

Ergonomic Analysis of the Work in a Garment Industry in Laranjal - Minas Gerais

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Abstract

The Garment Industry has been a great generator of employment in the country. Because it is a sector that needs a large use of labor, there are many concerns about the health, safety and well-being of employees. This study was carried out in a men's clothing factory in the city of Laranjal, Minas Gerais – Brazil, the aim was to analyze the risks that employees related to the production are exposed, movements and inadequate positions, the pains, and the activities that contribute most to the absence from work. The study involved the participation of 62 employees, to obtain the results, were applied, Couto's checklist and the Adapted Bezerra (2011) questionnaire, in addition to the visits to a company. The results showed that workers are prone to risks such as RSI / WMSDs from activities performed, inadequate postures, physical overload, repetitiveness, effort and inadequate work position. The most compromised parts of the body are the lower and upper parts of the back, neck and legs. Therefore, it is necessary to carry out changes in the workplace in order to comply with what NR 17 says and improve the work environment of the employees, minimizing the risks of RSI / WMSDs.

Keywords: *Ergonomics, Ergonomic analysis of work, RSI / WMSDs.*

I. INTRODUCTION

The Ergonomic Analysis of Work is an essential tool for organizations as well as for their workers as it provides benefits and improvements to both. As well as for managers, because it makes it possible to adapt your company to the standards established by the competent organs, provoking a significant increase in productivity and in the abstention of its employees, and to the worker, as it allows the reduction of the occurrence of work accidents, stress, early retirements and indemnities caused by RSI (Repetitive Strain Injuries) and WMSDs (Work-Related Musculoskeletal Disorders) as well as relevant improvements in your work environment.

In the environment of the garment industry, workers' health problems are always associated with employees' posture, the environment and their characteristics, due to psychological tensions, through long and tiring days, according [1], which shows that the need for careful observation according to the

specifications of NR17, that provides a sequence of parameters for ergonomics and guarantees safety and comfort to the employees, through a legal device of the Ministry of Labor. The NR 17 deals with Ergonomics in industries establishing physical and psychic characteristics for work environments considered safe and productive. As the production of the worker is directly related to the environment and working conditions, ergonomics aims to help in the development of jobs that contribute to reduce the biomechanical and cognitive demands of the operator, allowing the adoption of a more adequate posture.

Based on these considerations, the present study was carried out in a men's clothing factory in the city of Laranjal, Minas Gerais – Brazil. The specific objectives were to analyze the work environment in the production, and then to check the conditions in which the machinery and workstations were found, to analyze the places of the body in which the employees most feel pain and which the parties cause higher rates of absences, and finally compare the working environment of the clothing with the standards pre-established in accordance with NR17 to check for possible faults and the need for changes.

In view of these considerations, the present article aims, identifying the characteristics of the work and the risk factors to which workers who act directly in the production of the shirts are exposed by inappropriate movements and postures adopted during the execution of the activities, the musculoskeletal pain that affects them the most, as well as evaluating the work stations regarding NR 17.

II. THEORICAL REFERENCE

A. Ergonomics

Ergonomics is the study of people's interactions with technology, organization and the environment, aiming at interventions and projects aimed at improving, in an integrated and non-dissociated way, the safety, comfort, well-being and effectiveness of human activities [2].

According to [3], ergonomics takes care of issues related to incorrect postures and situations of ergonomic risks offered by environments and equipment, being crucial to avoiding health problems that often occur with workers in a company.

Ergonomics aims at the modification of work systems to adapt the activity therein to the

characteristics, abilities and limitations of people, with a view to their efficient, comfortable and safe performance [4].

For [5] it is important that companies invest in ergonomics. And there are several reasons why, in addition to the return on investment plan, it implies the ethical obligation to provide a safe, in accordance with its regulations, remaining competitive in the market for the most talented and motivated employees according to collective bargaining.

According to [6] in the search for competitiveness it is necessary to protect organizational assets, and through ergonomics reduce medical costs, reduce absence and improve worker satisfaction.

B. Regulatory Standard 17 (NR17)

The Regulatory Standard 17 (NR17) addresses the issue of ergonomics in industries by establishing physical and psychic characteristics for work environments considered safe and productive. NR-17 makes considerations regarding the transportation of heavy objects, loading and unloading, as well as the use of miscellaneous materials and equipment that require postural adjustments that do not pose an ergonomic risk to workers. This standard also specifies that it is the employers responsible for carrying out the EAW, and each analysis must be adequate to the specifics of each work environment, according to the industrial segment to be analyzed [7].

The Regulatory Standard 17 (NR17) refers to the parameters of working conditions, according to [7], and these must be adequate according to the characteristics of each worker, considering comfort and safety during the execution of their work activities. These conditions involve some criteria the handling of loads and materials, environmental conditions and work routine [7].

According to [7], NR 17 states that care should be taken regarding furniture contained in work environments, adequate seats, tables, pedals and equipment in general, since all must be adequate to the physiological characteristics of employees.

C. Incidence of RSI and WMSDs

The Repetitive Strain Injuries and Work-Related Musculoskeletal Disorders (RSI / WMSDs) pose a major problem to the health of industrial workers, both in the number of cases and in the impact on the functional capacity of individuals. The industrialists stand out in relation to the large number of cases of RSI / WMSDs, and this is due to the demands of rigid activities, where workers are subjected to a labor process characterized by extensive and competitive work days to gain recognition and increase of productivity.

D. The Ergonomics Observed in the Garment Industry

Reference [8] addresses the issue of ergonomics in industries as a sequence of analyzes made on the

work environment, where one can observe several characteristics of its components, from the physical structure to factors such as ventilation and lighting of the production sectors. Based on these analyzes, it is possible to relate actions that can reduce the ergonomic risks and improve the work of the employees and the productivity of the company, as stated by [3].

When speaking of ergonomics, [3] approach the term as a specific group of knowledge that deal with the man in the productive sectors of a company and their respective relationships machines and tools, with the intention of promoting care with respect to the safety and comfort of work activities, based on scientific knowledge to promote improvements in the quality of life of employees, based on the notion of prevention of health problems caused by incorrect postures and environments insecure.

In view of the foregoing, the concept of Ergonomic Analysis of Work (EAW), characterized by [9] as a simple methodology that is synonymous with gains in health and well-being, because EAW helps in correcting employees' behavioral flaws and eliminating the physical problems of plant and machinery used in factories. In the case of the garment industry, [9] seek to trace harmful aspects mainly in the posture of employees in the sector of sewing and finishing of the pieces, whose results are projected in physical, cognitive and organizational problems.

According to [1], the posture with which workers perform their functions has a direct effect on their health, which can lead to incorrect postures, bodily pain and even more serious problems of difficult and time-consuming treatment. They comment the wrong postures in the garment industry cause damage to the muscular and skeletal structures, especially in the spine, because the activities of the seamstresses are always done in the seated posture, demanding a correct positioning that not all follow.

According to [1], the activities of seamstresses are tasks that require a lot of physical effort, skill and concentration. However, they recognize that it is a monotonous, long-time work in the same position, which print, without all contexts, ergonomic risks.

III. METHODOLOGY

A. Classification

This article is classified as descriptive research, which according to [10] aims to describe the characteristics of a particular population or establishment. It involves the use of standardized data collection techniques.

We used the quantitative approach that according to [11] quantitative research aims to measure relationships between variables by association and obtain information about a given population. This study is based on bibliographical research by means of already elaborated literatures. It was based on books, scientific journals and research in the Google

Scholar database on master's and doctoral theses, scientific articles and papers published in congresses with the theme addressed.

B. Company Characterization

This study was carried out in a medium-sized company, a men's clothing factory, located in the city of Laranjal - Minas Gerais, Brazil, where social shirts have been produced for more than 30 years and are sent to various states of the country. The company has 102 employees. The study area for the work was the production sector, where the whole assembly process of the shirts takes place, in which the EAW (Ergonomic Analysis of Work) was made, that according to Regulatory Standard 17 (NR17) - Ergonomics, EAW is performed to assess the psychophysiological characteristics of workers in working conditions adaptation, [12] says that EAW searches through visual observations, measurements and records of critical situations to understand the overhead and the volume of output per worker. In addition, an interview was conducted with the company's managers, and the manufacturing sector was the sector that concentrated the largest number of absences according to them due to fractures in the spine.

The sample is composed of 62 people who proposed to participate in the survey of the total of 77 that work in three sectors that were divided for the study, the cutting sector with 6 people, production has 40 employees and termination with 16, which are the sectors where the direct line of production of shirts.

C. Instruments

Initially, the 'Employee Profile Analysis' questionnaire was adapted from [13] with closed questions. This questionnaire aims to identify the factors that affect the organizational environment of the company.

Then another instrument used was the Body Diagram [14], composed of the "Body Discomfort Assessment Scale", in which the employees marked the regions of the body where they felt most pains and intensity, which ranges from none to intolerable.

Reference [15] Checklist is a simplified assessment of the biomechanical factor in the risk for work-related upper limb musculoskeletal disorders, contains questions about job characteristics such as physical overload, hand strength, job conditions, repetitiveness, organization, among others [16]. Its objective is to combat and correct the possible occurrences of RSI and WMSDs (Repetitive Strain Injuries and Work-Related Musculoskeletal Disorders).

D. Procedures

In the first contact with the company were explained the reasons, objectives of the study, and the importance of employee participation in the study.

The management of the company was open and available for research. At this time, the company president along with the managers were interviewed for a better understanding of the work routine, regiment and its operation, capturing the management's point of view on the work performed by the dressmakers and the characteristics of the work.

After the first interview, a visit to the productive line supervised by the manager of each sector was started, presenting each employee, explaining their function. Then it was possible to observe and talk to the staff individually. Then, the "Employee Profiles Analysis Questionnaire" was delivered, which can be taken home and returned within 72 hours.

For the Couto Checklist, two more visits to the productive line were necessary for a more incisive observation of the work of the employees, were observed as characteristics of the work station and the work of physical overload, hand strength, posture at work, etc.

E. Data analysis

For the analysis of all the collected data, the R. O. R. software was used as statistical software, and due to its programming characteristics, it allows the creation of several types of graphical analysis, either a new methodology or a combination of existing methodologies.

According to [17], R has a large amount of statistical procedures in thousands of packages available on the internet that can be optionally loaded. You can also create and maintain various types of objects on the desktop. This allows for great flexibility and speed.

IV. RESULTS AND DISCUSSION

A. Questionnaire profile analysis of employees (adapted from [13])

The first tool used was the questionnaire adapted from [13], which aimed to analyze the profile of employees in the making of shirts, as well as their satisfaction in the workplace. The questionnaire was applied in the three sectors of the company: cutting, production and termination, where the samples were composed respectively by 8, 48 and 22 employees. From the total sample of each sector, 6 employees from the cutting sector (75.00% of the total sample, 40 employees from the production sector (83.33% of the total sample) answered the questionnaire, and in the termination sector they answered 16 employees (72.73% of the total sample). The characteristics of the samples, such as sex, age, working time in the company by sector, are shown in table 1.

As can be observed, the female sex is predominant in the production sector (80.00%) and termination sector (62.50%), whereas in the cutting sector male sex (83.33%) it is predominant. This may be related to a greater need for physical exertion.

Depending on the age, 50.00% of the employees are between 25 and 35 years of age. In the production sector, almost half (42.50%) have up to 25 years, and in the termination sector the age of employees is divided with 31.25%, for each interval up to 55 years. The predominant function time in the cutting, production and termination sectors is respectively above 15 to 20 years (50.00%), up to 5 years (45.00%) and up to 5 years (43.75%), may be linked with the age of the employees as quoted above.

Total answered by sector	6(75,00%)	40(83,33%)	16(72,73%)
	Cutting	Production	Termination
Characteristics	Sector		
Sex			
Male	83,33%	20,00%	37,50%
Female	16,67%	80,00%	62,50%
Age			
Up to 25 years	33,33%	42,50%	31,25%
Over 25 years and up to 35 years	50,00%	35,00%	31,25%
Over 35 years and up to 45 years	16,67%	12,50%	31,25%
Over 45 years and up to 55 years	-	10,00%	6,25%
Over 55 years	-	-	-
Working time in the company			
Up to 5 years	33,33%	45,00%	43,75%
Over 5 years and up to 10 years	-	25,00%	18,75%
Over 10 years and up to 15 years	16,67%	17,50%	6,25%
Over 15 years and up to 20 years	50,00%	10,00%	25,00%
Over 20 years	-	2,50%	6,25%

Table I: Characteristics of the samples by sector.

In this questionnaire there were four questions about the level of job satisfaction: whether the physical workplace is pleasant, whether it has adequate and sufficient work equipment to perform the job, and finally, whether it has adequate work safety equipment to perform the function. The options for answers were: I totally disagree, partially disagree, neither agree nor disagree, partially agree and totally agree. For better analysis, bar graphs were performed in R.

For the captions were used the acronyms: TD, PD, NAND, PA, TA, which means respectively Totally Disagree, Partially Disagree, Neither Agree nor Disagree, Partially Agree and Totally Agree. The graph of the generated sector of cut is shown, in figure 1.

As can be observed, the level of satisfaction of the workers in the cutting sector with the work is satisfactory according to 50.00% (3 people), since they totally agree, however the other half partially agree that what the work they perform is enjoyable. If the physical workplace is a pleasant place, 4 people (66.66%) totally agreed and 2 people partially agreed (33.33%) that the workplace is good for work. Both the work and safety equipment, 5 people (83.33%) totally agreed that they have adequate equipment for the exercise of the function and for physical security,

and only 1 person (17.67%) partially agree on that. It is noteworthy that there were no disagreements regarding the workplace and adequate equipment for the function and safety, so it is noted that workers agree in a partial and total way that the workplace is pleasant, being possible to perform their function of efficiently and safely. The graph generated for the cutting sector is shown in figure 1, below.

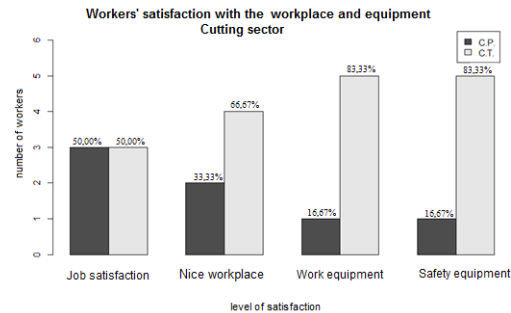


Figure 1: Level of satisfaction of the workers of the cutting sector for the work workplace and equipment.

In the production sector, half of the employees totally agree (50.00%) who are satisfied with the work, very close value when it comes to the pleasant work workplace, where 47.50% of employees totally agree. In relation to the provision of work equipment, 77.50% of workers totally agree these are sufficient and suitable to perform the function, totally disagreeing and partially 2.50%. Finally, 70.00% of employees fully agree that safety equipment is adequate to protect against work-related accidents.

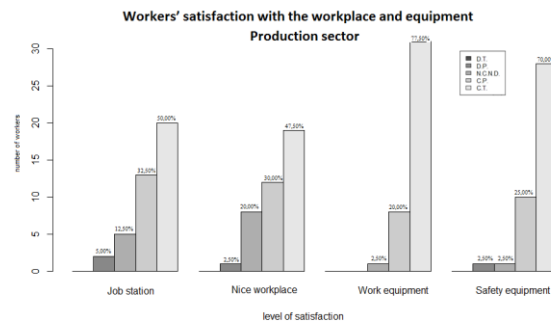


Figure 2: Level of satisfaction of the workers of the production sector for the work workplace and equipment.

In the termination sector, opinions were divided when the question was satisfaction at work and pleasant work workplace, as shown in figure 2.

In the termination sector, most of the employees were dissatisfied with the work, where 37.50% partially disagreed that they work satisfactorily, 25.00% are totally satisfied with their work. The same is true for the question about the workplace, where 37.50% partially disagree against 31.25% totally agree that the workplace is pleasant for the exercise of the function. Already for work equipment and safety equipment, both have obtained the same results, from those who totally agree to

totally disagree. It is worth mentioning that 75.00% totally agree that they have enough work and safety equipment to carry out their activities.

The only sector where there was total disagreement among some employees (6.25%) was in the termination sector when there was also partial disagreement in the production sector in all items, except the providing of equipment for work, and in the termination sector, obtained partial disagreement in all items. This shows that the sector's highest level of satisfaction, even if still small, is in the termination sector.

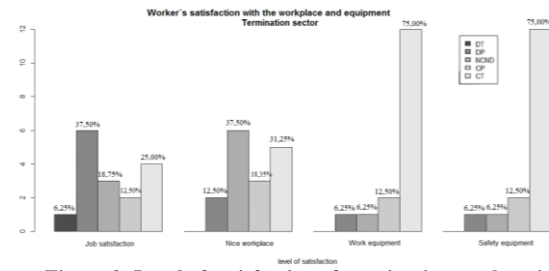


Figure 3: Level of satisfaction of termination workers in workplace and equipment.

B. Body diagram: Corlett and Manenica

The second tool used was the Corlett and Manenica body diagram, which aims to evaluate the musculoskeletal problems and the scale of evaluation of the workers' body discomfort in the last 30 days, in the last 12 months and absences in the last 12 months. Initially, it evaluated which regions of the body the employees felt most pain in these periods, as well as which caused higher indices of absences, as shown in table 2, divided by sectors.

Cutting			
Body Regions	Last 30 days (%)	Last 12 months (%)	Absence from work due to illness in the last 12 months (%)
Head	50,00%	50,00%	33,33%
Eyes	16,67%	16,67%	16,67%
Neck	33,33%	33,33%	33,33%
Shoulders	33,33%	33,33%	33,33%
Elbows	-	-	16,67%
Fist / Hands	16,67%	-	-
Upper Coast	33,33%	33,33%	33,33%
Lower Coast	33,33%	33,33%	33,33%
Hip / Buttock	-	-	-
One or both Thighs	16,67%	16,67%	16,67%
One or both Legs	33,33%	33,33%	33,33%
Production			
Body Regions	Last 30 days (%)	Last 12 months (%)	Absence from work due to illness in the last 12 months (%)
Head	27,50%	30,00%	7,50%
Eyes	17,50%	12,50%	7,50%
Neck	25,00%	25,00%	10,00%
Shoulders	22,50%	22,50%	12,50%
Elbows	12,50%	10,00%	-
Fist / Hands	30,00%	10,00%	-
Upper Coast	20,00%	12,50%	12,50%
Lower Coast	22,50%	20,00%	12,50%
Hip / Buttock	12,50%	7,50%	10,00%
One or both Thighs	15,00%	7,50%	10,00%

Body Regions	Last 30 days (%)	Last 12 months (%)	Absence from work due to illness in the last 12 months (%)
One or both Legs	17,50%	15,00%	15,00%
Termination			
Body Regions	Last 30 days (%)	Last 12 months (%)	Absence from work due to illness in the last 12 months (%)
Head	56,25%	50,00%	31,25%
Eyes	43,75%	56,25%	18,75%
Neck	62,50%	68,75%	18,75%
Shoulders	37,50%	37,50%	12,50%
Elbows	25,00%	25,00%	-
Fist / Hands	25,00%	31,25%	18,75%
Upper Coast	56,25%	62,50%	12,50%
Lower Coast	56,25%	62,50%	12,50%
Hip / Buttock	31,25%	25,00%	-
One or both Thighs	25,00%	25,00%	6,25%
One or both Legs	56,25%	56,25%	43,75%

Table II: Pain and absences caused by pain.

In the cutting sector, the region of the body that caused the most pain in the periods of 30 days and 12 months was the head (50.00%), since this caused 33.33% of the absences in the last 12 months. Other regions that caused higher rates of absences were necks, shoulders and legs with 33.33% each, in which the same values were for the pains caused in the period of 30 days and 12 months. On the other hand, the buttocks did not cause any pain during these same periods, nor absences. In the production sector, the head is also the region most affected by pain in both periods, however it is not the one that causes more absences. Being the legs, the limbs that most causes absence. This can be justified by the fact that the production sector is the one that most uses the legs to work with machines.

Finally, in the termination sector, the neck is the region of the body most affected by pain in the periods of 30 days and 12 months, already the legs were the members that caused the most absences, this can be justified by the work that requires as ironing of the parts and packages of the same ones, being the service carried out standing.

It can be concluded that the employees in the sector of cutting and termination are the ones who suffer most with pain and withdrawal in the last 12 months. With the predominance of males in the cutting sector and female in the termination sector, it can be seen that there is no relation of pain and absences in the last 12 months with the gender, that is, the pain affects both genders. Considering that in the cut sector there is a prevalence of service time of 15 to 20 years (50.00%), it can be said that there is a high chance of the pain being related to the service time by the employee. In the termination sector, the majority (43.75%) of employees work for up to 5 years, although the age of employees varies up to 45 years, which may be related to the pain and absences of the last 12 months. This may be due to the fact that the production sector was smaller in number than the other two, this can be explained by the fact that the predominance of employees is up to 25 years and work up to 5 years in this sector of the company.

Through the scale of assessment of body discomfort one can verify what is the level of pain that the employees feel in the trunk and in the members of the body belonging left side and right side. These levels of pain are classified as: none, some, quite moderate and unbearable. Initially, the scale of assessment of body discomfort of the trunk, that is, the level of discomfort involving the neck, cervical region, upper back, middle back, lower back and basin of each sector is presented in table 3.

Cutting sector					
Body discomfort assessment scale					
Body	None	Any	Moderate	Quite	Intolerable
Neck	66,67 %	16,67 %	-	16,67 %	-
Cervical region	66,67 %	16,67 %	-	16,67 %	-
Back-Upper	66,67 %	16,67 %	-	16,67 %	-
Backstroke	83,33 %	-	-	16,67 %	-
Bottom-back	83,33 %	-	-	16,67 %	-
Pelvis	83,33 %	-	-	16,67 %	-
Production sector					
Body	None	Any	Moderate	Quite	Intolerable
Neck	43,75 %	12,50 %	31,25%	12,50 %	-
Cervical region	43,75 %	12,50 %	31,25%	6,25%	6,25%
Back-Upper	37,50 %	12,50 %	37,50%	6,25%	6,25%
Backstroke	37,50 %	18,75 %	31,25%	6,25%	6,25%
Bottom-back	43,75 %	12,50 %	31,25%	6,25%	6,25%
Pelvis	50,00 %	12,50 %	31,25%	6,25%	-
Termination sector					
Body	None	Any	Moderate	Quite	Intolerable
Neck	45,00 %	17,50 %	25,00%	10,00 %	2,50%
Cervical region	45,00 %	27,50 %	20,00%	5,00%	2,50%
Back-Upper	47,50 %	15,00 %	15,00%	20,00 %	2,50%
Backstroke	52,50 %	12,50 %	22,50%	12,50 %	-
Bottom-back	47,50 %	12,50 %	25,00%	12,50 %	2,50%
Pelvis	67,50 %	7,50%	20,00%	5,00%	-

Table III: Scale of body discomfort and absences caused by pain.

As shown in the table above, in the cutting sector about 17.00% of employees feel a lot of pain in the regions of the trunk, value close to those who feel some discomfort or pain in the neck, cervical region and upper back. These pains may be related to the cutting bench, which was not planned and has no compatible adjustment, to meet the need of each employee. However, in this sector between 66.67% and 83.33% of the employees stated they did not feel any type of pain in the trunk region and none of them reported feeling unbearable pain.

In the production sector, almost half of the employees (between 37.50% and 50.00%) report moderate to unbearable pain in all parts of the trunk. The pains are intolerable in the cervical region, back,

middle, upper and lower - all with 6.25% - already the intense pain is greater in the neck region (12.50%), and moderate pain is higher in the upper back region (37.50%), and approximately 19.00% of employees feel some sort of average back pain. These pains can be caused by the large amount of time that staff remain seated, the accent back has no shape adapted to the body for lumbar protection, there is no foot support, it suits the length of the worker's leg, the pedals and controls are not positioned correctly making it difficult to adjust the characteristics and peculiarities of the work to be performed, besides the employees are inclined under the sewing machine. Finally, the minimum 37.50% and maximum 50.00% feel no pain in the region of the trunk.

In the termination sector, there is a minimum of 45.00% and a maximum of 67.50% of employees do not feel any type of pain in the trunk region. The region that feels some type of pain is the cervical region (27.50%) followed by the neck (17.50%). The regions where the pain is moderate are the lower back and neck (25.00%), then the middle back region (22.50%). The three regions that are most affected by moderate pain are upper-back (20.00%), middle-back (12.50%) and lower (12.50%). The pains are intolerable in the neck, cervical region, back-upper and lower (2.50%). These pains may be directly related to the time that workers in this sector remain standing, there is no rest seating in places where they can be used by all workers during breaks.

As can be seen the sites of the trunk that employees most feel pain, are related to the activities of each sector. In addition, there are no programmed breaks for exercise, for example, which can greatly increase the risk of RSI / DTS.

As can be seen the sites of the trunk that employees most feel pain, are related to the activities of each sector. In addition, there are no programmed breaks for exercise, for example, which can greatly increase the risk of RSI / WMSDs.

Thus, it is emphasized that the production sector and the cutting are the ones that the employees most suffer with pains in the trunk. This may be related to the types of tasks that are required, such as repetitive sewing and ironing movements, requiring greater twisting and curving of the trunk.

Graphs were performed in software R for the pain intensity scale of each sector as a function of the upper and lower limbs, which encompasses the left and right sides of the shoulder, arm, elbow, forearm, wrist, hand, thigh and leg. Figure 4 shows the degree of pain intensity for the cutting sector.

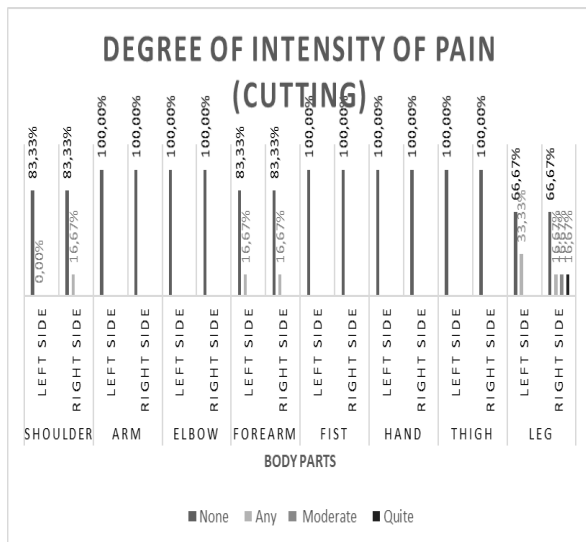


Figure 4: Degree of pain intensity for the cutting sector.

In this sector, the left side of the leg is the most affected by some type of pain according to 33.33% of the employees, then there is the right leg, the right shoulder, the right and left sides of the forearm (all with 16,67%). The pain becomes moderate and quite in the right leg (16.67%), being unbearable on the left side of the shoulder (16.67%).

The degree of pain intensity in the production sector is shown in figure 6. In this sector, every right side of the employee (except for the shoulder) suffers the most with some pain or discomfort. Nobody declared intolerable pain. The right arm is the region where 20.00% of employees reported moderate pain, followed by: left thigh (12.50%), wrist and right shoulder (12.50%). The right and left legs are the regions in which a greater number of employees feel a lot of pain, respectively 22.50% and 15.00%, which proves to be one of the members that caused the most absences in the last 12 months in this sector.

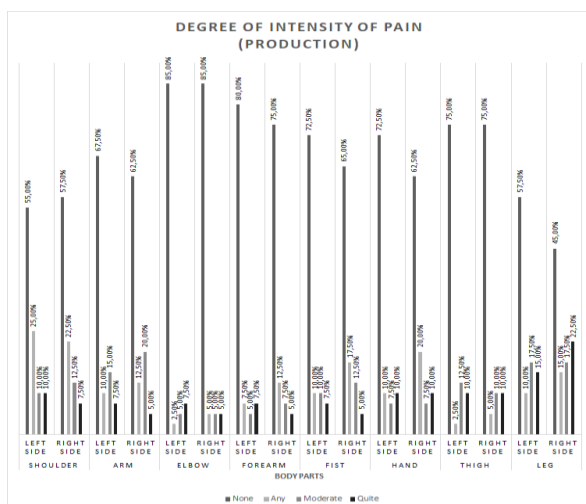


Figure 5: Degree of pain intensity for the production sector.

The final figure on the degree of pain intensity in the termination sector is shown in figure 6.

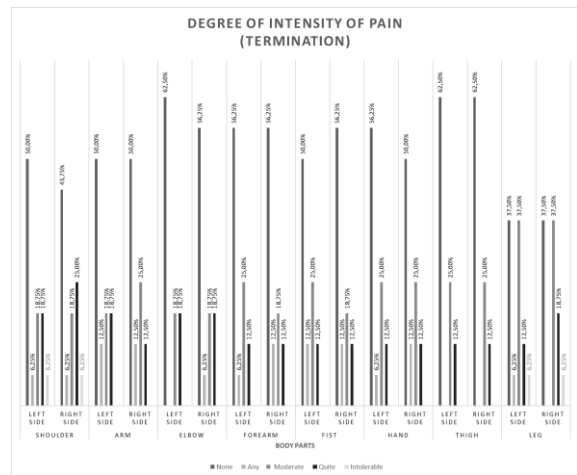


Figure 6: Degree of pain intensity for the termination sector.

In the termination sector, employees reported feeling pain on both, the right and left sides, except for the left elbow where no one reported any pain. The most moderate pains are: right arm (25.00%), and forearm and left wrist (25.00%). The right shoulder is the limb where 25.00% of employees feel a lot of pain, then they are left shoulder, left arm, both elbows, each being reported by 18.75% of employees. Finally, the intolerable level of pain was in the shoulder (6.25%). These pains can be associated with repetitive work.

The cutting sector was the only one in which employees reported experiencing intolerable pains in both left and right shoulders, which may be justified by the activity of ironing the garments, demanding to a greater degree those members. In the production sector, the members who are most affected, according to the employees are the legs, thighs and hands, all on both sides. This can also be justified by the type of activity that employees in this industry have to perform, hands are required to sew the garment parts, and although the machines are electric, leg pains can be caused by the long period of sitting, getting up just to go in the bathroom and have lunch once the water is brought to them at the work table. Finally, the cut sector is the least affected by intense limb pain, except for the left shoulder, where it was declared an intolerable pain scale, once again being linked to the activity that is to cut the pieces, requiring repetitions of the limb.

V. CONCLUSIONS

Through this study, it analyzed the levels of pain and absences of workers in a garment, as well as the regularities of the work environment so that modifications are suggested at the workplace as a way to bring greater physical health and well-being to employees.

It was verified that the female sex is predominant in the sectors of production and termination, and the male sex in the cutting sector. The prevailing age for each sector were 25 to 35 years, up to 25 years and up to 45 years for the cutting, production and termination

sectors, respectively. Finally, the prevailing time for each sector is 15 to 20 years for cutting, up to 5 years for the production and termination.

Regarding the pains, it was verified that the limbs are the members that the employees of the three sectors more pains, in the last 30 days and 12 months as it showed the scale of corporal discomfort and the degree of intensity of the pains, being also the region that caused the most absences, mainly in the cutting and termination sectors. This can be justified by the fact that both activities in these sectors have to be carried out standing, that is, in the cutting sector the activities such as cutting the pieces and in the termination sector, activities like ironing require that they be carried out standing.

It was verified the necessity of modifications and adjustments of the factors that contribute to the improvement of the quality in the work place, and that the risks of an inadequate workplace can cause musculoskeletal symptoms, absences, stress, low productivity and other health damage. It was recommended according to NR - 17 that the chairs should be adjustable to the height of the worker and the nature of the task, in addition, there must be footrest independent of the chair. And for activities where work is to be performed standing, resting seats should be placed in places where they can be used by all workers during breaks. In addition to these alterations, it was suggested intervals of 3 to 5 minutes every hour to minimize the effects of repetitive work, and that certain exercises are performed in the work gymnastics according to the activity performed at the work place.

It is very important the study carried out in the field of Industrial Engineering, allowing to suggest as many ergonomic measures as improvements in the productive systems, with results that benefit the quality and productivity of the activities performed.

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