Taylor & Francis
Taylor & Francis Group

Journal of Manual & Manipulative Therapy

ISSN: 1066-9817 (Print) 2042-6186 (Online) Journal homepage: www.tandfonline.com/journals/yjmt20

Reproducibility of a modified posterior talar glide test in ankle sprain conditions: a cross-sectional analysis on chronic ankle instability, copers, and healthy controls

Anh Phong Nguyen, Hugo Bogaerts, Chloé Galerne & François Fourchet

To cite this article: Anh Phong Nguyen, Hugo Bogaerts, Chloé Galerne & François Fourchet (09 Jul 2025): Reproducibility of a modified posterior talar glide test in ankle sprain conditions: a cross-sectional analysis on chronic ankle instability, copers, and healthy controls, Journal of Manual & Manipulative Therapy, DOI: 10.1080/10669817.2025.2531927

To link to this article: https://doi.org/10.1080/10669817.2025.2531927

Published online: 09 Jul 2025.

JOURNAL OF MANUAL & MANIPULATIVE THERAPY
https://doi.org/10.1080/10669817.2025.2531927

Reproducibility of a modified posterior talar glide test in ankle sprain conditions: a cross-sectional analysis on chronic ankle instability, copers, and healthy controls

Anh Phong Nguyen [a,b], Hugo Bogaerts [a,b], Chloé Galerne [b] and François Fourchet [c]

[a]Institut de Recherche Expérimentale et Clinique, Neuromusculoskeletal Lab, Université Catholique de Louvain, Bruxelles, Belgique; [b]Faculté des Sciences de la Motricité, Université Catholique de Louvain, Louvain La Neuve, Belgique; [c]Département de Physiothérapie, Hôpital de La Tour, Meyrin/Genève, Suisse

ABSTRACT

Background: The posterior talar glide test (PTGT) is recommended for ankle sprain assessment, but it has limited scientific support. Therefore, the aims of this study were to assess the reproducibility of PTGT in two conditions: 1) the clinical experience of the clinician and 2) in a modified setting using a referential horizontal plane in three clinical conditions (chronic ankle instability (CAI), copers, and healthy controls).

Methods: Twenty-eight participants were recruited. PTGT measurements were performed using two raters, i.e., novice and experienced, and performed twice with and without the referential horizontal plane with each rater on each ankle. Intraclass correlation coefficient (ICC), standard error of measurement (SEM), and minimal detectable change (MDC) were calculated.

Results: PTGT reported excellent intra-rater reliability for both novice (ICC = 0.97, SEM = 2.2°, MDC = 4.1°) and experienced rater (ICC = 0.94, SEM = 2.4°, MDC = 4.3°). Modified PTGT provided excellent intra-rater reliability for both experienced (ICC = 0.96, SEM = 1.4°, MDC = 3.3°) and novice rater (ICC = 0.96, SEM = 2.3°, MDC = 4.2°). Inter-rater reliability increases along with the addition of the referential horizontal plane, being poor to good for PTGT (ICC = 0.64, SEM = 2.8°, MDC = 4.7°), whereas moderate to good for modified PTGT (ICC = 0.78, SEM = 2.3°, MDC = 4.2°).

Conclusion: The PTGT appears reproducible enough to be used in a clinical setting. Its modified version, i.e., with a referential horizontal plane, offers a greater inter-rater reliability, making it a better option for research purposes.

ARTICLE HISTORY
Received 3 December 2024
Accepted 5 July 2025

KEYWORDS
Rehabilitation; testing; assessment; musculoskeletal; physiotherapy

Introduction

Lateral ankle sprains (LAS) are among the most common musculoskeletal injuries, with a high incidence and recurrence rate among physically active individuals [1]. In 2017, a modified Delphi study was carried out to offer guidance to medical professionals regarding the assessment of acute LAS [2]. To individualize the treatment for each patient and prevent chronic ankle instability (CAI), these guidelines, also referred to as the 'Rehabilitation Oriented ASsessmenT' or 'ROAST,' encourage healthcare professionals to objectively detect mechanical, sensory, and functional impairments following an ankle sprain [2]. According to Hertel and Corbett [1], CAI is characterized by a recurrent or continuous sensation of instability or giving way in the ankle joint, a tendency for recurrent ankle sprains and persistent symptoms like pain, swelling, decreased range of motion and weakness that maintain for a full year following an initial LAS incident. It is also worth noting that as many as 70% of ankle sprains could turn to CAI, potentially leading to osteoarthrosis and definitive impaired ankle function [3].

A potential anteriorization of the talus may be one of the causes of CAI. This could lead to arthrokinematic impairments at the talocrural joint [4]. This may consequently impair functional activities of daily living or result in persistent arthrokinematic restrictions, even if active dorsiflexion range of motion is normalized [5,6]. In the PTGT, the clinician maintains the patient's foot parallel to the ground while applying a horizontal antero-posterior force on the talus, with maximal tibial inclination indicating the degree of joint glide and restriction of ankle arthrokinematics [5].

Only four studies evaluated the PTGT's reliability over the last 20 years. Three studies evaluated its intra-rater reliability, although as a secondary rather than primary objective. With intraclass coefficient correlation (ICC) values ranging from 0.77 to 0.99, the PTGT demonstrated a good to excellent intra-rater reliability [5–7]. Smith et al. [8] carried out an investigation with the primary aim of evaluating the PTGT's reliability. With ICC values ranging from −0.31 to 0.60 for intra-rater reliability and from 0.46 to 0.81 for interrater reliability, they reported lower intra-rater reliability

CONTACT Hugo Bogaerts hugo.bogaerts.kine@gmail.com Institut de Recherche Expérimentale Et Clinique, Neuromusculoskeletal Lab, Université Catholique de Louvain, Avenue Mounier 53 (NMSK), Woluwe Saint Lambert, Brussels 1200, Belgium

scores than those mentioned in the previous studies. The authors stated that the PTGT might rely too much on a subjective end feel of the maneuver, making it subject to different factors, such as experience of the rater, manual skills, as well as the population of interest.

Copers, individuals who have experienced a LAS yet achieved complete recovery, offer a distinctive comparison group for exploring the posterior talar glide range of motion in both favorable and adverse clinical outcomes related to LAS [1,9]. Therefore, the present investigation had three objectives. The primary aim was to assess the PTGT's intra- and inter-rater reliability when delivered by one experienced and one novice clinician. Second, we experimented the PTGT in two conditions, i.e., a regular PTGT and a modified PTGT, performed with a referential horizontal plane to standardize the end feel. Finally, we compared the PTGT measurement into three clinical conditions related to ankle status, including healthy individuals, copers, and patients suffering from CAI.

Methods

Study design

This reproducibility study was carried out in a population of volunteers who were recruited within university facilities. The study was approved by the local ethics committee (CEHF nºB403201523492), and all participants provided written informed consent. Participant data were anonymized by assigning a unique identification number, and all electronic data were stored on a secure, password-protected server.

Population

A convenience sample of 28 participants was recruited [13 women; Mean (Standard deviation) age 28 (8); mean height: 173,9 (8.1) cm; mean body weight: 69.5 (11) kg]. To be included in the experiment, participants had to be aged from 18 to 65 years and reporting no history of joint dislocation or injury of the lower limbs except for a LAS, no history of surgery to the lower limbs or lower back, no history of hip pain or rheumatoid arthritis, no neurological or degenerative diseases and not be pregnant. Participants were excluded from the recruitment process if they were under any medication, if they reported any history of musculoskeletal, traumatic, or neurological disorders apart from LAS, or underwent any form of orthopedic surgery.

Participants were divided into three groups: healthy ($n = 6$, 3 women, no ankle injury history), copers ($n = 14$, 6 women, history of LAS requiring immobilization or non-weight bearing for ≥3 days, no episodes of giving-way or instability for ≥12 months, Cumberland Ankle Instability Tool score > 23) [10], and CAI ($n = 8$, 4 women, history of ≥ 1 ankle sprain with pain/swelling, ≥1 interrupted day of physical activity, initial sprain within the last year, ≥2 episodes of giving-way in the last 6 months, Cumberland Ankle Instability Tool score ≤ 23) [11]. The sample size ($n = 28$) was deemed sufficient for assessing reproducibility via ICC, despite no a priori calculation. Based on prior studies expecting ICC > 0.90 [5–8], 28 participants (56 ankles) with two raters provided adequate power. A clinically meaningful ICC difference was set at 0.10 [12]. Post-hoc power analysis for the observed intra-rater ICC (0.935, lowest among raters) yielded > 0.80 power at $\alpha = 0.05$, confirming sufficiency for detecting excellent reliability (ICC 0.935–0.968 intra-rater; 0.639–0.777 inter-rater).

Procedure

There were three raters for the testing session. Raters A and B were blinded to all measurements and were responsible for carrying out the PTGT. With 8 years of clinical experience as an orthopedic manual therapist and sport physiotherapist, rater A was regarded as an experienced healthcare professional. With less than 1000 h of clinical experience and being in the final year of his physiotherapy curriculum, rater B was regarded as a novice clinician. The third rater (C) supervised the collection and reporting of all the data. Throughout the procedure, the raters were not permitted to speak with one another to prevent bias when conducting the PTGT.Rater C recorded participants' age, height, weight, physical activity level, and occupation. Ankle dorsiflexion range of motion was measured using the weight-bearing lunge test (WBLT) [13]. During the PTGT procedure and to prevent any movement of the knee, the participant was seated on an examination table with the legs hanging off the edge. Using an elastic band, an iPhone 11 (Apple Inc., Cupertino, United States of America) was placed on each anterior tibial crest (Figure 1). The upper end of the telephone was placed 2 cm below the anterior tibial tuberosity. A smartphone app called Clinometer® having excellent reliability [14] was used to measure the angle of inclination (App Store, © 2020 Phoenix Solutions, Vietnam). Then, one of the rates, i.e., A or B, performed the PTGT on one of the participant's ankles. The rater started by placing the ankle in a neutral subtalar position, placing the fifth metatarsal of the foot parallel to the ground and the anterior crest of the tibia in the vertical plane, perpendicular to the ground. The rater induced a glide movement on the talus by applying a gentle anteroposterior pressure on the anterior face of the talus, leading to the displacement of the talocrural and knee joints into a flexed position. The rater stopped the test when a firm end feel was felt in the

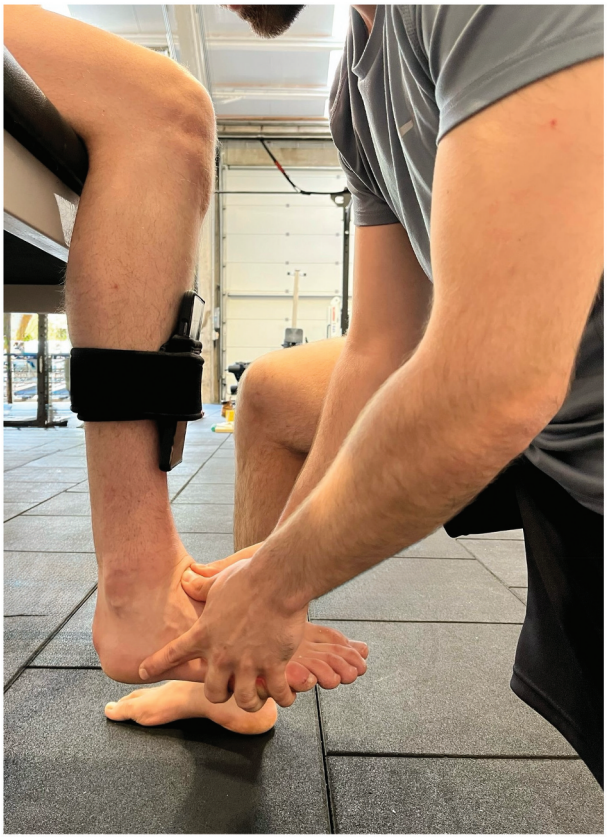

Figure 1. Posterior talar glide test.

Figure 2. Modified posterior talar glide test with box.

talocrural joint while keeping the foot parallel to the ground. At the end feel, the rater informed rater C to record the angle of inclination of the tibia.

The modified PTGT aimed to objectify the end of range assessment. Prior to starting the box test, the rater positioned the heel half a centimeter above the box and checked that the foot's fifth metatarsal was parallel to the box's upper surface. The test was then carried out as previously mentioned, but he made sure the fifth metatarsal remained parallel to the upper surface of the box (Figure 2).

The third rater (C) was the only one who could see the measure being streamed on an iPad Pro screen, while the rater conducting the PTGT was unable to see the screen of the phone. Each rater performed a total of four PTGT on each ankle – twice with the box as a guide and twice without. The order of testing was randomized with a sealed envelope. There was a minute of rest between each PTGT.

Statistical analysis

All statistical analyses were carried out using MedCalc® Statistical Software version 20.110 (MedCalc Software Ltd, Ostend, Belgium). The normality of the data was analyzed with the Shapiro-Wilk test. Descriptive data were compared between groups with a One-Way ANOVA. A Tukey post hoc analysis was performed if needed.

For the first aim of the present study, an intraclass correlation coefficient (ICC) was used to estimate intra-rater reliability (ICC 2,1) and inter-rater reliability (ICC 3,k) of PTGT for experienced and novice rater in the two conditions, i.e., PTGT and modified PTGT. ICC values of less than 0.5 indicate poor reliability, values between 0.5 and 0.75 indicate moderate reliability, values between 0.75 and 0.90 indicate good reliability and values over 0.90 indicates an excellent reliability [12]. A moderate reliability was considered enough for the test to be implemented in a clinical setting. Standard error of measurement (SEM) was calculated from the equation $SEM = SD*\sqrt{(1\text{-}ICC)}$ (SD = standard deviation). The minimum detectable change (MDC) was calculated from the equation $MDC = 1.96*\sqrt{2}\ SEM$ [15]. For completing the analysis, the raw data of PTGT and modified PTGT measurements were compared for each group between clinical experiences, i.e., experienced and novice clinician and PTGT conditions, i.e., with or without the reference plane. To this end, a two-way (rater × group) ANOVA was used. Bonferroni post hoc analysis was performed if needed. Finally, a one-way ANOVA compared PTGT measurements among groups, with Tukey post-hoc analysis performed if needed. Significance was set at $\alpha = 0.05$. Significance level was set at alpha = 0.05.

Results

Among the 28 participants (56 ankles assessed), 6 were in the healthy group, 14 in the coper group, and 8 in

Table 1. Descriptive data of all three clinical conditions.

	CAI ($n = 8$)		Copers ($n = 14$)		Healthy ($n = 6$)		pvalue
Age (years)	28.8	(10.1)	28.7	(9.6)	27.1	(4.6)	0.597
Height (cm)	170.68	(5.07)	175.57	(8.82)	174	(9.44)	0.375
Weight (kg)	63	(7.15)	73.64	(11.81)	68.5	(10.15)	0.433
CAIT left (/30)	22.2*	(4.23)	28.5	(1.91)	28.8	(0.98)	<0.001
CAIT right (/30)	19.1*	(4.45)	27.7	(2.09)	28.3	(1.51)	<0.001

Data are presented in mean (standard deviation). Comparison between clinical group was performed using One Way ANOVA (post hoc analysis = Tukey). *Indicated significant difference compared to healthy group. Abbreviations: CAI = Chronic ankle Instability, CAIT = Cumberland Ankle Instability Tool.

Table 2. Reproducibility of PTGT measurements.

			ICC	95%CI	SEM (°)	MDC (°)	Reliability
Posterior Talar Glide test	Intra-rater (2,1)	Novice	0.968	0.946 to 0.982	2.2	4.1	excellent
		Experienced	0.935	0.886 to 0.963	2.4	4.3	excellent
	Inter-rater (3,k)		0.639	0.469 to 0.754	2.8	4.7	good
Modified	**Intra-rater (2,1)**	**Novice**	0.959	0.929 to 0.976	2.3	4.2	excellent
Posterior Talar Glide test		**Experienced**	0.964	0.937 to 0.979	1.4	3.3	excellent
	Inter-rater (3,k)		0.777	0.662 to 0.851	2.3	4.2	good

Posterior Talar Glide test: performed without the box, Modified Posterior Talar Glide test: performed with the box. ICC= Intraclass coefficient correlation, CI= confidence interval, SEM= Standard Error of Measurement, MDC= Minimal Detectable Change. ICC classification followed the Shrout & Fleiss convention.

the CAI group. Descriptive statistics for the measurements of PTGT on each clinical group are presented in Table 1.

Excellent intra-rater reliability for both experienced and novice rater was found with an ICC ranging from 0.930 to 0.980. In contrast, the inter-rater reliability was somewhat lower across both tests, particularly for the PTGT. Inter-rater reliability ranged from 0.662 to 0.852 (moderate). Modified PTGT provided better reproducibility outcome than PTGT with a difference in SEM of 1° for both raters between conditions. The MDC was lower for experienced rater in the modified PTGT (3.3°) and similar for all other conditions (Table 2).

Concerning the condition of the PTGT, the two-way ANOVA reported no statistical differences between condition (PTGT or modified PTGT, difference = 0.877°, standard error = 0.469°, *p*value = 0.062), raters (novice or experienced, difference = 0.622°, standard error = 0.469°, *p*value = 0.185) nor interaction (Table 3). One way ANOVA reported lower PTGT measurement in coper (mean: 13.84°) compared to CAI group (mean: 17.14°) and Healthy individuals (mean: 17.39) (Table 4).

Discussion

To the best of our knowledge, this is the first investigation to address the lack of knowledge concerning the impact of clinical experience as well as the usefulness of a better standardization for the PTGT. Based on our results, clinical experience did not influence the reliability nor the reproducibility of the PTGT. However, modified PTGT demonstrated better reproducibility measures, especially for the experienced clinician and between raters.

Previous investigations demonstrated similar intra-rater reliability levels for PTGT, with ICC 95% CI values ranging from 0.77 to 0.99 [5–8]. Smith et al. [8] reported an inter-rater consistency assessment revealing an ICC with a 95% CI ranging from −0.29 to 0.92. The differences in reliability that were observed may be attributed to

Table 3. Two-way ANOVA of PTGT measurement (in degree) between conditions and raters.

	Condition				
	Modified PTGT		PTGT		
Rater	**Experienced**	14.38 (3.99)	**Experienced**	15.82 (3.86)	
	Novice	15.68 (5.73)	**Novice**	15.86 (5.41)	
Pairwise comparisons					**Pvalue**
difference between conditions (°)			−0.877		0.062
difference between raters (°)			−0.622		0.185
Interaction					0.213

Data are mean (standard deviation) for 28 participants (56 ankles). PTGT= Posterior Talar Glide Test.

Table 4. Posterior talar glide test measure between clinical conditions.

	CAI		Copers		Healthy		Pvalue
PTGT (°)	17.14	(5.08)	13.84	(4.31)*	17.39	(4.42)	< 0.001

Data are mean (standard deviation) of PTGT measurements averaged across two raters for each ankle. Comparison between clinical group was performed using One Way ANOVA (post hoc analysis = Tukey). *Indicated significant difference compared to healthy group. Abbreviations: CAI = chronic ankle instability, CAIT = Cumberland Ankle Instability Tool.

discrepancies in the statistical models used to assess PTGT reliability. The initial three studies employed ICC (3,1) and (3,3) models, which align with the (3,2) model used in this research, while the fourth study employed the ICC (2,3). Indeed, the controlled conditions and the small samples in which our study aim to analyze reproducibility (i.e., 8 CAIs, 14 copers and 6 controls) aligns well with mixed-effects models (i.e., ICC (3, k)) because those accurately reflects the reliability of PTGT under those subgroups conditions while including the variability existing between experienced and novice raters at the same time [12]. Because they use a random-effects model (i.e., ICC (2,k)) in their procedure, Smith et al. [8] doesn't account for the specific fixed conditions of their participants neither for the specific training of their raters, which might underestimate the PTGT reproducibility values [12]. Moreover, using a similar model as previous studies allow us to compare our Modified PTGT reliability values with the previous PTGT ones and encourage clinicians to use both versions of the test with confidence [5–8].

Although the subjective end-feel of the PTGT may challenge its reproducibility, our findings demonstrate that it can be applied with high reliability by both novice and experienced clinicians, suggesting its robustness across varying levels of clinical expertise. Similarly, Motantasut et al. [16] found comparable results when testing novice and expert clinicians in assessing the navicular drop test and foot posture index in healthy individuals. Their findings showed reliable measures, despite the tests could be interpreted subjectively. As the inclinometer is the device used to obtain the measurement in degrees for PTGT, it is the presence or absence of blockage that guides the examiner. Performing PTGT is therefore more like that of a Lachman test (positive or negative) than that of a Passive Accessory Intervertebral Movement (Likert scale from 0 to 3 points), which might explain those high intra- and inter-rater reproducibility values [17,18]. Additionally, novice clinicians appear to be as competent as experts in musculoskeletal testing, such as static stability [19], specific ranges of motion [14], and using classification algorithms [20]. Thus, musculoskeletal testing, including the PTGT, can be confidently recommended across various expertise levels in clinical settings, as it demonstrates strong intra-rater reliability.

An important limitation of the original PTGT is that the rater must keep the foot parallel to the ground as well as correctly identify the sensation of the end of the glide. This limitation led Smith et al. [8] to attribute the level of clinical expertise to reduced inter-rater reliability.

Similarly, our study found lower inter-rater reliability for the PTGT (ICC 0.639) compared to the modified PTGT (ICC 0.777), which incorporates a referential horizontal plane to standardize foot positioning. The modified PTGT improved reproducibility, particularly for the experienced rater, with a reduced SEM (from 2.4° to 1.4°) and MDC (from 4.3° to 3.3°). However, novice raters showed higher SEM (2.2° to 2.3°) and MDC values (4.1° to 4.2°), suggesting a learning curve for effective use of the standardization tool, possibly due to less familiarity with standardized protocols [17,21]. Intra-rater reliability remained excellent for both versions (ICC 0.935–0.968), indicating that standardization primarily enhances inter-rater consistency. Similarly, Li et al. [22] reported improved accuracy and fewer false negatives with a modified anterior drawer test for talofibular ligament injury. Although the 1.0° reduction in SEM and MDC may seem minor, it holds clinical promise. For example, the original PTGT's 4.3° MDC demands an improvement exceeding 54% of the baseline PTGT score in LAS patients (8.0 ± 5.8° [5]; to be clinically meaningful, while the modified PTGT's 3.3° MDC reduces this threshold to above 41%. Notably, Holland et al. [23] documented a 48.25% PTGT score increase following three sessions of Maitland Grade IV talocrural mobilizations, which fails to meet clinical significance with the original PTGT but achieves it with the modified version. In practice, the 1.0° improvement in measurement precision could therefore help identifying subtle arthrokinematic changes in patients with restricted talar glide, such as those with acute LAS or CAI [1]. However, for individuals with higher baseline talar glide because of intact arthrokinematics (e.g., 15.84 ± 4.70 in our study), the 1.0° enhancement lowers the necessary improvement from 27% to 21%, rendering the modified PTGT less critical in those participants. Clinicians should weigh their own experience level and patients' baseline PTGT scores when deciding whether to adopt the modified PTGT within the assess-treat-reassess framework for CAI rehabilitation [24].

The coper group reported significantly less posterior talar glide range of motion than healthy controls ($p < 0.001$). Copers may exhibit altered sensorimotor function and ankle musculoskeletal structure while maintaining normal scores on CAIT [11]. While the sample size of 28 participants was sufficient to achieve high power for assessing PTGT reproducibility, it restricts definitive conclusions about differences between clinical groups, rendering these measurements exploratory rather than normative. However, this confirmed the ability of clinicians at any experience level to use the PTGT or the modified PTGT in clinical or research practice. To the best of our knowledge, this is one of the first studies to report reproducibility measurements in healthy and CAI patients. Previous studies have emphasized the importance of assessing lower limb function in CAI or LAS patients [25,26].

The use of the PTGT and the WBLT could make it possible to identify foot and ankle deficiencies more effectively and offer appropriate therapy [2]. Restoring ankle dorsiflexion mobility and arthrokinematic properties is one of the recommendations for the management of LAS and CAI [2]. Studies already stated that no manual technique, i.e., Maitland [7] or Mulligan [27]) could provide immediate improvement. However, the application of pre-selected techniques without prior

identification of subgroup would be inappropriate when the aim is to improve function. While it is necessary in research, it may not be as relevant in clinical conditions. Nguyen et al. [28] reported that identifying potential responders could help achieve an average increase of 2.7 cm in ankle dorsiflexion in LAS patients. Similarly, adding the PTGT to the WBLT could help identify responders to hands-on manual therapy.

Several limitations need to be considered. First, while the population included CAI patients, the sample was rather small, and the results should be interpreted with caution. No clinical conclusions could be drawn from CAI and coper group compared to healthy individuals. Second, this reproducibility study compared rater experience and test conditions but no measures of reliability and reproducibility between groups. Future studies should therefore assess whether clinical history influences the tests. Finally, PTGT measurement for each clinical group should be considered as informative data rather than normative data. Clinicians should not feel restrained from using the PTGT due to concerns that the test is too technical and too dependent on the level of experience. This study has shown the opposite and aims to encourage even novice clinicians to use the PTGT and its modified version, which is easier to perform due to the presence of a referential horizontal plane.

Future studies interested in normative values and cutoff scores of PTGT should consider using the modified version of the PTGT in their experimental protocol. This will provide more reliable inter-rater measurements. In conclusion, skills and knowledge in the use of musculoskeletal tests such as PTGT could be important. The modified PTGT could help researchers for more accurate measurements for comparison purposes. This could highlight future guidelines for managing acute LAS or CAI. Based on our results, we confirmed the possibility of using the original PTGT in clinical practice and intra-rater conditions.

The PTGT is reliable enough for clinical use by physiotherapists. The modified version of the test, incorporating a referential horizontal plane, offers greater inter-rater reliability, making it a better option for research purposes. Therefore, integrating this modified version into clinical practices and future studies could enhance the accuracy of assessments and contribute to better management of patients with LAS and CAI.

Author contributions

CRediT: **Anh Phong Nguyen:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing; **Hugo Bogaerts:** Investigation, Methodology, Validation, Visualization, Writing – original draft, Writing – review & editing; **Chloé Galerne:** Investigation, Methodology, Supervision, Validation, Writing – original draft, Writing – review & editing; **François Fourchet:** Methodology, Supervision, Validation, Visualization, Writing – review & editing.

Disclosure statement

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

Funding

The author(s) reported there is no funding associated with the work featured in this article.

Notes on contributors

Anh Phong Nguyen, PT, PhD, Sports physiotherapist and Doctor of Motor Sciences, specializing in lower limb pathologies. Co-founder of Fyki Sports, he researches running biomechanics and ankle sprain rehabilitation at UCLouvain, contributing to evidence-based sports injury prevention and performance optimization.

Hugo Bogaerts, PT, Sports physiotherapist and manual therapist IFOMPT, focusing on spine and sports injuries. Pursuing a PhD at UCLouvain on manual therapy for ankle sprains.

Chloé Galerne, PT, Physiotherapist specializing in runners' injuries and musicians' musculoskeletal issues. She teaches hand physiotherapy and temporomandibular disorder management at UCLouvain.

François Fourchet, PT, PhD, Head of Physiotherapy at Hôpital La Tour, specializing in the management of foot and ankle pathologies. He serves on the International Ankle Consortium's steering committee, advancing evidence-based rehabilitation strategie.

ORCID

Anh Phong Nguyen http://orcid.org/0000-0002-6473-1780
Hugo Bogaerts http://orcid.org/0009-0002-3010-0515
François Fourchet http://orcid.org/0000-0002-2911-4859

References

[1] Hertel J, Corbett RO. An updated model of chronic ankle instability. J Athl Train. 2019 Jun;54(6):572–588. doi: 10.4085/1062-6050-344-18 Epub 2019 Jun 4. PMID: 31162943; PMCID: PMC6602403.
[2] Delahunt E, Bleakley CM, Bossard DS, et al. Clinical assessment of acute lateral ankle sprain injuries (ROAST): 2019 consensus statement and recommendations of the International Ankle Consortium. Br J Sports Med. 2018 Oct;52(20):1304–1310. doi: 10.1136/bjsports-2017-098885 Epub 2018 Jun 9. PMID: 29886432.
[3] Hertel J. Functional anatomy, Pathomechanics, and pathophysiology of lateral ankle instability. J Athl Train. 2002 Dec;37(4):364–375 PMID: 12937557; PMCID: PMC164367.
[4] Wikstrom EA, Hubbard TJ. Talar positional fault in persons with chronic ankle instability. Arch Phys Med

Rehabil. 2010 Aug;91(8):1267–1271. doi: 10.1016/j.apmr.2010.04.022 PMID: 20684909.
[5] Denegar CR, Hertel J, Fonseca J. The effect of lateral ankle sprain on dorsiflexion range of motion, posterior talar glide, and joint laxity. J Orthop Sports Phys Ther. 2002 Apr;32(4):166–173. doi: 10.2519/jospt.2002.32.4.166 PMID: 11949665.
[6] Vicenzino B, Branjerdporn M, Teys P, et al. Initial changes in posterior talar glide and dorsiflexion of the ankle after mobilization with movement in individuals with recurrent ankle sprain. J Orthop Sports Phys Ther. 2006 Jul;36(7):464–471. doi: 10.2519/jospt.2006.2265 PMID: 16881463.
[7] Cosby NL, Hertel J. Relationships between measures of posterior talar glide and ankle dorsiflexion range of motion. Athl Train Sports Health Care. 2011;3(2):76–85. doi: 10.3928/19425864-20100930-02
[8] Smith DH, Hoch JM, Facchini SJ, et al. Intra-rater and inter-rater reliability and responsiveness of the posterior talar glide test. Athl Train Sports Health Care. 2015;7(1):23–28. doi: 10.3928/19425864-20150121-05
[9] Wikstrom EA, Brown CN. Minimum reporting standards for copers in chronic ankle instability research. Sports Med. 2014 Feb;44(2):251–268. doi: 10.1007/s40279-013-0111-4 PMID: 24122774.
[10] Geerinck A, Beaudart C, Salvan Q, et al. French translation and validation of the Cumberland Ankle Instability Tool, an instrument for measuring functional ankle instability. Foot Ankle Surg. 2020 Jun;26(4):391–397. doi: 10.1016/j.fas.2019.05.002 Epub 2019 May 9. PMID: 31118138.
[11] Kwon YU, Harrison K, Kweon SJ, et al. Ankle coordination in chronic ankle instability, Coper, and control groups in running. Med Sci Sports Exerc. 2020 Mar;52(3):663–672. doi: 10.1249/MSS.0000000000002170 PMID: 31652242.
[12] Koo TK, Li MY. A guideline of selecting and reporting Intraclass correlation coefficients for reliability research. J Chiropr Med. 2016 Jun;15(2):155–163. doi: 10.1016/j.jcm.2016.02.012 Epub 2016 Mar 31. Erratum in: J Chiropr Med. 2017 Dec;16(4):346. doi: 10.1016/j.jcm.2017.10.001. PMID: 27330520; PMCID: PMC4913118.
[13] Powden CJ, Hoch JM, Hoch MC. Reliability and minimal detectable change of the weight-bearing lunge test: a systematic review. Man Ther. 2015 Aug;20(4):524–532. doi: 10.1016/j.math.2015.01.004 Epub 2015 Jan 29. PMID: 25704110.
[14] Whyte E, Ó Doinn T, Downey M, et al. Reliability of a smartphone goniometric application in the measurement of hip range of motion among experienced and novice clinicians. J Sport Rehabil. 2021 Jan 8;30(6):969–972. doi: 10.1123/jsr.2020-0165 PMID: 33418537.
[15] Weir JP. Quantifying test-retest reliability using the intraclass correlation coefficient and the SEM. J Strength Cond Res. 2005 Feb;19(1):231–240. doi: 10.1519/15184.1 PMID: 15705040.
[16] Motantasut P, Hunsawong T, Mato L, et al. Reliability of novice and experienced physiotherapists using the normalized navicular height truncated and the foot posture index-6 for classifying static foot posture in adults. J Phys Ther Sci. 2019 Apr;31(4):392–397. doi: 10.1589/jpts.31.392 Epub 2019 Apr 1. PMID: 31037016; PMCID: PMC6451949.
[17] Mulligan EP, Harwell JL, Robertson WJ. Reliability and diagnostic accuracy of the Lachman test performed in a prone position. J Orthop Sports Phys Ther. 2011 Oct;41(10):749–757. doi: 10.2519/jospt.2011.3761 Epub 2011 Sep 4. PMID: 21891874.
[18] Stolz M, von Piekartz H, Hall T, et al. Evidence and recommendations for the use of segmental motion testing for patients with LBP - A systematic review. Musculoskelet Sci Pract. 2020 Feb;45:102076. doi: 10.1016/j.msksp.2019.102076 Epub 2019 Oct 31. PMID: 31733430.
[19] Kuo KT, Hunter BC, Obayashi M, et al. Novice vs expert inter-rater reliability of the balance error scoring system in children between the ages of 5 and 14. Gait Posture. 2021 May;86:13–16. doi: 10.1016/j.gaitpost.2021.02.026 Epub 2021 Feb 24. PMID: 33668005.
[20] Ramiscal LS, Bolgla LA, Cook CE, et al. Reliability of the scapular dyskinesis test yes-no classification in asymptomatic individuals between students and expert physical therapists. Clin Shoulder Elb. 2022 Dec;25(4):321–327. doi: 10.5397/cise.2022.01109 Epub 2022 Nov 17. PMID: 36475300; PMCID: PMC9727491.
[21] Wilkin EJ, Hunt A, Nightingale EJ, et al. Manual testing for ankle instability. Man Ther. 2012;17(6):593–596. doi: 10.1016/j.math.2012.03.007
[22] Li Q, Tu Y, Chen J, et al. Reverse anterolateral drawer test is more sensitive and accurate for diagnosing chronic anterior talofibular ligament injury. Knee Surg Sports Traumatol Arthrosc. 2020 Jan;28(1):55–62. doi: 10.1007/s00167-019-05705-x Epub 2019 Sep 26. PMID: 31559464.
[23] Holland CJ, Hughes JD, De Ste Croix MBA. Acute effects of increased joint mobilization treatment duration on ankle function and dynamic postural control in female athletes with chronic ankle instability. Orthopaedic Journal Of Sports Medicine. 2020 Jun 22;8(6):2325967120927371. doi: 10.1177/2325967120927371 PMID: 32613023; PMCID: PMC7309406.
[24] Donovan L, Hertel J. A new paradigm for rehabilitation of patients with chronic ankle instability. Phys Sportsmed. 2012 Nov;40(4):41–51. doi: 10.3810/psm.2012.11.1987 PMID: 23306414.
[25] Khalaj N, Vicenzino B, Smith MD. Hip and knee muscle torque and its relationship with dynamic balance in chronic ankle instability, copers and controls. J Sci Med Sport. 2021 Jul;24(7):647–652. doi: 10.1016/j.jsams.2021.01.009 Epub 2021 Feb 9. PMID: 33640262.
[26] Kosik KB, Johnson NF, Terada M, et al. Health-related quality of life among middle-aged adults with chronic ankle instability, copers, and uninjured controls. J Athl Train. 2020 Jul 1;55(7):733–738. doi: 10.4085/1062-6050-190-19 PMID: 32432901; PMCID: PMC7384463.
[27] Nguyen AP, Pitance L, Mahaudens P, et al. Effects of mulligan mobilization with movement in subacute lateral ankle sprains: a pragmatic randomized trial. J Man Manip Ther. 2021 Dec;29(6):341–352. doi: 10.1080/10669817.2021.1889165 Epub 2021 Feb 26. PMID: 33634747; PMCID: PMC8725747.
[28] Nguyen AP, Mahaudens P, Detrembleur C, et al. Inferior tibiofibular joint mobilization with movement and taping does not improve chronic ankle dorsiflexion stiffness: a randomized placebo-controlled trial. J Man Manip Ther. 2021 Apr;29(2):73–82. doi: 10.1080/10669817.2020.1805690 Epub 2020 Aug 18. PMID: 32808592; PMCID: PMC8023605.