Herzberg's Hygiene Factors and Mental Well-being: A Study of Environmental Design, Equipment, and Safety in Manufacturing Sector

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ABSTRACT

Employee mental health has become a critical concern in modern organizations, particularly in labor-intensive industries such as manufacturing where physical workplace conditions can directly shape psychological well-being. This study examines the influence of physical workplace conditions, framed as Herzberg's Hygiene Factors, on employee mental well-being in the manufacturing sector. Specifically, the research investigates three key environmental factors: environmental design, equipment and tools, and health and safety. Quantitative research design was employed through a survey conducted to nearly 480 lower management employees, with 216 valid responses collected. Data was analyzed using SPSS software to evaluate descriptive statistics and correlations outcomes. Descriptive findings indicated that employees rated all three environmental factors within the "average" category, reflecting moderate levels of satisfaction. Correlation analysis revealed strong and statistically significant positive associations between environmental design, equipment and tools, and health and safety with employee mental health. These findings highlight the importance of environmental factors, namely environmental design, equipment and tools, and health and safety, in promoting employee mental health within the manufacturing context. The study contributes to extending Herzberg's framework by emphasizing its relevance to mental well-being and offers practical implications for organizational strategies aimed at fostering healthier work environments.

Keywords: Herzberg's Hygiene Factors, Mental Health, Environmental Design, Equipment and Tools, Health and Safety

INTRODUCTION

The mental well-being of employees has become a central concern in organizational research, especially in high-demand sectors such as manufacturing. The nature of manufacturing work often involves repetitive tasks, physical strain, and exposure to occupational risks, which can have long-term psychological implications. Scholars and practitioners alike have emphasized that beyond financial rewards, workplace conditions play a critical role in shaping employees' overall well-being and satisfaction [1]. This underscores the importance of examining factors within the work environment that influence mental health outcomes.

Herzberg's Two-Factor Theory provides a useful lens to explore workplace well-being, as it distinguishes between motivators that foster job satisfaction and hygiene factors that prevent dissatisfaction [2]. Within this framework, environmental design, equipment quality, and workplace safety represent critical hygiene factors that, while not directly motivating employees, have a profound impact on their psychological health if inadequately addressed. Studies have shown that poor environmental conditions and unsafe equipment elevate stress and cognitive load, ultimately undermining employee performance and well-being [3]. Similarly, the

absence of effective safety measures has been linked to dissatisfaction and diminished trust in organizational practices [4].

Despite the acknowledged importance of hygiene factors, manufacturing employees continue to face challenges such as unsafe work conditions, outdated equipment, and insufficient attention to psychological safety. These issues not only heighten risks of accidents but also contribute to mental strain, absenteeism, and reduced productivity. While research has investigated job satisfaction from a motivational perspective, fewer studies have explicitly focused on how hygiene factors, particularly environmental design, equipment, and safety, affect mental well-being in the manufacturing context [5]. This gap suggests the need for a more holistic framework that integrates Herzberg's hygiene factors with occupational mental health outcomes.

This gap presents a compelling problem: despite recognition that hygienic workplace conditions prevent dissatisfaction, manufacturing environments however, characterized by intense physical demands, machinery, and safety hazards, may uniquely influence mental well-being. The literature often emphasizes job satisfaction or physical safety, leaving mental health outcomes underexplored. Consequently, this study proposes to address that gap by investigating the relationships between three key environmental hygiene factors, environmental design, equipment and tools, and health and safety towards employee mental health in manufacturing settings, and by advancing a conceptual framework that integrates Herzberg's theory with occupational mental-health constructs.

Accordingly, this study aims to (a) empirically assess the impact of environmental design, equipment and tools, and health and safety on employee mental health, (b) present a research framework situating these factors within Herzberg's hygiene-factor paradigm, and (c) provide insights tailored to manufacturing operations. This endeavor is significant in enhancing both theoretical understanding and practical interventions: organizations can strategically improve physical conditions to safeguard mental well-being, and scholars gain deeper integration between motivation theory and occupational health psychology frameworks.

Theoretically, this research is grounded in Herzberg's Two-Factor Theory, which distinguishes between hygiene factors (contextual job features whose absence causes dissatisfaction) and motivators (factors that create satisfaction) [6]. By framing environmental design, equipment/tools, and health & safety as hygiene factors, the study aligns with Herzberg's contention that poor working conditions demotivate, even if their adequacy does not inherently motivate, and extends this logic to mental health outcomes beyond job satisfaction. Finally, the structure of the paper unfolds as follows: the next section reviews relevant literature on physical workplace conditions, hygiene factors, and occupational mental health. The subsequent methodology section details the quantitative survey design, sample, and analytic strategy. This leads into findings presenting descriptive, correlational, and regression results. The discussion interprets findings through the theoretical lens and outlines practical and policy implications, followed by concluding remarks and suggestions for future research.

LITERATURE REVIEW

The manufacturing sector is increasingly compelled to integrate sustainable and environmentally compliant workplace designs due to administrative regulations and consumer demands for environmental accountability [7]. Environmental design in manufacturing goes beyond aesthetics, encompassing product life cycle assessment, selection of sustainable raw materials, and energy efficiency [8]. These design elements directly influence not only ecological outcomes but also the psychosocial climate within the workplace, shaping employee perceptions of safety, comfort, and mental well-being. From the lens of Herzberg's Hygiene Factors, inadequate environmental design may act as a workplace stressor, undermining employee satisfaction and contributing to negative psychological outcomes. Conversely, effective design can help foster a healthier work environment that supports mental resilience.

Equipment and tools also constitute a critical dimension of workplace hygiene factors in manufacturing. The maintenance and safety compliance of machinery directly influences production efficiency and employee well-

being [9]. Research highlights that failure to comply with environmental and safety legislation can result not only in reduced equipment availability but also in heightened stress levels among employees due to work disruptions and unsafe working conditions [10]. Moreover, ergonomic considerations in equipment design are central to reducing occupational fatigue and psychological strain. By ensuring tools and machinery are reliable, safe, and ergonomically aligned, organizations can reduce job dissatisfaction and improve workers' mental health. Thus, the role of equipment transcends physical utility, serving as a critical component in shaping employees' overall psychological welfare in the manufacturing workplace.

Health and safety regulations remain a cornerstone of manufacturing environments, providing essential safeguards for employees' physical and mental well-being. Industrial safety standards such as ISO 14000 and OHSAS 18001 help manufacturers minimize environmental impact while ensuring occupational safety [11]. As [12] argue, the evolving nature of industrial safety standards reflects the dynamic risks associated with technological and operational changes in manufacturing. More recent studies emphasize the role of safety climate, shared employee perceptions about workplace safety practices as a determinant of stress reduction and positive mental health outcomes [13]. From Herzberg's perspective, the absence of adequate safety provisions can be a strong demotivator, while effective safety management serves to prevent dissatisfaction and promote mental stability. Despite these insights, there remains a need for a conceptual framework that explicitly links environmental design, equipment, and safety to employees' psychological outcomes, particularly in manufacturing contexts.

The present study aligns with the growing body of research in occupational health psychology that emphasizes the interplay between workplace environment and employee mental well-being. Globally, scholars have underscored that environmental factors such as workspace design, access to ergonomic tools, and robust safety protocols are not only determinants of productivity but also crucial to psychological health [14]. For instance, studies in Europe have highlighted how supportive physical environments mitigate stress and burnout, contributing to more sustainable work outcomes [15]. Similarly, research in North America demonstrates that investment in safety infrastructure and ergonomic design correlates with lower absenteeism and improved mental resilience among employees [16]. However, while much of the existing literature in occupational health psychology focuses on service or healthcare sectors [17], fewer studies explore these dynamics in the manufacturing sector. This gap underscores the unique contribution of the present study, while also calling for further cross-national comparisons to establish broader applicability.

Figure 1 illustrates the research framework of environmental factors on employee mental health. The framework proposes three hypotheses: H1 indicates the relationship between environmental design and employee mental health, H2 reflects the relationship between equipment and tools and employee mental health, and H3 represents the relationship between health and safety and employee mental health.

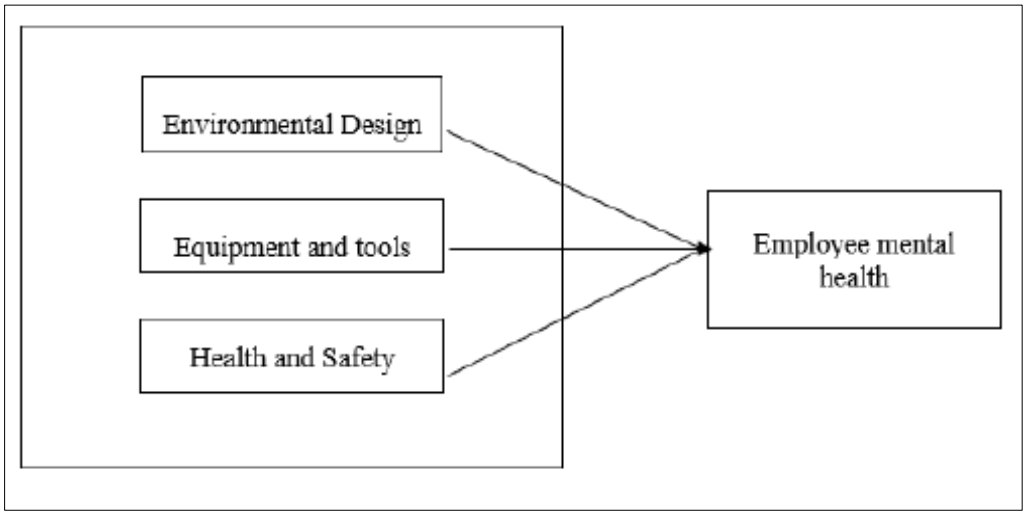

Fig. 1 Research Framework of Environmental Factors on Employee Mental Health

METHODOLOGY

Research Design

This study employed a quantitative research design to examine the relationship between physical workplace environment factors, conceptualized as Herzberg's Hygiene Factors, and employee mental health in the manufacturing sector. Specifically, the study investigated how three independent variables known as environmental design, equipment and tools, and health and safety, influence the dependent variable, namely employees' mental health. A causal research design was adopted, as the objective was to determine cause-and-effect relationships among the variables. This approach is appropriate given the study's aim to measure associations and predictive effects through statistical analysis.

Population and Sampling

The target population comprised lower management employees at a manufacturing company located in Kulim, Malaysia, totaling 480 individuals. The exclusion of upper management (n = 6) and middle management employees (n = 31) was intentional, as these groups are not directly involved in the production process and therefore less exposed to the physical workplace conditions under investigation. The focus on lower management employees ensures more accurate insights, as they are directly engaged in operational tasks and continuously experience the environmental conditions of the workplace.

The lower management population was distributed across three departments: operations (n = 326), packaging (n = 139), and administration (n = 15). Employees in the operations department were responsible for direct production and machinery handling, while those in the packaging department carried out inspection, quality control, and packaging tasks. Administrative employees, though not directly on production lines, worked in the same physical environment and were therefore also exposed to factors such as noise, ventilation, ergonomics, and safety measures.

The sample size was determined using [18] sampling table, which suggests that for a population of 480, a minimum of 214 respondents is sufficient to ensure representativeness at a 95% confidence level and 5% margin of error. The study therefore aimed to collect at least 214 responses. A stratified random sampling technique was employed to ensure proportional representation from each department, thus reflecting the organizational structure of the workforce.

Data Analysis

The data collected was processed and analyzed using the Statistical Package for the Social Sciences (SPSS) version 26.0 to test the study's hypotheses. The survey findings were examined and summarized through statistical procedures, including descriptive analysis, correlation analysis, and regression analysis.

RESULTS AND DISCUSSION

TABLE I Demographic Profile of Participants

Variable	**N**	**Frequency (n)**	**Percentage (%)**
Gender	216		
Male		154	71.3
Female		62	28.7
Age	216		
Less than 21 years old		2	0.9
21 – 30 years old		90	41.7
31 – 40 years old		88	40.7

41 – 50 years old		34	15.7
51 – 60 years old		2	0.9
Nationality	216		
Malayisan		81	37.5
Non-Malaysian		135	62.5
Department	216		
Operation		152	70.4
Packaging		53	24.5
Administration		11	5.1
Years in Service	216		
0-1 year		22	10.2
1- 3 years		20	9.3
4-6 years		8	3.7
7-10 years		53	24.5
11-40 years		113	52.3

Table 1 shows a total of 216 respondents completed the questionnaire, exceeding the required sample size of 214. The majority were male (71.3%), while females made up 28.7%. Most respondents were aged 21–30 years (41.7%) and 31–40 years (40.7%), with only a small proportion below 21 or above 50. In terms of nationality, 62.5% were non-Malaysians and 37.5% Malaysians. Department-wise, most respondents came from operations (70.4%), followed by packaging (24.5%) and administration (5.1%). Regarding tenure, 52.3% had worked for 11–40 years, while 24.5% had 7–10 years of service. A smaller portion had less than 6 years of experience, showing a larger workforce made up of long-tenured employees.

Normality Test

To assess normality, skewness and kurtosis values were analyzed for all variables, including the dependent variable (employee mental health) and the independent variables (environmental design, equipment and tools, and health and safety). A dataset is regarded as normally distributed when the skewness and kurtosis values fall within the acceptable threshold of -2 to +2.

TABLE II Analysis of Normality

Descriptive Statistics					
Variables	**N**	**Skewness**		**Kurtosis**	
	Statistic	**Statistic**	**Std. Error**	**Statistic**	**Std. Error**
Employee Mental Health	216	.112	.166	-.810	.330
Environmental Design	216	-.103	.166	-.411	.330
Equipment and Tools	216	-.175	.166	-.491	.330
Health and Safety	216	-.451	.166	.229	.330

Table 2 presents the skewness and kurtosis values for the study variables. The skewness results for employee mental health (0.112), environmental design (-0.103), equipment and tools (-0.175), and health and safety (-0.451) all fall within the acceptable range, indicating no major skewness. Likewise, the kurtosis values for employee mental health (-0.810), environmental design (-0.411), equipment and tools (-0.491), and health and safety (0.229) are also within the acceptable limits. These results confirm that the data distribution is approximately normal, fulfilling the normality assumption and making the dataset appropriate for parametric statistical analysis.

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Reliability Test

To evaluate the reliability of the questionnaire, Cronbach's Alpha was used as a measure of internal consistency, which reflects how closely related a set of items are as a group. The coefficient ranges from 0 to 1, with values above 0.5 considered acceptable, and values closer to 1 indicating stronger consistency. In this study, all independent and dependent variables were tested for reliability, and the results, presented in Table 3, demonstrate excellent internal consistency. The Cronbach's Alpha values ranged from 0.962 to 0.986, confirming the strong reliability of the instrument.

TABLE III Reliability Analysis

Variables	Cronbach's Alpha	N of Items	Reliability Assumed
Employee Mental Health	0.962	5	Yes
Environmental Design	0.968	8	Yes
Equipment and Tools	0.973	5	Yes
Health and Safety	0.986	11	Yes

Descriptive Analysis

Table 4 presents the descriptive analysis of the study variables. The mean scores for the dependent variable (employee mental health) and the independent variables (environmental design, equipment and tools, and health and safety) show variation but all fall within the average interpretation range, between 3 and 4. The standard deviation values, ranging from 0.941 to 1.110, indicate a moderate level of variation in responses around the mean.

TABLE IV Mean and Standard Deviation for Variables

Variables	N	Mean	Std. Deviation
Employee Mental Health	216	3.03	1.110
Environmental Design	216	3.23	0.995
Equipment and Tools	216	3.26	1.012
Health and Safety	216	3.46	0.941

Correlation Analysis

This study used Pearson Correlation Coefficient analysis to examine the relationships among the variables. The coefficient values indicate the strength and direction of the association: values near –1 represent a negative relationship, values near +1 a positive relationship, and values close to 0 indicate little or no relationship. Table 5 presents the correlation results between the three independent variables and the dependent variable.

TABLE V Correlation between All Variables

		Environmental design	Equipment and Tools	Health and Safety	Mental Health
Employee Mental Health	Pearson Correlation	.882**	.830**	.783**	1
	Sig. (2-tailed)	<.001	<.001	<.001	
	N	216	216	216	216

**. Correlation is significant at the 0.01 level (2-tailed).

H1: Environmental design affects employees' mental health

The first independent variable, environmental design, showed a correlation coefficient of r = 0.882, which falls within the range of "±0.70 to ±0.89," indicating a strong relationship with employee mental health. With a significant value of p < .001, the findings confirm a strong positive correlation between environmental design and employee mental health. This suggests that well-designed workplace environments in the manufacturing sector foster better working conditions and enhance employees' mental well-being. Recent research on healthy buildings highlights how improved lighting and access to green views enhance alertness and emotional state [19]. Additionally, incorporating elements of biophilic design, such as indoor plants and natural environmental cues, has been linked to stress reduction and improved cognitive functioning [20]. These findings reinforce that thoughtful environmental design serves as a critical hygiene factor in supporting mental health in workplace settings. For managers, this finding suggests that investing in ergonomic layouts, noise reduction systems, and optimized lighting are not merely aesthetic choices but critical interventions that directly influence employee mental health. For policymakers, this underscores the need to establish workplace design standards that mandate minimum requirements for physical workspace quality, especially in high-demand industries like manufacturing where stressful environments are common [21].

H2: Equipment and tools affect employee mental health

The second independent variable, equipment and tools, recorded a correlation coefficient of r = 0.830, which lies within the range of "±0.70 to ±0.89," indicating a strong relationship with employee mental health. The significance value of p < .001 confirms a strong positive correlation between the two variables. This implies that the provision of adequate and well-functioning equipment and tools in the manufacturing sector contributes to a better working environment and enhances employees' mental well-being. Prior research supports this finding, as access to reliable tools and ergonomic equipment reduces physical strain, prevents workplace stress, and increases job satisfaction [22]. Furthermore, well-designed and properly maintained equipment not only improves productivity but also safeguards employees' psychological health by minimizing frustration and work-related fatigue. This finding can translate into clear operational strategies, such as implementing regular equipment maintenance schedules and ensuring that tools are user-friendly and technologically updated. Policymakers, on the other hand, could integrate these insights into occupational health guidelines, reinforcing the responsibility of organizations to provide adequate resources for task completion [16].

H3: Health and safety affect employee mental health

The third independent variable, health and safety, recorded a correlation coefficient of r = 0.783, which falls within the range of "±0.70 to ±0.89," indicating a strong relationship with employee mental health. The significance level of p < .001 further confirms a strong positive correlation between health and safety and employee mental health. This finding suggests that improved health and safety conditions in the workplace foster a more supportive working environment, thereby enhancing employees' mental well-being. Importantly, many countries now recognize psychosocial risk as a critical aspect of workplace safety. For instance, recent legislative reforms, like Australia's adoption of ISO 45003 standards, embed psychosocial hazard management into occupational health frameworks, helping to prevent burnout and improve mental well-being [23]. These developments indicate that safety measures must evolve to address both physical and psychological dimensions in manufacturing environments. Managers can act on this evidence by prioritizing proactive safety audits, training employees on risk management, and creating a culture where safety protocols are visibly enforced. At the policy level, stronger enforcement of occupational safety regulations could be promoted as a dual-purpose initiative—protecting both physical and mental health outcomes of employees [17].

CONCLUSIONS

Overall, the results emphasize that environmental design, equipment and tools, and health and safety are essential determinants of employee mental health. These findings align with Herzberg's Two-Factor Theory,

where physical workplace conditions serve as hygiene factors that prevent dissatisfaction. When managed effectively, they establish a foundation for psychological well-being, allowing employees to thrive even in demanding manufacturing environments. The results show strong positive correlations between these factors and employees' psychological well-being, suggesting that a supportive work environment enhances concentration, reduces stress, and contributes to overall job satisfaction and productivity. The findings indicate that when organizations provide a safe working environment, ensure access to proper tools and equipment, and design workplaces that promote comfort and well-being, employees are more likely to experience improved mental health outcomes. Such improvements not only benefit individuals but also contribute to greater organizational effectiveness and long-term sustainability. The study highlights the importance of prioritizing workplace design, safety, and resources as part of organizational strategies. By fostering environments that support employees' mental health, manufacturing companies can enhance workforce motivation, reduce stress-related issues, and strengthen overall performance. While this research was conducted within the manufacturing sector, the implications of environmental design, adequate tools, and safety provisions can be extended to other industries where physical working conditions directly influence psychological well-being. Future research should extend the investigation to a wider range of organizations across multiple industries and geographic regions. Including diverse cultural, economic, and organizational settings would allow researchers to capture contextual variations, enhance the robustness of conclusions, and provide a more comprehensive understanding of how Herzberg's Hygiene Factors influence mental well-being in different workplace environments.

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