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Assessing Human Factors and Ergonomics: A Basis for Developing a Safety Assessment Model for Educational Institutions

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Abstract

In light of ongoing technological advancements and the disruptions caused by the recent pandemic, organizations, including educational institutions, face significant ergonomic challenges affecting employee well-being. This study presents a descriptive evaluation of human factors and ergonomics, proposing a conceptual ergonomic safety assessment model. Data were collected from 85 employees of a higher education institution and analyzed using descriptive statistics, including frequency, percentage, and weighted mean, along with one-way ANOVA to examine differences among groups. The analysis identified common ergonomic hazards such as improper posture, static loads, and fatigue, highlighting areas requiring immediate corrective actions as part of an integrated ergonomic safety program. The proposed model encompasses physical, cognitive, and organizational aspects of ergonomics, offering a structured approach to mitigate risks associated with evolving work environments. By proposing actionable strategies, this research contributes to workplace safety literature, aiming to enhance employee health and productivity and to inform future ergonomic frameworks within the educational sector.

Introduction

The 2019 pandemic has catalyzed rapid transformations in workplaces, particularly within the education sector, where technology-driven work has become prevalent, leading to increased productivity and complexities (Herath & Hearth, 2020; Onyema et al., 2020). Educational institutions worldwide have swiftly integrated technology to ensure continuity in teaching and administrative functions (Onyema et al., 2020). In this evolving landscape, ergonomics is critical in creating safe and comfortable settings and optimizing the alignment between individuals and their work environment (Pawar & Khedkar, 2016), considering physical, cognitive, and organizational factors.

The field of ergonomics has a well-documented history of evolving safety models, adapting to shifts in workplace demands and environments. Early ergonomic safety models primarily focused on physical aspects, such as

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workstation design, aimed at reducing musculoskeletal strain (Hofmann et al., 2017). Over time, models began to incorporate cognitive and

organizational ergonomics, recognizing that mental workload, decision-making processes, and organizational structure also impact well-being and efficiency (Johnsen et al., 2017). Recent studies emphasize the integration of digital ergonomics, addressing the increasing prevalence of technology and screen time across various professions, including education (Bently et al., 2021).

In educational institutions, the pandemic introduced unique ergonomic challenges, as administrative staff and educators had to adapt quickly to modified work environments and practices, emphasizing the importance of human-system interactions (Muljadi et al., 2022). However, existing ergonomic models are often insufficient to address these specific challenges within the educational sector. The rapid implementation of technology and altered work environments require comprehensive ergonomic assessment models tailored to this context (Dennerlein, 2020). By emphasizing participatory methodologies, data-driven changes, and organizational commitment, educational institutions can develop ergonomic safety assessment models that address physical, cognitive, and organizational factors more effectively.

The evolution of ergonomic safety models is particularly relevant in countries like the Philippines, where workplace health and safety have become prominent concerns, with over 125,000 reported occupational illnesses in 2015 alone (Zare et al., 2016). The International Ergonomics Association (IEA) categorizes human factors and ergonomics (HF/E) into three main domains: physical, cognitive, and organizational ergonomics. Each domain plays an essential role in optimizing physical conditions, mental processes, and social systems within workplaces (IEA, 2020; Christy & Duraisamy, 2020). Research across industries such as dentistry, office work, and banking has shown that ergonomic interventions can reduce musculoskeletal issues and improve productivity (Gupta et al., 2014; Kingsley, 2013; Deshpande, 2013).

As the field advances, ergonomic models have expanded to incorporate factors beyond physical and cognitive ergonomics. Models now increasingly consider environmental influences such as lighting, temperature, and air quality, which are crucial for creating sustainable and climate-resilient workspaces (Díaz-López et al., 2022). Recognizing these environmental factors, educational institutions are progressively adopting strategies that integrate ergonomic principles with sustainability, acknowledging that both student and staff well-being are influenced by the physical learning environment (Castellucci et al., 2017; Kibria & Rafiquzzaman, 2019). Additionally, educators have integrated exercises for postural awareness to enhance cognitive well-being, educational performance, and organizational effectiveness, aligning with an increasingly holistic view of ergonomics (Jabeen & Hussain, 2022; Alzahrani, 2019).

In light of these findings, this study seeks to address gaps in ergonomic safety models within the educational sector by proposing a comprehensive ergonomic safety assessment model. This model evaluates human factors domains, incorporating demographic information and hazard perception to create an ergonomic safety program for educational institutions. Real-world applications of ergonomic models, such as in healthcare and office environments, have demonstrated the value of targeted interventions in reducing workplace hazards and improving well-being (Khan et al., 2020). By adapting these practices to educational settings, this model

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introduces an innovative approach that considers the unique ergonomic challenges in academia, such as varied workspaces, increased screen time, and flexible job roles.

This study's model aligns with the call for educational ergonomics programs that build awareness and support safe working conditions in increasingly complex educational environments. Furthermore, it aims to contribute to the field by offering a structured, replicable model that educational institutions can use to identify and address specific ergonomic risks, fostering a safer, more productive working environment for staff and educators alike.

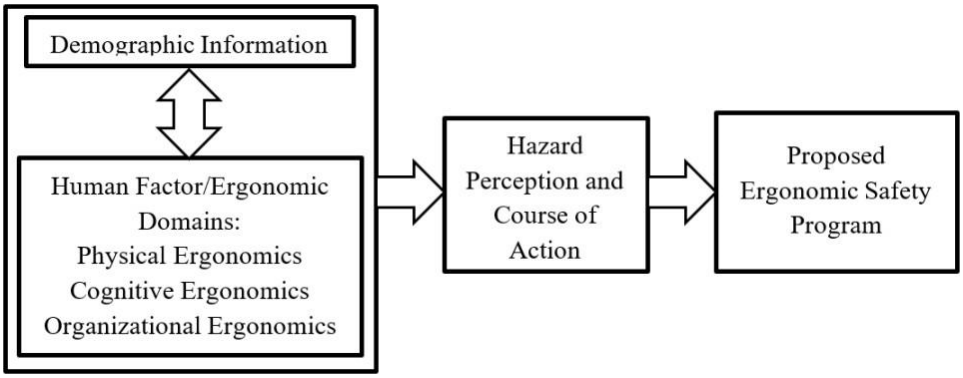
Conceptual Framework

The conceptual framework of this study includes demographic information, HF/E domain evaluation, environmental stress spectrum, and hazard control hierarchy, built from Kate's model, HF/E domains, and the hazard control hierarchy. Kates' Model emphasizes human and natural event system interaction in hazard perception and response (Kates, 1971, as cited by Vilímek & Šifta, 2024). Similarly, ergonomic hazards arise from human-work system interactions that do not meet ergonomic needs (Gaynor et al., 2019; Komarek et al., 2020).

The environmental stress spectrum influences hazard interpretation and response, from unawareness to intolerance. It includes awareness, action, and intolerance thresholds (Naji et al., 2021). The HF/E domain identifies three subdomains: physical, cognitive, and organizational ergonomics. Physical ergonomics optimizes workplace human-anatomy-related aspects for safety and reduced strain (MacLeod, 2018). Cognitive ergonomics deals with mental processes and their impact on human-system interactions. Disruptions and information overload can strain cognitive performance (Couffe & Michael, 2017; Kalakoski et al., 2020). Organizational ergonomics improves sociotechnical systems, addressing communication, work design, and collaboration issues for productivity and well-being (Johnsen et al., 2017).

The hazard control hierarchy mitigates workplace ergonomic hazards, from elimination to personal protective equipment (The National Institute for Occupational Safety and Health, 2022). The most effective methods are elimination and substitution, removing or replacing hazards, while engineering controls, administrative controls, and personal protective equipment provide varying protection levels. Figure 1 illustrates the interrelationships among the components of the proposed ergonomic safety assessment model.

Figure 1.
Ergonomic Safety Assessment Model



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The study collected demographic data, including age, sex, nature of work, workplace, and length of service. This data is essential as ergonomic hazards stem from interactions between workers and their workplaces that may not adequately meet their ergonomic needs. These demographics assessed employee interactions with their work's physical, cognitive, and organizational aspects. Following the evaluation of HF/E domains, the environmental stress spectrum identified perceived ergonomic hazards, determining employee perceptions of these hazards and the necessary response or action for mitigation.

Suitable hazard control measures were determined upon identifying perceived ergonomic hazards within the evaluated HF/E domains. These measures were integrated into a proposed ergonomic safety program to enhance the HF/E domains and reduce workplace ergonomic hazards. The safety program implementation was aligned with Kaya and Romanescue's (2020) findings advocating educational ergonomics programs for awareness.

This study evaluated the human factor domains using the proposed ergonomic safety assessment model. In addition, the study addressed the following specific research problems:

1. How may the respondent's demographic information that influence human factor/ergonomics domains be described in terms of:
   1.1 sex;
   1.2 age;
   1.3 nature of work;
   1.4 place of work; and
   1.5 length of service?
2. How may the human factor/ergonomics domains be described in terms of:
   2.1 Physical Ergonomics;
   2.2 Cognitive Ergonomics; and
   2.3 Organizational Ergonomics?
3. Is there a significant difference in the human factor/ergonomics domains (physical, cognitive, and organizational) based on the respondents' demographic information?
4. How may the hazard perception and course of action for the evaluated human factor/ergonomic domains be described?
5. What corrective measures that address the perceived ergonomic hazards may be proposed in an ergonomic safety program to improve the human factor domains?

Methodology

This study used a descriptive research design to study individuals, events, or conditions without manipulation (Siedlicki, 2020; Nassaji, 2015). The study examines and describes the human factor/ergonomic domains within the employee population, aiming to assess workplace ergonomics, identify hazards, and suggest corrective actions. Employing a non-probability purposive sampling method, 85 employees from Holy Cross College, Sta. Rosa, N.E., Inc., an educational institution, were selected as respondents, chosen to represent a diverse array of roles. Table 1 shows the respondent population and sample distribution.

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Table 1.
Distribution of the Respondents

Respondents	Population	Sample
College Department	57	40
Basic Education Department	70	36
Non-Teaching Staff	17	7
Administration	6	2
Total	**150**	**85**

The research instrument was developed based on the HF/E domains, definitions from the IEA, and principles and issues from related literature (MacLeod, 2018; Kalakoski et al., 2020; Johnsen et al., 2017). Ergonomic domains and constructs are summarized in Table 2.

Table 2.
Constructs of Human Factors/Ergonomics Domain

Human Factors/Ergonomics Domain		
Physical Ergonomics	**Cognitive Ergonomics**	**Organizational Ergonomics**
Neutral Postures and Position (IEA, MacLeod 2018)	Disruptions (Kalakoski et al 2020)	Responsibilities (Johnsen et al. 2017)
Excessive Force and Motions (IEA, MacLeod 2018)	Interruptions (Kalakoski et al 2020)	Work Time Design (IEA)
Reach and Proper Height (IEA, MacLeod 2018)	Information overload (Kalakoski et al 2020)	Organizational Structure, Policies, and Processes (IEA)
Fatigue, Static Load, and Pressure Points (MacLeod 2018)	Decision-Making (IEA)	Communication and Collaboration (IEA)
Space/Clearance and Movement (IEA, MacLeod 2018)	Human-Computer Interaction (IEA)	
Comfortable Environment (MacLeod 2018)		

The questionnaire, adapted from various sources, focused on physical, cognitive, and organizational ergonomics. It underwent validity and reliability tests for accuracy and consistency. After content validation, a pilot test was conducted with 11 employees representing different staff types in an educational institution. The data underwent a reliability test, and the results, including revisions, are shown in Table 3. A Cronbach's alpha value of at least 0.70 indicates good internal consistency (Taber, 2018).

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Table 3.
Reliability Test Results

Variable	Initial Reliability Test			Final Reliability Test		
	No. of Items	Cronbach's Alpha	Remarks	No. of Items	Cronbach's Alpha	Remarks
Physical Ergonomics						
Neutral Posture and Positions	10	0.858	Reliable	10	0.858	Reliable
Excessive Force and Motions	7	0.573	Remove item 1	6	0.753	Reliable
Reach and Proper Height	6	0.836	Reliable	6	0.836	Reliable
Fatigue, Static Load, and Pressure Points	5	0.657	Remove item 5	4	0.757	Reliable
Space/Clearance and Movement	6	0.748	Reliable	6	0.748	Reliable
Comfortable Environment	6	0.819	Reliable	6	0.819	Reliable
Cognitive Ergonomics						
Disruptions	6	0.927	Reliable	6	0.927	Reliable
Interruptions	8	0.804	Reliable	8	0.804	Reliable
Information Overload	6	0.763	Reliable	6	0.763	Reliable
Decision-Making	8	0.906	Reliable	8	0.906	Reliable
Human-Computer Interaction	5	0.827	Reliable	5	0.827	Reliable
Organizational Ergonomics						
Responsibilities	6	0.845	Reliable	6	0.845	Reliable
Work Time Design	5	0.617	Remove items 2 and 4	3	0.707	Reliable
Organizational Structure, Policies, and Processes	7	0.883	Reliable	7	0.883	Reliable
Communication and Collaboration	7	0.642	Remove items 4 and 5	5	0.710	Reliable

Data were collected through an online questionnaire, administered over a two-week period to accommodate participants' schedules and ensure flexibility. Prior to distribution, participants received detailed instructions via email, emphasizing the importance of full completion to avoid non-response bias and ensure data quality. For any incomplete responses, follow-up reminders were sent to encourage response completion.

Following the data collection, the HF/E domains were analyzed using the weighted mean, assigning different weights to response values. Table 4 shows the response, weight, weighted mean, and description.

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Table 4.
Rating Scale for Weighted Mean

Response (Weight of Response)	Range of Weighted Mean	Verbal Interpretation	Verbal Description
Strongly Disagree (1)	1.00-1.74	SD	Ergonomics is very unsatisfactory. The work is consistently unsuitable and requires changes. Ergonomic hazards are perceived as intolerable and cause apparent harm.
Disagree (2)	1.75-2.49	D	Ergonomics is unsatisfactory. The work is unsuitable and requires adjustments. Ergonomic hazards are perceived and tolerable but still cause harm.
Agree (3)	2.50-3.24	A	Ergonomics is satisfactory. The work is suitable but may occasionally lead to harm. Ergonomic hazards are perceived and acceptable.
Strongly Agree (4)	3.25-4.00	SA	Ergonomics is very satisfactory. The work is consistently suitable with little to no harm. Ergonomic hazards are negligible and easily absorbed.

A rating scale with verbal descriptions was used to evaluate HF/E domains. The scale included statements about ergonomics, work-hazard connections, and perceived ergonomic hazards. Guided by the environmental stress spectrum, these descriptions determined employees' hazard perceptions and informed necessary actions. These are outlined in Table 5.

Table 5.
Hazard Perception and Course of Action

Verbal Interpretation	Hazard Perception	Course of Action
SD	Above Intolerance threshold	Change use or location
D	Between Action and Intolerance threshold	Search for effective adjustment
A	Between Awareness and Action threshold	Accept or share losses
SA	Below Awareness threshold	Absorb losses

To examine the relationship between demographic variables and HF/E domains, a one-way ANOVA was applied, identifying significant differences across groups. This analysis provided insights into how demographic factors—such as age, sex, and nature of work—affect ergonomic outcomes. The results informed the development of customized corrective measures suited to various demographic profiles.

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The findings guided the formulation of an ergonomic safety program, which included an action plan comprising policies, recommendations, and corrective measures. This program specifically addresses the HF/E domains, with measures designed to mitigate identified ergonomic hazards and enhance workplace safety.

Results and Discussion

Demographic Profile

The study gathered data on demographic variables: sex, age, work nature, workplace, and service length. A summary of the respondents' demographic profiles frequency distribution is provided in Table 6.

Table 6.
Summary of Demographic Information

Demographic Information	Frequency
Sex	
Male	33
Female	52
Age	
Below 21 years old	0
21-30 years old	53
31-40 years old	17
41-50 years old	8
51-60 years old	6
Above 60 years old	1
Nature of Work	
Teaching Staff	76
Non-Teaching Staff	7
Administration	2
Place of Work	
Elementary Faculty Room	9
Junior High School Faculty Room	17
Senior High School Faculty Room	11
College Faculty Room 1	15
College Faculty Room 2	15
Criminology Faculty Room	5
Principal's Office	1
Dean's Office	1
MIS Office	3
NSTP and GAD Office	1
Registrar's Office	2
Admin Office	2
Library	3
Length of Service	
Less than five years	70
6-10 years	6
11-15 years	2

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16-20 years	1
21-25 years	2
26-30 years	3
31-35 years	1

The data shows a female-dominated workforce (52 females, 33 males) in an educational institution. Most employees were aged 21–30 (53 employees), suggesting a younger workforce. Most respondents (70 employees) had been employed for less than five years, indicating a relatively new workforce. Most employees (76) were teaching staff, with only nine non-teaching and administrative staff, suggesting tasks related to administrative and support services were likely assigned to the teaching staff. The teaching staff's predominance indicated that the ergonomic domain evaluation may primarily reflect their experiences.

Human Factor/Ergonomics Domains

The result of an interaction between the employee's physical, cognitive, and organizational needs and the workplace environment was evaluated using the human factor/ergonomic domains.

Table 7.
Human Factor/Ergonomic Domains Weighted Mean

Construct	WM	VI
Human Factor/Ergonomics	**2.92**	**A**
Physical Ergonomics	**2.79**	**A**
Neutral Postures and Positions	2.27	D
Excessive Force and Motions	3.10	A
Reach and Proper Height	3.00	A
Fatigue, Static Load, and Pressure Points	2.37	D
Space/Clearance and Movement	2.77	A
Comfortable Environment	2.86	A
Cognitive Ergonomics	**2.94**	**A**
Disruptions	2.52	A
Interruptions	2.84	A
Information overload	2.97	A
Decision-Making	3.05	A
Human-Computer Interaction	3.31	SA
Organizational Ergonomics	**3.04**	**A**
Responsibilities	3.21	A
Work Time Design	3.11	A
Organizational Structure, Policies, and Processes	2.90	A
Communication and Collaboration	2.95	A

Evaluating human factor/ergonomic domains revealed insights into employees' needs and the work environment. While overall ergonomics are satisfactory, occasional harmful work processes and environments exist. Physical and ergonomic hazards, such as posture, positions, fatigue, static loads, and pressure points, needed adjustments (Davis et al., 2020). Insufficient workstations and office sizes, inadequate workstation orientation, and limited

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lighting control contributed to physical and ergonomic challenges (Xiao et al., 2021; Vasilyev et al., 2022). Cognitive ergonomics was satisfactory, but disruptions posed potential safety risks (Kalakoski et al., 2020; Haynes et al., 2017; Lauri & Virkus, 2019). Employees were well-trained in computer use, but a lack of operational manuals can pose challenges (Johnsen et al., 2017; Rafique et al., 2021). Organizational ergonomics revealed issues with safety policies, procedures, and structures. Recognizing these issues was crucial for developing solutions to enhance employee well-being and safety.

Recognizing these ergonomic issues within the institution was crucial to identifying potential solutions. Addressing the factors contributing to these ergonomic challenges were essential in developing comprehensive solutions that enhance employees' overall well-being and safety.

Difference in Human Factor/Ergonomic Domains across Demographic Groups

The difference in human factor/ergonomic domains across demographic groups has been identified to gain a deeper understanding of the characteristics aimed at improving working conditions for employees. The results were shown in Table 8.

Table 8.
Difference in Human Factor/Ergonomic Domains across Demographic Groups

Construct	p-value				
	Sex	Age	Nature of Work	Place of Work	Length of Service
Human Factor/Ergonomics	**0.342**	**0.334**	**0.103**	**0.247**	**0.357**
Physical Ergonomics	**0.748**	**0.171**	**0.030**	**0.121**	**0.303**
Neutral Postures and Positions	0.922	0.189	0.050	0.259	0.828
Excessive Force and Motions	0.189	0.491	0.165	0.377	0.505
Reach and Proper Height	0.059	0.841	0.901	0.917	0.002
Fatigue, Static Load, and Pressure Points	0.704	0.071	0.046	0.000	0.718
Space/Clearance and Movement	0.108	0.434	0.158	0.515	0.812
Comfortable Environment	0.765	0.112	**0.022**	0.098	0.199
Cognitive Ergonomics	**0.583**	**0.695**	**0.656**	**0.572**	**0.230**
Disruptions	0.461	0.544	0.649	0.066	0.423
Interruptions	0.951	0.688	0.938	0.968	0.038
Information overload	0.888	0.397	0.028	0.138	0.804
Decision-Making	0.505	0.436	0.080	0.525	0.328
Human-Computer Interaction	0.702	0.953	0.716	0.382	0.496
Organizational Ergonomics	**0.169**	**0.567**	**0.088**	**0.387**	**0.654**
Responsibilities	0.245	0.642	0.130	0.305	0.339
Work Time Design	0.292	0.554	0.135	0.152	0.819
Organizational Structure, Policies, and Processes	0.036	0.631	0.194	0.017	0.708
Communication and Collaboration	0.785	0.715	0.226	0.455	0.962

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The study found that work nature significantly affects neutral posture and position (ρ = 0.050), with administrative and non-teaching staff having better postures than teaching staff due to ergonomic tool availability (Davis et al., 2020). Reach and height issues were related to service length (ρ = 0.002), suggesting new employees may not know how to adjust their workstations effectively. Fatigue, static load, and pressure points are influenced by work nature and place (ρ = 0.046 and ρ = 0.000), with teaching staff expressing more discomfort due to less ergonomic equipment. Work nature influences work environment comfort (ρ = 0.022), with administrative staff experiencing greater comfort (Gupta et al., 2019). Interruptions at work (ρ = 0.038) affect those with 26-30 years of service most, while younger employees handle interruptions better due to multitasking abilities (Michael & Couffe, 2017; Duggan et al., 2013). Administrative staff handle and manage information better than teaching and non-teaching staff (ρ = 0.028). Organizational structure, policies, and processes are related to sex and workplace (ρ = 0.036 and ρ = 0.017), with female employees more familiar with these aspects (World Economic Forum, 2018).

Overall, physical ergonomics were heavily influenced by work nature (ρ=0.030), while cognitive and organizational ergonomics showed no significant dependence on the respondent's profile.

Hazard Perception and Course of Action

Ergonomic hazards occurred when employees' interactions with their work system do not align with their physical, cognitive, and organizational needs. The environmental stress spectrum helps identify hazard perception levels and necessary actions within evaluated ergonomic domains. Table 9 outlines actions to address ergonomic concerns. Notably, "Neutral Postures and Positions" and "Fatigue, Static Load, and Pressure Points" require adjustments. Conversely, "Human-Computer Interaction" showed no perceived ergonomic concerns, suggesting practical training in computer use. Identifying these hazards and recommended actions forms a foundation for specific corrective measures to minimize or eliminate ergonomic hazards. This study, informed by a comprehensive evaluation of human factors/ergonomic domains and their alignment with employees' demographic profiles, provided insights for corrective actions prioritizing personnel well-being and safety.

Table 9.
Summary of Hazard Perception and Course of Action

Construct	Verbal Interpretation	Hazard Perception	Course of Action
Human Factor/Ergonomics	**A**	Between Awareness and Action threshold	Accept or share losses
Physical Ergonomics	**A**	Between Awareness and Action threshold	Accept or share losses
Neutral Postures and Positions	D	Between Action and Intolerance threshold	Search for effective adjustment
Excessive Force and Motions	A	Between Awareness and Action threshold	Accept or share losses
Reach and Proper Height	A		
Fatigue, Static Load, and Pressure Points	D	Between Action and Intolerance threshold	Search for effective adjustment
Space/Clearance and Movement	A	Between Awareness and Action threshold	Accept or share losses.
Comfortable Environment	A		Accept or share losses.

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Cognitive Ergonomics	**A**		
Disruptions	A		
Interruptions	A		
Information overload	A		
Decision-Making	A		
Human-Computer Interaction	SA	Below Awareness threshold	Absorb losses
Organizational Ergonomics	**A**	Between Awareness and Action threshold	Accept or share losses
Responsibilities	A		
Work Time Design	A		
Organizational Structure, Policies, and Processes	A	Between Awareness and Action threshold	Accept or share losses
Communication and Collaboration	A		

Corrective Actions

The corrective actions in Table 10 include suggested adjustments to enhance work safety. These actions were systematically compiled for an ergonomic safety program to improve workplace safety and employee well-being.

Table 10.
Summary of Corrective Actions

Construct	Corrective Actions	References
Human Factor/Ergonomics		
Physical Ergonomics		
Neutral Postures and Positions	Ergonomic chairs with adjustable design features and rest features for the head, neck, arms, knees, and back are provided. (Elimination) Provision of mouse and keyboard pad (Engineering Control) Knowledge sharing on Proper Posture and Positions. (Administrative Control)	Ansari et al. (2018) Gupta et al. (2014)
Excessive Force and Motions	Provision of external ergonomic keyboard and mouse. (Elimination) Knowledge sharing on Proper Materials Handling. (Administrative Control)	Davis et al. (2020)
Reach and Proper Height	Changing of work tables/stations. (Substitution) Knowledge sharing on Proper Reach and Height. (Administrative Control)	Woo et al. (2016)
Fatigue, Static Load, and Pressure Points	Ergonomic chairs with adjustable design features and rest features for the head, neck, arms, knees, and back are provided. (Elimination) Provision of mouse and keyboard pad. (Engineering Control)	Ansari et al. (2018) Gupta et al. (2014)

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Space/Clearance and Movement	Designation of additional offices for employees. (Administrative control) Change of work table/station. (Substitution) Provision of cabinets and drawers to minimize clutters. (Elimination)	Woo et al. (2016)
Comfortable Environment	Rearrangement of work table/station orientation. (Engineering Control) Provision of curtain blinds for better illumination control. (Engineering Control) Regular Air-con cleaning. (Administrative Control) Regular room cleaning. (Administrative Control)	Al Horr et al. (2016)
Cognitive Ergonomics		
Disruptions	Designation of additional offices for employees. (Administrative control) Schedule of consultation hours. (Administrative Control) Use of headphones to minimize auditory noise. (Personal Protective Equipment)	Herbig et al. (2016) Züger et al. (2019)
Interruptions	Schedule of consultation hours. (Administrative Control) Policy on limiting the use of distracting websites and devices. (Administrative Control)	Züger et al. (2019)
Information overload	Set a window time for messages, chats, and emails. (Administrative Control) Provision of Memos for tasks, appointments, meetings, and instructions. (Administrative Controls)	Tams et. al (2020) Hargrave & Van de Ven (2017)
Decision-Making	Reviewing and revision of operating manuals, instructions, and processes. (Administrative Controls) Seminar on Decision-Making. (Administrative Control)	-
Human-Computer Interaction	None	-
Organizational Ergonomics		
Responsibilities	Review of individual employee job design. (Administrative Control)	Too & Weaver (2014)
Work Time Design	Seminar on Managing Schedule. (Administrative Control) Strict compliance with the teacher's program. (Administrative Control)	
Organizational Structure, Policies, and Processes	Review of individual employee job design. (Administrative Control) Seminar and training on OSH. (Administrative Control).	DOLE Department Order 198 series of 2018

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		Designation of Safety Officer. (Administrative Control) Formation of Health and Safety Committee. (Administrative Control) Formulation and Implementation of Safety Program. (Administrative Control)	
Communication and Collaboration		Provision of Memos. (Administrative Control) Conducting Task Analysis. (Administrative Control)	Hargrave and Van de Ven (2017)

Conclusion

Based on the findings, the study concludes that there is a heightened risk for workplace injuries, particularly among newer employees, due to limited ergonomic awareness and inexperience in task optimization and workstation adjustments. Given that the majority of employees are young and relatively new to the workplace, they may be more susceptible to ergonomic hazards as they adapt to their roles. Additionally, teaching staff, who often undertake administrative responsibilities due to limited non-teaching staff, face unaligned tasks and task overload, which exacerbates ergonomic risks.

The assessment of the ergonomic domains revealed that while the overall ergonomic environment is generally satisfactory, various work processes and the physical layout of the work environment could contribute to potential injuries and discomfort if left unaddressed. Specifically, issues like improper posture, static loads, and fatigue—especially among teaching staff—are linked to inadequate ergonomic provisions, such as non-optimized chairs, worktables, and faculty rooms. These ergonomic concerns emphasize the necessity for targeted interventions to mitigate hazards and promote a culture of ergonomic safety and awareness.

To address these challenges, administrative support is essential in implementing corrective actions and ensuring ergonomic safety is prioritized across the institution. Such a commitment will lay the groundwork for a proactive approach to employee well-being and a safer work environment. Furthermore, establishing a culture of continuous improvement and ergonomic awareness will not only prevent injuries but also improve productivity and job satisfaction. Future research, including longitudinal studies, would be valuable in evaluating the long-term effects of the recommended interventions and further refining ergonomic practices tailored to the organization's evolving needs.

Limitations of the Study

This study offers valuable insights into ergonomic safety within educational institutions, but several limitations should be acknowledged to contextualize the findings accurately.

First, the assessment model relies on self-reported data from employees regarding their experiences and perceptions of ergonomic hazards. Self-reporting may introduce response bias, with participants potentially underreporting physical discomfort or overestimating their understanding of ergonomic practices. The subjectivity inherent in self-reported data may impact the reliability of the findings, potentially omitting nuances of the work environment that objective measures might capture more fully.

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Second, this study's sample is limited to a single educational institution, which may limit the generalizability of results across different educational or organizational contexts. Variations in institutional structure, available resources, and employee demographics across educational settings may affect both the nature of ergonomic risks and the success of recommended interventions. To improve generalizability, future research could incorporate multi-institutional studies across diverse educational environments, thus strengthening the model's relevance to a broader range of settings.

Another limitation lies in the study's lack of assessment on the long-term efficacy of the proposed ergonomic interventions. While immediate recommendations have been provided, their sustainability and potential long-term impact remain unexplored. Future studies could employ longitudinal designs to measure the enduring effectiveness of these interventions in promoting workplace safety and comfort over time.

Finally, the current model does not account for all possible ergonomic hazards, particularly external factors that may indirectly contribute to ergonomic challenges, such as personal lifestyle choices, external stressors, or environmental factors beyond the immediate workplace. Considering these broader influences in future studies could yield a more comprehensive understanding of factors impacting ergonomic health and employee well-being.

Recommendations

The recommendations from this study aim to significantly enhance ergonomic safety that leads to a healthier workplace environment while addressing the identified limitations. It is proposed that the corrective actions summarized in Table 10 be adopted as a foundational framework for developing an ergonomic safety program.

Implementing this model may present challenges, including limited resources, potential resistance to changes in workplace habits, and the need for ongoing staff engagement. To mitigate these issues, the institution could conduct phased training sessions and awareness programs, helping staff understand the importance of ergonomic practices and the model's benefits. Flexibility in application is also advised, allowing for adaptations based on staff feedback and organizational resources.

Future research should also prioritize longitudinal studies to evaluate the long-term effects of ergonomic interventions, systematically assessing changes in injury rates, employee satisfaction, and productivity over time. This will allow the institution to refine its safety program for its workforce. Additionally, it is essential to recognize and address external factors contributing to ergonomic risks by implementing initiatives that promote overall employee wellness, such as stress management workshops or lifestyle seminars.

Finally, continuous exploration of alternative ergonomic assessment frameworks through partnerships with ergonomics experts or consultation of relevant literature can provide insights into best practices and innovative strategies that enhance the institution's approach. By taking these comprehensive actions, Holy Cross College and similar educational institutions can significantly improve ergonomic safety, reduce injury risks, and create a sustainable culture of health and well-being for their employees.

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