Ergonomic Analysis of Call Center Work In A Company In City of Cataguases

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Abstract *— The call center sectors have activities that are monotonous and repetitive, with high demands on workers, consequently, they suffer ergonomic risks, leading to occupational illness in a stressful workplace, which harms the health and well-being of the employee and beyond their productivity, thus harming the company. The present study aims to analyse the risks of occupational diseases and their degree, associating employee postures with their workplace. The research was developed in a company with a telemarketing/telemarketing sector, in the city of Cataguases, Minas Gerais. Performing analyses through results obtained through the Body Diagram questionnaire, RULA method and Couto checklist, elaborating a discussion, suggesting recommendations to contribute to improvements in the company's work environment. It is concluded that the high pain/discomfort rates are caused by the postures adopted by the employees in their jobs, postures adopted due to the inadequate equipment and furniture and the layout of the place, which results in a high incidence of pain. / discomforts, which may cause future absences due to occupational diseases. Identifying thus the need for a change in the layout of the place and the adjustment of equipment and furniture, also implementing occupational gymnastics.*

Keywords — *Ergonomics, pain/discomfort, Telemarketing,.*

I. INTRODUCTION

The International Ergonomics Association [1] defines Ergonomics as a scientific discipline that links humans with other elements and systems, applying theories, principles, data, and methods to improve quality of life and our performance in the overall system environment.

According to [2], the Ministry of Labor of Brazil has been sought over the past few years by various workers 'associations and trade union entities that seek to address their associates' complaints through support and enforcement actions.

Confirmation of the complaints received regarding various types of illness at work can be observed in various international and national scientific papers. Where the reports highlight the traumas suffered by workers concerning vocal problems, hearing problems, mental and psychological illnesses in addition to work-related musculoskeletal disorders (WRMS). According [3] and [4], in 2017, 22,029 workers were removed from their activities due to illness related to WRMS, this number is 11.19% of the benefits granted by the INSS this year. These types of work illnesses mentioned are often seen in Telemarketing Services.

Considered vital to certain companies, Telemarketing / Telemarketing services require those who perform the function according to [5], expenses of various kinds, such as physical, mental and emotional expenses, which generate wear and costs for the individual. Consequently, generating problems for companies in the field or with call center sectors as the objective company of the article, such problems as absenteeism.

In view of the commercial, economic and worker satisfaction objectives, companies in the industry or using a call center, seek to comply with the terms of Regulatory Regulation No. 17, which aims to establish parameters that allow the adaptation of work to the worker, and Annex II of NR-17 - Work in Call Center / Telemarketing, approved by Ordinance No. 09 on March 30, 2007, which regulates the work of the teleoperator.

Companies are always on the lookout for business and economic growth, and with companies in the Telemarketing business or having a call center as an industry, it's no different. For these companies it is essential that employees are satisfied and motivated so that they can perform their jobs with quality and efficiency, especially being in direct contact with the customer.

For companies that only provide the telemarketing service as is the case of the target company, having a demotivated and dissatisfied employee, with high absenteeism is even more detrimental. Therefore, an ergonomically correct work environment is of utmost importance, and so the article is relevant. Because through it and the results obtained, improvements can be proposed that will increase the satisfaction and quality of service provided by the employee, consequently improving the quality of service provided by the company, thus attracting more customers to it.

The article aims to propose improvements in the work environment of a company that provides telemarketing/telemarketing services, to offer

comfort and better conditions to employees, thus preventing the occurrence of accidents and occupational diseases, adapting work to the worker. Improvement proposals are what can reduce the number of absenteeism and increase employee satisfaction, making them perform their function better and with better quality, thus increasing the quality of service of the company.

The specific objectives were: make observations during working hours and apply questionnaires to the employees of the target sector, performing analysis about the collected data, checking the furniture, equipment used and the body points where the employee feels more pain or discomfort.

II. LITERATURE REVIEW

A. Ergonomics

According to [6], although the official origin of ergonomics dates back to 1949, the year that English engineer Kenneth Frank Hywel Murrell started the Ergonomic Research Society (ERS), the first ergonomic society, the teachings that are currently used to manage ergonomics began at the beginning of human history.

According to [7], ergonomics goes through comprehensive analyses of the employee's working conditions in companies, these analyses take into account the physical work environment as a whole, including, for example, observations about lighting, acoustics, and ventilation, as well as the work tools and furniture used.

According to the Brazilian Association of Ergonomics (ABERGO), ergonomics is understood as the study of people's interactions with technology, organization, and the environment, aiming at interventions and projects aimed at improving, in an integrated and not dissociated way, the safety, comfort, well-being, and effectiveness of human activities [8].

According to [9], it is necessary to maintain a monitoring of the activities performed by employees to identify the ergonomic risks that the workplace offers so that these risks can be arranged on physical and psychological levels. Kassada et al. (2011) also state that these risks affect the physical and mental conditions of employees.

According to [10], Repetitive Strain Injuries / Work-Related Musculoskeletal Disorders (RSI) may be caused by discomfort, repetition of tasks performed during the workday, in addition to the work environment where the employee is.

[11] point out that ergonomics provides gains in the organizational process, acting as a discipline that guides human activities in the workplace.

B. Ergonomics and work environment

According to [7], due to changes in company structures, ergonomic threats are associated with the repetition of movements, due to the work routine where the employee is always interacting with machines or computers. Also, according to the author, ergonomic threats include poor posture of employees, poor lighting and exorbitant workdays, in addition to the monotony of activities.

As stated by [6], the degree of knowledge and the amount of information have significantly increased in the field of business organizations, increasing productivity and attention to the well-being and health of employees and their efficiency and effectiveness. income in performing their tasks in companies.

According to [7], Ergonomic Work Analysis (AET) has been generating relevant beneficial transformations in production environments, collaborating to obtain safer and more efficient environments.

C. Ergonomic Work Analysis

According to [10], analysing a situation in the workplace is based on studying the body movements and postures of employees, necessary to perform the work, measuring the time taken to perform the movements in the function, based on some principles of motion saving, so you can choose the method that uses the shortest execution time. It is necessary to identify the reasons that cause the problem, performing a meticulous analysis of the work done by the employee who reports suffering from tiredness or exhaustion, loss of muscle strength and / or reduced control of their movements. To correct a real service situation is to adapt to the work environment to the employee.

D. Regulation number 17 and Ergonomics

According to information in Social Security (2018), ergonomics is governed by Regulation 17 (NR-17) in the legal area.

This Regulatory aim to establish parameters that allow the adaptation of working conditions to the psychophysiological characteristics of workers, to provide maximum comfort, safety, and efficient performance. (Wording is given by MTPS Ordinance No. 3,751 / 1990).

This regulation has criteria for the conditions of the work environment, according to the characteristics of the employees, aiming to ensure that the activities are being performed safely and with satisfactory performance. The NR-17 in its specifications sets out conditions for the work environment, equipment in general, and the way the work environment itself is organized. According to NR-17, the employer must perform ergonomic analyses, as prescribed by the regulation. Also, according to [4], ergonomics is applied to all tasks performed by employees, to establish parameters for performing the tasks, according to the needs of each employee.

Regulation 17 establishes parameters for the worker, giving them benefits and comfort, aiming to ensure a safer working environment, reducing

ergonomic risks, resulting in the prevention of various problems and increasing self-esteem and the employee's physical and productive performance.

III. METHODOLOGY

The present work is characterized in descriptive research, with qualitative and quantitative approaches. According to [11], descriptive research determines associations between variables defining their nature, exposing the characteristics of a given population or phenomenon.

For this article, bibliographic research was carried out in books and articles published in congresses, as well as scientific journals.

Regulation 17 was also used to ascertain and compare the situation of the work environment in the target sector of the company that was conducted in ergonomic terms.

A. Company studied

This study was conducted in the call center sector of a microenterprise providing outsourced telemarketing/telemarketing services, located in Cataguases in the state of Minas Gerais, Brazil. The company is made up of 6 employees, all men. 5 of the employees are responsible for the call center calls and 1 employee is responsible for the management. All 5 call center employees work at 6:20 pm per day, but each employee's time in, out, and breaks vary.

In the target company for the elaboration of the article, the study was carried out in the call center sector, which is composed of 5 employees, where the customer service is performed by call, using a computer with a headset.

B. Instruments

First, the Rapid Upper Limb Assessment (RULA) method by [14] was used. According [12], it is advisable to analyse and evaluate the overload that concentrates on the upper limbs and neck during the working day, and to perform this analysis, diagrams are used, so that the amplitudes can be easily identified. movement in the joints, also evaluating the muscle work performed by the limbs. Through direct observations, this method seeks a quick screening regarding posture problems.

This ergonomic method uses scores from 1 to 7 to address risk outcomes, where higher scores mean higher levels of risk, but this high score does not ensure that a severe problem exists. Just as a lower score does not guarantee that the workplace is free of ergonomic hazards. And so, according to the score is to propose measures to be taken according to table 1.

Action Levels	Pointing	Description
1	Between 1 and 2	Acceptable posture if held or repeated for long periods
2	Between 3 and 4	Indicate the need for further investigation and changes may be required.
3	Between 5 and 6	Indicate that research and change should take place soon
4	7	Indicates that investigation and changes are required immediately.

Table 1 - Level of Actions to Take.

The second method used was the Body Diagram Questionnaire, to analyse the discomforts felt by the collaborators, identifying the causes and analysing the possible solutions. According to [13] authors of the method, the Body Diagram is represented by a body diagram divided by segments, to analyse the level of discomfort of each body part. For each of these body regions, there is a gradation ranging from 1 to 5, with a minimum value (1) indicating no pain or discomfort, and a maximum value (5) indicating pain or discomfort is intolerable.

And the last method used was the Couto Checklist, which according to [12], is a questionnaire that can be assisted by interviews, which contains 103 questions related to the characteristics of the work environment, with 19 questions evaluating the chair. work, 12 questions evaluating the desk, 8 questions evaluating the keyboard stand, 5 questions evaluating the footrest, 6 questions evaluating the document holder, 4 questions evaluating the keyboard, 8 questions evaluating the video monitor, 3 questions evaluating the case and CPU, 10 questions evaluating the notebook and accessories for use, 11 questions evaluating interaction and layout, 4 questions evaluating the work system, 8 questions evaluating ambient lighting and 5 questions evaluating the accessibility of the notebook. workplace. With this questionnaire, the employee expresses his perception about the job and the activity that it performs and in what intensity, whether it is related to their role in the company, in the organization, among others.

Each question in this questionnaire can only answer yes or no and some if not, and each question is rated at 1 or 0 points, where 1 means that there is no risk and 0 that the risk associated with the item answered. According to Couto [12], the results will fit 5 categories, where: 91 to 100% of the points the excellent ergonomic condition, 71 to 90% of the points the good ergonomic condition, 51 to 70% of the points the reasonable ergonomic condition, 31 to 50% of points the poor ergonomic condition and less than 31% of points the poor ergonomic condition.

The Couto Checklist was applied to verify the risk of occurrence of work-related musculoskeletal disorders by assessing the ergonomic conditions of the site, to identify the causes of RSI and WMSD, and thus conducting an analysis to combat and correct their conditions. possible occurrences.

The three methods will be used together to obtain higher quality results, by complementing ideas

between them, using the best evaluation points of each method. To evaluate the ergonomic conditions of the call center sector of the target company. So that improvements can be proposed for greater adaptation of the work environment to the employee.

C. Procedures

We contacted the target company of the study and explained the reasons and objectives of the study, highlighting the need for the participation of call center employees and the application of possible questionnaires to them, as well as the need for a visit to perform photographic observations and records. The direction of the study company was shown to be available for the research, as long the name was not disclosed and would not hinder the company's activities. The collaborators were contacted and explained why the research, and what its purpose was. In addition to stressing that their names will not be disclosed, the data collected will be for academic purposes only.

Two visits to the company were made, the first to be delivered the Body Diagram, where employees could take it home and return it on the next visit.

The second visit was made to perform the RULA Method through observations and photographs, to analyze and evaluate the attitude adopted by employees during the execution of their activities. On this second visit, the readily completed Body Diagram was also collected. The Couto Checklist was applied and answered online through the Google form.

After data collection through the Couto Checklist and Body Diagram, a quantitative analysis was performed using the Minitab18 software, created in 1972, the Minitab software is a program for statistical analysis. The use of this software made it possible to generate graphics that show the body parts that employees feel the most pain/discomfort and what their level is.

IV. RESULTS AND DISCUSSION

In this article, an ergonomic study of the work was done, so that the main symptoms of musculoskeletal discomforts/pains felt by the collaborators can be identified, as well as the verification of their level. In the present study, it was also verified through observations, questionnaires, and checklists, the well-being of the worker in his job. With the checks and ergonomic guidelines presented, it is expected to contribute to the health and well-being of employees in their work environment, reducing the musculoskeletal wear generated by the work performed, and maximize their productivity.

A. RULA Method

In the second visit to the study company, the RULA method was applied through photographic records and observations. This method was performed in the call center sector during working hours when one of the employees' activities was performed. The movements and postures adopted by the employee during the performance of his activity were analysed.

B. Furniture and Layout

In observing the furniture was analyzed the tables and chairs used by employees. It was found that the table has no adjustable parts, not even to elevate the computer monitor, thus forcing the employee to adapt to the work environment, and the correct would be the opposite. Also verified that the bottom of the table is very close to the wall as seen in figures 1 and 2, making it impossible for the employee to stretch the leg as needed and not allowing a better adjustment of his posture.

Figure - 1 Floor under the table.

Figure - 2 Distance from table to wall.

Regarding the chairs, it was observed that all have backrests and hand rests and that all their parts are adjustable according to Regulation 17. But it was also seen that the adjustable parts of the chairs are broken as seen in Figure 3, or defective, preventing the correct adjustment and impairing the posture of the employee.

Figure - 3 Adjustable chair with defective parts.

C. Employee Posture and Movement

In the exercise of the function, it can be observed that the employee tries to adopt a correct posture as shown in Figure 4, but is hampered by the chair that, even having an adjustable backrest, cannot be adjusted due to being defective (Figure 3). the employee's neck is slightly flexed at an angle of 10 ° to 20 °, as seen in figure 4, totaling 2 points as seen in figure 5 and table 2.

Figure - 4 Employee Position.

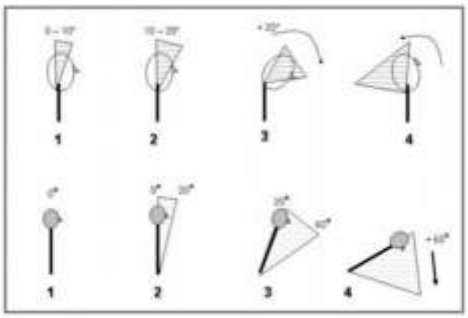

Figure - 5 Diagram of adopted postures.

Avaliation value	Description
1	For 0-10 ° bending
2	For 0-20 ° bending
3	For flexion of 20 ° or more
4	If there is extension

Table - 2 Values and Criteria for Neck Assessment.

Regarding the points, the analysis is performed through table 1 in which 2 points indicate that the need to investigate in more detail and what changes may be necessary.

In addition to the neck, the employee flexes the trunk by 20 ° as shown in Figure 4, also due to the broken backrest (Figure 3), and this flexion totals in 2 points as shown in Figure 6 and this also indicates the need to investigate in more detail and what changes may be required.

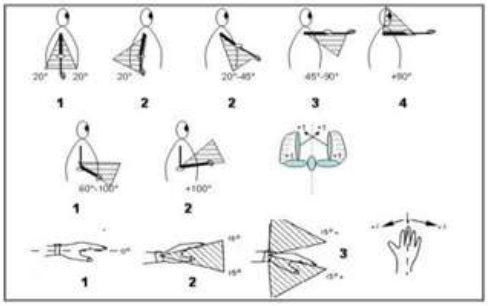

Figure - 6 Posture Diagram.

Regarding the hands and wrist, especially the right that is used for mouse handling, the employee maintains an angle of 15 ° as shown in figures 6 and 7, totaling 2 points (table 3), indicating the need to investigate in more detail and what changes may be required (table 1). This flexion is due to not using the wrist rest mouse support.

Figure - 7 Employee Position.

Avaliation value	Description
1	In neutral position
2	for flexion or extension between 0-15 °
3	for flexion or extension above 15 °

Table 3 - Values and criteria for pulse evaluation.

D. Body Diagram Questionnaires

The Painful Areas Diagram, applied to the 5 employees in the sector of the study company, showed a higher level of pain or discomfort in the upper body areas: neck, upper back, middle back, lower back, shoulders, arms, forearms, fists, and hand. And the lower level of pain or discomfort in the lower areas, namely: thighs, legs, ankles, and feet. However, the pelvis even being characterized as lower body area had greater pain intensity than several upper body areas such as the arm and forearm.

At the highest pain or discomfort intensities in the Pain Area Diagram (severe pain, intolerable pain), the highest percentages of the left body questionnaire are concentrated in the areas: lower back 80% is a lot of pain or discomfort, wrist with 40% of a lot of pain or discomfort. The areas: midcoast, pelvis, forearms and ankles had 20% of severe pain or discomfort. And the areas: neck, lower back, and left-sided arms both had 20% intolerable pain or discomfort intensity.

On the right side of the body, in the evaluation of the questionnaire, it can be noted the decrease in the percentage of severe pain or discomfort in the areas: lower back to 60% and wrist with a decrease to 20%. And also decrease in the intensity of pain or intolerable discomfort in the area: arms, to 0%.

Regarding the highest intensities of pain or discomfort (severe pain, intolerable pain), the only area of the body that presented increase was: hip, ranging from 20% to 40% of severe pain. It can be noted that most indices on this side of the body are lower, due to the right side becoming more static, most of the time responsible for mouse handling only.

The left side, in addition to moving to perform typing, is also responsible for handling the volume and mute buttons of the headset. In addition to the work's tasks performed by the employees, it was observed through the RULA method that all employees leave their water bottles on the left side of the table, thus obliging them to use the left side of the body for one more task, to take Water. However, it may justify the higher percentage in the higher intensity of pain on the left side of the body.

Because the collaborators work seated all the time, it is noted that the highest percentages in the highest pain intensities are concentrated in the upper areas of the body.

E. Couto's Checklist

The Couto checklist used was: Check-List for Evaluation of Ergonomic Conditions in Computerized Workstations and Environment, this specific checklist was chosen because it is the most appropriate concerning the activities developed in the studied workstation. It is a tool that analyzes the biomechanical risk factor for musculoskeletal disorders about work through a series of questions.

The scores at or below 50% that for Couto [12], have the worst ratings were: Chair Rating with 43.16% of points, Desktop Rating with 43.33%, Keyboard Support Rating with 40%, Briefcase Rating 23.33%, Keyboard Rating 50%, Interaction and Layout Rating 43.63% and Site Accessibility Rating 24% of the points. Of these, 5 of these characteristics of the study were evaluated as having the poor ergonomic condition and 2 of these characteristics as a poor ergonomic condition.

With the results obtained in the application of the checklist, it is evident that ergonomic measures must be taken so that eventual absences due to occupational diseases can be avoided.

F. Ergonomic Recommendations

In the course of this study, it is recommended to adapt the furniture and computers of the workplace studied, replacing and adding some items, respecting Regulatory Regulation 17. Make adjustments to the layout of the place, for example moving the tables from the walls respecting the anthropometric particularities. of employees. These adjustments are recommended, so that employees do not have to bend and do not necessarily have to keep their knees bent to perform their work, enabling them to adopt correct postures, to perform with good practice. occupational health the predestined service.

It is also advisable to insert in the company routine a program of occupational gymnastics, because according to [16] with the main objective of protecting employees from work-related illnesses, occupational gymnastics can be performed in the office environment, every day, or three times a week, between 8 to 12 minutes, during working hours service.

V. CONCLUSIONS

This study is relevant because ergonomics is significantly related to Production Engineering since the safety and quality of life of employees are related to the companies' planning, especially so that they can ensure quality and productivity. For the preparation of the study, data from the work environment and 5 employees of the telemarketing/telemarketing sector were collected and analyzed through the RULA Method to observe and score the posture adopted by the employees, from the Body Diagram Questionnaires to analyze the discomforts. felt by the employees identifying the causes and analyzing possible solutions and the Couto Checklist to verify the risk of work-related musculoskeletal disorders. Thus, assessing the ergonomic situation in which the company finds itself, checking their ergonomic needs in the target sector of the study, to propose ergonomic changes of work.

This study concludes that the research target company has ergonomic deficiencies, which impair the health and welfare of employees, thus compromising their productivity.

It is also concluded that the ergonomic demands of the telemarketing / telemarketing sector are considerable factors for pain and discomfort,

resulting from a bad posture adopted by employees, caused by inadequate furniture and work devices, showing a more severe discomfort in the upper body and pelvis that even being characterized as a lower body is a reason for complaints from employees throughout the research. Thus, the suitability of the work environment layout is proposed, as well as the suitability of the furniture and equipment used. It is also proposed to introduce an occupational gymnastics program, which should be implemented in the short and medium-term.

It is concluded that ergonomics must be present and intervene to improve the adequacy of the work environment to the worker. The study has relevance to contribute to the scientific environment and the research target company, because it was possible to realize the importance of ergonomic analysis within a company, as it is an important subject for accident prevention. and reduction of health problems resulting from activities in the workplace, considering that ergonomics is not only linked to the integrity and well-being of employees in the workplace but also their productivity and consequently to the quality of their work. products or services provided by companies.

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