a diverse community sample of young adults. *American Journal of Orthopsychiatry*, *73*(4), 381–391.

Lloyd, D. A., & Turner, R. J. (2008). Cumulative lifetime adversities and alcohol dependence in adolescence and young adulthood. *Drug and Alcohol Dependence*, *93*(3), 217–226.

Lynch, W., Roth, M., & Carroll, M. (2002). Biological basis of sex differences in drug abuse: Preclinical and clinical studies. *Psychopharmacology*, *164*(2), 121–137.

McCrory, E., De Brito, S. A., & Viding, E. (2012). The link between child abuse and psychopathology: A review of neurobiological and genetic research. *Journal of the Royal Society of Medicine*, *105*(4), 151–156.

McCutcheon, V. V., Heath, A. C., Nelson, E. C., Bucholz, K. K., Madden, P. A. F., & Martin, N. G. (2010). Clustering of trauma and associations with single and co-occurring depression and panic attack over twenty years. *Twin Research and Human Genetics*, *13*(1), 57–65.

McFall, E. M., Mackay, W. P., & Donovan, M. D. (1991). Combat-related PTSD and psychosocial adjustment problems among substance abusing veterans. *Journal of Nervous and Mental Disease*, *179*(1), 33–38.

McKee, S. A., Sinha, R., Weinberger, A. H., Sofuoglu, M., Harrison, E. L. R., Lavery, M., & Wanzer, J. (2011). Stress decreases the ability to resist smoking and potentiates smoking intensity and reward.(Clinical report). *Journal of Psychopharmacology*, *25*(4), 490–502.

Mills, K. L., Teesson, M., Ross, J., & Peters, L. (2006). Trauma, PTSD, and substance use disorders: Findings from the Australian National Survey of Mental Health and Well-Being. *American Journal of Psychiatry*, *163*(4), 652–658.

Miranda, R. J., Meyerson, L. A., Long, P. J., Marx, B. P., & Simpson, S. M. (2002). Sexual assault and alcohol use: Exploring the self-medication hypothesis. *Violence and Victims*, *17*(2), 205–217.

Molinaro, A. M., Simon, R., & Pfeiffer, R. M. (2005). Prediction error estimation: A comparison of resampling methods. *Bioinformatics*, *21*(15), 3301–3307.

Molnar, B., Buka, S., & Kessler, R. (2001). Child sexual abuse and subsequent psychopathology: Results from the National Comorbidity Survey. *American Journal of Public Health*, *91*(5), 753–760.

Nelson, E. C., Heath, A. C., Lynskey, M. T., Bucholz, K. K., Madden, P. A. F., Statham, D. J., & Martin, N. G. (2006). Childhood sexual abuse and risks for licit and illicit drug-related outcomes: A twin study. *Psychological Medicine*, *36*(10), 1473–1483.

Norris, F. (1992). Epidemiology of trauma: Frequency and impact of different potentially traumatic events on different demographic groups. *Journal of Consulting and Clinical Psychology*, *60*(Jun 92), 409–418.

Pruessner, J. C., Champagne, F., Meaney, M. J., & Dagher, A. (2004). Dopamine release in response to a psychological stress in humans and its relationship to early life maternal care: A positron emission tomography study using [11C]raclopride. *The Journal of Neuroscience*, *24*(11), 2825–2831.

Reddy, M. K. A., Bradley, J., Liebschutz, Jane; Stein, & Michael, D. (2013). Factor struction of PTSD symptoms in opioid-dependent patients rating their overall trauma history. *Drug and Alcohol Dependence*, *132*(3), 597–602.

Seal, K. H., Shi, Y., Cohen, G., Cohen, B. E., Maguen, S., Neylan, T. C., & Krebs, E. E. (2012). Association of mental health disorders with prescription opioids and high-risk opioid use in US veterans of Iraq and Afghanistan. *Journal of the American Medical Association*, *307*(9), 940–947.

Shenk, C. E., Noll, J. G., Putnam, F. W., & Trickett, P. K. (2010). A prospective examination of the role of childhood sexual abuse and physiological asymmetry in the development of psychopathology. *Child Abuse and Neglect*, *34*(10), 752–761.

Sinha, R. (2001). How does stress increase risk of drug abuse and relapse? *Psychopharmacology*, *158*(4), 343–359.

Sinha, R. (2008). Chronic stress, drug use, and vulnerability to addiction. *Annals of the New York Academy of Sciences*, *1141*(1), 105–130.

Sinha, R., Fox, H. C., Hong, K.-I. A., Hansen, J., Tuit, K., & Kreek, M. J. (2011). Effects of adrenal sensitivity, stress- and cue-induced craving, and anxiety on subsequent alcohol relapse and treatment outcomes. *Archives of General Psychiatry*, *68*(9), 942–952.

Stewart, S. H., Conrod, P. J., Pihl, R. O., & Dongier, M. (1999). Relations between posttraumatic stress symptom dimensions and substance dependence in a community-recruited sample of substance-abusing women. *Psychology of Addictive Behaviors*, *13*(2), 78–88.

Substance Abuse and Mental Health Services Administration. (2014). *Results from the 2013 National Survey on Drug Use and Health: Summary of national findings*. Rockville, MD: Substance Abuse and Mental Health Services Administration.

Trickett, P. K., Noll, J. G., & Putnam, F. W. (2011). The impact of sexual abuse on female development: Lessons from a multigenerational, longitudinal research study. *Developmental Psychopathology*, *23*(2), 453–476.

Trickett, P. K., Noll, J. G., Susman, E. J., Shenk, C. E., & Putnam, F. W. (2010). Attenuation of cortisol across development for victims of sexual abuse. *Developmental Psychopathology*, *22*(1), 165–175.

Tull, M. T., Gratz, K. L., Aklin, W. M., & Lejuez, C. W. (2010). A preliminary examination of the relationships between posttraumatic stress symptoms and crack/cocaine, heroin, and alcohol dependence. *Journal of Anxiety Disorders*, *24*(1), 55–62.

Turner, H. A., Finkelhor, D., & Ormrod, R. (2006). The effect of lifetime victimization on the mental health of children and adolescents. *Social Science and Medicine*, *62*(1), 13–27.

Turner, H. A., Finkelhor, D., & Ormrod, R. (2010). The effects of adolescent victimization on self-concept and depressive symptoms. *Child Maltreatment*, *15*(1), 76–90.

Turner, H. A., Shattuck, A., Finkelhor, D., & Hamby, S. (2017). Effects of poly-victimization on adolescent social support, self-concept, and psychological distress. *Journal of Interpersonal Violence*, *32*(5), 755–780.

Valverde, O., & Maldonado, R. (2005). Neurobiology of opioid addiction. *Adicciones*, *17*(2), 41–56.

Westermeyer, J., & Boedicker, A. E. (2000). Course, Severity, and Treatment of Substance Abuse Among Women Versus Men. *The American Journal of Drug and Alcohol Abuse*, *26*(4), 523–535.

Wilson, D. A., Passik, D. S., Faude, D. J., Abrams, D. J., & Gordon, D. E. (1989). A ierarchical model of opiate addiction: Failures of self-regulation as a central aspect of substance abuse. *Journal of Nervous and Mental Disease*, *177*(7), 390–399.

Wingood, G. M., Diclemente, R. J., & Raj, A. (2000). Adverse consequences of intimate partner abuse among women in non-urban domestic violence shelters. *American Journal of Preventive Medicine*, *19*(4), 270–275.

Zhou, Y., Proudnikov, D., Yuferov, V., & Kreek, M. J. (2010). Drug-induced and genetic alterations in stress-responsive systems: Implications for specific addictive diseases. *Brain Research*, *1314*, 235–252.

Zweig, J. M., Yahner, J., & Rossman, S. B. (2012). Does recent physical and sexual victimization affect further substance use for adult drug-involved offenders? *Journal of Interpersonal Violence*, *27*(12), 2348–2372.

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