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ASSESSMENT PROCEDURES

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ABSTRACT

Purpose: The aim of this study is to adapt the Special Interest Group in Amputee Medicine (SIGAM) mobility scale to Turkish, and to test its validity and reliability in lower extremity amputees.

Material and methods: Adaptation of the scale into Turkish was performed by following the steps in American Association of Orthopedic Surgeons (AAOS) guideline. Turkish version of the scale was tested twice on 109 patients who had lower extremity amputations, at hours 0 and 72. The reliability of the Turkish version was tested for internal consistency and test–retest reliability. Structural validity was tested using the "scale validity" method. For this purpose, the scores of the Short Form-36 (SF-36), Functional Ambulation Scale (FAS), Get Up and Go Test, and Satisfaction with the Prosthesis Questionnaire (SATPRO) were calculated, and analyzed using Spearman's correlation test.

Results: Cronbach's alpha coefficient was 0.67 for the Turkish version of the SIGAM mobility scale. Cohen's kappa coefficients were between 0.224 and 0.999. Repeatability according to the results of the SIGAM mobility scale (grades A–F) was 0.822. We found significant and strong positive correlations of the SIGAM mobility scale results with the FAS, Get Up and Go Test, SATPRO, and all of the SF-36 subscales.

Conclusion: In our study, the Turkish version of the SIGAM mobility scale was found as a reliable, valid, and easy to use scale in everyday practice for measuring mobility in lower extremity amputees.

➤ **IMPLICATIONS FOR REHABILITATION**

- Amputation is the surgical removal of a severely injured and nonfunctional extremity, at a level of one or more bones proximal to the body.
- Loss of a lower extremity is one of the most important conditions that cause functional disability.
- The Special Interest Group in Amputee Medicine (SIGAM) mobility scale contains 21 questions that evaluate the mobility of lower extremity amputees.
- Lack of a specific Turkish scale that evaluates rehabilitation results and mobility of lower extremity amputees, and determines their needs, directed us to perform a study on this topic when we took the number of amputations performed in our country into consideration.
- SIGAM mobility scale is directed at rehabilitation specialists who are working in amputee medicine. Turkish version of this scale was found both reliable and valid in our study and hence it can be used in clinical practice and studies.

Introduction

Amputation is the surgical removal of a severely injured and non-functional extremity, at the level of one or more bones proximal to the body.[1] Loss of a lower extremity is one of the most important conditions that cause functional disability.[2]

The primary aim of rehabilitation after lower extremity amputation is to increase the mobility of the patient and enable him/her to walk again, since the degree of mobility is the most important determinant of the quality of life in these patients.[3] Provision of suitable prostheses prepares the substantial basis of rehabilitation for lower extremity amputees.[4,5]

In 2003, Ryall et al. developed the Special Interest Group in Amputee Medicine (SIGAM) mobility scale for evaluation of the mobility in lower extremity amputees as an easy to use, self-reported clinical scale. The reliability and validity of the scale were demonstrated, and it was shown to be sensitive to changes.[6]

The scale was translated into Dutch by Rommers et al. in 2008 and into French by Joussain et al. in 2013.[7–9] Lack of a specific Turkish scale evaluating rehabilitation results and mobility of lower extremity amputees, thus determining their needs, motivated us to perform this study.

In this study, we aimed to adapt SIGAM mobility scale and related assessment algorithm into Turkish and to test its validity and reliability.

Methods

Before starting the study, we obtained the approval of the Scientific Research Evaluation Committee (Reference number is 720/2014). Afterwards, the patients were informed about the objective of the study and their written consent forms were obtained.

Translation and cultural adaptation

Translation and adaptation of the scale into Turkish was performed by following the steps in the American Association of Orthopedic Surgeons (AAOS) guideline.[10] There are many studies in the literature that use cross-cultural adaptation process as recommended by AAOS committee.[11,12]

The first stage (translation)

The SIGAM mobility scale and related evaluation algorithm were translated into Turkish by a medical doctor who is fluent in English, by an English teacher who has a Ph.D. degree in English language and literature and by a professional interpreter independently. The medical doctor was informed about the questions in the survey and the aim of the translation. On the other hand, the two other translators were not given any information about the aim of the translation.

The second stage (synthesis)

After the translations were completed, a consensus was reached by including all the translators and the two physiatrists into the process. The discrepancies among the translations were discussed by all the translators and a consensus was reached on a common text.

The third stage (back translation)

A professional interpreter uninformed about the original questions, and a native English speaker who has been living in Turkey and speaking Turkish for almost 10 years, back translated the prepared common test into English. The back translated form was seen and approved by Ryall, MD.

The fourth stage (expert committee)

The back translation was compared with the original text by a committee consisting of three physiatrists. This committee consisted of two expert physicians who have been working in this field for two and six years respectively and of a professor. There were two words different from the originals but they had similar meanings with originals. It was seen that the original text was matching up with the back translation.

The scale and the algorithm were checked by a Turkish language and literature teacher for syntax, and were corrected. In the end, an optimal and understandable final version that fitted Turkish culture and that reflected the original survey was prepared.

The fifth stage (preliminary validity, pretest)

The pretest phase was initiated with a pre-final version. In this phase, the scale was handed out to 20 patients with lower extremity amputations. The patients were asked to determine the points that they did not understand, and the actions and questions that sounded unfamiliar. The patients said that the text was understandable. There was no negative feedback.

Sixth phase (committee review and test)

The scale and the related assessment algorithm, and the results of the pretest were presented to a committee of physiatrists who were to prepare the final version. The physiatrists reported that the questions were understandable. Then the test phase was undertaken.

Patients

A total of 109 lower extremity amputees who were older than 18 years of age, and who had admitted to Physical Medicine and Rehabilitation outpatient clinic from January 2014 to July 2014, were included in the test phase of the study. Patients who are illiterate and who did not want to participate in the study were excluded. The demographic characteristics of the patients including age, gender, education level, and working status were recorded. The time of amputation, the etiology of amputation, the use of prostheses, the types and the numbers of prostheses used, the duration of prosthetic device use, co-morbid diseases, and the presence of residual limb wounds were also documented.

Measures

At the baseline of the study the tests that were used are as follows: Turkish version of the SIGAM mobility scale was used for evaluation the mobility of the patients, The Short Form-36 (SF-36) [13,14] was used for evaluating the quality of life of the patients, Satisfaction with the Prosthesis Questionnaire (SATPRO) [15] was used for determining the satisfaction with the prosthesis, Functional Ambulation Scale (FAS) [16] was used for evaluating the ambulation, Get Up and Go Test [17] was used for evaluating balance. Scores obtained from all these tests were recorded. FAS and Get Up and Go Tests were performed when patients were wearing their prostheses. The SATPRO was not applied to the patients who did not use any prosthesis. The patients who did not use any prosthesis and the two patients that could not use a functional prosthesis (wearing prosthesis due to cosmetic reasons or short distances) were not given the Get Up and Go Test. At 72 h Turkish version of the SIGAM mobility scale was re-applied to determine test–retest reliability.

SIGAM mobility scale and assessment algorithm

The SIGAM mobility scale consists of 21 questions evaluating the mobility of lower extremity amputees. Questions 4 and 5 are further divided into two as 4a and 4b, and 5a and 5b. All questions are replied as "yes" or "no". The SIGAM evaluation algorithm assigns patients into six grades as A, B, C, D, E, and F. The mobility of the patient improves as one progresses from A to F. Grades C and D have sub grades as C/a, C/b, C/c, C/d, D/a, D/b, and D/c. The mobility of the patient gets better within the grade itself as one moves from a to d. Turkish version of the SIGAM mobility scale and assessment algorithm is presented in Figures 1 and 2.

Statistical analysis

To describe continuous variables, mean ± standard deviation or median (min–max) was used according to the distribution of variables. Frequency and percentage were used to describe categorical variables. Shapiro–Wilk's test statistics was used to test the normality assumption of the distribution of continuous variables. For statistical analyses, Type-I error rate was taken as $\alpha = 0.05$ for statistical significance. IBM SPSS Statistics 21.0 (IBM Corp. Released 2012; IBM SPSS Statistics for Windows, Version 21.0; IBM Corp., Armonk, NY) software was used for statistical analyses. G Power software, Düsseldorf, Germany was used to evaluate the power of the study.

The reliability of the scale was determined with internal consistency and test–retest methods. Cronbach's alpha coefficient was used to analyze internal consistency. Test–retest reliability was analyzed using Cohen's kappa coefficient.[18,19] External construct validity was analyzed with Spearman's correlation test. To evaluate convergent and divergent validity, the correlations of the SIGAM

Bu anket size gerektiğinde yürümek için yardımcı cihaz kullanarak genelde nasıl hareket ettiğinizi sormaktadır.

Lütfen her sorudan sonra sizin için en doğru olan "EVET veya HAYIR kutucuklarına işaret koyunuz.

	EVET	HAYIR
1.Takma bacak(lar) kullanıyor musunuz?	☐	☐
2.Takma bacak(lar)ınızı sadece kozmetik görünüş için mi kullanıyorsunuz? (örneğin onlarla yürümüyorsunuz gibi)	☐	☐
3.Takma bacak(lar)ınızı çok kısa mesafelerde hareket etmenize yardımcı olması için mi kullanıyorsunuz? (örneğin yataktan sandalyeye veya sandalyeden tuvalete)	☐	☐
4a.Şu anda herhangi bir bakım hizmeti alıyor musunuz?	☐	☐

**"EVET" ise okumaya devam ediniz, "HAYIR"
ise soru 5a'ya geçin**

4b.Takma bacak(lar)ınızı alıyor olduğunuz bakım hizmetinde size yardımcı olması için mi kullanıyorsunuz?	☐	☐
5a.Şu anda herhangi bir fizyoterapi veya iş-uğraşı tedavisi alıyor musunuz?	☐	☐

**"EVET" ise okumaya devam ediniz, "HAYIR"
ise soru 6'ya geçin**

5b. Takma bacak(lar)ınızı alıyor olduğunuz tedavide size yardımcı olması için mi kullanıyorsunuz?	☐	☐
6.Takma bacak(lar)ınızı kullanarak genellikle ev içinde yürür müsünüz?	☐	☐
7.Takma bacak(lar)ınızı kullanıyorsanız, ev içinde yürümenize yardımcı olabilmesi için genellikle bir başka kişinin fiziksel yardımına ihtiyaç duyar mısınız?	☐	☐
8.Ev içinde, takma bacak(lar)ınızı kullanarak yürümek için genellikle bir yürüteç yardımına ihtiyaç duyar mısınız?	☐	☐
9.Ev içinde, Takma bacak(lar)ınızı kullanarak yürümek için genellikle iki adet koltuk değneğinin yardımına ihtiyaç duyar mısınız?	☐	☐
10. Ev içinde, Takma bacak(lar)ınızı kullanarak yürümek için genellikle iki adet bastonun yardımına ihtiyaç duyar mısınız?	☐	☐
11. Ev içinde, Takma bacak(lar)ınızı kullanarak yürümek için genellikle bir koltuk değneği veya bir bastonun yardımına ihtiyaç duyar mısınız?	☐	☐
12. Ev içinde, genellikle herhangi bir yürümeye yardımcı cihaz kullanıyor musunuz?	☐	☐
13. Genellikle bir seferde 50 metreden (55 yard) fazla yürümeyi başarır mısınız?	☐	☐
14.Dışarıda, genellikle takma bacaklarınızı kullanarak herhangi bir yere yürür müsünüz?	☐	☐

Figure 1. Turkish version of the SIGAM mobility scale.

EVET   HAYIR

15. Genellikle sadece zemin katta mı yürürsünüz?

16.Dışarıda, yürümek için genellikle bir yürüteç yardımına ihtiyaç duyar mısınız?

17.Dışarıda, yürümek için genellikle iki adet koltuk değneğinin yardımına ihtiyaç duyar mısınız?

18.Dışarıda, yürümek için genellikle iki adet bastonun yardımına ihtiyaç duyar mısınız?

19.Dışarıda, yürümek için genellikle 1 koltuk değneği veya 1 bastonun yardımına ihtiyaç duyar mısınız?

20. Dışarıda, sadece arada sırada, kötü hava koşulları veya bozuk zeminde, kendinize olan güveninizi arttırmak için mi yürümeye yardımcı cihaz kullanırsınız?

21.Dışarıda, takma bacaklarınızı kullanarak her yere, herhangi bir yürüme yardımcısı kullanmadan, her türlü hava koşulunda yürüyebilir misiniz?

Son.   Yardımınız için teşekkürler.

Figure 1. Continued.

mobility scale results with the SF-36, SATPRO, FAS, and Get Up and Go Test were calculated.

Results

A total of 109 patients, 16 (14.7%) females and 93 (85.3%) males, were included in the study. The female to male ratio was 1:6 and the mean age was 41.7 ± 12.6 years. The majority of our patients had graduated from elementary and high school (40.4% and 32.1% respectively). 41.3% of our patients were working. When we looked at the levels of amputation; transtibial and transfemoral amputations were the most frequent types (35.8%, and 57.8% respectively). The etiology of amputations was gunshot wounds and mine explosions in 43.1% of the patients. This was followed up by other traumas and vascular diseases. Demographic characteristics of the patients and the etiologies of the amputations are presented in Table 1.

Duration of prosthetic use was more than 10 years in 60 (55.0%) patients; however 17 (15.5%) patients did not use any prostheses. Forty-five (41.3%) patients had used 2–5 prostheses and 34 (31.2%) patients had used more than five prostheses until the date of the analysis.

The result of the SIGAM mobility scale was determined as grade A in 17 (15.6%), grade B in 2 (1.8%), grade C/b in 2 (1.8%), grade C/c in 2 (1.8%), grade D/b in 6 (5.5%), grade D/c in 15 (13.8%), grade E in 27 (24.8%), and grade F in 38 (34.9%) patients. The results of the SIGAM mobility scale are presented in Table 2.

Translation

There were three words which were translated differently by the translators. The translators stated that they had difficulty in translating the statements "wear a false leg" that was present in almost all questions, "level ground" in question 15, and "nursing care" in questions 4a and 4b. One of the translators translated "false leg" as "protez bacak", and the other as "takma bacak".

When preparing the common text, it was thought that the term "protez bacak" might mean hip and knee endoprostheses, and a decision was made to translate "false leg" as "takma bacak". The statement "wear a false leg" in the original text was translated as "protez bacak takmak" by one translator, and as "takma bacak kullanmak" by two other translators. In the meeting with the participation of all the translators, it was decided that the statement "takma bacak kullanmak" could be more understandable by the patients, and this statement was used. One of the translators translated "Level ground" as "düz zemin", others as "zemin kat". A decision was reached to translate "Level ground" as "zemin kat" as it was more acceptable for original text and more understandable.

Cultural adaptation

As the SIGAM mobility scale questions were clear, the Turkish adaptation did not cause significant problems. Only one word required cultural modification. Nursing care means "hastabakıcılık" in Turkish. However, when "receiving nursing care" is considered, the statement "bakım hizmeti almak" is a more proper statement in Turkish; therefore the translators decided to use "bakım hizmeti" as the translation of "nursing care".

Changes were not required for any item following the execution of the preliminary version (pretest).

Reliability and validity

The reliability of the SIGAM mobility scale was analyzed by using internal consistency and test–retest methods. The fourth and fifth questions of the scale were filter questions and there were insufficient "yes" answers for those questions; for this reason, they were excluded from the analysis of internal consistency. Cronbach's alpha coefficient of internal consistency was found to be 0.670 in our study. This value shows that our scale is reliable.[20]

The repeatability for each question was determined using Cohen's kappa coefficient to assess test–retest reliability
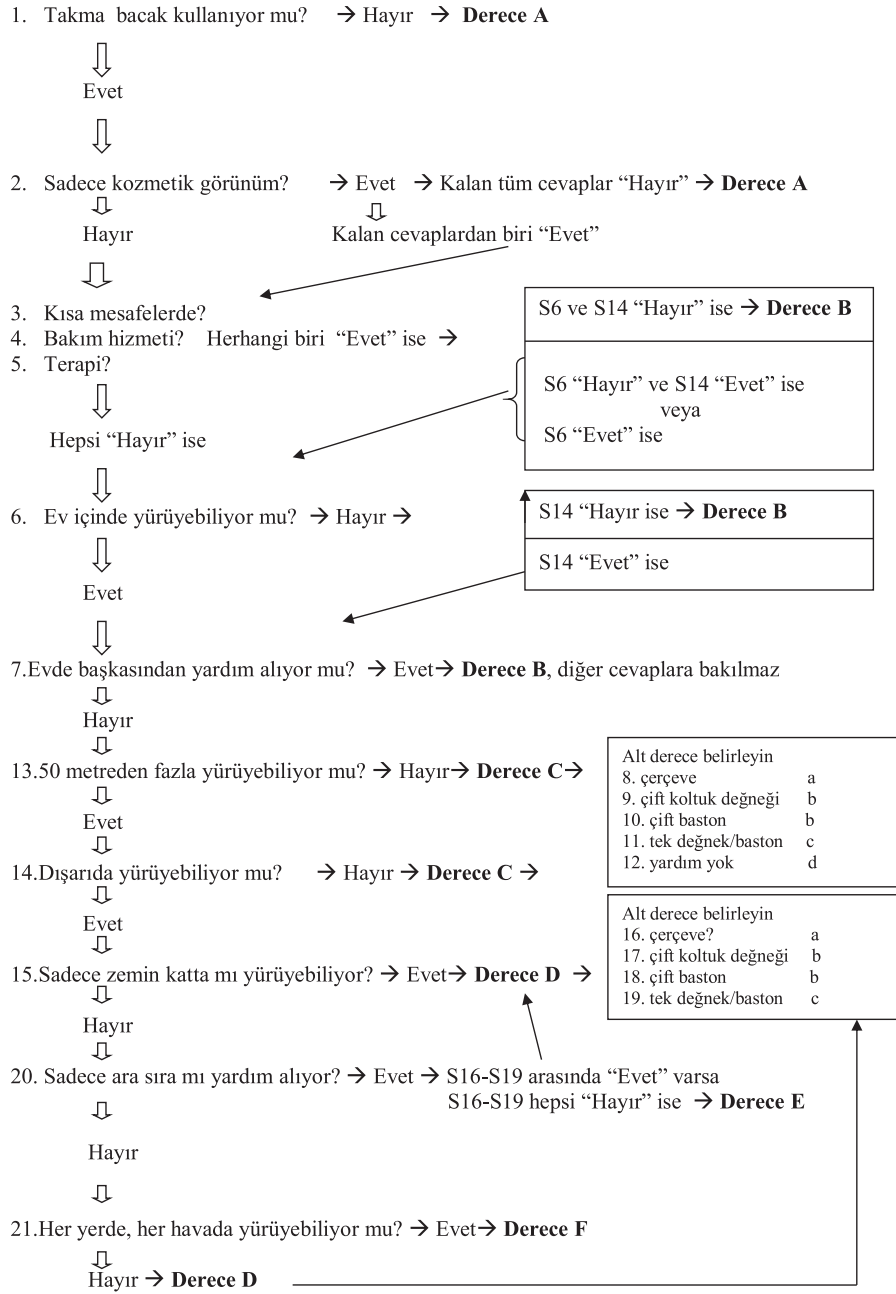
Figure 2. Turkish version of the SIGAM assessment algorithm.

of the scale. Cohen's kappa coefficients of the questions were between 0.224 and 0.999. Cohen's kappa coefficients of the questions in the scale are presented in Table 3. Repeatability of the SIGAM mobility scale results (grades A–F) was found to be 0.822. There was a perfect concordance between the first application of the SIGAM mobility scale, and its application 72 h later.[21] External structural validity of the scale was investigated by analyzing the correlations of the SIGAM mobility scale scores with eight domains of the SF-36, the FAS, SATPRO, and Get Up and Go Test. Significant and strong correlations were found between the SIGAM mobility grades of the patients and all domains of the SF-36, SATPRO, FAS, and Get Up and Go Test. The correlations between the SIGAM mobility grades and SF-36, SATPRO, FAS, and Get Up and Go Test are presented in Table 4. While taking lower critical correlation value as 0.76; upper critical correlation value as 0.88; Type-I error rate as $\alpha = 0.05$ achieved power of this study was 0.91 with total 109 patients.

Discussion

When we looked at the number of lower extremity amputees, lack of a specific Turkish scale evaluating mobility of these patients motivated us to perform a study. Taking this problem into consideration, in this study we aimed to adapt the SIGAM mobility scale into Turkish, and to test its validity and reliability. With this purpose, the Turkish version of the SIGAM mobility scale was tested on 109 patients and power of this study was found as 0.91. This result showed that our sample size was sufficient considering the aim of the study.

In our study, Turkish version of the SIGAM mobility scale was found to be reliable and valid. Repeatability of the SIGAM mobility scale was found as 0.822. This result indicates that the margin of error is small on repeated measurements of the Turkish version of the SIGAM mobility scale, and that it gives consistent results in the case of retest.[18] In the previous study which was conducted

Table 1. Demographic characteristics of the patients and etiology of amputation.

Age (years) [mean ± SD (min–max)]	41.7 ± 12.6 (18–70)
Gender n (%)	
Female	16 (14.7)
Male	93 (85.3)
Educational background n (%)	
Literate	6 (5.5)
Elementary education	44 (40.4)
High school	35 (32.1)
University	24 (22)
Working status n (%)	
Working	45 (41.3)
Not working	64 (58.7)
Etiology of amputation n (%)	
Gunshot wounds and mine explosion	47 (43.1)
Trauma (traffic and industrial accident)	28 (25.7)
Vascular reasons (diabetes mellitus, etc.)	13 (11.9)
Infections	10 (9.2)
Congenital reasons	6 (5.5)
Frostbite	3 (2.7)
Tumors	1 (0.9)
Electrical shock	1 (0.9)

Table 2. The results of SIGAM mobility scale.

SIGAM mobility scale grades	n (%)
A	17 (15.6)
B	2 (1.8)
C/b	2 (1.8)
C/c	2 (1.8)
D/b	6 (5.5)
D/c	15 (13.8)
E	27 (24.8)
F	38 (34.9)

Grades A and F represent the least and highest grade, respectively.

Table 3. Cohen's kappa coefficients of the questions in SIGAM mobility scale.

SIGAM mobility scale questions	Cohen's kappa coefficient
Question 1	0.927
Question 2	0.999
Question 3	0.999
Question 4	0.999
Question 5	0.999
Question 6	0.999
Question 7	0.999
Question 8	0.999
Question 9	0.999
Question 10	0.999
Question 11	0.999
Question 12	0.945
Question 13	0.883
Question 14	0.999
Question 15	0.999
Question 16	0.999
Question 17	0.999
Question 18	0.999
Question 19	0.961
Question 20	0.691
Question 21	0.224

Table 4. The relations of the SIGAM mobility scale with SF-36, SATPRO, FAS, and Get Up and Go Test.

	SIGAM mobility scale		
Clinical evaluations	Spearman's correlation coefficient	p	n
SF-36 physical functioning	0.950	<0.001	109
SF-36 physical role functioning	0.924	<0.001	109
SF-36 bodily pain	0.909	<0.001	109
SF-36 general health perceptions	0.907	<0.001	109
SF-36 vitality	0.899	<0.001	109
SF-36 social role functioning	0.907	<0.001	109
SF-36 emotional role functioning	0.833	<0.001	109
SF-36 mental health	0.862	<0.001	109
SATPRO	0.949	<0.001	92
FAS	0.993	<0.001	109
Get Up and Go Test	−0.881[a]	<0.001	90

SATPRO: Satisfaction with the Prosthesis Questionnaire; FAS: Functional Ambulation Scale.
[a]There was a negative correlation between the SIGAM mobility scale and Get Up and Go Test (while the mobility of patients increases, Get Up and Go Test time decreases).

lower (0.224) when compared to other questions. The reason for having lower Cohen's kappa coefficient for this question may be the difficulty to comprehend the question by the patients since it is much longer and more complicated when compared to other questions.

One of the parameters that show reliability is internal consistency. Cronbach's alpha coefficient is the most frequently used method for this purpose. In our study, we found Cronbach's alpha coefficient as 0.670 for the Turkish version of the SIGAM mobility scale. This value also indicates that the reliability of our scale is acceptable.

When we analyzed the correlations of the SIGAM mobility scale with SF-36, SATPRO, FAS, and the Get Up and Go Test, we found strong correlations ($p < 0.001$). This result shows the validity of the Turkish version of the SIGAM mobility scale.

When we approached our study from the demographic perspective, we saw that lower extremity amputations were more common in males which are similar to the findings in the literature.[22,23] This result may be due to the higher trauma risk in males compared to females. Peripheral vascular diseases have been reported as the most common causes for lower extremity amputations in the literature.[24] Trauma is usually the second leading cause.[25] In our study, the most frequent causes for amputation were gunshot wounds, mine explosions and other traumas. We think that, this result may be due to having several patients who experienced traumas during their military service in our study. In our study, 58.7% of our patients were not working. This poses an additional social and economic burden adding to the functional loss from lower extremity amputations. A study by McAnelly and Faulkner reported that 59% of patients had transtibial amputations.[26] Similar to this study, 57.8% of our patients had transtibial amputations. We suppose that high functional expectations played a role when determining the level of amputation, in accordance with the literature.[27] Additionally, the analysis of duration of amputation and prosthetic use, the number of prostheses used to date revealed that most of our patients (60.6%) had undergone amputation at least 10 years ago, and 55.0% of them had been using prostheses for at least 10 years. The relatively long time between the amputations and performing this study explains why 41.3% of our patients had used 2–5 prostheses following amputations.

The limitation of our study is finding Cronbach's alpha value of the Turkish version of the SIGAM mobility scale slightly low.

Ryall et al., repeatability was found as 0.86 similar to our results, also Cohen's kappa coefficient of the second question was found to be lower (0.38) when compared to other questions.[6] Unlike this study, in our study Cohen's kappa coefficient for question 21 (outdoors, wearing your false leg(s), do you walk anywhere, in any weather conditions, without using any walking aid at all?) was

We think that, it was due to having lower number of patients who had grade B and C compared to other grades (A–D–E–F). Cronbach's alpha coefficient might be found higher in further studies with inclusion of higher numbers of patients in grades B and C.

Conclusions

In conclusion, the Turkish version of the SIGAM mobility scale was found as reliable, valid, and easy to use in everyday practice for measuring mobility in lower extremity amputees. We believe that this study will solve the problem of not having an evaluation tool for the mobility of Turkish lower extremity amputees.

Acknowledgements

We express our gratitude to Muge Ozcan MD, Ipek Ziraman MD, and Ms. Zeynep Kaya for their support in translation of this manuscript.

Disclosure statement

The authors report no declarations of interest.

References

[1] Terry Canale S, Beaty JH. Campbell's operative orthopaedics. 12th ed. Chapter 14. Maryland Heights, Missouri: Mosby; 2012. p. 598–611.

[2] Demet K, Martinet N, Guillemin F, et al. Health related quality of life and related factors in 539 persons with amputation of upper and lower limb. Disabil Rehabil. 2003;25:480–486.

[3] de Laat FA, Rommers GM, Geertzen JH, et al. Construct validity and test–retest reliability of the questionnaire rising and sitting down in lower-limb amputees. Arch Phys Med Rehabil. 2011;92:1305–1310.

[4] Legro MW, Reiber GD, Smith DG, et al. Prosthesis evaluation questionnaire for persons with lower limb amputations: assessing prosthesis-related quality of life. Arch Phys Med Rehabil. 1998;79:931–938.

[5] Desmond DM, MacLachlan M. Factor structure of the Trinity Amputation and Prosthesis Experience Scales (TAPES) with individuals with acquired upper limb amputations. Am J Phys Med Rehabil. 2005;84:506–513.

[6] Ryall NH, Eyres SB, Neumann VC, et al. The SIGAM mobility grades: a new population-specific measure for lower limb amputees. Disabil Rehabil. 2003;25:833–844.

[7] Rommers GM, Ryall NH, Kap A, et al. The mobility scale for lower limb amputees: the SIGAM/WAP mobility scale. Disabil Rehabil. 2008;30:1106–1115.

[8] Joussain MC, Ryall N, Laroche D, et al. French version of the SIGAM mobility scale: cross-cultural validation of its psychometric properties. Amsterdam, Netherlands: Elsevier Masson; 2013.

[9] Joussain MC, Ryall N, Casillas JM, et al. French version of the SIGAM mobility scale: cross-cultural translation. Educational presentation. Amsterdam, Netherlands: Elsevier Masson; 2013.

[10] Beaton D, Bombardier C, Guillemin F, et al. Supported by the American Academy of Orthopedic Surgeons Institute for Work & Health. Recommendations for the Cross-Cultural Adaptation of Health Status Measures; 1998.

[11] Guillemin F, Bombardier C, Beaton D. Cross-cultural adaptation of health-related quality of life measures: literature review and proposed guidelines. J Clin Epidemiol. 1993;46:1417–1432.

[12] Acquadro C, Conway K, Hareendran A, et al. Literature review of methods to translate health-related quality of life questionnaires for use in multinational clinical trials. Value Health. 2008;11:509–521.

[13] Brazier JE, Harper R, Jones NM. Validating the SF-36 health survey questionnaire: new outcome measure for primary care. BMJ. 1992;305:160.

[14] Koçyiğit H, Aydemir Ö, Ölmez N, et al. Kısa Form-36 (KF-36)'nın Türkçe Versiyonunun Güvenilirliği ve Geçerliliği. İlaç Ve Tedavi Dergisi. 1999;12:102–106.

[15] Şimşek İE, Şener G, Yakut Y. Unilateral alt ekstremite amputelerinde Protez Memnuniyeti Anketi'nin Türkçe güvenirliği ve geçerliği: Pilot Çalışma. Fizyoterapi Rehabilitasyon. 2010;21:81–86.

[16] Viosca E, Martínez JL, Almagro PL, et al. Proposal and validation of a new functional ambulation classification scale for clinical use. Arch Phys Med Rehabil. 2005;86:1234–1238.

[17] Mathias S, Nayak US, Isaacs B. Balance in elderly patients: the 'get-up and go' test. Arch Phys Med Rehabil. 1986;67:387–389.

[18] Cohen J. A coefficient of agreement for nominal scales. Educ Psychol Meas. 1960;20:37–46.

[19] Cronbach LJ. Coefficient alpha and the internal structure of tests. Psychometrika. 1951;16:297–334.

[20] Metin Y. İstatistiğe Yönelik Tutum Ölçeği: Geçerlilik ve Güvenirlik Çalışması. Pamukkale Üniversitesi Eğitim Fakültesi Dergisi. 2014;36:59–75.

[21] Landis JR, Koch GG. The measurement of observer agreement for categorical data. Biometrics. 1977;33:159–174.

[22] Sinha R, van den Heuvel WJA, Arokiasamy P. Factors affecting quality of life in lower limb amputees. Prosthet Orthot Int. 2011;35:90–96.

[23] Sinha R, Van Den Heuvel WJA. A systematic literature review of quality of life in lower limb amputees. Disabil Rehabil. 2011;33:883–899.

[24] Dillingham TR, Pezzin LE, MacKenzie EJ. Limb amputation and limb deficiency: epidemiology and recent trends in the United States. South Med J. 2002;95:875–883.

[25] Esquenazi A. Amputation rehabilitation and prosthetic restoration. From surgery to community reintegration. Disabil Rehabil. 2004;26:831–836.

[26] McAnelly RD, Faulkner VW. In: Braddom RL, Buschbacher RM, Dumitru D, editors. Physical medicine and rehabilitation. Philadelphia, PA: W.B. Saunders Company; 1996. p. 286–320.

[27] Saeed AB, Saeed UB, Zain-Ur-Rehman M. Factors affecting functional outcome after lower extremity amputation. J Pak Med Assoc. 2015;65:220–224.