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Characterization of Comorbid PTSD in Treatment-Seeking Alcohol Dependent Inpatients: Severity and Personality Trait Differences*

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Abstract

Background—Post-traumatic stress disorder (PTSD) is often comorbid with alcohol dependence (AD), but little is known about the characteristics of AD treatment-seeking inpatients with PTSD. We examined differences between treatment-seeking alcohol dependent inpatients with and without comorbid PTSD. We hypothesized that those with AD and PTSD would have higher levels of: (1) alcohol use and AD severity; (2) anxiety and mood disorders; (3) neuroticism.

Methods—Individuals ($N=411$, mean age = 41.7 ± 10.0 years) with AD were monitored over 30 days in a suburban inpatient alcohol treatment setting. Patients were evaluated to identify AD and

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All authors have approved the final article.

comorbid PTSD, mood and anxiety disorders, alcohol use and dependence severity, personality, and aggression.

Results—Those with PTSD (19% of the sample) did not differ in the amount of alcohol consumed, but had greater: (1) severity of AD ($p = 0.001$, $d = 0.44$); (2) diagnosis of anxiety ($p = 0.000$, $OR = 3.64$) and mood ($p = 0.000$, $OR = 4.83$) disorders; and (3) levels of neuroticism ($p < 0.001$, $d = 0.67$) and aggression ($p < .001$, $d = 0.81$).

Conclusions—AD patients with comorbid PTSD present a more severe phenotype across AD severity, frequency of anxiety and mood disorders, and levels of neuroticism and aggression. This group may benefit from concurrent treatment of both AD and PTSD. Future research can investigate neuroticism as a potential treatment target.

Keywords

Alcohol Dependence; Alcoholism; PTSD; Neuroticism; Aggression

1. INTRODUCTION

Alcohol consumption causes approximately 9.6% of disability-adjusted total life years lost and is the fifth leading cause of death (Whiteford et al., 2013). Alcohol abuse can lead to the development of AD and associated cancer, liver cirrhosis, and suicide (National Institute on Alcohol Abuse and Alcoholism, 2012). AD heterogeneity necessitates targeted interventions (Litten et al., 2015).

Despite frequent AD comorbidity, alcohol treatment and research often focus on AD alone (Berenz and Coffey, 2012). PTSD is often comorbid with AD (AD/PTSD+); among those diagnosed with PTSD, 41.8% also have a lifetime diagnosis of alcohol abuse or dependence (Pietrzak et al., 2011). In 2012, President Obama issued an Executive Order directing the Department of Defense (DoD), Veterans Affairs (VA), and Health and Human Services (HHS) to develop a National Research Action Plan (NRAP) for PTSD and other mental health conditions to address the needs of a military that has been deployed in on-going wars since 2001 (Executive Order No. 13625, 77 C.F.R. 54783, 2012). In response, the NRAP specifically targets increasing research on PTSD and comorbid AD and substance use disorders (SUD) emphasizing prevention and treatment development (Department of Defense et al., 2013).

Clinical practice guidelines (CPG) recognize integrated treatment options for AD/PTSD+, but offer incomplete advice on concurrent treatment and conclude that further research is needed (The Management of Post-Traumatic Stress Disorder Working Group, 2010; Work Group on Substance Use Disorders American Psychiatric Association, 2006). A recent review and meta-analysis found that treating comorbid substance dependence and PTSD concurrently, possibly including naltrexone for AD (Foa et al., 2013), led to a decrease in PTSD symptoms with no worsening of substance use (Roberts et al., 2015).

A 2010 review found that individuals with AD/PTSD+ had more severe PTSD symptoms and were more prone to alcohol use relapse than those with either disorder alone (McCarthy and Petrakis, 2010). Jacobsen et al.'s 2001 review also supports a functional association

between PTSD and AD. AD and PTSD interact and produce worse outcomes than either disorder alone (Berenz and Coffey, 2012), further complicating treatment. Treating these disorders separately does not address possible common mechanisms and pathways (Logrip et al., 2012; Norman et al., 2012), leading to poorer prognosis (Berenz and Coffey, 2012). Further, McCarthy and Petrakis (2010) found that interventions targeting the symptoms of comorbid PTSD and AD were most effective. Clinical treatment would benefit from further exploration of characteristics that distinguish treatment-seeking inpatients with AD/PTSD+ from those with AD/PTSD–.

Recent research has focused on personality factors in alcohol use. Neuroticism is linked to anger, anxiety, depressed mood, and irritability (Barlow et al., 2014), substance use disorders (Valero et al., 2014), higher substance use relapse rates (Fisher et al., 1998), and PTSD (Cox et al., 2004). It is not known whether this association with neuroticism will be observed in a population of individuals with AD/PTSD+. The purpose of this study is to explore this potential association and inform treatment for those with AD/PTSD+.

We explored whether an association between PTSD and alcohol use/dependence would be observed in a large and unique inpatient population with severe AD in a highly controlled research hospital. We hypothesized that inpatients with AD/PTSD+ would have higher levels of alcohol use and dependence than AD/PTSD–. Consistent with Boschloo et al. (2013)'s finding that depressive/anxiety disorders predict the onset of AD and vice versa, we also hypothesized that inpatients with AD/PTSD+ would have greater rates of anxiety and mood disorders. Finally, we explored whether inpatients with AD/PTSD+ had more neuroticism and/or aggression.

2. METHODS

2.1 Participants

Participants who met the Diagnostic and Statistical Manual for Mental disorders, 4th Edition, Text-revised (DSM-IV-TR; American Psychiatric Association, 2000) criteria for alcohol dependence were consecutively voluntarily admitted from 2005 to 2009 to the National Institute on Alcohol Abuse and Alcoholism Inpatient Unit in the NIH Clinical Center. Participants were literate in English and were not suffering from active psychotic symptoms or cognitive impairment. They were routinely queried during one or more interviews regarding all clinical data, including current PTSD (see Table 1). Informed consent was obtained in accordance with the Declaration of Helsinki and the NIH Combined NeuroScience Institutional review board.

2.2 Procedures

All study measures were taken after participants had completed one week of medically supervised alcohol withdrawal. During the initial days of detoxification, if clinically indicated, some participants were administered standard doses of benzodiazepines for management of withdrawal symptoms.

2.2.1 Interview Assessments—The Structured Clinical Interview for DSM-IV (SCID) (First et al., 1995) was used for diagnostic assessment of current AD, PTSD, and other

psychiatric conditions. The Alcohol Dependence Scale (ADS; Skinner and Allen, 1982; Skinner and Horn, 1984) was used to assess AD severity. The Addiction Severity Index (ASI; McLellan et al., 1980) was used to identify problems in multiple dimensions of functioning, including alcohol, drug, psychiatric, legal, and family. The Timeline Follow-Back (TLFB; Sobell et al., 1979) assessed alcohol consumption for the 90 days prior to admission.

2.2.2 Questionnaire Assessments—The Clinical Institute Withdrawal Assessment-Alcohol revised (CIWA-Ar; Sullivan, et al., 1989) was used to measure alcohol withdrawal severity. The NEO Personality Inventory (NEO PI-R; McCrae and John, 1992) was used to measure five major personality factors: neuroticism, extraversion, openness, agreeableness, and conscientiousness. The Buss-Perry Aggression Questionnaire (BPAQ; Buss and Perry, 1992) was used to assess factors of aggression.

2.3 Statistical Analysis

Summary statistics are presented as Means \pm *SD*. Chi-square analyses and t-tests were conducted to examine background characteristics of the AD/PTSD+ and AD/PTSD- groups. As a result of these analyses, sex (Kessler et al., 1995) and age were included as covariates in all subsequent analyses.

To examine the effect of group on continuous and dichotomous outcome variables, we used analysis of covariance (ANCOVA) and multiple logistic regressions, respectively. For all analyses, SPSS (version 22) was used, alpha was set to 0.05, and tests were 2-tailed.

3. RESULTS

3.1 Demographics and Alcohol Consumption

Demographic and drinking data are summarized in Table 1. Participants reported drinking approximately 14 drinks per drinking day in the 90 days preceding admission. The two groups did not differ on number of drinks, drinking days, or drinks per drinking day. However, AD/PTSD+ participants had a greater severity of AD, with a moderate effect size. There was no between-group difference in peak CIWA-Ar scores, $F(1, 279) = 0.07$, $p = 0.80$, or CIWA-Ar scores on days 1 and 2 ($p = 0.57$) (not shown in table).

3.2 Anxiety and Depression

The AD/PTSD+ group had greater odds for having a diagnosis of anxiety disorders other than PTSD or mood disorders (Table 1).

3.3 Personality and Aggression

The AD/PTSD+ group had significantly higher scores on the NEO domain of neuroticism (Table 2). The AD/PTSD+ group had higher BPAQ scores on verbal aggression, anger, hostility, and aggression, but not physical aggression (Table 2).

4. DISCUSSION

This study compared AD/PTSD+ and AD/PTSD- on drinking, psychiatric symptoms, personality, and functioning. Participants with AD/PTSD+ did not report heavier alcohol consumption than those with AD/PTSD- in the ninety days before the study, nor did they report higher scores on the alcohol withdrawal scale. Interestingly, however, they did report higher level of dependence, with a moderate effect size. However, the relationship between PTSD and drinking is clearer in individuals without AD, with studies showing higher alcohol use in those with PTSD+ compared with PTSD- groups, thus supporting the self-medication hypothesis of alcohol use in PTSD (Op Den Velde et al., 2002). Our individuals with AD/PTSD- may be drinking at such a high rate that further increases are unlikely as a result of PTSD+. In contrast, individuals with AD/PTSD- scored 21 (out of 47) on the ADS, leaving room for increases.

Participants with AD/PTSD+ had higher levels of neuroticism. Cox et al. (2004) found that after controlling for a lifetime history of mood and anxiety disorders, which have neuroticism as a common mechanism, PTSD and neuroticism were still associated. Further, PTSD arousal symptoms, which include neuroticism-like symptoms such as trouble sleeping and irritability, have been particularly linked to neuroticism (Engelhard et al., 2003). Barlow et al. (2014) have suggested that neuroticism should be a target of treatment for anxiety and mood disorders, which may include PTSD.

The direction of the causal relationships between neuroticism and PTSD is not currently clear. A prospective study of women who experienced a pregnancy loss found that neuroticism was related to arousal symptoms before, but not after the traumatic loss, suggesting the relationship is not causal (Engelhard et al., 2003). In a prospective study of infantry troops, Engelhard et al. found that those with higher pre-trauma levels of neuroticism did not have an increase of PTSD symptoms post-trauma, further complicating the relationship between neuroticism and PTSD (Engelhard et al., 2009).

Studies have also found that those with substance use disorders like AD score higher on neuroticism and that neuroticism correlates with relapse (Fisher et al., 1998). However, the direction of causal relationships between neuroticism and AD is also not clear. Some argue that neuroticism is a risk factor for AD (Sher et al., 2005), and genetic data support neuroticism as part of the cause of AD (Slutske et al., 2002). However, Sutherland (1997) found that drinking alcohol may increase neuroticism in those with AD. If further research establishes neuroticism as a causal risk factor for AD, then it could be a target for intervention (Soskin et al., 2012).

In our sample, participants with AD/PTSD+ had higher levels of aggression, which could be due to re-experiencing their PTSD associated trauma. Orth and Wieland (2006) completed a meta-analysis of the association between anger/hostility and PTSD symptom severity and found a stronger correlation between PTSD and anger directed inward than anger directed outward (Siegel, 1986). This is consistent with our finding that those with AD/PTSD+ had greater aggression with the exception of physical, or outward angry behavior. Several studies

have found that PTSD leads to anger, not the other way around (Novaco and Chemtob, 2002; Orth et al., 2008).

A major strength of our study was that it examined the association between PTSD and alcohol use/dependence over 30 days in a large sample from a unique population in a highly controlled research environment.

4.1 Limitations

Most of our inpatients were from the greater Washington D.C. area, limiting the generalizability of our findings. We could not determine the causal relationships between PTSD and AD and we do not have follow-up data. Our participants were not selected for PTSD, thus we had a limited proportion of individuals with PTSD and limited information about their trauma severity and previous treatment. Finally, the presence of substantial missing data on a number of assessments reduced power for some analyses and complicates comparisons across measures.

Further studies could use a prospective design to examine the causal relationships between PTSD and alcohol use/dependence. Additionally, having non-alcohol dependent groups with and without PTSD would help clarify the relationship between AD and PTSD. Stewart et al. (1998) found that AD symptoms are strongly associated with PTSD arousal symptoms. Further research should investigate potential common mechanisms for AD and PTSD. A greater understanding of sources of variation, environmental and non-environmental, in the etiology of AD and AD/PTSD+ would identify risk mechanisms and treatment targets.

4.2 Conclusions

This study examined differences between AD/PTSD+ and AD/PTSD- in a rarely studied inpatient treatment-seeking population. Despite similar rates of drinking, those with AD/PTSD+ have more severe dependence, psychiatric functioning, mood and anxiety disorders, aggression, and neuroticism. A better understanding of these differences can contribute to clinical treatment for AD/PTSD+, for which concurrent treatment may be warranted (Roberts et al., 2015). Individual trauma-focused CBT (including prolonged exposure) alongside SUD treatment (which can include naltrexone or coping skills development), are promising integrated concurrent treatments for AD/PTSD+ (Coffey et al., 2006; Foa et al., 2013; Mills et al., 2012). Neuroticism, as a possible common mechanism for AD and PTSD, may be a promising treatment target.

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Highlights

- Treatment-seeking alcohol dependent inpatients with and without PTSD were examined.
- Those with PTSD had similar consumption but greater severity of alcohol dependence.
- Those with PTSD had greater mood and anxiety symptoms and disorder diagnoses.
- Those with PTSD also had higher levels of neuroticism and aggression.
- Alcohol-dependent patients with PTSD could benefit from individualized treatment.

Table 1

Baseline Sample Characteristics

Variable ↓	No PTSD (n = 332)	PTSD (n = 79)	All (N = 411)	t/χ ²	df	p- value	Effect Size	F-value ANCOVA	p-value ANCOVA
Age	42.12 (10.05)	40.04 (9.37)	41.72 (9.95)	1.67	409	0.09	-0.21 ^b	n/a	n/a
Gender (%)				14.84	1	0.001	0.19 ^c	n/a	n/a
Male	77.11	55.70	73.00						
Female	22.89	44.30	27.00						
Ethnicity (%)									
Caucasian	62.35	56.96	61.31	4.57	2	0.10	0.11 ^d	n/a	n/a
AA	30.12	27.85	29.68						
Others ^a	7.53	15.19	9.00						
Smokers (%)	73.58%	75.00%	73.87%	0.056	1	0.81	0.01 ^c	n/a	n/a
Benzodiazepines (yes/no)	31.63%	32.91%	31.87%	0.049	1	0.82	0.01 ^c	n/a	n/a
90 Day Total Drinks	1021.56 (726.81)	913.15 (674.39)	1000.50 (717.35)	-1.17	379	0.284	-0.15 ^b	0.20	0.65
90 Drinking Days	68.44 (25.11)	62.77 (24.37)	67.34 (25.04)	-1.75	372	0.101	-0.23 ^b	1.65	0.20
90 Day Drinks per Day	14.35 (8.59)	13.61 (7.56)	14.21 (8.40)	-0.68	372	0.609	-0.09 ^b	0.00	0.97
Alcohol Dependence Severity	21.21 (8.18)	24.79 (8.28)	21.89 (8.30)	3.32	377	0.001	0.44 ^b	8.62	0.004
ASI Psychiatric	0.25 (0.23)	0.38 (0.22)	0.28 (0.23)	4.18	374	<.001	0.57 ^b	13.39	<.001
ASI Family	0.23 (0.22)	0.31 (0.25)	0.25 (0.22)	2.39	340	0.02	0.36 ^b	2.26	.13
Anxiety Disorder	23.80%	53.16%	29.44%	24.70	1	0.000	3.64 ^e	n/a	n/a
Mood Disorder	12.35%	40.51%	17.76%	30.89	1	0.000	4.83 ^e	n/a	n/a
Substance Dependence	74.10%	82.28%	75.67%	2.29	1	.130	1.62 ^e	n/a	n/a

Note. Data are Mean (SD) unless otherwise noted.

^a“Others” includes: American Indian/Alaska Native, Native Hawaiian or Other Pacific Islander, More Than One Race, and Unknown. Effect sizes are Cohen’s *d* (continuous outcomes)^b, Phi (dichotomous outcomes)^c, Cramer’s *V* (nominal outcome variables)^d, and *OR*^e. ANCOVA includes Age and Sex as covariates. *df*(denominator) for ANCOVA are *df*- 2. For ASI: No PTSD (*n*=303), PTSD (*n*=73).

Table 2

NEO Personality and Buss-Perry Aggression Questionnaire (BPAQ)

Variable ↓	No PTSD (<i>n</i> = 283)	PTSD (<i>n</i> = 65)	All (<i>N</i> = 348)	<i>t</i>	<i>df</i>	<i>p-value</i>	<i>d</i>	<i>F-value</i> ANCOVA	<i>p-value</i> ANCOVA
NEO Neuroticism Factor	55.76 (10.36)	62.82 (11.48)	57.08 (10.92)	4.86	346	<0.001	0.67	20.94	<0.001
Anxiety	53.97 (10.10)	57.18 (9.71)	54.57 (10.09)	2.33	346	0.021	0.32	5.29	0.02
Angry Hostility	53.73 (11.17)	59.04 (11.96)	54.72 (11.49)	3.42	346	0.001	0.47	8.70	0.003
Depression	58.43 (10.94)	64.79 (10.69)	59.62 (11.16)	4.25	346	<0.001	0.58	16.18	<0.001
Self-consciousness	53.84 (10.32)	58.23 (11.23)	54.66 (10.62)	3.05	346	0.002	0.42	6.83	0.009
Impulsiveness	55.25 (9.32)	57.01 (7.49)	55.58 (9.03)	1.42	346	0.156	0.20	1.78	0.18
Vulnerability	56.30 (12.29)	62.42 (12.94)	57.44 (12.63)	3.59	346	<0.001	0.49	10.32	0.001
NEO Extraversion Factor	53.64 (10.05)	51.96 (10.06)	53.33 (10.06)	-1.22	346	0.225	-0.17	2.12	0.15
NEO Openness Factor	51.56 (10.22)	53.31 (9.95)	51.89 (10.18)	1.26	346	0.210	0.17	0.92	0.34
NEO Agreeableness Factor	47.07 (11.20)	45.10 (9.53)	46.70 (10.92)	-1.31	346	0.191	-0.18	0.71	0.40
NEO Conscientiousness Factor	43.22 (11.39)	42.74 (10.60)	43.13 (11.24)	-0.31	346	0.756	-0.04	0.01	0.91
BPAQ Physical Aggression	20.36 (7.59)	22.94 (9.05)	20.78 (7.86)	1.28	107	0.204	0.33	1.34	0.25
BPAQ Verbal Aggression	13.71 (3.83)	16.22 (4.57)	14.13 (4.05)	2.46	107	0.016	0.63	6.78	0.01
BPAQ Anger	15.15 (5.89)	18.94 (6.69)	15.78 (6.16)	2.44	107	0.016	0.63	3.97	0.05
BPAQ Hostility	43.31 (5.62)	50.22 (6.09)	44.45 (6.22)	4.71	107	<0.001	1.21	20.11	<0.01
BPAQ Aggression	92.54 (18.89)	108.33 (22.18)	95.15 (20.24)	3.15	107	0.002	0.81	9.09	0.003

Note. Data are Mean (*SD*) unless otherwise noted. ANCOVA includes Age and Sex as covariates. *df* (denominator) for ANCOVA are *df*-2. *d* = Cohen's *d*.

* For the BPAQ, No PTSD group (*n*=91), PTSD (*n*=18).