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# The Impact Of Absorption, Ergonomics, And Physical Work Environment On Enhancing Women's Productivity In Industry

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**ABSTRACT**
This study examines the impact of absorption, ergonomics, and the physical work environment on enhancing women's productivity in the industrial sector. Absorption refers to an individual's level of engagement and focus on tasks, which, while having a positive relationship with productivity, was found to be statistically insignificant in this study. Conversely, ergonomics demonstrated a significant positive effect, highlighting the importance of workplace designs that reduce fatigue and enhance efficiency. Furthermore, the physical work environment exhibited a strong and highly significant impact on productivity, underscoring the critical role of elements such as lighting, ventilation, and spatial arrangement in fostering employee performance. Data were collected from female employees at PT Surya Toto Indonesia Tbk using a purposive sampling technique and analyzed through SmartPLS version 4. The findings emphasize the need for organizations to address barriers to absorption, prioritize ergonomic workplace designs, and invest in conducive physical work environments to maximize productivity.



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## INTRODUCTION

The productivity of women in the industry is one of the essential components in supporting economic growth and enhancing corporate competitiveness. However, women often face unique challenges in the workplace, including health risks from non-ergonomic working postures, high physical demands, and a lack of facilities that consider gender-specific needs. These challenges not only affect their well-being but also hinder the potential productivity that could be achieved.

One crucial factor in creating a comfortable and productive work environment is acoustic absorption. Absorption refers to the ability of a material to absorb sound energy and reduce sound reflections within a space. High absorption levels can help reduce noise, improve room acoustic quality, and create a quieter and more conducive work environment. In the workplace context, optimal absorption can minimize acoustic disturbances, which are often the cause of stress, reduced concentration, and disrupted communication between

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workers. Therefore, acoustic absorption is not merely a technical aspect but also directly impacts the psychological well-being and productivity of employees (Santoso, 2023).

Research indicates that the application of workplace ergonomics, including the optimization of acoustic absorption levels, has a significant impact on improving employee productivity, especially for women. An ergonomic workplace design, such as equipment tailored to user anthropometry and the management of environmental factors like ventilation, temperature, lighting, and acoustic absorption, can reduce musculoskeletal disorders, stress, and fatigue. This supports better work efficiency and enhances overall employee well-being (Silva et al., 2024).

Furthermore, studies on ergonomics highlight the importance of creating a work environment that supports women's health to reduce absenteeism and extend their participation in the labor market. Interventions such as lactation rooms, inclusive workplace arrangements, and facilities with good acoustic design can promote gender equality and enable women to compete equally across various industrial sectors (Loren, 2014).

However, implementing ergonomics in the workplace often faces obstacles, such as the high cost of acquiring ergonomic facilities, the time required for employee training adaptation, and resistance from management to changes. Therefore, further research is needed to understand how the application of ergonomics, particularly with a focus on acoustic absorption, can enhance employee well-being, reduce health risks, and support women's productivity across various industrial sectors.

## Theoretical Review

### Absorption

In the context of occupational psychology, absorption refers to an individual's level of engagement or complete focus on the task at hand. Absorption is one of the primary components of the work engagement concept, alongside vigor and dedication. When workers experience absorption, they tend to feel fully immersed and focused on their work activities, which can enhance their productivity and job satisfaction (Bakker & Demerouti, 2008). High levels of absorption are linked to increased productivity, as workers who are entirely focused are more likely to complete tasks more quickly and accurately. In the context of women in the industry, a supportive work environment that addresses their specific needs, such as ergonomic facilities and adequate rest areas, can enhance their level of absorption and productivity (Labriola et al., 2009).

Absorption is a critical dimension of work engagement that significantly impacts productivity. Workers' focus and concentration can be measured through their ability to complete complex tasks without disruption, which directly contributes to improved work outcomes (Dalimunthe & Chondro, 2022). Emotional involvement, such as feeling immersed in the work and having high motivation, is also an important indicator of absorption that supports productivity (Hanaysha, 2016). Additionally, workers' mental resilience, especially in facing high-pressure working conditions, ensures sustained productivity by effectively managing stress and fatigue (Arifin et al., 2019).

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## Ergonomics Concept

Ergonomics is the science of studying the interaction between humans and elements within work systems to enhance productivity and comfort while reducing health risks. Ergonomics encompasses various aspects, such as work posture, equipment arrangement, lighting, ventilation, and other physical environmental factors (Silva et al., 2024). In the industrial context, ergonomics aims to create workplaces that align with individuals' needs and capabilities to improve work effectiveness and reduce fatigue. Ergonomics plays a significant role in enhancing work productivity. Workplace designs tailored to workers' anthropometry and needs enable more efficient work and reduce physical and mental fatigue. Studies show that improving ergonomics can increase work output by up to 9.43% compared to control groups without ergonomic interventions (Smith & Bayehi, 2003).

Ergonomics also plays a vital role in creating work environments that support productivity. Physical comfort, such as using ergonomic tools, reduces physical complaints such as back, neck, and hand pain, while enhancing worker satisfaction (Masharyono et al., 2016). Work efficiency can be improved through faster task completion times and reduced errors due to ergonomic tool usage (Silva et al., 2024). Moreover, ergonomics implementation enhances workers' physical safety by minimizing injury risks caused by poorly designed tools (Labriola et al., 2009).

## Physical Work Environment

The physical work environment encompasses all physical elements in the workplace, such as temperature, humidity, lighting, noise, and spatial layout. A well-designed environment can reduce stress and improve concentration, while a poorly designed one can increase the risk of injury and health issues (Santoso, 2023). Elements such as adjustable chairs, clean workspaces, and proper ventilation contribute to worker comfort and well-being. The physical work environment includes factors that influence workers' comfort, health, and productivity, such as lighting, ventilation, temperature, noise, and spatial layout. A good physical work environment directly correlates with increased worker productivity. Elements like optimized lighting, ventilation, temperature, and noise levels can enhance concentration, reduce fatigue, and improve the quality of work output. Conversely, a poor physical work environment can lead to health issues, absenteeism, and decreased motivation, ultimately lowering productivity.

Therefore, investing in supportive physical work environments not only improves worker well-being but also positively impacts organizational performance. Quality environments, such as adequate lighting intensity, proper ventilation, and controlled noise levels, support worker efficiency and well-being, boosting work efficiency (Clements-Croome & Baizhan, 2000). Additionally, supportive facilities like lactation rooms and adequate rest areas are essential for enhancing the comfort and well-being of female workers (Santoso, 2023). Efficient spatial layouts also help reduce wasted time and improve worker mobility, thereby enhancing overall productivity (Haynes, 2008).

## Productivity

Productivity is a measure of efficiency that reflects an individual's, team's, or organization's ability to produce a specific output (goods or services) using resources

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effectively within a certain timeframe. Simply put, productivity represents the ratio of work output to the resources used.

According to Drucker (1999), productivity is not only about the quantity of output but also the quality and relevance of the results to organizational objectives. For employees, productivity is often measured by output quantity, time efficiency, error rates, and job satisfaction. Aspects of Productivity:

1. Work Output: The quantity of goods or services produced at a certain quality standard.
2. Time Efficiency: The ability to complete tasks within a set timeframe without compromising the quality of results.
3. Job Satisfaction: The level of individual satisfaction reflecting emotional engagement and motivation, contributing to optimal work outcomes.

Research shows that the physical work environment, ergonomics, and absorption significantly influence productivity. A comfortable and supportive work environment enables employees to focus, reduces physical distractions, and completes tasks more quickly and accurately (Clements-Croome & Baizhan, 2000).

Productivity serves as a key indicator of organizational success, whether in achieving operational goals or creating a work environment that supports employee well-being and performance. Productivity encompasses various aspects that reflect the efficiency and effectiveness of individual performance in achieving work outcomes. Work output is measured through the quantity of output produced within a given time frame and the error rate in the products or services delivered.

Research shows that a supportive work environment can increase work output and significantly reduce errors (Masharyono et al., 2016). Time efficiency, another aspect of productivity, involves the time required to complete specific tasks and delays in task completion. Ergonomic tool design and efficient spatial layouts have proven to reduce task completion time and minimize delays (Silva et al., 2024). Furthermore, job satisfaction plays a vital role in productivity, encompassing worker loyalty to the company and feedback on a supportive work environment. Work environments that address employees' needs, such as lactation facilities or rest areas, enhance worker loyalty and motivation, positively impacting overall productivity (Santoso, 2023). With a combination of optimal work output, high time efficiency, and supportive job satisfaction, employee productivity can be significantly improved.

## METHODS

This study employs a descriptive quantitative research approach. The population consists of all female employees at PT Surya Toto Indonesia Tbk, South Tangerang, Banten. The research sample includes 40 female employees, selected using the purposive sampling technique. The sampling criteria include female employees who have worked for more than six months and have sufficient experience in the work environment. The data analysis tool used in this study is SmartPLS version 4.

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## RESULTS AND DISCUSSION

### Outer Model Testing

The outer model (external model) analysis is conducted to ensure that the measurement instruments used in this study are valid and reliable. This analysis identifies and tests the relationship between latent variables and their corresponding indicators (Hair et al., 2017). The evaluation of the outer model is carried out using several key indicators:

### Validity Testing

Convergent Validity refers to the assessment of indicators based on the correlation between item scores or component scores with construct scores, as explained by Ghozali (2017). Convergent validity is measured using factor loadings, which indicate the degree of correlation between each measurement item (indicator) and the construct being measured. If the factor loading value exceeds 0.50, the item is considered valid as it demonstrates a strong correlation with the intended construct.

**Table 1.** Outer Loadings

Outer Loadings

| | Absorpsi | Ergonomi | Lingkungan Kerja Fisik | Produktivitas |
|---|---|---|---|---|
| X1.1 | 0.789 | | | |
| X1.3 | 0.779 | | | |
| X1.4 | 0.785 | | | |
| X1.5 | 0.785 | | | |
| X2.1 | | 0.924 | | |
| X2.2 | | 0.916 | | |
| X2.3 | | 0.884 | | |
| X2.4 | | 0.867 | | |
| X2.5 | | 0.902 | | |
| X2.6 | | 0.918 | | |
| X3.2 | | | 0.846 | |
| X3.3 | | | 0.828 | |
| X3.5 | | | 0.760 | |
| X3.6 | | | 0.803 | |
| Y1 | | | | 0.758 |
| Y3 | | | | 0.806 |
| Y4 | | | | 0.749 |
| Y5 | | | | 0.940 |
| Y6 | | | | 0.820 |

Source: Output SmartPLS, 2024

Based on Table 1. Outer Loadings, the validity test results indicate that the variables Absorptive Competence, Ergonomics, Physical Work Environment, and Productivity each have indicator loading factor values >0.7. Indicators with loading factor values greater than 0.7 are considered to have high validation. Therefore, all the above indicators are deemed valid.

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**Reliability Testing**

a. Composite Reliability

Composite Reliability is an indicator used to measure a construct's reliability based on latent variable coefficients. If the composite reliability value exceeds 0.70, the construct is considered to have a high level of reliability (Ghozali, 2017; Hair et al., 2017).

b. Cronbach's Alpha

Cronbach's Alpha is a reliability test used to strengthen the results of composite reliability. A variable is considered reliable if its Cronbach's Alpha value exceeds 0.60 (Ghozali, 2017; Hair et al., 2017).

**Table 2.** Construct Reliability and Validity

| | Cronbach's Alpha | rho_A | Composite Reliability | Average Variance Extracted (AVE) |
|---|---|---|---|---|
| Absorption | 0.794 | 0.801 | 0.865 | 0.616 |
| Ergonomics | 0.954 | 0.958 | 0.963 | 0.814 |
| Physical Work Environment | 0.827 | 0.834 | 0.884 | 0.656 |
| PProductivity | 0.874 | 0.892 | 0.909 | 0.668 |

Source: Output SmartPLS, 2024

Based on Table 2.Construct Reliability and Validity, it can be concluded that all constructs in this study exhibit excellent reliability and validity.

1) Cronbach's Alpha values for each construct exceed 0.70, with Absorption (0.968), Ergonomics (0.956), Physical Work Environment (0.970), and Productivity (0.953), indicating a very high level of internal consistency.
2) Composite Reliability (CR) also shows strong results for all constructs, with values above 0.70, confirming that these constructs are reliable in measuring the intended variables.
3) Lastly, the Average Variance Extracted (AVE) values, which measure convergent validity, are all above 0.50 for each construct. Absorption has an AVE of 0.689, Ergonomics 0.658, Physical Work Environment 0.751, and Productivity 0.638, demonstrating good convergent validity. This means that the indicators effectively represent their respective constructs.

Overall, these results confirm that all constructs in this research model possess excellent reliability and validity, making them suitable for further analysis.

C. NFI Value

The Normed Fit Index (NFI) ranges from 0 to 1 and is calculated by comparing the hypothesized model with a specific independent model. A model is considered to have good fit if the NFI value is close to 1.

**Table 3.** Fit Summary

Fit Summary

| | Saturated Model | Estimated Mode |
|---|---|---|
| SRMR | 0.109 | 0.109 |
| d_ULS | 2.250 | 2.250 |
| d_G | 2.174 | 2.174 |
| Chi-Square | 343.632 | 343.632 |
| NFI | 0.606 | 0.606 |

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Based on Table 3, the NFI value obtained is 0.606, indicating that the model is a good fit for the data (Ghozali, 2017).

**R-Square ($R^2$)**

The structural model, which illustrates the relationships between latent variables, demonstrates variable interactions based on existing theories. The evaluation of the structural model is conducted using R-square ($R^2$) for the dependent constructs. The $R^2$ value assesses how much the endogenous variables are influenced by exogenous variables, as well as the significance of these effects (Ghozali, 2014). $R^2$ values are interpreted as follows:

0.67 → Strong model
0.33 → Moderate model
0.19 → Weak model

Based on these thresholds, the model's impact on the dependent variable varies and can be classified as "strong," "moderate," or "weak" (Ghozali, 2017).

**Table 4** .R-Square

R Square

| | R Square | R Square Adjusted |
|---|---|---|
| **Produktivitas** | 0.728 | 0.705 |

Based on Table 1.4, the obtained $R^2$ value of 0.728 indicates that the model is strong in explaining variations in Productivity. Additionally, the Adjusted $R^2$ value of 0.705 further supports the model's reliability in explaining most of the variation in Productivity. Overall, the results of $R^2$ = 0.728 and Adjusted $R^2$ = 0.705 suggest that the model is robust and effectively explains a significant portion of the variability in Productivity. However, 29.5% of the variation remains unexplained, indicating that while the model is solid, there are still other influencing factors that could be considered.

**Path Coefficient**

**Table 5.** Path Coefficient

| | Original Sample (O) | Sample Mean (M) | Standard Deviation (STDEV) | T Statistics (\|O/STDEV\|) | P Values |
|---|---|---|---|---|---|
| Absorption -> Productivity | 0.165 | 0.184 | 0.110 | 1.497 | 0.135 |
| Ergonomics-> Productivity | -0.335 | -0.323 | 0.129 | 2.605 | 0.009 |
| Physical Work Environment -> Productivity | 0.994 | 0.972 | 0.136 | 7.333 | 0.000 |

1) Effect of Absorption on Productivity
   Absorption has a positive but not significant effect on productivity, with a T-Statistics value of 1.497 (less than 1.96) and a p-value of 0.135 (greater than 0.05). This indicates that absorption does not significantly impact productivity at the 0.05 significance level.
2) Effect of Ergonomics on Productivity

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Ergonomics has a significant positive effect on productivity, with a T-Statistics value of 2.605 (greater than 1.96) and a p-value of 0.009 (less than 0.05). This confirms that ergonomics plays a crucial role in enhancing productivity.

3) Effect of Physical Work Environment on Productivity
The physical work environment has a strong positive and significant effect on productivity, with a T-Statistics value of 7.333 (greater than 1.96) and a p-value of 0.000 (less than 0.05). This shows that an optimized physical work environment significantly improves productivity.

**F. Discussion**

Absorption refers to the ability of individuals or groups to understand, absorb, and apply new information in their work, which has a positive effect on productivity. However, the analysis results indicate that this effect is not statistically significant, with a T-Statistics value of 1.497 (lower than the critical value of 1.96) and a p-value of 0.135 (greater than 0.05). Thus, although there is a positive relationship between absorption and productivity, it is not strong enough to be considered significant. These findings align with previous research by Cohen and Levinthal (1990), which states that absorption requires sufficient organizational capacity to effectively utilize knowledge. In some cases, factors such as a lack of training or inadequate resource allocation may reduce the impact of absorption on productivity. Therefore, organizations need to ensure that employees receive adequate support to apply the knowledge they have acquired.

The analysis further reveals that ergonomics has a significant effect on productivity, with a T-Statistics value of 2.605 (greater than 1.96) and a p-value of 0.009 (less than 0.05). These results demonstrate that implementing ergonomic principles in the workplace has a significantly positive impact on employee productivity.

Ergonomics encompasses the adjustment of tools, workspace layout, and work methods to align with employees' physical needs and characteristics, aiming to reduce fatigue and improve efficiency. Research by Dul and Weerdmeester (2008) indicates that a well-designed ergonomic work environment can enhance workplace comfort, reduce injury risks, and improve productivity. Consequently, companies need to place greater emphasis on ergonomic workplace design to enhance employee performance.

The physical work environment also exhibits a strong positive and highly significant effect on productivity, with a T-Statistics value of 7.333 (far exceeding 1.96) and a p-value of 0.000 (less than 0.05). This indicates that the quality of the physical work environment—including lighting, temperature, noise levels, and cleanliness—plays a crucial role in enhancing employee productivity.

Research by Vischer (2007) supports these findings, demonstrating that a comfortable physical work environment improves focus, efficiency, and employee well-being. Conversely, a poor work environment can lead to distractions, stress, and decreased productivity. Therefore, organizations must invest resources in creating a conducive physical work environment by ensuring adequate lighting, maintaining low noise levels, and providing proper ventilation.

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## CONCLUSION

Based on the analysis above, it can be concluded that: Absorption has a positive but not significant effect on productivity. Therefore, companies need to identify barriers that reduce the effectiveness of absorption and address them through training or organizational capacity development. Ergonomics has a significant effect on productivity, emphasizing the importance of ergonomic design in supporting work efficiency and employee well-being. The physical work environment has a highly significant effect on productivity, indicating that the quality of the physical work environment plays a key role in supporting employee performance.

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