

## The prevalence of musculoskeletal injuries in employees of automotive functional companies in Teresina-PI

### A prevalência de lesões musculoesqueléticas em funcionários de empresas de funilaria automotiva em Teresina-PI

Rivanda Berenice Silva de Freitas Adad<sup>1</sup>, Danyele Holanda da Silva<sup>2</sup>, Izabelle Macedo de Sousa<sup>3</sup>

<sup>1</sup>Corresponding author. Maurício de Nassau University Center. Teresina, Piauí, Brazil. ORCID: 0000-0002-2828-6464. rivandaadad@gmail.com

<sup>2</sup>Maurício de Nassau University Center. Teresina, Piauí, Brazil. ORCID: 0000-0001-7517-5890. dan\_sil\_holanda@hotmail.com

<sup>3</sup>Maurício de Nassau University Center. Teresina, Piauí, Brazil. ORCID: 0000-0003-1406-0365. izabelle\_macedo@hotmail.com

**RESUMO | INTRODUÇÃO:** Os distúrbios osteomusculares relacionados ao trabalho são um conjunto de afecções comumente ligadas ao trabalho e podem ocorrer de forma combinada ou não ao uso repetido e forçado de grupos musculares e à manutenção de posturas inadequadas. Sua incidência vem aumentando gradativamente a cada ano, devido à influência de diversos fatores. **OBJETIVOS:** Identificar a prevalência de lesões musculoesqueléticas em funcionários de empresas automotivas. **METODOLOGIA:** Este estudo foi do quantitativo e qualitativo. Participaram da pesquisa 23 voluntários, os quais foram analisados por meio de uma avaliação física e socioeconômica, além de ser aplicado o Questionário Nórdico de Sintomas Osteomusculares. Os participantes foram observados durante a execução de suas atividades no seu ambiente de trabalho, onde foram analisadas as manutenções e compensações posturais e os principais movimentos durante as atividades. **RESULTADOS:** O estudo evidenciou dentre os participantes predomínio do sexo masculino, foi apresentada a distribuição da amostra em relação a faixa etária, escolaridade, tempo de serviço, função que exerce, percepção de esforço, além de relatar a existência de dor durante e/ou após ao horário de trabalho. **CONCLUSÃO:** Os resultados apontaram para a região da coluna lombar como sendo a de maior intensidade de distúrbios musculoesqueléticos relacionados ao trabalho entre o grupo de trabalhadores pesquisados. Foi observado que não há uma relação linear entre sintomas osteomusculares, avaliação hemodinâmica, idade e tempo de serviço. Por outro lado, a baixa escolarização esteve associada com o aumento da probabilidade de diagnóstico.

**PALAVRAS-CHAVE:** DORT. Epidemiologia. Saúde do trabalhador. Qualidade de vida. Lesões ocupacionais.

**ABSTRACT | INTRODUCTION:** Work-related musculoskeletal disorders are a set of common conditions that can affect the combined form or not use repeated and forced repeated and forced muscle groups and the maintenance of inappropriate postures. Its incidence gradually arrives each year, due to the influence of several factors. **OBJECTIVES:** To identify the prevalence of musculoskeletal injuries in employees of automotive companies. **METHODOLOGY:** This study was quantitative and qualitative. 23 volunteers participated in the research, which were analyzed by means of a physical and socioeconomic evaluation, in addition to being applied or the Nordic Musculoskeletal Questionnaire. Participants were observed during the performance of their activities in their work environment, where they were analyzed as postural maintenance and compensation and the main movements during activities. **RESULTS:** The study showed among the participants with a predominance of male gender, who received a distribution of the sample in relation to age group, education, length of service, functions they exercise, perception of effort, in addition to relating a variable of pain during and/or after working hours. **CONCLUSION:** The results pointed to a region of the lumbar spine as being the highest intensity of work-related skeletal muscle disorders among the group of workers surveyed. It was observed that there is no linear relationship between musculoskeletal symptoms, hemodynamic assessment, age and length of service. On the other hand, low schooling was associated with an increased probability of diagnosis.

**KEYWORDS:** WMSD. Epidemiology. Worker's health. Quality of life. Occupational Injuries.

## Introduction

Musculoskeletal disorders are considered a serious public health problem, which has a significant impact on quality of life and a considerable economic burden on a country's compensation costs such as lost earnings and productivity. Studies describe a relationship between physical demands at work and musculoskeletal disorders, but psychosocial demands have also been identified as possible risk factors<sup>1</sup>.

Work-related musculoskeletal disorders (WMSDs) are a set of conditions that affect tendons, muscles, nerves, fasciae, synoviums and ligaments separately or in association, and tissue degeneration may occur or not, affecting mainly the upper limbs, region scapular, neck and lumbar spine. These dysfunctions are commonly linked to work and can occur in combination or not with the repeated and forced use of muscle groups and the maintenance of inappropriate postures<sup>2</sup>.

According to the records of the SINAN (Information System for Notifiable Diseases), the specific diagnoses most commonly reported were shoulder disorders, back pain and disorders of the synovium, tendon and vertebral disc. The incidence of WMSD cases has been gradually increasing each year due to the influence of several factors. This fact can be explained by the new organizational structure adopted by companies, which prioritize productivity and profit, to the detriment of the physical and psychosocial limits of their employees. Inadequate workplaces, equipment without proper adjustments, posture maintained for a long time, absence of breaks, repetitive movements, this reflects unfavorably on the worker's health<sup>3</sup>.

The instability of health among workers causes an increase in absences from work, in addition to increasing the risk of medical leave. Therefore, encouraging the promotion of health and well-being in the work environment, can be decisive to mitigate absences or premature exits due to pathological reasons and guarantee an increase in the financial return for the company<sup>4</sup>.

The RSI / WRMSD demonstrates a significant damage to the health of workers, not only due to the volume of notifications but also due to the harmful effect on people's functional and work capacity. This considerable number of notifications occurs due to the long working hours, with overtime compliance, encouraged to compete by the system of their gain being associated with productivity<sup>3</sup>.

In addition, the world of work is undergoing renovations very quickly, where new requirements are imposed on workers, new contracts, ways of working, ways of organizing work, schedules, goals, production, which can have a direct impact on the health of workers, causing pathologies and impairing the return to work process. In recent years, it has been possible to perceive the expansion of capitalist globalization, marked by situations of instability and insecurity, which may lead to the violation of labor rights, motivating precarious work and social inequalities<sup>5</sup>.

Therefore, it was found relevant to identify the prevalence of musculoskeletal injuries in employees of automotive companies through observational assessment and application of questionnaires, aiming to assess the socio-demographic profile of employees, correlating the risk factors that trigger musculoskeletal injuries and analyzing the quality of these employees' lives.

## Methodology

### Research type

This study was of a quantitative and qualitative type, as it was accounted for using numerical data and transformed into usable statistics, in addition to being subjectively studied as particularities, characteristics and individual participants of the participants.

### Research Location

The survey was conducted in 2 (two) automotive body shops.

## Sample

Through the selection and exclusion of selected employees, employees in the auto repair, assembly, painting and inventory sectors of automotive companies.

## Selection Criteria for Participants

Inclusion criteria: Technical collaborators registered in the automotive body shops, both genders, above 18 years old, literate and who use more than 1 year in the same function.

Exclusion criteria: those who were not present when the questionnaire was applied or answered it completely, or those who gave up participating at any time during a survey.

## Ethical Considerations

The protocol for this study was sent to the Ethics Committee based on Resolution (466/2012) of the National Health Council, and after the tests carried out by the research participants, who signed the free and informed consent form - IC. It was approved under the protocol CAAE Foi aprovado sob registro de CAAE 15813819.5.0000.5214.

## Data Collection Tools

After signing the informed consent form, the volunteers were assessed by means of a physical evaluation and the Nordic Musculoskeletal Questionnaire (QNSO) was applied. The assessment was previously scheduled with each volunteer and performed in a private room.

The QNSO is a self-applied questionnaire, composed of an engraving of the human body (posterior view) segmented into nine anatomical regions, where it is possible to measure the musculoskeletal symptoms of this sample according to the analysis of the following parts of the body: neck, shoulder, part upper back, elbows, lower back, wrists and hands, hips and thighs, knees, ankles and feet<sup>6</sup>.

Subsequently, the participants were observed during the performance of their activities in their work environment, where postural maintenance and compensation and the main movements during the participant's activity were observed.

It is worth mentioning that all data is confidential and the volunteers were not identified.

## Statistical analysis

The construction of the information was carried out using the Excel program, where the records were stored until the end of the study and tables and graphs were used to present the results. The level of significance was set at  $p < 0.05$ .

## Results

Out of the 36 employees duly hired by the companies and available to participate in the research, only 23 signed the informed consent form, as 6 participants were on vacation, 4 were on medical certificate, 2 had been absent on the days of data collection and 1 employee was on notice. prior, not interested in collaborating with the work. Therefore, only 63.9% of the volunteers participated effectively in the survey.

The study showed, according to table 1, that there was a male predominance of 100%. In the presentation in relation to the age group of the workers studied, it was observed that 2 (8.69%) of the employees are between an age range of 18 to 29 years, the majority represented by 10 (43.47%) are between 30 at 39 years of age, 8 participants (34.78%) are between 40 and 49 years old and only 3 (13.04%) volunteers are between 50 and 59 years old.

As for the time of activity, 8 employees (34.78%) from 1 to 10 years were identified performing the same function, also 8 employees (34.78%) working from 11 to 24 years in the same sector and only 7 workers (30, 43%) from 25 to 40 years old doing the same activity. Where it was possible to observe that the length of service did not affect the increase in the occurrence of injuries.

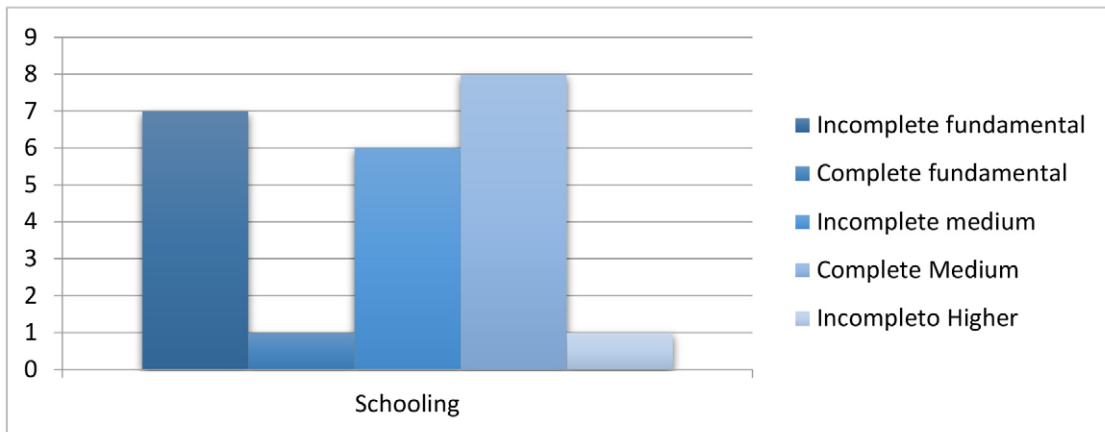
**Table 1.** General characterization of the studied sample according to the evaluation questionnaire (n = 23)

VARIABLES	n(%)	$\bar{x}$	$\pm$	Min-Max
<b>Genre</b>				
Male	23(100)			
Female	-			
<b>Age</b>				
		<b>40,17</b>	<b>9,38</b>	<b>24-59</b>
18 to 29 years	02(8,69)			
30 to 39 years	10(43,47)			
40 to 49 years	08(34,78)			
50 to 59 years	03(13,04)			
<b>Activity Time</b>				
		<b>17,39</b>	<b>10,61</b>	<b>4 - 40</b>
1 to 10 years	08(34,78)			
11 to 24 years	08(34,78)			
25 to 40 years	07(30,43)			
<b>Performs Physical Activity</b>				
Yes	15(65,22)			
No	08(34,78)			

Legend:  $\bar{x}$ = average  $\pm$ = standard deviation, Min-Max= Minimum and maximum.

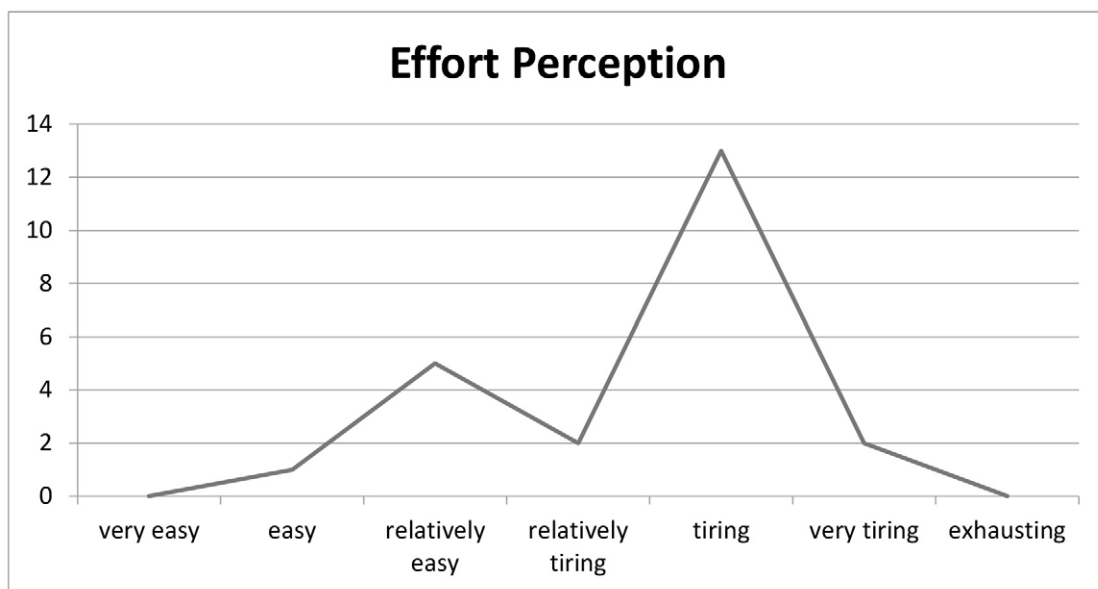
In Graph 1, it is possible to observe that the sample had a total of 7 (30.43%) employees with incomplete elementary school, while only 1 (1.35%) had complete elementary school, it was analyzed that 6 (26.08% ) employees had incomplete high school, while the majority 8 (34.78%) had completed high school and only 1 (1.35%) had already completed higher education.

**Graph 1.** Sample distribution regarding education (n = 23)



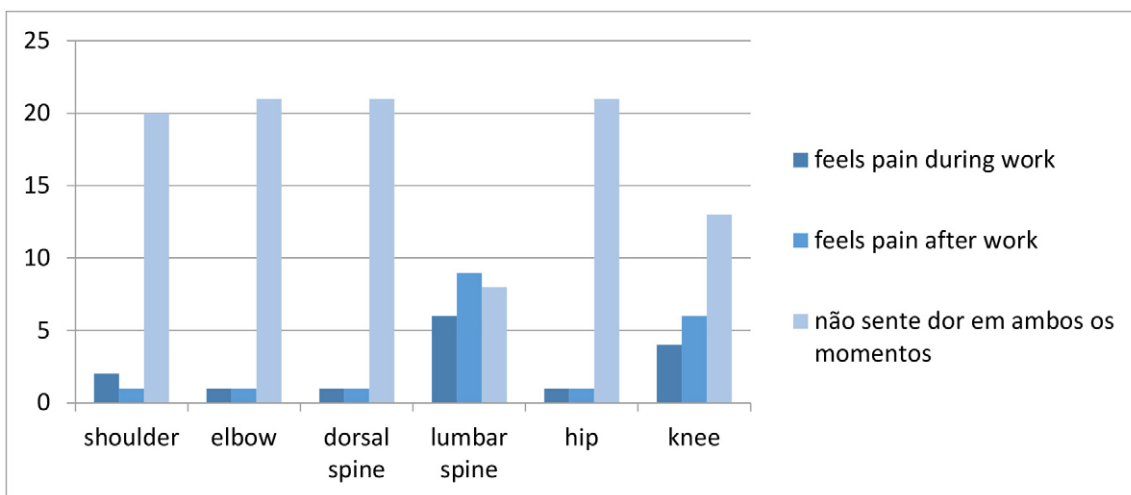
Graph 2 shows the variation in the subjective perception of the volunteers' effort at the end of a working day, according to the Borg Scale. With the results found, it was observed that none of the employees chose to say that their working day is very easy (scores 6, 7 and 8) or exhaustive (scores 19 and 20), only 1 (4.34%) of them said it was easy (scores 9 and 10), 5 (21.73%) confirmed that their day would be relatively easy (scores 11 and 12), 2 (8.69%) volunteers say they finish their shift relatively tired (scores 13 and 14), most of them 13 (56.52%) consider it tiring (scores 15 and 16) and only 2 (8.69%) report the day ending very tiring. When the employee has the capacity to perceive the effort exerted during his working day and how he finds himself at the end of the working day, it facilitates the understanding of the importance of preventing WMSD.

**Graph 2.** Distribution of the sample regarding the Perception of effort (n = 23)



Graph 3 shows the results found in the sample regarding reports of pain during and / or after working hours and those who did not report pain, in addition to specifying the location of the discomfort. Employees who reported feeling pain during office hours, say they feel pain in the shoulder (2), the elbow (1), the dorsal spine (1), the lumbar spine (6), the hip (1) and the knee (4). After work, some participants report pain in the shoulder (1), elbow (1), dorsal spine (1), lumbar spine (9), hip (1) and knee (6). And there are still those who declare not to feel pain neither during or after the day of work in the following regions of the body: shoulder (20), elbow (21), dorsal spine (21), lumbar spine (8), hip (21) and knee (13).

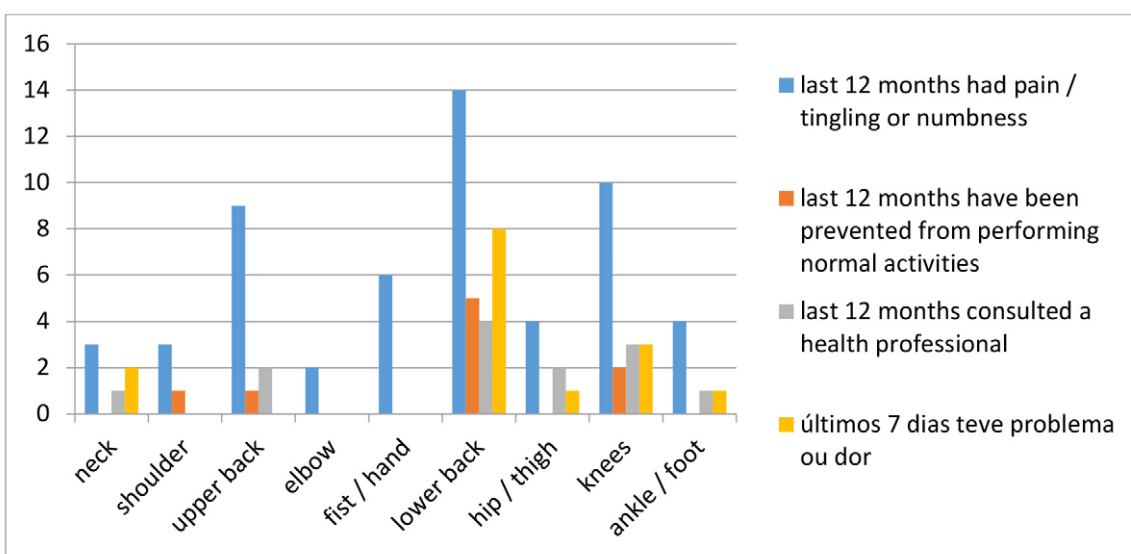
**Graph 3.** Sample distribution regarding pain reports during and / or after working hours (n = 23)



Graph 4 shows the result of the QNSO questionnaire (Nordic Musculoskeletal Questionnaire) developed with the purpose of standardizing the measurement of reporting musculoskeletal symptoms and, thus, facilitating the comparison of results between studies. Very simple and self-applicable, but they were all accompanied during the filling process, discarding any doubts and / or inconvenience. First question: In the last 12 months, have you had problems (such as pain, tingling / numbness), in: neck (3), shoulder (3), upper back (9), elbows (2), wrist / hands (6), lower back (14), hips / thighs (4), knees (10) and ankles / feet (4). Second question: In the past 12 months, have you been prevented from performing normal activities

(for example: work, domestic and leisure activities, because of the following problems: neck (0), shoulder (1), upper back (1), elbows (0), wrist / hands (0), lower back (5), hips / thighs (0), knees (2) and ankles / feet (0). Third question: In the past 12 months, have you consulted some health professional (doctor, physiotherapist) because of this condition: neck (1), shoulder (0), upper back (2), elbows (0), wrist / hands (0), lower back (4), hips / thighs (2), knees (3) and ankles / feet (1). And finally you were asked about the last 7 days, did you have any problems with: neck (2), shoulder (0), upper back (0), elbows (0), wrist / hands (0), lower back (8), hips / thighs (1), knees (3) and ankles / feet (1).

**Graph 4.** Distribution of the sample regarding the QNSO (n = 23)



## Discussion

The results of the present study showed the prevalence of musculoskeletal injuries in part of the participating employees, caused by a set of elements that favor the prevalence of occupational disorders. These pathologies, also known as RSI / WRMSD, are motivated by a series of factors generated by the environment and working conditions.

RSI / WRMSD demonstrate significant evidence of the working conditions determined for some workers of different occupations. These disorders are recognized by multiple causes, as they reach various dimensions such as psychological, biological and social. Because they are multi-causal pathologies, RSI / WRMS can be observed in the most varied professions, each worker injures a specific region according to the activity they perform<sup>7</sup>.

There are cases in which the illness is motivated by the excessive use of certain muscle groups, due to repetitive work in inadequate posture, problems in the organization of work that can be directly linked to management, in addition to a fast pace of production imposed on workers by capitalism, which can be the main trigger of these injuries<sup>8</sup>.

According to Silva<sup>9</sup>, RSI / WMSD have a multi-causal dimension and biomechanical, physiological and psychological factors are among the main causes. Biomechanics involve improper posture; mechanical compression and repeatability. Physiological include hormonal changes, bone and joint structure, obesity, general health, height, among others. Psychological refers to stress, individual psychological profile and social relationships. All of these factors make the occupational disorder a complex and degrading condition for an individual, directly influencing the balance between body and mind and the socioeconomic and cultural scenario of the worker.

During the data collection of this project, it was possible to observe that the number of participants who had a lower level of education (incomplete and fundamental education) was directly proportional to the prevalence of injuries in most situations.

It is believed that little information, triggers less care and / or no prevention during the execution of their work activities. And even when they were instructed in relation to static and dynamic posture, load, PPE's and some care in relation to health, a certain resistance was perceived when receiving the information. On the other hand, employees who had access to high school or higher, were more receptive and willing to accept the guidelines given by the team.

According to Moraes and Bastos<sup>8</sup>, among the sociodemographic aspects that are related to workers' health, there is education. The lower the education level of the researched volunteer, the higher the percentage of occurrence of RSI / WMSD symptoms and diagnoses.

In the study carried out by Veigas and Almeida<sup>3</sup>, on work-related musculoskeletal disorders, the results showed that there is a tendency for growth rates of absenteeism due to RSI / WRMSD and in relation to the level of education, a higher prevalence of cases was found in individuals with incomplete elementary education, also noting that individuals with formal employment were more affected.

According to Paula et al.<sup>10</sup>, a negative influence of low education on the quality of life of individuals with musculoskeletal disorders was found in their results, but with a more marked negative effect on the physical dimension, showing less perception of health, which corroborates with the authors' research. previously mentioned.

It is important to highlight that the region of the body most affected during the present study was the lumbar spine. In the application of the Nordic Musculoskeletal Questionnaire, there were reports from 14 employees (60%) of a total of 23 respondents, who in the last 12 months had problems, such as pain, tingling or numbness in the lower back, that is, the lower back. In addition, during the evaluation and application of the evaluation and sociodemographic questionnaires, it was possible to observe that the employees' pain complaints exist even before they start their daily activities, they remain during working hours and most of the times they get worse at the end of the day.



## Conclusion

The spine is the part of the human body with the greatest motor overload, which is why postural changes occur and where most of the musculoskeletal disorders and chronic spine problems (PCC) occur, as the most frequent ones can be cited, low back pain, chest and sciatica pain, spondylosis, radiculopathy and intervertebral disc disorders<sup>11</sup>.

According to Santos et al.<sup>12</sup>, back pain is a very frequent experience in adult workers, pointing to a prevalence of approximately 15 to 30% and being the major cause of impaired productive capacity, socioeconomic problems and loss of quality of life. Among the back pain diagnoses that led to disability pensions, the most recurrent were back pain and low back pain. In addition, reports that low back pain affects 10% of the world population, in mild to very severe intensities.

Concurrent with the questionnaires, the Borg Scale was also applied, considered to be of paramount importance, since the participants' own report was verified through their subjective perception of the effort, making it possible to perceive the degree of conditioning of the individuals after the workday.

The possibility of using the Effort Perception scales is quite varied, which can be used in stress tests, in the prescription of exercises, in clinical situations and in occupational activities<sup>13</sup>.

According to Silva et al.<sup>9</sup>, the perceived effort is a valid and reliable indicator to monitor an individual's tolerance to exercise. Commonly used during progressive stress tests, it is associated with heart rate and exercise intensity. The scales of perception of effort were created with the objective of establishing relationships between the perception of effort and external load data, or physiological stress.

In general, this study sought to demonstrate data to discuss the notion of RSI / WRMSD, its results pointed to the region of the lumbar spine as being the one with the highest intensity of work-related musculoskeletal disorders among the group of workers surveyed. It was observed that there is no linear relationship between musculoskeletal symptoms, hemodynamic assessment, age, function and length of service, when the health condition is controlled through self-reported diagnosis.

On the other hand, low schooling was associated with an increased probability of diagnosis, in the studied sample. This factor was directly proportional to the qualification of the worker and, consequently, to the occupation of less repetitive positions with greater possibilities of promotion and reward. RSI / WRMSD still remain one of the biggest public health problems related to incapacity to work. Companies need to collaborate, in order to promote actions, investing in trained professionals who correctly guide their employees, who encourage the prevention of musculoskeletal pain and discomfort, in addition to promoting vigilance in the construction of a healthy environment in the work context, regularizing breaks during expedient and encouraging the use of PPE.

This study is of great importance due to the benefits it can bring if well used. It will be able to guide new researches in the field of Physiotherapy at work according to the epidemiology found and contribute to the increase in the possibilities of prevention within companies. In the case of employees, the benefit will be the improvement of postural awareness, reduction of the biomechanical overload in the musculoskeletal structures, promoting less energy expenditure, preventing occupational diseases and favoring a reduction in leave from work.



## Author contributions

Adad RBSF participated in the conception, design, search, collection and statistical analysis of research data, interpretation of results, and writing of the scientific article. Silva DH participated in the research data collection. Sousa IM participated in the design, statistical analysis of the research data, interpretation of the results and writing.

## Competing interests

No financial, legal or political competing interests with third parties (government, commercial, private foundation, etc.) were disclosed for any aspect of the submitted work (including but not limited to grants, data monitoring board, study design, manuscript preparation, statistical analysis, etc.).

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