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Sex differences in the impact of musculoskeletal disorders on health-related quality of life: a population-based study, Campinas, SP – ISACamp 2014/15

Diferenças entre os sexos no impacto das doenças musculoesqueléticas na qualidade de vida relacionada à saúde: estudo de base populacional, Campinas, SP – ISACamp 2014/15

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Abstract *This article aims to estimate the prevalence of musculoskeletal disorders (MD) on the adult population of Campinas, São Paulo, Brazil, verifying associated demographic and socioeconomic factors, and to analyze their impact on Health-Related Quality of Life (HRQoL) according to sex. A population-based study was conducted with 2,166 individuals using data from the ISACamp 2014/15. The Medical Outcomes Study SF-36-Item Short Form Health Survey (SF-36) was used to measure HRQoL according to MD. Prevalence ratios (PR) were estimated by Poisson regression. Musculoskeletal disorders had a prevalence of 8.5% (6.7% tendonitis and 2.7% work-related musculoskeletal disorders – WMSD). Results showed a higher prevalence of musculoskeletal disorders in women, active or on leave due to illness, and in individuals with higher education levels. Moreover, reduced HRQoL scores were observed in 6 of the 8 domains, due to MD. The mental component and physical component showed greater impairment respectively among women and men after self-reported WMSD. These findings point to substantial damage from musculoskeletal disorders on the population's HRQoL. WMSD affect the HRQoL of men and women distinctly.*

Key words *Musculoskeletal disorders, Sex characteristics, Quality of life*

Resumo *O objetivo deste artigo é estimar a prevalência de doenças musculoesqueléticas (DM) na população adulta de Campinas/SP, Brasil, verificar fatores demográficos e socioeconômicos associados e analisar o seu impacto na qualidade de vida relacionada à saúde (QVRS) segundo sexo. Este é um estudo de base populacional utilizando dados do ISACamp 2014/15, com 2.166 indivíduos. Para a medida de QVRS, foram calculados os escores médios do Short Form Health Survey 36 (SF-36) segundo as DM e utilizada a regressão de Poisson para estimar as razões de prevalência (RP). A prevalência de DM foi de 8,5% (6,7% de tendinite e 2,7% de doenças osteomusculares relacionadas ao trabalho – DORT). Os resultados deste estudo mostraram maior prevalência de DM em mulheres, na população adulta ativa ou afastada por doença e em indivíduos com maior escolaridade. Além disso, observou-se redução nos escores de QVRS, devido às DM, em quase todos os domínios do instrumento. O maior comprometimento foi observado no componente mental entre as mulheres, e no componente físico, entre os homens, após autorrelato de DORT. Os achados mostram o impacto substancial das DM na QVRS da população. As DORT afetam distintamente a QVRS de homens e mulheres.*

Palavras-chave *Doenças musculoesqueléticas, Diferenças sexuais, Qualidade de vida*

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Introduction

As the second most common cause of disability worldwide, musculoskeletal disorders (MD) lead to a considerable increase in costs for employers and healthcare systems[1]. They remain a great burden for developing countries, where health budgets are already restricted and most often allocated to life-threatening conditions[2]. In Brazil, MD are not commonly targeted by epidemiological studies, making estimates of their prevalence and impact on the community scarce[3,4].

According to the Brazilian Ministry of Health Protocol (Ministério da Saúde – 2012), work-related musculoskeletal disorders (WMSD) "are characterized by the occurrence of various symptoms, concomitant or not, of insidious onset, usually on the upper limbs, such as pain, paresthesia, heaviness and fatigue"[5]. Tendinopathy consists of inflammation of one or more tendons[6], including rotator cuff injuries, which is a major complain reported by workers, significantly affecting work functionality[7]. Repetition, inadequate work environment, little task variability, reduced rest time and high psychosocial demands are the main factors that favor the development of WMSD[8-10].

Musculoskeletal disorders involve inflammatory and degenerative phenomena in various structures (muscles, nerves, tendons, fascia, ligaments, joints, bones)[10], resulting in pain, reduced mobility and social participation, with significant damage to the working population's quality of life, and impairment of their physical and mental health[11,12].

Health-related quality of life (HRQoL) is a health status measure of great relevance to understand how diseases affect different health dimensions, revealing their impact on people's daily lives[13]. Studies on the impairment caused by MD on HRQoL are scarce. A Dutch population-based study on the association of 12 diseases with HRQoL, including tendonitis and work-related musculoskeletal disorders, demonstrated that the population subgroup affected by these disorders presented significantly lower scores in all the Short Form Health Survey 36 (SF-36) dimensions, especially regarding the physical aspects[14].

According to 2013 National Health Survey (*Pesquisa Nacional de Saúde – PNS 2013*)[3,15], the prevalence of musculoskeletal disorders in Brazil was found to be 2.5%. Additionally, a previous study based on data from the 1998 National Household Sample Survey (*Pesquisa Nacional por Amostra de Domicílios – PNAD*)[4] reported a prevalence of 3.1%. Notably, the highest prevalence was observed among women.

Women generally report more musculoskeletal symptoms[16-18]. Although men are more likely to be injured or die on the job, women have grater chances of suffering cumulative injuries, such as musculoskeletal disorders[19]. When analyzing exposure by sex, studies show greater exposure to tiring and painful positions, in addition to repetitive movements[20]. It remains unclear why, with similar levels of exposure, women report higher levels of musculoskeletal disorders[17]. Collins and O'Sullivan[21] explain this finding by the combination of physical and psychosocial risks.

According to Oxfam Brasil (2018)[22], little is said about the importance of women's work in a country where they represent 50.7% of the population. In turn, female participation in the most valued occupations is vastly different from their demographic representativeness[22]. Sexism in the workplace tends to lead women towards lower-skilled positions and greater risk of injury[20,23,24]. Conversely, men are more vulnerable to serious and chronic diseases, in addition to higher rates of early mortality, risky behaviors and lower demand for health services[25]. The path to preventing injuries among men and women may thus differ, demonstrating the need for sex-specific research to facilitate the creation of more effective health protection and promotion strategies[19] aiming at the various dimensions of well-being.

We found no Brazilian population-based studies that assess the impact of musculoskeletal disorders on HRQoL according to sex differences. Thus, this study estimates the prevalence of these musculoskeletal disorders on the adult population of Campinas, São Paulo (ISACamp 2014/15), Brazil, to verify associated demographic and socioeconomic factors, as well as to analyze their impact on the different HRQoL domains according to sex.

Methods

Study design and target population

A cross-sectional population-based study was conducted using data from the "Campinas City Health Survey (*Inquérito de Saúde do Município de Campinas* – ISACamp 2014/15)" developed by the Collaborating Center on Health Situation Analysis (*Centro Colaborador em Análise de Situação de Saúde* – CCAS) of the Department

of Collective Health at the University of Campinas (UNICAMP). This survey sought to monitor the health status of the Campinas population and the main social trends and inequalities in various health and disease aspects. Located in Southeastern Brazil, within the state of São Paulo, Campinas had 1,194,094 inhabitants in 2018, and a Human Development Index (HDI) of 0.805 (2010).

Although the research included three subpopulations—adolescents (10 to 19 years), adults (20 to 59 years) and older adults (60 years or older) –, only information from individuals 18 years and older was analyzed. Interviews were conducted with the non-institutionalized population living in private households located in the urban area of Campinas.

Sampling process

ISACamp 2014/15 has a complex sampling design. The study sample was obtained by cluster probabilistic procedures divided into two stages: census tracts and households. First, we stratified the population into five regions: north, northwest, east, southwest and south, corresponding to the city's health districts. Fourteen census tracts were then drawn from each region considering the probability proportional to size (number of households), totaling 70 sample units, and then the list of households in each sector was updated.

On the second stage, we performed a systematic drawing of households for each sector drawn. We calculated the number of households to be visited by the expected average number of people in each household (people/household ratio) belonging to each age group, based on the 2010 Census. Subsequently, we divided the sample sizes in each age group (in each district) by the respective people/household ratios. Sample size was obtained considering P = 50% (corresponding to the maximum variability), 95% confidence interval (z = 1.96), sampling error of 4% and 5% and design effect equal to 2, resulting in 1,000 people for the age group of adolescents and older adults and 1,400 for adults. A larger number of households were drawn to reach an adequate sample size, considering possible nonresponses. ISACamp 2008/09 predicted nonresponse rates of 27% for adolescents, 22% for adults and 20% for older adults, thus the final number of households selected for interview was 3,119 (adolescents), 1,029 (adults) and 3,157 (older adults). We opted not to perform intra-residence selection, since this type of design has similar accuracy and is less expensive compared with selecting one respondent by household[26]. Thus, we decided to interview all residents in the specific age group for that residence. Home visits took place between December 2013 and August 2015. We interviewed 80.9% of the selected individuals, with the highest percentage of refusals among adults and the lowest among adolescents.

Data collection instrument

The questionnaire used for data collection consisted of 13 thematic blocks with closed-questions and predefined alternatives: list of residents of the randomly selected households (block A), control sheet (block B), morbidity, chronic disease and disabilities (block C), accidents and violence (block D), emotional health (block E), health and well-being (block F), use of services (block G), preventive practices (block H), immunization (block I), use of medication (block J), health-related behaviors (block K), socioeconomic characteristics (block L) and family and household characteristics (block M)[27]. Only blocks C, F and L were used in the present analysis. Data were collected by trained interviewers using tablet and by direct interview with the selected individual.

Variables analyzed

Presence of musculoskeletal disorders was the dependent variable, obtained by the following question: "Have you ever been diagnosed with tendonitis, repetitive strain injury (RSI) or work-related musculoskeletal disorder (WMSD)?" (yes or no response). To differentiate between individuals diagnosed with tendonitis and RSI/WMSD, we included the additional question: "Which of these disorders do you have?", to which they could answer "Tendonitis," "RSI" or "WMSD." Responses for RSI and WMSD were grouped (WMSD), as they are different terms for the same set of disorders. "WMSD" analysis included those who answered "RSI" or "WMSD" but who could also have answered "tendonitis." "Tendonitis" was analyzed considering those who answered only for this disease.

The set of independent variables was selected as follows:

- Demographic and socioeconomic factors: sex (male or female), age group (18-39 years; 40-59 years or 60 or older), race/color (black, white, other – yellow or indigenous), work situation (active, unemployed, on sick leave, active but retired, retired or homemaker), health insur-

ance (yes or no), per capita family income (less than 1 minimum wage, 1 to 3 minimum wages or greater than 3 minimum wages), and schooling (0 to 4 years, 5 to 11 years or 12 years and over). HRQoL was measured using The Medical Outcomes Study SF-36-Item Short Form Health Survey (SF-36), an instrument that aims to detect clinically and socially relevant differences in the health status of both the general population and people with a disease[28]. It was translated and validated in Brazil[29], and had its population-based validity tested by Laguardia *et al.*[30]. Research has found a high validity and reliability of its scales[28,31,32]**.** SF-36 is a 36-item instrument divided into 8 domains: physical functioning, physical role, pain, general health, vitality, emotional role, social functioning, and mental health. The results of each domain are translated into a 0-100 scale, where zero represents the worst quality of life and one hundred the best[28]. We calculated two summary measures: the physical component and the mental component[28], which provide greater accuracy and reduce the number of statistical comparisons required. Component scores were obtained using the average scores for the Campinas population, according to the manual. Association of these disorders with HRQoL was verified by considering the eight domains and the two SF-36 components composed as dependent variables, and the presence of musculoskeletal disorders as the main independent variable.

Data analysis

Considering the weights of the complex sampling design and nonresponse, data analysis was performed using the STATA 14.0 software on survey module (svy) (Stata Corp., College Station, United States). We calculated the prevalence of musculoskeletal disorders, and tested associations with demographic and socioeconomic variables using the chi-square test, considered statistically significant when $p < 0.05$. Crude and adjusted prevalence ratios and the respective confidence intervals were estimated by simple and multiple Poisson regression.

We calculated the averages of SF-36 scores, standard error and confidence intervals for each of the domains and components, and tested associations according to the musculoskeletal variables. Beta coefficients were calculated using simple and multiple linear regression models for each of the instrument's domains and components. The variables sex, age, number of chronic diseases and schooling were included to adjust for potential confounders, considering that these variables are associated, both, with musculoskeletal disease[3,4,15,16] and HRQoL[27,33]. Data analysis was conducted for the total population and stratified by sex. Model fit was verified by residue analysis, and the results found were satisfactory for most associations.

Ethical approval

All procedures were conducted according to the ethical standards of the Research Ethics Committee at the University of Campinas (UNICAMP) under protocol No. 3.655.912 of 10/22/2019 (CAAE: 22435419.5.0000.5404) and the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

Results

After drawing the households, we had 7.4% refusals and 4.4% other losses. Among the individuals available to answer the questionnaire, there were 20.5% of refusals and 1.9% of other losses. Of the 2,178 individuals aged 18 years or older interviewed, 12 did not answer the question about musculoskeletal disorders and were excluded from the study, totaling a sample of 2,166 participants, of whom 56.7% were women aged 44 years on average (± 0.7) and 43.3% men aged 41.8 years on average (± 0.8). Table 1 presents the general characteristics of the study population.

Prevalence of musculoskeletal disorders was 8.5% (n = 165) (8.8% for those aged 18 to 59 years and 6.7% for those aged 60 or over), of which 6.7% (n = 136) tendonitis and 2.7% (n = 44) WMSD. We found a 6.9% prevalence of tendonitis in adults (18 to 59 years old) and 3.1% of WMSD in this population. Of those diagnosed with WMSD, 38.6% (n = 17) had tendonitis. After adjustments, the prevalence of musculoskeletal disorders was significantly higher in women (11%) than in men (5.7%; 95%CI: 1.3-2.6), especially those aged 40 to 59 years (3.6; 95%CI: 2.3-5.8), active (2.0; 95%CI: 1.1-3.7) or on sick leave (7.1; 95%CI: 2.8-18.0), with high schooling level (2.4; 95%CI: 1.3-4.7) (Table 2). Among the male population with WMSD, 75% worked on the manufacturing and construction industries, whereas 45.8% of women worked on the service sector such as babysitter, cook, cleaner and hairdresser.

Individuals who reported the musculoskeletal disease analyzed had low scores in all SF-36 domains. Adjusted analysis found a statistically

Table 1. Characteristics of the study population. Campinas, SP – ISACamp 2014-2015.

Variables	Total		Female		Male		P-value
	n	%	n	%	n	%	
Total	2,178	100.0	1,235	56.7	943	43.3	
Age group (years)							
18-39	728	33.4	378	30.6	350	37.1	
40-59	464	21.3	258	20.9	206	21.9	0.0343
60 and older	986	45.3	599	48.5	387	41.0	
Race/color							
White	1,442	67.7	827	68.5	615	66.6	
Black	188	8.8	108	9.0	80	8.7	0.8193
Other	499	23.5	271	22.5	228	24.7	
Employment situation							
Does not work	401	18.4	260	38.8	141	15,0	
In activity	947	43.5	479	21.0	468	49.6	
On sick leave	24	1.1	8	0.7	16	1.7	
Active but retired	61	2.8	24	1.9	37	3.9	0.0001
Retired	525	24.1	246	19.9	279	29.6	
Homemaker	220	10.1	218	17.7	2	0.2	
Health plan							
No	1,229	56.5	657	53.2	572	60.7	0.0056
Yes	948	43.5	578	46.8	370	39.3	
Per capita family income							
< 1 minimum wage (MW)	767	35.4	459	37.2	308	33.0	
≥ 1 and ≤ 3 MW	1,125	51.9	622	50.3	503	53.9	0.0410
≥ 3 MW	276	12.7	154	12.5	122	13.1	
Education (years)							
0 to 4	744	34.2	461	37.3	283	30,0	
5 to 11	943	43.3	507	41.1	436	46,3	0.2267
12 and over	490	22.5	267	21.6	223	23,7	

Source: Authors.

significant association in six of the eight domains evaluated, with substantial impact on pain, physical role and vitality (Table 3).

Table 4 shows that individuals with musculoskeletal disorders tended to have decreased scored on the physical and mental components. However, when stratifying by sex, women had greater impaired mental health component, with 5.4 points, due to WMSD. For men, in turn, the impact of WMSD is observed on the physical component ($p < 0.05$). We observed no sex differences in tendonitis.

Discussion

Our results showed a higher prevalence of musculoskeletal disorders in women, active or on leave due to illness, and in individuals with higher education levels. Moreover, we observed reduced HRQoL scores due to musculoskeletal disorders in almost all SF-36 domains. The mental component and physical component showed greater impairment respectively among women and men after self-reported WMSD.

Data analysis showed a 8.5% prevalence of musculoskeletal disorders on the population, of which 2.7% WMSD (3.1% from 18-59 years old) and 6.7% tendonitis (6.9% from 18 to 59 years old). A study by Hofelmann *et al.*[33], in Southern Brazil found a 17.8% prevalence of tendonitis in adults (20-59 years old). Conversely, Frazão *et al.*[4], observed a prevalence of 3.1% (25-65 years old). Regarding WMSD, national studies found a 2.5% prevalence among Brazilian adults and older adults[3,15]. Authors in the United States and in the Netherlands have also found similar results[34,35].

Table 2. Prevalence of musculoskeletal diseases according to demographic and socioeconomic variables in population aged 18 years and older. Campinas, SP – ISACamp 2014-2015.

Variables	n[a]	%[b]	PR**	95%CI
Sex				
Male	47	5.7	1	1
Female	118	11.0	**1.9**	**1.3-2.6**
Total	165	8.5		
Age group (years)				
18-39	30	4.2	1	1
40-59	73	15.5	**3.6**	**2.3-5.8**
60 and older	62	6.7	1.5	0.9-2.6
Race/color				
White	107	8.5	1	1
Black	20	10.5	1.2	0.7-2.1
Other	33	7.7	1.0	0.6-1.5
Employment situation				
Does not work	19	5.4	1	1
In activity	87	8.8	**2.0**	**1.1-3.7**
On sick leave	7	29.1	**7.1**	**2.8-18.0**
Active but retired	2	5.2	0.7	0.1-3.4
Retired	34	8.3	1.0	0.5-1.8
Homemaker	16	7.9	1.1	0.5-2.3
Health plan				
No	81	7.5	1	1
Yes	84	9.5	1.2	0.8-1.7
Per capita family income				
< 1 minimum wage (MW)	52	7.5	1	1
≥ 1 and ≤ 3 MW	84	8.6	1.1	0.8-1.6
≥ 3 MW	29	10.5	1.3	0.7-2.4
Education (years)				
0 to 4	42	6.8	1	1
5 to 11	76	8.6	**2.2**	**1.2-4.0**
12 and over	47	9.2	**2.4**	**1.3-4.7**

[a] number of individuals (cases); [b] % in the weighted sample; ** adjusted by sex and age. In bold: results with $p < 0.05$.

Source: Authors.

Higher WMSD prevalence can be observed in bank workers (30% in a sample of 395 individuals)[36] and nurses (35% in a sample of 6,070 participants)[37]. Studies on specific professions are numerous and necessary, but do not present information on the general population[34], besides being subject to the healthy worker effect bias.

The musculoskeletal disorders evaluated were more commonly self-reported by women than by men, a finding consistent with previous national[4,15,33] and international[17,38] studies. Research shows that women are more likely to execute tasks with low control over work, low decision-making and autonomy, pressure, reduced mobility and repetitive movements[23,24,39]. Moreover, we must consider the combination of work outside home with housework[20] and, consequently, a shorter time for injury recovery[40].

Musculoskeletal disorders showed greater prevalence in active people, finding corroborated by some authors[4,15]. This prevalence tends to increase with age, and by the age of 30, most people have already experienced their first WMSD episode, commonly in the form of back pain[10]. According to the European Risk Observatory Report[20], further research is needed to explain whether this is due to most individuals starting their professional life with previous musculoskeletal disorders or to the rapid development of musculoskeletal diseases after starting work. Moreover, the high prevalence of sick leave found in the present study confirms their disabling character.

Individuals with high schooling level presented higher WMSD prevalence. Other population-based Brazilian studies corroborate this result[4,15], which may be explained by greater labor performance and greater awareness of the risks inherent to repetitive tasks, which may lead to greater access to diagnoses. Individuals with lower educational background may also present high prevalence, especially in high physical overload professions such as builders, painters, hairdressers, among others. However, the informality and higher risk of unemployment of such occupation hinder the diagnose and association of the disease with work. A study by Malta *et al.*[41] observed that the low schooling level and lack of private health insurance increase the prevalence of functional limitations.

As for the impact of MD on HRQoL, people diagnosed with musculoskeletal diseases showed a statistically significant decrease in six of the eight SF-36 domains, with substantial impact on pain, physical role and vitality. Vitality, which includes feelings of energy, exhaustion, tiredness, and whether a person feels "full of life" or "willful"[42], is an important HRQoL dimension and impacts on this dimension substantially upsets an individual's well-being. A population-based study conducted in the Netherlands showed that people who reported a diagnosis of repetitive strain injury and tendonitis had significantly lower scores in all SF-36 dimensions compared with the non-afflicted group, especially for phys-

Table 3. Average SF-36 scores according to the presence of musculoskeletal diseases and gross and adjusted beta coefficients. Campinas, SP – ISACamp 2014-2015.

Domains and components	No musculoskeletal diseases (n = 2,001)	With musculoskeletal diseases (n = 165)		
	Average score (standard error)		(p<0.05)	(p<0.05)
Physical functioning	88.8 (0.7)	80.6 (2.1)	**-4.7 (0.042)**	-2.8 (0.216)
Physical role	87.8 (0.9)	77.1 (3.1)	**-8.4 (0.013)**	**-7.2 (0.034)**
Pain	78.3 (0.9)	62.1 (2.8)	**-14.5 (0.001)**	**-11.3 (0.001)**
General health	80.3 (0.8)	72.3 (1.8)	**-6.6 (0.001)**	**-4.9 (0.026)**
Vitality	76.9 (0.7)	66.4 (2.3)	**-8.7 (0.001)**	**-7.2 (0.004)**
Emotional role	89.9 (0.8)	81.3 (2.3)	**-7.0 (0.004)**	**-5.8 (0.025)**
Social functioning	88.5 (0.8)	81.9 (2.4)	**-4.8 (0.041)**	-3.5 (0.166)
Mental health	78.0 (0.7)	70.0 (2.0)	**-6.6 (0.002)**	**-4.6 (0.050)**

β = beta coefficients; [a] adjusted by sex and age; [b] adjusted by sex, age, number of chronic diseases and education. In bold: results with $p < 0.05$.

Source: Authors.

ical functioning, physical role and pain[14]. Other studies on different musculoskeletal disorders evaluated by the SF-36 have also found severe impact on HRQoL[43,44].

Although WMSD may include tendonitis, we opted to analyze these conditions separately because some participants with tendonitis may not be diagnosed with a work-related disorder. By involving the work situation, diagnosis shows that psychosocial factors have often been associated with WMSD onset[45]. A recent systematic review showed that monotonous work and low social support are antecedents of musculoskeletal disorders, with odds ratio (OR) ranging from 1.1 to 1.6[46].

Another important finding of the present study shows that women with WMSD had lower scores in the HRQoL mental component, whereas men presented low scores in the physical component. Recent research found that women had a high prevalence of anxiety disorders and depression due to musculoskeletal injury[47]. Collins and O'Sullivan[21] observed a greater number of statistically significant associations between musculoskeletal diseases and high work demands, unfavorable work environment, and job content among women. Some of the mechanisms suggested to explain this association involve high work demands and mental loads, which increase muscle tension and decrease micropauses in muscle activity; changes induced by stress in the immune and inflammatory systems and greater activation of the medullary sympathetic-adrenal system in response to stress, which provides greater noradrenaline secretion and increases muscle activity[48,49].

Emotional suffering permeates the workers' trajectory of sickness[50], from needing to prove the existence of symptoms and illness to employers, family members, health services or Social Security, to experiencing bullying, disqualification, isolation, power abuse, and other acts considered "invisible," which leads to depression, anxiety, sleep disorders, post-traumatic stress, among others[51,52]. Moreover, Oxfam's report "Women's Economic Empowerment in Brazil"[22] shows that, in addition to their potential work hours outside the home, women spend 18 hours a week on average caring for others or doing domestic chores, compared with just 10 hours a week for men, fact that justifies, along with physical exhaustion, mental tiredness related to the exhaustive double burden. When exposure occurs both at home and at work, recovery time is reduced, leading to a pathological process that can manifest as a WMSD[16,21].

Conversely, men presented significant impairment in the HRQoL physical component, with physical role and pain having the lowest scores. Gender differences in pain perception and tolerance remains a contentious topic in the literature. While Budó *et al.*[53] reported a greater tolerance to pain by women after experiences such as menstrual cramps or labor, culturally, men tend to "naturalize" pain and avoid health care and rehabilitation, seeking help only when

Table 4. Average SF-36 scores according to the presence of musculoskeletal diseases stratified by sex, and gross and adjusted beta coefficients. Campinas, SP – ISACamp 2014-2015.

Components	Average Score (standard error)		(p < 0.05)	(p < 0.05)
	No musculoskeletal diseases (n = 2,001)	With musculoskeletal diseases (n = 165)		
Total (n = 165)				
Physical	50.5 (0.3)	45.6 (1.0)	**-3.8 (0.001)**	**-2.9 (0.009)**
Mental	50.3 (0.4)	47.2 (1.0)	**-2.6 (0.008)**	-1.8 (0.099)
Male (n = 47)				
Physical	51.1 (0.4)	44.5 (1.9)	**-5.6 (0.005)**	**-5.4 (0.013)**
Mental	51.7 (0.5)	51.5 (1.6)	-0.1 (0.953)	0.4 (0.838)
Female (n = 118)				
Physical	49.9 (0.3)	46.1 (1.1)	**-2.9 (0.019)**	-1.6 (0.169)
Mental	49.0 (0.4)	45.1 (1.4)	**-3.9 (0.006)**	**-3.1 (0.036)**
	No tendonitis (n = 2,059)	**With tendonitis (n = 119)**	**p < 0.05)**	**(p < 0.05)**
Total (n = 119)				
Physical	50.5 (0.3)	46.7 (1.0)	**-2.8 (0.007)**	-1.8 (0.067)
Mental	50.3 (0.4)	48.5 (1.2)	-1.4 (0.235)	-0.4(0.763)
Male (n = 34)				
Physical	51.1 (0.4)	47.1 (1.6)	**-3.1 (0.040)**	-2.8 (0.101)
Mental	51.7 (0.5)	52.2 (1.8)	0.6 (0.751)	1.0 (0.614)
Female (n = 85)				
Physical	49.9 (0.3)	46.5 (1.3)	-2.6 (0.062)	-1.4 (0.305)
Mental	49.0 (0.4)	46.5 (1.6)	-2.5 (0.129)	-1.3 (0.457)
	No WMSD (n = 2,134)	**With WMSD (n = 44)**	**(p < 0.05)**	**(p < 0.05)**
Total (n = 44)				
Physical	50.3 (0.3)	43.1 (2.4)	**-5.9 (0.023)**	-4.7 (0.076)
Mental	50.2 (0.4)	44.2 (2.1)	**-5.4 (0.010)**	**-4.9 (0.015)**
Male (n = 12)				
Physical	50.9 (0.4)	37.5 (4.8)	**-12.3 (0.017)**	**-11.4 (0.036)**
Mental	51.7 (0.5)	49.8 (3.4)	-1.9 (0.583)	-1.1 (0.752)
Female (n = 32)				
Physical	49.7 (0.4)	45.4 (2.7)	-3.3 (0.240)	-2.0 (0.449)
Mental	48.8 (0.4)	41.9 (2.4)	**-6.9 (0.005)**	**-7.1 (0.002)**

β = beta coefficients; [a] adjusted by sex and age; [b] adjusted by sex, age, number of chronic diseases and education. In bold: results with p < 0.05.

Source: Authors.

the condition has become serious, chronic and with severe limitations. In this sense, our study calls for specific attention at the impact of MD on the physical dimension of the male population, especially in relation to preventing the aggravation of these problems.

Approximately 75% of the men with WMSD analyzed in the present study work on the manufacturing and construction industries. Widanarko *et al.*[54] found that 77% of men performed heavy physical tasks, whereas 62% of women performed light physical tasks. While men tend to perform more vigorous manual labor, women are more likely to perform concentrated manual tasks (as teachers, cooks, hairdressers, or manicurists)[54]. In North America and Europe, for example, men are more likely to die from work-related accidents compared with women[19,55]. The sex division of labor can place men in jobs that pose greater physical risk[56,57], being often allocated to sectors such as construction, mining, military, agriculture, among other professions that require great physical effort[55,57,58].

Evidently, our research has some limitations. Cross-sectional studies usually do not allow us to identify causal factors; however, the MD diagnosis

was conducted months or years before the interviews, and the SF-36 instrument considered the previous four weeks, allowing one to deduce the data chronology – which suggests that the disorder is more likely to have an impact on HRQoL rather than the inverse. The population-based questionnaire used was designed to analyze several health issues, and not specifically for analyzing musculoskeletal disorders. Thus, it does not provide more detailed information about the types and sites of injuries involving WMSDs and tendonitis. Although the self-reported medical diagnosis was a limitation, as it may decrease result accuracy, self-reported physical morbidity data has been frequently used and considered valid in epidemiological studies[34,59]. In Brazil, data on occupational illness is still limited, fragmented and heterogeneous[60], resulting from significant underreporting of occupational diseases and accidents[61]. The Ministry of Social Security and Welfare provides data on formal labor market workers, which make up less than 50% of the Brazilian economically active population[60]. Thus, studies like ours may help to gather new information.

This is the first Brazilian population-based study to evaluate HRQoL on individuals afflicted by musculoskeletal disorders, focusing on sex differences and on the impact they may have on the general population, which justifies its importance.

Our findings may contribute to policy-making in occupational health and clinical practice aimed at alerting health professionals to the prevalence, associated factors and, especially, how musculoskeletal disorders can impact the quality of life of men and women, thus enabling more effective evidence-based practices and disease prevention programs for each sex. Despite the strong body of evidence demonstrating the impact of psychosocial risks on musculoskeletal health[20], they are rarely included in the assessment and rehabilitation of workers. Our results reinforce the importance of psychosocial factors and how greatly they can impair quality of life, especially in the female population. With the increasing number of women in the workforce and the extension of productive life, the lack of adequate interventions may leave women vulnerable to musculoskeletal disorders in the coming years[62].

Conclusion

Our findings show a substantial impact of musculoskeletal diseases on the population's HRQoL, which may reflect insufficient strategies aimed at rehabilitation, recovery, surveillance and reintegration into work, making this a necessary and urgent discussion, especially in a moment of social security reform in Brazil and proposals to extend working life.

Moreover, in addition to being more prevalent in women of still productive age, musculoskeletal diseases shows peculiarities in how they affect individuals' well-being. For example, while MD significantly affect the mental component of women, for men the physical component shows greater impairment. In this scenario, monitoring the health and illness profile of active men and women and, especially, the impact of health problems on quality of life is essential. Studies such as this are essential to help understanding the actions, goals and plans that could extend health and quality of life for workers.

Collaborations

DBO Souza and MG Lima designed the study. Data collection and material preparation were performed by MBA Barros, MG Lima, and DBO Souza. Data analysis was performed by DBO Souza and MG Lima. The first version of the manuscript was written by DBO Souza and corrections and improvements were performed by MG Lima and MBA Barros. All authors read, performed a critical review, and approved the final manuscript.

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Referências

1. Vos T, Flaxman AD, Naghavi M, Lozano R, Michaud C, Ezzati M, Shibuya K, Salomon JA, Abdalla S, Aboyans V, Abraham J, Ackerman I, Aggarwal R, Ahn SY, Ali MK, Alvarado M, Anderson HR, Anderson LM, Andrews KG, Atkinson C, Baddour LM, Bahalim AN, Barker-Collo S, Barrero LH, Bartels DH, Basáñez MG, Baxter A, Bell ML, Benjamin EJ, Bennett D, Bernabé E, Bhalla K, Bhandari B, Bikbov B, Bin Abdulhak A, Birbeck G, Black JA, Blencowe H, Blore JD, Blyth F, Bolliger I, Bonaventure A, Boufous S, Bourne R, Boussinesq M, Braithwaite T, Brayne C, Bridgett L, Brooker S, Brooks P, Brugha TS, Bryan-Hancock C, Bucello C, Buchbinder R, Buckle G, Budke CM, Burch M, Burney P, Burstein R, Calabria B, Campbell B, Canter CE, Carabin H, Carapetis J, Carmona L, Cella C, Charlson F, Chen H, Cheng AT, Chou D, Chugh SS, Coffeng LE, Colan SD, Colquhoun S, Colson KE, Condon J, Connor MD, Cooper LT, Corriere M, Cortinovis M, de Vaccaro KC, Couser W, Cowie BC, Criqui MH, Cross M, Dabhadkar KC, Dahiya M, Dahodwala N, Damsere-Derry J, Danaei G, Davis A, De Leo D, Degenhardt L, Dellavalle R, Delossantos A, Denenberg J, Derrett S, Des Jarlais DC, Dharmaratne SD, Dherani M, Diaz-Torne C, Dolk H, Dorsey ER, Driscoll T, Duber H, Ebel B, Edmond K, Elbaz A, Ali SE, Erskine H, Erwin PJ, Espindola P, Ewoigbokhan SE, Farzadfar F, Feigin V, Felson DT, Ferrari A, Ferri CP, Èvre EM, Finucane MM, Flaxman S, Flood L, Foreman K, Forouzanfar MH, Fowkes FG, Franklin R, Fransen M, Freeman MK, Gabbe BJ, Gabriel SE, Gakidou E, Ganatra HA, Garcia B, Gaspari F, Gillum RF, Gmel G, Gosselin R, Grainger R, Groeger J, Guillemin F, Gunnell D, Gupta R, Haagsma J, Hagan H, Halasa YA, Hall W, Haring D, Haro JM, Harrison JE, Havmoeller R, Hay RJ, Higashi H, Hill C, Hoen B, Hoffman H, Hotez PJ, Hoy D, Huang JJ, Ibeanusi SE, Jacobsen KH, James SL, Jarvis D, Jasrasaria R, Jayaraman S, Johns N, Jonas JB, Karthikeyan G, Kassebaum N, Kawakami N, Keren A, Khoo JP, King CH, Knowlton LM, Kobusingye O, Koranteng A, Krishnamurthi R, Lalloo R, Laslett LL, Lathlean T, Leasher JL, Lee YY, Leigh J, Lim SS, Limb E, Lin JK, Lipnick M, Lipshultz SE, Liu W, Loane M, Ohno SL, Lyons R, Ma J, Mabweijano J, MacIntyre MF, Malekzadeh R, Mallinger L, Manivannan S, Marcenes W, March L, Margolis DJ, Marks GB, Marks R, Matsumori A, Matzopoulos R, Mayosi BM, McAnulty JH, McDermott MM, McGill N, McGrath J, Medina-Mora ME, Meltzer M, Mensah GA, Merriman TR, Meyer AC, Miglioli V, Miller M, Miller TR, Mitchell PB, Mocumbi AO, Moffitt TE, Mokdad AA, Monasta L, Montico M, Moradi-Lakeh M, Moran A, Morawska L, Mori R, Murdoch ME, Mwaniki MK, Naidoo K, Nair MN, Naldi L, Narayan KM, Nelson PK, Nelson RG, Nevitt MC, Newton CR, Nolte S, Norman P, Norman R, O'Donnell M, O'Hanlon S, Olives C, Omer SB, Ortblad K, Osborne R, Ozgediz D, Page A, Pahari B, Pandian JD, Rivero AP, Patten SB, Pearce N, Padilla RP, Perez-Ruiz F, Perico N, Pesudovs K, Phillips D, Phillips MR, Pierce K, Pion S, Polanczyk GV, Polinder S, Pope CA 3rd, Popova S, Porrini E, Pourmalek F, Prince M, Pullan RL, Ramaiah KD, Ranganathan D, Razavi H, Regan M, Rehm JT, Rein DB, Remuzzi G, Richardson K, Rivara FP, Roberts T, Robinson C, De Leòn FR, Ronfani L, Room R, Rosenfeld LC, Rushton L, Sacco RL, Saha S, Sampson U, Sanchez-Riera L, Sanman E, Schwebel DC, Scott JG, Segui-Gomez M, Shahraz S, Shepard DS, Shin H, Shivakoti R, Singh D, Singh GM, Singh JA, Singleton J, Sleet DA, Sliwa K, Smith E, Smith JL, Stapelberg NJ, Steer A, Steiner T, Stolk WA, Stovner LJ, Sudfeld C, Syed S, Tamburlini G, Tavakkoli M, Taylor HR, Taylor JA, Taylor WJ, Thomas B, Thomson WM, Thurston GD, Tleyjeh IM, Tonelli M, Towbin JA, Truelsen T, Tsilimbaris MK, Ubeda C, Undurraga EA, van der Werf MJ, van Os J, Vavilala MS, Venketasubramanian N, Wang M, Wang W, Watt K, Weatherall DJ, Weinstock MA, Weintraub R, Weisskopf MG, Weissman MM, White RA, Whiteford H, Wiersma ST, Wilkinson JD, Williams HC, Williams SR, Witt E, Wolfe F, Woolf AD, Wulf S, Yeh PH, Zaidi AK, Zheng ZJ, Zonies D, Lopez AD, Murray CJ, AlMazroa MA, Memish ZA. Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet* 2012; 380(9859):2163-2196.
2. Woolf AD, Brooks P, Åkesson K, Mody GM. Prevention of musculoskeletal conditions in the developing world. *Best Pract Res Clin Rheumat* 2008; 22(4):759-772.
3. Assunção AA, Abreu MNS. Fatores associados a distúrbios osteomusculares relacionados ao trabalho autorreferidos em adultos brasileiros. *Rev Saude Publica* 2017; 51(Supl. 1):10s.
4. Frazão P, Costa CM, Almeida MF. Risks associated with tendinitis: effects from demographic, socioeconomic, and psychological status among Brazilian workers. *Am J Ind Med* 2010; 53(1):72-79.
5. Brasil. Ministério da Saúde (MS). *Dor relacionada ao trabalho*. Brasília: Ministério da Saúde; 2012.
6. Hubbard MJ, Hildebrand BA, Battafarano MM, Battafarano DF. Common soft tissue musculoskeletal pain disorders. *Prim Care* 2018; 45(2):289-303.
7. Redondo-Alonso L, Chamorro-Moriana G, Jiménez-Rejano JJ, López-Tarrida P, Ridao-Fernández C. Relationship between chronic pathologies of the supraspinatus tendon and the long head of the biceps tendon: systematic review. *BMC Musculoskelet Disord* 2014; 15:377.
8. Costa BR, Vieira ER. Risk factors for work-related musculoskeletal disorders: a systematic review of recent longitudinal studies. *Am J Ind Med* 2010; 53(3):285-323.
9. Iqbal ZA, Alghadir AH. Cumulative trauma disorders: a review. *J Back Musculoskelet Rehabil* 2017; 30(4):663-666.
10. Nestorova VD, Mircheva IS. Work-related musculoskeletal disorders (WMSDs): risk factors, diagnosis and prevention. *Scripta Scientifica Salutis Publicae* 2018; 4:15-21.
11. Punnett L, Wegman DH. Work-related musculoskeletal disorders: the epidemiologic evidence and the debate. J Electromyogr Kinesiol 2004; 14(1):13-23.
12. Soares CO, Pereira BF, Gomes MVP, Marcondes LP, Gomes FC, Melo Neto JS. Preventive factors against work-related musculoskeletal disorders: narrative review. *Rev Bras Med Trab* 2019; 17(3):415-430.
13. Seidl EMF, Zannon CMLC. Qualidade de vida e saúde: aspectos conceituais e metodológicos. *Cad Saude Publica* 2004; 20(2):580-508.

14. Picavet H, Hoeymans N. Health related quality of life in multiple musculoskeletal diseases: SF-36 and EQ-5D in the DMC3 study. *Ann Rheum Dis* 2004; 17; 63(6):723-729.
15. Oliveira MM, SSCA Andrade, Souza CAV, Ponte JN, Szwarcwald CL, Malta DC. Problema crônico de coluna e diagnóstico de distúrbios osteomusculares relacionados ao trabalho (DORT) autorreferidos no Brasil: Pesquisa Nacional de Saúde, 2013. *Epidemiol Serv Saude* 2015; 24(2):287-296.
16. Treaster D, Burr D. Gender differences in prevalence of upper extremity musculoskeletal disorders. *Ergonomics* 2004; 15; 47(5):495-526.
17. Nordander C, Ohlsson K, Åkesson I, Arvidsson I, Balogh I, Hansson GÅ, Strömberg U, Rittner R, Skerfving S. Risk of musculoskeletal disorders among females and males in repetitive/ constrained work. *Ergonomics* 2009; 52(10):1226-1239.
18. Gjesdal S, Bratberg E, Mæland JG. Gender differences in disability after sickness absence with musculoskeletal disorders: five-year prospective study of 37,942 women and 26,307 men. *BMC Musculoskelet Disord* 2011; 12:37.
19. Schwatka NV, Shore E, Atherly A, Weitzenkamp D, Dally MJ, Brockbank CVS, Tenney L, Goetzel RZ, Jinnett K, McMillen J, Newman LS. Reoccurring injury, chronic health conditions, and behavioral health – gender differences in the causes of workers' compensation claims. *J Occup Environ Med* 2018; 60(8):710-716.
20. Crawford JO, Davis A. *Work-related musculoskeletal disorders: why are they still so prevalent? Evidence from a literature review*. Luxenbourg: European Agency for Safety and Health at Work; 2020.
21. Collins J, O'Sullivan L. Psychosocial risk exposures and musculoskeletal disorders across working-age males and females. *Hum Factors Ergon Manuf* 2010; 20(4):272-286.
22. Teixeira MO, Faria N. *Empoderamento econômico das mulheres no Brasil – pela valorização do trabalho doméstico e do cuidado*. São Paulo: Oxfam Brasil; 2018.
23. Neves IR. LER: trabalho, exclusão, dor, sofrimento e relação de gênero. Um estudo com trabalhadoras atendidas num serviço público de saúde. *Cad Saude Publica* 2006; 22(6):1257-1265.
24. Neves IR. *A trajetória de mulheres portadoras das lesões por esforços repetitivos* [dissertação]. Campinas: Universidade Estadual de Campinas; 2003.
25. Bastos TF, Barros MBA. *Diferenciais de saúde entre homens e mulheres: estudo de base populacional no município de Campinas, São Paulo* [tese]. Campinas: Universidade Estadual de Campinas; 2016.
26. Alves MCGP, Escuder MML, Claro RM, Silva NN. Selection within households in health surveys. *Rev Saude Publica* 2014; 48(1):86-93.
27. Barros MBAB, Lima MG. *Retratos da saúde em Campinas sob as lentes do Inquérito ISACamp*. Campinas: Pontes Editores; 2022.
28. Ware JE. *User's Manual for the 36v2 Health Survey*. 2007. 2 ed.
29. Ciconelli RM. *Tradução para o português e validação do questionário genérico de avaliação de qualidade de vida "Medical Outcomes Study 36-Item Short-Form Health Survey (SF-36)"*. São Paulo: Universidade Federal de São Paulo; 1997.
30. Laguardia J, Campos MR, Travassos C, Najar AL, Anjos LA, Vasconcellos MM. Dados normativos brasileiros do questionário Short Form-36 versão 2. *Rev Bras Epidemiol* 2013; 16(4):889-897.
31. Sullivan M, Karlsson J, Ware JE. The Swedish SF-36 Health Survey-I. Evaluation of data quality, scaling assumptions, reliability and construct validity across general populations in Sweden. *Soc Sci Med* 1995; 41(10):1349-1358.
32. Sanson-Fisher RW, Perkins JJ. Adaptation and validation of the SF-36 Health Survey for use in Australia. *J Clin Epidemiol* 1998; 51(11):961-967.
33. Höfelmann DA, Gonzalez-Chica DA, Peres KG, Boing AF, Peres MA. Chronic diseases and socioeconomic inequalities in quality of life among Brazilian adults: Findings from a population-based study in Southern Brazil. *Eur J Public Health* 2017; 28(4):603-610.
34. Picavet H. Prevalence of self reported musculoskeletal diseases is high. *Ann Rheum Dis* 2003; 62(7):644-650.
35. Tanaka S, Petersen M, Cameron L. Prevalence and risk factors of tendinitis and related disorders of the distal upper extremity among U.S. workers: comparison to carpal tunnel syndrome. *Am J Ind Med* 2001; 39(3):328-335.
36. Lacerda EM, Nácul LC, Augusto LGDS, Olinto MTA, Rocha DC, Wanderley DC. Prevalence and associations of symptoms of upper extremities, repetitive strain injuries (RSI) and "RSI-like condition". A cross sectional study of bank workers in Northeast Brazil. *BMC Public Health*. 2005; 5:107.
37. Murofuse NT, Marziale MHP. Doenças do sistema osteomuscular em trabalhadores de enfermagem. *Rev Lat Am Enferm* 2005; 13(3):364-373.
38. Coggon D, Ntani G, Palmer KT, Felli VE, Harari R, Barrero LH, Felknor SA, Gimeno D, Cattrell A, Serra C, Bonzini M, Solidaki E, Merisalu E, Habib RR, Sadeghian F, Masood Kadir M, Warnakulasuriya SS, Matsudaira K, Nyantumbu B, Sim MR, Harcombe H, Cox K, Marziale MH, Sarquis LM, Harari F, Freire R, Harari N, Monroy MV, Quintana LA, Rojas M, Salazar Vega EJ, Harris EC, Vargas-Prada S, Martinez JM, Delclos G, Benavides FG, Carugno M, Ferrario MM, Pesatori AC, Chatzi L, Bitsios P, Kogevinas M, Oha K, Sirk T, Sadeghian A, Peiris-John RJ, Sathiakumar N, Wickremasinghe AR, Yoshimura N, Kelsall HL, Hoe VC, Urquhart DM, Derrett S, McBride D, Herbison P, Gray A. Disabling musculoskeletal pain in working populations: is it the job, the person, or the culture? *Pain* 2013; 154(6):856-863.
39. European Agency for Safety and Health at Work (EU -OSHA). Women and the ageing workforce: implications for occupational safety and health. A research review [Internet]. 2016. [cited 2023 ago 3]. Available from: publications/publications/safer-and-healthier -work-any-age-women-and-ageing-workforce
40. Souza DBO, Martins LV, Marcolino AM, Barbosa RI, Tamanini G, Fonseca M de CR. Capacidade para o trabalho e sintomas osteomusculares em trabalhadores de um hospital público. *Rev Fisio Pesq* 2015; 22(2):182-190.
41. Malta DC, Bernal RTI, de Souza MFM, Szwarcwald CL, Lima MG, Barros MBDA. Social inequalities in the prevalence of self-reported chronic non-communicable diseases in Brazil: national health survey 2013. *Int J Equity Health* 2016; 17; 15(1):153.

42. Ware JE, Gandek B. Overview of the SF-36 Health Survey and the International Quality of Life Assessment (IQOLA) Project. *J Clin Epidemiol* 1998; 51(11):903-912.
43. Roux CH, Guillemin F, Boini S, Longuetaud F, Arnault N, Hercberg S, S Briançon . Impact of musculoskeletal disorders on quality of life: an inception cohort study. *Ann Rheum Dis* 2005; 64(4):606-611.
44. Sluiter JK, Frings-Dresen MH. Quality of life and illness perception in working and sick-listed chronic RSI patients. *Int Arch Occup Environ Health* 2008; 81(4):495-501.
45. Buscemi V, Chang WJ, Liston MB, McAuley JH, Schabrun S. The role of psychosocial stress in the development of chronic musculoskeletal pain disorders: protocol for a systematic review and meta-analysis. *Syst Rev* 2017; 6(1):224.
46. Lang J, Ochsmann E, Kraus T, Lang JWB. Psychosocial work stressors as antecedents of musculoskeletal problems: a systematic review and meta-analysis of stability-adjusted longitudinal studies. *Soc Sci Med* 2012; 75(7):1163-1174.
47. Jones AM, Koehoorn M, Bültmann U, McLeod CB. Prevalence and risk factors for anxiety and depression disorders in workers with work-related musculoskeletal strain or sprain in British Columbia, Canada: a comparison of men and women using administrative health data. *Occup Environ Med* 2021. DOI: 10.1136/oemed-2020-106661.
48. Armon G, Melamed S, Shirom A, Shapira I. Elevated burnout predicts the onset of musculoskeletal pain among apparently healthy employees. *J Occup Health Psychol* 2010; 15(4):399-408.
49. Elfering A, Grebner S, Gerber H, Semmer NK. Workplace observation of work stressors, catecholamines and musculoskeletal pain among male employees. *Scand J Work Environ Health* 2008; 34(5):337-344.
50. Leinonen T, Viikari-Juntura E, Husgafvel-Pursiainen K, Virta LJ, Laaksonen M, Autti-Rämö I, et al. Labour market segregation and gender differences in sickness absence: Trends in 2005-2013 in Finland. *Ann Work Expo Health* 2018; 62(4):438-449.
51. Andrade CB, Assis SG. Assédio moral no trabalho, gênero, raça e poder: revisão de literatura. *Rev Bras Saude Ocup* 2018; 43:e11.
52. Silva EF, Oliveira KKM, Zambroni-de-Souza PC. Saúde mental do trabalhador: o assédio moral praticado contra trabalhadores com LER/DORT. *Rev Bras Saude Ocup* 2011; 36(123):56-70.
53. Budó MLD, Nicolini D, Resta DG, Büttenbender E, Pippi MC, Ressel LB. A cultura permeando os sentimentos e as reações frente à dor. *Rev Esc Enferm USP* 2007; 41(1):36-43.
54. Widanarko B, Legg S, Stevenson M, Devereux J, Eng A, Mannetje A, Cheng S, Douwes J, Ellison-Loschmann L, McLean D, Pierce N. Prevalence of musculoskeletal symptoms in relation to gender, age, and occupational/industrial group. *Int J Ind Ergon* 2011; 41(5):561-572.
55. Stergiou-Kita M, Mansfield E, Bezo R, Colantonio A, Garritano E, Lafrance M, Lewko J, Mantis S, Moody J, Power N, Theberge N, Westwood E, Travers K. Danger zone: men, masculinity and occupational health and safety in high risk occupations. *Saf Sci* 2015; 80:213-220.
56. Ibáñez M, Narocki C. Occupational risk and masculinity: the case of the construction industry in Spain. *J Work Rights* 2013; 16(2):195-217.
57. Messing K, Punnett L, Bond M, Alexanderson K, Pyle J, Zahm S, Wegman D, Stock SR, de Grosbois S. Be the fairest of them all: challenges and recommendations for the treatment of gender in occupational health research. *Am J Ind Med* 2003; 43(6):618-629.
58. Park J, Kim Y, Han B. Work sectors with high risk for work-related musculoskeletal disorders in Korean men and women. *Saf Health Work* 2018; 9(1):75-78.
59. Wu SC, Li CY, Ke D. The agreement between self-reporting and clinical diagnosis for selected medical conditions among the elderly in Taiwan. *Public Health* 2000; 114(2):137-142.
60. Reis RJ, Pinheiro TMM, Navarro A, Martin M. Perfil da demanda atendida em ambulatório de doenças profissionais e a presença de lesões por esforços repetitivos. *Rev Saude Publica* 2000; 34(3):292-298.
61. Alves S, Luchesi G. Acidentes do trabalho e doenças profissionais no Brasil. A precariedade das informações. *Informe Epidemiológico do SUS* 1992; 1:7-19.
62. Hauke A, Flintrop J, Brun E, Rugulies R. The impact of work-related psychosocial stressors on the onset of musculoskeletal disorders in specific body regions: a review and metanalysis of 54 longitudinal studies. *Work Stress* 2011; 25(3):243-256.

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