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Cultural adaptation, validity and reliability of the Turkish version of the wheelchair skills test questionnaire (wst-q) 5.0 form in individuals with spinal cord injury

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Abstract

Paraplegic individuals with spinal cord injury (SCI) use a wheelchair to move around. The level of independence they have in the community is related to their wheelchair skills. Therefore, wheelchair skills are important for individuals with SCI. To increase the use of manual wheelchairs, it is important to evaluate the skills of wheelchair users. When the literature was examined, we could not find a scale for evaluating wheelchair skills on the Turkish Scale. Thus, this study aimed to determine the validity and reliability of the Turkish cultural adaptation of the Wheelchair Skills Test Questionnaire (WST-Q) as a questionnaire evaluating the skills of manual wheelchair users in Türkiye. This study was conducted with paraplegic manual wheelchair users. For the reliability of the questionnaire, internal consistency and test-retest reliability were examined. Internal consistency was evaluated with the Cronbach α coefficient. For the validity of the questionnaire, the data obtained from the WST-Q-Turkish were compared with the World Health Organization Quality of Life, Brief Version (WHOQOL-BREF). The study was completed with 20 cases with a mean age of 40±8.95 years. The general Cronbach α score of the questionnaire was calculated as 0.985. According to the results, the questionnaire was determined to be reliable. The currently widely used WHOQOL-BREF was used for the concurrent validity of the WST-Q-Turkish. A strong correlation was determined between the WHOQOL-BREF and the WST-Q-Turkish. In this study, the validity and reliability Turkish of the WST-Q form was performed/evaluated and the final form was named WST-Q-Turkish. The WST-Q-Turkish was determined to be a valid and reliable questionnaire for the evaluation of the skill capacity of paraplegic adults with SCI using a manual wheelchair.

Keywords: spinal cord injuries, paraplegia, wheelchairs, questionnaire

1. Introduction

Spinal cord injury (SCI) causes disruption in the transmission of neural signals, motor and sensory losses, and autonomic dysfunction, and therefore leads to severe functional failures (1, 2). In the rehabilitation process, the focus should be on gaining back the lost functions, especially motor functions such as walking, wheelchair mobilization, transfer, and functional use of the upper limb (3). The goal is to improve the activities and social integration of individuals to the most independent level possible. (4).

Individuals with SCI use a wheelchair to be able to move around. These users should have good wheelchair usage skills in order to reach the most independent social and cultural levels possible. One of the widely used tools to evaluate these skills is the Wheelchair Skills Test-Questionnaire (WST-Q), which was developed in Canada by the Wheelchair Research Team under the presidency of Prof. Ronald Lee Kirby. The WST-Q includes questions of capacity, safety, performance, and training goals related to the wheelchair use skills of disabled individuals. 33 skills are defined on the scale (5). There are different forms for manual wheelchair users and electrical wheelchair users. The WST-Q has been translated into French (6), Norwegian (7), and Portuguese (8).

WST-Q (manual chair) scoring is explained below. Scoring is done for each skill. Responses in the capacity section include: "Yes, very well "[3], "Yes, but not well" [2], "Yes, in part" [1], "No" [0], "Not possible with this wheelchair" [NP], "Testing error" [TE]. Responses in the confidence section include: "Very confident" [3], "Fairly confident" [2], "Somewhat confident" [1], "Not confident" [0], "Not possible with this wheelchair" [NP], "Testing error " [TE]. If the answer to the capacity question for a skill is “no [0]”, the confidence question for the same skill also has a score of 0. If the answer to the capacity question for a skill is “NP”, the score of the confidence question for the same skill is also NP. Responses in the performance section include: "Always" [3], "Usually" [2], "Occasionally" [1], "Never" [0], "Not possible with this wheelchair" [NP], and "Testing error" [TE]. If the answer to the capacity question for a skill is “0”, the performance question for the same skill also has a score of 0. If the answer to the capacity question for a skill is “NP”, the score of the

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performance question for the same skill is also NP. Training goals: This section is used if the WST-Q is being applied to identify the individual's potential educational goals. Responses include: "Yes" or "No". Scoring is not calculated for training goals. The total capacity score, confidence score, and performance score are calculated separately. Total percentage scores range from 0-100%.

• Total capacity or confidence or performance score = sum of individual skill scores / ([number of skills - number of NP scores - number of TE scores] x 3) x 100% (9).

In the literature, no questionnaire evaluating wheelchair skills has been found in Türkiye. Therefore, the aim of this study was to carry out the Turkish cultural adaptation, validity, and reliability of the WST-Q as a questionnaire evaluating the skills of manual wheelchair users in Türkiye.

2. Materials and Methods

This study was conducted with paraplegic manual wheelchair users. All the participants included were volunteers. The informed consent form was obtained online from all participants who participated in the study. Approval for the study was granted by the Non-Interventional Clinical Research Ethics Committee of Izmir Demokrasi University (Decision No:2020/14-06, Dated: June 29, 2020). To calculate the sample size of participants to be included in the study, the optimal design method for study reliability was used, as described by Walter et al. (10). The values used were α:0.05, β:0.20, H0: p=0.5 (acceptable level of repeatability), and H1: p=0.9 (expected level of repeatability). According to this calculation, it was necessary to have a sample size of at least 9 participants.

Inclusion criteria for this study were determined as being SCI, using a manual wheelchair, being paraplegic, being 18 years of age or older, having disabilities of at least one year, not having cognitive problems, having reading and writing ability, and participating in the study voluntarily. The exclusion criteria for this study were determined: unfamiliarity with or a desire not to use a wheelchair, having systemic diseases such as heart, lung, or kidney, having orthopedic or neurologic problems in the upper extremities, having communication or cognitive problems, and being an active wheelchair athlete.

All the participants were informed about the study and were then instructed on how to complete the questionnaires online. The digital formats of the questionnaires to be used in the study were prepared using Google Forms. The demographic data of the participants were recorded, including age, height, weight, and body mass index (BMI). The participants were also questioned in respect of how long they had been using a wheelchair and the mean number of transfers per day with a wheelchair.

The necessary permission was obtained to perform Turkish validity and reliability studies of the WST-Q 5.0 (manual chair), which was developed in Canada by Kirby et al. (11). Firstly, cultural adaptation of the questionnaire was made. The WST-Q was translated into Turkish and then adapted culturally according to the stages recommended by Beaton et al. (12). The translation into Turkish was made by two native Turkish speakers with a good level of English. One of these was a physiotherapist and the other was a university graduate of the English Language and Literature Faculty. The translations were completed independently. To prevent contextual errors and inconsistencies, the two translations were compared by a single person with good knowledge of both languages, and a single text was produced from the translation.

This final Turkish version was then back-translated into English separately by two native English speakers with good knowledge of Turkish. These two translators had no knowledge of the aim of the study or the original scoring. A committee formed of these four translators and the first author compared the translated version of the WST-Q with the original English version. The committee approved the Turkish version and named the questionnaire “Turkish Wheelchair Skills Test Questionnaire (WST-Q-Turkish). After approval, to pilot test the WST-Q-Turkish it was applied to 4 wheelchair users who met the study criteria. Items in the questionnaire that were difficult to understand were determined by these pilot users, and these were made more comprehensible.

2.1. Reliability

For the reliability of the questionnaire, internal consistency and test-retest reliability were examined. Internal consistency was evaluated with the Cronbach α coefficient. For the test-retest reliability, the WST-Q-Turkish was applied twice to the individuals at a 2-week interval. The data obtained were evaluated using the Spearman Correlation and Intraclass Correlation Coefficient (ICC).

2.2. Validity

The data obtained from the WST-Q-Turkish were compared with the World Health Organization Quality of Life, Brief Version (WHOQOL-BREF), for which Turkish reliability and validity studies were made by Eser et al. in 1999 (13). The questionnaire includes items evaluating the areas of physical health, psychological health, social relationships, and environmental fields. With the addition of a national question during the Turkish validity study, the questionnaire was formed/consisted of a total of 27 items. Each area on the scale was scored from a maximum of 20 or 100 points (13).

2.3. Statistical Analysis

All the statistical analyses were performed using SPSS version 26 software (Statistical Package for the Social Sciences, SPSS Inc., Chicago, IL, USA). Demographic data were reported as frequency (n) and percentage (%). The conformity of the data to a normal distribution was assessed with the Kolmogorov-Smirnov test. For reliability, test-retest reliability analyses were applied. The data obtained were evaluated using the Spearman Correlation and Intraclass Correlation Coefficient (ICC). The strength of the correlation was considered

negligible (<0.29), weak (0.3–0.49), moderate (0.5–0.69), strong (0.7–0.89), or very strong 0.9–1.0 (14). The Cronbach α coefficient was calculated for internal consistency. Validity was examined by correlation with a currently widely used questionnaire with proven validity and reliability.

3. Results

A total of 31 cases were identified who had SCI and used a manual wheelchair. After the exclusion of 11 cases, 8 with communication problems, and 3 who did not repeat the test, the evaluations were completed with 20 cases with a mean age of 40±8.95 years. The data on patient age, height, weight, BMI, years of wheelchair use, and the number of daily transfers are shown in Table 1.

Table 1 Demographic Data of the Cases

Variables (n=20)	Min-Max.	Mean±SD
Age (years)	25-58	40±8.95
Height (cm)	145-190	175±10.22
Body weight (kg)	53-110	75±13.02
BMI (kg/cm^2)	16-38	24.62±4.73
W/C usage (years)	1-27	14±8.55
The number of daily transfers	3-30	9±7.62

SD: Standard Deviation, BMI: Body Mass Index, W/C: Wheelchair

For the reliability of the questionnaire, internal consistency and test-retest reliability were examined. The internal consistency of the items in the questionnaire was evaluated with the Cronbach α coefficient. The general Cronbach α score of the questionnaire was calculated as 0.985. Also, the questionnaire was applied twice to the same participants at an interval of 2 weeks and was examined with ICC. ICC coefficients were 0.967 (95% confidence interval: 0.938-0.985). The correlations to test-retest reliability were calculated as a minimum correlation of 0.94 and a maximum correlation of 0.98, demonstrating a very strong correlation ($p<0.001$). According to these results, the questionnaire was determined to be reliable. The data obtained are shown in Table 2.

The currently widely used WHOQOL-BREF was used for the concurrent validity of the WST-Q-Turkish. The relationship between the two questionnaires was examined with the Spearman correlation coefficient (rs) to investigate the validity of the WST-Q-Turkish for use in Türkiye. All the sub-dimensions of the questionnaire were correlated at a high level, and all the sub-parameters were found to be significant. A strong correlation was determined between the WHOQOL-BREF and the WST-Q-Turkish. These data are shown in Table 3.

Table 2. Reliability of WST-Q Turkish*

Skill Description		Can you do it?	How confident are you?	How often do you do it?	Is this a training goal?
1	Moving the wheelchair straight forward for a short distance, for example along a short hallway.	0.98	0.98	0.97	0.98
2	Moving the wheelchair straight backward for a short distance, for example to back away from a table.	0.95	0.95	0.97	0.97
3	While moving the wheelchair, coming to a sudden stop to avoid people who do not notice you.	0.97	0.98	0.97	0.97
4	Turning the wheelchair around in a small space so that it is facing in the opposite direction.	0.98	0.97	0.96	0.96
5	Turning the wheelchair around obstacles while moving forward.	0.98	0.98	0.98	0.98
6	Turning the wheelchair around obstacles while moving backward.	0.96	0.96	0.96	0.96
7	Moving the wheelchair sideways in a small space, for example to get the side of your wheelchair next to a kitchen counter, and then back to where you started.	0.97	0.95	0.97	0.95
8	Moving the wheelchair to pick up a small dropped object, for example a cell phone, pen or coin, from the floor in front of you.	0.98	0.98	0.98	0.98
9	Removing the weight from your buttocks, either one at a time or both together.	0.98	0.97	0.97	0.98
10	Transferring from the wheelchair to a bench that is about the same height as the wheelchair and then getting back into the wheelchair.	0.98	0.98	0.98	0.96
11	Folding your wheelchair or taking it apart without tools, for example to store it out of the way, and then opening or reassembling it again.	0.98	0.97	0.97	0.97
12	Opening a hinged door, moving the wheelchair through it and closing it behind you, then coming back the other way.	0.98	0.98	0.97	0.97
13	Moving the wheelchair over a longer distance, for example on a smooth surface about half the length of a sport field.	0.98	0.98	0.98	0.98
14	Moving the wheelchair up a slight incline, for example a standard ramp (12 times longer than it is high).	0.97	0.96	0.96	0.97
15	Moving the wheelchair down a slight incline.	0.98	0.97	0.98	0.98

Table 2. Reliability of WST-Q Turkish* (Continue)

	Skill Description	Can you do it?	How confident are you?	How often do you do it?	Is this a training goal?
16	Moving the wheelchair up a steep incline (about twice as steep as a standard ramp).	0.97	0.95	0.95	0.97
17	Moving the wheelchair down a steep incline.	0.98	0.98	0.98	0.97
18	Moving the wheelchair across a slight side-slope, for example when crossing a driveway.	0.98	0.98	0.98	0.98
19	Moving the wheelchair, a short distance across a soft surface, for example gravel.	0.98	0.98	0.98	0.98
20	Getting the wheelchair over an obstacle that sticks up above the surface, for example a high door threshold.	0.98	0.98	0.98	0.98
21	Getting the wheelchair over a gap, for example a rut in the road that is too big to simply roll over.	0.98	0.98	0.96	0.98
22	Getting the wheelchair up a low curb, for example when entering a building.	0.98	0.97	0.97	0.97
23	Getting the wheelchair down from a low curb.	0.98	0.97	0.98	0.98
24	Getting the wheelchair up a high curb, for example at a street corner without a ramp.	0.96	0.96	0.97	0.96
25	Getting the wheelchair down from a high curb.	0.97	0.98	0.98	0.97
26	Getting down on the ground, then back into the wheelchair.	0.98	0.98	0.98	0.98
27	Doing a wheelie, balancing the wheelchair on its rear wheels, for 30 seconds.	0.95	0.94	0.95	0.97
28	Staying in a wheelie, turning the wheelchair around in a small space so that it is facing in the opposite direction.	0.98	0.98	0.98	0.98
29	Moving forward and backward in the wheelie position.	0.98	0.98	0.98	0.97
30	Staying in a wheelie, moving forwards down a high curb.	0.97	0.97	0.98	0.97
31	Staying in a wheelie, moving forwards down a steep ramp.	0.95	0.96	0.96	0.97
32	Getting yourself and the wheelchair up a short flight of stairs that has a rail.	0.94	0.95	0.94	0.97
33	Getting yourself and the wheelchair down a short flight of stairs that has a rail.	0.96	0.98	0.94	0.96

*Spearman Correlation Coefficient

Table 3. Comparison of WST-Q Turkish with the Results of the WHO Quality of Life Short Form

Total Scores of the Questionnaires	Physical Domain – Whoqol-Bref 0-100	Psychological Domain – Whoqol-Bref 0-100	Social Domain – Whoqol-Bref 0-100	Environment Domain – Tr Whoqol-Bref 0-100
	rs/p	rs/p	rs/p	rs/p
WST-Q Total Capacity Score	rs: 0.68 p: 0.036*	rs: 0.60 p: 0.012*	rs: 0.78 p: 0.071	rs: 0.67 p: 0.038*
WST-Q Total Confidence Score	rs: 0.64 p: 0.003*	rs: 0.61 p: 0.005*	rs: 0.72 p: 0.082	rs: 0.61 p: 0.092
WST-Q Total Performance Score	rs: 0.75 *p*:<0.001**	rs: 0.60 p: 0.010*	rs: 0.67 p: 0.034*	rs: 0.73 p: 0.026*

*p<0.05, **p<0.001, rs: *Spearman Correlation Coefficient*

4. Discussion

The results of this study demonstrated that the WST-Q-Turkish is a valid and reliable questionnaire for adults with SCI who use a manual wheelchair. The WST-Q-Turkish can be used to evaluate the skills, abilities, and capacity of individuals with SCI when using a manual wheelchair.

Following SCI, it is of great importance for the individual to be able to achieve mobility (15). Therefore, paraplegics with SCI are in the situation of using a manual wheelchair. However, the wheelchair skills of many individuals with SCI remain insufficient to be able to achieve social integration (16). These skills include functional activities such as maneuvers made with the wheelchair, transfers, ascending-descending ramps, and stairs, and folding and opening the wheelchair. No measurement tool was found by the researchers which could be used to evaluate the wheelchair skills of individuals with SCI in Türkiye. Therefore, there is a need for a valid and reliable scale to evaluate the wheelchair skills of these individuals in Türkiye.

From an examination of the literature, the Wheelchair Skills Test (WST) developed by Kirby et al. (2002) was seen to be a frequently used measurement tool for the evaluation of wheelchair skills (17). The validity and reliability of the WST have been proven in several studies in different languages (11, 17, 18). There are translations of the WST in Portuguese (19), Spanish (20, 21), and French (6).

The study by Ossada et al. of the Portuguese translation of the WST included 15 cases, 13 with SCI. It was concluded that the Portuguese WST was sufficient for the evaluation of wheelchair user skills and was useful for the planning of rehabilitation programs (19). Passuni et al. translated the WST into Spanish and evaluated its reliability. In the study of 11 cases with SCI, the Spanish version of the WST was determined to be a reliable evaluation tool for individuals using a manual wheelchair (20).

The WST provides objective evaluation through observation of the skills performance of the individuals. The WST-Q, which is the questionnaire version, is a subjective evaluation in which the responses of the individuals related to skill capacity are recorded. In a study by Kirby et al. (2016), the measurement properties of the WST and WST-Q were examined for the evaluation of wheelchair skills capacity and performance of wheelchair users with SCI. As a result of the study, the use of WST and WST-Q was proven to have good content and concurrent and simultaneous validity in individuals with SCI (22).

The WST-Q form was developed to be able to provide an evaluation when it is not possible to use the WST. The skills evaluated in the WST-Q questionnaire form are the same as the skills tested in the WST. In special conditions such as the COVID-19 pandemic, the WST-Q is a particularly useful scale. It is extremely practical for use in at-home evaluations, remote follow-ups, small rehabilitation centers which are not suitable for WST, and in situations when the WST is contra-indicated (e.g., during bed rest after a fall). The time needed to complete the WST-Q is shorter than for the objective test. There is no requirement for a specific area and equipment for scoring the skills. Failure originating from technical errors which can arise when applying the test is eliminated with the use of the WST-Q. Therefore, this study was planned to examine the validity and reliability of the Turkish version of the WST-Q, as it is more economical, and practical, and can be applied remotely during a pandemic. Thus, it can be considered a questionnaire that can be widely applied for evaluation in a short time with a low error rate and without the need for equipment in healthcare institutions and disability units.

Kirby and his team researched wheelchair mobility for many years. They examined the wheelchair skills required in daily living activities and social participation. The tests were created appropriate/according to the data obtained. In the scale, the capacity, confidence, frequency of application, and training target of the individuals are questioned related to the 33 skills determined (9, 23). The validity and reliability of the WST-Q have been researched in several studies in the literature (5, 24). The WST-Q has been translated into Portuguese (8), French (6), and Norwegian (7).

The cultural adaptation study by Campos et al. was planned by translating the WST-Q into Portuguese as a measurement tool that would be able to be used in Brazil. In the study, which included 46 manual wheelchair users, the Brazilian version of the WST-Q was proven to be reliable and have excellent internal consistency (8). In 2018, Moen translated the WST-Q into Norwegian. As the result of a study that included 50 participants, the Norwegian version of the WST-Q was reported to be a reliable test for use on adults with SCI (7). In the current study, the WST-Q-Turkish was determined to be a valid and reliable questionnaire. It can be used in research in Türkiye, in rehabilitation centers, and in situations requiring remote evaluation during the pandemic.

There are few paraplegics with SCI using a manual wheelchair in the community. This study was planned by evaluating previous studies and calculating the sample size. Therefore, to increase the number of cases, the level of injury was ignored. In addition, the study included cases who used both manual and electric wheelchairs. Although it was aimed to include cases involving people who only used a manual wheelchair both inside and outside the home, 75% of the participants reported that they used an electric wheelchair for long distances and a manual wheelchair for short distances and within the home. The reason for preferring an electric wheelchair outside was explained as the person not having the functional capacity for the wheelchair and that the outdoor environment is not standardized or suitable for disabled individuals. This study was conducted on individuals with SCI. However, future validity and reliability studies of the WST-Q-Turkish could be planned to include other wheelchair users, such as amputees and patients with cerebral palsy. In addition, future studies could be made of the validity and reliability of the cultural adaptation to Turkish of the WST-Q form for electric wheelchair users.

In this study, cultural adaptation to Turkish of the WST-Q form was performed and the resulting form was named WST-Q-Turkish. The WST-Q-Turkish was determined to be a valid and reliable questionnaire for the evaluation of the skills capacity of paraplegic adults with SCI using a manual wheelchair. The questionnaire was seen as practical and suitable for use in the evaluation of the skills of manual wheelchair users in hospitals, rehabilitation centers, disability units, and in situations requiring remote evaluation, such as during a pandemic. In addition, the effects of treatments applied on manual wheelchair skills can be evaluated, and changes in the functionality of patients can be determined.

Ethical Statement

Approval for the study was granted by the Non-Interventional Clinical Research Ethics Committee of Izmir Demokrasi University (Decision No:2020/14-06, Dated: June 29, 2020).

Conflict of interest

The authors report no conflict of interest.

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Authors' contributions

Concept: E.K., F.T., Design: F.T., B.T., Data Collection or Processing: E.K., H.G., Analysis or Interpretation: E.K., F.T., Literature Search: E.K., B.T., Writing: E.K., F.T.

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