

The prosthesis evaluation questionnaire: reliability and cross-validation of the Turkish version

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Abstract. [Purpose] Currently, there are a limited number of amputee-specific instruments for measuring prosthesis-related quality of life with good psychometric properties in Turkey. This study translated the Prosthetic Evaluation Questionnaire to Turkish and analyzed as well as discussed its construct validity and internal consistency. [Subjects and Methods] The Prosthetic Evaluation Questionnaire was adapted for use in Turkish by forward/backward translation. The final Turkish version of this questionnaire was administered to 90 unilateral amputee patients. Second evaluation was possible in 83 participants within a median 28 day time period. [Results] Point estimates for the intraclass correlation coefficient ranged from 0.69 to 0.89 for all 9 Prosthetic Evaluation Questionnaire scales, indicating good correlation. Overall Cronbach's alpha coefficients ranged from 0.64 to 0.92, except for the perceived response subscale of 0.39. The ambulation subscale was correlated with the physical functioning subscales of Short Form-36 (SF-36) ($r=0.48$). The social burden subscale score of the Prosthetic Evaluation Questionnaire was correlated with social functioning subscales of SF-36 ($r=0.63$). [Conclusion] The Turkish version of the Prosthetic Evaluation Questionnaire is a valid and reliable tool for implementation in the Turkish unilateral amputee population.

Key words: Prosthetic Evaluation Questionnaire, Turkish, Validity

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INTRODUCTION

Quality of life is defined as individuals' perception of their position in life, in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns. In addition, multiple factors including physical health, level of independence, psychological state, social relationships, personal beliefs, and their interactions to salient features of their environment are related to the quality of life¹⁾. Rehabilitation practitioners should keep up with quality of life of the patients while creating intervention targets for rehabilitation programs²⁻⁴⁾. This approach is particularly important in the management of lower limb amputee patients with prostheses. In this context, in order to identify the perception of the user, measuring the quality of life related to prosthesis is critical, as well as defining its functionality^{5, 6)}.

Despite the large number of studies focusing on limita-

tions in the lower limb amputee population, there are only a few health-related outcome measurement tools available that are reliable and valid in patients with a lower limb amputation⁷⁾. The Prosthetic Evaluation Questionnaire (PEQ) that was specifically developed to assess prosthesis-related changes in quality of life is one of only a few detailed instruments. PEQ is organized into nine functional domain scales that may be used individually to measure a specific domain of interest⁸⁾. The Trinity Amputation and Prosthesis Experience Scales (TAPES), adapted to the Turkish language by Topuz et al., is a self-report test that measures health-related quality of life of lower limb amputee patients with prostheses⁹⁾. However, the authors were not able to determine any correlation between the total score of the psychosocial adjustment subscale of the Turkish version of TAPES and the emotional reaction subscale of the Nottingham Health Profile (NHP) or the NHP total score. Hence, adaptation and validation of more instruments in Turkish are essential for assessing care outcomes in people with amputations.

We preferred PEQ not only because it includes questions about measured prosthesis-related quality of life in lower limb amputees, but also because it has a wide range of topics relevant to amputation with good psychometric properties⁸⁾. We aimed to translate the PEQ to Turkish and assess its reliability and validity in lower limb amputees.

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SUBJECTS AND METHODS

PEQ is composed of 82 questions with 9 subscales including frustration (FR), perceived response (PR), social burden (SB), ambulation (AM), utility (UT), residual limb health (RL), appearance (AP), sounds (SO), and well-being (WB). Seventy-six of 82 questions in PEQ use a visual analog scale with scores expressed in millimeters (0–100 mm). Some questions also have check marks, which indicate that the question, scored on the visual analog scale, is not applicable to the respondent. For some questions, a check mark is scored as a 100, whereas for others, it indicates “no response”¹⁰. The scores for each subscale are generated by computing the arithmetic mean of all questions, and at least half of the questions of a single scale should be answered with a number score and not with “no response” for correct assessment⁶. The PEQ scale refers to the 4 weeks preceding the administration of the instrument⁴.

The Short Form-36 (SF-36) comprises 36 items with 8 multi-item subscales including bodily pain (BP), general health perception (GH), general mental health (MH), physical function (PF), role limitation due to emotional problems (RE), role limitation due to physical health problems (RP), social functioning (SF), and vitality (VT). All subscales are scored between 0 and 100 (higher scores indicate higher WB or functionality) and are summarized into 2 component summary scores; the physical component summary (PCS, consisting of VT, SF, RE, and MH subscales), and mental component summary (MCS, consisting of PF, RP, BP, and GH)^{11–13}. SF-36 has recently been used in some adaptation studies for PEQ^{8, 14}, and we used PF and SF subscales as in the original PEQ study by Legro et al⁸. SF-36 was previously translated to Turkish language, and it was proven to be valid and reliable¹⁵.

The translation team consisted of three bilingual native-Turkish speaking health care professionals as informed translators and one bilingual native-English speaking health care professional as the uninformed translator, all of who were blinded to the study protocol. The procedure of forward/backward translation has been previously described¹⁶. Briefly, each informed translator independently translated the PEQ and discussed the results with the other translators in order to obtain a consolidated version; the uninformed translator then re-translated that consolidated version back to English. Finally, the third native Turkish-speaking rehabilitation professional evaluated the disparity between the forward and backward translations.

The study participants were recruited from unilateral amputee patients who were admitted to the Ministry of Health, Ankara Physical Medicine and Rehabilitation Training and Research Hospital between January 2012 and December 2013. This is the biggest national inpatient rehabilitation center as well as one of the national reference centers for amputees in Turkey. The study was approved by the local institutional review board.

Patients were eligible to participate if they had a lower limb amputation and had used their current prosthesis for at least 6 months, and if they had given written informed consent. Exclusion criteria were as follows: bilateral lower limb

or concomitant upper limb amputation; mental or other disorders limiting the proper usage of prosthesis or other aids, participation in a prosthesis rehabilitation program within the previous six months; unstable medical conditions; and withdrawal of informed consent. Participants were asked to complete the PEQ and SF-36 at the first visit and complete only the PEQ at the second visit. All questionnaires were administered in the same center. If the patient did not attend within 4 weeks after the first evaluation, the patient was reminded via a phone call.

All data were recorded on a computer database and analyzed using the SPSS 20.0 package program (SPSS, Inc., Chicago, IL, USA). Data are presented as percentages and numbers for categorical variables, and means \pm standard deviations (SD) for continuous variables. The Kolmogorov-Smirnov test was used to determine the distribution characteristics of the variables.

Reliability of each subscale of the Turkish version of PEQ was evaluated separately in terms of test-retest reliability and internal consistency. The Cronbach's alpha coefficient was used to estimate the interrelation degree of constituent items. Rasch analysis with the Person Separation Index was performed for further reliability analysis. The intraclass correlation coefficient (ICC, range 0.00–1.00) was also determined. The intraclass correlation coefficient (ICC) was considered as very good if ranged between 0.60–0.80, and excellent if over 0.80¹⁷.

The external construct validity of the PEQ was assessed by quantifying the relationships (Pearson and Spearman rank correlation coefficient [r]) between the subscales of PEQ AM vs. SF-36 PF and PEQ SB vs. SF-36 SF.

RESULTS

Eighty-three participants completed the two visits with a very high completion rate of items on the PEQ scale. Seven subjects were excluded, as they did not come for the second evaluation. The mean age of the participants was 41.0 ± 12.2 years, with a male population of 94% (n: 78). The median PEQ re-test time was 28 days (mean \pm SD: 28 ± 11 days) The descriptive and socio-demographic characteristics of participants were summarized in Table 1. The causes of amputation were trauma in 71.1%; tumor in 12%; congenital problems in 2.4%; peripheral arterial disease in 8.4%; and others in 6%.

Reliability of the PEQ scale was examined in terms of internal consistency and temporal stability. The internal consistency represented by Cronbach's alpha coefficient could be sorted as follows: AM=0.92, SB=0.78, AP=0.77, FR=0.86, PR=0.39, RL=0.77, SO=0.65, UT=0.90, and WB=0.64. Evaluation of mean scores of the first and second visits on each subscale showed a temporal stability with interclass correlation, ranging from 0.69 to 0.89 (Table 2).

Additionally, a high association between PEQ SB and SF-36 SF ($r=0.63$, $p<0.01$) and moderate association between PEQ AM and SF-36 PF ($r=0.48$, $p<0.01$) were determined in the external construct validity assessment of PEQ.

DISCUSSION

The Turkish version of PEQ was reported to be reliable and partially valid for unilateral amputee patients as well as feasible for implementation in daily practice. The current study was designed to assess the validity of the SB and AM subscales of PEQ and not for the WB subscale of PEQ. Validity assessment of the WB was not included in the current study due to the requirement of another questionnaire to compare with which would most likely diminish the

completion rates of all scales. So that, our design allows us to reach very high completion rates for all scales applied to participants. However, the questions that offered the option of a check mark beside the visual analog scale to indicate that the question is not applicable to responder were marked to large extend for the PR subscale (For group 3-question d, “no response” rate was 27%; for group 3-question e, rate was 19%; for group 3-question g rate was 8%; for group 3-question h, rate was 7%). Therefore, this might have resulted in a particularly low Cronbach’s alpha coefficient that was 0.39 for the PR subscale in this study. All other Cronbach’s alpha coefficients in this study were ranging from 0.64 to 0.92 and were consistent with those reported by Ferriero et al.¹⁴), but were slightly lower than those reported by Legro et al.⁸).

The ICC results of AM, FR, PR, SO, and UT were over 0.80 (range 0.82–0.89), while the rest of the parameters of the ICC subscales ranged from 0.69 to 0.79. The ICC results in our study were lower than the Arabic version of the PEQ, which ranged from 0.82 to 0.97 in the study by Day and Buis⁷).

However, the design of the study performed by Day and Buis had limited comparisons in both results. They assessed ICC by comparing the English and Arabic versions of PEQ when examining patients who were bilingual in Arabic and English for both scales, and the re-test time was relatively shorter than ours (approximately 28 days in our study). However, the original validation study of PEQ was performed with mean re-test time of 30 days⁸). In comparison with the reported ICC distribution ranging from 0.56 to 0.90 by Legro et al., we obtained better results in our study (ranging from 0.69 to 0.89). Although, our study sample (n=83) was smaller compared to that in the study by Legro et al.(n=92)⁸), we did not lose any patients at follow-up. We believe that the higher re-test rate in our sample had better ICC results. In addition, we could not compare our ICC results with those reported by Ferrigo et al.¹⁴) due to the absence of a re-test evaluation in their study design.

The external construct validity in our study was evaluated in the same manner as the original PEQ questionnaire trial by Legro et al. According to this, they found that the SB score strongly correlated with the SF subscale of SF-36 ($r=0.59$)⁸). Similarly, we also observed a strong correlation between both scales. Moreover, we determined a moderate

Table 1. Participant characteristics

Characteristics	Mean±SD (Range)
Age (years)	41.0±12.2
Time since last prosthesis (months)	74±6
Gender (Male)	78 (94%)
Marital status	
Never married	13 (15.7%)
Married	66 (79.5%)
Widowed or divorced	4 (4.8%)
Education (years)	8.6±3.8
Work status: employed	67 (80.7)
Household members	4.1±1.6
Level of amputation	
Hip disarticulation	2 (2.4%)
Transfemoral	35 (42.2%)
Knee disarticulation	5 (6%)
Transtibial	41 (49.4%)
Time since amputation	
0–60 months	18 (21.7%)
61–120 months	18 (21.7%)
121 through 240 months	20 (24.1%)
241 or more months	27 (32.5%)
Reason for amputation	
Trauma	59 (71.1%)
Tumor	10 (12%)
Congenital problem	2 (2.4%)
Peripheral arterial disease	7 (8.4%)
Other	5 (6%)

Table 2. The prosthesis evaluation questionnaire scale summary

Scale name	Mean±SD	Range	Cronbach’s Alpha	Temporal stability
Ambulation	32.9±18.0	5–92	0.92	0.84 (0.76–0.89)
Social burden	56.6±26.4	3–100	0.78	0.73 (0.61–0.82)
Appearance	35.5±20.2	4–88	0.77	0.77 (0.67–0.85)
Frustration	63.7±34.4	2–100	0.86	0.89 (0.83–0.93)
Perceived response	62.1±21.6	5–100	0.39	0.82 (0.72–0.88)
Residual limb health	48.1±23.3	5–92	0.77	0.69 (0.55–0.79)
Sound	37.0±28.8	3–100	0.65	0.83 (0.75–0.89)
Utility	31.3±19.8	1–87	0.90	0.87 (0.8–0.91)
Well being	44.8±23.4	4–96	0.64	0.77 (0.67–0.85)

correlation between the AM score and SF-36 subscale of PF, while strong correlations were reported by Legro et al.

The present study had several limitations that should be acknowledged. The subjects were not recruited randomly and they represented a specific population in terms of the education level and employed state. Additionally, our study population was predominantly male.

In conclusion, the findings of the present study indicate that the PEQ is a useful tool for assessment of mobility and the psychosocial status in unilateral lower extremity amputees. For the Turkish speaking population, future studies are warranted to adapt similar tools in pediatric patients as well as upper limb amputees.

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