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SHORT COMMUNICATION

Impact of hazardous alcohol use on intensive PTSD treatment outcomes among veterans

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ABSTRACT

Background: Intensive treatment programmes (ITPs) for posttraumatic stress disorder (PTSD) produce large symptom reductions and have generally higher completion rates compared to traditional weekly care. Although ITPs do not appear to increase substance use, it has yet to be determined whether their effectiveness differs for veterans with and without hazardous alcohol use (HAU).

Objective: This study examined the effectiveness of a 3-week Cognitive Processing Therapy-based ITP for 538 veterans with PTSD (66.0% male; mean age = 41.22 years) and with (n = 193) or without HAU (n = 343) for reducing PTSD and depression symptoms.

Method: Veterans' PTSD (PCL-5) and depression (PHQ-9) symptoms were assessed at pre-treatment, during treatment, and at post-treatment. HAU (AUDIT-C total score ≥4 for males; ≥3 for females) was measured at intake.

Results: Treatment completion rates were high for both individuals who endorsed HAU (92.68%) and those who did not (93.37%), likely due to veterans being housed near the treatment facility. Mixed effects regression models revealed a significant time by alcohol use interaction when predicting both PCL-5 ($p < .001$) and PHQ-9 ($p = .003$), suggesting time-trends over the course of the ITP differed based on alcohol use. Veterans who endorsed HAU improved to a statistically significantly lesser extent. However, endpoint differences between groups for both outcomes were small (Cohen's ds between 0.15 and 0.20).

Conclusions: Veterans with and without HAU reported significant reductions in PTSD and depression symptoms and completed the ITP at comparably high rates. Findings support the effectiveness of intensive PTSD treatment programmes for individuals with PTSD and HAU. Future studies should utilize controlled designs to evaluate whether intensive PTSD treatment can reduce HAU.

Impacto del uso nocivo de alcohol sobre los resultados del tratamiento intensivo para el TEPT en veteranos

Antecedentes: Los programas de tratamiento intensivo (ITPs, por sus siglas en inglés) para el trastorno de estrés postraumático (TEPT) producen grandes disminuciones sintomáticas ygeneralmente tienen tasasmás altas de finalización comparados con los tratamientos tradicionales semanales. Apesar de que los ITPs no parecen aumentar el uso de sustancias, se debe aún determinar si su efectividad difiere para los veteranos con ysin uso nocivo de alcohol (HAU, por sus siglas en inglés).

Objetivo: Este estudio evaluó la efectividad para la reducción de síntomas del TEPT yla depresión de un ITP de tres semanas basado en la terapia de procesamiento cognitivo en 538 veteranos con TEPT (66,0% varones; promedio de edad = 41,22 años) con (n = 193) osin HAU (n = 343).

Método: Se evaluaron aveteranos con síntomas del TEPT (PCL-5) yla depresión (PHQ-9) antes del tratamiento, durante el tratamiento ydespués del tratamiento. El HAU (puntaje total del AUDIT-C ≥4 para varones; ≥3 para mujeres) fue medido al ingreso.

Resultados: Las tasas de finalización del tratamiento fueron altas tanto para los individuos que tenían un HAU (92,68%) como en aquellos que no lo tenían (93,37%), probablemente debido aque los veteranos vivían cerca de las instalaciones donde se brindaba del tratamiento. Los modelos de regresión de efectos mixtos revelaron una interacción significativa en el periodo en el que se consume alcohol yla predicción tanto de los puntajes en la PCL-5 (p<.001) como en el PHQ-9 (p=.003), sugiriendo que en el curso del ITP existen tendencias de temporalidad basadas en el uso de alcohol. Los veteranos que aceptaron presentar un HAU mejoraron en menor

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TEPT; uso indebido de alcohol; uso nocivo de alcohol; tratamiento Intensivo; veteranos; tratamiento de procesamiento cognitivo

关键词

PTSD; 酒精滥用; 有害酒精使用; 密集治疗; 退伍军人; 认知加工疗法

HIGHLIGHTS

- Veterans who endorsed hazardous alcohol use (HAU) reported large PTSD and depression symptom reductions during a 3-week intensive PTSD treatment programme.
- This study provides support for the effectiveness of intensive treatment for individuals with PTSD and HAU.

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medida, con significancia estadística. Sin embargo, la diferencia en los resultados finales del tratamiento entre ambos grupos fue pequeña (*d*s de Cohen entre 0.15 y0.20).
Conclusiones: Los veteranos con ysin HAU reportaron una disminución significativa en los síntomas del TEPT yla depresión. Además, completaron el ITP atasas comparativamente altas. Los hallazgos apoyan la efectividad de los programas de tratamiento intensivos para TEPT en individuos con TEPT yHAU. Los próximos estudios deben utilizar diseños controlados para evaluar si el tratamiento intensivo para el TEPT puede reducir el HAU.

有害酒精使用对退伍军人PTSD密集治疗结果的影响

背景: 创伤后应激障碍 (PTSD) 的密集治疗计划 (ITP) 与传统的每周护理相比, 可大幅减轻症状, 并具有较高的完成率。尽管ITP似乎并未增加药物使用, 但尚需确定其对于有, 无有害酒精使用 (HAU) 的退伍军人的有效性是否有所不同。
目的: 本研究考查了3周认知加工疗法ITP对538名患有PTSD, 有HAU (*n* = 193) 或无HAU (*n* = 343) 的退伍军人 (男性占66.0%平均年龄为41.22岁) PTSD和抑郁症状减轻的有效性。
方法: 在治疗前, 中, 后评估退伍军人的PTSD (PCL-5) 和抑郁 (PHQ-9) 症状。接受治疗时测量HAU (男性AUDIT-C总分≥4:女性≥3) 。
结果: 有HAU的个体 (92.68%) 和无HAU的个体 (93.37%) 的治疗完成率均很高, 可能是由于退伍军人被安置在治疗设施附近。混合效应回归模型揭示了在预测PCL-5 ($p < .001$) 和PHQ-9 ($p = .003$) 时, 时间与酒精使用的显著交互作用, 这表明ITP过程的时间趋势因酒精使用而异。有HAU的退伍军人的改善程度在统计学上显著更小。但是, 在两个结果上的组间最终差异都很小 (Cohen's *d*在0.15和0.20之间) 。
结论: 有, 无HAU的退伍军人报告PTSD和抑郁症状显著减轻, 并以相当高的比率完成了ITP。研究结果支持密集PTSD治疗方案对PTSD和HAU患者的有效性。未来的研究应利用对照设计来评估密集PTSD治疗是否可以降低HAU。

1. Introduction

Posttraumatic stress disorder (PTSD) and alcohol use disorder (AUD) often co-occur. Among veterans with PTSD, 55–68% show evidence of AUD (Dworkin, Bergman, Walton, Walker, & Kaysen, 2018; McDevitt-Murphy et al., 2010). Co-occurring PTSD and AUD (PTSD/AUD) is generally associated with more complex clinical profiles and lower levels of functioning than either disorder alone (Norman, Haller, Hamblen, Southwick, & Pietrzak, 2018; Ouimette, Goodwin, & Brown, 2006; Straus et al., 2019). Among treatment seeking veterans, AUD has been associated with higher initial PTSD and depression symptom severity (Kaysen et al., 2014).

Individuals with PTSD/AUD who have received evidence-based PTSD treatments, such as Cognitive Processing Therapy (CPT; Resick, Monson, & Chard, 2016), have reported significant decreases in PTSD and depression symptom severity (e.g. Dondanville et al., 2019). Reductions in PTSD severity predicted subsequent reductions in alcohol use, supporting the importance of addressing PTSD in individuals with hazardous alcohol use (HAU) (e.g. Hien et al., 2010). However, research has also shown that dropout rates for integrated PTSD/AUD treatments range from 32–61% (Back et al., 2019; Szafranski et al., 2018).

Intensive PTSD treatment programmes (ITPs), where evidence-based interventions are delivered daily for one to three weeks, have consistently reported high completion rates (~90%) and appear to be a promising approach to reducing high dropout rates (Held, Bagley, Klassen, & Pollack, 2019). ITPs produce large PTSD and depression symptom reductions in both veteran and non-veteran samples, including for individuals with complex clinical presentations (Voorendonk, De Jongh, Rozendaal, & Van Minnen, 2020), that can be maintained long-term (Held et al., 2020b; Hendriks, Kleine, Broekman, Hendriks, & van Minnen, 2018).

ITPs for PTSD do not appear to increase substance use (e.g. Beidel, Frueh, Neer, & Lejuez, 2017). However, it has yet to be determined whether their effectiveness differs for veterans with and without HAU. The present study examined PTSD and depression symptom reductions over the course of a 3-week CPT-based ITP for veterans who did and did not report HAU at the beginning of treatment and examined potential differences in treatment attendance and completion.

2. Method

2.1. Participants

The sample included 538 active-duty service members (5.3%) and veterans (93.8%) with PTSD, hereafter collectively referred to as 'veterans', who did (n= 195) and did not (n= 343) endorse HAU and completed at least one treatment day in a 3-week CPT-based ITP between April 2016 and February 2020. The majority of the sample identified as male (66.0%) and White (68.6%). The average age was 41.22 years (SD = 9.41, Range = 24–74 years). See Table 1 for demographic information.

2.2. Procedure

Study procedures were approved by the Rush University Medical Center Institutional Review Board.

Table 1. Demographic characteristics.

	No Hazardous Alcohol Use		Hazardous Alcohol Use			
Variable	*n*	%	M (SD)	*n*	%	M (SD)	*p*
Age	538		41.73 (9.45)			40.33 (9.29)	.097
Sex[a]							.001
Male	208	60.6		135	75.4		
Ethnicity							.353
Not Hispanic or Latinx	270	78.7		160	82.1		
Race							.101
American Indian/Alaskan Native	7	2.0		3	1.5		
Asian	5	1.5		1	0.5		
Black or African American	71	20.7		31	15.9		
Native Hawaiian/Pacific Islander	4	1.2		0	0		
Other	35	10.2		11	5.6		
Refusal	1	0.3		0	0		
Unknown	1	0.3		0	0		
White	219	63.8		149	76.4		
Marital Status							.457
Divorced	73	21.3		42	21.5		
Domestic Partner	2	0.6		0	0		
Legally Separated	15	4.4		12	6.2		
Married	179	52.2		97	49.7		
Single	73	21.3		41	21.0		
Widowed	1	0.3		3	1.5		
Military Service Branch[b]							
Air Force	28	8.3		14	7.2		.787
Army	225	66.4		125	64.1		
Coast Guard	4	1.2		2	1.0		
Marines	47	13.9		34	17.4		
Navy	35	10.3		20	10.3		
Military Pay Grade[b]							.195
E1-E3	42	12.4		17	8.7		
E4-E9	267	78.8		166	85.1		
Officer	30	8.8		12	6.2		
Discharge Status[c]							.109
Active Duty	9	2.7		7	3.6		
Discharged	228	67.5		132	67.7		
Inactive Ready Reserve	1	0.3		2	1.0		
Medically Retired	70	20.7		28	14.4		
National Guard	2	0.6		3	1.5		
Reserves	0	0		3	1.5		
Retired	28	8.3		20	10.3		
Discharge Characterization[d]							.051
General	11	3.3		4	2.1		
Honourable	255	75.7		157	80.5		
Medical	60	17.8		20	10.3		
Not Applicable	8	2.4		11	5.6		
Other than Honourable Conditions	3	0.9		3	1.5		
Service Era							
Post-9/11	309	91.4		174	89.2		.404
Deployed							.049
Yes	260	75.8		162	83.1		
Primary Trauma Type							<.001
Combat Trauma	181	52.8		134	69.7		
Military Sexual Trauma	162	47.2		59	30.3		
AUDIT-C Score			1.06 (0.98)			6.47 (2.66)	<.001
Endpoint PCL-5 Below 33							.109
Yes	142	44.2		66	36.9		
Treatment days completed			14.02 (1.96)			13.86 (1.92)	.348
Programme completion							.835
Yes	320	93.3		181	92.8		

[a]41.41% of all males and 26.23% of all females were above AUDIT-C cut-offs representing alcohol abuse/misuse. [b]n = 534, [c]n= 533, [d]n = 532

As all assessments were collected as part of routine clinical care, a waiver of consent was obtained. All veterans underwent a clinical intake evaluation, which included the Clinician Administered PTSD Scale for DSM-5 to confirm a diagnosis of PTSD (CAPS-5; Weathers et al., 2018). Veterans were deemed ineligible if they were actively suicidal/homicidal, engaged in severe non-suicidal self-harm in the past three months, or were diagnosed with mania/psychosis. Exclusion criteria also included alcohol or substance use that would have required medical observation due to potential lethality if discontinued or if use prevented participation in ITP programming during the day. See Held et al. (2020a) and Zalta et al. (2018) for more information about the intake process.

During 15 days of PTSD-focused clinical programming, veterans received 14 individual CPT and 13 group CPT sessions, as well as 13 mindfulness groups

and 12 yoga groups. All veterans also participated in 18 psychoeducation groups on various topics including two groups on the impact substance use can have on health and PTSD recovery. CPT providers completed the official 2-day CPT training and consultation; mindfulness and yoga providers were certified to teach respective classes. All veterans were required to stay in the same hotel (unaffiliated with the ITP) and were not monitored outside of treatment hours. Alcohol use outside of programming was discouraged but not prohibited.

2.3. Measures

2.3.1. The PTSD Checklist for DSM-5 (PCL-5)

The PCL-5 (Bovin et al., 2016) is a 20-item self-report measure of PTSD symptom severity based on DSM-5 diagnostic criteria. A cut-off score of ≥33 is used to indicate probable PTSD (Bovin et al., 2016). The PCL-5 was administered at intake, days 2, 3, 5, 6, 8, 10, 11, 13, and 14 (post-treatment). At intake, veterans reported their symptom severity for the past month. During and post-treatment, symptom severity over the past week was assessed. Cronbach's alpha = .89-.96.

2.3.2. Patient Health Questionnaire (PHQ-9)

The PHQ-9 (Kroenke, Spitzer, & Williams, 2001) is a 9-item self-report measure of depression symptoms occurring during the past two weeks. This measure was administered at intake, days 3, 5, 6, 8, 10, 11, 13, and 15 (post-treatment). Cronbach's alpha = .81-.89.

2.3.3. Alcohol Use Disorder Identification Test (AUDIT-C)

The AUDIT-C (Bush, Kivlahan, McDonell, Fihn, & Bradley, 1998) is a self-report measure of alcohol consumption during the past year. Recommended cut-off scores of ≥4 for males and ≥3 for females were used to detect HAU (Bush et al., 1998). This measure was administered at intake. Cronbach's alpha = .87.

2.4. Statistical analysis

Linear mixed effects regression models (LMMs) were used to assess PCL-5 and PHQ-9 changes over the course of the ITP due to their less restrictive assumptions regarding variances and covariance structure over time, ability to accommodate missing data, and treatment of random effects. Models were adjusted for age, sex, and cohort type (combat or military sexual trauma). Conditionally independent errors were selected for LMMs based on Akaike Information Criteria (AIC) values, and both random intercept and slope components were included due to improved model fit in likelihood ratio tests ($ps<.001$). Effect sizes for pre-post and endpoint differences in outcomes by group were illustrated via standardized difference (d) between means, and Gibbons' within-subjects variant of d was utilized for pre-post comparisons (Gibbons, Hedeker, & Davis, 1993).

3. Results

LMMs indicated significant symptom reductions across time ($ps<.001$). A significant quadratic time trend existed for PCL-5 ($p < .001$) but not PHQ-9 ($p = .487$). No differences in either outcome were found based on sex, age, or cohort type ($ps>.5$). No overall differences were found between veterans with and without HAU across time for PCL-5 ($p= .230$) or PHQ-9 ($p= .052$). A time by alcohol use interaction was significant in predicting both PCL-5 ($p< .001$) and PHQ-9 ($p= .005$). Although average PCL-5 and PHQ-9 scores across time did not significantly differ, time-trends over the course of the ITP differed based on HAU. Individuals who endorsed HAU at intake showed less improvement than individuals who did not (see Figures 1 and 2). There were no significant group differences in the percentage of individuals who fell below the probable PTSD cut-off, completed the ITP, and the number of ITP days attended (see Table 1). The amount of PCL-5 and PHQ-9 change over the course of the programme was large and clinically meaningful across the entire sample (see Table 2).

4. Discussion

Veterans who reported HAU endorsed significantly higher pre-treatment PTSD and depression symptoms compared to those who did not, supporting previous notions that veterans with PTSD and HAU generally present with more severe symptomatology (Kaysen et al., 2014). However, veterans with HAU experienced large PTSD and depression symptom reductions. Both groups reported similar post-treatment symptom severity levels. It appears that the ITP was generally effective, including for individuals with HAU upon entering the programme. Symptom change generally occurred following the first ITP week. It is possible that the cognitive restructuring during the first ITP week led to a loosening of cognitive patterns and incorporation of newly acquired information about their traumatic experiences, which led to subsequent symptom reductions (Hayes, Laurenceau, Feldman, Strauss, & Cardaciotto, 2007). In line with findings from a recent meta-analysis (Straud, Siev, Messer, & Zalta, 2019), fewer individuals fell below the suggested PTSD cut-off compared to civilian ITP participants (Voorendonk et al., 2020). Treatment completion was high and did not significantly differ for veterans with and without HAU, and both groups attended most treatment days, possibly aided by the structure of ITPs, where common barriers were reduced by housing individuals near the treatment facility. Despite the promising effects, there is room to further improve treatment for

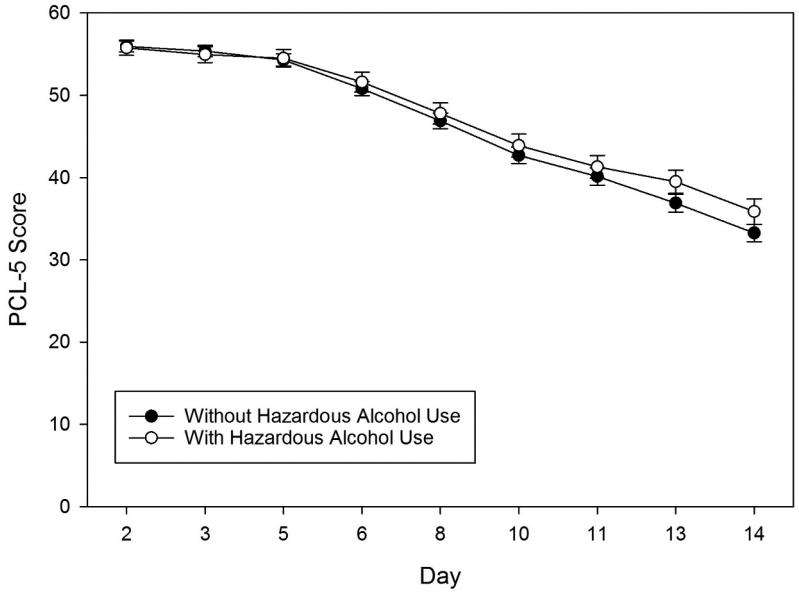

Figure 1. PTSD symptom change over time by hazardous alcohol use endorsed at intake. PCL-5: PTSD Checklist for DSM-5. Treatment Day: Treatment day during the ITP. Without hazardous alcohol use: $n = 343$. With hazardous alcohol use: $n = 195$. Error bars represent standard error.

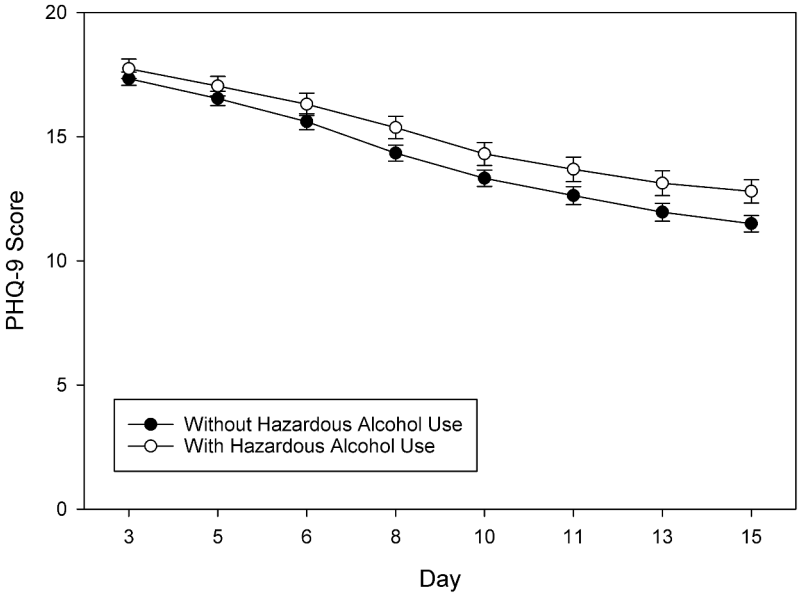

Figure 2. Depression symptom change over time by hazardous alcohol use endorsed at intake. PHQ-9: Patient Health Questionnaire. Treatment Day: Treatment day during the ITP. Without hazardous alcohol use: $n = 343$. With hazardous alcohol use: $n = 195$. Error bars represent standard error.

Table 2. PTSD and depression symptom reduction by hazardous alcohol use.

	No Hazardous Alcohol Use				Hazardous Alcohol Use			
Variable	Intake *M* (*SD*)	Post *M* (*SD*)	*d*	*p*	Intake *M* (*SD*)	Post *M* (*SD*)	*d*	*p*
PCL-5	55.26 (11.82)	33.26 (18.70)	1.41	<.001	56.41 (12.72)	36.12 (19.94)	1.21	<.001
PHQ-9	17.45 (4.92)	11.96 (6.31)	0.97	<.001	18.12 (5.30)	13.21 (6.42)	0.83	<.001

d represents Cohen's *d*; the standardized difference between group means. By convention, all pre-post changes are considered large (>0.8). Effect sizes for the differences between the two groups at endpoint were small for both PCL-5 ($d = .13$) and PHQ-9 ($d = .20$).[1]

individuals who endorse HAU. It is possible that incorporating non-psychoeducation alcohol-specific interventions into the curriculum could further reduce symptoms.

The present study has several limitations. In this study AUDs were not diagnosed. We instead relied on a broader measure of past year hazardous drinking, which makes it difficult to compare findings to prior

treatment studies on PTSD/AUD. As is common in clinical programmes, all measures involved self-report, possibly introducing reporting bias. Additionally, the PCL-5 was not originally developed for daily assessment of PTSD symptoms. The lack of a control group prevents us from attributing changes in symptoms solely to the ITP. Veterans in the ITP received a number of interventions and we are not able to determine which of the programme components contributed to treatment response. Moreover, the ITP did include substance use-specific interventions as part of the comprehensive programming. Alcohol use during the programme was not assessed. This precluded us from examining whether alcohol use improved as a function of PTSD symptom reductions and whether improvements in alcohol use impacted changes in PTSD or depression. This study did not assess symptoms following the ITP, which makes it impossible to determine longer-term outcomes. Lastly, findings from the present study may not be applicable to non-veterans or individuals with more severe alcohol use, as this was one of the exclusion criteria.

Findings suggest intensive PTSD treatment can achieve comparable outcomes as have been reported for traditionally delivered/weekly outpatient care while ensuring much greater completion rates. Results also suggest that veterans with PTSD and HAU may not need to be excluded from participation in ITPs, although additional research is warranted. ITPs may be a viable alternative to lengthier speciality and residential PTSD treatments for some veterans with co-occurring PTSD and HAU (Haller et al., 2016; Walter, Varkovitzky, Owens, Lewis, & Chard, 2014). Future studies should utilize controlled designs to evaluate whether intensive PTSD treatment can reduce HAU.

Note

1. Tests of non-inferiority of endpoint PCL-5 and PHQ-9 scores using the TOST procedure (Schuirmann, 1987) with equivalence margins of 10-point and 5-point, respectively, indicated that the two groups can be considered equivalent at endpoint in both measures.

Data availability statement

Datasets generated and analyzed during the current study are not publicly available because they contain more than two indirect identifiers of human research participants that cannot be sufficiently anonymized for a public repository. The datasets are available from the corresponding author on reasonable request.

Disclosure statement

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