REVISTA Ação Ergonômica

R. Ação Ergon., 17(2), 2023.
ISSN 2965-7318. doi: 10.4322/rae.v17n2.e202311.en

PARTICIPATORY MANAGEMENT IN ERGONOMICS AND THE WORKER'S PROTAGONISM: AN EXPERIENCE REPORT IN A FURNITURE INDUSTRY IN RIO GRANDE DO SUL

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Abstract

This article is based on an experience report of participatory management in ergonomics, as an important measure of workers' commitment to actions and results. The objective was to describe the results of the application of the Ergonomic Checkpoints questionnaire: practical and easy-to-apply solutions to improve safety, health and working conditions. The study site was a furniture industry in the greater Porto Alegre area (Rio Grande do Sul). The questionnaire guided the ergonomic issues and integrated the vision of the multidisciplinary group, composed of workers from the packaging sector, representatives of the Internal Accident Prevention Committee and the Specialized Service in Safety Engineering and Occupational Medicine, the mechanical maintenance sector, production engineering, managers and ergonomics professionals, totaling 10 participants. The study is classified as observational and descriptive. Regarding the procedures, it is characterized by being an experience report with an approach to the problem under the qualitative paradigm. The results highlighted the importance of participatory management through the use of a simple tool that guided the analysis of the problems and actions that were implemented. Improvements were made in the organization of work and the environment, in addition to facilitating and mitigating the greatest risk found, which was product handling. Also in terms of results, financial gains were assessed, although this was not the primary objective of this study group. The gains are related to the reduction of handling and transportation of loads and optimization of production processes.

Keywords: Furniture industry; Participatory management; Macroergonomics; International Labour Organization ergonomic checkpoints.

1. INTRODUCTION

Occupational Health and Safety (OSH) practices in companies aim to seek the well-being of workers, the prevention of accidents, illness at work, as well as the optimization of work and its results. The attention of prevention professionals is of paramount importance for companies that are characterized by manufacturing, such as the furniture industry, considering the number of workers involved in industrial processes. In this context, the furniture industry

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in Brazil, according to the Brazilian Association of Furniture Industries (ABIMÓVEL, 2023), has approximately 18 thousand companies, 80% of which are located in the South and Southeast regions. The Brazilian furniture industry, in 2021, directly and indirectly employed 270 thousand workers in the production of furniture, representing the eighth chain that generates the most jobs, being responsible for 1.2% of the Gross Domestic Product (GDP). The Association of Furniture Industries of Rio Grande do Sul (MOVERGS, 2022) highlights that the state of Rio Grande do Sul is the second largest furniture producing state in the country, with approximately 2,400 furniture industries that generate 37.4 thousand direct jobs.

Considering the number of workers in the furniture industry, one of the strategies to obtain results in the area of OSH is participatory management. Costa and Lionço (2006) state that the subjects, in the exercise of participatory management, sustain the meanings of their own experiences, being the protagonists in the clarification of their social realities and their strategies to promote quality of life and in line with their values and social coexistence. In this line of conduct, the updated view of Occupational Risk Management (GRO) provided for in the new Regulatory Standard (NR) 01 (2020), indicates that prevention work must be integrated at all levels of the company. This approach includes operators up to management levels, with the aim of strengthening the health and safety culture in companies (MULLER, 2021).

A more horizontal action, based on the integration of all the actors involved in solving problems, becomes a tool to cover a greater number of workers. In the context of the company that is the focus of this case report, the ergonomics management process has been taking place for approximately 20 years, and it is possible to infer that in these years, there has been an important transformation process in the organizational culture, as the view of ergonomics has become part of the company's daily life. Ergonomic performance is based on macroergonomics, with the active participation of all organizational actors, especially workers. Ergonomics with a macroergonomic view, according to Hendrick (1990), focuses on the human being, the environment, the machine, the work process and the organization, aiming to optimize the functioning of these interfaces. Macroergonomics seeks ergonomic improvements with the active participation of workers through tacit knowledge with the objective of building the most appropriate solution to ergonomic problems as a team.

Regarding the identification of ergonomic demands, NR 17 (MINISTRY OF LABOR AND SOCIAL SECURITY, 2021) advises the evaluation of the organization of work, the lifting, transport, and individual unloading of loads, the furniture of workstations, work with machines, equipment, and hand tools, as well as the comfort conditions in the work environment. In the ergonomic approach, Iida and Guimarães (2018) highlight that it covers all

situations in which the relationship between the human being and a productive activity occurs. In this sense, with the objective of simplifying the concepts and applications of ergonomics in the daily lives of workers and to guide the search for improvements, the Ergonomic Checkpoints questionnaire proposed by the International Labor Organization (ILO) and translated by Fundacentro was used as a tool. The questionnaire was developed to be used by teams that seek to apply improvements to working conditions, based on practical solutions to ensure safety, health and efficiency (ILO, 2018).

The questionnaire, revised in 2018, covers the main ergonomic factors of the workplace, which are organized by categories in the following subjects: the storage and handling of materials; hand tools; the safety of the production machinery; the design of workstations; lighting; the facilities; the control of dangerous substances and agents; the places and facilities of service and the organization of work. It is observed that in this context, where workers were the main protagonists of the analysis and implementation of improvements, the ILO tool was essential, due to the simple and didactic way in which it presents the ergonomic issues to be verified, including the organization of work.

In the case of this study, the use of the questions proposed by the ILO was adjusted based on the needs of the company, sector and/or ergonomic demand. In this way, it is possible to use it to guide the search for solutions for a specific objective that meets the categories proposed in the questionnaire. It is noteworthy, however, that the expertise of each worker brought specific knowledge to propose solutions and the integration of actions that guided the most appropriate solutions for each situation. In view of the importance of workers in the macroergonomic approach as a means of transforming the organizational culture, the following research problem is presented: can an approach directed through a questionnaire contribute to facilitate the interaction of ergonomic concepts with the experience of workers in the search for ergonomic improvements?

Thus, the objective of this study is focused on describing the experience of using the ILO questionnaire for the development of ergonomic improvements in the packaging sector in a furniture industry, with the worker as the protagonist of ergonomic actions. As for the objective, the study is classified as observational and descriptive and as for the technical procedures, it is characterized by being an experience report with an approach to the problem under the qualitative paradigm.

The meetings to discuss ergonomic demands and application of the ILO questionnaire were attended by 10 workers, including representatives of the packaging sector of a company

in the furniture industry, representatives of the Internal Commission for the Prevention of Accidents (CIPA) and the Specialized Service in Safety Engineering and Occupational Medicine (SESMT), from the mechanical maintenance sector, production engineering, managers and ergonomics professionals. As for the data collection instrument, a block of questions from the ILO Ergonomic Checkpoint was selected, related to the handling and storage of materials. This demand was previously identified in the Ergonomic Analysis of Work (AET) in the packaging sector. Another step carried out, which complements the application of the questionnaire, was the visit of all members of the group to the workplaces, to analyze the activities of the packaging sector and thus provide a more focused experience for the search for solutions to ergonomic problems.

The analysis and discussion of data was carried out through data triangulation, based on the concepts proposed by Minayo, Assis and Souza (2005). The authors describe by data triangulation, the interlocution of different points of view that allows in a practical way the interaction, criticism and comparison between knowledges to allow a synthesis of the collective construction.

2. DEVELOPMENT

In view of participatory management in ergonomics and the role of the worker in the process of analysis and discussion of ergonomic improvements, the Ergonomic Checkpoints questionnaire proposed by the ILO (2018) was used. The tool provides the opportunity for a participatory approach and aimed to assist in the resolution of ergonomic problems. In this way, bringing together more and more workers who are part of the areas of the industry to exchange experiences and knowledge. In this sense, Iida and Guimarães (2018) highlight that participatory ergonomics involves the system user himself in solving ergonomic problems by considering that users have practical knowledge, the details of which may go unnoticed by the analyst or designer. The proposal to apply the ILO questionnaire arises due to the fact that the methodology advocates practical solutions that are easy to apply in daily work, through a systematic analysis carried out by a discussion group.

The objective of applying the ILO questionnaire to workers and the multidisciplinary team was focused on providing a participatory experience of analysis and discussion of ergonomic problems and the search for improvements. To this end, monthly face-to-face meetings and *on-site analysis* of the work activities of the packaging sector of a furniture industry took place. The proposal of the questionnaire was clarified, and one of the differentials

was to count on the participation of workers from other sectors to add experiences and share the good ergonomics practices already implemented.

The focus of this study was the packaging sector, which in terms of ergonomic problems, according to the Ergonomic Analysis of Work, is centered on product handling. Biomechanical risks are caused by weight/force overload and critical postures of spinal flexion and rotation during product handling. According to Kroemer and Grandjean (2005), the handling of loads such as lifting, lowering, pushing, pulling, carrying, holding and dragging, can involve static and dynamic effort, which characterizes it as heavy work. According to the ILO's Ergonomic Checkpoint 15 (2018), turning or tilting the trunk are unstable movements, the worker loses more time and ends up more tired than when performing the same work without these movements.

Associated with the handling of products, the main complaints reported by the workers were focused on the corridors blocked by excess of materials from the Shipping sector. This situation generated extra physical effort, as it made it difficult to manually load the products, especially when repairs were carried out. In this case, the products were loaded above shoulder level, due to the restricted physical space, to the repair machine that was far from the packaging area.

To meet the demands centered on the handling of products, block 1 of the Ergonomic Checkpoints, proposed by the ILO, which evaluates the handling and storage of materials, was chosen. This block consists of 21 questions that aim to assess the possibilities of mitigating inappropriate postures and physical exertion, as well as improving the safety of the work environment. Each meeting lasted one hour, where initially the questions proposed in the questionnaire were read, and afterwards, a visit to the sector was carried out to clarify doubts and evaluate together with the workers the proposals for improvements.

3 monthly meetings were proposed, which took place in the months of July, August and September of 2022. The demands were forwarded and in the first month, several actions were carried out, and at the end of the third month, it was found that the processes of the Packaging stage were more organized. Among the actions carried out are: removal of ready-made products that were occupying the space around the machine and obstructing the aisles; the plastic coils were stored in a place near the winch, avoiding manual transport; the cardboard angles were identified and organized to facilitate the work activity; pallet racks were installed for better use of physical space; a sewing machine was installed to repair the products next to the packaging machine to avoid handling the products; the aisles near the machine were demarcated to avoid

pallets of finished products in inappropriate areas; the plastic scrap disposal cage was relocated elsewhere to ensure the aisles remained unobstructed; The plastic sealing machine was put to the test to correct the flaws in the plastic closure carried out automatically by the equipment. This measure avoids handling the mattress to repack, in addition to the waste of plastic in the new packaging.

Figure 1 shows the situation before (1A) and after (1B) the improvements made: such as freeing up the aisles and removing pallets of products in the circulation area and placing shelves for stock, which provided more space and improved the organization of the sector.

Figure 1 – Before and after the organization of the physical space of the packaging

Source: Authors, 2023

The Production Engineering sector evaluated the improvements made in order to measure the financial gains. In this context, Hal Hendrick, in an international lecture held in 1996, emphatically mentioned that "good ergonomics is good economy" (HENDRICK, 2003). This bias allows ergonomics, related to the productive sector, to be accepted also when proving the favorable cost/benefit ratio. The result can be seen in Chart 1, where it is possible to identify the improvement and the gain obtained.

Table 1 – Improvements and gains obtained

Improvement description	Gain Obtained
The plastic coils were stored in a place near the winch, avoiding transport.	Displacements were avoided and the approximation of materials was improved, resulting in daily savings in the number of changes and in the time involved to carry them out.
The electric hoist was replaced by a more robust structure, making it possible to increase the weight of the plastic coils from 50 kg to 100 kg. The weight of the plastic was unified, thus eliminating 12-micron plastics.	By unifying the plastic weights to 10 microns, the physical space was improved as fewer storage pallets were needed around the machine. With the unification of plastics, we had savings of R$9,438.59 per month with materials.
A sewing machine was installed to repair the products next to the packaging machine to avoid handling the products.	Monthly savings of R$424.75 with the reduction of product movement.
The plastic sealing machine is being tested to correct the flaws in the plastic closure carried out automatically by the equipment. This measure	Monthly savings of R$819.06 with materials, as it avoided plastic waste with packaging.
It avoids handling the product for repackaging, in addition to the waste of plastic in the new packaging.	
Total savings/month	R$ 10,914.44

Source: Authors, 2023

Although the initial objective of the ergonomics project was not centered on achieving financial gains, it is important to highlight that ergonomic improvements represent a win-win for companies. Working conditions improve and allow workers to perform their activities more easily and comfortably, as well as with less physical and biomechanical constraints. The company, on the other hand, saves in terms of time, with unnecessary material handling.

The loss due to movement and the loss due to transportation are described by Shingo (1996), who identifies the seven production losses, which include: losses due to overproduction, losses due to transportation, losses due to overprocessing, losses due to manufacturing defective products, losses due to waiting, losses due to movement, losses due to inventories. In the Packaging sector, the transport or movement of materials was optimized by bringing the sewing machine closer to perform the repair, and by using equipment to manually correct the failure in closing the plastic package. In both situations, the product was handled, causing physical overload in the performance of the fault correction. By eliminating handling, there is an increase in the time in which workers perform activities that are intended to add value, based on the total time they are in the organization (ANTUNES *et al.*, 2008).

In addition to the gains related to the process, satisfaction was expressed with the improvements in the activity and work environment of the team of workers at the Packaging. This was manifested in the opinion survey with the workers, carried out to understand their

perception of the improvements made. Next, two testimonies of the opinion survey on the improvement implemented to organize the physical space of the Packaging are presented. The results were expressed as follows: "The physical space has improved, the shelves have become good and so has the sewing machine", and "I think it's looking great! The sector is getting organized, the physical space has increased, and with the sewing machine for repair it has become more practical". In terms of suggestions for improvements, in addition to those already implemented, it was exposed that: "there could be a table to facilitate the removal of the product at the end of the package", "have one more fan and one more time clock to pass the badge". Based on this feedback, improvements will continue to be implemented, configuring a continuous process of improvements in ergonomics and participatory management. From the results of the opinion survey, the validation of the improvements implemented by the study group in the packaging stage was successfully obtained.

The methodology of an interactive and participatory approach, with the protagonism of the workers, will be applied in other specific demands of other sectors of the same industry. So far, the methodology has been applied in two other sectors of the furniture industry, to meet specific ergonomic demands with different work groups. In both situations, the positive results in working conditions and compliance with NR 17 stand out. Thus, it was observed that the use of the questionnaire proposed by the ILO, associated with the macroergonomic and participatory approach for the development of improvements, facilitated the understanding of the appropriate concepts and methodologies adapted to the reality of the company and the workers, considering the assumptions of NR 17.

3. CONCLUSIONS

The purpose of this study was to evaluate the results of a directed approach through a questionnaire and its contributions to facilitate the interaction and approximation of the concepts of ergonomic practice, considering the experience and protagonism of workers in the search for ergonomic improvements. It is believed that a single method alone does not guarantee that the objectives of the study will be achieved. Thus, the approach used was successful, by associating the macroergonomic view, which provides for the participation of workers in all phases of the ergonomic assessment process, added to the systematized proposal of the questionnaire, with directed questions.

This simple tool, but which has proven to be effective, will be applied to other ergonomic demands of the industry. By involving other participants in new study groups, it provides the opportunity to disseminate ergonomic concepts in a simple, practical and

applicable way in any context, with the worker as the main agent of transformation to improve processes and mitigate ergonomic risks.

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