



Behavior of Users Personal Protective Equipment based on Health Belief Model and Social Capital

Budi Yulianto^{1*}, Djoko Windu Purno Irawan¹, Vincentius Supriyono¹, Uswatun Khasanah², Nurlailis Saadah²

¹Department of Environmental Health, Polytechnic Ministry of Health Surabaya, Surabaya, East Java, Indonesia; ²Department of Midwifery, Health Polytechnic Ministry of Health Surabaya, Surabaya, East Java, Indonesia

Abstract

BACKGROUND: Developing a health belief model using social capital in social groups that have the same social characteristics has never been done.

METHODS: This study was conducted on employees of the weaving division in one of the largest textile industries in Indonesia located in Sukoharjo Regency, Central Java, Indonesia. In this case, 178 respondents were selected randomly to be assessed for the health belief model through the construct of perception: Vulnerability, severity, benefit, threat, self-efficacy, barriers to readiness for action, and social capital through the construction of social networks, norms, trust, and reciprocity. To get a suitable model, the data were analyzed using path analysis with the assistance of Stata 13.

RESULTS: The results of the development of the health belief model using social capital for behavioral changes in weaving employees obtained the following results. First, the health belief model consists of the constructs of perception of vulnerability, perception of severity, perception of benefits, and perception of barriers that indirectly affect the perception of threats to behavioral changes using personal protective equipment ($b = -1.07$; 95% CI = $-1.88-0.26$; $p = 0.010$). Second, social capital has a direct effect on behavioral changes in the use of personal protective equipment ($b = 0.85$; 95% CI = $0.18-1.53$; $p = 0.013$). Furthermore, cues to action have a direct effect on behavioral changes in the use of personal protective equipment ($b = 1.35$; 95% CI = $0.49-2.21$; $p = 0.02$).

CONCLUSION: Behavioral changes to use personal protective equipment for weaving employees who are exposed to high-intensity noise are directly affected by cues to action and social capital. In addition, it is also indirectly affected by the variable of health belief model.

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***Correspondence:** Budi Yulianto, Department of Environmental Health, Polytechnic Ministry of Health Surabaya, Surabaya, East Java, Indonesia. E-mail: budiyul.by@gmail.com
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Introduction

Weaving is a part of a textile company that processes yarn into sheets of cloth using conventional weaving machines or jet loom. Characteristic that distinguishes the weaving division from others is that the weaving process produces high-intensity sounds and cotton dust fibers that are scattered in the air of the weaving room. The sound is produced by each weaving machine during the weaving process, while the cotton dust is produced by the friction between the threads during the weaving process. Such sound has characteristics of continuous and high intensity. Almost all sounds of the weaving processes produced a high intensity, exceeding the threshold value that has been set. Meanwhile, the cotton dust has various sizes that affect the length of time the cotton dust hovers in the air.

Several studies have proven that cotton dust has a risk to employee health. Research conducted previously by Ali *et al.* (2016) [1] found that employees in the textile industry in Pakistan with an average age of 32.5 years old have an FEV index of 82.6 and have symptoms of cough (15%), coughing up phlegm

(20%), and wheezing (20%). Furthermore, a study was by Tefera (2020) [2], revealing that the prevalence of respiratory symptoms in the integrated textile industry was 54% compared to the control group (28%) with chronic cough by 23%, chest tightness by 33%, and shortness of breath by 37%. In addition, based on the assessment that has been done in the study, it was also found that the lung function in employees based on work shifts has also decreased. Hinson (2016) [3] further reported the results of his research in Benin where subjects who were exposed to cotton dust (36.9%) had more respiratory symptoms than those who were not exposed to cotton dust (21.2%). In this case, the prevalence of critical cough was 16.8%, expectations were 9.8%, dyspnea was 17.4%, asthma was 2.6%, chronic bronchitis was 5.9%, and byssinosis was 44.01%. It was reported that the prevalence of these symptoms depends on the field of activity and the age of the subject.

The results of Fariba Mansouri's research (2016) [4] reported that subjects who were exposed to cotton dust had abnormal respiratory complaints based on FEV1 and FVC compared to subjects who were not exposed to cotton dust. This study did not include

the behavioral variable of using personal protective equipment. Another study conducted by Tefera (2020) further reported on subjects' exposure to cotton dust and endotoxin as well as the differences in exposure to cotton dust and endotoxin based on the share of work in a full shift in the integrated textile industry that processes cotton. The study shows a low correlation between cotton dust exposure and endotoxin, meaning that even low cotton dust exposure does not necessarily guarantee low endotoxin exposure by 9%. In this study, the prevalence of byssinosis is 44.01%, showing that the prevalence of symptoms depends on the field of activity and the age of the subject.

Noise and cotton dust in the air in the weaving area are a hazard that must be controlled. It is not possible to control the hazard of both noise and cotton dust in the weaving section, since it can be done through various methods, such as elimination, substitution, engineering, and administration. However, the most effective and efficient effort in controlling hazard is using personal protective equipment (PPE) in the form of ear protection and respiratory protection. PPE in the form of ear protective equipment and respiratory protective equipment in the textile industry as a last resort must be used by every employee while working. The company must provide PPE in accordance with the standards, quality, quantity, comfort, availability, monitoring, and mandatory use of personal protective equipment at work. In addition, the company is also obliged to socialize PPE so that it is used properly and correctly to protect safety and occupational diseases.

Disobedience or improper use of PPE can cause occupational diseases and work accidents. Work accidents increase continuously from time to time. According to Dhakiri (2019) [5], work accidents in Indonesia tend to increase, where there were 123,041 cases in 2017, which further increased by 173,105 cases in 2018 (40%). Among these cases, the majority were at the mild level with claim payments of 1.2 trillion rupiah. According to Fauziah (2019) [6], BPJS data in 2018 contained 157,133 cases from various categories. According to Helena (2019) [7], the number of work accidents in Indonesia in 2019 decreased by 130,923 cases (26.40%) from the previous year. Although these work accidents have not been divided into categories, the behavior of using PPE in a noisy workplace with high intensity, in addition to causing health problems or occupational diseases, also contributes to increase the number of work accidents.

"PT SX" is one of the textile industries in Sukoharjo Regency, Central Java, Indonesia, that produces fabrics and garments. The textile industry generally produces high-intensity noise (Yulianto, 2018) [8]. Noise in the weaving division of the textile industry is generally more than 95 dBA (Yulianto, 2019) [8], exceeding the NAV. Hazard

control in the textile industry has been widely carried out by providing PPE in accordance with quality/quantity standards, SOPs, supervision, and sanctions. Supervision that is not carried out strictly can be an opportunity not to use PPE properly and correctly.

Based on the description above, it is necessary to conduct study in predicting the of employees' behavior in using PPE with an individual belief approach through the health belief model to understand their behavior in using PPE in a noisy place. Individual behavior in the workplace community is also influenced by the quality of social interaction among employees. Social interaction in the workplace can be assessed through its social capital. In this case, to get an idea of how to predict the employees' behavior in the weaving division in using personal protective equipment, it is deemed necessary to conduct further studies by developing the theory of health belief model with social capital in the community of employees in the weaving section.

Materials and Methods

Study subject

This research is cross-sectional study using an observational approach. The purpose of this study is to obtain a behavioral model of using personal protective equipment based on the health belief model and social capital (Figures 1 and 2). In this case, 178 employees were selected as the research subjects using simple random sampling at PT SRI as the largest textile company in Indonesia located in Sukoharjo Regency, Central Java, Indonesia. The inclusion criteria determined are permanent employees, not breathing and not hearing impaired, and willing to participate in the research. Subjects who did not meet the inclusion criteria were not included to participate in this study. This research has been approved by the Health Polytechnic Ethics Commission of the Ministry of Health Surabaya, Indonesia. Furthermore, the research variables involved are the dependent variable of behavior in using personal protective equipment, while the independent variable is the health belief model: Perceived threat perception.

Statistical method

All variables studied were analyzed using path analysis with the assistance of Stata 13.0 test. Through this statistical test, new model of the development of a health belief model with social capital was obtained (Figure 3). The results of the modeling further showed the results of the path analysis that describes the variables that directly and indirectly affect the behavior of using personal protective equipment.

Results

Characteristics of subject data

The characteristics of the subjects based on the variables studied are as follows in Table 1. Most of the respondents' behavior is categorized as sufficient (82.0%) with the majority age category mean is 43.06 years old (53.4%), are junior high school graduates (69.7%), have been working in the company at the average of 7.53 years (51.7%), has day shift (73.0%), and are married (59.6%). In addition, they also have good threat perception (52.8%), moderate vulnerability perception (88.2%), sufficient perceived severity (83.7%), sufficient perceived benefit (64.0%), lacking perceived barrier (50.6%), sufficient stimulus to act (73.6%), sufficient social capital (50.6%), sufficient belief (52.2%), sufficient norm (47.8%), sufficient mutual trust (48.9%), sufficient social network (48.9%), and sufficient reciprocity (50.0%).

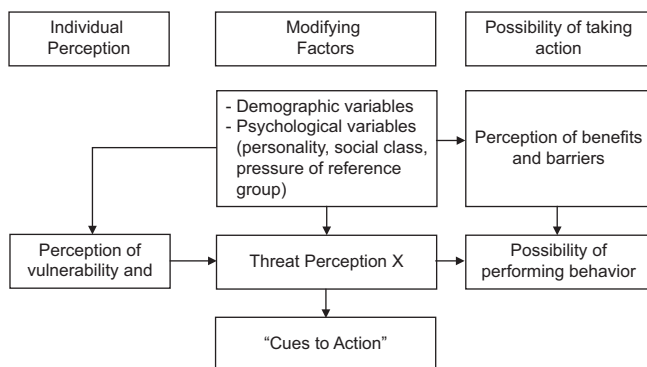


Figure 1: Health belief model

The relationship between the independent variable and the dependent variable

In this case, the bivariate analysis was performed using Chi-square test with 95% confidence level ($p = 0.05$) (Table 2).

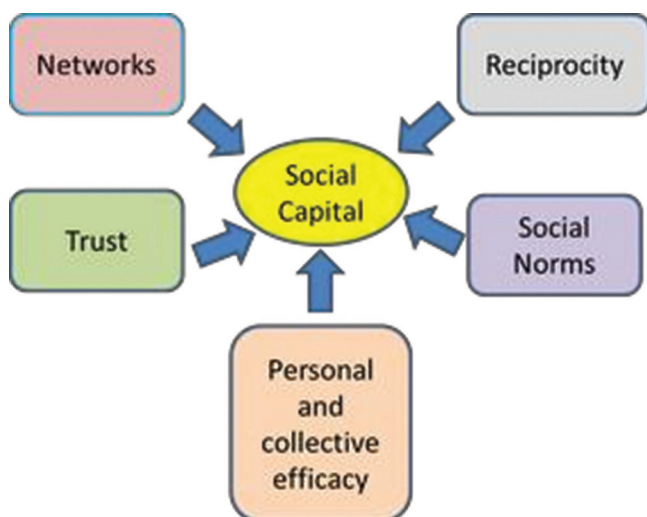


Figure 2: Social capital

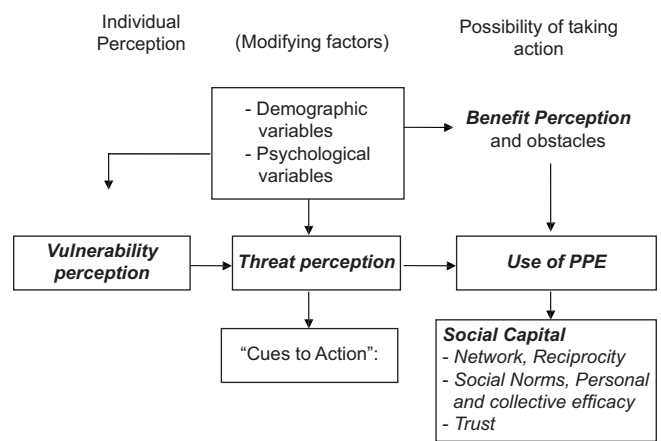


Figure 3: Development of health belief model theory with social capital

Path analysis

Furthermore, path analysis was also conducted to analyze the direct and indirect relationship between the variables involved using Stata 13.0 test (Table 3).

Model specification

Model specifications that describe the relationship between exogenous variables and endogenous variables and parameter estimates are shown in Figure 4.

Discussion

The direct influence of threat perception on the behavior of using personal protective equipment

Threat perception is proven to affect the behavior of using personal protective equipment ($p = 0.010$). Good threat perception has 1.07 times lower risk than less threat perception. This means that employees with good threat perceptions have a risk of reducing behavior in using personal protective equipment. Good threat perception shows that employees have understood the impact of hazards in the workplace. Meanwhile, the bad behavior in using personal protective equipment in employees who have a good threat perception is due to the indirect hazard impact. In this case, the hazard impacts are cumulative and cannot be predicted when they occur, possibly at the time of retirement.

A good perception of obstacles has the risk of decreasing the perception of threats on the weaving employees. They understand that hazards in the workplace can potentially cause health problems to the employees ($B: -0.76$), thus using personal protective equipment is not an obstacle but a must for anyone in

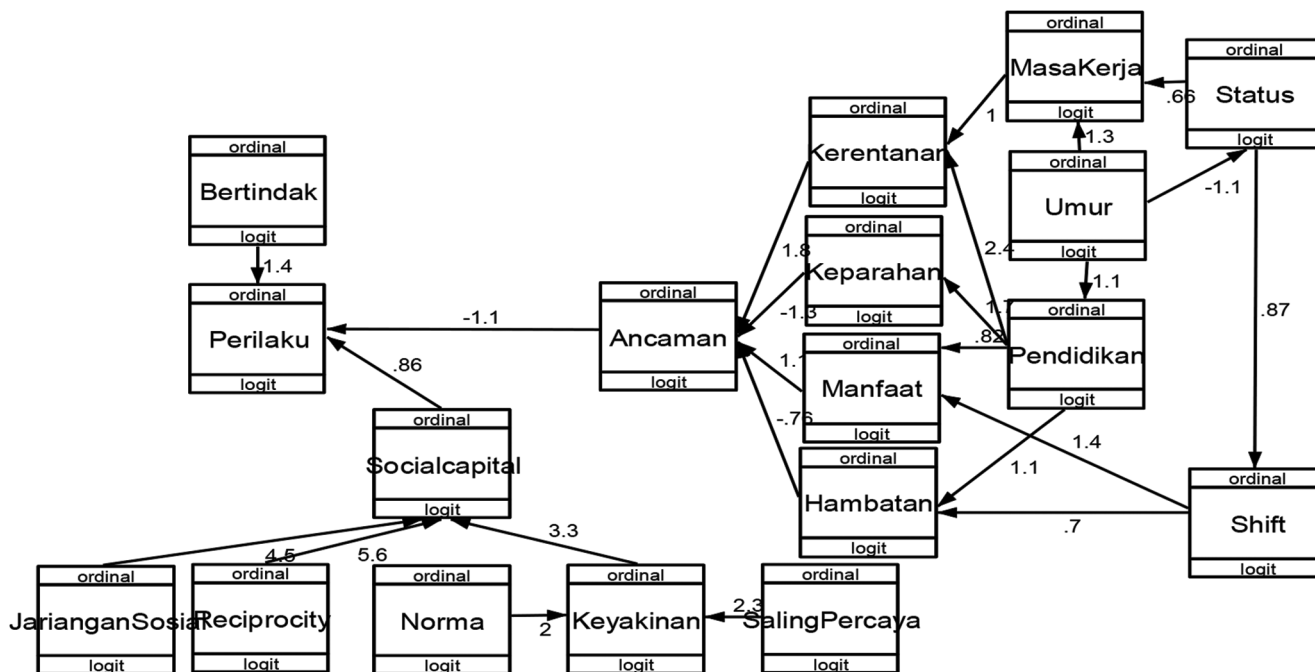


Figure 4: Model suitability and parameter estimation

Table 1 : Characteristics of subjects exposed to high-intensity noise

Variable	Category	n	%
Behavior	Insufficient	26	14.6
	Sufficient	146	82.0
	Good	6	3.4
Age	<Mean of 43.06 years	83	46.6
	>Mean of 43.06 years	95	53.4
Education	Elementary school	24	13.5
	Junior high school	124	69.7
	Senior high school	30	16.9
Years of service	<Mean (7.53)	86	48.3
	>Mean (7.53)	92	51.7
Shift	Morning	35	19.7
	Afternoon	130	73.0
	Evening	13	7.3
Status	Married	106	59.6
	Single	72	40.4
	Insufficient	4	2.2
Threat perception	Sufficient	80	44.9
	Good	94	52.8
	Insufficient	13	7.3
Vulnerability perception	Sufficient	157	88.2
	Good	8	4.5
	Insufficient	26	14.6
Severity perception	Sufficient	149	83.7
	Good	3	1.7
	Insufficient	9	5.1
Perception of benefits	Sufficient	114	64.0
	Good	55	30.9
	Insufficient	90	50.6
Obstacle perception	Sufficient	84	47.2
	Good	4	2.2
	Insufficient	11	6.2
Stimulus for action	Sufficient	131	73.6
	Good	36	20.2
	Insufficient	20	11.2
Social capital	Sufficient	90	50.6
	Good	68	38.2
	Insufficient	17	9.6
Belief	Sufficient	93	52.2
	Good	68	38.2
	Insufficient	33	18.5
Norm	Sufficient	85	47.8
	Good	60	33.7
	Insufficient	25	14.0
Mutual trust	Sufficient	99	55.6
	Good	54	30.3
	Insufficient	24	13.5
Social network	Sufficient	87	48.9
	Good	67	37.6
	Insufficient	18	10.1
Reciprocity	Sufficient	89	50.0
	Good	71	39.9

the weaving room. A good perception of severity also has a risk of decreasing the employee's perception of the threat to hazard (B; -1.3). Weaving employees are generally aware that the impact of hazards in the workplace can be irreversible and worsen at they get older. The severity can be prevented if the employees are discipline in using personal protective equipment.

Perception of benefit is a construct of threat perception. A good perception of benefits has the risk of increasing the perception of threats to employees (B: 1.1). Company regulations require employees to use personal protective equipment based on the long-term health benefits for employees and their families. Non-compliance in using personal protective equipment can be a threat to employee health problems. Green (1991) in Notoatmodjo (2015) [9] claimed that company provisions require employees to use personal protective equipment because it is very useful for employees in the weaving division. A fairly high level of education makes it easier for employees to understand the benefits of using personal protective equipment. Meanwhile, work shift does not affect the behavior of using personal protective equipment (p = 0.104). Employees have understood the importance of personal protective equipment, which is to maintain their health. In this case, even though they work in different shifts, they still use personal protective equipment. Furthermore, marital status does not affect the use of personal protective equipment, (p = 0.510), showing that using personal protective equipment has become an employee's need to maintain their health both now and in the future.

Perception of severity affects behavior using personal protective equipment (p = 0.000). Employees

Table 2: Chi-square test results relationship of independent variables on behavior of using personal protective equipment (PPE) based on health belief model and social capital

Variable	Behavior						p
	Insufficient		Sufficient		Good		
	n	%	n	%	n	%	
Age							
<Mean (43.06) years	15	8.4	67	37.6	1	0.6	0.176
>Mean (43.06) years	11	6.2	79	44.4	5	2.8	
Education							
Elementary School	7	3.9	17	9.6	0	0	0.002
Junior high school	14	7.9	108	60.7	2	1.1	
Senior High school	5	2.8	21	11.8	4	2.2	
Years of service							
<Mean (7.53)	18	10.1	67	37.6	1	0.6	0.026
>Mean (7.53)	8	4.5	79	44.4	5	2.8	
Shift							
Morning	10	5.6	24	13.5	1	0.6	0.104
Afternoon	15	8.4	111	62.4	4	2.2	
Evening	1	0.6	11	6.2	1	0.6	
Status							
Married	18	10.1	85	47.8	3	1.7	0.510
Single	8	4.5	61	34.3	3	1.7	
Threat perception							
Insufficient	2	1.1	1	0.6	1	0.6	0.001
Sufficient	6	3.4	69	38.8	5	2.8	
Good	18	10.1	76	42.7	0	0	
Vulnerability perception							
Insufficient	4	2.2	8	4.5	1	0.6	0.000
Sufficient	22	12.4	133	74.6	2	1.1	
Good	0	0	5	2.8	3	1.7	
Severity perception							
Insufficient	13	7.3	13	7.3	0	0	0.000
Sufficient	13	7.3	133	74.7	3	1.7	
Good	0	0	0	0	3	1.7	
Perception of benefits							
Insufficient	8	4.5	1	0.6	0	0	0.000
Sufficient	11	6.2	101	56.7	2	1.1	
Good	7	3.9	44	24.7	4	2.2	
Obstacle perception							
Insufficient	14	7.9	75	42.1	1	0.6	0.000
Sufficient	12	6.7	70	39.3	2	1.1	
Good	0	0	1	0.6	3	1.7	
Stimulus for action							
Insufficient	10	5.6	1	0.6	0	0	0.000
Sufficient	8	4.5	122	68.5	1	0.6	
Good	8	4.5	23	12.9	5	2.8	
Social capital							
Insufficient	9	5.1	11	6.2	0	0	0.000
Sufficient	8	4.5	81	45.5	1	0.6	
Good	9	5.1	54	29.2	5	2.8	
Belief							
Insufficient	6	3.4	11	6.2	0	0	0.002
Sufficient	10	5.6	83	46.6	0	0	
Good	10	5.6	52	29.2	0	0	
Norm							
Insufficient	10	5.6	22	12.4	1	0.6	0.003
Sufficient	5	2.8	79	44.4	1	0.6	
Good	11	6.2	45	25.3	4	2.2	
Mutual trust							
Insufficient	10	5.6	15	8.4	0	0	0.000
Sufficient	8	4.5	90	50.6	1	0.6	
Good	8	4.5	41	23.0	5	2.8	
Social network							
Insufficient	9	5.1	15	8.4	0	0	0.000
Sufficient	8	4.5	79	44.4	0	0	
Good	9	5.1	52	29.2	6	3.4	
Reciprocity							
Insufficient	7	3.9	11	6.2	0	0	0.005
Sufficient	9	5.1	79	44.4	1	0.6	
Good	10	5.6	56	31.5	5	3.4	

who have a good perception of severity have a lower risk of perceived threat ($B = -1.33$). Based on the level of education, employees easily understand the risk of workplace hazards on employee health, where misbehaving in using personal protective equipment will cause more serious health problems (Green, [1991] in Notoatmodjo [2015]) [9]. The hazard impact is cumulative and difficult to be predicted when it will occur. However, when this occurs, the individuals will reduce the perception of the threat of weaving employees. Perception of benefits affects the behavior of using personal protective equipment ($p = 0.000$). A good perception of benefits will increase the perception

Table 3: Results of pathway analysis of behavioral factors in using personal protective equipment (PPE) based on health belief model and social capital on employees exposed to high-intensity noise

Relationship between dependent and independent variables	Line coef. (B)	95% CI		p
		Lower limit	Upper limit	
Direct				
Behavior				
Threat	-1.07	-1.88	-0.26	0.010
Social capital	0.85	0.18	1.53	0.013
Stimulus to act	1.35	0.49	2.21	0.002
Indirect				
Threat perception				
Vulnerability perception	1.81	0.62	3.00	0.003
Severity perception	-1.33	-2.47	-0.19	0.021
Perception of benefits	1.10	0.45	1.74	0.001
Vulnerability perception				
Years of service	1.01	-0.01	2.05	0.054
Education	2.39	1.46	3.32	0.000
Severity perception				
Education	1.68	0.88	2.48	0.000
Perception of benefits				
Education	0.81	0.20	1.42	0.009
Shift	1.35	0.62	2.08	0.000
Education				
Social capital				
Social network	4.53	2.39	6.68	0.000
Reciprocity	5.57	2.88	8.26	0.000
Belief	3.25	1.17	5.34	0.002
Belief				
Norm	2.01		1.34	
Mutual trust	2.31	1.54	3.07	0.000
Years of service				
Age	1.29	0.63	1.95	0.000
Status	0.65	-0.01	1.32	0.056
Education				
Age	1.09	0.41	1.78	0.002
Status				
Age	-1.09	-1.71	-0.47	0.001
Shift				
Status	0.86	0.15	1.57	0.017

N Observation = 178, log likelihood = -1222.6551, AIC = 2537.31, BIC = 2683.672, Information: Connected.

of threat ($B = 1.1$). High-intensity noise and cotton fiber dust are real hazards and can harm the health of employees. Respiratory protective equipment and hearing protection equipment provided by the company will reduce the risk of health problems if they are used properly. Work shift does not affect the behavior of using personal protective equipment ($p = 0.104$), as confirmed by Green (1991) in Notoatmodjo (2015) [9]. Reinforcing factor can force employees to obey the regulations of using personal protective equipment for all weaving employees for all work shifts, because it is useful for maintaining the health of the weaving division employees regardless of their status. The perception of vulnerability affects the behavior of using personal protective equipment ($p = 0.000$). A good perception of vulnerability has a risk of increasing the perception of threat ($B = 1.81$). Weaving employees have a good perception of vulnerability to hazards in the workplace supported by a fairly high education. With sufficient education and the average working period of 7 years, this illustrates the length of exposure to hazards on the employees. The longer exposure to hazards in the workplace and supported by a sufficient level of education will increase the perception of employees' vulnerability to hazards. The longer the employee's working period, the more hazard will accumulate in the individual's body and the individual will feel more vulnerable to hazards.

Effect of social capital on the behavior of using personal protective equipment

Social capital affects the behavior of using personal protective equipment ($p = 0.013$). Good social capital will increase the behavior of using personal protective equipment ($B = 0.85$). Social capital in this study is composed of social network, reciprocity, and belief constructs. Social networks affect the behavior of using personal protective equipment ($p = 0.00$). A good social network has the risk of increasing special capital. The social capital of the employees of the weaving division shows that individual and group social relationships have regularity in their behavior in their group environment through good and strong knots and ties between individuals in the group based on values, vision, or common views. A good social network shows that cooperation between individuals in social groups is also good.

The reciprocal relationship affects the behavior of using personal protective equipment ($p = 0.005$). Good reciprocity increases social capital in the workplace ($B = 5.5$). Reciprocity is felt when the weaving employees take a break by handing over the duties and responsibilities of supervising the weaving machine to other friends in turn. Break time is a very valuable time for every employee in the weaving division to eat, worship, and relieve fatigue even for a while.

In this study, belief (efficacy) is a construct of social capital. Belief affects the behavior of using personal protective equipment ($p = 0.002$). Good efficacy risks increasing social capital ($B = 3.25$). Efficacy in this study is formed by the construct of norms and trust in each other (trust). Good efficacy is shown by mutual trust in handing over the duties and responsibilities of supervising the weaving machine to other coworkers. This method has been arranged by the company so that the target of each employee is achieved.

The effect of cues to action on the behavior of using personal protective equipment

Cues to action directly affect the behavior of using personal protective equipment ($p = 0.000$). Good cues to action increased the behavior of using personal protective equipment ($B=1.35$). Various factors that encourage employees to act using personal protective equipment, according to Lawrence Green (1991) in Notoatmodjo (2015) [9], are education, mature age (at the average of 43 years old), and a good level of trust. These factors are predisposing factors for employees to behave well in using personal protective equipment. In addition, the availability of facilities (ear protection and respiratory protection) by the company is an enabling factor for employees to act to use. The company has regulations that require everyone in the weaving room to use personal protective equipment. This regulation is forcing the employees to maintain the health of the employees.

Research limitations

The development of a behavioral model based on the health belief model and social capital was carried out on employees in a textile industry that has a high intensity noise hazard and cotton fiber dust. There are several similarities in the community groups studied, namely, the type of work, culture, and level of education.

Conclusion

Changes in behavior using the development of the health belief model and social capital theories in community groups exposed to high-intensity noise are directly influenced by readiness to act (cues to action). In addition, the vulnerability factor, severity factor, barrier factor, and benefit factor in the health belief model theory affect directly through the threat factor. Meanwhile, social capital has a direct effect on behavioral changes in using personal protective equipment which is built through the construction of social networks, reciprocity, and beliefs that are supported by norms and mutual trust between employees.

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