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Perception of Reality vs. Professional Reality in Unilateral Lower Limb Prothesis User Amputees

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Abstract
Introduction
To understand the perception of lower limb amputees, regarding movement with prothesis, wellbeing and perceived appearance, and to elaborate a socio-professional demographic and clinical study, to establish patterns and relations that may help enjoy a better quality of life.
Methods
We conducted a questionnaire survey of socio-professional, demographic and clinical data of 103 lower limb amputees, between 29th March 2018 and 9th July 2018. 74 interviewees also replied to sub-scales from the PEQ-PT questionnaire.
Results
The values attributed to movement, wellbeing and perceived appearance, were on average, 59.3%, 62.7% and 75.3%, respectively. A large number of patients (80.6%) stated that because of the amputation, there is an increase in the monthly expenses and a reduction in the monthly income. The value attributed to the prosthetics perceived appearance for males and females, was, on average, 79.32% and 65.03% respectively, this difference being significant.
Conclusions
Our main aim was to study the perception regarding movement with prothesis; the perception regarding wellbeing with prothesis; the perception regarding prothesis perceived appearance; to elaborate a socio-professional, demographic and clinical analysis.In the first three points, the values attributed are good, mainly the perceived appearance issue. In the fourth point, we can conclude that it was successfully undertaken.
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Keywords: *Amputation; Lower limb amputee; Post-amputation employability; Prothesis;Transfemoral amputation;Transtibial amputation*
Abbreviations: *PEQ-PT: Prothesis Evaluation Questionnaire – in Portuguese*

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I. Introduction

There are continuous evolutions of medical science and technology accompanied by an improved formation of health professionals, including ortho-prosthetic professionals [1].

With the evolution of ortho-prosthetics and continuous increase in the number of amputees, there is need to think about their rehabilitation. It is estimated that in the US alone, the number of amputees will go up from 1.6 million in 2005 to 3.6 million in 2050, out of which, 85% of the amputations are of lower limbs[2].

The main objective of rehabilitating lower limb amputees is total reintegration in society [3], [4]. For rehabilitation, biomechanical devices, namely prothesis are used. These must be used in a conscious, sustained form with fundamentals of a scientific basis[5].To reintegrate, a number of instruments that can quantify results and monitor with accuracy the impact of therapeutic interventions with the use of prothesis have been introduced [6], [7].

II. Methods

a. Epidemiological characterization of lower limb amputees

In USA, around one in 300 people has already undergone a major amputation and every year around 35.000 amputations take place, out of which 85% are lower limbs[8]. The amputations main etiology is vascular (80%), followed by traumatic (10.6%), mainly among young adults [2].75% are males [9].

Though there are no databases to quantify amputees in Portugal, [10]mentioned the number of effective amputations done in Continental Portugal in the period between 2000 and 2015 as 76.288 limb amputations, out of which 45.446 were

lower limbs. The same study mentions that 66.5% amputees are males. Regarding etiology, the major percentage was due to circulatory diseases (44%), followed by diabetes (26%). The major number of amputations was registered in the age band of 70 to 80 years (around 28.2%) and between the ages of 80 and 90 (around 22.5%) [10].

b. Movement problems, wellbeing and perceived appearance in lower limb amputees using prothesis

Restoring movement is the aim of rehabilitating amputees to improve life quality [11].Lower limb amputees, many times, feel that only after regaining movement will they regain their previous lifestyle[12].

Whenever a lesion or trauma occurs, such as loss of a corporal segment, there is a drastic change in the way the individual starts feeling physically, mentally and socially, altering his behavior towards others. The individual loses self-esteem and his social functioning is clearly affected, diminishing his perception of wellbeing [13].

Nevertheless, using prothesis also brings frustrations influencing how individuals see their wellbeing, namely initial loss of balance, missing cosmetic cover in the prothesis, impossibility of wearing certain types of clothes or shoes, etc. However, an evolution is expected with time and the perception betters, as the capacity to undertake day-to-day activities are inductors to amputees´ wellbeing [14], [15].

Corporal sensations that ensure image building and are essential for better living get compromised after an amputation, and investigation about physical deficiency and corporal image suggest that the former has a negative impact on the latter [16], [17], [18], [19], [20].The possibility of prothesis implantation acquires a unique character, as it enables the reconstruction of the body in a way that the individual takes self-control again, being seen again as someone "healthy", complete, distancing himself from someone "sick", and the body, though rebuilt artificially, acquires a new visibility and valuation [21]. Prothesis users tendentially reveal a reduced corporal dissatisfaction as compared with people with other deficiencies, as the prothesis provide a greater independence, reducing levels of worry and inferiority complex, improving self-image [18], [22].

The prothesis perceived appearance are important for the amputee and can influence his opinion or acceptance [23], [24], [25].

Literature points out that females are the least satisfied with their corporal image, once their sentiments are related to their self-image and so they invest more in perceived appearance[13], [26], [27].

c. **Employability issues in disabled persons**

The admission to the job market constitutes an important moment for an individual for active participation in society. Having a job contributes greatly for attaining personal fulfillment. The labor market is one such area where exclusion is quite notorious [28], [29].

Among incapacitated individuals, amputees have the best work return rate as compared to those with neuromuscular diseases, strokes, multiple sclerosis, etc.[30],[31].

Studies in Europe point out to a percentage between 58.3% and 89% amputees returning to the labor market [32], [33], [34]. However, other authors, like [31] argue that such percentages do no correspond to the reality, as the epidemiological profile described by different authors do not match the epidemiological profile of lower limb amputees, namely, individuals characterized by advanced age at the time of the amputation, prevalence of vascular etiology and low level of schooling. In this optic, the rates of return to the labor market are much lower (10.2%) [32], [31],[33].

d. Methodology

Six initial questions were elaborated to undertake this study: Q1: Are the amputation age and schooling related to employability after amputation? Q2: After amputation/prothesis fitting was there increase in unemployment, increase in associated costs and reduction of amputee´s income? Q3: Are there any significant differences in the value attributed to the prothesis perceived appearance gender-wise? Q4: Do amputees classify wellbeing as good with prothesis use? Q5: Are higher values attributed to movement with the help of prothesis related to the existence of professional activities after amputation requiring more physical and less intellectual exertion? Q6: Are higher values associated to wellbeing, prothesis perceived appearance and movement related to higher rates of employability and lower associated costs?

The sampling method used was non-probabilistic, through a convenience sampling.

The sample had 103 elements, who are patients of Ortopedia Marques & Gonçalves Lda., that participated via e-mail, telephone, letter or personally between 29th March 2018 and 9th July 2018. All interviewees replied to a questionnaire of socio-professional, demographic and clinical data and 74 interviewees also replied to sub-scales from the PEQ-PT questionnaire.

III. Discussion of Results

a. Sample descriptive analysis

Demographically, 76% of interviewees were male and 39.8% had only the 1st Cycle of Basic Education (4th standard or its legal equivalent). Clinically, the predominant etiology of amputation was traumatic (45.6%), followed by vascular (25.2%). 29.1% was amputated more than 25 years ago and 22.3%, 1-5 years ago. Amputations were mainly transfemoral (44.7%) followed by transtibial (39.8%). 56.3% patients mentioned other existing pathologies, mainly bad circulation (19%). 49.5% use movement aids and 38.8% have a degree of incapacity above 70%.

Regarding professional data, these were divided into before amputation, after amputation and at present. Before amputation 66% amputees were employed, 25.5% in industrial sectors, 14.7% in commerce, unemployed were 2.9% and retirees were 10.7%; post-amputation 42.7% were employed in industrial sectors(31.8%), 15.9% each in commerce and services, unemployed were 9.7% and retirees increased to 37.9%; actually, 26.2% are employed, 22.2% in commerce, government (18.5%), services (14.8%) and industry (11.1%); unemployed are 10.7% and retirees 60.2%. From the working interviewees, 48.1% classified the access to their workplace as accessible. From all the interviewees, 3.9% returned to their

studies in order to get a new job after amputation; 64.1% felt more fulfilled professionally before amputation and 28.2% confirmed having requested anticipated retirement after amputation.

Regarding social data 27.2% received health subsidy after amputation, with 67.9% having received for more than 365 days. 37.9% interviewees admitted the need of a 3rd person, of which 46.2% said that help was for at least 2 hours a day; 80.6% mentioned that being amputated increased the monthly financial expenses, out of which 37.3% mentioned a value between 50 to 100 euro, the main reason (12%) being prothesis revision. 41.7% interviewees admitted that being amputees reduces the monthly income, out of which 72.1% referred that the reduction is above 150 euro and 32.6% mentioned that the reduction was due to the fact of not being able to find employment.

b. Inferential data analysis of the six initial questions (Q1 to Q6)

Q1:Regarding labor activity after amputation or in amputations since birth/childhood in the case of the first job, the percentage of "Employed" is higher for ages between 35 and 45 years, followed by 25 to 35 years and then 55 to 65 years, and 65 to 75 years of age, respectively, reducing for ages above 75 years and zero for ages between 15 and 25 years. The "Employed" percentage is higher for habilitations of 3rd cycle, followed by 2nd cycle, 1st cycle and secondary education, and finally higher education, and zero for those that cannot read and write. In the actual employment, "Employed" is higher for ages till 45 years and then starts reducing with advancing age and "Employed" is higher for qualifications of secondary school or university education, reducing for the remaining lower level qualifications.

Q2: Regarding labor activity, there is no significant increase in unemployment, but there is a reduction in "Employed" and increase in "Retired" condition. Also, it is concluded that there is increase in costs for a great number of amputees and reduction in income for an even greater number.

Q3: There is statistical data evidence proving significant differences between values attributed to prothesis perceived appearance as per the amputee´s gender and the value attributed to prothesis perceived appearance is higher for males.

Q4: There is statistical data evidence proving that amputees classify as good their wellbeing with prothesis use.

Q5: There is no statistical data evidence proving that higher values attributed to movement with prothesis are related with post-amputation professional activities that demand more physical and less intellectual exertion.

Q6: There is no statistical data evidence proving that higher values associated to wellbeing, prothesis perceived appearance and movement are related to higher rates of employment and lower cost values.

Analysis

From the 103 interviewees, a predominance of males is observed (76%), matching data obtained from[2] in USA and[10] in Portugal. This leads us to believe that there is a strong relation between lower limb amputations and gender.

The predominant cause of amputations was traumatic (45.6%), followed by vascular (25.2%), and tumoral (13.6%). These facts go against the two studies mentioned above, where the predominant etiology was vascular. Our values are due to the fact that Ortopedia Marques & Gonçalves Lda. works mainly with amputees coming from several insurance companies and the regional military hospital no. 1, where the main etiology is traumatic, and around 29.1% interviewees wear a prothesis for more than 25 years. Our study does not cover recent amputations as in[10]. The amputations were transfemoral (44.7%) as compared to transtibial (39.8%) and these values differ from[2], where the most frequent amputations were transtibial;

Age-wise, the majority of interviewees had between 65 and 75 years (34%) and between 55 and 65 years (22.3%), however, this cannot be compared with any study as the others mention the amputee age at the amputation time, while ours refers to the present age, with the study covering amputations done more than 25 years ago (29.1%) and between 1 and 5 years (22.3%).

49.5% interviewees admitted using movement auxiliaries, out of which 43.1% use 1 crutch and 33.3%, 2 crutches, matching [35], where more than 80% used crutches in the first study and majority used movement auxiliaries in the second study.

Starting with Q1, in the world deficiencies report it is mentioned that the rates of employability are higher in the age groups between 18-49 years (WHO, 2012), and as such, the values presented were expected.We also expected, based on[36]that intellectual activities would be preferred as they cater to less physical exertion, but such is not the case. We found percentages of "Employed" that were higher for 3rd cycle, 2nd cycle and 1st cycle of schooling (lower levels of schooling) and activities with more physical and less intellectual exertion.

Table 1: Frequencies table: Relation between "Post-amputation labor activity or in the case of amputation since birth/childhood and first job" and academic qualifications

		Labor activity post-amputation or in the case of amputation since birth/childhood and first job			
		Employed	Unemployed	Student	Retired
Cannot read/write	N	0	1	0	5
	% of qualifications	,0%	16,7%	,0%	83,3%
1st cycle	N	18	5	0	18
	% of qualifications	43,9%	12,2%	,0%	43,9%
2nd cycle	N	8	3	0	6
	% of qualifications	47,1%	17,6%	,0%	35,3%
3rd cycle	N	9	1	0	1
	% of qualifications	81,8%	9,1%	,0%	9,1%
Secondary School	N	8	0	6	7
	% of qualifications	38,1%	,0%	28,6%	33,3%

University	N	1	0	4	2
	% of qualifications	14,3%	,0%	57,1%	28,6%

Source: own compilation

In Q2, no increase in unemployment was verified, but retirees increased. This was expected[30], as amputees seek invalidity retirement to guarantee income, to avoid difficulties in returning to the labor market that may also result in a reduction in income, coupled with an increase in costs (prothesis maintenance, creams for the stump, movement auxiliaries, etc.).

Through Q3, significant differences between the value attributed to prothesis perceived appearance and amputees´ gender are seen. However, considering [37] and [38], it was expected that males would give special importance to prothesis functional aspects related to the capacity to attend to economic activities and participation in adequate physical activities, while females ought to give more importance to aesthetical or cosmetic aspects, but such did not happen, leading us to believe that there is a paradigm change.

Table 2: Descriptive Statistics and student´s t-test: Relations between PEQ-PT questionnaire of prothesis evaluation and amputee gender

	Gender	N	Average	Standard deviation	t_{72}	p
Deambulation scale	Male	53	61,02	22,614	0,981	0,330
	Female	21	55,01	26,607		
Looks scale	Male	53	79,32	20,681	2,593	* 0,012
	Female	21	65,03	23,079		
Wellbeing scale	Male	53	62,23	19,384	-0,277	0,783
	Female	21	63,74	25,202		

* p < 0,05 ** p < 0,01

Source: own compilation

Table 3: Descriptive Statistics and student´s t-test:: Relations between "How relevant are the prothesis looks to you" and amputee gender

	Gender	N	Average	Standard deviation	t_{72}	p
How relevant for you is the prothesis looks	Male	78	2,29	1,106	-2,734	** 0,007
	Female	25	2,96	,889		

* p < 0,05 ** p < 0,01

Source: own compilation

Regarding Q4 and based on [12],the amputees classified their wellbeing with prothesis use as good, as all of them used them for at least one year. However, as expected these values do not go far beyond good as per[14] and [20], prothesis bring frustrations that influence the way the individual perceives his wellbeing.

In Q5, contrarily to expected, were accounted higher values for prothesis movement for professional activities that demand more physical and less intellectual exertion, opposing what is mentioned in [36], where though there was a good percentage of job returnees, reintegration was mainly towards intellectual activities. In our view, our data is not contradictory, as many interviewees mentioned that though there has been no change in the profession post-amputation, some activities like crawling, driving heavy vehicles, lifting heavy objects, etc. were stopped.

Table4: Descriptive Statistics and student´s t-test: Relations between PEQ-PT questionnaire of prothesis evaluation and post-amputation professional activity

	Post-amputation profession	N	Average	Standard deviation	t_{42}	p
Deambulation scale	More physically and less intellectually demanding	20	65,65	21,861	0,488	0,628
	Less physically and more intellectually demanding	24	62,10	25,652		
Looks scale	More physically and less intellectually demanding	20	84,55	13,622	2,702	* 0,010
	Less physically and more intellectually demanding	24	66,89	26,414		
Wellbeing scale	More physically and less intellectually demanding	20	66,95	14,792	0,254	0,800
	Less physically and more intellectually demanding	24	65,21	27,448		

* p < 0,05 ** p < 0,01

Source: own compilation

Lastly, in Q6, there is no statistical data to prove, neither in literature to make comparisons and draw conclusions.

IV. Conclusions

Our main aim was to study the perception regarding movement with prothesis; the perception regarding wellbeing with prothesis; the perception regarding prothesis perceived appearance; to elaborate a socio-professional demographic and clinical analysis.

In the first three points on average, the values attributed are good, with predominance to the value attributed to perceived appearance. In the case of the fourth point, the demographic, clinical, professional and social analysis of patients, we can conclude that it was successfully undertaken.

We established correlations between amputees´ perception regarding movement, wellbeing and perceived appearance with socio-professional, demographic and clinical data. The correlations could be established mainly through six questions: Q1: That amputation age and schooling are related with post-amputation employability; Q2: That there are no statistical data proving that after amputation/prothesis use, unemployment increases, however it was possible to prove that there is an increase in costs and reduction in income; Q3: That the value attributed to prothesis look is higher for males and statistically there are significant differences for the value attributed to prothesis perceived appearance regarding amputee gender; Q4: That there are statistical data proving that amputees classify their wellbeing as good with prothesis use; Q5: That it is inconclusive if there are significant differences in the values attributed to movement between two types of exertions. However, many times, while there is no change in the profession, there is a change in tasks; Q6: That there are no statistical data to prove that in the labor activity after amputation, higher values related to wellbeing, prothesis perceived appearance and movement, are associated to higher employability rates and lower costs.

a. Contributions

Our findings can be used to supply information to health caretakers, enabling them to take decisions based on scientific grounds, including monitorization of practices and results and to optimize the quality of life of lower limb amputees.

The opinion of amputees was on average in all cases above 4, in a Likert scale of 1 to 5, with statements like: "Studies such as this one are of special relevance taking into consideration their scarcity and importance"; "Studies like this can help reformulate employers´ opinion and motivate them to recruit more disabled people"; and "The prothesis influences directly the working way, and when badly adapted can result in job absenteeism, so it is important to establish this relation between prothesis adaptation versus job, in studies like this".

As theoretical contributions, it is important to mention the fact that males give more importance to prothesis perceived appearance, opposing all other studies where it was stated that the females attributed a higher importance to perceived appearance.

Still theoretically, the majority of interviewees mentioned that being amputated increased monthly expenses, such a fact not being referenced in any other study.

b. Limitations

The limitations are: Reduced temporal interval used; Extensive questionnaires that could have conditioned some replies. Further, the sample was limited to the patients of Ortopedia Marques & Gonçalves Lda.

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