



ERGONOMIC STUDIES AND ANALYSIS OF LIBRARY WORKSTATIONS AT THE UNIVERSITY LOCATED IN MARABÁ-PA

Danilo Alcântara Milhomem (daniloalcantaramilhomem@gmail.com; UEPA)

Jessica Eskalete Santos de Oliveira (jersica.eskarlete@gmail.com; UEPA)

Kildare Carlos Duarte Segundo (kildaresegundo@gmail.com; UEPA)

Luciana das Costa de Araujo (luciana.araujo.eng@hotmail.com; UEPA)

Melissa Lara Porto (melissalaraporto@hotmail.com; UEPA)

Summary: Daily work carried out in adverse conditions, over time, can trigger the emergence of various problems, such as physical or mental health, which is why companies must understand the relationship between working conditions and their possible effects on employee performance. Therefore, the general objective of this work was to analyze the ergonomic aspects of workstations at the University library, located in the municipality of Marabá-PA, in order to diagnose problems and propose improvements in this sector. The specific objectives are: checking the operational, environmental and organizational conditions of the workplace. Through Ergonomic Work Analysis, using tools such as computers and questionnaires, it was possible to confirm the importance of Ergonomic Work Analysis in the workplace. Therefore, problems related to posture, furniture and environmental conditions were identified in the library. This article details the ergonomic problems and subsequently the solutions for them, with a view to the great benefits that the improvements would provide for the employee, directly impacting their performance in carrying out tasks.

Keywords: Ergonomics, Ergonomic Work Analysis, Library.

1. Introduction

The study of ergonomics appears to help define the appropriate space for carrying out workers' tasks in a safe and quality manner, influencing companies' productivity (IIDA, 2005). The work present here has a very broad meaning, covering not only those carried out with machines and equipment, used to transform materials, but also the entire situation in which the relationship between man and a productive activity occurs, focusing mainly on physical and cognitive systems.

Daily work carried out in adverse conditions, over time, can trigger the emergence of various problems, such as physical or mental health, which is why companies and information units must understand the relationship between working conditions and their potential impacts on employee performance. For Prates (2007), the issue of seeking quality of life at work is linked

to improving productivity, since the combination of satisfied and healthy employees with the appropriate work environment and technology provides positive growth for any organization.

Therefore, the general objective of this work was to analyze the ergonomic aspects of workstations at the University library, located in the municipality of Marabá-PA, in order to diagnose problems and propose improvements in this sector. The specific objectives are: checking the operational, environmental and organizational conditions of the workplace.

The importance of the study is justified, as it involves the search, through analysis, for a project suited to local climatic conditions, and the inherent needs of the activity carried out by the employee, aiming to optimize the elements that make up and directly participate in improving quality of life. of the workstation user.

2. Theoretical Reference

2.1 Ergonomics

Iida (1992), points out that ergonomics is a relatively new science, although man has sought to adapt tools and utensils for everyday use since ancient civilizations, however the origin and evolution were defined by socioeconomic transformations and mainly by technological evolution. Ergonomics can also be defined as the set of sciences and technologies that seek to adapt work to the physiological and psychological needs of the worker, that is, a harmonious relationship between man and his respective work.

For Couto (1995), ergonomics is a set of sciences and technologies that seeks comfortable and productive adaptation between the employee and his work, basically seeking to adapt its conditions to the characteristics of the human being.

2.2 Ergonomic Work Analysis (AET)

For Guérin et.al. (2001), activity analysis has a broader spectrum than mere ergonomics tools bring. These cannot provide a description of the activities, nor their understanding. In this way, they do not highlight the interactions between the different components, placing problems of physical dimensions, time constraints, lighting, cognitive activity, among others, on the same plane.

AET comprises three phases: demand analysis, task analysis and activity analysis. The first phase is to define the problem to be studied, from the point of view of the people involved. In the second phase, environmental, technical and organizational working conditions are analyzed. In the third phase, human behavior at work is analyzed, which can be gestural, informational, regulatory and cognitive.

According to Gaigher (2001), the ergonomist must analyze the functioning of a given company through open observations and check whether there are constraint relationships in the work situation. From there, a diagnosis can be made and then an observation plan can be made in order to verify the solution hypotheses.

3. Methodology

The methodology used for the research was field study, which was developed in two stages. Initially, the strategy adopted aimed to identify and analyze the problems experienced by librarians in their jobs, based on exploratory research into real work situations, carried out with workers through interviews carried out in their places of work. work or with focus groups. The second stage was to identify and classify the nature of these problems and difficulties, which constituted the basis of the quantitative research instrument (questionnaire), adopted in the next stage.

Field research is characterized by investigations in which, in addition to bibliographic and/or documentary research, data is collected from people, using different types of research (ex-post-facto research, action research, participatory research, etc.) (FONSECA, 2002).

Synthesis of the workstation: the workstation must be designed according to its productive functionalities, taking into account the height and weight of the library security guards and supervisors.

Basically, what was examined in the job were the following aspects:

1. Relationship of employees with the job studied;
2. Relationship of employees with machines/tools and materials;
3. Influences of ecological factors (temperature, humidity, ventilation and light).

3. Case study

3.1 Demand Analysis

The functions of employees in the library are: serving students and organizing the collection of books that occupy the sector, issuing and receiving books. This workstation has very little equipment, increasing employee participation in the process.

For 7 (seven) days, activities carried out in the workplace (Library) were monitored, in addition to interviews with librarians, and it was possible to observe some situations described below:

Table 1- Library Overview

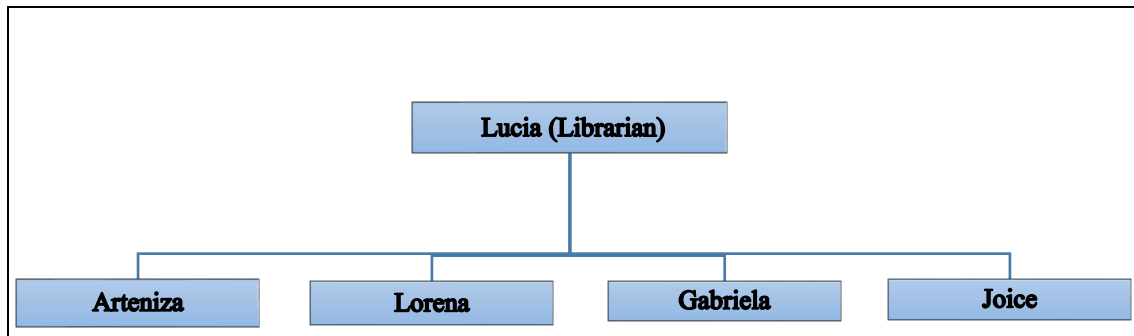
Occupational diseases	There was no record of any type of Occupational Diseases (at the workplace);
Work accidents	No type of accident was recorded in the workplace, although librarians say there is a risk, for example when picking up a book, the shelf could fall and hurt someone, but this risk is minimal;
Absenteeism rates	Absences occur for reasons outside of working in the library, for example: a cold, or in the case of interns during exam periods;
Productivity Indexes	A list of how many books are issued per day and per month is filled in.

Source: Authors, 2015.

According to the demand analysis, a workplace was identified without major problems with accidents and illnesses, but only with the need to adjust the physical arrangement of the place and adapt chairs, tables and counters.

Figure 1 shows the company's organizational chart, which is made up of 5 people, one of whom is the leader, Lucia, who delegates and monitors the tasks of the other employees. The others: Joice, Gabriela, Lorena and Arteniza are in charge of the operational part.

Figure 1: Organizational chart



Source: Authors, 2015.

3.2 Task Analysis

3.2.1 Data relating to the worker

The function of the operators is to provide services to the university with regard to the library, helping students search for books based on authors or name of the work, and also maintaining order within the library, that is, they are responsible for both the organization of books and the place and for maintaining silence in the place. At the time of re-enrollment they provide the “Nothing appears” a type of document that proves that the student does not have any outstanding issues (books to be returned to the library). The work does not require many standards and specifications such as the use of uniforms or PPE, but it is necessary to maintain ethical and moral behavior within the institution.

3.2.2 Division of Labor

The library recently underwent a redesign, and previously they worked with desks (they still use them today when the system doesn't work), and currently they have a computer system available that allows students to search if the book they need is available in the library, Doing this from anywhere as long as you have a device that accesses the internet. In the current model, students go to a counter where employees are located and request the book they want, this would become a bottleneck if there is an increase in demand for books. At this counter, workers spend most of their time sitting, but alternate activities, sometimes being necessary to get up and walk around, whether to look for or organize a book, or even to go to the office.

The work shifts are: morning, afternoon and night, the schedules are distributed below in table 1:

Table 1 - Shifts

Names	Schedules
Arteniza and Gabriela	8am to 2pm
Lorraine	2pm to 6pm
Joyce	6pm to 8pm

Source: Authors, 2015.

Despite the distribution made on the board, it is necessary to remember that the interns are monitored for 2 hours, that is: Joyce and Gabriela, and this monitoring can be done by both Arteniza and Lorena. When carrying out tasks there is no break, however librarians say that there is no problem with this, as the work is not tiring. Work takes place from Monday to Friday, with only Saturday and Sunday or public holidays off.

3.2.3 Career path

Table 2 shows the salary categories, which are different, but there is no career plan or possibility of professional development in the job. There are different isolated positions (remnants of competitions or contracts).

Quadro 2 – Categoria salarial

Employee	Salary
Joice and Gabriela (interns)	R\$ 516,00
Lorena (contractor)	R\$ 1354,00
Arteniza (public candidate)	R\$ 1354,00
Lúcia (public candidate)	R\$ 4000,00

Source: Authors, 2015.

3.2.4 Anthropometric Data

Table 3 shows the anthropometric data of the library employees:

Table 3 – Anthropometric data

Anthropometric data	Arteniza	Lucia	Gabriela	Lorraine	Joyce
Age years)	29	52	19	23	20
Sex	Feminine	Feminine	Feminine	Feminine	Feminine
Height	1.65	1.7	1.75	1.72 m	1.82 m
Weight	69kg	60 kg	59kg	83 kg	62 kg
Normal Range	38 cm	41 cm	44 cm	40cm	43cm
Maximum Range	61 cm	67 cm	68 cm	66cm	71 cm

Source: Authors, 2015.

It is worth mentioning that the anthropometric data of the librarians are, in general, very close. Only two values could be considered as “outliers”, they are the weight of 83 kg and the height of 1.65 m.

3.2.5 Data Regarding Physical Environmental Conditions

The environmental conditions are considerably good, and the temperature is pleasant, except for some eventualities in which the air centrals are faulty. The environment has no noise, gases, vibrations or vapors. In the same location as the library there is the auditorium where some lectures and presentations are given, and the environment should be exclusively that of the library and therefore without any type of noise. Due to the fact that there is an auditorium in the library, the space available for students to sit and study is reduced, making it sometimes necessary for the student to pick up the book and go to another location to study or research. The lighting in the library, according to the librarians, during the day is good, but at night the lamps do not illuminate the place adequately and the environment becomes dark.

What can cause pain or muscle injuries is the fact that employees sit for a long time and the chairs and seats are not fully adjustable (this feature would allow for changes in posture). The structure of the shelves is shaking, which could cause an accident if the shelf collapses. The counter is shaped like the letter U (considered ergonomic), however this space is shared by two people and in this situation there is a space restriction.

3.3 Results

3.3.1 Activity Analysis

3.3.1.1 Ergonomic Diagnosis

Factors that affect the analyzed workplace and the workers there are: the counter with little space to accommodate two people; The fact that the workplace is used as an auditorium also causes discomfort, as in addition to reducing library space, it prevents a greater number of students from using the environment.

A condition that can cause pain and musculoskeletal injuries at the workplace is posture. In the case of the library, the employees' postures are: standing and sitting. The first can require a lot of muscular effort as employees constantly need to look for and put away books as well as clean the shelves and organize them. The second can cause discomfort if the period of immobility is long, as the chairs are not fully adjustable (although they are height adjustable).

The actions analyzed (student assistance, registering books in the system, transporting and collecting them, cleaning shelves, among others) are characterized as dynamic. The lighting at night is of poor quality, causing great visual discomfort for students and staff. The tables have adequate heights, however, some are uneven and this makes it difficult for students to study and complete their tasks.

3.3.1.2 Ergonomic Recommendations Specifications

A greater number of shelves made of resistant material are recommended (current shelves shake a lot and the material is fragile). More space is needed on the counter (approximately 2.64 m wide), as the actual size does not accommodate two employees comfortably and therefore this distribution of space for leg accommodation must be reviewed in order to carry out lateral movements of the counter. body.

Another important recommendation is to review another environment for the auditorium, which shares space with the library, in order to make better use of the space occupied by providing a larger and specific environment for studying. By inserting quality lamps, it is possible to improve ambient lighting at night.

The height of the work surface (counter) and the maximum and minimum hand reach are in accordance with the recommendations and definitions of ergonomic factors and requirements for activities. Foot accommodations are necessary for shorter employees if the seat is too high. And finally, it is recommended that chairs are adjustable to make it easier for users to change their posture, and tables need to be properly leveled.

4. Conclusion

In view of the AET developed in the library, it is concluded that ergonomics is of great importance in the day-to-day lives of workers, with science being responsible for developing and determining the best methods for carrying out activities, so that fatigue, tiredness and injuries occur in a very small number or even disappear from the work environment.

This article proves the importance of ergonomic work analysis to diagnose and propose solutions in work environments. It is worth mentioning that the proposals for modifications made in the specifications are practical solutions that do not require a large investment (although it is necessary to make some to acquire new chairs, counters and shelves, these materials generate impacts more focused on librarians), but just a reorganization of the environment.

The library, being a work area considered calm, did not demonstrate alarming situations regarding ergonomic disadvantages, just risks of falling shelves, and chairs that do not allow a good variation in posture. The anthropometric measurements of the librarians were collected to measure the maximum range of their respective movements, and with these data it can be stated that despite the limitations in workstations and situations that are in line with ergonomic

philosophy, the collaborators are able to perform their tasks. functions efficiently, however they may suffer from fatigue caused by inadequate posture.

As a proposal for new work, it is suggested that a more refined statistical study of anthropometric measurements be carried out at the university, specifically aimed at classrooms, for two reasons: firstly, because the sample is larger (number of students), secondly, because with this study it is possible to determine dimensions (of chairs, tables, laboratory benches...) that are comfortable for the majority of students.

Bibliographic references

COUTO, Hudson de Araújo. **Ergonomia aplicada ao trabalho: manual técnico da máquina humana**. Belo Horizonte: ERGO Editora, 1995.

FONSECA, J. J. S. **Metodologia da pesquisa científica**. Fortaleza: UEC, 2002. Apostila.

GAIGHER, W. F; MELO, S. I. L. **LER/DORT A psicossomatização no processo de surgimento e agravamento**. São Paulo: LTr, 2001.

GUÉRIN, F. et al. **Compreender o trabalho para transformá-lo: a prática da ergonomia**. São Paulo: Edgar Blucher, 2001.

IIDA, Itiro. **Ergonomia projetos e produção**. São Paulo: Edgar Blücher Ltda., 1992.

_____. **Ergonomia: projeto e produção**. 2 ed. São Paulo: Edgard Blüncher, 2005.

PRATES, Glaucia Aparecida. Reflexão sobre o uso da ergonomia aliado à tecnologia: Propulsores do aumento da produtividade e da qualidade de vida no trabalho. **Racre – Revista Científica Eletrônica de Administração**. Esp. Sto. Do Pinhal - v. 07, n. 11, jan/dez.2007. Disponível em: <<http://www.revista.inf.br/adm09/pages/artigos/ADM-edic09-anov-art01.pdf>> Acesso em: 6 de Outubro de 2015.