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## RESEARCH ARTICLE

# THE IMPACT OF UNDER KNEE PROSTHESIS ON VARIOUS DIMENSIONS OF LIFE QUALITY OF DISABLED INDIVIDUALS REFERRING TO REHABILITATION CENTER OF SHIRAZ RED CRESCENT IN 2017

Abbas Ghavam<sup>1</sup>, Ali Hooshmandi<sup>2</sup>, Shaghayegh Vahdat<sup>3</sup>

<sup>1</sup>Department of Environmental Science, Institute of Sciences and High Technology and Environmental Sciences, Graduate University of Advanced Technology, Kerman, Iran.

<sup>2</sup>Department of Healthcare Management, Marvdasht Branch, Islamic Azad University, Marvdasht, Iran.

<sup>3</sup>Department of Health Services Administration, South Tehran branch, Islamic Azad University, Tehran, Iran.

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#### \*Address for Correspondence:

Abbas Ghavam, Department of Environmental Science, Institute of Sciences and High Technology and Environmental Sciences, Graduate University of Advanced Technology, Kerman, Iran. E-mail: [ghavam39@gmail.com](mailto:ghavam39@gmail.com)

### Abstract

**Objectives:** Mutilation is one of the most common motor disability and each year due to factors such as illness, trauma and birth defects about 200 to 500 million mutilation occurs that from this number almost 85% is related to lower limb. Lower limb mutilation creates many changes in the life quality of patients and their families. This study is semi-experimental before and after intervention which has been performed in 2017.

**Methods:** The research sample is 78 disabled individual of lower limb mutilation referring to rehabilitation center of Shiraz Red Crescent selected with census method. For evaluating variables, TAPES questionnaire has been used. Data analysis was performed with SPSS software and using descriptive and inferential statistics.

**Results:** Using under knee prosthesis has a significant impact on adaptation scales (the individual adaptation rate with mutilation and using prosthesis) and satisfaction (the individual satisfaction rate from various aspects of prosthesis) but the under knee prosthesis on limitation scale doesn't have a significant impact. Using under knee prosthesis has had a significant impact on two scales of adaptation and satisfaction of disables and has increased their life quality.

**Conclusion:** Despite using prosthesis, still there are limitations and dissatisfactions due to sport activities and also high weight of prosthesis for disabled individuals that this problem could be somewhat solved using carbonic prostheses and sport claws. This point should be mentioned that due to the high price of prostheses, most disabled individuals don't have the possibility of using these services and necessity of being under insurance coverage of these costs for providing more facilities for disabled people is felt more than before.

**Keywords:** life quality, mutilation, prosthesis.

## INTRODUCTION

Disability includes deprivation and inappropriate status of an individual which is the outcome of defect and inability and prevents from performing the role which has been considered for the individuals. About 10% of the world population suffer disability that 80% of them are in developing countries<sup>1</sup>. Mutilation is one of the most prevalent motor disabilities and each year each year due to factors such as illness, trauma and birth defects about 200 to 500 million mutilation occurs that from this number almost 85% is related to lower limb<sup>2</sup>. Based on the formal statistics, physical disability in Iran is 2.23 in one thousand that 2 in one thousand are related to disability due to mutilation. Based on the

statistics of Islamic Republic of Iran foundation of veterans, of total state veterans, 20810 veterans suffer mutilation that from this number 12981 individuals suffer from lower limb mutilation<sup>3</sup>. Disability as an unpleasant phenomenon could create serious problems in the individual and social life trend of the disabled and his relatives. Despite that the range and depth of implications due to mutilation depends on various variables like type and severity of disability, age, sex and some other factors, disability and its consequences could impact on the physical health, social relations, life in family, friends and neighbors domains, psychological status and the individual independence level<sup>4</sup>. Also, mutilation and following that disability has had destructive impacts on the disabled individuals'

life quality especially this impacts marriage, knowledge acquisition, employment and generally influences the individuals various dimensions of life. On rehabilitation viewpoint, mutilation is considered a type of defect whose consequence is creating disability in the individual and follows socio-psychological problems<sup>5</sup>. Rehabilitation plans and services have an important and effective role on improvement and promotion of life quality among disabled. Strategic rehabilitation is for improving life quality of disabled through providing services and supporting rights. In fact, implementing rehabilitation plan could help better performance and reduction of their dependence on family individuals. This, in one hand, causes more self-recognition of the disabled which considerably helps accession of his abilities and talents<sup>6</sup>. The significance of this issue is specified when World Health Organization designed the society-based rehabilitation plan in 1990 for obviating the needs of disabled and suggested its implementation to the world. In this plan, the emphasis is on a wide part of the disabled needs such as mobility, life daily activities and social activities with empowerment, training and involving disabled people, his family and local society to be obviated<sup>7</sup>. Today, life quality is one of important health consequences whose measurement has become necessary in various studies. According to the definition of World Health Organization, life quality is the individuals' perception of their situation in life in respect of culture, value system where he lives, his objectives, expectations, standards and priorities. So, it is a quite subjective subject and is not observable by others and is based on the people perception of various life aspects. The results obtained from April *et al.*, study show that there is a significant and positive impact between rehabilitation and improvement of physical and social performance as life quality dimensions<sup>8</sup>. By implementing rehabilitation plans, a considerable progress has been observable in life quality dimensions. Rehabilitation team is multi-specialty and improvement of motor function using prosthesis is the footstone of the team measurements. Various organizations and institutes are serving for improvement of life quality, such as organizations providing healthcare services, Islamic Republic of Iran Red Crescent which is among custodians of providing rehabilitation services. In Red Crescent rehabilitation centers various services such as work therapy, speech therapy, physiotherapy, technical orthopedics and so on<sup>9</sup>. What is presentable in technical orthopedics is a series of auxiliary instruments and artificial limbs which is replaced with the lost organ. So, for the disabled individual to be able to optimally use the artificial limb training necessary subjects about correct use of prosthesis is required. Training the individual about how prosthesis works to less feels anxiety and phobia and he knows when he could adapt with the prosthesis<sup>10</sup>. Studies show that investigating various dimensions of disabled life quality helps policy makers and authorities of providing rehabilitation and educational services to evaluate the existing plans and design and implement more efficient and suitable plans for raising the life quality of disable people who use

lower limb prosthesis. This study tries to investigate the impact of under knee prosthesis on various dimensions of life quality of disabled with lower limb mutilation referring to Shiraz Red Crescent rehabilitation center in 2017<sup>11</sup>.

## METHODS

This study is of semi-experimental type before and after intervention which was conducted in 2017 on disabled with lower limb mutilation referring to Shiraz Red Crescent rehabilitation center that were selected by census method. All disabled people with lower limb mutilation who referred to Shiraz Red Crescent rehabilitation center were 100 that here 22 questionnaires due to incomplete answers, upper limb mutilation disabled, disabled with mental disorders and so on were omitted from the sample and only 78 questionnaires were investigated. Among 78 persons responding the questionnaire of TAPES life quality, 40 persons were selected and were randomly placed in two 20-person groups of test and control. After that test group received 4 sessions of one and half hour training about correct use of under knee prostheses and in the control group no intervention was conducted. After completion of training session's period post-test was conducted, that is, again people answered TAPES life quality questionnaire. Data collecting was performed using TAPES questionnaire. TAPES questionnaire is a specialized TAPES questionnaire for patients with mutilation which has 37 items and includes 3 sections of adaption, limitation and satisfaction and 9 sub-scales of general adaption, social adaption, and adaption with limitation, sport limitation, function limitation, social limitation, and satisfaction with beauty, satisfaction with weight and satisfaction with performance. In this questionnaire, in two sections of adaption and satisfaction with score acquisition means more optimal life quality and low score means lower life quality. But in the limitation section, acquiring low score means better life quality and high score acquisition means more unfavorable life quality. Adaption was in the sub-sections of general adaption, social adaption and adaption with limitation generally with posing 15 questions that each question is related to triple sub-sections and the scores obtained from subscales were summed. The subsection of activity limitation was estimated with 12 questions about limitation with activity. Four 3-option questions were considered for each section that their responses were categorized to yes, it has completely limited, it has somehow limited and no, at all and in this section the total score of limitation of activity was obtained from summing up the subscales, of course the less score was the positive point in this section which was indicative of less limitation<sup>12,13,14</sup>.

The last subsection includes satisfaction with prosthesis which was performed in three categories of satisfaction with beauty, satisfaction with weight and satisfaction with performance with 4, 1 and 5 questions respectively and totally 10 evaluation questions. In this section, the scores obtained from answers were summed up and the general score of satisfaction with

prosthesis is expressed so that the higher score indicated more satisfaction. Participants responded by answering questions in three sections of social mental adaption, activity limitation and satisfaction with prosthesis with answers it is not at all so to it is exactly so<sup>15,16</sup>. Data analysis using descriptive and inferential tests was conducted using SPSS software version 21.

## RESULTS

From 75 participants in this study, 16.75 of studied people were women and 83.3% were men. The most prevalent reason of mutilation was accident (due to driving, work, war and so on) with frequency about 54, diabetes 21.8%, peripheral vascular 12.8% and 11.5 % other cases. 65.4% of people lacked another medical problem and 34.6% of them had another medical

problem. Other most prevalent problems include cardiovascular diseases and metabolic illnesses. For investigating the impact of under knee prosthesis on each subscale of adaption, limitation and satisfaction with single-sample T test was used.

As it is observed in Table 1, the impact of using under knee prosthesis on all three subscales of adaption has become significant ( $p < 0.05$ ). Therefore, using prosthesis has improved all three subscales of general adaption, social adaption and adaption with limitation in people. In investigating the impact of using under knee prosthesis on limitation subscales, the impact of using it on sport limitation has not been significant ( $p < 0.05$ ). Therefore, using prosthesis still limitation exists for the people. But the impact of using prosthesis on social and of functional limitation has been significant ( $p < 0.05$ )<sup>17,18</sup>.

**Table 1: Single sample t-test for each subscale of TAPES life quality.**

Sample average difference with test rate	P	Freedom degree	Statistics t	Subscale (item number)	Scale
0.66	0.000	77	8.79	General (5)	Adaption
0.55	0.000	77	9.23	Social (5)	Test rate = 3
0.32	0.000	77	3.68	With limitation (5)	
0.49	1.000	77	8.85	Sport (4)	Limitation
-0.10	0.035	77	-1.84	Functional (5)	Test rate = 2
0.57-	0.000	77	-10.20	social (4)	
0.86	0.000	77	12.55	beauty (4)	Satisfaction
0.13	0.856	77	-1.07	Weight (4)	Test
0.69	<b>0.000</b>	77	38.7	performance (5)	satisfaction = 3

**Table 2: Single sample t-test for each of scales of TAPES life quality.**

Sample average difference with test rate	P	Freedom degree	Statistics t	Scale
0.49	0.000	77	11.58	Adaption Test rate = 3
-0.06	0.107	77	-1.25	Limitation Test rate = 2
0.68	0.000	77	10.28	Satisfaction Test rate = 3

Therefore, using prosthesis somewhat has improved the people social and functional limitations. In investigating the impact of using under knee prosthesis on satisfaction subscale, the impact of using it on satisfaction with weight has not been significant ( $p > 0.05$ ). So, in using under knee prostheses satisfaction with weight doesn't exist. But the impact of using prosthesis on satisfaction with beauty and performance was significant ( $p < 0.05$ ).

For investigating the impact of under knee prosthesis on each scale of life quality single sample t-test was used that its results are provided in Table 2. As it is observed in Table 2, in investigating the impact of using under knee prostheses on scales of life quality, the impact of using it on limitation scale has not been significant ( $p > 0.05$ ). So using prosthesis, still limitation exists for people. But the impact of using prosthesis on scales of adaption and satisfaction has been significant ( $p < 0.05$ ). So, in using under knee prosthesis improvement has been created in adaption and satisfaction. As it is observed in Table 3, the impact of sex factor on dependent variables of general

adaption ( $p > 0.05$ ,  $F(1,76)=0.97$ ) and adaption with limitation ( $F(1,76)=0.67$ ,  $p < 0.05$ ) is not statistically significant in level 5%. As a result, in general adaption and adaption with limitation, there is no significant difference between men and women. But the impact of sex factor on dependent variable of social adaption ( $F(1,76)=5.31$ ,  $p < 0.05$ ) is statistically significant in 5% level. Therefore, in social adaption there is a significant difference between men and women. This impact rate is based on partial square 6.5% and therefore, 6.5% of social adaption changes are explainable by sex factor.

In investigating effectiveness of provided training about correct use of under knee prosthesis on scales of life quality among 78 persons responding TAPES life quality 40 persons were selected and were randomly placed in two 20-persons groups of test and control. After that test group received four 1.5-hour sessions of correct use of under knee prostheses and in control group no intervention was performed. After completion of training session's period, posttest was conducted.

As the results of covariance analysis in Table 4 shows, test statistics of impact of independent variable (group)

on adaption and limitation in posttest has become significant in posttest stage in 55 level ( $p < 0.05$ ). So, there is a significant difference between average score of adaption and limitation in both groups of test and control in posttest stage after omitting the impact of posttest scores and this means that the provided training on correct use of under knee prostheses has had a significant impact on adaption and limitation. Also, the impact of pretest in investigating effectiveness of training in 5% level ( $p < 0.05$ ) is significant and so scores of posttest have well showed the difference between two groups of test and control.

There is a significant difference between scores of posttest and pretest of satisfaction in both groups of test and control ( $p < 0.05$ ). Significance of scores obtained from difference of pretest and posttest between two groups of test and control indicate that training has a significant impact on satisfaction and causes its increase on subjects.

The present study was conducted with the aim of influencing under knee prosthesis on various dimensions of life quality of disabled people referring to Shiraz Red Crescent rehabilitation center in 2017.

**Table 3: The results of testing intragroup impacts for comparing subscales of adaption in women and men.**

Partial squares	P	F	Mean squares	Freedom degree	Sum of squares	Source of changes	Subscale
0.013	0.329	0.97	0.42	1	0.42	Sex	General
			0.43	76	33.09	Error	adaption
0.065	0.024	5.31	1.17	1	1.17	Sex	Social
			0.22	76	16.80	Error	adaption
0.009	0.414	0.67	0.39	1	0.39	Sex	Adaption with
			0.59	76	44.44	Error	limitation

**Table 4: Effectiveness of training provided in correct use of under knee prostheses on scales of life quality.**

Ata square	p	F	Mean square	Freedom degree	Sum of squares	Source of changes	Dependent variable	Scale
0.284	0.000	14.70	0.30	1	0.30	Group		
0.853	0.000	214.96	4.35	1	4.53	Pretest	Posttest	Adaption
			0.02	37	0.75	Error		
0.129	0.025	5.47	0.17	1	0.17	Group		
0.659	0.000	71.61	2.29	1	2.29	Pretest	Posttest	Limitation
			0.03	37	1.18	Error		
0.107	0.039	4.57	0.72	1	0.72	Group	Difference of posttest and pretest	Satisfaction
			0.16	38	6.01	Error		

## DISCUSSION

The results of this study showed that using under knee prosthesis impacts subscale of TAPES life quality questionnaire which is consistent with the results of a previous study<sup>19</sup>. In explaining this finding, we can express that prosthesis plays a considerable role on people mobility and in respect of mental dimension, raises life expectancy among consumers. The stage of returning to life after the process of mutilation in individuals is along with many problems, this people due to non-adaption with new conditions suffer from socio-mental problems like depression, dissatisfaction, reducing self-confidence, fatigue, anxiety and sometime suicide. Also, they may suffer from other disorders like drug abuse, using Psychotropic or weak social function. In people with lower limb mutilation, life quality reduces due to motor problems. In the trend of rehabilitation of people with mutilation using prosthesis could improve movement and social activities. The final goal of rehabilitation is improvement of patients' efficiency in mental, physical, social and economic aspects and returning these individuals to the society. There is no doubt that making high-quality prosthesis could considerably help in returning these individuals to the society, for this reason various groups of medical engineers, designers

and prosthesis makers always try to design and manufacture high-quality prostheses. People with lower limb mutilation regarding the conditions raised experience various challenges relating to walking, caring themselves and fighting with the conditions created with losing limb. Regarding the generated challenges, it seems that this people experience change in life quality. General adaption with the individual getting used to prosthesis and feeling of shortage and ease of suing it for the individual has been evaluated. People get used to their prosthesis and accept their problem. Social adaption which addresses the significance rate of the individual to others views, this group could accept this problem too. Adaption with limitation which investigates limitation in doing works for people with prosthesis shows that this group has also accepted their problem. In a previous study it was shown that using suitable prosthesis and presence in social and occupational settings has a positive correlation with life quality and when this presence is reduced, this will inversely impact the life quality<sup>17</sup>. Using prosthesis influences functional limitation on lighter activities like going up the stairs or walking about 1 to 2 kilometers and less and also social limitations which had influenced routine activities of life like friendly relations, performing amusing works and going to work<sup>19</sup>. The results showed that using

under knee prosthesis has had a significant impact on adaption scale (the individual adaption rate with mutilation and using prosthesis) and satisfaction scale (the individual satisfaction rate with prosthesis various aspects) but has had no significant impact on limitation scale (limitation rate which is created due to mutilation and using prosthesis) and using prosthesis still limitation exist for people. These studies are consistent with studies of Naseri *et al.*<sup>21</sup>. Using prosthesis in disabled causes limitation of doing their works and duties<sup>20</sup>. Mutilation in disabled like other chronic illnesses could influence these individuals life various aspects and causes several inabilities since many of these individuals are involved in clinical chronic complications which could lead to drop of life quality and limits their physical activities. These limitations are observed in many daily activities such as wearing clothes, personal cleanliness, bathing, eating food, management of home affairs, using office instruments and public vehicles and also may clearly reduce self-confidence in these people, change their image of their body negatively, reinforce their susceptibility. In the present study, provided training in correct use of under knee prosthesis has had a significant impact on scales of life quality. In explaining this finding, we can argue that the provided training in correct use of under knee prosthesis has had a significant impact on adaption and limitation. Also, training has had a significant impact on satisfaction and increased it in subjects. This study is consistent with studies of Tavafian *et al.*,<sup>19</sup> and Nasiripour *et al.*,<sup>12</sup>. Studies performed in Taiwan by Lin *et al.*,<sup>21</sup>, Uganda *et al.*,<sup>11</sup> have shown that performing training plans and social interventions promotes the disabled ability<sup>21</sup>. Rehabilitation and occupation therapy (through the disabled adaption with his working environment) and training correct walking for the person whose leg has been amputated may be necessary. Psychological training is required for mental and emotional adaption of these persons. Disabled people who couldn't use prosthesis for any reason require more aid in their movement and relocation. On the other hand, it should be noticed that mutilation increases the risk of other diseases. Due to reduction of mobility and physical activity, the individual will be susceptible to a series of diseases secondarily like overweight, diabetes, kidney stone, muscular skeletal diseases such as backache and pain in knees. Implementing the training of using prosthesis improves life status and efficiency and capability of disabled. And this training could extend services of medical rehabilitation center to society and attention to all daily, social and employment needs of disabled.

## CONCLUSIONS

Using under knee prosthesis has had a significant impact on two scales of adaption and satisfaction of disabled and increases their life quality. But despite using prosthesis, also there are some limitations and dissatisfactions due to sport activities and also high weight of prosthesis for disabled that this problem could be somewhat obviated using carbonic prosthesis and sport claws. This point should be mentioned that

due to high price of prosthesis, most disabled don't have the possibility of using these services and necessity of these costs being covered by disabled for providing more facilities is felt more than before. Undoubtedly, rehabilitation and using prosthesis, along with training could improve movement and social activities and finally leads to increase of disabled life quality.

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## AUTHOR'S CONTRIBUTION

**Ghavam A:** designed the study. **Hooshmandi A:** acquired the data. **Vahdat S:** analyzed the data and interpreted the results. All authors read and approved the final manuscript for publication.

## DATA AVAILABILITY

The datasets generated during this study are available from the corresponding author upon reasonable request.

## CONFLICT OF INTEREST

None to declare.

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