

Evaluation of teachers' ergonomic work conditions: an analysis from an Ecuadorian Technological Institute

Avaliação das condições ergonômicas de trabalho dos professores: uma análise de um Instituto Tecnológico Equatoriano

Evaluación de las condiciones ergonómicas de trabajo de los docentes: un análisis desde un Instituto Tecnológico Equatoriano

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ABSTRACT

The preservation of workers' health has generated the incorporation of concepts such as ergonomics that have provided organizations with excellent results. In this sense, this study is oriented to the ergonomic evaluation of the teachers' lounge block 1 of the Instituto Superior Tecnológico Luis Tello, Esmeraldas, Ecuador. For this purpose, a quantitative methodological approach was followed, with a field design, non-experimental and descriptive level, supported by a documentary inquiry. The study sample consisted of 23 teachers working at the aforementioned headquarters. The technique used for data collection was direct observation and the instrument used was the ROSA (Rapid Office Strain Assessment) Field Sheet. Data processing was carried out using the Excel program. The results found under the ROSA methodology, are in the range of 6-7-8 respectively, which denotes a very high ergonomic risk, level 3, which is an indication that action is needed as soon as possible. Based on the findings it is concluded that: there is an urgent need to address the situation through the optimal design of workstations under the principles provided by ergonomics adapted to the individual requirements of each of the teachers who provide their services teaching room block 1 of the Instituto Superior Tecnológico Luis Tello, Esmeraldas, Ecuador, as a way of preventing ergonomic risks through adjuvant spaces for the improvement of proper postural habits of each of these professionals, which will result in the long-term preservation of health, as established in international and national regulations.

Keywords: Ergonomics, workstations, evaluation, ROSA method.

RESUMO

A preservação da saúde dos trabalhadores tem gerado a incorporação de conceitos como a ergonomia que têm proporcionado excelentes resultados às organizações. Neste sentido, este estudo está focado na avaliação ergonômica da sala de professores do bloco 1 do Instituto Superior Tecnológico Luis Tello, Esmeraldas, Equador. Para tal, seguiu-se uma abordagem metodológica quantitativa, com desenho de campo, de natureza não experimental e de nível descritivo, apoiada numa investigação documental. A amostra do estudo foi composta por 23 professores que atuam na referida sede. A técnica utilizada para coleta de dados foi a observação direta e o instrumento consistiu na Ficha de Campo do Método ROSA (Rapid Office Strain Assessment). O processamento dos dados foi realizado no programa Excel. Os resultados encontrados na metodologia ROSA estão na faixa de 6-7-8 respectivamente, o que denota um risco ergonômico muito elevado, nível 3, o que é uma indicação de que é necessária uma ação o mais rápido possível. Com base nos resultados, conclui-se que: há uma necessidade urgente de resolver a situação através da concepção ótima dos locais de trabalho sob os princípios proporcionados pela ergonomia adaptada às necessidades individuais de cada um dos professores que prestam os seus serviços. do Instituto Superior Tecnológico Luis Tello, Esmeraldas, Equador, como forma de prevenção de riscos ergonômicos por meio de espaços que contribuem para melhorias nos hábitos posturais adequados de cada um desses profissionais, o que resultará na preservação a longo prazo da saúde, conforme estabelecido em regulamentos internacionais e nacionais.

Palavras-chave: atitudes ambientais, nível de proficiência, ciência ambiental.

RESUMEN

La preservación de la salud de los trabajadores ha generado la incorporación de conceptos como ergonomía que han proporcionado a las organizaciones excelentes resultados. En tal sentido, este estudio está orientado en la evaluación ergonómica de la sala de docentes bloque 1 del Instituto Superior Tecnológico Luis Tello, Esmeraldas, Ecuador. Con este fin se siguió un enfoque metodológico cuantitativo, de diseño de campo, de carácter no experimental y nivel descriptivo, con apoyo de una indagación documental. La muestra de estudio quedó conformada por 23 docentes que laboran en la referida sede. La técnica empleada para la recolección de datos fue la observación directa y el instrumento consistió en la Hoja de Campo del método ROSA (Rapid Office Strain Assessment). El procesamiento de datos se realizó mediante el programa Excel. Los resultados encontrados bajo la metodología ROSA, se encuentran en el rango de 6-7-8 respectivamente, lo cual denota un riesgo ergonómico muy alto, de nivel 3, lo cual es un indicativo de que es necesaria la actuación cuanto antes. Sobre la base de los hallazgos encontrados se concluye que: existe la imperiosa necesidad de abordar la situación mediante el diseño óptimo de los puestos de trabajo bajo los principios que aporta la ergonomía adaptados a los requerimientos individuales de cada uno de los docentes que prestan sus servicios sala de docentes bloque 1 del Instituto Superior Tecnológico Luis Tello, Esmeraldas, Ecuador, como una forma de prevención de riesgos ergonómicos a través de espacios coadyuvantes de mejoras de los hábitos posturales adecuados de cada uno de estos profesionales, lo cual se traducirá en la preservación en el largo plazo de la salud, tal como se establece en las normativas internacionales y nacionales.

Palabras clave: Ergonomía, puestos de trabajo, evaluación, método ROSA.

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INTRODUCTION

Usually when we talk about ergonomics we think of an effective way to provide a safe working environment to protect the health and comfort of workers, whose favorable conditions can significantly influence the increase in effectiveness and productivity with great benefits for the organization, company or institution where people work. All work in itself involves some risk for the employee, hence, it is extremely necessary to apply the principles of ergonomics to avoid or in any case solve problems related to the work environment, these rules are related to the design of spaces, furniture, equipment, organization, the workplace, among others.

The International Ergonomics Association (IEA) has set out a series of principles, which focus on respecting the individual and social integrity of workers, creating safe and healthy workplaces, and providing decent work opportunities. (IEA, 2020). The principles of ergonomics/human factors (E/HF) according to (IEA, 2020) which are fundamental to the design and management of work systems, are as follows:

Principle 1: Ensure the safety, health and well-being of workers as a top priority in the optimization of work systems;

Principle 2: Design and manage work systems to ensure organizational and employee alignment, continuous assessment and learning, and sustainability;

Principle 3: Create a safe, healthy and sustainable work environment from a holistic perspective, understanding and addressing human needs;

Principle 4: Take into account individual differences and organizational contingencies in the design of work systems; and

Principle 5: Use collective and transdisciplinary knowledge, as well as the full participation of workers to design such systems, detect problems and create ergonomics-based solutions to ensure the effective operation and management of work systems.

From this perspective, in the framework of fundamental principles and rights at work of the International Labor Organization (ILO), a safe and healthy work environment is declared to be a fundamental principle and right at work. (United Nations, 2023). Likewise, article 33 of the Ecuadorian Constitution declares the exercise of work as a right and a social duty, where the State guarantees employees the performance of a healthy and dignified work activity. (Constitution of Ecuador, 2008).

Based on these approaches, an effective approach to promoting occupational health and safety by ensuring that work environments are optimal is through the scientific discipline Ergonomics/Human Factors (E/HF), as defined by the International Ergonomics Association (IEA, 2020). (IEA, 2020) as a transdisciplinary and user-centered "binding science" in the sense that it integrates and applies theories, principles and data from many disciplines relevant to the design of work systems, considering the complex interactions between the system operator(s) and other humans, the environment, tools and equipment, and technology (p.40).

In the same means, Bestratén, Oncins, & Solé, (2008), emphasize that advances in Ergonomics involve not only focusing the design on aspects of the person, but the global vision of work environments. This implies the consideration of everything that may affect health, that is, the search for a balanced interrelationship between personal, environmental, organizational and, of course, the task being performed (p.6). Currently in the labor system new changes have been generated at the time of executing or performing an activity safely, which has created the need to cover in the daily life where the worker performs the function linked to their area of knowledge, ergonomic principles, in an attempt to avoid any kind of risks to which employees may be exposed, because when workplace conditions are not in accordance with the requirements of the employee may arise dangerous situations both physical and mental for workers.

In this regard, Daza Fragozo, (2021) points out that a work environment that does not optimally meet the needs of employees can have a negative impact on their productivity. Ergonomic risks in work performance include physical injuries caused by incorrect postures, repetitive movements, strenuous physical efforts or the lack of appropriate breaks and rest periods. (Molina & Carpio, 2020). It has also been proposed that ergonomic risks can affect the mental health of employees, which are associated with the organizational climate, work overload, stress, noise, poor lighting and others, which generate anxiety, anxiety and affect the concentration of people to focus properly on the tasks they perform, with the consequent impact on the performance of the task to be executed. (Cueva & Salinas, 2021)..

Higher education institutions are not exempt from ergonomic risks, therefore, it has been considered convenient to inquire about them in a particular case of Esmeraldas in Ecuador and it has been proposed as an object of study the teachers' lounge block 1 of the Instituto Superior Tecnológico Luis Tello, of the referred locality, in order to reinforce occupational health practices. In this sense, a diagnosis was made through the observation technique to estimate the ergonomic risks to which workers are exposed daily in this institutional space, which may eventually lead to occupational diseases, such is the case of De Quervain's tenosynovitis, an occupational disease detected in one of the employees addressed during the identification phase of the problem.

In Ecuador, according to (Ontaneda, 2015) labor activity is governed constitutionally, by laws, international conventions, ministerial agreements, among others, such as, the labor code in article 38; the Regulation of Safety and Health of Workers and Improvement of the Working Environment. Executive Decree 2393, in Article 1; Regulation of the General

Insurance of Labor Risks.

Likewise, Decision 584 of the Andean Instrument for Occupational Safety and Health, in Article 11, states that: "In all workplaces, measures must be taken to reduce occupational risks. These measures shall be based, for the achievement of this objective, on guidelines on occupational safety and health management systems and their environment as a social and corporate responsibility".

In this sense, the ROSA method (Rapid Office Strain Assessment) is a valuable tool to carry out this task, in the understanding as Castro Estrada, (2022) states, it is a methodology focused only on administrative or office work, it calculates the existing deviation between the characteristics of the position to be evaluated and those of an office position with ideal characteristics. For this purpose, scoring diagrams are used that assign a score to each of the elements of the job: chair, screen, keyboard, mouse and telephone. Therefore, the general objective of this research is to evaluate the ergonomic risk in the office workstations of the teachers of the Instituto Superior Tecnológico Luis Tello by applying the ROSA (Rapid Office Strain Assessment) method.

Ergonomics

While it is true that in its beginnings ergonomics sought to increase the productivity of workers or human beings in any field, over the years this perspective has evolved through the use of science to determine and design a system where people can take advantage of their abilities and leave aside their limitations by using safe products in any area in which they perform a function, increasing their performance and their capabilities (Cercado, Chinga, & Soledispa, 2021)..

Sometimes, advances in ergonomics, although technically well argued, are not translated into practice. This is due, among other principles, to the fact that the efforts dedicated to projecting the benefits achieved, as well as the study of alternatives to show them and convince top management to implement them, are minimal, compared to the total volume of work performed. (Rodríguez, Pérez, & Vázquez, 2023)..

CACES 2024 evaluation model

The Evaluation Model of the Higher Education Quality Assurance Council (CACES, 2021) (CACES, 2021) in the faculty workplaces indicator states: "working conditions have a significant influence on the work performance and well-being of an institution's employees. Each type of work occupation demands specific conditions in terms of instruments, furniture, access to services and physical environment of the premises, but intellectual work is especially sensitive, because external situations disturb the level of mental concentration, which is not completely controllable by human will" (p. 56).

Executive Order 2393

According to the Ecuadorian Institute of Social Security (IESS, 1986) Article 11 of Executive Decree 2393, referring to the obligations of employers in paragraphs 2, 3 and 14, states:

2. To adopt the necessary measures for the prevention of risks that may affect the health and well-being of workers in the workplaces under their responsibility.
3. Maintain in good working order the installations, machines, tools and materials for safe work.
4. Immediately notify the labor authorities and the Ecuadorian Institute of Social Security of accidents and occupational diseases occurring in their work centers and provide a copy to the Safety and Industrial Hygiene Committee.

Theoretical basis

The authors Lazo & Pérez, (2022), in their thesis entitled "Application of the Rosa method for the reduction of occupational diseases in the administrative area of the company Tracklog", emphasize that due to the diversity of this type of disorders, science has developed methods that allow to perform assessments of jobs in order to detect possible deviations or factors that may eventually lead to the emergence of a disease related to this type of disorders. One of these methods is the ROSA (Rapid Office Strain Assessment), which is responsible for calculating office work with ideal-type characteristics, for which diagrams are used that have scores for each characteristic of the workplace, such as the chair, keyboard, mouse, screen and telephone (p. 1).

In the same line, Parra Cruz, (2019) developed a study entitled: "Ergonomic risk factors in administrative staff, an occupational health problem" mentions that the postural situation, "is the position that a person takes with his body and the analogy of this with the area in which he is, in this case the interaction that takes his body with his work area, specifically the interaction of his body with the chair, monitor and peripherals, both in static and moving conditions" (p. 39).

Moreover, Párraga Velásquez, (2014), presented a research called: "Ergonomic design of university classrooms to optimize comfort and reduce fatigue of students and teachers", indicating that "keeping a forced or non-neutral posture can cause pain and fatigue reducing work capacity and therefore productivity" (p. 13)

METHODS

The research was of quantitative approach, field design, non-experimental and descriptive level, supported by a documentary inquiry, taking into consideration that it was focused on carrying out an ergonomic evaluation of the teachers' room block 1 of the Instituto Superior Tecnológico Luis Tello, Esmeraldas, Ecuador.

Field work is very important to learn about the realities directly (Sandoval, 2022). (Sandoval, 2022). Regarding non-experimental research, it is performed without intentionally manipulating the variables, observing the facts as they are, in their natural context, to extract the data of interest which will be analyzed (Hernández, Fernández, & Baptista, 2014)..

According to Bernal, (2016), one of the main functions of descriptive research is the ability to select the fundamental characteristics of the object of study and its detailed description of the parts, categories or classes of that object.

On the other hand, documentary research consists of an analysis of written information on a given topic, with the purpose of establishing relationships, differences, stages, positions or current state of knowledge regarding the topic under study (Bernal, 2016).

In this sense, in the present research, a search for information was carried out in digital platforms of an academic and scientific nature, where access was gained to theses, articles and documents from specialized institutions on the subject of interest.

Population and Sample

The population was based on the personnel working in the teaching room of Block 1 of the Instituto Superior Tecnológico Luis Tello, and consisted of 23 education professionals of this institutional headquarters. According to Hadi, Martel, & Arias, (2023), "The research population is the set of individuals or elements about which it is desired to obtain information or knowledge" (p.70). The sample of the present study was of the census type, given that the population is finite and small enough to allow working with all its units. For this reason, sampling was dispensed with. According to Hernández, Fernández, & Baptista, (2014), it is defined "as a group of the population from which data is collected and should be representative of that population" (p. 302), which indicates that for this study the sample was representative.

Data collection techniques and instruments

The technique used for data collection was direct observation and the instrument was the Field Sheet of the ROSA method. According to Méndez, (2009), direct observation is the process by which certain features existing in reality are deliberately perceived by means of a previous conceptual scheme and based on certain purposes generally defined by a conjecture to be investigated (p.251).

According to Diego Mas, (2015), to evaluate with the field sheet of the ROSA method, the evaluator will observe the job while the worker performs his task. The data collection of the job can be performed in situ using this field sheet in which the following items should be filled in: a) Job data (job identifier, description, company, department/area, section); b) Evaluation data (evaluating company, evaluator data, evaluation date); c) Worker data (worker's name, gender, age, seniority in the job, time in the job per day, duration of the working day) and d) Observations.

For ethical purposes, the research included a consent statement from the participating teachers. By not revealing personal data, the risks related to personal information are totally minimized.

ROSA Methodology (Rapid Office Strain Assessment)

To develop the ROSA method, the most common elements of workstations (chair, work surface, screen, keyboard, mouse and other peripherals) are considered in the evaluation. As a result of its application, an evaluation of the measured risk and an estimation of the need to act on the workstation to reduce the risk level is obtained. (Diego Mas, 2015).

As a result of its application, an assessment of the measured risk and an estimate of the need to act on the job to reduce the level of risk is obtained. (Diego Mas, 2015). In this research, the ROSA (Rapid Office Strain Assessment) methodology was applied to the study sample on the basis of posture, using 5 evaluation criteria:

Chair, broken down into the characteristics of the seat (considering the height and depth), and the set formed by the back support and armrests (Section A).

- Telephone (Section B)
- Screen (Section B)
- Mouse (Section C)
- Keyboard. INSSST (2022). Model for office job evaluation: ROSA (Rapid Office Strain Assessment) method (Section C).

Each section has a subsection and a corresponding graph and value, due to the combination of the partitions. The application of the ROSA method, allows to obtain partial scores of the elements that make up the job, the final ROSA score is obtained by consulting the tables established for this purpose. (Diego Mas, 2015).

The value of the ROSA score can range from 1 to 10, with the greater the risk to the person in the position. A value of 1 indicates that no risk is perceived. Values between 2 and 4 indicate that the level of risk is low, but that some aspects of the job can be improved. Values equal to or greater than 5 indicate that the level of risk is high. (Diego Mas, 2015).

Figure 1. Risk and action levels ROSA

Score	Risk	Level	Performance
1	Inappreciable	0	No action required
2,3,4	Improvable	1	Some elements of the post can be improved
5	High	2	Action is needed
6,7,8	Very high	3	Action is needed as soon as possible
9,10	Extreme	4	Urgent action is needed

Note: Prepared by the authors. Source: (Diego Mas, 2015)

In accordance with the ROSA method, in the development of the present inquiry, photographs were taken of each workstation (side and back), the position of the eyes, upper arms, upper and lower back, knees and feet were used as a reference when the evaluator observed the positions of the teachers directly from the photographs. No angles or distances were measured from the photographs and no reference points were placed on the participants. The rating is given by means of tables through partial scores from 1-10, related to each of the 23 teachers in the study sample.

Data processing

The evaluation of ergonomic risks in the teachers' lounge block 1 of the Instituto Superior Tecnológico Luis Tello, Esmeraldas, Ecuador, was carried out by applying the steps suggested in the ROSA method. The data tabulation was carried out using the Excel program, which allowed to record information and tabulate the data, this organization allows a faster, easier and more reliable interpretation of the findings.

RESULTS AND DISCUSSION

The data obtained after the application of the data collection techniques and instruments are shown in the following tables where they were separated by gender.

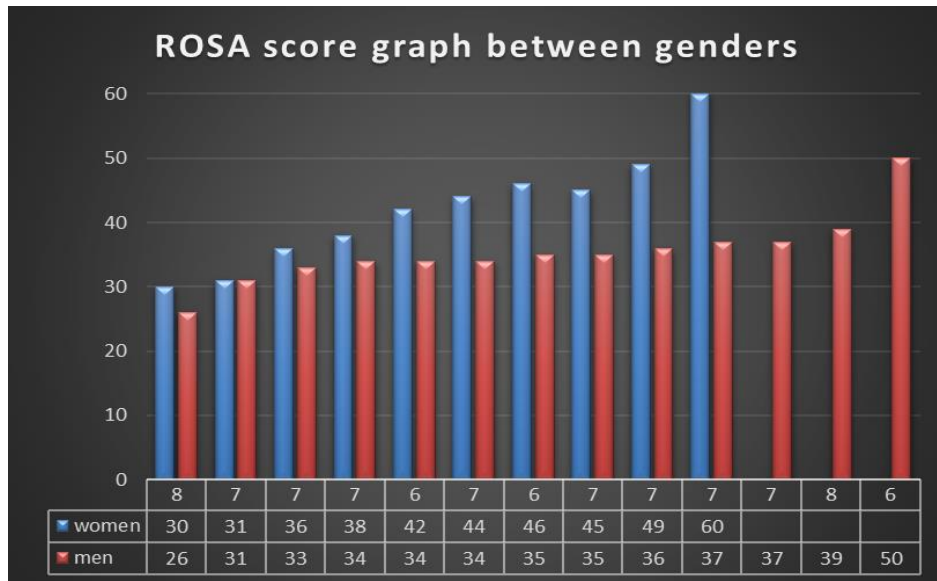
Table 1. Sample of data obtained for male and female personnel in the teaching room block 1 of the Instituto Superior Tecnológico Luis Tello

N	Sex	Age	Score ROSE
1	F	30	8
2	F	31	8
3	F	36	7
4	F	38	6
5	F	42	7
6	F	44	7
7	F	46	6
8	F	45	6
9	F	49	7
10	F	60	8

Item	Sex	Age	Score ROSE
1	M	26	8
2	M	31	7
3	M	33	7
4	M	34	7
5	M	34	6
6	M	34	7
7	M	35	6
8	M	35	7
9	M	36	7
10	M	37	7
11	M	37	7
12	M	39	8
13	M	50	6

Note: Source. Own elaboration (2023). ROSA Method (Rapid Office Strain Assessment).

Figure 2. Sample of the data obtained for female and male staff in the teaching room block 1 of the Luis Tello Higher Technological Institute



Note: Source. Own elaboration (2023). ROSA Method (Rapid Office Strain Assessment)

The data obtained from the 23 participants in the sample under the ROSA methodology are in the range of 6-7-8 respectively. This score, according to the estimates proposed in the ROSA methodology, indicates a very high risk, which requires an action as soon as possible to correct the problematic situation found for the sake of workers' health. In view of these results, it can be inferred that possibly the furniture used in the teaching room, since it does not have ergonomic chairs in its entirety, and the non-use of an ergonomic mouse, are factors associated to the fact that in many cases the working postures are forced, which has some influence on the values recorded after the application of the ROSA methodology.

The results obtained after the application of the ROSA methodology leading to an ergonomic evaluation in the teachers' lounge block 1 of the Instituto Superior Tecnológico Luis Tello, Esmeraldas, Ecuador, show that the score obtained is in the range of 6, 7, 8, which denotes a very high risk, level 3, which is an indication that action is needed as soon as possible.

On this basis, it is undoubtedly necessary to undertake the proper conditioning of this work unit, since the affected people are in the age range between 30 and 60 years, a stage considered of higher productivity in people. In addition, Quervain's tendonitis was found in one of the participants, which may be associated as determined in her study (Ontaneda, 2015) This author also found that there is 7.35 times more risk of having Quervain's tendinitis in the female gender in relation to the male gender.

The age range considered in this study (30 to 60 years), as expressed above, is a phase considered of higher productivity in employees, in this regard, (Posthuma & Campion, 2007) argue that productivity increases with age, since older employees are more stable, responsible, honest, committed, reliable and loyal. Coinciding with the above, (de Sivatte Font, Olmos, Simón, & Martel, 2018) indicate, that older and more educated employees are clearly more productive than younger and less educated employees. Experience also positively affects productivity, but the effects are much smaller. Moreover, the effects differ considerably across occupational categories.

Taking into consideration the above, the application of ergonomics as a preventive technique to promote, maintain and protect the health of employees who work regularly in the teachers' lounge block 1 of the Instituto Superior Tecnológico Luis Tello, Esmeraldas, Ecuador, and who are also in the period of highest productivity, are ample reasons for this educational organization to consider addressing occupational health as a fundamental factor in its institutional programs, where the worker is valued as an important part in achieving both objectives and goals formulated, These are ample reasons for this educational organization to consider the approach to occupational health as a fundamental factor within its institutional programs, where the worker is valued as an important part for the achievement of both the objectives and goals that are formulated in this institute of higher education.

In this sense, Gaibor, (2021) emphasizes that since the quality of the workstation space influences comfort and the latter influences work efficiency, the analysis and design of these workstations should be used in the following fields: ergonomic design of objects; ergonomic design of workspaces; ergonomic design of operational and functional designs; and

environmental ergonomic design.

For their part, the authors Pino, Tapia, & Campos, (2021) express that the environmental conditions to which workers are subjected, the control of these conditions is performed through a study and dimensional analysis of the workplace that should cover all postures and situations that can be adopted. Hence, Valencia & Anchundia, (2022) emphasize the importance of the application of occupational ergonomics, as it contributes positively in their health and facilitates the correct performance of their tasks and functions to prevent injuries and occupational diseases. Therefore, companies should increasingly carry out ergonomic studies to know the occupational risk factors of each job, which allows them to determine how their work activity can influence in the short, medium and long term their health (Valencia & Anchundia, 2022).

FINAL CONSIDERATIONS

In attention to the general objective set out in this research focused on evaluating the ergonomic risk in the office workstations of the teachers of the Instituto Superior Tecnológico Luis Tello through the application of the ROSA method (Rapid Office Strain Assessment), it can be concluded that the score obtained through the applied methodology showed that it is in the range of 6, 7, 8, which denotes a very high risk, level 3, therefore, it is an indication that action is necessary as soon as possible. In addition, the findings found in the initial diagnosis of the problem highlight that one of the employees is affected by De Quervain tendinitis, associated with repetitive movements.

From this, it is evident that the personnel are exposed to very high ergonomic risk factors in their daily work, which was evidenced in the study sample where the degree of affectation affects people between 30 and 60 years of age, a period considered by several authors as a period of higher productivity in employees.

The findings highlight the need to address the situation through the optimal design of workstations adapted to the individual requirements of each of the teachers who work there, as a way of preventing ergonomic risks through spaces that contribute to the improvement of adequate postural habits of each of the professionals who provide their services in the teaching room block 1 of the Instituto Superior Tecnológico Luis Tello, Esmeraldas, Ecuador, which will result in the long-term preservation of the employee's health, as established in international and national regulations.

REFERENCES

- AIE. (2020). Principios y Directrices de Ergonomía/Factores Humanos para el Diseño y Gestión de Sistemas de Trabajo. *Asociación Internacional de Ergonomía (AIE)/Organización Internacional del Trabajo (OIT)*. http://www.ulaergo.com/archivos/Principios_y_Directrices_de_EFH_para_el_Dise%C3%B1o_y_Gesti%C3%B3n_de_Sistemas_de_Trabajo_v1.pdf, pp.77.
- Bernal, C. (2016). *Metodología de la Investigación, administración, economía, humanidades y ciencias sociales*. Bogotá D.C., Colombia: Pearson Educación. Cuarta edición. Pág. 310.
- Bestratén, M., Hernández, A., Luna, P., Nogareda, C., Oncins, M., & Solé, M. (2008). *Ergonomía*. Madrid, España: Edita Servicio de Ediciones y Publicaciones - INSHT (Centro Nacional de Condiciones de Trabajo). Quinta edición. Pág.321.
- CACES. (2021). Modelo de Evaluación Externa 2024 Con Fines de Acreditación Para los Institutos Superiores Técnicos y Tecnológicos. *Concejo de Aseguramiento de la Calidad de la Educación Superior (CACES)*. Quito. Ecuador. <https://tecnologicosucre.edu.ec/page/reglamentos/modelo%20CACES2024.pdf>, pp.187.
- Castro Estrada, M. (2022). Evaluación Ergonómica Mediante la Aplicación del Método Rosa y Propuesta de Intervención en los Trabajadores Administrativos de la Gerencia de Planeamiento y Desarrollo de la Empresa Electro Sur Este S.A.A., Cusco 2022. *Universidad Andina del Cusco. Perú. Trabajo de Titulación*. https://repositorio.uandina.edu.pe/bitstream/handle/20.500.12557/5048/Miguel_Tesis_bachiller_2022.pdf?sequence=1&isAllowed=y, pp.101.
- Cercado, M., Chinga, G., & Soledispa, X. (2021). Riesgos ergonómicos asociados al puesto de trabajo del personal administrativo. *Revista Publicando*, 8(32). doi.org/10.51528/rp.vol8.id2268, pp.69-81.
- Constitución del Ecuador. (2008). *Constitución de la República de Ecuador*. Quito. Ecuador: Asamblea Nacional Constituyente. Pág. 218. <https://www.acnur.org/fileadmin/Documentos/BDL/2008/6716.pdf>.
- Cueva, F., & Salinas, K. (2021). Riesgos ergonómicos y su implicancia en el desempeño laboral del personal administrativo de una empresa del rubro eléctrico. *Universidad San Ignacio de Loyola. Lima. Perú. Trabajo de titulación*. <https://repositorio.usil.edu.pe/server/api/core/bitstreams/0c1dbd4e-c70f-4864-9ff5-703402cc9b8f/content>, pp.171.
- Daza Fragozo, M. (2021). Revisión bibliográfica sobre los trastornos músculo-esqueléticos más comunes asociados al riesgo ergonómico en los profesionales de la salud en Latinoamérica en el período 2005 a 2020. *Fundación Universitaria del Área Andina. Trabajo de titulación*. <https://digitk.areandina.edu.co/bitstream/handle/areandina/4210/trabajo%20final.pdf?sequence=1&isAllowed=y>, pp.26.
- de Sivatte Font, I., Olmos, R., Simón, I., & Martel, M. (2018). El efecto de la edad, la experiencia y la formación en la productividad laboral. *Cuadernos de Información económica, ISSN 1132-9386, N° 263*, <https://dialnet.unirioja.es/servlet/articulo?codigo=6397692>, pp. 13-24.

Diego Mas, J. (2015). Evaluación de puestos de trabajo de oficinas mediante el método ROSA. *Ergonautas, Universidad Politécnica de Valencia*, <https://www.ergonautas.upv.es/metodos/rosa/rosa-ayuda.php>.

Gaibor, J. (2021). Factores ergonómicos y el rendimiento laboral del personal administrativo de las universidades públicas en la provincia de Chimborazo. *Universidad Técnica de Ambato. Ecuador. Trabajo de Grado de Maestría*. <https://repositorio.uta.edu.ec/bitstream/123456789/33788/1/049%20ADE.pdf>, pp.127.

Hadi, M., Martel, C., Huayta, F., Rojas, R., & Arias, J. (2023). *Metodología de la Investigación. Guía Para el Proyecto de Tesis*. Puno. Perú: Editorial: Instituto Universitario de Innovación Ciencia y Tecnología Inudi Perú S.A.C. Primera edición digital.

Hernández, R., Fernández, C., & Baptista, P. (2014). *Metodología de la investigación*. México D.F: McGraw-Hill. 6ta. edición.

IESS. (1986). Decreto Ejecutivo 2393 Reglamento de Seguridad y Salud de los Trabajadores y Mejoramiento del Medio Ambiente de Trabajo. *Instituto Ecuatoriano de Seguridad Social (IESS)*. https://ewsdata.rightsindevelopment.org/files/documents/19/IADB-EC-L1219_f25d5vw.pdf, pp.230.

Lazo, Y., & Pérez, F. (2022). Aplicación del método Rosa para la disminución de enfermedades ocupacionales en el área administrativa de la empresa Tracklog, Lima, 2022. *Universidad César Vallejo. Lima. Perú. Trabajo de titulación*. https://repositorio.ucv.edu.pe/bitstream/handle/20.500.12692/111939/Lazo_NYE-Perez_SFE-SD.pdf?sequence=4&isAllowed=y, pp.144.

Méndez, C. (2009). *Metodología, Diseño y desarrollo del proceso de Investigación*. Colombia: McGraw Hill Interamericana S. A.

Molina, J., & Carpio, E. (2020). Registro Nacional de Trabajos de Investigación: Influencia de los factores de riesgo ergonómico en el desempeño laboral de los trabajadores de la empresa Ferreyros S.A. Toquepala y propuesta de mejora. *Universidad Católica San Pablo. Trabajo de titulación*. <https://renati.sunedu.gob.pe/handle/sunedu/3002888>.

Naciones Unidas. (2023). Día mundial de la seguridad y la salud en el trabajo, 28 de abril. *Naciones Unidas*. <https://www.un.org/es/observances/work-safety-day>.

Ontaneda, J. (2015). Asociación de movimientos repetitivos y tendinitis de Quervain en cajeros de una institución bancaria de la ciudad de Quito. Abril-Junio 2014. *Universidad Tecnológica Equinoccial. Quito. Ecuador. Trabajo de Grado de Maestría*. https://repositorio.ute.edu.ec/bitstream/123456789/17936/1/61531_1.pdf, pp.71.

Parra Cruz, A. (2019). Factores de riesgo ergonómico en personal administrativo, un problema de salud ocupacional. *Revista Sinapsis*, 2(15), DOI: <https://doi.org/10.37117/s.v2i15.212>. <https://revistas.itsup.edu.ec/index.php/sinapsis/article/view/212>.

Párraga Velásquez, M. (2014). Diseño ergonómico de aulas universitarias que permitan optimizar el confort y reducir la fatiga de estudiantes y docentes. *Universidad Nacional Mayor de San Marcos. Lima. Perú. Trabajo de Grado de Maestría*. https://cybertesis.unmsm.edu.pe/bitstream/handle/20.500.12672/3618/Parraga_vm.pdf?sequence=1&isAllowed=y, pp.124.

Pino, J., Tapia, O., Merino, P., & Campos, Y. (2021). Estudio comparativo entre la anamnesis y la ergonometría en la detección de limitaciones biomecánicas por sintomatología musculoesquelética. *Investigación Clínica; vol.62, n.1*, http://ve.scielo.org/scielo.php?pid=S0535-51332021000100052&script=sci_abstract, pp.52-62.

Posthuma, R., & Champion, M. (2007). Age stereotypes in the workplace: Common stereotypes, moderators and future research directors. *Journal of Management*, 35(1). <https://doi.org/10.1177/0149206308318617>, pp.158-188.

Rodríguez, Y., Pérez, E., & Vázquez, L. (2023). Introducción de mejoras ergonómicas. Beneficios para la organización. *Revista Técnica de Ingeniería Universidad de Zulia*. http://ve.scielo.org/scielo.php?script=sci_arttext&pid=S0254-07702013000200010&lng=es.

Sandoval, E. (2022). El trabajo de campo en la investigación social en tiempos de pandemia. *Espacio Abierto. Cuaderno Venezolano de Sociología; Vol.31. No.3. Maracaibo. Venezuela*. http://ve.scielo.org/scielo.php?script=sci_arttext&pid=S1315-00062022000300010.

Valencia, J., & Anchundia, R. (2022). Ergonomía, una prioridad en la salud ocupacional. *Pol. Con. (Edición núm. 70) Vol 7, No 9*. DOI: 10.23857/pc.v7i8, pp. 2270-2281.

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