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The Effect of Nutritional Status and Workload Intensity on Fatigue and Productivity Levels Among Production Unit Workers at PT X in East Jakarta, DKI Jakarta

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ABSTRACT

Achieving health in the workplace is greatly influenced by how the workforce fulfills its nutritional requirements. Every worker needs nutrients according to the type of work they do. Heavy work requires consuming more calories compared to medium and light work, as this achieves a balance between nutritional intake and workload. Insufficient nutrition relative to workload demands can cause a decrease in productivity and increase the risk of work fatigue. The aim of this research is to analyze the influence of nutritional status and workload intensity on the levels of fatigue and work productivity among workers at PT X. A quantitative approach with multiple linear regression analysis was employed, with data collected through field observation and questionnaires. The results indicate that nutritional status and workload simultaneously and significantly influence work fatigue ($F = 422.480$, $p = 0.000$) and work productivity ($F = 5302.358$, $p = 0.000$). There is a significant influence between nutritional status and workload on the level of fatigue, and a significant influence between nutritional status and workload on the level of work productivity.

Introduction

Human resources are among the most valuable assets of a company. Individuals with a strong work ethic, enthusiasm, and high discipline are capable of executing their duties and responsibilities to the best of their abilities, thereby assisting the organization or company in achieving its designated productivity targets [1]. This validates the critical importance of optimal employee productivity, necessitating companies to pay serious attention to improving overall performance and productivity [2]. Work productivity is not solely viewed as the generated work output; it is also expected to be interpreted as a way of life and a mental attitude

of all employees to provide their best contribution to the company [1]. With optimal work performance, tasks can be executed effectively, ensuring that the company's targets are met as expected [3]. Nevertheless, maintaining employee productivity is not an easy feat, as it is influenced by various factors. In a corporate setting, production outputs fluctuate, frequently presenting a distinct challenge for companies in meeting their performance target demands [3].

One aspect closely related to productivity is individual fatigue experienced during work. Research indicates that more than 2.78 million workers die every year [4]. This is certainly ironic considering the vital role humans play in supporting company performance, yet they receive minimal protection from occupational risks, including those caused by fatigue. Work fatigue inevitably increases occupational risks, ranging from declining performance to potential workplace accidents. The potential risk of work fatigue can escalate under unideal ergonomic conditions, such as monotonous tasks or those performed at high speed, non-neutral or awkward body postures, inadequate supporting environments or situations, and insufficient rest periods [5]. Recent research also highlights that long working hours, which are strongly associated with fatigue, act as a primary cause, contributing to approximately 700,000 occupational-related deaths [6]. Generally, work fatigue is triggered by physical and mental activities, physical variables in the workplace, workload, and psychological factors.

One of the primary causes of fatigue is workload, defined as the total amount of work combined with the time spent completing it. This aligns with research findings emphasizing a significant relationship between physical workload and work fatigue [7]. Each department within a company handles a highly diverse workload, both physically and mentally; thus, it is imperative for companies to calculate workloads, particularly in divisions or units with a high risk of fatigue. A study conducted at a company in Muara Bungo, Jambi, revealed that workload contributed to 75.8% of work fatigue cases. This was driven by continuously increasing corporate pressure amidst a sluggish local economy, making targets increasingly difficult to achieve [8]. These findings illustrate that workload is not solely related to physical demands but also encompasses the circumstantial and mental pressures experienced by workers.

Excessive workload without any effort to balance it inevitably affects employee productivity. Employee productivity can increase alongside their skills in producing quality goods and services; therefore, at a certain stage, a proportional workload is necessary to motivate workers to continuously enhance their capabilities [9]. Nevertheless, workload assignments must still consider the workers' capacity and motivation to prevent adverse effects

that could further decrease productivity [10]. Productivity serves as both a primary goal and a major demand for workers, influenced by various factors, including the nutritional intake consumed by the workers.

Previous studies indicate that nutritional status can influence work fatigue among production workers in a company [11]. Workers' nutritional needs must be adequately met, both quantitatively and qualitatively; failure to do so makes workers more susceptible to fatigue when executing assigned tasks. Other research demonstrates that nutritional status is vital for maintaining employee productivity by preventing excessive work fatigue [12].

PT X is a margarine processing company established in 2012. Based on a preliminary study, the company divides its production time into three shifts: the morning shift from 06:30 to 15:00 with a break at 10:00 - 10:30, the afternoon shift from 14:30 to 23:00 with a break at 17:00 - 17:30, and the night shift from 22:30 to 07:00 with a break at 01:00 - 01:30. During break times, workers are provided with meals from a catering service supplied by the company. The preliminary study also revealed that several employees have poor nutritional status, causing them to complain of symptoms such as weakness, lethargy, dizziness, and reduced enthusiasm for work.

Based on the elaboration above, the researcher formulated a study entitled "The Effect of Nutritional Status and Workload Intensity on Work Fatigue and Productivity Levels Among Workers at PT X in 2023" aiming to identify the factors influencing worker fatigue and productivity. This study is expected to provide constructive input for the company, as addressing these primary factors can optimize worker productivity and, consequently, drive collective corporate performance.

Method

This research is a quantitative analytic study utilizing a cross-sectional design. The population in this study consisted of all workers in the production unit of PT X, totaling 48 employees. The inclusion criteria for the subjects involved active workers aged 20 to 50 years, possessing more than one year of work experience, and being in a good health condition. The sampling process was conducted using a simple random sampling technique calculated by Slovin's formula, which resulted in a sample of 32 respondents. Data collection utilized several instruments, namely a stadiometer and a weighing scale to measure nutritional status (BMI), a workload questionnaire, the Fatigue Assessment Scale (FAS) questionnaire to measure fatigue

levels, alongside questionnaires and observation sheets to assess work productivity. The data analysis comprised univariate and multivariate analyses using Multiple Linear Regression computed through statistical software. This research has obtained official permission from the Human Resources Management of PT X and strictly adheres to research ethics principles, including respect for human dignity, privacy, and justice for the subjects.

Results and Discussion

Table 1. Univariate Analysis

Variable	Frequency (n)	Percentage (%)
Nutritional Status		
Underweight	1	3.1
Normal	11	34.4
Overweight	3	9.4
Obesity I	14	43.8
Obesity II	3	9.4
Workload Intensity		
High	3	9.4
Moderate	24	75.0
Low	5	15.6
Fatigue Level		
Fatigued	23	71.9
Not Fatigued	9	28.1
Productivity Level		
Decreased	18	56.3
Increased	14	43.8
Age		
20 - 40 Years Old	12	37.5
41 - 55 Years Old	20	62.5
Gender		
Male	24	75.0
Female	8	25.0
Work Tenure		
<1 Year	5	15.6
1-23 Years	22	68.6
>23 Years	5	15.6

Based on Table 1, the majority of the respondents were male (75%) and fell within the 41–55 years age bracket (62.5%), with a work tenure of 1 to 23 years (68.8%). Regarding the primary variables, most respondents had a nutritional status classified as Obesity I (43.8%), experienced a moderate workload level (75%), reported feeling work fatigue (71.9%), and encountered a declining trend in work productivity (56.3%). Prior to hypothesis testing, the

data were confirmed to satisfy the classical assumption requirements, demonstrating that all variables were normally distributed ($p > 0.05$), free from multicollinearity issues (Tolerance > 0.10 and VIF < 10), exhibited linear relationships, and were free from heteroscedasticity problems.

Table 2. Bivariate Analysis

Variable X	Variable Y	t-value / F-value	Significance (p)	Result
Nutritional Status (X1)	Work Fatigue (Y1)	t = 9.191	0.000	Significant
Workload (X2)	Work Fatigue (Y1)	t = 990.911	0.000	Significant
Nutritional Status (X1)	Work Productivity (Y2)	t = 2.611	0.014	Significant
Workload (X2)	Work Productivity (Y2)	t = 68.763	0.000	Significant
Nutritional Status & Workload	Work Fatigue (Y1)	F = 422.480	0.000	Simultaneously Significant
Nutritional Status & Workload	Work Productivity (Y2)	F = 5302.358	0.000	Simultaneously Significant

Based on the multiple linear regression analysis and partial test (T-test) results in Table 2, it is evident that nutritional status has a significant partial effect on work fatigue ($p = 0.000$) as well as on work productivity ($p = 0.014$). Workload also exhibits a significant partial effect on work fatigue ($p = 0.000$) and work productivity ($p = 0.000$). Further analysis through the F-test proves that, simultaneously, nutritional status and workload significantly influence work fatigue with a coefficient of determination (Adjusted R Square) of 0.740, meaning that these two factors contribute a 74.0% influence. Concurrently, both variables also have a significant simultaneous effect on work productivity, contributing an influence of 69.5%.

Discussion

The Effect of Nutritional Status and Workload on Work Fatigue

Based on statistical data analysis, nutritional status significantly affects work fatigue among production workers at PT. X. Workers with abnormal nutritional statuses, particularly those classified as obese, encounter greater physical difficulties in performing their duties, which accelerates the onset of fatigue [13]. This finding aligns with previous studies in the industrial sector, establishing that nutrition is a critical component of human health that directly influences a worker's wellbeing, discipline, and stamina [14]. Inadequate nutrient intake leads to weakened immunity, pale skin, lack of energy, and sluggish responses. In the context of PT.

X, this issue is exacerbated by insufficient rest periods ranging only from 15 minutes to an hour which prevents workers from consuming proper meals to replenish their energy, contradicting occupational health recommendations that suggest scheduled breaks every two hours [15]. Furthermore, workload intensity demonstrates a significant positive effect on work fatigue. When a worker's physical exertion exceeds their working capacity, their muscles are forced to work longer, depleting greater amounts of energy and inevitably causing exhaustion [16].

Although the majority of workers in this study reported a moderate workload due to the assistance of modern machinery, their primary tasks involve continuous monitoring operations. This constant vigilance demands sustained concentration, proving that even moderate burdens, if not managed with proper physical adaptation, significantly increase the probability of work fatigue [17].

The Effect of Nutritional Status and Workload on Work Productivity

The findings also reveal that nutritional status and workload simultaneously play a significant role in determining work productivity. A well-maintained nutritional status correlates directly with increased productivity, as it enables more effective and efficient work execution. When the body is deprived of essential energy and protein, initial hunger leads to weight loss and diminished output, whereas excessive food intake causes obesity and restricts movement speed [18]. Unfortunately, irregular eating schedules, skipping breakfast, and a lack of rest often disrupt workers' nutritional balance.

Literature suggests that workplace interventions, such as providing meals and encouraging physical activity, can significantly boost worker performance and subsequently increase company revenue by reducing absenteeism. In addition to nutrition, workload significantly and positively impacts work productivity. The current production system at PT. X heavily relies on advanced machinery. Interestingly, this moderate workload, combined with the internal pressure to maintain relevance against automation, compels workers to remain highly productive.

While some previous studies found no significant impact of workload on performance, the findings at PT. X align with research demonstrating that an appropriate, manageable workload strongly correlates with enhanced employee performance and higher overall production output [19].

Study Limitations

Despite the significant findings, this study acknowledges several methodological limitations. First, the research exclusively focused on nutritional status and workload, omitting other potential determining factors that might influence fatigue and productivity. Second, the relatively small sample size of 32 respondents may lead to statistical instability, and the cross-sectional design restricts the ability to establish definitive long-term causal relationships. Furthermore, data collection relied heavily on self-reported questionnaires and simple personal observations rather than in-depth, structured interviews, which introduces the possibility of subjective bias. Lastly, productivity was merely measured through production data over the last three months and questionnaire evaluations, highlighting the need for more comprehensive measurement tools in future studies.

Conclusion

This study highlights that nutritional status and workload significantly impact both work fatigue and productivity among production workers at PT. X, either partially or simultaneously. A higher Body Mass Index (BMI) paired with heavy workloads directly escalates fatigue levels. Interestingly, well-maintained nutritional health combined with manageable workload pressures actually serves as a strong driver for higher productivity. To balance these outcomes, the management should initiate regular workplace stretching sessions, conduct biannual Medical Check-Ups (MCU) focused on BMI monitoring, and ensure fair task distribution through clear job descriptions. For the workers themselves, maximizing break times and performing simple stretches during shifts are highly recommended to prevent muscle stiffness and maintain blood circulation. Finally, future studies should explore other underlying variables to provide a broader perspective on occupational health and worker productivity.

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