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Original Article

Validity and Reliability of Connor-Davidson Resilience Scale in Patients with Multiple sclerosis: A Psychometric Study in Iran

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Abstract

Background and Objective: Resilience refers to a protective factor that reduces stress in people with multiple sclerosis (PwMS). Given the significance of this issue, the present research aimed to assess the validity and reliability of the Connor-Davidson Resilience Scale (CD-RISC) in PwMS.

Materials and Methods: The present cross-sectional study aimed to assess the psychometric properties of CD-RISC in the statistical population of Guilan MS Society (GMSS). In this study, 442 people with MS participated and responded to CD-RISC in an online survey. The data were analyzed in SPSS (version 23) and Amos (version 21) software packages.

Results: The confirmatory factor analysis results of the first stage with five factors revealed that 25 CD-RISC items benefited from high factor load and good fit indices were reported ($\chi2$=605.55; df=265; P-Value=.0001; $\chi2$/df=2.28; GFI=.88; CFI=.93; TLI=.92; RMR=.06; RMSEA=.05); therefore, CD-RISC has good construct validity. Cronbach's alpha coefficients for the whole scale and subscales were calculated at 0.94 and 0.71-0.89, respectively, indicating the optimal reliability of CD-RISC in PwMS.

Conclusions: The current study presented evidence for CD-RISC validity and reliability. Further studies are recommended to ensure the psychometric properties of this scale in other chronic patients.

Keywords: Multiple sclerosis (MS), Psychometric, Reliability, Resilience, Validity

Background

Multiple sclerosis (MS) refers to a chronic demyelinating disease of the central nervous system (CNS), resulting in a reduction in patients' quality of life (QoL) [1]. The youth period between the ages of 20-40 years is the peak prevalence of the disease; moreover, the incidence of this disease is higher in women than in men [2]. Epidemiological studies in Iran have pointed to the increasing prevalence of this disease, and 21 out of 31 provinces in Iran are at high risk of MS [3]. Owing to its progressive and chronic nature, this disease leads to premature disability of the affected people, while imposing a lot of stress on patients [4]; therefore, effective coping with stress may play a significant role in improving the QoL in these patients [5]. Moreover, studies suggest that ineffective coping is a mediating variable in the association between stress and psychological disorders (e.g., depression and anxiety) in these patients [6].

Resilience is a general capacity employed to cope with, minimize, and overcome stress, reflecting one's abilities as a protective factor and a tool for growth [7]. Prior to implying invulnerability to stress, resilience, which is recognized as a protective factor against stress, emphasizes rehabilitation in the face of stressful events [8], [9]. Numerous studies imply that resilience is associated with improved gait and motor function [10], improved quality of life [11], as well as reduced stress [12], anxiety, and depression [13], in people with multiple sclerosis (PwMS).

Today, given the increased number of PwMS, apart from a need to perform research to assess and promote their mental health, measurement tools have to be specifically accredited for these patients in order for them to provide reliable results [14]. The Connor-Davidson Resilience Scale (CD-RISC) is a valid scale validated in various studies(i.e., a powerful tool in measuring resilience) [15-20].

Objectives

The review of the literature revealed that no study has investigated the psychometric specifications of this tool in PwMS. Given the necessity of validating this tool in PwMS, the present study has dealt with its validation.

Materials and Methods

This analytical study aimed to assess the psychometric properties of CD-RISC in the statistical population of Guilan MS Society (GMSS). In GMSS, 2,500 patients were identified and registered, out of whom 442 PwMS participated in the study and responded to the online survey (created on Porsline). The sample size was calculated at 442 cases based on the formula of Chow et al. [21] and the extracted findings (σ=18.12, 1-α=0.95; 1-β=0.90; d=2.8) by running the CD-RISC pilot in 40 PwMS of Guilan province. Participants were selected from the GMSS from August to September 2021 by the convenience sampling method. The informed consent form and CD-RISC were designed in the Porsline online survey system and the link was then sent via SMS in GMSS to all PwMS. After completing 442 survey forms, sampling was stopped. In this study, participants were fully aware of our goals and completed the questionnaire after signing the informed consent form.

The inclusion criteria were membership in GMSS, availability of a mobile phone number in the medical record, a minimum level of diploma education, and provision of informed consent. Failure to answer at least 10% of the questions was also considered an exclusion criterion. At all stages of the research, all the Declaration of Helsinki ethical principles were respected by researchers. The present study was registered with the code IR.GUMS.REC.1400.218 in the Research Ethics Committee of Guilan University of Medical Sciences.

Connor-Davidson Resilience Scale

This scale was initially designed and validated by Connor and Davidson [15]. The CD-RISC has 25 items and five subscales of personal competence, tolerance of negative affect, positive acceptance, self-control, and spiritual influences responded based on a 5-point Likert scale (completely false=0 to completely true=4). The score range on this scale is 0-100, and a high score is suggestive of more resilience [15]. This scale was run and validated in the general and clinical population (people with Generalized Anxiety Disorder and PTSD) by Connor and Davidson, demonstrating good psychometric properties and obtaining the factor analysis of five factors. Moreover, repeated-measures ANOVA revealed that the patient's further improvement during treatment was associated with an increase in CD-RISC score; furthermore, in the clinical sample, the test-retest reliability of this scale was calculated to be 0.87 [15]. In the current study, the CD-RISC was translated in accordance with the recommendations of the World Health Organization (WHO) and then implemented in PwMS. To this end, four steps were passed, including 1- Persian translation: At this stage, the questionnaire was translated into English by a PhD expert. 2- Expert panel and reverse translation: After two English language and psychology experts commented on the translated version and compared it with the English version, the Persian version was translated into English by an English language expert and then returned to the previous two experts for comparison. 3- Preliminary application and cognitive interview: At this stage, 40 people with MS were provided with a questionnaire in the form of an interview. At this stage, all 40 participants confirmed the sentence fluency and item comprehensibility. 4- Final version: The final version was implemented on 442 PwMS.

The obtained data were analyzed in SPSS (version 23) and Amos (version 21) software packages. Descriptive data analysis was conducted with frequency, percentage, mean, and standard deviation (SD). The normal distribution of data was reported according to skewness and kurtosis statistics. Pearson correlation coefficient test was employed in order to investigate the correlation between the overall CD-RISC score and the subscales. The confirmatory factor analysis method was utilized for validity and fit of the proposed model reported by Chi-square (χ2), Degrees of freedom (DF), Goodness of Fit Index (GFI), Comparative Fit Index (CFI), Tucker and Lewis Index (TLI), Root Mean Square Residual (RMR), and Root Mean Square Error of Approximation (RMSEA).

Results

Out of 442 collected samples, 401 cases could be analyzed and employed to assess validity and reliability, while 41 samples were excluded from the analysis as the outliers. Table 1 shows the demographic information of PwMS.

Table 1. Demographic information of participants (n=401)

Variables		N (%)	M	SD	Minimum	Maximum
Age (years)		401 (100)	37.10	9.00	18	64
Disease duration (Month)		401 (100)	65.92	74.86	1	384
Gender	Female	305 (76.1)				
	Male	96 (23.9)				
Marital status	Married	231 (57.6)				
	Single	118 (29.4)				
	divorced	52 (13.0)				
Type of MS	RRMS	273 (68.1)				
	PPMS	79 (19.7)				
	SPMS	49 (12.2)				
Education level	Diploma and less than diploma	161 (40.5)				
	Associate and Bachelor	166 (41.5)				
	Postgraduate education	74 (18.0)				

Note: M=Mean; SD= Std. Deviation; RRMS= Relapsing-remitting multiple sclerosis; PPMS= Primary Progressive multiple sclerosis; SPMS= Secondary progressive multiple sclerosis

The mean scores of age and disease duration were 37.10±9.00 years and 65.92±74.86 months, respectively. Most participants were female (n=305; 76.1%), married (n=231; 57.6%), with relapsing-remitting multiple sclerosis (RRMS) (n=273; 68.1%), as well as associate and BA degrees (n=166; 41.5%). Table 2 presents the mean, standard deviation (SD), skewness, and kurtosis indices of each of the subscales, as well as the total score of the scale.

In Table 2, the mean CD-RISC was equal to 58.89±19.08. Indicators and skewness are all in the range of 2 to -2; therefore, the data distribution is established in each of them. By internal consistency method and calculating Cronbach's alpha coefficient, Table 3 shows Pearson correlation coefficients between subscales and their reliability in 401 PwMS patients.

The results of Table 3 revealed that Cronbach's alpha coefficients for CD-RISC and its subscales were 0.94 and 0.71-0.89, respectively. Pearson correlation coefficients suggested a positive and significant correlation(0.50-0.95) between the subscales and CD-RISC (P<0.01). Moreover, the subscales had a positive and significant correlation with each other (P<0.01). The confirmatory factor analysis method was used to assess the validity of the CD-RISC structure. Figure 1 and Table 4 present the results of the first step of confirmatory factor analysis using Maximum Likelihood Estimation (MLE).

The factor load of each question is greater than 0.30. Furthermore, the critical ratio (CR) calculated for the CD-RISC items' factor loads is greater than the absolute value of 2.58, indicating the significance at the error level of 0.01. Table 5 exhibits the CD-RISC five-factor structure fit indices.

As illustrated in Table 4, the chi-square value ($\chi 2$)

Table 2. Mean, standard deviation (SD), skewness, and kurtosis indices (n=401)

Variables	Questions	M±SD	Skewness	Kurtosis
Total CD-RISC	1-25	58.89±19.08	-.253	-.221
Personal competence	10,11,12,16,17,23, 24, 25	18.76±7.32	-.175	-.564
Tolerance of negative affect	6,7,14,15,18,19,20	14.96±5.51	-.121	-.281
Positive acceptance	1,2,4,5,8	12.63±3.89	-.487	.304
Self-control	13,21,22	6.71±3.08	-.303	-.628
Spiritual influences	3,9	5.81±2.20	-.951	.194

Table 3. Cronbach's alpha and Pearson correlation coefficients

Variables	Cronbach's alpha	1	2	3	4	5
1- Total CD-RISC	.94	1				
2- Personal competence	.89	.95**	1			
3- Tolerance of negative affect	.80	.88**	.79**	1		
4- Positive acceptance	.71	.86**	.79**	.71**	1	
5- Self-control	.77	.88**	.83**	.71**	.72**	1
6- Spiritual influences	.74	.50**	.40**	.26**	.41**	.44**

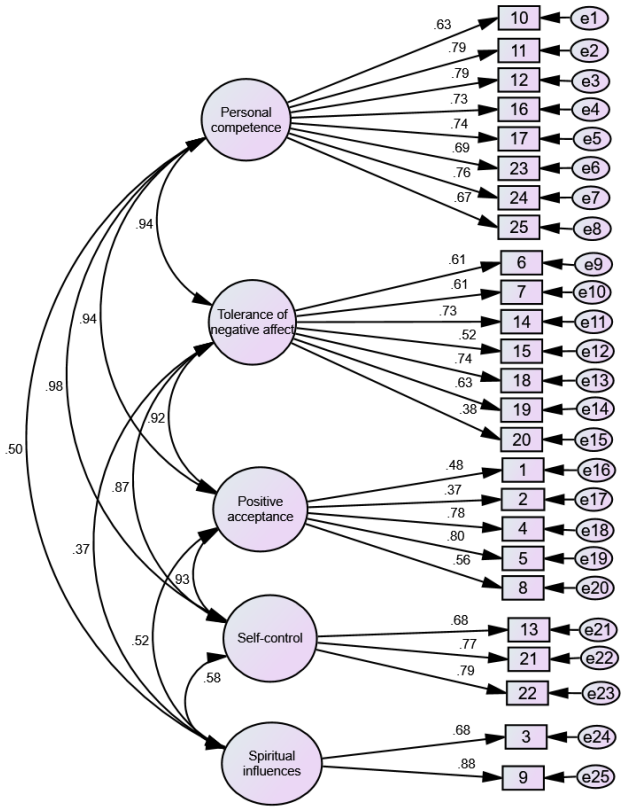

Figure 1. Connor-Davidson Resilience Scale confirmatory factor analysis

Table 4. Results of Connor-Davidson Resilience Scale confirmatory factor analysis

Item	Load Factor	S.E.	C.R.	Item	Load Factor	S.E.	C.R.	Item	Load Factor	S.E.	C.R.
1	.48	.063	13.632	10	.63	.079	13.364	19	.63	.042	11.143
2	.37	.038	12.775	11	.79	.055	12.399	20	.38	.066	13.498
3	.68	.042	12.778	12	.79	.073	13.594	21	.77	.065	13.050
4	.78	.051	13.247	13	.68	.048	12.231	22	.79	.055	12.083
5	.80	.045	13.161	14	.73	.066	13.144	23	.69	.044	11.632
6	.61	.063	13.423	15	.52	.048	13.897	24	.76	.089	9.230
7	.61	.043	13.018	16	.73	.058	13.717	25	.67	.115	2.883
8	.56	.067	13.516	17	.37	.112	13.927				
9	.88	.072	13.262	18	.78	.036	11.654				

is significant (P=0.001) and equal to 605.55; however, when the sample size is high, $\chi 2$ is significant, not a good indicator for model fit. In these cases, the $\chi 2$/df index is more valid, calculated at 2.28 in this study; and since it is less than 3, the model fit is optimal. The GFI in the present study was calculated at 0.88, and since it is from 0.85 to 0.89 and close to 0.90, the model has an acceptable fit. The CFI and TLI were respectively calculated at 0.93 and 0.92, indicating the optimal fit of the model. In this model, RMR and RMSEA indices were calculated at 0.06 and 0.05, respectively, considering that they are between 0.05 and 0.08, indicating an acceptable fit [22]. Generally, since the most important fit indices ($\chi 2$/df, CFI, and RMSEA) are in good condition, it may be concluded that the five-factor CD-RISC model in PwMS has an optimal fit. Overall, the results demonstrated that all 25 items of CD-RISC in the five-factor measurement mode had an acceptable factor load. Fitness indices also showed that the five-factor measurement model has a good fit; therefore, CD-RISC has construct validity.

Table 5. Model fit indices for five-factor structure

$\chi 2$	df	P-Value	$\chi 2$/df	GFI	CFI	TLI	RMR	RMSEA
605.55	265	.0001	2.28	.88	.93	.92	.06	.05

GFI: Goodness of Fit Index, CFI: Comparative Fit Index, TLI: Tucker and Lewis Index, Root Mean Square Residual, RMR: Root Mean Square Residual

Discussion

The present study aimed to validate CD-RISC in Iranian PwMS. The factor analysis results revealed the desired construct validity of this scale with five factors; moreover, reliability was calculated to be optimal by the internal consistency method and calculation of Cronbach's alpha coefficient. In Iran, CD-RISC has been previously validated in other groups. The validity of this scale in Iranian students was examined by exploratory factor analysis, and four factors (achievement motivation, self-confidence, tenacity, and adaptability) were identified. Cronbach's alpha coefficient for each of the subscales was reported from 0.78 to 0.91 [16]. In terms of validity, the results of the stated study are not consistent with the present result; nonetheless, they are in agreement regarding reliability.

In another study in 2014 on 63 people with a cerebrovascular accident, Cronbach's alpha for CD-RISC was reported as 0.89 [17], which is in accordance with the results of the present study. In another research on women with breast cancer, the validity was identified by two factors by exploratory factor analysis, totally explaining 48.34% of the variance. The internal consistency of CD-RISC was calculated at 0.94 [18]. In terms of validity, the result of the referred study is not consistent with the present study but has similar reliability to the result of the present study. In general, it may be concluded that in previously conducted studies, researchers have not considered the construct validity by confirmatory factor analysis and the use of heuristic factor analysis has resulted in a change in the main scale's factor structure; nevertheless, in terms of reliability by internal consistency and calculation of Cronbach's alpha coefficient, previous studies have reported similar results. Convenience sampling, non-random selection of subjects, selection of cases from GMSS, as well as conducting online surveys in data collection, are among the notable limitations of the current study, limiting the generalizability of the results. Despite all the limitations, researchers hope that the present study will be the starting point for future studies, covering the limitations of completing scale psychometric properties and directly used in clinical and research situations.

Conclusions

The results of the present study provided evidence for the validity and reliability of CD-RISC in Iranian PwMS. It is worth noting that further studies should be conducted in the field of assessing the psychometric scale prior to the widespread use of this tool in clinical and research situations. However, this tool can fill the gap in resilience measurement in Iranian PwMS, and the present study may be completed by further research and other psychometric methods, such as concurrent validity.

Compliance with ethical guidelines

The present study was approved by the Research Council of the Neuroscience Research Center and the Vice Chancellor for Research of Guilan University of Medical Sciences. Moreover, its ethical license with the ID (IR.GUMS.REC.1400.218) was issued by the Research Ethics Committee of Guilan University of Medical Sciences. All the ethical principles of the Declaration of Helsinki were respected by researchers in all stages of the research.

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Authors' contributions

All authors participated in the drafting of the article and approved the final version.

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Conflicts of Interest

The authors declare that they have no conflict of interest.

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