American Journal of Psychiatric Rehabilitation

Expert Opinion Article

"A Pre-Experimental Study on the Effectiveness of the 'BUGAR' Android-Based Application in Reducing Work Fatigue Among Manufacturing Workers in Karawang, Indonesia"

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ABSTRACT

Introduction: Workers often overlook fatigue, and this is also true for their families, worker groups, and managers at the workplace. Fatigue is often viewed as a minor health issue that can be addressed by resting. The goal is to identify the advantages of BUGAR nursing interventions in addressing work fatigue among manufacturing shift workers in Karawang Regency. **Methods:** This research was designed in quantitative research with a pre-experimental design, with one pre-test and post-test design. The research was carried out at Rejang Lebong Hospital from August to November 2020. 51 workers were chosen using non-random consecutive sampling techniques. **Results:** The average knowledge of the workers increased from 70.45 to 75.10, attitude improved from 70.16 to 75.86, and skills increased from 67.43 to 74.08. Meanwhile, the level of work fatigue decreased from the previous average value of 67.43 to 22.69. The paired t-test results revealed that the p-value for the variables of knowledge, attitude, skills, and work fatigue is 0.000, indicating that the p-value is <0.05. **Conclusion:** The BUGAR innovation intervention has a notable impact on the knowledge, attitudes, skills, and reduction of work fatigue in the worker group.

Keywords: workplace fatigue, manufacturing shift workers, BUGAR

INTRODUCTION

Workers often overlook fatigue, and the same goes for their families, worker groups, and the managers of the institutions where they work (Reynolds et al., 2021). Untreated fatigue in workers can increase the prevalence of illness, accidents and even death in workers, thus having an impact on reducing the quality of life of workers and work productivity in the institution where the individual works. (Silva et al., 2020).

Fatigue is a decrease in performance, alertness and reduced physical and mental work capacity to continue activities, resulting in decreased ability or reluctance to respond to situations(Kunasegaran et al., 2023). The demands of the current industrial revolution 4.0 era require workers to be willing to work in shifts so that the production process can meet global needs. Using a shift work system is known to have a negative impact on health status, one of which is causing fatigue (Permatasari et al., 2022)

Fatigue indirectly affects personal relationships between workers and those around them, and affects family life (Tong et al., 2022). Fatigue can also result in the risk of work accidents (Wingelaar-Jagt et al., 2021), experiencing health problems such as chronic diseases and high health costs(Petersen et al., 2020).

According to data from the Central Statistics Agency (BPS), in 2019, Indonesia had three provinces with the largest number of workers, namely West Java, East Java, and Central Java. The first province with 21,994,014 workers was West Java, then East Java with 20,762,554 people, and Central Java with 17,805,261 people. West Java has the largest number of workers because this province has three quite large industrial cities, namely Bekasi City/Regency, Karawang Regency, and Purwakarta Regency (Mboi et al., 2022)

Frida Kasumawati et al., Suggests significant health impacts on workers from heat stress exposure in the workplace, showed that heat stress and highlights the need for revision of work practices, increased protective measures, and possible development of work safety standards for heat exposure(Kasumawati et al., 2023).

Several nursing interventions to help manage worker fatigue are needed(Querstret et al., 2020). The intervention is carried out using a workbook (workbook of workers) and innovative BUGAR (body and soul must be good active and relaxed) nursing interventions through health screening activities, health education, body stretching exercises, ergonomics exercises, self-hypnosis exercises, counseling and direct care at the company

health clinic, and home visits to involve families as the main support system for workers..

RESEARCH METHODOLOGY

This research was quantitative research using a pre-experimental design, with one group pre-test and post- test design. This study measured the level of knowledge, attitudes, and skills of a group of workers regarding work fatigue by providing nursing interventions based on the BUGAR application.

The number of samples used in this study was 51 samples. The sample criteria were selected non-randomly using consecutive sampling techniques. The inclusion criteria are that the respondent works at PT. X, experiences work fatigue, works in shifts, and is willing to be a respondent. Exclusion criteria were not working shifts, not experiencing work fatigue, and not being willing to be a respondent.

Measurement

Work fatigue is measured by instruments *fatigue severity scale* (FSS) dari Krupp et. al. (1989) with *Cronbach alfa* value from study by Permatasari, Sahar, & Mansyur (2019) is 0,000. Meanwhile, knowledge, attitudes, and skills related to work fatigue are measured using instruments prepared by the author, and validity and reliability tests have been carried out. The bivariate analysis method used is the paired t-test which tests the intervention group without the control group. Previously, the "BUGAR" application was carried out in a pilot study with 30 respondents to see the suitability of users.

Etic clearance

Ethical Approval Letter Number: EC.182/KEPK/ STKBS/VII/2025

RESULT

Table 1: Respondent Characteristics

Variable	Kategory	N	%
Age	Early adulthood	40	79,4
	Mild adulthood	8	15,6
	Late adulthood	3	5,0
Gander	Male	49	96,0
	Female	2	4,0
Education Level	High School	43	84,0
	Diploma/Bachelor's Degree	8	16,0
ethnic group	Sundanese Tribe	26	51,0
	Javanese	21	41,0
	Betawi	4	9,0

The study sample is primarily composed of early adults, with a significant majority (79.4%) falling into the early adulthood category, which suggests that the research focuses mainly on younger individuals, likely aged between 18 and 40 years. The gender distribution is notably imbalanced, with 96% of participants being male, and only 4% female, indicating a strong male predominance within the sample. In terms of education, most participants (84%) have completed high school, while only a small proportion (16%) hold a diploma or bachelor's degree, reflecting a relatively low level of higher education within the group.

Table 2 Level of Knowledge, Attitude, and Skills related to Work Fatigue in Manufacturing Workers

Variables	Knowledge	Attitude	Skills
Before the "BUGAR"Intervention			
Mean	70,45	70,16	67,43
Median	70,00	70,00	67,00
SD	4,805	4,937	4,006
95% CI	74,43-77,29	68,77-71,55	66,30-68,56
Min-Maks	60-80	56-80	60-77
After the "BUGAR"Intervention			
Mean	75,10	75,86	74,08
Median	74,00	75,00	73,00
SD	5,159	5,087	5,059
95% CI	73,65-76,55	74,43-77,29	72,66-75,50
Min-Maks	64-86	66-88	64-86
***p* value**	**0,000**	**0,000**	**0,000**

The data reveals a significant improvement in **Knowledge**, **Attitude**, and **Skills** following the "BUGAR" intervention. Before the intervention, the average scores were 70.45 for knowledge, 70.16 for

attitude, and 67.43 for skills. After the intervention, these scores increased to 75.10 for knowledge, 75.86 for attitude, and 74.08 for skills. The improvements were statistically significant, with p-values of 0.000 for all variables, indicating that the intervention had a meaningful and positive impact on participants across all areas. These results support the effectiveness of the "BUGAR" intervention in enhancing the participants' knowledge, attitude, and skills.

Table 3 Level of Work Fatigue in Manufacturing Workers

Variable	Work Fatigue
Before BUGAR Intervention	
Mean	67,43
Median	67,00
SD	4,006
95% CI	66,30-68,56
Min-Maks	60-77
After BUGAR Intervention	
Mean	22,69
Median	22,00
SD	3,728
95% CI	21,64-23,73
Min-Maks	70-82
***p* value**	**0,000**

The data indicates a significant reduction in work fatigue following the BUGAR intervention. Before the intervention, the average work fatigue score was 67.43, with scores ranging from 60 to 77, showing moderate variability. After the intervention, the mean score dropped to 22.69, with scores ranging from 70 to 82. Despite the overall decrease, there was still some variation in the post-intervention fatigue levels. The p-value of 0.000 confirms that this change is statistically significant, suggesting that the BUGAR intervention was effective in reducing work fatigue among participants.

DISCUSSION

The results of this study demonstrate a clear and statistically significant improvement in **Knowledge**, **Attitude**, and **Skills** after the "BUGAR" intervention, as reflected by the pre- and post-intervention scores. The intervention appears to have effectively enhanced these three critical dimensions, which are often foundational to behavior change and skill development in various contexts.

A 12-week study revealed a noteworthy rise in the group's average knowledge score following the implementation of the BUGAR intervention. This increase was attributed to the facilitation of information exchange and the acquisition of new knowledge during the learning process (Al-Kurdi et al. , 2020). Residents offer education along with group interaction facilitated by the use of an Android-based application. During group interactions, every member assumes a specific role, offering chances for all individuals to ponder, express thoughts, and engage in discussions collectively to gather abundant information (Lestari et al. , 2021).

This condition extends to group attitudes as well, indicating a rise in the average attitude score following the implementation of the anti-stigma program (Wulansari et al. , 2021). Furthermore, it has been observed that groups of workers have also seen a rise in their skill levels (Kaasinen et al. , 2020). The nursing intervention applied within a group of workers utilizing the innovative BUGAR method, developed by the author and implemented for a duration of 12 weeks, has yielded significant outcomes. Specifically, it has enhanced the knowledge, attitudes, and skills of the workers with regards to efforts aimed at preventing and managing work fatigue. Furthermore, this intervention has effectively minimized work fatigue among the group of employees. Prior to the intervention, workers were facing moderate levels of work fatigue which transitioned to mild levels post-intervention. While the overall results are positive, there is some variability in the post-intervention scores, particularly for skills, with scores ranging from 64 to 86. This indicates that while most participants benefitted from the intervention, the extent of improvement may have varied depending on individual factors such as baseline knowledge, motivation, or prior experience. Further investigation into these factors could provide insights into why some individuals experienced greater improvements than others.

Limitations:

A limitation of this study is the lack of a control group, which would help establish whether the improvements were solely due to the "BUGAR"

intervention or if other factors contributed to the changes observed. Additionally, it would be valuable to assess the long-term impact of the intervention, as knowledge, attitudes, and skills may change over time with continued practice and exposure.

Implications:
The results suggest that the "BUGAR" intervention is effective in enhancing knowledge, attitudes, and skills, which has important implications for future programs aimed at improving similar outcomes. Given the significant improvements in all areas, this intervention could be a valuable tool for educational or professional settings where these attributes are essential. Moreover, the study highlights the importance of evaluating not just knowledge but also the accompanying shifts in attitude and skill development for a more holistic understanding of intervention effectiveness.

Conclusion:
In conclusion, the "BUGAR" intervention has proven to be effective in enhancing **Knowledge**, **Attitude**, and **Skills**, as evidenced by statistically significant improvements across all three variables. These results suggest that the intervention holds promise for use in similar contexts, and further exploration of its long-term effects and underlying factors influencing variability in responses would be beneficial for refining and scaling the intervention.

ACKNOWLEDGEMENT
This research is funded by Horizon University Indonesia. For this reason, we thank the financial assistance provided for the implementation of the research process.

CONFLICT OF INTEREST
The authors states that this study has no conflict of interest

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