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Physical activity and quality of life in adults and elderly individuals with lower limb amputation

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SUMMARY

OBJECTIVE: The aim of this study was to investigate the levels of physical activity (PA) and quality of life (QOL) in adults and elderly individuals with lower limb amputation (LLA).

METHODS: This was a cross-sectional observational study. Participants completed three surveys as follows: a demographic survey, the International Physical Activity Questionnaire, and the World Health Organization Quality of Life. Thirty-six individuals with lower limb amputation were separated into two different groups as follows: Adults-lower limb amputation (n=12), composed of individuals with lower limb amputation who aged from 18–59 years, and Elderly-lower limb amputation (n=24), composed of individuals with lower limb amputation who aged 60 years and above. Statistical differences were determined as $p<0.05$.

RESULTS: Age and number of individuals with a low level of functional independency were higher in the Elderly-lower limb amputation group ($p<0.05$). The International Physical Activity Questionnaire scores were reduced in the Elderly-lower limb amputation group ($p<0.05$). The Pearson's correlation test between low metabolic equivalent task (MET), time since amputation, and family income presented positive significant results in the Elderly-lower limb amputation ($p<0.05$). Adults-lower limb amputation just presents a positive significant correlation with the low family income ($p<0.05$).

CONCLUSION: Elderly individuals with lower limb amputation are more susceptible to present negative health outcomes than adults with lower limb amputation.

KEYWORDS: Physical exercise. Amputee. Health. Aging.

INTRODUCTION

Amputation is considered a major life-changing event because it leads to permanent disability[1]. The number of lower limb amputation (LLA) is supposed to be increased due to an increase in age expectation of living and to the increased incidence of diabetes and cardiovascular conditions[2]. Walking with a prosthesis influences the heart rate and oxygen consumption[3]. One of the most important aspects of rehabilitation procedures following LLA is supporting amputated individuals to engage in the regular practice of physical activity (PA) for physical, psychological, and social health benefits[2].

The PA can be defined as a routine of performing any type of body movement, such as swiping the floor or gardening, which burns calories at higher levels than in a rest state. The World Health Organization (WHO) recommendations say that lifting weights

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should be performed at a minimum weekly frequency of 2 days[4]. Aerobic exercises should be performed for at least 150 min at moderate intensity, or for 75 min at high intensity, at least 5 times per week[5]. According to the general sense, the regular practice of sports or PA is a fundamental part of developing and maintaining a healthy lifestyle[6]. Higher PA levels influence mental and general health positively[7]. The association of PA with health can be evaluated through the measurement of quality of life (QOL)[8].

There are several factors that can influence the level of PA and the QOL in individuals with LLA, such as age and time of amputation[9]. Usually, disabled individuals present a lower level of PA and QOL than the nondisabled population[10]. It is known that sedentary behavior is associated with bad effects on general health[9]. However, there is a small body of evidence regarding PA and QOL among adults and elderly individuals with LLA and presenting conflicting results many times. For example, there are a small number of studies that reported individuals with LLA to be regularly physically active[11,12], while the majority of the published studies have reported lower levels of PA in these individuals[10,13]. Thus, the aim of this study was to investigate the PA and QOL levels in adults and elderly individuals with LLA.

METHODS

Study design

This was a cross-sectional observational study. This study was carried out in four Family Health Units (FHUs). Participation in the study was voluntary and anonymous. Written informed consent was obtained from each participant. This study was performed in accordance with the Declaration of Helsinki and its later amendments.

Procedures and measures

Participants completed three surveys as follows: a demographic survey, the International PA Questionnaire (IPAQ) (short-term)[14], and the World Health Organization QOL (WHOQOL) on its short version (WHOQOL-BREF)[8]. The surveys collected self-reported information. Individuals who aged above 18 years and had LLA were considered in this study. They were separated into two different groups as follows: Adults-LLA, composed of individuals with LLA who aged from 18–59 years, and Elderly-LLA, composed of individuals with LLA who aged 60 years and above. The exclusion criteria for the individuals were as follows: currently a hospital inpatient; unable to independently answer survey questions; or did not fulfill the IPAQ guidelines. The initial number of participants was 43, but 7 were excluded due to the responses to the IPAQ. As per the guidelines, responses were excluded from analysis if the IPAQ

1) was incomplete and
2) had unreasonably high scores (>16 hours of PA per day) (i.e., these issues could not be rectified as surveys were returned anonymously)[14].

Finally, we had 36 individuals in the sample.

Demographic survey

The demographic survey evaluated the participant's age, gender, schooling, time since amputation, level of amputation, site of amputation, cause of amputation, functional level, and family income (i.e., number of salaries). Status of family income is subdivided into five levels, from A–E, where the level E comprehends individuals who receive up to two salaries; D from two up to four salaries; C from four up to 10 salaries; B from 10 up to 20 salaries; and A, over 20 salaries. We used as inclusion criteria for individuals who passed through LLA (i.e., unilateral or bilateral, at the thigh, leg, foot, or toe levels) in etiologies related to trauma, diabetes mellitus, infections, ischemia, or any others.

International Physical Activity Questionnaire

For the categorization of the individual's level of PA, the quantification standard of the IPAQ guidelines was adopted. The level of PA of each individual was, then, divided into three categories as follows:

1) high, to individuals who performed the high-intensity PA for at least three or more days a week reaching a minimum metabolic equivalent task (MET) of 1.500 or had seven days of any combination of PA (i.e., walking, moderate intensity, high intensity) reaching a minimum of 3.000 MET per week;
2) moderate, to individuals who performed the moderate-intensity PA for three or more days of intense activity for at least 20 min a day, or five or more days of moderate activity or walking for at least 30 min a day, or five or more days of any combination of PA (i.e., walking, moderate intensity, high intensity) reaching a minimum of 600 MET per week;
3) low, to individuals who did not meet any of the criteria that would allow them to be classified in the other two categories. The data from the IPAQ were processed and reported according to its guidelines.

World Health Organization Quality of life Brief Version

The QOL was verified through the WHOQOL-BREF questionnaire, which measures four domains, namely, physical, psychological, social relationship, and environment[15].

Statistical analysis

For the comparison of qualitative variables, we used the chi-square test. For the quantitative variables, we used a two-way analysis of variance (ANOVA). To study the correlation between quantitative variables, we used the Pearson's correlation coefficient test. The qualitative variables were expressed in frequency (i.e., number/total number). The quantitative variables were expressed as mean and standard deviation (SD). Statistical differences were determined as $p<0.05$. The statistical analysis was carried out using the GraphPad Prism 7.0 (version 7.00 for Mac OS X, GraphPad Software, San Diego, CA, USA).

RESULTS

A total of 36 individuals with LLA composed the sample. The sample characteristics were described in both groups, Adults-LLA and Elderly-LLA (Table 1). As expected, we found a statistical difference between the age of the groups ($p<0.05$). Independent functional levels also presented statistical difference ($p<0.05$) with the number of individuals with the low level being higher in the Elderly-LLA group. Schooling presented a tendency to have a statistical difference ($p=0.0551$), with the number of individuals in primary school and not literate being higher in the Elderly-LLA group.

Table 1. Characteristics of adults and elderly individuals with lower limb amputation.

General characteristics	Adults-LLA	Elderly-LLA	p-value
Age (years)	43.41±12.42	72.040±7.73	<0.0001*
Gender			0.8090
Men	5/12	9/24	
Women	7/12	15/24	
Schooling			0.0551
University degree	2/12	N/A	
High-school	2/12	3/24	
Primary school	6/12	13/24	
Not literate	2/12	8/24	
Time since amputation			
Number of months	77.41±67.66	70.58±101.65	0.1619
Type of amputation			0.4142
Unilateral	10/12	17/24	
Bilateral	2/12	7/24	
Level of amputation			0.3989
Thigh	6/12	10/24	
Leg	4/12	8/24	
Foot	1/12	N/A	
Toe	1/12	6/24	
Cause of amputation			0.1045
Trauma	5/12	3/24	
Ischemia	3/12	4/24	
Diabetes mellitus	2/12	13/24	
Infections	1/12	2/24	
Other	1/12	2/24	
Rehabilitation			0.4795
Yes	7/12	11/24	
No	5/12	13/24	

Continue...

Table 1. Continuation.

General characteristics	Adults-LLA	Elderly-LLA	p-value
Prosthetic use			0.6353
Yes	6/12	10/24	
No	6/12	14/24	
Independent functional level			0.0230*
Low	4/12	18/24	
Moderate	5/12	4/24	
High	3/12	2/24	
Family income			
Number of salaries	2.33±1.77	2.21±1.81	0.3176

LLA: lower limb amputation; N/A: non-applicable. Age: time since amputation, and family income results are shown in mean±SD. *p<0.05. The other variables are presented as number/total number.

The IPAQ scores presented significant results (p<0.05), with the number of individuals presenting low scores in the Elderly-LLA group being 18–24. The categorization of the QOL of Adults-LLA and Elderly-LLA groups did not present any significant differences between the groups. However, there was a tendency to present lower scores in the physical domain (p=0.0624) and the social domain (p=0.0925) in the Elderly-LLA group (Table 2). These results suggest that physical function and social network may be more affected in the Elderly-LLA group.

The Pearson's correlation between MET below 600 kcal/kg/week, time since amputation, and family income presented positive significant results in the Elderly-LLA group (p<0.05). The Adults-LLA group just presents a positive significant correlation (p<0.05) between MET below 600 kcal/kg/week with the family income (Table 3).

DISCUSSION

It is widely known that the regular practice of PA induces lots of health-related benefits, such as improvement in cardiovascular[16] and mental health[17]. The main findings in this study reveal that the lower levels of PA are applied in the Elderly-LLA group. The number of individuals with a low level of functional independency was also significantly higher in the Elderly-LLA group. Schooling seems to be influencing both groups (p=0.551). Both groups were revealed to receive salaries in the D level, which characterizes a low family income. We also identified a positive correlation between MET below 600 kcal/kg/week, time since amputation, and family income in the Elderly-LLA group. However, just family income presented a positive correlation with the Adults-LLA group.

It is necessary to study a broad spectrum of potential determinants over the lifetime that affects sedentary behavior[9]. In our study, the number of individuals who completed primary schooling and who were not literate seems to be influencing both groups. This indicates that the schooling level is an important social factor for avoiding amputation. The low family income was also associated with reduced PA levels in both Adults-LLA and Elderly-LLA groups. The causes of amputation are often reported to be influenced by the degree of industrialization of the country, the transportation system, and how easy is to have access to medical care[18].

People with LLA are usually less physically active and participate less in sports activities[13]. However, comparisons between adults and elderly individuals with LLA regarding PA and functional levels are not usual in the scientific literature. Our results revealed lower functional independency and PA levels in the Elderly-LLA group. Interestingly, we did not find significant differences between the groups when evaluating the weekly metabolic expenditure. We hypothesized that this occurred because individuals with LLA, independently of the age, spend more energy for lack of training on how to use new motor coordination and balance strategies to successfully walk and do daily activities that may also influence the QOL.

The QOL is reported to be the individual's perception of his/her position in the culture and values in which he/she is inserted and with respect to his/her goals, expectations, principles, and concerns[19]. The QOL can be affected by many factors, such as hypertension and sleep disturbances[20]. Many factors related to QOL in patients with LLA have been reported in the scientific literature, such as time since amputation and family income status[21]. Besides not presenting a statistical

Table 2. Categorization of physical activity and quality of life levels in adults and elderly individuals with lower limb amputation.

IPAQ scores	Adults-LLA	Elderly-LLA	p-value
Low	3/12	18/24	0.0052*
Moderate	5/12	4/24	>0.9999
High	4/12	2/24	0.9998
WHOQOL-BREF	**Adults-LLA**	**Elderly-LLA**	**p-value**
Physical domain	14.38±3.79	12.12±3.07	0.0624
Psychological domain	15.39±2.86	13.72±2.88	0.1099
Social domain	16.44±2.15	14.61±3.32	0.0925
Environmental domain	13.17±2.00	12.77±2.67	0.6534
Overall	14.44±2.36	13.08±2.23	0.1005

PA: physical activity; IPAQ: International Physical Activity Questionnaire; LLA: lower limb amputation; WHOQOL: World Health Organization Quality of Life. The other variables are presented as number/total number. *p<0.05.

Table 3. Pearson's correlation between low level of weekly metabolic expenditure (below 600 MET), time since amputation, and family income in adults and elderly individuals with LLA.

	p-value	
	Adults-LLA	Elderly-LLA
MET and age	0.0550	0.4186
MET and time since amputation	0.7422	0.0009*
MET and family income	0.0423*	0.0017*

LLA: lower limb amputation; MET: metabolic equivalent task (kcal/kg/week). Pearson's correlation was applied to individuals with less than 600 metabolic equivalent task, who were classified into the category "low level of physical activity" according to the International Physical Activity Questionnaire (Adults-lower limb amputation, n=5; Elderly-lower limb amputation, n=18), *p<0.05.

significance, our results point to a tendency that QOL can be diminished in the physical (p=0.0624) and social (p=0.0925) domains in the Elderly-LLA group.

To have a better understanding of the changes in PA and QOL in adults and elderly individuals with LLA over time and to better assess its determinant factors, it is necessary for the development of a multicentric approach containing larger samples. The community-based exercise programs supported by the government may provide an opportunity for clinicians to offer better healthcare and to improve the PA and QOL levels of individuals with LLA. Thus, disability education for future healthcare professionals is a must. Finally, the regular practice of physical exercise is necessary to avoid the development of negative outcomes over cardiovascular and mental health[22].

CONCLUSIONS

Elderly individuals with LLA present lower levels of PA when compared to adults with LLA. Elderly individuals with LLA are more susceptible to present negative health outcomes than adults with LLA.

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AUTHORS' CONTRIBUTIONS

VHM: Conceptualization, Methodology, Data curation, Formal Analysis, Investigation, Methodology, Validation, Visualization, Writing–review & editing. **RALS:** Conceptualization, Methodology, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Supervision, Validation, Visualization, Writing – original draft, Writing–review & editing. **ACIC:** Conceptualization, Methodology, Data curation, Formal Analysis, Writing – original draft, Writing–review & editing. **MAPN:** Conceptualization, Methodology, Data curation, Formal analysis, Investigation, Methodology, Supervision, Validation, Visualization.

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