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The Effect of the Shift System on the Physiological Response of Blood Pressure and Pulse Frequency on Nusa Cendana University's Campus Security Unit Officers

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Abstract

Background: Changes in daily activity schedules, such as work shifts, disrupt the circadian rhythm, resulting in physiological effects such as sleep disruptions, fatigue, hypertension, cardiovascular issues, and diabetes.The purpose of this study is to examine the effect of the shift system on physiological responses such as blood pressure and pulse frequency.Methods and Design: This study employs a quasi-experimental design. This study was done at the Nusa Cendana University's Campus Security Unit Office, with a sample size of 90 people.Total sampling was utilized, and the Kruskal Wallis test was performed to analyze the data. Results: The bivariate analysis indicated a significant value in the physiological response to blood pressure between the morning shift (p=0.000), night shift (p=0.000), and holiday shift (p=1,000), as well as in the physiological response to pulse frequency between the morning shift (p=0.829), night shift (p=0,548), and holiday shift (p=0,692).Conclusion: There is a significant effect of blood pressure on the morning and night shifts, but there is no effect on holiday rotation. The shift system has no effect on pulse frequency in the morning shift, night shift, or holiday rotation.

Keywords: Work Shift; Blood Pressure; Pulse Frequency.

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1. Introduction

Shift work, while providing numerous advantages in terms of the production process, also has a negative effect. Shift work has physiological, social, and performance consequences. The physiological effect that manifests is the body's reaction to changing situations as a work stressor [1]. Work shifts and continuous work activities for 24 hours will have an impact on the basic physiological functions of the human body connected to the human biological clock, which has its own pace and rhythm and is generally referred to as a circadian rhythm [2]. Increased activity during the day might cause an increase in pulse rate and blood pressure. Meanwhile, at night, all body functions slow down and drowsiness sets in. This is because of natural circumstances like day and night.This habitual bodily condition is unquestionably tough to change. As a result, if the body is required to work at night, modifications and proper work schedule preparations are required so that the workforce can still achieve and be productive [3].

2. Material and Methods

This is a quantitative type of research [4]. A Quasi-Experimental Pre-Test - Post Test Control group with paired samples was employed in the design [5]. This study was done at the Nusa Cendana University Campus Security Unit office from February to March 2021, with a total sample size of 90. Total sampling was employed as a sampling technique [6]. The Kruskal Wallis test was used to analyze the variables examined: blood pressure and pulse frequency [7].

3. Results

3.1 Characteristics of Respondents

Characteristics of respondents based on work unit and respondent's age

Table 1: Characteristics of respondents by work unit and age of respondents.

Variable	Criteria	n	%
Work Unit	Rectorate	4	12,1
	Post 1	3	9,1
	Post 2	5	15,2
	Post 3	2	6,1
	Post 4	6	18,2
	Post 5	2	6,1
	Post 6	4	12,1
	Post 7	6	18,2
	Post 8	1	3
	Total	33	100
Age of Respondent	≤30 years old	9	27,3
	> 30 years old	24	72,7
	Total	33	100

Table 1 shows that the majority of respondents work in postal work units 4 and 7, with a total of 6 respondents (18.2 percent), and the majority of respondents are above the age of 30.

3.2 The effect of the shift system on the physiological response of blood pressure in each shift

Table 2: Differences in physiological responses to systolic blood pressure before and after working in the morning, night, and holiday shifts.

Data Normality						**Kruskal-Wallis Test**		
Variable	Shift	Pre and Post	Statistic	Df	Sig.	n	MeanRank	Asymp.Sig.
Blood Pressure	Morning	Morning Shift Pre-Test	0,746	33	0,000	33	22,29	0,000
		Morning ShiftPost Test	0,874	33	0,001	33	44,71	
	Night	Night Shift Pre-Test	0,746	33	0,000	33	22,91	0,000
		Night Shift Post Test	0,93	33	0,035	33	44,09	
	Holiday	Holiday Shift Pre-Test	0,746	33	0,000	33	33,5	1,000
		Holiday Shift Post Test	0,746	33	0,000	33	33,5	

The Kruskal Wallis analysis for blood pressure before and after working the morning shift yielded a significant result of 0.000, indicating that the morning shift has a significant effect on the physiological response of blood pressure. On the night shift, a significant value of 0.000 was obtained, indicating that the night shift has a significant effect on the physiological response of blood pressure, whereas on the holiday rotation, a significant value of 1.000 was obtained, indicating that the holiday rotation has no significant effect on the physiological response of blood pressure.

3.3 The effect of the shift system on the physiological response of the pulse rate in each shift

Table 3: Differences in the physiological response of pulse frequency before and after working in the morning, night, and holiday shifts.

Data Normality						**Kruskal-Wallis Test**		
Variable	Shift	Pre and Post	Statistic	Df	Sig.	n	MeanRank	Asymp.Sig.
PULSE	Morning	Morning Shift Pre-Test	0,884	33	0,002	33	33,03	0,829
		Morning Shift Post Test	0,842	33	0	33	33,97	
	Night	Night Shift Pre-Test	0,909	33	0,009	33	32,11	0,548
		Night Shift Post Test	0,88	33	0,002	33	34,89	
	Holiday	Holiday Shift Pre-Test	0,929	33	0,033	33	32,58	0,692
		Holiday Shift Post Test	0,931	33	0,037	33	34,42	

The Kruskal Wallis analysis for pulse frequency before and after working the morning shift yielded a significant value of 0.829, indicating that the morning shift had no significant influence on the physiological response of pulse frequency. There was a significant value of 0.548 for the night shift, indicating that there was no significant effect of the night shift on the physiological response of the pulse frequency, while a significant value of 0.692 was obtained for the holiday rotation, indicating that there was no significant effect of the holiday rotation on the physiological response of the pulse frequency.

4. Discussion

4.1 The effect of the shift system on the physiological response of blood pressure in each shift

The Kruskal Wallis analysis for the blood pressure variable reveals that morning shift and night shift have a significant effect on blood pressure, but holiday rotation has no significant effect on blood pressure. Blood pressure increased by 8.5 percent after work in the morning shift compared to before work. Meanwhile, the increase in blood pressure after work on the night shift was 11.5 percent higher than before work. [8]This is aligned with Lubis research on the comparison of blood pressure before and after staying up late at security at the J-City Medan Johor housing, which found that there was a change in blood pressure when staying up late. Another study, done by Maulana [9] found no significant difference in blood pressure changes between nurses working morning, afternoon, and night shifts.This can occur due to differences in samples, research sites and individual characteristics.Circadian rhythms can differ from one person to another owing to genetic reasons [10]. Disruption of the circadian rhythm is a trigger for many of the pathways that lead to hypertension. Circadian rhythm disruption can result in altered endothelial function via reduced nitric oxide or myocyte hypertrophy and fibrosis [11]. Furthermore, this can be caused by a common mechanism involving disturbance of the circadian rhythm. Melatonin disorders are also considered to be the root cause of hypertension. Melatonin is secreted by the pineal gland under the control of the hypothalamic suprachiasmatic nucleus [12].

Melatonin was the first hormone discovered to regulate the circadian rhythm. Melatonin regulates diurnal genes in the gonads and peripheral tissues via the hypothalamic-pituitary-gonadal axis and the hypothalamic-pituitary-adrenal gland axis and blood pressure control via vascular endothelial cells [12,11].

The presence of light influences melatonin secretion and inhibition, but blood pressure regulation is more difficult in shift workers than in non-shift workers because irregular light exposure, which is linked with melatonin secretion, disrupts circadian rhythms [11]. So, in summary, the night shift blood pressure rise is caused by disruptions in the circadian rhythm, secretion of the hormone cortisol, and secretion of the hormone melatonin in night shift workers.

4.2 The effect of the shift system on the physiological response of the pulse rate in each shift

The morning shift ($p=0.829$), night shift ($p=0.548$), and holiday rotation ($p=0.692$) had no significant influence on the pulse frequency, according to Kruskal Wallis analysis. This study supports the findings of Nazri SM [13], who discovered that the average pulse rate of the morning, afternoon, and night shifts did not change significantly. This study contradicts Indrasari [14] research, which found variations in pulse rates between shift and non-shift workers. The variation in physical activity with each shift leads a person to have a greater heart rate frequency [15]. This is due to the heart muscle working hard at each contraction, and the higher the pressure exerted on the arteries, the harder and more often the heart muscle pumps [16]. The pulse frequency parameter is the body's physiological response that varies rapidly in response to physical activity, therefore the physical state and workload when measured in each shift will have a significant impact on the pulse frequency results [17]. The work of the heart, according to Tarwaka [17], may be observed in the pulse, which is a propagation of the heart rate. Every 9 minutes, the pulse is measured using a count of repetitions (times/minute) or a maximum

pulse minus age. A typical resting heart rate is the same as the heart rate, which is around 70 to 80 beats per minute [16].

5. Conclusion

According to the findings of this study, the morning shift and night shift systems have a significant effect on blood pressure, while the rotation of holidays has no effect on blood pressure. Furthermore, the morning shift system, night shift system, or holiday rotation have no significant effect on pulse frequency.

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