Research Report

European Addiction Research

Eur Addict Res 2015;21:71–77
DOI: 10.1159/000365283

Received: February 10, 2014
Accepted: June 17, 2014
Published online: November 19, 2014

Screening of Current Post-Traumatic Stress Disorder in Patients with Substance Use Disorder Using the Depression, Anxiety and Stress Scale (DASS-21): A Reliable and Convenient Measure

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Key Words
Screen · Assessment · Post-traumatic stress disorder · Substance use disorder · Depression, Anxiety and Stress Scale

Abstract
Background: Several instruments have been developed and validated as screens for post-traumatic stress disorder (PTSD) in substance use disorder (SUD) patients. Unfortunately, many of these instruments have one or several disadvantages (e.g. low specificity, low sensitivity or high costs). No research has been conducted on instruments that screen simultaneously for other psychiatric disorders, which would be a potentially time-saving and cost-effective approach. In the current study we tested the psychometric properties of the Depression, Anxiety and Stress Scale (DASS) as a screen for PTSD. ***Methods:*** The DASS was assessed in an inpatient facility during intake with 58 patients and again 4 weeks after admission. Another 138 patients were assessed 4 weeks after admission only. The results were compared to the Clinician-Administered PTSD Scale (CAPS) that was also administered after 4 weeks of abstinence. ***Results:*** ROC curve analyses showed an area under the curve of 0.84 for the DASS at intake and 0.78 for the DASS after 4 weeks' abstinence. ***Conclusion:*** The DASS is therefore a reliable and convenient measure to use as a screen for PTSD in SUD patients.

Introduction

The high rate of co-occurrence of post-traumatic stress disorder (PTSD) with substance use disorder (SUD) is well established [1]. In SUD inpatients, the prevalence rate of current PTSD ranges from 25 to 51% [2–5]. In SUD outpatients, prevalence rates between 8 and 27% have been found [6–8].

Although highly prevalent, the detection rate of PTSD in SUD treatment settings is low [4]. Assessment of PTSD has long been the domain of general mental health care, with SUD treatment professionals reluctant to assess PTSD for fear of opening 'Pandora's box', i.e., evoking intense emotion associated with trauma [9]. Additional difficulties in the assessment of PTSD in SUD patients include the influence of active substance use or withdrawal on PTSD symptoms and patients' hesitance to discuss trauma-related subjects due to shame and guilt [10]. Men,

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1022–6877/14/0212–0071$39.50/0

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for example, may underreport some traumatic experiences, such as sexual or physical abuse, if they perceive these to violate their image of masculinity [11].

Also, in general, there seems to be a greater focus on co-occurring psychiatric diagnoses in SUD patients for which effective pharmacotherapy is available, or in which the relationship with SUD is better understood than for PTSD (e.g. major depression) [10]. The low level of detection of PTSD and therefore the lack of proper treatment has important clinical implications as SUD patients with concurrent PTSD show worse treatment outcomes than patients with either disorder alone [6, 12, 13], and addiction severity in patients with SUD and PTSD is higher than in patients with SUD alone [5].

Screening instruments have been developed to increase the detection rate of PTSD in SUD patients. Examples of these are the Primary Care Posttraumatic Stress Disorder questionnaire (PC-PTSD) [4, 14], the PTSD Checklist (PCL) [15], the Impact of Events Scale (IES) [16], the Trauma Screening Questionnaire (TSQ) [17] and the Self-Rating Inventory for PTSD (SRIP) [18]. The choice of which instrument to use can be based on a variety of attributes, for example, the psychometric properties, ease of use (such as length of assessment time), and the availability in the public domain. Thus far, three screening instruments for PTSD have been validated in SUD patients in the Netherlands: the SRIP, the PTSD section of the MINIplus and the PC-PTSD. The SRIP and the MINIplus have been validated in an inpatient population after a few weeks' abstinence. The SRIP showed good psychometric properties (area under the curve, AUC, of 0.84; sensitivity of 0.80 and specificity of 0.73) [19]. The MINIplus did not perform well as a screen and showed a sensitivity of 0.58 and specificity of 0.91 [19]. The assessment time of both instruments is relatively short, approximately 5 min. The SRIP, however, is not available in the public domain and each assessment costs money. The PC-PTSD has been validated in a Dutch SUD population during outpatient intake procedures which yielded a sensitivity of 0.86 and specificity of 0.58 [14]. Furthermore, it has recently been altered, leading to better diagnostic efficiency (sensitivity 0.87 and specificity 0.75) [8]. However, although there are several instruments that could be used in clinical practice, the reality is that time and resources become more and more limited due to budget cuts and reorganizations. Thus, the idea of a screening instrument that is free to use, short in assessment time and can be used to screen for more than one disorder is appealing. In the current study we investigated the performance of the Depression, Anxiety and Stress Scale (DASS-21), the screening instrument by default for depression, anxiety and stress symptoms in SUD patients in the Netherlands [20, 21].

Symptoms of PTSD show at least some overlap with depression, anxiety and stress (e.g. a diminished sense of the future, conditioned fear of situations, hyperarousal) [22]. Furthermore, depression and anxiety are often part of the symptom profile of complex PTSD [23–25]. Therefore, a quick assessment of depression, anxiety and stress symptoms could be a convenient and reliable way to assess the risk of PTSD in SUD patients. The DASS is free to use, relatively short (21 items) and has good internal consistency, construct validity and criterion validity [26, 27]. In addition, a major advantage is that it can simultaneously screen for anxiety and depression.

In the current study we tested the psychometric properties of the DASS-21 as a screen to determine which patients are at risk for current PTSD in a sample of SUD patients during intake procedures and a larger sample of SUD inpatients 4 weeks after their admission. This last group was thus at least 4 weeks abstinent from substances. The DASS was compared with the gold standard measure for PTSD, the Clinician-Administered PTSD Scale (CAPS) [28]. A second objective was to determine whether screening for PTSD at two consecutive time points might increase the detection rate of SUD patients with comorbid PTSD.

Methods

Design

Our objective is to validate the DASS as a screen for PTSD, using both cross-sectional and longitudinal approaches. The data are drawn from a larger prevalence study for PTSD that addressed the psychometric properties of the SRIP and the MINIplus as PTSD screening tools [19].

Participants

The study was conducted from 2008 to 2010, and was approved by the local medical ethics committee (METC/11270.haa). Study participants were 263 patients admitted consecutively to one of four different inpatient SUD treatment facilities in the Netherlands between 2008 and 2011. Inclusion criteria were: (1) current SUD per DSM-IV criteria, and (2) capable of speaking Dutch. Exclusion criteria were: (1) severe cognitive impairment, (2) severe self-destructive behaviour, defined as patients that are known to self-mutilate or have suicidal tendencies as assessed during intake, and (3) his or her practitioner did not approve the patient's participation. Of the 263 eligible patients, 8 were excluded based on exclusion criteria, 53 refused to participate and 5 did not complete all the interviews and were therefore excluded from the analyses. These patients will be referred to as the non-participants (n = 66). The DASS was also administered at admission in one of the treatment centres. These data were collected for the patients in this treatment centre (n = 58).

Measures

Depression, Anxiety and Stress Scale. The DASS-21 is a 21-item self-report questionnaire designed to measure the severity of depression, anxiety and stress symptoms. It was derived from the original 42-item DASS [21]. Each subscale consists of 7 items that are scored from 0 (did not apply to me at all) to 3 (applied to me very much, or most of the time) for the week preceding the interview. The item scores are summed and then multiplied by 2 to obtain total scores that can be compared to the original DASS-42 [29]. In non-clinical samples, the internal consistency, reliability and validity were found to be strong [21]. The three subscales have been supported by factor analysis and internal consistency in a psychiatric clinical group [30]. Strong support for an underlying model of negative emotionality has recently been found in the short version of the DASS in a sample of adolescents [31]. The Dutch version of the DASS has been validated in an occupational health setting, showing high internal consistency of the subscales with Cronbach's α of 0.94 (depression), 0.88 (anxiety) and 0.93 (stress). Construct validity was supported by moderately high correlations of the DASS with indices of divergent validity ranging from –0.22 to 0.07 [26]. It has also been validated in a population of students and psychiatric patients in which support was found for convergent and divergent validity [27].

Clinician-Administered PTSD Scale. Hovens et al. [32] translated the CAPS [28] into Dutch. It is the most widely used and rigorously structured interview for the diagnosis and severity of PTSD. Both the original and the Dutch CAPS have strong psychometric properties, with interrater reliability between 0.92 and 1.00 and internal consistency of 0.89 [18, 33]. The interview identifies a trauma and ratings of the 17 symptoms of PTSD in relation to it (using DSM-IV-TR criteria). Each symptom is rated on a 5-point scale for frequency of the symptom's occurrence and intensity (e.g., distress or functional impairment).

Self-Rating Inventory for PTSD. The SRIP [34] is a Dutch self-report questionnaire of PTSD symptoms. Twenty-two items are rated on a 4-point frequency scale, with three subscales per the DSM-IV symptom clusters re-experiencing (B), avoidance (C) and hyperarousal (D). The internal consistency has been found to be 0.92 [34]. Convergent validity has also been tested, comparing the SRIP to the results of the Mississippi PTSD Scale [35] and the IES [16]. Intercorrelation with the Mississippi PTSD Scale was high (0.82) and moderate with the IES (0.69). For criterion validity the Dutch version of the CAPS was used, which resulted in a recommended cut-off score of 52, and sensitivity and specificity of 0.86 and 0.71, respectively, in a psychiatric population [34], and a cut-off score of 48 in an SUD inpatient population [19].

Procedure

The study was performed in inpatient settings. Before the interview, written informed consent was obtained. All research assistants had a bachelor's or master's degree in psychology. For patients, 4 weeks of abstinence was required before the interview to control for withdrawal symptoms. Therefore, the interview took place 4 weeks after admission. The SRIP was administered to all patients in the participating facilities during the research period. The SRIP of non-participating patients was used to compare them with the study participants to evaluate possible selection bias. The data from the DASS that was administered during intake were collected after inclusion.

Table 1. Comparison of participants and non-participants

	Participants (n = 196)	Non-participants (n = 59)		p
Gender, % men	75.1	81.3	$\chi^2 = 1.235$	0.353
Age	38.7±12.6	37.3±13.5	t = 0.598	0.551
SRIP total	46.8±13.3	45.7±4.0	t = 0.540	0.589
SRIP intrusion	11.9±4.4	11.4±5.3	t = 0.697	0.486
SRIP avoidance	19.8±5.9	19.0±5.6	t = 0.882	0.38
SRIP hyperarousal	15.2±4.6	15.3±4.5	t = –0.208	0.836

Percent or mean ± SD.

Analyses

χ^2 and t tests were used to compare baseline characteristics between participants and non-participants. Descriptive statistics were conducted on sociodemographic variables and PTSD prevalence on the CAPS.

Mean scores and standard deviations were calculated for the DASS and its subscales assessed during intake (DASS 1) and 4 weeks after admission (DASS 2) for the 58 participants for whom these data were available. The DASS 2 scores for the 58 participants were compared to the scores of the other 138 participants that only filled in the DASS 2 with a t test.

Correlational analyses were then used to evaluate the association between the DASS and its subscales with the CAPS. To determine a cut-off score for the DASS, receiver operating characteristic (ROC) analyses were conducted for the two different time points, i.e. during intake and after 4 weeks of abstinence with 58 study participants. In case there were no significant differences between the 58 participants and the other participants at the second time point, a ROC curve was also produced for the whole sample at the second time point. Finally, sensitivity, specificity, positive predictive power, negative predictive power and overall efficiency were calculated for the DASS 1 and DASS 2 for different cut-off points. Sensitivity and specificity for the two time points combined were calculated as follows: If a patient screened positive on either time point, he or she was considered PTSD-positive for the combined analysis of the two time points. If a patient screened negative on both time points, he or she was considered PTSD-negative. High sensitivity will be preferred over high specificity, because a positive screening will be followed by assessment with a clinical interview.

Results

We were able to collect the data for the SRIP from 59 of the 66 non-participants. Comparison of participants and non-participants yielded no significant differences on gender, age, SRIP total score or its subscales (table 1). Sociodemographic characteristics of the study participants are shown in table 2. PTSD prevalence as deter-

Table 2. Characteristics of the study population (n = 196)

Sociodemographics	
Gender, % male	75.1
Mean age ± SD	38.7±12.6
Marital status, %	
Married/cohabitating	19
Single	63
Divorced/widowed	18
Education, %	
No education, primary school	7.7
Secondary school, lower level	31.4
Secondary school, higher level	46.9
Postsecondary	13.9
Primary substance of abuse[1], %	
Alcohol	46.6
Cocaine/amphetamines	22.5
Cannabis	10.5
Opiates	3.1
Polysubstance	8.4
Other	8.9

[1] Measured by EuropASI.

Table 3. DASS scores at intake (DASS 1) and after 4 weeks' abstinence (DASS 2)

	DASS 1 (n = 58)	DASS 2 (n = 58)	t	p
Total score	53.6±26.9	41±24.6	3.144	0.003
Depression subscale	20.3±11.9	13.6±10.6	3.55	0.001
Anxiety subscale	13.4±10.1	10±8	2.476	0.016
Stress subscale	19.9±9.6	17.4±10.1	1.581	0.119

Mean ± SD.

Table 4. Comparison of DASS 2 scores for patients assessed at both time points versus those assessed only at time 2

	DASS 2 (n = 58)	DASS 2 (n = 138)	t	p
Total score	41±24.6	41.5±28.2	0.125	0.901
Depression subscale	13.6±10.6	12.6±11.1	0.576	0.565
Anxiety subscale	10±8	11.1±9.7	0.771	0.442
Stress subscale	17.4±10.1	17.9±10.9	0.242	0.809

Mean ± SD.

mined with the CAPS was 25.4% current and 46.2% lifetime. All patients diagnosed with PTSD had the disorder prior to intake and none developed a new PTSD diagnosis between the two assessments.

Mean scores for the DASS and its subscales for the 58 patients at the two time points are presented in table 3. The scores of these 58 patients compared to the other 138 patients at the second time point are presented in table 4. There were no significant differences between the two groups.

Correlational analyses showed that the strongest relationship existed between the total score for current PTSD symptoms on the CAPS and the total score on DASS 2. See table 5 for all correlations.

ROC analyses were calculated for the DASS administered during intake (n = 58) and 4 weeks after admission (n = 58). This yielded an AUC of 0.837 (CI: 0.719–0.955) for the DASS during intake, and an AUC of 0.759 (CI: 0.618–0.900) for the DASS after 4 weeks of abstinence (fig. 1). A third ROC curve for all the 196 patients at DASS 2 showed an AUC of 0.793 (CI: 0.708–0.878; fig. 2).

Several cut-off scores were tested for the total DASS 1 score using the presence of PTSD at the second time point as a reference (table 6). The best cut-off score was 66, with a sensitivity of 0.79 and specificity of 0.78. With this cut-off score the overall efficiency was 0.78. The same analyses were performed with the data from the DASS 2. A cut-off score of 44 resulted in the highest overall efficiency and the best balance between sensitivity (0.80) and specificity (0.70). Of the 58 patients who completed the DASS during intake, 14 met the criteria for PTSD. A total of 11 were correctly classified as such with the DASS 1. When the score on the DASS 2 was also used 2 more patients were classified correctly. Using both the DASS 1 and DASS 2 to screen for PTSD yields a sensitivity of 0.93 and a specificity of 0.71.

Table 5. Association between the DASS and CAPS (Pearson's r)

	Current PTSD symptoms (CAPS)
DASS 1 total	0.50 ($p < 0.001$)
DASS 1 depression	0.41 ($p = 0.001$)
DASS 1 anxiety	0.34 ($p = 0.009$)
DASS 1 stress	0.54 ($p < 0.001$)
DASS 2 total	0.55 ($p < 0.001$)
DASS 2 depression	0.46 ($p < 0.001$)
DASS 2 anxiety	0.53 ($p < 0.001$)
DASS 2 stress	0.45 ($p < 0.001$)

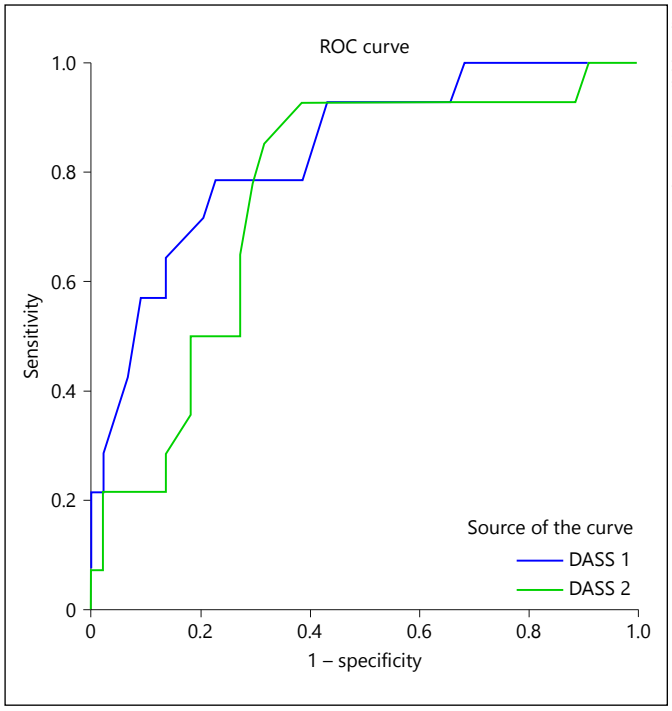

Fig. 1. ROC curve illustrating the ability of the DASS to discriminate patients with PTSD from patients without PTSD. DASS 1 is assessed at intake (n = 58), DASS 2 is assessed after 4 weeks' abstinence (n = 58). Diagonal segments are produced by ties.

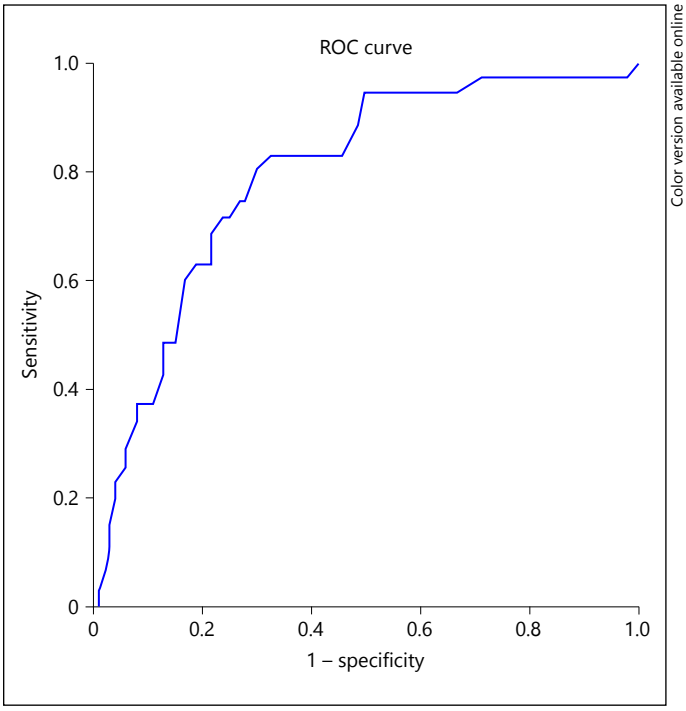

Fig. 2. ROC curve illustrating the ability of the DASS 2 (n = 196) to discriminate patients with PTSD from patients without PTSD. Diagonal segments are produced by ties.

Table 6. Diagnostic efficiency of the DASS at intake (DASS 1, n = 58) and after 4 weeks of abstinence (DASS 2, n = 138) compared to the CAPS

	Cut-off score	Sensitivity	Specificity	PPP	NPP	Efficiency
DASS 1	50	0.93	0.56	0.39	0.96	0.64
	66	0.79	0.78	0.52	0.92	0.78
	68	0.71	0.80	0.52	0.9	0.78
DASS 2	38	0.86	0.61	0.42	0.93	0.67
	40	0.86	0.65	0.45	0.93	0.70
	42	0.84	0.68	0.47	0.92	0.72
	44	0.80	0.70	0.48	0.91	0.73
	46	0.71	0.72	0.47	0.88	0.72

PPP = Positive predictive power; NPP = negative predictive power.

Discussion

We evaluated the psychometric properties of the DASS as a screen for PTSD in a sample of SUD inpatients (n = 196, of whom a subsample of 58 completed the DASS at both intake and 4 weeks after admission). Results indicate that the DASS has good psychometric properties in screening for PTSD in SUD. The psychometric properties are comparable to those of a PTSD screen, the SRIP, that was recently studied [19]. The AUC in case of the SRIP (see Introduction) was slightly higher than the AUC of the DASS. However, the differences between the DASS and the SRIP as screening measures for PTSD are very small.

The DASS that was administered during intake yielded slightly better results than the DASS that was administered after a period of abstinence. To obtain these results, the cut-off score had to be raised. This means that patients suffer from more depression, anxiety and stress symptoms, and also PTSD symptoms during intake. Only the difference in stress symptoms did not reach statistical significance (table 3). As can be seen in figure 1, the AUC for the DASS during intake is larger than the second measurement with the DASS. This provides support for the possibility of early detection of PTSD, which is important because detoxification and the first steps towards abstinence are difficult for patients that suffer from PTSD, as their PTSD symptoms may worsen during this period

[36]. Accurate identification of these symptoms as early as possible may help prevent dropout and guide treatment planning.

The DASS has several other advantages compared to the PTSD screens that were mentioned in the Introduction. First, with the DASS it is also possible to screen for depression and anxiety disorders, which makes it a time-efficient and therefore cost-effective approach. Second, the DASS is in the public domain, so there are no financial costs. Third, the DASS is already being used in many treatment facilities in the Netherlands and could thus be a convenient measure.

The DASS 1 was administered at least 4 weeks before the CAPS was assessed, which makes it more difficult to draw firm conclusions about the relation between the two measures. It could be argued, for example, that during the time between the two measurements, a patient may have developed PTSD. We know this was not the case, however, as all patients had developed PTSD prior to intake. Therefore we conclude that it is useful to screen for PTSD during intake to determine an 'at-risk' population. Furthermore, screening again during a later stage increases the detection rate of PTSD considerably. We would thus advise to always screen for PTSD with the DASS during outpatient intake procedures and, if the score is high (>65), consider assessing PTSD with a structured interview. When the score is lower than 66, it is suggested to screen again after a few months or when the patient has been abstinent for at least 4 weeks as several false-negatives can subsequently be detected.

A limitation of this study is that our results regarding the possibility of reliable screening during intake were obtained from only 58 patients of the 196 who participated in the study. Although we did not find a systematic bias, replication of our findings with a larger sample would be a useful next step. Another limitation is that other psychiatric disorders in the mood and anxiety domain were not assessed. These disorders often coexist with PTSD and also have some symptom overlap [37]. It would be interesting to study which specific symptoms from the DASS differentiate between PTSD, anxiety and stress symptoms related to intoxication and/or withdrawal versus symptoms of mood and anxiety disorders. Hierarchical models of anxiety and depression posit that each anxiety disorder can be differentiated from the others by one or more specific components [38, 39] and it has been suggested that intrusions probably represent such a specific component for PTSD [40]. This notion also offers possibilities for improving the DASS as a screening instrument for PTSD, for example by adding one or more items relating to intrusion. Although the SRIP does incorporate items regarding this domain it does not outperform the DASS as a screen for PTSD; thus it would be interesting to test an adjusted version of the DASS with items related to intrusion.

Conclusion

The DASS-21 can be used as a reliable screen for PTSD during intake and after 4 weeks of abstinence in SUD patients. The best results are obtained when the DASS is administered twice: at intake and after a period of abstinence (which in our study was 1 month). Because the DASS is already being used in many facilities in the Netherlands, it is a convenient measure. Its potential to screen for depression and anxiety disorders, short assessment time, and public-domain availability also make it an appealing instrument for clinical and research use.

Acknowledgements

The authors thank Tactus Addiction Treatment, Iriszorg, Vincent van Gogh Institute and Novadic-Kentron for their cooperation during the data collection process.

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