Original Research

Effect Of Use Of Flexible Transfemoral Prosthesis On Level Of Independence In Performing Daily Activities Of Transfemoral Amputee

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ABSTRACT

Background: Transfemoral amputees experience many difficulties in carrying out daily activities. One of the devices that can be used in above-knee amputation patients is transfemoral prosthesis. The use of transfemoral prostheses in post-amputation patients can help with activities, one of which is independence in self-care, mobility, and locomotion.

Methods: The study was conducted at PT Kuspito Orthotic Prosthetics and the time of the study was carried out in 2021. The population of this study was users of flexible prostheses at PT Kuspito Ortotik Prosthetic. The samples of this study were flexible prostheses users at PT. Kuspito prosthetic orthotic that meets the criteria as many as 30 users. The sampling technique was purposive sampling, inclusion criteria: subjects aged 17-35 years, subjects in good health, subjects using a flexible unilateral prosthesis, at least using an artificial leg for 1 month, having a strength value of 4, having normal Range Of Motion. Exclusion criteria: the subject had advanced disease, bilateral prosthesis user. The measuring instrument used was the Functional Independence Measure (FIM) questionnaire that is valid and reliable.

Results: The value of Sig. is 0.000, there is a significant difference in the level of independence between the results of the pre-test and post-test. there is a significant difference in the results that using a flexible prosthesis can increase the level of independence in above-knee amputees in carrying out daily activities.

Conclusion: The functional independence of above-knee amputation patients is strongly influenced by the use of a flexible prosthesis. It is recommended that above-knee amputation patients can use a flexible prosthesis to increase the level of independence.

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INTRODUCTION

Amputation occurs in most cases for people with unhealed or infected wounds associated with complex vascular pathologies, including severe diabetes mellitus. After

vascular amputation, nearly 50% of individuals do not achieve community ambulation and the majority of individuals complain of difficulty in performing various activities. In addition, 40-50% of individuals with unilateral amputation suffer from comorbid disabilities, such as low back pain which further compromises function and mobility, which ultimately negatively impacts the quality of life (Murray et all, 2017).

The main focus of post-amputation rehabilitation is the restoration of functional independence, and a return to pre-amputation activities, which is easier to achieve if assisted with a prosthesis. Transfemoral amputation resulting in loss of the knee joint requires more physical and cognitive effort (Hebenton et al, 2019). Initial rehabilitation with physiotherapy is carried out to reduce the incidence of other post-amputation disabilities while also supporting mobility with walking aids and the provision of prostheses (Hebenton et al, 2019).

The transfemoral prosthesis is indicated for amputees above the knee which is placed outside the body (Kementerian Kesehatan Republik Indonesia, 2015). The use of this tool is expected to help restore the anatomical shape of the lower body and help the functional independence of above-amputees (Eidt & Kalapatapu, 2010). Functional independence is an individual's ability to successfully carry out daily activities needed to carry out basic needs, carry out daily activities and maintain health and well-being. Poor functional conditions are associated with higher levels of psychological distress and poor quality of life in older adults (Hamidi et al., 2018).

The use of transfemoral prostheses in post-amputation patients can help with activities, one of which is independence in self-care, mobility, and locomotion. There are several types of joints in the transfemoral prosthesis, namely with a locked and flexible free knee joint. Locked knee joint provide more stability when walking, while flexible prostheses allow a wider range of movement. Flexible transfemoral prosthesis, that have free motion knee joints that can bend and ankle joints that can bend can help patients to stand, walk, sit, and perform daily activities. Above knee amputation patients experience many difficulties in carrying out activities.

One of the tools that can be used in above-knee amputation patients is a flexible transfemoral prosthesis. The use of transfemoral prosthesis for post-amputation patients in some literature is known to help activities, one of which is independence in self-care from mobility and locomotion. Aim of study is to know the effect of use of flexible transfemoral prosthesis on level of independence in performing daily activities of transfemoral amputee.

MATERIALS AND METHOD

This research uses quantitative research, quasi-experimental research, one group pre-post-test research design, namely one treatment group with two measurements. The treatment group was instructed to wear a flexible artificial leg for one month in a row, without removing it except during bathing and sleeping. Then a post-test was carried out by measuring the functional level of independence of the treatment group.

The study was conducted at PT Kuspito Orthotic Prosthetics and the time of the study was carried out in 2021. The population of this study was users of flexible prostheses at PT Kuspito Ortotik Prosthetics. The sample of this study were artificial leg users at PT. Kuspito Orthotic Prosthetic that meets the criteria as many as 30 users.

The sampling technique was purposive sampling, inclusion criteria: a) subjects aged 17-35 years, b) subjects in good health, c) subjects using a flexible unilateral artificial leg, d) at least using an artificial leg for 1 month, e) having a strength value of

4, e) having normal Range Of Motion. Exclusion criteria: a) the subject had advanced disease, b) the subject was pregnant, c) the subject used a bilateral prosthesis, d) the subject was not willing to follow the research procedure.

In this study there are two variables, the dependent variable is functional independence. Functional independence is an individual's ability to successfully carry out daily activities needed to carry out basic needs, carry out daily activities and maintain health and well-being. Functional independence was measured using the Functional Independence Measure (FIM) before and after treatment. The independent variable was the use of a flexible artificial leg, intervention in the form of a flexible artificial leg attached to the stump of an above-knee amputation patient.

This flexible artificial leg is used for above-knee amputation respondents when doing daily activities for a long period of time for one month. Measuring instrument on the effect of using a flexible prosthesis on the level of independence in carrying out daily activities using Functional Independence Measure (FIM) (Turner et al, 1999). FIM scores are as follows: 18-35 full assistance/total assistance, 36-53 maximum assistance/maximal assistance, 54-71 moderate assistance, 72-89 minimal assistance/assistance, 90-107 requiring "set up" every activity, 108-126 complete independence (Frengopoulos et al, 2017). Validity test of the instrument obtained results from five parameter has an r value of 0.45 and reliability test obtained cronbach's alpha value 0.81.

Initial data collection includes a pre-test starting at the first time the subject takes part in the study where the subject is also given a previous explanation. The treatment was given after the initial data was collected on each subject and given treatment in the form of using artificial legs for one month. Data collection after post-test treatment or after the use of Flexible Prosthesis counted 1 month after the patient wore it. The data that has been recapitulated for the results of measuring the functional ability of independence both before and after the treatment is then analyzed statistically with the data normality test used to determine whether the data is normally distributed or not.

Normality test using Shapiro-Wilk. The different pre and post-test tests were used to determine the results of differences in the functional level of independence before and after receiving treatment. The results of the normality test of the data obtained are normally distributed, the statistical analysis used is the paired t-test. The patient has signed the informed consent for the conduct of the study. Ethical clearance was obtained from Poltekkes Kemenkes Surakarta with number LB.02.02/1.1/9782/2021.

RESULTS

The subjects in this study were users of flexible artificial feet from PT. Kuspito Orthotic Prosthetic. The number of samples is 30 people. Each subject received two treatments at one time. The study was carried out in 2021. The purpose of this study was to determine the effect of using a flexible prosthesis in above-knee amputee on the level of independence in carrying out daily activities. The largest sample was early adulthood, namely patients aged 26-35 years old as many as 20 people (66.7%). The least sample is the late old age category, which is 1 patient.

Based on the characteristics of the respondents by gender, the male is more than the female. There were 21 men (70%) while only 8 women (27%). Judging from religion, patients are Muslim is the majority that is 73%. The majority of patients are working in the private sector, which is as much as 60%. The most recent education of

patients is senior high school, which is 70%. Characteristics of respondents can be seen in table 1.

Table 1. Characteristics of respondents

Description	Frequency	Percentage
Age		
Late adolescence = 17 – 25 years old	2	6,7
Early adulthood = 26 – 35 years old	20	66,7
Late adulthood = 36 – 45 years old	4	13,3
Early old age = 46 – 55 years old	3	10,0
Late old age = 56 – 65 years old	1	3,3
Gender		
Male	22	73
Female	8	27
Religion		
Islam	22	73,3
Christian	3	10,0
Catholic	4	13,3
Hindu	1	3,3
Occupation		
Does not work	6	20.0
entrepreneur	5	16.7
Private	18	60.0
Government employees	1	3.3
Education		
Junior High School	2	6,7
Senior High School	21	70,0
Diploma	7	23,3

Statistical analysis was carried out to determine normal or abnormal data using the data normality test after all treatment data had been obtained. The normality test of the data used the Shapiro-Wilk test because the sample was <50. The results of the normality of the data were obtained as shown in table 2.

Table 2. Normality Test Result (Shapiro-Wilk)

Test	Statistic	df	Sig.
Pre-test	0,931	18	0,066
Post-test	0,958	30	0,317

Based on table 2 obtained from the Shapiro-Wilk test, the category of independence level from the results of the pre-test has a significance value of 0.066, it is said that the data is normal because the p-value> 0.05 and the post-test category has a significance value of 0.317. It is said that the data is normal because the p-value> 0.05. According to (Dahlan, 2011) this test is used when a small number of samples or samples < 50 produced both normal data because the p-value > 0.05. It is said that the independence level normality test has a normal data distribution because both have normal data distribution with p> 0.05. P-value (p < 0.05).

The results of the test of homogeneity of variance show that the sig on the Levene test for equality of variance is 0.780, which means the data is homogeneous. The data obtained from the paired-sample t-test correlation test can be seen in Table 3.

Table 3. Paired-sample t-test

	Variable	Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre-test	79,5	30	8,68161	1,64067
	Post-test	116,03	30	4,33318	0,81889

From the data in table 4, the results obtained from before treatment with an average value of 97.50 and after treatment with an average value of 116.03 with a difference in the increase in the level of independence of 18.53, this means that from the average value of the level of independence there is an increased level of independence. Then the correlation results are obtained as shown in table 4.

Table 4. Correlation test results (paired-sample t-test)

N	Correlation	Sig.
30	0,801	0,000

From the data in table 4, a significance value of 0.000 is obtained where the results are p <0.05, it can be indicated that there is a difference between the pre-test and post-test on functional independence.

Table 5. Different test results pre and post-test (paired-sample t-test)

t	df	Sig. (2-tailed)
-16,849	27	0,000

As seen in the table 5, the results obtained from the value of Sig. (2-tailed) is 0.000 where the results are p <0.05 so there is a significant difference in the level of independence between the results of the pre-test and post-test. So it can be concluded that there is a significant difference in the results that using a flexible prosthesis can increase the level of independence in above-knee amputees in carrying out daily activities.

So this can answer the question of whether the use of flexible artificial limbs in above-knee amputees has an effect on the level of independence in carrying out daily activities. Where the functional independence of above-knee amputation patients is strongly influenced by the use of a flexible prosthesis.

DISCUSSION

The purpose of this study was to determine the effect of using a flexible artificial leg in post-amputation patients above the knee on the level of independence in carrying out daily activities. Supported by previous research with a value of t = -2.687 with p = 0.007 there is an effect of using a transfemoral prosthesis on the level of mobility in

patients with transfemoral amputations (Pudjiastuti et al, 2017) and in line with the Statistical research for Medicine and Health with the results of the Spearman correlation that ranged from 0.550 to 0.87 (P < 0.001 for overall) on the Reliability, Validity, And Responsiveness Of The Locomotor Capabilities Index In Adults With Lower-Limb Amputation Undergoing Prosthetic Training x and Research on the Relationship of Stump Length to Locomotor Ability Levels in Transfemoral User Patients The prosthesis (Rachmat, 2016) is supported by the results of the hypothesis test showing a probability value (p-value) of 0.000 < = 0.05 so that H0 is rejected and H1 is accepted, which means that there is a relationship between stump length and the level of locomotor ability in patients with transfemoral users. Prosthesis with a correlation value (r) of 0.718 which means the strength of correlation is strong.

Data on users of Flexible Prosthesis were obtained from PT Kuspito Orthotic Prosthetics. From all the data obtained, the results of the sample as research subjects were 30 as research subjects in accordance with the inclusion and exclusion criteria. Research subject data obtained through primary data with individual measurements. All research subjects are users of flexible artificial limbs with an age range of 24-64 years. The research subjects were given the treatment of several sub-tests in the Functional Independence Measure.

Functional independence is an individual's ability to successfully carry out daily activities needed to carry out basic needs, carry out daily activities and maintain health and well-being. The activities carried out can be in the form of self-care, sphincter control, mobility, locomotor, communication, and also social cognitive. Due to changes in physiological function and an increase in the burden of comorbidities, age can also affect the increase and decrease in functional independence. Poor functional conditions are associated with higher levels of psychological distress and poor quality of life in older adults (Hamidi et al., 2018).

Flexible artificial limbs can affect the level of independence possessed by above-knee amputees. To find out the value of the level of independence, Functional Independence Measure was used on the respondent and then the results obtained from its use from before and after using a flexible artificial leg, in research (Rachmat et al., 2017) the use of a prosthesis is recommended for post-amputation patients because of the balance of the patient's walking pattern after amputation is not affected by the use of the prosthesis.

From the analysis that has been carried out, the primary data of the research subject is obtained, namely, the minimum age is 26 years in the adult age category, while the maximum age is 64 years in the early elderly category. From the sex data collection, it was found that there were more males than females, 22 were male and 8 were female. Before being given treatment using a transfemoral prosthesis, treatment without using a transfemoral prosthesis was given and the results obtained were a minimum level of independence of 74 and a maximum of 110 with an average of 97.5, and after treatment using a flexible artificial leg.

The results obtained a minimum level of independence value of 108 and a maximum 125 with an average of 116.03 then a normality test was carried out using Shapiro-wilk because the number of samples was small <50 and the pre-test results had a significance value of 0.066, so it was said that the data was normal because the p-value> 0.05 and the post-test category has a significance value of 0.317, it is said that the data is normal because the p value> 0.05. According to (Dahlan, 2011). So it is said

that the normality test for the level of independence has a normal data distribution because both have normal data distribution with p> 0.05.

The correlation test was carried out using a paired-sample t-test with the results of the correlation value of Sig. (2-tailed) which is 0.000 where from the results $p <0.05$ there is a significant difference in the value of the level of independence between the results of the pre-test and post-test which can be interpreted that there is a significant difference in the use of a flexible artificial leg that can increase the level of independence in patients after above-knee amputation in performing daily activities.

According to Stineman et al., (2010) After fitting, amputees who underwent professional rehabilitation showed an average FIM motor gain of 8.0 points higher than those who underwent consultative rehabilitation. Patients whose rehabilitation was delayed until after discharge from surgical indicators tended to be clinically complex, but showed a similar increase as those who received early rehabilitation. Older age, amputation of the thigh, paralysis, severe malnutrition, and psychosis were all associated with decreased FIM increase in motor neurons. The variance of the random effect of the institution is statistically significant, suggesting external variation within the institution that cannot be explained by the variables observed at the patient level.

There are several studies that are relevant to this research. In a study Franchignoni, et al, (2004) entitled "Reability, Validity, And Responsiveness Of The Locomotor Capabilities Index In Adults With Lower-Limb Amputation Undergoing Prosthetic Training" that this study aims to assess the reliability, validity, and responsiveness of standard and standardized movement indicator ability (LCI) in people with lower limb amputations who underwent prosthetic training with the result that patients with transtibial amputations were more independent in carrying out activities compared to those with transfemoral amputations.

Their locomotor abilities were negatively correlated with age. In the research of Varekova, et al, (2018), it was shown that by consuming transfemoral prosthesis, the majority of the patients had accessible washrooms in units, could ambulate independently, were confident after provision of prosthesis and were spared by their units for timely follow-up. In research, Karaali et al., (2020) stated that there was no significant difference between male and female patients in terms of prosthesis and amputation adaptation, physical balance, and activities of daily living.

In the research of Wen, et al., (2018) found no gender differences in psychosocial adjustment and physical outcomes, except for strenuous physical activities and phantom pain, and both genders reported difficulty in social adjustment. After controlling for strenuous physical activities and phantom pain, we found that men showed worse psychosocial adjustment than women. In the study of Silva et al., (2021) stated The transfemoral group (n = 14) improved significantly (p = 0.045) the FAC before starting and after 3 months of discharge from ambulatory rehabilitation.

Both groups increased the time of prosthesis use during the day after 3 months of follow up. In a study (Falola et al., 2018) stated Functional outcomes scores such as the LEFS demonstrate that patients can obtain an adequate level of functionality for independent community activity after free tissue transfer, although functional improvement diminishes with age.

CONCLUSION

There is a significant difference in the value of the level of independence between the results of the pre-test and post-test. There is a significant difference in the results

that using a flexible prosthesis can increase the level of independence in post amputation patients above the knee in carrying out daily activities. Functional independence of above-knee amputation patients is strongly influenced by the use of a flexible prosthesis. It is recommended that above-knee amputation patients can use a flexible prosthesis to increase the level of independence.

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