

Work-Satisfaction Throughout Workplace Design: An Approach on Ergonomics and Hedonomics for Office Design

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DOI: [10.22059/JDT.2023.369054.1108](https://doi.org/10.22059/JDT.2023.369054.1108)

Received: 2 December 2023, Revised: 30 December 2023, Accepted: 30 December 2023, Available Online from 30 December 2023.

Abstract

To increase productivity and consider people's health and safety in the workplace, the science of ergonomics attempts to design the environment based on human physical-mental abilities, limitations, and interests. The purpose of this study is to determine the significant environmental factors and design-based environment features in increasing the level of pleasantness. In this cross-sectional research, ergonomic and hedonomic factors which are related to design and aesthetics were assessed among office employees. 248 participants responded to the questionnaires. The findings showed the items related to the workplace had a positive and significant relationship with job satisfaction. The results depicted that several factors, such as environmental ergonomic factors (including light, sound, temperature, optimal and customizable size of office furniture and equipment for each individual), were effective in creating an optimal environment for positive and constructive interaction. The mentioned outcome might be used in the design.

Keywords

Job Satisfaction, Office Design, Ergonomics, Hedonomics.

Introduction

The health and well-being of employees in the workplace are influenced by various physical and mental factors. The World Health Organization (WHO) defines health as a state of complete physical, mental, and social well-being, not merely the absence of disease or disability (Voordt & Jensen, 2023). Therefore, a healthy workplace can be defined as a workplace that contributes to the physical, psychological, and social well-being of its users. Designers play a crucial role in creating healthy workplaces by considering the ergonomic, environmental, and cognitive aspects of workstations and their effects on the employees. One of the major physical issues that affect employees in the workplace is work-related musculoskeletal disorders (WMSDs), which result from cumulative trauma, improper postures, and incorrect body movements during long working hours. WMSDs can cause chronic pain, disability, reduced productivity, and additional healthcare costs for the employees and the industry (Heidarimoghadam et al., 2020; Kahya, 2021; Lewis et al., 2002). WMSDs are more prevalent among office workers, who spend significant portions of their workday sitting and using computers, which increases the risk of cardiometabolic and musculoskeletal diseases, especially in the lower back, neck, and shoulder areas (Arippa et al., 2022; Castellucci et al., 2021; Collins & O'Sullivan, 2015; Cui et al., 2020; Lim et al., 2021; Pollard et al., 2021). The physical health and productivity of office workers are affected by their sedentary behavior and the design of their furniture. Office workers are often physically inactive for most of their workday, which puts them at risk of various health problems (Dillon et al., 2021; Pütz et al., 2022). Therefore, ergonomic furniture is essential to ensure the comfort and well-being of office workers. For instance previous studies have shown that the ergonomic design of workstations can reduce the level of perceived discomfort, prevent musculoskeletal disorders, and improve the comfort and productivity of the staff (Black et al., 2022; de Barros et al., 2022; Kar & Hedge, 2021; Malińska et al., 2021; Oakman et al., 2022; Shahwan et al., 2022; Sithipornvorakul et al., 2020; Szeto et al., 2005).

Another important issue that affects employees in the workplace is mental workload, which is the ratio of an individual's cognitive resources that must be expended to perform a given task under particular environmental and efficient conditions (Pütz et al., 2022). High mental workload can impair the ability of the employees to perceive, judge, and pay attention, leading to operational errors, lower performance, and reduced efficiency of the human-machine system (Shao et al., 2021). Mental workload is influenced by various factors, such as the pace of modern life, competition in the workplace, poor working conditions, and countless tasks with short deadlines, which increase work-related stress (Richter et al., 2019). Job stress can cause psychological and physiological problems, such as anxiety, depression, fatigue, and cardiovascular diseases (Virmani & Salve, 2021). Moreover, the quality of the work environment can affect the job satisfaction, motivation, well-being, and productivity of the employees, as well as the extent to which the organization converts input resources into goods and services (Avinante et al., 2021; Baleshzar & Tabbodi, 2019). Therefore, the design of the workplace should consider not only the physical, but also the mental and psychological aspects of the employees.

Designers play a crucial role in creating healthy workplaces by considering the ergonomic, environmental, and cognitive aspects of workstations and their effects on the employees. This research evaluates the various factors that influence the physical and mental well-being of employees in the workplace, and proposes some design solutions and recommendations to improve them. This research not only addresses the physical issues that influence the employees' performance in the workplace, but also the mental issues that they face. Previous studies have mostly focused on the physical aspects of workstations and their impacts on the user. This study aims to bridge the research gap in this area by exploring and evaluating the factors that affect the mental and psychological well-being of employees in the work setting.

Ergonomics and Hedonomics

Health, safety, and performance are maximized if equipment, workstations, and work methods are designed to meet the capabilities and limitations of the employees (Baba et al., 2021; Naeini et al., 2023).

The term hedonomics, derived from the two Greek words hedon (pleasure) and nomos (rules, principles), is related to how the user evaluates the emotional interaction between people and the environment and artifacts (Helander & Po Tham, 2003; Naeini & Mostowfi, 2015; Oron-Gilad et al., 2017). Hedonomics emerged as a set of non-task qualities and non-instrumental elements that make subjective judgments of attractiveness (Hashim et al., 2021). It is a branch of science dedicated to promoting pleasurable human-technology interaction (Oron-Gilad et al., 2005). In fact, hedonomics and ergonomics are two sides of the same coin, and basically, they are synergistically driven toward the same goal, namely the optimized human-technology interaction that is central to all future designs (Hancock et al., 2005). In general, the goal of ergonomic design and its derivative concepts, such as hedonomics, is to achieve greater comfort and well-being, furthermore, pleasure in our lives is beyond productivity (Afrashteh & Razzaghi, 2022). *Well-being* is a term that can define concepts such as a person's physical, social and mental health (Seaborn et al., 2015; Figure 1). In recent years, steps have been taken beyond ergonomics and hedonomics, in order to achieve well-being, and concepts, such as Eudaimonia, have been introduced (Figure 1). The term Eudaimonia, popularized by Aristotle in the fourth century BC (Huta, 2016), is the feeling of happiness at a time when one can live life to its maximum potential and in accordance with some inner virtues (Ramiah, 2020).

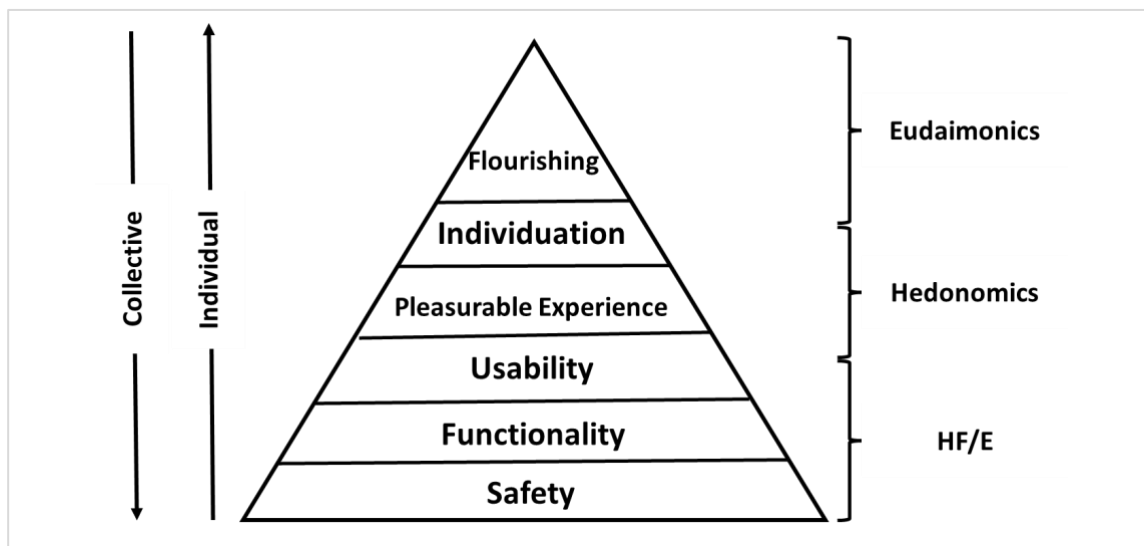


Figure 1: Developed Model of Human Factors with Eudaimonia Components-Adapted from (Seaborn et al., 2015).

In view of the foregoing, and in order to ensure the welfare and well-being of the working class in society, compliance with the requirements to design a suitable work environment and increase the quality of the environment is inevitable. Factors that can be considered in connection with this issue include environmental ergonomic design factors (light, sound, temperature, etc.), hedonomic design factors (enjoyable experience, personalization, etc.), and finally, the factors influencing Eudaimonia (self-actualization), which will ultimately lead to improved job satisfaction and employee performance. There are some sorts of ergonomics-based design methods, however, one of the practical process is user center design, actually, UCD helps the design process to identify and remove the problem (Baldwin et al., 2022; Udoewa, 2022).

Methodology

This research employed a case and cross-sectional study design to assess the office work environment from the perspectives of ergonomics and hedonomics, examining the relationship between workplace design, job satisfaction, and pleasantness. This design allowed for a comprehensive investigation of the interplay between physical and psychological factors that contribute to employee well-being.

Sample and Sampling

A non-probability sampling approach was employed to recruit a sample of 513 individuals engaged in administrative work of these, only 248 questionnaires were able to enter the analysis stage. The sample consisted of employees from various sectors, including Sepah Bank, industrial organizations, hospital nursing staff, and municipal workers. This diverse representation aimed to capture the broader range of office environments and ergonomic experiences.

Data Collection Instrument

A self-administered questionnaire was developed to assess the office work environment from both ergonomic and hedonic perspectives. The questionnaire incorporated validated items from established studies, including (Czerw, 2019; Fassoulis & Alexopoulos, 2015; Galy et al., 2018; Groen et al., 2019; Harris & Bladen, 1994; Maarleveld et al., 2009; Parker & Hyett, 2011). To ensure content validity, the preliminary questionnaire was reviewed by ergonomics experts and professors in the field of ergonomics and occupational health. Based on their feedback, revisions were made to enhance the questionnaire's clarity and comprehensiveness.

Data Analysis

The collected data was analyzed using SPSS Win Software. Descriptive statistics were employed to summarize the demographic characteristics of the participants. Inferential statistics, including Pearson correlation and multiple linear regression, were used to examine the relationships between ergonomic and hedonic factors, job satisfaction, and pleasantness. This methodological approach was specifically designed to address the research questions and achieve the study's overarching aim. The case and cross-sectional design allowed for a comprehensive assessment of the office work environment among a diverse sample of administrative employees. The questionnaire, developed based on validated research, provided a reliable measure of ergonomic and hedonic factors, job satisfaction, and pleasantness. The statistical analyses employed were appropriate for the type of data collected and the research questions posed.

Result

Out of the 248 participants in this survey, 122 were male and 126 were female, with an average height of 169.73 centimeters (SD = 14.584). Table 1 shows the demographic information of the participants. The level of education of the participants is 84.3% for Bachelor's and Master's Degrees, 10.2% for high school diplomas, and 2.5% for PhD. From the perspective of job satisfaction, the average job satisfaction was recorded at 3.38. The lowest mean score was recorded in the section of independent variables belonging to the variable *high noise in the workplace*, with an average score of 2.51.

Gender					Level of Education						
		Frequency	Percentage	Valid Percentage	Cumulative Percentage			Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	Male	122	49.2	49.2	49.2	High School Diploma		26	10.5	10.5	10.5
	Female	126	50.8	50.8	100.0	Bachelor		104	41.9	41.9	52.4
	Total	248	100.0	100.0		Master		105	42.3	42.3	94.8
						PhD		13	5.2	5.2	100.0
						Total		248	100.0	100.0	

Age					Work Experience (Years)						
		Frequency	Percentage	Valid Percentage	Cumulative Percentage			Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	18-25	32	12.9	12.9	12.9	<5		66	26.6	26.6	26.6
	26-35	80	32.3	32.3	45.2	6-10		59	23.8	23.8	50.4
	36-45	86	34.7	34.7	79.8	11-20		63	25.4	25.4	75.8
	46-55	45	18.1	18.1	98.0	20<		60	24.2	24.2	100.0
	up to55	5	2.0	2.0	100.0	Total		248	100.0	100.0	
	Total	248	100.0	100.0							

Figure 2: Demographic Particulars of Participants: Gender (Top Left), Age (Top Right), Work Experience (Down left), and Level of Education (Down Right).

Figure 3 shows the relation between the work experiences of individuals, divided into four categories: less than 5 years, 6 to 10 years, 11 to 20 years, and more than 20 years, with average job satisfaction. The results did not show a significant difference between the average score of satisfaction among individuals of different groups and different number of years of work experience. Also, the result of Cronbach's alpha test was obtained at 0.865.

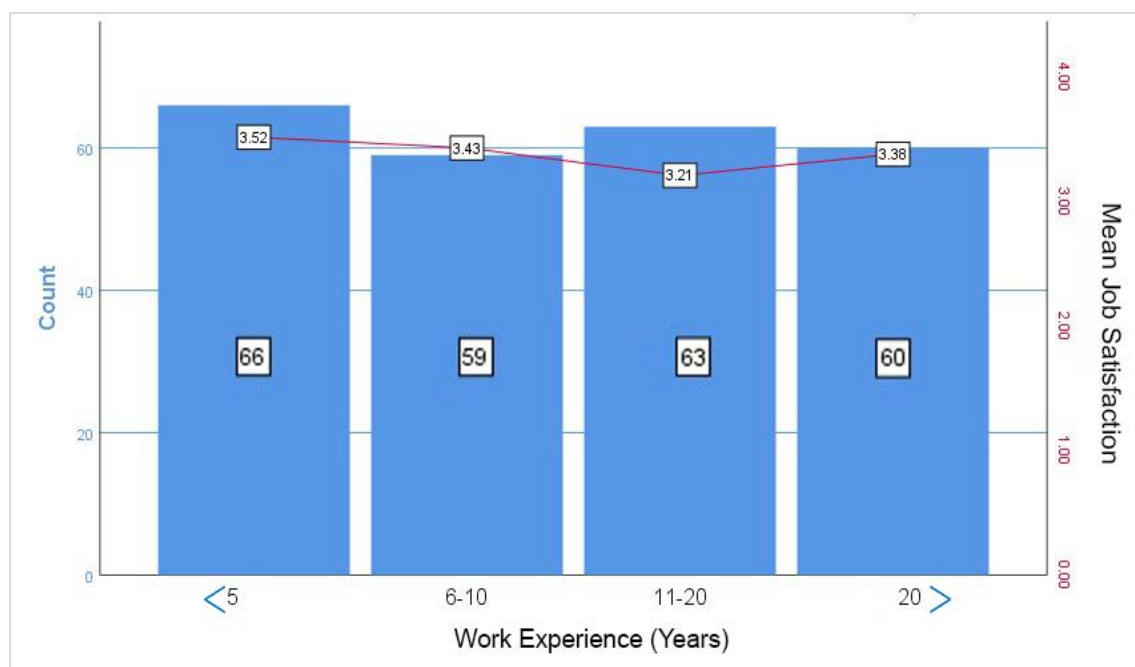


Figure 3: Relation between Work Experience and Average Job Satisfaction (SPSSWin Statistics Software V. 26).

Table 1: Descriptive Statistics.

	Mean	Std. Deviation	N
Light	3.1599	.72792	248
Temperature	3.1169	1.09583	248
Ergonomics of Furniture	3.3831	1.01440	248
Workplace Decoration and Furniture Aesthetics	3.0874	.94423	248
Ambient Noise	2.51	1.230	248
Physical Activity	3.2870	.64277	248
Light, Temperature and Ambient Sound	3.0370	.66521	248
Satisfaction	3.3836	.72248	248

Considering the factors of office workplace ergonomics, such as noise, temperature, and lighting, the participants expressed their opinions (Table 1).

Table 2, shows the correlations between different factors related to workplace design and employee satisfaction. The factors include light, temperature, ergonomics of furniture, workplace decoration and furniture aesthetics, ambient noise, physical activity, and the combination of light, temperature, and ambient sound. In Table 2 The correlations are measured using Pearson correlation coefficients. The correlation coefficient measures the strength and direction of the relationship between two variables. According to the results of the correlation test, all variables related to the work environment had a positive and significant relationship with job satisfaction (Table 2 shows the results of the Pearson correlation test). According to Table 2, the two variables aesthetic status (beauty) in furniture and decoration and expected (physical and mental) activity had the greatest impact on job satisfaction.

Table 2: Pearson Table (SPSS W in Statistics Software 26).

		Correlations							
		<i>Light</i>	<i>Temperature</i>	<i>Ergonomics of Furniture</i>	<i>Workplace Decoration and Furniture Aesthetics</i>	<i>Ambient Noise</i>	<i>Physical Activity</i>	<i>Light, Temperature and Ambient Sound</i>	<i>Satisfaction</i>
Light	Pearson Correlation	1	.328**	.216**	.310**	.174**	.197**	.781**	.280**
	Sig. (2-Tailed)		.000	.001	.000	.006	.002	.000	.000
	N	248	248	248	248	248	248	248	248
Temperature	Pearson Correlation	.328**	1	.350**	.423**	.142*	.337**	.773**	.381**
	Sig. (2-Tailed)	.000		.000	.000	.025	.000	.000	.000
	N	248	248	248	248	248	248	248	248
Ergonomics of Furniture	Pearson Correlation	.216**	.350**	1	.570**	.142*	.384**	.354**	
	Sig. (2-Tailed)	.001	.000		.000	.025	.000	.000	
	N	248	248	248	248	248	248	248	248
Workplace Decoration and Furniture Aesthetics	Pearson Correlation	.310**	.423**	.570**	1	.223**	.419**	.471**	.488**
	Sig. (2-Tailed)	.000	.000	.000		.000	.000	.000	.000
	N	248	248	248	248	248	248	248	248
Ambient Noise	Pearson Correlation	.174**	.142*	.142*	.223**	1	.228**	.481**	.276**
	Sig. (2-Tailed)	.006	.025	.025	.000		.000	.000	.000
	N	248	248	248	248	248	248	248	248
Physical Activity	Pearson Correlation	.197**	.337**	.384**	.419**	.228**	1	.363**	.705**
	Sig. (2-Tailed)	.002	.000	.000	.000	.000		.000	.000
	N	248	248	248	248	248	248	248	248
Light, Temperature and Ambient Sound	Pearson Correlation	.781**	.773**	.354**	.471**	.481**	.363**	1	.448**
	Sig. (2-Tailed)	.000	.000	.000	.000	.000	.000		.000
	N	248	248	248	248	248	248	248	248
Satisfaction	Pearson Correlation	.280**	.381**	.355**	.488**	.276**	.705**	.448**	1
	Sig. (2-Tailed)	.000	.000	.000	.000	.000	.000	.000	
	N	248	248	248	248	248	248	248	248

** . Correlation is significant at the 0.01 level (2-tailed).
 * . Correlation is significant at the 0.05 level (2-tailed).

Discussion

This study aimed to investigate the impact of ergonomic design of environmental factors and workstations on the job satisfaction of office workers. The main findings of this study were that ergonomic requirements in designing environmental factors (light, sound, temperature, appropriate and changeable dimensions and size for each user) and providing a suitable environment for positive and constructive interaction directly affected the job satisfaction of office workers.

The variable *noise pollution rate* had the least correlation with job satisfaction, while the variables *ambient temperature* and *ergonomic design of workstations* had the highest correlations. These findings are consistent with previous research that has shown the relation between the quality of the physical environment and employee satisfaction, well-being, and productivity (Altomonte et al., 2019; Babu & Latha, 2022; Brunia et al., 2016; Chim, 2019; Choobineh et al., 2011; Fassoulis & Alexopoulos, 2015; Hoendervanger et al., 2019; Lee et al., 2015; Naeini et al., 2022; Tanabe et al., 2015; Villanueva et al., 2019). However, some of these studies have also reported positive results of intervention in the noise pollution area, which contradicts the weak relation found in this study (Hongisto et al., 2016; Ornetzeder et al., 2016). This discrepancy may be due to the different criteria of perception of noise pollution and job satisfaction, as well as the different characteristics of the samples and settings. This study implies that office workers can benefit from ergonomic design of environmental factors and workstations, as they can enhance their comfort, health, and performance. Moreover, employers and organizations can also benefit from the ergonomic design, as they can improve the efficiency, productivity, and retention of their staff. Therefore, designers play a crucial role in creating healthy workplaces by considering the ergonomic, environmental, and cognitive aspects of workstations and their effects on the employees. The limitations of this study are that it used a cross-sectional design, which limits the causal inference and the generalizability of the findings. A longitudinal design would be more suitable to examine the changes in job satisfaction over time and the effects of ergonomic interventions. Moreover, the study relied on self-reported measures, which may introduce bias and error due to social desirability, memory, and mood. Objective measures, such as physiological indicators, behavioral observations, and performance tests, would complement the subjective measures and provide more valid and reliable data. Furthermore, the study did not control for potential confounding variables, such as individual differences, organizational factors, and external factors, that may influence job satisfaction. Future studies should account for these variables and examine their interactions with the ergonomic design of environmental factors and workstations. This study recommends that office workers should be provided with ergonomic design of environmental factors and workstations that suit their needs and preferences, and that they should be involved in the design process and have some control over their work environment. Additionally, office workers should be encouraged to adopt healthy behaviors, such as taking breaks, changing postures, and exercising, to reduce the negative effects of sedentary work. Furthermore, office workers should be supported by their employers and colleagues, and be rewarded and appreciated for their work, to increase their motivation and satisfaction. Finally, office workers should be aware of the importance of ergonomic design and its impact on their well-being and productivity, and seek help when they experience any discomfort or dissatisfaction.

Conclusion

This study aimed to investigate the factors that influence the job satisfaction of office workers, with a focus on the content of work, the quality of employee relations, and the ergonomic design of environmental factors and workstations. The main findings of this study were that these factors had a significant impact on the job satisfaction of office workers, especially the variables related to the pleasure of using and interacting with beautiful objects, such as furniture and decoration, and the balance of the employer's expectations of physical and mental work with the physical and mental capability of the employees. The study also found that mental comfort was the highest level of comfort in the workplace and that an ergonomic workplace could create mental comfort for the employees.

Contributions and Implications

This study contributes to the existing body of knowledge and practice by providing a comprehensive and integrated model of variables affecting job satisfaction, which combines the three concepts of ergonomics, hedonomics, and Eudaimonia (Figure 4). This model can help researchers and practitioners to better understand the complex and dynamic relations between the physical, psychological, and social aspects of the workplace and the job satisfaction of office workers.

This study implies that office workers can benefit from a work environment that meets their needs and preferences, and that enhances their comfort, health, and performance. Moreover, employers and organizations can benefit from a work environment that improves the efficiency, productivity, and retention of their staff. Therefore, designers play a crucial role in creating healthy and satisfying workplaces by considering the ergonomic, environmental, and cognitive aspects of workstations and their effects on the employees.

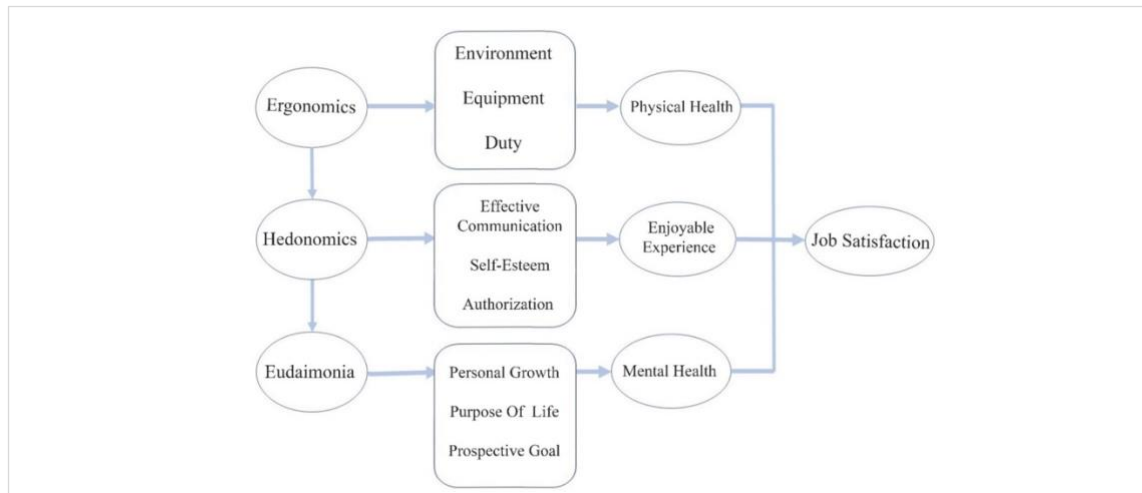


Figure 4: Model of Variables Affecting Job Satisfaction (Authors).

Limitations and Suggestions

The limitations of this study are that it used a cross-sectional design, which limits the causal inference and the generalizability of the findings. A longitudinal design would be more suitable to examine the changes in job satisfaction over time and the effects of ergonomic interventions. Moreover, the study relied on self-reported measures, which may introduce bias and error due to social desirability, memory, and mood. Objective measures, such as physiological indicators, behavioral observations, and performance tests, would complement the subjective measures and provide more valid and reliable data. Furthermore, the study did not control for potential confounding variables, such as individual differences, organizational factors, and external factors, that may influence job satisfaction. Future studies should account for these variables and examine their interactions with the ergonomic design of environmental factors and workstations. This study suggests that office workers should be provided with ergonomic design of environmental factors and workstations that suit their needs and preferences and that they should be involved in the design process and have some control over their work environment. Additionally, office workers should be encouraged to adopt healthy behaviors, such as taking breaks, changing postures, and exercising, to reduce the negative effects of sedentary work. Furthermore, office workers should be supported by their employers and colleagues, and be rewarded and appreciated for their work, to increase their motivation and satisfaction. Finally, office workers should be aware of the importance of ergonomic design and its impact on their well-being and productivity, and seek help when they experience any discomfort or dissatisfaction.

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