

## On the functional limitation in below elbow amputation men using Mechanical and Myoelectric prosthesis via TAPES questionnaire

mA. Keivani Hafshejani<sup>1</sup>, M. Sattari Naeini<sup>\*2</sup>, A. Langari<sup>3</sup>

1- Shahrekord University of Medical Sciences, Shahrekord, Iran

2-Naein Branch, Islamic Azad University, Naein, Iran

3- North Khorasan University of Medical Sciences, Bojnurd, Iran

E-Mail: [Sattari@gmail.com](mailto:Sattari@gmail.com)

**Abstract:** It is well established that the Myoelectrical prosthesis must also be effective, smart, light, strong and high permanence, compared to those of Mechanical prosthesis. It is time consuming and expensive that has ultimately led to significant increases in the price of Myoelectrical prosthesis. Therefore, considering the high cost of these prostheses should be decrease the functional limitation, hence assessment the functional limitations between two groups must be clear and explicit. Therefore this study was conducted in this regard. In this descriptive cross-sectional analytical study, to groups compared to each other from quality of life, participants was two groups of 20 below elbow amputation veterans that use from Mechanical or Myoelectrical prosthesis that refer to central technical orthopedic Kosar. For gathering the data we use TPEAS questionnaire. This questionnaire evaluates participants from 3 items: psychosocial adaptation, functional limitation and satisfaction of life. For data analysis use to t independent and ANOVA test. This research showed that there are significant differences between two groups from functional limitation. The findings identified that the Myoelectrical groups have lower functional limitation in compare to Mechanical group. So that the hypothesis of this research in terms of lower functional limitation in the Myoelectrical group was accepted.

[Keivani Hafshejani mA, Sattari Naeini M, Langari A. **On the functional limitation in below elbow amputation men using Mechanical and Myoelectric prosthesis via TAPES questionnaire.** *Life Sci J* 2012;9(4):5579-5582] (ISSN:1097-8135). <http://www.lifesciencesite.com>. 828

**Keywords:** TPEAS questionnaire, Myoelectrical prosthesis, Mechanical prosthesis, functional limitation.

### 1. Introduction:

It is well established that the limb amputation is a term that separate means or part of a human body. Throughout the history, enduring failure is usually equal to amputation (Jhon *et al.*, 1992). There are 1700000 amputations people who live in the United States of America and 185,000 people yearly are discharged from the hospital with amputation (Edeer 2011).

Several factors such as trauma, infection, tumors, vascular disease, accidents, infectious diseases, and so create an amputation. Yet a high percentage of amputation statistics are in countries at war. so the 68/8% of statistics amputation is due to trauma in the above organ pipe (Jhon *et al.*, 1992; Gerzeli *et al.*, 2008; Atkins *et al.*, 1996). Although recent improvements of human science improve the quality prosthetics and prosthetic limbs but it is costly (Gerzeli *et al.*, 2008; Kahle *et al.*, 2008; Brodkorb *et al.*, 2008).

A person with an amputation is met with a sharp decline in the ability to fulfill his/her activities. In general, a variety of upper limb prostheses are designed and used. They can be split based on kinetic mechanisms of mechanical prostheses, Beauty (cosmetic) and myoelectric.

The researches which compare mechanical prostheses and myoelectric show that myoelectric Prosthetics are more acceptable because of the more power of grip, no need to the total bandage

system and increasing the personal ability (Weaver *et al.*, 1988).

Unfortunately, despite the efforts that have been made in the field of prostheses performance, the ability of individuals to use them is not so well and some people do not prefer to use any type of prosthesis (Jhon *et al.*, 1992; Atkins *et al.*, 1996; Biddiss *et al.*, 1988; Mazet *et al.*, 1956).

A very important point that should be considered is that the rehabilitation of the upper limb amputation should be done as a team, in which the Constructive prosthesis is considered as one of the team members (Weaver *et al.*, 1988; Durance and shea, 1998). Despite significant improvement in the area of prosthetic parts with high performance and high aesthetic, patient satisfaction has not improved significantly. Specifically many of the above-limb amputees, straw or prefer not to use prosthesis or use the cosmetic prostheses. Identify factors affecting performance of the upper limb prostheses and evaluation of individual skills in the use of dental prosthesis is very important (Weaver *et al.*, 1988; Durance and shea, 1998).

Despite the importance of identifying factors that affect the performance of prostheses, few studies have been done in this area and researches have shown conflicting results. Roeschelin and Domholdt (1989) found that factors such as age, lack of a dominant hand, the lack of elbow and learning how to use a prosthetic implant

have not a considerable effect on the performance of prosthetic (Roeschelin and Domholdt, 1989).

However Bourough and Book (1991) in their study concluded that a personal training in the use of prosthetic have significant impact on the success and performance of the prosthesis. Studies have shown that people with different levels of amputation of both physical and mental performance, social must be able to adapt to new conditions. In the past, the more physical aspects generally considered, but recently the psychological variables, is more social. Fewer studies have been done in relation to quality of life and there is little literature about quality of life and none have worked exclusively on this issue (Gallgher and Maclachan, 2004). Thus, to obtain valuable results reveal that the policy prescription, buy and the standard implant should be install, classical studies in higher education and research is done.

Seems to be largely a function of the quality of life in people with amputations easily, improving mental and emotional satisfaction in using the prosthesis, artificial performance seems directly related to the quality of life, so it was researchers to assess quality of life between the two groups amputation using simple mechanical joint myoelectric and amputee veterans with equal sample size for orthopedic services Technical Orthopedics Orthotics & Prosthetics Center will visit Tehran Kowsar, TAPES questionnaire to assess quality of life, and then compare the data to.

## 2. Method

A descriptive cross-sectional study is to compare functional limitation for veterans with unilateral below elbow amputees using two mechanical prostheses and myoelectric unilateral below elbow amputee veterans of our study population center in Tehran Orthotics & Prosthetics Kosar Foundation, formed in 2011.

The plan approved by the Research Council of Tehran University of Medical Sciences Faculty of Rehabilitation offers a referral center providing comments and cooperation Kosar Center officials. All files honored war veterans with amputations below the elbow will get away from the Archive Center. Following hospital records, using the criteria for inclusion and exclusion criteria were not sampled cases that were excluded.

That in each case was given a code number using four wood samples and 40 samples were selected randomly, then, 40 people were randomly divided into two equal groups of 20 which used their current prosthesis last six months. These people have no underlying problems, including heart disease - cardiovascular, diabetes, chemical injury, severe orthopedic conditions such as fractures and bone infections of the upper limb, blindness, lower limb amputation, and physiological illness. they were invited to Kosar

center to provide for the orthotics and prosthetics was constructed.

The program participants were invited to the orthoses and prostheses Kosar center and after examination, interview and re-sample matching criteria TAPES questionnaire will be provided. Participants completed questionnaires and returned it. TAPES questionnaire is designed and introduced for the first time in 1999 by Gallagher and Maclachan and used in order to improve the knowledge of prosthesis about individual compliance and improving the services (Gallgher and Maclachan, 2004). The validity and reliability of questionnaire are examined in Iran in 2008 in the satisfactory condition (Fardipoor, 2008).

According to a study that has examined the reliability and validity of the questionnaire to assess quality of life of people with upper limb amputations addressed, the research team in order to examine the validity of the questionnaire, the questionnaire was given to 10 academic experts people, and to their views and corrective actions have been considered.

The reliability of the questionnaire was assessed using Cronbach's alpha coefficient for the overall reliability of the questions related to compliance, social compliance, compliance with limits, exercise limits, functional limitations, social limitations, aesthetic satisfaction, satisfaction, satisfaction with weight and yield Respectively 81%, 78%, 73%, 71%, 75%, 72%, 71%, 77%, 70%, respectively.

Desmond and Maclachan (2005) to assess the validity and reliability TAPES questionnaire, have used TAPES in a study to assess the scale factors for upper extremity amputees.

This study was conducted on 100 men with upper limb amputation, the findings suggest that there is good reliability and validity in 9 subscales of TAPES questionnaire to assess quality of life was amputation of the upper limb (Desmond and Maclachlan, 2005).

Its sections are:

The first part is personal information, the second part consists of three main questions, psychosocial adjustment, activity restriction and satisfaction with the prosthesis, the last sub-section is satisfactory prosthesis The three categories of aesthetic satisfaction, satisfaction, satisfaction with weight and performance are the limitations of activity limitation exercise, functional limitations, and social limitations to bring a rubber The other part to questions about the amount of pain that a person is a member of cut, phantom pain, feeling healthy individuals to own and use average pay.

For data analysis software SPSS version 17 was used to mash Excel., In this study using techniques based on a comparison of independent variables (mechanical and Myoelectric)

Calculate the mean of the dependent variable (compliance, restrictions, satisfaction, performance, style, ...) will draw the necessary tables and then compare the averages and the difference paid to the analysis of data. Methods and 1- Descriptive statistics including: mean, standard deviation

2 - T-test and ANOVA test data used

Obtaining informed consent from all patients, respecting ethical considerations and the principle of secrecy and pledged that there was no risk of physical or mental

Table 1- Studied variables

MYOELECTRIC				MECHANICAL					
S.D.	Average	%	No.	S.D.	Average	%	No.	Year	
7.414	45.42	15	3	9.593	45/89	15	3	Below 35	Age
		20	4			25	5	36-44	
		65	13			60	12	Above 45	
6.393	23.26	15/8	3	6.889	18/75	25	5	Below 15	Time of amputation
		47/4	10			65	13	15-25	
		36/8	7			10	2	Above 25	
6.504	21.75	20	4	6.778	17/05	40	8	Below 15	Duration of implant
		55	11			60	12	15-25	
		25	5			-	-	Above 25	
6.353	9.6	15	3	7.087	9/7	25	5	Below 5	Duration of current prosthetic
		60	12			40	8	5-10	
		25	5			35	7	Above 10	

Table 2. Descriptive and analytical statistics parameters of mechanical and myoelectric prosthetics group.

T	P value	MYOELECTRIC		MECHANIC		Variable
		S.D	AVERAGE	S.D	AVERAGE	
2.125	0.04	1.436	5.8	2.693	7.25	Limit Sports
1.116	0.272	0.933	4.35	1.997	4.9	Functional limitations
2.075	0.045	2.292	19.1	2.28	20.60	Overall compliance

### 3. Result:

In the exercise limitation section the average of mechanical was more and showed that the prosthesis of this group are more restrictive than other groups. In this case T statistic was estimated equal to (2.125) and the significance are equal to (0.04), the research hypothesis test at a significance level ( $0.05 > p$ ) was adopted.

In performance constraint section was found that the average of mechanical group is more than other groups and the limitation are higher in this group. In this case T statistic was estimated equal to (1.116) and significance of tests are (0.272) which this difference was significant

In Public sector limitations the average and limitation of mechanical group are higher than Myoelectric groups. In this case T statistic was estimated equal to (2.090) and significance of tests are (0.043) which this difference was significant ( $0.05 > p$ ).

### 4. Discussion:

The functional limitations due to physical activity are one of the questions in this section, and the effect on the strength and endurance of upper limb prosthesis no person in physical activity, the results were not unexpected (Desmond and MacLachlan 2008).

Da Silva *et al.* (2011) in a study of physical activity and quality of life in people with amputations in southern Brazil showed that there are a significant relationship between quality of life

and level of physical activity and mental quality of life of these people. Researchers showed there were no relationship between gender and other variables and there quality of life or level of physical activity.

Rosechlyne and Domoldt (1989) found that factors such as age, lack of a dominant hand, lack of training and the use of prosthetic elbow joint cannot have a significant impact on the performance of the prosthesis (Rosechlein and Domholdt, 1989).

This explains part of the social restrictions imposed on the severed arm of a large variety of social, physical and mental challenges as image and lifestyle changes, changes in self-concept, physical and social function impairment in the use of prostheses and also cause pain in the back. Complexity and diversity of functions performed by the hands as well as hands important role in communication and conduct of life is clear Resulting in failure and the loss of the member causing mental limitations, physical and gets a great community (Desmond 2007).

Available support systems (social, family, economic) performance improvement (Desmond 2007) enhances the quality of life and reduces the incidence of depression and social problems (Hopman *et al.*, 1997).

### 4. Conclusions:

In this paper, tow groups compared to each other from quality of life, participants was two

groups of 20 below elbow amputation veterans that use from Mechanical or Myoelectrical prosthesis that refer to central technical orthopedic Kosar. The results of TAPES questionnaire and statistically analysis show that:

- The functional limitation of men below elbow amputation that used myoelectric prosthesis lowers than mechanical prosthesis.
- The exercise limitations of mechanical prosthesis are more restrictive than myoelectric prosthesis.
- The performance constraints of mechanical prosthesis are more restrictive than myoelectric prosthesis and the limitation of mechanical prosthesis are more than other prosthesis.

#### Acknowledgements:

The author would like to thank vice head of research affairs of rehabilitation school and officials and employees of Kosar rehabilitation center as well as the veteran's which participants in the study.

#### Corresponding Author:

Dr. M. Sattari Naeini

Naein Branch, Islamic Azad University, Naein, Iran

E-mail: [Sattari@gmail.com](mailto:Sattari@gmail.com)

#### References

1. John H, Bowker John W, Michael ED, Louis ST. American Academy of Orthopedic Surgeons, Atlas of limb prosthetics: surgical, prosthetic, and rehabilitation. Principles. 2nd ed, London, Mosby Year Book, 1992.
2. Edeer D. Upper Limb Prostheses – A Review of the Literature with a Focus on Myoelectric Hands. February 2011. Available at: [http://worksafebc.com/health\\_care\\_providers/Assets/PDF/UpperLimbProstheses2011.pdf](http://worksafebc.com/health_care_providers/Assets/PDF/UpperLimbProstheses2011.pdf)
3. Gerzeli S, Torbica A, Fattore G: Cost utility analysis of knee prosthesis with complete microprocessor control (C-Leg) compared with mechanical technology in trans-femoral amputees. *European Journal of Health Economics* 2009; 10(1):47-55.
4. Atkins DJ, Heard DCY, Donovan WH. Epidemiologic Overview of Individuals with Upper-Limb Loss and Their Reported Research Priorities. *Journal of Prosthetics and Orthotics* 1996;8(1):2-11.
5. Kahle JT, Highsmith MJ, Hubbard SL. Comparison of Non-microprocessor Knee Mechanism versus C-Leg on Prosthesis Evaluation Questionnaire, Stumbles, Falls, Walking Tests, Stair Descent, and Knee Preference. *Journal of rehabilitation Research and development* 2008; 45(1):1-14.
6. Brodkorb TH, Henniksson M, Johansson-Munk K, Thidell F. Cost effectiveness of C-Leg compared with non-microprocessor-controlled knees, a modeling approach. *Archives Physical Medicine and Rehabilitation* 2008; 89(1):24-30.
7. Weaver SA, Lange LR, Vogts VM. Comparison of myoelectric and conventional prostheses for adolescent amputees. *Am J Occup Ther* 1988; 42(2):87-91.
8. Biddiss E, Chau T. Upper-limb prosthetics, critical factors in device abandonment. *Am J Phys Med Rehabil* 2007; 86(12):977-87.
9. Mazet R, Taylor CL, Bechtol CO. Upper extremity amputation surgery and prosthesis prescription. *Journal of Bone and Joint Surgery* 1956;38:1185-98.
10. Durand JP, O'Shea BJ. Upper-limb amputees: a clinical profile, a clinical profile. *Inter Disab Stud* 1998; 10(2):68-72.
11. Roeschlein RA, Domholdt E. Factors related to successful upper extremity prosthetic use. *Prosthet Orthot Int* 1989; 13(1):14-18.
12. Burrough SF. Patterns of acceptance and rejection of the upper-limb prosthesis. *Journal of Prosthetics and Orthotics* 1991;39(2):40-47.
13. Gallgher P, Maclachlan M. The Trinity Amputation and Prosthesis Experience Scales and quality of life in people with lower – limb amputation. *Arch Phys Med Rehabil* 2004; 85:730-736.
14. Fardipoor SH, Salavati M, Mazaheri M, Bahramizadeh M. crosscultural adaptation and Validation of Trinity Amputation and Prosthesis Experience Scales (TAPES) in Iranians with lower limb amputation. 1387
15. Desmond DM, Maclachlan M. Factor structure of the Trinity Amputation and Prosthesis Experience Scales (TAPES) with individuals with acquired upper limb amputation. *Am J Phys Med Rehabil* 2005; 84(7):506-13.
16. Dda Silva R, Rizzo JG, GutierrezFilho PJ, Ramos V, Deans S. Physical activity and quality of life of amputees in southern Brazil. *Prosthet Orthot Int* 2011; 35(4):432-8.
17. Desmond DM. Coping, affective distress, and psychosocial adjustment among people with traumatic upper limb amputations. *J. Psychosom Res.* 2007;62(1):15-21.
18. Scharloo AA, Kaptein J, Weinman, JM, Hazes LNA, Willems W. Illness perceptions, coping and functioning in patients with rheumatoid arthritis, chronic obstructive pulmonary disease and psoriasis. *J Psychosom Res* 1998;44:573–585.
19. Hopman-Rock M, Kraaijaat FW, Bijlsma J. Quality of life in elderly subjects with pain in the hip or knee. *Qual Life Res* 1997; 6:67–76.

12/21/2012