



Original Article

Artigo Original

## Prevalence of Health Problems and Associations with Physical Activity Level in the Brazilian Army Female Segment

### *Prevalência de agravos à saúde e associações com nível atividade física em militares do segmento feminino do Exército Brasileiro*

Lilian C. X. Martins<sup>§1</sup> PhD

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#### Abstract

**Introduction:** Physical activity has been consistently associated with disease prevention and treatment, health promotion, and decreased all-cause mortality. There are few studies focused on the determinants of physical activity and health among women of the Brazilian Armed Forces.

**Objective:** To evaluate the prevalence of factors associated with levels of physical activity military women.

**Methods:** Sectional and observational study. The sample consisted of the female segment (n = 31) in a study conducted in the census of a Brazilian Army Directorate. The prevalence of hypertension, high cholesterol, job stress, anxiety and depression symptoms (common mental disorders), gastritis, asthma, sleep disorders, smoking, and self-rated health were estimated. The tests used were Shapiro Wilk, Student's *t*-test and Pearson and Spearman coefficients. All analyzes with 95% confidence level.

**Results:** There were associations of self-rated health and self-rated health comparing with 12 months ago, age and JS with higher levels of leisure-time physical activity (on SEL and PALL scores) ( $p < 0.05$ ). Rank and age were inversely associated with AFO: the lower the exposure, the higher the AFO levels.

**Conclusion:** The factors related to leisure-time physical activity levels among military women were different from those exhibited in military men. Furthermore, results were similar in relation to occupational physical activity.

**Keywords:** military personnel, women, peacetime, job stress, common mental disorders.

#### Keypoints

- Better self-rated health was associated with higher levels of leisure-time physical activity.
- Rank and age were inversely associated with occupational physical activity.
- Compared to men, exposures showed distinct effects on physical activity levels.

#### Resumo

**Introdução:** A prática de atividade física tem sido, consistentemente, associada à prevenção e ao tratamento de doenças, à promoção da saúde e à diminuição da mortalidade por todas as causas. São escassos os estudos que tenham focalizado os fatores determinantes da quantidade de atividade física e da saúde no seguimento feminino nas Forças Armadas brasileiras.

**Objetivo:** Avaliar a prevalência de fatores associados com níveis de atividade física, em militares do sexo feminino do Exército Brasileiro.

<sup>§</sup> Corresponding Author: Lilian Martins – e-mail: [lilitina@gmail.com](mailto:lilitina@gmail.com)

Affiliations: Instituto de Pesquisa da Capacitação Física do Exército (IPCFEx).

**Métodos:** Estudo seccional e observacional. A amostra foi composta do seguimento feminino (n=31) de estudo conduzido no censo da população de integrantes de uma Diretoria do Exército Brasileiro, em 2010. Estimou-se a prevalência de hipertensão arterial, colesterol elevado, estresse no ambiente de trabalho, sintomas de ansiedade e depressão, gastrite, asma, distúrbios do sono, hábito de fumar, e autopercepção de saúde. Os testes utilizados foram Shapiro Wilk, teste *t* de Student e coeficientes de Pearson e Spearman. Todas as análises com nível de confiança de 95%.

**Resultados:** Houve associação, com maiores níveis na atividade física no lazer, de percepção de saúde atual e comparada com há 12 meses, idade e EAT ( $p < 0,05$ ). Posto e idade estavam inversamente associados com atividade física ocupacional.

**Conclusão:** Concluiu-se que os fatores relacionados aos níveis de atividade física no lazer entre mulheres militares apresentaram-se distintos dos exibidos em homens militares, e que foram semelhantes em relação à atividade física relacionada a atividades ocupacionais.

#### **Pontos-Chave Destaque**

- Melhor autopercepção de saúde estava associada maiores níveis de atividade física no lazer.

- Posto e idade estavam inversamente associados com atividade física ocupacional.

- Na comparação com os homens, as exposições mostraram efeitos distintos sobre os níveis de atividade física.

**Palavras-chave:** militares, mulheres, tempos de paz, estresse no ambiente de trabalho, transtornos mentais comuns.

## **Prevalence of Health Problems and Associations with Physical Activity Level in the Brazilian Army Female Segment**

### **Introduction**

Physical activity has been consistently associated with diseases prevention and treatment, health promotion and decreased all-cause mortality(1). Literature shows that about 10% of premature deaths are associated with inadequate levels of physical activity on aerobic exercise(2).

The concept of physical activity is "any body movement produced by skeletal muscles that results in energy expenditure"(3) and can manifest itself in various ways, which science has sought to define and conceptualize. Physical activity can be structured and unstructured, which are further divided into dimensions, according to the summary presented in Panel 1. There are two main aspects involved in the evaluation of physical activity: quantity and intensity, basic concepts for physical activity. classification of physical activity or inactivity(4), and its assessment is an important issue which become highly discussed in epidemiology(5).

The impact of health costs related to physical inactivity is very high. In the United States of America (USA) it was around US \$ 17 million(6) whereas, in Brazil, the estimative was around US \$ 377 million – representing 14% of hospital admission expenses in the Public Health System (*Sistema Único de Saúde: SUS*) were due to causes related to physical inactivity(7). In the USA, the prevalence of adults with insufficient or physically inactive levels was 50.2%(8), in Brazil, they represented 59% of the population(9). Often, physical activity among women presents lower levels compared to men(8,9).

Among the main benefits of physical activity there are those related to cardiovascular health and the body evidence is rich in the literature. One of the most prevalent cardiovascular disease is hypertension, which relates to other diseases. and physical activity is an important adjuvant treatment(10).

Another factor that is associated with lower levels of physical activity is job stress(11). Job stress relates to mental health(12) and

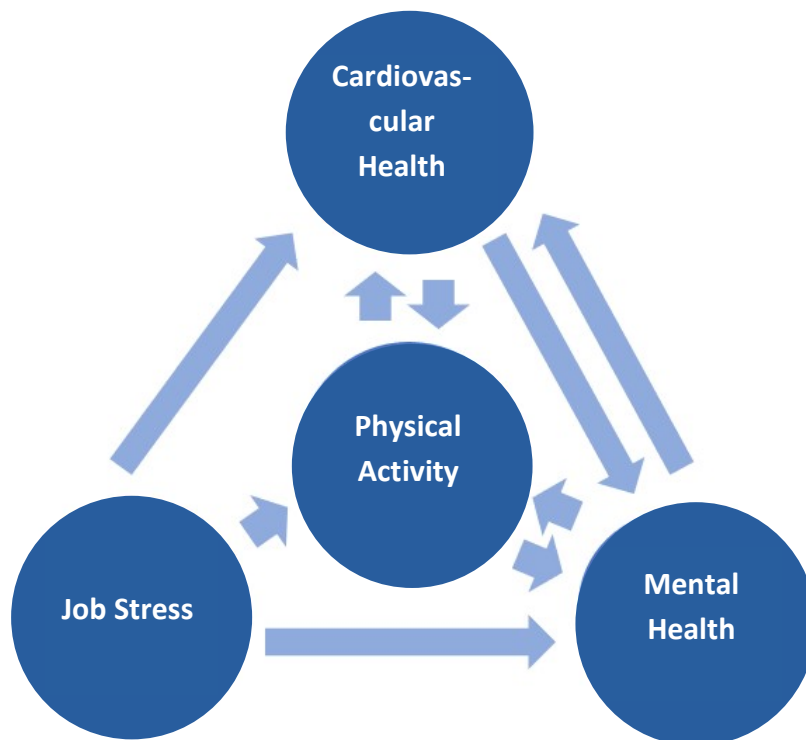
cardiovascular health(13) composing a complex network of causes with bi or multidirectional relationships. Figure 1 shows this network.

There are bilateral relations between physical activity and mental health and cardio-

-vascular health. In other words, both physical activity can act in the treatment and prevention of symptoms in mental health, and symptoms in mental health may be related to lower levels of physical activity(14). The same happens with cardiovascular diseases(15,16).

**Panel 1 – Types of physical activity, their dimensions and examples classified**

Types of physical Activity	Dimensions		
	Occupational physical Activity (OPA)	Physical activity in sports/exercise in leisure (SEL)	Physical activity in leisure and locomotion (PALL)
<b>Structured</b>		<ul style="list-style-type: none"> <li>• Individual and collective sports structured with rules; And</li> <li>• Structured Exercises (bodybuilding, localized gymnastics and others oriented by the physical education teacher).</li> </ul>	
<b>Unstructured</b>	<ul style="list-style-type: none"> <li>• Load weight;</li> <li>• Remain upright;</li> <li>• Walk And</li> <li>• Up and down stairs.</li> </ul>		<ul style="list-style-type: none"> <li>• Tours, commuting to work, school (walking or biking).</li> </ul>



**Figure 1 – Causal network of physical activity, job stress, cardiovascular health and mental health.**

As in the general population, within the Armed Forces, there is a concern about the development of chronic diseases. Thus, it is determined the annual full health checkup for Brazilian military personnel. Military professionals are an adult productive population, from which is required physical fitness performance. In that context, there is the need for increased levels of physical activity. Thus, they are a population classified as physically active.

Presently, the proportion of women in the Brazilian Army is quite small compared to men and they perform non-operational duties. The incorporation of women for military training in operational functions initiated very recently, and the first class completed the course a few months ago(17). The quantitative difference in female numbers can be observed, for example, in international peace missions such as the mission in Haiti. For each contingent, which comprised 600 to 800 members, only between 5 and 15 women (about 1%) participated(18). Within this scenario, in Brazil, the literature shows that little was investigated about the amount of physical activity or health of military women in the Armed Forces.

The aim of the present study was to evaluate the association between the prevalence of health problems and other health related factors (hypertension, high cholesterol, job stress, symptoms of anxiety and depression, gastritis, asthma, sleep disorders, smoking, and self-rated health) with physical activity levels in the Brazilian Army female segment.

## Methods

### *Study design and sample*

This was a cross-sectional observational study conducted in the census of the population of members of a Brazilian Army Directorate. The results of the analysis of military men were published elsewhere(19-21). The inclusion criterion for the present study was to be female. Exclusion criteria were being on mission outside the city for a long period; be on leave; and not volunteering to participate.

### *Ethical aspects*

The study was submitted and approved by the Human Research Ethics Committee of the

Institute of Social Medicine of the State University of Rio de Janeiro (UERJ) and registered with CONEP / MS under CAAE 1368.0.000.259-09. All participants signed the Informed Consent Form.

### *Data collect*

All variables were self-reported. The occurrence of disease was stated based on the previous diagnosis made by a physician. The collection was performed through a questionnaire composed of five blocks: 1) Sociodemographic characteristics (age, marital status, education and income); 2) Questionnaire about the presence of health problems; 3) Screening questionnaire on mental health; 4) Job stress questionnaire; and 5) Questionnaire on physical activity levels. All variables are described in more detail below.

### *Outcome variables*

The primary outcome was the level of physical activity. Secondary outcomes examined for prevalence were hypertension, high cholesterol, job stress, symptoms of anxiety and depression, gastritis and asthma.

### *Exposure Variables*

The exposure variables examined in relation to the main outcome were age, hypertension, high cholesterol, job stress, common mental disorders (anxiety and / or depression symptoms), gastritis, asthma, sleep disorders, smoking, and self-rated health.

### *Covariables*

The covariates integrated the study to describe the sociodemographic characteristics of the study population. They were marital status, education and income.

### *Physical activity (PA)*

The level of physical activity was estimated with Baecke Questionnaire(22), adapted and validated in Brazil(23). It estimates the practice of habitual physical activity in a recollection of the last 12 months. Results expressed as scores. The dimensions are the following: occupational physical activity (OPA), physical activity in sport and / or exercise in leisure-time (SEL) and other physical activity in leisure and / or locomotion (PALL) and the sum of the dimensions

<sup>§</sup> Corresponding Author: Lilian Martins – e-mail: lilitina@gmail.com

Affiliations: Instituto de Pesquisa da Capacitação Física do Exército (IPCFEx).

(OPA+SEL+PALL) is the total physical activity score (TS). The method preconizes that the reported physical activities be standardized according to the MET (metabolic equivalent – metabolic unit of energy consumption)(24), following the classification of Ainsworth et al.(25).

#### *Arterial hypertension (AH)*

The estimate of the prevalence of arterial hypertension (AH) was self-reported (previous diagnosis by a physician) with answer options “Yes” or “No”.

#### *Common mental disorders (CMD)*

To assess the presence of anxiety and depression symptoms known as common mental disorders (CMD), the General Health Questionnaire version 12 items (GHQ-12)(26) was used – it was translated and adapted to Brazilian Portuguese(27). The questions refer to situations on the last two weeks. According to the methodology of the instrument, the answer options are presented in Likert scale (four ordinal items: never, rarely, sometimes, always) which are subsequently dichotomized (values 0 and 1) as follows: never or rarely = 0; and sometimes or always = 1 and then are summed.  $\text{Sum} \geq 3$  results are considered cases.

#### *Job Stress (JS)*

Job stress (JS) was assessed by Siegrist's effort-reward-imbalance model(28), adapted and validated in Brazil(29). The model is based on the ratio of effort expended to meet job demands and perceived rewards, as well as an assessment of overcommitment - the latter a feature of the individual's personality. The results are presented as a score.

#### *Other physical health problems and lifestyle variables*

The following health problems were investigated: high cholesterol, gastritis and asthma - by self-report (previous diagnosis made by the physician), with “Yes” or “No” response options. In addition, we asked about sleep disorders (difficulty falling asleep and / or waking up in the middle of the night and having difficulty falling asleep again), smoking status and self-rated health (current and comparing to 12 months ago). Furthermore, the presence of comorbidity of

high cholesterol and hypertension was assessed.

#### *Sociodemographic characteristics*

The following sociodemographic characteristics were age, marital status, education, rank and income.

#### *Pre-test and pilot studies*

To assess the test-retest reliability of the applied instruments, pretest and pilot studies were conducted. The results showed high reliability ranging from substantial to perfect(30).

#### *Statistical analysis*

Exploratory and descriptive analyzes were performed. Normality of data distribution was assessed by the Shapiro Wilk test. To examine the association of exposure variables with physical activity level (main outcome), the unpaired Student's *t*-test was used for dichotomous variables. To analyze the correlation the coefficients of Pearson and Spearman were used. The classification of correlation analyzes for positive (direct correlation) or negative (inverse correlation) was as follows: for values from 0 to <0.3: negligible correlation; from 0.3 to <0.5: weak correlation; from 0.5 to <0.7: moderate correlation; from 0.7 to 0.9: strong correlation; and for values equal to or above 0.9: very strong correlation(31). For all analyzes the established confidence level was 95%.

## **Results**

Participated in this study 31 military women, female sample of the health study conducted at the Brazilian Army, in the city of Rio de Janeiro, in 2010 and 2011. Mean of age was 34.07 ( $\pm 7.62$ ) years, 77.42% was postgraduate, and 12% were Sergeants, the others were all Officers. Forty-five percent were married, the rest were single and divorced / separated. As for skin color: 51.61% were white, 38.71% brown and 9.68% black. On average, family income was 6.47 ( $\pm 4.06$ ) minimum wages and 54.8% (n=17) had no health or disease problems. On self-rated health, 64.5% perceived as Very Good and 35.5% as Good. Actual health compared to 12 months ago, only 6.5% considered their health worse today. As for sleep disorders, 67.7% had no difficulty falling asleep and 61.30% did not wake up in

the middle of the night with difficulty returning to sleep. There was no comorbidity between high cholesterol and AH.

The prevalence of hypertension was 6.5%, the same value for the prevalence of high cholesterol and asthma. The prevalence of gastritis was 19.4%. The prevalence of CMD was 12.9% and JS was 35.5%. There was no comorbidity of cholesterol and AH.

Smoking prevalence was of 6,45% and it was not associated with physical activity level.

Table 1 presents the results of the amount of physical activity in total score and by dimensions (OPA, SEL and PALL) and results of the correlation analysis with age. There was a moderate inverse correlation of age with OPA ( $p=0.002$ ) and a weak direct correlation of age with SEL ( $p=0.038$ ).

Table 2 presents the association between the prevalence of health problems, CMD, JS, health perception, sleep disorders and sociodemographic factors with level of physical activity (total score and by dimensions).

#### *Factors associated with physical activity total score (TS)*

People with asthma had lower TS levels than non-asthmatics ( $p=0.006$ ). Perceiving your current health as Very Good was associated with higher TS levels than Good perception ( $p=0.009$ ). Marital status, too, was significantly associated with TS levels, and those with the highest levels were single, followed by married ones. Divorced/Separated or separated women had the lowest levels of the three categories ( $p=0.032$ ). The other exposure factors examined were not associated with TS.

#### *Factors associated with physical activity sports / exercise in leisure-time (SEL)*

The only factor that was associated (borderline) with SEL was current health perception, with the Very Good assessment showing higher levels of SEL compared to the Good assessment ( $p=0.055$ ). The other exposure factors examined were not associated with SEL.

#### *Factors associated other physical activity in leisure and locomotion (PALL)*

Regarding PALL, military personnel with JS exhibited higher levels compared to those who were not suffering from JS ( $p=0.046$ ). Current perception of health as Very Good was associated with higher levels of PALL compared with Good perception ( $p=0.011$ ). Regarding health status, compared with 12 months ago, the Worst assessment was associated with lower PALL levels compared to the Equal or Better assessment ( $p=0.008$ ). The other exposure factors examined were not associated with PALL.

## **Discussion**

The results of this study are new, and studies that have investigated the health of military women in Brazil are rare. The main results were that asthma, current health perception, and marital status were associated with lower levels of TS (Table 1). The analysis by dimensions identified the factors associated with the levels of OPA, SEL and PALL.

#### *Total physical activity score (TS)*

Current perception of health rated Very Good was associated with higher levels of TS

**Table 1** – Association of age with physical activity (total score and dimensions) in Brazilian Army military women (n = 31)

Physical Activity	Mean	Median	DP	Min	Max.	Rho	P
OPA	3,11	3,00	0,63	2,00	4,63	<b>-0,544</b>	<b>0,002</b>
SEL	3,29	3,25	0,84	1,75	5,00	<b>0,375</b>	<b>0,038</b>
PALL	2,50	5,50	0,49	1,50	3,50	0,336	0,065
TS	8,90	9,25	1,17	6,25	10,63	0,115	0,538

TS: Total Physical Activity (OPA + SEL + PALL); OPA: occupational physical activity; SEL: Physical activity sports / exercise in leisure-time; PALL: Other physical activities in leisure and/or locomotion; DP: standard deviation; Min.: Minimum value; Max.: maximum value; Rho: Pearson's correlation coefficient; P: P-value of Pearson's<sup>a</sup> and Spearman's<sup>b</sup> analyses.

**Table 2** – Association of arterial hypertension (AH), common mental disorders (CMD), job stress (JS), other health problems and associations with levels of physical activity (total score and dimensions) in military women of the Army Brazilian

Exposure	Physical Activity					P
	Mean	Median	SD	Min.	Max.	
<b>TS</b>						
<i>AH</i>						0.285
No	8.93	9.38	1.21	6.25	10.63	
Yes	8.50	8.50	0.35	8.25	8.75	
<i>High Cholest.</i>						0.190
No	8.82	8.75	1.16	6.25	10.50	
Yes	10.13	10.13	0.71	9.63	10.63	
<i>Asthma</i>						<b>0.006</b>
No	<b>8.99</b>	9.38	1.16	6.25	10.63	
Yes	<b>7.69</b>	7.69	0.27	7.50	7.88	
<i>Gastritis</i>						0.836
No	8.88	8.75	1.18	6.25	10.63	
Yes	9.00	9.38	1.24	7.00	10.50	
<i>CMD</i>						0.846
No	8.89	9.25	1.24	6.25	10.63	
Yes	8.97	9.06	0.58	8.25	9.50	
<i>JS</i>						0.229
No	8.72	8.75	1.21	6.25	10.50	
Yes	9.24	9.38	1.07	7.50	10.63	
<i>Self-rated health (SRH)</i>						<b>0.009</b>
Very Good	<b>9.32</b>	9.50	0.10	7.50	10.63	
Good	<b>8.15</b>	8.25	1.12	6.25	10.13	
<i>SRH 12 months</i>						0.263
The same or better	8.56	8.56	0.27	8.38	8.75	
Worse	8.93	9.38	1.21	6.25	10.63	
<i>Diff. falling asleep</i>						0.448
No	9.01	9.38	1.27	6.25	10.63	
Yes	8.69	9.00	0.97	7.00	9.75	
<i>Awakening and diff. as.</i>						0.506
No	8.96	9.38	1.26	6.25	10.63	
Yes	8.75	9.00	0.92	7.00	9.75	
<i>Marital status<sup>a</sup></i>						<b>0.032</b>
Single	<b>9.46</b>	9.75	1.41	6.25	10.63	
Divorced/Separated	<b>8.54</b>	8.56	1.02	7.50	9.63	
Married	<b>8.63</b>	8.56	0.91	7.00	10.25	
<i>Schooling</i>						0.519
Higher education	8.95	9.31	1.19	6.25	10.63	
Secondary education	8.46	8.25	1.08	7.50	9.63	
<i>Rank</i>						0.966
Official	8.89	9.31	1.22	6.25	10.63	
Sergeant	8.93	8.75	1.12	7.50	10.50	
<b>OPA</b>						
<i>AH</i>						<b>&lt;0.001</b>
No	<b>3.05</b>	3.00	0.61	2.00	4.63	
Yes	<b>4.00</b>	4.00	0.00	4.00	4.00	

(Continue)

Exposure	Physical Activity					P
	Mean	Median	SD	Min.	Max.	
<i>High Cholest.</i>						0.481
No	3.14	3.00	0.64	2.00	4.63	
Yes	2.75	2.75	0.53	2.38	3.13	
<i>Asthma</i>						0.809
No	3.10	3.00	0.63	2.00	4.63	
Yes	3.31	3.31	0.97	2.63	4.00	
<i>Gastritis</i>						0.891
No	3.12	3.00	0.66	2.00	4.63	
Yes	3.08	3.00	0.55	2.50	4.00	
<i>CMD</i>						0.892
No	3.11	3.00	0.64	2.00	4.63	
Yes	3.16	3.06	0.64	2.50	4.00	
<i>JS</i>						0.707
No	3.14	3.00	0.68	2.00	4.63	
Yes	3.06	3.13	0.57	2.38	4.00	
<i>Self-rated health (SRH)</i>						0.453
Very Good	3.18	3.13	0.60	2.25	4.63	
Good	3.00	2.88	0.71	2.00	4.00	
<i>SRH 12 months</i>						0.832
The same or better	3.06	3.06	0.27	2.88	3.25	
Worse	3.12	3.00	0.65	2.00	4.63	
<i>Diff. falling asleep</i>						0.643
No	3.15	3.13	0.66	2.00	4.63	
Yes	3.04	2.94	0.59	2.38	4.00	
<i>Awakening and diff. as.</i>						0.952
No	3.11	3.13	0.66	2.00	4.63	
Yes	3.13	2.94	0.61	2.38	4.00	
<i>Marital status<sup>a</sup></i>						0.478
Single	3.34	3.25	0.72	2.00	4.00	
Sep./Divorced/Separated	2.67	2.56	0.33	2.25	3.13	
Married	3.13	3.00	0.59	2.38	4.63	
<i>Schooling</i>						0.137
Higher education	3.05	3.00	0.62	2.00	4.63	
Secondary education	3.71	4.00	0.51	3.13	4.00	
<i>Rank</i>						<b>0.004</b>
Official	<b>2.85</b>	2.88	0.37	2.00	3.38	
Sergeant	<b>3.76</b>	4.00	0.68	2.25	4.63	
<b>SEL</b>						
<i>AH</i>						0.194
No	3.35	3.25	0.82	1.75	5.00	
Yes	2.38	2.38	0.53	2.00	2.75	
<i>High Cholest.</i>						0.379
No	3.23	3.25	0.82	1.75	5.00	
Yes	4.13	4.13	0.88	3.50	4.75	
<i>Asthma</i>						0.351
No	3.35	3.25	0.81	2.00	5.00	
Yes	2.38	2.38	0.88	1.75	3.00	
<i>Gastritis</i>						0.865
No	3.30	3.25	0.90	1.75	5.00	
Yes	3.25	3.38	0.55	2.50	4.00	



Exposure	Physical Activity					P
	Mean	Median	SD	Min.	Max.	
<i>CMD</i>						0.965
No	3.29	3.25	0.83	1.75	5.00	
Yes	3.31	3.38	1.03	2.00	4.50	
<i>JS</i>						0.363
No	3.20	3.13	0.95	1.75	5.00	
Yes	3.46	3.25	0.58	2.50	4.75	
<i>Self-rated health (SRH)</i>						<b>0.055</b>
Very Good	3.50	3.50	0.82	1.75	5.00	
Good	2.91	2.75	0.75	2.00	4.50	
<i>SRH 12 months</i>						0.791
The same or better	3.30	3.25	0.87	1.75	5.00	
Worse	3.25	3.25	0.00	3.25	3.25	
<i>Diff. falling asleep</i>						0.854
No	3.31	3.25	0.87	2.00	5.00	
Yes	3.25	3.25	0.81	1.75	4.50	
<i>Awakening and diff. as.</i>						0.606
No	3.34	3.25	0.86	1.75	5.00	
Yes	3.16	3.00	0.82	2.00	4.50	
<i>Marital status<sup>a</sup></i>						0.227
Single	3.55	3.50	1.01	1.75	5.00	
Divorced/Separated	3.33	3.25	0.82	2.50	4.50	
Married	3.07	3.25	0.68	2.00	4.00	
<i>Schooling</i>						0.387
Higher education	3.37	3.25	0.78	2.00	5.00	
Secondary education	2.58	2.00	1.23	1.75	4.00	
<i>Rank</i>						0.133
Official	3.44	3.25	0.80	2.00	5.00	
Sergeant	2.92	2.75	0.85	1.75	4.00	
<b>PALL</b>						
<i>AH</i>						0.104
No	2.53	2.50	0.50	1.50	3.50	
Yes	2.13	2.13	0.18	2.00	2.25	
<i>High Cholest.</i>						0.161
No	2.45	2.50	0.46	1.5	3.25	
Yes	3.25	3.25	0.35	3.00	3.50	
<i>Asthma</i>						0.249
No	2.53	2.50	0.49	1.50	3.50	
Yes	2.00	2.00	0.35	1.75	2.25	
<i>Gastritis</i>						0.290
No	2.46	2.25	0.51	1.50	3.50	
Yes	2.67	2.75	0.376	2.00	3.00	
<i>CMD</i>						1.000
No	2.50	2.50	0.51	1.50	3.50	
Yes	2.50	2.38	0.35	2.25	3.00	
<i>JS</i>						<b>0.046</b>
No	<b>2.38</b>	2.25	0.49	1.50	3.25	
Yes	<b>2.73</b>	2.75	0.43	2.25	3.50	
<i>Self-rated health (SRH)</i>						<b>0.011</b>
Very Good	<b>2.64</b>	2.75	0.54	1.50	3.50	
Good	<b>2.25</b>	2.25	0.25	1.75	2.50	

Exposure	Physical Activity					P
	Mean	Median	SD	Min.	Max.	
<i>SRH 12 months</i>						<b>0.008</b>
The same or better	<b>2.52</b>	2.50	0.50	1.50	3.50	
Worse	<b>2.25</b>	2.25	0.00	2.25	2.25	
<i>Diff. falling asleep</i>						0.437
No	2.55	2.50	0.50	1.50	3.50	
Yes	2.40	2.25	0.47	1.75	3.25	
<i>Awakening and diff. as.</i>						0.830
No	2.51	2.50	0.51	1.50	3.50	
Yes	2.47	2.38	0.45	2.00	3.25	
<i>Marital status<sup>a</sup></i>						0.629
Single	2.57	2.50	0.65	1.75	3.50	
Divorced/Separated	2.54	2.50	0.29	2.25	3.00	
Married	2.43	2.38	0.43	1.50	3.25	
<i>Schooling</i>						0.228
Higher education	2.54	2.50	0.49	1.50	3.50	
Secondary education	2.17	2.25	0.38	1.75	2.50	
<i>Rank</i>						0.084
Official	2.60	2.50	0.47	1.75	3.50	
Sergeant	2.25	2.25	0.48	1.50	3.00	

TS: total physical activity (OPA + SEL + PALL); OPA: occupational physical activity; SEL: physical activity in laser exercise; PALL: Other physical activity in leisure-time and / or locomotion; SD: standard deviation; Min.: minimum value; Max.: maximum value; AH: hypertension; High Cholest.: high cholesterol; CMD: common mental disorders; JS: job stress; SRH 12 months: current self-rated health compared to 12 months ago; Diff. falling asleep: difficulty falling asleep; Awakening and diff. as.: waking up in the middle of the night and having trouble getting back to sleep; Rank: military rank; P: p-value of Student's *t*-test analysis and Spearman<sup>a</sup> correlation coefficient.

compared with perception rated Good. The relevance of investigating self-rated health lies in the fact that science has shown that self-rated health is related to the prognosis of various diseases and is a powerful predictor of mortality(32). The experimental study by Andreasson et al.(33) investigating the effect of self-rated health on experimental design using placebos showed a correlation of subjective health assessment as poor with higher inflammatory activity. In the case of the present study, a better perception of health was associated with higher levels of TS.

Marital status was associated with TS. Studies that have focused on the relationship of this sociodemographic factor with the practice of physical activity are scarce. Among the identified, two studies in population samples found no association(34,35). Corroborating the findings of the present study, another study, conducted in industry professionals, showed that among women, single women had lower

prevalence of insufficiently active in leisure(36).

About the effect of JS and CMD on physical activity levels we found no significant association of both with TS, which agrees with results men in previous study(20).

#### *Occupational Physical Activity (OPA)*

AH was associated with higher levels of OPA, which is in accordance with the results of Jardim et al.(37), who found association of higher prevalence of hypertension in individuals with moderate-intensity OPA. The literature consistently shows that higher levels of physical activity are related to health benefits(4), however, there is a paradox regarding the effects of OPA and SEL(38) on cardiovascular health. Previous studies have shown that OPA is associated with an increased risk of cardiovascular disease(38,39). This type of approach is relatively new, which underlines the importance of investigating physical activity

levels by dimensions among military personnel.

JS and CMD were not associated with OPA among military women. These findings differ from those shown in military men, for whom higher JS scores and presence of CMD were associated with higher levels of OPA(20). Panel 2 exhibits the present study results compared to the previous study in military men from the same source population(20).

Rank was inversely associated with higher levels of OPA - the lower the rank, the higher the levels of OPA. The same association was observed in military men(20). In both studies, sergeants presented higher levels of OPA than officers – which relates with the respective career tasks. In line with these findings, a cohort study (20-year-old segment) in a population sample with 2,469 female participants showed no significant difference in OPA in men and women(40).

*Physical activity in sports/ exercise in leisure-time (SEL)*

Regarding SEL, only current perception of health had a borderline association (p=0.055). Corroborating these results, Pan et al.(41) demonstrated an association of self-rated health with higher levels of physical activity in the Canadian population and pointed to the consistency of the literature in that better health perceptions are related to higher levels of SEL.

The other exposures examined were not associated with SEL. These findings are quite different from those found in military men, since it is observed that in military men, higher levels of JS and presence of CMD were associated with lower levels of SEL, and the higher the rank, the higher the levels of SEL(20).

**Panel 2** – Discussion panel on comparative results of the association of AH, JS and rank with physical activity levels (by dimensions and total score) in male and female soldiers in the Brazilian Army

Physical Activity	Comparison of Scores		Associations							
			JS		CMD		Rank		Age	
	H <sup>a</sup>	M	H <sup>a</sup>	M	H <sup>a</sup>	M	H <sup>a</sup>	M	H <sup>a</sup>	M
<b>TS</b>	9,70 (±1,21)	8,13 (±0,73)	-	-	-	-	↓	-	↓	-
<b>OPA</b>	3,15 (±0,53)	3,11 (±0,63)	↑	-	↑	-	↓	↓	↓	↓
<b>SEL</b>	3,67 (±0,70)	2,63 (±3,29)	↓	-	↓	-	↑	-	-	↑
<b>PALL</b>	2,88 (±0,64)	2,39 (±1,70)	-	↑	-	-	↓	-	↓	-

Outcome variable: Physical Activity; Exposure variables: JS, CMD and post/Grad. JS: job stress; CMD: symptoms of anxiety and depression; Rank.: Military rank; H<sup>a</sup>: Results of the analyses performed among military men, published in a previous study(34), members of the same source population to which the sample of the present study (female segment); M: Results of the present study, with analyses performed in military women.

Obs.: Significant variations in the association with physical activity level: ( ↑ Direct Association); ( ↓ Inverse Association); - (absence of significant association). Direct Association: The greater the exposure factor the greater the outcome. Inverse Association: The higher the exposure factor, the lower the outcome.

*Other physical activities in leisure-time and locomotion (PALL)*

There was a direct association between JS, current health perception and comparison of current health perception 12 months ago with PALL. The relationship of higher JS plus PALL can be explained by the commuting factor, which may involve exposure to physical insecurity situations. The city of Rio de Janeiro, in 2015, was among the most violent cities in Brazil, and the homicide rate among

women in Rio de Janeiro between 2005 and 2015 was 4.4 per 100,000 women - considered very high(42). In this context, it is plausible that physical activity on the commuting to work (part of the PALL dimension) means greater exposure of women to urban violence and explains the association of JS - remembering that JS involves the analysis of the balance between the facets effort and reward at work. Among military men, there was no relationship between JS and PALL(20), as observed in the Panel 2.

The results of the systematic review by Stults-Kolehmainen et al.(11) showed that the literature is not consistent about the influence of JS on physical activity levels. They concluded that there is a gap in knowledge about the underlying mechanisms in relation to the multiple influences of stress on physical activity behaviors. Moreover, for the authors, new research should seek to evaluate physical activity according to dimensions to clarify the relationships in question.

#### *Age and physical activity levels*

The average age in the study population was 34.07 ( $\pm$  7.62) years and there was an inverse linear correlation of age with OPA and direct correlation with SEL (Table 1). That is, in military women, with increasing age, the amount of OPA decreased and SEL levels increased slightly. And there was no correlation of age with TS or PALL. There is no great variation in physical activity levels among Brazilian women aged 25-34, 35-44 and 55-64 years, as observed in the prevalence of physical inactivity, respectively: 6.6%; 6.7%; and 7.5%(9).

Comparing the correlation between age and OPA in military women with men the results were similar. These findings are in line with the literature(40).

Regarding the other physical activity scores (TS, SEL and PALL), age exhibited distinct correlations between military men and women (Panel 2). Among men, there was an inverse correlation of age with TS, OPA and PALL. That is, with increasing age, these levels of physical activity increased. Among women it was different. According to the literature(4) it is expected that with advancing age, the levels of SEL decrease, which was exhibited in men. However, the opposite was shown in military women: with age there was a slight increase in these levels. This can be explained by the increase in OPA – according to the literature higher levels of OPA lead to lower levels of SEL(43) and in female military decreasing age was related to higher levels of OPA.

#### *Prevalence of health problems and physical activity levels*

The only health problem that had significant association with lower levels of physical activity in TS was asthma, which prevalence

was of 6.45%. According to the literature, both people with asthma practice less physical activity, and lower levels of physical activity are related to higher prevalence of asthma(44,45). From this perspective, given the two-way relationship, the importance of increasing the levels of physical activity is highlighted: to improve health status of asthmatics and to protect health individuals against the development of asthma. Such prevalence of 6.45% is high compared to that found in a study of a population sample in Brazil, which showed a self-reported prevalence of 2.16% among women(46). In the USA, a populational-based study conducted in a population sample (n=3,840) found that most adults with self-reported asthma were physically inactive and that physical inactivity appears to be associated with an increased prevalence of asthma, which was of 9.0% (47). The difference between the prevalence observed between the two countries may be related to access to basic health care, which may be more available in the United States and to members of the Brazilian Army, compared to the general Brazilian population. In this sense, the prevalence of asthma among military women can be considered low.

The prevalence of high cholesterol and gastritis were, respectively, 6.5% and 19.4%. High cholesterol was not comorbidity to AH. Again, these results differ from those found in military men, in which the prevalence of high cholesterol (7.3%) was higher and with the prevalence of comorbidity of AH and high cholesterol (32.4%)(21).

The prevalence of 6.45% gastritis was high, as a recent systematic review study showed that the overall prevalence of gastritis (autoimmune type) is 2%, with peaks among older women of 4-5%(48). Therefore, special attention is recommended for this health problem among military women.

Finally, sleep disorders were not associated to physical activity levels, which differs from the literature(49).

#### *Strengths and limitations of the study*

A strength point of the study is the originality of the research. The findings are new, and the literature is scarce regarding the health of military women in peacetime, even in the international literature.

One limitation is that self-reported prevalence may, in the general population, can be biased because it is associated with access to basic health care services. However, the study population – military of the Brazilian Army, have all the health care they need, in addition to the obligation to have an annual full medical checkup.

Another limitation of the study concerns the cross-sectional design, which makes it impossible to make causal inferences due to the impossibility of temporal analysis of the occurrence of events. In this sense, studies with longitudinal design should be conducted.

## Conclusion

The aim of the present study was to evaluate the association between the prevalence of health problems and other health related factors (hypertension, high cholesterol, job stress, symptoms of anxiety and depression, gastritis, asthma, sleep disorders, smoking, and self-rated health) with physical activity levels in female soldiers of the Brazilian Army. Factors associated with higher levels of leisure-time physical activity (SEL and PALL) were self-rated health and health compared with 12 months ago, age (with SEL) and JS (with PALL). Findings that are in line with the literature.

JS being associated with PALL diverges from literature; thus, further studies should be conducted in order to clarify the relationship. The hypothesis formulated in the present study considered that, physical activity on the commuting to work at one of the most violent cities of Brazil may be a factor that explains the observed association.

We concluded that the factors related to the levels of leisure-time physical activity (EFL and PALL) among military women were distinct from those exhibited by military men and were similar in relation to physical activity related to occupational activities (OPA).

The findings of the present study are original in a female military study population. Other studies, preferably with longitudinal design, are needed in order to confirm our results and clarify the associations found. Follow-up studies on types of physical activity and associations with health outcomes among

military men and women in Brazil are recommended.

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## Conflict of Interest Statement

There is no conflict of interest regarding this study.

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