Original Article

Validity and reliability of the Persian version of the exercise self-efficacy scale in people with multiple sclerosis

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Abstract:

BACKGROUND: Exercise self-efficacy has been identified as one of the primary determinants of physical activity in people with multiple sclerosis (MS). Therefore, assessment of exercise self-efficacy is important to be measured with valid and reliable scale to provide tailored interventions.

MATERIALS AND METHODS: The English version of the exercise self-efficacy scale was translated into Persian using a forward-backward translation approach. Factorial validity was conducted using the expletory factor analysis (EFA) and the confirmatory factor analysis (CFA). In addition, construct validity was performed using convergent and known-group validity. Reliability was evaluated by internal consistency and test-retest reliability. Participants were recruited from two hospitals (MS clinics).

RESULTS: Expletory factor analysis identified a single factor structure which explained 64.7% variance in exercise self-efficacy scale (EXSE). CFA supported a single factor structure with a good model fit. Average variance extracted = 0.60 and composite reliability = 0.93 values confirmed the convergent validity. The known-group validity was verified with significant differences between subgroups. The Cronbach's alpha coefficient = 0.93 and intraclass correlation coefficient = 0.85 supported reliability of EXSE scale.

CONCLUSIONS: Our findings provided sufficient evidence of validity and reliability for EXSE scale in people with MS. This measure can utilize by researchers and health-care providers in studies and clinical practice as a robust measure to assess exercise self-efficacy and to develop interventions in people with MS.

Keywords: Exercise self-efficacy, multiple sclerosis, validity and reliability

Introduction

Multiple sclerosis (MS) is the most common autoimmune disease in central nervous system that affects young adults, especially women. MS is characterized with inflammation, demyelination, and lesions. The patients with MS experience different symptom including visual problems, balance disorder, spasticity, cognitive dysfunctions, and mobility impairment. The patients with MS also suffer from pain, fatigue, depression, and muscle weakness.

Patients' activities decrease due to increase these symptoms and physical inactivity leads to exacerbation of symptoms and decrease quality of life (QOL). There is abundant evidence which indicate that physical activity (PA) has considerable benefits for improving fatigue, balance, coordination, and health-related QOL.

Despite growing evidence of the benefits of PA, recent studies indicated that the majority of persons with MS are engaging in insufficient PA. Therefore, it is important to identify and assess factors related to PA. Two review studies reported that self-efficacy...
is one of the most powerful predictors of PA among persons with MS.\cite{13,14} Self-efficacy is a primary or focal construct of social cognitive theory which was initially developed by Bandura\cite{15} and has been widely used in various populations and individuals with MS.\cite{16} Self-efficacy is an individual’s confidence in his or her ability to perform a specific behavior. In other words, self-efficacy refers to the confidence that a person has in overcoming barriers while performing a given behavior. For example, to become more physically active, one must overcome several barriers, such as being tired, feeling depressed, feeling anxious, and encountering bad weather.\cite{17} The people with higher levels of self-efficacy have more effort to face challenges than persons with low levels of self-efficacy.\cite{18}

As noted, exercise self-efficacy has been identified as one of the primary determinants of PA in people with MS.\cite{13,14} Therefore, exercise self-efficacy needs to be measured with valid and reliable scale. McAuley initially developed a scale of exercise self-efficacy in middle-age\cite{19} that this scale has been used in people with MS.\cite{16,20} Resnick and Jenkins revised and validated this scale in older adults.\cite{21,22} Patients with epilepsy,\cite{23} and stroke survivors.\cite{24} This instrument is a short scale and appropriate for assessing exercise self-efficacy in individuals with MS. However, to our knowledge, there is insufficient evidence for the validity of this measure in people with MS.

The purpose of this study is validity and reliability of exercise self-efficacy scale in people with MS. Understanding the level of exercise self-efficacy in individuals with MS could help health providers to develop interventions for increasing self-efficacy and PA in this population.

**Materials and Methods**

**Procedures and participants**

**Study design and setting**

This cross-sectional study was conducted from April to November 2020 among patients with MS referred to MS clinics in Tehran, Iran.

**Study participants and sampling**

Participants were recruited from MS clinics of two hospitals affiliated to the Tehran University of Medical Sciences (TUMS) in Tehran, Iran. The sample size was calculated based on the ratio of the number of subjects per item required for a factor analysis. This is an acceptable method that the minimum ratio of sample per item should be 10:1.\cite{25} We considered 210 samples for confirmatory factor analysis (CFA) and 110 samples for exploratory factor analysis in the present study.

The first, individuals with MS were screened based on inclusion criteria then a member of the research team described the research and its procedures.

The inclusion criteria were (a) definite diagnosis of MS, (b) relapse-free in the past 30 days, (c) age of 18–65 years, (d) willingness to complete the questionnaire. The expanded disability status scale (EDSS) of participants was assessed by neurologists according to standard clinical procedures in MS clinics in the hospital settings.

**Data collection and technique**

We used the exercise self-efficacy scale which has been revised by Resnick and Jenkins.\cite{21} This measure assesses an individual’s belief in overcoming barriers while performing PA. This scale has 9 items that main statement is “How confident are you that you could exercise three times per week for 30 min if....” Items are rated on a scale ranging from 0 (not confident at all) to 100 (highly confident) and averaged into a total score. Higher scores reflect greater exercise self-efficacy to engage in PA.

PA was measured using the Godin Leisure-Time Exercise questionnaire (GLTEQ) which is a self-reported scale with two parts.\cite{26} We used only the first part in this study which includes three items which measure the frequency of strenuous, moderate, and mild exercise for more than 15 min in during a typical week. The frequencies of strenuous, moderate, and mild activities were multiplied by 9, 5, and 3 metabolic equivalents (METS), respectively, and were summed into a total score. There is evidence for the validity this measure in persons with MS.\cite{27} We used a cut point at 24 units to determine the activity level of the participants (i.e., 24 units or more: active and 23 units or less: Insufficiently active).\cite{26}

After attaining permission to perform the translation and validation the exercise self-efficacy scale from the authors, we followed the process of forward and back translations of this scale into Persian version. Two translators independently translated the exercise self-efficacy scale from English into Persian version. A panel of 5 experts (one sport medicine specialist, four health educators) compared translated items to examine the equivalence of meaning. The discrepancies were amended and then one consensus version was approved.

Two other translators independently performed backward translation from Persian to English and the panel of experts compared these versions with the original questionnaire, and then, the backward translation version was verified by original developer. Ultimately, the panel of experts confirmed the final version. The Persian version of measure was examined to assess the face validity by 20 patients with MS. They were asked to respond to the questionnaire and express any ambiguity or problems in understanding. Patients reported that the items were clear and there was no ambiguity. Then, we tested the validity and reliability of the questionnaire. The factorial validity was assessed.
using both exploratory factor analysis (EFA) and CFA. Moreover, psychometrics of the questionnaire was followed using convergent validity, known-group validity, and reliability of EXSE scale. All questionnaires were checked for incomplete responses.

Ethical consideration
This project was approved by the ethics committee of TUMS. Permission to perform the translation and validation the ESE scale from the authors was attained. Participants signed a written informed consent and completed measures in MS clinics.

Statistical analysis
Descriptive statistics were presented as frequency, mean, and standard deviation (SD). The skewness and kurtosis were used to test the normality of EXSE scale. All data were analyzed using SPSS version 23 (IBM Corporation, Armonk, NY, USA) and Amos 20. Factor analysis was performed using EFA and CFA. For the factor loadings, a value of 0.4 or higher was considered as acceptable values.[28] In CFA, the model fit was examined using the following indices: Chi-square/degrees of freedom ($\chi^2 / df < 3$), Root Mean Square Error of Approximation (RMSEA $\leq 0.06$), Goodness-of-fit index (GFI $> 0.95$), comparative fit index (CFI $> 0.95$), Tucker-Lewis index (TLI $> 0.94$).[29]

In addition, we tested convergent validity and known-group validity. Convergent validity was assessed based on relevant criteria including average variance extracted (AVE $> 0.5$) and composite reliability (CR $> 0.7$).[30]

Known-group validity was tested using an independent $t$-test to compare the EXSE score between patients with disability status (EDSS $\leq 2$ and EDSS $\geq 2.5$) as well as people with insufficient exercise (GLTEQ $< 24$) and sufficient exercise (GLTEQ $\geq 24$) in people with MS. Known-group validity measures an instrument’s ability to distinguish among distinct groups.

Moreover, construct validity was examined using Pearson correlations between EXSE score with physical activity (GLTEQ). Guidelines of 1, 3, and 5 were used for judging the magnitude of the correlations as small, moderate, and large, respectively.[31]

The internal consistency of the instrument was calculated using Cronbach’s alpha coefficient. Values $> 0.7$ indicate high internal consistency.

Test-retest reliability was conducted by 30 participants over a 2-week interval and assessed using intraclass correlation coefficient (ICC).[32] All of these patients completed the measures and were included in the final data analysis.

Results

Participant characteristics
The demographic and clinical characteristics of the total participants ($n = 210$) are presented in Table 1. Most participants were female, were married, and had university degree with the mean age 34.2 years (SD = 8.1). Ninety-six percent had relapsing remitting MS (RRMS) and the mean duration of disease was 7.6 years (SD = 5.2). The median EDSS was 2. The mean score of the EXSE total was 50.2 (SD = 24.3), while the mean scores of items ranged from 4.2 to 6.7 [Table 2]. The normality of each item was assessed based on the values of skewness and kurtosis. The range of skewness was between 0.06 and 0.58 and the range of kurtosis was between $-0.82$ and $-1.4$, indicating that the items of the EXSE scale were normally distributed. The ceiling effect was 3.8%. While there was no the floor effect of the total scale.

Exploratory factor analysis
Exploratory factor analysis was conducted ($n = 110$) on the 9 items of EXSE scale. The results of exploratory factor analysis supported the validity of the EXSE scale. The result of Bartlett’s test of Sphericity was significant ($\chi^2 = 717.26$, df = 36, $P < 0.001$) which allowed performing factor analysis for data. The Kaiser-Meyer-Olkin value was very good (0.89) indicating sampling adequacy for factor analysis.

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Table 1: Sample characteristics ($n=210$)

| Characteristics          | $n$ (%) |
|--------------------------|---------|
| Sex                      |         |
| Female                   | 168 (80)|
| Male                     | 42 (20) |
| Marital status           |         |
| Single                   | 75 (35.7)|
| Married                  | 127 (60.5)|
| Divorced                 | 8 (3.8) |
| Education                |         |
| Diploma and lower        | 69 (32.9)|
| University degree        | 141 (67.1)|
| Employed                 |         |
| Yes                      | 92 (43.8)|
| No                       | 118 (56.2)|
| Disability status (EDSS) |         |
| 1–2                      | 184 (87.6)|
| 2.5                      | 11 (5.2) |
| 3                        | 9 (4.3)  |
| 3.5                      | 6 (2.9)  |

EDSS=Expanded disability status scale
Confirmatory factor analysis
The CFA ($n = 210$) confirmed single factor structure with a good model fit ($\chi^2/df = 1.6$, RMSEA = 0.05, CFI = 0.99, GFI = 0.97, TLI = 0.99). All items had factor loadings of greater than 0.4 which were ranged from 0.67 to 0.85 [Figure 1].

Convergent validity and known-group validity
Convergent validity analysis demonstrated AVE and CR values were 0.60 and 0.93, respectively.

The CR and AVE values were higher than the recommended values indicating a good convergent validity of the EXSE scale.

The results of known-group validity are presented in Table 4. There were significant differences in EXSE scores between subgroups ($P < 0.01$). Patients with lower disability had significantly higher scores of EXSE than those with higher disability. People who had higher PA levels reported higher EXSE score than those had lower PA levels. There was a significant and moderate correlation between the EXSE scores and PA ($r = 0.39; P < 0.001$).

Reliability
The Cronbach’s alpha coefficient was 0.93 demonstrating a high internal consistency.

In test-retest analysis, ICC was 0.85 indicating stability of the EXSE scale.

Discussion
The purpose of this study was to test validity and reliability of the exercise self-efficacy scale in people with MS. The results of this study provide evidence for psychometric properties of exercise self-efficacy instrument in individuals with MS. The first, the standard forward-backward translation process was conducted, and then, the validity and reliability of exercise self-efficacy were followed.

Factorial validity of the exercise self-efficacy scale was evaluated by exploratory factor analysis (EFA) and CFA. The preliminary findings of EFA identified a single factor structure that explained 64.7% of the variance in the measure. All items had acceptable factor loadings. These results are consistent with previous studies among older adults and people with stroke survivors reported exercise self-efficacy with a single factor structure.

The results of CFA supported the single factor structure with a good model fit for data and significant factor loadings. These findings were consistent with previous studies among older adults and people with stroke survivors.
research that factor loadings were >0.5, but reported fair fit for the data. In the present study, AVE and CR values were greater than recommended values that these criteria confirmed convergent validity of this measure. Moreover, a significant and moderate correlation between exercise self-efficacy and PA behavior provided other evidence for construct validity.

In our study, there were significant differences between subgroups in exercise self-efficacy which verified known-group validity. The patients with more disability status had lower exercise self-efficacy as well as the people who had higher PA levels reported greater exercise self-efficacy score. Finally, internal consistency of this scale was good indicating reliability of this measure. This finding is comparable with previous results among stroke survivors (0.86) and older adult (0.89). Likewise, Test-retest reliability of the EXSE scale provided acceptable evidence of the stability of the scale.

Limitation and recommendation
Study limitations
We acknowledge that this study has several limitations. The main limitation in this study was that most of the participants were female and majority of the sample had type of RRMS. Therefore, our results should not be generalized for other types of MS. The other limitation is that the data were collected using self-reported measures and participants may underestimate or overestimate their beliefs and behavior in self-reported questionnaires. To improve generalizability, it is recommended that future studies include other MS types, increasing the number of males, and people with different levels of disability.

Replicating this study among individuals with MS in other languages and cultures is also recommended. Despite those limitations, the results of our study provided sufficient evidence of validity and reliability for EXSE scale in people with MS and support the utilization of instrument as robust measure to evaluate exercise self-efficacy.

Conclusions
Our study results provide psychometric evidence for a robust measure to evaluate exercise self-efficacy in people with MS. This measure can utilize by researchers and health-care providers in studies and clinical practice as a valid and reliable measure to assess exercise self-efficacy in people with MS.

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Conflicts of interest
There are no conflicts of interest.

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Table 4: Comparison exercise self-efficacy between subgroups for known-group validity

| Groups      | Mean (SD) | T    | P   |
|-------------|-----------|------|-----|
| EDSS<2      | 51.54 (24.02) | 2.13 | 0.03 |
| EDSS>2.5    | 40.76 (24.78) | 4.98 | 0.001 |
| GLTEQ<24    | 47.36 (23.6) | 2.13 | 0.03 |
| GLTEQ>24    | 72.62 (17.6) | 4.98 | 0.001 |

EDSS=Expanded disability status scale, GLTEQ=Godin leisure-time exercise questionnaire, SD=Standard deviation
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