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RESEARCH ARTICLE

Personal and Environmental Risk Factors of Work-Related Stress: A Cross-Sectional Study among Female Workers of a Textile Industry in Indonesia

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Abstract:

Background:

In 2017, the prevalence of work-related stress reached 10.7% of the 792 million population. This work-related stress is common in the textile industry, characterized by many environmental risk factors coming from the weaving processes. The stress problem is discussed in various countries worldwide.

Objective:

The study aimed to investigate the personal and environmental risk factors for work-related stress in textile industry workers.

Methods:

This cross-sectional study was conducted in a textile factory weaving section in Solo, Indonesia. The subjects of this study were 188 female weaving operators that met the inclusion and exclusion criteria. The sound level meter was operated to measure the environmental noise, while environmental working conditions, work experience, social support, and work-related stress were measured using questionnaires. Furthermore, the Somers' Delta correlation was used to analyze the relationship between personal and environmental risk factors for work-related stress.

Results:

Surprisingly, this study found no significant correlation between personal and environmental risk factors (independent variables) with work-related stress (dependent variables). In personal factors, most of the workers are late adulthood (36-45 years old), the length of working dominated more than ten years (90.42%), with most of them having senior high school education (58.51%). In terms of environmental risk factors, most of the workers have good working environment conditions (51.6%); are well experienced in weaving tasks (54.3%), with a high social support category (58%).

Conclusion:

Although some previous studies indicated that personal factors, working conditions, and social support could trigger stress among workers, this study found no correlation between the independent and the dependent variables.

Keywords: Noise, Social support, Work experience, Work-related stress, Weaving processes, Female workers.

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1. INTRODUCTION

Indonesia has been experiencing a serious economic distraction due to the COVID-19 pandemic, forcing many companies to formulate policies to survive unfavorable conditions [1]. Many companies reduced costs by delaying machine repairs and limited working hours [2], one of which happened to IT Co., Ltd., the largest textile company in Solo. The weaving section has a high noise level, unfavorable working conditions from old damaged machines, and poor interaction between workers and management. This problem can interfere with workers' mental health, such as causing

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work-related stress, a work-related disease often complained about in the weaving section [3]. A systematic review study in European countries stated that noise exceeding the threshold value could cause various stress symptoms. These include sleep disorders, cardiovascular, birth and reproduction complications, mental health, well-being, and quality of life [4, 5]. Moreover, studies in Asia, especially in China, show that noise intensity exceeding 85 dB could cause physiological and mental disorders, and the risk increases when it exceeds 95 dB [6, 7].

The work-related stress problem has been discussed worldwide as one of the occupational health problems [8]. In 2017, stress and mental disorder prevalence reached 10.7% of the 792 million people in many developed and developing countries [9]. Also, in developed countries such as the United States, the job stress prevalence was 94% of the total workforce in 2019. Absenteeism decreased productivity, and stress treatment caused 120,000 deaths and 300 billion US dollars loss [10]. This number far exceeds the loss or injury cost of 171 billion dollars resulting from work accidents in the same year [11]. A survey in various developing countries in Asia showed that work is the main cause of stress. The prevalence of stress is 57% in Malaysia, 62% in Hong Kong, 63% in Singapore, 71% in Vietnam, 73% in China and Indonesia, and 75% in Thailand [12].

The February 2020 data from Social Health Insurance Administration Agency in Indonesia showed that the total workforce was 137.91 million people, an increase of 1.73 million from the previous year [13]. Therefore, the magnitude of the losses and the work-related stress prevalence in Indonesia are important factors that must be studied with more incentives. Furthermore, several previous studies showed that women are vulnerable to stress [14, 15].

The weaving process of the textile industry poses a high-intensity noise hazard, which comes from machine movements that have the potential to cause work-related stress, so proper analysis and recommendations are needed to overcome this noise. IT Co. Ltd is one of the largest textile companies in Solo - Indonesia, surviving the economic shocks due to the global COVID-19 pandemic. It uses many damaged production machines, causing a high level of noise. This condition is suspected of causing many work-related stress complaints among weaving workers. Therefore, this study investigates the correlation between personal and environmental risk factors and work-related stress. The results could be useful for industries, governments, practitioners, and researchers to take corrective actions that reduce the negative impact of environmental risk factors and work-related stress.

2. METHODS

2.1. Study Design and Setting

This cross-sectional study was conducted in the weaving section of IT Co. Ltd., Solo, Indonesia. It aimed to investigate the personal and environmental risk factors with work-related stress among 188 female weaving workers exposed to high noise levels. The participants comprised operators that met the inclusion and exclusion criteria. These included the willingness to become research participants, working the morning shift with a minimum of eight working hours per day, being female, and having a normal body mass index.

2.2. Data Collection

Data collected in August 2021 is located in the weaving section of IT Co. Ltd, Solo, Indonesia. Public health practitioners, psychologists, and community medicine experts were invited to develop and validate the environmental working conditions, work experience, and social support questionnaire. A sound level meter, EXTECH 10059792, was used to measure environmental noise by assessing the exposure of noise intensity (decibel/dB) during working hours from 08.00to 11.00 Western Indonesian Time. Moreover, the questionnaire from HSE Executives assessed the level of work-related stress, with scale categories ranging from mild, moderate, high, and very high. The questionnaire in this study has also been tested for validity and reliability with the Pearson Product Moment test.

2.3. Data Analysis

The Somers' Delta correlation test analyzed the relationship between personal factors, including age, length, educational attainment, and work experience. Also, the study tested environmental factors, such as noise exposure, environmental working condition, and social support in work-related stress with SPSS 21 application program.

3. RESULTS

This research was conducted in IT Co. Ltd., Solo, Central Java, Indonesia, with 188 weaving operators. Table **1** shows participants' age, working duration, educational attainment, noise exposure, environmental working condition and experience, social support, and work-related stress. Also, Table **2** shows a bivariate analysis using the Somers' Delta correlation test.

Table 1. Participants distributed work-related stress in IT Co. Ltd., Solo, Central Java Indonesia.

Variables	Frequency (People)	Percentage (%)
Age		
Early adulthood (26-35 years old)	42	22.34
Late adulthood (36-45 years old)	103	54.79
Early old age (46-55 years old)	43	22.87
Total	188	100
Length of Working		
New (<6 years)	3	1.60

(Table 1) contd....

Variables	Frequency (People)	Percentage (%)
Moderate (6-10 years)	15	7.98
Senior (>10 years)	170	90.42
Total	188	100
Educational Attainment		
Primary School	12	6.38
Junior High School	66	35.11
Senior High School	110	58.51
Total	188	100
Noise Exposure		
96-100 dB	12	6.38
101-105 dB	162	86.17
106-110 dB	13	6.92
111-115 dB	1	0.53
Total	188	100
Environmental Working Condition		
Good Working Environment	97	51.6
Unfavorable Working Environment	91	48.4
Total	188	100
Work Experience		
Well Experienced	102	54.3
Less Experienced	86	45.7
Total	188	100
Social Support		
High Social Support	109	58
Low Social Support	79	42
Total	188	100
Work-related Stress		
Light	91	48.4
High	97	51.6
Total	188	100

Table 2. Bivariate analysis of work-related stress using Somers' Delta correlation test.

Risk Factors of Work-Related Stress	Work-related Stress Category					
	Category	High	Light	Total	r	*p*
Age	Early adulthood (26-35 years old)	21 (48.8%)	22 (51.2%)	43 (100%)	0.022	0.751
	Late adulthood (36-45 years old)	57 (55.3%)	46 (44.7%)	103 (100%)		
	Early old age (46-55 years old)	19 (45.2%)	23 (54.8%)	42 (100%)		
Length of working	New (<6 years)	91 (53.5%)	79 (46.5%)	170(100%)	-0.104	0.104
	Moderate (6-10 years)	5 (33.3%)	10 (66.7%)	15 (100%)		
	Senior (>10 years)	1 (33,3%)	2 (66,7%)	3 (100%)		
Educational attainment	Primary School	10 (83.3%)	2 (16.7%)	12 (100%)	0.125	0.075
	Junior High School	35 (53%)	31 (47%)	66 (100%)		
	Senior High School	52 (47.3%)	58 (52.7%)	110 (100%)		
Noise exposure	111-115 dB	1 (100%)	0	1 (100%)	-0.026	0.699
	106-110 dB	7 (53.8%)	6 (46.2%)	13 (100%)		
	101-105 dB	81 (50%)	81 (50%)	162 (100%)		
	96-100 dB	8 (66.7%)	4 (33.3%)	12 (100%)		
Environmental working condition	Unfavorable working environment	44 (48.4%)	47 (51.6%)	91 (100%)	-0.063	0.388
	Good working environment	53 (54.6%)	44 (45.4%)	97 (100%)		
Work experience	Less experienced	45 (52.3%)	41 (47.7%)	86 (100%)	0.013	0.854
	Well experienced	52 (51%)	50 (49%)	102 (100%)		

(Table 2) contd....

Risk Factors of Work-Related Stress	Work-related Stress Category					
	Category	High	Light	Total	r	*p*
Social Support	Low social support	39 (49.4)	40 (50.6%)	79 (100%)	-0.038	0.603
	High Social Support	58 (53.2%)	51 (46.8%)	109 (100%)		

All participants in this study were females working in the weaving section on the morning shift (08.00-16.00 Western Indonesian Times). Most of the respondents had good working environment conditions (51.6%); were well experienced in weaving tasks (54.3%), with a high social support category (58%). Most workers were in late adulthood (36-45 years old). At the same time, the length of work dominated more than ten years (90.42%), with most of them having senior high school education (58.51%). In environmental risk factors, noise exposure in weaving workers dominated 101-105 dB (86.17%). More than half of weaving workers experienced subjective stress in the high category (51.6%).

The Somers' Delta correlation test results showed no significant correlation between the independent variables, such as personal factors of age, length of work, educational attainment, work experience, environmental factors of noise exposure, environmental working condition, social support, and the dependent variable, work-related stress at $p > 0.05$.

4. DISCUSSION

Most workers were above 36 years old; most of the workers had been working at the company for more than ten years, and more than half of the workers had a senior high school education. Bivariate analysis showed no significant correlation between personal factors of age, length of work, educational attainment, work experience, and work-related stress. This result contradicts the previous studies published in international journals. Workers' factors included gender, age, length of work, and education level influence, work-related stress and burnout in various developing countries [16]. Specifically, increasing the workers' age could increase the risk of work-related stress in the workplace. Most individuals over the age of 30 easily experience stress because they must perform competitive work that requires the mind and stamina [17]. Therefore, company management should consider age when giving job descriptions, especially for women with high physical burdens. The working period of weavers in this research was mostly more than ten years. According to several studies, workers with longer experience are more resistant to related pressures than those with a shorter tenure [18]. The length of work relates to a worker's experience in dealing with problems at work. It also has the potential to affect both positively and negatively. The longer a person works, the more experience he will have and the quicker he will be able to solve issues at work. On the other side, longer working period results in boredom [19].

Education level is not the main parameter in recruiting weaving workers, especially in IT Co., Ltd. Companies need more workers with experience and expertise in weaving work [20]. Although, in theory, an individual's level of education can affect their sense of self, capacity for problem-solving, and outlook on reaching maturity.Education is a learning process; the higher a person's education, the easier it will receive and manage information, making it easier to solve various problems in the workplace [21, 22]. Sometimes this is different from the data from some studies in many developed countries. A higher education level also has a higher risk for workers experiencing work-related stress; this happens because people with high positions in companies will get a type of work with a high level of difficulty and busyness, which can trigger stress in the workplace [23].

Bivariate analysis showed no significant correlation between environmental factors of noise exposure, environmental working conditions, and social support in work-related stress. The noise measurement results showed that all spot working areas in the weaving section exceeded the permissible intensity value (>85dB), dominated by 101 dB and beyond. Lack of variability in the noise levels could be the reason for no significant correlation between the predictors and the outcome variables. The high noise intensity causes auditory and non-auditory effects in weaving workers, especially work-related stress. Noise can be a stressor after 3 hours of continuous noise exposure in the workplace [24, 25]. The negative health effect of noise has triggered studies on noise control in the workplace. One of them is called the Hierarchy of Control [26]. The control starts with elimination control, this program removes and replaces noise-causing work tools, but it takes time and requires relatively large funds [27]. The engineering control could be applied using materials that reduce noise [28]. Reducing noise loudness from the production machine requires materials with a sound absorption function. Examples are porous, large perforated, fibrous, and combination materials [29]. Furthermore, administrative control and personal protective equipment programs could be applied when engineering controls cannot effectively regulate workplace hazards. However, these controls could interfere with the company's work operations and comfort [30].

Good environmental working conditions and high social support could reduce the stress impact and symptoms [31, 32]. Such impacts include impaired concentration, emotional disturbances, less performance and productivity, and cardiovascular and heart disease [33, 34]. An unfavorable working environment can be one of the causes of stress and burnout for workers [35, 36], although it also depends on the perception of each worker [37, 38]. If the stressor felt by the worker is within the individual tolerance threshold, the worker will not experience stress. In other conditions, if the stressor is perceived as outside the individual's tolerance threshold, thereby causing stress. This condition can be influenced by coping mechanisms in individual adjustment/adaptation /response behavior in dealing with stressors or threatening situations [39, 40]. In addition, good social support from families and friends can be a protective mechanism against stress and burnout [41, 42]. Social support obtained from co-workers and supervisors in workplaces will help workers do their jobs (correcting mistakes and helping to overcome difficulties) [43]. Mutual support behavior can be given in the

form of giving advice, feedback, appreciation, real help obtained from close social relationships, or also through the presence of other people [44, 45].

CONCLUSION

Although some previous studies indicated that personal factors, working conditions, and social support could trigger stress among workers, this study found no correlation between the independent and the dependent variables. However, considering the high occupational noise intensity, the effort to reduce stress among weaving workers should be invested to keep their workers healthy.

A practical engineering control using sound-absorbing materials could be an idea to be tried out. In the upcoming study, the researchers will use low-cost sound-absorbing materials from the company's waste, such as patchwork waste, as a sound absorber in the working area.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethics approvals for this study were obtained from the Research Ethics Committee, Faculty of Health, Jendral Soedirman University (No: 529/EC/KEPK/VIII/2021). Permission to conduct the study in the weaving section was obtained from the Director of IT Co. Ltd., Solo Indonesia, and all participants.

HUMAN AND ANIMAL RIGHTS

No animals were used for studies that are the basis of this research. All the humans were used in accordance with the ethical standards of the committee responsible for human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2013 (http://ethics.iit.edu/ecodes/node/3931).

CONSENT FOR PUBLICATION

Informed concern was obtained from all the participants.

STANDARDS OF REPORTING

STROBE guidelines were followed.

AVAILABILITY OF DATA AND MATERIALS

The data used to support the findings of this study are available from the corresponding author [H.M.D] on special request.

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CONFLICT OF INTEREST

The authors declared no potential conflicts concerning this article's research, authorship, and publication.

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