ORIGINAL ARTICLE

# CROSS-CULTURAL ADAPTATION AND VALIDATION OF THE TURKISH VERSION OF THE 25-QUESTION GERIATRIC LOCOMOTIVE FUNCTION SCALE

Turkish Journal of Geriatrics
2025; 28(2):239–249

DOI: 10.29400/tjgeri.2025.440

Barış GÜRPINAR[1]
Hülya TUNA[2]
Nursen İLÇİN[2]

[1] Izmir University of Economics , Physiotherapy and Rehabilitation, İzmir, Turkey

[2] Dokuz Eylül University, Faculty of Physical Therapy and Rehabilitation , İzmir, Turkey

## Abstract

**Introduction:** Locomotive syndrome, characterized by gait disorders, loss of balance, and cognitive difficulties, significantly impacts older adults by increasing morbidity and reducing independence. This study aimed to adapt the 25-item Geriatric Locomotive Function Scale into Turkish and evaluate its validity and reliability.

**Materials and Method:** The translation process involved forward and backward translations by bilingual experts to ensure linguistic and conceptual equivalence with the original scale. A total of 250 individuals aged ≥65 years participated, completing the Turkish version of the scale alongside functional mobility tests; the timed up-and-go, five repetitions of sit-to-stand, two-step, and standing tests. Participants repeated the scale 1 week after the initial evaluation to assess the test–retest reliability.

**Results:** The internal consistency of the Turkish version was excellent (Cronbach's alpha = 0.952). Test–retest reliability, assessed 1 week apart, yielded an intraclass correlation coefficient of 0.974, indicating excellent reliability. Concurrent validity was examined by correlating scale scores with functional test results. Significant correlations were observed ($p < 0.001$), with Pearson's correlation coefficients of 0.472 for timed up-and-go, 0.504 for five repetitions of sit-to-stand, -0.871 for the two-step test, and -0.518 for the standing test. These findings demonstrate that the Turkish version is a valid and reliable tool for assessing mobility impairment and functional limitation in older adults.

**Conclusion:** The adaptation and validation of the 25-item Geriatric Locomotive Function Scale into Turkish provide a comprehensive measure for evaluating and monitoring locomotor function, supporting early detection and intervention in this population.

***Keywords:*** Geriatric Assessment; Locomotion; Aged.

*Correspondence*

Barış GÜRPINAR
Phone : +905333106587
e-mail : baris.gurpinar@ieu.edu.tr

Received : Feb 01, 2025
Accepted: May 09, 2025

*Cite this article as:*
Gürpınar B, Tuna H, İlçin N. Cross-Cultural Adaptation and Validation of the Turkish Version of the 25-Question Geriatric Locomotive Function Scale. Turkish Journal of Geriatrics2025;28(2):239–249.doi:10.29400/tjgeri.2025.440

## INTRODUCTION

Problems with the locomotor system, resulting from gait disorders and loss of balance, are significant causes of mortality and morbidity among older adults (1). Maintaining mobility in later life is crucial for sustaining metabolic homeostasis, preventing frailty, and maintaining independence. Loss of mobility negatively impacts these aspects, creating a vicious cycle for older adults (2).

In 2007, the Japanese Orthopedic Association (JOA) introduced the term "locomotive syndrome" (LoS) to raise public awareness of this condition and its management strategies (3).

LoS, observed in geriatric populations, is defined as a combination of slowness, movement abnormalities, and cognitive difficulties that can result in poor performance in activities of daily living and increased bone fragility (4). Developing effective health policies and practices to prevent LoS and its associated morbidities is among the significant healthcare challenges of the twenty-first century. Monitoring and early intervention in pre-symptomatic older adults can potentially prevent musculoskeletal and musculotendinous deterioration associated with long-term LoS (3). Maresova et al. that mobility assessments for older adults should adopt a multifactorial approach, considering their functional abilities rather than relying solely on limited factors (5). From this perspective, the 25-question Geriatric Locomotive Function Scale (GLFS-25), developed by Seichi et al., is an effective tool for detecting early mobility disorders. This assessment tool requires respondents to rate their experiences of pain, activities of daily living, social functions, and mental health status over the past month using a 4-point Likert scale. (6)

Existing literature on LoS predominantly addresses the syndrome's presence and severity without considering the participants' age ranges. Clinical studies have shown that the GLFS-25 correlates with specific functional assessments, such as grip strength, time to stand on one leg, and time to walk 6 meters. Additionally, research highlights the GLFS-25's utility in determining falls (7), lower extremity muscle strength (8), level of independence in activities of daily living (9), and physical performance (10).

While these functional assessments are acknowledged as valuable, the two-step and standing tests are the most widely accepted methods for evaluating LoS (4). However, studies on the GLFS-25's validity and reliability in Brazil, Iran, and China employed other validation methods, without using these tests (11-13) In this study, the GLFS-25's validity was analyzed using the timed up-and-walk test, five repetitions of sit-to-stand, two-step, and stand-up tests.

This study aimed to examine the Turkish language adaptation, validity, and reliability of the GLFS-25.

## MATERIALS AND METHOD

### Design

This epidemiologic cross-cultural adaptation and psychometric analysis study was conducted per the Declaration of Helsinki (Ethical Principles for Medical Research Involving Human Subjects) and approved by the Ethics Committee of Dokuz Eylul University (No: 2021/28-24).

*Participants:*

The study announcement was disseminated via social media platforms, including Facebook, WhatsApp groups, Instagram, and Twitter. Individuals residing in Izmir province who volunteered for the study were included. To ensure scale validity and reliability, at least 10 individuals were included per scale item (14). Since the scale contained 25 items, a minimum of 250 participants were required.

The study population included voluntary individuals aged ≥65 years living in Izmir. Individuals

with acute conditions affecting mobility, such as a history of fracture of the lower extremities and/or spine within the past 6 months or those who had undergone acute trauma treatment, were excluded.

Signed written informed consent was obtained from participants. Data were collected in a single session. Rest periods of 5 minutes were allowed between physical measurements. Demographic data were gathered through interviews conducted at the session's outset, followed by a self-administered questionnaire.

*Study outcome measures:*

Turkish Translation of GLFS-25: Necessary permissions were obtained from the original study's author. Forward translation of the original questionnaire was performed by two native Turkish speakers with advanced English proficiency, one being a health professional. The translations were consolidated into a consensus version, which was back-translated into English by two bilingual (English-Turkish) non-healthcare professional and compared with the original questionnaire. Expert committee review confirmed no discrepancies in meaning or structure. A pilot test involving 20 healthy individuals determined the translation was linguistically comprehensible, requiring no modifications.

Data were collected in person at the Dokuz Eylul University School of Physical Therapy and Rehabilitation. Study objectives and evaluation methods were explained to participants before obtaining informed consent. After demographic data collection, participants completed the GLFS-25 and underwent the timed up-and-go test, 5-repetition sit-to-stand test, two-step test, and standing-up test to assess concurrent validity.

To evaluate test-retest reliability of the Turkish version, participants completed GLFS-25 again 1 week after the initial evaluation.

The GLFS-25, a self-administered scale, consists of 25 items: four questions on pain in the past month, 16 on daily activities in the past month, three on social functioning, and two on mental health status in the past month. Items are scored on a 5-point Likert scale from no difficulty (0) to severe difficulty (4), with a total possible score of 100. Higher scores indicate more severe LoS (6). Scores of 7–15 indicate Level 1 LoS, and scores ≥16 indicate Level 2 LoS (4).

Two-Step Test: The test was considered complete if the participant starts upright, takes two steps forward without losing balance, and holds the final standing position for ≥3 seconds. The test is performed twice and the best result is recorded. The distance covered was divided by the participant's height and the resulting value was recorded as the two-step test result (15).

Timed Up-and-Go Test: In the timed up and go test, participant sits on a standard chair (43 cm high) with his/her back on the chair, and a point 3 m away from the chair is marked. The participants were asked to get up from the chair, walk 3 m, and return to the chair. The completion time of the test was measured in seconds. The test was performed three times and the best result was recorded. Times of ≥14 seconds indicate high fall risk (16).

Five Repetitions of the Sit-to-Stand Test: Participants were asked to stand up and sit down five times as fast as they could in a chair with no arm support and a height of 43 cm with the arms crossed over the chest. The test started from a sitting position, and repetitions where the participants did not fully stand up or make contact with the chair were not counted. The time required to complete the test was measured in seconds. The test was performed three times and the best result was recorded (17).

Standing up test: Participants were asked to stand up from 40-, 30-, 20 and 10 cm high stools first using two legs and then one leg (right and left foot). The test starts with the participant standing

up with two legs using a 40 cm stool, which is the easiest size, and then using increasingly difficult heights downwards by 10 cm each time. The same method is then applied using one leg. If the person being evaluated manages to hold the position after standing up for >3 seconds without any additional steps, the test is considered complete, and the person is expected to stand up with both legs from a specified level in single-leg steps. The scoring of the test was based on the values listed in Table 1 for the most difficult step completed (15). A high score on the test was indicative of good mobility.

Statistical Analysis: Cronbach's alpha coefficient measured the internal consistency of the scale. Values ≥0.80 were considered excellent, 0.70–0.79 adequate, and <0.50 inadequate (18).

The intraclass correlation coefficient (ICC) was used to determine test-retest reliability. Reliability was categorized as poor (<0.50), moderate (0.50–0.75), good (0.75–0.90), and excellent >0.90 (19).

To examine concurrent validity, the correlation between the GLFS-25 score and the results of the two-step test, the timed up-and-go test, and five repetitions of the sit-to-stand test was analyzed with Pearson correlation coefficient r.

All data were analyzed using SPSS for Windows (version 21.0; SPSS Inc., Chicago, IL, USA).

**Table 1.** Clinic Features of The Participants

| | | Min | Max | Mean X ± SD |
|---|---|---|---|---|
| Total (n=250) | GLFS-25 | 0 | 86 | 20.82 ± 17.83 |
| | Age (year) | 65 | 85 | 69.50 + 4.37 |
| | BMI (kg/m2) | 17.58 | 38.46 | 27.49 +3.87 |
| | TUG (sec) | 5.30 | 24.00 | 8.36 ± 2.37 |
| | 5RSTS (sec) | 5.35 | 56.50 | 9.96 ± 6.14 |
| | SUT | 1.00 | 6.00 | 3.84 ± 1.14 |
| | 2ST | 0.29 | 1.28 | 0.84 ± 0.19 |
| LoS1 (n=74) | GLFS-25 | 7 | 15 | 11.02 ± 2.87 |
| | Age (year) | 65 | 78 | 68.32 ± 2.88 |
| | BMI (kg/m2) | 19.72 | 35.56 | 20.07 ± 3.82 |
| | TUG (sec) | 5.30 | 11.10 | 8.01 ± 1.34 |
| | 5RSTS (sec) | 5.45 | 15.70 | 8.61 ± 1.97 |
| | SUT | 1.00 | 6.00 | 4.22± 0.95 |
| | 2ST | 0.36 | 1.08 | 0.91 ± 0.10 |
| LoS 2 (n=124) | GLFS-25 | 16 | 86 | 33.98 ± 16.64 |
| | Age (year) | 65 | 85 | 70.67 ± 5.11 |
| | BMI (kg/m2) | 17.58 | 35.64 | 27.41 ±3.95 |
| | TUG (sec) | 5.89 | 24.00 | 9.06 ± 2.93 |
| | 5RSTS (sec) | 5.30 | 56.50 | 8.61 ± 1.97 |
| | SUT | 1.00 | 6.00 | 3.36 ± 1.09 |
| | 2ST | 0.29 | 1.28 | 0.71 ± 0.16 |

TUG: Timed Up and Go, 5RSTS: Five Repetitions of Sit-to-Stand, SUT: Standing up Test, 2ST: Two-step test, GLFS-25: Geriatric Locomotive Function Scale, BMI: Body Mass Index.

## RESULTS

Of the 250 study participants 186 were females (74.4%), and 160 (64.0%) were married. Participants demonstrated no difficulty completing the GLFS-25 independently and repeated it after a 1-week interval. No unanticipated problems or adverse events were reported by any participants.

The mean GLFS-25 score for the initial assessment was 20.82+17.83, and the re-test score was 21.13+17.48. Based on GLFS-25 scores, 29.6% of participants were classified as Level 1 LoS, and 49.6% as Level 2 LoS. Table 1 presents the clinical features of participants by LoS levels.

Internal consistency was assessed using Cronbach's alpha revealed excellent reliability with a value of 0.952. The distribution of item-specific results is shown in Table 2.

During the adaptation of the GLFS-25 scale into Turkish, the suitability of its factor structure

**Table 2.** Distribution of the results

| | Range | Mean (SD) | Lowest n (%) | Highest n (%) | Cronbach's Alpha if item deleted |
|---|---|---|---|---|---|
| Total Score | 0-100 | 20.82(17.84) | 8 (3.2) | 0 (0) | |
| 1 | 0-4 | 1.54+ 1.01 | 33 (13.2) | 9 (3.6) | 0.951 |
| 2 | 0-4 | 1.60+ 1.7 | 51 (20.4) | 12 (4.8) | 0.950 |
| 3 | 0-4 | 0.52+0.86 | 65 (26.0) | 17 (6.8) | 0.950 |
| 4 | 0-4 | 0.58+ 0.83 | 99 (39.6) | 3 (1.2) | 0.949 |
| 5 | 0-4 | 0.56+ 0.97 | 171 (6.4) | 4 (1.6) | 0.950 |
| 6 | 0-4 | 0.44+ 0.81 | 177 (70.8) | 4 (1.6) | 0.950 |
| 7 | 0-4 | 0.52+ 1.02 | 173 (69.2) | 14 (5.6) | 0.950 |
| 8 | 0-4 | 0.33+ 0.74 | 202 (80.8) | 0 (0) | 0.926 |
| 9 | 0-4 | 0.58+ 0.83 | 153 (61.2) | 1 (0.4) | 0.925 |
| 10 | 0-4 | 0.77+ 1.19 | 165 (66.0) | 10 (4.0) | 0.936 |
| 11 | 0-4 | 0.24+ 0.56 | 207 (82.8) | 0 (0) | 0.928 |
| 12 | 0-4 | 1.44+ 1.34 | 89 (35.6) | 19 (7.6) | 0.926 |
| 13 | 0-4 | 0.47+ 0.94 | 112 (44.8) | 4 (1.6) | 0.923 |
| 14 | 0-4 | 0.52+ 0.86 | 192 (76.8) | 14 (5.6) | 0.935 |
| 15 | 0-4 | 0.80+ 1.16 | 138 (55.2) | 16 (6.4) | 0.926 |
| 16 | 0-4 | 0.39+ 0.80 | 188 (75.2) | 0 (0) | 0.929 |
| 17 | 0-4 | 0.81+ 1.13 | 149 (59.6) | 6 (2.4) | 0.935 |
| 18 | 0-4 | 0.33+ 0.74 | 192 (76.8) | 1(0.4) | 0.926 |
| 19 | 0-4 | 0.58+ 0.83 | 174 (69.6) | 0 (0) | 0.925 |
| 20 | 0-4 | 1.82 + 1.41 | 65 (26.0) | 37 (14.8) | 0.952 |
| 21 | 0-4 | 0.94 + 1.02 | 107 (42.8) | 5 (2.0) | 0.949 |
| 22 | 0-4 | 0.41 + 0.80 | 185 (74.0) | 0 (0) | 0.949 |
| 23 | 0-4 | 0.59 + 0.98 | 170 (68.0) | 0 (0) | 0.949 |
| 24 | 0-4 | 0.96 + 0.99 | 108 (43.2) | 0 (0) | 0.950 |
| 25 | 0-4 | 1.11 + 1.07 | 95 (38.0) | 4 (1.6) | 0.951 |

SD: Standard Deviation

was assessed using the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity. The KMO value was 0.884, indicating excellent sampling adequacy, while Bartlett's test of sphericity was significant ($\chi^2$ = 5726.841, p < 0.001). These results confirm that the Turkish version is highly suitable for factor analysis (Table3).

Following the Exploratory Factor Analysis, the factor structure of the Turkish version of GLFS-25 was identified as comprising five distinct factors, as presented in Table 3.

The Exploratory Factor Analysis identified five distinct subscales. Confirmatory Factor Analysis revealed factor loadings ranging from 0.61 to

**Table 3.** Exploratory factor analysis: Factor loading of 25 items (n=250)

| | Body Pain | Movement Related Difficulty | Usual Care | Social Activities | Cognitive |
|---|---|---|---|---|---|
| Item 19 | 0.890 | | | | |
| Item 22 | 0.890 | | | | |
| Item 16 | 0.822 | | | | |
| Item 23 | 0.776 | | | | |
| Item 18 | 0.774 | | | | |
| Item 21 | 0.735 | | | | |
| Item 17 | 0.713 | | | | |
| Item 15 | 0.624 | | | | |
| Item 13 | 0.585 | | | | |
| Item 20 | 0.530 | | | | |
| Item 12 | 0.503 | | | | |
| Item 8 | | 0.927 | | | |
| Item 11 | | 0.916 | | | |
| Item 9 | | 0.816 | | | |
| Item 10 | | 0.798 | | | |
| Item 14 | | 0.795 | | | |
| Item 3 | | | 0.880 | | |
| Item 4 | | | 0.851 | | |
| Item 2 | | | 0.813 | | |
| Item 1 | | | 0.735 | 0.301 | |
| Item 7 | | | | 0.753 | |
| Item 5 | | | | 0.727 | |
| Item 6 | | | | 0.677 | |
| Item 25 | | | | | 0.946 |
| Item 24 | | | | | 0.893 |
| Explained Total Variance | | | 75.942 % | | |
| KMO Coefficient | | | 0.884 | | |
| Barlett test | | X2= 5726.841 | | (p<0.001) | |

KMO Coefficient: Kaiser-Meyer-Olkin.

0.88, indicating that the items demonstrated good concurrent validity and good compatibility (Fig. 1).

The fit indices of the Turkish version of GLFS-25 were found to be within acceptable standards (Table 4)

To assess the reliability of the GLFS-25 Turkish version and its five factors, internal consistency reliability was evaluated in this study. The analysis revealed that the Cronbach's alpha values for the total scale and each of its sub-dimensions,

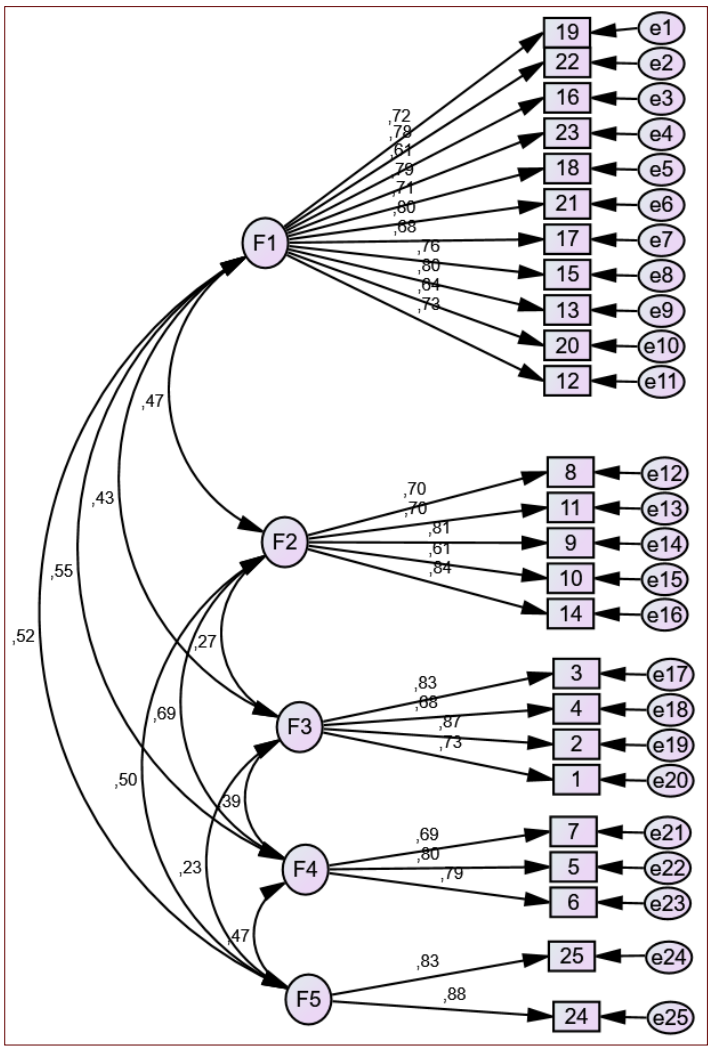


**Figure 1.** Confirmatory factor analysis of Turkish version of GLFS-25

F1:Body Pain, F2: Movement Related Difficulty, F3: Usual Care, F4: Social Activities, 5: Cognitive

**Table 4.** Goodness of fit indices (n=250)

| Models/Data-model fit indices | X2 | Df | X2/Df | sRMR | RMSEA | CFI | IFI | TLI | GFI |
|---|---|---|---|---|---|---|---|---|---|
| Five Factor Model | 762.893 | 265 | 2.878 | 0.043 | 0.078 | 0.92 | 0.92 | 0.91 | 0.90 |

Notes: $X^2$, Chi-square; df, Degrees of Freedom; RMSEA, Root Mean Standard Error Approximation; sRMR, Standardized Root Mean Square Residual; CFI, Comparative Fit Index; IFI, Incremental Fit Index; TLI, Trucker-Lewis Index; GFI, Goodness of Fit.

**Table 5.** Results of reliability analysis of scale and subdimensions

| GLFS-25 subdimension | Item number | Cronbach's α internal consistency coefficient | Test–retest reliability coefficients |
|---|---|---|---|
| Body Pain | 4 | 0.784 | 0.894 |
| Movement Related Difficulty | 3 | 0.892 | 0.931 |
| Usual Care | 5 | 0.793 | 0.879 |
| Social Activities | 11 | 0.834 | 0.784 |
| Cognitive | 2 | 0.835 | 0.842 |

**Table 6.** Correlation between the GLFS-25 and other scales

| | GLFS-25 Total | Body Pain | Movement Related Difficulty | Usual Care | Social Activities | Cognitive |
|---|---|---|---|---|---|---|
| TUG (sec) | 0.472* | 0.336* | 0.530* | 0.287* | 0.438* | 0.214* |
| 5RSTS (sec) | 0.504* | 0.370* | 0.559* | 0.360* | 0.444* | 0.130* |
| SUT | -0.518* | -0.296* | -0.391* | -0.332* | -0.371* | -0.267* |
| 2ST | -0.871* | -0.554* | -0.708* | -0.702* | -0.773* | -0.574* |

*Correlation is significant at the 0.05 level (2-tailed).

TUG: Timed Up and Go, 5RSTS: Five Repetitions of Sit-to-Stand, SUT: Standing up Test, 2ST: Two-step test.

indicating acceptable levels of internal consistency reliability for the GLFS-25 Turkish version (Table 5).

Seven days after the initial assessment, all participants were asked to complete the questionnaire again. Analysis of mean total scores from both assessments using the Pearson correlation coefficient yielded an intraclass correlation coefficient (ICC) of 0.974. The internal consistency and test-retest reliability results for all subscales are presented in Table 5.

All performance tests exhibited statistically significant correlations with the total score of GLFS-25 ($p < 0.001$). Pearson's correlation coefficients were as follows: 0.472 for the Timed Up-and-Go test, 0.504 for the Five-Repetition Sit-to-Stand test, -0.871 for the Two-Step test, and -0.518 for the Stand-Up test. Additionally, all performance tests demonstrated statistically significant correlations with the subscales of GLFS-25 ($p < 0.005$) (Table 6).

## DISCUSSION

This study investigated the validity and reliability of the Geriatric Locomotor Function Scale-25 in a sample of older adults (> 65 years old) in Izmir.

The findings demonstrate excellent internal consistency (Cronbach's alpha = 0.952) of locomotor function in this population. Seichi et al. determined the Cronbach's alpha score of the original test as 0.961 (6). Similarly, studies validating the scale in other languages reported substantial consistency, with Cronbach's alpha values of 0.942 in Brazilian Portuguese (11) and 0.932 in Farsi (12) language.

The study's findings indicate that the GLFS-25 exhibits excellent test-retest reliability, achieving a satisfactory ICC. These results are consistent with previous research, further supporting the stability and consistency of the GLFS-25 as a measurement instrument (6, 12).

The significant correlations between the GLFS-25 and the two-step and stand-up tests further support the scale's validity and comprehensive nature (20, 21). These correlations align with those of previous research demonstrating the GLFS-25's relationship with various functional assessments, indicating its ability to capture essential aspects of locomotor function. Inanaga et al. reported a weak correlation between the GLFS-25 and the stand-up test and two-step test. However, the GLFS-25 scores of the participants were lower than expected, and a post-hoc test revealed statistically significant correlations among the three tools (22). Muramoto et al. examined the threshold value in individuals diagnosed with LoS according to GLFS-25 was examined through the use of physical performance tests. The results of the two-step and timed up-and-go tests were statistically significant in individuals with LoS (23).

The moderate strength of these correlations suggests that while the GLFS-25 measures key components of locomotor function assessed by these performance tests, it also evaluates unique constructs not fully captured by these tests. This underscores the GLFS-25's potential as a comprehensive assessment tool that provides a holistic evaluation of overall locomotor abilities rather than relying solely on a limited set of performance-based measures.

The findings of this study revealed a strong negative correlation between GLFS-25 and the two-step test and stand-up tests, a positively moderate correlation with TUG, and a positively strong correlation with five repetitions of sit-to-stand. Although the GLFS-25 is widely employed to assess physical function, literature findings remain limited. A recent systematic review demonstrated its relevance to the TUG test and maximum stride length. The GLFS-25 also showed sensitivity and specificity for LoS categories. Specifically, TUG times of ≥6.7 seconds for males and ≥7.5 seconds for females corresponded to sensitivities of 73%–81% and specificities of 65%–83%. Similarly, maximum stride lengths of ≤119 cm for males and ≤104 cm for females were associated with sensitivities of 65%–71% and specificities of 57%–79% (24).

Seichi stated that the GLFS-25 was developed as a tool for early detection of LoS. Additionally, Kobayashi et al. reported that the total GLFS-25 score might predict recurrent falls during a one-year follow-up study. However, their findings revealed that recurrent falls were correlated primarily with the physical pain and anxiety domains of the GLFS-25 (25). These results suggest that the GLFS-25 alone may not comprehensively capture functional impairment. Therefore, combining the GLFS-25 with a test assessing functional strength, particularly in the lower extremities, could provide more clinically meaningful insights into physical impairment.

The adequate sample size in this study enhances the generalizability of the findings to the older adult population. However, the voluntary recruitment process may have introduced selection bias, potentially affecting the representativeness of the sample. Furthermore, since the study was advertised on social media, individuals who are not digitally literate may have been excluded. Future research should examine the validity and reliability of the GLFS-25 in more diverse samples, including individuals with varying mobility impairments and across different cultural contexts.

Further investigation of the relationship between the GLFS-25 scores and specific aspects of LoS, such as slowness, movement abnormalities, and cognitive difficulties, would enhance the clinical utility of this scale. Longitudinal studies examining the predictive validity of the GLFS-25 for future mobility decline and adverse health outcomes such as falls and loss of independence are warranted.

## CONCLUSION

This study provides strong evidence for the validity and reliability of the Turkish version of the GLFS-25

as a measure of locomotor function in older adults. The scale's comprehensive nature and correlation with established performance tests suggests its potential as a valuable tool for assessing and monitoring mobility in this population. Further research is required to explore the clinical utility and predictive validity of this scale in diverse populations and settings.

**Conflict of interest:** The authors declared that they have no conflict of interest..

**Funding:** This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## REFERENCES

1. Freiberger E, Sieber CC, Kob R. Mobility in older community-dwelling persons: a narrative review. Front Physiol. 2020;11:881. doi:10.3389/fphys.2020.00881.
2. Osoba MY, Rao AK, Agrawal SK, Lalwani AK. Balance and gait in the elderly: A contemporary review. Laryngoscope Investig Otolaryngol. 2019;4(1):143-53. doi:10.1002/lio2.252
3. Nakamura K, Ogata T. Locomotive syndrome: definition and management. Clin Rev Bone Miner Metab. 2016;14:56-67. doi:10.1007/s12018-016-9208-2
4. Ikemoto T, Arai Y-C. Locomotive syndrome: clinical perspectives. Clin Interv Aging. 2018;819-27. doi:10.2147/CIA.S148683
5. Maresova P, Krejcar O, Maskuriy R et al. Challenges and opportunity in mobility among older adults–key determinant identification. BMC Geriatr. 2023;23(1):447. doi:10.1186/s12877-023-04106-7
6. Seichi A, Hoshino Y, Doi T, Akai M, Tobimatsu Y, Iwaya T. Development of a screening tool for risk of locomotive syndrome in the elderly: the 25-question Geriatric Locomotive Function Scale. J Orthop Sci. 2012;17(2):163-72. doi:10.1007/s00776-011-0193-5
7. Kimura A, Takeshita K, Inoue H et al. The 25-question Geriatric Locomotive Function Scale predicts the risk of recurrent falls in postoperative patients with cervical myelopathy. J Orthop Sci. 2018;23(1):185-9. doi:10.1016/j.jos.2017.10.006
8. Maezawa K, Nozawa M, Yuasa T et al. Influence of hip joint dysfunction on motor disorders in Japanese patients with osteoarthritis of the hip: assessment of the JHEQ and GLFS-25 scores and hip muscle strength. Arch Gerontol Geriatr. 2019;82:45-9. doi:10.1016/j.archger.2019.01.017
9. Ide K, Yamato Y, Hasegawa T et al. Prospective nursing care certification using the 25-question Geriatric Locomotive Function Scale. Geriatr Gerontol Int. 2021;21(6):492-7. doi:10.1111/ggi.14169
10. Kobayashi K, Imagama S, Ando K et al. Locomotive syndrome stage 1 predicts significant worsening of future motor performance: the prospective Yakumo study. Biomed Res Int. 2019;2019(1):1970645. doi:10.1155/2019/1970645
11. Tavares DRB, Santos FC. Locomotive syndrome in the elderly: translation, cultural adaptation, and Brazilian validation of the tool 25-Question Geriatric Locomotive Function Scale. Rev Bras Reumatol 2017;57(1):56-63. doi:10.1016/j.rbre.2016.07.015
12. Mahali NS, Hosseini MA, Rahgozar M, Tabrizi KN. Evaluation of cultural adaptation, validity and reliability of the questionnaire of Geriatric Locomotive Function Scale-25 questions. Pharmacophore. 2017;8(0-2017):0-.
13. N. Zhang, R. Zhang, H. Li. Validity and reliability of the Chinese version of geriatric locomotive function scale. Clin J nurs.2016; 51 (6) 747~751, doi:10.3761/j.issn.0254-1769.2016.06.024.
14. Özdamar K. Package programs and statistical data analysis 5th ed. ed. Eskişehir: Kaan Publication; 2004.
15. Ogata T, Muranaga S, Ishibashi H et al. Development of a screening program to assess motor function in the adult population: a cross-sectional observational study. J Orthop Sci. 2015;20:888-95.doi:10.1007/s00776-015-0737-1
16. Podsiadlo D, Richardson S. The timed "Up & Go": a test of basic functional mobility for frail elderly persons. J Am Geriatr Soc. 1991;39(2):142-8. doi:10.1111/j.1532-5415.1991.tb01616.x
17. Seeman TE, Charpentier PA, Berkman LF et al. Predicting changes in physical performance in a high-functioning elderly cohort: MacArthur studies of successful aging. J Gerontol. 1994;49(3):M97-M108. doi: 10.1093/geronj/49.3.M97
18. Andresen EM. Criteria for assessing the tools of disability outcomes research. Arch Phys Med Rehabil. 2000;81:S15-S20. doi: 10.1053/apmr.2000.20619

19. Koo T, Li M. A guideline of selecting and reporting intraclass correlation coefficients for reliability research. J Chiropr Med 15: 155–163. 2016. doi: 10.1016/j.jcm.2016.02.012

20. Ma Y, Wu X, Hong W et al. The relationship between locomotive syndrome and depression in young Chinese college students. Mod Rheumatol. 2024;34(5):1056-61. doi: 10.1093/mr/road103

21. Nishimura A, Ohtsuki M, Kato T et al. Locomotive syndrome testing in young and middle adulthood. Mod Rheumatol. 2020;30(1):178-83. doi:10.1080/14397595.2018.1551176

22. Inanaga S, Hasegawa M, Kosuge M, Ichimura S, Morii T, Hosogane N. Relationship between the 25-question geriatric locomotive function scale and physical function in the elderly people. J Bone Miner Metab. 2023;41(4):550-6. doi:10.1007/s00774-023-01427-w

23. Muramoto A, Imagama S, Ito Z et al. Threshold values of physical performance tests for locomotive syndrome. J Orthop Sci. 2013;18:618-26. doi: 10.1007/s00776-013-0382-5

24. Kobayashi T, Morimoto T, Shimanoe C, Ono R, Otani K, Mawatari M. Clinical characteristics of locomotive syndrome categorised by the 25-question Geriatric Locomotive Function Scale: a systematic review. BMJ open. 2023;13(5):e068645. doi: 10.1136/bmjopen-2022-068645

25. Kobayashi T, Morimoto T, Shumanoe C, Ono R, Otani K, Mawatari M. Relationship Between the 25-Question Geriatric Locomotive Function Scale and Falls: A One-Year Longitudinal Observational Study of 1,173 Healthy Community-Dwelling Residents Aged 65 and Older. Cureus. 2024;16(11):e72907. doi: 10.7759/cureus.72907