Research Article

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Validation of β- Patient Self-Sufficiency Assessment Scale - the Results of a Pilot Study

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Abstract

The aim of the pilot study was to validate the newly created β scale for assessing the self-sufficiency of patients with a focus on selected neurological diseases. A group of 39 patients from the National Rehabilitation Center in Kováčová was included in the pilot testing. Each patient was tested for self-sufficiency three times during hospitalization. The reliability of β scale was evaluated by content construct (convergent) validity, while we chose Barthel's self-sufficiency test as a comparative scale. The reliability of the β scale was verified by Cronbach's α coefficient. In all three assessments, the value of the Cronbach coefficient α was ≤ 0.9. The reliability of the assessment tool was also measured by Person's correlation of the results of repeated measurements. p values were >0.0001. The results encourage further testing of the β scale to assess the level of self-sufficiency, which would lead to the improvement of nursing care.

Introduction

Self-sufficiency and self-care are nursing phenomena and are the central metaparadigm of many nursing theories and models [1]. The nurse has the opportunity to directly identify the areas of nursing care deficit using assessment tools and specialize directly in them, in order to achieve the highest possible level of self-sufficiency [2]. The assessment of the level of self-sufficiency is carried out by a nurse in various areas of nursing care, in all age categories. Self-care means the ability to perform daily activities and is an indicator of health and quality of life [3-5]. In the broadest sense, an assessment tool is a collection of scales, questions and other information that provide a picture of an individual's needs and related factors. In the narrower sense, it is a mean of identifying and aiming for a specific health condition, which also includes self-care [6,7].

Neurological diseases prevent patients from normal activities and therefore adequate self-care, because many patients suffer from a wide range of symptoms, among which motor symptoms predominate. Impairment of gross and fine motor skills gradually leads to partial or complete loss of self-care ability and invalidation of the patient. For the above reason, we decided to create a new scale, which we called the β scale. We believe that it can become a relevant tool for assessing the self-sufficiency of patients with selected neurological diseases [8]. We first presented the β scale in 2006 and since then it has been tested several times at selected workplaces in Slovakia and the Czech Republic.

The starting point for the construction of our proposed scale was the Kurtz scale - EDSS, the Clifton self-sufficiency scale and diagnostic criteria for multiple sclerosis.

Also, many studies of patients with chronic neurological diseases confirm that the patient's belief that he himself is able to manage certain difficulties resulting from the disease is associated with a higher probability of effective adherence, i.e.compliance with the recommended procedures for the treatment of the disease on the patient´s side [9].

Material and Methods

The goal of our pilot study was to validate and assess the reliability of the β scale for assessing the level of self-sufficiency of patients with selected neurological diseases. The β scale (Table 1) contains 20 items - activities, which are evaluated on a scale of 0-3 points, while the evaluation of 0 points represents complete independence, 1 point partial dependence, 2 points significant dependence and 3 points complete dependence of the patient.

Need	0 points	1 point	2 points	3 points
Gross motility - - movement	Trouble free autonomous movement	Autonomous movement, problems in overcoming barriers and obstacles	Movement using compensatory aids	Immobile patient (wheelchair, patient on bed)
Receiving food and fluids	Independently without any help	Independently, difficulty grabbing objects	Help required (cutting, table manners)	Fed by another person
Emptying the bladder	Independently, without problems	Occasional need for help, occasional spontaneous urinary or stool leakage	Frequent, spontaneous urinary leakage using the compensatory aids	Incontinence
Emptying the colon	Independently, without problems	Occasional problems with constipation	Frequent problems with constipation	Incontinence
Dressing, undressing	Independently without any help	Independently, the tasks take longer time	Other person´s help required	Full help from another person required
Fine motility	Without problems, without reduced sensitivity	Reduced sensitivity of the fingers and upper extremities	Significant paresthesis, great effort in grabbing objects	Intentional tremor
Appearance care, aesthetics	Independently, with interest in own appearance	Independently, without a stronger interest in own appearance	Requires occasional other person´s help	Other person´s help required

Body hygiene	Independently	Independently, using the safety utilities	Partial independence, other person´s assistance required	Other person´s help required
Active exercises, rehabilitation	Independently, several times a day	Independently, once a day	Regularly, other person´s help required	Immobile
Orientation in time and space	Fully oriented	Occasional disorientation (especially in the afternoon), help required	Frequent confusion and disorientation during a day	Total confusion and disorientation
Visual perception	Unlimited	Loss of visual acuity, double vision	Reduction of field of view, oculomotor nerve paresis	Blind
Hearing perception	Unlimited	Objectively assessed reduced audibility without the need for compensatory aids	Loss of hearing, the need for compensatory aids	Deaf
Rest and sleep	Quality sleep with no interruption	Night waking, 1- to 3-times	Night waking, over 3-times	Insomnia
Communication	Active, adequate, fully-preserved n o n - v e r b a l expressions	Poor articulation, slightly limited non-verbal expressions	Significantly impeded, poor, nonverbal expressions, mourning prevails	Both verbal and non-verbal communication inability
O c c u p a t i o n , employment:	No limitations	Full-time employee, burden causes problems	Part-time employee	Full disability

Learning, receiving new information	Active, No-limitations	Adequate interest, limited activity	Reduced interest in activities depending on moods and ther person´s help required	Inactivity
Leisure activities	Spending leisure time actively, hobbies:	Spending leisure time actively, occasional help required	Spending leisure time actively, continuous assistance required	Inactivity
Cultural events attendance	R e g u l a r l y , independently	Sometimes assistance required	Very rarely and limited	Inactivity due to associated symptoms
Club visiting ROSKA	Frequent, active help in organizing events	Occasional, sporadic help in organizing events	Rare visit assistance necessary	Not attending any club activities
Total number of points				

Table 1: The β scale for patient's self-sufficiency level assessment (Frčová, Rapčíková); Assessment of self sufficiency based on the number of gained points; 0 - 15 point-independent patient; 16 - 30 points patient partially dependent on the help from another person; 31 - 30 points patient considerably dependent on the help from another person; 46 - 60 points patient fully dependent on the help from another person.

Individual items include common daily activities, fine and gross motor skills, aesthetics of appearance, exercise, orientation in space and time, sensory perception, communication, work, learning, free-time activities and self-help groups.

The pilot study involved 39 patients from the National Rehabilitation Center in Kováčová, which is a specialized hospital with a nationwide scope for the treatment of patients after spinal cord injuries with spinal cord damage, selected neurological diagnoses, polytraumatism, amputations, and after demanding operations of the locomotor system. The average length of stay of the patients in this facility was three weeks, so it was possible to assess the level of self-sufficiency in three phases. Of the 39 patients, 17 were women (43.59%) and 22 were men (56.41%). The average age of the men was 58.27 years (SD 11.05, median 58.5 and mode 69 years). The average age of the women was 57.94, (SD 16.36, median and mode were the same 65 years). For 26 patients (66.67%) it was the first hospitalization and 13 patients (33.33%) were hospitalized repeatedly.

Each patient's self-sufficiency was assessed by the β scale to verify its reliability repeatedly at the beginning, in the middle and at end of hospitalization. The average length of hospitalization was three weeks. Between the first and the second measurements, the patients had already completed rehabilitation treatment, which is top-notch in this medical facility and could have affected the level of self-sufficiency of the patients. Kobsah's validity was also expressed by renowned experts from the Center for the Treatment of Demyelinating Diseases at the Thomayer Hospital in Prague in the Czech Republic and at the Neurological Department in Žiar nad Hronom in Slocvakia.

Results

To verify the construct (convergent) validity of the β scale, we used a comparison of its results with the results of the simultaneously performed Barthel self-sufficiency test at each assessment. A statistically significant correlation of the given assessment tools was found, the correlation coefficients of the corresponding items are statistically significant and

indicate their high agreement (p < 0.0001 in all items). Due to the fact that the assessment in the items of the b scale and the Barthel test is reversed, the correlation coefficients are negative. The reliability of the β scale was verified in three ways: Cronbach's a coefficient, repeating of the measurement with a step of time (test-retest method) and determining the agreement of the evaluators despite the fact that there is a time gap between the evaluations.

Cronbach's coefficient[a]

In all three measurements, the value of the Cronbach's a coefficient is telling about the significant internal reliability of the assessment scale . Its values are greater than 0.9 in all three evaluations, thus indicating a good internal consistency of the assessment tool.

Cronbach´s a coefficient: I. measurement: II. Measurement III. Measurement

- b scale: 0.9131 0.9121 0.9221

- Barthel´s test 0.9210 0.9156 0.9240

Correlations of individual items to the total score (item-total correlation) were also calculated in each measurement, with proven statistical significance.

Only the correlation of item 12 (visual perception) was problematic, because most of the respondents functioned without limitation of visual perception, only three respondents had a narrowing of the visual field. Item 16, related to employment, was also problematic because most of the respondents in our group are retired (old-age or disabled). Question 20, visiting the ROSKA club, was also problematic because the respondents do not visit the club. However, we would not rule out problematic questions, because we plan to use our assessment tool in various medical facilities, and we must take into account the fact that the patients at the National Rehabilitation Center are mostly patients with more serious health problems.

We also verified the reliability of our assessment tool by Pearson's correlation of the results of repeated measurements. The correlation coefficients indicate the significant relationship of the measured total score of patients' self-sufficiency within all three assessments (Table 2), the corresponding p values confirmed their statistical significance. In all three intercomparisons, p values were less than 0.0001.

TS I. measurement	1	0.9118	0.7773
TS II. measurement	0.9118	1	0.9389
TS III. measurement	0.7773	0.9389	1

Table 2: Pearson correlation matrix of the total score of individual assessments (measurements); TS - Total Score.

We expected that, due to the effect of rehabilitation, the correlation coefficient I. and III. of the measurement could have smaller value. Although the value is smaller compared to the remaining coefficients (0.7773), it still speaks of the statistically significant connection of the first and third measurement. The statistical significance of all correlation coefficients speaks in favor of significant reliability of the assessment tool.

The validity of the use of the Pearson correlation coefficient was verified by the normality of the data of the total score of all three measurements at the significance level a = 0.01. The Shapiro-Wilk test was used to verify the normality of the data (I. measurement: W=0.9308; p=0.0190; II. measurement: W=0.9406; p=0.0398; III. measurement: W=0.9333; p=0.0229; W(39 ;0.01) = 0.917).

The assessment scale was administered by experts, the assessors were professionally qualified nurses from particular departments of the health care facilities.

The total score of the respondents in the β scale identified individual measurements of the frequency of patients independency of the help of another person, partially dependent, significantly dependent and completely dependent on the help of another person (Table 3).

Assessment of selfsufficiency of the patient	I. measurement		II. measurement		III. measurement	
	n	%	n	%	n	%
Independent	7	17.95	10	25.64	14	35.90
Partially dependent	15	38.46	17	43.59	15	38.46
Heavily dependant	14	35.90	11	28.21	9	23.08
Totally dependant	3	7.69	1	2.56	1	2.56
together	39	100.00	39	100.00	39	100.00

Table 3: Assessment of the level of self-sufficiency of the respondents by the β scale.

At the initial measurement, only 7 (17.95%) respondents were completely independent of the help of another person, 15 (38.46%) respondents were partially dependent on the help of another person, almost the same number of respondents 14 (35.90%) were heavily dependent and 3 (7.69%) respondents were completely dependent on the help of another person. We assume that due to the rehabilitation treatment and also due to the patients' diagnosis, their dependence on the help of others could change to a certain extent, as can be seen in the number of respondents of the given categories in Table 3.

We also verified the reliability of our assessment tool by measuring the mutual agreement of the assessors. We expressed the statistical significance of the degree of agreement of given measurements in pairs with each other using Cohen's kappa.

In the classification according to Landis and Koch [10] a statistically significant good agreement between the evaluators was confirmed in all cases. In the case of the 2nd and 3rd measurements, it was the most significant, the value of Cohen's kappa was the largest, and the agreement of the assessors in this case was up to 84.62% (33/39). In the case of the 1st and the 2nd measurements, the percentage of agreement was 71.79% (28/39) and the smallest percentage of agreement was in the case of the 1st and 3rd measurements 58.97% (23/39), which could have already been influenced by the change in respondents' self-sufficiency due to rehabilitation treatment.

The above analysis demonstrated a significant degree of reliability of the β scale as an assessment tool of patients' self-sufficiency and the suitability of testing it by patients of other facilities too.

Discussion

The results of testing the β scale, as a new proposed tool for assessing the level of self-sufficiency of patients with selected neurological diagnoses, show its high validity and reliability and greater suitability of its use in comparison with Barthel's self-sufficiency test. The limiting factor was the size of the tested sample of patients, but the testing will continue with other groups of patients. The low number of tested patients was also caused by the COVID-19 pandemic, when the hospital facility had a significantly lower proportion of hospitalized patients.

In the scientific resources, we encounter similar studies in which the authors monitor the validity and reliability of various assessment tools. In studies of Turkish authors Oguz et al. [11] in 2021, the effectiveness of the Palliative Performance Scale version 2 of geriatric oncology patients was tested and compared with the Katz ADL. The tested scale was evaluated as highly reliable and effective. Studies by Pires et al. In the year 2020 [12], the use of the accelerometer in mobile phones was tested to identify activities of daily life. Although the use of new technologies is certainly revolutionary in this direction, the study also demonstrated certain limits that these technologies still have. In the Finnish studies of the authors Pohjola et al. in 2021 [13] tested the modified Rankin Scale in patients with cerebral vascular malformations and assessed the quality of life and health of these patients and compared the results with the general population. The modified Rankin Scale showed significantly better results of the followed patients than the general population, which was measured by the original Rankin Scale. In 2018, the authors Lee and McCambridge [14] published in the Journal of Physiotherapy the results of testing the Rating Scale (ALSFRS-R) of patients with amyotrophic lateral sclerosis, and it was possible to fill out the questionnaire with the scale not only in print form, but also in online mobile application. The results were very encouraging and the authors confirmed the Rating scale as the most advantageous for assessing the self-sufficiency and quality of life of these patients. An important aspect of the comparison of several scales was the study by the Japanese authors Goto et al. [15], who investigated the effectiveness of the Kurtzke Expanded Disability Scale (EDSS), which is used in multiple sclerosis, and compared it with the Rankin scale in patients with brainstem surgery to assess the performance of patients. The EDSS allowed a better assessment and a more precise assessment of the patient's

condition than Kurtzke's extended scale.

We also come across other authors with similar researches where they test different evaluation scales. Above all, there is a study Ghosna et al. in 2016 [16], the results of Australian authors Aggarwal, Kean in 2010 [17] Czech women authors led by Taliánová in 2013 [18].

Conclusion

The use of assessment scales in nursing aims primarily to increase the objectivity of the assessment of the patient's condition and consequently to help the nurse in planning the implementation of interventions in the nursing process. Creating and testing new instruments is such an important research activity, because introducing a new assessment scale into life is a long and demanding process. The results that we have published in this article are very important for informing the professional public, as well as for cooperation on further testing of the β scale for assessing the level of self-sufficiency of patients with selected neurological diseases.

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