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The Role of Patient Characteristics in the Concordance of Daily and Retrospective Reports of PTSD

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Abstract

Research has documented discrepancies between daily and retrospective reports of psychological symptoms in a variety of conditions. A limited number of studies have assessed these discrepancies in samples of individuals with posttraumatic stress disorder (PTSD), with even less research addressing potential covariates that may influence such discrepancies. In the current study, 65 individuals with co-occurring PTSD and alcohol use disorder (AUD) completed daily assessments of their PTSD symptoms for one month, followed by a standard retrospective report of PTSD over the same month. Initial analyses explored the mean levels of daily and retrospective PTSD symptoms, while multilevel models assessed the level of agreement between daily and retrospective reports and the role of demographic variables and comorbid psychopathology (e.g., depression) or substance use (e.g., alcohol use) in moderating the association of daily and retrospective reports. Results showed that retrospective reports of arousal and avoidance symptoms were weakly related to daily reports of these symptoms, while reports of re-experiencing and numbing symptoms showed better agreement. Intra-individual alcohol consumption also moderated associations of re-experiencing and avoidance symptoms, such that on days individuals drank more, their daily reports resembled their retrospective reports less well. Future research should explore the degree to which these results generalize to non-dually-diagnosed samples, as well as the role such reporting discrepancies may play in PTSD treatment.

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Keywords

posttraumatic stress disorder; assessment; daily diary; alcohol use disorder

Introduction

Diagnostic criteria for Posttraumatic Stress Disorder (PTSD) specify that symptoms must have been present and significantly impairing for at least one month at the time of diagnosis (American Psychiatric Association; APA, 2013). However, the method by which PTSD symptoms are assessed may influence the recall and therefore the overall severity ratings of an individual's PTSD symptoms. The vast majority of clinical diagnoses are made based on an individual's recall of the past month, either via retrospective self-report or clinical interview. Although there are myriad sound reasons for this approach, including the need to demonstrate persistent impairment, retrospective self-report nonetheless may not be the most accurate reflection of daily symptom severity. Since individuals do not typically reflect on their experiences in month-long estimates, recall of symptoms in other timeframes (e.g., the prior day) may be a better reflection of experience. Research suggests that short-term recall is more accurate than long-term recall (i.e., retrospective report), with the latter often resembling semantic rather than episodic memory (Robinson & Clore, 2002).

Indeed, individuals regularly self-report more severe symptoms on retrospective reports as compared to daily evaluations in a variety of psychiatric and health conditions, including panic disorder (de Beurs, Lange, & Van Dyck, 1992), borderline personality disorder (Ebner-Priemer et al., 2006), major depressive disorder (Ben-Zeev & Young, 2010), schizophrenia (Ben-Zeev, McHugo, Xie, Dobbins, & Young, 2012), smoking (e.g., Shiffman et al., 1997), and chronic pain (Van Den Brink, Bandell-Hoekstra, & Abu-Sadd, 2001). Notably, studies assessing sexual activity and alcohol use have regularly found higher levels of activity reported on daily relative to retrospective reports (e.g., Leigh, 2000; McAuliffe, DiFranceisco, & Reed, 2007), and retrospective underreporting of alcohol consumption may be more common in heavy drinkers (Searles, Perrine, Mundt, & Helzer, 1995).

To our knowledge, only two studies have assessed concordance of daily and retrospective reports of PTSD symptoms using the same measure. One of these studies assessed frequency of daily intrusions and flashbacks (no other symptom clusters were assessed) using bivariate non-parametric analyses in a sample of White, female, substance-abstinent childhood sexual abuse victims in long-term, trauma-focused residential treatment for PTSD (Priebe et al., 2013). In contrast to research in other disorders showing higher symptom levels on retrospective reports (e.g., de Beurs, Lange, & Van Dyck, 1992, Ebner-Priemer et al., 2006), this study found that daily reports of intrusions and flashbacks were approximately 50% higher than corresponding retrospective reports.

In contrast, reports of retrospective and daily subclinical PTSD symptoms in a largely White sample of female college students with sexual assault and childhood sexual abuse histories found the opposite pattern, such that retrospective reports of re-experiencing symptoms were 118% higher than average daily reports of these symptoms (Naragon-Gainey, Simpson, Moore, Varra, & Kaysen, 2012). Across the other symptom clusters, retrospective reports

were 75% higher for dysphoria, 54% higher for hyperarousal, and 85% higher for avoidance, while overall retrospective PTSD scores were 67% higher. Although the absolute values of daily and retrospective reports demonstrated notable differences, multilevel models (MLMS) that accounted for missing data and captured individual differences in concordance demonstrated reasonably good agreement between retrospective and daily reports. Pseudo- R^2 estimates ranged from .55–.76 depending on the cluster. The contrasting results between the two studies suggest that agreement of daily and retrospective reports of PTSD depends on a variety of factors, which may include the analytic method (e.g., MLMs vs. Wilcoxon tests for paired data), assessment context (e.g., inpatient treatment vs. routine life), and sample characteristics (e.g., whether participants meet full criteria for PTSD or are currently abusing substances). In light of the limited research assessing the concordance of retrospective and daily reports of PTSD symptoms, additional work is needed to better understand these relationships and to ascertain which of the results can be replicated with a more diverse sample.

Moreover, there may be important participant characteristics (e.g., demographic and psychiatric factors) that influence concordance. For instance, one participant characteristic found to influence retrospective symptom reporting accuracy is age. Authors have speculated that younger individuals may be more likely to retrospectively view their lives as more emotionally intense or volatile than older individuals, thereby potentially inflating retrospective reports (Ben-Zeev, et al., 2012). In contrast, other research has shown that compared to younger adults, older adults retrospectively *under-report* their level of negative symptom intensity compared to initial reports (Levine & Bluck, 1997). Thus, age may be associated with both retrospectively under- and over-reporting symptoms, therefore influencing concordance with daily reports. Conflicting evidence also exists regarding gender, with some research suggesting that women are more likely to retrospectively over-report emotion intensity (e.g., Feldman-Barrett, Robin, Pietromonaco, & Eyssell, 1998; Levine & Bluck, 1997), while other research has shown that men display worse agreement than women in their daily and retrospective reports of alcohol consumption (Krenek, Lyons, & Simpson, 2016). Another relevant participant characteristic is depression severity. Compared to non-depressed individuals, depressed individuals may be more susceptible to mood-congruent responding, as well as deficits in autobiographical memory that limit the accuracy of recall (e.g., Koster, de Raedt, Goeleven, Franck, & Crombez, 2005; Williams et al., 2007). Similar results were found regarding mood-congruent recall of posttraumatic stress symptoms two years post-trauma (Harvey & Bryant, 2000).

Alcohol and drug use may also influence the accuracy of retrospective recall. Although alcohol use did not moderate daily/retrospective PTSD symptom report concordance in prior research (Naragon-Gainey et al., 2012), the combination of mild-to-moderate alcohol consumption *and* subclinical PTSD symptoms in that sample may have contributed to a null effect. Additionally, this study only analyzed between-person differences in alcohol consumption, and did not examine within-person variation in consumption as a potential moderator of concordance. Past research with heavy drinkers carrying dual diagnoses of PTSD and alcohol use disorder (AUD) (Krenek et al., 2016) found moderate-to-weak daily/retrospective correspondence in reports of alcohol consumption, suggesting that dually-diagnosed individuals may have particular difficulty with retrospective recall accuracy.

Indeed, there are significant memory concerns inherent to both PTSD and AUD (meta-analysis by Scott et al., 2015). Thus, additional research in a clinical sample is needed to ascertain the degree to which levels of PTSD and AUD influence recall.

The present study evaluates the degree of concordance between retrospective and daily reports across PTSD symptom clusters and the extent to which participant characteristics influence concordance (e.g., age, gender, depression severity, concurrent alcohol use). We further assess the degree of symptom instability to better characterize PTSD symptoms and improve understanding of factors that may influence concordance. Prior research has suggested that more stable symptoms may be more trait-like, and, thus, more easily recalled retrospectively compared to unstable symptoms (e.g., Stone, Schwartz, Broderick, & Shiffman, 2005; Naragon-Gainey et al., 2012). Our aims are to: 1) assess the average daily, aggregate daily, and average retrospective symptom reports of PTSD in a treatment-seeking sample of individuals with comorbid PTSD/AUD; 2) explore the relative stability/instability of PTSD symptoms; 3) assess the correspondence of daily and retrospective symptom reports accounting for nesting of daily data within person, restricting daily data to the 31 days prior to the retrospective assessments; and 4) explore moderators of the correspondence.

Based on prior research on PTSD symptom report concordance, symptom stability, and recall, we hypothesized that the avoidance cluster would have the lowest degree of concordance across retrospective and daily reports, followed by the re-experiencing cluster (Naragon-Gainey et al., 2012; Priebe et al., 2013), while hyperarousal would have the highest degree of concordance (Naragon-Gainey et al., 2012). Because there is no relevant prior research regarding numbing, we did not have an a priori hypothesis regarding daily and retrospective reporting concordance. We further hypothesized that the following participant characteristics would moderate the concordance of daily and retrospective reports: age, gender, and depression. Specifically, we hypothesized that more depressed participants would demonstrate weaker concordance compared to less depressed participants. Given conflicting research on sex and age differences in retrospective symptom reporting accuracy in general and the dearth of research on these variables in PTSD reporting accuracy specifically, we view these analyses as exploratory. Finally, we hypothesized that both higher than personal and higher than sample average alcohol use would reduce the concordance of daily and retrospective reports of PTSD.

Method

Participants

A total of 92 participants were recruited through newspaper advertisements or flyers for a larger study advertised to help individuals with co-occurring PTSD and AUD reduce their drinking. The primary aim of the larger study was to explore mechanisms of change in a single-session treatment of co-occurring PTSD and AUD (registered at ClinicalTrials.gov; protocol #: NCT00760994). Participants met criteria for that study if they were 18 or older, met criteria for current DSM-IV-TR alcohol dependence and PTSD, had regular access to a telephone, and were able to provide consent. Participants were excluded if they had current psychosis, a history of delirium tremens or current seizures (indicating complicated alcohol

withdrawal such that reduction of alcohol use in the context of the study would not be safe), were currently using opioids or methamphetamines, or in chronic opioid treatment (which would significantly influence responding), were receiving naltrexone and/or Antabuse (because of the pharmacological effects of these medications on alcohol use, since alcohol use was a primary dependent variable in the original study), were experiencing symptoms of alcohol withdrawal, or reported elevated suicidality/homicidality with intent and/or plan.

Seventy-eight of the 92 eligible participants continued with the study after baseline assessments and returned for the single treatment session (described below). Of those 78 participants, 65 provided interactive voice response (IVR) data on at least 50% of the 31 days prior to the follow-up assessment *and* completed the follow-up assessment. These 65 participants did not differ from the original 78 on demographic variables, including age, ethnicity, gender, educational attainment, marital status, or veteran status. Participants who were and were not included exhibited statistically significant differences in baseline PTSD ($p < .001$) and baseline days drinking ($p < .001$), such that those who were included had higher PTSD and fewer days drinking than those who were excluded. Table 1 shows participant demographic characteristics.

Procedure

Baseline assessments—Interested individuals completed an initial phone screen, followed by an in-person assessment, including informed consent procedures and the following interview screening measures: the Substance Use Disorder and Psychotic Disorder modules of the Structured Clinical Interview for DSM-IV-TR (First & Gibbons, 2004), the PTSD Symptom Scale-Interview Version (PSSI; Foa, Riggs, Dancu et al., 1993) (to confirm PTSD diagnosis for inclusion in the study, not used in study analyses), the suicide section of the Hamilton Depression Inventory (HAM-D; Hamilton, 1960), the Life Events Checklist (LEC), and a shortened version of the Form-90 to assess baseline alcohol use (Miller & DelBoca, 1994). Eligible participants were trained in the IVR procedures and the pager system that issues prompts after missed calls. Participants were compensated \$30 for completing baseline assessments.

Daily monitoring assessments and brief intervention—In the larger study, participants completed daily assessments of alcohol use and PTSD over the previous 24 hours for approximately 7 days before a single-session intervention. Participants were randomized into the intervention, which taught coping skills (cognitive restructuring or experiential acceptance) for alcohol craving, or into an attention control condition involving instruction about nutrition. They then completed approximately one month of daily assessments. Only the post-intervention IVR data are used in the present study, as the time period aligns with the follow-up assessments (described below). Database Systems Corp. automatically tracked and maintained IVR compliance, and participants who did not call independently were contacted within two business days to collect data verbally. Thus, the range of time between the target day and the day of data collection could be 1–4 days. Approximately 10% of calls were collected verbally. Participants were paid \$1 for each day of IVR completed, with a bonus payment of \$10 for 7 consecutive days of data, or \$7 for 6 consecutive days. The number of days between the intervention session and follow-up

session varied among participants (up to 5 weeks), but only the month (31 days) prior to the follow-up assessments is included in the present study.

Follow-up assessments—Participants attended a follow-up assessment session in which they completed additional measures of psychological distress, coping, and alcohol use, and were debriefed on the purpose of the study. They were paid \$40 for the follow-up assessment.

Measures

Demographic measures—A standard demographic measure was used to collect information on age, gender, and other demographic variables described in Table 1.

PTSD—For the IVR PTSD assessments, 12 items were selected from the PTSD Checklist-Civilian Version (PCL-C; Weathers & Ford, 1996) based on their strong associations with PTSD clusters in factor analytic studies of PTSD (e.g., Palmieri, Weathers, Difede, & King, 2007). Participants responded to three re-experiencing items, two avoidance items, three emotional numbing items, and four hyperarousal items. For each item, participants rated how much they were bothered by the symptom over the previous day on a 9-point Likert scale from 0 (*not at all*) to 8 (*all the time*). The 0–8 scale was selected for the daily version of the PCL to maximize scale sensitivity on the daily level and correspond to other daily measure scales (reducing participant confusion), and a subset of 12 items from the full 17-item scale was selected in order to minimize participant burden. Daily total and cluster scores were created by averaging the items.

Retrospective PTSD was also assessed using the PCL-C (Weathers & Ford, 1996). The retrospective PCL-C asks participants to respond while considering their symptoms over the previous month, using a 5-point Likert scale from 1 (*not at all*) to 5 (*extremely*). The original scale was retained to allow comparison to normative data regarding cut-offs. Using all 17 items, participants' mean post-treatment score was 43.69 ($SD = 13.95$; range 14–72), which is near the recommended PTSD screening cutoff of 45 (Blanchard, Jones-Alexander, Buckley, & Forneris, 1996). Approximately 51.6% of the sample scored below 45, and 48.4% scored above 45. Importantly, for the analyses presented here, we used only the same 12 items used for the daily report of PTSD for comparison of retrospective with daily scores and use in MLMs. Descriptive statistics of both forms of PTSD measures (using 12 items) are shown in Table 2.

Alcohol use—Daily alcohol consumption was assessed by asking participants to report the number of standard drinks of beer (12 oz.), wine (5 oz.), and liquor (1.5oz) they had consumed the previous day. Each type of alcohol was assessed separately, and the total number of drinks was summed to create a daily drinking tally.

Depression—Depressive symptoms were assessed at follow-up using the depression module of the Patient Health Questionnaire (PHQ-9; Kroenke, Spitzer, & Williams, 2001). The PHQ-9 asks respondents to report how often they have been bothered by symptoms in the previous two weeks on a 4-point Likert scale from 0 (*not at all*) to 3 (*nearly every day*).

Analytic Plan

An initial aim was to assess levels of daily and retrospective PTSD. To improve comparability and interpretability of daily and retrospective reports, daily and retrospective averages of PTSD symptoms were calculated using both raw and “percent of maximum possible” (POMP) metrics (Cohen, Cohen, Aiken, & West, 1999). The POMP scores are calculated using the following formula: $[(\text{raw score} - \text{minimum}) / (\text{maximum} - \text{minimum})] \times 100$ (Cohen et al., 1999). Put simply, POMP scores transform scores to be the same scale, and allow direct comparison of daily and retrospective reports of PTSD, given that they were initially measured on different scales. We then assessed symptom instability over the 31 days on monitoring using root-mean-square successive difference (RMSSD) scores for those with at least 50% of daily data ($n = 65$). RMSSD scores include frequency and amplitude of change, as well as temporal dependency, and are interpretable as an individual’s *average* daily symptom fluctuation (Ebner-Priemer, Eid, Kleindienst, Stabenow, & Trull, 2009). RMSSD was calculated with the following formula $\sqrt{\sum (x_{i+1} - x_i)^2 / (n - 1)}$, where x_j is the individual’s score on the j th daily assessment, and $n =$ the number of completed daily assessments. Comparisons of instability across symptom clusters were calculated using paired t tests with Bonferroni-corrected alpha set at .008 (.05/6 comparisons) (Cohen et al., 1999).

To evaluate the correspondence of daily and retrospective reports of PTSD symptoms, MLMs were used, accounting for the data’s nested structure of days within individuals. MLMs account for missing data (using maximum likelihood estimation) without introducing meaningful bias into estimates or standard errors (Schafer & Graham, 2002; Singer & Willett, 2003), particularly when missing data are likely related to variables included in the models (e.g., PTSD, alcohol use). All models used the MIXED procedure in SPSS version 19. Level 2 predictors were group mean centered, while Level 1 predictors (e.g., daily alcohol) were group- and person-mean centered to parse out between- and within-person variability. Pseudo- R^2 was calculated to create a metric of the explanatory power of each model. Pseudo- R^2 is calculated with the following formula:

$\sigma_0^2(\text{empty model}) - \frac{\sigma_0^2(\text{model of interest})}{\sigma_0^2(\text{empty model})}$, where σ_0^2 is the between-person variance estimate (Singer & Willett, 2003).

To assess the basic association of retrospective PTSD with daily PTSD, the POMP of retrospective PTSD was used as a Level 2 predictor of the POMP of mean daily PTSD. Although retrospective PTSD was temporally assessed after daily assessments, the two measures cover the same timespan, and MLMs necessitate that Level 2 variables predict Level 1 variables. After assessing the basic model of retrospective PTSD as a Level 2 predictor of mean daily PTSD, additional models were run that separately included each of the following covariates: gender, age, depression, and alcohol use. Then, additional models were run in which each covariate was assessed as a moderator of the association of retrospective PTSD with mean daily PTSD¹. Finally, the models described above were

¹Because the sample had roughly equal numbers of non-White and White participants, we also conducted main effect and moderation analyses with race as a moderator of the association of daily and retrospective reports of overall and individual symptoms of PTSD. Race did not significantly predict main effects or interactions in these analyses, thus they are not described in detail.

repeated for each symptom cluster. To ascertain the effect of treatment condition on agreement between daily and retrospective reports, we also ran models for total PTSD and individual clusters using condition as a moderator.

Results

Preliminary Analyses

Participants who did and did not complete at least 50% of IVR entries in the 31 days prior to follow up were compared on demographic variables using chi-square and univariate ANOVA analyses. Analyses revealed no significant differences in gender, age, ethnicity, living situation, veteran status, employment status, education level, or marital status ($ps > .13$). We did not analyze data from participants who provided data for less than 50% of the 31 monitoring days prior to follow-up following conventions suggested by Nezlek (2012). There were a possible 2,015 days for the daily monitoring period (31 days x 65 participants), and data were provided for 1,880 (93.3%) of those days. A little over a third of the sample ($n = 23$; 35.3%) provided data for all possible days of their monitoring period, whereas 18.5% ($n = 12$) missed one day, 23.1% ($n = 15$) missed two days, and 23.1% ($n = 15$) missed 3 or more days.

Participants reported a range of traumas on the LEC. The mean number of traumatic events per participant was 6.05 ($SD = 2.89$). Most of the sample (85.7%) experienced physical assault, with 64.1% also reporting assault with a weapon. Nearly 66% had been in a motor vehicle accident, and 61.5% experienced sexual assault. The majority (53.1%) also reported other unwanted sexual experiences (distinct from endorsing sexual assault). Nearly 50% experienced a natural disaster, and less than 50% of the sample experienced “other traumatic events.” Time since trauma ranged from 7.38 years ($SD = 10.56$ years) for “severe human suffering” to 25.52 years ($SD = 17.12$ years) since experiencing a fire or explosion. Mean depression symptoms at follow-up were in the moderate range ($M = 11.60$, $SD = 6.86$). The mean number of daily drinks was 2.67 ($SD = 5.86$).

Descriptive statistics for PTSD symptoms are shown in Table 2. Retrospective scores are higher than their daily counterparts, for both total scores and individual clusters (retrospective total PTSD was ~10% higher than daily PTSD, re-experiencing ~16% higher, avoidance ~2% higher, numbing ~9% higher, and arousal ~12% higher). Paired t tests assessing relative instability of daily symptom clusters showed that daily avoidance symptoms were significantly more unstable than re-experiencing and arousal symptoms ($ps < .008$), with a trend toward significantly more instability than numbing symptoms ($p = .012$). Arousal symptoms were significantly *more stable* than re-experiencing, avoidance, and numbing symptoms ($ps < .001$).

Although the between-person internal consistency reliability of the daily arousal subscale was acceptable ($\alpha = .76$), the within-person internal consistency reliability was poor ($\alpha = .51$). The internal consistency reliability of the retrospective arousal subscale obtained at follow-up was also poor ($\alpha = .56$). Notably, the internal consistency reliability of the arousal subscale of the retrospective PCL administered at baseline ($\alpha = .75$) and mid-point ($\alpha = .71$) was acceptable. Between-person internal consistency reliability of all other clusters and the

total score of the daily version was good-to-excellent ($.83 < \alpha s < .92$), and within-person internal consistency reliability of all other clusters and the total score of the daily version was acceptable-to-good ($.73 < \alpha s < .83$). Between-person internal consistency reliability of the retrospective version of all other clusters and the total score was good-to-excellent ($.86 < \alpha s < .92$) at follow-up.

Daily/Retrospective Agreement

Pseudo- R^2 calculations reflecting the concordance of retrospective and daily reports for the MLMs demonstrated effect sizes ranging from medium to large ($.38 < \text{pseudo-}R^2 < .60$). The retrospective reports accounted for the following amounts of variance in their parallel daily reports: total PTSD 54%; numbing 56%; re-experiencing 54%; arousal 44%, and avoidance 38%. Pseudo- R^2 values for models incorporating moderators are reported below. Adding interaction terms pertaining to gender, age, and alcohol use increased the pseudo- R^2 s while interaction terms pertaining to treatment condition and depression did not. These latter variables are omitted from the final models presented in Table 3.

Moderating Effects of Demographics and Alcohol Use

Table 3 shows the MLMs in which significant main effects or interactions were found for demographic or alcohol use variables.

Total PTSD—Models assessing agreement of daily and retrospective total PTSD with gender, age, and within-person and between-person deviations in daily alcohol consumption as potential moderators had pseudo- R^2 values of .58 (gender model), .59 (age model), and .56 (alcohol model), and detected significant main effects for retrospective PTSD, gender, age, and within-person alcohol consumption, but no significant interactions. The mean level of daily PTSD for men is 41.23 POMP units and for women is 34.27 POMP units ($p < .05$). (For these models and the ones pertaining to PTSD symptom clusters described below, please see Table 3 for details on main effects of continuously scaled variables.)

Re-experiencing—Models assessing agreement between retrospective and daily re-experiencing symptoms (including moderators) had pseudo- R^2 values of .58 (gender model), .56 (age model), and .56 (alcohol model), and found significant main effects for re-experiencing, gender, and within-person drinking. There were no significant main effects for age or between-person drinking. The only significant interaction was between re-experiencing symptoms and within-person drinking such that on days that individuals drank more alcohol relative to their average, the association between their retrospective and daily reports of re-experiencing symptoms was weaker. The mean level of daily re-experiencing for men was 41.74 POMP units, whereas the mean level for women was 33.72 POMP units ($p < .05$).

Avoidance—Models assessing agreement of retrospective and daily avoidance symptoms (including moderators) had pseudo- R^2 values of .44 (gender model), .44 (age model), and .45 (alcohol model), and found significant main effects for avoidance, gender, age, and both alcohol variables. The model also revealed a significant interaction between retrospective avoidance and within-person drinking which followed the pattern of the interaction of re-

experiencing and within-person drinking. The mean level of daily avoidance for men was 43.70 POMP units, whereas the mean level for women was 33.20 POMP units ($p < .05$).

Numbing—Models assessing the agreement of retrospective and daily numbing symptoms (including moderators) had pseudo- R^2 values of .58 (gender model), .59 (age model), and .60 (alcohol model) and found a significant main effect for numbing in all models and significant main effects for both alcohol variables, but no other significant main effects or interactions. The interaction between retrospective numbing and age was marginally significant ($.01, p = .08$), such that as age increased, the associations of retrospective and daily reports of numbing were stronger. There was a marginally significant interaction of numbing and within-person drinking in line with the interactions described for re-experiencing and avoidance ($p = .08$).

Arousal—Models assessing agreement of daily and retrospective arousal (including moderators) had pseudo- R^2 values of .47 (gender model), .52 (age model), and .46 (alcohol model), and found significant main effects for arousal, age, and both alcohol variables but no significant main effect for gender or significant interactions.

Discussion

This study used a daily monitoring format with follow-up to assess the stability of PTSD symptoms, level of agreement between retrospective and daily reports of PTSD, and possible moderators of that agreement in a sample of dually-diagnosed (PTSD/AUD) treatment-seeking individuals. In general, individuals reported higher levels of symptoms for total PTSD and the PTSD clusters in retrospective reports compared to daily reports. Although the differences between the clusters within each of the measurement types were modest, on retrospective reports, participants reported highest average levels of re-experiencing symptoms, while on daily reports, numbing symptoms were highest. This suggests that there may be some differences in how symptoms are recalled over the previous 24 hours versus over the past month.

To date, limited research exists on the day-to-day variability of PTSD symptoms, which may influence symptom recall (e.g., Stone et al., 2005). In our sample, participants' average daily fluctuations of symptoms ranged from 14.99% for arousal to 23.87% for avoidance. This notable daily variability suggests that there is appreciable symptom instability for many individuals with PTSD, particularly regarding avoidance. Moreover, we found that avoidance symptoms were significantly more unstable than re-experiencing and arousal symptoms, but not significantly more unstable than numbing symptoms. This finding may indicate that despite the long-standing conceptualization of numbing symptoms as being especially stable (Feeny, Zoellner, Fitzgibbons, & Foa, 2000), among individuals with co-occurring PTSD and AUD, numbing and avoidance symptoms are instead among the more unstable symptoms of PTSD. Additionally, participants' arousal symptoms were significantly *more* stable than all other symptom types. This was an unanticipated finding, not produced in Naragon-Gainey et al., (2012). It may be that the particular arousal symptoms assessed on the daily level in this study (e.g., anger, difficulty concentrating, startle response, hypervigilance) have a more trait-like function in this dually-diagnosed

population. These results help to shape our characterization of PTSD symptom profiles as variably unstable (avoidance, numbing) and stable (arousal).

Based on the prior literature (e.g., Naragon-Gainey et al., 2012; Stone et al., 2005), our primary study hypotheses were that avoidance symptoms would show the lowest concordance between retrospective and daily assessments while arousal would have the highest concordance. We did, indeed, find that avoidance had the lowest agreement between daily and retrospective reports. As noted in the Results, avoidance was highly unstable, which may help explain why participants had more difficulty accurately recalling these symptoms retrospectively than the others. Alternatively, poor agreement between daily and retrospective recall may exist because avoidance behaviors make it difficult to recall avoidance itself.

Although we hypothesized that hyperarousal would have highest concordance between daily and retrospective reports, we found that numbing had the best agreement, followed closely by re-experiencing. The high level of concordance in reports of re-experiencing may suggest that patients better recall more salient or emotionally intense symptoms (see also Ben-Zeev et al., 2012). However, salience would not likely explain high correspondence in reports of numbing, as these symptoms tend not to punctuate daily experience in the same way as re-experiencing symptoms. Nonetheless, it may be that feeling “bothered” by an inability to enjoy activities or have loving feelings, or feeling disconnected from others, may be emotionally salient when compared to prior emotional functioning. Thus, though speculative, it is possible that because numbing symptoms often arise in response to situations, such as interpersonal conflict, life stress, or activities that “should be” enjoyable, they stand out in both daily and prior month recall. Additionally, because numbing symptoms were quite variable day-to-day, it is unlikely that stability facilitates their recall. Future research should replicate these findings and evaluate potential explanations for how a low-intensity and highly variable set of symptoms could have good agreement across daily and retrospective assessments.

Additional hypotheses addressed the role of participant characteristics in altering the association of daily and retrospective reports of PTSD symptoms. Depression and treatment condition did not affect daily PTSD symptoms *or* moderate of the association of retrospective and daily PTSD. Men reported higher daily levels of re-experiencing and avoidance symptoms, and although Krenke et al., (2016) found that gender moderated correspondence of daily and retrospective drinking reports, we did not find similar effects for any symptom cluster. Age was significantly associated with daily avoidance and arousal symptoms, with older participants reporting higher daily levels of both symptoms, relative to younger participants. While we did not find that age, gender, or depression moderated the agreement of daily and retrospective reports of PTSD, we encourage future research on these moderating variables when exploring discrepancies in other types of symptom reporting, as they are likely not unique to PTSD.

Regarding alcohol consumption, analyses revealed notable main effects and interactions. First, on days that participants drank more than their average level, they experienced higher levels of all PTSD symptoms. Moreover, participants who drank more than the sample

average also reported higher levels of avoidance and numbing symptoms. In contrast to findings in Naragon-Gainey et al., (2012)², alcohol consumption also weakened the agreement of daily and retrospective reports of re-experiencing and avoidance (with a trend toward influencing associations between daily and retrospective reports of numbing).

These results are clinically useful in understanding the potential differences in representativeness of daily and retrospective PTSD reports for individuals also struggling with elevated alcohol use. It is also interesting that this effect of alcohol was only found for the re-experiencing and avoidance symptom clusters. Although we have no firm explanation for this, it is possible that heavier than usual alcohol consumption was the result of elevations in these hallmark PTSD symptoms on certain days (potentially to cope with these symptoms, e.g., Simpson et al., 2014). Indeed, as our sample had largely experienced numerous traumas per person, and daily reports did not require responding about the same index trauma each time, the frequency of intense re-experiencing and avoidance symptoms seems likely. Use of such a coping strategy may mean that such days were not completely accounted for in retrospective recall. Thus, although this interpretation is speculative, days with worse re-experiencing and avoidance symptoms *and* more drinking than is typical may not have been well encoded and subsequently may have been more poorly recalled. An alternative explanation may be that arousal symptoms are so stable that alcohol use does not influence agreement of daily and retrospective recall. Future research elucidating these subtle associations would be useful.

Study Strengths and Limitations

This study is notable for its ability to measure concordance of daily and retrospective reports of PTSD symptoms over precisely the same time frame, in a clinical sample, using sophisticated statistical analyses such as MLM and RMSSD scores. Additionally, the roughly equal proportion of males and females, the mixture of veteran and civilian participants, and the diversity of trauma types, are strengths of the sample. However, there are important limitations to note. All participants were part of a treatment study, and thus there may be some effects of treatment influencing both daily and retrospective reports of PTSD symptoms. Notably, treatment condition was unassociated with differences in daily and retrospective PTSD reports at the bivariate level, did not alter pseudo R^2 values, did not moderate the association of daily and retrospective PTSD or individual symptom clusters, and thus does not appear to have been influential overall. Second, we did not assess all 17 symptoms of PTSD on the daily level, and trimmed the symptoms included in the retrospective measure to directly match the daily assessment. While we selected symptoms most likely to vary on a daily basis, it remains possible that omitted symptoms could have influenced the level of concordance between daily and retrospective reports. Indeed, levels of agreement between daily and retrospective reports were generally lower for our sample than for participants in Naragon-Gainey and colleagues' (2012) study, where all 17

²It is possible that Naragon-Gainey et al., (2012) found null effects for alcohol because their sample had elevated rates of drinking, but may not have met criteria for AUD and/or had subclinical levels of PTSD. Additionally, their analyses did not separate within- and between-person variability in drinking and only assessed drinking moderating total PTSD symptom concordance. Had we conducted our analyses in the same way (e.g., not separated within and between person drinking variance and done moderation analyses for each separate symptom cluster), we would not have discovered the effect of within-person variability in drinking on daily/retrospective re-experiencing and avoidance symptom concordance.

symptoms were assessed, though it is impossible to know whether this is due to omitted PTSD symptoms, or previously noted differences between the samples.

Third, the psychometric reliability of the arousal cluster of PTSD symptoms was particularly weak. While the baseline and midpoint assessments of arousal were at acceptable levels, the follow-up assessment used for these analyses demonstrated poor reliability, which was also reflected in the within-person (though not between-person) daily reliability. It is possible that the treatment interventions had an effect on some but not other arousal symptoms, thereby affecting the degree to which these subscale items are internally consistent with one another, though other plausible explanations may exist. Moreover, 27 participants completed baseline assessments and then either left the study prior to the intervention, did not provide adequate IVR data prior to the follow-up assessment, or did not complete the follow-up assessment. As described in the Participants section, those who were included in our analyses had higher levels of PTSD symptoms and fewer baseline days drinking than those who were not included. Thus, they differed from participants who only completed baseline assessments, and the results may better generalize to those with PTSD as a primary diagnosis and milder levels of alcohol use.

It is also important to note, however, that participants were selected at baseline for clinically significant levels of both PTSD and alcohol consumption, and thus the results may not generalize to subclinical or non-dually diagnosed individuals, or perhaps more impaired dually-diagnosed individuals, given participants' ability to complete an intensive, multi-phase study. Nonetheless, the prevalence of comorbid alcohol misuse in those with PTSD has been shown to be anywhere from 9.8% to 61.3% (Debell et al., 2014), so these results may in fact generalize to many survivors of trauma with problematic drinking. Although we used DSM-IV-TR criteria for Alcohol Dependence in recruiting our sample (and thus participants would meet criteria for moderate to severe AUD in the DSM-5), these findings may be attenuated in future studies that assess and distinguish mild, moderate, and severe AUD.

Fourth, as the assessment method was purely self-report, we were unable to ascertain whether instability shown in the RMSSD metric was due to instability in self-report or instability in symptoms. Although continuously gathering physiological data may give us more information about the instability of certain symptom clusters, such as physiological arousal, even such an intensive method would not provide important data on perception of emotional state, and may be so intrusive as to render it ecologically invalid. Additionally, although participation in a daily monitoring exercise may have affected the frequency or severity of PTSD symptoms, prior daily monitoring studies of PTSD symptoms have not found this to be the case (Dewey et al., 2015). Finally, the study was conducted using DSM-IV-TR criteria for PTSD. DSM-5 criteria have added two symptoms in the "negative alterations in cognitions and mood" cluster: "persistent and distorted blame of self or others" and "persistent negative emotional state." Both suggest strong symptom stability, which would be carefully assessed in a clinical interview. However, in the PCL for DSM-5, neither of those symptom prompts includes reference to persistence, likely because persistence is built into the upper end of the response scale. Thus, symptoms conceptualized by the makers of the DSM-5 as stable may still be assessed as unstable with our current measures, which

would impact agreement of daily and retrospective reports. Similarly, the DSM-5 criterion of risky or harmful behavior in the arousal cluster is the most distinctly behavioral of the arousal symptoms. Given research showing that daily reports of risky sex and alcohol use were higher than retrospective reports (e.g., Leigh, 2000; McAuliffe et al., 2007) this behavioral criterion may also contribute to discrepancies in daily and retrospective reports.

The findings have potentially useful clinical implications in spite of the noted limitations. First, clinicians should be aware that for individuals with co-occurring PTSD/AUD, retrospective reports of PTSD may not be as representative of their daily experience of PTSD as may be found in other groups, though additional research involving people with PTSD who do not have co-occurring AUD is needed to address this issue. Review of mean levels of symptoms (Table 2) suggests that alcohol-dependent individuals may retrospectively over-report most PTSD symptom clusters relative to their daily experience of PTSD. This may be particularly useful when considering the standard diagnostic interviews to assess PTSD, which rely solely on an individual's memory of their symptoms in the last month. For individuals who are dually-diagnosed with AUD, additional corroborating reports may be useful, and though daily data collection is an inappropriate addition to a diagnostic interview, a timeline follow-back method may be useful for situating behavioral symptoms such as nightmares and risk-taking behaviors.

Moreover, in our study, pseudo- R^2 estimates for models without covariates ranged from .38-.56, whereas in Naragon-Gainey et al., (2012), pseudo- R^2 estimates ranged from .55-.76, suggesting that agreement was markedly weaker in our sample.³ Although mean levels suggest generally good agreement (with retrospective scores anywhere from 2–16% higher than daily scores, depending on the cluster), pseudo- R^2 estimates are weak- to moderate in this sample. If significant change on the PCL is identified by a 6% decrease, and clinically meaningful change is identified by a 12% decrease (Monson et al., 2008), then the discrepancies highlighted by the pseudo- R^2 statistics are both significant and clinically meaningful. These discrepancies highlight the advantages of using MLMs since simple mean comparison may obscure the between-person differences in concordance of daily and retrospective symptom reports.

These results may also be particularly relevant to treatment, where useful clinical dialogue could result from the knowledge that patients may experience milder symptom levels on a day-to-day basis relative to their “gestalt” retrospective perception of their symptoms. In particular, for patients who have come to strongly identify with a PTSD diagnosis (e.g., Frueh et al., 2005), exploring the notion that daily experience may not be as severe as retrospective recall of symptoms may foster some psychological flexibility around the concept of PTSD. Similarly, understanding that many PTSD symptoms show substantial day-to-day variability (at least in this sample) may highlight for patients the degree to which symptoms are mutable, rather than fixed, thereby helping to challenge beliefs in symptom permanence that are associated with PTSD chronicity (e.g., Dunmore, Clark, & Ehlers,

³The weak pseudo- R^2 estimates in this sample may seem surprising when compared with the relatively similar mean POMP values shown in Table 2. However, the MLMs provide better estimates of agreement than simple ocular inspection of mean POMP values, as MLMs account for missing daily data using maximum likelihood estimation, where simple mean estimates do not.

2001). These findings also suggest the utility of keeping daily PTSD symptom logs for at least a portion of treatment for PTSD (either in addition to AUD or not) so that both patient and clinician have more accurate information to support initial and ongoing treatment planning. Ascertaining the degree to which daily symptom logs versus retrospective symptom reports are associated with indices of general functioning/impairment (e.g., days of missed work, engagement with social network, healthcare utilization) would also be useful for treatment monitoring and evaluation, and future studies should include measures of psychosocial impairment to gather more data on this issue.

Indeed, recently developed free applications for smart phones (e.g., Mood Tracker; T2, National Center for Telehealth and Technology) enable users to track and graph daily psychological symptoms using brief and user-friendly symptom measures (which can be tailored by the clinician/patient), and could be easily adapted to monitor basic domains of psychosocial functioning. These applications provide a visual and quantitative measure of daily symptoms to compare to retrospective reports and to allow more nuanced assessment of how daily stressors are associated with PTSD symptom fluctuations. In sum, these applications (or simple paper-and-pencil logs combined with electronic spreadsheets in clinicians' offices) could provide useful information about treatment response or potential impediments to improvement. Although patients are unlikely to respond with 100% compliance, this study provides evidence that daily monitoring practices aid our characterization of PTSD symptoms, and if this practice is combined with simpler, more accessible tools, the benefits could be maximized.

Conclusions

In conclusion, our findings suggest that retrospective reports of PTSD symptoms, particularly avoidance and arousal symptoms, should be treated cautiously in individuals with co-occurring PTSD/AUD. The degree of correspondence of retrospective and daily reports of these two symptom clusters was particularly weak, relative to reports of re-experiencing and numbing symptoms. Moreover, alcohol use influenced the correspondence of re-experiencing and avoidance retrospective and daily self-reports. These findings build on prior work by Naragon-Gainey et al., (2012) and Preibe et al., (2013) to add nuance to our understanding of daily PTSD symptom presentation. Future research exploring discrepancies between daily and retrospective symptom reports in other samples (e.g., recently diagnosed PTSD) or with additional moderators (e.g., quality/quantity of sleep, presence of TBI, co-occurring borderline personality disorder, chronic pain) will be useful in further describing this phenomenon.

Additionally, future work should evaluate whether poor symptom recall is associated with poorer treatment outcomes or functional impairment. For example, if patients are unable to accurately recall arousal and avoidance symptoms for the past month, they may not be as motivated to work on them, or clinicians may not select treatment strategies that adequately address these issues. Although it remains to be seen whether discordant daily and retrospective symptom assessments are associated with challenges engaging in and benefiting from treatment, this line of inquiry could help the PTSD field further strengthen approaches to measurement-based treatment. Previous studies have suggested that daily

monitoring of PTSD symptoms has no adverse effect (e.g., Dewey, et al., 2015), and such assessments may complement the standard weekly symptom assessments that already form a critical component of existing evidence-based treatments for PTSD (e.g., Cognitive Processing Therapy; Resick, Monson, & Chard, 2007; Prolonged Exposure Therapy; Foa, Hembree, & Rothbaum, 2007). Incorporating discussion of symptom report discrepancies and modifiable lifestyle factors that influence such discrepancies (e.g., alcohol consumption) may enrich clinical conversations about the lived experiences and possible treatment targets of individuals suffering from PTSD.

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Highlights

Daily and retrospective reports of emotional distress are frequently discrepant.

Increased alcohol use weakens agreement of daily and retrospective reports of PTSD.

Avoidance and arousal symptoms have poor agreement across assessment types.

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Table 1

Demographic Characteristics of Sample (N = 65)

Characteristic	<i>M(SD)</i>
Age	45.20 (11.78)
	N (%)
Female	34 (52.3)
Ethnicity	
African American	28 (43.1)
Asian American	1 (1.5)
Hispanic	3 (4.6)
Native American	2 (3.1)
White	26 (40.0)
Other	3 (4.6)
Multiple	2 (3.1)
Veteran Status	17 (26.2)
Housed	49 (75.4)
Employed full or part time	11 (16.9)
Married or partnered	8 (12.3)
Education	
Less than high school	12 (18.5)
High school graduate	10 (15.4)
Some college	43 (66.2)

Table 2

Descriptive Statistics

	<i>Mean</i>			<i>SD</i>	α^a
Scale	Raw	POMP	Raw	POMP	Btw-person (W/in-person)
<i>Retrospective PCL scores</i>					
Total	2.65	41.14	.83	20.79	.88
Re-experiencing	2.76	43.88	1.01	25.23	.86
Avoidance	2.56	39.04	1.05	26.36	.92
Numbing	2.70	42.50	1.22	30.47	.90
Arousal	2.61	40.18	.81	20.27	.56 ^b
<i>Mean Daily PCL Scores</i>					
Total	3.00	37.52	1.78	22.24	.92 (.83)
Re-experiencing	3.04	37.99	2.32	29.10	.85 (.73)
Avoidance	3.05	38.14	2.45	30.61	.83 (.76)
Numbing	3.11	38.87	2.37	29.57	.89 (.80)
Arousal	2.87	35.83	1.63	20.40	.76 (.51)
<i>Mean Instability in Daily Scores (RMSSD)</i>					
Total	1.05	13.18	.54	6.75	
Re-experiencing	1.58	18.25	.85	10.99	
Avoidance	1.86	23.87	.98	14.04	
Numbing	1.57	19.87	.78	9.81	
Arousal	1.15	14.99 ^c	.51	6.49	

Note. POMP: percent of maximum possible. PCL: PTSD Checklist. RMSSD: root mean square successive difference score.

^aDaily reliability calculated using variance composition method (Cranford et al., 2006).

^bCronbach's alpha for the arousal subscale of the retrospective PCL was .75 at baseline and .71 at mid-point. Daily PCL was scored on 0–8 Likert scale while retrospective PCL was scored on 1–5 scale.

Table 3

Results of Multilevel Models Predicting Mean Daily PTSD Symptoms

Model	Total PTSD		Re-experiencing		Avoidance		Numbing		Arousal	
	<i>T</i>	<i>se (T)</i>	<i>T</i>	<i>se (T)</i>	<i>T</i>	<i>se (T)</i>	<i>T</i>	<i>se (T)</i>	<i>T</i>	<i>se (T)</i>
1.	.64 ^{***}	.08	.64 ^{***}	.08	.53 ^{***}	.09	.57 ^{***}	.06	.50 ^{***}	.08
2.										
PTSD	.65 ^{***}	.10	.71 ^{***}	.10	.57 ^{***}	.10	.57 ^{***}	.08	.45 ^{***}	.10
Gender	6.96 [*]	3.01	8.02 [*]	3.77	10.51 [*]	4.31	6.64	3.80	4.57	2.98
PTSD × Gender	-.04	.15	-.17	.15	-.16	.17	-.02	.13	.12	.15
3.										
PTSD	.65 ^{***}	.07	.66 ^{***}	.08	.54 ^{***}	.08	.57 ^{***}	.06	.51 ^{***}	.07
Age	.31 [*]	.13	.26	.17	.44 [*]	.19	.22	.16	.34 ^{**}	.12
PTSD × Age	.01	.01	-.00	.01	.00	.01	.01 [^]	.01	.01	.01
4.										
PTSD	.58 ^{***}	.08	.60 ^{***}	.08	.47 ^{***}	.08	.49 ^{***}	.07	.44 ^{***}	.09
W/I ETOH	1.10 ^{***}	.22	1.13 ^{***}	.23	1.11 ^{***}	.26	1.26 ^{***}	.29	.92 ^{***}	.21
B/w ETOH	.92	.64	.90	.66	1.54 ^{**}	.58	1.81 [*]	.77	.85	.60
PTSD × W/I ETOH	-.01	.01	-.03 ^{**}	.01	-.02 [*]	.01	-.02 [^]	.01	-.00	.01
PTSD × B/w ETOH	-.01	.02	-.00	.81	-.03	.03	-.02	.02	-.01	.02

Note.

p < .001;**
p < .01;*
p < .05;^
p = .08.

PTSD: Posttraumatic Stress Disorder. ETOH: daily alcohol consumption. Model 1: retrospective PTSD as sole predictor of daily PTSD. Model 2: Interaction of PTSD and Sex. Model 3: Interaction of PTSD and Age. Model 4: Interaction of PTSD, within-person, and between-person alcohol. Raw scores were first converted to percentage of maximum possible metric. Level 2 predictors were grand mean centered, and Level 1 predictors were person mean centered.