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Original Article / Оригинални рад

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Subscales correlations between MSSS-88 and PRISM scales in evaluation of spasticity for patients with multiple sclerosis

Корелација између субскала *MSSS-88* и *PRISM* скале у евалуацији спастицитета код оболелих од мултипле склерозе

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SUMMARY

Introduction/Objective Patient-reported outcomes have been recognized as an important way for assessing health and well-being from a personal perspective patients with multiple sclerosis (MS).
The aim of this wor was correlation among different subscales of (PRISM) and MSSS-88 scales in estimation of spasticity influence on different domains

Methods The cross sectional observational study. MSSS-88 and PRISM scales were analyzed in 5 domains: Body function domain, activity domain, participation domain, personal factors/wellbeing domain and hypothesis). For statistical interpretation of correlation we performed Spearman's Rho test, concurrent validity, divergent validity, linear regression model.

Results Significant correlation gained between subscales of evaluated MSSS-88 and PRISM scales for body domains, the highest correlation was between Need for Assistance/Positioning (NA/P) and Walking (W). Spasticity has weakest correlation with Need for Intervention (NI), stressing out presence of pain have negative impact and significant positive correlation between pain discomfort and need for intervention. In domain of body function for males there was non-significant correlation between muscle spasms and NI. In the participation domains non-significant correlation was gained between Social Functioning (SF) and Social Embarrassment (SE), same applies between Emotional health (EH) and Psychological Agitation (PA) for Personal factors/Wellbeing domain. Differences between genders of MS patients persist in different domains, muscle spasms are strong predictors for NI, and Body Movement (BM) is strong predictor versus W for NA/P.

Conclusion MSSS-88 and PRISM scales could be considered as reliable in measurement of different domains of disability for MS patients with spasticity. Because it is shorter, quicker and simple to use it is stated in the conclusion that PRISM scale can successfully compete with and replace MSSS-88 scale in certain domains. Subscales correlations between MSSS-88 and PRISM scales in evaluation of spasticity for patients with MS.

Keywords: multiple sclerosis; spasticity; scales; patient orientid scales

САЖЕТАК

Увод/Циљ Упитници који укључују властито дозивљавање болести се све више користе јер су веома важни у процени здравља и задовољства оболелих од мултипле склерозе.
Циљ рада је био корелација различитих субскала *PRISM* и *MSSS-88* скале у процени утицаја спастицитета у разлицитим дневним активностима.

Методе У опсервационој студији пресека анализиране су *MSSS-88* и *PRISM* скале у пет домена: телесни домен, домен активности, домен учешћа, домен личних фактора и добробити, хипотеза). За статистичку интерпретацију користили смо Спирманов *Rho* тест, конкурентну валидност, дивергентне валидности, линеарни регресиони метод.

Резултати Значајна је повезаност између субскала *MSSS-88* и *PRISM* за телесни домен, највећа корелација била је између потребе за асистенцијом и позиционирањем и хода. Спастицитет има најслабију корелацију нарочито са потребом за интервенцијом. Присуство бола има негативан утицај, постоји позитивна корелација између бола, дискомфора и потребе за интервенцијом. У домену телесне функције за мушкарце није било значајне разлике између мишићних спазама и потребе за интервенцијом. У домену учешћа није значајна разлика између социјалног функционисања и соци-јалне непријатности, исто и између емоционалног здравља и психолошку агитацију за домен добро-бита и личних фактора. Разлика између полова постоји у различитим доменима, мишићни спазам је снажан предиктор за потребу за интервенцијом, Телесна покретљивост је снажан предиктор наспрам хода и потребе за асистенцијом и позиционирањем.

Закључак *MSSS-88* и *PRISM* су поуздане у мерењима различитих домена инвалидности код којих је просутан спастицитет. *PRISM* скала је краћа, бржа, једноставнија и може успешно да се такмичи и да замени *MSSS-88* скалу у одређеним областима.

Кључне речи: мултипла склероза; спастицитет; скале

INTRODUCTION

Multiple sclerosis (MS) presents a chronic autoimmune disorder with particular affection of central nervous system, which is characterized by inflammation, demyelination and axonal degeneration and is the most common cause of neurologic disability in young adults [1, 2]. The epidemiology assessment incidence and prevalence can demonstrate the existence of spatial, temporal

and demographic variations of disease risks which are important for identifying genetic and environmental factors that act together to cause disease [3].

The important group of clinical manifestations refers to the functional disability with various degrees of neurological affection and therefore reduction of functional capacity. Although the symptoms individually vary, the majority of persons with MS presents with some degree of spasticity. The reported prevalence of spasticity in MS is up to 65% in Europe [4] and 85% in the USA [5]. Spasticity is often disabling [6] and may affect the physical, psychological, and social well-being of patients with MS [7].

Outcome measurement is important for assessing disability and selecting of an appropriate scale of measurement is one of the most important steps in clinical research. Many of the available disability outcome measures used in clinical trials of multiple sclerosis are insensitive to change over time, inadequately validated, or insensitive to patient-perceived health status or quality of life [8].

To be appropriate to the task a scale must be valid, accurate, precise, efficient and easy to use, sensitive to change in disease without being sensitive to symptom fluctuation, cover the whole range of disease [9]. Outcomes measures are difficult to choose because of the diversity, progressive and fluctuating nature of disease.

Patient-reported outcomes have been increasingly recognized as an important way for assessing health and well-being from a personal perspective. For that purpose, the Multiple Sclerosis Spasticity Scale (MSSS-88) has been developed to address how spasticity affects daily life of people with MS [10]. Previously we have validated Multiple sclerosis spasticity scale (MSSS-88) in MS patients with spasticity and provided as well present of findings correlation among different functional scales [11]. We hypothesized that correlations in different domains in MSSS 88 scale is expected with different domains of daily activities for patients with MS. Since PRISM was originally developed and validated in the spinal cord injury population [12] we have previously validated PRISMSR in persons with MS.

The PRISMSR shows adequate validity and reliability for assessing the impact of spasticity on quality of life in persons with MS provides a unique personal experience of spasticity and may complement other clinical outcome measures [13]. We are interested, and we tried to demonstrate whether these two scales correlate completely, or in certain domains.

Therefore, the aim of our study was to assess the correlation among different subscales of and Patient-Reported Impact of Spasticity Measure (PRISM) scales in estimation of spasticity influence on different domains of daily activities for patients with MS.

METHODS

The cross sectional observational study included 58 patients with diagnosed MS that we recruited at Clinic for rehabilitation" Dr Miroslav Zotovic". This type of study was used since our participants differed in the variable of interest, while they shared variables such as educational

background, socioeconomic status, and ethnicity, and thus study environment wasn't manipulated. Patients were evaluated separately regarding gender: males (n=17) and females (n=41).

Prior inclusion in the study patients were informed about study protocol and informed consent was obtained. The study was approved by the Institutional Review Board for Human Research of Clinical for Rehabilitation in Belgrade, and the informed written consent was obtained.

The criteria for inclusion in the study were: age above 18 years; disease duration MS for more than a year, from the diagnosis establishment by magnetic resonance imaging and oligoclonal band; remission of disease longer than 3 months and the presence of spasticity either subjectively reported or documented on clinical examination.

MSSS-88 and PRISM scales were analyzed in 5 domains (Body function domain, activity domain, participation domain, personal factors/wellbeing domain and hypothesis). Body domain included MSSS-88 subscales (Muscle Stiffness (MSS), Muscle Spasms (MS), Pain and Discomfort (PD), Body Movement (BM) and Walking (W)) and PRISM subscales (Need for Intervention (NI) and Need for Assistance/Positioning (NA/P)). Activity domain included MSS-88 subscale Activities of Daily life (ADL) and PRISM subscale Daily Activities (DA). Participation domain included MSSS-88 subscale Social Functioning (SF) and PRISM subscales (Social Embarrassment (SE) and Social Avoidance/Anxiety (SAA)). Personal factors/Wellbeing domain included MSSS-88 subscale Emotional health (EH) and PRISM subscales (SAA and Psychological Agitation (PA). Hypothesis domain included MSSS-88 subscales (PD, W, ADL, SF and EH) and PRISM subscale Positive Impact (PI).

MSSS-88 scale contains a total of 88 questions divided into 8 subscales: MSS-12 items, PD-9 items, MS-14 items, ADL-11items, W-10 items, BM-11 items, EH-13 items, SF-8 items (1). Each item is ranked on a 4 point Likert scale: 1 (not bothered at all), 2 (a little bothered), 3 (moderately bothered) and 4 (extremely bothered) (1).

PRISM scale consists of 44 items grouped into seven subscales. SAA-11 items, PA-5 items, DA-6 items, NA/P-5 items, PI-4 items, NI-5 items, and SE-5 items (2). The participants answered to which extent each statement is true for their situation using a 5-point Likert-type scale (0-"never", 1-"rarely", 2-"sometimes", 3-"often", and 4-"very often") (2). The reported score for Positive Impact is reversed (0-"very often", 4- "never"), thus, the higher the score, the lower the positive impact of spasticity (2).

Statistical analysis

Data were presented as whole numbers (n) and as percentage (%). Chi squared test was used for statistical interpretation of categories distribution for different parameters in table 1.

For statistical interpretation of correlation strength and significance among different subscales of evaluated scales (MSSS-88 and PRISM) we performed Spearman's Rho test, where R was indicated as the measure of strength, while *p*-value represented statistical significance. Statistical

significance was set at $p<0.05$. Body function, activity and participation domains, and personal factors/wellbeing domains were analyzed thru concurrent validity, while hypothesis was analyzed by divergent validity. For predictor subscales of MSSS-88 on subscales values of PRISM scale we used linear regression model.

RESULTS

The mean age of the studied participants is 45±10 years. Females, individuals with high school education, those that were retired as well as married were significantly more frequent than others (p<0.001) (Table 1). The significantly predominant type of MS was the primary progressive (55%), followed by the secondary progressive (31%) and relapsing-remitting (8%) (p<0.001) (Table 1).

Table 1. Demographic and multiple sclerosis-related characteristics of the sample (n=58).

Parameters	Categories	n (%)	*p*-value
Gender	Male	17 (31%)	**<0.001**
	Female	41 (69%)	
Education	High school	42 (72%)	**<0.001**
	College/University	16 (28%)	
Employment	Unemployed	7 (12%)	**<0.001**
	Employed	19 (33%)	
	Retired	32 (55%)	
Marital status	Single	11 (19%)	**<0.001**
	Married	35 (60%)	
	Divorced/Widowed	12 (21%)	
Type of MS	Primary progressive MS	32 (55%)	**<0.001**
	Relapse-remitting MS	8 (14%)	
	Secondary progressive MS	18(31%)	

There is significant positive correlation between every tested subscale, with highest positive correlation for NA/P subscale of PRISM and BM subscale of MSSS-88 (R=0.727) and for subscale W of MSSS-88 scale (R=0.730) (Table 2). The weakest positive correlation was obtained between PI subscale of PRISM and SF subscale of MSSS-88 scale (R=0.339) (Table 2).

Table 2. Correlations between subscales of MSSS-88 and PRISM scales.

MSSS -88 sub-scale	PRISM subscales	R	*p*
CONCURENT VALIDITY: Body function domain			
MSS	NI	0.568	0.000
MS		0.652	0.000
P D		0.607	0.000
BM	NA/P	0.727	0.000
W		0.730	0.000
CONCURENT VALIDITY: Activity domain			
ADL	DA	0.671	0.000
CONCURENT VALIDITY: Participation domain			
SF	SE	0.384	0.003
	SAA	0.619	0.000
CONCURENT VALIDITY: Personal factors/Wellbeing domain			
EH	SAA	0.593	0.000
	PA	0.553	0.000
DIVERGENT VALIDITY: Hypothesis			
PD	PI	0.418	0.001
W		0.625	0.000
ADL		0.530	0.000
SF		0.339	0.009
EH		0.417	0.001

MSS–Muscle Stiffness, MS–Muscle Spasms, PD–Pain and Discomfort, BM–Body Movement W–Walking, AD– Activities of Daily life, SF–Social Functioning, EH– Emotional health, NI–Need for Intervention, NA/P– Need for Assistance/Positioning, DA–Daily Activities, SE–Social Embarrassment, SAA–Social Avoidance/Anxiety, PA– Psychological Agitation, PI–Positive Impact, R–correlation factor.

There is significant positive correlation between every tested subscale except for PI subscale of PRISM with SF subscale of MSSS-88 (R=0.259; p=0.101) and with EH subscale of MSSS-88 (R=0.289; p=0.066) (Table 3). There is the highest positive correlation for NA/P subscale of PRISM and BM

Table 3. Correlations between subscales of MSSS-88 and PRISM scales in female subjects.

MSSS -88 sub-scale	PRISM subscales	R	*p*
CONCURENT VALIDITY: Body function domain			
MSS	NI	0.616	**0.000**
MS		0.702	**0.000**
P D		0.615	**0.000**
BM	NA/P	0.752	**0.000**
W		0.761	**0.000**
CONCURENT VALIDITY: Activity domain			
ADL	DA	0.668	**0.000**
CONCURENT VALIDITY: Participation domain			
SF	SE	0.450	**0.003**
	SAA	0.620	**0.000**
CONCURENT VALIDITY: Personal factors/Wellbeing domain			
EH	SAA	0.561	**0.000**
	PA	0.643	**0.000**
DIVERGENT VALIDITY: Hypothesis			
PD	PI	0.430	**0.004**
W		0.600	**0.000**
ADL		0.503	**0.001**
SF		0.259	**0.101**
EH		0.289	0.066

MSS–Muscle Stiffness, MS–Muscle Spasms, PD–Pain and Discomfort, BM–Body Movement W–Walking, AD–Activities of Daily life, SF–Social Functioning , EH–Emotional health, NI–Need for Intervention, NA/P–Need for Assistance/Positioning , DA–Daily Activities, SE–Social Embarrassment, SAA–Social Avoidance/Anxiety, PA–Psychological Agitation, PI–Positive Impact.

Table 4. Correlations between subscales of MSSS-88 and PRISM scales in male subjects.

MSSS -88 sub-scale	PRISM subscales	R	*p*
CONCURENT VALIDITY: Body function domain			
Muscle stiffness	NI	0.438	**0.007**
Muscle spasms		0.471	0.056
PD		0.537	0.026
BM	NA/P	0.630	**0.006**
W		0.667	**0.003**
CONCURENT VALIDITY: Activity domain			
ADL	DA	0.691	**0.002**
CONCURENT VALIDITY: Participation domain			
SF	SE	0.288	0.260
	SAA	0.640	**0.005**
CONCURENT VALIDITY: Personal factors/Wellbeing domain			
EH	SAA	0.682	**0.002**
	PA	0.455	0.066
DIVERGENT VALIDITY: Hypothesis			
PD	PI	0.443	0.074
W		0.688	**0.002**
ADL		0.615	**0.008**
SF		0.607	**0.009**
EH		0.809	**0.000**

MSS–Muscle Stiffness, MS–Muscle Spasms, PD–Pain and Discomfort, BM–Body Movement W–Walking, AD–Activities of Daily life, SF–Social Functioning , EH–Emotional health, NI–Need for Intervention, NA/P–Need for Assistance/Positioning , DA–Daily Activities, SE–Social Embarrassment, SAA–Social Avoidance/Anxiety, PA–Psychological Agitation, PI–Positive Impact.

subscale of MSSS-88 (R=0.752) and for subscale W of MSSS-88 scale (R=0.761) (Table 3). The weakest positive correlation was obtained between PI subscale of PRISM and SF subscale of MSSS-88 scale (R=0.259) (Table 3).

There is significant positive correlation between every tested subscale except for NI subscale of PRISM and Muscle spasms subscale of MSSS-88 (R=0.471; p=0.056), for SE subscale of PRISM and SF subscale of MSSS-88 (R=0.288; p=0.260), for PA subscale of PRISM and EH subscale of MSSS-88 (R=0.455; p=0.066), and PI subscale of PRISM with PD subscale of MSSS-88 (R=0.443; p=0.074) (Table 4). There is the highest positive correlation for PI subscale of PRISM and EH subscale of MSSS-88 (R=0.809) (Table 4). The weakest positive correlation was obtained between SE subscale of PRISM and SF subscale of MSSS-88 scale (R=0.288) (Table 4).

For NI significant predictor if MS, while for NA/P of PRISM scale, significant predictor is BM of MSSS-88 scale (Table 5).

Table 5. Predictor parameters of MSSS-88 for subscales of PRISM.

Parameters	B	SE	*p*
		NI	
MSS	-0,045	0,099	0,653
MS	0,203	0,089	0,027
PD	0,048	0,120	0,691
		NA/P	
BM	0,176	0,077	0,026
W	0,194	0,111	0,087
		PI	
PD	0,065	0,105	0,535
W	-0,018	0,080	0,818
ADL	0,092	0,061	0,138
SF	-0,064	0,114	0,576
EH	0,092	0,066	0,167

MSS–Muscle Stiffness, MS–Muscle Spasms, PD–Pain and Discomfort, BM–Body Movement W–Walking, AD–Activities of Daily life, SF–Social Functioning, EH–Emotional health, NI–Need for Intervention, NA/P–Need for Assistance/Positioning, PI–Positive Impact, SE–Social Embarrasment, B–Predictor parameter.

DISCUSSION

Numerous scales that are used in clinical practice for spasticity measurement, that assess subjective and objective parameters makes it more complex to perform reliable measurement of spasticity degree presented by the patient.14).

We have demonstrated that there are significant correlation between subscales of evaluated MSSS-88 and PRISM scales for body domains, where it was noticed that the highest correlation was between NA/P and W. Such finding regarding the correlation between NA/P and W could be explained by the fact that assistance over the rehabilitation treatment period reduces secondary comorbidities and influences mobility. Previous studies are in line with such observations, where it was noticed that training of locomotor system is to the certain degree beneficial for rehabilitation outcome in patients with MS [15, 16].

Our study stressed out that spasticity (muscle stiffness and muscle spasms) has weakest correlation particularly with NI. This could be to the certain degree explained by the fact that there are different degrees of spasticity, where in the study of Haas [17], it was pointed out that 80% of MS patients in UK study reported spasticity, with more than 50% of moderate to severe degree. However, in the study of Flachenecker et al., [18] it was stressed out that 74% of patients with spasticity reported stiffness. In the same study it was noticed as well that need for treatment increases as spasticity degree is higher [19]. It should be underlined that treatment satisfaction is also variable from the perspective of both physician and patients. Therefore, individual approach for the interventional programs in rehabilitation treatment in patients with spasticity is desirable, in order to improve efficacy of functional outcome and spasticity reduction. This would ultimately improve the patient's quality of life long-term.

Previous studies have demonstrated that presence of pain in patients with MS to have negative impact on daily activities and overall quality of life [20]. Our findings are consistent with previous reports, stressing out significant positive correlation between pain discomfort and need for intervention.

In the study of Casetta et al [21] it was noticed that MS in male population have stronger impact on disability than for females. Our study has demonstrated that in domain of body function for males there was non-significant correlation between muscle spasms and NI. In the participation domains non-significant correlation was gained between SF and SE. same applies between EH and

PA for Personal factors/Wellbeing domain. In hypothesis domain females had non- significant correlation between SF and EH of MSSS-88 scale, and PI of PRISM scale, while for males non-significant correlation was between PD and PI. Our results stress out that differences between genders of MS patients persist in different domains. Previously the role of gender of MS patients on activities of daily living was evaluated in the study of Buchanan et al. [22], where different domains were shown to have different impact on these activities regarding gender. Such findings stress out the necessity for individually based rehabilitation programs with particular attention to the gender based planning.

Aside presences of muscle stiffness we have demonstrated that muscle spasms are strong predictors for NI. This could be justified by the fact, that spasms are more severe than presence of spasticity in terms of objective perspective. Further, BM is strong predictor versus W for NA/P. This is in line with the fact that walking considers the presence of certain ability of body movement and thus reduces the necessity in some cases for NA/P.

CONCLUSION

Comparing and considering these two scales (PRISM and MSSS-88), it is evident that each has its own characteristics and advantages. MSSS-88 evaluates negative impact of spasticity across 8 domains, but the scale is lengthy (88 items) and does not consider possible positive aspects of spasticity. PRISM includes 44 items and it has been developed to assess how to spasticity effects on quality of the life in person with multiple sclerosis. PRISM scale is simple, account for both negative and positive aspects of spasticity and it is not time consuming. Given the facts above, we have demonstrated that both scales (MSSS-88 and PRISM) could be considered as reliable in measurement of different domains of disability for MS patients with spasticity. Because of its features that is shorter, quicker and simple to use it is stated in the conclusion that PRISM scale can successfully compete with and replace MSSS-88 scale in certain domains.

Thus they should be considered as valuable measuring instruments in assessment of patient's functional status and further rehabilitation program planning.

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