The Arabic Version of Trinity Amputation and Prosthetic Experience Scale - Revised (TAPES-R) for Lower Limb Amputees: Reliability and Validity

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ABSTRACT

Purpose: *Despite the importance of the evaluation process in lower limb prosthetic rehabilitation, prostheses are rarely evaluated properly in the Arab world. This is partly due to the absence of any suitable Arabic evaluative tool. The aim of this study is to translate TAPES-R (a standardised evaluative questionnaire) into Arabic and to investigate its psychometric properties on lower limb amputees. Such a tool would ultimately be of benefit for clinical follow-up and research purposes.*

Method: *International standards were followed for the forward- and back-translation of the TAPES-R questionnaire. A sample of 111 Arabic-speaking volunteers with lower limb amputation completed the translated version of the questionnaire. The responses were then statistically analysed using factor analysis and Cronbach's* α *to assess the content and construct validity, and internal consistency (reliability) respectively.*

Results: *Factor analysis showed that the questionnaire's items (included in the analysis) can be divided into three distinct dimensions as was originally suggested. The distribution of the items within the three dimensions is comparable with the original questionnaire. All three parts of TAPES-R showed high reliability; where Cronbach's* α *were .892, .894, and .873 respectively.*

Conclusion: *This study found that the Arabic version of TAPES-R represents a valid and reliable tool.*

Limitations: *The questionnaire is designed to be emailed or posted, but the majority of the amputee population in Jordan did not have these services, so direct contact with each participant was necessary.*

Key words: *quality of life, TAPES, amputation, rehabilitation*

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INTRODUCTION

Individuals with lower limb amputation face complex functional, psychological, and social challenges as a direct result of the permanent surgical procedure (Day, 1981; Gallagher and MacLachlan, 1999; Atherton and Robertson, 2006; Zidarov et al, 2009). The impact of these challenges is widely assessed clinically and/or with the use of validated instruments such as questionnaires.

Although there are a number of English language instruments for the assessment of lower limb amputation and its functional and psychosocial impact (Legro et al, 1998; Gallagher, 2000; Calmels et al, 2001; Miller et al, 2001; Rushton and Miller, 2002; Devlin et al, 2004; Skevington et al, 2004; Deans et al, 2008; Larsson et al, 2009), the authors of the current study are not aware of any valid and reliable questionnaire for the Arabic-speaking individuals who undergo amputation. Arabic multidimensional prosthetic outcome measurement instruments would enable clinicians to better understand and improve client rehabilitation outcomes.

The high quality and relatively low-cost prosthetic and orthotic services in Jordan are in demand by Arabic-speaking amputees from a number of neighbouring countries, including Iraq and Syria, where there are armed conflicts. Therefore, the need for an Arabic evaluative tool is urgent. Jordanian Arabic is easily understood in almost all Arab countries, and hence a Jordanian Arabic evaluative tool can be widely used in these places.

To date, only two published studies have attempted Arabic translations of clients' self-reported evaluations of functional outcome measures. In a work by Day and Buis (2012), the Prosthetic Evaluation Questionnaire (PEQ) has been translated into Arabic, but the validity of this instrument is questionable as only 7 subjects completed the translated questionnaire. At most, their study would show that the Arabic version of the PEQ was linguistically comparable to the original English version.

A study by Hadeel et al (Bakhsh H et al, 2014) aimed to translate and validate the original English version of Client Satisfaction with Device (CSD-Ar) module of the Orthotics and Prosthetics Users' Survey (OPUS) in order to assess clients' satisfaction with an orthosis. Although the CSD-Ar is a unidimensional scale designed for users of prosthetics and orthotics, this study was restricted to clients using orthotics only. Additionally, such an instrument overlooks the multi-dimensional impacts of the prosthesis as mentioned above.

The Trinity Amputation and Prosthesis Experience Scale (TAPES) is a multi-dimensional evaluative questionnaire designed for individuals with lower

limb amputation (Gallagher and MacLachlan, 2004). TAPES is able to provide a subjective understanding of the experience of amputation and adjustment to lower limb prosthesis. It was designed to assess 4 distinct domains: psychosocial adjustment, activity restriction, prosthetic satisfaction, and the experience of residual limb pain, phantom limb pain, and other medical complications. In the course of improving and revising the measurement quality of TAPES, a complete psychometric analysis of the main three scales of TAPES was carried out, using both classical test theory and Resch analysis. A revised version of TAPES (TAPES-R) with a more simplified structure and psychometrically suitable for the evaluation of amputation experience and adjustment to lower limb prosthesis has been released in English (Gallagher et al, 2010).

Having been translated into many languages, such as Portuguese, Cambodian, Swedish, Italian, Turkish, and Persian (Mazaheri et al, 2011; Topuz et al, 2011), TAPES is a self- reported instrument that has been widely used in research. The need for a standard tool for assessing the prosthetic and rehabilitation outcomes of amputees in Jordan (i.e., Jordanian and refugee amputees) was the impetus for this study. Therefore, this study aimed to translate TAPES-R into Arabic and to establish some of its psychometric properties in order to provide a valid understanding of the experience of amputation and adjustment to lower limb prosthesis in Jordan.

METHOD

Translation of TAPES-R into Arabic

After permission to translate TAPES-R was obtained from the developers, the guidelines recommended by the International Quality of Life Assessment project for cross-cultural adaptation were used to translate TAPES-R to Arabic (Guillemin et al, 1993).

Two native speakers of Arabic, with no medical background, independently translated the original English version of TAPES-R into the Arabic language. After several meetings with the researchers, an Arabic draft was agreed on. The translation draft was then sent to a recommended translation company in Amman, Jordan, for back-translation into English. The translators had no medical or prosthetic background. A first draft was sent to the researchers who reviewed the back-translation along with the developers of TAPES-R and compared it with the original.

The developers of TAPES-R advised the modification of a few of the wordings in the translation. These were all related to prosthetic definitions, such as phantom pain and phantom sensations. The researchers considered these modifications carefully, but no changes were made to the draft of the Arabic language translation as the English modifications have no effect on Arabic meaning or understanding of the words.

To assess the clarity of the language used in the translated questionnaire, the Arabic version of TAPES was handed to 7 randomly assigned undergraduate students at the University of Jordan/ Department of Prosthetics and Orthotics. The students were asked to give feedback on the final translation and comment on the ease of understanding. Students were blinded as to the purpose of the study. No misunderstood wordings or major comments were reported.

Participants

Approval for the study was obtained from the Scientific Committee of the Faculty of Rehabilitation Sciences at the University of Jordan on the 24th of February 2015.

For the selection of study participants, three different limb-fitting centres in Amman were approached. While one is a government centre (the Prosthetic and Orthotic workshop at Al Basheer Hospital), the other two are private organisations (Al Handasiyeh Prosthetic and Orthotic Company and Medical Step Prosthetic and Orthotic Company). Any native speaker of Arabic, with lower limb amputation and fitted with a prosthesis, was considered a potential candidate for this study.

A total of 111 amputees were recruited. They were invited to complete the Arabic version of TAPES-R questionnaire during their routine visit to their limb-fitting centre. TAPES was originally designed to be posted or emailed; however, there is no database for amputees in Jordan, so the questionnaires had to be completed on-site by willing candidates.

TAPES-R Questionnaire

The questionnaire contains four sections: psychosocial adjustment, activity restriction, prosthetic satisfaction, phantom limb pain and stump pain.

The first section consists of three psychosocial sub-scales: general adjustment, social adjustment, and adjustment to limitation. Each sub-scale contains five items, which are measured along a 4-point rating scale (Strongly disagree; Disagree;

Agree; Strongly agree). Scores range from 4 - 20; the higher the score, the greater the level of adjustment. The second section consists of an activity restriction scale that has ten items with a 3-point rating scale (Yes, limited a lot; Limited a little; No, not limited at all). Scores range from 10 - 30; the higher the score, the greater the activity restriction. The third section addresses the satisfaction with the use of prosthesis, relating to functional and aesthetic characteristics of prostheses. The section consists of eight items with a 3-point rating scale (Not satisfied; Satisfied; Very satisfied). The fourth section investigates the experience of phantom limb pain, stump pain, and other medical conditions not linked to the amputation procedure.

RESULTS

Sample Characteristics

The demographic and amputation-related characteristics of all the participants (80 male, 31 female) are shown in Table 1. Of the 111 participants, there were 57 below-knee amputees, 40 above-knee amputees, 6 knee disarticulations, 3 partial foot amputees, and 5 with other types of amputations. The cause of amputation for the majority of the participants was trauma/ accidents (60.4%), followed by peripheral vascular disorder (24.3%). The mean length of prosthetic use was 12.6 years.

Table 1: **Sample Characteristics**

Characteristics	*n*	*%*	*Mean*	*SD*	*Range*
Gender					
Male	80	72.1			
Female	30	27.9			
Age (Years)			42.3	15.5	33-88
>18	7	6.3			
19-44	46	41.4			
45-64	53	47.7			
65-84	4	3.6			
85<	1	0.9			
Causes of Amputation					
Congenital	7	6.3			

Cancer	8	7.2			
Accident	67	60.4			
Peripheral vascular disorder	27	24.3			
Other	2	1.8			
Level of Amputation					
Partial foot	3	2.7			
Below Knee	57	51.4			
Through Knee	6	5.4			
Above Knee	40	36			
Through Hip	0	0			
Others	5	4.5			
Length of Prosthetic use (Years)			12.6	13.6	0.08-50

Statistical Analysis

In the process of standardising a translated questionnaire, an assessment of the psychometric properties of the translated questionnaire should be done. That is, a proper translation of the questionnaire's items does not fully guarantee maintaining the same psychometric properties of the original English version questionnaire.

Accordingly, Monte Carlo Simulation (MCS) (known also as parallel analysis or PA), exploratory factor analysis (EFA), and Cronbach's alpha test were completed, to establish certain psychometric properties of the translated questionnaire. PA and EFA were used to establish the construct validity of the sub-scales of TAPES (Bowling, 2009; Courtney and Gordon, 2013). Cronbach's alpha examines the reliability (internal consistency) of each sub-scale after establishing the construct validity (Nunnally, 1978). Furthermore, it can be assumed that face and content validity of the Arabic version of TAPES has been ensured through the translation procedure.

However, it was not possible to examine the criterion validity of the questionnaire due to the lack of a gold standard Arabic tool with which to compare the Arabic version of TAPES.

It must be mentioned that the psychometric properties of section four of the questionnaire (phantom limb pain and stump pain) were not examined here because it does not involve a scoring system for assessment of the validity.

Data was analysed using the Statistical Package for the Social Sciences (IBM® SPSS Statistics®), version 22 (IBM®. Armonk, New York, USA).

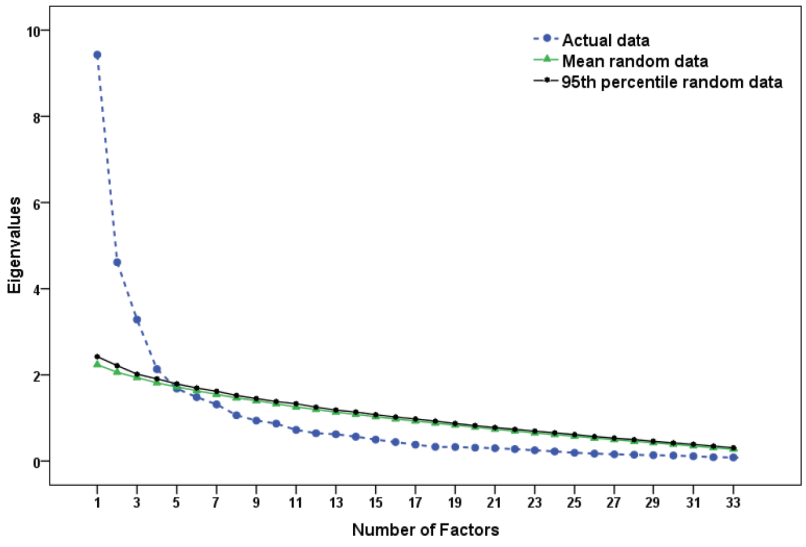
Validity Evaluation

Construct validity was evaluated by means of EFA. It was assumed that the questionnaire items should be clustered on three distinct factors; each of these represents a dimension (questionnaire section) of TAPES-R included in the analysis, making it possible to verify consistency with the original English version. The items of each dimension should also show an acceptable level of correlation between one another.

First, Monte Carlo Simulation (MCS) was performed to determine the minimum number of factors in TAPES (O'Connor, 2000; Field, 2009). MCS is one of the recommended tests to decide on the number of factors by defining the statistically significant eigenvalues in the data set. PA basically extracts eigenvalues from random data sets which are parallel to the actual data set.

According to Figure 1, four factors appear to exceed the corresponding random data eigenvalues for the same roots and therefore, four factors would retain eigenvalues that are beyond chance. However, the fourth factor has an eigenvalue of (2.1) that is just above the eigenvalue of the random data (1.8). Therefore, the fourth factor can be ignored.

Figure 1: Screen Plot of Parallel Analysis of the Arabic version of TAPES-R



EFA with 3 predetermined factors, using principal axis factoring as the extraction method with direct oblique rotation, was completed (Field, 2009). The extraction method was chosen because the data is not normally distributed; direct oblimin rotation was chosen since the factors were assumed to correlate with each other.

Kaiser-Meyer-Olkin (KMO) which is a measure of sampling adequacy showed that the sample size (111) meets the desired minimum sample size, where KMO = 0.816. Also, Bartlett's Test of Sphericity (χ^2 (528) =2575.84, p< .05) was significant, which supports the existence of correlations between the variables sufficiently large for factor analysis. All KMO values for individual items were > 0.76, which is well above the acceptable limit of 0.5 (Field, 2009).The three-factor solution explained 46.6% of the variance in the data.

Table 2 shows the direct oblique-rotated three-factor solution for all TAPES-R items. According to Table 2, the items that clustered on factor 1 (**bold**) represent section 1 of TAPES-R (Psychosocial adjustment scale), items on factor 2 represent section 2 of TAPES-R (Activity restriction scale), while items on factor 3 represent section 3 of TAPES-R (Satisfaction adjustment scale).

Additionally, according to Table 2, the items 11, 12, 15 (i.e., "A prosthesis interferes with the ability to do my work", "Having a prosthesis makes me more dependent on others than I would like to be", and "Having a prosthesis limits the amount of work that I can do", respectively) of psychosocial adjustment scale (factor 1) have a factor loading below .4; therefore, they have to be removed from the three-factor model (Field, 2009).

The item 15 (i.e., "Having a prosthesis limits the amount of work that I can do") showed factor loading on factor 2 instead of factor 1 where this item originally belongs to psychosocial adjustment scale. Therefore, this item should perhaps be deleted from the Arabic version.

Table 2: The Direct Oblique-rotated Three-factor Solution for all items of the Arabic Version of TAPES-R

	Factor		
Item	**1**	**2**	**3**
Psychosocial Adjustment			
General Adjustment			
1. I have adjusted to having a prosthesis	**.574**	.004	.164
2. As time goes by, I accept my prosthesis more	**.636**	.045	.165

3. I feel that I have dealt successfully with this trauma	**.717**	.044	.085
4. Although I have a prosthesis, my life is full	**.539**	.123	.120
5. I have gotten used to wearing a prosthesis	**.614**	.057	.144
Social Adjustment 6. I don't care if somebody looks at my prosthesis	**.826**	.030	.020
7. I find it easy to talk about my prosthesis	**.863**	.048	.163
8. I do not mind people asking about my prosthesis	**.868**	.024	.126
9. I find it easy to talk about my limb loss in conversation	**.705**	.003	.190
10. I don't care if somebody notices that I am limping	**.567**	.133	.058
Adjustment to Limitation **11. A prosthesis interferes with the ability to do my work**	.227	.266	.149
12. Having a prosthesis makes me more dependent on others than I would like to be	.352	.217	.325
13. Having a prosthesis limits the kind of work that I can do	**.452**	.311	.166
14. Being an amputee means that I cannot do what I want to do	**.441**	.367	.132
15. Having a prosthesis limits the amount of work that I can do	.308	**.421**	.047
Activity Restriction 1. Vigorous activities such as running, lifting heavy objects, participating in strenuous sports	.063	**.713**	.065
2. Climbing several flights of stairs	.013	**.736**	.052
3. Running for a bus	.110	**.772**	.142
4. Sport and recreation	.096	**.708**	.097
5. Climbing one flight of stairs	.035	**.774**	.140
6. Walking more than a mile	.065	**.678**	.070
7. Walking half a mile	.142	**.776**	.176
8. Walking 100 metres	.038	**.541**	.097
9. Working on hobbies	.036	**.578**	.061
10. Going to work	.123	.361	.088
Satisfaction Adjustment 1. Satisfaction concerning colour	.055	.051	**.601**
2. Satisfaction concerning shape	.079	.011	**.700**
3. Satisfaction concerning appearance	.083	.040	**.698**
4. Satisfaction concerning weight	.071	.063	**.402**
5. Satisfaction concerning usefulness	.124	.023	**.764**
6. Satisfaction concerning reliability	.207	.012	**.672**
7. Satisfaction concerning fit	.032	.050	**.778**
8. Satisfaction concerning comfort	.033	.035	**.704**

Reliability Evaluation

Internal Consistency was estimated by Cronbach's alpha after completing the factor analysis. All 3 parts of TAPES showed high reliabilities, where Cronbach's α were 0.892, 0 .894, 0.873 respectively.

DISCUSSION

The results of factor analysis showed that for the psychosocial adjustment scale, all items loaded on their common factor with the exception of items 11, 12, and 15. Items 11 and 12 had a factor loading below 0.4, whereas item 15 of the psychosocial adjustment scale loaded on the second factor (i.e., activity adjustment scale). Perhaps this item, in particular, was not translated properly and was a source of uncertainty and confusion for some respondents. The Arabic equivalent of the word "work" is related to vocational activities, and thus is close to the word "job". This translation of the word "work" changed the intended English meaning of the sentence in item 15 of the original TAPES-R. In item 15, the word "work" seems to refer to any physical activity that the amputee is engaged in. Perhaps this word has to be rephrased in the revised version of the Arabic translation of TAPES-R, and accordingly a check on the validity of the questionnaire may be carried out in future; but for the time being this item can be deleted.

For the activity restriction scale, analysis showed that all items loaded on one factor, with the exception of one item (item 10, i.e., "going to work"). Presumably this result is related to the quality of the sample included in the study. More specifically, most of the amputees were from refugee camps; therefore, the possibility of engaging in work once again is relatively low. Local amputees who participated in this study were generally retired and depended on their pension for living, due to their limitations and social status. This would suggest that this item could be deleted from the Arabic version.

Finally, for the satisfaction adjustment scale, analysis showed that all items loaded on one factor. This result is consistent with the original version of TAPES-R.

Therefore, based on the result of the factor analysis, it is possible to claim that if the aforementioned items of the questionnaire are removed, the Arabic version of TAPES-R measures what the original TAPES-R is supposed to measure.

The results of internal consistency show that the items of each scale produce similar scores which make them closely related to each other. Therefore, it, suggests that all items of each scale are measuring a distinct construct.

CONCLUSION

The results of this study show that the Arabic version of TAPES-R is a reliable and valid tool that can be used to measure the psychological adaptation to artificial limbs in lower limb amputees.

Limitations

The study's main limitation was that the TAPES-R questionnaire is designed to be emailed or posted to the participants; since only a minority of the amputee population in Jordan have these services; direct contact with each participant was a must. This limited the size of the sample. Additionally, many amputees found the questionnaire lengthy and time-consuming to complete. Participants recruited from the private sector, in particular, felt bored and were annoyed by the lengthy questionnaire. In fact, a considerable number of them refused to participate due to this reason. This would cast some doubts on the feasibility of implementing TAPES-R, in its current form, in the rehabilitation programme in Jordan; hence, a shorter version is needed.

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