

Original Article

# Workplace Ergonomics and Its Impact on Employee Well-being and Productivity: A Comparative Study Across Professions

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**Abstract** - This paper examines the impact of ergonomics, employee well-being, and productivity on various workspaces across the Medical, Corporate, and educational sectors. The results are intended to help employers design and create workspaces while having ergonomic principles in mind to improve the day-to-day functioning of the workspace. This study utilized the Building Occupant Survey System Australia (BOSSA) Time-Lapse survey to assess employees' opinions on workplace ergonomics. Ergonomics was examined both as a composite construct and across four sub-dimensions: Posture & Equipment, Privacy & Layout, Environmental Comfort, and Overall Outcomes. The present research was conducted on a total sample of 97 participants, out of which N=38 are corporate employees, N=32 belong to the education section, and N=27 hail from a healthcare profession. The study's results highlighted that different professions did not differ significantly in terms of well-being and productivity; however, significant differences were observed in ergonomics. It is the only variable that has shown statistically significant differences among the three sectors. Hence, the findings suggest that higher ergonomics scores are associated with greater employee well-being and productivity, and that these two factors are strongly interrelated. Mediation analysis indicated that employee well-being partially mediated the association between ergonomics and productivity. Ergonomics directly influenced productivity and indirectly enhanced well-being. These findings underscore the essential importance of workplace ergonomics in promoting healthier and more productive work environments.

**Keywords** - Corporate Sector, Ergonomics, Employee Well-Being, Employee productivity, Education sector, Medical sector.

## 1. Introduction

The Greeks were among the first people to utilize ergonomics, which they employed in prehistoric times. Tools and machines were created for everyday use with ergonomics in mind to make work easier and safer for workers (Apollo Hospitals, n.d.). But the Greeks are said to have never used the name "ergonomics." Studies indicate that the design of the Ancient Greeks was anthropocentric. They would also use the way the parts of the human body work together to create building parts (Apollo Hospitals, n.d.). Hippocrates of Kos, a Greek physician and philosopher, is regarded as one of the most significant figures in the history of medicine. His writings contain some of the earliest mentions of ergonomics concepts in the design of the instruments, apparatus, and workplaces that a surgeon uses (Apollo Hospitals, n.d.).

The term "ergonomics" originates from the Greek words "ergon" and "nomos," meaning work and natural law, respectively. The term ergonomics was initially used by Polish scholar Wojciech Jastrzębowski in 1857. The year 1997 saw its English translation. His seminal work established

ergonomics as a discipline grounded in natural laws and human efficiency (Jastrzębowski, 1857). Teresa Bałuk-Ulewiczowa translated the original Polish version into English. The term was first used in the middle of the Industrial Revolution. The Industrial Revolution transformed people's lives from farming to hard factory work, making it necessary to learn about the science of work. Jastrzębowski utilized his understanding of ergonomics to make labor easier. The logical foundation for the distinct field of ergonomics (ergon + nomos), or the study of work, was established by the Polish scholar W.B. Jastrzębowski in 1857. Ergonomics was suggested as a scientific field with a vast range of interests and applications, including all facets of human behaviour, including work, leisure, cognition, and commitment (Karwowski, 1991; Karwowski, 2001).

Ergonomics, as defined by the Oxford Dictionary, is the examination of people's performance at work in contemporary settings. Ergonomics is a field that investigates labor and the relationship between humans and their occupational environments (Wignjosoebroto, 2007). Dul and Neumann



(2009) referenced the International Ergonomic Association (IEA) definition of ergonomics: “Ergonomics is concerned with the understanding of interactions among humans and other elements of a system, which, by doing so, it also provides optimisation for human well-being and overall performance of such system” (Masterizki et al., 2019). This pertains to examining the relationship between individuals within their work environment, comprising both the physical and organizational elements, and seeks to ensure alignment between the operator’s abilities and constraints with the requirements of the task, job, and/or work environment (Hoffner & Buchanan, 2020).

Currently, the incorporation of ergonomic considerations often sparks innovative ideas among engineering designers. Ergonomics-based design ensures safety, satisfaction, and efficiency by taking human characteristics into account. Ergonomically designed goods also help people avoid fatigue and stress (OSHA, n.d.). Studies indicate that businesses failing to implement ergonomic principles in workspace design elevate the likelihood of physical injuries among employees. However, a business that incorporates ergonomic principles into its workstation design has several benefits. An ergonomic workplace design strategy prevents problems like musculoskeletal disorders, which include back pain, neck discomfort, and shoulder pain, by minimizing the worker’s physical workload. A well-designed workplace can reduce the risk of musculoskeletal problems. All of the components of the workplace, the employees who work there, the requirements of the job, the atmosphere, and the typical body movements and postures that working individuals assume are dependent on one another. A friendly workplace can also make products, equipment, systems, and facilities easier to use, which makes tasks more straightforward to do and more efficient (Cornell Chronicle, 2002; OSHA, n.d.).

Tools, furniture, and equipment are all vital parts of the work environment. They all have a significant impact on how people work, which affects both their mental and physical health. People’s bodies assume specific postures as they use tools, furniture, and other work-related items. When designing office furniture and equipment, it is essential to ensure that people can sit and stand in a manner that minimizes stress on their bones and muscles. Some poorly designed work positions can cause problems with the spine and lead to muscle fatigue. It could cause the worker to develop chronic back pain and other musculoskeletal ailments. Poorly built workspaces can also cause fatigue or discomfort in many muscles, joints, tendons, and nerves in the arms, pelvis, legs, neck, and trunk. It is crucial to remember that even a perfect posture can put stress on the muscles and bones if it has to be held for too long without any chance to move. The human body is designed to move; therefore, staying still goes against its natural inclination. To meet the body’s natural demand for mobility, the workspace must be built to allow for movement (OSHA, n.d.; Weill Cornell Environmental Health and Safety, n.d.). To

put it simply, if the design of the workspace allows the office worker to move around freely and often, it is human-centered and incorporates ergonomics.

Most of the time, the chairs in offices are poorly made and uncomfortable for the people who work there. There are too many seats that force the worker to change to fit them, not the other way around. When designing chairs, consider how adjustable and adaptable they will be. A well-designed chair needs to have the right height for the seat. If the height is incorrect, it can put stress on the muscles in the back and legs, potentially causing muscle-joint illness. If you have to move your body around a lot at work, a backrest that touches your back too high or does not move could create bruising. The size of the chair’s seat is also quite important. If the seat of a chair is overly lengthy, it might put too much stress on the lower back and thighs. The seat’s material should be permeable, allowing body heat to escape. Chairs that do not adhere to ergonomic principles can compromise the health of workers, making it more difficult for employees to perform their jobs effectively. Regularly, productive time is squandered due to other poorly designed parts of the workstation (Mokarami et al., 2022; Cornell Chronicle, 2002).

There are numerous ways ergonomic concepts can be applied in the workplace. Increasingly, professionals in the industrial design field agree that incorporating user-friendly design concepts and ergonomic principles into sustainable design is crucial. Ergonomics is the study of how to make machines, workplaces, and homes that fit people’s physical and mental needs so that they can work and live in comfort and ease. In simpler terms, ergonomics is an engineering science that comes from finding solutions to issues (Kogi, 1998; OSHA, n.d.; Weill Cornell EHS, n.d.).

### ***1.1. Contemporary Importance Of Ergonomics***

Office ergonomics encompasses business process analysis and workplace design, incorporating furniture, equipment, computer systems, and environmental elements. Chandra et al. (2009) report a notable rise in job injuries attributed to overexertion and repeated strain. The extensive utilisation of computers and information technology in the office necessitates an assessment of employee performance and potential work-related health and stress issues. Ergonomic work design aids users in making educated choices to optimize efficiency and boost employees’ psychological well-being.

Musculoskeletal Diseases (MSDs) rank among the most prevalent occupational health issues, especially among healthcare personnel. These illnesses, which affect muscles, nerves, tendons, and joints, are often caused by repetitive and prolonged movements or abnormal postures that put strain on the body’s musculoskeletal system. A primary advantage of ergonomics is the prevention of musculoskeletal disorders and associated injuries. Ergonomic treatments, including adaptable physical workstations designed to reduce strain and

fatigue, can enhance employee well-being, boost efficiency, and increase productivity when suitable tools and equipment are provided (Chandra et al., 2009).

The contemporary discipline of ergonomics was independently developed by Murrell in 1949 (Edholm & Murrell, 1974). At that moment in time, it was regarded as an applied science, a technology, or a synthesis of the two (Karwowski, 1991, 2001). Since then, ergonomics has evolved into a holistic, human-centric discipline that considers physical, cognitive, social, organizational, and environmental elements in the design of work systems (Grandjean, 1986; Wilson & Corlett, 1990; Sanders & McCormick, 1993; Chapanis, 1996, 1999; Salvendy, 1997; Karwowski, 2001; Vicente, 2004; Stanton et al., 2004).

In recent years, there has been increasing acknowledgement of the correlation between job circumstances and the onset of Musculoskeletal Disorders (MSDs). Employers, employees, and governmental bodies increasingly recognise that Musculoskeletal Disorders (MSDs) diminish productivity and lead to absenteeism and economic detriment (Buckle, 2005).

In his 1857 article in *Nature and Industry*, Jastrzębowski categorized work into two main types: worthwhile effort, which promotes the common good, and harmful (or discreditable) activity, which leads to degradation. Utilitarian labor was further classified into four categories: physical, aesthetic, logical, and moral (Karwowski, 2001). Modern Human Factors and Ergonomics (HFE) enhances this notion by applying knowledge of human behavior, abilities, limitations, and other characteristics to guide the design of tools, machines, systems, tasks, jobs, and environments for maximum efficiency, safety, comfort, and effectiveness (Sanders & McCormick, 1993; Helander, 1997).

## **1.2. Ergonomics In Different Work Establishments**

### **1.2.1. Corporate Sector**

In today's workplaces, especially in businesses, ergonomics aims to eliminate discomfort and reduce the likelihood of injury (Grandjean, 1986; Sanders & McCormick, 1993). When considering how to build and use a workstation, the health and safety of the worker is the most important thing. In India, the legislation says that people should work 8 hours a day and 48 hours a week. However, in high-pressure corporate environments, these hours are generally longer, which makes employees forget about their health and posture (Chandra, Sharma, & Gupta, 2009). Bad work habits and poorly designed computer workstations can lead to significant long-term health issues (Mokarami & Sadeghi, 2022a). People who have this condition often have pain and stiffness in their back, neck, shoulders, hands, and wrists, as well as headaches and eye strain. Carpal tunnel syndrome is a typical occupational ailment that happens when you do the same thing over and over again with your hands and wrists, including

typing or using vibrating instruments. This can irritate the nerves, cause numbness, tingling, and pain (Buckle, 2005).

In the workplace, ergonomic solutions include the use of proper workstations, adequate lighting, and ergonomic equipment such as wrist supports, standing desks, and optimal screen positions to prevent repetitive strain injuries (Wilson & Corlett, 1990). Planning for breaks and reassigning tasks stimulates frequent activity to prevent musculoskeletal disorders (MSDs) (Grandjean, 1986; Karwowski, 2001). Managing noise and air quality involves monitoring noise levels and ensuring sufficient airflow to maintain a comfortable workplace (Sanders & McCormick, 1993).

In India, the corporate sector is known for long, stressful hours at work, inadequate sleep, and insufficient exercise. Due to the perceived connection between ergonomics and employee productivity, major international companies are increasingly recognizing the importance of ergonomics, particularly in the business world. The present study reveals that 52.6% of the 97 participants in the sample engage in work beyond 8 hours every day. Since workers spend one-third of their day at an office, it should be tailored to their needs and built with their needs in mind. As time has passed, the number of competitors in an industry has increased, leading to more efficient operations and improved employee health. Ergonomic programs can make workers more productive and healthier. Due to globalization in India, computer-based technology has become increasingly popular. As a result, a large part of the population spends most of their day on computers. As a result, the design of the computer workspace must prioritize user-centric concepts to reduce the risk of neck and eye strain, as well as musculoskeletal problems. An improperly designed workstation can negatively impact job quality and employee productivity (Kumar & Kumar, 2017). People frequently disregard the environment's aesthetic design. The light emitted by the computer must not produce glare, bright spots, or bothersome reflections within the users' field of vision. Research indicates that users exhibited a pronounced preference for lensed-indirect uplighting over parabolic lensed downlighting.

### **1.2.2. Medical Sector**

The corporate world generally recognizes that employees need to be comfortable, but the healthcare industry requires both ergonomic adjustments and increased awareness (Wignjosoebroto, 2007). Applying ergonomic principles can enhance the health of healthcare workers, enabling them to achieve strategic goals and provide patients with the best possible care (Keebler, 2022). But healthcare workers do not always use this information in their daily work. Keebler (2022) states that healthcare professionals often lack knowledge do human factors and ergonomics. When they do, it is usually in smaller, multidisciplinary groups that are seen as expensive and time-consuming.

Common concerns include Musculoskeletal Disorders (MSDs); healthcare personnel, especially nurses and physiotherapists, are at high risk due to repetitive activities, uncomfortable postures, and prolonged standing (Buckle, 2005; Mokarami & Sadeghi, 2022b). Lifting heavy objects and moving patients also increases the risk of back injuries and other musculoskeletal issues (Chandra et al., 2009). Poorly designed workplaces, long hours, and not enough basic ergonomic training all contribute to injuries that could have been avoided (Grandjean, 1986).

This means providing healthcare workers with the proper techniques for lifting and moving patients to reduce the risk of musculoskeletal injuries (Keebler, 2022). It also discusses how to set up medical equipment so that tools are easily accessible and people do not have to stand in awkward positions (Wilson & Corlett, 1990). The focus also includes managing workloads and shifts to reduce excessive workload and improve scheduling, thereby minimizing fatigue. Design for sanitation and hygiene is taken into account, with layouts that facilitate infection control and streamline workflow. Additionally, it is essential to wear Personal Protective Equipment (PPE) that fits well to ensure safety and comfort for an extended period (Karwowski, 2001).

### *1.2.3. Educational Sector*

In educational environments, ergonomics refers to the strategic design and arrangement of classrooms, furniture, and tools to support students' and teachers' physical well-being, learning efficiency, and engagement. The focus is on minimizing strain, fatigue, and injury by ensuring learning environments support proper posture, movement, and engagement (Saarni, Nygård, & Rimpelä, 2007; Creative Learning, 2020).

A century ago, school systems featured rigid wooden desks, reflecting an assumption that teachers were the sole source of information, leading to long hours of passive learning and strict discipline with little awareness of the physical strain on students (THE Journal, 1994; Akanegbu, 2012). Today, ergonomic science has evolved to prioritize ergonomic furniture, flexible and collaborative learning spaces, and technology integration, centering students' mental, physical, and emotional well-being in school design (Creative Learning, 2020; Learniture, n.d.).

In educational environments involving minors, such as schools and student activity centers, ergonomic furniture, like properly designed desks and chairs, is important for supporting good posture for both students and teachers. The strategic placement of technology aids, such as screens, keyboards, and digital tools, is crucial for managing cognitive load. Movement-friendly spaces are designed to encourage dynamic learning and prevent prolonged sitting (Molenbroek, 2010; Oyewole, Haight, & Freivalds, 2010; Learniture, n.d.). Lighting and acoustics must be carefully considered to

enhance concentration and reduce distractions (Lin, 2020; Klätte, Hellbrück, Seidel, & Leistner, 2010). Furthermore, backpack design, promoting awareness of proper weight distribution, is often considered to prevent back and shoulder strain and improve overall ergonomics (Negrini & Carabalona, 2002; Dockrell, Simms, & Blake, 2015).

Overall, these ergonomic factors and approaches contribute to improving worker productivity, enhancing student learning, and promoting patient well-being and recovery (Creative Learning, 2020; Learniture, n.d.; Lin, 2020).

### *1.3. Ergonomics, Well-Being, And Productivity*

Ergonomics has been found to have a significant impact on enhancing employee productivity, which is directly linked to their perceived well-being. Certain factors, including sunlight, thermal comfort, and vibrations - primarily associated with environmental ergonomics - substantially diminish stress levels among employees and enhance productivity in the workplace (Masterizki, Armanu, & Irawanto, 2019).

A study by Masterizki, Armanu, and Irawanto (2019) suggests that a comfortable workplace, characterized by sufficient lighting, an appropriate temperature, minimal noise, and the necessary resources, can enhance employee comfort and, in turn, improve their performance. These results align with six performance indicators: quality and quantity were met, all tasks were completed on time, all facilities were utilized, and all employees performed their team tasks independently without assistance.

Incorporating ergonomics into the workplace is also beneficial for mental health. It helps keep employees from becoming anxious and burned out by keeping them from working too hard or feeling uncomfortable. This, in turn, could make people more involved, motivated, and generally happier. Creating ergonomic workstations and implementing fair regulations, as well as regularly communicating with employees, can help keep them happy and healthy. It can help reduce injuries and musculoskeletal disorders, which in turn can decrease absenteeism and increase productivity (Gani et al., 2018).

### *1.4. Augmenting Human Productivity in Stress-Oriented Jobs*

Factors that determine human productivity in stress-oriented workplaces were identified and analyzed. Essential aspects include Indoor Air Quality (IAQ), the work environment, and occupational stress. The predominant impact of these factors and associated parameters was noted on the workers' metabolism, significantly affecting their efficiency. Inadequate indoor air quality, reduced physical activity, limited recreational options, organizational issues,

and subpar workspace design contribute to stressful environments (Allen et al., 2016; Remark Group, 2019).

Studies demonstrate that factors related to indoor environmental quality in the workplace, including temperature, humidity, and ventilation/air quality, have a substantial impact on human productivity. A survey conducted in the UK indicated that approximately 80% of office workers experienced a decline in productivity due to poor indoor air quality. Additionally, controlled studies have established a connection between ventilation, CO<sub>2</sub> levels, and indoor pollutants, leading to diminished cognitive performance (Allen et al., 2016; Remark Group, 2019).

The duration and frequency of breaks, along with inadequate physical activity, were identified as factors influencing productivity. In contrast, a supportive environment and lack of workplace bullying were observed. Factors in the workplace environment, such as organised individual workstations, furniture, cafeteria facilities, and job security, significantly influence human productivity. A substantial portion of the workforce acknowledges the effect of these factors on their productivity (Masterizki et al., 2019).

Ergonomic seating design must accommodate common conditions such as scoliosis and pregnancy. Implementing special seating arrangements for pregnant women employees, such as providing cushions for lumbar support, is advisable. Workstations must be designed to minimise glare during computer, desktop, and other digital device usage by employees. Chairs allocated to employees must be comfortable, featuring an ergonomic seat back design, adjustable height, arm support, and, where feasible, integrated synchro-tilt mechanisms. Work should be segmented into smaller tasks to allow employees to take breaks, thereby decreasing stress levels in the workplace and enhancing worker well-being (Gani et al., 2018).

Ergonomics in Product Design has evolved significantly from past practices to contemporary approaches, with potential advancements anticipated in the near future. Product design serves as a critical differentiator for success in a competitive market. Newly developed digital tools exhibit distinct features compared to their predecessors, and users engage with these innovations in varied ways. Companies can offer advantages to consumers that exceed those of rival products through consumer-friendly goods (Masterizki et al., 2019).

This research aims to address the deficiency in the current literature by investigating the influence of ergonomics across various workplace environments, including corporate offices, healthcare institutions, and educational facilities. This study will analyze the impact of ergonomics on employee productivity and well-being in these three situations, and compare and contrast the results.

A study conducted by Deshpande (2013) demonstrates that office ergonomics and ergonomically designed workspaces have a positive impact on employee productivity, particularly in the banking sector. Other papers also tend to investigate the impact of ergonomics in a specific sector or industry. However, the present study aims to analyze the relationship between three unique variables: ergonomics, employee well-being, and productivity, as well as compare and contrast the effects of three separate workspaces, something that a majority of papers do not delve into in depth.

The present study, therefore, aims to investigate whether there are any differences in the influence of ergonomic factors, employee productivity, and well-being among three different sectors: corporate, educational institutions, and the medical sector.

## 2. Materials and Methods

### 2.1. Purpose of the study

The present paper aims to explore and compare the impact of ergonomics, employee well-being, and productivity across medical, corporate, and educational work environments. Specifically, it aims to examine the differences among these professions with regard to ergonomics, well-being, and productivity; to analyze the interrelationships among these three variables; and to investigate how ergonomic factors, such as posture and equipment, privacy and layout, and environmental comfort, influence both well-being and productivity. Furthermore, this paper aims to determine whether employee well-being serves as a mediating factor in the relationship between ergonomics and productivity.

### 2.2. Hypothesis

H1: There is a difference between the 3 categories of the independent variable, *Profession*, with respect to the dependent variable of employee well-being.

H2: There is a difference between the 3 categories of the independent variable, *Profession*, with respect to the dependent variable, Ergonomics.

H3: There is a difference between the 3 categories of the independent variable, *Profession*, with respect to the dependent variable of employee productivity.

H4: There will be a correlation between employee well-being, Posture and Equipment, Privacy and Layout, Environmental Comfort, Overall Outcomes, and Productivity.

H5: There will be a correlation between employee well-being, total ergonomic score, and productivity

H6: Posture and equipment will be a significant predictor of employee well-being

H7: Privacy and layout will be a significant predictor of employee well-being

H8: Environmental comfort will be a significant predictor of employee well-being

H9: Overall outcomes will be a significant predictor of employee well-being

H10: Posture and equipment will be a significant predictor of employee productivity

H11: Privacy and layout will be a significant predictor of employee productivity

H12: Environmental comfort will be a significant predictor of employee productivity

H13: Overall outcomes will be a significant predictor of employee productivity

H14: Ergonomics will be a significant predictor of employee well-being.

H15: Ergonomics will be a significant predictor of employee productivity.

H16: Employee well-being will mediate the relationship between ergonomics and productivity, such that better ergonomics will lead to higher well-being, which in turn will lead to higher productivity.

### 2.3. Participants

The present study was conducted on a sample of 97 participants, out of which N=38 are corporate employees, N=32 belong to the education section, and N=27 hail from a healthcare profession. The respondents were comprised of 57.3% females and 42.3% males. The majority of the data collected consisted of respondents who were between 40 and 49 years old (36.1%). A large proportion of the respondents fell within the age categories of 20-29 years (22.7%) and 30-39 years (21.6%). 85.6% of the employees who participated in the survey work in person, while 14.4% of the respondents work in a hybrid manner.

### 2.4. Instrumentation

1. The study employed the Building Occupant Survey System Australia (BOSSA) Time-Lapse survey (Candido, Kim, de Dear, & Thomas, 2016) to assess employees' perceptions of workplace ergonomics. The BOSSA survey is a validated post-occupancy evaluation tool that has been widely used to measure occupant satisfaction with indoor environmental quality (IEQ) in organizational settings. It contains core questionnaire items that evaluate domains such as spatial comfort, air quality, noise and privacy, and thermal and visual comfort, with responses recorded on 7-point Likert-type scales (1 = *Dissatisfied* to 7 = *Satisfied*). Prior research demonstrates the instrument's strong construct validity and reliability in workplace assessments (Candido et al., 2016).

For the present study, the ergonomics-related items from BOSSA were adapted and organized into four subcategories for focused analysis:

- Posture & equipment – seating support, workstation adjustability, musculoskeletal comfort, and adequacy of equipment (e.g., keyboard, monitor).
- Privacy & Layout – Visual and sound privacy, workspace personalization, and layout that enable focused work.

- Environmental Comfort – satisfaction with lighting, noise levels, air quality, and thermal comfort.
- Overall Outcomes – perceived influence of the work environment on health and productivity.

The BOSSA Time-Lapse survey is one of the few questionnaires that examines ergonomics and its variables in great detail. It looks at multiple factors within ergonomics, some of which include privacy & layout, Posture and Equipment, etc., which other questions fail to do appropriately and in such elaborate detail, making it relevant for the present study being conducted. All items were rated on 5-point Likert-type scales, with anchors ranging from *Strongly Disagree* to *Strongly Agree* or *Uncomfortable/Negative* to *Comfortable/Positive*, depending on the question format.

2. Employee well-being was measured using a 10-item self-report questionnaire developed for the present study, adapted from workplace well-being and organizational support literature (e.g., Eisenberger, Huntington, Hutchison, & Sowa, 1986). The items reflected employees' perceptions of their mental and emotional state, ability to manage stress, work-life balance, collegial relationships, and organizational support for well-being. Sample items included: *"I feel emotionally balanced and mentally present during my workday," "I can maintain a healthy balance between my work and personal life,"* and *"My organization takes meaningful steps to support employee well-being."*

Responses were rated on a 5-point Likert scale ranging from 1 (*Strongly Disagree*) to 5 (*Strongly Agree*), with higher scores indicating stronger perceptions of well-being in the workplace. The scale was used as a composite measure, with all items summed or averaged to produce an overall employee well-being score.

3. Perceived productivity was measured using a 9-item self-report questionnaire developed for the present study, informed by workplace performance and job resources literature (e.g., Demerouti, Bakker, Nachreiner, & Schaufeli, 2001; Koopmans et al., 2014). The items assessed employees' perceptions of their ability to complete tasks on time, maintain motivation and focus, use working hours efficiently, and manage workload demands. Additional items captured contextual factors that influence productivity, such as the adequacy of tools and technology, support from managers, and the effectiveness of team communication. One reverse-coded item assessed feelings of being overwhelmed by workload.

Sample items included: *"I consistently complete my tasks on time," "My work environment helps me stay focused and efficient,"* and *"Communication within my team helps me complete tasks efficiently."*

All responses were recorded on a 5-point Likert scale ranging from 1 (*Strongly Disagree*) to 5 (*Strongly Agree*), with

higher scores reflecting greater perceived productivity at work. The scale was analyzed as a composite measure, with items averaged to produce an overall productivity score.

### 2.5. Data Collection Procedure

Respondents were provided with a Google Form that consisted of the three questionnaires, along with various demographic questions such as age, years of experience,

Profession, and gender. The respondents were primarily from Gurgaon and Jaipur.

### 2.6. Ethical Considerations

Informed consent was procured from all the respondents. Their participation in the study was entirely voluntary. All responses were kept confidential. The questionnaire also provided clear instructions to the respondents.

## 3. Results of the Study

**Table 1. ANOVA values for the different professions and employee well-being**

Profession	n	M	S.D.	F	p	$\eta^2$
Corporate/Private Sector Employee	38	39.32	6.2	2.38	.098	0.05
Education Sector	32	42.44	5.99			
Medical/Health Care Sector (Doctors, Nurses)	27	40.22	5.9			

A one-way Analysis of Variance (ANOVA) was conducted to examine differences in employee well-being across three professional groups: corporate/private sector employees, education sector employees, and medical/health care sector employees. Results indicated that there was no statistically significant difference in well-being scores among the groups,  $F = 2.38$ ,  $p = .098$ ,  $\eta^2 = .05$ . Although not statistically significant at the conventional  $\alpha = .05$  level, the

effect size ( $\eta^2 = .05$ ) suggests a small-to-moderate practical effect. Descriptively, education sector employees reported the highest mean well-being score ( $M = 42.44$ ,  $SD = 5.99$ ), followed by medical/health care employees ( $M = 40.22$ ,  $SD = 5.90$ ), and corporate/private sector employees ( $M = 39.32$ ,  $SD = 6.20$ ). These results imply that while mean differences exist, they did not reach statistical significance in this sample. H1 is thus rejected.

**Table 2. ANOVA values for professions in different sectors and office ergonomics.**

	n	M	S.D.	F	p	$\eta^2$
Corporate/Private Sector Employee	38	91.42	20.28	5.6	0.005	0.11
Education Sector	32	106.25	14.39			
Medical/Health Care Sector (Doctors, Nurses)	27	98.7	20.08			

A one-way analysis of variance (ANOVA) was also conducted to examine differences in office ergonomics across three professional groups: corporate/private sector employees, education sector employees, and medical/health care sector employees. Results indicated a statistically significant difference in ergonomics scores among the groups,  $F = 5.6$ ,  $p = 0.005$ ,  $\eta^2 = 0.11$ , as the p-value was equal to the conventional  $\alpha = 0.05$  level. The effect size ( $\eta^2 = .11$ ) suggests a moderate-

to-large practical effect. Descriptively, education sector employees reported the highest mean well-being score ( $M = 106.25$ ,  $SD = 14.39$ ), followed by medical/health care employees ( $M = 98.7$ ,  $SD = 20.08$ ), and corporate/private sector employees ( $M = 91.42$ ,  $SD = 20.28$ ). These results suggest that statistically significant differences exist between the three professions, as indicated by the mean differences observed in this sample. H2 is thus accepted.

**Table 3. ANOVA values for professions in different sectors and employee productivity.**

	n	M	S.D.	F	p	$\eta^2$
Corporate/Private Sector Employee	38	34.21	5.85	2	0.141	0.04
Education Sector	32	36.53	5.58			
Medical/Health Care Sector (Doctors, Nurses)	27	33.63	6.81			

A one-way analysis of variance (ANOVA) was conducted to examine differences in employee productivity across three professional groups: corporate/private sector employees, education sector employees, and medical/health care sector employees. Results indicated that there was no statistically significant difference in productivity scores among the groups,  $F = 2$ ,  $p = .141$ ,  $\eta^2 = .004$ . Although not statistically significant at the conventional  $\alpha = .05$  level, the effect size ( $\eta^2$

$= .04$ ) suggests a small-to-moderate practical effect. Descriptively, education sector employees reported the highest mean well-being score ( $M = 36.53$ ,  $SD = 5.58$ ), followed by medical/health care employees ( $M = 33.63$ ,  $SD = 6.81$ ), and corporate/private sector employees ( $M = 34.21$ ,  $SD = 5.85$ ). These results imply that while mean differences exist, they did not reach statistical significance in this sample. H3 is thus rejected.

**Table 4. Correlation Matrix of Employee Well-Being, Subscales of Ergonomics and Productivity**

		<b>EWB</b>	<b>P&amp;E</b>	<b>P&amp;L</b>	<b>EC</b>	<b>OVO</b>	<b>PROD</b>
<b>EWB</b>	<b>Correlation</b>	1	0.49	0.66	0.55	0.69	0.66
	<b>p</b>		<.001	<.001	<.001	<.001	<.001
<b>P&amp;E</b>	<b>Correlation</b>	0.49	1	0.64	0.52	0.64	0.48
	<b>p</b>	<.001		<.001	<.001	<.001	<.001
<b>P&amp;L</b>	<b>Correlation</b>	0.66	0.64	1	0.73	0.73	0.51
	<b>p</b>	<.001	<.001		<.001	<.001	<.001
<b>EC</b>	<b>Correlation</b>	0.55	0.52	0.73	1	0.79	0.66
	<b>p</b>	<.001	<.001	<.001		<.001	<.001
<b>OVO</b>	<b>Correlation</b>	0.69	0.64	0.73	0.79	1	0.73
	<b>p</b>	<.001	<.001	<.001	<.001		<.001
<b>PROD</b>	<b>Correlation</b>	0.66	0.48	0.51	0.66	0.73	1
	<b>p</b>	<.001	<.001	<.001	<.001	<.001	

\*EWB = Employee well being, P&E = Posture and Equipment, P&L = Privacy and Layout, EC = Environmental Comfort, OVO = Overall Outcomes, PROD = Productivity.

Pearson's correlation coefficients were calculated to examine the relationships among employee well-being, posture and equipment, privacy and layout, environmental comfort, overall outcomes, and productivity. Results indicated that employee well-being was positively correlated with posture and equipment ( $r = .49$ ,  $p < .001$ ), privacy and layout ( $r = .66$ ,  $p < .001$ ), environmental comfort ( $r = .55$ ,  $p < .001$ ), overall outcomes ( $r = .69$ ,  $p < .001$ ), and productivity ( $r = .66$ ,  $p < .001$ ).

Posture and equipment were also positively correlated with privacy and layout ( $r = 0.64$ ,  $p < 0.001$ ), environmental comfort ( $r = 0.52$ ,  $p < 0.001$ ), overall outcomes ( $r = 0.64$ ,  $p < 0.001$ ), and productivity ( $r = 0.48$ ,  $p < 0.001$ ). Privacy and

layout showed strong positive correlations with environmental comfort ( $r = 0.73$ ,  $p < 0.001$ ), overall outcomes ( $r = 0.73$ ,  $p < 0.001$ ), and productivity ( $r = 0.51$ ,  $p < 0.001$ ). Environmental comfort was strongly correlated with overall outcomes ( $r = 0.79$ ,  $p < 0.001$ ) and productivity ( $r = 0.66$ ,  $p < 0.001$ ). Finally, overall outcomes demonstrated a strong positive correlation with productivity ( $r = .73$ ,  $p < .001$ ).

Taken together, these results suggest that all aspects of ergonomics (posture and equipment, privacy and layout, and environmental comfort) are strongly and positively related to employee well-being, overall outcomes, and productivity. H4 is thus accepted.

**Table 5. Correlation Matrix of Employee Well-Being, Ergonomics, and Productivity**

		<b>Employee well-being</b>	<b>Ergonomics</b>	<b>Productivity</b>
<b>Employee well-being</b>	<b>Correlation</b>	1	0.69	0.66
	<b>p</b>		<.001	<.001
<b>Ergonomics</b>	<b>Correlation</b>	0.69	1	0.66
	<b>p</b>	<.001		<.001
<b>Productivity</b>	<b>Correlation</b>	0.66	0.66	1
	<b>p</b>	<.001	<.001	

Pearson's correlation coefficients were computed to examine the relationships among employee well-being, ergonomics, and productivity. Results indicated that employee well-being was positively correlated with ergonomics ( $r = 0.69$ ,  $p < 0.001$ ) and productivity ( $r = 0.66$ ,  $p < 0.001$ ).

Ergonomics was also positively correlated with productivity ( $r = .66$ ,  $p < .001$ ). These findings suggest that higher ergonomics scores are associated with greater employee well-being and productivity, and that well-being and productivity are strongly interrelated. H5 is thus accepted.

**Table 6. Multiple Regression Predicting Employee Well-Being from Ergonomic Subscales**

Predictor	B	SE B	$\beta$	t	p	95% CI for B
Constant	20.81	2.48	—	8.39	<.001	[15.88, 25.74]
Posture & Equipment	-0.04	0.16	-0.03	-0.27	.788	[-0.36, 0.27]
Privacy & Layout	0.28	0.09	0.38	3.21	.002	[0.11, 0.45]
Environmental Comfort	-0.14	0.12	-0.15	-1.17	.244	[-0.37, 0.10]
Overall Outcomes	1.03	0.25	0.55	4.19	<.001	[0.54, 1.52]

\*Note. DV = Employee well-being. Model summary:  $R = .73$ ,  $R^2 = .54$ , Adjusted  $R^2 = .52$ ,  $p < .001$ .

A multiple regression analysis was conducted to examine which ergonomic subscales predict employee well-being. The overall model was significant,  $p < .001$ , accounting for 54% of the variance in well-being ( $R^2 = .54$ , Adjusted  $R^2 = .52$ ). Among the predictors, Privacy & Layout ( $\beta = .38$ ,  $p = .002$ ) and Overall Outcomes ( $\beta = .55$ ,  $p < .001$ ) emerged as significant positive predictors of well-being. Posture & equipment ( $p = .788$ ) and Environmental Comfort ( $p = .244$ )

were not significant predictors of employee well-being, indicating that these factors did not contribute meaningfully to the model. These findings suggest that employees' perceptions of privacy and layout, as well as the overall ergonomic outcomes, are stronger contributors to their well-being than posture or environmental comfort alone. H7 and H9 are thus accepted, while H6 and H8 are rejected.

**Table 7. Multiple Regression Predicting Employee Productivity from Ergonomic Subscales**

Predictor	B	$\beta$	SE B	t	p	95% CI for B
Constant	12.03	—	2.42	4.97	<.001	[7.22, 16.83]
Posture & Equipment	0.1	0.06	0.15	0.65	.519	[-0.21, 0.41]
Privacy & Layout	-0.1	-0.14	0.08	-1.22	.224	[-0.27, 0.06]
Environmental Comfort	0.24	0.26	0.11	2.12	.036	[0.02, 0.47]
Overall outcomes	1.09	0.59	0.24	4.54	<.001	[0.61, 1.56]

\*Note. DV = Employee productivity. Model summary:  $R = .75$ ,  $R^2 = .56$ , Adjusted  $R^2 = .54$ ,  $p < .001$ .

A multiple regression analysis was conducted to examine which ergonomic subscales predict employee productivity. The overall model was significant,  $p < .001$ , accounting for 56% of the variance in productivity ( $R^2 = .56$ , Adjusted  $R^2 = .54$ ). Among the predictors, Environmental Comfort ( $\beta = 0.26$ ,  $p = .036$ ) and Overall Outcomes ( $\beta = .59$ ,  $p < .001$ ) emerged as significant positive predictors of employee productivity. Posture & equipment ( $p = .519$ ) and Privacy and Layout ( $p =$

.224) were not significant predictors of employee productivity, indicating that these factors did not contribute meaningfully to the model. These findings suggest that employees' environmental comfort, as well as the overall ergonomic outcomes, are stronger contributors to their productivity than their posture, privacy, or the layout of their workspace. H12 and H13 are thus accepted, while H10 and H11 are rejected.

**Table 8. Simple Linear Regression Predicting Employee Well-Being from Ergonomics:**

Predictor	B	$\beta$	SE	t	p	95% CI for B
Constant	19.22	—	2.37	8.1	<.001	[14.5, 23.93]
Ergonomics	0.22	0.69	0.02	9.18	<.001	[0.17, 0.26]

\*Note. DV = employee well-being. Model summary:  $R = .69$ ,  $R^2 = .47$ , Adjusted  $R^2 = .46$ ,  $p < .001$ .

A simple linear regression was conducted to examine whether ergonomics predicted employee well-being. The results indicated that ergonomics significantly predicted employee well-being,  $B = 0.22$ ,  $SE = 0.02$ ,  $\beta = 0.69$ ,  $t = 9.18$ ,  $p < .001$ , with a 95% confidence interval of [0.17, 0.26]. The

model explained approximately 47% of the variance in employee well-being ( $R^2 = .47$ ). These findings suggest that higher ergonomics scores are associated with greater employee well-being. Hence, H14 is accepted.

**Table 9. Simple Linear Regression Predicting Employee Productivity from Ergonomics**

Predictor	B	$\beta$	SE	t	p	95% CI for B
Constant	14.21	—	2.43	5.85	<.001	[9.39,19.04]
Ergonomics	0.21	0.66	0.02	8.64	<.001	[0.16,0.26]

\*Note. DV = Employee productivity. Model summary:  $R = .66$ ,  $R^2 = .44$ , Adjusted  $R^2 = .43$ ,  $p < .001$ .

A simple linear regression was conducted to examine whether ergonomics predicted productivity. The results indicated that ergonomics significantly predicted productivity,  $B = 0.21$ ,  $SE = 0.02$ ,  $\beta = 0.66$ ,  $p < .001$ , with a 95% confidence

interval of [0.16, 0.26]. The model predicted approximately 44% of the variance in productivity ( $R^2 = .44$ ). These findings suggest that higher ergonomic scores are associated with increased employee productivity. Hence, H15 is accepted.

**Table 10. Regression Coefficients for the Mediation Model Testing The Effect Of Ergonomics (X) On Productivity (Y) Through Employee Well-Being (M)**

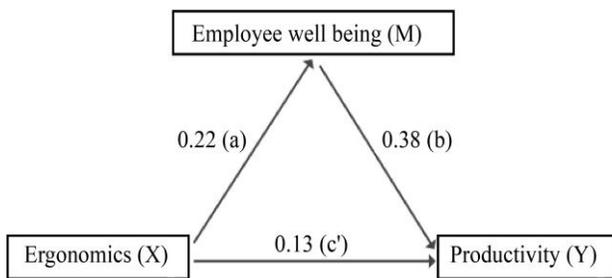
Path	B	SE	$\beta$	t	p
<b>Model 1: Mediator (M = Employee well-being)</b>					
Ergonomics → Employee well-being (a)	0.22	0.02	.69	9.18	<.001
<b>Model 2: Dependent Variable (Y = Productivity)</b>					
Ergonomics → Productivity (c')	0.13	0.03	.40	4.06	<.001
Employee well-being → Productivity (b)	0.38	0.10	.39	3.93	<.001
<b>Total effect (c) Ergonomics → Productivity</b>	<b>0.22</b>	<b>0.02</b>	<b>.69</b>	<b>9.18</b>	<b>&lt;.001</b>

A mediation analysis was conducted to examine whether employee well-being mediated the relationship between ergonomics and productivity. Results indicated that ergonomics had a positive relationship with employee well-being ( $a = 0.22$ ,  $p < .001$ ), which in turn positively predicted productivity ( $b = 0.38$ ,  $p < .001$ ). The direct effect of ergonomics on productivity remained significant ( $c' = 0.13$ ,  $p < .001$ ), though smaller than the total effect ( $c = 0.22$ ,  $p < .001$ ), suggesting partial mediation. Overall, the model explained 52% of the variance in productivity. Thus, H16 is accepted.

**4. Discussion**

The findings from the present study indicate that there were no significant differences in well-being and productivity among different professions. The sample size of the respondents was relatively small and unevenly distributed across different professions, which may have contributed to the present study’s inability to account for variation in the sample. Moreover, the use of convenience sampling further limits the study’s findings. The present research, however, did report significant differences with regard to ergonomics.

In the case of employee well-being, popular literature reports contradictory findings wherein researchers have reported that sector-related differences do exist when looking at employee well-being. Chandanshive (2022) found that discrepancies in well-being exist among different professions, with respondents from the Education sector displaying superior well-being scores compared to those in the corporate and medical sectors. These findings highlight the importance of understanding sector-specific challenges to enhance employee well-being and work-life balance. Women educators exhibit much greater psychological well-being than their female counterparts in several domains (Srimathi & Kumar, 2010). The research finds that employee well-being mediates the correlation between ergonomics and productivity, indicating that improved ergonomics enhances well-being, which in turn results in increased productivity.



**Fig. 1 Mediation Model Showing the Indirect Effect of Ergonomics on Productivity Through Employee Well-Being**

\*Note. X = Ergonomics, M = Employee well-being, Y = Productivity. Path a represents the effect of ergonomics on employee well-being. Path b represents the effect of employee well-being on productivity. Path c' represents the direct effect of ergonomics on productivity after accounting for employee well-being.

Hanaysha (2016) demonstrates that all characteristics of work engagement—vigor, devotion, and absorption—exert considerable favourable benefits on employee productivity. Research indicates that workspace design improves employee productivity, with employees themselves affirming this belief. The current findings indicate that, among the several subscales of ergonomics, overall ergonomic outcomes and employees' perceptions of privacy and layout are more significant contributors to their well-being than posture and environmental comfort. In terms of productivity, employees' environmental comfort and overall ergonomic results are more significant factors than their posture or the privacy and configuration of their workspace.

The current data indicate that ergonomics is the sole variable that has demonstrated statistically significant variations among the three industries. Comprehensive ergonomic solutions, including adaptable workstation design, significantly enhance musculoskeletal health and environmental enjoyment. Robertson et al. (2008) mentioned that by improving elements in workspace ergonomics and giving training to employees, there can be a significant drop in business process durations and even the compensation costs incurred by the organisation. Hence, an active ergonomic strategy to enhance workplace surroundings can be beneficial to the physical health and the performance of the employees. Research demonstrates that the importance of office space design is rising due to the growing average hours worked and the more sedentary characteristics of employment, especially in knowledge sectors (KRD & Mukhopadhyay, 2024). In medical professions such as nursing, research has found an increase in occurrences of musculoskeletal disorders stemming from handling patients. Nurses are at risk of developing trauma disorders arising from computer usage. Studies in the medical domain demonstrate the imperative of incorporating ergonomic factors into workplace settings to improve safety for nurses (Nielsen & Trinkoff, 2003). In summary, ergonomics is a crucial element of workplace design that profoundly influences employee health, well-being, and satisfaction.

The current findings indicate that elevated ergonomics scores correlate with enhanced employee well-being and productivity, and that well-being and productivity are significantly interconnected. Research indicates that enhanced employee well-being is positively connected with productivity (Krekel et al., 2019). Prior study highlights the significance of ergonomics in enhancing productivity through the mitigation of accidents and injuries, thereby lowering expenses and augmenting profits for the organisation (Gani, Zamberi & Teni, 2018). A study by Malla et al. (2022) indicates that workplace ergonomic improvements can positively influence productivity and employee health. A decrease in musculoskeletal problems, together with enhancements in employee happiness and productivity, was specifically observed. Ergonomic outcomes foster a secure and healthy

workplace, improving employee health and well-being, enabling employees to perform efficiently without interruptions caused by personal health issues or physical discomfort. It can also be a crucial factor in fostering a congenial work atmosphere and enhancing staff morale, resulting in improved productivity.

## 5. Conclusion

Over the years, the importance and value of ergonomics across different sectors have increased. Companies around the world are understanding their importance and designing workspaces while keeping the same in mind, as ergonomics will foster a more engaging and positive working environment, which undoubtedly will yield better results for the organization. Ergonomics plays an integral and essential role in increasing efficiency and productivity of the user, as it helps in designing tools and machines while keeping in mind the worker's efficiency and needs. This paper aimed to understand if there is any impact of office ergonomics on employee well-being, satisfaction, happiness, and productivity across three prominent fields: the corporate sector, the medical and health sector, and the educational sector.

The quantitative analysis revealed that ergonomics was the only workplace variable showing significant group differences across sectors ( $p = 0.005$ ), with education sector employees reporting the highest ergonomics scores, followed by healthcare and corporate workers. There were no statistically significant differences for employee well-being across sectors. Results indicated that employee well-being was positively correlated with ergonomics ( $r = .69, p < .001$ ) and productivity ( $r = .66, p < .001$ ). Ergonomics was also positively correlated with productivity ( $r = .66, p < .001$ ). These findings suggest that higher ergonomics scores are associated with greater employee well-being and productivity, and that well-being and productivity are strongly interrelated. The findings for the present research show that ergonomics is positively correlated with employee well-being and efficiency. In fact, in the sample, there was statistically significant evidence that office ergonomics is associated with higher levels of well-being and productivity among employees, and that well-being and productivity are strongly interrelated. Results indicated that ergonomics positively predicted employee well-being, which in turn positively predicted productivity. The direct effect of ergonomics on productivity remained significant, though smaller than the total effect, suggesting partial mediation. Among various subscales of office ergonomics, employees' perceptions of privacy and layout, as well as the overall ergonomic outcomes, are stronger contributors to their well-being than posture or environmental comfort alone. For the case of productivity, employees' environmental comfort, as well as the overall ergonomic outcomes, are stronger contributors than posture, their privacy, and the layout of their workspace.

## Limitations of the Study

1. The findings are based on a relatively small participant pool, which may limit the generalizability of the results. The conclusions arising from statistical data are not exactly accurate and are true only on average, giving only approximate instead of accurate results.
2. Participants were not evenly represented across different occupational groups, potentially introducing bias in profession-related comparisons.
3. The present study utilised a convenience sampling approach, which can contribute to selection bias and reduce the representativeness of the sample.
4. The study was conducted within a specific demographic and cultural setting, which may limit the applicability of findings to other populations.
5. ergonomics in mind while creating workspaces due to its impact on the overall employee physical and mental health, satisfaction, productivity, and well-being.
3. Future research can ensure a longitudinal design to better capture changes in employee well-being and productivity levels over time due to workplace ergonomics.
4. Other random sampling methods, such as stratified, cluster, and systematic random sampling methods, should be used instead of convenience sampling. This is to reduce maximum undercoverage bias, especially while collecting data from a diverse sample.
5. Organisations should promote awareness campaigns that normalize seeking help for stress and anxiety among workers.
6. Employers should provide access to counseling and mental health resources to employees, while ensuring sensitivity to cultural and professional contexts. This would help make the workspace a more productive and open space.

## Future Recommendations

1. For any future research done on the subject, one should include a sample that represents the population well to remove selection bias. The sample selected should preferably be uniform, with respect to each sector in which research is conducted, so that research can be generalised for a larger population of individuals, not just those from whom data was collected.
  2. Employers and designers of the workspace and those who design the tools and machines within it should keep
- Organisations should ensure to maintain the privacy of their employees, offer them sufficient breaks, and overall try to deliver ergonomics that promote employee well-being. By doing so, the employee productivity will show a dramatic improvement.

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