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ABSTRACT

Objective: Motivation is a widely used concept in substance use treatment, which is related to the change during treatment. The Drug Use Disorders Identification Test–Extended (DUDIT-E) is one of the instruments to measure motivation. Among clients who have been screened already for drug-related problems, DUDIT-E maps the frequency of illicit drug use (D), the positive (P) and negative (N) aspects of drug use, and treatment readiness (T). The aim of the present study was to evaluate the psychometric properties of the Turkish DUDIT-E in adult male patients with substance use disorder (SUD) in Turkey.
Methods: We examined the psychometric characteristics of this instrument in a population of outpatients with SUD and who are under probation ($n = 196$). The participants were administered the Drug Use Disorders Identification Test (DUDIT), the DUDIT-E, and the Addiction Profile Index (API).
Results: Cronbach's alpha coefficient was 0.96 for P score, 0.95 for N score, and 0.85 for T score. Principal component analysis supported construct validity for P, N, and T scores. The DUDIT-E subscales were mild to moderately correlated with the DUDIT and the API.
Conclusions: The findings showed that the Turkish version of the DUDIT-E, when used together with the DUDIT, could effectively identify substance use problems in outpatients with SUD who are under probation.

Introduction

Substance use disorders (SUDs) are a worldwide public health problem [1]. A quick assessment of the extent of drug problems is essential for planning appropriate treatment and prevention strategies [2]. One of the several drug abuse screening instruments that have been developed to assess the severity of substance abusers' drug use is the 11-item Drug Use Disorders Identification Test (DUDIT) [3]. Developed as an analogous instrument to the Alcohol Use Disorders Identification Test (AUDIT) [4], the questions on the DUDIT are parallel to those on the AUDIT with very few exceptions (i.e. two items on the AUDIT were deleted and three new items were added). The DUDIT assesses an individual's illicit drug use and related consequences over the past year and collects data in the following areas: (a) frequency of drug use, (b) drug-related problems, and (c) drug dependence symptoms. The DUDIT has three main advantages over these other instruments. Firstly, in contrast to other similar scales, the DUDIT offers scaled responses on behavioral frequency for each item. Secondly, the DUDIT includes

a drug list with commonly abused prescription medications for clients' and counselors' easy reference. Thirdly, the DUDIT is suitable for use in public health surveys of drug use [2]. The DUDIT was found to be a reliable and valid drug abuse screening instrument that measures a unidimensional construct in Turkish adolescent and adult patients with drug use disorder [5] and in a high-risk population of prisoners [6].

Although there are several instruments available for measuring treatment motivation, a more time-efficient and targeted measure of treatment motivation, such as the Drug Use Disorders Identification Test–Extended (DUDIT-E), could be useful in settings where time is limited [2]. The questionnaire was created to provide detailed information about substance use, excluding alcohol, including patients' perceptions about use. This 54-item questionnaire consists of four subscales: the drug frequency (D) subscale (10 items), which measures the frequency of use of 10 commonly abused substances (except for alcohol); the positive and negative (P and N) subscales (17 items, correspondingly), which measure the positive and negative aspects of

substance use; and the treatment (T) subscale (10 items), which assesses treatment readiness to assess the motivation to change drug use. Also based on these dimensions, a Motivational Index (MotInd) is calculated as a ratio of positive to negative aspects of substance abuse, multiplied with readiness, in order to get a simple index of motivation. According to Berman et al. [2], the three dimensions comprising MotInd are composed of distinct subcomponents contributing to the factors. The P and N factors are both made up of four components, and the T factor has three subcomponents. The original scale was studied in a sample of heavy drug users, which yielded a Cronbach's alpha coefficient of 0.88 for both P and N aspects of using drugs and 0.72 for the T section; in a separate sample of prison inmates, Cronbach's coefficients were 0.92, 0.90, and 0.81, respectively [2]. To date, Berman et al.'s original Swedish scale has been adapted to Bosnian, Danish, English, Finnish, French, German, Hungarian, Portuguese, Norwegian, Mandarin Chinese, Russian, and Turkish and was approved by European Monitoring Centre for Drugs and Drug Addiction [7]. Also together with DUDIT, DUDIT-E was successfully used in a web-based screening ($n = 2361$) in Sweden [8] and among patients ($n = 185$) who received inpatient substance use treatment in five different settings in Northern Norway [9]. Finally, Norwegian [10] and Hungarian [11] versions were validated among patients admitted to an inpatient substance abuse treatment unit and across diverse settings in populations of young drug users ($n = 105$ and $n = 259$, respectively).

In this article, we examined the psychometric properties of the Turkish DUDIT-E including its internal consistency reliability, factor structure, and concurrent validity.

Methods

Participants

Outpatients with SUD who are under probation ($n = 196$) were included in the study. Data were gathered from Probation Outpatient Treatment Center (POTC) in the Alcohol and Drug Research Training and Treatment Center (AMATEM), Bakirkoy Training and Research Hospital for Psychiatry, Neurology and Neurosurgery in Istanbul, Turkey. Therefore, the inclusion criterion was to be an outpatient in the POTC, while there were no exclusion criteria for the sample due to the fact that outpatients with severe psychopathology and/or cognitive deficits were treated elsewhere. All subjects participated voluntarily in the study and written informed consents were obtained after the study protocol was thoroughly explained to them. Seven patients were excluded due to illiteracy and 29 patients declined participation in the study. Although, other than these 29 patients, none of the patients declined participation, 75 patients were excluded due

to the fact that they did not complete the study scales fully or did not return the forms back to the researchers.

Translation

The original DUDIT-E was independently translated from English into Turkish by two psychiatrists. Consensus was reached on a common draft by these experts. This Turkish version was back-translated into English by an independent translator who did not see the original items and the translation was approved by Berman, who developed the original version of the questionnaire.

Psychometric measures

The DUDIT

The DUDIT is an 11-item self-reported questionnaire that was developed to screen individuals for drug problems [3]. As the development and psychometric properties of the DUDIT have been described earlier in the Introduction section, they will not be repeated here. The first nine questions are scored on 5-point scales ranging from 0 to 4, and the last two are scored on 3-point scales with values of 0, 2, and 4. Thus, the total score ranges from 0 to 44, with higher scores suggestive of a more severe drug problem. The DUDIT was validated in Turkish adolescent and adult patients with drug use disorder [5] and in a high-risk population of prisoners [6]. The Cronbach's alpha coefficient was 0.88 for the present study.

The DUDIT-E

The DUDIT-E was characterized by five variables, that is, the four subscale scores including D (drug frequency), P (positive), N (negative), and T (treatment), as well as MotInd [2]. MotInd is derived from the N, P, and T subscales. It represents a derived variable based on 41 items of the scale, including all 17 items of the P, all 17 items of the N, and 7 of 10 items (excluding Items 6, 7, and 10) from the T subscales. The index was computed based on scale developers' recommendations using the following formula: (N total score/P total score) × T[(2 + 3+4 + 5+8 items) − (1 + 9 items)] [2]. Unfortunately, receiving 0 points from any of these sub-dimensions results in the disruption of the computing.

P and N responses are coded 0, 1, 2, 3, and 4, and a total score is summed for each section, with a possible range of 0–68 points for each section. T responses are coded 0, 1, and 2, and the items are summed using reverse scoring for Items 1 and 9 and excluding Items 6 and 7. Items 6 and 7 are excluded because they refer to the respondents' perception of treatment availability and belief that they actually can benefit from treatment, rather than the perception of readiness to change.

The DUDIT-E is presented in a one-page, two-sided, four-section format with a user-friendly graphic

design. The time interval for drug use reported in the DUDIT-E remains unspecified – an advantage in clinical settings where clinicians often want to use a time frame that suits circumstantial assessment needs (i.e. the past week, the past 30 days, the past 6 months, the past year, or a certain period in the past, such as before incarceration). The clinician must thus verbally inform the client which time frame should be considered when responding to DUDIT-E items [2]. In the present study, we used a time frame as "before probation."

The Addiction Profile Index

The Addiction Profile Index (API) is a valid and reliable questionnaire that can be used to measure the severity of different dimensions of substance dependency [12]. The API is a self-report questionnaire consisting of 37 items and the following 5 subscales: characteristics of substance use, dependency diagnosis, the effects of substance use on the user, craving, and motivation to quit using substances. The Cronbach alpha coefficient for the total API was 0.89 and it ranged from 0.63 to 0.86 for the subscales. Item-total correlation coefficients ranged from 0.42 to 0.89. The Spearman–Brown split-half method coefficient for the total API was 0.83. A four-factor solution that accounted for 52.3% of the variance was observed. The API craving subscale was observed to be consistent with the Penn Alcohol Craving Scale (PACS) and the API motivation subscale was consistent with the Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES). The API total score was strongly correlated with the mean the Michigan Alcoholism Screening Test score, and the composite Addiction Severity Index medical status, substance use, legal status, and family social relations subscale scores. Based on receiver operating characteristic curve analyzes, the area under curve was 0.90. With a total API cut-off score of 4, the scale's sensitivity and specificity were 0.85 and 0.78, respectively.

Statistical analysis

The following strategies were used to investigate the psychometric properties of the DUDIT-E: (a) convergent validity was evaluated by calculating the Pearson product–moment correlation between the DUDIT-E, the DUDIT, and the API; (b) internal consistency reliability was assessed using Cronbach's alphas; and (c) factor structure for each sub-dimension of the DUDIT-E was examined using a principal component analysis (PCA).

Results

Table 1 presents the socio-demographic characteristics, previous psychiatric treatment status of the study group, and the prevalence of substances that are used according to the DUDIT-E D sub-dimension.

Factor structure

To explore the factor structure of the DUDIT-E sub-dimensions, PCA was performed using all participants ($n = 196$) and a Varimax with Kaiser normalization was used for rotating the factors. The criteria for retaining extracted components on the PCA were (a) visual inspection of the scree plot to note breaks in the size of eigenvalues between the components, (b) eigenvalues greater than one, and (c) percentage of variance accounted for by components retained.

To measure sampling adequacy, we used the Kaiser–Meyer–Olkin (KMO) test, which was considered good (0.92), and to test sphericity, we used Bartlett's test (should be significant, $p < .05$), which was found to be significant ($p < .001$). For DUDIT-E, the exploratory factor analysis (EFA) of the questionnaire's 44 items (P, N, and T sub-dimensions) resulted in a 7-factor solution, which accounted for 68.6% of the total variance. The distribution of explained variance was 34.9%, 16.0%, and 5.6% for the first three factors, respectively. Since none of the remaining factors explained more than 5%, and a visual inspection of the scree plot revealed three components accounting for the majority of variance, we derived a three-factor solution for the scale. Altogether, the three factors used in this analysis explained 56.5% of the variance. The factors identified in the EFAs showed full correspondence with the P, N, and T subscales, respectively (data not shown).

Table 1. Socio-demographic characteristics, previous psychiatric treatment status of the study group, and the frequency of substances that were used according to the DUDIT-E drug frequency (D) sub-dimension.

	28.10 ± 7.81	
Age (mean ± SD)	*n*	%
Education		
Literate	12	6.1
Elementary school	45	23.0
Secondary school	88	44.9
High school	38	19.4
University	13	6.6
Marital status		
Married	48	24.5
Single	141	71.9
Divorced/separated	8	4.0
Having a child	45	22.9
Previous psychiatric treatment	64	32.7
Frequency of substance used	User (%)	Non-user (%)
Cannabis	69.4	30.6
Amphetamines	8.7	91.3
Cocaine	13.8	86.2
Opiates	17.9	82.1
Hallucinogens	6.6	93.4
Thinner and other inhalants	7.7	92.3
GHB and other drugs	1.5	98.5
Pills (sleeping/calming)	20.4	79.6
Pills (pain relievers)	22.4	77.6

Table 2. Items belonging to the factors of DUDIT-E positive (P) subscale, its factor loadings, and corrected item-total correlations.

	Component			Positive
	1	2	Unidimensional	Corrected item-total correlation
12. Life without drugs is boring.	0.762		0.689	0.649
11. Get a feeling that everything will work out.	0.754		0.822	0.791
15. With drugs I feel that I am part of the group.	0.748		0.755	0.721
13. I can control feelings like anxiety, anger, and depression.	0.743		0.731	0.694
14. With drugs I can function socially.	0.737		0.769	0.736
17. I get more out of my life.	0.730		0.727	0.687
16. I get better contact with others.	0.707		0.806	0.774
9. More self-confidence.	0.697		0.856	0.829
8. Love everybody and the whole world.	0.658		0.836	0.806
4. Become strong.	0.644		0.861	0.834
5. Feel "normal."	0.641		0.844	0.815
10. Feel less pain in my back, neck, head, etc.	0.598		0.772	0.738
6. Become creative (get ideas, do artistic things).	0.578		0.806	0.774
2. Lose tension and become relaxed.	0.876		0.686	0.655
1. Sleep better.	0.815		0.652	0.619
3. Become happy.	0.753		0.834	0.811
7. Become active (clean home, do dishes, wash the car, etc.).	0.590		0.792	0.758
Eigenvalues	10.370	1.146	10.370	
% of Variance	61.000	6.744	61.000	
Cronbach's alpha coefficient			0.959	
Mean			19.61	

Note: Extraction method: PCA. Rotation method: Varimax with Kaiser normalization. $p < .001$.

We conducted a PCA for each sub-dimension separately. To measure sampling adequacy, we used the KMO test, which was perfect for P and N (0.95 and 0.93, respectively) and very good for the T sub-dimension (0.84). Also to test sphericity, Bartlett's test was used (should be significant, $p < .05$), which was found to be significant for all the subscales ($p < .001$).

A visual inspection of the scree plot revealed two components accounting for the majority of variance for all the subscales (P, N, and T sections) before the components started to level off. For all the subscales, two components on the DUDIT-E reached the criterion of an eigenvalue greater than one (10.37 and 1.15 for P, 9.47 and 1.49 for N, and 4.35 and 1.34 for T) and the variance accounted for by these components were 61.00% and 6.74% for P, 55.68% and 8.73% for N, and 43.52% and 13.37% for T. In the two-factor solution of the PCA for all sub-dimensions, the first eigenvalue was larger than three times of the second eigenvalue. Hence, the output for the two-factor solution indicated a unidimensional construct for the measure.

As shown in Tables 2–4, all item-component loadings were higher than 0.30 and were in the "fair" (0.38) to "excellent" (0.86) range. Thus, results from the PCA suggest that each subscale of the DUDIT-E (P, N, and T) assesses a unidimensional construct.

Table 3. Items belonging to the factors of DUDIT-E negative (N) sub-dimension, its factor loadings, and corrected item-total correlations.

	Component			Negative
	1	2	Unidimensional	Corrected item-total correlation
2. Over the past year, I have sought medical or hospital care or had medical problems (e.g. memory loss or hepatitis) because of drugs.	0.765		0.685	0.634
3. Over the past year, I have been in quarrels or used violence under the influence of drugs.	0.751		0.656	0.609
6. Get suicide thoughts.	0.726		0.696	0.647
9. Have worse contact with friends.	0.707		0.796	0.752
8. Get headaches or feel nauseous.	0.677		0.709	0.659
4. Over the past year, I have had trouble with the police because of drugs.	0.667		0.595	0.546
10. Have trouble concentrating.	0.665		0.847	0.812
7. Avoid the company of others.	0.624		0.780	0.738
5. Feel anxiety.	0.589		0.733	0.688
11. Feel less like having sex.	0.580		0.721	0.676
1. Over the past year, I have had trouble at work, in school, or at home because of drugs.	0.565		0.686	0.642
14. Health worsens.	0.879		0.798	0.777
16. Destroys family life.	0.870		0.758	0.733
12. Destroys finances.	0.842		0.795	0.774
15. Become inconsiderate.	0.811		0.827	0.807
13. Become passive.	0.707		0.719	0.684
17. See everything as a big chaos.	0.688		0.832	0.806
Eigenvalues	9.465	1.485	9.465	
% of Variance	55.677	8.734	55.677	
Cronbach's alpha coefficient			0.949	
Mean			17.87	

Note: Extraction method: PCA. Rotation method: Varimax with Kaiser normalization.

Table 4. Items belonging to the factors of DUDIT-E treatment (T) sub-dimension, its factor loadings, and corrected item-total correlations.

	Component			Treatment Corrected item-total correlation	Treatment[a] Corrected item-total correlation
	1	2	Unidimensional		
8. Do you think it is important to change your drug use?	0.777		0.693	0.693	0.522
4. Are you ready to work to change your drug use?	0.774		0.636	0.636	0.489
6. Do you believe you can get the right sort of professional help?	0.752		0.741	0.741	
7. Do you believe you can be helped by professional treatment for your drug use?	0.721		0.746	0.746	
10. Have you already changed your drug use and are looking for methods to help you avoid relapses?	0.637		0.686	0.686	
3. Have you been worried about your drug use over the past year?	0.551		0.634	0.634	0.550
2. Do you feel tired of using drugs?	0.529		0.635	0.635	0.542
9. Do you believe it will be difficult to change your drug use?	0.820		0.624	0.624	0.540
1. Do you enjoy taking drugs?		0.785	0.380	0.380	0.322
5. Do you think you need professional help to change your drug use?		0.678	0.743	0.743	0.594
Eigenvalues	4.352	1.337	4.352		3.069
% of Variance	43.520	13.370	43.520		43.84
Cronbach's alpha coefficient		(Total: 0.854)	0.854		0.784
Mean					4.20

Note: Extraction method: PCA. Rotation method: varimax with Kaiser normalization.
[a]Items 6, 7, and 10 were not included.

Convergent validity and internal consistency reliability

Corrected item-total correlations for the P, N, and T subscales in the total sample are shown in Tables 2–4, respectively. Internal consistency reliability for the DUDIT-E subscales, examined by Cronbach's alphas, was also sufficiently high (coefficient alpha was 0.96 for P, 0.95 for N, and 0.78 for T) (Tables 2–4, respectively). The Pearson product–moment correlations between the DUDIT-E, the DUDIT, and API scores for all participants were mild to moderate (Table 5).

Discussion

The DUDIT [3] 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 the criteria for an SUD diagnosis. Previous studies established the psychometric properties of the Turkish version of this scale in adult and adolescent substance users [5] and in prisoners with or without any drug use disorders [6].

To provide an in-depth assessment tool to further delineate substance use identified by DUDIT, Berman et al. [2] developed the DUDIT-E [11]. Based on the identification of a possible substance abuse or dependence with the DUDIT, the DUDIT-E provides additional information to clinicians, which can be applied in clinical decision-making and in treatment planning. In the present study, overall, the DUDIT-E subscales were found to have satisfactory psychometric characteristics in outpatients with SUD who are under probation.

Previous research in a sample of heavy drug users yielded Cronbach's alpha coefficients of 0.88 for both P and N aspects of using drugs and 0.72 for the T section; in a separate sample of prison inmates, the coefficients were 0.92, 0.90, and 0.81, respectively [2]. For the instrument's online version, Sinadinovic et al. [8] reported Cronbach's alpha values greater than 0.75 for all subscales. The Cronbach's alpha values for the total sample of the Hungarian version were acceptable for each subscale (P, 0.95; N, 0.94; T, 0.90). Consistent with these findings, the Turkish version of the DUDIT-E had high internal consistency reliability.

In the present study, we examined the factorial structure of the DUDIT-E and replicated the proposed three-factor model ("Positive aspects of substance abuse"; "Negative aspects of substance abuse"; and "Treatment readiness") of the original scale, while the Norwegian version did not replicate the three-factor

Table 5. Correlations of DUDIT-E sub-dimensions with DUDIT and API subscales.

	Totaled	Positive	Negative	Treatment
DUDIT	0.434	0.455	0.690	0.380
Characteristics of substance use	0.360	0.337	0.571	0.226
Dependency diagnosis	0.439	0.455	0.609	0.415
The effects of substance use on the user	0.480	0.445	0.712	0.457
Craving	0.453	0.459	0.543	0.296
Motivation to quit using substances	0.251	0.102*	0.361	0.526

Note: *$p < .05$, others $p < .001$, DUDIT: drug use disorders identification test; API: addiction profile index.

model in 105 patients admitted to an inpatient substance abuse treatment unit in Northern Norway [10].

The original study conducted by Berman et al. [2] implicated that the P and N factors were both made up of four components, and the T factor has three components, although these components were not supported by later studies in different languages [10,11]. In the present study, a visual inspection of the scree plot revealed two components accounting for the majority of variance for all subscales (P, N, and T sections) before the components started to level off, and two components for each subscale reached the criterion of an eigenvalue greater than one. In the two-factor solution of the PCA for all the subscales, the first eigenvalue was larger than three times of the second eigenvalue, which suggested that the output for the two-factor solution indicated a unidimensional construct for these submeasures. Thus, the subscales of P, N, and T each produced a unidimensional construct, with a single component accounting for 61.00%, 55.68%, and 43.52% of the total variance, respectively. Since all item-component loadings were higher than 0.30 and were in the "fair" (0.38) to "very good" (0.86) range, results from the PCA suggested that each subscale of the DUDIT-E assessed a unidimensional construct.

Convergent validity was examined by estimating Pearson's correlations among the DUDIT and individual subscales of the DUDIT-E. Consistent with a previous study for Hungarian version [11], which found high correlation ($r = 0.86$) between the DUDIT and the DUDIT-E, the present study confirmed a good convergent validity. The strongest relationship was detected between the DUDIT and the N subscale of the DUDIT-E ($r = 0.69$, $p < .001$). Mild relationships were observed across the D, P, and T subscales of the DUDIT-E and the total score of the DUDIT ($r = 0.43$, $r = 0.46$, and $r = 0.38$, respectively). Mostly API subscales showed moderate correlations with the DUDIT-E subscales. The strongest relationships were detected between the N subscale of the DUDIT-E and "the effects of substance use on the user" of API ($r = 0.71$, $p < .001$) and between the T subscale of the DUDIT-E and "the motivation to quit using substances" of API ($r = 0.71$, $p < .001$). These findings further supported for good convergent validity.

There were no female participants in the present study, which was one of the limitations of the study. The sample size was adequate for the analyzes, but larger studies would provide better results. Finally, in contrast with previous studies, test–retest reliability was not conducted in the present study. Therefore, future research are needed to evaluate the DUDIT-E's characteristics, including test–retest reliability, using a larger and severe clinical sample of both female and male drug abusers.

In conclusion, the DUDIT-E has good psychometric characteristics. The present study extended the evaluation of the psychometric properties of the DUDIT-E to male outpatients with SUD who were under probation, supported the dimensional construct of the Turkish DUDIT-E, and replicated the findings of the original study [2].

Disclosure statement

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