

THE RELATIONSHIP BETWEEN WORKLOAD AND WORK FATIGUE WITH WORK PRODUCTIVITY OF COURIER WORKERS AT PT. NUSANTARA CINTA DAMAI BRANCH

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ABSTRACT

This study used a quantitative design with a cross-sectional design and a total sampling technique on 35 couriers of PT. Nusantara Ekspres, Cinta Damai Branch to analyze the relationship between workload (NASA-TLX) and work fatigue (KAUPK2) with work productivity. The NASA-TLX instrument consists of six dimensions (mental, physical, time pressure, performance, frustration, and effort) with a scale of 0–100 categorized from low to very high. Work fatigue was measured by KAUPK2 (20 items, $\alpha = 0.89$ in the Indonesian population) and classified into low–high categories. Productivity was measured through a standardized questionnaire and an objective indicator of ≥ 150 packages/day from the company's internal application data. The Pearson correlation test results showed a positive relationship between workload and productivity ($r = 0.442$; 95% CI 0.15–0.67; $p = 0.008$) and a negative relationship between work fatigue and productivity ($r = -0.346$; 95% CI -0.60 to -0.04 ; $p = 0.042$). This analysis indicates an association (not a causal relationship) between workload and fatigue with productivity. Limitations of this study include the small sample size, the data did not consider confounding factors such as age, tenure, route length, weather conditions, and working hours, and the potential for single method bias. Implementation recommendations include scheduling micro-breaks, rotating heavy/light routes, and using NASA-TLX thresholds as indicators of OHS interventions to maintain a balance between workload, fatigue, and productivity.

Keywords: Workload, Work Fatigue, Work Productivity, Courier, OSH.

Introduction

Productivity is the relationship between output (goods and services) and input (labor, materials, and money). If workers experience subjective fatigue caused by psychological factors, the resulting impact will be felt by the company in the form of decreased productivity (Usmawati et al., 2021). This can be influenced by the level of workload (Lestari & Iriani, 2022). Based on Decree of the Minister of Manpower of the Republic of Indonesia Number 156 of 2021 concerning

the Productivity Improvement Management System, productivity is defined as the ratio between the results achieved and the total resources used in the production process.

According to the International Labour Organization (ILO), labor productivity is a key factor in assessing economic performance. Increasing labor productivity plays a crucial role in strengthening the economy as a whole, particularly in maintaining global competitiveness. Therefore, increasing

productivity is a key element in realizing a more competitive, sustainable, and prosperous economy (ILO, 2023).

In its 2020 health model, the World Health Organization (WHO) estimated that mental health disorders in the form of severe fatigue leading to depression would be the second-largest killer after heart disease. Muller reported that according to a 2018 survey by the National Safety Council (NSC), two-thirds of the US workforce experienced workplace fatigue, meaning nearly 107 million of the 160 million US workers were affected by work fatigue (Purba, T. A., & Siagian, 2021).

Indonesia's productivity remains below the ASEAN average, at around 74.4 percent. This figure is lower than the ASEAN average of 78.2 percent and lags behind neighboring countries such as the Philippines (86.3 percent), Singapore (82.7 percent), Thailand (80.1 percent), and Vietnam (80 percent). In fact, when compared to other countries whose productivity is also below the ASEAN average, Indonesia still lags behind Laos (76.7 percent) and Malaysia (76.2 percent). The Job Creation Law is expected to improve the employment climate and support increased national productivity (Kemenaker RI, 2020).

Approximately 60% of Indonesian workers are employed in the informal sector, which often has lower productivity

levels than the formal sector. This poses a challenge in efforts to increase national productivity (Komdigi, 2024). There is still a mismatch between the skills possessed by the workforce and the needs of industry. This mismatch has resulted in Indonesian labor productivity falling below the ASEAN average (Kemenaker RI, 2024).

Work fatigue not only affects productivity but also increases the risk of workplace accidents. Couriers who experience fatigue tend to have decreased concentration, which can compromise their safety while working (Febriana & Susilowati, 2023).

Working as a courier is not only physically demanding but also involves mental stress and time demands. Couriers are tasked with picking up packages from the warehouse, sorting and mapping delivery routes, and then delivering large quantities of goods to various locations within specified timeframes. This activity is repeated daily, even in extreme weather conditions or traffic jams. This process requires physical endurance and high levels of concentration, which, if not managed properly, can lead to work fatigue and stress, which can trigger burnout and impact worker productivity =(Febriana & Susilowati, 2023).

Several previous studies have shown a significant relationship between workload, fatigue, and employee

productivity. Research by Afiqah, Pratama, and Hidayat (2022) found that higher levels of fatigue led to lower productivity. Similar results were demonstrated by (Suleman, A., & Fitriyanti, 2020), who revealed that workload significantly impacted productivity, contributing 44.8%. Meanwhile, research by (Regina, M., Putri, L. A., Santoso, B., & Wijaya, 2025) also confirmed that increased workload and fatigue negatively impact workforce productivity. Overall, these findings emphasize the importance of effective workload management to reduce fatigue and increase productivity optimally and sustainably.

Initial survey results indicate that of the five courier workers, two experienced moderate fatigue and two experienced high fatigue. Meanwhile, of the three courier workers measured using NASA-TLX, two experienced light workloads and one experienced moderate workloads. This indicates that workload and fatigue are already clearly present, and if left unchecked, will impact productivity, occupational safety, and employee well-being (Afiqah, N., Pratama, A. R., & Hidayat, 2022).

Work productivity is a strategic element in the operational effectiveness of the logistics industry. However, most couriers at PT. Nusantara Ekspres, the Cinta Damai branch, are struggling to reach their target

of 150 out of 200 packages per day, indicating a high workload and potential for fatigue. Macroeconomic data from the ILO and ASEAN (2023) indicate that Indonesian labor productivity remains below the regional average, but local contexts such as delivery target pressures, long working hours, and road conditions are more relevant to study. A research gap lies in the lack of empirical evidence regarding the relationship between workload and fatigue and productivity among digital platform-based couriers in Indonesia with high distribution targets. Therefore, this study uses NASA-TLX to measure multidimensional workload and KAUPK2 to measure work fatigue, both of which are appropriate to the psychophysiological context of couriers facing time pressure and daily delivery demands.

Method

This study employed a quantitative approach with a cross-sectional design, which only describes the relationships between variables without inferring causal effects. The study sample consisted of 35 courier workers, obtained using a total sampling technique from the entire courier population at PT. Nusantara Ekspres, Cinta Damai Branch. Data collection was conducted from February to June 2025 after obtaining ethical approval from the Health Research Ethics Committee of the Faculty of Public Health, UIN Sumatera Utara (No.

03/KEPK/FKM-UINSU/II/2025), accompanied by written permission from the company and informed consent from all respondents. Data on the number of daily packages was obtained from the company's official application using an anonymous system to maintain respondent confidentiality.

Univariate analysis was used to describe respondent characteristics, while bivariate analysis was conducted using the Pearson correlation test because the data were normally distributed based on the Shapiro–Wilk test ($p > 0.05$). Correlation values are reported with 95% confidence intervals using the Fisher z transformation. Spearman's sensitivity test, linearity test, Cook's distance, and scatterplot regression line were used to test assumptions. Next, a multiple linear regression model was used exploratively with work productivity as the dependent variable and age, length of

service, education, workload (NASA-TLX), and work fatigue (KAUPK2) as covariates, with reporting of β , p , and VIF values for multicollinearity tests (Hart, S. G., & Staveland, 1998).

Results

Description of the Research Location

This research was conducted at PT. Nusantara, Cinta Damai Branch, an operational branch of PT. Shopee International, a logistics and e-commerce company established on April 13, 2018. PT. Nusantara Ekspres is responsible for distributing packages and goods to Shopee customers in various regions across Indonesia, including North Sumatra. This branch was chosen for the research due to its high level of operational activity, particularly in terms of courier management, delivery volume, and well-organized distribution system.

Tabel 1. Descriptive & Correlation Statistics (n = 35)

Variables	Mean \pm SD	Median [IQR]	Min–Max	r (95% CI)	p-value
Workload (NASA-TLX)	71.71 \pm 19.55	70.66 [59.25–87.50]	27–100	0.442 (0.15–0.67)	0.008
Work Fatigue (KAUPK2)	28.60 \pm 9.97	26.00 [22.00–36.00]	8–49	–0.346 (–0.60 – –0.04)	0.042
Productivity Score	49.69 \pm 7.85	50.00 [45.00–55.00]	33–60	—	—
Number of Packages (per day)	—	Median = 150	80–200	—	—

Note:

1. Workload categories: low (0–25), moderate (26–50), high (51–75), very high (>75).
2. Work fatigue categories (KAUPK2): low (≤ 20), moderate (21–40), high (>40).
3. Productivity categories: moderate (33–46), high (47–60).
4. The r value and 95% CI were calculated using the Fisher z transformation.
5. The correlation using the Pearson correlation test after the Shapiro–Wilk normality test showed $p > 0.05$.

Univariate Analysis

Respondent Characteristics

The characteristics of respondents in this study were used to describe the varied backgrounds of the respondents involved. Observed aspects included age, length of service, and education level. The results of observations on these characteristics are presented according to their respective classifications.

Tabel 2. Respondent Characteristics

Respondent Characteristics	f	(%)
Age		
20 – 29 year	19	54,3
30 – 39 year	13	37,1
40 – 49 year	3	8,6
Years of service		
< 5 year	31	88,6
≥ 5 year	4	11,4
Education		
Elementary School	9	25,7
Junior High School	7	20,0
Senior High School	16	45,7
Bachelor	3	8,6
Total	35	100,0

Based on the respondent characteristics table, it is known that most of the courier workers at PT. Nusantara Ekspres, Cinta Damai Branch are in the age range of 20–29 years, namely 19 people (54.3%), indicating that the majority of respondents are in the young productive age. A total of 13 people (37.1%) are aged 30–39 years, and only 3 people (8.6%) are aged 40–49 years. Based on the length of

service, the majority of respondents, namely 31 people (88.6%), have a work period of less than 5 years, while 4 people (11.4%) have worked for 5 years or more. Based on education level, the majority of respondents have a high school education of 16 people (45.7%), followed by elementary school of 9 people (25.7%), junior high school of 7 people (20.0%), and bachelor's degree of 3 people (8.6%).

Frequency of Workload, Job Fatigue, and Work Productivity in Courier Workers

Table 3. Frequency Distribution of Workload, Job Fatigue, and Work Productivity in Courier Workers

Variable	f	(%)
Workload		
Low	0	0
Medium	1	2,9
Somewhat	4	11,4
High	16	45,7
Very High	14	40,0
Work Fatigue		
Low	3	8,6
Medium	29	82,9
High	3	8,6
Work Productivity		
Low	0	0
Medium	8	22,9
High	27	77,1
Number of Packages		
< 150 Packages	8	22,9
≥ 150 Packages	27	77,1

Based on the results of the research on the variables examined, it was found that the majority of courier workers at PT. Nusantara Ekspres, Cinta Damai Branch,

had a high workload (16 people (45.7%)), and a very high (14 people (40.0%)). Meanwhile, only 4 people (11.4%) had a somewhat high workload, and 1 person (2.9%) had a moderate workload. No respondents had a low workload. Regarding work fatigue, the majority of respondents (29 people) fell into the moderate category, while 3 people (8.6%) each experienced low and high levels of fatigue.

Regarding work productivity, the majority of respondents (27 people) exhibited high levels of productivity, while 8 people (22.9%) fell into the moderate category, and none were classified as low. In addition, based on the number of packages sent, the majority of workers, namely 27 people (77.1%), sent ≥ 150 packages per day, while 8 people (22.9%) sent less than 150 packages per day.

Bivariate Analysis

Table 4. Normality Test

Variabel	Shapiro-Wilk		
	Statistic	Df	Sig.
Workload	0,965	35	0,323
Work Fatigue	0,958	35	0,199
Work Productivity	0,945	35	0,061

Based on the results of the Shapiro-Wilk normality test in the table above, the significance value for the workload variable was 0.323, work fatigue 0.199, and work productivity 0.061. Since all significance values were greater than 0.05, the data were declared normally distributed and could be analyzed using the Pearson correlation test.

Discussion

Relationship between Workload and Work Productivity among Courier Workers

The findings of this study indicate that, based on a univariate analysis of 35 respondents, the average workload was recorded at 71.71, with a minimum score of 27 and a maximum score of 100. This indicates that the average workload among courier workers is considered high.

Furthermore, the results of the bivariate analysis using the Pearson Correlation test showed a correlation coefficient (r) of 0.442 with a significance level of 0.008 ($p < 0.05$), indicating a moderate strength of relationship. This finding indicates a positive and significant relationship between workload and work productivity. This indicates that the higher the workload a courier receives, as long as it is within their capabilities, the more likely it is that their work productivity will increase. However, excessively high workloads that are not properly managed can still lead to fatigue and reduced performance.

Based on these results, the alternative hypothesis (H_1), which states that there is a relationship between workload and work productivity, is accepted, and the null hypothesis (H_0) is rejected. These results indicate that in the context of courier work, a well-structured

and managed workload can encourage increased work output. However, workloads must be maintained to prevent fatigue and reduced productivity.

The results of this study are supported by a study conducted by Arini and Wibowo (2023) at PT XYZ, which examined the relationship between workload and employee productivity in the production department. In the study, employees had a clear daily production target, namely completing a minimum of 24,000 gear units per day in the casting and packing division. Using a Pearson correlation test, the study obtained a correlation coefficient value of $r = 0.462$ with a significance value of $p = 0.002$ ($p < 0.05$). The correlation value of $r = 0.462$ is in the moderate relationship category, meaning that the higher the workload given, the higher employee productivity will be as long as the workload remains proportional. A well-managed increase in workload actually helps employees achieve the company's daily production targets. Although the work context is different from that of couriers, this finding corroborates the results of the current study, which also showed a positive and significant correlation ($r = 0.442$; $p = 0.008$) between workload and work productivity in jobs with daily targets (Lendo, T., Suot, H., & Bacilius, 2023).

On the other hand, research conducted at St. Michael Catholic Vocational School in Surakarta showed different results. The study examined the relationship between workload (heat stress) and work productivity using a Pearson correlation test and obtained an r value of 0.174 with a p value of 0.200 ($p > 0.05$). A low r value indicates a very weak relationship, and a p value exceeding 0.05 indicates the relationship is not statistically significant (Koto, D. F., & Primanita, 2024).

According to Suma'mur's theory, a high workload will actually decrease productivity because it triggers physical and mental fatigue. Suma'mur asserts that when workload exceeds a threshold, workers will experience decreased efficiency and performance due to chronic fatigue and stress. This theory focuses more on the inverse relationship: the higher the workload, the lower the productivity (Abdullah, D. P., Saleh, L. M., & Russeng, 2024).

This research finding is interesting because it contrasts with Suma'mur's theory. Instead, it shows that in situations where the workload remains within optimal limits, it can act as a trigger that increases productivity. This difference in results indicates that workload isn't always negative; its impact can be positive (encouraging) or negative (inhibiting),

depending on the level of workload and the worker's capacity.

This phenomenon can occur because a high workload is perceived as a trigger or "eustress," pushing couriers to work faster and more efficiently to meet daily targets. Monitoring systems via apps and reports to superiors create positive psychological pressure, causing couriers to feel compelled to demonstrate good performance to avoid reprimands, loss of trust, and the risk of being assigned more demanding routes or even being fired from the company.

Furthermore, the "finish quickly, go home quickly" work culture contributes to motivation, as couriers who complete their workloads faster can leave earlier, while those who are slower must work longer. Another factor that contributes to productivity is the package-based revenue system, where each package delivered is worth a certain amount of rupiah, so the more packages delivered, the higher the income. Thus, a high workload is not seen as an obstacle, but as an opportunity to increase income and expedite task completion.

However, the results of this study also underscore the importance of workload management. Poorly managed workloads can disrupt work efficiency and increase the risk of errors in the work process. Overburdened couriers tend to rush, lose

focus easily, and experience physical problems such as muscle pain or extreme fatigue, ultimately reducing work accuracy and speed (Mahdy, F., & Marzolina, M. (2024).

Besides its physical impact, excessive workloads also trigger mental fatigue, which indirectly contributes to decreased productivity. When workloads persist for long periods without adequate breaks or rest periods, workers are prone to stress, decreased motivation, and even burnout. This hinders productivity because workers no longer work with the same enthusiasm and thoroughness (Hasbullah, Laden Agusra, 2025).

The Relationship between Work Fatigue and Work Productivity in Courier Workers

The findings of this study indicate that, based on univariate analysis, the work fatigue scale had an average of 28.60, with a minimum score of 8 and a maximum score of 49. This indicates that the average work fatigue among courier workers is classified as moderate

Based on the bivariate analysis in this study, a significant relationship was found between work fatigue and work productivity. The Pearson correlation test showed a correlation coefficient (r) of -0.346 with a significance value of 0.042 ($p < 0.05$). This indicates a weak correlation.

These results indicate that the higher the level of work fatigue experienced by courier workers, the lower their work productivity tends to be. The negative direction of the relationship indicates a decrease in performance due to fatigue, both physical and mental.

Thus, the alternative hypothesis (H_1) stating that there is a relationship between work fatigue and work productivity is accepted, and the null hypothesis (H_0) is rejected. These results strengthen the conclusion that work fatigue plays a significant role in influencing the productivity of courier workers at PT Nusantara Ekspres, Cinta Damai Branch.

The results of this study are in line with the study by (Maipiana & Utami, 2023) which examined the relationship between work stress and fatigue with the productivity of couriers at PT. SiCepat Express in Medan. The study used a cross-sectional design and analyzed the data using the Spearman correlation test, resulting in significant results with a p value of 0.030 and $r = -0.405$. The study explained that physical fatigue due to high mobility and mental fatigue due to work pressure reduce the effectiveness and efficiency of couriers in the field. These findings corroborate the results of the current study using the Pearson test, which also found a negative correlation between work fatigue and courier productivity at PT.

Nusantara Ekspres, Cinta Damai Branch, making fatigue an important factor that must be considered in maintaining courier performance.

However, these results contradict research by Juliana et al. (2021). This study of 52 general workers used a Spearman correlation test and found that work fatigue was not significantly related to productivity ($p = 0.235$). Although the correlation was negative, it was weak and not statistically significant. This is likely due to work flexibility, rest patterns, and improved eating and sleep quality during the pandemic (Manein et al., 2023).

The findings of this study support Suma'mur's theory, which explains that fatigue is the body's protective mechanism to prevent further damage, resulting in decreased productivity and the body's need for recovery through rest (Suma'mur, 2014).

In the context of PT. Nusantara Ekspres Cinta Damai Branch, work fatigue experienced by couriers is triggered by an accumulation of factors such as high workloads, a daily volume of 200 packages with a minimum target of 150 packages, limited rest time, and challenging field conditions. Couriers often have to work in extreme weather, traffic jams, difficult terrain, and even face customers who put additional pressure on them, such as canceled orders or re-delivery requests. All

of these things add to the physical and mental burden which ultimately triggers work fatigue.

Work fatigue, both physical and mental, disrupts concentration, work speed, and decision-making accuracy, thus directly impacting work productivity. Increasing fatigue negatively impacts productivity. Fatigue leads to decreased work speed and output quality, increased errors, and the risk of workplace accidents, thus decreasing overall company productivity (Sidiq, 2019).

High levels of fatigue significantly impact work productivity. Couriers who are already fatigued generally work more slowly, lack focus, and are at risk of making errors during the delivery process. In the long term, this condition can lead to excessive stress, decreased motivation, and even health problems (Maipiana & Utami, 2023).

This study has several limitations that should be considered when interpreting the results. First, the study focused solely on analyzing workload and fatigue variables in relation to courier worker productivity. External factors highly relevant to courier activities were not included in the research model and were not measured quantitatively, such as delivery route length, traffic density, and weather conditions, which fluctuate daily. These

three variables have the potential to influence delivery duration, physical energy consumption, fatigue, and work pace, potentially biasing the productivity and fatigue levels measured in this study.

Furthermore, the cross-sectional study design only describes the relationship over a single time period and cannot account for dynamic changes in fatigue and productivity from day to day. Fatigue measurement also relies on subjective instruments, potentially introducing perception bias among respondents. Despite these limitations, the study results remain relevant in the context of PT Nusantara Ekspres, Cinta Damai Branch. However, generalizations to a broader courier population should be approached with caution. Future research is recommended to integrate route length, traffic density, and weather conditions, and employ a longitudinal approach to obtain a more nuanced picture of the dynamics of courier workload, fatigue, and productivity over time.

Conclusions

This study showed that workload had a moderate positive relationship ($r = 0.442$; 95% CI 0.15–0.67; $p = 0.008$) and work fatigue had a weak negative relationship ($r = -0.346$; 95% CI -0.60 to -0.04 ; $p = 0.042$) with courier productivity. These findings suggest an association

between psychophysiological factors and performance, not a causal relationship. Limitations include the cross-sectional design, small sample size, lack of control for confounding variables (age, tenure, route length, weather, vehicle condition, and incentives), and potential single method bias. Practical recommendations for management include implementing a micro-break schedule every 90 minutes, rotating heavy and light routes, and implementing a NASA-TLX threshold of ≥ 70 as a signal for the need for OSH intervention.

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