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Original Article

Assessments of the Factor Structure and Psychometric Properties of the Persian Version of the 30-Item Drug Attitude Inventory in Patients with Schizophrenia

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Abstract

Background: Schizophrenia is a debilitating psychiatric disorder in which non-adherence to medication leads to symptom relapse, rehospitalization, reduced quality of life, and increased treatment costs; therefore, an appropriate tool is needed to assess the attitudes of patients with schizophrenia towards medication.

Methods: Three hundred patients with schizophrenia enrolled at the specialized neuropsychiatric clinic at Shafa Hospital in Rasht 2023 participated in this cross-sectional study. The patients filled out the Drug Attitude Inventory-30 (DAI-30) and a demographic questionnaire. Qualitative and quantitative methods were used to evaluate content validity. Face validity was assessed using qualitative content validity, and the content validity ratio (CVR) and content validity index (CVI) were computed for quantitative content validity. Kolmogorov-Smirnov test was used to assess the normal distribution of the questionnaire scores. Reliability was assessed using test-retest procedures and Cronbach's alpha. Data were analyzed using SPSS version 26, and confirmatory factor analysis (CFA) and model fit were performed using Smart PLS version 8.8. A P value < 0.05 was considered statistically significant.

Findings: In this study, 211 participants (70.33%) were male and the mean ± standard deviation (SD) of age was 40.32 ± 10.87 years. All items of the Persian version of DAI-30 showed a CVR greater than 0.62 and CVI greater than 0.80, confirming their content validity. Construct validity showed sufficient internal correlations for conducting exploratory factor analysis (EFA). Cronbach's alpha for reliability was 0.983. The test-retest correlation coefficient was high ($r = 0.936$, $P < 0.001$).

Conclusion: The findings of this study recommend that the Persian version of the DAI-30 is a relevant and reliable measure for evaluating drug attitudes in patients with schizophrenia.

Keywords: Schizophrenia, Inventory, Psychometrics, Iran

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Introduction

Eugen Bleuler first introduced Schizophrenia in 1911.[1] It is one of the most severe and debilitating psychiatric disorders.[1-4] According to the World Health Organization's 2018 report,[5] there are 24 million persons diagnosed with schizophrenia worldwide, with a recurrence rate of 75%. Long-term antipsychotic pharmaceutical treatment is required for schizophrenia, which is a chronic and lifelong illness that can result in hospitalization and symptom relapse.[6,7] At both acute and long-term stages of treatment, medications are essential[8] for mental health disorders. In this regard, 14% of all diseases worldwide are mental health disorders, and their management is complex because of medication non-adherence.[5,9,10] Adherence to prescribed medications significantly improves treatment outcomes for patients with psychiatric disorders such as schizophrenia,[11] which depends on several factors, including poor insight into the illness, substance abuse, negative attitudes toward medication, and side effects.[12] In psychiatric patients, non-adherence to treatment is primarily due to poor insight into the illness,[9,13,14] leading to symptom relapse, rehospitalization, reduced quality of life, increased suicide attempts, and higher treatment costs.[9,15] Discontinuation of antipsychotic medications in patients with schizophrenia causes the risk of relapse by approximately five times,[6,16] and nearly 40%-50%

of patients with schizophrenia do not adhere to their medication regimen.[6,13]

The self-report Drug Attitude Inventory (DAI), developed by Hogan et al in 1983 to predict adherence and response to treatment in patients with schizophrenia, is one of the instruments that can be used to evaluate the attitudes of patients with schizophrenia toward medication.[10,17] This inventory has two versions: DAI-30 (original) and DAI-10.[18,19] In 2017, Shariati et al[20] conducted a psychometric evaluation of the 10-item version for patients with bipolar disorder in Iran. An appropriate tool is required because medication attitudes play a crucial role in treatment adherence for psychiatric patients, especially those with schizophrenia. Because the 30-item version of the DAI (DAI-30) is the original tool and has not been psychometrically evaluated in Iran, it is critical to assess the validity and reliability of the DAI-30 for evaluating medication attitudes in schizophrenia patients; therefore, the purpose of this study was to determine the psychometric properties of the Persian version of the DAI-30 in schizophrenia patients.

Methods

This study is a cross-sectional, methodological, and validation research that assesses the psychometric properties of the DAI in schizophrenic patients. The study population comprised all patients with schizophrenia who attended the specialized neuropsychiatric clinic at Shafa Psychiatric Hospital in Rasht in 2023. The treating physician's diagnosis was based on the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5). Participants were gradually recruited based on inclusion criteria, which included willingness to participate, use of antipsychotic medication, and absence of cognitive impairment. According to the rule of thumb, the minimum acceptable sample size for factor analysis of the DAI-30 in patients with schizophrenia was estimated to be 300, with 10 participants per item.[21] All participants completed an informed consent form.

The data collection tool consisted of a questionnaire with 30 DAI items and five demographic questions. After confirming its validity and scientific credibility, the researcher used the tool in person.

The Drug Attitude Inventory-30

The DAI is a self-report questionnaire with 30 items across seven domains: positive feelings (items 18, 26, 6, 15, 21, 9, 29, 2), negative feelings (items 3, 25, 12, 16, 11, 28), illness/health (items 20, 13, 1), role of the physician (items 24, 17), control (items 5, 8), avoidance (items 30, 23), and harm (items 7, 14), designed and introduced by Hogan et al in 1983.[10,17,22] Responses are given as "yes/no," with 15 items requiring a "yes" response and 15 items requiring a "no" response. Correct answers are scored + 1, and incorrect answers are scored -1. A score of + 30 indicates the highest adherence to medication, while -30 indicates the lowest adherence.[23]

Following the methodology suggested by Wild et al, two independent translators simultaneously translated the tool from English to Persian for the Persian translation of the questionnaire after gaining permission from the original inventor. Two more translators then reverse-translated the Persian versions into English.[24] After final editing, the researcher prepared the Persian version. To determine face validity qualitatively, face-to-face interviews were conducted with several participants to assess the questions' difficulty, relevance, and clarity. Qualitative and quantitative approaches were used to evaluate content validity. Qualitative content validity involved formal validity and expert opinions from the head of the psychiatry department and other faculty members. After incorporating their feedback, the Persian version was evaluated for content validity (CVR and CVI) by 10 psychiatry faculty members at the Shafa Educational and Therapeutic Center. Items with a CVR above 0.79 were considered acceptable based on Lawshe's table. For CVI, experts assessed each item for simplicity, specificity, and clarity, with items scoring above 0.79 deemed appropriate and items scoring between 0.79 and 0.70 requiring revision.

Cronbach's alpha and test-retest methods were used to assess reliability. For test-retest reliability, 10% of the sample (30 participants) were randomly selected and re-evaluated after 15 days.

Statistical analysis

Data were analyzed using SPSS version 26, and CFA and model fit were performed using Smart PLS version 8.8. Given that the theoretical seven-factor model proposed by the original designer did not exhibit adequate fit in confirmatory factor analysis (CFA), exploratory factor analysis (EFA) was initially conducted. The Kolmogorov-Smirnov test indicated that the scores did not follow a normal distribution. Due to the violation of the normality assumption, robust maximum likelihood estimation and various fit indices were used for CFA. Internal consistency was assessed using Cronbach's alpha, and test-retest reliability was evaluated using the intraclass correlation coefficient (ICC). A P value < 0.05 was considered statistically significant.

Results

In this study, 300 patients diagnosed with schizophrenia, all undergoing pharmacological treatment, completed the questionnaire. 211 (70.3%) were male, and 89 (29.7%) were female. The average age of the participants was 40.3 ± 10.9 years, with the youngest being 15 and the oldest 70 years old. Of the participants, 191 (63.7%) were unemployed, 187 (62.3%) were single, and 119 (39.7%) had an education level below high school.

Table 1 illustrates the frequency distribution of responses to each item on the DAI-30 questionnaire. The mean total score on the scale for the study respondents was 24.5 ± 5.7, ranging from -30 to + 30. More details are provided in Table 1.

Quantitative face validity

One method for determining quantitative face validity is

Table 1. Frequency distribution of responses to the Drug Attitude Inventory (DAI-30) questionnaire items among the study sample

			N (%)	IS	CVR	CVI
1	When I feel better, I do not need to take medication anymore.	True	131 (43.67)	4.7	1.0	1.0
		False	169 (56.33)			
2	For me, the benefits of medication outweigh its drawbacks.	False	119 (39.67)	4.7	1.0	1.0
		True	181 (60.33)			
3	I feel strange, almost euphoric, when I take medication.	True	98 (32.67)	4.4	0.8	0.9
		False	202 (67.33)			
4	I need to take medication regularly even when I am not hospitalized.	False	126 (42.00)	4.7	1.0	0.9
		True	174 (58.00)			
5	I take medication only because of pressure from others.	True	124 (41.33)	4.4	1.0	1.0
		False	176 (58.67)			
6	When I take medication, I know what I am doing, and I am aware of my surroundings.	False	105 (35.00)	4.2	1.0	0.8
		True	195 (65.00)			
7	Taking medication has no harm for me.	False	174 (58.00)	4.4	1.0	1.0
		True	126 (42.00)			
8	I take medication willingly.	False	117 (39.00)	4.7	0.9	0.9
		True	183 (61.00)			
9	Medication calms me down.	False	106 (35.33)	4.7	0.9	0.8
		True	194 (64.67)			
10	It makes no difference to me whether I take medication or not.	True	114 (38.00)	4.7	1.0	0.9
		False	186 (62.00)			
11	Medications always have unpleasant side effects.	True	114 (38.00)	4.7	0.8	0.9
		False	186 (62.00)			
12	Medications make me feel tired and lazy.	True	133 (44.33)	4.4	1.0	0.9
		False	167 (55.67)			
13	I only take medication when I feel unwell.	True	130 (43.33)	4.4	1.0	1.0
		False	170 (56.67)			
14	Medications are slow-acting poisons.	True	113 (37.67)	4	0.9	1.0
		False	187 (62.33)			
15	I get along better with others when I take medication.	False	116 (38.67)	4.4	0.9	1.0
		True	184 (61.33)			
16	I cannot concentrate on anything when I take medication.	True	120 (40.00)	4.6	1.0	0.9
		False	180 (60.00)			
17	I know better than my doctor when to stop taking my medication.	True	122 (40.67)	4.7	0.9	0.9
		False	178 (59.33)			
18	I behave more naturally when I take medication.	False	119 (39.67)	4.4	1.0	0.8
		True	181 (60.33)			
19	I prefer to feel unwell rather than take medication.	True	108 (36.00)	4.6	1.0	1.0
		False	192 (64.00)			
20	It is not natural to let medication control my mind and body.	True	138 (46.00)	4.7	1.0	0.9
		False	162 (54.00)			
21	I think better when I take medication.	False	136 (45.33)	4.7	0.9	1.0
		True	164 (54.67)			

Table 1. Continued.

			N (%)	IS	CVR	CVI
22	I need to continue taking medication even when I feel well.	False	131 (43.67)	4.4	0.8	0.8
		True	169 (56.33)			
23	Taking medication prevents the recurrence of my symptoms.	False	116 (38.67)	4.2	1.0	1.0
		True	184 (61.33)			
24	My doctor decides when I should stop taking medication.	False	107 (35.67)	4.2	1.0	0.9
		True	193 (64.33)			
25	Simple tasks become very difficult when I take medication.	True	104 (34.67)	4.4	0.9	1.0
		False	196 (65.33)			
26	I feel happier and better when I take medication.	False	136 (45.33)	4.7	0.9	1.0
		True	164 (45.67)			
27	I am given medication to prevent me from doing things others disapprove of.	True	141 (47.00)	4.2	0.7	1.0
		False	159 (53.00)			
28	I cannot stay calm when I take medication.	True	112 (37.33)	4.7	0.8	0.9
		False	188 (62.67)			
29	I have more control over myself when I take medication.	False	114 (38.00)	4.7	1.0	0.9
		True	186 (62.00)			
30	Continuing medication helps prevent the return of my symptoms.	False	116 (38.67)	4.7	1.0	0.8
		True	184 (61.33)			

the item impact method. For this purpose, 20 patients with schizophrenia were asked to rate the importance of each item based on their experiences using a 5-point Likert scale: significant (score 5), critical (score 4), somewhat important (score 3), slightly important (score 2), and not significant (score 1). This study retained items with an impact score (IS) of 1.5 or higher. The results showed that none of the items had an impact score below 1.5; therefore, no items were removed at this stage (Table 1).

Quantitative content validity

Ten experts served as a panel to assess the validity of the quantitative content. According to Lawshe's table for ten evaluators, each items's CVR must exceed 0.62. No questions were eliminated from this survey because every one of its questions had a CVR greater than 0.62. All items of the Persian version of the DAI-30 showed a CVI greater than 0.8, confirming their strong content validity (Table 1).

Construct validity

Exploratory factor analysis

All participants completed the DAI-30 scale. Due to significant collinearity observed among certain items (specifically Questions 23, 29, and 30), an EFA with a varimax rotation was conducted to identify the underlying structure of the measurement scale. Questions 23 and 29 were removed at this stage because of their strong correlation (greater than 0.9) with each other and Question 30, and multicollinearity.

The Kaiser-Meyer-Olkin (KMO) measure was 0.958, and Bartlett's test of sphericity was statistically significant ($\chi^2 = 10546.746$, $df = 378$, $P < 0.001$). These criteria confirmed the adequacy of the data for conducting EFA of the DAI questionnaire. The commonalities of the DAI items, assessed using principal component analysis, indicated that 28 items (after removing questions 23 and 29) were significant in determining attitudes toward medication. All these items had factor loadings above 0.4, demonstrating their suitability for defining the domains of medication attitudes. Using principal component analysis and varimax rotation, two domains were identified for the DAI questionnaire (Figure 1).

In Figure 1, two domains were delineated for the DAI based on eigenvalues more significant than one. Notably, eigenvalues above one and item correlations within each domain above 0.5 were considered for determining domains and items. These two domains accounted for 73.0% of the variance in medication attitudes. According to the findings, items 2, 4, 8, 9, 10, 11, 14, 15, 17, 18, 19, 20, 21, 22, 24, 26, 28, and 30 constituted the first factor, while the remaining items formed the second factor. Hereafter, this questionnaire is referred to as PDAI-28.

Confirmatory factor analysis

To validate the model proposed in the EFA, CFA was conducted. The findings indicated that the factor loadings of the PDAI-28 items in the first subscale ranged from 0.687 to 0.913, with the highest loading for question 5 and the lowest for question 3. In the second subscale, factor loadings ranged from 0.692 to 0.916, with the highest loading for question 30 and the lowest for question 18. Factor loadings between 0.3 and 0.6 are considered acceptable, and values above 0.6 are highly desirable

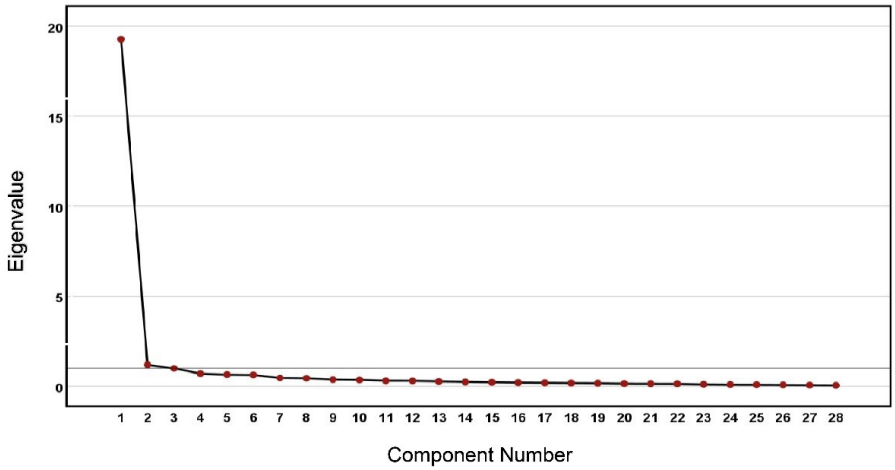

Figure 1. Represents the scree plot to determine the number of factors in the Drug Attitude Inventory (DAI) questionnaire

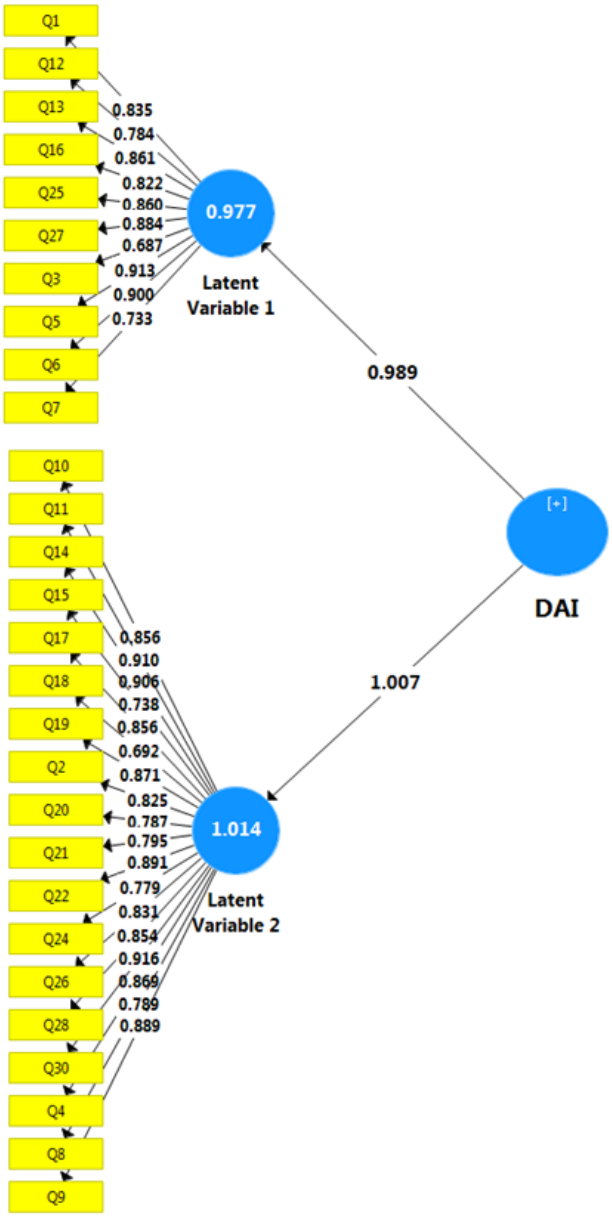

Figure 2. The factor loadings of the items in the drug attitude questionnaire are represented in a two-subscale model

(Table 2 and Figure 2).

The t-test statistic was used to assess the significance of the relationships between variables. According to the findings, since the t-values for each item were outside the range of -1.96 to 1.96, there was a statistically significant relationship between the items and their respective subscales; therefore, no items were removed.

The essential criterion for evaluating model fit is the examination of the determination coefficients. The determination coefficients are presented in Table 2 and Figure 2. Based on the calculated values, the model fit is confirmed. Another criterion for assessing the model's predictive power is the Stone-Geisser Q criterion. Models with acceptable structural fit should be able to predict the indicators related to the constructs. The predictive power of the model for the constructs is categorized as weak (0.02), moderate (0.15), and strong (0.35). The Q^2 values for the first and second subscales and the overall attitude toward medication were 0.653, 0.683, and 0.662, respectively, indicating strong predictive power. Thus, the proposed two-factor model demonstrates an acceptable fit (Table 2).

Internal reliability

Cronbach's alpha was employed to evaluate the internal consistency of the scale. The Cronbach's alpha for the PDAI-28 was 0.983, indicating high internal consistency. For the two subscales, Cronbach's alpha was 0.956 and 0.977, respectively. The more recent composite reliability criterion was employed in addition to the conventional Cronbach's alpha to assess each construct's internal reliability. For each construct, a composite reliability value above 0.7 denotes sufficient internal stability for the measurement model; a value below 0.6 denotes unreliability. All of the model's constructs had composite reliability values greater than 0.7 (Table 2).

Test-retest reliability

The test-retest reliability and intraclass correlation

Table 2. Indices of confirmatory factor analysis (CFA), model fit, and reliability of the 2-component model of Drug Attitude Inventory (PDAI-28)

Component	Items	Factor loading	T-value statistic	Composite reliability	Cronbach's alpha	Determination coefficient	Stone-Geisser criterion
Factor 1	1	0.835	30.164	0.957	0.956	0.977	0.653
	3	0.687	17.737				
	5	0.913	59.975				
	6	0.900	49.681				
	7	0.733	25.327				
	12	0.784	27.220				
	13	0.861	39.605				
	16	0.822	31.800				
	25	0.860	37.093				
	27	0.884	53.012				
Factor 2	2	0.825	28.637	0.977	0.977	1.014	0.683
	4	0.869	41.238				
	8	0.789	24.752				
	9	0.889	51.677				
	10	0.856	38.905				
	11	0.910	62.947				
	14	0.906	56.882				
	15	0.738	19.703				
	17	0.856	35.189				
	18	0.692	16.970				
	19	0.871	39.743				
	20	0.787	28.533				
	21	0.795	29.146				
	22	0.891	49.304				
	24	0.779	23.435				
	26	0.831	34.235				
	28	0.854	37.006				
	30	0.916	59.892				
PDAI-28				0.983	0.983		0.662

coefficients (ICCs) were used to assess the questionnaire's repeatability. The overall questionnaire and both domains had statistically significant ICC values of 0.925, 0.978, and 0.898 (Table 3). Moreover, table 4 summarizes that the correlation coefficients between the scores from repeated administrations of the examination for each subscale and the overall score were high, thereby indicating strong instrument reliability.

Discussion

This study aimed to determine the psychometric properties of the Persian version of the DAI-30 in patients with schizophrenia at Shafa Hospital in Rasht in 2023. A total of 300 patients meeting the inclusion criteria participated in the present study. Medication is a crucial method for treating psychiatric disorders such as schizophrenia.[8] A critical factor in assessing medication adherence is evaluating patients' attitudes toward antipsychotic drugs, for which the DAI is a valuable tool.[10] Medication adherence is vital for achieving functional improvement in patients with schizophrenia, and the DAI-30 is a standard tool for this assessment. The subscales of this tool include awareness of the need for medication, awareness of medication effects, and perceptions of medication. The questionnaire was psychometrically evaluated by Hogan et al in 1983 in Canada with 150 patients. They reported a reliability of 0.93 using the Kuder-Richardson formula 20 ($P<0.001$) and noted item correlations. In a test-retest conducted four weeks later with 27 patients, the questionnaire's stability in terms of repeatability was reported as 0.82, indicating good reliability. The exploratory analysis using the Kaiser index reported a value of 1.0, and seven domains were identified using varimax rotation.[22]

We used a sample of 300 patients in our investigation. Cronbach's alpha was used to evaluate the questionnaire's internal consistency; a score of 0.983 indicated a high internal consistency. After 15 days, the tool was given to 30

Table 3. Test-retest reliability using the intraclass correlation coefficient for the subscales and the Drug Attitude Inventory

Scale	ICC	95% Confidence Interval		*P* value
		Lower Bound	Upper Bound	
First Subscale	0.978	0.953	0.989	<0.001
Second Subscale	0.898	0.787	0.952	<0.001
PDAI-28	0.925	0.843	0.964	<0.001

randomly chosen patients again to assess its repeatability and stability. The high correlation coefficients between the total score and the scores from the repeated administration of each subscale indicated good reliability. In our study, we used varimax rotation and principal component analysis to identify two domains for the DAI.

Awad et al, in their study titled "Assessment of Patients' Subjective Experience in Acute Neuroleptic Treatment," noted that the DAI is used in eight languages worldwide among hospitalized and outpatient schizophrenia patients.[23] Roopun et al conducted a study titled "Attitudes and Preferences for Oral vs. Long-Acting Injectable Antipsychotics" in 140 patients with schizophrenia spectrum disorders in South Africa. They used the DAI-30 and suggested it as a tool for indirectly predicting adherence to psychiatric medications, aligning with our study's findings that it is suitable for assessing treatment adherence in schizophrenia patients.[25] Sowunmi published a study titled "Psychometric Properties of the DAI in Schizophrenia Patients" in Nigeria with a sample size of 220, where the DAI-30 was psychometrically evaluated. They reported a Cronbach's alpha of 0.56 and an ICC of 0.55, which were lower than our study, possibly due to their smaller sample size. They concluded that the tool has good validity and reliability for assessing medication attitudes in schizophrenia patients and reported significant correlations between marital status and education.[10] Ishii et al published a study titled "Relationship Between Functional Improvement and Medication Adherence in Schizophrenia" in Japan, using the DAI-30 to assess medication attitudes. Their findings indicated that having a positive perception of medication might be associated with adherence.[16] Shariati et al conducted a study titled "Psychometric Properties of the DAI in Bipolar Disorder Patients" in Tehran with a sample size of 82, where the DAI-10 was psychometrically evaluated. They reported a Cronbach's alpha of 0.787 and concluded that the tool has good validity and reliability for assessing medication attitudes in bipolar disorder patients.[20]

Conclusion

This tool has appropriate validity and reliability for assessing medication attitudes in schizophrenia patients. Since one of the reasons for non-adherence to treatment is the attitude towards medication, it is recommended that other causes be investigated and policymakers and planners adopt appropriate strategies to improve adherence in schizophrenia patients.

Table 4. The test-retest reliability was evaluated using correlation coefficients across subscales and the overall score of the Drug Attitude Inventory

Before / After		PDAI-28	First Subscale	Second Subscale
PDAI-28	r	0.936	0.816	0.838
	P value	<0.001	<0.001	<0.001
First Subscale	r	0.882	0.962	0.670
	P value	<0.001	<0.001	<0.001
First Subscale	r	0.792	0.554	0.847
	P value	<0.001	0.001	<0.001

r= Correlation Coefficient

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Competing Interests

The authors declare no conflicts of interest.

Ethical Approval

The study was approved by the Ethics Committee of Guilan University of Medical Sciences (code: IR.GUMS.REC.1401.471). Detailed information regarding the study was provided to eligible subjects through a patient information sheet, and informed consent was obtained. Participants were informed of their right to withdraw from the study at any stage, and confidentiality was strictly maintained throughout the study.

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