

INTERNAL CONSISTENCY AND TEST RETEST RELIABILITY OF MOBILITY DISABILITY SCALE IN COMMUNITY DWELLING INDIVIDUALS

CONSISTENȚA INTERNĂ ȘI VALIDITATEA TEST-RETEST A SCALEI DE DISABILITATE A MOBILITĂȚII LA INDIVIZII ACTIVI DIN COMUNITATE

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Cuvinte cheie: mobilitate în comunitate, validitatea conținutului, dimensiunea mobilității, acuratețe

Abstract

Background. Mobility disability scale (MDS) is a new generic scale developed to assess level of mobility disability in community dwelling individuals. This scale being new requires systematic evaluation of psychometric properties for its effective use in community.

Objectives of the study. The objectives of the study were to determine the internal consistency and test-retest reliability of the MDS in community dwelling individuals

Method. Fifty-two community dwelling patients with mobility disability were evaluated using MDS. Total and domain scores were analyzed for internal consistency using Cronbach's alpha. After one week, same patients were re-evaluated using MDS and Intra class correlation coefficient (ICC) was used to analyze the test retest reliability.

Results. MDS showed very high Cronbach's alpha (0.981) for total and domain scores (0.82- 0.96). MDS also showed high ICC (0.995, CI 0.991 to 0.997) for total and domain scores (0.97 to 0.99).

Conclusion. We conclude that MDS possesses excellent internal consistency and test retest reliability which implies that MDS could be used to screen and quantify the mobility disability in community dwelling individuals.

Rezumat

Introducere. Mobilitate disability scale (MDS) este o scală generică nouă, concepută pentru a evalua nivelul de disabilitate a mobilității la indivizii active din comunitate. Fiind nouă, această scală necesită evaluări sistematice a proprietăților psihometrice, pentru stabilirea eficienței utilizării sale.

Obiectivele studiului. Studiul își propune să determine consistența internă și validitatea test-retest a MDS la indivizii activi din comunitate.

Metode. Cincizeci și doi de pacienți ambulatori comunitate dwelling patients cu deficiențe de mișcare au fost evaluați folosind MDS. Au fost analizate scorurile totale și pe domenii, pentru a stabili consistența internă a testului, folosind Cronbach's alpha. După o săptămână, același grup de pacienți au fost reevaluați folosind MDS și coeficientul de corelație intragrup (ICC), pentru a analiza test retest reliability.

Rezultate. MDS a demonstrat un coeficient Cronbach's alpha foarte mare (0.981), atât pentru scorul total, cât și pentru scorurile pe domenii (0.82- 0.96). MDS a demonstrat de asemenea scoruri ICC mari (0.995, CI 0.991 to 0.997) pentru scorurile total și pe domenii (0.97 to 0.99).

Concluzii. Concluzionăm că MDS are o consistență internă excelentă și validitate test retest, ceea ce ne permite să afirmăm că MDS poate fi folosită pentru screeningul și cuantificarea gradului de disabilitate motorie la pacienții activi din comunitate.

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Introduction

Community mobility has been defined as “independent mobility outside the home which includes the ability to confidently negotiate uneven terrains, private venues, shopping centers and other public venues” [1]. It is characterized by start and stops, changes in direction and speed, accommodating surfaces with different geometric and physical properties, avoiding obstacles and concurrent execution of other tasks. Achievement of independent community mobility has been considered as an important goal in the rehabilitation of patient with mobility deficits. However it is dependent on various factors like, the skills and abilities of the performer, requirement of the task and challenges of the environment [2].

Mobility disability results when the impairments in mobility restrict the ability of individuals in performing the activities of daily living. Recently, researchers have begun to consider the effect of factors extrinsic to the individual such as the environment, on the disabling process [3]. Although clinical tests have their value, these may not be appropriate for determining the contributing factors for independent community mobility and the impact of environment on the individual’s mobility[4]. New models suggest that determination of the degree of disability must include the extent to which the physical, social and psychological environment constrains a particular individual due to the condition [5].

Researchers have also suggested that mobility disability in community dwelling individuals need to be assessed under certain dimensions. Existing scales, which measure mobility, are far from ideal to be used in community. Addressing these issues, we developed a mobility disability scale (MDS) including the critical environmental factors or dimensions that operationally define mobility disability in community.

The MDS was developed by generating the items through literature search and direct patient interviews and had been content validated by the experts. The MDS was developed to assess level of mobility disability in community dwelling individuals which consists of fifty items grouped under nine domains (Appendix). One of the major objectives in development was to make it generic, so that it can be used to evaluate mobility disability in persons irrespective of their age, gender and condition. This scale to be used as a screening tool or to quantify the impact of mobility disability on the community dwelling individual requires systematic evaluation of its psychometric properties. The usefulness of a scale is reliant on the extent to which it can be considered reliable and accurate as an indicator of behavior [6]. Reliability is one of the basic psychometric properties which indicate the degree of consistency of scale. It can be classified as intra-rater, test-retest and internal consistency reliability. Test retest reliability is done to estimate the temporal consistency, while internal consistency is done to evaluate the internal structure of the scale.

Objectives of the study

The objectives of the study were to determine the internal consistency and test-retest reliability of the MDS in community dwelling individuals.

Method

The study protocol was submitted to the institutional ethical committee and approval to conduct the study was obtained prior to onset.

Study design: Cross-sectional study design

Study Setting: Patients’ houses and the outpatient department of physiotherapy, in a tertiary care hospital.

Sampling method: Convenience sampling

Screening criteria

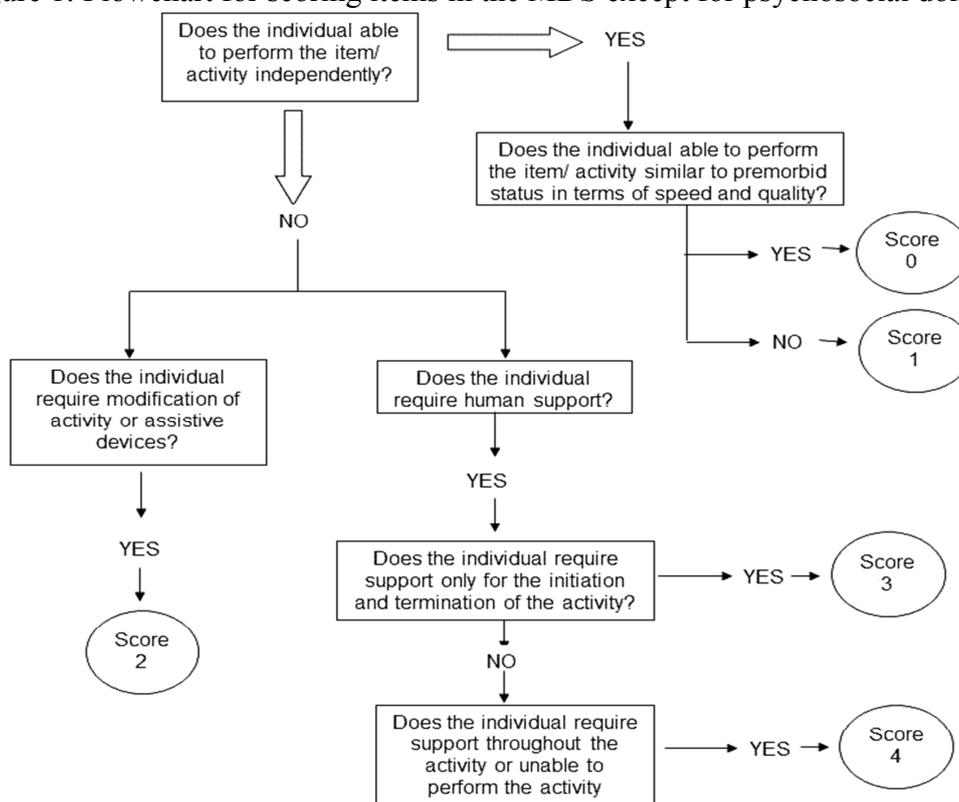
Patients with mobility deficits living in home, with the onset duration more than one month and who were able to understand and follow instructions were included. Patients with coexisting acute illness who require immediate management were excluded from the study.

Sample size: Sixty patients

Procedure:

Patients identified were screened for the criteria and the selected patients were explained about the purpose of the study and informed consent was obtained. The mobility disability scale was administered on the patients by the interview method. In the interview, patients were asked, whether they were able to perform the particular item in the scale. Based on the answer given, they were scored accordingly for the particular item. Each item in the domains were scored on a 5 point scale ranging from 0 to 4, where 0 is no disability and 4 is 100% disability for the respective item. The middle scores represent 1 (25%), 2 (50%) and 3 (75% disability) respectively. The flow chart for scoring the items in the scale is given in the figure 1. Adequate explanations were given to make the patient understand the item. When required, examples of situations were provided to make the patient understand the scoring options. In situations, where two scores were applicable, the highest score was recorded. All the items in the particular domain were completed before moving to next domain. Whenever required and possible, patients were allowed to perform the activity to decide the scoring option, if there was an ambiguity in scoring.

Figure 1: Flowchart for scoring items in the MDS except for psychosocial domain



The items in the psychosocial domains were scored in terms of frequency. Privacy of the patient was ensured when scoring the items under this domain to prevent any proxy influence from the family members. However the family members were consulted to decide the scoring for other items, especially when the patients reported the need of assistive device, modification of activity or human support in other domains. The tester provided adequate explanation, when the patients did not understand the item and ensured that all the items in the scale were scored. The scores were added to calculate the individual domain as well as the total score and subjected to analyze the internal consistency of the MDS.

Test retest reliability

To determine the test retest reliability, the MDS was administered again to the same patients after 5 days but less than 7 days of the initial evaluation. In order to prevent the recall bias of the patients, domains were re-arranged during the second assessment. The scores obtained during

the second assessment were also added to calculate the individual domain and total score of the MDS. The scores of both the initial and second assessment were used to determine the test retest reliability of the MDS.

Data analysis

Descriptive statistics was used to summarize the demographic characteristics of the patients. Cronbach's alpha coefficient was used to analyse the internal consistency and Intra class Correlation Coefficient (ICC) was used to analyse the test retest reliability of total and domain scores of the MDS.

Results

Sixty-five patients were screened for this phase of study, of which sixty patients completed the study. Four patients did not give consent and one required medical attention during the evaluation and hence were excluded from the analysis. The median and Interquartile range (IQR) for the age of selected fifty-two patients was 46 (33.5, 57) years, and the duration of condition was 12 (2, 36) months. Fifteen patients (25%) had stroke resulting in hemiparesis or hemiplegia, while the remaining forty-five patients had varied conditions including orthopedic and other neurological impairments. The severity of conditions varied considerably with the total score ranging from 12 to 177 out of 200 in the MDS providing the ideal situation for testing the consistency of the scale.

The Cronbach's alpha value for the total score of MDS was 0.981 which indicate that all the items in the scale possess acceptable internal consistency. The ICC and 95% confidence interval (CI) values for the MDS total score was 0.995 (0.991, 0.997), which indicate excellent test retest reliability. The individual domain scores of the MDS were also analyzed for internal consistency and test retest reliability. The domain scores, Cronbach's alpha and ICC values for the same are given in table 1.

Table 1: Domain scores, Cronbach's alpha and ICC values of MDS (n=52)

MDS Domains	Scores Median (IQR)	Cronbach's Alpha	ICC* (95% CI)
Self-care	14 (8.3, 20)	0.93	0.98 (.97-.99)
Ambulation	4 (2, 7)	0.89	0.97 (.96-.98)
Ambient condition	11 (3, 17.8)	0.96	0.98 (.97-.99)
Postural transition	11 (5, 17.5)	0.92	0.99 (.99-.99)
Terrain characteristics	6 (4, 12)	0.96	0.99(.98-.99)
Attentional demands	7 (2, 10)	0.93	0.98 (.98-.99)
IADL	15 (8, 20.8)	0.88	0.98 (.98-.99)
Transport	7 (4, 10)	0.86	0.97 (.96-.98)
Psychosocial	8.5 (6, 14)	0.82	0.97 (.96-.98)
Total Score	84.5 (44, 126.3)	0.981	0.99 (.991-.997)

*All the values were statistically significant with p values < 0.001

Discussion

Reliability or measure of consistency in our study was tested by two methods, internal consistency and test retest reliability. Internal consistency of a scale is the extent to which subparts or items of an instrument measure the same attribute or dimension, and represents an index of an instrument's reliability [7]. As the MDS consist of various items grouped under the domains related to mobility disability, it becomes important to measure whether items under the domains are related and all the items of the scale are related to the latent variable i.e. mobility disability.

A high Cronbach's alpha was desirable since it reflects that the items were homogeneous and thereby were measuring the same underlying property. The Cronbach's

Alpha of 0.981 in the MDS suggests that all the items were related to the construct and hence capable of measuring the mobility disability in community dwelling individuals. The general rule of thumb suggest that 'good' scale require alpha of 0.80 [8] and the MDS had exceeded this requirement. The internal consistency was also tested for the individual domains, which shows that the Cronbach's alpha of all the domains meets or approaches the standard of 0.8. This suggests that items in the subscale or domains are adequately grouped in the MDS and possesses good internal consistency.

Test retest reliability was done to demonstrate the extent to which scores on a scale can be generalized over two different occasions within the period of one week. One week period was chosen so that effect of progression or worsening of the condition does not affect the reliability values. However, more than 50 % of the subjects were assessed within five days of the initial assessment. The ICC value of the total score was very high indicating excellent test retest reliability of the scale.

Excellent reliability in spite of variability in the conditions and its severity suggests the consistency of the scale in patients with wide range of mobility impairments. The range of ICC values (0.97 to 0.99) across domains indicates that all the domains of MDS show high degree of consistency and hence meets the requirements of a measure to assess the same patient across time.

This is an important finding, as the scale was intended not only to screen the patients in community at a given point of time but also to measure the change in the mobility disability of community dwelling individuals at different points of time. If the scale did not demonstrate temporal stability, users cannot be confident that the change in scores represents change in the construct rather than measurement error. These findings indicate that the MDS is capable of measuring the mobility disability in community dwelling individuals with consistency and hence may be used to evaluate the prognosis of condition or effect of interventions. However, these assumptions warrant the testing of sensitivity or responsiveness of scale in patients with mobility disability.

Conclusion

We conclude that MDS possesses excellent internal consistency and test retest reliability which implies that MDS could be used to screen and quantify the mobility disability in patients living in community.

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Conflict of Interest

None

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Appendix: Mobility Disability Scale

Patient Name:		Age:	Diagnosis:	Duration:				
				0	1	2	3	4
Item No	Domain: Self care							
1	Wearing footwear							
2	Eating							
3	Dressing							
4	Buttoning							
5	Combing							
6	Toileting							
7	Bathing							
8	Brushing							
9	Squatting and getting up							
Item No	Domain: Ambulation							
10	Household ambulation (6 meters) (Walking/ wheelchair							
11	Community ambulation (100 meters) Walking / wheelchair)							
Item No	Domain: Ambient conditions							
12	Walking/ moving around in wet toilet							
13	Walking in rain							
14	Walking at night							
15	Going to space constrained areas							
16	Walking in crowd							
Item No	Domain: Terrain characteristics							
17	Walking uneven surface (slopes)							
18	Climbing stairs							
19	Crossing or avoiding the obstacle							
Item No	Domain: Attentional demands							
20	Balance while crossing roads							
21	Walking while speaking into phone/ looking other person face							
22	Reacting to traffic lights while driving							
Item No	Domain: Postural transitions							
23	Rolling in the bed							
24	Getting up from bed							
25	Sitting							
26	Sit to stand							
27	Turning while walking							
28	Standing							
29	Bend and pick up objects							
30	Sitting on floor							
Item No	Domain: IADL							
31	Writing							
32	Signing							
33	Shopping							
34	Cooking/ shaving							
35	Gardening							
36	Using mobile or fixed phone							
37	Using computer or any such gadgets							
38	Manipulating objects in hand							
Item No	Domain: Transport							
39	Riding/driving the vehicle							
40	Using the public transport (Bus or train)							
41	Travelling by private transport(Auto/taxi)							
Item No	Domain: Psychosocial							

42	Feel fear of fall while walking					
43	Feel depressed					
44	Feel for disturbance in family role					
45	Feel less motivation in doing activities					
46	Feel dependent for personal care					
47	Feel cannot participate in functions					
48	Feel cannot continue the job					
49	Feel tiredness during activities					
50	Feel pain during activities					

Scoring criteria of MDS for all except psychosocial domain

Score	Description
0	Able to do the activity without any difficulty
1	Able to do the activity independently but not faster or perfectly as premorbid
2	Able to do the activity independently, but requires aid or modification of the tools
3	Unable to do independently, requires human help to initiate and/or to complete the activity
4	Unable to do independently, requires human support throughout the task or avoids activity

Scoring criteria of MDS for the psychosocial domain

Score	Description
0	Never
1	Rarely
2	Occasionally
3	Frequently
4	Always