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ERGONOMIC ANALYSIS OF A PERSONAL TRAINER STUDIO IN PARAÍBA BASED ON THE SPM METHOD

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Abstract: The work is based on the global evaluation of a Personal Trainer Studio located in the city of João Pessoa, Northeast-Paraíba, involving real work situations carried out in the light of ergonomics applied to biomechanics combined with the project resources of interior design. To this end, tools such as the SPM method (situation, problem, improvement), GUT Matrix (severity, urgency and tendency) were used, in addition to the Painful Areas Diagram with a study of the layout and its interaction with the ten professionals who work in the environment. In the study, adverse conditions in the physical/postural aspect were identified, such as overload on the spine resulting from the lack of support in some areas, in addition to flow problems resulting from restricted circulation between the equipment. This way, it was feasible to propose opportunities for improvement in all the aspects listed by identifying the work situation of that company.
Keywords: Ergonomics; SPM method; Personal trainer; human factors

INTRODUCTION

The work is based on the global evaluation of a Personal Trainer Studio located in the city of João Pessoa, Northeast-Paraíba, involving real work situations carried out in the light of ergonomics applied to biomechanics combined with the project resources of interior design. The Physical Education professional, the Personal Trainer, was the object of study of this analysis and its interaction with the environment. The company offers personalized bodybuilding services in which each student is accompanied exclusively by a teacher, with training sessions lasting an average of 45 minutes, by appointment. It is open from 5 am to 10 pm from Monday to Friday and on Saturdays until 12 pm. In management, it is composed of three partners graduated in physical education who act as the company's managers and also in the role of personal trainer in a physical environment with 144 m² of floor space. The study aimed to follow the human limitations and needs of its workers, Physical Education professionals and, in fact, apply Ergonomics in the restructuring of this work project.

METHODOLOGY

An ergonomic evaluation of the work of this company was carried out, using qualitative and quantitative analysis tools such as the GUT Matrix, Indication of painful points by the author Corllet and Manenica, in addition to on-site observations, conversation with the workers. Data collection took place in alternating periods between morning, afternoon and night in order to draw a profile of the company's professionals. At the same time, another assessment tool called the GUT Matrix (severity, urgency and tendency) recommended by the same aforementioned author was applied.

DISCUSSION

PRIORITIZATION GUT MATRIX

The GUT matrix refers to the factors of Severity, Urgency and Tendency, quantifying the processes in a systematic way using a scale ranging from 1 (one) to 5 (five), built to order a list of items that will be prioritized based on criteria defined by weights. For the evaluation, it is necessary to fill out a form that corresponds to a table where the processes, problems and the values assigned by it are recorded, which will classify the priority processes as can be seen in the next table (MATTOS, 2009).

GRADE	GRAVITY	URGENCY	TREND
1	It has no gravity	There is no rush	It does not get worse
2	A little bit serious	It can wait a while	Worse in the long term if nothing is done
3	Serious	It needs an action as soon as possible	Worse in the medium term if nothing is done
4	Very serious	It needs an action urgently	It gets worse in a short time if nothing is done
5	Extremely serious	It needs an immediate action	It gets worse quickly if nothing is done

Table 01: GUT Matrix

Source: MATTOS, 2009.

The final result of the Gut matrix scale is the result of multiplying the three criteria of severity, urgency and tendency. Thus, the worst prognosis result would be equivalent to 125 (one hundred and twenty-five), where all criteria would present GUT 5; and the best prognosis would be 8 (eight), with the GUT criteria with a 2 scale, since 1 means no problems. For the evaluation of the personal studio, this quali-quantitative tool was used, where the expert's opinion and expertise is the basis for the definition of the final score.

The form was divided into four aspects to facilitate the detailing of the problems to be pointed out and improved. Below is the table with the evaluation based on the Gut matrix following seven criteria: space; posture; standing position; safety; organization; cargo handling; cognitive load. Each of the above-mentioned items is detailed to better define the problems identified (see Figure below).

	Observer*	Gravity	Urgency	Trend	Score
1-Space					
1.1-Circulation	S	4	4	4	64
1.2- Total area	S	3	3	4	36
1.3-Windows	N	1	1	1	1
1.4-Lighting	N	1	1	1	1
1.5-Communication	N	1	1	1	1
1.6-Work area between shoulder and pelvis	S	3	3	4	36
2-Posture					
2.1- Extended/flexed neck	S	2	2	2	8
2.2-Abduction/flexion of the arms	S	4	4	5	80
2.3-Deviation of hands	S	2	2	2	8
2.4-Open wing time	S	4	4	4	64
2.5-Other types of static work	N	1	1	1	1
3- Standing position					
3.1- Flexed or rotated trunk	S	3	3	4	36
3.2- Flexed knee	N	1	1	1	1
3.3- Only on one leg	N	1	1	1	1
3.4- Eventual crouching	S	3	3	4	36
3.5-Efforts away from the body	S	3	3	4	36
4-Security					
4.1- Risk of falls	S	3	3	3	27
4.2-Exposed live corners	S	4	4	5	80
4.3- Non-slip floor	S	2	3	4	24
4.4-Lighting	N	1	1	1	1
4.5- Necessity of PPE	N	1	1	1	1
5- Organization					
5.1- Repeatability**	S	3	3	3	27
5.2- Pace / productivity control	N	2	1	1	1
5.3- Pauses/dead time	S	1	3	4	24
6- Movement of loads					
6.1- Niosh /value up to 23 kilos	S	2	3	4	24
6.2- More than 23kg indication of inadequacy	N	1	1	1	1
7- Cognitive load * **	S	2	2	2	8

Table 02: GUT matrix (personal studio).

Source: Research data

DIAGRAM FOR PAINFUL AREAS (CORLLET AND MANENICA, 1980)

According to Maciel (1995), the main risk factors related to the appearance of Injuries due to repetitive strain are postures, the type of movements and forces applied during the activities, involving the sequences of actions and the devices used. After using the diagram to identify painful areas, developed by the authors Corllet and Manencia (1980), it was found that workers' complaints of musculoskeletal pain are consistent with the regions of request for the postures developed during assignment.

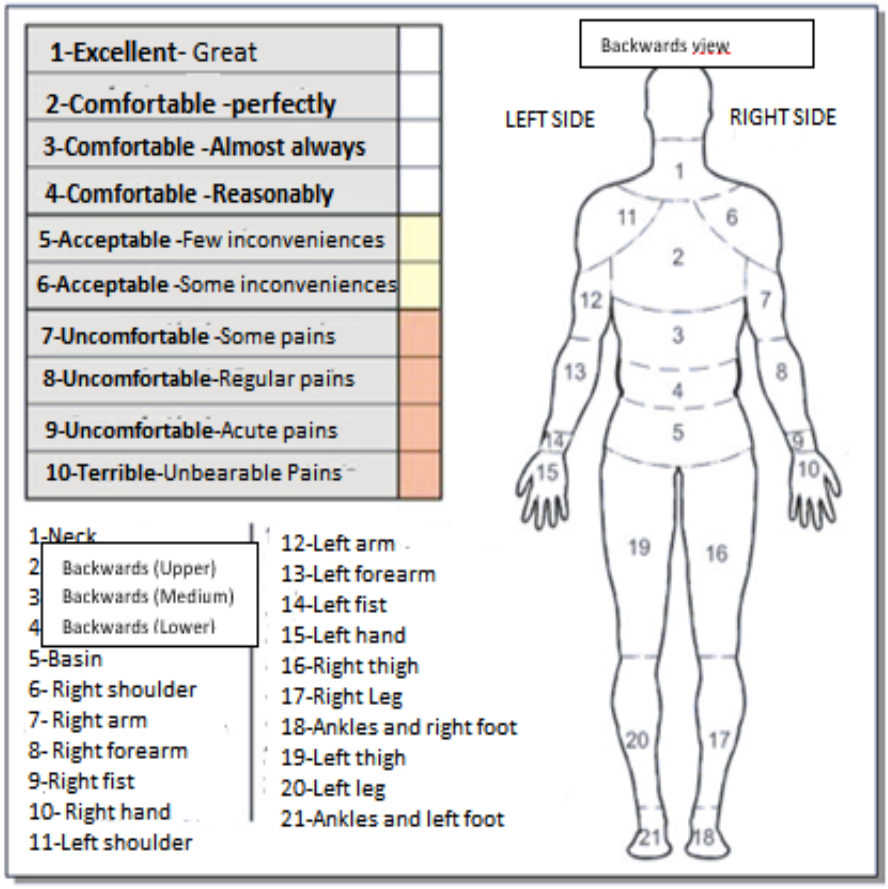

Figure 01: Diagram of painful areas.

Source: Adapted from CORLETT and MANENICA (1980).

This tool is an important indicator in the identification of the first symptoms of body discomfort, as it allows the active participation of the worker by pointing out the painful area(s) and its intensity. Pain, in turn, is considered a strong indication of the presence and/or onset of inflammatory processes that may or may not be a result of RSI/WRMD. Below is the result of the application of the tool to the ten professionals, divided by gender and perception of pain.

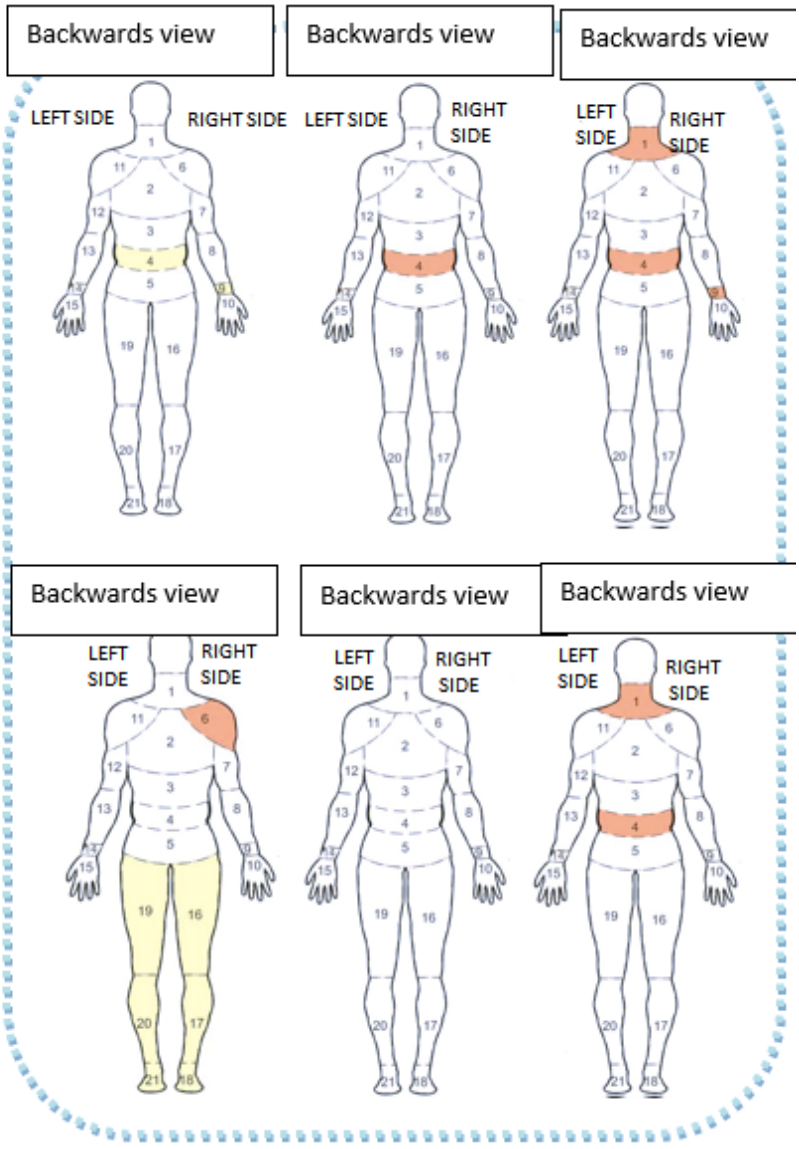

Figure 02: Diagram of Painful Areas- Male workers.

Source: Adapted from CORLETT and MANENICA (1980).

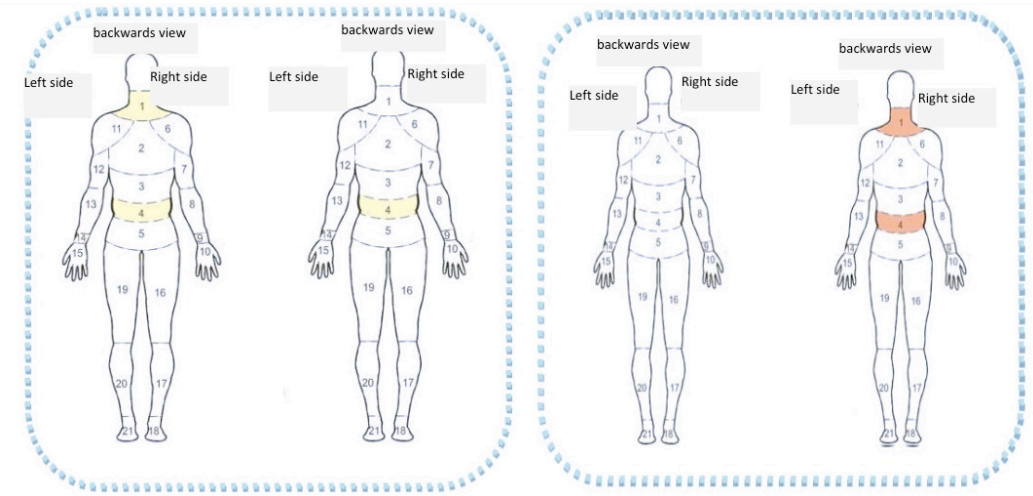

Figure 03: Diagram of Painful Areas - Female workers.

Source: Adapted from CORLETT and MANENICA (1980).

When analyzing the diagrams of the painful areas, a higher incidence of involvement was found in the cervical and lumbar regions, in addition to complaints from other parts such as shoulders, lower limbs and wrist. Of the total number of respondents, only two said they did not feel any pain or discomfort, but reported that they occasionally feel general tiredness at the end of a work week. The location and incidence of body pain and discomfort are considered compatible with the work activity developed by the personal trainer, so through this finding it becomes possible to mitigate these symptoms from an ergonomic intervention and adjustments in the work process of this company.

PRODUCTION FLOW ANALYSIS

The personal trainer's task has as its main objective to monitor the student throughout the performance of bodybuilding training, where the demand does not restrict age, sex or pathology of the same. The layout consists of machines that need to have their own load while others depend on the use of these loads, the washers which are located on the central support. This way, it is possible to observe that the displacement of workers, with the application of weights, is greatly influenced by the arrangement of the support in relation to the machinery.

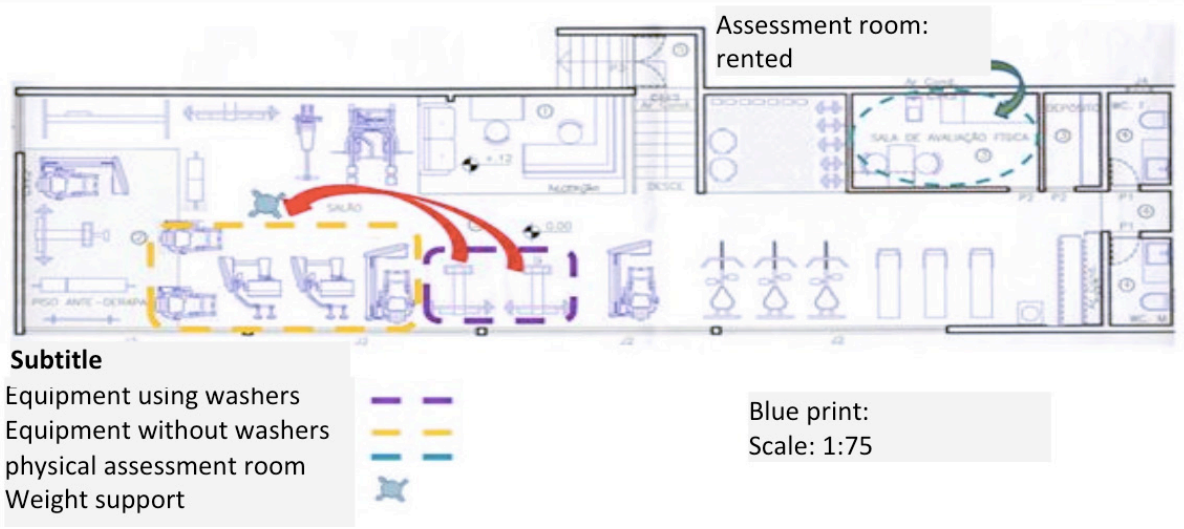

Figure 04: Flow analysis.

Source: Research data

The constraints of the task and the postures assumed depend on each equipment, when the professional needs to insert loads into the bars or even manually deliver them to the students. The constraints are smaller in relation to exercises with equipment that have loads, since the physical effort is less, as it allows a micro-pause in the professional's manual task, leaving for him the visual monitoring of the process.

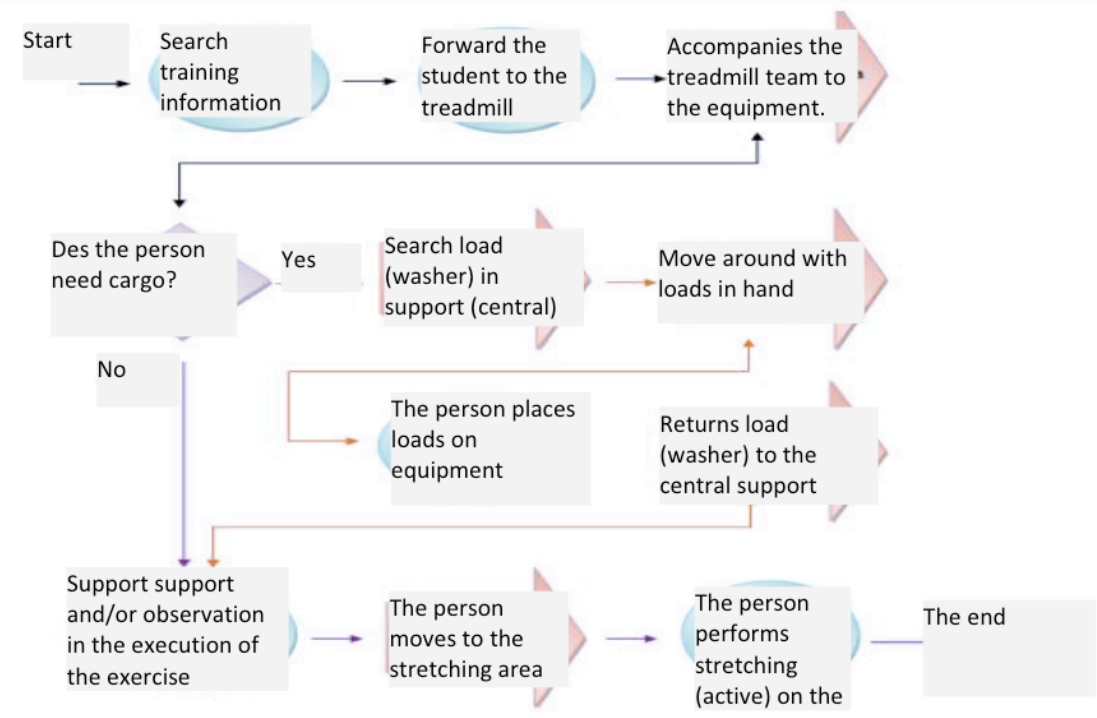

Figure 05: Flowchart of personal trainer activity in the company under study.

Source: Research data

TASK CHARACTERIZATION

To better understand the task, the scheme was used, establishing a global and therefore more comprehensive view of the system in relation to inputs, outputs, goal, requirements, restrictions, unreasonable results, in addition to the feeder and further sub-systems, shown in Figure.

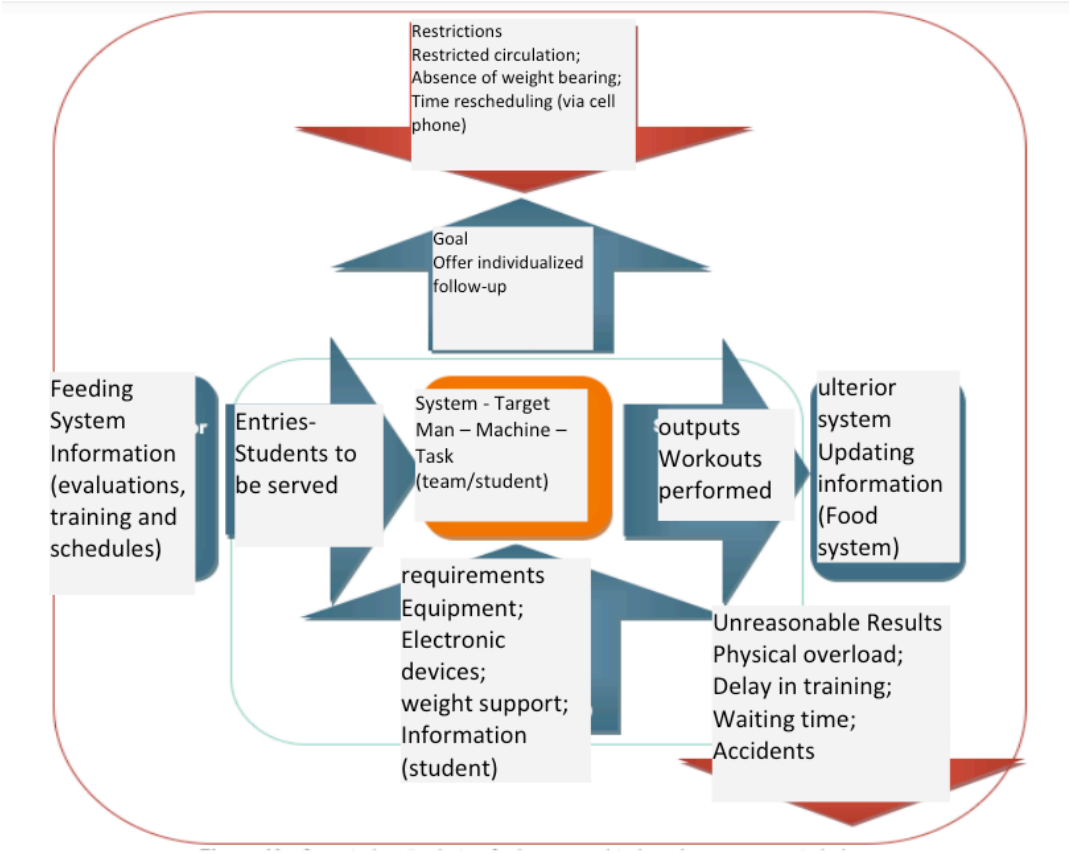

Figure 06: Characterization of the task of the personal trainer of the company studied.

Source: Adapted from MONT'ALVão; FIGUEREDO; RIBEIRO (2003).

OPPORTUNITIES FOR IMPROVEMENT AND DEEPENING PHYSICAL-POSTURAL ASPECT

Aiming to stop problems of this nature, the topics most frequently studied by physical ergonomics are unfavorable postures, excessive force, repetitive movements and load transport (VIDAL, 2002). In this sense, the study proposes:

- Provide adequate support for the storage of dumbbells that currently do not have, forcing the professional's posture to handle them;
- Repositioning of the weights in the central support, leveling the loads in the area between the shoulder and the pelvis that reduce the inclination and/or lateralization of the trunk;
- In the "exercise area", provide a semi-sitting bench (which allows adjustments) for posture alternation, since in this space the personal

monitoring is carried out in the form of inspection, allowing its execution in the sitting position;

- Apply non-slip flooring along the entire length of the studio, instead of restricted spaces as observed during the research, to prevent accidents in this regard, as workers circulate with loads throughout the physical space;
- Provide support for the storage of aluminum bars, avoiding their positioning in the circulation area, avoiding accidents in sharp corners;

Suggestions for ergonomic intervention are theoretically based on the authors' citations. According to Abrahão and Pinho (1999) Ergonomics advocates, above all, the safety of men and equipment, the efficiency of the production process; well-being of workers in work situations. The environment and activities that provide the alternation of postures that relieve the pressures on the vertebral discs and the tensions of the dorsal muscles of support, reduce fatigue. The best station design is one that provides for the work to be performed both standing and sitting (IIDA, 1990).

ORGANIZATIONAL ASPECT

Organizational ergonomics aims to optimize socio-technical systems, including organizational structure, corporate policies and production and business processes. In this field, the research seeks to understand the activities developed to produce results that, when combined, are the product of that organization (VIDAL, 2002). To solve organizational problems of the company under study, it is suggested:

- Promoting a rearrangement of the layout creating sectors, as can be seen in the Figure below, with the aim of avoiding cross-flows between professionals and reducing the number of displacements;
- The adequacy of the work environment with the rearrangement of the layout, adequacy of the floor, repositioning of the bars, acquisition of supports is important in reducing the physical stress on the spine; The physical arrangement of the workplace must encourage the development of rhythmic and habitual movements, facilitating the task and reducing fatigue.
- Establish a work rhythm in which the professional has breaks between one student and another, avoiding physical overload;
- Promote basic training in ergonomics with workers so that they are able to identify risks, promote adjustments in the biomechanics of their activity and raise awareness of the importance of this action to prevent and minimize damage to health.
- Develop personal protective equipment (PPE) with a kind of lumbar belt, aimed at the activity of the personal trainer that reduces body effort during manual transport of loads;
- Create a company's own protocol with rules and regulations based on the Regulations rules in order to systematize the work process;

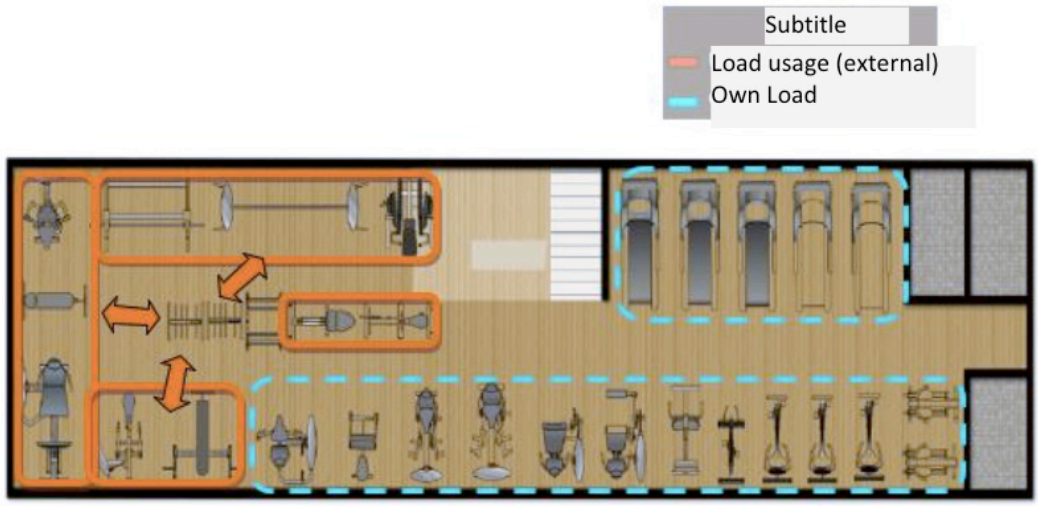

Figure 07: Layout rearrangement

Source: Research data

CONCLUSION

It is evident the need to include the principles of Ergonomics in this company, in order to follow the human limitations and needs of its workers, Physical Education professionals and, in fact, apply Ergonomics in the restructuring of this work project. In this research, some adverse working conditions were found for the personal trainer, with regard to the physical/postural environment, and also organizational. Among the problems pointed out in the physical/postural aspect are the overload on the spine resulting from the lack of support in some areas, in addition to the flow resulting from the restricted circulation between the equipment.

Regarding the organization, the relayout was identified as an opportunity for improvement in order to adapt to the Regulamentory Rules at the same time as it would solve problems of flow crossing and risk of accidents. This way, the company develops its best practices, increases ergonomic maturity and grows in competitiveness in the job market. However, the effectiveness of the positive results in the work activity, and the gain in productivity proposed through the ergonomic suggestions and recommendations, depend directly on the managers' commitment to continue the ergonomic intervention process proposed in the present work.

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