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Emotional reactivity across individuals with varying trauma and substance dependence histories

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Abstract

Background—Research has reported a high rate of substance dependence in traumatized individuals who do not develop PTSD (TWP). While past studies have failed to consistently demonstrate that TWP individuals experience PTSD symptoms, findings have indicated that TWP and a history of substance dependence aside from nicotine dependence (SDH) are linked to affect disruption.

Aims—The present study explored positive and negative affective mechanisms across four groups with varying SDH and TWP including TWP + SDH, TWP only, SDH only, or no history. Researchers hypothesized that adults ($n = 78$) would be more emotionally reactive to an experimentally-induced negative mood compared to a neutral mood induction as the presence of co-existing TWP and SDH increased.

Method—After a brief telephone screening, eligible participants completed baseline self-report questionnaires and experimentally-manipulated negative and neutral mood inductions.

Results—Most notably, results showed a significant TWP \times SDH \times Mood induction interaction ($F(1, 63) = 4.154$; $Mse = 51.999$; $p = .046$) for positive affect responses. Simple effects indicated that all participants except TWP + SDH individuals experienced a significant decrease in positive affect during the negative compared to the neutral mood condition.

Conclusion—Findings may identify a protective mechanism for relapse among individuals with a history of both TWP and SDH.

Keywords

affect; cue reactivity; substance dependence; trauma

Introduction

Trauma and substance dependence frequently coexist regardless of trauma type (DeFronzo & Pawlak, 1993; Saladin, et al., 1995; Stewart, et al., 1998) or the development of Posttraumatic Stress Disorder (PTSD; Quimmette, et al., 2000). More specifically, trauma-exposed individuals have two times the risk of alcohol dependence and eight times the risk of drug dependence compared to individuals without trauma (Giaconia, 1995, 2000). Previous research has focused primarily on understanding the relationship between PTSD and substance dependence, with a number of studies concluding that trauma exposure precedes substance dependence and that individuals use substances in an attempt to alleviate PTSD symptoms

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(Bremner, et al., 1996; Hutchinson, et al., 1997; Khantzian, 1997). However, past research has failed to consistently show that traumatized individuals who do not develop PTSD (TWP; 77% of trauma survivors) experience diagnostic PTSD symptoms (Jones, et al., 1997; Parslow, et al., 2006) leaving the high rate of substance use in TWP somewhat ambiguous.

An alternative explanation for concurrent substance dependence in TWP individuals is that they are more susceptible to environmental stress and use substances to alleviate presumed acute affective and chronic mood disruption. Research partially supporting this assumption links traumatic events to elevated negative affect, as well as lower positive affect in both children and adults regardless of PTSD development (Armsworth, & Holaday, 1993; Goenjian, et al., 2000; Riggs, et al., 1992; Winkel, et al., 1999). Further, some evidence shows that TWP participants compared to controls produce greater labile emotions (acute elevations in fear, anger, shame, disgust, and sadness with lower levels of being pleased and surprised) from exposure to negative mood stimuli (Amdur, et al., 2000). Implicating a possible susceptibility to chronic mood symptomatology, data has also shown that former prisoners of war (POWs) report increased negative affect and decreased positive affect associated with their initial trauma response nearly 20 years post-combat (Engdahl, et al., 1993). Despite such promising evidence, research has yet to fully examine the intensity or frequency of the suggested affective dysregulation among those with TWP. Furthermore, little is known about how TWP individuals cope with such mood dysregulation. Plausibly, to the extent that affect/mood is disrupted, TWP individuals may be given the opportunity to learn that affective regulation can be achieved through substances.

Substances indeed may be used to regulate disrupted levels of affect. For example, greater alcohol and drug use has been associated with higher basal negative affect such as anxiety, depression, verbal hostility, and physical hostility (e.g., Fishbein, et al., 1993; Pasion-Gonzales, et al., 2001) as well as lower basal positive affect including joy, affection, and vigor in those currently using and in treatment (Newcomb, et al., 1988; Pasion-Gonzales, et al., 2001). Carpenter and Hasin (1998) suggest a temporal sequence between substance use and affect regulation, reporting that drinking to reduce negative affect is related to frequency of intoxication; this was higher in those with current alcohol dependence compared to controls. Further, anxiety, depression, anger, and feeling uptight have retrospectively been identified as contributors to both alcohol and drug relapse less than 12 weeks to three years post-cessation (Connors, et al., 1998; Litt, et al., 1990; Pickens, et al., 1985; Rubin, et al., 1996). Such research indicates that individuals use substances to regulate affective disruptions, and suggests that disruptions in affect provide a mechanism to relapse.

To acquire more knowledge of individuals who have experienced a history of substance dependence (SDH; i.e. alcohol or illicit drug dependence aside from current nicotine dependence) and TWP, the current study seeks to provide a preliminary exploration of plausible affect dysregulation in individuals with varying histories of TWP and SDH. Specifically, we examined unique patterns of affective response during counterbalanced negative and neutral mood inductions. Research has shown experimentally induced mood in cue reactivity designs can successfully manipulate affect and has been implemented in studies of substance use (Litt, et al., 1990; Hufford, 2001; Tiffany, & Drobles, 1990). We hypothesize that with greater vulnerability there would be stronger affective responsiveness from the neutral to negative mood condition. The greatest vulnerability to affective response was defined as participants having both TWP and SDH because research reports of affect disruption in TWP and SDH, independently, may be compounded with the presence of both constructs. This group was compared with the following groups: TWP only, SDH only, and no histories.

Method

Participants

The current study was comprised of smokers with and without a history of depression, allowing researchers a unique opportunity to explore the research question in a clinically relevant, highly comorbid sample (Brady, et al., 2000; Maes, et al., 2000; Pfefferbaum, 2002). Refer to Table 1 for participant characteristics across study groups, and Table 2 for participant response rate and flow. Flyers and newspaper advertisements in a large US Midwestern city were distributed to recruit participants. Persons with *current* Axis I disorders such as major depressive disorder, substance use disorder, or PTSD were excluded, with the exception of current nicotine dependence. Individuals actively using smoking cessation techniques, unable to read the questionnaires, and abstinent less than six months from a previous substance dependency other than nicotine were excluded. Diagnostic histories were assessed via clinical interview (see Measures section below) and SDH, history of major depressive disorder, and trauma exposure were documented. Reported trauma exposures consisted of scenarios resulting in bodily harm, threat of harm, or harm to a loved one. At no time did individuals with trauma exposure meet criteria for lifetime PTSD, and no individuals using antidepressant medication were included in the analysis.

Measures

Participants were screened using the Structured Clinical Interview for DSM-IV Non-Patient version (SCID-NP; First, et al., 1996) to determine study eligibility, identify potential Axis I Disorders, and document a history of substance dependence and trauma exposure (meeting criteria A for PTSD while not meeting full criteria or a lifetime PTSD diagnosis). The Positive and Negative Affect Schedule (PANAS; Watson, et al., 1988) was used to assess affective response pre- and post-mood induction. Measures either included as covariates and/or utilized to help discount PTSD symptomatology included the Profile of Moods States (POMS; McNair, et al., 1971), the Fawcett-Clark Anhedonia Scale (Fawcett, et al., 1983), the Beck Depression Inventory (BDI; Beck, et al., 1961), and the Fagerstrom Test for Nicotine Dependence (FTND; Heatherton, et al., 1991).

Procedure

Screening—After a brief telephone screening and obtaining written consent from all individuals, the screening session assessed eligibility via an ecolyzer test (to assess smoking status), and clinical interview by the principle investigator (DEM) and a trained post-doctoral staff member using the SCID-NP. Those still remaining eligible for the study completed basal mood and smoking questionnaires. In addition, participants verbally generated personal memories of several events in the past year that had caused feelings of ‘upset, very anxious, angry, or sad’, as well as events that did not elicit such feelings (Litt, et al., 1990). Next, participants indicated, using a 10-point Likert scale, the degree to which each event made them feel sad, angry, or anxious. As described below, events scoring 7 or greater were scripted for the negative mood induction, while those scoring a 0 or 1 were included in the neutral mood induction. Prior research has found this autobiographical technique successful in manipulating mood (Ekman, et al., 1983).

Experimental procedure—Following the screening session, four experimental sessions followed (counterbalanced using a Latin square design). On testing days, participants were asked to abstain from caffeine after 9:00 a.m., subjects’ alcohol, food, caffeine, and exercise behaviors were measured, and all participants began by smoking one cigarette to prevent nicotine withdrawal and to standardize the time from their last cigarette. Following the cigarette, individuals rested for 30 minutes to stabilize mood and arousal while measures of blood pressure and heart rate were taken. Next, baseline mood and craving were recorded via

self-report measures. Simultaneous mood induction and environmental cue exposure procedures followed with all persons experiencing both a negative or neutral mood induction and a condition of the environmental cue exposure (in vivo cue or control – roll of tape). For the purposes of this analysis, affective change data gathered during the environmental cue *control* groups only (i.e. negative mood induction + control, neutral mood induction + control) was targeted, and accordingly, will be discussed below.

Mood induction procedure—Following baseline self-report measures, participants undergoing the negative mood induction listened to audiotaped pieces of classical music including *Russia Under the Mongolian Yoke* (Prokofiev, 1938) and *Adagio Pour Cordes* (Barber, 1936), which have both been shown to induce negative mood (Clark & Teasdale, 1985; Gerrards-Hessc, et al., 1994; Marin, 1990). Further, research assistants prompted participants to recall their scripted negative memory. Because prior research has shown music can evoke negative and positive mood states (Clark, 1983; Vaestfjaell, 2002), the scripted neutral mood induction did not include a musical component. Each mood exposure period lasted 10 minutes with self-reported mood assessed immediately afterwards. Vividness was rated on a 100-point scale at the five minute mark of the mood induction to assess engagement in memory (Tiffany & Hakenewerth, 1991). At end, a positive mood induction was conducted to dispel any lingering negative feelings.

Data Analysis—A mixed factorial, 3-way Analysis of Covariance (ANCOVA) evaluated the effect of TWP and/or SDH (between group variables) as well as mood induction condition (within group variable) on change in affective response (dependent variable). Change scores were derived by subtracting PANAS scores directly following each mood induction period from baseline PANAS scores. Several covariates were included in the analysis for theoretical and statistical reasons.

Given the characteristics of the current sample, participant responses on the *FTND*, *BDI*, and *Fawcett-Clark Anhedonia Scale* were entered as covariates to control for the influence of varying severities of nicotine dependence and subsyndromal symptoms commonly exhibited by individuals with a history of major depressive disorder (Borrelli, 1999; Fawcett, et al., 1983). *Marital status* was controlled as a measure of social support which has been shown to facilitate psychosocial adjustment after trauma (Khamis, 1993; Rodrigue & Park, 1996). Finally, *gender* and *family history of alcohol dependence* were controlled, both having significant bivariate relations with the dependent variables ($p < .01$). Family history of drug dependence was not significantly correlated, and therefore, not included as a covariate. All covariates in the analysis were centered or dummy coded to reduce unnecessary collinearity. Refer to Table 1 for a summary of univariate means across covariates.

Results

Preliminary data

Preliminary data analysis first examined bivariate correlations among multiple variables including the dependent variables, demographic characteristics, and Latin square procedures. As mentioned above, two demographic variables were entered as covariates due to significant bivariate correlations. As the current analysis included only two of four possible conditions within the larger design, there is a possibility that an order effect exists such that the negative or neutral mood induction condition occurred first more often than the other. However, with no significant correlations among the Latin square and dependent variables ($p > .05$) as well as similar frequencies among Latin square sequences, order effects were not present.

Manipulation check—Indicating successful participant response to the mood induction technique, paired sample t-tests demonstrated an overall significant increase in negative affect pre- to post-negative mood induction ($t(76) = -8.062; p > .001; r = .679$). Positive affect significantly decreased pre- to post-negative mood induction ($t(76) = 8.330; p < .001; r = .674$). Vividness ratings for memory engagement in the neutral ($M = 76.96; SD = 25.26$) and negative ($M = 76.17; SD = 25.59$) mood induction procedures reached the third quartile. Vividness ratings were comparable to previous studies (Tiffany & Drobles, 1990; Tiffany & Hakenewerth, 1991) while effectiveness of the negative mood induction procedure exceeded similar studies ($r = .532$; Hufford, 2001).

Subsyndromal PTSD check—To rule out the possibility that subsyndromal PTSD symptoms among the TWP groups may influence results, screening session responses on several indices were compared across individuals with and without TWP. No significant differences in baseline depression ($F(1,76) = 3.653; p = .060; Mse = 58.262; r = .214$), anhedonia ($F(1,76) = .758; p = .387; Mse = 222.303; r = .099$), anger ($F(1,72) = .022; p = .883; Mse = 71.294; r = .017$), or anxiety ($F(1,75) = 1.076; p = .303; Mse = 25.959; r = .119$) were reported. These findings are consistent with previous research reporting elevated symptoms of depression, anxiety, and anger scores among PTSD individuals compared to TWP and no-trauma controls who endorsed statistically equivalent levels (Butler, et al., 1996).

Primary data

After controlling for covariates, there were no significant differences in negative affect across mood conditions ($p > .05$); across each group negative affect decreased from the neutral to negative mood induction. However, significant differences in positive affect responses produced a 3-way interaction among TWP, SDH, and mood induction conditions ($F(1,63) = 4.154; p = .046; Mse = 51.999; r = .249$). Differences in positive affect ratings across groups are displayed in Figure 1. Examination of the simple effects ($LSD_{mmd} = 4.679$) revealed that, contrary to the research hypothesis, those with SDH+TWP did not have significantly different responses in positive affect between negative and neutral mood inductions ($r = .169$); change in positive affect was minimal across both mood induction conditions. In contrast, the three comparison groups (TWP only, SDH only, and no histories) experienced a substantially greater change in positive affect in the negative mood induction condition compared to the neutral condition such that positive affect decreased significantly during the negative mood induction condition. This effect was two-fold for TWP only ($r = .810$).

Lastly, findings also indicated a significant 2-way interaction between SDH and mood induction condition ($F(1,63) = 5.685; p = .020; Mse = 51.999; r = .288$). Those without SDH showed an affective change such that positive affect significantly decreased during the negative mood induction. However, positive affect did not significantly change pre- to post- mood conditions in SDH individuals similar to the restricted affect in the 3-way interaction ($LSM_{mmd} = 3.308$). Given the similarity between the 2-way and 3-way findings, researchers were interested in examining the role of trauma in the 2-way interaction and hypothesized that history of trauma exposure may be confounding the current 2-way result. An ANCOVA analysis comprised of the former covariates and including trauma exposure as an additional covariate indicated the 2-way interaction between SDH and mood induction condition was no longer significant after trauma was controlled ($p > .05$).

Discussion

The current study examined whether the comorbidity between TWP and SDH disproportionately influenced affective responses in a negative compared to a neutral mood condition. Findings were consistent with previous studies showing that negative mood was

successfully elicited by the negative mood induction procedure (e.g., Jansma, et al., 2000; Tiffany & Drobles, 1990; Tiffany & Hakenewerth, 1991). While negative affect was elevated among all participants pre- to post-mood induction regardless of group type, positive affect responsiveness produced significant group differences. Most notably, results showed a 3-way interaction among TWP, SDH, and mood condition. Post-hoc simple effects indicated that those *without* trauma, regardless of SDH, reported significant decreases in positive affect from the negative compared with the neutral mood condition. Although not statistically different from those without trauma, the TWP only condition produced similar results; however, at a two-fold greater magnitude. Contrary to expectations, TWP + SDH individuals – hypothesized as the group with the largest vulnerability to strong affective response – reported restricted change in positive affect from the neutral to the negative mood induction.

To our knowledge, the current study is the first to test affective vulnerability among groups with and without TWP and SDH histories. Compatible with the current findings, past research has reported that positive affect decreases in response to negative mood inductions in both 2-week abstinent substance dependent individuals (Jansma, et al., 2000) and trauma-exposed populations (Amdur, et al., 2000; Reebye, et al., 2000; Robinson, et al., 1994). While previous cue-reactivity studies have targeted comorbid PTSD and substance dependence using personalized trauma scripts in mood induction procedures (e.g., Coffey, et al., 2002), less is known about TWP persons' *general* affective reactivity to scripts not emphasizing traumatic situations. Potentially, the current labile responses in TWP only individuals may suggest a susceptibility to initiating substance use in the absence of adaptive coping methods.

In contrast, retained levels of positive affect for TWP + SDH individuals may underscore a protective factor to relapse. While some studies conclude those with PTSD are more likely to relapse compared to primarily TWP individuals (Jacobsen, et al., 2001; Najavits, et al., 1998; Read, et al., 2004), others report relapse rates and length of abstinence across PTSD and TWP to be similar (Back, et al., 2000; Kubiak, 2004; Sharkansky, et al., 1999). TWP + SDH individuals who are able to maintain levels of positive affect during a stressor may be less likely to experience relapse compared to their confederates who do not maintain positive affect levels. Speculatively, given the similar changes in negative affect across groups, it may not be that extreme levels of negative affect prompt a relapse in TWP + SDH populations. Rather, dual history individuals cope with presumed typical levels of negative affect less adaptively.

Despite our findings, there were notable limitations. Although research has reported a high comorbidity between the current population and the population of interest, future research should be conducted to replicate the study's findings in a larger, non-smoking sample. Additionally, specific drug and alcohol dependencies were not investigated in the current study; rather the focus was collective substance dependence. Lastly, length of abstinence greater than 6 months was not recorded.

The present study is the first to use a cue-reactivity paradigm featuring personalized emotional cues not targeting substance use or trauma-related situations to investigate affective vulnerabilities in those with trauma and/or substance dependence histories. While TWP only individuals reported a substantial decrease in positive affect following an induced stressor, dual history individuals experienced a restricted positive affective response. The reported maintenance of positive affect in TWP + SDH individuals may highlight a protective factor to relapse. With the high rate of substance dependence in trauma-exposed individuals who do not develop PTSD, future research should work to replicate both negative and positive affect findings with specific emphasis in treatment implications.

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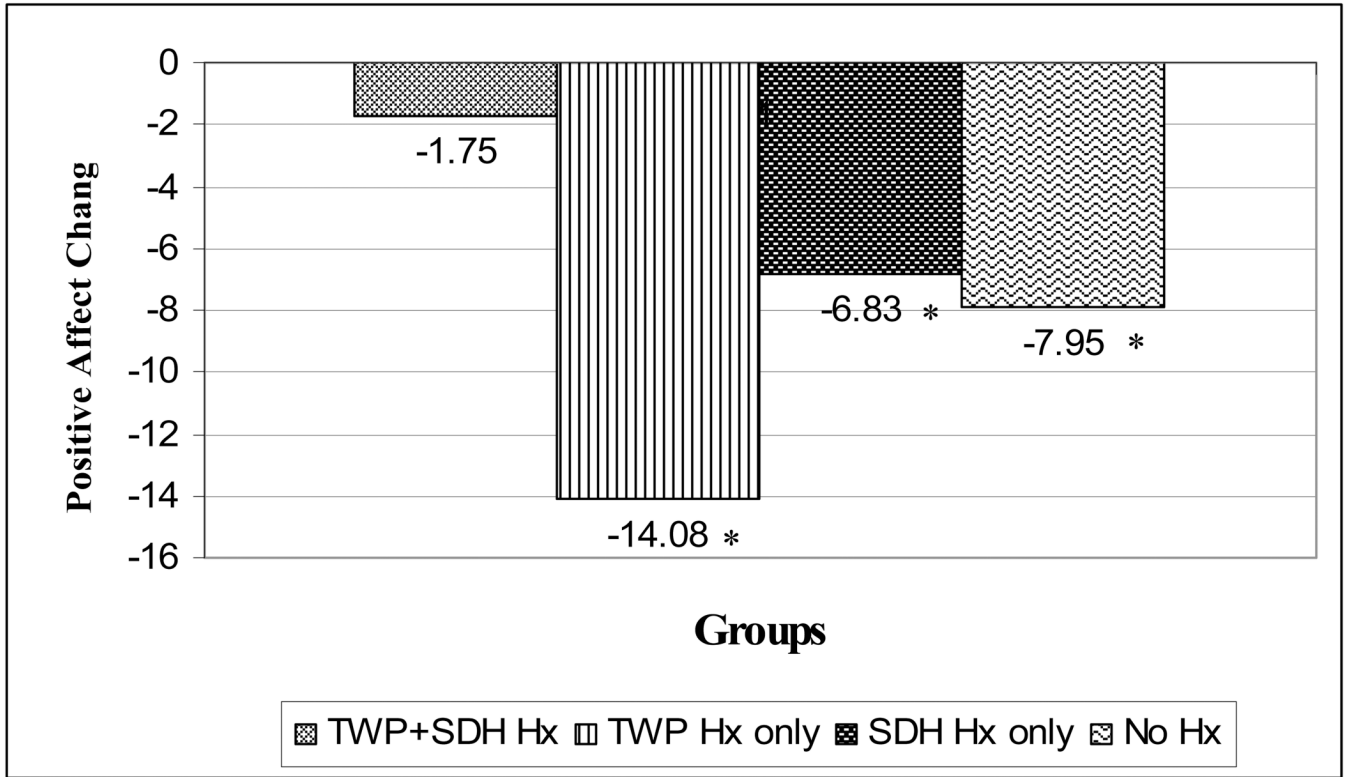


Figure 1. Changes in positive affect from neutral to negative mood condition
 Substance Dependence History (SDH); Trauma exposure without PTSD (TWP);
 * = Change across mood condition is significant based on LSDmmd = 4.679.

Table 1

Summary of univariate statistics across groups

Variable	Univariate Statistics Across Groups M (S) or Frequency (%)			
	No Hx (n = 31)	SDH only (n = 22)	TWP only (n = 14)	Dual Hx (n = 11)
Age	42.68 (10.14)	39.18 (10.14)	36.93 (12.46)	43.55 (9.98)
Gender				
Male	13 (41.9)	19 (86.4)	6 (42.9)	6 (54.5)
Female	18 (58.1)	3 (13.6)	8 (57.1)	5 (45.5)
Marital				
Married	17 (54.8)	9 (40.9)	3 (21.4)	7 (63.6)
Widowed	3 (9.7)	1 (4.5)	4 (28.6)	1 (9.1)
Divorced	7 (22.6)	11 (50.0)	6 (42.9)	3 (27.3)
Never married	4 (12.9)	1 (4.5)	1 (7.1)	
Alcohol Family Hx				
Yes, 1 st deg	12 (38.7)	14 (63.6)	10 (71.4)	7 (63.6)
Yes, 2 nd deg	6 (19.4)	3 (13.6)	1 (7.1)	2 (18.2)
No	13 (41.9)	5 (22.7)	3 (21.4)	2 (18.2)
FTND	5.32 (2.27)	6.23 (2.07)	6.21 (1.93)	6.27 (1.68)
BDI	7.26 (6.37)	10.64 (8.17)	12.71 (10.22)	11.55 (5.43)
Anhedonia	123.29 (16.75)	119.00 (15.54)	114.64 (11.89)	123.09 (9.44)

Hx – History; BDI – Becks Depression Inventory; FTND – Fagerstrom Test for Nicotine Dependence; Anhedonia – Fawcett-Clark Anhedonia Scale

Table 2

Participant response rate and flow

