



THE ROLE OF INDIVIDUAL CHARACTERISTICS, PSYCHOSOCIAL ENVIRONMENTS, WORK FATIGUE, AND CALORIC ADEQUACY IN PERFORMANCE AMONG FEMALE POTTERY ARTISANS IN KARANGANYAR, BOROBUDUR

PERAN KARAKTERISTIK INDIVIDU, LINGKUNGAN PSIKOSOSIAL, KELELAHAN KERJA, DAN KECUKUPAN KALORI TERHADAP KINERJA PENGRAJIN GERABAH PEREMPUAN DI KARANGANYAR, BOROBUDUR

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ABSTRACT

Background: Pottery making is a vital tourism-supporting industry in Karanganyar, Borobudur, predominantly operated by female workers. **Purpose:** Investigate the factors influencing the performance of female pottery workers in Karanganyar. **Method:** A cross-sectional approach was employed and respondents were selected using simple random sampling techniques, yielding 43 participants out of 70 female workers. Data were collected using questionnaires and measurement devices (reaction timer, stature meter, and digital weight scale), then analyzed using Chi-square. Variables such as performance, psychosocial environment in the workplace, individual characteristics (age, marital status, number of children, and length of service), fatigue, and calorie adequacy were measured. The Copenhagen Psychosocial Questionnaire (COPSOQ) and the Individual Work Performance Questionnaire (IWQP) were employed to assess psychosocial environments and performance, respectively. **Result:** The majority of pottery workers were 41 - 50 years old (32.56%), were married (93.02%), had 1 - 2 children (46.51%), and had more than 30 years of services (46.51%). Calorie deficits affected 41.86% workers, with 62.79% showing moderate performance, 81.40% experiencing a moderate psychosocial environment, and 48.84% facing mild fatigue. The Chi-square test revealed a significant association between age (p -value = 0.023), fatigue (p -value = 0.033), psychosocial environment (p -value = 0.022), and calorie adequacy (p -value = 0.047) toward performance. **Conclusion:** The findings highlight the importance of age, psychosocial environments, work fatigue, and calorie intake on the performance of female pottery workers.

ABSTRAK

Latar belakang: Pembuatan gerabah merupakan industri pendukung pariwisata yang vital di Karanganyar, Borobudur yang sebagian besar dilakukan oleh tenaga kerja wanita. **Tujuan:** Mengetahui faktor-faktor yang mempengaruhi kinerja pekerja gerabah wanita di Karanganyar. **Metode:** Pendekatan yang digunakan adalah penelitian *cross-sectional* dan responden dipilih melalui teknik *simple random sampling* sebanyak 43 orang dari total 70 pekerja wanita. Pengumpulan data menggunakan seperangkat kuesioner dan alat ukur (pengatur waktu, pengukur tinggi badan, dan timbangan berat badan digital), kemudian dianalisis menggunakan *Chi-square*. Variabel yang diukur adalah kinerja, lingkungan psikososial, karakteristik individu (usia, status perkawinan, jumlah anak, dan tahun kerja), kelelahan, dan kecukupan kalori. Kuesioner *Copenhagen Psychosocial Questionnaire* (COPSOQ) dan *Individual Work Performance Questionnaire* (IWQP) masing-masing digunakan untuk menilai lingkungan psikososial dan kinerja. **Hasil:** Mayoritas pekerja gerabah berusia 41 - 50 tahun (32,56%), menikah (93,02%) dan memiliki 1 - 2 anak (46,51%), serta memiliki masa kerja lebih dari 30 tahun (46,51%). Defisit kalori dialami oleh 41,86% pekerja, dengan 62,79% memiliki kinerja sedang; 81,40% memiliki lingkungan psikososial sedang, dan 48,84% mengalami kelelahan ringan. Uji *Chi-square* menunjukkan adanya hubungan yang signifikan antara usia (p -value = 0,023), kelelahan (p -value = 0,033), lingkungan psikososial (p -value = 0,022), dan kecukupan kalori (p -value = 0,047) terhadap kinerja. **Kesimpulan:** Hasil penelitian ini menemukan signifikansi usia, lingkungan psikososial, kelelahan kerja, dan asupan kalori terhadap kinerja pekerja gerabah perempuan.

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INTRODUCTION

Borobudur is one of the super priority destinations currently under the development focus of the Indonesian government. In addition to the temples, one of the region's assets and tourist attractions is the existence of various handicraft centers scattered across villages in the Borobudur area, including pottery making. This pottery craft can be categorized as a small business run informally and managed individually by local citizens. As a supporting business for the Borobudur tourist area, the development of this industry is vital for the sustainability of tourism in this region. However, this craft business is not exempt from the challenges commonly encountered by other informal sectors. Poor work organization, inadequate access to clean water and proper sanitation, ergonomic hazards, and the use of heavy manual equipment are characteristics of this sector (Nag *et al.*, 2016).

Perceived organizational support has been found to impact well-being and performance positively (Meyers *et al.*, 2020). However, many self-employed informal workers, including pottery makers lack work structure, organizational support, and supervision, relying heavily on individual motivation for performance (Mayangsari *et al.*, 2020; Wolfe and Patel, 2019). The dual role conflict between work and family responsibilities can lead to overwhelming challenges, stress, and subsequent effects on performance for female workers, (Muis *et al.*, 2021). Women, particularly those in self-employment, experience a higher prevalence of mental health problems attributed to stress compared to men (Arias-de la Torre *et al.*, 2016). This stress disparity significantly impacts women's performance. The textile industry, as studied by Andarini and Prasetya (2017), demonstrates a strong correlation between stress levels and fatigue among female workers. Stress and fatigue experienced by workers can lead to a decline in task performance and a reduced capacity for mental and physical activities, resulting in critical errors and accidents (Sadeghniaat-Haghighi and Yazdi, 2015).

Occupational Health and Safety (OHS) aspects in the informal sector work environment are often inadequate and not protected by labor regulations. Thus, workers in this sector are closely associated with poor health status, especially in countries with lower-middle incomes (Montero-Moraga *et al.*, 2020). Nutrition interventions in the workplace are a health sector initiative that may be made to improve performance and productivity (Maes *et al.*, 2012). Workers' energy and nutritional demands must be met for them to stay healthy and perform efficiently and effectively. Workers fail to consume an adequate and balanced diet are more likely to be involved in work accidents and have insufficient energy (Kartasapoetra, 2003). The lack of nutritional value in food consumed by workers can also

result in diminished immunity and physical capacities, lack of desire, and decreased perceptive speed, all of which can reduce job productivity (Ramadhanti, 2020). This is consistent with Rahmawati's study, which found that calorie intake, breakfast habits, and nutritional status are associated with worker productivity (Rahmawati *et al.*, 2023). Inadequate calorie intake can lead to a decrease in skeletal muscle mass, resulting in weakness, decreased physical performance, and a loss of overall muscle strength. It can also cause a decline in intracellular and total body water, impacting hydration levels and impairing essential bodily functions, which in turn can negatively affect workers performance (Zalejska-Fiolka *et al.*, 2022).

Psychosocial risk factors in informal workers are typically found in this research field. According to a study by Gimeno Ruiz de Porras in Central America, informal workers reported a higher prevalence of psychosocial and musculoskeletal disease risk factors (Gimeno Ruiz de Porras *et al.*, 2017). The working relationship, including employer and employee interaction, shapes the work environment. However, due to their non-formal working relationship, informal workers have limited involvement in the organization and are deprived of the ability to influence work relationships. These conditions place them in a vulnerable position and increase their vulnerability to psychosocial risk factors (Montero-Moraga *et al.*, 2020). However, some studies present conflicting findings that show self-employed individuals might be more satisfied with their occupations, which is paradoxical considering their poor quality of work conditions (Wolfe and Patel, 2019).

The understanding of how the unique working conditions of informal and self-employed workers relate to their performance is still unclear, and even scarcer in women informal self-employed workers. In the preliminary survey, it was found that the pottery artisans in Karanganyar were predominantly female workers engaged in informal employment with inadequate equipment standards. They often worked independently, without assistance from colleagues. Working from home, they bore a dual burden, involving both their roles as pottery artisans and their domestic household responsibilities. These conditions made them susceptible to fatigue and psychosocial disturbances. Furthermore, many of these workers had irregular and insufficient dietary habits, resulting in inadequate nutrition and calorie intake. Therefore, the purpose of this research is to determine the relationship between psychosocial environment, individual characteristics (age, marital status, number of children, and length of service), work fatigue, and calorie intake on the individual performance of female pottery workers in Karanganyar village, Borobudur Sub-district.

MATERIAL AND METHOD

This research has received ethical approval from The Health Research Ethic Committee Faculty of Public Health University of Airlangga No. 184/EA/KEPK/2022. This cross-sectional study analyzed variables such as individual performance, individual characteristics, fatigue, calorie intake, and psychosocial environment among pottery craftsmen in Karanganyar Village, Borobudur Sub-district, Magelang District, Central Java. A total of 43 female participants were selected from a population of 70 female potters in Karanganyar Village using a simple random sampling technique based on Lemeshow formula. The inclusion criteria were females working as pottery makers in Karanganyar Village.

An L77 Lakassidaya reaction timer was used to measure fatigue. The reaction timer had been calibrated and was known to have good validity test results and was very reliable ($r = 0.9$) (Dirgayudha, 2014). The measurement results were classified into four categories: (1) Normal (reaction time 150.0 - 240.0 milliseconds), (2) Mild tiredness (reaction time > 240.0 - 410.0 milliseconds), (3) Moderate fatigue (reaction time 410.0 - 580.0 milliseconds), and (4) Severe fatigue (reaction time > 580.0 milliseconds) (Maulida *et al.*, 2023). Meanwhile, calorie adequacy was determined by comparing the workers' caloric intake based on food recall to their woman *Basal Metabolic Rate* (BMR), which was estimated using the Formula (1) (Kuwabara *et al.*, 2011). The results were then classified as deficit if less than 90%, adequate if between 90% and 110%, and excessive if more than 110% (Wardana *et al.*, 2018).

$$\text{BMR} = 655 + 9.6 \text{ weight} + 1.8 \text{ height} - 4.7 \text{ age} \dots\dots\dots (1)$$

Measurement of individual performance, individual characteristics, and the psychosocial environment was carried out using a questionnaire. Psychosocial factors were measured using the *Copenhagen Psychosocial Questionnaire* (COPSOQ) instrument, and the performance factors were measured using the *Individual Work Performance Questionnaire* (IW PQ). The COPSOQ items were assessed using a likert scale with 5 response options, assigned from 1 (very low) to 5 (very high). Each item was then converted to a score of 0, 25, 50, 75, or 100 for analysis, and the total scores were determined by calculating the average scores (Berthelsen *et al.*, 2018; Novanda and Dwiyaniti, 2014).

The study questionnaire included qualitative demand, emotional demand, social support, feedback at work, social relations, the meaning of work, and the sense of community. The IW PQ scores were calculated by summing the scores and dividing by the number of items, while the total IW PQ score was derived from *Task Performance* (TP) + *Contextual Performance* (CP) + (4 - *Counterproductive Work Behavior* (CWB)) (Widyastuti and Hidayat, 2018). The Kolmogorov-Smirnov normality

test confirmed the normal distribution of COPSOQ and IW PQ data, with significance values of 0.20 and 0.173 (> 0.05), respectively, allowing the use of mean values to categorize the results of both data into low, moderate, and high performance groups. The data analyses were conducted using IBM SPSS statistics 21. Since the data were categorical, the *Chi-square* statistical test was used to assess the association of psychosocial environment, individual characteristics (age, marital status, number of children, and length of service), work fatigue, and calorie intake with performance.

RESULT

Table 1 shows the demographic data of the pottery workers who participated in this research. The majority of the female workers involved in this research were married, with a rate of 93.02%, and had children 46.51% of the workers had 1 - 2 children, and only 6.98% of female pottery workers were single. The age group of 41- 50 had the highest representation among the pottery workers, accounting for 32.56% of the total. The youngest worker was 27 years old, while the oldest worker was 70 years old. Most workers have been working in pottery for more than 10 years. The majority of workers had a length of service of 30 years or more, accounting for 46.51% of the total workers. Additionally, most of the workers have been craftsmen since they were young.

As shown in Table 2, the majority of workers experienced mild fatigue (48.84%), while experienced moderate fatigue (34.88%), and experienced severe fatigue 4.65%. The majority of pottery workers face a moderate psychosocial environment (81.40%) and a moderate performance (62.79%). Furthermore, it was found that 41.86% of participants reported insufficient calorie consumption, while 25.58% reported excessive calorie intake.

The results of mean and standard deviation values for performance in this research are shown in Table 3. The results of this research, the value of TP for pottery workers had a mean value of 1.656, CP had a value of 0.811, and CWB had a value of 0.484. Thus, the total performance score obtained was 5.980 out of a total of 12 scores.

Table 4 shows the results of the association between individual characteristic factors and the performance of female pottery workers in this research. The results of the age-performance relationship, using the *Chi-square* test with a significance level of $\alpha = 5\%$ and 8 *Degrees of Freedom* (df), yielded a calculated χ^2 value greater than the tabulated χ^2 value ($17.758 > 15.507$) with a *p-value* of 0.023 (<0.05). Consequently, the null hypothesis (H_0) was rejected. This means that there was a significant relationship between age and performance.

Table 1. Individual characteristic factors of female pottery workers in Karanganyar

Factors	Categories	Frequency	Percentage (%)
Age (years)	21 - 30	3	6.98
	31 - 40	7	16.28
	41 - 50	14	32.56
	51 - 60	10	23.26
	>60	9	20.93
Length of service (years)	<10	8	18.60
	11 - 20	7	16.28
	21 - 30	8	18.60
	>30	20	46.51
Marital status	Single	3	6.98
	Married	40	93.02
Number of children	0	3	6.98
	1 - 2	20	46.51
	3 - 4	14	32.56
	>4	6	13.95
	0	3	6.98

Table 2. Fatigue, psychosocial environment, and calorie adequacy of female pottery workers in Karanganyar

Variables	Categories	Number (N)	Percentage (%)
Fatigue	Normal	5	11.63
	Mild	21	48.84
	Moderate	15	34.88
	Severe	2	4.65
Psychosocial environment	Low	4	9.30
	Moderate	35	81.40
	High	4	9.30
Calorie adequacy	Deficit	18	41.86
	Adequate	14	32.56
	Excessive	11	25.58
Performance	Low	7	16.28
	Moderate	27	62.79
	High	9	20.93

Table 3. Mean and standard deviation values for performance

Performance	N	Minimum	Maximum	Mean	Std. deviation
Task Performance (TP)	43	0.20	3.20	1.656	0.671
Contextual Performance (CP)	43	0.13	1.88	0.811	0.532
Counterproductive Work Behavior (CWB)	43	0.00	2.40	0.484	0.496
Total		4.23	8.05	5.980	1.061

Table 4. Association between individual characteristic factors and performance of female pottery workers in Karanganyar

Factors	Performance			n	%	χ^2 value	p-value
	Low (n = 7)	Moderate (n = 27)	High (n = 9)				
Age (years)							
21 - 30	0	1	2	3	6.98	17.758*	0.023**
31 - 40	4	3	0	7	16.28		
41 - 50	1	9	4	14	32.56		
51 - 60	1	6	3	10	23.26		
>60	1	8	0	9	20.93		
Length of service (years)							
<10	2	2	4	8	18.60	8.238	0.221
11 - 20	1	5	1	7	16.28		
21 - 30	1	7	0	8	18.60		
>30	3	13	4	20	46.51		
Marital status							
Single	1	2	0	3	6.98	1.259	0.533
Married	6	25	9	40	93.02		
Number of children							
0	1	2	0	3	6.98	3.621	0.728
1 - 2	3	14	3	20	46.51		
3 - 4	2	7	5	14	32.56		
>4	1	4	1	6	13.95		

* The *Chi-square* value indicates significance and ** *p-value* < 0.05

Table 5. Association between fatigue, psychosocial environment, and calorie adequacy toward performance based on *Chi-square*

Factors	Performance						n	%	χ^2 value	p-value
	Low (n = 7)	%	Moderate (n = 27)	%	High (n = 9)	%				
Fatigue										
Normal	0	0.00	1	20.00	4	80.00	5	11.63	13.729*	0.033**
Mild	5	23.81	13	61.90	3	14.29	21	48.84		
Moderate	2	13.33	11	73.33	2	13.33	15	34.88		
Severe	0	0.00	2	100.00	0	0.00	2	4.65		
Psychosocial environment										
Low	2	50.00	2	50.00	0	0.00	4	9.30	11.395*	0.022**
Moderate	5	14.29	24	68.57	6	17.14	35	81.40		
High	0	0.00	1	25.00	3	75.00	4	9.30		
Calorie adequacy										
Deficit	0	0.00	15	83.33	3	16.67	18	41.86	9.635*	0.047**
Adequate	5	35.71	5	35.71	4	28.57	14	32.56		
Excessive	2	18.18	7	63.64	2	18.18	11	25.58		

* The *Chi-square* value indicates significance and ** *p-value* < 0.05

On the other hand, length of service (p -value = 0.221, $df = 6$, $\chi^2 = 8.238$), marital status (p -value = 0.533, $df = 2$, $\chi^2 = 1.259$), and the number of children (p -value = 0.728, $df = 6$, $\chi^2 = 3.621$) had p -values exceeding 0.05, and their *Chi-square* values (χ^2) were lower than the critical values. Therefore, the length of service, marital status, and the number of children had no significant association with the pottery workers' performance.

Table 5 shows the relationship between fatigue, psychosocial environment, and calorie adequacy on the individual performance of female pottery craftsmen in Karanganyar. Most of the pottery workers experienced mild fatigue and had a moderate psychosocial environment. In addition, as many as 18 workers (41.86%) experienced a lack of calorie intake. The *Chi-square* test for fatigue and performance yielded a *Pearson Chi-square* (χ^2) value of 13.729 with 6 df , exceeding the critical value (12.592). In addition, its p -value was 0.033, less than the significance level ($\alpha = 0.05$). The *Pearson Chi-square* value of the association of psychosocial environment and performance was 11.395 with 4 df and the p -value was 0.022 (<0.05), indicating statistical significance. Meanwhile, *Chi-square* test for calorie adequacy and performance with a significance level of $\alpha = 5\%$ and 4 df resulted in a χ^2 value greater than the tabulated χ^2 value ($9.635 > 15.507$) with a p -value of 0.047 (<0.05). Hence, from these results, fatigue, psychosocial environment, and calorie adequacy were significantly correlated with performance.

DISCUSSION

Based on conducted measurements, Karanganyar's pottery workers achieved an average total performance score of 5.980, task performance (mean = 1.656), contextual performance (mean = 0.811), and counterproductive work behavior (mean = 0.484). In comparison to a prior study by Koopmans *et al.* (2014) on blue-collar workers, the pottery workers exhibited relatively low values in task performance (<2), contextual performance (<1.25), and counterproductive work behavior (<1.8) (Koopmans *et al.*, 2014). The low task performance score suggests a lack of skills in planning, organizing work, producing high-quality products, and working effectively among pottery workers (Widyastuti and Hidayat, 2018). Contextual performance, which pertains to non-beneficial activities related to organizational success, was also low, indicating a lack of initiative, proactivity, cooperation, and enthusiasm among workers (Şahin *et al.*, 2020). On the other hand, the low score in counterproductive work behavior indicates positive performance, as it reflects a minimal occurrence of undesirable behaviors such as off-task conduct and task completion with negative intentions (Ramos-Villagrasa *et al.*, 2019).

In this research, age was the only individual characteristic factor significantly related to performance (p -value = 0.023, $\chi^2 = 17.758$). Age carries greater influence than length of service (p -value = 0.221, $\chi^2 = 8.238$), as numerous pottery artisans exhibit extensive tenure despite their youth, having initiated their work during childhood. Conversely, some other workers entered the pottery industry at an advanced age. This age disparity can impact their productivity, as older workers are prone to diminished physical capability and work morale, potentially influencing their overall job performance (Hamouche and Parent-Lamarche, 2022). However, older workers are perceived as highly reliable due to their valuable experience and knowledge from past work and life experiences. They also demonstrate strong work ethics and are recognized for their exceptional social skills, commitment, and loyalty to organizations compared to younger workers, which helps compensate for any potential lack of technical performance (Harris *et al.*, 2018). Marital status (p -value = 0.533, $\chi^2 = 1.259$) and number of children (p -value = 0.728, $\chi^2 = 3.621$) had no significant effect in this research. For married working women, the difficulty in balancing work and family is an important factor that affects their performance and often leads them to quit work (Anita *et al.*, 2020). However, as self-employed, female pottery workers in Karanganyar have greater autonomy and flexibility to manage work and family life, allowing them to prioritize family commitments without significantly affecting their job performance.

This research found that the psychosocial environment plays a significant role in the performance of pottery craftsmen in Karanganyar (p -value = 0.022, $\chi^2 = 11.395$). Pottery making is an independent and isolated job, resulting in low social interaction during work. This social isolation negatively affects worker performance, leading to reduced productivity and job satisfaction (Toscano and Zappalà, 2020; Van der Lippe and Lippényi, 2020). Although pottery workers often work from home, which can cause social and professional isolation, they still maintain a strong sense of community and receive support from fellow craftsmen, contributing to positive outcomes such as engagement and participation (Cicognani *et al.*, 2020).

In this research, approximately 48.84% of the workers experienced mild fatigue. Fatigue was also found to correlate with the performance of female potters (p -value = 0.033, $\chi^2 = 13.729$). The flexibility of working hours and varying workloads based on pottery orders contribute to increased work fatigue. The absence of a clear work structure and limited access to resources, combined with the demands of solving work problems independently, makes informal workers vulnerable to burnout. Fatigue resulting from these factors leads to stress, decreased productivity, and performance issues such as reduced speed, decreased product quality, increased errors and accidents, and inaccuracies in

work (Atiqoh *et al.*, 2014). Adequate rest and sleep can alleviate fatigue, but its presence negatively impact physical performance and concentration (Sagherian *et al.*, 2017; Tucker and Folkard, 2012), to reduce fatigue, it is recommended to take breaks that are long enough to recharge but not so long, as longer breaks are associated with reduced fatigue but may lead to more significant declines in performance (Lim and Kwok, 2016), to reduce fatigue and maintain performance, workers are recommended to take short 1-2 minute stretching breaks every 30 minutes and a 30 - 60 minute break after 4 hours of work (Narpati *et al.*, 2019).

This research also found an association between calorie intake and the performance of female pottery workers ($p\text{-value} = 0.047$, $\chi^2 = 9.635$). Nutrition plays a vital role in productivity by influencing overall health and work performance, as studies indicate that nutrient intake levels, particularly energy and iron, are linked to worker productivity (Arsanti *et al.*, 2023). However, a significant portion of artisans, 41.86%, do not consume enough calories to meet their nutritional needs. Economic constraints, particularly among low-income groups, hinder their ability to obtain sufficient calories. The research revealed that workers primarily rely on vegetable protein sources, such as tofu and tempeh, which are more affordable than animal protein sources. Additionally, 86% of potters do not consume meat daily, and their food variety is limited to 1 or 2 food groups.

While adequate calorie intake is crucial for maintaining bodily functions and activities, maximizing calories without considering nutritional quality is insufficient for improving performance, for example, overconsumption of carbohydrates can lead to cardiovascular disease and diabetes (Nishisaka *et al.*, 2022). Insufficient calorie intake can result in decreased concentration and increased accident risk, while excess calories can lead to drowsiness, sluggishness, and reduced work speed (Novanda, 2014). Thus, workers need to maintain a balanced diet and ensure sufficient intake of macro and micronutrients to support their performance. Therefore, the role of community health centers in pottery crafts areas is crucial in providing occupational health and safety outreach, especially in promoting the importance of a balanced diet.

CONCLUSION

The age, psychosocial environment, work fatigue, and calorie adequacy of female pottery artisans in Karanganyar, Borobudur, are found to be significantly linked to their performance outcomes. This research reveals that a considerable portion of pottery artisans in Karanganyar village are elderly. Additionally, these artisans work independently, which restricts their access to social support in the workplace. A predominant number of pottery artisans also contend

with insufficient calorie intake and maintain an imbalanced diet. Based on these findings, improving the performance of women potters in Karanganyar can be achieved by addressing these factors through community support initiatives, improving work and rest management, and promoting healthy eating habits.

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