



Physical activity and quality of life of the amputees in Southern Brazil

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Title

Physical activity and quality of life of the amputees in Southern Brazil

Review Copy

Abstract

Study Design: Descriptive, cross-sectional design, with nonrandomized sample.

Background: Physical activity is a positive component of human health. Its effects are associated to improvement of the physical, psychological and social aspects of quality of life. Therefore the physical activity is an important factor for the rehabilitation of amputees.

Objective: To analyze the relationship between physical activity and quality of life of the amputees in Southern Brazil.

Methods: A total of 40 instruments were distributed to the subjects who met the inclusion criteria adopted, with a response rate of 55% (22 individuals). The outcome measurements were obtained through the International Physical Activity Questionnaire and World Health Organization Quality of Life – Brief.

Results: The sample was characterized by males, adults, prosthetic users, physically active, with positive quality of life, and amputation below the right knee caused by mechanical traumas related to traffic accidents with motorcycles. Significant correlations were identified between all the domains of quality of life and between the level of physical activity and the psychological

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9 domain of quality of life. No correlations were identified between gender and the
10 variables of quality of life and physical activity.
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13 **Conclusions:** This study showed that in very active amputees of both genders,
14 the level of physical activity is not associated with the quality of life, except for
15 the psychological domain.
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22 Word count abstract: 216
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25 26 **Keywords**

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28 Physical activity level, Quality of life, Amputee
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33 **Clinical relevance**

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37 This paper contributes to understanding the importance of physical activity for
38 the quality of life of amputees, principally of active individuals with lower limb
39 amputations. Therefore, the relevance of physical mobility in the process
40 rehabilitation of amputees, mainly on the psychological domain of quality of life,
41 is evident.
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51 Word count clinical relevance: 48
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Background

Physical activity is associated with physical fitness and can be considered as a **positive** aspect for the rehabilitation of amputees¹⁻³. The health statistics indicate that about 40% of Brazilians aged between 25 and 49 years do not perform sufficient physical activity for health maintenance⁴. **Studies show that physical inactivity causes conditions associated with significant morbidity and mortality in contemporary societies^{5,6}, that can be associated with some of the causes of amputations^{7,8}.** However, studies indicate that regardless of the cause, the amputation can cause damage to the welfare and quality of life of the affected individuals^{7,9,10}.

Estimates and causes of amputations

The official statistic data show that approximately 24.6 million Brazilians have disability, and 478,597 have some kind of amputations¹¹. The global statistics has estimated the incidence of amputation to be around 2.8-43.9 cases per 100,000 population per year⁸, while the Brazilian statistics has estimated the incidence of amputation to be around 13.9 cases per 100,000 population per year in the country¹². Studies show that in Brazil, the major cause of amputation

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9 is peripheral vascular disease (80%), which is caused mainly by diabetes
10 mellitus^{7,9,10,12}. This mainly affects individuals aged between 50 and 75 years⁹.
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12 Traumatic injuries are the second major cause of amputation in Brazil (10.6%),
13 primarily affecting individuals aged between 25 and 44 years, and are mainly
14 caused by traffic accidents and work^{7,9,10}.
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20 21 22 *Rehabilitation of amputees* 23 24 25

26 The consequence of greater severity refers to the mortality due to bilateral
27 amputation of lower limbs, which affects almost 20% of the cases¹³. However,
28 the consequences of amputations prevalent in Brazil include the loss or
29 functional impairment, psychiatric disturbances, and occupational absence, with
30 reduction in quality of life^{7,9-11,12}. The rehabilitation of amputees in Brazil has
31 advanced significantly in recent years, highlighting the multidisciplinary
32 interventions and the lawful guarantee in public health system⁸. However,
33 studies have demonstrated that the Brazilian health system still presents
34 difficulties in rehabilitation of individuals who experience amputations, such as
35 delays in referral to appropriate treatment, delays in inclusion in rehabilitation
36 programs, and socioeconomic difficulties^{7,10}. In the context of rehabilitation,
37 numerous studies have shown that active lifestyle and welfare are important
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8 factors in this process^{8,10,13-17}. However, several other studies indicate a lack of
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10 consensus on the best form of assessment of these factors^{13,19-22}.
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13 14 15 *The purpose of the study*

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19 The primary purpose of this study was to analyze the relationship between
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21 physical activity and quality of life of the amputees in Southern Brazil. The
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23 secondary purpose was to describe the sociodemographic and clinical data of
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25 physical activity and quality of life characteristics grouped by gender. We
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27 hypothesized that if the level of physical activity of an amputee is higher, then
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29 their quality of life, especially among men, would be greater.
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35 **Methods**

36 37 38 39 *Study Design*

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44 This research is a descriptive cross-sectional study, with subjects selected by
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46 nonrandomized sampling, developed through the application of questionnaires
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48 between 2006 and 2009, which was approved by the Ethical Committee in
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9 Research Involving Human Beings, of the Xxxxx XXXXXXXX Xxxxx XXXXXXXXXXXX
10 (Protocol XXX/XXXX).

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15 *Subjects*

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20 A preliminary survey was conducted with administrators of clinics and hospitals
21 of rehabilitation of the states of Southern Brazil that identified approximately 800
22 lower limb amputees in age range 18-69 years, who were invited to participate
23 of meeting in Florianópolis, Santa Catarina, Brazil. The meeting brought
24 together 260 amputees.
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33 A total of 40 participants were selected from three states of southern region of
34 Brazil who had conditions (self-declared) to answer questions that could
35 psychologically and emotionally affect the ability to recall detailed events of the
36 last weeks or to evaluate complex situations of everyday life, and conditions to
37 practice physical activities (home/yard, sports, leisure, work-related and
38 transport-related activities).
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48 Subjects were recruited from one rehabilitation clinic that is part of a public
49 hospital of state of Santa Catarina, in one rehabilitation clinic-school that is part
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9 of a public university of state of Santa Catarina, and from four private prosthetic
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11 clinics of the southern Brazil.

12 13 14 15 *Instruments and Procedures*

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19 The subjects were asked to complete the International Physical Activity
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21 Questionnaire (IPAQ)^{22,23}, the World Health Organization Quality of Life
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23 (WHOQOL)^{24,25}, and a data sheet with sociodemographic and clinical
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25 information. The IPAQ is composed of 25 questions that evaluate the physical
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27 activities in four groups: leisure time, domestic and gardening (yard), work-
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29 related, and transport-related²³. The WHOQOL - Bref, brief version, is
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31 composed of 26 questions that quantitatively evaluate the quality of life
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33 according to four domains: physical, psychological, social, and environmental²⁴.
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35 Based on the literature, the choice of the IPAQ and WHOQOL - Bref is justified
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37 for the following five reasons²²⁻²⁵: (1) they have sufficient psychometric
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39 consistency; (2) they are internationally accepted and widely used; (3) they are
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41 reliable and validated in the Brazilian context; (4) they have the capability to
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43 quantitatively evaluate the target variables; and (5) they provide results with
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45 sufficient accuracy for comparison between different groups or conditions.
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9 Scientific use of the IPAQ and WHOQOL - Bref has been permitted by the
10 World Health Organization.
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15 On examining the principal databases, a shortage of studies on the relationship
16 between the level of physical activity and amputations, in particular, using the
17 IPAQ, was evident. The option to use the IPAQ was based on the need to
18 obtain comparable data for the general population and the study group for tasks
19 that both the groups were able to carry out, by taking into account the physical
20 condition of amputation. The physical activities assessed in the instrument
21 included home/yard, daily, sports/recreation, and leisure activities.
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33 The study instruments were self-administered by the subjects, without the
34 intervention of the researchers who remained at the interview only to answer
35 any questions from the individuals. The instruments were returned to from the
36 investigators 48 hours after its distribution. Additional information, such as the
37 cause, level, side and treatment of the amputation were collected by consulting
38 the medical records of the study subjects in the rehabilitation and prosthetics
39 clinics involved.
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50 *Data Analysis*
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11 Data treatment was realized using SPSS 17.0 software. Analyses of central
12 tendency through descriptive statistic (standard deviation, mean, minimum
13 value, maximum value) were performed. The analyses of coefficient of reliability
14 were applied through calculation of Cronbach's alpha (>0.70) in the study
15 instruments²⁶. The analyses of normality distribution were realized through the
16 application of Kolmogorov-Smirnov test that demonstrated the nonnormality of
17 the data. Inferential analyses were carried out through nonparametric tests
18 (Mann-Whitney's U test; Fisher's exact test; and Spearman's correlation test).
19 The level of significance was set at 0.05 for all the tests.
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33 Classification of the level of physical activity was performed according to the
34 criteria of the Karolinska Institute²⁷ and Center for Disease Control of North
35 American Govern²⁸ for IPAQ, as well as physical conditions, such as sedentary
36 (<250 metabolic equivalent tasks (MET)), irregularly active (250–600 MET),
37 active (600–3000 MET), and very active (>3000 MET). The MET can be
38 considered as a measure or expression, which represent the metabolic rate of
39 an individual. MET is a measure of energy requirements in different volumes of
40 activity. MET were calculated through multiplication of the reference values for
41 each group of activity (walking at work=3.3; cycling for transportation=6.0;
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9 moderate yard work=4.0; vigorous intensity of activity in leisure=8.0) by the
10 spent time of realization (minimum=10; maximum=960) and by the week days
11 (maximum=7)²⁷.
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17 Classification of the quality of life was performed according to the criteria of the
18 World Health Organization²⁹ for the WHOQOL - Bref. The quality of life score
19 was scored over four domains: physical (7 items); psychological (6 items);
20 social (4 items); environment (9 items); and two related general items. The
21 items were rated on a five-point scale with higher score indicating the higher
22 quality of life, with exception 3, 4, and 26 facets that have their values reversed
23 (lower score indicating higher quality of life). Domain scores were calculated by
24 multiplying the mean of the scores specific for the 24 facets of the four domains
25 by a factor of 4, which ranged from 4 to 20 scores in each domain.
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27 Transformation of the scores on a scale (0=lower quality of life; 100=highest
28 quality of life) was performed by subtracting 4 points from the calculated score
29 and multiplying the rest by 6.25.
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46 **Results**

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9 Preliminary analysis of the questionnaires revealed that three instruments were
10 not returned, nine did not sign the consent forms, and six showed incomplete
11 data. Thus, a total 22 questionnaires were validated, demonstrating a return
12 rate of 55%, mostly provided from the private institutions and prosthetic clinics
13 of Santa Catarina State (Table 1).
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22 **Table 1.**
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26 Cronbach's alpha values of IPAQ showed moderate values (Cronbach's $\alpha =$
27 0.55–0.63) and that of WHOQOL presented good values of internal consistency
28 reliability (Cronbach's $\alpha = 0.84–0.89$).
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35 The values of frequencies showed that most of the subjects of the sample were
36 male, aged between 25 and 34 years, who were physically active, with
37 amputation below left knee caused by mechanical trauma (motorcycle accident)
38 and users of orthopedic prosthesis (Table 2).
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46 **Table 2.**
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9 Measures of central tendency in this sample showed appropriate values for all
10 physical activities; however, men had higher scores in all the physical activity
11 groups and women had values below the recommended level for health in the
12 physical activities of transport and leisure (Table 3). Both the genders had high
13 average values related to sedentary behavior; however, men showed higher
14 scores in all types of sedentary behaviors (Table 3). Both the genders showed
15 satisfactory scores of quality of life, and the men had higher values in social
16 domain, while women had higher values in psychological domain. However, the
17 lowest values of men were in psychological domain and women in physical
18 domain (Table 3). Nevertheless, the comparison between the genders did not
19 show significant differences in the physical activities, level of physical activity,
20 and quality of life and its domains.
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37 **Table 3.**

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42 The correlation values indicated strong or very strong relationship between the
43 variables of quality of life: physical domain, psychological domain, social
44 domain, environmental domain, and overall quality of life in this sample (p
45 <0.001). However, significant correlation was found only between the level of
46 physical activity and psychological domain in this sample ($p=0.028$) (Table 4).
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11 **Table 4.**
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15 **Discussion**
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20 The results of this study must be analyzed from three relevant limitations: (a)
21 severe shortage of baseline studies on the relationship between the level of
22 physical activity and quality of life in the amputees; (b) nonrandomized sampling
23 based on convenience; and (c) low number of subjects selected.
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31 Sociodemographic results are confirmed by studies principally with regard to
32 gender related to amputations, showing higher occurrence of men with
33 amputations than women^{15-17,31}. This higher occurrence of amputations in men
34 can be explained by different factors, such as the males are associated with
35 professions that involve high occupational risk, and fixed and modifiable habits
36 on health risk.
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46 Clinical results are confirmed by studies showing a higher incidence of
47 traumatic causes, related to transit^{16,31}. However, results emerging from other
48 studies show a higher incidence of vascular and endocrine diseases^{12,15}. In
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9 developed countries, the increase of vascular diseases, especially those
10 associated with endocrine disorders are evident, while in developing countries,
11 trauma caused by working conditions and transport are widespread³². Results
12 show that most of the amputations were caused by trauma in motorcycle
13 accidents, overcoming the results of studies showing that traumatic causes are
14 the second major prevalence of amputation in Brazil^{7,9,10}.
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24 Clinical results also show that the level and side of amputations are mainly
25 related to the etiologic factors, because they are direct consequences of
26 peripheral vascular diseases, especially diabetes that affects feet⁷. Unilateral
27 amputation results are confirmed by studies that show higher occurrence of
28 amputation on the right side^{2,3,17}. With regard to the level of amputation, the
29 results corroborate to most of the studies that had no pre-condition of
30 amputation below the knee as a criterion for inclusion of subjects^{15-17,31}. The
31 prevalent type of accident (motorcycle accident) may explain the high levels of
32 amputations below the knee and on the right side corresponding to the position
33 of the brake system of the motorcycles.
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With regard to the quality of life and its domains, it is possible to verify that there are variations in their scores, which can be explained by several factors related

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9 to the quality of life, such as health, transport, financial condition, and
10 environment. The data obtained show that scores of quality of life were
11 satisfactory in all domains. However, these results diverge from the Irish study,
12 which identified poor scores in the physical, psychological, and environmental
13 domains, while the scores were very poor on the social domain of the
14 amputees¹⁶. The results are in agreement with a United Kingdom-based,
15 Scottish study that identified good score in the physical domain score and very
16 good score in the psychological, social, and environmental quality of life of the
17 amputees³.
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31 Specialized literature indicates that the prosthetic rehabilitation is important,
32 because mobility of the individual is a priority⁹. However, it should be noted that
33 the economic and social conditions reflect the access and quality of prostheses
34 used by private and public health in Brazil⁷. The results are corroborated by
35 studies that demonstrated high prevalence of individuals who use orthopedic
36 prostheses¹⁵⁻¹⁷. However, this result should be analyzed carefully, because
37 most individuals in this study were selected in prosthetic clinics within the
38 private sector. In the private sector products and advanced prosthetic
39 treatments are available, which did not necessarily occur in the public health
40 sector in Brazil^{7,9}.
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11 After extensive literature searching in principal databases, we found that there
12 is a lack of studies on the relationship between the level of physical activity and
13 the quality of life in amputees. Therefore, we also attempted to analyze articles
14 that have also adopted other rating scales, both generics and specifics. The
15 adoption of a generic questionnaire for assessing the level of physical activity in
16 this study was based on the possibility of obtaining data that could be compared
17 with several other populations. However, despite the relative reliability of
18 survey-type questionnaires for assessing the level of physical activity, it should
19 be noted that this type of evaluation does not offer the precision of direct and
20 indirect measurements of this variable³³. It should be noted that no study could
21 be observed on amputees who used the IPAQ, although several studies have
22 adopted other scales.
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On comparing the results of the classification level of physical activity with the studies that adopted other specific scales, we observed various studies conducted in the USA. Among them, one study was carried out with 56 amputees, which examined the body image and participation in physical activities and sports using the Multidimensional Body Self-Relations Questionnaire (MBSRQ), and found that only a few could be classified as active

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9 (42.9%)². Furthermore, the study conducted in Japan with 33 individuals with
10 and without lower-limb amputation, investigated the physical fitness using a
11 cycle ergometer to determine the maximal oxygen uptake of the amputees,
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13 observed values comparable with sedentary individuals ($V_{O2max}=18.8 -4.9$)¹.
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15 Furthermore, in a study developed in Brazil, which conducted a survey on the
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17 level of physical activity through the IPAQ with 2001 individuals in the general
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19 population, it was observed that physical inactivity affects almost 60% of the
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21 population²⁸.
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29 The significant correlation between the level of physical activity and
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31 psychological domain ($p=0.028$) is partially corroborated by a study conducted
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33 in Scotland, with 25 lower-limb amputees, who were prosthetic users, which
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35 investigated the relationship between the quality of life and the restrictions of
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37 physical activity in these individuals, and found a strong positive relationship
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39 between the level of physical activity and perceived quality of life of the
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41 amputees³. Despite the literature showing that women have higher rates of
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43 physical inactivity than men, the results failed to show significant differences
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45 between the physical activities realized, level of physical activity, and quality of
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47 life and its domains, thus diverging from the specialized literature²⁸.
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Conclusion

This study analyzed the relationship between physical activity and quality of life of the amputees in Southern Brazil, and described the data related to sociodemographic, clinical, physical activity, and quality of life characteristics grouped by gender. We verified that most of the sample is characterized by males, who were adults, prosthetic users, physically active, had a positive quality of life, and had amputation below the right knee caused by mechanical traumas, mainly by traffic accidents with motorcycles. We also verified that despite statistically significant relations between all the variables of quality of life, significant correlation existed only between the level of physical activity and psychological domain of quality of life, and was found that no significant differences existed between gender and the variables associated with the quality of life and level of physical activity of the intentionally selected amputees. Therefore, it was not possible to suggest that an increased level of physical activity is associated with an increased quality of life score in both men and women, except for the psychological quality of life domain.

It is suggested that this study may contribute to the understanding of two relevant aspects of the rehabilitation process of amputees: (1) physical mobility;

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9 (2) and the well-being of individuals, mainly from countries with high rates of
10 amputations, which have become a grave public health concern. However, it
11 can be emphasized that more studies are needed with application of different
12 research instruments and in different populations, mainly with larger samples.
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9 **Declaration of interest**

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13 The authors report no conflicts of interest. The authors alone are responsible for
14 the content and writing of this paper.
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Table 1. Institution type, maintainer type and states of the Southern Brazil of the amputees($n=22$).

	<i>n</i> male	<i>n</i> female	<i>n</i> total
Institution type			
Rehabilitation clinic - General hospital (<i>n</i>)	1	0	1
Rehabilitation clinic - University clinic-school (<i>n</i>)	1	0	1
Prosthetic clinic (<i>n</i>)	13	7	20
Maintainer type			
Public (<i>n</i>)	2	0	2
Privative (<i>n</i>)	13	7	20
State			
Santa Catarina (<i>n</i>)	11	4	15
Paraná (<i>n</i>)	2	1	3
Rio Grande do Sul (<i>n</i>)	2	2	4

Table 2. Sociodemographic and clinical characteristics of the amputees in Southern Brazil ($n=22$).

	<i>n</i> male	<i>n</i> female	<i>n</i> total
Gender (<i>n</i>)	15	7	22
Age			
Young – 18–24 years (<i>n</i>)	3	0	3
Young adult – 25–34 years (<i>n</i>)	6	5	11
Adult young – 35–44 years (<i>n</i>)	4	0	4
Adult middle age – 45–54 years (<i>n</i>)	1	2	3
Mature adult – 55–64 years (<i>n</i>)	1	0	1
Condition physical			
Very active (<i>n</i>)	11	3	14
Active (<i>n</i>)	1	2	3
Irregularly active (<i>n</i>)	0	1	1
Sedentary (<i>n</i>)	4	0	4
Type of amputation			
Amputation – left lower limbs (<i>n</i>)	6	5	11
Amputation – right lower limbs (<i>n</i>)	9	1	10
Amputation – bilateral lower limbs (<i>n</i>)	0	1	1
Amputation/disarticulation level			
Transtibial (<i>n</i>)	9	4	13
Knee (<i>n</i>)	1	0	1
Transfemoral (<i>n</i>)	5	2	7
Hip (<i>n</i>)	0	1	1
Cause of amputation			
Congenital (<i>n</i>)	1	1	2
Metabolic (<i>n</i>)	4	0	4
Vascular (<i>n</i>)	2	0	2
Mechanical trauma (<i>n</i>)	8	7	15
Use of prosthesis			
User (<i>n</i>)	15	7	22
Non user (<i>i</i>)	0	0	0

Table 3. Values of physical activities, sedentary behaviors, and quality of life scores for gender of amputees in Southern Brazil ($n=22$)

	Values (Mean SD)		
	<i>n</i> male	<i>n</i> female	<i>n</i> general*
Physical activity (MET's)			
Work domain	2734.4 ± 1215.4	2567.6 ± 1101.9	2681.4 ± 4148.3
Active-transportation domain	996.7 ± 551.3	254.6 ± 118.0	760.6 ± 1786.7
Yard-work domain	3230 ± 1063.3	1424.3 ± 816.8	2655.5 ± 3658
Leisure-time domain	2259.3 ± 763.6	295.6 ± 242.3	1634.5 ± 2612.5
Walking	1735.8 ± 866.4	1169.1 ± 568.4	1555.5 ± 2868.2
Moderate intensity	4237.3 ± 1190.8	2719.9 ± 991.1	3754.5 ± 4082.6
Vigorous intensity	2941.3 ± 945.7	628.6 ± 416.9	2205.5 ± 3241.4
Sedentary behaviors (min)			
Automobile utilization	72 ± 77.6	49.2 ± 22.2	64.8 ± 65.5
Television watch – weekday	322 ± 280.2	220.7 ± 148.7	289.8 ± 246.9
Television watch – weekend	412.7 ± 260.8	314.3 ± 211.3	381.4 ± 245.5
Work sitting	200.00 ± 215.4	188.57 ± 130.4	196.36 ± 189
Quality of life (score)			
Physical domain	58.6 ± 11.6	58.6 ± 11.9	57.8 ± 11.4
Psychological domain	56.2 ± 11.3	59.1 ± 12.4	57 ± 13
Social domain	69.5 ± 22.5	65.4 ± 19.5	67.8 ± 21.1
Environmental domain	66.5 ± 14.2	64.9 ± 8.1	65.8 ± 12.4
Overall	62.5 ± 13.2	61.6 ± 10	62.1 ± 12.6

Legend: * General values (men and women).

Abbreviation: SD, Standard Deviation; MET's, Metabolic Equivalents; min, minutes.

Table 4. Nonparametric correlations values (rs) between the level of physical activity and the quality of life domains of amputees in Southern Brazil ($n=22$).

	Physical domain QV	Psychological domain QV	Social domain QV	Environmental domain QV	Overall score QV	PA level
Physical domain QV	1					
Psychological domain QV	0.569**	1				
Social domain QV	0.596**	0.701**	1			
Environmental domain QV	0.615**	0.842**	0.741**	1		
Overall score QV	0.738**	0.873**	0.911**	0.896**	1	
PA Level	0.240	0.469*	0.212	0,274	0.349	1

Abbreviations: PA, Physical Activity; QV, Quality of Life.

*. Correlation is significant at the 0.05 level (two-tailed).

** . Correlation is significant at the 0.01 level (two-tailed).