■ **Original Article**

Validity and Reliability of the World Health Organization Disability Assessment Schedule 2.0 36-Item Persian Version for Persons with Multiple Sclerosis

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Background: No previous studies have assessed the psychometric properties of the 36-item version of the World Health Organization Disability Assessment Schedule 2.0 (WHODAS 2.0) in the Persian language of Iran. This study was designed and conducted to evaluate the validity and reliability of the Persian version using a sample of persons with multiple sclerosis in Ahvaz, Iran.

Methods: The methodological study was conducted in two stages: First, the 36 items of the original WHODAS 2.0 were translated to create a Persian version, after which the translation validity and psychometric properties were tested. The factor structure of the instrument was also tested using exploratory and confirmatory factor analyses.

Results: The intraclass correlation coefficients were very good to excellent, varying between 0.82 and 0.99 for the six domains, and all domains had Cronbach's α reliability values of above 0.70. For construct validity, results showed negative and strong correlation between the total score of WHODAS 2.0 and the Multiple Sclerosis Quality of Life-54. Exploratory factor analysis divided the Persian version of WHODAS 2.0 into seven factors for multiple sclerosis patients.

Conclusion: The results of this study indicate that the Persian version of WHODAS 2.0 is a valid and reliable instrument to study the disabilities of people with multiple sclerosis.

Keywords: World Health Organization Disability Assessment Schedule 2.0; Multiple Sclerosis

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INTRODUCTION

Multiple sclerosis (MS) is a complex, debilitating, and chronic disease of the central nervous system that has affected more than two million people worldwide. It is the most common neurological disease leading to the disability of young adults.[1] Although the etiology of this multi-factorial and costly disease has yet to be identified, it is widely believed that genetics, vitamin D deficiency, the autoimmune mechanism, and several environmental factors play major roles in its development. Of significant concern are the varied prevalence rates of MS worldwide. For example, 12 cases per 100,000 are reported in Mexico compared to 55 per 100,000 in Spain. MS prevalence is also high in Iran at approximately 50 per 100,000 and women are affected at approximately 3 times the rate of men.[2]

The nature of this disabling disease can affect the activities and social participation of MS patients. A Germany study found that anorgasmia in women and erectile dysfunction in men are the most common problems in sexual relationships among MS patients. It may also result in unemployment, with at least one study finding that persons with MS lost their jobs after being diagnosed with the disease based solely on their employers' bias toward the disease. This in itself often leads to reduced quality of life of patients.[1,3] Measuring activity limitations—especially participation restrictions—instead of the level of impairment seems to be more important for finding ways to increase the participation of patients in order to integrate those with disabilities into the community.[4]

Although numerous instruments have been developed to measure disabilities, the World Health Organization Disability Assessment Schedule 2.0 (WHODAS 2.0) was designed to assess the general health and disability levels based on the International Classification of Functioning, Disability, and Health (ICF) concepts as outlined in its activity and participation chapter.[5,6] The instrument has been used to assess activity limitation, disability, functioning, and intervention effectiveness for diseases and disorders in clinical and research centers.[5,7] Moreover, the majority of studies have shown that WHODAS 2.0 has acceptable psychometric properties. More than 28 countries have translated and adapted it to their specific cultures.[8] The questionnaire's simplicity, short completion time, and a structure based on the bio-psychosocial model of ICF set WHODAS 2.0 apart from other instruments.[9,10] The aim of this paper was to assess the psychometric properties (test-retest reliability, internal consistencies of reliability, floor and ceiling effects in every domain, and construct validity) of the Persian version of WHODAS 2.0 for persons with MS.

METHODS

1. Stages

This paper was conducted in two stages. Stage 1 involved the translation and adaptation of the English version of WHODAS 2.0 into Persian. Stage 2 evaluated the psychometric properties of the Persian version using patients with MS.

1) Stage 1: translation and adaptation process of WHODAS 2.0
Permission to translate WHODAS 2.0 into Persian was obtained from the World Health Organization (WHO), and the instrument was adapted according to their guidelines.[11] The English version of the instrument was initially translated into Persian by two professional native translators. During expert sessions, three health professionals (two physiotherapists and one occupational therapist) collaborated with the two Persian translators. After discussions, they agreed upon a formal Persian version. A backward translation was conducted by one Iran-based translator who was a native-English speaker with considerable experience in the health field, especially WHODAS 2.0.

To review and confirm the backward translation, we compared the original and backward versions. Near the end of the process, the approved instrument was tested with ten individuals to identify any potential difficulties with comprehension. All participants confirmed that they did not encounter any problems, misunderstandings, or ambiguity with the Persian version of WHODAS 2.0.

2) Stage 2: participants
A total of 121 MS patients over 18 years old and living in Khuzestan province were selected to participate in the study. All had at least the minimum required ability to read and write in Persian. Their Mini-Mental Score Examination scores were over 24, and their Expanded Disability Status Scale scores ranged from 1–7. All participants signed the informed consent form approved by the Ethics Committee of Ahvaz Jundishapur Medical Sciences University (IRB approval no., IR.AJUMS.REC.1394.195).

In order to assess the factor structure, content validity, and the internal consistency reliability of the 36-item WHODAS 2.0, the participants first responded to all items. A Multiple Sclerosis Quality of Life-54 (MSQoL-54) questionnaire was used together with WHODAS 2.0 in order to measure the construct validity of the 36-item version. Ten days after the first assessment, 60 patients repeated the WHODAS 2.0 to determine its test–retest reliability.[12]

2. Instruments

1) MSQoL-54
This instrument was designed based on the Short Form-36 (SF-36) instrument and further adapted to assess the health-related quality of life of persons with MS. The MSQoL questionnaire was developed by adding 18 special items regarding MS in the form of 36 items related to SF-36. The criteria evaluated were the following subscales: physical health, role limitation caused by physical problems, role limitation based on emotional problems, pain, emotional well-being, energy, health perceptions, social functioning, cognitive functioning, health distress, sexual functioning, changes in health, satisfaction with sexual functioning, and overall quality of life. These 14 subscales were divided into two groups (physical and mental health). The 14 scores and the two groups ranged from 0–100, and higher scores represented higher quality of life for persons with MS.[13]

2) WHODAS 2.0

In this study, the 36 items and the self-administrated WHODAS 2.0 were used to measure disability levels. This instrument encompasses six domains: (1) cognition (understanding and communicating), (2) mobility (moving and getting around), (3) self-care (hygiene, dressing, eating, and being around people), (4) getting along (interacting with people), (5) life activities (domestic responsibilities, leisure, work, and school), and (6) participation (joining community activities). The WHODAS 2.0 questionnaire uses 5-point Likert scales with responses ranging from 0 (no difficulty) to 4 (extreme difficulty or total inability), and its total scores range from 0 (no disability) to 100 (full or complete disability). Lower scores represent less disability.[14]

3. Statistical Analysis

1) Reliability

(1) Internal consistency
Cronbach's α values were used to determine the internal consistency of WHODAS 2.0, with the minimum acceptable value determined to be above 0.70 for each domain.[15]

(2) Test–retest reliability
Intraclass correlation coefficients (ICC) using a two-way random model (95% confidence interval [CI]) were conducted for each domain to examine the test–retest reliability of WHODAS 2.0.[16] In order to interpret the ICC, "Munro's manual on correlation coefficients" was used, and the following levels of reliability were assigned: between 0–0.25 (little), 0.26–0.49 (low), 0.50–0.69 (moderate), 0.70–0.89 (high), and 0.90–1 (very high). Another way to assess reliability is the standard error of measurement (SEM) that we also applied in this study. SEM can be used to determine the minimal detectable change.

2) Validity

(1) Construct validity
In this study, WHODAS 2.0 and MSQoL-54 questionnaires were utilized together to determine construct validity by assessing the correlation (Pearson coefficient) between the domains of both instruments. Roos guidelines were used to assess and interrupt this validity. Roos et al.[17] posited that when correlation coefficients among two instruments were >0.20 between 0.20 to 0.60 and over 0.60, they would represent weak, moderate, or strong validity, respectively.

(2) Ceiling and floor effects
Ceiling and floor effects were extensively used to measure the content validity of WHODAS 2.0.[4] When the scores of an instrument are disproportionally distributed, ceiling and floor effects occur. To calculate these effects, the frequency of study participants who score at the highest and lowest levels of the scale must be considered.[18]

(3) EFA and CFA
Exploratory factor analysis (EFA) with a principal component and a varimax rotation was performed in order to interpret the WHODAS 2.0 structure. A Kaiser-Meyer-Olkin (KMO) test was used to examine the applicability of confirmatory factor analysis (CFA). A KMO result greater than 0.70 is considered acceptable for using EFA. To confirm the structure of the instrument, CFA was applied. Comparative fit index (CFI), incremental fit index (IFI), and normed fit index (NFI) were used to approve the structure of WHODAS 2.0. The acceptable amount for these indices was a minimum of 0.70.[4,9]

The SPSS ver. 16.0 for Windows (SPSS Inc., Chicago, IL, USA) and Lisrel ver. 8.80 (Scientific Software International Inc., Skokie, IL, USA) were used to perform the analyses of the participants' data.

RESULTS

The demographic variables of the participants (for both whole and test–retest samples) are displayed in Table 1.

1. Reliability

The ICC and 95% CI, the mean±standard deviation, Cronbach's α values, the ceiling and floor effects of each domain, and the total scores of WHODAS 2.0 and MSQoL-54 are presented in Table 2. The ICC shows a high to very high variation between 0.82 and 0.99 for the six domains. All domains had Cronbach's α values above 0.70, which is the minimum value of acceptable internal consistency. The sexual activity question had the highest proportion of missing data (20.7%). The final WHODAS 2.0 scores were calculated for only 65 participants.

2. Validity

Table 3 shows the correlation between the six domains of WHODAS 2.0 and MSQoL-54 (physical and mental health composite) questionnaires. For construct validity, the results show a negative but strong correlation between the total scores of WHODAS 2.0 and the physical health composite of MSQoL-54 (P<0.05).

Table 1. Demographic characteristics of participants

Characteristic	Total (n=121)	Test–retest (n=60)
Gender		
Male	25 (20.7)	11 (18.3)
Female	95 (78.5)	49 (81.7)
Age (yr)	33±9	32±10
Expanded Disability Status Scale	3.2 (1–7)	3 (1–7)
Marital status		
Unmarried	43 (35.5)	24 (40)
Married	76 (62.8)	36 (60)
Divorced	2 (1.7)	0
Widowed	0	0
Occupation		
Employee	65 (53.7)	46 (76.7)
Unemployed	53 (43.8)	14 (23.3)

Values are presented as number (%), mean±standard deviation, or mean (range).

Table 2. Distribution and reliability coefficients for the Persian version of the WHODAS 2.0 and MSQoL-54 scores

Scale/domain	No. (missing %)	Mean±SD	ICC (95% CI)	Floor (%)	Ceiling (%)	Cronbach's α
WHODAS 2.0						
Cognition	121 (0)	26.65±22.3	0.82 (0.69–0.89)	19 (15.7)	1 (0.8)	0.70
Mobility	121 (0)	29.3±25.6	0.98 (0.96–0.99)	26 (21.5)	2 (1.7)	0.84
Self-care	120 (0.8)	12.66±19.6	0.98 (0.97–0.99)	68 (56.7)	1 (0.8)	0.76
Getting along	96 (20.6)	16.14±19.1	0.96 (0.92–0.98)	34 (35.4)	1 (1)	0.75
Life activities (household)	121 (0)	24.62±24.9	0.95 (0.92–0.97)	31 (25.6)	2 (1.7)	0.85
Life activities (work/school)	81 (33.1)	16.13±20.3	0.98 (0.96–0.99)	35 (43.2)	2 (2.5)	0.87
Participation	120 (0.8)	33.54±21	0.99 (0.98–0.99)	8 (6.7)	2 (1.7)	0.85
Total score*	65 (46.3)	22.5±15.3	0.98 (0.98–0.99)	3 (4.6)	1 (1.5)	0.94
MSQoL-54						
Physical health composite	84	60.8±20.4	-	1 (1.2)	1 (1.2)	0.88
Mental health composite	118	56.5±22.6	-	1 (0.8)	1 (0.8)	0.81

WHODAS 2.0, World Health Organization Disability Assessment Schedule 2.0; MSQoL-54, Multiple Sclerosis Quality of Life-54; SD, standard deviation; ICC, intraclass correlation coefficient; CI, confidence interval.
*Standard error of measurement for WHODAS 2.0, 0.31; minimal detectable change for WHODAS 2.0, 0.86.

Table 3. Pearson correlation coefficients between Persian version of the WHODAS 2.0 and MSQoL-54 scores

	WHODAS 2.0							
	Cognition	Mobility	Self-care	Getting along	Life activities (household)	Life activities (work/school)	Participation	Total score
MSQoL-54								
Physical health composite	-0.594	-0.624	-0.578	-0.508	-0.509	-0.475	-0.644	-0.744
Mental health composite	-0.570	-0.459	-0.498	-0.505	-0.399	-0.400	-0.576	-0.655

WHODAS 2.0, World Health Organization Disability Assessment Schedule 2.0; MSQoL-54, Multiple Sclerosis Quality of Life-54.

3. Exploratory Factor Analysis and Confirmatory Factor Analysis

For construct validity, the researchers used EFA. The results of this analysis are shown in Table 4. EFA divided the Persian WHODAS 2.0 into seven factors for MS patients. The results of the CFA are shown in Figure 1 with a factor loading range of 0.79 to 0.87 in all domains (root mean square error of approximation, 0.091; CFI, 0.846; IFI, 0.85; NFI, 0.74).

DISCUSSION

This study was designed and conducted to examine the psychometric properties of the Persian version of the 36-item WHODAS 2.0 using a sample of persons with MS in Iran. The results excellent psychometric properties. They also show that Cronbach's α coefficients for each subscale were between 0.70 (understanding and communication) and 0.88 (life activities), and the value was also high (α=0.94) for the WHODAS 2.0 total score. This is greater than a Portuguese version of WHODAS 2.0 with persons with musculoskeletal pain (α=0.84)[19] and similar to the Chisolm study with persons with hearing loss (α=0.94).[20] Cronbach's α coefficient for the Persian version was very similar to the Taiwanese study (α=0.91).[5]

In Table 2, the results for test–retest show that the ICC of all domains were greater than 0.80, and the cognition (D1) and participation in society (D2) domains had the minimum and maximum ICC at 0.82 and 0.99, respectively. Guilera et al.[21] (who studied schizophrenia) argued that the minimum and maximum amount of ICC for D1 and D2 was 0.86 and 0.89, respectively. These findings are similar to those obtained using the Persian version. In the present study, the total ICC for WHODAS 2.0 was 0.98, a value greater than the Guilera study. Similarly, the Portuguese study of Silva et al.[19] also reported that the total ICC score for WHODAS 2.0 was 0.95. This is also consistent with the Persian version. Further, the 0.80 ICC of the Taiwanese study is not consistent with the present study that revealed a lower coefficient.[5]

The results of the content validity analysis show that the Persian version of WHODAS 2.0 had floor effects over 30% for the following domains: "self-care," "getting along," and "life activities (work/school)." In a study carried out by Garin et al.,[9] lower floor and ceiling effects were found for WHODAS 2.0 compared to the results of the present study. Chiu et al.[5] (Taiwan study) reported that all WHODAS 2.0 domains had floor effects greater than 35%, and the "self-care," "getting along," and "life activities" dimensions were over 40%; however, the total floor effect of WHODAS 2.0 was only 7.2%. The results obtained in the Taiwan study were similar to the Persian version of WHODAS 2.0 that showed a 4.6% floor effect.

The correlation between WHODAS 2.0 and MSQoL-54 confirmed the construct validity between the two instruments. The results of the correlation are shown in Table 3. Compared to other studies, this result is similar to that obtained for the English version of WHODAS 2.0 originally developed by WHO that shows an acceptable correlation between other instruments, such as the SF-36, SF-12, and WHOQoL (r=0.43–0.58).[7] The correlation between the Persian version of WHO-

Table 4. Exploratory factor analysis of the Persian version of the WHODAS 2.0 (n=121)

Items of WHODAS 2.0	Components						
	1	2	3	4	5	6	7
D1.2: Remembering to do important things	**0.84**	0.13	0.04	-0.02	0.16	0.18	0.18
D1.1: Concentrating on doing something for 10 minutes	**0.76**	-0.05	0.03	0.21	-0.05	0.12	0.33
D1.3: Analyzing and finding solutions to problems in daily life	**0.75**	0.26	0.05	0.01	0.08	0.22	0.11
D1.6: Starting and maintaining a conversation	**0.70**	0.11	0.31	-0.03	0.27	0.03	0.06
D1.4: Learning a new task (e.g., how to get to a new place)	**0.69**	0.15	0.13	0.06	0.24	0.18	0.10
D1.5: Generally understanding what people say	**0.67**	0.36	0.25	0.02	0.23	0.12	-0.09
D3.1: Washing your entire body	0.20	**0.72**	0.04	0.28	0.06	-0.03	0.22
D4.5: Sexual activities	0.11	**0.70**	0.07	0.14	0.02	0.26	0.07
D3.4: Staying by yourself for a few days	0.07	**0.65**	0.01	0.08	0.13	0.08	0.18
D5.1: Taking care of your household responsibilities	0.25	**0.59**	0.31	0.35	0.09	0.21	0.21
D3.2: Getting dressed	0.35	**0.58**	0.27	0.31	-0.04	0.22	0.01
D5.2: Doing most important household tasks well	0.20	**0.57**	0.53	0.24	0.24	0.08	0.14
D3.3: Eating	0.30	**0.47**	0.34	0.33	-0.06	0.09	-0.12
D5.4: Getting your household work done as quickly as needed	0.01	**0.47**	0.32	0.35	0.39	0.05	0.38
D4.3: Getting along with people close to you	0.24	0.08	**0.83**	0.18	-0.10	0.02	0.03
D4.4: Making new friends	0.02	0.10	**0.83**	-0.03	0.20	0.12	0.05
D4.1: Dealing with people you do not know	0.05	0.33	**0.72**	-0.06	0.34	0.18	0.15
D4.2: Maintaining a friendship	0.39	-0.05	**0.68**	0.18	0.08	0.18	0.24
D5.3: Getting all required household work done	0.10	0.42	**0.55**	0.28	0.21	0.00	0.41
D5.7: Completing all work you needed to do	0.12	0.30	0.12	**0.87**	0.09	0.04	0.14
D5.6: Doing most important work/school tasks well	0.08	0.30	0.08	**0.87**	0.14	0.16	0.11
D5.5: Your day-to-day work/school	-0.02	0.16	0.06	**0.84**	0.25	0.13	0.15
D5.8: Getting your work done as quickly as needed	-0.07	0.30	0.08	**0.55**	0.41	0.31	0.26
D2.5: Walking a long distance, e.g., a kilometer or equivalent	0.15	-0.08	0.08	0.35	**0.76**	0.20	0.11
D2.4: Getting out of your home	0.40	0.16	0.25	0.24	**0.69**	0.10	0.09
D2.1: Standing for long periods, e.g., 30 minutes	0.33	0.03	0.12	0.07	**0.63**	0.07	0.46
D2.2: Standing up from sitting down	0.44	0.27	0.16	0.11	**0.58**	0.25	0.12
D2.3: Moving around inside your home	0.48	0.40	0.17	0.14	**0.51**	0.01	0.04
D6.6: Health is a drain on your financial resources	0.15	0.14	-0.03	0.14	0.10	**0.87**	0.08
D6.7: Your family is facing difficulties due to your health	0.21	0.09	0.15	0.14	-0.00	**0.77**	0.26
D6.4: From time spent on health condition	0.15	0.09	0.22	0.09	0.22	**0.67**	0.04
D6.5: Feeling emotionally affected	0.28	0.28	0.16	0.00	0.24	**0.53**	0.28
D6.1: Joining community activities	0.13	0.24	0.11	0.04	0.18	0.23	**0.79**
D6.2: Because of barriers or hindrances in the world	0.21	0.12	0.19	0.32	0.15	0.10	**0.77**
D6.8: Doing things for relaxation or pleasure by yourself	0.30	0.35	0.17	0.30	-0.11	0.42	**0.52**
D6.3: Living with dignity	0.28	0.34	0.04	0.20	0.22	0.28	**0.48**
Accumulated variance by factor	14.2	12.5	11	10.8	9.2	8.6	8.5
Kaiser-Meyer-Olkin test=0.75							

These bold-typed cells mean that the factor loading amount for any items were greater than 0.45 and every single item loaded in their own subscale.
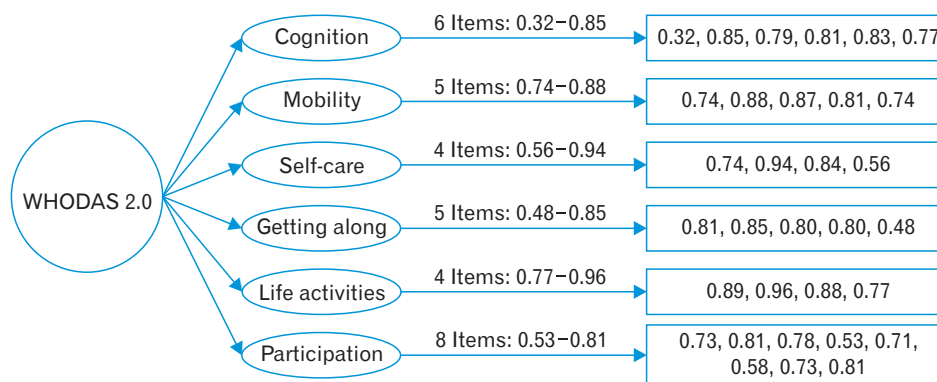WHODAS 2.0, World Health Organization Disability Assessment Schedule 2.0.

Figure 1. Confirmatory factor analysis for WHODAS2.0. Root mean square error of approximation, 0.09; comparative fit index, 0.85; incremental fit index, 0.85; normal fit index, 0.74. WHODAS 2.0, World Health Organization Disability Assessment Schedule 2.0.

DAS 2.0 and MSQoL-54 (r=-0.67) was more than the previous studies (Taiwan and Guilera)[5,21] but less than the correlation observed in the study of Thomas et al.[22] that was conducted with persons with lymphatic filariasis (r>0.7). Magistrale et al.[23] reported moderate correlations between mental health in a study frame comprising MSQoL-54 and WHODAS 2.0 and strong correlation between physical health based on the same combined framework with MS patients. The results of the correlation analysis between WHODAS 2.0 and MSQoL-54 in this study indicate that the Persian WHODAS 2.0 shows good external construct validity.

The EFA results showed that approximately 75% of the total variance was influenced by seven factors, more than both the English[9] and Japanese versions[24] of WHODAS 2.0. The identification of seven factors for the Persian version is similar to previous research, including the Taiwan,[5] English,[7] and European[25] studies; however, it differs from the Italian[26] version that explained only six factors. The CFA results are displayed in Figure 1, wherein the Persian WHODAS 2.0 is shown to have an acceptable construct validity. Consistent with this finding, Chiu et al.[5] reported that the traditional Chinese version of WHODAS 2.0 items loaded greater than 0.4 in CFA.

In general, the results of the current study show that the Persian WHODAS 2.0 has acceptable internal consistency, excellent ICC, a strong construct, and good content validity. Most of these results align with those reported in the original WHODAS 2.0, and there is little difference between the factor structures of the Persian and original versions. In this study, our factor analyses explored and divided the instrument's questions into seven factors, thus yielding one more factor or domain than the original. It should be noted that during the study when the original WHODAS 2.0 was being developed, the life activities (school/work) domain was not considered for the factor structure analysis. This in itself could be due to the decreased number of WHODAS 2.0 factors.

The results of this study indicate that the Persian WHODAS 2.0 is a valid and reliable instrument to evaluate the disability for persons with MS. Its limitations are as follows. First, we did not include a healthy control sample for proper comparison with the patient sample to potentially derive more accurate results. Also, in order to assess test–retest reliability, only 60 patients cooperated by completing the WHODAS 2.0 the second time. It is therefore recommended that a larger, more comprehensive and heterogeneous sample be included in future studies. One final point is that the "sensitivity to changes" factor in the WHODAS 2.0 was not evaluated in this study.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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