Disability and Rehabilitation

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/idre20

Cultural adaptation and Turkish version of Physical Activity Scale for Individuals with Physical Disabilities in individuals with spinal cord injury: a reliability and validity study

Kübra Köçe, Emine Atıcı, Yasemin Buran Çırak, Nurgül Dürüstkan Elbaşı & Yunus Emre Tütüneken

To cite this article: Kübra Köçe, Emine Atıcı, Yasemin Buran Çırak, Nurgül Dürüstkan Elbaşı & Yunus Emre Tütüneken (2022) Cultural adaptation and Turkish version of Physical Activity Scale for Individuals with Physical Disabilities in individuals with spinal cord injury: a reliability and validity study, Disability and Rehabilitation, 44:21, 6414-6423, DOI: 10.1080/09638288.2021.1964624

To link to this article: https://doi.org/10.1080/09638288.2021.1964624

View supplementary material

Published online: 20 Aug 2021.

Submit your article to this journal

Article views: 365

View related articles

View Crossmark data

Citing articles: 1 View citing articles

Full Terms & Conditions of access and use can be found at
https://www.tandfonline.com/action/journalInformation?journalCode=idre20

DISABILITY AND REHABILITATION
2022, VOL. 44, NO. 21, 6414–6423
https://doi.org/10.1080/09638288.2021.1964624

Taylor & Francis
Taylor & Francis Group

ASSESSMENT PROCEDURE

Check for updates

Cultural adaptation and Turkish version of Physical Activity Scale for Individuals with Physical Disabilities in individuals with spinal cord injury: a reliability and validity study

Kübra Köçe[a], Emine Atıcı[b], Yasemin Buran Çırak[a], Nurgül Dürüstkan Elbaşı[a] and Yunus Emre Tütüneken[a]

[a]Faculty of Health Sciences, Physiotherapy and Rehabilitation Department, Istinye University, Istanbul, Turkey; [b]Faculty of Health Sciences, Physiotherapy and Rehabilitation Department, Istanbul Okan University, Istanbul, Turkey

ABSTRACT

Purpose: To translate the "Physical Activity Scale for Individuals with Physical Disabilities (PASIPD)" into Turkish, to make a cultural adaptation, and to examine the psychometric properties including validity and reliability.

Methods: During the translation period cross-cultural adaptation design proposed by guideline was used. Patients completed the Turkish version of the PASIPD and it was applied again a week later. To determine the reliability and internal consistency, Cronbach's alpha coefficient was calculated. Test–retest reliability was determined by using intraclass correlation coefficient (ICC) and Pearson's correlation analysis. Construct validity was examined with factor analysis. Convergent validity was examined by comparing PASIPD with Functional Independent Measurement (FIM), Nottingham Health Profile (NHP), and Craig Handicap Assessment and Reporting Technique Short (CHART-SF), and criterion validity was examined by comparing PASIPD with Manual wheelchair propulsion tests scores.

Results: Cronbach's alpha coefficient was 0.725. The ICC coefficient for the test–retest reliability was 0.851. PASIPD was explained by three factors. The ratio of explaining the total variance of these 3 factors was determined as 51.66%. FIM ($r = 0.307$, $p = 0.040$) and CHART-SF were moderately positively correlated with PASIPD total score. The correlation between the total score of PASIPD and NHP was $r = -0.443$ ($p = 0.002$). 20 Meters Propulsion ($r = -0.404$, $p = 0.005$) and Slalom Tests ($r = -0.305$, $p = 0.037$) were highly negative and 6 min Push Propulsion ($r = 0.456$, $p = 0.001$) were moderately positive with PASIPD total score.

Conclusion: The Turkish version of the PASIPD is a valid and reliable scale in patients with spinal cord injury.

ARTICLE HISTORY
Received 31 May 2020
Revised 21 July 2021
Accepted 29 July 2021

KEYWORDS
Physical activity; Physical Activity Scale for Individuals with Physical Disabilities; spinal cord injury; validity; reliability

➤ IMPLICATIONS FOR REHABILITATION

- The Turkish and cross-culturally adapted version of PASIPD is a useful physical activity scale to evaluate the physical activity level of SCI.
- The Turkish version of the PASIPD is a valid and reliable scale and can be used in Turkish patients with SCI.
- PASIPD can be used to compare physical activity levels between disability types and groups with and without disabilities.
- PASIPD can be used to evaluate the effectiveness of attempts to increase physical activity in patients with SCI.

Introduction

Spinal Cord Injury (SCI) is a severe neurological condition that results from traumatic or nontraumatic causes and results in motor, sensory, and/or autonomic dysfunction [1,2]. Physical inactivity leads to loss of functional independence and decreased quality of life and significantly affects social participation [3].

Physical activity is important in preventing musculoskeletal problems that may develop due to physical inactivity, improving health, providing weight control, reducing stress, and supporting independent life in individuals with SCI. Assessment of the level of physical activity of individuals with SCI gives information about their abilities in daily life activities and is a guide for exercises. Therefore, the correct assessment of the physical activity level of patients is also very important for the success of rehabilitation [4,5].

The assessment of physical activity level is a difficult and complicated process. Disease-specific measurement methods are required for individuals with SCI, which report specific activity types, durations, and intensities. The lack of such information makes it almost impossible to develop physical activity guidelines for the SCI population. This situation reveals how important it is to develop a valid and reliable physical activity scale for SCI patients [6].

CONTACT Kübra Köçe kubrakoce@gmail.com

Supplemental data for this article can be accessed here.

© 2021 Informa UK Limited, trading as Taylor & Francis Group

Self-reporting scales are the most commonly used method to evaluate individuals' physical activity levels. However, existing scales used in physical activity assessment have been developed for use in the general population. In particular, they are not sensitive enough to measure very low-intensity activities that will affect the daily physical activity levels of large wheelchair-bound individuals, such as SCI [6]. These scales should also evaluate alternative forms of physical activity [6]. Physical Activity Scale for Individuals with Physical Disabilities (PASIPD), one of the scales developed to eliminate this problem, was developed by Washburn in 2002. PASIPD is a 13-item physical activity scale that questions leisure activities; light, moderate, and strenuous sports activities; exercises to increase muscle strength and endurance; light and heavy household activities; and work-related activities [7].

The PASIPD questionnaire has been translated into different languages and used to measure physical activity among different populations. Validation studies of PASIPD have mostly been carried out in groups with physical disabilities and Caucasians [7–13]. A study in the Netherlands showing the relationship and validity of PASIPD with physical fitness parameters in SCI patients reported a weak-moderate relationship [12]. A similar Malaysian PASIPD study found that the adapted PASIPD demonstrated adequate internal consistency and acceptable test–retest reliability; this study was intended to provide preliminary support for the construct validity and reliability of the Malaysian version of PASIPD [4]. PASIPD can be used for various populations with physical disabilities, can be easily self-administered within a short time (15 min), and is a practical instrument. Further, PASIPD allows the addition of new activities that have appropriate Metabolic equivalents (METS) categories in the examples of physical activity listed in the questionnaire. Perhaps most importantly, the validity and reliability of PASIPD in different populations have been shown. Jimenez-Pardo et al. examined the reliability and factor structure of PASIPD in Parkinson's disease and looked at the questions in 3 factors [13]. The researchers suggested that PASIPD is an appropriate measure for assessing the physical activity of individuals with Parkinson's disease and the easily comprehensible format of the measure should facilitate its use in large-scale questionnaire-based studies.

As far as we know, there is no standard, valid and reliable Turkish physical activity scale that evaluates the physical activity levels of SCI individuals and takes into account the cultural differences of Turkish SCI patients. For this reason, our study aims to translate the "Physical Activity Scale for Individuals with Physical Disabilities (PASIPD)" into Turkish, to adapt the questionnaire to the culture, and to examine the psychometrics, including validity and reliability.

Materials and methods

Participants

Our study was carried out with 47 volunteers in the Spinal Cord Injury Association of Turkey and other associations connected to Hüsnü Ayı k Special Care Center between June 2019 and November 2019. Our inclusion criteria: SCI diagnosis according to ASIA (American Spinal Injury Association) Impairment Scale [14]; full or partial wheelchair dependence; sufficient upper limb muscle strength to use a wheelchair; age between 18 and 75; willingness to participate in research; Turkish literacy; and lack of cognitive impairment (Mini Mental Total Test score of 25 and above). Individuals who were completely bedridden were excluded from the study.

First, the Spinal Cord Injury Association of Turkey announced to its members that physiotherapists would evaluate the physical conditions of SCI patients. 128 SCI patients applied for the evaluation and were then informed about the study and invited to participate in the study. 28 people who did not meet the inclusion criteria at the end of the preliminary evaluation were excluded from the study. 93 patients were accepted to the study and were pre-evaluated. Among 65 patients who met the inclusion criteria, 47 patients were included in the study using computer-aided randomization (Figure 1).

Procedure

Our study was carried out in two stages. Stage 1 was the translation and cultural adaptation of PASIPD into Turkish. Stage 2 was the analysis of Turkish PASIPD's reliability and validity. Before starting the study, written permission to use PASIPD was obtained from Richard A. Washburn, the developer of the scale.

Stage 1: Translation of PASIPD into Turkish and Cultural Adaptation

At the translation step, the directive defined by Beaton et al. was followed [15].

Step 1: Contacting the Developer of the Original Version of PASIPD

Before starting the study, written permission was obtained from Richard A. Washburn, the developer of PASIPD, to translate PASIPD into Turkish.

Step 2: Translation (from English to Turkish)

A translation team was formed of 5 people, consisting of 2 Turkish-speaking physiotherapists, two physiotherapists who speak Turkish and English, and an English teacher who can speak Turkish and English. The original PASIPD was translated independently from English to Turkish by 4 physiotherapists. Then 4 translations were compared and a preliminary Turkish translation of PASIPD was prepared.

Step 3: Back Translation (from Turkish to English)

The translation of the Preliminary Turkish translation of PASIPD from Turkish to English was done by the English teacher on the translation team.

Step 4: Synthesis

The contents of the original version and the translated English versions were compared and differences were recorded. The translation team examined all versions. Word choice and meaning were discussed and referees commented on the differences. A synthesis of these differences was created.

Step 5: Consensus

The translation team discussed and reviewed all materials (original English, Turkish and re-translated English versions and the synthesis of translation differences) for the Turkish language and cultural adaptation.

Some of the activities in the questionnaire were adjusted to the cultural structure of Turkish society. Activity intensity (light, moderate, strenuous) was considered in substituting different types of activity in the Turkish version of the questionnaire. The changes made in the Turkish version include:

- Dog-walking was excluded.
- Table tennis and billiards replaced golf with a cart among the light sport or recreational activities.
- Volleyball and folk games replaced softball and golf without a cart among the moderate sport and recreational activities
- Basketball replaces rugby among the strenuous sport and recreational activities

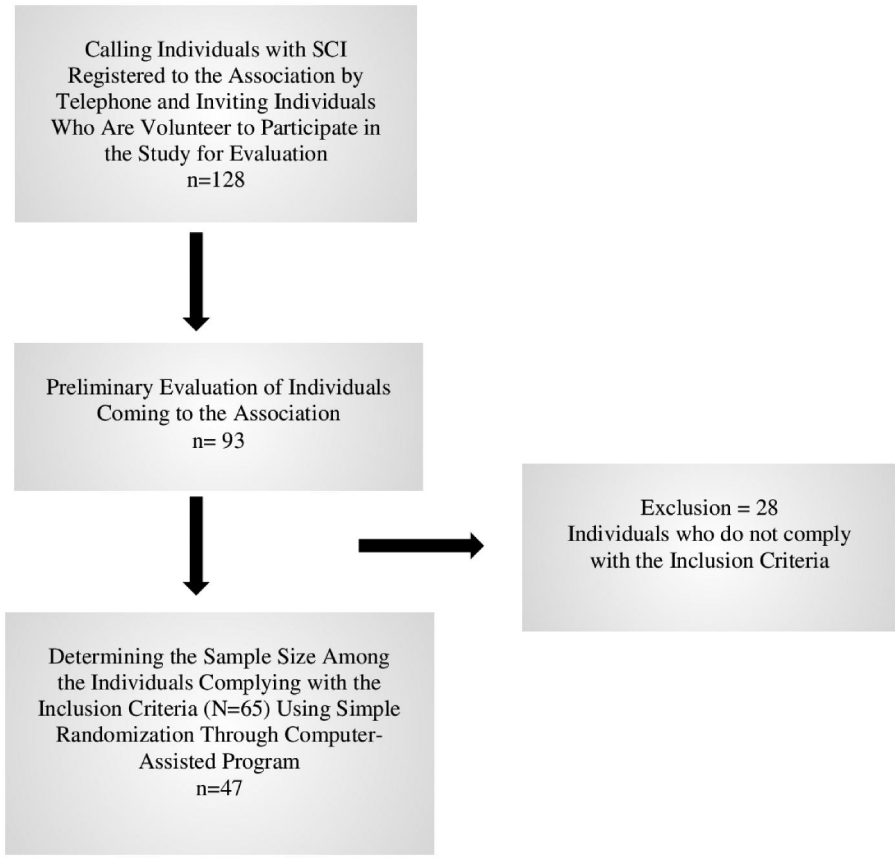

Figure 1. Flow chart.

- Planting vegetables/fruits, irrigation, picking, etc. was added to make the outdoor gardening activity understandable

At last, the final version of the scale was created.

Step 6: Pilot Testing

To evaluate the comprehensibility of the final version of the scale, a pilot study was conducted with 8 people (Supplementary Appendix 1).

Stage 2: Psychometric properties of Turkish PASIPD

Reliability

To determine the reliability and internal consistency of PASIPD, the Cronbach's alpha coefficient of the whole scale was calculated. The test–retest method was used for the stability of the scale. In the test–retest method, the scale was applied to the same people after 7 days. Spearman's correlation analysis was performed between the first test and the second test. Test–retest reliability was determined using the intraclass correlation coefficient (ICC).

Validity

The validity of PASIPD was determined using construct validity and criterion validity. The construct validity was tested by factor analysis and convergent validity methods. The convergent validity was tested using the daily life activity scales Functional Independence Measurement (FIM); the quality of life scale NHP (Nottingham Health Profile); and Craig Disability Assessment and Reporting Technique Short Form (CHART-SF). Criterion validity was demonstrated using Manual wheelchair propulsion tests.

Outcome measures

Socio-demographic information and health status of all participants included in the study were recorded on the Patient Evaluation Form.

Turkish Version of Physical Activity Scale for Individuals with Physical Disabilities (PASIPD)

PASIPD is a 13-item self-report form that includes leisure activities (items 1–6), household activities (items 7–12), and work-related activities (items 13) taking place over the 7 days preceding completion of the form [7]. PASIPD collects information regarding leisure time activities, such as walking and wheeling outside; light, moderate, and strenuous sports activities; exercises to increase muscle strength and endurance; household activities including light and heavy housework; home repair; lawn work and outdoor gardening; caring for another person; and occupational activity. PASIPD asks respondents how often in the preceding 7 days they participated in these activities (never, seldom (1–2 days/week), sometimes (3–4 days/week) or often (5–7 days/week). Respondents are asked how many hours a day they spend on these activities: less than 1 h, 1 h but less than 2 h, 2–4 h, or more than 4 h.

The Turkish version of PASIPD was used to evaluate the physical activity level of SCI individuals. The first question acclimated participants to the scale format and was not included in the scoring. The total score was obtained by multiplying the daily average time for each item (items 2–13) by Metabolic equivalents (METS) associated with the intensity of the activity. For example, an individual who walked or wheeled or pushed outside the home 5–7 days a week for 2–4 h daily, performed light housework 3–4 days a week for at least 1 h (but $<$ 2 h) daily, performed heavy housework 1–2 days a week for at least 1 h (but $<$ 2 h) daily, and

worked 5–7 days a week for at least 5 h (but < 8 h) daily received a PASIPD score of 22.74 MET h/day. The Turkish version of PASIPD instrument and its scoring instructions are in Supplementary Appendix 1.

Functional Independence Measurement (FIM)

The participants' independence level in daily life activities was evaluated with FIM. FIM is a multidimensional scale that evaluates functional disorders and care burden [16] and consists of 18 items in total. The first 13 items evaluate the motor function and the last 5 items evaluate cognitive function [17]. Küçükdeveci et al. performed the Turkish validity and reliability study in 2001 [18]. The study found that the scale to be valid and reliable for Turkish people.

Manual wheelchair propulsion tests

Manual wheelchair propulsion tests were used to assess participants' ability to use manual wheelchairs. The test is 3 different tests in one: the 20 Meters Propulsion Test, Slalom Test, and 6 min Propulsion Test [19]. In the 20 Meters Propulsion Test, each participant pushed their wheelchair as fast as they could on a 20 m-track and their time was recorded [19]. In the Slalom Test, an 18-meter track was prepared (3 lines at 3 meters intervals, 2 lines at 2 meters intervals, 2 lines at 1 m intervals and the track ends 3 meters after the last line); each participant slalomed between the lines and returned by slalom from the last line and their time was recorded [19]. In the 6 min Propulsion Test, a 25-meter track was prepared. Lines were drawn in the middle and on both sides of the track. Each participant started in the middle of the track, wheeled to the line on the right or left side, and returned to the middle of the track; then they wheeled towards the line on the other side of the track, proceeding like this for 6 min. The distance they traveled in 6 min was recorded in meters [19].

Nottingham Health Profile (NHP)

NHP is a general quality-of-life questionnaire that measures health problems perceived by the participant and the extent to which these problems affecting normal daily life activities. The questionnaire consists of 38 items and evaluates six dimensions related to health status. Scores between 0 and 100 are made to each section. 0 indicates the best health status, 100 shows the worst health status [20]. A Turkish validity and reliability study of NHP was prepared in 2000 by Küçükdeveci et al. The study found that the scale is valid and reliable for Turkish people [21].

Craig Handicap Assessment and Reporting Technique Short Form (CHART-SF)

CHART-SF is a simple and objective scale that can be used to evaluate handicaps that occur after SCI. It consists of 5 sections: physical independence, cognitive independence, mobility, occupation, social integration, and economic self-sufficiency [22].

Statistical analysis

Statistical analyses were performed using Statistical Package for the Social Sciences (SPSS) version 22 software. The suitability of variables to normal distribution was examined using visual (histogram and probability plots) and analytical methods (Kolmogorov–Smirnov/Shapiro–Wilk tests). Variables were not normally distributed (Kolmogorov–Smirnov tests, all $p < 0.05$). Descriptive analyses were given using the mean and standard deviation for normally distributed variables, and the median and interquartile range for non-normally distributed variables. Number and percentages were given for nominal variables. Comparison of the groups was done with the significance test of the difference between the two averages for the normally distributed data, and if the data were not suitable for the normal distribution, the Mann Whitney U and Kruskal Wallis test. Chi-square test (Pearson Chi-square, Yates corrected chi-square, or Fisher exact chi-square) was used to examine the relationship between categorical variables. The reliability of the Turkish version of PASIPD was tested by the test–retest method and internal consistency analysis. The internal consistency was determined by Cronbach's alpha and item-total correlation coefficient. Cronbach's alpha coefficient and ICC value > 0.70 were considered sufficient [23]. Spearman's correlation analysis and ICC were used to evaluate test–retest reliability. Construct validity was evaluated with factor analysis. Also convergent and criterion validity was analysed. The correlation coefficient was accepted as a strong relationship if $r > 0.60$, the moderate relationship between $r = 0.3$–0.6 and a weak relationship if $r < 0.3$. In addition, $p < 0.05$ values were evaluated statistically significant results [23]. The total type-1 error level was determined as 5% for statistical significance.

Sample size

Power analysis was made using G*Power 3.0.10. It was found that 47 participants should be included in the study to provide a medium-level relationship ($r = 0.4$) in the Pearson correlation test used in 80% power and 0.05 type 1 error with criterion and convergent validity to determine the sample size [24].

Results

The socio-demographic and clinical characteristics of the 47 participants included in the study are summarized in Table 1.

Reliability

The Cronbach's alpha coefficient of the whole scale was found to be 0.725 (Table 2). In addition, it was seen that the Cronbach's alpha coefficient of PASIPD found for each question was lower than the Cronbach's alpha coefficient of the whole scale. Correlation coefficients of the items with the total score were 0.347–0.640 in the item-total score correlations.

The Cronbach's alpha coefficient of the leisure time activities subscale was found to be 0.708, and the Cronbach's alpha coefficient of the household activities subscale was 0.701 (Table 3). The Cronbach's alpha coefficient could not be calculated since the work-related activities subscale consisted of only one question.

Table 4 shows the correlation coefficients of each subscale item with the subscale total score of PASIPD.

In test–retest reliability, the total PASIPD, and subscales of PASIPD (leisure time activities, household activities, and work-related activities) were found to have excellent correlation, and all subscales and the scale total had high reliability (Table 5).

The ICC coefficient for the test–retest reliability of the Turkish version of PASIPD was found to be 0.851 (Table 5).

Factor structure and construct validity

The KMO value (0.641) and the Bartlett test ($p = 0.00$) showed the suitability of the Turkish version of PASIPD for factor analysis. When we look at the total variance explained; Although the Eigenvalues are 4 factors above 1, looking at the Scree Plot graph, it is seen that the number of factors is 3 (Figure 2). When we

Table 1. Sociodemographic and clinical characteristics of the participants.

Characteristics	*n*	Minimum	Maximum	Mean	Standard deviation
Age	47	18	69	43.98	13.50
BMI (kg/cm^2)	47	18.34	37.78	27.49	5.22
Cigarettes (packet × years)	47	20	610	330	160.74
Leisure time (MET)	47	0	30.03	9.92	7.96
Household (MET)	47	0	11.95	1.92	2.95
Work-related (MET)	47	0	19.275	3.80	7.21
Total PASIPD (MET)	47	0	49.305	15.53	10.92

Characteristics		*n*	%
Gender	Female	26	55.3
	Male	21	44.7
Dominant Side	Right	41	87.2
	Left	6	12.8
Marital Status	Married	15	31.9
	Single	32	68.1

Characteristics	*n*	Minimum	Maximum	Mean	Standard deviation
Time since injury (years)	47	2	55	18.87	12.492

Characteristics		*n*	%
Reason of injury	Traumatic	34	72.3
	Nontraumatic	13	27.7
ASIA level	A complete	26	55.3
	B incomplete	6	12.8
	C incomplete	13	27.7
	D incomplete	2	4.3
Neurological level	C5–C6	6	12.8
	C7–C8	5	10.6
	T1–T12	22	46.8
	L1–L5	14	29.8
Clinical type	Paraplegia	37	78.7
	Tetraplegia	10	21.3
Ambulation	Ambulatory for exercise	2	4.3
	In-house ambule	11	23.4
	In-community ambule	34	72.3

Table 2. Reliability and internal consistency of the Turkish Version of PASIPD.

PASIPD	Item-total correlations	Item-deleted Cronbach's alpha coefficient	Whole scale Cronbach's alpha coefficient
Question 2	0.616	0.686	0.725
Question 3	0.385	0.723	
Question 4	0.382	0.716	
Question 5	0.368	0.718	
Question 6	0.347	0.715	
Question 7	0.562	0.721	
Question 8	0.516	0.719	
Question 9	0.640	0.718	
Question 10	0.610	0.717	
Question 11	0.392	0.720	
Question 12	0.357	0.721	
Question 13	0.559	0.678	

Table 3. Cronbach's alpha coefficients of PASIPD subscales.

Subscales of PASIPD	Item number	Cronbach's alpha coefficient
Leisure activities (questions 2–6)	5 Items	0.708
Household activities (questions 7–12)	6 Items	0.701
Work-Related activities (question 13)	1 Item	–

interpret the results according to the Varimax rotation method used, the 12 questions included in the PASIPD scoring were explained by three factors (Table 6). According to these results, it was determined that PASIPD had construct validity and was explained by three factors; these three factors explained 51.66% of the total variance (Table 6).

Table 4. Item-total score relationship of PASIPD subscales.

Items		Item-total score correlations
Leisure activities		
Question 2	*r*	0.750**
	p	0.000
Question 3	*r*	0.482**
	p	0.001
Question 4	*r*	0.319*
	p	0.029
Question 5	*r*	0.448**
	p	0.002
Question 6	*r*	0.631**
	p	0.000
Household activities		
Question 7	*r*	0.822**
	p	0.000
Question 8	*r*	0.737**
	p	0.000
Question 9	*r*	0.405*
	p	0.012
Question 10	*r*	0.564**
	p	0.000
Question 11	*r*	0.501**
	p	0.000
Question 12	*r*	0.558**
	p	0.000
Work-related activities		
Question 13	*r*	1.000
	p	

Spearman's correlation: $^*p < 0.05$; $^{**}p < 0.01$.

Table 5. Test–retest reliability correlation and ICC coefficient of the Turkish Version of PASIPD.

Test	Re-test	*r*	95% CI	*p*
Leisure activities 1	Leisure activities 2	0.803**	0.671–0.885	0.00
Household activities 1	Household activities 2	0.698**	0.514–0.820	0.00
Work-related activities 1	Work-related activities 2	0.761**	0.607–0.860	0.00
Total score 1	Total score 2	0.821**	0.699–0.896	0.00

	Cronbach's alpha	ICC	95% CI
Test–retest	0.919	0.851	0.747–0.914

Spearman's correlation: $^*p < 0.05$; $^{**}p < 0.01$; CI: Confidence Interval.

Convergent validity of the Turkish Version of PASIPD

It was determined that a moderate positive correlation existed between FIM total score and all subscales and PASIPD total score and all subscales of PASIPD ranging from 0.288 to 0.461 (Table 7).

A moderate negative and positive correlation was found between PASIPD total and subscales, and NHP total and subscales (excluding Emotional reactions dimension), ranging from 0.296 to 0.443 (Table 7).

Table 8 shows the relationship between PASIPD total score and subscales and CHART-SF subscales.

Criterion validity of the Turkish Version of PASIPD

Table 9 shows the relationship between PASIPD total and subscales and Manual Wheelchair Propulsion Tests (20 Meters Propulsion, 6 min Propulsion and Slalom Test) results. It was determined that there was a moderate negative correlation between the total PASIPD value and 20 m Propulsion and Slalom Test results, and there was a moderate positive relationship with the 6 min Propulsion Test results. As participants had the greater

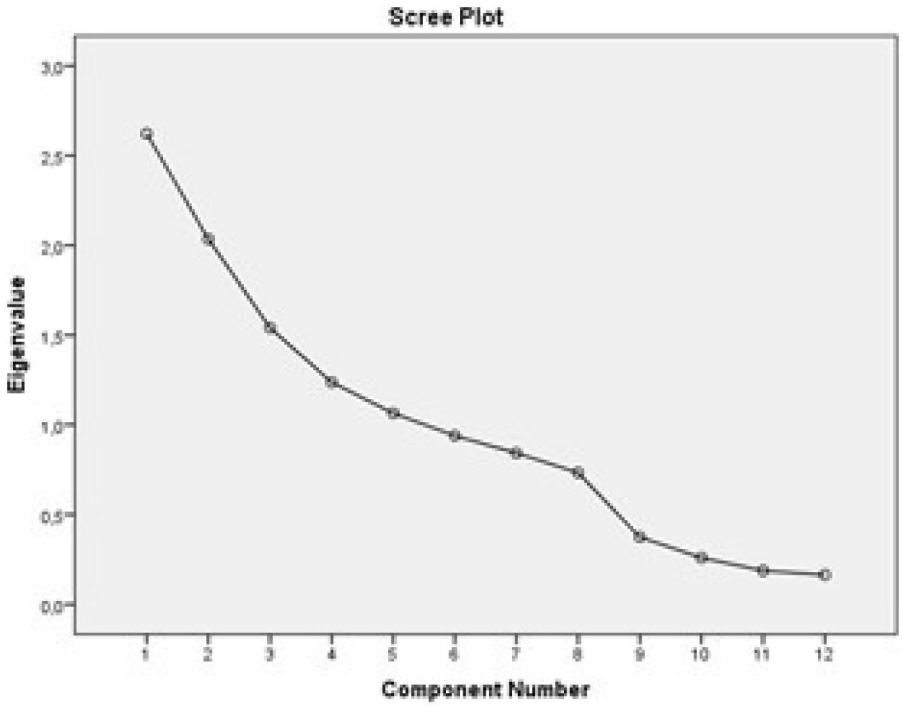

Figure 2. Scree plot.

Table 6. Factor analysis of Turkish Version of PASIPD.

Items	Factor 1	Factor 2	Factor 3
Question 2	−0.242	**0.713**	0.436
Question 3	−0.021	**0.825**	−0.231
Question 4	−0.061	**0.586**	−0.063
Question 5	−0.222	**0.488**	0.180
Question 6	0.148	**0.903**	0.036
Question 7	**0.776**	−0.056	−0.167
Question 8	**0.724**	−0.038	−0.068
Question 9	**0.478**	−0.098	−0.057
Question 10	**0.792**	0.107	0.259
Question 11	**0.439**	−0.104	−0.088
Question 12	**0.718**	0.073	−0.059
Question 13	−0.163	−0.205	**0.671**

Items in bold indicate fit.

ability (faster speed and longer distance), their PASIPD scores increased.

Discussion

In the present study where we investigated the validity and reliability of the Physical Activity Scale for Individuals with Physical Disabilities (PASIPD) in individuals with SCI, we determined that the Turkish version of PASIPD is valid and reliable method of evaluating the level of physical activity in individuals with SCI.

Having a questionnaire or a version of the scale in different languages allows generalizing the results obtained in clinical studies using the questionnaire. Translating such patient scales into another language requires adaptations to be made to the wording of the translation. As a result of our study, good reliability and validity test results show that our translation and adaptation process is good.

In the original version of PASIPD, Washburn et al. divided the questions into 5 separate categories. The Cronbach's alpha values of these categories were as; 0.59 for questions about home repair, lawn, and garden work (9th, 10th, and 11th questions), 0.55 for home-related questions (questions 7, 8, and 12) 0,65 for strenuous sports and recreational activities (questions 5 and 6), 0.48 for light and medium sports and recreational activities (questions 3 and 4) and 0.37 for about professional and transportation (questions 2 and 13) [7]. In the Malaysian version of PASIPD, the total Cronbach's alpha value was 0.68 (4). In the study examining the reliability and structure validity of PASIPD in individuals with Parkinson's disease, the Cronbach's alpha value of the first factor was 0.72, the second factor was 0.60 and the third was 0.49 (13). In the study conducted by Warms et al., Cronbach's alpha value of PASIPD was 0.70 (10). In the study evaluating the physical activity level with PASIPD in individuals with SCI, Cronbach's alpha value was 0.63 (12). The results we obtained from our study are very similar to the results of other studies. In our study, the Cronbach's alpha coefficient of the whole scale was 0.725. The Cronbach's alpha coefficient of the leisure time activities subscale of PASIPD was 0.708, and the Cronbach's alpha coefficient of the household activities subscale was 0.701.

ICC value is used to evaluate test–retest reliability. If this value is above 0.80, it is accepted as proof of a high level of reliability [25]. Mat Rosly et al. used the ICC coefficient in the test–retest reliability of the Malaysia version of the scale and found the ICC value as 0.87 (4). Similarly, in our study, the ICC coefficient was found to be 0.851 and according to this value, PASIPD was found to have a high level of reliability.

Washburn et al. explained the 12 questions with 5 factors (home repair and gardening, housework, vigorous sports, moderate sports, and occupation) [7]. In the Malaysian version, it was examined with 4 factors [4]. In the study that examined the reliability and structural validity of PASIPD in Parkinson's disease, they found that the scale was explained with 3 factors (housework and outdoor activities, recreational and fitness activities, and occupational activities) [13]. De Groot et al. defined the results in 4 factors (light/moderate activities, housework activities, home repair, and yard care activities, and miscellaneous activities) [12]. These results are similar to our study, we explained PASIPD with 3 factors.

Table 7. Relationship between PASIPD and FIM and NHP total score and subscales.

Item		FIM self care	FIM sphincter control	FIM transfer	FIM movement	FIM total motor	FIM communication	FIM social perception	FIM total cognitive	FIM total score	NHP pain	NHP emotional reaction	NHP sleep	NHP social isolation	NHP physical mobility	NHP energy level	NHP part 1 total score	NHP part 2 total score
Leisure activities	r	**0.302***	**0.343***	**0.336***	0.251	**0.338***	**0.398****	0.160	**0.372***	**0.342***	**−0.349***	−0.209	−0.123	−0.280	−0.190	**−0.384****	**−0.411****	**−0.296***
	p	**0.039**	**0.020**	**0.021**	0.089	**0.020**	**0.006**	0.290	**0.010**	**0.020**	**0.020**	0.159	0.408	0.055	0.205	**0.008**	**0.004**	**0.043**
Household activities	r	0.254	0.250	**0.304***	0.211	**0.288***	**0.311***	0.160	0.047	0.260	0.020	−0.198	**0.335***	0.033	0.008	0.045	0.037	**0.325***
	p	0.085	0.100	**0.038**	0.155	**0.040**	**0.033**	0.290	0.752	0.080	0.910	0.183	**0.021**	0.824	0.960	0.766	0.806	**0.026**
Work-related activities	r	0.211	0.070	0.172	−0.041	0.160	0.159	**0.343***	**0.375****	0.180	−0.100	−0.151	−0.200	**−0.339***	0.156	−0.16	**−0.315***	−0.280
	p	0.155	0.640	0.247	0.783	0.270	0.286	**0.020**	**0.009**	0.220	0.490	0.312	0.177	**0.020**	0.295	0.275	**0.031**	0.057
Total score	r	0.287	0.270	0.277	0.131	0.280	**0.411****	**0.292***	**0.461****	**0.307***	**−0.380****	−0.260	−0.134	**−0.345***	−0.060	**−0.360***	**−0.443****	**−0.314***
	p	0.051	0.070	0.059	0.379	0.060	**0.004**	**0.050**	**0.001**	**0.040**	**0.010**	0.077	0.369	**0.017**	0.670	**0.013**	**0.002**	**0.031**

Spearman's correlation: $^{*}p < 0.05$; $^{**}p < 0.01$.
Items in bold indicate fit.

In the literature for the validity of PASIPD, construct validity usually was used. Other forms of validity, such as convergent, criterion validity, were used less frequently. Evidence of convergent validity was provided by the moderate correlation found between the PASIPD score and the self-reported extent to which Parkinson's disease has affected the level of physical activity, the total number of hours per week spent in physical activity, and rate of engagement in stationary activities. Further, some evidence of content validity was presented by the high percentage (85.7%) of individuals who reported that the survey allowed them to properly describe their physical activity [13]. In our study, we tested the validity of the Turkish version of PASIPD with more than one method including construct validity, convergent validity, and criterion validity. There is no Turkish scale in the literature that measures physical activity levels in individuals with disabilities. For this reason, FIM is frequently used in evaluating the independence in daily life activities known to be related to physical activity; NHP and CHART-SF, which examined the quality of life with different dimensions, were used for convergent validity. It showed that PASIPD total score was moderately correlated with FIM, NHP, and CHART-SF and PASIPD had similar scale validity.

In our study, 3 different scales (FIM, NHP, and CHART-SF) were used to evaluate the relationship between physical activity level and independence level, and life satisfaction in all dimensions. In various studies conducted on SCI patients, it has been reported that physical activity has psychosocial effects besides its physiological effects. A meta-analysis on physical activity and independence level and life satisfaction reported that there is a small-medium-scale positive relationship between physical activity and independence level and life satisfaction in individuals with SCI [26]. The level of independence and life satisfaction is a cognitive component of subjective well-being and is a multifaceted definition accepted as an important outcome criterion in individuals with SCI. Participation in both social and leisure activities is restricted for wheelchair users, often as a result of reduced physical fitness. Low active participation in life and a low level of independence have been reported to greatly reduce overall satisfaction in life [27–31].

In our study, it was found that there was a significant negative and positive relationship between PASIPD total and subscales and NHP total and subscales (excluding emotional reactions), and a positive significant relationship between PASIPD total and subscales and CHART-SF subscales. These results are consistent with the literature and show that individuals with SCI with higher physical activity levels report better quality of life and higher independence. In addition, in our study, consistent with the literature, a moderately positive significant relationship was found between the PASIPD household activities and total score, and the FIM total and all subscales. According to these results, it has been observed that individuals with SCI become more independent and functional in their daily life activities as their physical activity level increases.

Criterion validity of PASIPD questionnaire showed a weak correlation compared to accelerometer-based and other measures of physical activity level [9–12]. Tanhoffer et al.'s PASIPD criterion validity, comparing it to the doubly labeled water technique only showed a non-significant underestimation of the physical activity energy expenditure by 3%, suggesting good criterion validity for energy expenditure [8]. Other studies compared PASIPD to self-reported physical activity lists that showed weak but significant correlations for physical activity level [12,13].

To demonstrate the criterion validity of the Turkish version of PASIPD, Manual Wheelchair Propulsion Tests are used, which the

Table 8. Relationship between PASIPD total score and subscales and CHART-SF subscales.

Item		CHART-SF physical independence	CHART-SF physical independence	CHART-SF mobility	CHART-SF occupation	CHART-SF social integration	CHART-SF economic self sufficiency
Leisure activities	*r*	**0.294***	**0.403****	**0.623****	0.216	**0.447****	0.164
	p	**0.045**	**0.005**	**0.000**	0.145	**0.002**	0.271
Household activities	*r*	0.188	−0.060	−0.100	**0.418****	0.034	**0.320***
	p	0.207	0.683	0.514	**0.003**	0.819	**0.028**
Work-related activities	*r*	−0.090	0.228	**0.334***	0.284	**0.478****	−0.210
	p	0.560	0.124	**0.022**	0.053	**0.001**	0.157
Total score	*r*	0.204	**0.357***	**0.597****	**0.393****	**0.545****	0.107
	p	0.168	**0.014**	**0.000**	**0.006**	**0.000**	0.473

Spearman's correlation: $^{*}p < 0.05$; $^{**}p < 0.01$.
Items in bold indicate fit.

Table 9. Relationship between PASIPD total score and subscales and manual wheelchair propulsion tests.

Item		20 Meters Propulsion	Slalom Test	6 min Propulsion
Leisure activities	*r*	**−0.507****	**−0.429****	**0.539****
	p	**0.000**	**0.003**	**0.000**
Household activities	*r*	−0.010	−0.161	−0.121
	p	0.945	0.280	0.419
Work-related activities	*r*	0.003	0.078	0.150
	p	0.986	0.600	0.313
Total score	*r*	**−0.404****	**−0.305***	**0.456****
	p	**0.005**	**0.037**	**0.001**

Spearman's correlation: $^{*}p < 0.05$; $^{**}p < 0.01$.
Items in bold indicate fit.

literature indicates are related to the level of physical activity and which show functional capacity. In the version studies in the literature, criterion validity has not been evaluated, and other studies are using functional capacity known to be related to physical activity level for criterion validity. However, in the studies of Van Der Ploeg et al. comparing PASIPD and physical activity objectively with the actigraph accelerometer relationship, they found the criterion validity between PASIPD and actigraph accelerometer as Spearman's correlation 0.30 (11). In our study, the 20 Meters Propulsion Test, Slalom Test, and 6 min Propulsion Test results that we used to assess criterion validity were found to be moderate between the PASIPD total score. Thus, we determined that physical activity level was related to functional capacity. This could be measured with the Turkish version of PASIPD.

Between 50% and 80% of all SCI patients use manual wheelchairs to perform daily activities [32,33]. Manual wheelchairs allow these people to participate in many activities in daily life by increasing their mobility and independence. Also, the studies have shown that manual wheelchair push tests are reliable and sensitive for evaluating the wheelchair useability, functional capacity, and cardiovascular fitness of individuals with SCI [34–36]. In the literature, it has been shown that physical fitness level is closely related to physical activity level [34]. For all these reasons, manual wheelchair tests evaluating physical and cardiovascular fitness were used as validity criteria.

In the study conducted by Gagnon et al. of individuals with SCI, the average of the 20 Meters Propulsion Test was 10 s, the Slalom Test average was 18 s, and the 6 min Propulsion Test average was 518 m [37]. Our study determined that there is a moderately negative significant relationship between the total PASIPD score and the results of the 20 m Propulsion and Slalom Test, and a positive moderate relationship with the 6 min Propulsion Test results. These results can be interpreted as showing that the increase in the level of physical activity is associated with the increase in wheelchair useability and endurance.

Using the original version of PASIPD, Washburn et al. found the average PASIPD score as 20.2 MET h/day in 372 physically disabled individuals [7]. In the Malaysian version of PASIPD, the average PASIPD score was 18.92 MET h/day [4]. Van den Berg-Emons et al. compared PASIPD with an accelerometer-based activity monitor in 124 wheelchair-dependent patients. The mean PASIPD score in the total group was 11.3 MET h/day, 11.8 MET h/day in the group with the cerebral palsy group, 10.8 MET h/day in the meningomyelocele group and 10.9 MET h/day in the SCI group [9]. De Groot et al. evaluated physical activity in 124 individuals with SCI using PASIPD. The average PASIPD score was 17.8 MET h/day [12]. In another study conducted by De Groot et al., individuals with a PASIPD score of 30 MET h/day were defined as inactive [31]. We also found the average PASIPD score of the individuals with SCI as 15.53 MET h/day. Overall, a review of studies in the literature evaluating physical activity levels of SCI individuals with PASIPD showed that the average PASIPD scores other studies obtained were compatible with our study.

Our study also has limitations. Although multiple methods are used for the purposes of validation, it will be useful to compare the PASIPD scale with an objective measurement such as pedometer, heart rate measurement, or accelerometer evaluating physical activity level. Although our sample size is enough for us to make statistically significant comparisons, larger samples can be studied. Our study is the first to translate a scale into Turkish to evaluate the level of physical activity in individuals with physical disabilities. In our study, unlike other studies of versions of the same scale, examined the relationship between many parameters that may be related to physical activity levels, such as functional capacity, quality of life, and level of daily life activities in individuals with SCI.

The Turkish version of PASIPD is a valid and reliable, easily applicable functional scale. The Turkish version of PASIPD can be used in studies on the physical activity level of individuals with SCI and will be a valuable clinical tool in the evaluation of the SCI patient. Comprehensive information will be provided on the measures that can be taken for these patients.

Ethical approval

This study was conducted in accordance with the Helsinki declaration. Permission was obtained from Richard A. Washburn, developer of the PASIPD scale, for the Turkish translation of PASIPD. The compliance of the study with the ethical principles was approved by the Istanbul Okan University Ethics Committee on Science, Social, and Non-Interventional Health Sciences Research. Our study's clinical trials number is NCT04234269.

Disclosure statement

No potential conflict of interest was reported by the author(s).

ORCID

Kübra Köçe http://orcid.org/0000-0003-4166-085X

References

[1] Kirshblum S, Brooks M. Rehabilitation of spinal cord injury. In: Gans B, Walsh N, Robinson L, editors. DeLisa's physical medicine and rehabilitation. Philadelphia (PA): Lippincott Williams & Wilkins; 2010. p. 665–717.

[2] McKinley WO, Jackson AB, Cardenas DD, et al. Long-term medical complications after traumatic spinal cord injury: a regional model systems analysis. Arch Phys Med Rehabil. 1999;80(11):1402–1410.

[3] McKinley WO, Gittler MS, Kirshblum SC, et al. Spinal cord injury medicine. 2. Medical complications after spinal cord injury: identification and management. Arch Phys Med Rehabil. 2002;83(3):58–64.

[4] Mat Rosly M, Halaki M, Mat Rosly H, et al. Malaysian adaptation of the physical activity scale for individuals with physical disabilities in individuals with spinal cord injury. Disabil Rehabil. 2020;42(14):2067–2075.

[5] Ginis KAM, Hicks AL, Latimer AE, et al. The development of evidence-informed physical activity guidelines for adults with spinal cord injury. Spinal Cord. 2011;49(11):1088–1096.

[6] Murphy SL, Kratz AL, Zynda AJ. Measuring physical activity in spinal cord injury using wrist-worn accelerometers. Am J Occup Ther. 2019;73(1):730120509001–730120509010.

[7] Washburn RA, Zhu W, McAuley E, et al. The physical activity scale for individuals with physical disabilities: development and evaluation. Arch Phys Med Rehabil. 2002;83(2):193–200.

[8] Tanhoffer RA, Tanhoffer AIP, Raymond J, et al. Comparison of methods to assess energy expenditure and physical activity in people with spinal cord injury. J Spinal Cord Med. 2012;35(1):35–45.

[9] Van Den Berg-Emons RJ, L'Ortye AA, Buffart LM, et al. Validation of the physical activity scale for individuals with physical disabilities. Arch Phys Med Rehabil. 2011;92(6):923–928.

[10] Warms CA, Whitney JD, Belza B. Measurement and description of physical activity in adult manual wheelchair users†. Disabil Health J. 2008;1(4):236–244.

[11] van der Ploeg HP, Streppel KRM, van der Beek AJ, et al. The physical activity scale for individuals with physical disabilities: test-retest reliability and comparison with an accelerometer. J Phys Act Health. 2007;4(1):96–100.

[12] De Groot S, Van Der Woude LHV, Niezen A, et al. Evaluation of the physical activity scale for individuals with physical disabilities in people with spinal cord injury. Spinal Cord. 2010;48(7):542–547.

[13] Jimenez-Pardo J, Holmes JD, Jenkins ME, et al. An examination of the reliability and factor structure of the physical activity scale for individuals with physical disabilities (PASIPD) among individuals living with Parkinson's Disease. J Aging Phys Act. 2015;23(3):391–394.

[14] Betz R, Biering-Sørensen F, Burns SP, et al. The 2019 revision of the international standards for neurological classification of spinal cord injury (ISNCSCI)—what's new? Spinal Cord. 2019;57(10):815–817.

[15] Beaton DE, Bombardier C, Guillemin F, et al. Guidelines for the process of cross-cultural adaptation of self-report measures. Spine. 2000;25(24):3186–3191.

[16] Hall KM, Cohen ME, Wright J, et al. Characteristics of the functional independence measure in traumatic spinal cord injury. Arch Phys Med Rehabil. 1999;80(11):1471–1476.

[17] Karamehmetoğlu SS, Karacan I, Elbaşi N, et al. The functional independence measure in spinal cord injured patients: comparison of questioning with observational rating. Spinal Cord. 1997;35(1):22–25.

[18] Küçükdeveci AA, Yavuzer G, Elhan AH, et al. Adaptation of the functional independence measure for use in Turkey. Clin Rehabil. 2001;15(3):311–319.

[19] Gagnon D, Décary S, Charbonneau MF. The timed manual wheelchair slalom test: a reliable and accurate performance-based outcome measure for individuals with spinal cord injury. Arch Phys Med Rehabil. 2011;92(8):1339–1343.

[20] Tarsuslu T, Tütün Yümin E, Öztürk A, et al. Kronik fiziksel özürlü bireylerde ağrı, depresyon, anksiyete ve fonksiyonel bağımsızlık ile yaşam kalitesi arasındaki ilişki. Ağrı. 2010;22(67):30–36.

[21] Kücükdeveci AA, Mckenna SP, Kutlay S, et al. The development and psychometric assessment of the Turkish Version of the Nottingham Health Profile. Int J Rehabil Res. 2000;23(1):31–38.

[22] Menter RR, Whiteneck GG, Charlifue SW, et al. Impairment, disability, handicap and medical expenses of persons aging with spinal cord injury. Paraplegia. 1991;29(9):613–619.

[23] Portney L, Watkins M. Foundations of clinical research: applications to practice. Norwalk (CT): Appleton & Lange; 1193. p. 497.

[24] Hulley S, Cummings S, Browner W, et al. Designing clinical research: an epidemiologic approach. 4th ed. Philadelphia (PA): Lippincott Williams & Wilkins; 2013. p. 79.

[25] Koo TK, Li MY. A guideline of selecting and reporting intraclass correlation coefficients for reliability research. J Chiropr Med. 2016;15(2):155–163.

[26] Martin Ginis KA, Latimer AE, Arbour-Nicitopoulos KP, et al. Leisure time physical activity in a population-based sample of people with spinal cord injury part I: demographic and injury-related correlates. Arch Phys Med Rehabil. 2010;91(5):722–728.

[27] Dysterheft J, Rice I, Learmonth Y, et al. Effects of daily physical activity level on manual wheelchair propulsion technique in full-time manual wheelchair users during steady-state treadmill propulsion. Arch Phys Med Rehabil. 2017;98(7):1374–1381.

[28] Anneken V, Hanssen-Doose A, Hirschfeld S, et al. Influence of physical exercise on quality of life in individuals with spinal cord injury. Spinal Cord. 2010;48(5):393–399.

[29] Lannem AM, Sørensen M, Frøslie KF, et al. Incomplete spinal cord injury, exercise and life satisfaction. Spinal Cord. 2009;47(4):295–300.

[30] Van Koppenhagen CF, Post M, De Groot S, et al. Longitudinal relationship between wheelchair exercise capacity and life satisfaction in patients with spinal cord injury: a cohort study in The Netherlands. J Spinal Cord Med. 2014;37(3):328–337.

[31] Manns PJ, Chad KE. Determining the relation between quality of life, handicap, fitness, and physical activity for

persons with spinal cord injury. Arch Phys Med Rehabil. 1999;80(12):1566–1571.

[32] Lemay V, Routhier F, Noreau L, et al. Relationships between wheelchair skills, wheelchair mobility and level of injury in individuals with spinal cord injury. Spinal Cord. 2012;50(1): 37–41.

[33] De Groot S, Van Der Scheer JW, Bakkum AJT, et al. Wheelchair-specific fitness of persons with a long-term spinal cord injury: cross-sectional study on effects of time since injury and physical activity level. Disabil Rehabil. 2016;38(12):1180–1186.

[34] Van Der Westhuizen L, Mothabeng DJ, Nkwenika TM. The relationship between physical fitness and community participation in people with spinal cord injury. South African J Physiother. 2017;73(1):1–5.

[35] De Groot S, Post MWM, Bongers-Janssen HMH, et al. Is manual wheelchair satisfaction related to active lifestyle and participation in people with a spinal cord injury? Spinal Cord. 2011;49(4):560–565.

[36] Coutinho ACB, Neto FR, Perna CV. Determination of normative values for 20 min exercise of wheelchair propulsion by spinal cord injury patients. Spinal Cord. 2013;51(10): 755–760.

[37] Gagnon DH, Roy A, Gabison S, et al. Effects of seated postural stability and trunk and upper extremity strength on performance during manual wheelchair propulsion tests in individuals with spinal cord injury: an exploratory study. Rehabil Res Pract. 2016;2016: 6842324.