



HEALTH MANAGER'S RESPIRATOR RECOGNITION AND INFLUENCING FACTORS

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Volume6, Issue7, June 2024

Received: 25 April 2024

Accepted: 03 June 2024

Published: 21 June 2024

doi:10.48047/AFJBS.6.7.2024.1246-1256

ABSTRACT

Purpose: The purpose of this study was to investigate the factors influencing health managers' recognition of respirators. **Methods:** The subjects of the study analysis were 203 health managers working nationwide.

Data collection was conducted using a Google form from May 1, 2023, to May 10, 2023. Data analysis was performed using SPSS/WIN 23.0. The analysis was conducted to identify differences in job satisfaction and awareness of respirators according to general characteristics and job characteristics related to respirators. *t*-test, ANOVA, and correlation analysis were used. Multiple regression analysis was used for factors affecting respirator recognition. **Results:** The factors influencing the subject's recognition of respirators were job satisfaction ($t=2.54$, $p=.012$), experience of participating in safety and health education instructors ($t=-3.12$, $p=.002$), and participation in the selection of suitability for personal protective equipment ($t=2.49$, $p=.013$), and conducted a respirator fit test ($t=-1.34$, $p=.040$) ($F=5.107$, $p<.001$). **Conclusion:** In workplaces using respirators, it is necessary to support the legal work of health managers and increase job satisfaction, and efforts to raise recognition of respirators are needed.

Keywords: Health Manager, Respirator Recognition, Respirator Fit Test, Job Satisfaction

1. INTRODUCTION

A health manager is a person who assists the business owner or the person in charge of safety and health management on technical matters related to health and provides guidance and advice to the supervisor (Occupational Safety and Health law., 2023). Persons who can become health managers are doctors, nurses, occupational health instructors, industrial hygiene management technicians and industrial technicians, atmospheric environment technicians, industrial technicians, or higher, ergonomic technicians or higher, and graduates of related departments (Lee., 2020). Among the duties of a health manager, one of the main tasks is to assist, guide, and advise on the selection of qualified products when purchasing health-related protective equipment (Occupational Safety and Health law., 2010). However, the uncertainty of the laws and regulations given by tasks such as assistance and guidance were found to be a major factor in reducing job satisfaction by causing confusion in decision-making for health managers' work (Lee et al., 2019).

Among them, the tightness test is important for dust and gas masks that generate negative pressure rather than positive pressure when wearing a respirator, and the fit test is a test to ensure that the respirator is correctly worn on the wearer's face (KOSHA GUIDE H-82-2020., 2020). The main body that selects respirators in the workplace is the health manager. Looking at the error of wearing a respirator at the workplace, 54.55% of the cases of wearing a dust mask at a workplace where a gas mask is required were found, and 12.75% of the error wearing a gas mask at a workplace where a dust mask is required (Kim et al., 2008). A preceding study (Jung et al., 2020) suggested that health managers should have their own expertise and continuously inform health management performance for workers, but being involved in the selection of protective equipment is a professional area of health management.

Workplaces should conduct adhesion tests for the health of workers and publicize the effectiveness of fit tests to increase the need for them. To this end, it is necessary to conduct research that is the basis for training professional adhesion testers and developing guidelines for fit test education (Han et al., 2017). However, recent studies on health managers and respirators have been difficult to find. Therefore, this study was conducted to investigate the factors affecting respirator recognition.

The specific purpose of this study is as follows.

- Identify the general characteristics of the subject and job characteristics related to respirators.
- Identify differences in job satisfaction and awareness of respirators according to the general characteristics of the subject and job characteristics related to respirators.
- Investigate the correlation between the subject's job satisfaction and awareness of respirators.
- Identify the factors affecting the subject's awareness of respirators.

2. RESEARCH METHODOLOGY

This study is a descriptive research study to identify health managers' recognition of respirators and influencing factors.

2.1. Subject of Research

The subjects of this study were health managers working in 206 workplaces nationwide. For the survey, data from 203 people who faithfully responded out of 206 people were used for analysis. For the number of samples, G*Power 3.1.9.7 program was used. For the calculation of the sample size, a significance level (α) of .05, a power ($1-\beta$) of 90%, and a median effect size of .15 were applied for regression analysis.

In addition, it was calculated that 162 people were needed by inputting 9 predictor variables, including independent and dependent variables. In conclusion, the sample number of 203 in this study was found to be adequate.

2.2. Data Collection

Data collection was conducted from May 1, 2023, to May 10, 2023. For research ethics, the questionnaire was made in a Google form, and it was produced in a format in which the research consent form had to be signed using a smartphone to move on to the next questionnaire, and there was no information that could identify individuals.

In the research consent form, the purpose of the study was explained by the researcher, and the process of disposal after using the questionnaire was explained. When the subject completed the survey, a small gift was provided.

2.3. Research Variable

2.3.1. General Characteristics

As for the general characteristics, 7 items of health manager's gender, age, education, position, company type, qualification and career were measured.

2.3.2. Job Characteristics

Job characteristics related to respirators consisted of 8 items: wearing time of respirators, participation in selection of qualified products, supply of respirators, adhesion test of respirators, storage method of respirators, respirators supplied to workplaces, harmful factors in workplaces, and participation of in-house safety and health instructors.

2.3.3. Job Satisfaction

The index of work Satisfaction (IWS) tool developed by Slavitt et al (Slavitt et al, 1978) was used with a total of 16 items used in the study by Kim (Kim, 2019).

The tool consists of 9 questions on job satisfaction and 7 questions on job satisfaction. It is composed of a Likert 5-point scale, and the higher the score, the higher the job satisfaction. In Kim's study (Kim, 2016), Cronbach's α values were .87 for job satisfaction and .89 for job satisfaction. In this study, Cronbach's α values were .89 for job satisfaction and .91 for job satisfaction.

2.3.4. Respirator Awareness Survey

The respirator recognition level used the tools used in the Eoh's study (Eoh, 2018).

As for the tool, a total of 5 questions were used, including 4 questions about wearing, managing, and recognizing the discomfort of respirators, and 1 question about the need for training on how to properly wear respirators. The tool consisted of a Likert 5-point scale, and questions 2 and 3 were reversed. The higher the score, the higher the awareness of respirators. Cronbach's α value in this study was .78.

3. RESULT

3.1. Subject's General Characteristics

The average age of the subjects was 44.52 ± 9.5 , and there were 178 females (87.7%) and 25 males (12.3%). The educational background of the subject

118 university graduate (58.1%), graduate school 45 (22.2%), followed by 40 (19.7%) college graduates. In terms of position, 105 employees (51.7%), 63 section manager (31.0%), and 24 head manager (11.9%) were ranked in the order. By industry, 72 (35.5%) were manufacturing, 48 (23.6%) agency, 37 (18.2%) construction, 32 (15.8%) service, and 14 (6.9%) medical institutions.

The qualifications selected as health managers were 162 nurses (79.8%), 27 industrial hygienists (13.3%), 12 others (5.9%), 1 doctor (0.5%), and 1 ergonomic engineer (0.5%). As for the working period of the subjects, 129 people (63.5%) worked 5 years to 10 years or more, 28 people (13.8%) 3 years to less than 5 years, 28 people (13.8%) 1 year to less than 3 years, and 18 people (8.9%) less than 1 year (Table1).

Table 1. Subject's General Characteristics (N=203)

Characteristics	Categories	n(%) or M \pm SD
Age(year)		44.52 \pm 9.5
Gender	Male	25(12.3)
	Female	178(87.7)
Education	College Graduate	40(19.7)
	University Graduate	118(58.1)
	Graduate School	45(22.2)
Position	Employee	105(51.7)
	Team Leader	11(5.4)
	Section Manager	63(31.0)
	Head Manager	24(11.9)
Company Type	Manufacturing	72(35.5)
	Service industry	32(15.8)
	Construction	37(18.2)
	Medical Institution	14(6.9)
	Agency	48(23.6)
Qualification	Doctor	1(0.5)
	Nurse	162(79.8)
	Hygienist	27(13.3)
	Ergonomics Engineer	1(0.5)
	Others	12(5.9)
Career(year)	1~<3	18(8.9)
	3~<5	28(13.8)
	5~<10	28(13.8)
	\geq 10	129(63.5)

3.2. Job Characteristics Related to Respirators

The average time of wearing respirators for workers at the workplace where the subject works was 4.00 ± 2.74 . 114 non-participants (56.2%) and 89 participants (43.8%) were involved in the selection of qualified protective equipment. Regarding the supply of

respirators, 141 (69.5%) had sufficient supply, 48 (23.6%) had insufficient supply, and 14 (6.9%) did not supply.

In the respirator fit test, 85 (41.9%) sometimes performed, 69 (34.0%) did not, and 49 (24.1%) always performed. Respirator storage was in the order of protective box 112 (55.2%), work site/bench 53 (26.1%), office 28 (13.8%), clothes pocket 10 (4.9%). Respirators supplied to workplaces were 84 (41.4%) dustproof, gas-supplied masks/air respirators, 65 dust masks (32.0%), 48 dustproof and gas masks (23.6%), and 6 gas masks (3.0%).

Harmful factors in workplaces were dust/noise/organic compounds/gaseous substances 126 (62.1%), gas/vapor substances 41 (20.2%), organic compounds 14 (6.9%), noise 13 (6.4%), and dust 9 (4.4%).

There were 137 (67.5%) and 66 (32.5%) no training experiences related to protective gear, and 129 (63.5%) participants and 74 (36.5%) non-participants participated in the participation of safety and health instructors (Table 2).

Table 2. Job Characteristics Related to Respirators (N=203)

Characteristics	n(%) or M±SD
Respirator Wear Time	4.00±2.74
Safety and Health Education Instructor Participation	
Participation	129(63.5)
Non-Participation	74(36.5)
Selection of Qualified Protective Equipment	
Participation	89(43.8)
Non-Participation	114(56.2)
Respirator Supply	
Enough	141(69.5)
Insufficiency	48(23.6)
Not Supplied	14(6.9)
Respirator Fit Test	
Always Performed	49(24.1)
Sometimes	85(41.9)
Not Conducted	69(34.0)
Storage of Respirators	
Protective Box	112(55.2)
Clothes Pocket	10(4.9)
Work Site/Bench	53(26.1)
Office	28(13.8)
Type of Respirator Used	
Dust Mask	65(32.0)
Gas Mask	6(3.0)
Dust Mask, Gas Mask	48(23.6)
Dust Mask, Gas Mask, Air Supply Mask	84(41.4)
Harmful Factor	
Dust	9(4.4)
Noise	13(6.4)
Organic Compounds	14(6.9)

Gas, Vapor Phase Substance	41(20.2)
Dust, Noise, Organic Compounds, Gas	126(62.1)
Respirator Training Experience	
Experienced	137(67.5)
No Experience	66(32.5)

3.3. Differences in Job Satisfaction and Recognition of Respirators According to General Characteristics and Job Characteristics

There was no difference in job satisfaction and recognition of respirators according to the general characteristics of the subjects. In the analysis according to job characteristics, the participation (51.49±10.80, 19.00±3.20) of the in-house safety and health education instructors showed higher job satisfaction ($t=3.30$, $p=.03$) and higher recognition of respirators ($t=2.83$, $p=.05$) compared to non-participation (41.90±8.00, 15.00±3.00).

Participation (51.09±10.52, 22.00±2.26) in the workplace where subjects were involved in the selection of qualified protective equipment showed higher job satisfaction ($t=1.90$, $p=.05$) and higher recognition of respirators ($t=2.01$, $p=.04$) compared to non-participation (40.49±9.47, 17.81±2.51).

The respirator fit test at workplaces showed high recognition of respirators ($F=3.30$, $p=.03$) always performed (20.73±2.71), sometimes (18.73±2.31), and not (16.50±2.48).

Regarding the respirator training experience, 'experienced' (21.20±2.19) showed higher respirator recognition than 'no experience' (16.55±2.75) ($t=2.01$, $p=.04$) (Table 3).

Table 3: Differences in Job Satisfaction and Recognition of Respirators According to General Characteristics and Job Characteristics (N=203)

Characteristics	Job satisfaction		Respirator recognition		
	M±SD	t or F(p)	M±SD	t or F(p)	
Safety and Health Education Instructor Participation					
Participation	51.49±10.80	3.30(.03)	19.00±3.20	2.83(.05)	
Non-Participation	41.90±8.00		15.00±3.00		
Selection of Qualified Protective Equipment					
Participation	51.09±10.52	1.90(.05)	22.00±2.26	2.01(.04)	
Non-Participation	40.49±9.47		17.81±2.51		
Respirator Supply					
Enough	54.46±10.34	1.67(.09)	18.03±2.43	1.17(.28)	
Insufficiency	51.19±9.29		18.13±2.51		
Not Supplied	47.71±8.21		18.00±2.21		
Respirator Fit Test					
Always Performed	55.31±9.21	4.48(.06)	20.73±2.71 ^a	3.30(.03)	
Sometimes	51.94±10.90		18.73±2.31 ^a		a>b
Not Conducted	49.80±9.10		16.50±2.48 ^b		
Storage of Respirators					
Protective Box	53.74±9.26	2.50(.06)	18.14±2.26	2.57(.22)	

Clothes Pocket	50.50±5.26		17.19±1.51	
Work Site/Bench	50.19±10.26		18.34±2.65	
Office	49.18±9.18		17.04±2.56	
Type of Respirator Used				
Dust Mask	51.46±7.05	1.14(.93)	17.40±2.46	2.24(.08)
Gas Mask	53.00±16.38		17.80±2.31	
Dust Mask, Gas Mask	52.60±9.58		18.01±1.94	
Dust Mask, Gas Mask, Air Supply Mask	52.04±18.85		18.40±1.26	
Harmful Factor				
Dust	50.22±5.68	3.20(.10)	18.07±2.17	5.11(.06)
Noise	52.23±7.90		16.00±1.07	
Organic Compounds	54.07±13.83		16.07±1.05	
Gas, Vapor Phase Substance	51.59±6.90		18.11±2.40	
Dust, Noise, Organic Compounds, Gas	52.05±9.87		18.13±2.26	
Respirator Training Experience				
Experienced	52.00±12.19	1.83(.08)	21.20±2.19	2.01(.03)
No Experience	51.00±9.75		16.55±2.75	

a, b: Scheff's test

3.4. Subject's Job Satisfaction and Respirator Recognition level

The job satisfaction level of the subjects was 52.02±10.02 points and the awareness of respirators was 17.99±2.40 points (Table 4).

Table 4. Subject's Job Satisfaction and Respirator Recognition level (N=203)

Variable	Min	Max	M±SD
Job Satisfaction	24	80	52.02±10.02
Respirator Recognition	12	25	17.99±2.40

3.5. Correlation between Job Satisfaction and Awareness of Respirators of Subjects

Respirator awareness of the subjects was significantly positively correlated with job satisfaction (r=.593, p=.006) (Table 5).

Table 5. Correlation between Job Satisfaction and Awareness of Respirators of Subjects (N=203)

Variable	Job Satisfaction	Respirator Recognition
	R(ρ)	R(ρ)
Job Satisfaction	1	.593 (.006) *
Respirator Recognition	.593 (.006) *	1
*p<.05		

3.6. Factors Affecting Subjects' Awareness of Respirators

Multiple regression analysis was conducted to identify the factors affecting the subject's awareness of respirators. Multiple regression analysis was conducted to identify the factors affecting the subject's recognition of respirators.

Among the job characteristics, the independent variables included job satisfaction, safety and health education instructor participation, selection of qualified protective equipment, respirator training experience, and respirator fit test of the subject. Respirator recognition was input as the dependent variable.

The tolerance limits were all 0.8, showing more than 0.1, and the variance inflation factor (VIF) values were all lower than 10, so there was no problem with multicollinearity. The Durbin Watson value was 2.088, indicating that the errors were independent and that there was no autocorrelation.

The factors affecting the subject's recognition of respirators are participation in safety and health education instructors ($t=-3.12$, $p=.002$), selection of qualified protective equipment ($t=2.49$, $p=.013$), respirator fit test ($t=-1.34$, $p=.040$), and subject's job satisfaction ($t=2.54$, $p=.012$) ($F=5.107$, $p<.001$) (Table 5).

Table 6. Factors Affecting Subjects' Awareness of Respirators (N=203)

Variable	Respirator recognition					
	B	SE	β	t	p	VIF
(Constant)	17.00	1.32		12.84	<.001	
Job Satisfaction	.04	.01	.17	2.54	.012	1.07
Safety and Health Education Instructor Participation	-1.14	.36	-.23	-3.12	.002	1.19
Selection of Qualified Protective Equipment	.87	.35	.18	2.49	.013	1.17
Respirator Training Experience	-.30	.35	-.06	.86	.390	1.09
Respirator Fit Test	-.29	.22	-.09	-1.34	.040	1.07
R ² =.339, Adj.R ² =.092 F=5.107, p<.001 Durbin-Watson=2.088						

4. DISCUSSION

In this study, there was no difference in job satisfaction according to general characteristics, which was different from previous studies (Lee, 2019) showing differences in job satisfaction according to general characteristics of health managers' age, gender, position, and field. In the difference according to job characteristics, job satisfaction was high in the case of participating in the health manager's in-house safety and health instructor and in the case of being involved in the selection of qualified protective equipment (Choi et al, 2022). In a study on job satisfaction of health managers in medical institutions, the factors influencing the job satisfaction of health managers were whether the health management office was installed, and if they did not perform other tasks, job satisfaction was significantly higher in the case of full-time health managers (Woo, 2014). This means that the health manager's participation in safety and health lectures and the selection of qualified protective equipment are the duties of the health manager specified in the law (Occupational Safety and Health law., 2023). Most of the subjects of this study were full-time health managers who had worked for more than 5 years. Therefore, it seems that the job satisfaction level was high as shown in the above research result because they are relatively familiar with the work of the health manager's own job. In addition, in the health management task achievement study (Kim, 2006), it was found that the task performance

was high if the person in charge of the health management task and supervised the protective equipment management task and safety and health education. The job satisfaction used in this study includes job satisfaction and job satisfaction, so it seems that the job satisfaction was high in the case of participating in the safety and health instructor in the company and in the selection of qualified protective equipment.

Respiratory protection awareness was higher when the health manager participated in the in-house safety and health lecturer and in the selection of qualified protective equipment compared to non-participation. In a study (Choi et al., 2022) including health managers and safety managers, 83.9% of the total respondents showed that they were aware of the regulations regarding the wearing of personal protective equipment for hazardous chemical handlers. In addition, in this study (Choi et al., 2022), the positive attitude toward the provision and use of protective equipment, considering the level of exposure linked to chemical risk assessment and the level of current safety measures, was high at 84.7%. In this study, if the subjects participated in the safety and health instructors, it is considered that they would be more aware of the protective gear wearing regulations if they participated in the selection of qualified protective gear products. In addition, it seems that this led to a positive attitude toward respirators, resulting in increased awareness of wearing respirators.

The respirator fit test showed a difference in respirator recognition. Recognition of respirators appeared high in the order of 'always performed', 'sometimes', and 'don't do' for the respirator fit test. In a previous study (Eoh et al., 2018), because of training workers on how to wear respirators, both regular and non-regular workers showed an increase in the adhesion coefficient of respirators, and the awareness of respirators was high in the group that received repeated training and the group that received more than 5 training sessions. In the end, it was found that as the number of trainings increased, the fit factor of respirators increased, and the awareness of respirators also increased.

There was a difference in respirator recognition according to the respirator training experience. Respirator education experience was higher in 'yes' than 'no' in respirator recognition. A study on nurses (Kim & Lee., 2012) showed that the higher the knowledge of respirators, the higher the attitude toward respirators. In addition, in a study on nursing students' recognition of respirators (Kim & Kang., 2019), it was found that the higher the level of knowledge, the higher the recognition of wearing respirators, and the attitude toward respirators also increased. In the previous study (Han, 2013; Han et al., 2017), compared to experienced employees, new employees who received respirator training had a higher degree of respirator fit. This can be interpreted as the result of increased recognition of respirators due to education. In addition, in the study of chemical recognition, it is the same result that the higher the knowledge and educational experience on chemical toxicity, the higher the recognition (Eoh et al., 2019). From this, as the educational experience increases, the level of recognition increases.

Therefore, it is necessary to increase the exposure of the subjects to educational experiences on respirators to increase their attitude toward respirators and to increase their awareness of respirators.

5. CONCLUSION

The factors influencing the subject's recognition of respirators were job satisfaction, participation in safety and health education instructors, participation in selection of qualified protective equipment, and conduct of a respirator fit test.

In conclusion, it is first necessary to provide an environment in which health managers participate in safety and health instructors in the workplace, participate in the selection of qualified protective equipment, and increase their workplace satisfaction.

The limitations and suggestions for the results of this study are as follows.

First, the subjects of this study were some health managers who participated in the education, so there are limitations in applying it to all health managers nationwide. To make effective policy recommendations, more follow-up studies on respirators are needed.

Second, in this study, the subjects were repeatedly asked to select the protective equipment used in the workplace for each type of respirator. Therefore, there may be a difference between the protective equipment used in actual workplaces and the protective equipment recognized by health managers.

Third, a simple multiple-choice questionnaire was used to determine whether the subjects had a fit test for respirators, and there is a limit in that accurate knowledge of the fit test was not measured. In the future, the researcher needs a follow-up study that adds the measurement of qualitative data and education on how to wear protective gear correctly to measure the awareness of the fit test.

However, despite the above limitations, this study aims to improve the working conditions of workplace workers and reduce industrial accidents by studying the influencing factors on health managers' respirators.

6. ACKNOWLEDGEMENTS

There is no interest.

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