Validity and reliability of the Icelandic translation and transcultural adaptation of the Prosthetic Mobility Questionnaire in individuals with lower limb amputations

ANNA LÁRA ÁRMANNSDÓTTIR, PT, MSc.[1]

KRISTÍN BRIEM PT, PhD [1]

AÐSETUR RANNSAKENDA:
[1]**RANNSÓKNARSTOFA Í HREYFIVÍSINDUM, LÆKNADEILD, HÁSKÓLI ÍSLANDS, REYKJAVIK, ÍSLAND. HRINGBRAUT 31, 101 REYKJAVÍK. SÍMI: 00354 525 4004.**

**STOFNANIR ÞAR SEM RANNSÓKNIN VAR GERÐ:
ÖSSUR STOÐTÆKJAFYRIRTÆKI, LANDSPÍTALI HÁSKÓLASJÚKRAHÚS, GRENSÁSDEILD**

**TENGILIÐUR:
ANNA LÁRA ÁRMANNSDÓTTIR, TEL. +354 862 2929, ALA20@HI.IS**

VINNUTITILL: TRANSLATION AND VALIDITY STUDY FOR PROSTHETIC MOBILITY QUESTIONNAIRE

Abstract: *Background: An evidence-based documentation of an amputee's mobility is a vital part of the rehabilitation setting as well as in research and in the development of new prosthetic devices. The Prosthetic Mobility Questionnaire (PMQ) has undergone several iterations to reach its current form, successfully addressing the mobility capabilities of a broad spectrum of amputees.*

Objectives: *The aim of this study was to analyze the psychometric properties of an Icelandic translation and transcultural adaptation of the PMQ.*

Methods: *Following standardized procedures of translation, the questionnaire was tested for validity and reliability. Participants (n=28) were transtibial and -femoral amputees recruited from prosthetic clinics or outpatient rehabilitation centers. Reliability of PMQ was tested by analyzing the internal consistency with Cronbach´s alpha. Convergent and discriminant validity were tested using the Spearman´s rank correlation coefficient and the Mann-Whitney test, respectively.*

Results: *The internal consistency was high for the PMQ, indicating a high reliability. Moderate to strong correlation of the PMQ to other measures related to mobility indicate a high convergent validity, and the questionnaire was able to differentiate between age groups and between Medical Functional Classification Levels 2 and 3.*

Conclusions: *This study presents the results of the first Icelandic translated questionnaire with validated transcultural adaptation procedures, specifically designed to address the needs of amputees. This version of the PMQ is a reliable and valid measure for Icelandic speaking amputees and can be used in the realm of the amputee rehabilitation, research, or development of prosthetic devices to evaluate mobility.*

Keywords: *Prosthetic Mobility Questionnaire (PMQ), psychometric properties, lower limb amputation, mobility*

Ágrip

Bakgrunnur: Áreiðanleg skráning á hreyfifærni einstaklinga sem ganga með gervifót er mikilvægur hluti í endurhæfingu, sem og við rannsóknir og þróun á nýjum stoðtækjum. Prosthetic Mobility Questionnaire (PMQ) var þróaður með það að markmiði að hann gagnist við mat á breiðum hópi fólks með ólíka hreyfigetu eftir aflimun.

Markmið: Markmið þessarar rannsóknar var að meta próffræðilega eiginleika íslenskrar þýðingar á spurningalistanum PMQ.

Aðferðir: Staðlaðar aðferðir voru notaðar við þýðingu á þessum lista og í kjölfarið var listinn prófaður til þess að meta áreiðanleika og réttmæti hans. Þátttakendur (n=28) voru einstaklingar sem höfðu undirgengist aflimun fyrir ofan eða neðan hné og voru í reglubundinni þjónustu hjá stoðtækjafræðingi eða í viðhaldsþjálfun

við endurhæfingarstofnun. Áreiðanleiki var metinn með því að skoða innri samkvæmni með Cronbach´s alpha. Samleitniréttmæti var prófað með Spearman´s rank correlation coefficient og aðgreiniréttmæti með Mann-Whitney prófi.

Niðurstöður: Innri stöðugleiki var hár fyrir spurningalistann sem gefur til kynna háan áreiðanleika. Marktæk fylgni á milli PMQ og annarra mæliaðferða sem meta hreyfigetu, sem og geta hans til að aðgreina á milli aldurshópa og á milli flokka „Medical Functional Classification Levels" 2 og 3 gefur til kynna gott réttmæti.

Ályktanir: Þessi rannsókn er sú fyrsta sem notar staðlaðar aðferðir til íslenskrar þýðingar á spurningalista sem er sérstaklega ætlaður þörfum einstaklinga sem misst hafa neðri útlim/útlimi. Niðurstöður á próffræðilegum eiginleikum íslensku þýðingarinnar gefa til kynna að listinn sé bæði réttmætt og áreiðanlegt tæki til að meta hreyfifærni þessa hóps og er hann framlag til endurhæfingar einstaklinga með aflimun sem og til rannsókna og þróunar á stoðtækjum.

Lykilorð: Prosthetic Mobility Questionnaire (PMQ), próffræðilegir eiginleikar, aflimun neðri útlima, hreyfifærni

Background

Exploration of mobility and functional performance applies to various areas in the field of prosthetic and assistive devices. A standardized and suitable method of evaluating mobility is of great importance as part of a comprehensive documentation during rehabilitation treatment[1]. Standardized tests also facilitate evidence based prosthetic prescription[2,3] and may provide valuable information during a user – centered design process when developing prosthetic and assistive devices[4].

Prosthetic feet have evolved greatly in the last decades, with increased complexity and a variety of detailed design features. The mechanical properties of different prosthetic feet influence gait and the overall satisfaction of the user[5]. The prosthetic device's properties are typically assessed during both the design and prescription process by documenting feedback from users regarding their perception while using the device'. When rating, documenting and interpreting important but subtle factors of the prosthetic components, such as prosthetic foot stiffness or alignment, a holistic approach must be considered, i.e. assessing these subtle factors within the context of the user's general mobility. For instance, an individual dependent on a walking aid may take short steps and therefore perceive the characteristics of a particular prosthetic foot differently than a very active individual. Similarly, in emphasizing a user-centered design process, the guidance of results from standardized evaluation method is of importance. An example of a validated tool that evaluates and quantifies mobility is the Prosthetic Mobility Questionnaire (PMQ), an amputee-specific mobility scale which has not been available in the Icelandic language. The aim of this study was therefore to assess the validity and reliability of a recently translated Icelandic version of the PMQ[6].

The PMQ was originally derived from two mobility-specific subscales out of a total of 9 subscales of the very comprehensive 82-item Prosthetic Evaluation Questionnaire[7]. This version was called the Prosthetic Evaluation Questionnaire – Mobility Scale (PEQ – MS)[8], but was modified a few years later, following a Rasch analysis, and this improved version was called the "PEQ – MS 12/5"[9]. The PMQ was proposed following yet another Rasch analysis, where the addition of two items relating to more demanding aspects of mobility were among the changes made[6]. This was proposed to ensure that the questionnaire might better reflect the abilities of highly active individuals. The 12-item final version of the PMQ is therefore the result of an iterative process, using several sophisticated analyses. It is designed to measure the perceived mobility capabilities of lower limb amputees walking with a prosthesis. Each question has a 5-point grading scale (zero to four), with higher scores representing greater mobility. The responses to each question are summed up to form a total score ranging from zero to 48. The PMQ has been shown to be a reliable and valid tool for evaluating mobility among users of prosthetic feet[6].

No questionnaires of this nature have been available in order to assess mobility among Icelandic speaking prosthetic foot users. Therefore, the purpose of the study was to investigate the psychometric properties of a recently translated Icelandic version of the PMQ. Optimally, the study will result in a transcultural adaptation of the PMQ, for use during rehabilitation of amputees, as well as in research and the developmental process of prosthetic feet, reaching a broad spectrum of prosthetic foot users.

Methods

Process of translation

Standardized methods were used to adapt the questionnaire to the Icelandic language[10]. Two translators whose first language was Icelandic, one of whom had a medical background, each translated and adapted the original questionnaire to the Icelandic language. After synthesizing these two Icelandic versions and reaching a consensus regarding the final version, one bilingual translator, who had not been familiarized with the topic, translated the text back to English. An expert committee involving the persons who conducted the translations and one supervisor reviewed the Icelandic and English translations and any discrepancies were resolved in that meeting. As a pretest, the questionnaire was administered to four prosthetic foot users, chosen by a convenience sample, to assess its feasibility. No major changes were made after that, other than changing the font size (see Appendix 1).

Participants

Prosthetic foot users, who were attending either their prosthetic clinic in Reykjavík or an outpatient rehabilitation program at The National University Hospital of Iceland, in 2017-2019 were invited to participate in the study. A total of 28 individuals were interested and met inclusion criteria. All signed an informed consent form prior to participation. Inclusion criteria were the following: a) transtibial or -femoral amputation of one or both lower limbs; b) ability to walk independently with a prosthetic foot; c) minimum age of 18; d) proficient in the Icelandic written and spoken language.

Procedure

The study was approved by the National Bioethics Committee of Iceland (VSNb2017060001/03.01). Two physical performance measures were used to test convergent validity; the „Timed up and go test" (TUG)[11] and the „Two minute walk test" (2MWT)[12]. Furthermore, two self-reported measures were used, the "Knee

and Osteoarthritis Outcome Score, Activities of daily living sub-scale" (KOOS-ADL)[13], and self-reported perceived mobility capabilities during the last week on a visual analog scale VAS scale (PMC-VAS).

The TUG test has been used in validation studies for other mobility questionnaires intended for amputees[14-16] and has been found to be a valid and reliable tool to measure mobility among amputees[17] as well as for elderly or frail persons[11]. It was hypothesized that PMQ scores would have a moderate or strong negative correlation with outcomes from the TUG (time measured in seconds). The 2MWT has specifically been tested for lower limb amputees and determined to be a good measure of functional improvement for this population[18], and has previously been used in validation studies for questionnaires[16,19]. It was hypothesized that PMQ scores would have a moderate or strong positive correlation with outcomes from the 2MWT (distance walked in meters).

As there are no other standardized questionnaires in the Icelandic language available that specifically address amputees, the activities of daily living (ADL) subscale of the Icelandic version of the KOOS (KOOS-ADL) was also used as an outcome to test convergent validity. The KOOS scores range from zero (worst) to 100 (best) and the questionnaire has been shown to be a valid and reliable measure of knee impairments[20]. The structure and design of the KOOS strongly resembles that of the PMQ. It was hypothesized that PMQ scores would have a moderate or strong positive correlation with the scores from KOOS-ADL. One additional test of convergent validity was performed, using the participants' rating of their perceived mobility capabilities during the previous week on a visual analog scale, the PMC-VAS, hypothesizing a moderate or strong positive correlation with the scores from the PMQ.

Statistical methods

Discriminant validity was evaluated by testing the ability of the Icelandic version to differentiate between groups that are expected to differ in mobility capabilities, using the Mann-Whitney test. Three analyses were run for comparison a) between younger (22-59 years) and older (60-84 years) amputees; b) between transtibial and transfemoral amputees; c) based on the Medical Functional Classification Levels (MFCL)[21] where classification levels range from 0 to 4, with higher value in MFCL representing higher mobility capabilities. The participants were assessed by their certified prosthetist and were all categorized as MFCL 2 or MFCL 3, and so these two MFCL were contrasted.

Convergent validity was tested using the Spearman´s rank correlation coefficient. When testing the *a priori* hypothesis a correlation coefficient of $r > 0.7$ and > 0.5 have been considered to give evidence of strong and moderate correlation, respectively, in similar validation studies[15].

For testing the reliability of the Icelandic version, the internal consistency was analyzed, as a measure of the homogeneity of the items in the questionnaire, using the Cronbach´s alpha where values between 0.70 and 0.95 were considered acceptable[22]. All statistical test results were considered significant at p values < 0.05. For statistical analyses R-Jamovi statistical software was used.

Results

A total of 28 individuals consented to participate in the study

(Table 1). The average age ± SD (range) was 57 ± 14 (22 to 84) years, the average BMI ± SD (range) was 27 ± 3.7 (20-40.1) kg/m2 and the time since amputation ± SD (range) was 17.6 +15.5 (0.5 to 52) years. All participants completed both the PMQ and the KOOS-ADL questionnaires. Due to various reasons, such as time constraints, 6 of the 28 participants did not complete the physical performance measures and there were two missing values for the PMC-VAS. Therefore, the number of participants is not the same for all data analyses.

Twenty of the 28 participants were transtibial amputees (TTA) while 8 were transfemoral amputees (TFA). Trauma was the most common cause of amputation, or among 54% (N=15) of the participants.

Table 1. Clinical and demographic characteristics of participants (N = 28)

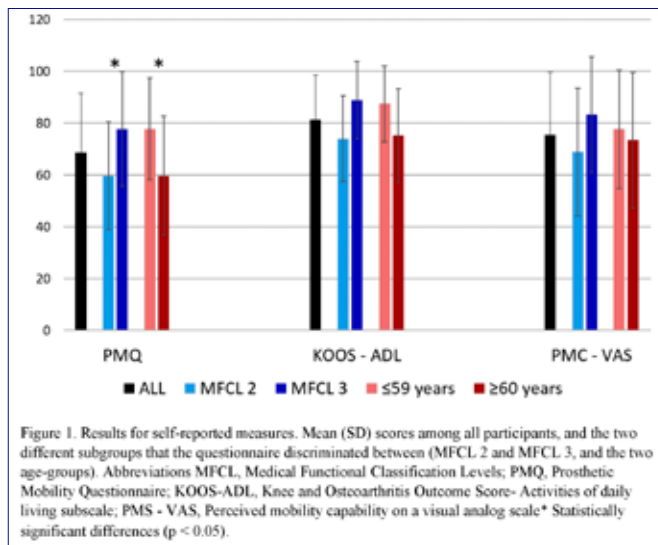|	n
Sex	
Male	25
Female	3
Amputation Level	
Transfemoral	8
Transtibial	20
Amputation etiology	
Traumatic	15
Dysvascular	6
Tumour	3
Infection	1
Congenital	1
Other	2
MFCL	
MFCL 2	14
MFCL 3	14

Abbreviations: MFCL, Medical Functional Classification Levels

There was a significant difference between PMQ scores when the participants were divided into two age groups, i.e. younger (n=14) and older (n=14) (p=0.032; table 2, figure 1). When discriminating between MFCL 2 and MFCL 2, significant differences were found in the scores from the two MFCL groups (p=0.035). When contrasting scores from the two groups of transfemoral (n=8, Mean (SD) : 56.8 (19.2)) vs. transtibial (n=20, mean (SD) : 73.4 (23.0)) amputees, the difference in PMQ scores did not reach statistical significance (p = 0.093). The Cronbach´s alpha coefficient for the 12 items of the PMQ was 0.954.

Table 2. Mean (SD) scores among all participants, and by the two different subgroups that the PMQ questionnaire discriminated between (MFCL 2 and MFCL 3, and the two age-groups)

	ALL	MFCL 2	MFCL 3	≤59 years	≥60 years
Physical performance measures tests (n=22)					
TUG (sec)	8.8 (5)	10 (5.85)	7.59 (3.89)	6.77 (3.26)	10.8 (5.74)
2MWT (meters)	151 (57.4)	129 (51.7)	173 (56.6)	162 (46.4)	140 (67.1)
Self-reported measures					
PMQ (n=28)	68.7 (22.9)	59.7 (20.7)	77.7 (22.1)	77.7 (19.7)	59.7 (23)
KOOS - ADL (n=28)	81.4 (17.2)	74 (16.6)	88.9 (14.9)	87.5 (14.6)	75.3 (18)
PMC - VAS scale (n=26)	75.5 (24.2)	68.9 (24.6)	83.3 (22.3)	77.7 (22.9)	73.4 (26.2)

Abbreviations: MFCL, Medical Functional Classification Levels; TUG, Timed up and go; 2MWT, 2 minute walk test; PMQ, Prosthetic Mobility Questionnaire; KOOS-ADL, Knee and Osteoarthritis Outcome Score- Activities of daily living subscale; PMC-VAS, Perceived mobility capability on a visual analog scale. Statistically significant differences found (p < 0.05) for validity are marked by bold characters.

Figure 1. Results for self-reported measures. Mean (SD) scores among all participants, and the two different subgroups that the questionnaire discriminated between (MFCL 2 and MFCL 3, and the two age-groups). Abbreviations MFCL, Medical Functional Classification Levels; PMQ, Prosthetic Mobility Questionnaire; KOOS-ADL, Knee and Osteoarthritis Outcome Score- Activities of daily living subscale; PMS - VAS, Perceived mobility capability on a visual analog scale* Statistically significant differences (p < 0.05).

The results for the convergent validity were based on 22 individuals as there were six missing measures for the TUG and 2MWT. Scores of the PMQ were moderately correlated with both the TUG and 2MWT (p < 0.01 for both; Table 3). A strong correlation was also found between PMQ scores and those from the KOOS - ADL and the PMC-VAS scale (p < 0.001 for both; Table 3).

Table 3. Convergent validity of the PMQ

	Spearman´s rho	P-value
Physical performance measures (n=22)		
TUG (sec)	-0.629	0.002
2MWT (meters)	0.689	< 0.001
Self-reported measures		
KOOS - ADL (n=28)	0.867	< 0.001
PMC - VAS scale (n=26)	0.771	< 0.001

Abbreviations: TUG, Timed up and go; 2MWT, 2 minute walk test; PMQ, Prosthetic Mobility Questionnaire; KOOS-ADL, Knee and Osteoarthritis Outcome Score- Activities of daily living subscale; PMS - VAS, Perceived mobility capability on a visual analog scale

Discussion and conclusion

The results indicate that the Icelandic version of the PMQ is a reliable and valid instrument for evaluating the self-reported mobility and physical performance of Icelandic users of prosthetic feet. The results supported all proposed hypotheses excluding the discriminative validity between different amputation levels.

The PMQ questionnaire is the recent end-product of a Rasch-based iterative process and has been shown to be a promising psychometrically-sound measure, although future studies will need to further verify its clinical usefulness[6]. The main rationale for choosing the PMQ for this trans-cultural adaptation for the Icelandic amputee community was the questionnaire's brevity and its ability to reach a broad group of people with different mobility capabilities. The relatively few items included in the questionnaire makes it practical to use in the clinical setting, and the fact that it is based on a more extensively studied questionnaire, the PEQ[7], and modified through a sound iterative process may also be considered a strength.

The PMQ was recently translated and validated for the Slovenian language, where a Rasch analysis identified two pairs of locally dependent items[23]. Each pair described the same task but in opposite direction; i.e. walking up and down a) stairs, b) hill, so these pairs were collapsed, resulting in a new scale, PMQ 2.0. Correlation analysis between these specific items was carried out for data of the current study. This certainly did reveal a high correlation between walking up vs. downstairs and between up- vs.

downhill (r=0.88 and r=0.94, respectively). These were the highest two correlations in the analysis, so the decision of Burger et al. to collapse these items is rational from a statistical point of view. However, although walking up vs. down either stairs or hills may be considered similar tasks to some extent, the demands placed on the lower limb and prosthesis are quite different in the opposite directions. The authors of the current study are therefore confident in the choice of using of the previous version of the PMQ, not least due to interest in assessing the functional performances of different prosthetic components of both walking up and walking down tasks separately[24,25]

Convergent validity was examined by the strength of the association between PMQ scores and other constructs related to mobility, i.e. the two physical performance measures, TUG and 2MVT, and the two self-reported measures reflecting mobility (KOOS-ADL questionnaire and the PMC-VAS). Moderate to strong correlation was demonstrated for all comparisons and always in the hypothesized direction. The results thereby confirm the validity of the Icelandic version of the PMQ (Table 3). A stronger correlation was observed for the self - reported measures (KOOS-ADL and PMC-VAS) than for the two physical performance measures. This may be explained by the diverse movement control strategies among amputees, which might have affected the outcome of the physical performance measures, for example a slower initiation of gait or difficulties standing up from a chair, as performed in the TUG.

Discriminant validity was demonstrated by the significant difference in scores where these are to be expected, as shown for the two different age groups and two MFCL groups (figure 1). A trend towards a statistically significant difference was shown between the two levels of amputation, TTA and TFA (p = 0.093), but the low number of TFA individuals in the study limits the statistical power, which may have hindered analysis of this factor for discriminative validity. In a larger cohort (n=83), the psychometric properties of an Italian version of the PMQ´s precursor (the PEQ´s two mobility subscales) were analyzed (26). The results were similar to those seen in the Icelandic cohort regarding the discriminant validity for amputation levels, showing a non-significant difference of scores between these two groups (p = 0.12). Other mobility scales however, (LCI/5) (16, 26) have been able to discriminate between these two categories of amputees, making this an interesting variable to test. The decision to divide the group in only two age groups was based on the replies received where the mean age was 56.8 years and the age range was 22 years – 84 years. Having the groups from ≤59 years and ≥60 years instead of smaller subgroups gave us an even distribution of 14 people in each group.

The high Cronbach´s alpha of 0.954 confirms one aspect of the reliability of the questionnaire and reflects the fact that the items of the questionnaire are interrelated. These results are similar to the Slovenian PMQ transcultural adaptation, where a Cronbach´s alpha reached 0.93 and the number of participants was 148, leading the authors to conclude that the questionnaire was reliable to allow for judgement on an individual level in clinical practice or in research[23]

An obvious limitation to this study is the low number of participants. The Icelandic speaking amputee population is very small and studies among amputees in Iceland will always suffer from small sample size. The results are based on answers from indi-

viduals only categorized in MFCL 2 and MFCL 3, which also limits the external validity of the study. Despite the small sample size, the results are   in line with the much larger Slovenian transcultural adaptation[23] which supports our conclusion of this questionnaire being valid and reliable.

None of the participants scored the lowest possible score in the questionnaire and only 7% of them scored the highest possible score, which indicates that the results of the validity analysis were not influenced by a ceiling effect. These results should however be interpreted with caution, due to the small sample size. Floor and/or ceiling effects are generally considered to be present if more than 15% of participants score the highest or lowest possible scores, in a sample size of at least 50 patients[22].

A relatively high number of participants had been amputated due to trauma, or 53% of the 28 participants, which may affect the degree to which their scores represent the Icelandic amputee population. Individuals with amputations with a trauma etiology are known to have fewer comorbidities than individuals with amputations due to dysvascular causes[27]. Therefore, the population in the current study might have a higher score than would be expected from an international amputee population. There are currently no published numbers on the incidence rate of amputation in Iceland to confirm that this ratio of cause of amputation is to be expected. Other western societies have reported that a rate of amputation caused by diabetes and / or peripheral vascular diseases is much higher than by trauma[28,29]. There is however a high mortality rate among the individuals that undergo amputation due to vascular diseases[30] and due to this reason and that this group of amputees is less likely to participate in research studies, this skewed ratio could be explained.

In conclusion, the results of the analysis of the psychometric properties of a transcultural adaption and translation of the PMQ indicate good validity and reliability among Icelandic speaking prosthetic foot users. This is a questionnaire that has been developed with an iterative process to fit the abilities of a broad group of amputees, specifically adding items applying to the more active individuals. This translated version can therefore be implemented both during the development of prosthetic feet, which is an established field of work in Iceland due to the location of a large prosthetic foot developer, as well as in the rehabilitation setting.

References

1. Hawkins AT, Henry AJ, Crandell DM, Nguyen LL. A systematic review of functional and quality of life assessment after major lower extremity amputation. Ann Vasc Surg. 2014;28(3):763-80.

2. Schaffalitzky E, Gallagher P, Maclachlan M, Ryall N. Understanding the benefits of prosthetic prescription: exploring the experiences of practitioners and lower limb prosthetic users. Disabil rehabil. 2011;33(15-16):1314-23.

3. Hafner BJ, Morgan SJ, Abrahamson DC, Amtmann D. Characterizing mobility from the prosthetic limb user's perspective: Use of focus groups to guide development of the Prosthetic Limb Users Survey of Mobility. Prosthet Orthot Int. 2016;40(5):582-90.

4. Ármannsdóttir AL, Beckerle P, Moreno JC, van Asseldonk EHF, Manrique-Sancho MT, Del-Ama AJ, et al. Assessing the Involvement of Users During Development of Lower Limb Wearable Robotic Exoskeletons: A Survey Study. Hum Factors. 2020;62(3):351-64.

5. Hafner BJ. Perceptive Evaluation of Prosthetic Foot and Ankle Systems. J Prosthet Orthot. 2005;17(4):S42-S6.

6. Franchignoni F, Monticone M, Giordano A, Rocca B. Rasch validation of the Prosthetic Mobility Questionnaire: A new outcome measure for assessing mobility in people with lower limb amputation. J Rehabil Med. 2015;47(5):460-5.

7. Legro MW, Reiber GD, Smith DG, del Aguila M, Larsen J, Boone D. Prosthesis evaluation questionnaire for persons with lower limb amputations: assessing prosthesis-related quality of life. Arch Phys Med Rehabil. 1998;79(8):931-8.

8. Miller WC, Deathe AB, Speechley M. Lower extremity prosthetic mobility: a comparison of 3 self-report scales. Arch Phys Med Rehabil. 2001;82(10):1432-40.

9. Franchignoni F, Giordano A, Ferriero G, Orlandini D, Amoresano A, Perucca L. Measuring mobility in people with lower limb amputation: Rasch analysis of the mobility section of the prosthesis evaluation questionnaire. J Rehabil Med. 2007;39(2):138-44.

10. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. Spine (Phila Pa 1976). 2000;25(24):3186-91.

11. 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.

12. Butland RJ, Pang J, Gross ER, Woodcock AA, Geddes DM. Two-, six-, and 12-minute walking tests in respiratory disease. Br Med J (Clin Res Ed). 1982;284(6329):1607-8.

13. Roos EM, Roos HP, Lohmander LS, Ekdahl C, Beynnon BD. Knee Injury and Osteoarthritis Outcome Score (KOOS)--development of a self-administered outcome measure. J Orthop Sports Phys Ther. 1998;28(2):88-96.

14. Larsson B, Johannesson A, Andersson IH, Atroshi I. The Locomotor Capabilities Index; validity and reliability of the Swedish version in adults with lower limb amputation. Health Qual Life Outcomes. 2009;7:44.

15. Hafner BJ, Gaunaurd IA, Morgan SJ, Amtmann D, Salem R, Gailey RS. Construct Validity of the Prosthetic Limb Users Survey of Mobility (PLUS-M) in Adults With Lower Limb Amputation. Arch Phys Med Rehabil. 2017;98(2):277-85.

16. Salavati M, Mazaheri M, Khosrozadeh F, Mousavi SM, Negahban H, Shojaei H. The Persian version of locomotor capabilities index: translation, reliability and validity in individuals with lower limb amputation. Qual Life Res. 2011;20(1):1-7.

17. Schoppen T, Boonstra A, Groothoff JW, de Vries J, Goeken LN, Eisma WH. The Timed "up and go" test: reliability and validity in persons with unilateral lower limb amputation. Arch Phys Med Rehabil. 1999;80(7):825-8.

18. Brooks D, Parsons J, Hunter JP, Devlin M, Walker J. The 2-minute walk test as a measure of functional improvement in persons with lower limb amputation. Arch Phys Med Rehabil. 2001;82(10):1478-83.

19. Joussain C, Laroche D, Casillas JM, Paysant J, Ader P, Bastable P, et al. Transcultural validation of the SIGAM mobility grades in French: The SIGAM-Fr. Ann Phys Rehabil Med. 2015;58(3):161-6.

20. Briem K. [Reliability, validity and responsiveness of the Icelandic version of the knee injury and osteoarthritis outcome score (KOOS)]. Laeknabladid. 2012;98(7-8):403-7.

21. Gailey RS, Roach KE, Applegate EB, Cho B, Cunniffe B, Licht S, et al. The amputee mobility predictor: an instrument to assess determinants of the lower-limb amputee's ability to ambulate. Arch Phys Med Rehabil. 2002;83(5):613-27.

22. Terwee CB, Bot SD, de Boer MR, van der Windt DA, Knol DL, Dekker J, et al. Quality criteria were proposed for measurement properties of health status questionnaires. J Clin Epidemiol. 2007;60(1):34-42.

23. Burger H, Giordano A, Bavec A, Franchignoni F. The Prosthetic Mobility Questionnaire, a tool for assessing mobility in people with lower-limb amputation: validation of PMQ 2.0 in Slovenia. Int J Rehabil Res. 2019;42(3):263-9.

24. Shepherd MK, Rouse EJ. The VSPA Foot: A Quasi-Passive Ankle-Foot Prosthesis With Continuously Variable Stiffness. IEEE Trans Neural Syst Rehabil Eng. 2017;25(12):2375-86.

25. Gholizadeh H, Lemaire ED, Sinitski EH. Transtibial amputee gait during slope walking with the unity suspension system. Gait & posture. 2018;65:205-12.

26. Ferriero G, Dughi D, Orlandini D, Moscato T, Nicita D, Franchignoni F. Measuring long-term outcome in people with lower limb amputation: cross-validation of the Italian versions of the Prosthetic Profile of the Amputee and Prosthesis Evaluation Questionnaire. Eura Medicophys. 2005;41(1):1-6.

27. Fajardo-Martos I, Roda O, Zambudio-Periago R, Bueno-Cavanillas A, Hita-Contreras F, Sánchez-Montesinos I. Predicting successful prosthetic rehabilitation in major lower-limb amputation patients: a 15-year retrospective cohort study. Braz J Phys Ther. 2018;22(3):205-14.

28. Dillingham TR, Pezzin LE, MacKenzie EJ. Limb amputation and limb deficiency: epidemiology and recent trends in the United States. South Med J. 2002;95(8):875-83.

29. Imam B, Miller WC, Finlayson HC, Eng JJ, Jarus T. Incidence of lower limb amputation in Canada. Can J Public Health. 2017;108(4):e374-e80.

30. Thorud JC, Plemmons B, Buckley CJ, Shibuya N, Jupiter DC. Mortality After Nontraumatic Major Amputation Among Patients With Diabetes and Peripheral Vascular Disease: A Systematic Review. J Foot Ankle Surg. 2016;55(3):591-9.

Apppendix 1

Prosthetic Mobility Questionnaire – PMQ- Íslensk þýðing

Dagsetning:_____   Auðkenni: _____

Leiðbeiningar: Með síðastliðna viku í huga, vinsamlega metið getu ykkar við framkvæmd eftirfarandi athafna þegar gervifóturinn er notaður. <u>Merkið aðeins við einn svarmöguleika.</u>

	Get ekki (0)	Mjög erfitt (1)	Frekar erfitt (2)	Ekki mjög erfitt (3)	Full geta (4)
1. Að ganga innandyra	☐	☐	☐	☐	☐
2. Að ganga í takmörkuðu rými	☐	☐	☐	☐	☐
3. Að ganga upp tröppur í stigagangi	☐	☐	☐	☐	☐
4. Að ganga niður tröppur í stigagangi	☐	☐	☐	☐	☐
5. Að ganga upp bratta brekku	☐	☐	☐	☐	☐
6. Að ganga niður bratta brekku	☐	☐	☐	☐	☐
7. Að ganga á gangstéttum og götum	☐	☐	☐	☐	☐

Prosthetic Mobility Questionnaire – PMQ- Íslensk þýðing

	Get ekki (0)	Mjög erfitt (1)	Frekar erfitt (2)	Ekki mjög erfitt (3)	Full geta (4)
8. Að setjast inn í eða stíga út úr bifreið. Merkið aðeins við eitt svar skv. erfiðari athöfninni	☐	☐	☐	☐	☐
9. Að setjast í og standa upp úr hefðbundnum stól án stólarma, (t.d. borðstofustól)*.Merkið aðeins við eitt svar skv. erfiðari athöfninni	☐	☐	☐	☐	☐
10. Að setjast í og standa upp úr lágum hægindastól (t.d. djúpum sofa). Merkið aðeins við eitt svar skv. erfiðari athöfninni	☐	☐	☐	☐	☐
11. Að hlaupa 100-200 metra	☐	☐	☐	☐	☐
12. Að ganga í allt að tvo klukkutíma	☐	☐	☐	☐	☐

*Stíf stólseta, sethæð í um 100% af sköflungslengd (þ.e. læri í láréttri stöðu).

Þakka þér fyrir að svara þessum spurningarlista!