Artículo

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Vulnerability Scale for People with Motor Disabilities After an Acquired Neurological Lesion*

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Theme: Health care technologies

Contribution to the subject: It is believed that validating a scale for the Nursing practice in the scope of Primary Health Care and Nursing assistance in rehabilitation contributes to teaching, research and extension. In addition to that, it can be employed as a teaching-learning tool for critical and reflective students, with competencies and skills and for comprehensive assistance to people with disabilities. This study provides data for future surveys, given the need for other validation analyses to deepen the construct under investigation.

Abstract

Introduction: After an acquired neurological lesion, some people are in situations of greater vulnerability to complications and comorbidities, which can exert impacts on their life and health, compromise their quality of life, and lead to hospitalizations and premature death. Identifying the vulnerability situation can guide nurses in the development of actions to prevent complications, comorbidities, and other conditions after the neurological lesion. **Objective:** To validate a scale to identify the vulnerability situation of people with motor disabilities after an acquired neurological lesion (*Escala de Vulnerabilidade de Pessoas com Deficiência,* EVU-PcD). **Materials and method:** The article presents a methodological development and psychometric study with a quantitative approach. The construct validity stages were as follows: application of the Vulnerability Scale for people with motor disabilities after an acquired neurological lesion (EVU-PcD) and reliability and confirmatory factor analysis. EVU-PcD, initially with 38 items, was applied to 102 individuals with acquired motor disabilities. Reliability was assessed using Cronbach's alpha from 0.7 to 0.9. In the confirmatory factor analysis, the structural equations model for latent variables a path diagram was used. **Results:** The overall Cronbach's alpha coefficient was 0.86, which was considered excellent. The fit indices, chi-square ratio (1.63), root mean square of approximation errors (0.08) and parsimonious fit quality index (0.61) presented acceptable indicators of adequacy to the final model with three domains and 28 items. **Conclusions:** The final factor structure of the EVU-PcD scale with 28 items showed satisfactory reliability and validity results to identify the vulnerability of people with motor disabilities after an acquired neurological lesion.

Keywords (Source: DeCS)
Disabled persons; nervous system diseases; health vulnerability; validation study; rehabilitation nursing.

Escala de vulnerabilidad de las personas con discapacidad motora tras una lesión neurológica adquirida*

Resumen

Introducción: algunas personas, tras una lesión neurológica adquirida, se encuentran en situaciones de mayor vulnerabilidad a complicaciones y comorbilidades, que pueden repercutir en la vida y la salud, comprometer la calidad de vida, provocar hospitalizaciones y muerte prematura. La identificación de la situación de vulnerabilidad puede orientar al personal de enfermería en el desarrollo de acciones de prevención de complicaciones, comorbilidades y otras afecciones tras una lesión neurológica. **Objetivo:** validar una escala para identificar la situación de vulnerabilidad de las personas con discapacidad motora después de una lesión neurológica adquirida (EVU-PcD). **Material y método:** estudio metodológico, de desarrollo psicométrico con un enfoque cuantitativo. Las etapas de validez de constructo fueron la aplicación de la "Escala de vulnerabilidad de personas con discapacidad motora tras lesión neurológica adquirida (EVU-PcD)", el análisis de fiabilidad y el análisis factorial confirmatorio. La EVU-PcD, compuesta inicialmente por 38 ítems, se aplicó a 102 personas con discapacidad motora adquirida. La fiabilidad se midió utilizando el alfa de Cronbach de 0,7 a 0,9. El análisis factorial confirmatorio utilizó el modelo de ecuaciones estructurales para variables latentes, mediante el diagrama de trayectorias. **Resultados:** el alfa de Cronbach total fue de 0,86, considerado excelente. Los índices de ajuste, ratio chi-cuadrado (1,63), raíz cuadrada media de los errores de aproximación (0,08) e índice de calidad de ajuste parsimonioso (0,61) mostraron indicadores aceptables de adecuación al modelo final con tres dominios y 28 ítems. **Conclusiones:** la estructura factorial final de la EVU-PcD con 28 ítems mostró resultados satisfactorios de fiabilidad y validez para identificar la vulnerabilidad de las personas con discapacidad motora tras una lesión neurológica adquirida.

Palabras clave (Fuente: DeCS)
Personas en condición de discapacidad; enfermedades del sistema nervioso; vulnerabilidad en salud; estudio de validación; enfermería en rehabilitación.

Escala de vulnerabilidade das pessoas com deficiência motora após lesão neurológica adquirida*

Resumo

Introdução: algumas pessoas, após lesão neurológica adquirida, estão em situações de maior vulnerabilidade a complicações, comorbidades e outras condições após a deficiência, as quais podem impactar na vida e na saúde, comprometer a qualidade de vida, levar a hospitalizações e à morte prematura. A identificação da situação de vulnerabilidade pode orientar o enfermeiro no desenvolvimento de ações para prevenir complicações, comorbidades e outras condições após lesão neurológica. **Objetivo:** validar uma escala para identificar a situação de vulnerabilidade de pessoas com deficiência motora após lesão neurológica adquirida (EVU-PcD). **Materiais e método:** estudo de desenvolvimento metodológico, psicométrico, com abordagem quantitativa. As etapas de validade de construto foram aplicação da "Escala de vulnerabilidade de pessoas com deficiência motora após lesão neurológica adquirida (EVU-PcD)", análise da confiabilidade e análise fatorial confirmatória. A EVU-PcD, composta inicialmente de 38 itens, foi aplicada a 102 pessoas com deficiência motora adquirida. A confiabilidade foi medida por meio do alfa de Cronbach de 0,7 a 0,9. Na análise fatorial confirmatória, utilizou-se o modelo de equações estruturais para variáveis latentes, por meio do diagrama de caminhos. **Resultados:** o alfa de Cronbach total foi 0,86, considerado excelente. Os índices de ajuste, razão de qui-quadrado (1,63), raiz média quadrática dos erros de aproximação (0,08) e índice de qualidade de ajuste parcimonioso (0,61) apresentaram aceitáveis indicadores de adequação ao modelo final com três domínios e 28 itens. **Conclusões:** a estrutura fatorial final da EVU-PcD com 28 itens mostrou resultados satisfatórios de confiabilidade e validade para identificar a vulnerabilidade de pessoas com deficiência motora após lesão neurológica adquirida.

Palavras-chave (Fonte: DeCS)
Pessoas com deficiência; doenças do sistema nervoso; vulnerabilidade em saúde; estudo de validação; enfermagem em reabilitação.

Introduction

The number of people with some type of disability is high. It is estimated that 1.3 billion people (16 % of the world population) will have some disability in 2023. People with disabilities (PwD) die prematurely, present worse health conditions, and need more health care. In addition, they face inequalities in access to health services (1-4).

Stroke represents one of the main causes of death, disabilities, and hospitalizations worldwide. It is estimated that 70 % of the cases occur in low-and middle-income countries. From 1990 to 2019, the number of stroke cases increased substantially: 102 % prevalence, 70 % incidence, 43 % deaths, and 143 % disability-adjusted life years lost (1, 5, 6).

Regarding cranioencephalic trauma, it stands out as one of the causes of morbidity and mortality for external reasons and long-term disability among young adults (2, 7). Mortality is high in low- and middle-income countries, and sociodemographic factors such as race and schooling level played an important role in that result (7). Spinal Cord Injury (SCI), on its part, affects nearly 500,000 people worldwide; urban violence constitutes the most common cause for this type of lesion, which in most cases compromises the individual with serious and disabling sequelae (3, 8, 9).

In this context, some people with motor disabilities after an acquired neurological lesion are in situations of greater vulnerability to secondary health conditions, which are physical and psychosocial health conditions associated with the primary disability, such as complications, comorbidities, and other conditions after the disability (10-14). Such conditions can exert a major impact on health and well-being (14, 15), compromise the quality of life, and lead to hospitalizations and premature death (14, 16, 17), especially when there is no adequate intervention for the person or family (18). At a global level, 95.8 % of the individuals with SCI report having experienced at least one secondary health problem that might be reduced or prevented (13).

Meleis' Nursing Theory of Transitions reveals that people who are in an adjustment process are more vulnerable. In turn, transition means "changes," whether in health status or the role or skill relationships. According to the theory, a person in this process needs care targeted at a healthy transition; in other words, to better health conditions and to better cope with this situation. For this, it is necessary to understand the experiences regarding how each individual undergoes their transition process considering the "personal" aspect: meanings, attitudes, beliefs, and knowledge; the "social" aspect: social reintegration, stigmas, gender inequalities, and stereotyping, and the "community" aspect: aid and support, and availability of information and human/material resources for health care (18).

In the collective health view, according to Ayres, vulnerability can be understood in a broad and multidimensional way. This is peo-

ple's chance of exposure to diseases and health problems and, consequently to illness, considering individual aspects, that is, the conditions a person has to protect themselves in a given social context and of access to public policies, in the programmatic scope. Unlike risk, vulnerability seeks to analyze a set of the various factors involved in people's health-disease process (19).

In this perspective, the validation of a scale based on the concept of Ayres and Meleis' Nursing Theory of Transitions is justified to identify the situation of vulnerability of people with motor disabilities after an acquired neurological lesion (EVU-PcD scale). Identifying the situation of vulnerability can guide nurses in the care and development of actions to prevent complications, comorbidities and other secondary health conditions throughout life in PwD after the acquired neurological lesion (18, 19), also favoring comprehensive and individualized care for this group. However, the lack of knowledge about constructs that involve the vulnerability of PwD after suffering a neurological topography lesion is highlighted and, consequently, the absence of a specific instrument that provides information about this situation (20).

It is expected that the EVU-PcD scale proposed may be used in research studies and nursing professionals' practice, both in the primary care context and in specialized rehabilitation centers, which broadly contributes to health promotion, as well as to the rehabilitation of PwD after a neurological lesion.

Rehabilitation nursing care is fundamental, regardless of the disease or motor/sensory disabilities, aiming to promote independence and autonomy, developing strategies for self-care, quality of life and prevention of complications and for social inclusion (17, 21, 22). In this sense, the objective was to validate the EVU-PcD scale.

Materials and Methods

This was a methodological development and psychometric study with a quantitative approach. For construct validity, a cross-sectional study was conducted from July 2019 to February 2020 in a specialized rehabilitation center located in the city of Campina Grande, Paraíba, Brazil. According to the Brazilian Institute of Geography and Statistics, the Northeast Region has the highest percentage of PwD (23).

The probability sample was estimated with the aid of the Epi Info 7 software. THz following was considered for the calculation: the population of people with motor disabilities at the specialized rehabilitation center (N = 2,116), the tolerated error (e = 0.05), the prevalence of people with physical disabilities in the city of Campina Grande (P = 7.14), and 95% confidence. A total of 97 individuals was obtained after the calculation. Subsequently, with a 5 % correction applied for losses inherent to the sample

selection process, the result was a sample comprised of 102 users with motor disabilities. Simple random sampling was used, drawing from the users' medical records. The reference by Hair Junior (24) was adopted for sample size, which suggests a sample size equal to or greater than 100 in factor analyses.

The inclusion criteria were being aged from 18 to 59 years old and presenting some motor disability arising from an acquired brain and/or SCI. People with neurodegenerative neurological diseases were excluded, as they comprise a more specific group that progressively loses functional capacity, in addition to those with psychiatric diseases diagnosed by a specialist, people with altered cognition and hospitalized patients during the research period.

The construct validation study stages were as follows: applying EVU-PcD; performing a reliability analysis using Cronbach's alpha; and carrying out a Confirmatory Factor Analysis. The EVU-PcD was created in Brazilian Portuguese, with 60 items, and validated in terms of content by nine experts from Brazil. The Content Validity Index (CVI) corresponding to the scale items evidenced 38 valid items, with a minimum agreement of 0.80. The binomial test acknowledged agreement of all 38 items with a p-value>0.05. The significance level adopted was 95 %.

The EVU-PcD has 38 items and consists of three domains: "Personal," with 19 items (from 1 to 19); "Social," with 13 items (from 20 to 32); and "Community," with six items (from 33 to 38). Conserning the EVU-PcD answer format, a Likert-type scale with five self-reported options was used, namely: 0 – Never, 1 – Rarely, 2 – Sometimes, 3 – Frequently and 4 – Always, for items with a positive denotation; and 4 — Never, 3 — Rarely, 2 — Sometimes, 1 — Frequently and 0 — Always, for those with a negative one. The lower the score, the greater the situation of vulnerability.

Data collection took place by applying EVU-PcD to users who met the eligibility criteria and agreed to participate in the study, formalizing their consent by signing the free and informed consent terms. The collection procedures took place before the users were assisted at the specialized rehabilitation center or after that in a private place, or, for those who were not attending the center, home visits were also carried out.

The set of data inherent to the research was initially tabulated in Microsoft Excel from the Office package and later incorporated into the SPSS software (Statistical Package for the Social Sciences) to carry out the entire pre-processing, descriptive and reliability analysis phases. The Confirmatory Factor Analysis was performed with the aid of the R software, version 4.2.1, resorting to the "ltm", "lavaan" and "semplot" packages.

Absolute and relative frequencies were calculated in the descriptive analysis. Cronbach's alpha was used to assess reliability and mea-

sure internal consistency. Minimum, total and by domain alpha values ≥ 0.7 were considered (24).

In the Confirmatory Factor Analysis, the estimation between items and factors was analyzed using the Critical Ratio test, considering $p<0.05$ as significant. The EVU-PcD factor structure hypothesis test was performed by implementing the structural equations model for latent variables, using a path diagram. For the implementation of structural equations modeling, the "Personal" (Factor 1), "Social" (Factor 2) and "Community" (Factor 3) factors were considered as latent variables, and the observed variables corresponded to the 38 items of the EVU-PCD scale.

To test the quality of the fit to the structural model, the χ^2/DoF ratio, RMSEA, TLI, Comparative Fit Index (CFI) and PGFI were estimated. The following values were considered acceptable: TLI and CFI ≥ 0.90; RMSEA from 0.05 to 0.08; PGFI ≥ 0.6; and χ^2/DoF between 1 and 5 (25).

The ethical and legal aspects considered in the National Health Council Resolution No. 466/2012 were safeguarded for compliance with the guidelines and regulatory standards for research studies involving human beings. The project was approved by the Research Ethics Committee of Universidade Estadual da Paraíba under Opinion number 3,401,254. The research participants were guaranteed data secrecy and anonymity.

Results

Among the 102 individuals with motor disabilities after neurological lesions, there was a predominance of men, with low schooling levels, without a partner, low incomes and limited access to work, as well as people with acquired brain injuries, with less than one year since the lesion.

The reliability of the 38-item EVU-PcD scale before factor analysis showed a total Cronbach's alpha of 0.86, considering that, by domain, the alpha value corresponded to 0.79 in the "Personal" domain, 0.75 in the "Social" domain, and 0.48 in the "Community" domain.

Regarding the confirmatory factor analysis, the estimate between items and factors showed that items P7 ($p = 0.169$), P11 ($p = 0.139$), P12 ($p = 0.816$) and P15 ($p = 0.829$) related to Factor 1; P21 ($p = 0.207$), P26 ($p = 0.086$) and P27 ($p = 0.587$) related to Factor 2; and P34 ($p = 0.252$) and P35 ($p = 0.059$) related to Factor 3, did not present significance, thus being removed from the first model. In a subsequent analysis with the second model, one non-significant item (P24, $p=0.061$) related to Factor 2 was obtained, thus removing it. In the third analysis, a third model comprised of 28 statistically significant items was obtained, as presented in Table 1.

Table 1. Estimate between Items and Factors from the Final Structural Model of the Vulnerability Scale for People with Motor Disabilities after an Acquired Neurological Lesion (n = 102), Campina Grande, Paraíba, Brazil, 2019-2020 (Free translation into English)

| Item	Estimate	Error	z	value*
P1. Do you take care of yourself as you would like to (for example: eating, taking a bath, getting dressed, going to the bathroom, taking care of personal hygiene?	1.000			
P2. Do you perform your activities of daily living on your own (Example: shopping, household chores, managing your own money, using the telephone?	1.178	0.161	7.311	<0.001
P3. Does tiredness prevent you from performing any activity you would like to do?	0.570	0.156	3.655	<0.001
P4. Do the strategies you use to do what you need work?	0.941	0.139	6.774	<0.001
P5. Do you accept your condition as a person with a disability?	0.961	0.160	5.995	<0.001
P6. Do you feel rehabilitated given your new life condition?	0.750	0.154	4.868	<0.001
P8. Do you feel satisfied with your sexuality?	0.369	0.147	2.513	0.012
P9. Do you feel capable of taking care of your health?	1.171	0.171	6.863	<0.001
P10. Do you practice any type of physical activity?	0.531	0.147	3.612	<0.001
P13. Do you sleep the necessary number of hours to feel good and recovered every day?	0.586	0.146	4.022	<0.001
P14. Do you feel stressed?	0.564	0.136	4.154	<0.001
P16. Can you eliminate feces in a spontaneous and controlled way?	0.255	0.124	2.049	0.040
P17. Do you change positions on your own or with help to avoid skin wounds?	0.115	0.058	1.985	0.047
P18. Do you have positive feelings (for example: trust, optimism, motivation)?	0.398	0.111	3.578	<0.001
P19. Do you have negative feelings (for example: fear, anxiety, frustration, or sadness)?	0.461	0.116	3.957	<0.001
P20. Do you have enough money to meet your needs?	1.000			
P22. Do you feel capable of doing your job?	2.477	1.015	2.440	0.015
P23. Can you access the labor market?	2.131	0.860	2.478	0.013
P25. Do you feel that you are a burden to your family?	1.206	0.579	2.081	0.037
P28. Do you use transportation means on your own?	2.638	1.074	2.457	0.014
P29. Do you take part in social activities as you would like to?	2.443	0.982	2.488	0.013
P30. Do you have good family relationships?	0.872	0.435	2.006	0.045
P31. Do you have good friends?	1.565	0.685	2.284	0.022
P32. Do you take part in leisure, cultural or artistic activities, among others?	2.024	0.814	2.485	0.013
P33. Do you seek health assistance to remain healthy?	1.000			
P36. Do you make your health-related decisions with the support of health professionals?	1.117	0.345	3.240	0.001
P37. Do you feel that you have sound information about your health?	1.450	0.420	3.450	0.001
P38. Do health professionals provide you with guidelines about how to avoid complications after the neurological lesion?	1.182	0.374	3.164	0.002

Source: Prepared by the authors.

Notes: *p<0.05.

The following was obtained for the quality fit indices of the model: Chi-square by degrees of freedom (χ^2/DoF) of 1.63; RMSEA of 0.08; and PGFI of 0.61. CFI was 0.73 and TLI was 0.70. It was shown that the fit indices, chi-square ratio, RMSEA and PGFI presented acceptable indicators of adequacy to the final model. Consequently, the third model (comprised of 28 items), defined the best fit for the final model.

Figure 1 presents the final structural model, which proved to present a good fit. Greater distribution of items with a strong influence on the factors was observed. P4, P8, P16, P17, P18, P20, P25 and P30 exerted lower influences. The relationship between the latent variables is unidirectional, as well as the one between the factors under study is more intense, between F2 ("Social") and F1 ("Personal"), between F3 ("Community") and F2 ("Social") and between F3 ("Community") and F1 ("Personal").

Figure 1. Path Diagram Corresponding to the Final Structural Model of the Vulnerability Scale for People with Motor Disabilities after an Acquired Neurological Lesion (n = 102), Campina Grande, Paraíba, Brazil, 2019-2020
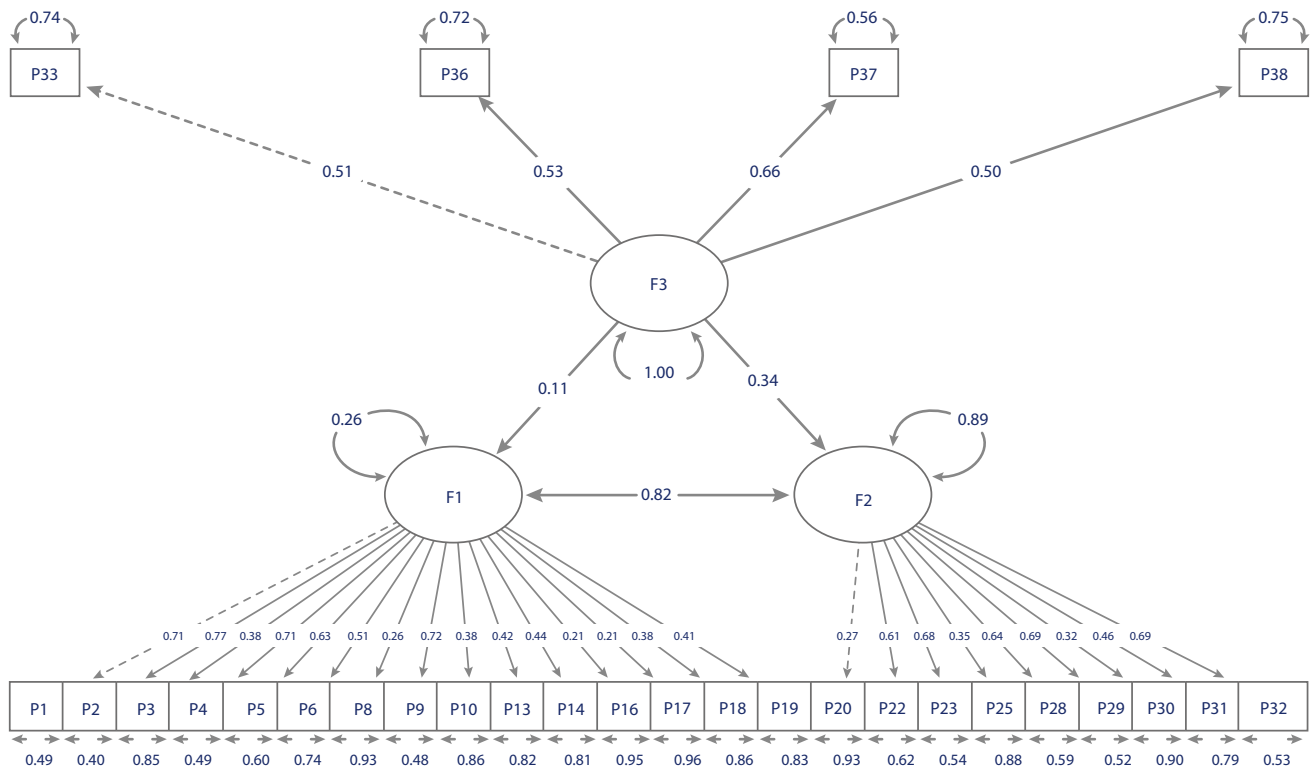
Source: Prepared by the authors.

*F1: Factor 1 ("Personal"), F2: Factor 2 ("Social"), F3: Factor 3 ("Community").

After defining the final model, the internal consistency of the EVU-PcD scale was tested again; it revealed an increase in the total Cronbach's alpha from 0.86 to 0.87 and, by domain, the alpha values were 0.82, 0.76, and 0.64 for the "Personal", "Social" and "Community" domains, respectively. The final version of the reliable and valid EVU-PcD scale is presented in Table 2.

Table 2. Final version of the Vulnerability Scale for People with Motor Disabilities (in Portuguese) after an Acquired Neurological Lesion (n = 102), Campina Grande, Paraíba, Brazil, 2019-2020

Escala de vulnerabilidade de pessoas com deficiência motora após lesão neurológica adquirida					
As questões nesta escala estão relacionadas com as suas experiências após lesão neurológica. Por favor, indique a frequência com que ocorrem as seguintes situações no seu dia a dia:	Nunca	Raramente	Algumas vezes	Frequentemente	Sempre
Domínio "pessoal"					
1. Você cuida de si mesmo(a) como gostaria (exemplo: alimentar-se, tomar banho, vestir-se, ir ao banheiro, cuidar da higiene pessoal)?	0	1	2	3	4
2. Você realiza sozinho(a) suas atividades diárias (exemplo: fazer compras, realizar tarefas domésticas, gerir o próprio dinheiro, usar telefone)?	0	1	2	3	4
3. O cansaço lhe impede de realizar alguma atividade que gostaria?	4	3	2	1	0
4. As estratégias que você utiliza para fazer o que precisa funcionam?	0	1	2	3	4
5. Você aceita a sua condição de pessoa com deficiência?	0	1	2	3	4
6. Você se sente reabilitado(a) diante da sua nova condição de vida?	0	1	2	3	4
7. Você está satisfeito(a) com a sua sexualidade?	0	1	2	3	4
8. Você se sente capaz de cuidar da sua saúde?	0	1	2	3	4
9. Você pratica algum tipo de atividade física?	0	1	2	3	4
10. Você dorme diariamente o número de horas suficientes para se sentir bem e recuperado?	0	1	2	3	4
11. Você se sente estressado(a)?	4	3	2	1	0
12. Você consegue eliminar as fezes de maneira espontânea e controlada?	0	1	2	3	4
13. Você realiza mudança de posição, sozinho(a) ou com ajuda, para evitar o aparecimento de feridas na pele?	0	1	2	3	4
14. Você tem sentimentos positivos (exemplo: confiança, otimismo, motivação)?	0	1	2	3	4
15. Você tem sentimentos negativos (exemplo: medo, ansiedade frustração, tristeza)?	4	3	2	1	0
Domínio "social"					
16. O seu dinheiro é suficiente para satisfazer as suas necessidades?	0	1	2	3	4
17. Você se sente capaz de realizar o seu trabalho?	0	1	2	3	4
18. Você tem acesso ao mercado de trabalho?	0	1	2	3	4
19. Você sente que sobrecarrega sua família?	4	3	2	1	0
20. Você utiliza os meios de transporte sozinho(a)?	0	1	2	3	4
21. A sua participação nas atividades sociais ocorre como gostaria?	0	1	2	3	4
22. Você mantém um bom relacionamento familiar?	0	1	2	3	4
23 Você mantém boas relações de amizade?	0	1	2	3	4
24. Você participa de atividades de lazer, culturais, artísticas etc.?	0	1	2	3	4

Escala de vulnerabilidade de pessoas com deficiência motora após lesão neurológica adquirida					
As questões nesta escala estão relacionadas com as suas experiências após lesão neurológica. Por favor, indique a frequência com que ocorrem as seguintes situações no seu dia a dia:	Nunca	Raramente	Algumas vezes	Frequentemente	Sempre
Domínio "comunitário"					
25. Você procura assistência à saúde para se manter saudável?	0	1	2	3	4
26. Você toma suas decisões em saúde com apoio de profissionais de saúde?	0	1	2	3	4
27. Você sente que é bem-informado(a) sobre a sua saúde?	0	1	2	3	4
28. Você recebe orientações dos profissionais de saúde sobre como evitar as complicações após lesão neurológica?	0	1	2	3	4

Source: Prepared by the authors.

Discussion

The confirmatory factor analysis with acceptable fit indices (χ^2/DoF, RMSEA, PGFI) and satisfactory reliability by the total Cronbach's alpha resulted in construct validity of the EVU-PcD scale, comprised of 3 domains and 28 items in its final version.

Characterization of the sample, with a mean age of 44 years old and predominance of men, brown-skinned, married, with elementary school education, unemployed, and with low socioeconomic status corroborates with national and international studies (2, 9, 26).

Regarding the clinical data, motor sequelae can reduce the functional capacity of individuals affected by neurological lesions, limiting their independence and autonomy and, consequently, their quality of life (17); they also contribute to depression, difficulties returning to work, low socioeconomic status, social activities and accessibility (5, 26-28).

In this context, it is necessary to present the sociodemographic and clinical characteristics to show the validity of the EVU-PcD scale focused on a given situation and for a given purpose. As the psychometric parameters are not fixed, they can change according to the population characteristics (29).

Concerning the analysis of the psychometric properties, Cronbach's alpha results showed excellent internal consistency between the items and the scale at the global level and, consequently, its reliability, according to parameters reported in the literature (24). In addition to that, removing any of the items did not exert any significant influence on the alpha value of EVU-PcD.

From the final structural model, in the confirmatory factor analysis, internal consistency was considered with even more satisfactory Cronbach's alpha values, showing how reliable the final EVU-PcD scale was. Internal consistency meant asserting the items are inter- and correlated, although it does not mean that they are measuring the same construct. To such end, it was indispensable to apply factor analysis to validate the construct (29).

Confirmatory factor analysis was necessary to confirm the structural model, pre-established in the light of Meleis' Theory of Transitions, the concept of vulnerability and integrative review, which reflected vulnerability through three domains ("Individual/Personal," "Social/Society", and "Programmatic/Community"). Through structural equations modeling, the Confirmatory Factor Analysis proposed to analyze to which extent the latent and observed variables approached reality, as empirically observed, and thus validate the results generated by EVU-PcD (24, 25, 30).

Another study is similar to the elaboration and validation stages: the questionnaire on interpersonal relationships in Nursing care, which followed the three procedures proposed by Pasquali's psychometry: theoretical, empirical and analytical. In this study, Imogene King's Nursing theory was used to support the definition of the construct, CVI to validate the content, and Cronbach's alpha and factor analysis to validate the construct of the questionnaire items, which were adequate reliability and validity parameters (31).

The nine non-significant items specified which of them were not related to the construct. This verification may have been due to the lower frequency of "Never" and "Rarely" answers for these items, thus weakening their estimates. For this reason, it is believed that applying the EVU-PcD to a larger sample may reduce the error and increase the estimate (24).

With the acceptable fit indicators of the EVU-PcD model (χ^2/DoF, RMSEA and PGFI), the hypothesis that the pre-established model represents the construct is confirmed. Such indices are typically considered in a Confirmatory Factor Analysis, thus enabling the validity of the model (24). The TLI and CFI indices, both comparison indicators, are sample-size-sensitive indices; therefore, the EVU-PcD application in a larger sample may increase the indicators, thus obtaining acceptable values (24, 25).

A study on the validation of the Three Factors Influence Scale applied to university students, used similar indices in the analysis (χ^2/DoF = 2.97, RMSEA = 0.08, CFI = 0.87, TLI = 0.86), evidencing an adequate instrument to measure the construct (32).

After defining the final structural model, there was an increase in the overall and by domain Cronbach's alpha values. This result showed that the reliability of the 38-item EVU-PcD scale was not influenced by the number of items since, even when removing one-third of

them, there was an improvement in the coefficient estimate, evidencing better consistency between the items of the final scale. Validation of the construct under study, the EVU-PcD scale, constitutes a major advance for the praxis and for research in the Rehabilitation Nursing field, evolving health care for people with motor disabilities, who need to have their health problems investigated and, above all, nursing care focused on and specific to their health needs (33).

Diverse evidence points to the need for services and interventions for the prevention of secondary health conditions in PwD with lifelong acquired motor disabilities (15, 34); this type of prevention should be a priority to improve PwD's experience and health (35). For this purpose, it is of utmost importance to adopt an interdisciplinary approach and holistic care to minimize the impact of such conditions (34). In addition, effective technologies and training are necessary to better support vulnerable populations (36).

It is worth noting that Nursing professionals' performance is significant in a person's transition process after a neurological lesion, from hospitalization to the post-discharge discharge, at home and with full care continuity, that is, at all health care levels (37), in the rehabilitation of people undergoing health-disease transition processes for the development of skills and coping after acquired neurological lesions (38).

The study limitations correspond to the sample size and to the number of items in the Community factor in the final model, events that may have influenced its relationship with other factors (Personal and Social) and the values of the CFI and TLI quality indices. Therefore, reproducibility analyses such as test-retest need to be collected, in search of a greater understanding of the situations that predispose PwD to secondary conditions after a neurological lesion.

Conclusion

The final factor structure of the 28-item EVU-PcD scale showed satisfactory reliability and validity results to identify the vulnerability situation of people with motor disabilities after an acquired neurological lesion. Other validation stages are suggested to reach a more in-depth construct.

It is believed that the validated EVU-PcD scale collaborates with other studies and research involving the vulnerability construct of people with motor disabilities after an acquired neurological lesion and in the development of other instruments; in addition to that, its applicability can collaborate in the clinical and care practice for the health care of PwD in the Brazilian Unified Health System.

In the results obtained by the Confirmatory Factor Analysis, the exclusion of items, especially from the "Community" domain, modified the original EVU-PcD scale, meaning that new studies should be carried out using the adjusted EVU-PcD version to verify its factor structure.

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Referências

1. World Health Organization. World Stroke Day. Genebra: 2021. Available from: https://www.who.int/southeastasia/news/detail/28-10-2021-world-stroke-day

2. Yue JK, Satris GG, Dalle Ore CL, Huie JR, Deng H, Winkler et al. Polytrauma is associated with increased three- and six-month disability after traumatic brain injury: A TRACK-TBI pilot study. Neurotrauma Rep. 2020;23(1):32-41. DOI: https://doi.org/10.1089/neur.2020.0004

3. World Health Organization. Disability. Genebra: WHO; 2023. Available from: https://www.who.int/news-room/fact-sheets/detail/disability-and-health

4. Cunha MAO, Santos HF, de Carvalho MEL Miranda GMD, Albuquerque MSV, Oliveira RS et al. Health care for people with disabilities in the unified health system in Brazil: A scoping review. Int J Environ Res Public Health. 2022;19(3):1472. DOI: https://doi.org/10.3390/ijerph19031472

5. GBD 2019 Stroke Collaborators. Global, regional, and national burden of stroke and its risk factors, 1990-2019: A systematic analysis for the Global Burden of Disease Study 2019. Lancet Neurol. 2021;20(10):795-820. DOI: https://doi.org/10.1016/S1474-4422(21)00252-0

6. Taylor A, Ntusi NAB. Evolving concepts of stroke and stroke management in South Africa: Quo vadis?. S Afr Med J. 2019;109(2):69-71. DOI: https://doi.org/10.7196/SAMJ.2019.v109i2.00009

7. Bonow RH, Barber J, Temkin NR Videtta W, Rondina C, Petroni G et al. The outcome of severe traumatic brain injury in Latin America. World Neurosurg. 2018;111:e82-e90. DOI: https://doi.org/10.1016/j.wneu.2017.11.171

8. Madasa V, Boggenpoel B, Phillips J, Joseph C. Mortality and secondary complications four years after traumatic spinal cord injury in Cape Town, South Africa. Spinal Cord Ser Cases. 2020;6(1):84. DOI: https://doi.org/10.1038/s41394-020-00334-w

9. Faleiros F, Marcossi M, Ribeiro O, Tholl A, Freitas G, Riberto M. Epidemiological profile of spinal cord injury in Brazil. J Spinal Cord Med. 2023;46(1):75-82. DOI: https://doi.org/10.1080/10790268.2021.1947679

10. Rimmer JH, Chen M, Hsieh K. A conceptual model for identifying, preventing, and managing secondary conditions in people with disabilities. Physical Therapy. 2011;91(12):1728-39. DOI: https://doi.org/10.2522/ptj.20100410

11. Jansen MP, Molton IR, Groah SL, Campbell ML, Charlifue S, Chiodo A et al. Secondary health conditions in individuals aging with SCI: Terminology, concepts and analytic approaches. Spinal Cord. 2012;50(5), 373-8. DOI: https://doi.org/10.1038/sc.2011.150

12. Krnjacki L, Aitken Z, Noemi S, Emerson E. Disability-based discrimination and health: findings from an Australian-based population study. Aust N Z J Public Health. 2018;42(2):172-4. DOI: https://doi.org/10.1111/1753-6405.12735

13. Strøm V, Månum G, Arora M, Joseph C, Kyriakides A, Le Fort M et al. Physical health conditions in persons with spinal cord injury across 21 countries worldwide. J Rehabil Med. 2022;54:jrm00302. DOI: https://doi.org/10.2340/jrm.v54.2040

14. Mashola MK, Olorunju SAS, Mothabeng J. Factors related to hospital readmissions in people with spinal cord injury in South Africa. S Afr Med J. 2019;109(2):107-11. DOI: https://doi.org/10.7196/SAMJ.2019.v109i2.13344

15. Pilusa SI, Myezwa H, Potterton J. Experiences of secondary health conditions amongst people with spinal cord injury in South Africa: A qualitative study. S Afr J Physiother. 2021;77(1):1530. DOI: https://doi.org/10.4102/sajp.v77i1.1530

16. Prynn JE, Kuper H. Perspectives on disability and non-communicable diseases in low- and middle-income countries, with a focus on stroke and dementia. Int J Enviro Res Public Health. 2019;16(18):3488. DOI: https://doi.org/10.3390/ijerph16183488

17. Faleiros F, Silva JCF e, Cordeiro A, Tholl AD, Fumincelli L, Tate D. Quality of life and traumatic spinal cord injury: A study using international data sets. Rev Eletrônica Enferm. 2020;22. DOI: https://doi.org/10.5216/ree.v22.56256

18. Meleis AI, Sawyer LM, Im EO, Messias DAKH, Schumacher K. Experiencing transitions: An emerging middle-range theory. In: Meleis AI, organizators. Transition Theory. New York: Springer Publishing Company; 2010. p. 52-65.

19. Ayres JRCM, França Junior I, Calazans GJ, Saletti Filho HC. O conceito de vulnerabilidade e as práticas de saúde: novas perspectivas e desafios. In: Czeresnia D, Freitas CM, organizators. Promoção da saúde: conceitos, reflexões, tendências. Rio de Janeiro: Fiocruz; 2003. p. 2207-2672.

20. Aragão JS, França ISX, Coura AS, Pereira ABR, Basilio EEF, Silva AFR, Silva FMF. Elementos da vulnerabilidade de adultos com deficiência após lesão neurológica: revisão integrativa. Res, Soc Dev. 2022;11:e39811831169. DOI: https://doi.org/10.33448/rsd-v11i8.31169

21. Dornelles SS, Martins MM, Ribeiro I, Souza Lima DK, Itayra Padilha M, Pereira Gomes B. Breve panorama mundial da enfermagem de reabilitação. Rev Port Enf Reab. 2018;1(1):6-12. DOI: https://doi.org/10.33194/rper.2018.v1.n1.01.4388

22. Dias MDRJ, Alves Faria ADC, Ferreira MSM Faleiros F, Novo A, Gonçalves MN et al. From health literacy to self-care: Contributions of the specialist nurse in rehabilitation nursing. Int J Environ Res Public Health. 2022;19(13):7767. DOI: https://doi.org/10.3390/ijerph19137767

23. Instituto Brasileiro de Geografia e Estatística. PNS 2019: país tem 17,3 milhões de pessoas com algum tipo de deficiência. Rio de Janeiro: IBGE; 2021. Disponível em: https://agenciadenoticias.ibge.gov.br/agencia-sala-de-imprensa/2013-agencia-de-noticias/releases/31445-pns-2019-pais-tem-17-3-milhoes-de-pessoas-com-algum-tipo-de-deficiencia

24. Hair Junior JF. Análise multivariada de dados. 5ª ed. Porto Alegre: Bookman; 2009.

25. Maroco, J. Análise de equações estruturais. 2ª ed. Portugal: Report Number; 2010.

26. Jorge A, White MD, Agarwal N. Outcomes in socioeconomically disadvantaged patients with spinal cord injury: A systematic review. J Neurosurg Spine. 2018;29(6):680-6. DOI: https://doi.org/10.3171/2018.5.SPINE171242

27. Jet van der K, Willeke JK, Tanja CWN, Coen AMB, Caroline van H, Johanna MAV-M. Return to work after mild-to-moderate stroke: Work satisfaction and predictive factors. Neuropsychol Rehabil. 2019;29(4):638-53. DOI: https://doi.org/10.1080/09602011.2017.1313746

28. Câmara-Costa H, Francillette L, Opatowski M, Toure H, Brugel D, Laurent-Vannier A, Meyer P, Dellatolas G, Watier L, Chevignard M. Participation seven years after severe childhood traumatic brain injury. Disabil Rehabil. 2020;42(17):2402-11. DOI: https://doi.org/10.1080/09638288.2019.1594398

29. Pasquali L. Psicometria: teoria dos testes na psicologia e na educação. 5ª ed. Petrópolis: Vozes; 2013.

30. Tavares DMS, Oliveira NGN, Marmo FAD, Meneguci J. Using structural equation modeling in the understanding of functional disability in older adults. Rev Lat Am Enfermagem. 2021;29:e3451. DOI: https://doi.org/10.1590/1518-8345.4555.3451

31. Borges JWP, Moreira TMM, Andrade DF. Nursing Care Interpersonal Relationship Questionnaire: Elaboration and validation. Rev Lat Am Enfermagem. 2017;25:e2962. DOI: https://doi.org/10.1590/1518-8345.2128.2962

32. Silva WR, Maroco JC, Bonini JAD. Escala de Influência dos Três Fatores (TIS) aplicada a estudantes universitários: estudo de validação e aplicação. Cad Saude Publica. 2019;35(3):e00179318. DOI: https://doi.org/10.1590/0102-311x00179318

33. Faleiros F, de Oliveira Braga DC, Schoeller SD Henriques SH, Cunha NBF, Videira LGN et al. Surveying people with spinal cord injuries in Brazil to ascertain research priorities. Sci Rep. 2023;13(1):654. DOI: https://doi.org/10.1038/s41598-022-26733-7

34. Adriaansen JJ, Ruijs LE, van Koppenhagen CF, van Asbeck FW, Snoek GJ, van Kuppevelt D. et al. Secondary health conditions and quality of life in persons living with spinal cord injury for at least ten years. J Rehabil Med. 2016;48(10):853-60. DOI: https://doi.org/10.2340/16501977-2166

35. Tasiemski T, Kujawa J, Tederko P, Rubinelli S, Middleton JW, Craig A et al. Relationship between secondary health conditions and life satisfaction in persons with spinal cord injury: Study across twenty-one countries. Qual Life Res. 2023;32(7):2069-77. DOI: https://doi.org/10.1007/s11136-023-03376-3

36. Hogan C, Burridge L, Foster M, Kendall M, Pershouse K, Unger-er G et al. The impacts and vulnerabilities for people living with spinal cord injury and their service systems of the COVID-19 pandemic in Queensland, Australia. Health Soc Care Community. 2023:1-12. DOI: https://doi.org/10.1155/2023/7255395

37. Tholl AD, Nitschke RG, Viegas SMF, Potrich T, Marques-Vieira C, Castro FFS. Strenghts and limits in the daily life of the adherence to rehabilitation of people with spinal cord injury and their families. Texto Contexto Enferm. 2020;29:e20190003. DOI: https://doi.org/10.1590/1980-265x-tce-2019-0003

38. Sousa L, Martins MM, Novo A. A Enfermagem de Reabilitação no empoderamento e capacitação da pessoa em processos de transição saúde-doença. Rev Port Enf Reab. 2020;3(1):64-9. DOI: https://doi.org/10.33194/rper.2020.v3.n1.8.5763