JURNAL
KESEHATAN LINGKUNGAN
JURNAL DAN APLIKASI TEKNIK KESEHATAN LINGKUNGAN

ISSN 1829-9407 (Print)
ISSN 2581-0898 (Online)

Volume 23, No.2, July 2026 ; Page: 231-244; *DOI: https://doi.org/10.31964/jkl.v23i2.1145*

Original Research

APPLICATION OF HAZARD IDENTIFICATION, RISK ASSESSMENT, AND CONTROL (HIRAC) IN ACADEMIC OFFICE WORKSPACES

Yosef Barita Sar Manik, Betesda Ronauli Simanihuruk, Fadya Hersya Rahmani, Olivia Lumban Tobing, Khofifah Hajriani Dassahrudyn, Annisa Putri Handayani
President University
Jababeka Education Park, Jl. Ki Hajar Dewantara, Mekarmukti, Cikarang Utara, Bekasi Regency, West Java
E-mail: yosef.manik@president.ac.id

Article Info

Article history:

Received April 13, 2026
Revised May 30, 2026
Accepted July 31, 2026

Keywords:

HIRAC
Occupational safety
Risk assessment
Work environment
Academic office workspace

ABSTRACT

Application of Hazard Identification, Risk Assessment, and Control (HIRAC) in Academic Office Workspaces: A Case Study at President University. *Occupational Health and Safety (OHS) is essential for creating a safe, healthy, and productive work environment, including academic offices. However, occupational safety and health (OSH) practices in higher education administrative workplaces remain limited, and workplace hazards are often underestimated. This study aimed to identify workplace hazards, assess occupational risks, and propose appropriate control measures in the faculty cubicle area at President University using the Hazard Identification, Risk Assessment, and Control (HIRAC) method. A descriptive observational design was applied following ISO 45001:2018. Data were collected through direct observation and documentation, and risk levels were determined using a likelihood–severity matrix. The assessment identified 21 hazard scenarios involving safety, physical, ergonomic, biological, and psychosocial hazards. Electrical hazards, particularly damaged outlets and excessive use of extension cords, presented the highest risk (risk value = 16) because of their potential to cause electric shock, short circuits, and fire. Other notable hazards included damaged chairs, cluttered workspaces, improper fire extinguisher placement, and inadequate ventilation. Control measures developed according to the hierarchy of controls reduced the average calculated risk value from 9.0 to 3.3, indicating improved workplace risk management. These findings demonstrate that HIRAC provides a practical and systematic approach for identifying workplace hazards, prioritizing risks, and supporting effective risk control in academic office environments. The study was limited to a single workspace and a relatively short observation period.*

INTRODUCTION

Occupational safety and health (OSH) is a fundamental aspect of creating a safe, comfortable, and productive work environment [1]. The implementation of Health, Safety, and Environment (HSE) principles plays a crucial role in reducing workplace accidents and improving work efficiency [1]. According to data from the Ministry of Manpower of the Republic of Indonesia [2], there were 278,564 cases of workplace accidents recorded during the period from January to August 2024. This figure indicates that the implementation of OSH systems remains a serious challenge, particularly in office environments where potential hazards are often underestimated compared to the industrial sector.

Academic office environments have unique risk characteristics that differ from the industrial sector. Office OSH standards in Indonesia are regulated by Regulation of the Minister of Health of the Republic of Indonesia No. 48 of 2016 [3], which covers four main aspects: occupational safety, occupational health, occupational environmental health, and office ergonomics. However, their implementation in academic settings remains inconsistent due to low institutional awareness and a lack of structured risk assessment practices. Previous studies indicate that inconsistent implementation of OSH standards in office environments is a recurring issue requiring serious attention from institutional policymakers [4]. The importance of systematic hazard identification has also been widely recognized across various institutional settings, with evidence that a structured approach can significantly reduce workplace injury rates [5].

Ergonomic hazards including the use of broken chairs and disorganized desks significantly contribute to an increased risk of work-related musculoskeletal disorders (WMSDs) among office workers. Meanwhile, psychosocial hazards arising from cramped and cluttered work environments have been shown to increase work-related stress, cognitive load, and reduce productivity effects that are increasingly documented in office-based occupational safety and health (OSH) research [6].

Based on initial observations conducted in faculty cubicles, several potential hazards were identified, including: disorganized room layouts, scattered documents, tangled electrical cords around electronic devices, improper placement of portable fire extinguishers (PFEs), and inadequate ventilation. These conditions indicate that the workspace does not yet fully meet applicable OSH standards. Furthermore, the lack of employee awareness regarding workplace safety and the absence of a structured risk assessment system result in these potential hazards remaining unidentified and poorly managed, thereby increasing the risk of accidents and reducing overall work productivity.

This study offers a novel approach by specifically applying the Hazard Identification, Risk Assessment, and Control (HIRAC) method to the faculty cubicle environment in academic institutions, a context that has been relatively under-explored in previous OSH literature. Furthermore, this study provides a systematic evaluation of workplace hazards and proposes practical control measures based on actual field conditions. Therefore, this study aims to identify, assess, and control potential hazards in the third-floor faculty cubicles at President University using the HIRAC method, as a foundation for improving OSH implementation and creating a safer and more comfortable work environment.

MATERIALS AND RESEARCH METHODS

This study employed a descriptive observational research design using the Hazard Identification, Risk Assessment, and Control (HIRAC) method in accordance with the ISO 45001:2018 occupational safety and health management system guidelines [7]. The study was conducted in the faculty cubicle area of Building A at President University on September 11–12, 2025. The unit of analysis in this study was the faculty cubicle area and the work activities taking place within it during the observation period. The HIRAC framework consists of three main, integrated stages: planning, hazard identification and risk assessment, and risk control, to provide a comprehensive understanding of workplace conditions and determine effective preventive measures.

Hazard Identification

The first stage of HIRAC is hazard identification, which involves recognizing potential risks in the cubicle environment. Data collection was conducted through direct observation of the faculty cubicle environment and the activities of its users, supported by documentation in the form of photographs and field notes. Observations were carried out for approximately two hours per day during the study period by six trained observers who were members of the research team.

To ensure consistency and reliability, observations were conducted systematically based on predefined hazard categories, including safety, chemical, biological, physical, ergonomic, and psychosocial aspects [8]. Safety hazards include scattered electrical cables and liquids placed near electronic devices. Chemical hazards stem from cleaning agents and printer ink, which can cause irritation or respiratory issues. Biological hazards relate to dust accumulation and mold growth due to poor ventilation. Physical hazards include inadequate lighting, unstable room temperatures, and damaged furniture. Ergonomic hazards are associated with improper sitting posture, furniture that is not the right size, and long work hours without breaks. These conditions have the potential to cause fatigue, musculoskeletal disorders, and decreased productivity. Psychosocial hazards were identified through observations of cramped and disorganized workspaces that have the potential to cause stress and excessive cognitive load.

Risk Assessment

After hazard identification is completed, a risk assessment is conducted to evaluate the likelihood and severity of each hazard and determine the risk level [9]. The assessment uses a Risk Assessment Matrix (RAM), which combines likelihood and severity values in a two-dimensional grid to classify risk levels [10]. The risk value is calculated using the following formula:

$$\text{Risk Value (RV)} = \text{Likelihood (L)} \times \text{Severity (S)}$$

The product of the likelihood and severity values is then plotted on a Risk Assessment Matrix (RAM) to determine the final risk level of each potential hazard. This matrix presents all possible combinations of L and S values in a two-dimensional grid, making it easier for readers to understand the relative position of each hazard on the overall risk scale [10]. The RAM used in this study is presented in Table 1.

Table 1. Risk Matrix [11]

	Risk Matrix				
Likelihood	4	4	8	12	16
	3	3	6	9	12
	2	2	4	6	8
	1	1	2	3	4
		1	2	3	4
	Severity				

Based on the risk scores obtained from the RAM, each hazard is then categorized into one of four risk levels: Low, Medium Low, Medium High, or High. This categorization serves as the basis for prioritizing control measures hazards with a low risk level need only be monitored periodically, while hazards with a high risk level require immediate control measures to prevent serious consequences [11]. Details of the risk level categorization and the corresponding value ranges are presented in Table 2.

Table 2. Indication of Risk Level [11]

Risk Rating	
1 and 2	LOW
3 and 4	MEDIUM LOW
6, 8, or 9	MEDIUM HIGH
12 or 16	HIGH

To obtain an accurate risk score, the two assessment dimensions likelihood and severity are explicitly defined using a four-point scale. The likelihood scale describes how often a hazard is expected to occur, ranging from very rare events to those that are almost certain to occur every month. This scale is presented in Table 3, which details the four categories of event frequency along with their respective descriptions [12].

Table 3. Scale Table of Likelihood [11]

TABLE OF LIKELIHOOD (4-POINT SCALE)		
Scale	**Description**	
1	Rare Likelihood-the risk might occur once every year. (1 time every year)	Very rare
2	Unlikely Likelihood-the risk might occur once every six months. (1 time every 6 months)	Rare
3	Likely Likelihood-the risk might occur less frequently than once in every three months (1 time every 3 months)	Likely
4	Almost Certain Likelihood-the risk might occur less frequently than once in one month. (1 time every 1 month)	Very often

Meanwhile, the severity scale describes the severity of the impact that would result if a hazard were to actually occur, ranging from negligible to catastrophic impacts. This scale is presented in Table 4, which details the four severity categories along with their explanations[11]

Table 4. Scale Table of Severity [11]

TABLE OF SEVERITY (4-POINT SCALE)		
Scale	**Description**	
1	Negligible Risks - These risks do not pose any significant threat and which can be left unmediated without any fear	Very Light
2	Moderate and Marginal Risks - Moderate risks have a chance of causing serious effects and need control. Marginal risks cause minor effects but still must be watched and managed.	Moderate
3	Critical Risks - Which can cause large effects that lead to destruction and delaying or stopping the process, this one needs to be solved as soon possible	High
4	Catastrophic Risks - Risks that may cause severe injury, major property damage, or significant disruption to workplace activities	Extreme

Likelihood and severity assessments were conducted jointly by all members of the research team (six observers) through consensus discussions based on field observation results. This consensus approach was applied to minimize individual assessment bias and improve the consistency of scoring results across observers [9]. The assessment results were then categorized into risk levels to prioritize control measures, thereby supporting systematic decision-making in risk management [10].

Risk Control

The final stage involves determining appropriate control measures based on the hierarchy of controls, including elimination, substitution, engineering controls, administrative controls, and personal protective equipment (PPE) [9]. Control measures were proposed based on the identified hazards, such as repairing electrical installations, reducing the use of extension cords, replacing damaged furniture, rearranging the workspace layout, and conducting routine OSH inspections. The effectiveness of the controls was evaluated by comparing risk scores before and after implementing the control measures.

It should be noted that there are several limitations to this study. First, the limited observation duration (approximately 2 hours per day over two days) may not fully represent the overall dynamics of work activities. Second, the likelihood and severity assessments were based on the research team's observational judgments without quantitative environmental measurements such as lighting levels, air quality indices, or noise measurements. These limitations should be considered when interpreting the study results.

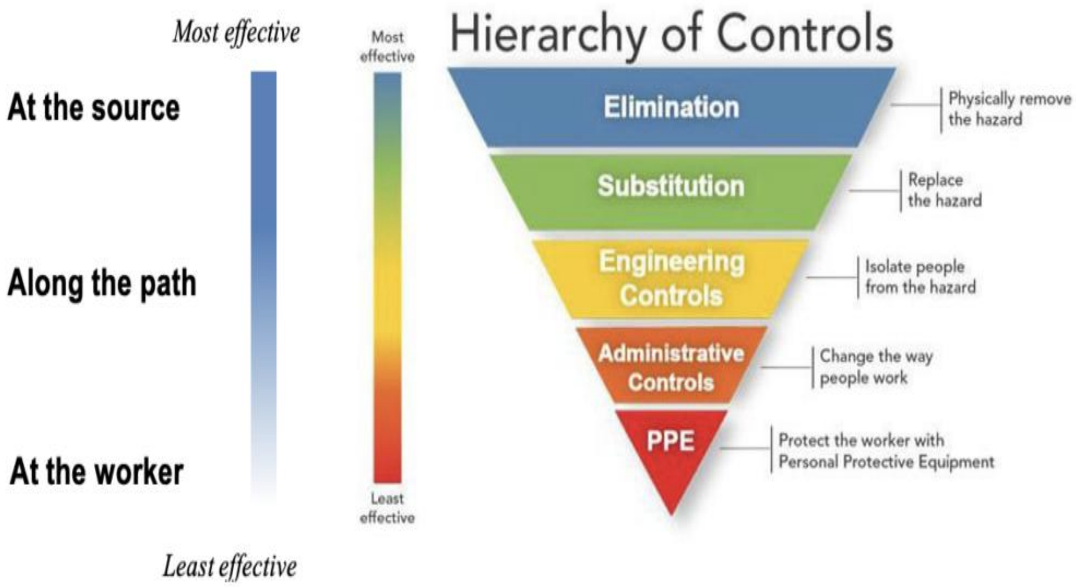

Figure 1. Hierarchy of Controls

RESEARCH RESULTS AND DISCUSSION

Hazard Identification Results

Field observations identified a total of 21 hazard scenarios spread across the entire observed cubicle area, covering five hazard categories: safety, physical, ergonomic, biological, and psychosocial. The complete distribution of the identified hazards along with the associated activities is presented in Table 5.

Table 5. Distribution of Risk Rating in The Cubicle Workspace Hazard Identification Results

No	Activity	Types of Hazard	Current Control	Hazard Potential
1	Place the containing the drink next to the printer	Safety Hazard	-	Spilled glass on the printer or work desk
		Physical Hazard	-	Liquid spills reach electrical components
		Physical Hazard	-	Spilled drink contacts electrical source
		Ergonomic Hazard	-	Drink spills onto desk and documents
2	Storage and Placement of APAR (Light Fire Extinguisher)	Physical Hazard	-	fire extinguishers fall over, roll over, and blocking the evacuation route
		Safety Hazard	-	APAR is stored/placed improperly in the evacuation route
3	Installation of wall-mounted server/network rack	Physical Hazard	-	Rack may fall if not properly secured
		Physical Hazard	-	Improper installation of wall-mount server/network rack causing the rack or equipment to fall.
4	Sitting on a damaged chair	Ergonomic Hazard	-	Torn seat reduces comfort and support
		Ergonomic Hazard	-	Damaged chair does not provide proper back support, leading to poor posture
		Ergonomic Hazard	-	Continuous use of uncomfortable/damaged chair causes muscle strain and discomfort
		Ergonomic Hazard	-	reduce concentration and work performance
5	Storing documents under the desk	Physical Hazard	-	Documents stacked on a weak box may fall, scatter, or cause tripping.
		Safety Hazard	-	Documents stored under desks obstruct walking path
		Safety Hazard	-	Tripping over documents causes loss of balance
6	Cables and headsets scattered on the table	Safety Hazard	-	Cable stuck
		Safety Hazard	-	obstruct movement / cause entanglement
7	Limited workspace due to clutter	Ergonomic Hazard	-	Clutter obstructs pathways
		Safety Hazard	-	Movement becomes limited
8	Damaged ceiling	Safety Hazard	-	Ceiling material is potentially collapsing
		Physical Hazard	-	Falling debris damages office equipment
9	Storing thick books in a recessed position	Safety Hazard	-	A book falls on a person
		Physical Hazard	-	Books fall on items
10	Cable terminals on the floor	Safety Hazard	-	Electric shock when there is cable damage
11	Cluttered workspace	Psychosocial Hazard	-	The room feels cramped and uncomfortable
12	The room looks dusty	Biological Hazard	-	Risk of becoming a hotbed of dust, or mould
		Safety Hazard	-	Inhalation of accumulated dust in the room
13	The door opens inward, but it should open outward	Safety Hazard	-	Inward opening doors can block evacuation and slow down emergency escape
		Safety Hazard	-	Door opens inward, creating obstruction and slowing evacuation flow during emergency

14	A small glass table with jars of dead plants is placed beside the pathway	Safety Hazard	-	People may trip over or bump into the table, dead plants may collect dust, mold, or attract small insects, glass table/jars may break and cause injury
		Safety Hazard	-	Glass table breaks if bumped into
		Biological Hazard	-	Dead plants in jars attract dust/pests, unhygienic environment
15	Lack of ventilation in the room	Physical Hazard	-	Poor air circulation
16	The table is full and messy	Ergonomic Hazard	-	The layout is not ergonomic, making it difficult to take items/do things on the table
17	Separate equipment placement from the dining area	Ergonomic Hazard	-	No space integration (separate eating utensils vs. cooking/drinking utensils)
18	Glasses and thermos placed on top of the refrigerator	Safety Hazard	-	Items may fall due to vibration or when opening/closing the fridge
		Physical Hazard	-	Glasses or thermos tip over, liquid spills onto electrical parts
19	Scattered documents and binders	Safety Hazard	-	Documents/binders obstruct walkway
		Ergonomic Hazard	-	Documents are misplaced or lost
20	Stacked boxes with heavy contents	Safety Hazard	-	Unstable pile, risk of falling
		Physical Hazard	-	Falling boxes hit/damage nearby equipment
21	Photocopier placed unevenly on the desk	Physical Hazard	-	Machine may fall or tip over
		Physical Hazard	-	Photocopier may tip/fall due to unstable placement

Risk Assessment Results

Table 6 presents the risk values obtained from the likelihood × severity calculation for each identified hazard. The assessment was conducted on 10 key activities that represent the hazards with the highest frequency and severity based on field observations.

Table 6. Risk Assessment Results

No.	**Activity (Aktivitas)**	**Hazard Potential (Potensi Bahaya)**	**L (Likelihood)**	**S (Severity)**	**Risk Value (L×S)**	**Level (Risk Level)**
1.	Place the glass containing the drink next to the printer	Spilled glass on the printer or work desk	3	2	6	MEDIUM HIGH
		Liquid spills reach electrical components	3	2	6	MEDIUM HIGH
		Spilled drink contacts electrical source	3	2	6	MEDIUM HIGH
		Drink spills onto desk and documents	3	1	3	MEDIUM LOW
2.	Storage and Placement of APAR	Fire extinguishers fall over, roll over, and blocking the evacuation route	2	3	6	MEDIUM HIGH
		APAR is stored/placed improperly in the evacuation route	2	3	6	MEDIUM HIGH
3.	Installation of wallmount server/network rack	Rack may fall if not properly secured	1	2	2	LOW
		Improper installation... causing the rack or equipment to fall.	1	2	2	LOW

4.	Sitting on a damaged chair	The chair breaks when someone sits on it	3	4	12	HIGH
		Chair is uneven/broken causing poor posture	3	2	6	MEDIUM HIGH
5.	Incorrect sitting posture	Poor posture, back pain	3	2	6	MEDIUM HIGH
6.	Using a broken/damaged power outlet	Electrical short circuits	4	4	16	HIGH
		Minor fire risk	4	4	16	HIGH
		Electric shock	4	4	16	HIGH
7.	Using many extension cords	Overheating/cable melting	4	3	12	HIGH
		Electrical short circuits	4	3	12	HIGH
		Minor fire risk	4	3	12	HIGH
8.	Cables scattered on the floor	Tripping	4	2	8	MEDIUM HIGH
		Cables are accidentally severed	4	2	8	MEDIUM HIGH
9.	Messy desk with lots of documents	Items/documents falling onto the floor	3	1	3	MEDIUM LOW
		Difficulty finding files (time consuming)	3	1	3	MEDIUM LOW
		Documents pile up and obstruct the monitor	3	1	3	MEDIUM LOW
		Dust accumulation on documents and equipment	3	1	3	MEDIUM LOW
10.	Lack of room lighting	Eye strain/tiredness	3	2	6	MEDIUM HIGH
		Headaches/Dizziness	3	2	6	MEDIUM HIGH

Priority Sorting and Risk Control Proposals

Table 7 presents the results of hazard prioritization, along with proposed controls and the expected risk scores following intervention. The average risk score of 9.0 prior to intervention was successfully reduced to 3.3 after implementing control measures, representing an average risk reduction of 63% across all identified hazard scenarios.

Table 7. Priority Sorting of HIRAC Results

No.	Activity	Hazard Potential	Level (Risk Level)	Proposed control	Expected Risk		
					L Likelihood	S (Severity)	Risk Value (L×S)
1.	Place the glass containing the drink next to the printer	Spilled glass on the printer or work desk	6	Providing a special area for drinks (cup holder/side table).	1	2	2
		Liquid spills reach electrical components	6	Move electronic devices away from the beverage area	1	2	2
		Spilled drink contacts electrical source	6	Move electronic devices away from beverage areas. Arrange cables so that they are not in spill areas.	1	3	3
2.	Storage and Placement of APAR	Fire extinguishers fall over, roll over, and blocking the evacuation route	6	Install a special bracket/wall mount for the fire extinguisher so that it does not fall easily.	1	2	2
		APAR is stored/placed improperly in the evacuation route	6	Provide clear signage (fire extinguisher location sign)	1	2	2

3.	Sitting on a damaged chair	The chair breaks when someone sits on it	12	Replace damaged seats with new, safe seats immediately	1	2	2
		Chair is uneven/broken causing poor posture	6	Providing ergonomic chairs with adjustable height/backrest	1	2	2
4.	Incorrect sitting posture	Poor posture, back pain	6	Providing ergonomic chairs (adjustable height, lumbar support).	1	2	2
5.	Using a broken/damaged power outlet	Electrical short circuits	16	Immediately replace the broken or cracked power outlet	1	3	3
		Minor fire risk	16	Ensure wiring connections are secure (no looseness).	1	3	3
		Electric shock	16	Install proper safety covers/faceplates.	1	4	4
6.	Using many extension cords	Overheating/cable melting	12	Ensure extension cords are rated for the connected load.	2	3	6
		Electrical short circuits	12	Replace damaged or worn extension cords immediately.	2	3	6
		Minor fire risk	12	Provide fire extinguishers nearby.	2	3	6
7.	Cables scattered on the floor	Tripping	6	Use cable covers or floor cord protectors in walkways.	2	2	4
		Cables are accidentally severed	6	Keep cables off high-traffic areas or covered.	1	3	3
8.	Lack of room lighting	Eyestrain/ tiredness	6	Provide task lighting (desk lamps) for detailed work.	2	2	4
		Headaches/Dizziness	6	Reduce glare from monitors or reflective surfaces.	2	2	4
Existing Average Risk Value			**9**	**Improved Average Risk Value**			**3,3**

Hazard Profile in the Academic Cubicle Environment

The findings of this study reveal that the faculty cubicle environment at President University harbors a more diverse range of hazards than is generally assumed in an office setting. The dominance of safety and physical hazards in the identification results reflects a pattern consistent with previous office OSH studies. [13], in a similar study of the office environment at PT. Wasa Mitra Engineering, found that electrical hazards and poor spatial layout consistently emerged as dominant categories in HIRADC-based hazard identification [14]. This similarity in patterns indicates that OSH issues in institutional office environments are cross-sectoral and not limited to specific industrial contexts.

Interestingly, the absence of existing controls across all 21 identified hazard scenarios constitutes a significant organizational finding.[4] state that inconsistencies in OSH implementation within institutional settings are largely due to the absence of structured monitoring mechanisms, not merely a lack of regulations. This finding reinforces that argument OSH regulations for offices in Indonesia are actually in place through Ministry of Health Regulation No. 48 of 2016 [3], but without a system of periodic inspections, the existence of regulations does not automatically translate into on-the-ground practice.

Electrical Hazards as a Priority Risk

Electrical hazards, particularly the use of damaged electrical outlets (RV = 16) and overloaded extension cords (RV = 12) resulted in the highest risk scores in this study. These results align with the findings of [15] who documented that damaged electrical equipment and improper installation are the primary causes of electrical incidents in institutional settings [3]. Furthermore, [14] specifically demonstrated that the excessive use of extension cords without considering load capacity is a significant risk factor for overheating and short circuits in non-industrial settings [16]. The findings of this study reinforce and extend this evidence to the academic context, where awareness of electrical hazards tends to be lower compared to industrial settings.

From a hierarchy of controls perspective, replacing damaged electrical outlets is the most cost-effective intervention because it directly eliminates the hazard source without requiring major infrastructure changes. This is consistent with the recommendation by Liu et al.[17] that preventive engineering controls are proven to be more effective than administrative controls in the long term, especially for hazards with a high likelihood [(14)].

Ergonomic Hazards and Their Implications for Long-Term Health

Damaged chairs (RV = 12) and poor sitting posture (RV = 6) were the most prominent ergonomic findings in this study. Compared to the study by Zhou et al.[18] which broadly examined ergonomic risk factors among office workers, this study identified more acute conditions not merely suboptimal furniture design, but furniture that is structurally damaged yet still in use [19]. This situation has more serious implications because, in addition to the risk of chronic injury due to poor posture, there is a risk of acute injury due to sudden structural failure of the chair (RV = 12, S = 4).

Lee et al.[20] demonstrated that an ergonomic intervention involving furniture replacement resulted in a significant reduction in musculoskeletal pain among office workers during a six-month follow-up period [8]. Based on these findings, replacing damaged chairs in the faculty cubicles at President University is not only relevant as a response to acute safety risks but also as a long-term investment in faculty health and productivity.

Biological and Psychosocial Hazards: Risks That Are Often Overlooked

Although biological and psychosocial hazards result in lower risk scores compared to electrical and ergonomic hazards, both carry significant indirect consequences that are often overlooked in conventional office occupational safety and health assessments. The accumulation of dust and dead plants identified in this study creates conditions conducive to mold growth and pest infestation, which have the potential to worsen indoor air quality and trigger respiratory problems among space occupants.

In the context of psychosocial hazards, Taibi et al.[21] emphasize that cramped, cluttered, and disorganized workspaces contribute to increased work-related stress and reduced cognitive capacity, which ultimately impact worker productivity and well-being [20]. These findings are relevant to the conditions observed in faculty cubicles at President University, where space constraints are exacerbated by the accumulation of disorganized documents, equipment, and personal belongings. Robertson et al.[1] even found a significant correlation between poor psychosocial work environment conditions and increased long-term healthcare costs for office workers [22], suggesting that investment in workplace improvements has economic implications that go beyond mere safety considerations.

Effectiveness of Controls and Institutional Implications

The average risk reduction of 63% (from a risk value of 9.0 to 3.3) achieved through the implementation of control measures in this study provides empirical evidence that systematic OSH interventions based on the hierarchy of controls can have a significant impact even without major structural changes. These results are consistent with the findings of Bazaluk et al. [23] which show that a combination of engineering and administrative controls consistently yields greater risk reductions compared to single interventions [24].

From an institutional implications perspective, this study highlights three strategic areas that require attention from the management of President University and similar academic institutions. First, the need to establish a schedule for periodic OSH inspections ideally every quarter as a mechanism for early detection of hazards before they escalate into incidents.

Second, electrical maintenance should be prioritized in the institutional safety budget, given that electrical hazards carry the highest risk values and have the potential to cause the most serious consequences. Third, an integrated, multi-hazard OSH intervention approach is more advisable than isolated responses to a single risk category, given the coexistence of ergonomic, biological, and psychosocial hazards in the same workspace, as found in this study.

CONCLUSIONS AND RECOMMENDATIONS

This study identified 21 occupational safety and health (OSH) hazard scenarios in the faculty cubicles of Building A at President University, encompassing five hazard categories: safety, physical, ergonomic, biological, and psychosocial. Electrical and ergonomic hazards emerged as the highest priorities for intervention due to their relatively higher risk levels, while biological and psychosocial hazards, despite lower risk scores, should not be overlooked because of their potential cumulative effects on employees' health, well-being, and work productivity.

The application of the hierarchy of controls through a consensus-based risk assessment approach effectively reduced the average risk score from 9.0 to 3.3, representing an overall risk reduction of 63%. These findings demonstrate that systematic hazard identification, risk assessment, and the implementation of appropriate control measures can substantially improve workplace safety in academic office environments. Furthermore, the absence of existing controls across all identified hazard scenarios highlights a systemic weakness in OSH implementation, suggesting that the primary challenge lies not in the lack of regulatory frameworks but in the absence of structured inspection, monitoring, and preventive management systems. Strengthening these mechanisms is essential to achieving a safer, healthier, and more productive workplace in accordance with applicable occupational health and safety standards.

Based on these findings, several practical recommendations are proposed. Academic institutions should establish routine inspections and preventive maintenance of electrical installations, including the replacement of damaged electrical outlets and the regulation of extension cord usage. Workspace organization and housekeeping practices should also be strengthened through systematic document storage, effective cable management, and proper handling of organic materials to minimize dust accumulation and mold growth. Ergonomic improvements should be prioritized by replacing damaged office furniture and ensuring that workstations are appropriately adjusted to reduce the risk of musculoskeletal disorders and support long-term employee productivity. In addition, regular, context-specific OSH training programs should be implemented to improve hazard awareness and foster sustainable safe work behaviors among academic staff. Future studies are recommended to expand the scope of investigation by including multiple academic buildings, longer observation periods, quantitative environmental measurements, and employee perception surveys to provide more comprehensive and generalizable evidence for strengthening OSH management in higher education institutions.

ETHICAL APPROVAL

This study did not require formal ethical approval as it did not involve human subjects or sensitive personal data. The research was conducted through direct observation of the workplace environment.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

YBSM: supervision and critical review of the manuscript; BRS: data analysis; FHR: manuscript writing; OLT: data collection and documentation; KHD: editing and literature review; APH: conceptualization and study design. All authors read and approved the final manuscript.

REFERENCES

1. Robertson, M. M., Huang, Y. H., Lee, J. Relationship between physical and psychosocial work environment and healthcare costs in office workers. J Occup Environ Med. 2020;62(8).
2. Kementerian Ketenagakerjaan Republik Indonesia. Data Kecelakaan Kerja Indonesia Januari–Agustus 2024 [Internet]. 2024. Available from: https://kemnaker.go.id/
3. Kementerian Kesehatan Republik Indonesia. Peraturan Menteri Kesehatan Nomor 48 Tahun 2016 tentang Standar Keselamatan dan Kesehatan Kerja Perkantoran. Permenkes [Internet]. 2016 Sep 28. Available from: https://peraturan.bpk.go.id/Details/113097/permenkes-no-48-tahun-2016
4. Hollá K, Kuricová A, Kočkár S, Prievozník P, Dostál F. Risk assessment industry driven approach in occupational health and safety. Front Public Health. 2024 Jun 4;12:1381879. doi:10.3389/fpubh.2024.1381879
5. Ghasemi F, Doosti-Irani A, Aghaei H. Applications, Shortcomings, and New Advances of Job Safety Analysis (JSA): Findings from a Systematic Review. Saf Health Work. 2023 Jun;14(2):153–62. doi:10.1016/j.shaw.2023.03.006
6. Goetsch DL. Occupational Safety and Health for Technologists, Engineers, and Managers. 7th ed. 2011.
7. International Organization for Standardization. ISO 45001:2018 Occupational health and safety management systems — Requirements with guidance for use [Internet]. 2018. Available from: https://www.iso.org/standard/63787.html
8. Oakman J, Weale V, Kinsman N, Nguyen H, Stuckey R. Workplace physical and psychosocial hazards: A systematic review of evidence informed hazard identification tools. Appl Ergon. 2022 Apr;100:103614. doi:10.1016/j.apergo.2021.103614
9. Purohit, Devdatt P., Siddiqui, N. A., Nandan, Abhishek, Yadav, Bikarama P. Hazard Identification and Risk Assessment in Construction Industry. Int J Appl Eng Res. 2018;13(10).
10. Jensen RC, Bird RL, Nichols BW. Risk Assessment Matrices for Workplace Hazards: Design for Usability. Int J Environ Res Public Health. 2022 Feb 27;19(5):2763. doi:10.3390/ijerph19052763
11. QHSE Support. On Safe Lines [Internet]. 2024. Risk Matrix and Indication of Risk Level. Available from: https://onsafelines.com/qhse.support/topics/risk-assessment-matrix
12. Arini SY. Comprehensive Analysis of Occupational Health, Safety, and Risk Factors: Examining Exposure, Ergonomics, Fatigue, Rule-Breaking, Safety Performance, and Fire Protection, Work-Related Musculoskeletal Disorders Across Diverse Work

Environments. Indones J Occup Saf Health. 2024 Dec 31;13(3):268–70. doi:10.20473/ijosh.v13i3.2024.268-270
13. Amin M, Salim Dahda S, Dhartikasari Priyana E. IDENTIFIKASI BAHAYA DAN PENILAIAN RISIKO KECELAKAAN KERJA DI AREA PERKANTORAN PT. WASA MITRA ENGINEERING DENGAN METODE HIRADC DAN METODE FTA. INTECOMS J Inf Technol Comput Sci. 2025 Oct 22;8(5):1605–13. doi:10.31539/y7ve0894
14. Novieto DT, Kulor F, Markus ED, Apprey MW. Safety precautions in the usage of extension cords by students in halls and hostels. TELKOMNIKA Telecommun Comput Electron Control. 2023 Apr 1;21(2):468. doi:10.12928/telkomnika.v21i2.24743
15. Salvaraji L, Jeffree MS, Lukman KA, Saupin S, Avoi R. Electrical safety in a hospital setting: A narrative review. Ann Med Surg. 2022 Jun;78. doi:10.1016/j.amsu.2022.103781
16. Jensen R, Gilkey DP. Risk-Reduction Research in Occupational Safety and Ergonomics: An Editorial. Int J Environ Res Public Health. 2023 Mar 16;20(6):5212. doi:10.3390/ijerph20065212
17. Liu R, Liu HC, Shi H, Gu X. Occupational health and safety risk assessment: A systematic literature review of models, methods, and applications. Saf Sci. 2023 Apr;160:106050. doi:10.1016/j.ssci.2022.106050
18. Zhou, Z, Ma, Q, Liu, X, Zhao, Z, He, J. Ergonomic risk factors and work-related musculoskeletal disorders in office workers. J Occup Health. 2021;63(1).
19. Wurzelbacher SJ, Lampl MP, Bertke SJ, Tseng CY. The effectiveness of ergonomic interventions in material handling operations. Appl Ergon. 2020 Sep;87:103139. doi:10.1016/j.apergo.2020.103139
20. Lee S, De Barros FC, De Castro CSM, De Oliveira Sato T. Effect of an ergonomic intervention involving workstation adjustments on musculoskeletal pain in office workers—a randomized controlled clinical trial. Ind Health. 2021;59(2):78–85. doi:10.2486/indhealth.2020-0188
21. Taibi Y, Metzler YA, Bellingrath S, Neuhaus CA, Müller A. Applying risk matrices for assessing the risk of psychosocial hazards at work. Front Public Health. 2022 Sep 6;10:965262. doi:10.3389/fpubh.2022.965262
22. Hassanain MA, Al-Harogi M, Ibrahim AM. Fire Safety Risk Assessment of Workplace Facilities: A Case Study. Front Built Environ. 2022 Mar 7;8:861662. doi:10.3389/fbuil.2022.861662
23. Bazaluk O, Tsopa V, Okrasa M, Pavlychenko A, Cheberiachko S, Yavorska O, et al. Improvement of the occupational risk management process in the work safety system of the enterprise. Front Public Health. 2024 Jan 15;11:1330430. doi:10.3389/fpubh.2023.1330430
24. Jia JA, Nwaogazie IL, Anyanwu BO. Risk Matrix as a Tool for Risk Analysis in Underwater Operations in the Oil and Gas Industry. J Environ Prot. 2022;13(11):856–69. doi:10.4236/jep.2022.1311054
25. Kuzior A, Kopij G. Occupational Risk Management in OHS Based on Risk Assessment and Control. Syst Saf Hum - Tech Facil - Environ. 2024 Dec 1;6(1):26–34. doi:10.2478/czoto-2024-0004