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## Self-perception of Venous Symptoms and Quality of Life Analysis in Wheelchair Athletes and Non-athletes: A Pilot Study

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### Authors' contributions

*This work was carried out in full collaboration among the authors. Authors RCAP and EJRG have participated on the design of the study. They have done the literature searches and methodologies. They also performed the statistical analysis and have actively participated in the writing of the manuscript. Author MFJ supervised the statistical analysis. Author CBAR has designed the study and also participated and supervised all the phases of the study including the preparations of manuscript. All authors have read and approved the final manuscript.*

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### ABSTRACT

**Aims:** Evaluate the impact of the physical activity in individuals with muscular atrophy on the inferior members (wheelchair users) considering two main aspects: the quality of life and the self-perception of the venous return symptoms.

**Place and Duration of Study:** Data of handicapped non athletes were collected from a university physiotherapy clinic at the University of Ribeirão Preto, Ribeirão Preto, São Paulo, Brazil. Data of the athletes' sample (basketball players) were obtained from Cava do Bosque, Ribeirão Preto, São Paulo, Brazil, between September 2013 and December 2013.

**Methodology:** This is a cross-sectional study, with a convenience sampling of wheelchair users: non athletes (n=12) and athletes (n=13). A socio-demographic

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questionnaire was applied. Self-perception of functional performance and of venous symptoms was evaluated by the VEINES-QOL/Sym, and the quality of life was evaluated by the WHOQOL-Bref. The statistical analysis was performed by the Chi-square test for VEINES-QOL/Sym, Student's *t*-test for WHOQOL-Bref and Student's *t*-test, proportion test and G-test for the socio-demographic questionnaire.

**Results:** Twenty-three subjects were men (92%). Data of physical conditions, environmental and psychological domains from WHOQOL-bref questionnaire demonstrated no significant differences between the groups. On the other hand, social relations domain had higher values in athletes compared to non athletes ( $P < .05$ ). Results from VEINES-QOL/Sym questionnaire (the questions 1, 2, 3, 4(a, b, c), 5(b, c), 6, 7 and 8 showed no statistically significance between the groups. Analyzing the 4d (leisure activity) and 5a (time spent for daily activities) questions, higher values were observed for the athletes ( $P < .05$ ).

**Conclusion:** Considering the data obtained by WHOQOL/Bref survey, physical exercise improves the quality of life of wheelchair individuals. However, it has not been possible to establish the relationship between physical exercise and the improvement of self-perception on venous symptoms in wheelchair individuals.

*Keywords: Handicapped; exercise; athletes; non athletes; cardiac output; venous symptoms.*

## 1. INTRODUCTION

Venous return is a hemodynamic mechanism that involves the transport of venous blood to the right atrium through veins focusing the right atrial pressure variation in relation to the rate of flow through the peripheral vasculature [1,2]. Elevated cardiac output (the volume of blood ejected by the heart per minute, which determines the amount of blood delivered to the exercising muscles) is regulated by the increase in skeletal muscle blood flow and venous return to the heart [3].

The great majority of cardiac output during exercise is devoted to the working skeletal muscle [4]. During dynamic exercise, the rhythmic contraction of the peripheral skeletal muscles results in the compression of the intramuscular veins, and imparts a considerable amount of kinetic energy to the venous blood and facilitates its return to the heart. The skeletal muscle pump has been shown to be very effective at emptying the venous vessels, since more than 40% of the intramuscular blood volume can be translocated centrally with a single muscular contraction [5]. Furthermore, the vast majority of venous outflow during dynamic muscular exercise occurs during the concentric phase of contraction, providing further credence to the notion that increases in intramuscular pressure are important sources of energy for the blood returning to the heart during exercise [6,7].

Exercise training optimizes the ventilatory oxygen uptake by increasing both maximum cardiac output and the ability of muscles to extract and use oxygen from blood. Beneficial changes in hemodynamic, hormonal, metabolic, neurological, and respiratory functions also occur with increased exercise capacity [8,9].

It is widely established that the practice of physical activities improves the muscular tonus and the physiologic hypertrophy of skeletal muscles increases the efficiency of venous return. Long-term moderate exercise training determines a sustained improvement in functional capacity and quality of life in patients with chronic heart failure [10].

However, the overall life quality must be the most important reason to stimulate the abilities to practice physical activity [11]. In this way, regular physical exercise practicing means an improvement in lifestyle and may enhance health in many aspects besides physical, for example by facilitating and fostering social contact, i.e., positively impacting the global quality of life [12].

Venous diseases have been extensively studied through clinical [13,14] and observational studies [15]. The symptoms and clinical signs [16] are important tools to evaluate venous function. In addition to that, investigative studies based on biochemical markers [17,18] and inquiries that define the profile of the patients are also useful to improve the knowledge and to clarify ways to deal with the venous diseases and their complications [19-21].

Kahn et al. [22] described a comprehensive psychometric evaluation of a venous-disease-specific quality of life measure questionnaire that was developed and validated by Abenheim et al. [23], in an independent sample of patients with acute deep venous thrombosis. Studies like these, whose subjects are wheelchair users, are rarely found.

The purpose of the present study is to evaluate the impact of the physical activity in persons with lower limbs muscular atrophy considering two main aspects: the quality of life and the self-perception of the venous return symptoms.

Therefore, we have delineated an observational cross sectional study in order to access the influence of the regular physical activity on those aspects.

## **2. METHODS**

### **2.1 Subjects/Groups, Inclusion and Exclusion Criteria**

At the first contact with the potential subjects, they received an explanation concerning the objective of the study and then were invited to be part of the research.

Twenty five volunteers attended the study. Inclusion criteria were people aged between 20-60 years old and wheelchair users of two groups: the ones who regularly practiced physical exercises and the ones who did not.

Groups:

Group 1: Twelve participants who did not practice regular physical activities and were being followed up in a university physiotherapy clinic—University of Ribeirão Preto (UNAERP), which is located at 2201, Costabile Romano Avenue, Ribeirão Preto, São Paulo, Brazil (zip code: 14096-030). It has been analyzed the real impact of venous return to individuals with paralysis of the lower limbs. The members from this group were called non athletes.

Group 2: Thirteen participants who practice physical activities regularly (members of the basketball team) on the Cava do Bosque, a municipal sports center that is located at 627, Camilo Matos Street, Ribeirão Preto, São Paulo, Brazil (zip code: 14090-210). This group was designed to analyze the impact of exercise on reducing the impacts of lower limb muscular atrophy on venous return. The members of this group were called athletes.

Subjects who could not answer the questionnaires alone, with acute coronary syndromes, coronary artery bypass grafting or percutaneous intervention during the first three months of these events were excluded as well as those with renal insufficiency (serum creatinine >2.0mg/dL), hepatic insufficiency and uncontrolled hypothyroidism.

## **2.2 Study Procedures**

In any type of procedure, volunteers were held solely and exclusively, after approval and agreement, signing the Informed Consent Form (ICF) on a voluntary basis. The study was previously approved by the Ethics Committee of The National Ministry of Health/University of Ribeirão Preto (CAAE: 18388513.7.0000.5498/ protocol: 462.531/2013).

Subjects were submitted to respond three questionnaires: VEINES-QOL/Sym, Social-demographic questionnaire and WHOQOL–Bref [22-25].

The questionnaires were applied between September 2013 and December 2013. Researchers impartially informed the individuals about the objectives of each questionnaire, without any induction and/or intervention in order to avoid tendentious results, since the questionnaires were self-administered.

## **2.3 Questionnaires**

VEINES-QOL/Sym (Portuguese version) is a valid questionnaire, consisting of 26 questions, each one with 10 items that assess the self-perception of the chronic venous disease symptoms and performance of interviewees in their daily activities. The answers allow to predict, analytically, in which individuals, venous return is more impaired and also evaluate the impact of this vascular disorder symptoms on their daily routine [22,24].

Social-demographic questionnaire: consisting of 10 questions (age, home address, marital status, quantity of children, living arrangements, current occupation, educational level and family income) that together point epidemiological individuals' profile [22].

WHOQOL-Bref (version in Portuguese) is a valid questionnaire that consists of 26 questions that assess the quality of life, physical capacity, psychological status, social and environmental interactions in which the interviewee is inserted. The responses made possible to identify and quantify the magnitude of daily limitations due to health problems of individuals included. The results of this tool complement the results of the first questionnaire (VEINES-QOL/Sym) [25].

## **2.4 Protocol**

### **2.4.1 WHOQOL–Bref protocol**

The WHOQOL-Bref was a WHO [26] questionnaire that was adapted and validated to Portuguese by Fleck et al. [25].

The WHOQOL-Bref module consists of 26 questions (with question number 1 and 2 on the overall quality of life), the answers follow Likert scale (1 to 5, the higher the score the better quality of life) [26]. Except for these two questions (1 and 2), the instrument has 24 facets,

which make up 4 domains: Physical health (7 items), Psychological (6 items), Social relations (3 items) and Environment (8 items) [26].

This instrument will need to recode the value of questions 3, 4, 26. (1=5) (2=4) (3=3) (4=2) (5=1) [26].

To calculate each facet is just sum the values of interview answers and divide by the number of participants. After that, the average is made and the results will be from 1 to 5. The mean scores are then multiplied by 4 in order to make domain scores comparable with the scores used in the WHOQOL-100 and subsequently transformed to a 0-100 scale [26].

#### **2.4.2 VEINES-QOL/-Sym analysis**

The VEINES-QOL/Sym produces two scores, one is the estimate of the impact of Venous Chronic Disease on quality of life (the VEINES-QOL) and other related to symptoms resulting from Venous Chronic Disease (the VEINES-Sym) [24]. The items related to the symptoms are: heavy legs, aching legs, swelling, night cramps, heat or burning sensation, restless legs, throbbing, itching and tingling sensation [24].

It was not necessary to calculate this questionnaire's scores, because the purpose of the present study was to compare only the impact of the exercise in wheelchair individuals.

### **2.5 Statistical Analysis**

For all the questions involving the VEINES-QOL/Sym, except the questions number 4 and 5, the Likert scale was used. It consists of a psychometric response scale primarily used in questionnaires to obtain participant's preferences or degree of agreement with a statement or set of statements. Most commonly seen as a 5-point scale ranging from "Strongly Disagree" on one end to "Strongly Agree".

The statistical analysis of VEINES-QOL/Sym questionnaire considered the questions 4 and 5 as dichotomic variables.

All the questions/answers were tabulated on Excel before proceeding to the statistical analysis between athletes and non-athletes.

The results from VEINES-QOL/Sym were analyzed by Chi-square test, which is used to investigate whether distributions of categorical variables differ from one another. It compared the tallies or counts of categorical responses between two independent groups. The test uses only actual numbers and not percentages, mean and proportions.

The results of the WHOQOL-Bref were analyzed by unpaired Student's *t*-test. The data were expressed as Mean±SD.

The results of the Social-demographic questionnaire were analyzed by Student's *t*-test and proportion test.

Non-parametric G test was suitable applied for analyzing two independent samples for categorical data [27].

The differences between groups were considered significant at  $P < .05$ .

To statistical analysis the following software packages were used: Graph Prism 5.03 (San Diego, CA-USA); Excel (Microsoft Corporation) and Bio Estat 5.0 ([www.mamiraua.org.br](http://www.mamiraua.org.br)).

### 3. RESULTS AND DISCUSSION

#### 3.1 Profile

Basic characteristics of the subjects are presented in Table 1.

**Table 1. Baseline characteristics of the volunteers (n=25)**

<b>Characteristic</b>	<b>Athletes n=13 No (%) or mean (range)</b>	<b>Non athletes n=12 No (%) or mean (range)</b>
<b>Sex</b>		
Male	92.3%(12)	91.67%(11)
Female	7.7%(1)	8.33%(1)
<b>Age</b>		
21-30 years	15.38%(2)	33.3%(4)
31-40 years	69.24%(9)	25%(3)
41-60 years	15.38%(2)	41.7%(5)
<b>Marital status</b>		
Single	61.53%(8)	58.33%(7)
Married	38.47%(5)	41.67%(5)
<b>Occupation</b>		
Work	53.85%(7)	0%
Non-work	0%	33.33%(4)
Retired	46.16%(6)	66.67%(8)
<b>Schooling</b>		
Basic education	38.4%(5)	25%(3)
High school	46.25%(6)	75%(9)
College	15.35%(2)	0%
<b>Habitation</b>		
Alone	84.61%(11)	16.67%(2)
With relatives	15.39%(2)	83.33%(10)
<b>Continuous medication</b>		
Yes	53.85%(7)	100%(12)
No	46.15%(6)	0%
<b>Pre-existence of cardiovascular disease</b>		
Yes	23.07%(3)	58.33%(7)
No	76.93%(10)	41.67%(5)
<b>Monthly income</b>		
Average(R\$)	1923(mean)	1852(mean)

The athletes group consisted in thirteen volunteers (7.7% female, 92.3% male). Most of the volunteers (84.62%) were aged between 20-40 years and 61.63% were single. The non athletes group consisted in twelve participants (8.33% female, 91.67% male), most of them (58.3%) was aged between 20-40 years and 58.33% was single.

In terms of each absolute values of age (not ranges of age), it was not found significant difference (Student's *t*-test) between the groups ( $P > .05$ ); the  $H_0$  hypothesis was not

rejected, thus assuming equal variances. At the same way, comparing the monthly income between the wheelchair users athletes and non athletes, the  $H_0$  hypothesis ( $P > .05$ , Student's  $t$ -test) was also not rejected.

Excluding monthly income and ranges of age parameters, G-test was applied [27]. The nonparametric G - test was used to compare ranges of age and marital status between both groups of wheelchair users. When comparing ranges of age (21-30; 31-40; 41-60), the  $H_0$  hypothesis of equality was not rejected for athletes and non-athletes groups ( $P = .0778$ ). The condition of being an athlete or non athlete is not associated with marital status, since the hypothesis of equality  $H_0$  ( $P > .05$ ) was not rejected.

Regarding labor condition (occupation), the value of  $P$  was .0004 ( $P < .05$ ), so the  $H_0$  hypothesis was rejected. This result demonstrates dependence between being an athlete and this condition (working/occupation).

The level of education is also a factor that is related to being an athlete or not, because the  $H_0$  hypothesis of equality was rejected ( $P = 0.0082$ , i.e.,  $P < .05$ ). According to the 2010 census conducted by IBGE (Brazilian Institute of Geographic and Statistic) [28], the vast majority of handicapped individuals had only basic education. This data also was observed on the non athletes profile (25% had basic education). On the other hand, the athletes group had an improvement on the schooling levels (15.3% undergraduate individuals). We may infer from these results that practicing sports can be a powerful motivation to keep on studying despite their physical limitations. Analyzing the data on the educational level and occupation, we were able to establish a positive association between higher educational levels and higher percentage of persons working. In the group of non athletes no one was working, and this was also the group that had the lower educational levels.

Concerning living alone or with relatives, most athletes (wheelchair users) reported living alone. Comparing to the non athletes, the obtained value of  $P$  was lower than 0.5 ( $P = .0011$ ), the  $H_0$  hypothesis of equality was rejected, hence there is dependence between living alone and practice of sports. Indeed living alone and working are associated. Working brings financial independence, which provides stability and self-assurance for the individual to live by himself. Among athletes, 53.85% are employed and as a result of that, a higher percentage (84.61%) of individuals live alone.

The use of continuous medication among the wheelchair users is also another factor that is related to the fact of being or not an athlete ( $P = .0019$ ). The long-term use of medication is another point. It was more prevalent in the non athletes group (100%), while among the athletes, 53.85% declared to consume medicines continuously.

The mentioned pre-existence of cardiovascular diseases, before the beginning of this research, was prevalent in the non athletes group (58.33%) than in the athletes (23.07%). Similarly to the analysis of the parameter "use of continuous medication", the pre-existence of cardiovascular diseases is positively associated to the disposition to be an athlete or non athlete. The  $H_0$  hypothesis of equality was rejected for this parameter ( $P = .0187$ , i.e.  $P < .05$ ). The data revealed that the physical exercise has an important impact in the prevention of chronic disease's development, whether cardiovascular or not, and in minimizing the need of ongoing medication. As described by Chakravarthy et al. [29], there is an essential reduction in chronic disease on individuals who perform minimal physical activity.

### 3.2 WHOQOL-Bref

Individuals who regularly practiced physical activity (athletes) had higher scores on the WHOQOL-Bref domains. The analysis between the groups showed significantly statistical difference ( $P \leq 0.05$ , unpaired Student's *t* test) only in the third domain Table 2.

**Table 2. Comparison of the world health organization quality of life–Bref Form (WHOQOL-Bref) between the non athletes and the athletes groups, Ribeirão Preto, SP, Brazil, 2013**

Assessment <sup>a</sup>	Non athletes (n=12)	Athletes (n=13)	P
Domain 1	78.28±10.7	83±5.14	0.315
Domain 2	85.53±6.37	90.43±2.26	0.106
Domain 3	71.6±5	85.06±2.33	0.013
Domain 4	79.52±4.43	77.8±8.09	0.605

<sup>a</sup> Higher scores indicate better outcome. Scores are shown as mean±standard deviation

Differently to the 3<sup>o</sup> domain, the comparisons of the scores related to other domains (1<sup>o</sup>, 2<sup>o</sup> and 4<sup>o</sup>) did not present significant statistical difference. The first domain refers to physical conditions, and considers facts like energy to execute daily activities, sleep quality, mobility and physical discomfort. The second domain deals with psychological conditions, such as self-esteem, spirituality, positive feeling and self-appearance. The fourth domain concerns environmental conditions, such as security, transportation and social care, which are all independent variables. The absence of statistical difference among the groups in fourth domain could be explained as not depending on the subjects, since the Brazilian government supplies those variables.

The third domain is related to social relationships, such as personal relationships and social support. In these aspects, there were significant statistical difference between the results obtained from athletes and non athletes. Our results were in accordance as demonstrated by Resnick [12], that regular physical exercises enhance health, facilitate and foster social contact, and positively affect the quality of life, thus leading to improved social life and interaction.

### 3.3 VEINES-QOL/ Sym

The results obtained from VEINES-QOL/ Sym are presented on the Table 3. It is possible to observe that only the answers for the 4d and 5a questions are statistically different between the groups of wheelchair users ( $P < 0.05$ , Chi-square test).

The Table 3 shows the analysis between the athletes and non athletes groups, when analyzed using the Chi-square test.

The answers related to the question 4d showed that 84.6% of the wheelchair athletes did not feel limited to have leisure activities due to leg injury, and just 41.6% of the non athletes answered the same. This fact can be an indication that the regular physical exercise increases the individual motivation.

**Table 3. Statistically significance between the wheelchair users: athletes and non athletes, in VEINES-QOL/Sym questionnaire**

<b>Question</b>	<b>Athletesxnon athletes (P-value)</b>
Q4-d Does your leg problem now limit you in social or leisure activities in which you are sitting for long periods?	0.025**
Q5-a During the past four weeks, did you cut down the amount of time you spent on work or other activities?	0.046**

*Q: question. (\*\*P<.05)*

The answers given to the question 5a showed that 92.3% of the athletes did not notice any difference on the time spent for daily activities, and 58.3% of the non athletes declared likewise.

The questionnaire is limited in terms of time, only assessing the past four weeks. Since both groups have been using wheelchair for a long time (eight years minimum), we hypothesize that the athletes could not realize the real impact of how positively practicing regular physical exercises can interfere in the execution of daily activities, because they have only been playing basketball for two years.

The issues analyzed with the other answers did not support statistical differences when comparing the data of athletes and non athletes. This indicates that physical exercise does not reduce self-perception of venous symptoms, and possibly does not reduce the development of a venous disease. This fact could be explained when considering that both athletes and non athletes are conditioned to a wheelchair status, i.e., they are limited to perform only sitting activities, which decrease the work of the lower limbs muscles [30].

Although the literature presents solid data concerning the stimulation of cardiac function and its beneficial relationship with venous return [1,2], regular physical activity (basketball) of the superior members, accomplished by wheelchair athletes included in the present research, was not proven enough to improve self-perception of venous return.

#### **4. STUDY LIMITATIONS**

The cross sectional nature and the influence of seasonal variations are some of the limitations of the study.

The main limitations of the present study are related to the recordatory. To conduct the study using questionnaires, it is necessary to rely on the memory of the respondent. Some of the information may be inaccurate due to forgetfulness.

The small number of subjects able to fit in the study is another important limitation (being a wheelchair user and practicing a group sports). However, all individuals were assessed using two different validated instruments (VEINES-QOL/Sym and WHOQOL-Bref).

## **5. CONCLUSION**

The practice of regular physical activity may be a direct causal factor in the motivation for individuals who live alone, since sports provide greater self-esteem and more confidence. In addition to that, physical exercises can be considered activities of social interaction, which reduce the isolation of the individual and decrease the family emotional dependence. The financial and emotional independence, which come from working, are reinforced by the improvement of self-confidence, which is stimulated when practicing sports in groups, such as basketball. This fact observed in the athletes highlights the different profile comparing to the non athletes wheelchair users.

Considering specifically the data obtained by WHOQOL/Bref survey, physical exercise improves the quality of life of wheelchair individuals. However, it has not been possible to establish the relationship between physical exercise and the improvement of self-perception on venous symptoms (VEINES-QOL/Sym).

## **CONSENT**

All authors declare that, 'a written informed consent was obtained from the patients/ participants for publication of this study'.

## **ETHICAL APPROVAL**

Ethics Committee of The National Ministry of Health/University of Ribeirão Preto, São Paulo, Brazil (CAAE: 18388513.7.0000.5498/ protocol: 462.531/2013).

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## **COMPETING INTERESTS**

Authors have declared that no competing interests exist.

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