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Psychometric properties of the Drug Use Disorders Identification Test (DUDIT) with substance abusers in outpatient and residential treatment☆

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ABSTRACT

The psychometric properties of the Drug Use Disorders Identification Test (DUDIT), an 11-item self-report questionnaire developed to screen individuals for drug problems, are evaluated. The measure, developed in Sweden and evaluated there with individuals with severe drug problems, has not been evaluated with less severe substance abusers or with clinical populations in the United States. Participants included 35 drug abusers in an outpatient substance abuse treatment program, 79 drug abusers in a residential substance abuse treatment program, and 39 alcohol abusers from both treatment settings who did not report a drug abuse problem. The DUDIT was found to be a psychometrically sound drug abuse screening measure with high convergent validity ($r = .85$) when compared with the Drug Abuse Screening Test (DAST-10), and to have a Cronbach's alpha of .94. In addition, a single component accounted for 64.91% of total variance, and the DUDIT had sensitivity and specificity scores of .90 and .85, respectively, when using the optimal cut-off score of 8. Additionally, the DUDIT showed good discriminant validity as it significantly differentiated drug from alcohol abusers. These findings support the DUDIT as a reliable and valid drug abuse screening instrument that measures a unidimensional construct. Further research is warranted with additional clinical populations.

1. Introduction

Several brief drug abuse screening instruments have been developed to assess the severity of substance abusers' drug use (reviewed in Carey, 2002; Sobell, Toneato, & Sobell, 1994). One of these instruments, the Drug Use Disorders Identification Test (DUDIT; Berman, Bergman, Palmstierna, & Schlyter, 2005b), was recently developed in Sweden. Like the Drug Abuse Screening Test (DAST-10; Skinner, 1982), the DUDIT assesses an individual's illicit drug use and related consequences over the past year. In line with the Institute of Medicine's (1990) recommendations concerning relevant domains for substance abuse assessment tools, the DUDIT collects data in the following areas: (a) frequency of drug use, (b) drug-related problems, and (c) drug dependence symptoms.

The 11-item DUDIT was the result of an extensive literature review and think-aloud testing of three preliminary versions of the measure (Berman et al., 2005b). Developed as an analogous instrument to the Alcohol Use Disorders Identification Test (AUDIT; Saunders, Aasland, Babor, de la Fuente, & Grant, 1993), the questions on the DUDIT parallel those on the AUDIT with very few exceptions (i.e., two items on the AUDIT were deleted and three new items were added). Nine questions are scored on 5-point scales ranging from 0 to 4, and two are scored on 3-point scales with values of 0, 2, and 4. Thus, total scores range from 0 to 44, with higher scores suggestive of a more severe drug problem.

In their initial investigation of the psychometric properties of the DUDIT, Berman et al. (2005b) used both general and clinical population samples. Thus, the DUDIT was developed to identify individuals in the general public who may have a drug problem as well as individuals in clinical settings who are likely to meet criteria for a substance dependence diagnosis. As a comparison measure, Berman et al. (2005b) used the "Swedish translation of Chapter 12 of the Schedules for Clinical Assessment in Neuropsychiatry, Version 2.1" (p. 23) which is based on the *Diagnostic and Statistical Manual of Mental Disorders (4th ed) Text Revision* (DSM-IV-TR; American Psychiatric Association, 2000). For the general population sample, the DUDIT was administered to 1109 randomly selected individuals from the Swedish Population Registry. Using this sample, a Cronbach's alpha of .93 was found and it was reported that the T-scores at 1, 2, and 3 standard deviations (*SD*) from the mean (i.e., T = 60, 70, and 80, respectively) occurred at DUDIT scores of 3, 6, and 8 for men and 1, 2, and 3 for women, respectively. Based on these data, the authors recommend that scores of 6 for males and 2 for females be used as cut-off values suggestive of drug-related problems in the general population (Berman, Bergman, Palmstierna, & Schlyter, 2005a). The clinical population consisted of 160 individuals who were either inpatients at an addiction detoxification unit, prison detainees, prison inmates, or probation clients. In this sample, the DUDIT yielded a Cronbach's alpha of .80. In addition, a cutoff score of 25 yielded a

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sensitivity of 90% and a specificity of 78% and the area under the curve (AUC) was .94 for drug dependence diagnoses. Consequently, the authors suggested that scores greater than 25 be used as the cut-off for identifying individuals in clinical populations who are likely to meet substance dependence criteria (Berman et al., 2005a, 2005b).

Subsequent articles have reported mean (*SD*) DUDIT scores in substance abusing samples ranging from 16.9 (9.8) for dependent substance abusers who had relapsed (Landheim, Bakken, & Vaglum, 2006) to 31.9 (6.1) for inpatient opiate abusers (Berman, Källmén, Barredal, & Lindqvist, 2008). The latter study also found that 88% of this known substance abusing sample scored greater than 25 points on the DUDIT (the recommended cut-off score for probable substance dependence), suggesting that the measure was useful in detecting substance dependence in this population.

Berman, Palmstierna, Kallmen, and Bergman (2007) also developed the DUDIT-Extended, a 54-item instrument that contains additional questions about drug-related consequences for individuals who have been identified by the DUDIT as possibly having a drug problem. Finally, another group of investigators (Stuart, Moore, Kahler, Ramsey, & Strong, 2004; Stuart, Moore, Ramsey, & Kahler, 2003, 2004) also developed a 14-item brief drug abuse screening instrument that they called the DUDIT, but to the authors' knowledge there are no published reports describing this version's development and/or psychometric characteristics.

Although a variety of drug use measures currently exist, the DUDIT has several advantages over other instruments. For example, unlike the Addiction Severity Index (McLellan, Luborsky, Woody, & O'Brien, 1980) and the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST; WHO ASSIST Working Group, 2002), the DUDIT's administration time is brief (<5 mins) and it is easy to score. Also, unlike some drug screening measures that inquire about lifetime use (e.g., Cut-down Annoy Guilty Eye-opener Adapted to Include Drugs [CAGE-AID]; Brown & Rounds, 1995), the DUDIT focuses on drug use and drug-related consequences occurring within the past year, thus identifying possible diagnosable drug use problems. Another advantage is that the questions on the DUDIT are scored using continuous rather than dichotomous (e.g., yes or no) scales. Unlike dichotomous scaling (used by the DAST and CAGE-AID), continuous interval scaling has been found to reduce underreporting of drug use and related consequences (Saunders et al., 1993).

Unfortunately, psychometric evaluations of the DUDIT have been restricted to studies in Europe (three in Sweden, one in Norway, one in England) and they have been conducted mostly with severely dependent drug abusers in highly constrained settings (e.g., detoxification and inpatient units, prisons; Bakken, Landheim, & Vaglum, 2007; Bakken & Vaglum, 2007; Berman et al., 2005b, 2008; Cruce, Nordstrom, & Ojehagen, 2007; Cruce & Ojehagen, 2007; Hodgins, Alderton, Cree, Aboud, & Mak, 2007; Hodgins, Cree, Alderton, & Mak, 2008; Landheim et al., 2006). Such restrictions greatly limit the generalizability of the DUDIT. The present study was conducted to extend the evaluation of the psychometric properties of the DUDIT to substance abusers in the United States, to those with less severe drug problems, and to less restrictive settings (i.e., outpatient and residential treatment programs).

2. Materials and methods

2.1. Participants

De-identified archival data were gathered from two treatment programs in South Florida, an outpatient substance abuse treatment program and a residential substance abuse treatment program. Participants were classified into one of three groups: (a) outpatient drug abusers (ODA; $n=35$), (b) residential drug abusers (RDA; $n=79$), or (c) alcohol abusers without a drug abuse problem from either of the two treatment programs (AB; $n=39$). Group membership was based on participants' scores on both the DAST and the AUDIT (e.g., to be included in the AB group, individuals must have scored <3 on the DAST-10 and ≥8 on the AUDIT). The third group was included to evaluate the discriminant validity of the DUDIT. The study was approved by the Institutional Review Board of Nova Southeastern University.

2.2. Measures

Participants at both treatment programs completed the DAST-10, the DUDIT, the AUDIT, and a short questionnaire gathering demographic and substance abuse history information.

2.2.1. DAST-10

The DAST was selected as a comparison measure for the DUDIT because it is frequently used in the drug abuse field and has demonstrated sound psychometric properties (reviewed in Yudko, Lozhkina, & Fouts, 2007). The DAST assesses drug consequences and problem severity in the past year (Skinner, 1982). Originally a 28-item measure, 20- and 10-item versions have subsequently been created and psychometrically analyzed. The original DAST, modeled after the Michigan Alcoholism Screening Test (Selzer, 1971), has a unidimensional construct when factor analyzed (Skinner, 1982) and the 20-item version has been shown to successfully discriminate drug from alcohol abusers (Gavin, Ross, & Skinner, 1989). In a comprehensive review of studies using all versions of the DAST from 1982 to 2005, Yudko et al. (2007) concluded that the DAST has been found to have moderate to high levels of validity, sensitivity, and specificity. Since the 10-item version of the DAST (DAST-10) has comparable sensitivity and specificity to its 28- and 20-item counterparts (Rush, First, Blacker, & American Psychiatric Association Task Force for the Handbook of Psychiatric Measures, 2008), the former was used in the present study. For the DAST-10, scores range from 0 to 10, with a score of 3 or greater being suggestive of a drug problem.

2.2.2. DUDIT

As the development and psychometric properties of the DUDIT have been described earlier, they will not be repeated here. Since the DUDIT is not readily available in the United States, it has been included as Appendix A to this article.

2.2.3. AUDIT

The AUDIT is a widely used, psychometrically sound alcohol screening instrument that assesses harmful and hazardous drinking. This 10-item self-report measure has a total score range from 0 to 40, with a value of 8 or greater being suggestive of problematic drinking. Psychometrically, the instrument has demonstrated high internal consistency, test–retest reliability, convergent validity, sensitivity, and specificity (for a review see Reinert & Allen, 2007; Rush et al., 2008). When factor analyzed the AUDIT has yielded a two-factor solution (dependence/consequences, alcohol consumption; Maisto, Conigliaro, McNeil, Kraemer, & Kelley, 2000). As previously mentioned, the current study used the AUDIT to classify participants into the alcohol group and to evaluate the discriminant validity of the DUDIT.

2.3. Analyses

The following strategies were used to investigate the psychometric properties of the DUDIT: (a) convergent validity was evaluated by calculating a Pearson product–moment correlation between the DUDIT and DAST-10; (b) internal consistency reliability was assessed using Cronbach's alpha; (c) internal structure was examined using a principal component analysis (PCA); (d) predictive validity, sensitivity, specificity, and optimal cut-off scores were estimated by constructing a Receiver Operating Characteristic (ROC) curve; and

(e) discriminant validity was evaluated using a one-way analysis of variance (ANOVA) of the DUDIT scores for the three groups of participants.

3. Results

Table 1 presents demographic and substance abuse history variables for the three groups of participants (ODA, RDA, and AB). For dichotomous variables (i.e., gender, employment status, marital status, previous substance abuse treatment), a series of 3×2 chi-square comparisons was performed using an alpha level of .01 to control for multiple tests. If initial tests were significant, pairwise chi-square comparisons were carried out to determine which group pairings differed significantly. Post-hoc analyses indicated that a significantly greater proportion of participants in the RDA group reported having been in substance abuse treatment compared to those in the other two groups.

For continuous variables (i.e., age, years of education, years with substance abuse problem), one-way ANOVAs were performed again using an alpha level of .01, and a *t*-test was used in the one case involving a two group comparison. Significant omnibus *F* statistics were investigated using post-hoc pairwise comparisons and the Tukey Honestly Significant Difference test ($\alpha = .01$). These analyses found that ODA participants were significantly younger than those in the other two groups and had significantly more years of education than participants in the RDA group. As expected, individuals in the RDA group reported a longer history of drug problems than those in the ODA group.

3.1. Internal structure

To explore the internal structure of the DUDIT, a PCA was performed using all participants ($N = 153$). Criteria for retaining extracted components on the PCA were: (a) visual inspection of the scree plot to note breaks in size of Eigenvalues between the components (Cattell, 1966), (b) Eigenvalues greater than one, and (c) percentage of variance accounted for by components retained. A visual inspection of the scree plot revealed only one component accounting for the majority of variance before components started to level off. As seen in Table 2, all item-component loadings were in the "good" to "excellent" range (Tabachnick & Fidell, 2007). In addition, only one component on the DUDIT reached the criterion of an Eigenvalue greater than one (7.14) and the variance accounted for by this component was 64.91%. The next largest Eigenvalue was only 0.81 and only accounted for 7.23% of the total variance. Thus, results from the PCA suggest that the DUDIT assesses a unidimensional construct.

Table 1
Pretreatment characteristics of participants by group.

Variable	Group			Statistical test
	ODA ($n = 35$)	RDA ($n = 79$)	AB ($n = 39$)	
Male (%)[a]	65.71	87.34	71.79	$\chi^2 = 8.07$
Employed (%)[b]	65.71	50.00	52.63	$\chi^2 = 2.42$
Married (%)[a]	25.71	16.46	15.38	$\chi^2 = 1.69$
No previous substance abuse treatment/self-help groups (%)[c]	54.29_1	$13.92_{1,2}$	44.74_2	$\chi^2 = 23.03^{**}$
M (*SD*) age (years)[a]	30.66 $(9.34)_{1,3}$	41.51 $(9.59)_1$	43.21 $(10.33)_3$	$F = 18.97^{**}$
M (*SD*) education (years)[d]	13.49 $(2.19)_1$	11.97 $(1.87)_1$	13.25 (2.84)	$F' = 7.90^{**}$
M (*SD*) DAST score	6.60 $(1.94)_1$	6.61 $(1.97)_2$	0.51 $(0.76)_{1,2}$	$F' = 379.86^{**}$
M (*SD*) DUDIT score	23.46 $(11.03)_1$	25.97 $(12.42)_2$	3.26 $(5.73)_{1,2}$	$F' = 113.28^{**}$
Primary drug used (%)[g]				
Marijuana	25.00	2.74		
Cocaine	60.71	89.04		
Other	14.29	8.22		

Note. ODA = outpatient drug abusers; RDA = residential drug abusers; AB = alcohol abusers without a drug abuse problem from either of the two treatment programs; DAST = Drug Abuse Screening Test; DUDIT = Drug Use Disorders Identification Test; N/A = not applicable. Group means that share a common subscript differ significantly ($p < .01$). Since assumption of homogeneity of variance was not satisfied ($p < .05$) for years of education, DAST and DUDIT scores, and years with a drug problem, F' and t' were utilized, respectively.
[a] $n = 153$. [b] $n = 145$. [c] $n = 152$. [d] $n = 150$. [e] $n = 112$. [f] $n = 39$. [g] $n = 101$.
** $p < .01$.

3.2. Convergent validity and internal consistency reliability

The Pearson product–moment correlation between the DUDIT and DAST-10 scores for all participants ($N = 153$) was very high ($r = .85$, $p < .01$). Internal consistency reliability for the DUDIT, examined by Cronbach's alpha, was also very high (coefficient $\alpha = .94$) and was higher than that found by Berman et al. (2005b) using a Swedish sample (coefficient $\alpha = .80$). Item means, item variances, and inter-item correlations for the DUDIT are shown in Table 3.

3.3. Predictive validity, sensitivity, specificity, and optimal cut-off scores

The DUDIT's predictive validity, sensitivity, and specificity were examined using a ROC curve that included all participants ($N = 153$). Participant's DAST-10 scores were dichotomously classified with a score of 3 or greater being indicative of the presence of a drug problem (based on the recommendation of Skinner, 1982) and a score of 2 or less being indicative of the absence of a drug problem. Results revealed that the AUC (.95) was in the "excellent" range and that a score of 8 was the most critical value for identifying a participant as having a drug problem. As seen in Table 4, this cut-off score corresponds to sensitivity and specificity values of .90 and .85, respectively.

3.4. Known-groups validity

To evaluate known-groups validity, a one-way ANCOVA with three levels was conducted using scores on the DUDIT as the dependent variable and participants' group membership (ODA, RDA, AB) as the independent variable. The assumption of homogeneity of regression hyperplanes was met ($p > .05$). As seen in Table 5, after controlling for significant mean group differences for age, years of education, and no past substance abuse treatment, the overall ANCOVA was statistically significant. Post-hoc comparisons using Bonferroni's adjustment demonstrated that the adjusted mean scores were significantly higher for the two drug abuse groups (ODA = 22.76; RDA = 24.00) compared to that of the AB group (7.37). Thus, the DUDIT was effective in distinguishing drug from alcohol abusers.

Table 2
Item-component loadings for the Drug Use Disorders Identification Test.

DUDIT item	Component loading
Item 1	.86
Item 2	.63
Item 3	.76
Item 4	.89
Item 5	.85
Item 6	.89
Item 7	.90
Item 8	.75
Item 9	.86
Item 10	.65
Item 11	.76

Table 3
Item analyses for the Drug Use Disorders Identification Test.

	Mean	Minimum	Maximum	Range	Variance
Item means	1.80	1.24	2.28	1.04	0.12
Item variances	2.71	2.21	3.48	1.27	0.12
Inter-item correlations	0.61	.39	.83	.44	0.02

4. Discussion

The present study extended the evaluation of the psychometric properties of the DUDIT to substance abusers in the United States, to those with less severe drug abuse problems, and in less restrictive settings (i.e., outpatient, residential) than had been studied in Europe. Overall, the DUDIT was found to have satisfactory psychometric characteristics as a drug abuse screening test. The instrument's high correlation with the DAST-10, an established drug abuse screening measure, indicated good convergent validity. The DUDIT also showed good discriminant validity as evidenced by its ability to significantly differentiate drug abusers from alcohol abusers, and it had high internal consistency reliability. Finally, PCA for the DUDIT produced a unidimensional construct, with a single component accounting for 64.91% of the total variance. In the future, a replication of this study using Confirmatory Factor Analyses would provide further support for the structure of the DUDIT.

The ROC curve showed that the DUDIT had good predictive validity as suggested by high sensitivity, specificity, and the AUC. Results revealed that a cut-off score of 8 was the most critical value for identifying participants as having an above-criterion value on the DAST-10. This lower cut-off point, compared to the Swedish study's score of 25 (Berman et al., 2005b), was expected as the participants in this sample had less severe drug abuse histories. In addition to having good psychometric characteristics, the DUDIT has an advantage over other drug abuse screening instruments, such as the ASSIST, because it is brief, not substance specific, and inquires about use and consequences within the past 12 months, consistent with the DSM-IV-TR interval criterion for diagnosis. As compared to the DAST-10, the DUDIT has the advantage of gathering information about quantity and frequency of drug use.

The current study has two main limitations. First, all data were obtained from participants' self-reports, which may raise a concern because both the DUDIT and DAST-10 have high face validity. Although it would have been ideal to obtain independent validation of participants' self-reports, the literature has consistently shown that substance abusers' self-reports are generally as accurate as other data sources as long as participants provide information voluntarily, are interviewed when substance-free, interviewed by researchers or clinicians, and told their responses will be kept confidential (Babor, Brown, & Del Boca, 1990; Gladsjo, Tucker, Hawkins, & Vuchinich, 1992; Maisto, McKay, & Connors, 1990; Maisto, Sobell, & Sobell, 1982; Secades-Villa & Fernandez-Hermida, 2003). Since these criteria were met for this study, there would be little reason for participants to provide invalid self-reports. A second limitation concerns the homogeneity of the sample. Specifically, about three-quarters of all drug abusers in the present study reported cocaine as their primary drug of use and about a fifth reported marijuana as their primary drug of use. Future research will need to evaluate the DUDIT's characteristics using a larger and more heterogeneous sample of drug abusers.

In conclusion, the present study extended the evaluation of the psychometric properties of the DUDIT to less severe substance abusers in two different types of substance abuse treatment settings in the United States (i.e., outpatient and residential). This and previous studies support the use of the DUDIT in various clinical settings and encourage continued research into its use.

Table 4
Drug Use Disorders Identification Test cut-off point analysis.

Cut-off point	SE	SP	Kappa	PPP	NPP	HR
12	.84	.85	.63	.94	.65	.84
11	.86	.85	.65	.94	.67	.86
10	.89	.85	.69	.94	.72	.88
9	.90	.85	.71	.94	.73	.88
8	.90	.85	.71	.94	.73	.88
7	.90	.80	.68	.93	.74	.88
6	.92	.77	.69	.92	.77	.88

Note. SE = sensitivity; SP = specificity; Kappa = Cohen's Kappa; PPP = positive predictive power; NPP = negative predictive power; HR = hit rate. To conserve space, only the three cut-off scores above and below the suggested critical value of 8 are shown.

Table 5
Analysis of covariance of Drug Use Disorders Identification Test scores as a function of group membership, with no past treatment, age, and education as covariates ($N = 149$).

Source	*df*	*SS*	*MS*	*F*	*p*	η^2
No previous substance abuse treatment/self-help groups	1	4.68	4.68	0.04	.84	.00
Age	1	66.36	66.36	0.56	.46	.00
Education	1	47.80	47.80	0.40	.53	.00
Group	2	12,306.22	6153.11	51.58	.00	.42
Error	143	17,057.68	119.28			
Total	149	90,031.00				

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Contributors
Andrew C. Voluse, Christopher J. Gioia, Linda Carter Sobell, and Mark B. Sobell designed the study. Andrew C. Voluse conducted literature searches and provided summaries of previous research studies. Christopher J. Gioia conducted the statistical analyses. Mariam Dum and Edward R. Simco provided statistical consultation. Andrew C. Voluse and Christopher J. Gioia wrote the first draft of the manuscript and Mark B. and Linda Carter Sobell contributed to subsequent drafts. All authors contributed to and have approved the final manuscript.

Conflict of Interest
All authors declare that they have no conflicts of interest.

Appendix A. DUDIT questionnaire

[Because of the current study's setting and population our version of the DUDIT and the original version vary slightly with respect to instructions. Readers can go to http://www.emcdda.europa.eu/attachements.cfm/att_10455_EN_DUDIT.pdf for a copy of the original English version.]

These questions refer to your use of drugs. When the word "drug" is used, it includes any non-medical use of drugs and use of prescribed and over-the-counter drugs in excess of their directions. The various classes of drug may include: cannabis (e.g., marijuana, hash), solvents, tranquilizers (e.g., Valium, Xanax), barbiturates, cocaine, crack, stimulants (e.g., speed), hallucinogens (e.g., LSD) or narcotics (e.g., heroin, Percocet).

Remember that the questions do not include alcohol or tobacco. Please circle the answer that is correct for you.

1. How often do you use drugs other than alcohol?

0	1	2	3	4
Never	Once a month or less often	2–4 times a month	2–3 times a week	4 times a week or more often

2. Do you use more than one type of drug on the same occasion?

0	1	2	3	4
Never	Once a month or less often	2–4 times a month	2–3 times a week	4 times a week or more often

3. How many times do you take drugs on a typical day when you use drugs?

0	1	2	3	4
0	1–2	3–4	5–6	7 or more

4. How often are you influenced heavily by drugs?

0	1	2	3	4
Never	Less often than once a month	Every month	Every week	Daily or almost everyday

5. Over the past year, have you felt that your longing for drugs was so strong that you could not resist it?

0	1	2	3	4
Never	Less often than once a month	Every month	Every week	Daily or almost everyday

6. Has it happened, over the past year, that you have not been able to stop taking drugs once you started?

0	1	2	3	4
Never	Less often than once a month	Every month	Every week	Daily or almost everyday

7. How often over the past year have you taken drugs and then neglected to do something you should have done?

0	1	2	3	4
Never	Less often than once a month	Every month	Every week	Daily or almost everyday

8. How often over the past year have you needed to take a drug the morning after heavy drug use the day before?

0	1	2	3	4
Never	Less often than once a month	Every month	Every week	Daily or almost everyday

9. How often over the past year have you had guilt feelings or a bad conscience because you used drugs?

0	1	2	3	4
Never	Less often than once a month	Every month	Every week	Daily or almost everyday

10. Have you or anyone else been hurt (mentally or physically) because you used drugs?

0	2	4
No	Yes, but not over the past year	Yes, over the last year

11. Has a relative or a friend, a doctor or a nurse, or anyone else, been worried about your drug use or said to you that you should stop using drugs?

0	2	4
No	Yes, but not over the past year	Yes, over the last year

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