Scientific Research Publishing

Open Journal of Therapy and Rehabilitation, 2025, 13(2), 41-53
https://www.scirp.org/journal/ojtr
ISSN Online: 2332-1830
ISSN Print: 2332-1822

Cross-Cultural Adaptation, Validation, and Test-Retest Reliability of the Greek Version of the Victorian Institute of Sport Assessment for Gluteal Tendinopathy Questionnaire (VISA-G)

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How to cite this paper: Karanasios, S., Papadimitriou, T., Barakos, N., Paraskevopoulos, E., Krekoukias, G. and Gioftsos, G. (2025) Cross-Cultural Adaptation, Validation, and Test-Retest Reliability of the Greek Version of the Victorian Institute of Sport Assessment for Gluteal Tendinopathy Questionnaire (VISA-G). *Open Journal of Therapy and Rehabilitation*, **13**, 41-53.
https://doi.org/10.4236/ojtr.2025.132005

Received: March 25, 2025
Accepted: May 9, 2025
Published: May 12, 2025

Abstract

Purpose: The Victorian Institute of Sport Assessment-Gluteal (VISA-G) questionnaire is a widely used outcome measure for patients with Greater trochanteric pain syndrome (GTPS) that is available in different languages. Our purpose was to develop the Greek version of the VISA-G (VISA-G-Gr) and evaluate its psychometric properties including test-retest reliability and validity in a cohort of patients with GTPS. **Methods:** For the translation and cross-cultural adaptation process we followed the best available published guidelines and recommendations. Eighty patients with GTPS completed the VISA-G-Gr on two occasions (2 - 7 days) to evaluate test-retest reliability. In the first visit participants also completed the Greek versions of the Lower Extremity Functional Scale (LEFS) and the Modified Harris Hip Score (m-HHS) to assess convergent validity. **Results:** During translation and cross-cultural adaption, we needed to make some Minor wording adaptations to the questionnaire. The VISA-G-Gr was found to be reliable (intraclass correlation coefficient: 0.96, 95% confidence interval: 0.94 - 0.97) with a small measurement error (standard error of measurement: 3.9%, minimal detectable change: 9.1%). The questionnaire showed a strong correlation with the LEFS (0.81) and m-HHS (0.85). **Conclusions:** The VISA-G-Gr can be used as a reliable and valid patient reported outcome measure to evaluate the functional status of patients with GTPS.

Keywords

VISA-G, Outcome Measure, Greater Trochanteric Pain Syndrome, Reliability, Validity

1. Introduction

Greater trochanteric pain syndrome (GTPS) is a chronic and painful condition of the hip causing significant disability, a substantial decline in quality of life and sleep disturbances [1] [2]. GTPS includes various conditions such as trochanteric bursitis, gluteus medius and minimus tendinopathy or tears, and snapping hip [3] [4]. Patients with the condition describe pain and tenderness over the greater trochanter, as well as in the lower back, buttocks, or lateral thigh, which is aggravated by activity (e.g., walking, climbing stairs) and in a side-lying position [1] [5]. The higher prevalence of GTPS is associated with gender (four times more common in women than in men), middle age (45 - 63 years old), the presence of knee or lower back pain, overweight/obesity, and altered lower limb biomechanics [5] [6]. Although GTPS is reported to have a significant prevalence, accurately diagnosing, and effectively managing the condition remains challenging [1] [3]. This difficulty is attributed to the complex pathophysiology of GTPS, which complicates the effective evaluation of management outcomes. Consequently, using condition-specific patient-reported outcome measurement (PROM) tools when treating patients with GTPS is considered necessary [7] [8]. Traditional assessment tools often fail to capture the multifactorial nature of GTPS and may not reflect the patient's experiences accurately, leading to ineffective treatment plans.

Fearon *et al*. (2015) introduced the Victorian Institute of Sport Assessment-Gluteal (VISA-G) questionnaire following the established structure of other VISA questionnaires that are considered valid for assessing lower limb tendinopathies [9]. Previous tools often lacked the comprehensive psychometric properties necessary for reliable outcome measurement; however, the VISA-G demonstrates excellent test-retest reliability, high internal consistency, and good responsiveness, which makes it a critical resource in both clinical and research settings. The VISA-G consists of eight questions, with a maximum score of 100 points, and has been designed to measure the severity of disability in patients with GTPS [9]. The VISA-G has presented excellent test-retest reliability (intraclass correlation co-efficiency [ICC]: 0.827), high internal consistency (Cronbach's Alpha: 0.809), acceptable validity and good responsiveness in GTPS-associated disability [9] [10]. Access to validated questionnaires is crucial for comparing populations with the same condition across different languages and cultures, as well as for facilitating comparative international research, provided that the translated versions are equivalent. Considering the clinical importance of the appropriate management of GTPS, the VISA-G has been culturally adapted into different languages, showing psychometric properties similar to those of the original version [11].

To the best of our knowledge, there is currently no Greek version of the VISA-G available. Thus, the present study aimed to translate and cross-culturally adapt the VISA-G questionnaire (VISA-G-GR) and to test the psychometric properties of reliability and validity in a cohort of Greek-speaking patients with GTPS-related disability.

2. Methodology

2.1. Cross-cultural Adaptation

Before starting the study, permission was obtained from the VISA-G developer (Dr. Angie Fearon). For the translation and cross-cultural adaptation of the current PROM, we adhered to the best practice guidelines [12]-[14].

Two bilingual translators—one with a medical background and the other unfamiliar with the questionnaire—who both spoke Greek as their native language created two independent translations of the VISA-G. Then, a research committee, composed of the two translators and the research investigators, synthesized the forward translations into a single version through a consensus process.

Next, two back translations were produced by two different translators (native English speakers and fluent in Greek) who were blind to the concepts being assessed. Forward and back translations were reviewed by the research committee via a consensus procedure to develop the pre-final Greek version of the VISA-G. Throughout this process, the committee evaluated the comparability of the language and the similarity of interpretations [15] [16].

The pre-final Greek version of the VISA-G was administered to a sample of twelve Greek-speaking individuals with GTPS of different educational levels and diverse activity backgrounds for content validity evaluation (comprehensibility, relevance, and comprehensiveness). Participants were interviewed to evaluate the content validity of the PROM using face-to-face interviews with the respondents to assess the comprehensibility of each item, the clarity of the instructions and response options, and the relevance of the questionnaire to their condition. Following the interpenetration of the findings from the previous process, the research committee produced the final Greek version of the VISA-G (VISA-G-Gr).

2.2. Participants and Procedures

A convenient sample of patients with GTPS was recruited from a physiotherapy clinic in Athens, Greece from April 2024 to September 2024. An orthopaedic consultant assessed all the patients for their eligibility and the diagnosis of GTPS was based on the following criteria: lateral hip pain aggravated with activity and affected side-lying position; single leg standing >30 seconds; and resisted lateral rotation in 90˚ hip flexion [17] [18]. Participants of both sexes, >18 years old and fluent in the Greek language were included. Exclusion criteria were inability to read Greek; neurological diseases; systemic inflammatory diseases; psychiatric diseases; lumbar spine nerve root signs; and inability to read Greek. Also, an asymptomatic group of 24 individuals with no signs or symptoms of GTPS was included

for known group validity evaluation of the VISA-G-Gr. All the participants signed an informed consent form. Ethical approval was provided by the University of West Attica Ethics Committee (ID: 35360/24-04-2024).

The participants' demographic characteristics such as age, sex, height, weight, symptom duration, and painful side were documented during the initial visit. To assess convergent validity, patients filled out the VISA-G-Gr along with the Greek versions of the Lower Extremity Functional Scale (LEFS) and the Modified Harris Hip Score (m-HHS). To determine test-retest reliability, the VISA-G-Gr was administered twice within a 2 to 7-day interval after the initial visit. All questionnaires were completed in a quiet room without any assistance or feedback.

2.3. Instruments

The VISA-G questionnaire consists of eight questions regarding the intensity of hip pain and its impact on daily activities. The first question relates to the intensity of hip pain on a scale from 0 to 10, where 0 indicates no pain and 10 represents the most severe pain. Questions 2 to 7 focus on the limitations related to hip mobility during everyday activities, with participants selecting one of five options that best reflect their symptoms. The final question relates to how current hip pain affects their ability to perform weight-bearing activities such as walking, running, squatting, and shopping. The total VISA-G score is computed by summing the responses to all eight questions, ranging from 0 (maximum disability) to 100 (no disability) [9].

The m-HHS has been designed to evaluate patient's self-reported levels of pain and functional ability concerning their hip joint [19]. It consists of two main domains: one that evaluates the severity of hip pain experienced by the patient during various activities (44 points) and one that focuses on the patient's ability to perform daily activities and assess the functional aspects of the hip (47 points) such as the capacity to walk, climb stairs, and engage in other physical activities, with or without the use of walking aids or support. As a result, the overall score ranges from 0 (indicating the worst condition) to 91 (indicating the best condition). The Greek version of m-HHS has shown moderate to excellent reliability, moderate to strong validity properties and excellent responsiveness in patients with hip joint-related problems [20].

The LEFS is a region-specific outcome measure to evaluate a wide range of lower-extremity musculoskeletal conditions [21]. It consists of 20 items, each rated on a five-point scale: 0 for extreme difficulty or unable to perform the activity; 1 for considerable difficulty; 2 for moderate difficulty; 3 for slight difficulty; and 4 for no difficulty. The total score ranges from 0 to 80 points, with higher scores reflecting better function. The scale has demonstrated acceptable reliability and construct validity, along with greater responsiveness compared to the Short Form-36 in patients with various lower-extremity injuries or conditions [22]. Both the LEFS and m-HHS have been validated across diverse populations and have demonstrated sensitivity to change, which is crucial for evaluating the effectiveness of interventions. By utilizing these benchmarks, we aimed to ground our results in established,

clinically relevant measures that resonate with the experiences of patients with GTPS, thus enhancing the robustness of our findings and their applicability in clinical practice.

2.4. Statistical Analysis

According to a sample size calculation (ICC > 0.85; statistical significance $p < 0.05$), a minimum of 80 participants was considered adequate for the study aims. The normal distribution of the data was assessed using the Shapiro-Wilk test and Q-Q plots. Descriptive statistics were used for the demographic characteristics of participants and the outcome measures.

Seven bilingual physiotherapy researchers and 12 patients with GTPS evaluated the comparability of language and similarity of interpretability. We analyzed the content validity index (CVI) by calculating the items rated > 3 divided by the number of experts. We assumed that Item-CVI > 0.83 and scale-CVI > 0.80 corresponded to acceptable values [23].

To assess construct validity, we hypothesized that the asymptomatic group would score differently on the VISA-G compared to the patients. We anticipated that the healthy group would have statistically higher scores than the patient group. A t-test was performed to determine the differences between the groups (patients with upper limb musculoskeletal disorders and healthy individuals).

Pearson's correlation coefficient (r) was used to evaluate convergent validity between the VISA-G-Gr at baseline and the Greek versions of the LEFS and m-HHS. Values for Pearson's correlation coefficient of ≥ 0.70, between 0.51 and 0.70, and ≤ 0.50 were interpreted as high, moderate, and low, respectively [24]. We hypothesized a strong correlation among the PROMs.

The internal consistency of the VISA-G-Gr was assessed using Cronbach's α, with values between 0.70 and 0.95 indicating high internal consistency. The ICC with a two-way random model for absolute agreement and 95% confidence intervals (CI) was employed to determine test-retest reliability. ICC values above 0.75 were regarded as excellent, between 0.4 and 0.75 as fair, and below 0.4 as poor [25]. To calculate absolute reliability, we determined the standard error of measurement (SEM) [SEM = SD × √ (1-test-retest reliability coefficient)] and minimal detectable change [$MDC_{95} = 1.96 \times \sqrt{2} \times SEM$].

We recorded the time needed to complete the VISA-G-GR and assessed the floor and ceiling effects of the PROM. The floor and ceiling effects were considered present if more than 15% of participants achieved the lowest (0) or highest (100) possible scores, respectively.

Data analysis was conducted using IBM SPSS Statistics (Version 25.0, Armonk, NY: IBM Corp.).

3. Results

3.1. Translation and Cross-Cultural Adaptation

Three linguistic discrepancies were noted during forward and backward translation,

and cultural-linguistic adaptations were required. The word "slope" (question 4), and the phrases "Work about the house or garden" (question 6) and "I do not undertake any extra activity on my legs" (question 8) needed modifications to enhance comprehensiveness until final consensus was reached from the research committee. Twelve volunteers with GTPS (nine women and three men), with a mean age of 52.4 years (range 49 to 58 years) were interviewed resulting in no issues regarding comprehensibility, comprehensiveness, and relevance of the items/responses of the VISA-G-Gr. The VISA-G-GR is available in Supplementary Material Appendix 1.

3.2. Participants

A total of 80 patients (48 women and 32 men) with a mean age (±SD) of 52.5 (±19.7) years were included in the study. The participants' demographic characteristics are shown in Table 1**.** The responders required 8 to 10 minutes to complete the questionnaire.

Table 1. Demographic and clinical characteristics of participants.

Characteristic	Mean ±SD (range) or No (percentage)			
	Symptomatic (N = 80)		Asymptomatic (N = 24)	
Age (years)	52.5 ±19.7 (18-91)		46.75 ±14.9 (18-77)	
Sex	Men	Women	Men	Women
	28 (35%)	52 (65%)	14 (58.3%)	10 (41.7%)
Dominant Side	Right	Left	Right	Left
	54 (67.5%)	26 (32.5%)	18 (75%)	6 (25%)
Affected Side	Right	Left		
	41 (51.2%)	39 (48.8%)		
Height (cm)	171.8 ± 8.4 (152-193)		169 ± 9.2 (150-193)	
Weight (kg)	79.3 ± 17.5 (50-145)		69.7 ± 14.55 (47-110)	
VISA-G-Gr (%)	43.4 ± 19.6		95.5 ± 2.8	
LEFS (%)	37.1 ± 17.8			
m-HHS (%)	57 ± 24.9			

Abbreviations: VISA-G-GR, Victorian Institute of Sports Assessments for gluteal tendinopathy questionnaire Greek; LEFS, lower extremity functional scale; m-HHS, Modified Harris Hip Score; SD, standard deviation; N, sample; kg, kilograms; cm, centimeters.

3.3. Validity

Item-CVI was found to be between 0.92 and 1.00, the scale-CVI/universal agreement was 0.92, and the scale-CVI/average was 0.98. Known group validity analysis showed that patients with GTPS (mean score ±SD: 43.4 ± 19.6) scored significantly lower ($p < 0.001$) than the healthy individuals (mean score ±SD: 98.9 ± 2.1).

VIS-G-Gr showed a strong correlation with the LEFS ($r = 0.81$; $p < 0.001$) (Table 2). A strong correlation was found between the VISA-G-Gr and m-HHS ($r = 0.85$, $p < 0.001$) (Table 2). No ceiling and floor effects were identified.

Table 2. Test-rest reliability, internal consistency, and convergent validity of the VISA-G-Gr. (N = 80)

	Cronbach's α	ICC (95%CI)	SEM%	MDC90%	Pearson Correlation (LEFS)	Pearson correlation (m-HHS)
VISA-G-Gr	0.73	0.96 (0.94 to 0.97)	3.9	9.14	0.81	0.85

Abbreviations: VISA-G-GR, Victorian Institute of Sports Assessments for gluteal tendinopathy questionnaire Greek; LEFS, lower extremity functional scale; m-HHS, Modified Harris Hip Score; ICC, intraclass correlation coefficient; SEM, standard error of measurement; MDC, minimal detectable change; CI, confidence interval; N, sample size.

3.4. Reliability

Eighty patients with GTPS were included in the reliability analysis suggesting an excellent test-retest reliability (ICC = 0.96, 95%CI = 0.94 to 0.97) and a high internal consistency of the questionnaire (Cronbach's alpha = 0.73). The ICC for each item ranged from 0.69 to 0.83 (Table 3). The SEM and MDC90 were 3.9 and 9.14, respectively (Table 2). The measurement properties of the available translated VISA-G versions are illustrated in Table 4.

Table 3. Results of the relative reliability reported in $ICC_{2.1}$.

Item	$ICC_{2.1}$
1	0.750
2	0.745
3	0.835
4	0.772
5	0.725
6	0.827
7	0.691
8	0.816

Abbreviations: ICC, intraclass correlation coefficients.

Table 4. Measurement properties of the translated VISA-G versions.

Version	Reproducibility (ICC)	Internal consistency (Cronbach's alpha)	Measurement Error (%)	Responsiveness	Convergent validity	Ceiling and floor effects
Brazilian-Portuguese [26] (N = 68)	0.91	0.65	SEM: 4.2, MDC: 11.6	ES: 0.19	−0.77 (ODI)	0
Danish [27] (N = 49)	0.96	0.98	SEM: 0.6, MDC: 3.17	-	-	0
Dutch [28] (N = 48)	0.87	0.96	SEM: 2.3, MDC: 3.5	-	0.88 (HHS), 0.90 (HOOS), 0.84 (OHS), 0.89 (NAHS)	
French [29] (N = 52)	0.99	0.81	SEM: 1.64, MDC: 4.55	-	0.55-0.77 (SF-36)	0
Italian [30] (N = 38)	0.91	0.79	SEM: 4.1, MDC: 11.4	-	−0.80 (ODI)	0

Continued

Norweg ian [11] (N = 78)	0.85	0.77	SEM: 6.6, MDC: 18.4	-	>−0.50 (NPRS), −0.70 (ODI), 0.64 (m-HHS)	0
Slovenian [31] (N = 59)	0.97	0.98	SEM: 2.4, MDC: 6.9	-	0.48 (HHS)	0
Turkish [32] (N = 108)	0.94	0.94	SEM: 4.8, MDC:11.3	-	0.69 (HHS), −0.65 (ODI), 0.67 (OHS), 0.44 (IPAQ)	0
English [9] (N = 52)	0.82	0.81	SEM: 1.8, MDC: 4.2	ES:1.48, SRM: 1.28	0.02 (HHS), 0.2 (ODI)	0
Greek (N = 80)	0.96	0.73	SEM: 3.9, MDC: 9.1	-	0.81 (LEFS), 0.85 (m-HHS)	0

Abbreviations: ICC, intraclass correlation coefficient; ODI, Oswestry Disability Index; GPE, Global Perceived Effect; PSFS, Patient-Specific Functional Scale; m-HHS, modified Harris Hip Scale; LEFS, lower extremity functional scale; SEM, standard error of measurement; MDC, minimal detectable change; NPRS, Numerical Pain Rating Scale; HOOS, Hip Disability and Osteoarthritis Outcome Score; OHS, Oxford Hip Score; NAHS, Nonarthritic Hip Score; IPAQ, International Physical Activity Questionnaire; ES. Effect size; SRM, standardized response means.

4. Discussion

Our study findings indicate that the VISA-G was effectively translated and culturally adapted into Greek. The psychometric characteristics of the questionnaire were consistent with those of other translated versions **(Table 4).** The VISA-G-Gr exhibited acceptable face and content validity, along with a significant correlation when compared to the LEFS and m-HHS. Also, the questionnaire demonstrated excellent test-retest reliability and an acceptable level of measurement error.

For the translation and adaptation process, we followed a thorough approach, incorporating a combined methodology based on established guidelines [12] [33]-[35]. Although some linguistic discrepancies were identified in questions 4, 6 and 8, the research committee appropriately resolved these. Comparable inconsistencies were reported in the Norwegian (question 8) and Danish versions (questions 1, 2 and 4) which similarly employed a systematic method to address semantic, idiomatic, experiential, and conceptual equivalents between the original and the translated versions [27] [28].

To the best of our knowledge, our study represents the second largest investigation into construct validity and reliability, with a sample size of 80 patients diagnosed with GTPS, following the Turkish translation study, which involved 108 participants [32]. The mean score for the VISA-G-Gr was comparable to the scores reported for the English and Slovenian versions, ranging from 35.5% to 47% [9] [31]. However, these scores notably differed from those of the Turkish, Italian, and Norwegian versions that ranged from 50% to 60% [11] [30] [32]. Such discrepancies may be attributed to the different study settings considering that the present study was conducted in a private physiotherapy clinic in contrast to a hospital-based specialist care environment used in other reports.

For the assessment of convergent validity, other versions of the VISA-G have used the Oswestry Disability Index as a reference standard. This is designed to measure pain-related disability in individuals with low back pain [11] [26] [30] [32]. Although gluteal tendinopathy and non-specific low back pain may overlap in terms of pain-related disability, there was significant diversity among the study results, with correlations ranging between 0.20 and 0.80 [11] [26] [30] [32]. For this reason, we decided to use two different instruments as reference patient-reported outcome measures, including a joint-specific questionnaire (the m-HHP) and a region-specific questionnaire (the LEFS). The correlation results for the m-HHP were consistent with previous reports (0.64 - 0.88), confirming the strong association between the VISA-G and this questionnaire [11] [28] [31] [32]. Notably, our study was the first to provide evidence of a strong correlation between the VISA-G and the LEFS, which includes a wide range of functional impairments of the lower extremities.

The relative and absolute reliability of the VISA-G-Gr were among the highest compared to what has been previously reported in studies on VISA-G. The test-retest reliability of the available translated versions is excellent, with values ranging between 0.82 and 0.99 (**Table 3**). However, the observed variation in ICC values can be attributed to methodological differences between the studies, such as the time interval between administrations (2 - 45 days) and the type of data collection (paper versus phone), which might have influenced participants' responses. Although we found a high test-retest reliability (ICC = 0.96), the $MDC_{90\%}$ was 9.1 points, suggesting a relatively high measurement error for the VISA-G-Gr with a low sensitivity to change. The high measurement error was similar to that of some previous studies, including the Brazilian-Portuguese, Norwegian, and Turkish versions and was possibly due to the increased standard deviation of the mean score [11] [26] [32].

Limitations and Future Research

Although we used a short time interval (2 - 7 days) between administrations to ensure the stability of patients' conditions [36], this brief period may have significantly increased the risk of recall bias in our study. The generalizability of our findings should be considered with caution, as the diagnosis of GTPS patients can include a wide variety of symptoms and manifestations. Additionally, our study did not include the evaluation of responsiveness, which is a critical psychometric property that measures the ability of a questionnaire to detect clinically important changes over time [34]. Future research investigating the responsiveness of the VISA-G-Gr is necessary for the effective utilization of the instrument in clinical practice.

5. Conclusion

The Greek version of the VISA-G presented a strong correlation with well-established and validated outcome measures, such as the m-HHS and LEFS question-

naires. Additionally, our findings suggested high internal consistency and excellent test-retest reliability. The VISA-G-Gr can be recommended as a standard outcome measure for Greek-speaking patients diagnosed with VISA-G. Further evaluation of the responsiveness of the questionnaire is necessary.

Funding

This study was Funded by the Special Account for Research Grants of the University of West Attica.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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