

## THE EFFECT OF JOB INSECURITY ON MULTIDIMENSIONAL FATIGUE DUE TO WORK IN ENGINEERING SUPPORTING WORKERS FOR POWER PLANT REPAIR SERVICES

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**Abstract:** Power Plant Repair Service Engineering Supporting Workers are workers who provide service solution services such as Maintenance and Overhaul of power plants. In practice, work placements tend to move according to the needs of the maintenance schedule, as well as the demands for completion of work which tend to be short resulting in continuous overtime work during the work period. Based on the results of measuring psychological factors in 2022 at work, it is known that workers have an excess of quantitative and qualitative burdens and role ambiguity as the dominant triggers that cause work stress/burnout/fatigue. From the explanation above, there is a potential indication of multidimensional fatigue due to work which is hypothesized to have an influence with job insecurity. This study aims to analyze whether or not there is an influence between latent variables in this case job insecurity on multidimensional fatigue through the AMOS Structural Equation Modeling (SEM) method in order to obtain overall test results for the constructs tested. The test results show that Job Insecurity has a significant effect on all indicators (Concerns About Transferring to Another Job (JI1), Concerns About Changes in Job Descriptions (JI2), Concerns About Work Schedules (JI33), Concerns About Decreases in Salary (JI4) and Concern About Job Prospects (JI5)) with (p-value = 0.001) and Job Insecurity have a significant effect on Multidimensional Work-related Fatigue (p-value = 0.001).

## 1. INTRODUCTION

The growing demand for electricity demands the Power Generation Industry to carry out maintenance in order to improve performance. In practice, there are workers who are directly involved in the entire maintenance process. Technical support workers for repair services (Maintenance and Overhaul) of the Power Plant have a strategic role as a provider of total service solutions for power generation equipment and other industrial utilities. In its application, in the process of maintenance and overhaul work, assembly/disassembly, measurement, calibration, online maintenance, assessment and repair. Technical support workers for repair services (Maintenance and Overhaul) of the Power Plant have a strategic

role as a provider of total service solutions for power generation equipment and other industrial utilities. In practice, the services offered are complemented by expertise certification and assembly/disassembly, measurement, calibration, online maintenance, assessment and repair equipment.

Based on the recapitulation of the Overhaul implementation schedule in 2022, the Overhaul work took 445 working days with a total of 23 work projects. In practice, staff tend to do dynamic work and often move around because they are assigned to standby in the district that is carrying out the Overhaul in the eastern region. In addition, Overhaul work has the pressure of short completion deadlines that make workers to force and manage work time according to predetermined work execution targets. Based on the results of measuring the work environment of psychological factors at work in 2022, it can be concluded that workers predominantly experience quantitative overload, qualitative overload, and role ambiguity.

According to [1] quantitative workload is related to the amount of work, work speed, and work under pressure. While the qualitative workload relates to the feelings of employees who feel they do not have enough time to produce quality work. With regard to the theory of [2] this idea is relevant to role overload which indirectly takes part in excessive workload and impacts on physical and mental fatigue.

Based on previous research [3], who examined the relationship between psychosocial aspects and multidimensional work-related fatigue among oil and gas workers. In that study, the independent variables used were found to be related to job satisfaction and family-worker conflict, which are associated with total fatigue on land. Furthermore, the method used to test the relationship was multivariable linear regression. In addition, there was research [4] that looked at the impact of work-life balance, job demand, and job insecurity on employee performance, with employee well-being as a mediating variable. The results showed that employee well-being partially mediated the influence of work-life balance and job insecurity on employee performance. The SEM PLS method was used, with a total of 100 respondents.

Based on the previously conducted research framework [3], [4], [5], [6], adjustments, modifications, and development of the variables used as a reference for the conceptual framework of this study were made. The selection of variables used is based on several phenomena observed in the field, which were referred from preliminary studies and the measurement of psychological factors in the workplace. Researchers determined five exogenous factors to be tested for the relationship and influence of multidimensional work-related fatigue as endogenous factors. The exogenous factors tested were Job Insecurity with indicators including Concerns About Transferring to Another Job (JI1), Concerns About Changes in Job Descriptions (JI2), Concerns About Work Schedules (JI3), Concerns About Decrease in Salary (JI4) and Concern About Prospect Occupation (JI5) [7]. With Endogenous Factors including Multidimensional Fatigue with indicators including Physical Fatigue (PF), Decreased Motivation (DM), Mental Fatigue (MF) [8].

This research was conducted to find out what factors are related to and influence the multidimensional fatigue due to work that can be experienced by workers supporting engineering repair services (Maintenance and Overhaul). With this research, it is hoped that researchers can provide solutions and recommendations from variables that are proven to be related to and influence multidimensional fatigue due to work so that the problem of work fatigue experienced by workers can be followed up and minimized.

## 2. LITERATURE REVIEW

### 2.1. Job Insecurity

Job insecurity is insecurity about employees' feelings about the possibility of circumstances not in line with their wishes. Job insecurity is defined as an employee's

expectation of job continuity, and job security cannot be separated from attending to uncertainty about continued employment and uncertain conditions causing organizational changes. Job insecurity is a psychological state of employees who feel disoriented or feel insecure due to changing environmental conditions (perceived instability) [6]. Job insecurity is a reflection of how much employees feel their work is a threat and feel powerless to do anything about it. This condition occurs because there are many jobs with contract status and outsourcing that are adequately performed by the company, and many jobs with temporary or non-permanent duration [9].

## 2.2. Multidimensional Fatigue

According to Usman & Yuliani [10], fatigue is a system and form of the body's defense mechanism to avoid potential long-term damage resulting in recovery from rest. Work fatigue is a decrease in process efficiency, productivity, and reduced physical strength/endurance of the body to continue activities that need to be performed [11] Multidimensional fatigue is fatigue that is divided into several categories according to different definitions and impacts. According to Unit et al. [12], multidimensional fatigue is subdivided into 5 aspects, consisting of general fatigue, physical fatigue, decreased activity, decreased motivation, and mental fatigue. In this study, multidimensional fatigue focuses on only three fatigue indicators adjusted to field phenomena and research subjects. Essentially, the subjects in this study are daily casual laborers who have been shown to have a qualitative (task complexity, responsibility, problem solving, intellectual ability) and quantitative (volume of work, production targets, number of working hours, number of tasks to be completed) work overload based on the measurements of psychological factors in the workplace in 2022. Based on this fact, it can be decided that these three indicators represent the background and research problem formulation. The three indicators will be explained as follows:

- Physical fatigue  
A condition that refers to the physical sensations associated with feeling tired, such as dizziness, muscle pain, and other somatic symptoms
- Decreased motivation  
A condition caused by fatigue and affecting the decrease in employee motivation at the beginning of any activity
- Mental fatigue  
A condition that refers to a person's mental state, such as difficulty concentrating, etc.

## 3. METHODOLOGY

The population used in this study were 185 workers who had been adjusted to the fields of work that sent the most workers who tended to be placed dynamically in the eastern region. The research respondents were taken by means of a sampling technique with the Slovin formula so that 126 research samples were obtained. The distribution of questionnaires was carried out using the Google form to reach all workers who were carrying out projects in outer districts.

The research instrument used to construct Job Insecurity uses the COPSOQ III instrument with a total of 5 indicators which include Concerns About Being Transferred to Another Job (JI1), Concerns About Changes in Job Descriptions (JI2), Concerns About Work Schedules (JI3), Concerns About Decreased Salary (JI4) and Concern About Employment Prospect (JI5), while for the Multidimensional Fatigue construct using the Multidimensional Fatigue Inventory-20 which consists of 5 indicators, but in this study the main focus is on 3 indicators namely Physical Fatigue (PF), Decreased Motivation (DM), and Mental Fatigue (MF). Each question item in the questionnaire was assessed using a Likert scale of 1 (strongly disagree) to 5 (strongly agree).

SEM (Structural Equation Modeling) is a set of techniques used to test a relatively complex hierarchical or simultaneous relationship [13]. Furthermore, SEM can also confirm whether the indicators used in a study are theoretically justified, allowing them to be used to confirm constructs/variables under examination. Given that the variables under investigation in this study are multidimensional, the Structural Equation Model analysis technique is appropriate because it can comprehensively determine the influence among variables [14]. SEM test was carried out in 2 stages, namely the measurement model (confirmatory factor analysis) for each construct aimed at obtaining a fit variable model and testing how strong the indicators can explain the construct. The model can be said to be fit if one of the criteria in the Goodness of Fit meets the cut-off value [13].

While the full model analysis is intended to obtain a model of influence and whether the hypothesis is accepted or not. Construct indicators can be declared valid if the value of standardized regression weights is  $> 0.5$  and declared reliable if the value of construct reliability is  $> 0.6$  [13]. The research hypothesis can be accepted if the Critical Ratio value in Regression Weights is  $> 1.96$  or the probability value ( $p$ )  $< 0.05$  [15].

#### 4. RESULTS AND DISCUSSION

This research was tested using the SEM method which includes 2 stages, namely the measurement model and the structural model [15]. The preparation of this research framework was carried out by modifying or developing from previous research which consisted of research [4], [16], and [17]. The elaboration of results and data analysis will be explained as follows:

##### 4.1 Measurement Model

SEM begins with testing the measurement model (confirmatory factor analysis) for each construct [13]. The results of the confirmatory factor analysis test for the Job Insecurity and Multidimensional Fatigue constructs have shown that the Goodness of Fit criteria met the cut off values for the Chi-square, Goodness Fit Index (GFI), Root Mean Square Error of Approximation (RMSEA), Adjusted Goodness of Fit Index (AGFI), Tucker Lewis Index (TLI), Normed Fit Index (NFI), and CMIN/DF criteria. Then, standardized regression weights were tested for the constructs of Job Insecurity and Multidimensional Fatigue as presented in Table 1.

**Table 1.** Construct Standardized Regression Weights

Indicators		Construct	Estimate
J11	←	Job_Insecurity	0.845
J12	←	Job_Insecurity	0.981
J13	←	Job_Insecurity	0.844
J14	←	Job_Insecurity	0.731
J15	←	Job_Insecurity	0.861
PF	←	Multidimensional_Fatigue	0.723
DM	←	Multidimensional_Fatigue	0.872
MF	←	Multidimensional_Fatigue	0.752

Based on Table 1 it is known that all indicators in the Job Insecurity and Multidimensional Fatigue constructs show a loading factor value of  $> 0.5$  which indicates that the indicator is valid for the construct [13]. In a sense, these indicators can form and explain the construct variable. Furthermore, the indicator significance test was carried out on the

construct on the output Regression Weights on AMOS [18]. The results of the significance test are presented in Table 2.

**Table 2.** Construct Regression Weights

Indicators		Construct	Estimate	S.E.	C.R	P
J11	←	Job_Insecurity	1.000			
J12	←	Job_Insecurity	1.119	0.071	15.788	0.001
J13	←	Job_Insecurity	1.003	0.082	12.272	0.001
J14	←	Job_Insecurity	0.901	0.077	11.639	0.001
J15	←	Job_Insecurity	1.047	0.083	12.694	0.001
PF	←	Multidimensional_Fatigue	1.000			0.001
DM	←	Multidimensional_Fatigue	0.779	0.125	6.259	0.001
MF	←	Multidimensional_Fatigue	0.763	0.122	6.268	0.001

The forming indicators can be said to be significant if the Critical Ratio (C.R) value is  $\geq 1.96$  or the probability value (P)  $\leq 0.05$ . In table 2, the probability value (P) of the all indicators has a value of 0.001. It can be seen that for forming indicators such as J11, J12, J13, J14, J15, PF, DM, MF are significant because the value of C.R. each indicator  $\geq 1.96$  and the probability value of indicator  $< 0.05$  [15]. Where the level of significance of an indicator affects how strong the indicator can define or clarify its construct.

After that, a construct reliability test was carried out using the construct reliability equation. The test results for construct reliability values in the Job Insecurity and Multidimensional Fatigue constructs are shown in Table 3.

**Table 3** Construct Reliability Job Insecurity

Construct	Indicator	$\lambda_i$	$\lambda_i^2$	$1-\lambda_i^2$	Construct Reliability
Job Insecurity	J11	0,845	0.714	0.286	0.84
	J12	0.981	0.962	0.038	
	J13	0.844	0.712	0.288	
	J14	0.731	0.534	0.466	
	J15	0.861	2.923	1.077	
	$\Sigma$	4.262	4.822	3.346	
	$\Sigma^2$		18.16		

**Table 4** Construct Reliability Multidimensional Fatigue

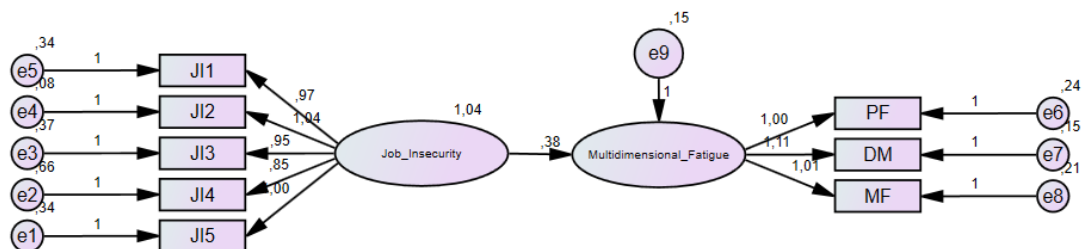
Construct	Indicator	$\lambda_i$	$\lambda_i^2$	$1-\lambda_i^2$	Construct Reliability
Multidimensional Fatigue	PF	0.723	0.523	0.477	0.75
	DM	0.872	0.760	0.240	
	MF	0.752	0.566	0.434	
	$\Sigma$	2.347	5.132	1.868	
	$\Sigma^2$	5.51			

Based on the results of construct reliability in Table 3 a construct reliability value of 0.84 is obtained for the Job Insecurity construct and based on Table 4 construct reliability value is 0.75 for the Multidimensional Fatigue construct which indicates that the value is greater than the cutoff value (> 0.6) so that it can be stated that the indicator the forming variables are reliable multidimensional job insecurity and burnout [19].

Based on the test results, it can be stated that the entire model in each construct is declared fit and valid, meaning that the model is suitable and relevant to the observed data and can strongly measure the construct being studied. In line with several recent studies about job insecurity that risk-averse workers are less likely to move to other jobs [20], insecurity at work is the feeling of powerlessness of workers in facing threats, where the indicator focuses on the level of powerlessness felt by workers when changes occur [21], Instability of working hours is a source of insecurity experienced by workers.[22], income can moderate the positive relationship between affective job insecurity and orientation of future job prospects [23], Koen and van Bezouw [23] argue that the more workers experience insecurity about the future of their jobs, the more important it is to manage these insecurities Therefore, the model can be continued to the next stage of analysis.

**4.2 Structural Model**

The next stage is to carry out a structural model analysis (full model) by combining exogenous variables which are pointed with arrows to the endogenous variables visualized in Figure 1.



**Fig. 1.** Structural Model

Based on the output of Goodness of Fit, it is obtained that criteria such as Goodness Fit Index (GFI), Root Mean Square Error of Approximation (RMSEA), Adjusted Goodness of Fit Index (AGFI), Tucker Lewis Index (TLI), Normed Fit Index (NFI), and CMIN/DF criteria have

met the cutoff value so that it can be stated that the structural model is fit [24], which is presented in Table 5 below:

**Table 5.** Goodness Of Fit Full Model

Criteria	Cutoff value	Output	Conclusion
<b>Absolute index</b>			
Chi Square	-	7.597	-
<b>Incremental index</b>			
Degree of freedom	-	17	-
GFI	$\geq 0.90$	0.986	Fit
RMSEA	$< 0.08$	0.000	Fit
<b>Parsimonious index</b>			
AGFI	$> 0.80$	0.970	Fit
TLI	$\geq 0.90$	1.021	Fit
NFI	$\geq 0.90$	0.990	Fit
<b>Parsimonious index</b>			
PNFI	$> 0.50$	0.601	Fit
PCFI	$> 0.50$	0.607	Fit
NC (CMIN/DF)	$< 5$	0.447	Fit

Furthermore, to test the hypothesis shown in Table 6 shows that Job Insecurity has had a significant effect on the indicators which include Concerns About Being Transferred to Another Job (JI1), Concerns About Changes in Job Descriptions (JI2), Concerns About Work Schedules (JI3), Concerns About Decrease in Salary (JI4) and Opinions Regarding Employment Prospects (JI5). In addition, Table 1 also shows that Multidimensional Fatigue has a significant effect on the indicators which include Physical Fatigue (PF), Decreased Motivation (DM), and Mental Fatigue (MF). As for the results of the hypothesis test are shown in the following table

**Table 6.** Recapitulation Conclusion Hypothesis Test

		Estimate	S.E.	C.R.	P	Conclusion
<b>Multidimensional Fatigue</b>	<b>&lt;-- Job_Insecurity</b>	<b>0.397</b>	<b>0.55</b>	<b>6.929</b>	<b>***</b>	<b>Significant</b>

			Estimate	S.E.	C.R.	P	Conclusion
J5	<--	Job_Insecurity	1.000				Significant
J4	<--	Job_Insecurity	0.861	0.09	9.491	***	Significant
J3	<--	Job_Insecurity	0.956	0.08	12.627	***	Significant
J2	<--	Job_Insecurity	1.072	0.06	16.871	***	Significant
J1	<--	Job_Insecurity	0.955	0.08	12.64	***	Significant
PF	<--	Multidimensional_ Fatigue	1.000				Significant
DM	<--	Multidimensional_ Fatigue	1.112	0.13	8.533		Significant
MF	<--	Multidimensional_ Fatigue	1.016	0.13	8.006	***	Significant

Based on the results of research that has been conducted on technical support workers for power plant repair services, it is found that Job Insecurity have a significant effect on multidimensional fatigue due to work. Thus, the hypothesis which states that Job Insecurity has a significant effect is accepted because it can be seen in Table 4.6 the P \*\*\* (0.001) <  $\alpha$  value (0.005). Contrary to research conducted by Herlina & Azizah [25], findings were found which stated that there was no significant effect between job insecurity and burnout/fatigue. In addition, a similar study conducted by Nainggolan [26] states that job insecurity has no effect on employee burnout.

Research conducted on technical support workers for power plant repair services is in line with research conducted by Green [9], that cross-sectional studies in epidemiology, psychology, and economics show a strong relationship between work anxiety/insecurity and poor physical or mental health. . The feeling of insecurity experienced by workers is a concept part of the framework on psychological aspects that can cause stress related to uncertainty. Where in his findings, high or prolonged stress is bad for physical and mental health. In addition, the concept of feelings of worry experienced by workers is a part that can significantly intimidate workers, as a result it can also lead to low worker motivation and worker compliance with safety efforts.

With regard to job insecurity, Rizzo et al., [27] put forward the idea that there are several indicators that are relevant to the conditions experienced by technical support workers for plant repair services, such as ambiguity regarding authority, ambiguity regarding job description, ambiguity regarding determination/distribution of work schedules, unclear job prospects. Where, if we look back at the results of measuring psychological factors in 2022 at supporting workers, dominant workers experience role ambiguity in their work, where this is included in a conceptual uncertainty or cause for worry experienced by workers [28].

Some facts in the field can also explain that the conceptual job insecurity experienced by workers has a strong relationship with multidimensional fatigue. Based on the interviews



that have been conducted, workers who support engineering repair services experience work placements that tend to be erratic, work schedules to be uncertain and to add uncertain job descriptions. Where, if the common thread is drawn, the main cause of the non-compliance is due to the presence of troubles that are beyond the scope and schedule of maintenance, as well as the lack of firmness in communication between the managerial coordinator and co-workers. In addition, there are several categories/positions for technical support workers for power plant repair services who have the right to facilities, salaries, and work stability that differ both subjectively and objectively, making some of the treatment of workers unfair and unequal.

Sverke & Näswall [29] has argue that employees' perceptions of fair treatment and involvement in decision-making during the change process will have a beneficial effect on their work attitudes and well-being, and may also moderate the negative impact of reducing staff levels leading to employee burnout. So it can be concluded that these facts are an elaboration of the conceptual job insecurity put forward by Rizzo, House and Lirtzman, Rollman [27]. Weiss, Zacher [30] in their research, consistently shows that job insecurity is positively correlated with work exhaustion. Similar findings also state that job insecurity has a significant positive effect on burnout, where if the sense of insecurity/worry felt by workers is high, then the fatigue felt by workers will also increase [6]

The research conducted on workers supporting engineering repair services in general discusses organizational systems and policies as well as the psychology of workers in the work industry, so that the administrative control stage can be carried out to overcome research problems regarding the linkage of job insecurity to multidimensional fatigue due to work. Recommendations that can be suggested such as fair treatment during the change process and participation in decision making, where it has beneficial consequences for workers' welfare and reduces the impact of burnout on workers [29], maintaining communication, this can reduce workers perception of workers insecurity [31], such as reduce ambiguity in the work environment, provide clarity of work roles and assignments, reduce conflict so as to minimize feelings of insecurity [32]. Klein Hesselink and van Vuuren [33] in their ideas recommend contracts workers with specific functions and jobs, organizes them into pools of workers, and conducts training for specific tasks in similar organizations for specific areas.

## 5. CONCLUSION

Job Insecurity construct has a significant effect on indicators Concerns About Being Transferred to Another Job (JI1), Concerns About Changes in Job Descriptions (JI2), Concerns About Work Schedules (JI3), Concerns About Decrease in Salary (JI4) and Concern About Employment Prospect (JI5) ( $P = 0,001$ ). Job insecurity construct has a positive and significant effect on multidimensional fatigue due to work ( $P = 0,001$ ). In a sense, the higher the job insecurity experienced by workers impact the higher the fatigue experienced by workers. Recommendations that can be given minimize job insecurity to relieve multidimensional fatigue with involve workers in decision-making, maintain work communication between coordinators and workers through tool box meeting before work, carry out work contracts in a transparent manner, and invest in workforce with training.

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