Cross-cultural validation of self-report questionnaires
Houghton Scale, PLUS-M and PPA-LCI-5 in Ukrainian
in the lower limb amputee population

Oleh Burii, P. Herbé, M. Zapotichna, V. Aleynik, O. Taranenko, A. Touillet, I. Loiret, J. Pierret, J. Paysant

INTRODUCTION

- Major lower limb amputation significantly limits mobility and quality of life

- Validated assessment tools needed:
  - PLUS-M: prosthetic mobility
  - Houghton Scale: prosthetic use
  - PPA-LCI-5: locomotor capabilities

- **Ukrainian context**: Increase in traumatic amputations (military conflict)

- **Problem**: Lack of validated assessment tools in Ukrainian

OBJECTIVE
Validate the 3 self-report questionnaires in Ukrainian

METHODOLOGY

Population
81 patients
- 51 stabilized
- 30 undergoing rehabilitation
Mean age: 33 ± 7.9 years
97.5% male
98% traumatic

Process
1. Translation/back-translation
2. Expert committee
3. Pilot test (n=12)
4. Psychometric validation
5. 4 visits for responsiveness to change

Psychometric analyses:
- Internal consistency (Cronbach's α)
- Test-retest reliability at 4 weeks (ICC)
- Convergent validity (correlations)
- Discriminant validity
- Responsiveness to change (V1-V4)

Functional tests:
- 6-Minute Walk Test (6MWT)
- Timed Up and Go (TUG)
- Four Square Step Test (FSST)

References
1. Penn-Barwell JG. Outcomes in lower limb amputation: a systematic review. Injury. 2011;42(12):1474-9. doi:10.1016/j.injury.2011.07.005
2. Hafner BJ, Morgan SJ, Askew RL, Salem R, Gaunaurd IA, Gramstorff A, et al. Construct validity of the Prosthetic Limb Users Survey of Mobility (PLUS-M). Arch Phys Med Rehabil. 2017;98(2):277-85. doi:10.1016/j.apmr.2016.07.026
3. Franchignoni F, Orlandini D, Ferriero G, Moscato TA. Reliability, validity, and responsiveness of the Locomotor Capabilities Index in adults with lower-limb amputation undergoing prosthetic training. Arch Phys Med Rehabil. 2004;85(5):743-8. doi:10.1016/j.apmr.2003.06.010
4. Devlin M, Pauley T, Head K, Garfinkel S. Houghton Scale of prosthetic use in people with lower-extremity amputations: reliability, validity, and responsiveness to change. Arch Phys Med Rehabil. 2004;85(8):1339-44. doi:10.1016/j.apmr.2003.09.025
5. Cruchinho P, López-Franco MD, Capelas ML, Almeida S, Bennett PM, da Silva MM, et al. Translation, cross-cultural adaptation, and validation of measurement instruments: a practical guideline for novice researchers. Int J Environ Res Public Health. 2024;21(4):38840704. doi:10.3390/ijerph21040567 PMCID: PMC11151507

RESULTS

1. Internal consistency (Cronbach's α)
- **PLUS-M:** α = 0.96 (Excellent)
- **PPA-LCI-5:** α = 0.92 (Excellent)
- **Houghton:** α = 0.55 (Moderate)

2. Test-retest reliability (ICC)
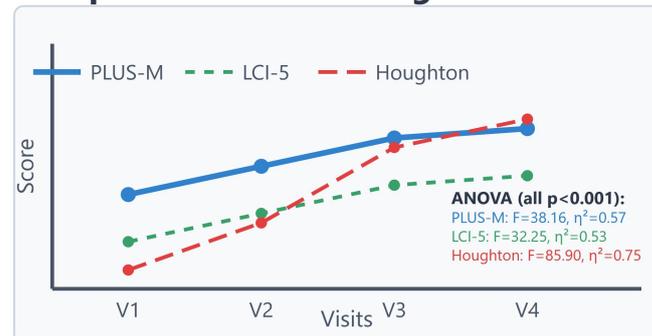- **PLUS-M:** ICC = 0.84 (Good)
- **PPA-LCI-5:** ICC = 0.74 (Good)
- **Houghton:** ICC = 0.71 (Good)

3. Convergent validity

Test	PLUS-M	LCI-5	Houghton
6MWT	0.63***	0.69***	0.72***
TUG	-0.59***	-0.72***	-0.63***
FSST	-0.47***	-0.61***	-0.64***

*** $p<0.001$ Moderate   Good   Excellent

4. Responsiveness to change

PLUS-M — LCI-5 — Houghton

Score / Visits — V1 V2 V3 V4

ANOVA (all $p<0.001$):
PLUS-M: F=38.16, η²=0.57
LCI-5: F=32.25, η²=0.53
Houghton: F=85.90, η²=0.75

5. Discriminant validity

Unilateral vs Bilateral Comparison

PLUS-M Unilateral	58.4±11.8	*p=0.013
PLUS-M Bilateral	50.7±10.4	d=0.71
LCI-5 Unilateral	52.8±5.3	ns
LCI-5 Bilateral	49.6±7.5	
Houghton Unilateral	10.2±1.7	ns
Houghton Bilateral	9.6±1.0	

CONCLUSION

The Ukrainian versions of the 3 self-report questionnaires are valid and reliable
for assessing prosthetic mobility in people with amputation

Psychometric properties: PLUS-M and LCI-5 show excellent performance (α>0.92, ICC>0.74)

Expected correlations confirmed: Positive with 6MWT and negative with TUG/FSST (shorter test times = better mobility), demonstrating construct validity

Responsiveness: All scales sensitive to change (p<0.001), but only PLUS-M significantly discriminates bilateral from unilateral patients (p=0.013, d=0.71)

Limitations: Study population restricted to young, active males (mean age: 33y, 97.5% male, 98% traumatic), limiting generalizability to broader amputee populations (vascular, elderly, female patients)

Clinical impact: First validated tools in Ukrainian • Quick administration (<5 min) • Usable in routine clinical practice and research