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Examination of Treatment Effects on Hazardous Drinking Among Service Members With Posttraumatic Stress Disorder

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Posttraumatic stress disorder (PTSD) and alcohol use disorder are frequently comorbid and present significant treatment challenges. Unfortunately, since the September 11, 2001, terrorist attacks in the United States, the rates of PTSD and hazardous drinking among active duty service members have increased significantly. Previous research on PTSD has typically excluded participants with current substance abuse. However, there is some research examining independent treatments for PTSD and substance abuse provided consecutively, concurrently, or as enhancements to other treatment. The current study examined the association between current hazardous drinking and PTSD treatment among 108 active duty service members with PTSD in a randomized controlled trial of group cognitive processing therapy and group present-centered therapy. Total scores above 8 on the Alcohol Use Disorders Identification Test defined hazardous alcohol use. At baseline, 25.0% of the sample was categorized as hazardous drinkers, and the hazardous and nonhazardous drinking groups did not differ in PTSD symptom severity, $F(1, 106) = 0.08$, $p = .777$, $d = 0.06$. Over the course of treatment, the two groups also did not differ significantly in PTSD symptom severity change on the PTSD Checklist, $F(1, 106) = 1.20$, $p = .280$, $d = 0.33$. Treatment for PTSD did not exacerbate hazardous drinking, and the hazardous drinking group showed significant reductions in drinking following PTSD treatment. Limitations and implications for treatment considerations are discussed.

Posttraumatic stress disorder (PTSD) and alcohol use disorders (AUD) co-occur at significant rates within the general population (Pietrzak, Goldstein, Southwick, & Grant, 2011). Comorbidity rates of PTSD and AUD among U.S. veteran populations are even higher, ranging from 63% to 76% (Seal et al., 2011). Since the September 11, 2001, terrorist attacks in the United States, increased deployments and combat exposure have been associated with higher rates of PTSD (Hoge et al., 2004), and surveys indicate a steady increase (i.e., 15%–20%) in the number of U.S. service members who report heavy alcohol use from year to year (Bray et al., 2010). A recent longitudinal

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study of U.S. National Guard members found that AUD was associated with increases in both PTSD and depressive symptoms (Sampson et al., 2015). Patients with co-occurring PTSD and substance abuse have been found to have a more severe clinical profile when compared to those with either disorder alone, including lower general functioning, poorer well-being, and worse outcomes across a variety of measures (Schäfer & Najavits, 2007). Not only are these patients considered as more difficult to treat, but the comorbidity is associated with poorer recruitment into treatment programs and with poorer treatment adherence, retention, and outcomes (Foa et al., 2013; McCarthy & Petrakis, 2010; Schäfer & Najavits, 2007). Determining the best treatment approaches for co-occurring PTSD and alcohol abuse is imperative for this population.

Cognitive behavioral treatments for PTSD, such as cognitive processing therapy (CPT), have been well established and found to be effective at reducing PTSD, with results lasting 5–10 years posttreatment (Resick, Williams, Suvak, Monson, & Gradus, 2012). However, more research is needed about the efficacy of PTSD treatments for individuals with AUD because individuals with AUD have either been excluded from research or only small numbers of these individuals have been enrolled in research protocols (e.g., Chard, Schumm, Owens, & Cottingham, 2010; Monson et al., 2006; Resick et al., 2012; van Minnen, Harned, Zoellner, & Mills, 2012). A common clinical concern among clinicians is that engaging individuals with AUD in trauma-focused treatment may lead to an exacerbation of symptoms (Back, Waldrop, & Brady, 2009). Despite the high rates of comorbidity between PTSD and AUDs, few studies have examined how treatment for PTSD may benefit individuals who present with PTSD but also suffer from comorbid AUD (Back, 2010).

Much of the psychotherapy research in this area has focused on independent treatments for PTSD and substance abuse that are (a) administered consecutively or concurrently (e.g., Foa et al., 2013), (b) enhancements addressing PTSD that are added to substance abuse treatments (e.g., Mills et al., 2012), or (c) enhancements within PTSD treatments that address substance abuse (e.g., McCarthy & Petrakis, 2011). In one study, Hien et al. (2010) examined outcomes from participants who received an integrated treatment for PTSD and substance abuse and found that improvements in PTSD symptoms were associated with improvements in subsequent substance use outcomes, although the opposite was not true. Roberts, Roberts, Jones, and Bisson (2015) published a systematic review of 14 studies and found that trauma-focused cognitive behavioral intervention delivered concurrently with a substance use disorder (SUD) intervention was more effective than treatment-as-usual. Although promising, these findings were judged to be of low or very low quality, and half of the studies used the Seeking Safety program as the trauma-focused intervention. The Veteran Affairs and Department of Defense PTSD treatment guidelines (2017) do not recommend for or against utilizing Seeking Safety due to insufficient evidence for the program in the treatment of PTSD.

Research that has focused exclusively on PTSD treatment among individuals who are also abusing substances is limited. Recent reviews of prolonged exposure therapy randomized controlled trials have noted that most trials excluded participants for substance abuse, and in the few trials that reported on substance use, there were no significant increases or decreases in use at all follow-up (van Minnen et al., 2012; van Minnen, Zoellner, Harned, & Mills, 2015). Additionally, Kaysen and colleagues (2014) investigated the tolerability and effectiveness of CPT among veterans with comorbid AUD through archival records review of an outpatient PTSD treatment program. The researchers concluded that CPT was well tolerated and found significant reductions in symptoms of PTSD and depression among individuals both with and without current or past AUD diagnoses. However, notably, only 11% of the sample met criteria for current AUD, and the study authors were unable to determine how PTSD treatment impacted alcohol use.

Additional research that examines treatment for individuals with PTSD who are also currently abusing alcohol is needed, especially among military personnel. Understanding efficient and effective treatment for service members with co-occurring PTSD and hazardous drinking is crucial. The purpose of this study was to evaluate the effects of current hazardous alcohol use among active duty service members with PTSD who participated in a previous randomized clinical trial for the treatment of PTSD (Resick et al., 2015). We hypothesized that service members who reported current hazardous drinking at baseline would have higher levels of baseline PTSD symptoms. We also predicted that service members who reported current hazardous drinking at baseline would attend fewer treatment sessions and would thus drop out at higher rates than those who reported less drinking. Given that the literature regarding hazardous drinking and PTSD treatment is sparse, we posed two exploratory research questions. First, does baseline current hazardous drinking impact PTSD symptom change over the course of treatment? Second, would individuals reporting current hazardous drinking at baseline reduce drinking over the course of treatment?

Method

Participants

Data for these analyses were collected from a group of active duty U.S. Army Soldiers stationed at Fort Hood in Killeen, Texas, who were participating in a randomized clinical trial comparing group CPT-C (version with no written accounts) and group present-centered therapy (PCT; Resick et al., 2015). This observational secondary analysis examined hazardous drinking in the randomized clinical trial. Participants provided written informed consent before participating in treatment. Participants were active duty military personnel who were 18 years of age or older. If participants had been prescribed psychotropic medications, the medications were required to be stable for at least 6 weeks prior to study entry. Concurrent mental health

treatment was allowable if it was not trauma-focused treatment. Eligibility required participants to have experienced at least one Criterion A traumatic event during deployment to Iraq or Afghanistan as well as a diagnosis of PTSD as defined by the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; *DSM-IV-TR*; American Psychiatric Association, 2000). Exclusion criteria for the trial included active psychosis or acute suicidal or homicidal risk needing crisis intervention.

Detailed descriptions of participants are presented elsewhere (see Resick et al., 2015). Overall, the 108 participants were predominately male (92.6%), married (79.6%), in their early 30s ($M = 32.09$ years, $SD = 10.75$), had completed some college or had an associate's degree (59.3%), and were personnel with a military grade between junior enlisted E-3 to junior noncommissioned officer E-5 (65.7%). More than half of the participants identified racially as White (57.4%), 13.9% identified as Hispanic, and 20.4% identified as Black. Participants had been deployed an average of 2.14 times ($SD = 1.27$) and had completed about 10 years of active duty military service ($M = 123.53$ months, $SD = 108.79$). Most participants reported taking at least one prescribed medication (82.4%), with the mean number of medications reported as 2.67. Half of the participants (50.0%) reported taking a psychotropic medication.

Procedure

The study was reviewed and approved by the Institutional Review Boards at Brooke Army Medical Center, The University of Texas Health Science Center at San Antonio, and the VA Boston Healthcare System. Detailed descriptions of recruitment, assessment, intervention, and procedures are described elsewhere (Resick et al., 2015). Briefly, all participants provided informed consent and received a comprehensive baseline assessment conducted by an independent evaluator. Eligible participants were randomized into either 12 sessions of group CPT or PCT. Group treatment was conducted twice weekly for 6 weeks, with both treatment conditions running simultaneously. Groups consisted of 8 to 12 participants, and there were six cohorts in the study.

Study therapists were master's- and doctoral-level clinicians who were trained in both therapies and conducted each in approximately the same number of groups. Fidelity to both treatments was rated by two independent clinicians for adherence to the treatment protocol and therapist competence. Standard procedures included rating a random sample of 35% of the treatment sessions in addition to 20% of these sessions scored by both raters to establish reliability. Both CPT and PCT had acceptable adherence to the unique and essential elements of the treatment protocols, and no proscribed elements were identified in either treatment (Resick et al., 2015). Similarly, therapist competence was rated as "good" for both treatments. Participants were assessed at 2 weeks posttreatment by independent evaluators blinded to the treatment condition.

Measures

PTSD symptoms. The PTSD Checklist-Stressor Specific Version (PCL-S; Weathers, Litz, Herman, Huska, & Keane, 1993) was used to assess PTSD symptoms. The PCL-S is a 17-item, self-report measure that measures how much an individual is bothered by arousal, avoidance, or reexperiencing symptoms on a scale of 1 (*not at all*) to 5 (*extremely*). Higher scores reflect a higher level of PTSD symptom severity. In the current sample, coefficient alpha on the PCL-S was .84 at baseline and .95 at posttreatment.

Alcohol use. The Alcohol Use Disorders Identification Test–Interview Version (AUDIT; Babor, Higgins-Biddle, Saunders, & Monteiro, 2001) is a 10-item, clinician-administered interview that measures physiological and psychological dependence on alcohol as well as negative consequences associated with drinking. The AUDIT has a complicated scoring algorithm in which participants answer varying numbers of items depending on how they answer earlier ones; given this, it is inappropriate to calculate the coefficient alpha for this measure. Total scores can range from 0 to 40; higher scores indicate a higher likelihood of an alcohol use disorder (AUD) and scores of 8 or above indicate the likely presence of an alcohol use disorder. We used a hazardous/nonhazardous dichotomization in our analyses to maximize clinical utility and generalizability, which is consistent with suggestions by the measure's authors. The AUDIT-C consists of the sum of Items 1–3 and measures current alcohol consumption (Bush et al., 1998); scores range from 0 to 12, with scores greater than 4 and 3 reflecting probable alcohol misuse in men and women, respectively.

Data Analysis

Participants were categorized as hazardous drinkers if their baseline total score on the AUDIT was 8 or above. The resulting hazardous drinker group consisted of 27 participants (25.0% of the sample); the remaining 81 (75.0%) participants were categorized as nonhazardous drinkers at baseline. At posttreatment, the hazardous drinker group reduced to 24 participants (26.9%) and the nonhazardous drinker group reduced to 68 participants (73.1%).

Our first hypothesis predicted that service members who reported currently abusing alcohol at baseline would have higher levels of baseline PTSD symptoms. We directly tested this hypothesis as part of our test of our first research question (i.e., whether baseline current hazardous drinking would impact PTSD symptom change over the course of treatment) using an intent-to-treat linear mixed model regression with repeated measures that specified baseline hazardous drinking status (hazardous drinkers vs. nonhazardous drinkers) and assessment (pretreatment to posttreatment) in a 2×2 factorial design, with assessment as a repeated factor using an unstructured covariance matrix. An a priori specific contrast of baseline PCL-S scores in the two drinking subgroups was used to test our first hypothesis. To examine our second hypothesis—that

there would be more drop-out among hazardous drinkers—we categorized individuals as treatment completers if they completed 9 or more of 12 treatment sessions; we then conducted a chi-square test to determine whether treatment completion was associated with baseline drinking status.

Our first research question sought to determine whether baseline current hazardous drinking would impact PTSD symptom change over the course of treatment. The formal test of this research question was the Hazardous Drinking Status × Time interaction from the aforementioned intent-to-treat linear mixed model. To summarize clinically meaningful improvement, we tallied the number of cases in which scores on the PCL-S improved 10 points or more between assessments. Our second research question sought to determine whether hazardous drinkers would reduce their drinking over the course of treatment. To address this question, we conducted a mixed model to examine the main effect of time on AUDIT-C scores for individuals who qualified as hazardous drinkers at baseline. Effect sizes and confidence intervals are provided for all analyses to help contextualize results. Given the original study design, we also tested identical models for all analyses but controlled for treatment type (CPT or PCT); this effect and its associated interactions with drinking status and assessment were not significant in any of the models and did not substantively affect the other parameters in the model. Therefore, it was subsequently dropped from the final models presented hereafter. Similarly, possible clustering effects of both patient cohort and therapy group were explored by including them as random effects in preliminary analyses. As reported in the original outcome publication (Resick et al., 2015), these estimated variance components were zero, and those effects were dropped from the final models. All analyses were conducted using SPSS (Version 23).

Results

Primary Analyses

Outcome analyses are summarized in Tables 1 and 2. The hazardous and nonhazardous drinking groups did not differ in baseline PTSD symptom severity, $t(106) = -0.28$, $p = .777$, $d = 0.06$. Hazardous drinkers (80.2% completers) were no less likely to complete treatment than nonhazardous drinkers (77.8% completers), $\chi^2(1, N = 108) = .076$, $p = .783$, odds ratio (OR) = 1.16, 95% CI [0.40, 3.35]. Symptoms of PTSD improved significantly among both hazardous ($M = -5.61$, $SE = 2.65$), $t(91) = -2.12$, $p = .037$; and nonhazardous ($M = -9.01$, $SE = 1.61$), $t(91) = 5.61$, $p < .001$ drinkers, a 3.40 point difference in change that was not large, $d = 0.33$, 95% CI [−0.25, −0.92], or statistically significant, $t(91) = 1.10$, $p = .278$. The proportions of participants with clinically meaningful improvements of 10 or more points on the PCL-S were also very similar (36.2% of hazardous drinkers vs. 40.4% of nonhazardous drinkers). Very few (4.4%) of the nonproblem drinkers developed drinking problems during treatment, and, on average, individuals with hazardous drinking at baseline exhibited a significant decrease in AUDIT-C scores, $p = .011$. However, although 80.0% (i.e., 20 out of 25) of participants in this group had improved AUDIT-C scores, 64.0% remained above the cutoff for hazardous drinking.

Discussion

This study was the first to our knowledge to specifically explore the effect of current hazardous drinking on treatment outcomes for active duty service members with PTSD. In addition to examining whether problematic alcohol use was related to PTSD symptomatology before and after treatment, this study also addressed the question of whether treatments targeting PTSD symptoms would have a positive or negative impact on drinking behaviors.

Contrary to our hypothesis, service members with current hazardous drinking did not have significantly higher PTSD scores at baseline than those who were not problematic drinkers. In fact, the mean PCL-S scores for the two groups at baseline were virtually identical, $d = 0.06$. These cross-sectional data are thus not consistent with the results of a prospective study that found that predeployment PTSD severity predicted the onset of alcohol use disorder postdeployment (Kline et al., 2014). However, in the current study, the association may have been attenuated because our baseline data were collected at the point of recruitment for a PTSD treatment study, a time at which PTSD severity is uniformly elevated and restricted in range.

With regard to treatment engagement and PTSD outcomes, we found that service members with current hazardous drinking completed treatment at the same rate as those who were not problematic drinkers. Furthermore, although the problem drinkers improved somewhat less in PTSD severity than the nonhazardous drinkers, the difference was not statistically significant. Notably, both hazardous and nonhazardous drinkers had significant reductions in PTSD symptoms during treatment, and the proportions of individuals who made clinically significant improvements on the PCL-S were similar (36.2% of hazardous drinkers vs. 40.4% of nonhazardous drinkers). We found significant decreases in PTSD symptoms for participants both with and without hazardous drinking, which is comparable to what was reported by Kaysen et al. (2014), and, like them, we did not find differences in change over time across groups, although our interaction effect size of $d = 0.33$ was larger than theirs ($d = -0.05$).

In sum, these findings provide preliminary evidence that hazardous drinking among service members receiving PTSD treatment does not preclude either engagement in PTSD treatment or clinically meaningful symptom improvement. Service members with hazardous drinking behaviors may be motivated and able to effectively receive treatment for PTSD. Risky drinking among military personnel can lead to disciplinary action, and even discharge, under the Uniform Code of Military Justice (2018); thus, military personnel who are problem drinkers

Table 1
Change in Outcome Scores Over Time

	M	*SE*	95% CI	*d*[a]	95% CI	*t*	*df*	*p*
			PCL-S Total					
Nonhazardous drinkers								
Baseline	59.06	1.15						
Posttreatment	50.05	1.95						
Within-group Δ	−9.01[b]	1.61	[−12.20, −5.82]	0.87	[1.18, 0.56]			
Hazardous drinkers								
Baseline	58.41	1.99						
Posttreatment	52.79	3.27						
Within-group Δ	−5.61[b]	2.65	[−10.87, −0.35]	0.54	[1.05, 0.03]			
Group × Time								
Baseline diff.	0.65	2.30	[−3.91, 5.22]	0.06	[−0.50, 0.38]	−0.28	106	.777
Posttreatment diff.	−2.74	3.81	[−10.30 4.82]	0.26	[−0.47, 0.99]	0.72	98	.473
Within-group Δ diff.	3.40	3.09	[−2.75, 9.54]	0.33	[−0.27, 0.92]	1.10	91	.278
			AUDIT-C					
Hazardous drinkers								
Baseline	7.89	0.36						
Posttreatment	6.12	0.62						
Within-group Δ	−1.77[b]	0.94	[−3.10, −0.45]	−0.31	[−0.54, −0.08]	2.76	24	.011

Note. Nonhazardous drinkers: $n = 81$ pretreatment, $n = 68$ posttreatment. Hazardous drinkers: $n = 27$ pretreatment, $n = 25$ posttreatment. PCL-S = PTSD Checklist–Stressor-Specific version; AUDIT-C = consumption questions on the Alcohol Use Disorders Identification Test; Diff = Difference.
[a]Cohen's *d* was standardized using baseline standard deviations of 10.357 for the PCL-S and 5.696 for the AUDIT. [b]Within-group change was significant from baseline to posttreatment for designated group.

may have more incentives to remain in treatment as compared to what has been demonstrated in research on civilians with PTSD and problematic drinking. Other research also suggests that individuals with PTSD and co-occurring alcohol use disorders are able to successfully engage in treatment for PTSD when treatments are concurrent and/or integrated (Kaysen et al., 2014; Roberts et al., 2015; Taylor, Petrakis, & Ralevski, 2017; van Minnen et al., 2012, 2015).

Becker et al. (2004) reported that 75% of a large group of surveyed psychologists believed that increases in substance abuse were a likely complication of exposure therapy for PTSD. Back et al. (2009) noted that the few studies on this topic have found reductions in substance use rather than relapse or increased cravings; our findings are consistent with this. Only 4.4% of participants initially classified as nonhazardous drinkers in the current study were classified as hazardous at posttreatment. Among the hazardous drinkers at baseline, 80.0% had lower AUDIT-C scores after treatment, and current drinking actually decreased significantly in that group. Among female veterans seeking treatment for PTSD, Schnurr and colleagues (2007) also did not find exacerbation in the addiction severity index of alcohol and drug use, with 55% of their sample reporting a history of a substance abuse and/or dependence diagnosis and 2% meeting current criteria for a substance abuse disorder. The belief that trauma treatment would trigger increased alcohol use among problem drinkers is thus not supported by our findings or recent reviews of prolonged exposure trials (van Minnen et al., 2012, 2015).

Table 2
Association Between Baseline and Posttreatment Drinking Status

Baseline Drinking Categorization	Nonhazardous Drinker at Posttreatment		Hazardous Drinker at Posttreatment		Baseline Status × Posttreatment Status Association			
	n	%	*n*	%	$\chi^2(1, N = 93)$	*p*	*OR*[a]	95% CI
Nonhazardous	65	95.6	3	4.4	39.93	< .001	38.52	[9.34, 158.80]
Hazardous	9	36.0	16	64.0				

Note. OR = odds ratio.
[a]An odds ratio of 38.52 is roughly equivalent to $d = 2.0$, which indicates a very large effect.

These findings have several clinical implications. First, providers should not assume that engaging in trauma-focused treatment will lead patients to increase their drinking behaviors. Few of the nonproblem drinkers had meaningful increases in drinking, and most hazardous drinkers reduced their alcohol use following trauma treatment. That is not to ignore the fact that despite the overall reductions in drinking among the hazardous drinkers, posttreatment drinking in that group remained at elevated levels. In the current study, CPT was not an effective treatment for alcohol abuse, and problem drinking remained a problem for most (64.0%) of the hazardous drinkers. This suggests that patients should be encouraged to reduce their substance use while engaged in trauma treatment. Whether this would be best achieved by engaging in some level of treatment for SUD prior to beginning CPT or by an integrated treatment addressing PTSD and SUD simultaneously remains to be determined (Hien et al., 2010; Simpson, LeHavot, & Petrakis, 2017).

A few limitations must be noted. This study was a secondary analysis of data that were gathered as part of a randomized control trial designed for another purpose, namely to evaluate the effectiveness of CPT. The size of the sample, small number of hazardous drinkers, unbalanced group sizes, and recruitment of few women were all factors that reduced power and affected generalizability of this study.

As with any study with null findings, the lack of statistical significance must be interpreted with caution. The sampling plan was determined by the parent study, which compared two treatment groups that were essentially of equal size. For the purposes of statistical power, the total sample of 108 participants yielded an "effective sample" of 108. When groups are unequal in size, however, the effective sample size can be considerably smaller than the actual sample size, which can exacerbate issues of limited power. In the present analyses, with one group 3 times as large as the other, the effective *N* value for comparing the drinking groups was 76, only about 70% as large as the actual sample size; that is, the total for our two unbalanced pretreatment groups of 81 and 27 participants each was functionally equivalent to comparing two balanced groups of 38 each. The small sample, coupled with small observed effect sizes and the fact that the current study addressed secondary research questions that the parent study was not designed to specifically answer, might explain many of the null findings. That said, the results should certainly be used to inform future researchers who wish to investigate the associations directly.

Additionally, alcohol use was measured using a self-report clinical screening tool and the analyses were conducted on the dichotomous variables "hazardous drinkers" and "nonhazardous drinkers." Dichotomizing alcohol use in the analyses may hide important effects of alcohol use on treatment outcomes. Future research should incorporate measures that observe alcohol use continuously and at follow-up time points 3 months, 6 months, and 1 year posttreatment to better inform the impact of alcohol use on PTSD treatment and the level of alcohol use posttreatment. Another limitation is that the analyses utilized the self-report of PTSD symptoms rather than the gold standard clinician-administered PTSD measure. However, published analyses from the primary outcomes of the study reported the interview-based assessment of PTSD severity was highly correlated with the PCL-S (Resick et al., 2017). Comorbid conditions such as depression and anxiety may also play a role but were not examined in this study due to concerns about statistical power.

Also, some participants were enrolled in concurrent mental health treatment. It is possible they were receiving treatment for hazardous drinking, and we are unable to determine the effects of the concurrent treatment on the outcomes. Because the participants were all active duty service members and primarily male, the results may not generalize to veteran, civilian, or female populations. Additionally, the treatments in this study were both delivered in a group format. Given recent evidence that individual CPT is more effective than group CPT in active military (Resick et al., 2017), these research questions also should be examined in individually delivered formats to determine if the results are consistent.

Despite its limitations, however, this study provides an important first examination of current hazardous drinking among active duty service members undergoing treatment for PTSD. Individuals with PTSD and comorbid hazardous drinking represent a substantial group of patients who need effective treatments. Our data did confirm that active duty service members with PTSD who are problem drinkers improve significantly in CPT treatment in terms of both PTSD and drinking severity. Whether or not their response to treatment was as robust as that of nonproblem drinkers, our findings suggest that these individuals should be encouraged to engage in PTSD treatment. Future research examining the effects of treatments on both disorders is needed to understand the best approaches to treatment.

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