Original Research

# Evaluating Human Factors and Ergonomics: A Comprehensive Ergonomic Safety Assessment Model

John Vincent Santos *

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***Corresponding Author Email, j.vince103@gmail.com**

Department of Engineering Management, Holy Cross College, Sta. Rosa, N.E., Inc. Philippines

**Abstract**
Continuous developments in technology and the recent pandemic brought organizational changes that threaten the appropriateness of work to the employees. Holy Cross College, Sta. Rosa, NE, Inc. is no exception to these changes that pose ergonomic concerns in the physical, cognitive, and organizational aspects. This study focused on evaluating the human factor/ergonomics domain through a proposed concept of an ergonomic safety assessment model. A descriptive research design was employed and 85 employees of the educational institution participated in the study. Following the concept of an ergonomic safety assessment model, findings suggest that the prevailing cause of ergonomic hazards comes from the unfamiliarity with the work environment and the nature of work. Leading ergonomic concerns perceived are improper posture, fatigue, static loads, pressure points, and work disruptions that require immediate effective adjustments. The corrective actions to these hazards were identified and suggested to be integrated into an ergonomic safety program.

**Keywords**- Physical Ergonomics, Cognitive Ergonomics, Organizational Ergonomics, Hazard Perception, Corrective Actions

## INTRODUCTION

The 2019 pandemic has rapidly transformed workplaces, including education, towards technology-driven work, increasing productivity and complexities [1,2]. Educational institutions have swiftly integrated technology to ensure continuity [2]. Ergonomics has become crucial in creating safe and comfortable settings and optimizing the alignment between individuals and their work environment [3]. Considering physical, cognitive, and organizational factors, this is relevant in offices. The administrative staff's role in adapting to pandemic guidelines highlights the importance of human-system relationships in facility and process design [4].

Human factors and ergonomics (HF/E) address challenges from physical, cognitive, and organizational work aspects [5]. Considering technological and pandemic-related shifts, Holy Cross College, Sta. Rosa, NE, Inc. is developing an ergonomic safety assessment model. The program aims for participatory methodologies, data-driven changes, and leadership commitment to strengthen human factor domains and address safety policy gaps [6].

In the Philippines, over 125,000 occupational illnesses were reported in 2015, highlighting the role of ergonomics in workplace health [7]. The IEA identifies three HF/E domains: physical, cognitive, and organizational ergonomics. Physical

ergonomics optimizes equipment for health and productivity, considering human anatomy and physical work. Cognitive ergonomics examines mental processes like decision-making, emphasizing a conducive work environment to reduce cognitive strain [5,8].

Ergonomics is significant across industries like dentistry, office work, and banking, reducing musculoskeletal problems and enhancing productivity [9-11]. In schools, proper design, ergonomic workstations, and physical activity integration are crucial for safe, conducive education spaces [12, 13]. Environmental factors like temperature and ventilation can create sustainable, climate-resilient buildings. This aligns with organizational ergonomics, optimizing sociotechnical systems within organizations and considering technology's effects on human relationships, processes, and well-being [14].

The significance of ergonomics in schools is recognized, with teachers incorporating exercises for postural awareness [15]. This holistic approach extends to cognitive well-being and educational and organizational performance [16]. The literature underscores ergonomics' multifaceted nature, its role in occupational health, workplace design, and conducive learning environments. Ergonomics promotes well-being and performance across sectors, including educational institutions like Holy Cross College, Sta. Rosa, NE, Inc.

## CONCEPTUAL FRAMEWORK

The conceptual framework 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 [17]. Similarly, ergonomic hazards arise from human-work system interactions that do not meet ergonomic needs [18, 19]. The environmental stress spectrum influences hazard interpretation and response, from unawareness to intolerance. It includes awareness, action, and intolerance thresholds [20].

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 [21]. Cognitive ergonomics deals with mental processes and their impact on human-system interactions. Disruptions and information overload can strain cognitive performance [22, 23]. Organizational ergonomics improves sociotechnical systems, addressing communication, work design, and collaboration issues for productivity and well-being [24].

The hazard control hierarchy mitigates workplace ergonomic hazards, from elimination to personal protective equipment (NIOSH, 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 shows the relationships between the components of the proposed ergonomic safety assessment model.

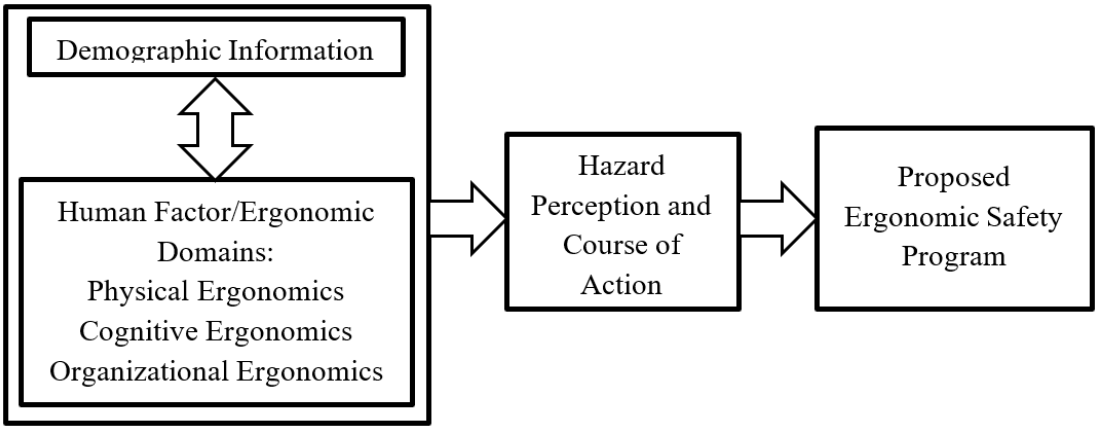


FIGURE 1
ERGONOMIC SAFETY ASSESSMENT MODEL

The study collects demographic data like age, sex, work nature, workplace, and service length. This data is crucial as ergonomic hazards result from worker-workplace interactions that may not meet their ergonomic needs. These demographics will assess employee interaction with their work's physical, cognitive, and organizational aspects. After evaluating the HF/E

domains, the environmental stress spectrum identifies perceived ergonomic hazards, determining employee perception of these hazards and the necessary response or action for mitigation.

Suitable hazard control measures can be determined upon identifying perceived ergonomic hazards within the evaluated HF/E domains. These measures are integrated into a proposed ergonomic safety program to enhance the HF/E domains and reduce workplace ergonomic hazards. The safety program implementation aligns 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 be described in terms of the following:
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 the following:
2.1 Physical Ergonomics;
2.2 Cognitive Ergonomics; and
2.3 Organizational Ergonomics?
3. How may the relationship between the respondent's demographic information and human factor/ergonomics domains be described?
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?

## DESIGN AND METHODS

This study uses a descriptive research design to study individuals, events, or conditions without manipulation [25, 26]. 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. It describes the existing state of ergonomics at Holy Cross College, Sta. Rosa, without altering any variables. A non-probability purposive sampling method selected 85 employees as respondents. Table I shows the respondent population distribution based on the institution's payroll officer's information and the actual sample.

TABLE I
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 relevant literature [21, 23, 24]. Ergonomic domains and constructs are summarized in Table II.

TABLE II
CONSTRUCTS OF HUMAN FACTORS/ERGONOMICS DOMAIN

| Human Factors/Ergonomics Domain | | |
|---|---|---|
| **Physical Ergonomics** | **Cognitive Ergonomics** | **Organizational Ergonomics** |
| Neutral Postures and Position [5, 21] | Disruptions [23] | Responsibilities [24] |
| Excessive Force and Motions [5, 21] | Interruptions [23] | Work Time Design [5] |
| Reach and Proper Height [5, 21] | Information overload [23] | Organizational Structure, Policies, and Processes [5] |
| Fatigue, Static Load, and Pressure Points [21] | Decision-Making [5] | Communication and Collaboration [5] |

| | |
|---|---|
| Space/Clearance and Movement [5, 21]<br>Comfortable Environment [21] | Human-Computer Interaction [5] |

The research instrument was developed based on HF/E domains, definitions from the International Ergonomics Association (IEA), and principles and issues identified in the relevant literature [21, 23, 24]. Ergonomic domains and constructs are summarized in Table II. 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. The data underwent a reliability test, and the results, including revisions, are in Table III. A Cronbach's alpha value of at least 0.70 indicates good internal consistency [27].

TABLE III
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 |

Descriptive statistics were used to evaluate the HF/E domains and develop an evidence-based ergonomic safety program. These statistics summarize characteristics within a sample or population. Demographic information was organized using percentages and presented visually. The HF/E domains were analyzed using the weighted mean, assigning different weights to response values. Table I shows the response, weight, weighted mean, and description.

TABLE IV
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.<br>The work is consistently unsuitable and requires changes.<br>Ergonomic hazards are perceived as intolerable and cause apparent harm. |
| Disagree (2) | 1.75-2.49 | D | Ergonomics is unsatisfactory.<br>The work is unsuitable and requires adjustments.<br>Ergonomic hazards are perceived and tolerable but still cause harm. |
| Agree (3) | 2.50-3.24 | A | Ergonomics is satisfactory.<br>The work is suitable but may occasionally lead to harm.<br>Ergonomic hazards are perceived and acceptable. |
| Strongly Agree (4) | 3.25-4.00 | SA | Ergonomics is very satisfactory.<br>The work is consistently suitable with little to no harm.<br>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 V.

TABLE V
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 |

Evidence-based information from the HF/E domains evaluation, perceived ergonomic hazard identification, and appropriate hazard control determination led to the formulation of the ergonomic safety program. This program proposed an action plan with policies, recommendations, and corrective measures to address perceived ergonomic hazards and improve human factor domains. A one-way ANOVA was used to determine a connection between the demographic profile and the HF/E domain among employees. These findings provided insights into the demographic profile's connection with the HF/E domains, allowing the formulation of respondent-profile-fitting corrective measures.

## RESULTS AND DISCUSSION

### *I.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 VI.

TABLE VI
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 |
| 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 academic institutions. Most employees are aged 21-30 (53 employees), suggesting a younger workforce. Most respondents (70 employees) have been employed for less than five years, indicating a relatively new workforce. Most employees (76) are teaching staff, with only nine non-teaching and administrative staff, suggesting tasks related to administrative and support services are likely assigned to the teaching staff. The teaching staff's predominance indicates that the ergonomic domain evaluation may primarily reflect their experiences.

*II. Human Factor/Ergonomics Domains*

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

TABLE VII
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, need adjustments [28]. Insufficient workstations and office sizes, inadequate workstation orientation, and limited lighting control contribute to physical and ergonomic challenges [29, 30]. Cognitive ergonomics is satisfactory, but disruptions pose potential safety risks [ 23, 31, 32]. Employees are well-trained in computer use, but a lack of operational manuals can pose challenges [24, 33]. Organizational ergonomics reveals issues with safety policies, procedures, and structures. Recognizing these issues is crucial for developing solutions to enhance employee well-being and safety.

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

### *III. Relationship of Demographic Information and Human Factor/Ergonomic Domains*

The relationship between demographic profiles and human factors/ergonomics has been identified to gain a deeper understanding of the characteristics aimed at improving working conditions for employees. The results are shown in Table VIII:

TABLE VIII
RELATIONSHIP OF DEMOGRAPHIC INFORMATION AND HUMAN FACTOR/ERGONOMIC DOMAINS

| Construct | 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 |

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 [28]. Reach and height issues are 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 [9]. 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 [22, 34]. 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 [38].

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

### *IV. Hazard Perception and Course of Action*

Ergonomic hazards occur 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 VIII outlines actions to address ergonomic concerns. Notably, "Neutral Postures and

Positions" and "Fatigue, Static Load, and Pressure Points" require adjustments. Conversely, "Human-Computer Interaction" shows 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, provides insights for corrective actions prioritizing personnel well-being and safety.

TABLE IX
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 | | |
| Comfortable Environment | A | | |
| ***Cognitive Ergonomics*** | **A** | Between Awareness and Action threshold | Accept or share losses. |
| Disruptions | A | | Accept or share losses. |
| 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 | | |

## *V. Corrective Actions*

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

TABLE X
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)<br>Provision of mouse and keyboard pad (Engineering Control)<br>Knowledge sharing on Proper Posture and Positions. (Administrative Control) | [39, 9] |
| Excessive Force and Motions | Provision of external ergonomic keyboard and mouse. (Elimination)<br>Knowledge sharing on Proper Materials Handling. (Administrative Control) | [28] |
| Reach and Proper Height | Changing of work tables/stations. (Substitution)<br>Knowledge sharing on Proper Reach and Height. (Administrative Control) | [40] |
| 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)<br>Provision of mouse and keyboard pad. (Engineering Control) | [39, 9] |
| Space/Clearance and Movement | Designation of additional offices for employees. (Administrative control)<br>Change of work table/station. (Substitution)<br>Provision of cabinets and drawers to minimize clutters. (Elimination) | [40] |
| Comfortable Environment | Rearrangement of work table/station orientation. (Engineering Control) | [41] |

| | | |
|---|---|---|
| | Provision of curtain blinds for better illumination control. (Engineering Control)<br>Regular Air-con cleaning. (Administrative Control)<br>Regular room cleaning. (Administrative Control) | |
| ***Cognitive Ergonomics*** | | |
| Disruptions | Designation of additional offices for employees. (Administrative control)<br>Schedule of consultation hours. (Administrative Control)<br>Use of headphones to minimize auditory noise. (Personal Protective Equipment) | [42, 43] |
| Interruptions | Schedule of consultation hours. (Administrative Control)<br>Policy on limiting the use of distracting websites and devices. (Administrative Control) | [43] |
| Information overload | Set a window time for messages, chats, and emails. (Administrative Control)<br>Provision of Memos for tasks, appointments, meetings, and instructions. (Administrative Controls) | [44, 45] |
| Decision-Making | Reviewing and revision of operating manuals, instructions, and processes. (Administrative Controls)<br>Seminar on Decision-Making. (Administrative Control) | - |
| Human-Computer Interaction | None | - |
| ***Organizational Ergonomics*** | | |
| Responsibilities | Review of individual employee job design. (Administrative Control) | [46] |
| Work Time Design | Seminar on Managing Schedule. (Administrative Control)<br>Strict compliance with the teacher's program. (Administrative Control) | |
| Organizational Structure, Policies, and Processes | Review of individual employee job design. (Administrative Control)<br>Seminar and training on OSH. (Administrative Control).<br>Designation of Safety Officer. (Administrative Control)<br>Formation of Health and Safety Committee. (Administrative Control)<br>Formulation and Implementation of Safety Program. (Administrative Control) | DOLE Department Order 198 series of 2018 |
| Communication and Collaboration | Provision of Memos. (Administrative Control)<br>Conducting Task Analysis. (Administrative Control) | [45] |

## CONCLUSIONS

The following discussions present the conclusions of this study and address each stated problem:

1. Demographic Information: Regarding length of service, most employees belong to the younger generation and are new to the working environment. The U.S. Bureau of Labor Statistics suggests that new employees are five times more likely to be injured than their more experienced counterparts. Therefore, ergonomic hazards are expected to occur because most employees are new to the working environment and are not yet familiar with optimizing their tasks and workstations to ensure safety and reduce hazards.

Regarding the nature of work, most of the employee population belongs to the teaching staff, and only a few belong to the non-teaching and administrative staff. The Philippine Statistics Authority (PSA) suggests that administrative and support service activities are the riskiest industries. However, there are limited non-teaching and administrative staff; teaching staff are given administrative and support services tasks. This results in unaligned tasks or task overload, often leading to organizational ergonomic hazards.

2. Human Factor/Ergonomic Domains: The overall ergonomics is satisfactory. However, the work process and environment may occasionally lead to work-related disorders and injuries because of the perceived ergonomic hazards if left unaddressed.

3. Relationship of Demographic Information and Human Factor/Ergonomic Domains: Findings suggest improper posture, fatigue, static loads, and pressure points occur due to inadequate provision for physical and ergonomic safety among the teaching staff. The equipment they use, such as the chairs, worktables, and faculty rooms, are not optimized for physical and cognitive safety. Additionally, the teaching staff occasionally experiences discomfort with the work environment and sometimes fails to handle information overload compared to the non-teaching and administrative staff. This concludes that the nature of work, which shows insufficient administrative workforce, is another factor that could cause ergonomic hazards.

Furthermore, since most employees are considered new to the working environment, this concludes that unfamiliarity with the work process and environment is one factor that could cause ergonomic hazards. Improper reach, height, and interruptions are the main concerns because of unfamiliarity with the work process and environment.

4. Hazard Perception and Course of Action: Problems with neutral postures and positions, fatigue, static load, and pressure points require immediate, effective adjustments. There are also perceivable ergonomic hazards in other areas of ergonomics,

but at an easily absorbed and accepted level. However, to maximize the safety of the employees, corrective actions must be proposed to eliminate the perceived hazards that pose a threat if continually left unaddressed.

Despite having concerns in almost every ergonomic domain, the employees have the knowledge and skills to navigate and interact with its computers. Using these to their advantage, they can quickly educate themselves using their computers with the necessary ergonomic awareness.

5. Corrective Actions: Corrective actions to reduce these ergonomic hazards included modifying existing equipment and purchasing new tools or other devices to assist production. However, these modifications require a budget to be allocated and may take longer to provide. Administrative controls are appropriate in these cases where the engineering controls cannot be implemented yet. Most of the corrective actions proposed in this thesis focused on establishing efficient processes or procedures that the administration can initiate. Therefore, the administration will play a significant role in planning and implementing the ergonomic safety program since most of the proposed activities rely on their commitment and support to promote safety in the workplace.

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## REFERENCES

[1] Herath, T., & Herath, H. S. (2020). Coping with the new normal imposed by the COVID-19 pandemic: Lessons for technology management and governance. Information Systems Management, 37(4), 277-283.
[2] Onyema, E. M., Eucheria, N. C., Obafemi, F. A., Sen, S., Atonye, F. G., Sharma, A., & Alsayed, A. O. (2020). Impact of Coronavirus pandemic on education. Journal of Education and Practice, 11(13), 108-121.
[3] Pawar, P. Y., & Khedkar, E. B. (2016). Review of Ergonomics practices in difference Sectors. STUDIES, 2(9).
[4] Muljadi, C., Idawati, L., & Ardi, A. (2022). Developing Leadership Skills in Administrative Staff Through Professional Development Program at School Pelita Harapan. JIIP-Jurnal Ilmiah Ilmu Pendidikan, 5(7), 2547-2553.
[5] International Ergonomics Association. (2020). What Is Ergonomics (HFE)?. Retrieved September 29, 2022, from https://iea.cc/what-is-ergonomics/
[6] Dennerlein, J. T., Burke, L., Sabbath, E. L., Williams, J. A., Peters, S. E., Wallace, L., ... & Sorensen, G. (2020). An integrative total worker health framework for keeping workers safe and healthy during the COVID-19 pandemic. Human factors, 62(5), 689-696.
[7] Zare, M., Croq, M., Hossein-Arabi, F., Brunet, R., & Roquelaure, Y. (2016). Does ergonomics improve product quality and reduce costs? A review article. Human Factors and Ergonomics in Manufacturing & Service Industries, 26(2), 205-223.
[8] Christy, D., & Duraisamy, D. S. (2020). Ergonomics and employee psychological well being. International Journal of Management, 11(3).
[9] Gupta, A., Bhat, M., Mohammed, T., Bansal, N., & Gupta, G. (2014). Ergonomics in dentistry. International journal of clinical pediatric dentistry, 7(1), 30.
[9] Sharma, SK, & George, SA. (2018). Modelling resilience of truckload transportation industry. *Benchmarking An International Journal*, 25, 2531–2545. https://doi.org/10.1108/BIJ-07- 2017-0188
[10] Kingsley, A. (2013). The impact of office ergonomics on employee performance; a case study of the ghana national petroleum corporation (gnpc). Institute of Distance Learning, Kwame Nkrumah University, 51-56.
[11] Deshpande, D. (2013). Ergonomics and Its Stress Relating Issues for the Employees Working in Banking Sector in Gujarat. In Journal of National Conference on Paradigm for Sustainable Business: People, Planet and Profit Organized by Department of Management Studies, IIT Roorkee.
[12] Castellucci, H. I., Arezes, P. M., Molenbroek, J. F. M., de Bruin, R., & Viviani, C. (2017). The influence of school furniture on students' performance and physical responses: results of a systematic review. Ergonomics, 60(1), 93-110.
[13] Kibria, M., & Rafiquzzaman, M. (2019). Ergonomic Computer Workstation Design for University Teachers in Bangladesh. Jordan Journal of Mechanical & Industrial Engineering, 13(2).
[14] Díaz-López, C., Serrano-Jiménez, A., Verichev, K., & Barrios-Padura, Á. (2022). Passive cooling strategies to optimise sustainability and environmental ergonomics in Mediterranean schools based on a critical review. Building and Environment, 109297.
[15] Jabeen, R., & Hussain, N. (2022). Teachers' awareness and practices on school ergonomics in Karachi, Pakistan. Journal of Humanities, Social and Management Sciences (JHSMS), 3(1), 366-381.
[16] Alzahrani, N. A. (2019). Workplace ergonomics and academic staff performance in the College of education at Umm Al-Qura university in Makkah. Am. J. Educ. Res, 7, 604-617.
[17] Kates, R. W. (1971). Natural hazard in human ecological perspective: hypotheses and models. Economic Geography, 47(3), 438-451.
[18] Gaynor, K. M., Brown, J. S., Middleton, A. D., Power, M. E., & Brashares, J. S. (2019). Landscapes of fear: spatial patterns of risk perception and response. Trends in ecology & evolution, 34(4), 355-368.
[19] Komarek, A. M., De Pinto, A., & Smith, V. H. (2020). A review of types of risks in agriculture: What we know and what we need to know. Agricultural Systems, 178, 102738.
[20] Naji, G. M. A., Isha, A. S. N., Mohyaldinn, M. E., Leka, S., Saleem, M. S., Rahman, S. M. N. B. S. A., & Alzoraiki, M. (2021). Impact of safety culture on safety performance; mediating role of psychosocial hazard: an integrated modelling approach. International journal of environmental research and public health, 18(16), 8568.
[21] MacLeod, D. (2018). Principles of Ergonomics. Iegūts no: http://www. danmacleod. com/ErgoForYou/10_principles_of_ergonomics. htm[skat. 01.06. 2018.].

[22] Couffe, C., & Michael, G. A. (2017). Failures due to interruptions or distractions: A review and a new framework. The American journal of psychology, 130(2), 163-181.
[23] Kalakoski, V., Selinheimo, S., Valtonen, T., Turunen, J., Käpykangas, S., Ylisassi, H., ... & Paajanen, T. (2020). Effects of a cognitive ergonomics workplace intervention (CogErg) on cognitive strain and well-being: a cluster-randomized controlled trial. A study protocol. BMC psychology, 8(1), 1-16.
[24] Johnsen, S. O., Kilskar, S. S., & Fossum, K. R. (2017). Missing focus on Human Factors–organizational and cognitive ergonomics–in the safety management for the petroleum industry. Proceedings of the Institution of Mechanical Engineers, Part O: Journal of risk and reliability, 231(4), 400-410.
[25] Siedlecki, S. L. (2020). Understanding descriptive research designs and methods. Clinical Nurse Specialist, 34(1), 8-12.
[26] Nassaji, H. (2015). Qualitative and descriptive research: Data type versus data analysis. Language teaching research, 19(2), 129-132.
[27] Taber, K. S. (2018). The use of Cronbach's alpha when developing and reporting research instruments in science education. Research in science education, 48(6), 1273-1296.
[28] Davis, K. G., Kotowski, S. E., Daniel, D., Gerding, T., Naylor, J., & Syck, M. (2020). The home office: Ergonomic lessons from the "new normal". Ergonomics in design, 28(4), 4-10.
[29] Xiao, Y., Becerik-Gerber, B., Lucas, G., & Roll, S. C. (2021). Impacts of working from home during COVID-19 pandemic on physical and mental well-being of office workstation users. Journal of occupational and environmental medicine, 63(3), 181.
[30] Vasilyev, A. S., Zemlyak, V. L., & Boychin, R. E. (2022, February). Taking into account the requirements of ergonomics as an important factor in creating a comfortable environment in an educational institution. In IOP Conference Series: Earth and Environmental Science (Vol. 988, No. 5, p. 052016). IOP Publishing.
[31] Haynes, B., Suckley, L., & Nunnington, N. (2017). Workplace productivity and office type: An evaluation of office occupier differences based on age and gender. Journal of Corporate Real Estate, 19(2), 111-138.
[32] Lauri, L., & Virkus, S. (2019). Information overload of academic staff in higher education institutions in Estonia. In Information Literacy in Everyday Life: 6th European Conference, ECIL 2018, Oulu, Finland, September 24–27, 2018, Revised Selected Papers 6 (pp. 347-356). Springer International Publishing.
[33] Rafique, G. M., Mahmood, K., Warraich, N. F., & Rehman, S. U. (2021). Readiness for Online Learning during COVID-19 pandemic: A survey of Pakistani LIS students. The Journal of Academic Librarianship, 47(3), 102346.
[34] Duggan, G. B., Johnson, H., & Sørli, P. (2013). Interleaving tasks to improve performance: Users maximise the marginal rate of return. International Journal of Human-Computer Studies, 71(5), 533-550.
[35] Tohidi, H., Jabbari, M.M., (2012). "Measuring organizational learning capability". Procedia-social and behavioral sciences, 31, 428-432. https://doi.org/10.1016/j.sbspro.2011.12.079
[36] Jabbari, M.M., Tohidi, H., (2012). "Important factors in determination of innovation type". Procedia Technology, 1, 570-573. https:// doi: 10.1016/j.protcy.2012.02.124
[37] Jabbari, M.M., Tohidi, H., (2012). "Providing a Framework for Measuring Innovation within Companies". Procedia Technology, 1, 583-585. https:// doi: 10.1016/j.protcy.2012.02.127
[38] World Economic Forum. (2018). Women are more productive than men, according to New Research. Retrieved April 7, 2023, from https://www.weforum.org/agenda/2018/10/women-are-more-productive-than-men-at-work-these-days
[39] Ansari, S., Nikpay, A., & Varmazyar, S. (2018). Design and development of an ergonomic chair for students in educational settings. Health scope, 7(4).
[40] Woo, E. H. C., White, P., & Lai, C. W. K. (2016). Ergonomics standards and guidelines for computer workstation design and the impact on users' health–a review. Ergonomics, 59(3), 464-475.
[41] Al Horr, Y., Arif, M., Kaushik, A., Mazroei, A., Katafygiotou, M., & Elsarrag, E. (2016). Occupant productivity and office indoor environment quality: A review of the literature. Building and environment, 105, 369-389.
[42] Herbig, B., Schneider, A., & Nowak, D. (2016). Does office space occupation matter? The role of the number of persons per enclosed office space, psychosocial work characteristics, and environmental satisfaction in the physical and mental health of employees. Indoor Air, 26(5), 755-767.
[43] Züger, M., Corley, C., Meyer, A. N., Li, B., Fritz, T., Shepherd, D., ... & Snipes, W. (2017, May). Reducing interruptions at work: A large-scale field study of flowlight. In Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems (pp. 61-72).
[44] Tams, S., Ahuja, M., Thatcher, J., & Grover, V. (2020). Worker stress in the age of mobile technology: The combined effects of perceived interruption overload and worker control. The Journal of Strategic Information Systems, 29(1), 101595.
[45] Hargrave, T. J., & Van de Ven, A. H. (2017). Integrating dialectical and paradox perspectives on managing contradictions in organizations. Organization Studies, 38(3-4), 319-339.
[46] Too, E. G., & Weaver, P. (2014). The management of project management: A conceptual framework for project governance. International journal of project management, 32(8), 1382-1394.