

Ergonomic approach in academic scientific research An analytical reading of a sample of Algerian studies

AHMED GUERINIAI ^{1,*}, SAMIRA BADAOUI ²

¹⁻² Ibn Khaldoun University - Tiaret (Algeria)

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Abstract:

Our goal through this theoretical-analytical study is to understand the effectiveness of ergonomic intervention in workplaces in Algeria and its impact on the health and occupational safety of workers. This is achieved by highlighting a sample of academic studies examining the ergonomic reality within Algerian businesses for practical insights.

In this perspective, during our research on studies addressing ergonomic design in the work environment, we found a large number of studies covering various aspects of the subject globally and locally. However, our study exclusively focuses on local (Algerian) studies to assess the reality of ergonomic design within Algerian institutions.

Our selection of six local Algerian studies, taken as a sample for reading and analysis, allows us to grasp the interest of researchers in our country in this subject, based on a descriptive analytical approach.

After the analytical reading of the six studies and consulting their results, we can conclude that attention to ergonomic design in workplaces in Algeria is necessary. However, it has not reached the desired level in line with the observed evolution in global enterprises. Furthermore, there is a lack of involvement of psychologists and ergonomics specialists in the design and organization of workplaces, although some ergonomic interventions aimed at improving working conditions and promoting worker health and safety in certain companies are present. Nevertheless, they remain insufficient.

This underscores the need to pay increased attention to the discipline of ergonomics and the requirements of workplace design and organization in the service of worker safety and health. This involves strengthening support for workers to enhance their performance in line with their individual goals, the company's objectives, and its interests..

Keywords: Ergonomic design; Occupational Health and Safety; Work environment; The Worker.

ملخص:

يهدف من خلال هذه الدراسة النظرية التحليلية إلى معرفة فاعلية التدخل الأروغونومي في مؤسسات العمل الجزائرية، ومدى تأثيره على الصحة والسلامة المهنية للعمال، وذلك من خلال تسليط الضوء على عينة من الدراسات العلمية الأكاديمية، التي تناولت الواقع الأروغونومي في المؤسسة الجزائرية للاستفادة منها، من هذا المنطلق وعند بحثنا عن الدراسات التي تناولت التصميم الأروغونومي في بيئة العمل، تبين لنا أن هناك عددا كبيرا من الدراسات التي تناولت الموضوع من شتى الجوانب، سواء على الصعيد العالمي أو المحلي، وقد اقتصرنا في دراستنا هذه على الاعتماد والاهتمام بالدراسات المحلية (الجزائرية) فقط، لنقف على واقع التصميم الأروغونومي داخل المؤسسة الجزائرية.

وقد كان اختيارنا لست دراسات محلية (جزائرية) تناولت الموضوع أخذناها كعينة للقراءة والتحليل، لنقف على مدى اهتمام

* Corresponding author: e-mail: ahmedguerinai1969@gmail.com.

الباحثين في بلادنا بهذا الموضوع. معتمدين على المنهج الوصفي التحليلي.

وبعد القراءة التحليلية للدراسات الست والاطلاع على نتائجها ، يمكننا استنتاج أن الاهتمام بالتصميم الأروغونومي في مؤسسات العمل الجزائرية ضروري، إلا أنه لم يكن في المستوى المطلوب الذي يتمناه العامل تماشياً مع التطور الذي تشهده مؤسسات العمل في العالم، إضافة إلى عدم إشراك أخصائيين نفسانيين وأخصائيين في مجال الأروغونوميا عند تصميم وتنظيم مواقع العمل، وهذا لا ينفي وجود بعض التدخلات الأروغونومية التي تسعى إلى تحسين ظروف العمل والاهتمام بصحة العامل وسلامته المهنية في بعض المؤسسات، لكنها تبقى غير كافية. وهذا ما يستدعي الاهتمام أكثر بمجال الأروغونوميا ، وما يتطلبه تصميم وتنظيم مواقع العمل في مؤسسات العمل خدمة لسلامة وصحة العامل، وتدعيماً له لتحسين أدائه بما يخدم أهدافه وأهداف المؤسسة ومصالحها.

الكلمات المفتاحية: التصميم الأروغونومي؛ الصحة والسلامة المهنية؛ بيئة العمل؛ العامل.

1- Introduction

There is no doubt that contemporary work organizations constantly strive to provide their best services due to the evident competition in the labor market, whether in production or services. They rely on competent and effective human resources. However, these employees, in turn, seek the best offers and the most favorable conditions that ensure their happiness, stability, and fulfillment of their material, psychological, and social needs. This can only be achieved in a workplace that provides such conditions. For work organizations to retain their human resources, they need to create a suitable work environment free from risks and accidents by designing and organizing work sites in line with modern requirements, especially in aspects related to ergonomics and its various interventions.

From this perspective, in this analytical study, we will examine a sample of studies that have addressed the reality of ergonomic design in Algerian workplaces. We aim to extract their findings and determine how institutions can utilize these results to improve workers' occupational health and safety.

2- Importance of the Study:

The importance of this study lies in the attention given by researchers in the field of human factors engineering (ergonomics) to the reality of ergonomic design in Algerian work environments and its relationship to workers' occupational health and safety. It also highlights the scientific contributions they have made by raising awareness among managers and those interested in the organization and design of work sites, drawing their attention to creating better working conditions to improve institutional productivity.

Additionally, the study holds scientific importance in the field of research, serving as a reference for researchers, students, and specialists interested in workers and the workplace.

3- Objectives of the Study:

The objectives of the study are as follows:

- To highlight a sample of academic scientific studies that have addressed the ergonomic reality in Algerian institutions and to benefit from their insights.
- To understand the effectiveness of ergonomic intervention in Algerian workplaces and its impact on workers' occupational health and safety.
- To examine the findings of these studies and assess how accurately they diagnose the reality of ergonomic design.

Theoretical Approach to the Study Variables:

1. Concept of Ergonomics:

1.1 Definition of Ergonomics:

Defining scientific terms is one of the methodological steps in research design, as accuracy and objectivity are characteristics of science. Precision in science requires clear definitions for each term. From this perspective, it is essential to identify the key definitions related to the topic of ergonomics. There is no consensus among researchers and specialists on a comprehensive definition of ergonomics, which will be evident through the differences in definitions as follows:

Najm Aboud Najm defined ergonomics as the integrated whole of various scientific knowledge used in the study and rationalization of the work environment, aiming to preserve and optimally utilize human energy and anthropometric dimensions at work (Najm Aboud Najm, 2014, p. 224).

Additionally, Maqaddam (2010, p. 10) indicates that it collects as much information as possible about human capabilities, limitations, and characteristics required for ergonomic design, and utilizes them in designing work tools, their placement, various systems, and environment to ensure safe and truly comfortable human use.

The European Ergonomics Society defines ergonomics, as mentioned by Wahid (2001, p. 10), as concerned with the compatibility, suitability, conformity, and harmony between humans and the things they use, the activities they perform, and the environment in which they work and move. When this compatibility and suitability are achieved well, the pressures on humans decrease. They will feel more comfortable, perform their tasks faster and easier, and make fewer errors.

On the other hand, Catterall (1997, p. 18) views ergonomics as a body of knowledge, skills, tools, and techniques that, if appropriately applied, can achieve positive outcomes in terms of productivity, effectiveness, efficiency, and safety in any work environment. Ergonomics is the study of work systems within the context of realistic human performance, not assumptions.

Meanwhile, Chapanis et al. (1949, p. 4) add: Ergonomics is the science that combines basic and applied research to achieve a state of interaction among machine designs, processes, and the human element using them.

In conclusion, we can define ergonomics as an applied science that integrates various disciplines to coordinate systems for humans, aiming to achieve optimal adaptation for humans in their work environment and its components such as machinery and equipment, workplace layout, and physical factors (like heat, humidity, lighting, and

noise). It aims to fit these elements according to human characteristics, capabilities, limitations, and anthropometric dimensions, with the goal of protecting workers' health and safety from occupational hazards.

1-2. Origins and Development of Ergonomics: The development of ergonomics passed through several stages as follows:

The First Stage - Pre-World War II:

One of the significant developments during this stage, despite the term 'ergonomics' not being coined yet, was the advancement in work methods and the design of appropriate work times or schedules to enhance productivity.

A: Emergence of Scientific Management:

Scientific management refers to the efforts made by engineer Frederick Taylor to increase productivity and find the optimal work method. Taylor observed that workers at the electric company where he worked, responsible for loading iron bars onto trucks, were using inefficient methods. He selected a worker, who happened to be Dutch, and informed him that he could train him in a new loading method that would increase his productivity and consequently his wages from the company. The worker agreed to Taylor's proposal, who then proceeded to train him in the new work method. After the training, the worker was able to load 48 tons of iron daily, compared to his previous rate of 12.5 tons per day.

B: Motion and Time Study:

Motion and time study refers to the efforts made by American engineer Frank and his wife Lillian Gilbreth. They sought to study motion and time to increase productivity and improve its quality by eliminating unnecessary and excessive movements performed by workers during their tasks. One day, the researchers observed that bricklayers were making excessive motions during their work. Upon applying a study that reduced movements from 18 to 4.5, brick production increased from 120 bricks per hour to 350 bricks per hour. Their work can be seen as an extension of the scientific management principles pioneered by Frederick Taylor, showing the integration of scientific management principles with motion and time studies.

The Second Stage - Post-World War II:

This stage is divided into several sub-stages, including:

A. Emergence of Ergonomics (1945-1960):

When discussing this stage, it is essential to highlight certain years considered crucial for the emergence and development of ergonomics:

- In 1949, British psychologist Hywel Murrell first used the term 'ergonomics.'
- In 1957, the Ergonomics Research Society in Britain published the journal 'Ergonomics,' which continues to be published today. Additionally, the Human Factors and Ergonomics Society was established within the American Psychological Association.

In 1959, the International Ergonomics Association was established to connect ergonomics societies that had been formed in various countries around the world. (Maqaddam, 2010, pp. 22-24).

B. Rapid Growth Stage of Ergonomics (1960-1980):

During this stage, ergonomics expanded into civilian domains, and many ergonomics societies were formed, both in developed and developing countries alike.

C. Disaster Stage (1980-1990):

This stage witnessed numerous disasters that significantly contributed to the development of ergonomics. These disasters were painful, with human lives lost and considerable damage to machinery. However, they provided valuable lessons for those willing to learn from them and served as a warning for others. One of the key lessons learned was the necessity of integrating ergonomics into the design of machinery, processes, and work environments to prevent such accidents in the future. If ergonomics had been considered, many of these disasters could potentially have been avoided or their impact reduced significantly. (Maqaddam, 2010, p. 25).

Ultimately, Maqaddam (2010, p. 27) anticipates that ergonomics will experience significant development due to various issues in the current era, spanning from 1990 to the present day:

- * The extensive use of information technology in various operations was not initially thought to pose ergonomic problems for humans, such as musculoskeletal disorders and physical fitness decline due to prolonged sitting.
- * The space exploration undertaken by many advanced countries has led to the emergence of other ergonomic issues related to understanding human capabilities and limitations in work environments.
- * There is a growing focus on the elderly, disabled individuals, and those with special needs, emphasizing the necessity of ergonomic design for the tools and equipment they require.
- * Attention to children and the need for designs that suit their comfort to the greatest extent possible.
- * Achieving maximum human efficiency, ergonomics in this stage aims to develop both physical and mental human capabilities.

It becomes evident through reviewing the origins of ergonomics that this concept is not a recent development but rather the result of several advancements. Previously, the focus was primarily on designing machinery, equipment, and workplaces, as seen in the principles of scientific management, often neglecting the psychological and physical characteristics of humans. However, with modern trends represented by ergonomics, there is a focus on adapting everything surrounding the worker—equipment, machinery, and workplaces—to fit their mental capabilities.

1 – 3 Goals of Ergonomics:

Ergonomics aims to make the work environment, in all its components, suitable for human work or to improve health, safety, and efficiency in designing and adapting machinery for workers. The main goals, as highlighted by Rabei Shhata (2006), include:

- Improving work methods by modifying them to fit the worker, achieved through analyzing work into its basic movements to eliminate unnecessary actions and measure the time required.

- Designing or adapting machines, tools, and equipment to enhance productivity without increasing fatigue.
- Organizing work tools, equipment, and materials so that workers can access them quickly without wasting time searching.
- Identifying proper ergonomic postures for workers during their tasks.
- Studying physical conditions suitable for work, such as noise levels, lighting, temperature, humidity, and their impact on accidents or fatigue.

From the above, it can be concluded that focusing on ergonomics and applying its principles significantly contributes to improving the efficiency of an organization by saving time, eliminating waste and fatigue, enhancing spatial utilization in the workplace, and ultimately ensuring the comfort, satisfaction, and safety of workers.

2/ Ergonomic Design of Workplaces:

2/1- Definition of Design:

Design is the implemented invention that meets human needs in life, providing its benefits by employing it to achieve the desired effect or as the creative work that fulfills its purpose. It is also the translation of a specific subject or a deliberate idea related to the complete means of execution, bearing artistic values in its aspects. Therefore, design is the process of formation and innovation. (Khalf, 2005, p. 15).

2/2- Design of Workplaces:

When designing a workplace, it is important to study muscular capabilities (bones, joints, muscles) and sensory abilities (vision, hearing, touch, smell, taste). The combination of bones, joints, and muscles in humans forms models of force and muscle systems, similar to mechanical systems of levers and pulleys in machines. The efficiency of these systems depends on the distance between the pivot point (joint center) and the muscle force centers with bones, aiming for optimal use of lever and force systems.

For each joint movement, there is an optimal position where a muscle works with maximum mechanical advantage. However, this does not mean operating all muscles at their maximum mechanical advantage individually, but rather achieving the sum of all muscles' maximum productivity. The main sources of human strength are concentrated in the four limbs (arms, hands, legs, feet), with most tasks being performed by the arms and hands.

2/3- Principles of Ergonomic Design for Workplaces:

Ergonomics aims to harmonize between the individual and the environment in which they operate, aiming to achieve well-being. It seeks to improve designs related to the work environment, focusing on organizing workspace for each individual and for the organization as a whole. Efficiency and the capabilities of the worker, as well as their limits, are taken into consideration to enhance performance on one hand and their comfort and safety on the other.

Safe design involves considering the work environment and workstations for the individual, as well as the arrangement of workstations and tools, and the relationships between different workstations. Generally, there are three common types of

workstations found in various organizations: sitting, standing, and positions where workers alternate between sitting and standing.

1. **Sitting Positions:** These are suitable for tasks where tools and equipment are within reach of the worker's hands and within a frame or space they can access easily. Typically, these tasks do not require heavy physical exertion such as lifting weights or vigorous movements, with computer work being the most common example.
2. **Standing Positions:** Designed for tasks involving heavy lifting and moving loads between locations, often found in large factories where production lines require moving parts of products from one workstation to another.
3. **Positions Requiring Both Sitting and Standing:** These involve tasks with diverse demands, requiring workers to adopt postures that suit each task to perform them effectively.

Primary Principles:

1. The worker should be able to adopt a straight posture, facing towards the work.
2. Visual requirements for work should ensure that key work points are clear, with the head and trunk either straight or slightly forward.
3. All work activities should allow the worker to adopt multiple healthy postures without posing risks or limiting the individual's ability to perform their work.
4. Provide the individual with the choice to work either standing or sitting.
5. In standing postures, body weight should be evenly distributed on both legs, and the design of manual controls should adhere to this framework.
6. Work should not be performed continuously at heart level or above; conversely, arm support should be provided.
7. Rest periods should alleviate the physical strain experienced by the individual during work activities.

Secondary Principles:

1. Work activities should be performed using joints at the midpoint of each joint's range of motion. This primarily includes the head, trunk, and upper limbs.
2. When activities require muscular strength, it should primarily come from the larger muscles, and movement should be in the longitudinal direction of the muscle or limb involved.
3. When continuous strength is required, its source should either be the muscles of the arms or the muscles of the legs.
4. Assistance should be used whenever possible to aid the worker, and it should be minimized if muscle strength is to be prioritized.
5. Priority should be given to continuous and curved movements over straight-line movements that involve sharp and sudden changes in direction.

3/Occupational Health and Safety:

3/1- Definition of Occupational Health and Safety:

Occupational health and safety is defined as providing safe working conditions to preserve the three elements of production: human, machine, and material, and surrounding them with a fence of security within an atmosphere of safety and tranquility in the work environment.

It also includes various activities and administrative procedures aimed at protecting workers from risks associated with their work activities and from workplaces that may cause diseases and accidents. (Suheila Mohamed, 2010, in the study by Bouhara and Wadi).

It is also defined as the science that focuses on maintaining the safety and health of humans by providing safe work environments free from causes of accidents, injuries, or occupational diseases. In other words, it comprises a set of procedures, rules, and systems within a legislative framework aimed at protecting humans from the risk of injury and preserving property from the risk of damage and loss. (National Information Center).

Additionally, occupational health and safety can also be referred to as industrial safety, which serves as a deterrent protecting all workers in institutions from risks that threaten their lives, such as occupational diseases, injuries, wounds, and accidents. Therefore, companies' and institutions' managements have focused on industrial safety, dedicating maximum financial and operational efforts to prevent industries from leaving behind many injured and sick workers.

In conclusion, occupational health and safety in any institution serves as a protector, guardian, and safety net for both workers' lives and the work environment alike. (Previous Reference)

3/2- Objectives of Occupational Health and Safety:

The primary objective of implementing occupational safety measures is to achieve good production without accidents and injuries through:

- Protecting Individuals: This involves protecting individuals from risks by either completely eliminating hazards from the work area, minimizing risks to the lowest possible level if elimination is not feasible, or providing personal protective equipment to workers when risk reduction is not possible.
- Providing a Healthy Work Environment: This includes ensuring a conducive work atmosphere concerning lighting, humidity, and comfortable temperatures. It also entails installing safety and peace of mind in the hearts of workers during their tasks and reducing episodes of anxiety and panic.
- Protecting the Institution: This involves safeguarding the facility, including machines and work materials, from potential risks such as collisions, fires, and others.

The World Health Organization and the International Labour Organization defined the objectives of occupational health in 1950 as follows:

- Ensuring that workers are not deprived of health due to their working conditions.

- Working to achieve the highest levels of physical, mental, and social fitness for workers in all sectors and maintaining these levels.
- Protecting workers from hazards that could harm their health.
- Matching workers to jobs that align with their physical and mental readiness to achieve harmony between the worker and their work. (National Information Center).

Analytical Reading of Previous Studies:

1. Selected Studies for Review (Studies on Ergonomic Design):

Previous studies are crucial sources from which researchers in social sciences build their theoretical and methodological frameworks for their studies, utilizing them to analyze their findings and contribute novel insights within the context of scientific research aimed at solving specific social problems or phenomena. In this regard, when researching studies that have addressed ergonomic design in the workplace, it became evident that there are numerous studies covering various aspects globally and locally. Our focus in this study was specifically on Algerian studies to understand the reality of ergonomic design within Algerian institutions. We concentrated on six studies as samples for reading and analysis, to gauge the level of interest among researchers in our country on this subject. These studies are as follows:

1/1 - Study by Maref Menour (2021), published on 01/01/2022 at the University of Tlemcen – Algeria, titled: Ergonomic Intervention; A Prospective Vision Towards Worker Health and Safety.

The study aimed to highlight the role of ergonomics and what it offers to workers in the context of occupational health and safety, especially in this era filled with technological changes and developments. The researcher concluded that the work of the ergonomic specialist primarily depends on the type of request for intervention:

Either requests from general management or requests from worker representatives. The intervention is carried out according to the following procedures:

1. Conducting preliminary investigations: After obtaining authorization, the ergonomic specialist conducts initial investigations regarding:

- Work centers
- Task analysis
- Activity analysis

2. Preparing the initial diagnosis, which includes:

- Conducting initial interviews about the work centers.
- Carrying out initial observations.

3. Collecting information and analyzing the results.

The researcher concluded her study by emphasizing that ergonomic intervention in the institution is very necessary. In addition to the intervention of the ergonomic specialist, the collective participation of various stakeholders, who can contribute to finding solutions and achieving effective results, cannot be overlooked. This approach aligns

with ensuring safety and health, and guaranteeing the security of workers in the professional environment.

1/2- The study by Masouda Ajal (2021) from the University of Biskra, Algeria, titled: "The Reality of Ergonomic Design within the Algerian Institution - A Field Study at the Cable Manufacturing Company in Biskra."

The study aimed to get closer to the reality of ergonomic design within the Algerian institution, taking the Cable Manufacturing Company in Biskra as a model. This was done by following the descriptive analytical approach, relying on interviews, implicit observation, and a questionnaire with sections that express the main indicators of the presence of ergonomic design within this institution. The researcher reached the following conclusions:

- The focus on ergonomic design, specifically in the design and adaptation of machines to workers' abilities and capacities, is concentrated only on the ability to operate the machine.
- There is a lack of attention to mental capabilities and the absence of training courses that would make the worker cognitively capable and mentally prepared to understand the precise steps of machine operation. Workers often struggle to face and solve problems that arise.
- There is significant attention given to designing programs to ensure health and protect workers from accident risks.
- Attention to the moral aspect of workers to achieve psychological health and compatibility is weak, with only 51.87% effectiveness, as there is no psychological specialist within the institution.

In general, the reality of working with the principles of ergonomic design at the Cable Manufacturing Company in Biskra has not yet reached the level of advanced countries.

1/3- The study by Ballnou and Mansour (2020) from the University of El Oued, Algeria, titled:

"The Relationship between Human Energy Engineering (Ergonomics) and Occupational Safety and Health Systems and Their Impact on Improving the Performance of Workers in Algerian Industrial Institutions – A Theoretical Analytical Study."

The study aimed to understand the occupational safety and health systems and demonstrate their impact on improving the performance of workers in Algerian industrial institutions. This was achieved by exploring some concepts related to ergonomics, safety, and occupational health, as well as presenting the reality and efforts of Algeria and the world concerning occupational safety and health based on some statistics and figures. The researchers concluded:

- The occupational health and safety system in Algerian institutions has not yet yielded its fruits. Regarding the ergonomic approach, the situation is even worse; Algeria has not yet entered the field of developing the science of human energy engineering or even conducting some scientific studies and research in this area.

- Many experts believe that the best way to address workplace accident issues is to start with the ergonomic approach, where the workplace, machines, and equipment are designed appropriately, free from anything that could lead to occupational accidents.

1/4- The study by Rima Laamari (2020), published on 11/04/2021, at the University of M'sila, Algeria, titled:

"The Reality of Ergonomics Application in Algerian Institutions between Theoretical Approach and Practical Applications - An Evaluative Study from the Perspective of Condor Workers in Bordj Bou Arreridj."

The study aimed to identify and highlight the importance and role of the ergonomic approach in supporting professional adaptation and achieving harmony between the worker and the surrounding conditions and how it reflects on their comfort and safety thereafter.

The researcher adopted a descriptive evaluative approach, utilizing several tools including a questionnaire designed by the researcher, direct observation of the work environment, and interviews with some workers. The study concluded the following results:

- * The Condor company applies occupational health and safety standards at a high level in the workplace.

- * The Condor company applies the indicator of suitability of physical conditions at a high level in the workplace.

- * The Condor company applies the indicator of workplace design and organization at a high level in the workplace.

1/5- The study by Ben Houa and Yacoub (2017), Mascara – Algeria, titled:

"The Impact of Work Design on Occupational Health and Safety – An Applied Study at Sonelgaz Company in Mascara."

The study aimed to identify the dimensions of work design and highlight the relationship between work design and occupational health and safety in Algerian institutions through a case study of Sonelgaz Company in Mascara. The study relied on the Work Design Questionnaire (WDQ) by researchers Frederik P. Morgeson and Stephen E. Humphrey (2006) and the Occupational Health and Safety Model by Jeremy E. Stranks (2001). The findings concluded that there is a strong and positive correlation and impact between social support (35%), ergonomics (44%), and working conditions (47%) on the variable of occupational health and safety.

1/6- The study by Bouhara and Wadi (2016), conducted at the Universities of Sidi Bel Abbes and Annaba – Algeria, titled:

"The Reality of Ergonomics Applications in Service Institutions and the Role of Occupational Health and Safety Programs in Preventing Work Accidents - An Exploratory Field Study (Civil Protection Service in El Tarf Province as a Model)."

The study aimed to explore the reality of ergonomics in service institutions and to identify the importance and role of preventive programs in preventing work accidents and improving professional conditions within the framework of occupational health and safety. The study concluded with the following results:

- The work environment of the Civil Protection Service provides decent professional conditions in terms of physical and organizational aspects.
- Some occupational diseases were identified, which are related to the nature of the job, especially among the service agents.
- Behavioral reasons, i.e., those related to the worker, were identified as one of the main causes of work accidents, as well as those related to the work environment.
- The study also found that occupational health and safety programs play an effective role in reducing accidents, injuries, and even occupational diseases that may arise in the professional environment.

2/ Analytical Review of the Studies

As previously mentioned, the selected studies are local, originating from the Algerian environment and from various regions of the country. This selection aims to examine the reality of ergonomic design, the extent of attention given to it, and the difficulties and challenges faced by specialists in this field.

Based on the above, we will present the similarities and differences between these studies and then attempt to draw a common understanding of the importance of ergonomic intervention and design in Algerian work institutions.

2/1- Similarities between the Studies:

- **Objectives:** Despite variations in specific objectives, there is consensus among researchers on examining the state of ergonomic design in Algerian workplaces.
- **Methodology:** All researchers used the descriptive method, justifying it as the most suitable for the nature of their studies.
- **Sample:** The studies primarily focused on workers as their sample. However, the study by Bouhara and Wadi selected only managers and specialists in security and prevention among the workers.
- **Theoretical Approach:** The studies concentrated on two main aspects:
 - Ergonomics (Human Energy Engineering): This includes the design and ergonomic intervention, and the role of the ergonomic specialist.
 - Occupational Health and Safety: This covers the relationship between worker health and safety, their performance, and working conditions.

2/2- Differences between the Studies:

- **Title and Scope of Study:** Researchers articulate the problem or phenomenon they intend to study in the title, encompassing the key variables of their research. The formulation of the title may vary among researchers even when addressing the same phenomenon. This variation depends on the theoretical background, intellectual heritage, or previous studies they build upon. The approach can be theoretical or empirical, depending on the researcher's perspective and the specific aim of the study.
- **Specific Examples:** In our selected studies focusing on the state of ergonomic design in Algerian institutions, differences were noted in the formulation of study titles. Despite similar theoretical approaches, the primary objective for researchers was to assess the state of ergonomic design in workplaces, identify challenges, and propose solutions to enhance working conditions.

- **Theoretical Approach:** Studies like Marif Menouar (2021) and Balnou and Mansour (2020) approached the topic theoretically. The former focused on a single variable (ergonomic design), while the latter explored the relationship between human energy engineering (ergonomics) and occupational health and safety systems.

- **Empirical Approach:** On the other hand, the remaining four studies took an empirical approach. Masouda Ajal (2021) and Rima Lamari (2020) focused on a single variable (ergonomic design or ergonomics). Meanwhile, studies by Bouhara and Wadi (2016) and Ben Hawa and Yakoub (2017) extended their focus to two variables (ergonomic design and occupational health and safety).

-Results:

Results of the studies varied according to their respective problematics and objectives. Marif's study emphasized the necessity of ergonomic intervention involving ergonomic specialists and all stakeholders to ensure occupational safety, health, and worker security in the professional environment.

Ajal's study highlighted that the implementation of ergonomic design principles at the Cables Company in Biskra has yet to meet the standards of developed countries.

Balnou and Mansour affirmed that the occupational health and safety system in Algerian institutions has not yet fully materialized, indicating that the ergonomic approach in Algeria has yet to significantly advance in the field of human energy engineering.

In contrast, Rima's study found that the level of occupational health and safety standards, physical conditions, and workplace organization was relatively high at the study site.

Similarly, Bouhara and Wadi illustrated that the work environment generally provided satisfactory professional conditions in terms of physical and organizational aspects, emphasizing the effective role of occupational health and safety programs in reducing accidents and injuries.

Furthermore, Ben Hawa and Yakoub's study concluded that there is a strong positive correlation and impact between ergonomic dimensions (ergonomics, social support, working conditions) and the variable of occupational health and safety.

These findings underscore the diverse perspectives and outcomes regarding the implementation and effectiveness of ergonomic practices in Algerian workplaces.

3-Conclusion:

After reviewing the similarities and differences among the six previous studies and their results, we can conclude that while there is attention to ergonomic design in Algerian workplaces, it has not reached the desired level seen in developed countries. Additionally, there is a notable absence of involvement of psychological and ergonomics specialists in the design and organization of work sites.

The existing ergonomic interventions in some institutions aim to improve working conditions and focus on the health and safety of workers. However, these efforts predominantly emphasize physical ergonomics and occupational health and safety programs, neglecting organizational ergonomics and cognitive ergonomics, which

concern mental capabilities. This oversight extends to the lack of training courses, particularly those focusing on ergonomics, which could empower workers cognitively to understand the precise steps of machine operations and the risks present in their work environment, thereby preventing workplace accidents and occupational diseases.

This underscores the need for greater emphasis on ergonomics and its requirements in designing and organizing workplaces within Algerian institutions. This emphasis should serve the safety and health of workers, enhancing their performance to align with both their personal goals and the objectives of the organization. Human resources are a crucial asset that global organizations strive to preserve, ensuring their competitiveness amid rapid technological advancements.

4-Recommendations and suggestions:

In conclusion, and based on the results of this study and previous studies, the following recommendations are suggested:

–conduct further scientific studies to develop the field of ergonomics, taking into account physiological, physical, anthropometric characteristics, and the culture of Algerian society.

– Facilitate the involvement of experts in psychology and organization, especially those interested in ergonomics.

– Implement globally recognized ergonomic design standards when establishing new businesses. –Establish institutions or committees composed of diverse members specializing in various sciences such as engineering, medicine, psychology, experienced workers, and workplace safety and prevention specialists.

–The role of these committees should be ergonomic intervention before the workplace design process.

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