

A Study on the Effects of Firefighters' Job Autonomy and Job Satisfaction on Organizational Commitment

Bok-Mu, Choi¹, Ha-Sung, Kong^{2}*

¹Fire Sergeant, Jeonju Gunsan Fire Station.

²Associate professor, Dept. of Fire Protection and Disaster Prevention, Woosuk Univ, 443 Samnye-ro, Samnye-eup, Wanju-gun, Jeollabuk-do, Korea.

E-mail: 119wsu@naver.com

Abstract: This study empirically analyzed the effects of job autonomy and job satisfaction on organizational commitment of firefighters performing the current standard daily routine for firefighters, and aimed to provide basic data for standard days and improvements that reflect the working environment and dispatch characteristics. It is unreasonable to uniformly apply the current standard routine to the unpredictable dispatch environment of firefighters. As a result of analyzing a sample of firefighters nationwide, it was found that the current standard work and performance hindered job autonomy and job satisfaction. As a result of empirical analysis with job autonomy and job satisfaction as independent variables and organizational commitment as a dependent variable, it had a positive (+) effect. Therefore, the results of this study suggest that there is a need to increase organizational commitment through the current standard work and improvement of firefighters. However, there is a limitation in that research does not reflect all matters such as differences in work patterns by region, characteristics of dispatch by region, and characteristics by position, and it should be improved into a standard routine that can be commonly applied to firefighters nationwide through future research.

Keywords: Firefighters, Standard Daily Routine, Job autonomy, Job Satisfaction, Organizational Commitment.

1. INTRODUCTION

Large-scale fires such as the Jecheon Sports Center fire in 2017, the Sejong Hospital fire in Millyang in 2018, the Jungang Market fire in Wonju in 2019, and the warehouse fire in Icheon in 2020 caused enormous damage. This served as an opportunity for the transformation of the firefighting organization into a national position and a rapid expansion of its external appearance after 47 years, and it can be said to reflect the people's longing for a 'safe country' and the public's trust in 'firefighting'.

In this sense of responsibility, the National Fire Agency established a regular workplace education and training system for fire, rescue, and first-aid workers after the fire at the Jecheon Sports Center in 2017, and provided training during working hours for the purpose of strengthening field response capabilities through the preparation of field-oriented firefighters' working days. strengthened training. In addition, in order to establish a field-oriented work day and performance system that reflects the characteristics of government offices by region, season, and work type, in January of the following year, 「Improvement of the on-site firefighting officer workplace education and training system (draft)」 was delivered to each city and province, and opinions were reflected. After a trial operation, in June of the same year, the 'on-site response capacity reinforcement program' was fully implemented.

However, firefighters are sharing difficulties in reality. Firefighting work has characteristics such as urgency, risk, professionalism, and crisis response1), and from this point of view, it was a part that required a lot of thought and sufficient discussion about whether the current standard daily routine was realistic. Psychological motivation factors such as pride in one's work, trust in one's colleagues, and trust in the organization play an important role in faithfully carrying out one's duties even in the face of the dangers of such disaster sites.2) In the case of firefighters, it is an organization in which new work processing methods and problem solving through individual creativity are restricted, and promotion is achieved by accumulated status and experience under a strict hierarchical order. Therefore, it is not easy to form motivation compared to general administrative organizations. 3) In addition, the level of trust in the organization of firefighters was very low. So, strategy must be established.4) Previous studies have something in common with this study in that they ultimately tried to contribute to the improvement of the quality of safety services provided to the public through the improvement of organizational commitment of on-site firefighters.

However, although studies on firefighters and organizational commitment have been conducted, there is no study that has identified the relationship between standard daily routine and organizational commitment. Therefore, this study differs from previous studies in that it analyzes the current standard work routine, identifies its relevance with organizational commitment, and prepares basic data to achieve the essential goal of the standard work routine by increasing organizational commitment.

As for the type of organizational commitment, Mayer & Allen (1990) defined the sub-factors as emotional, normative, and continuous commitment.⁵ In addition, through many previous studies, it can be seen that the higher the commitment of organizational members to the organization, the higher the work performance, the longer the service period, and the higher the motivation to work. The positive effects of organizational commitment include job autonomy and job satisfaction (Hussain, Iqbal, & Rehman, 2023; Hassnain, 2022; Pandzic, & Hadziahmetovic, 2022)

Job autonomy can be seen as the process in which organizational members feel responsible for their work through intrinsic motivation and actively perform the duties given to them by the organization. It was first suggested in Hackman and Oldham's (1975) theory of job characteristics, and it was verified that they have the greatest influence on organizational performance.⁶ Firefighters are public officers with special duties to protect people's lives, bodies, and property. Job autonomy can be seen as a factor that has a great influence on carrying out activities that meet the purpose of existence of firefighters actively with a mission for the responsibilities given to firefighters.

It can be seen as an extremely subjective concept in which members of an organization feel satisfied when they have expectations and work performance for the job given to them. Herzberg's two-factor theory defines motivating factors that affect job satisfaction, such as achievement, growth potential, and promotion.⁷ It can be seen that job satisfaction for firefighters is related to and affects subjective satisfaction with attachment to the given responsibilities and carrying out the duties.

This study sets organizational commitment as a dependent variable and job autonomy and job satisfaction as independent variables so that firefighters can improve their organizational commitment through standard work and improvement to provide quality public safety services. The purpose of this study was to substantively identify the relationship between and organizational commitment.

2. COMPARISON AND ANALYSIS WITH DOMESTIC AND FOREIGN PUBLIC OFFICERS IN SPECIFIC POSITIONS

In order to study the current standard days of firefighters and ways to increase organizational commitment through improvement, we compared and analyzed the standard daily schedules of domestic and overseas firefighters.

2.1. Currently implemented standard daily schedule for firefighters

Table <1-1> below is the current standard daily schedule for firefighters. Work is performed according to the time zone, and is divided into day shift and night shift. However, disaster situations such as fire, rescue, and ambulance have unpredictable characteristics, and the factors such as the shape, size, and time required of the disaster are all different, making it unreasonable to apply them collectively as a standardized daily schedule. Therefore, if a disastrous situation occurs and is mobilized during the set working hours, the possibility of performing the standard work day is significantly lowered. In addition, applying to the form of working on duty (All-Day) can reduce work efficiency due to overlapping daily routines and make it difficult for firefighters to maintain their physical condition due to the composition of heavy work hours.

Table 1A. 「On-site Response Capability Reinforcement Program」 Implementation Plan.

Separation	Time	Work details
Day Shift	08:40~09:00	Handover
	09:00~10:00	Equipment operation training
	10:00~12:00	Daily routine
	12:00~13:00	Lunch
	13:00~14:00	Daily routine
	14:00~16:00	Fire fighting training, Rescue training, First aid training, SOP education.
	16:00~17:40	Physical training
	17:40~18:00	Handover
Night Shift	18:00~19:00	Dinner
	19:00~21:00	Fire fighting training, Rescue training, First aid training, SOP education.
	21:00~23:00	Daily routine
	23:00~07:00	A night patrol And Preparaion for Dispatch
	07:00~08:00	Breakfast
	08:00~08:40	Daily routine

2.2. Comparison and analysis with similar job functions in the domestic

<Table 1-2> is the result of comparing and analyzing the standard daily schedule of firefighters and jobs similar to the firefighters. Compared to other jobs, the number of items in the standard daily schedule for firefighters was found to be the highest. The fact that there are many items performed during the same time can limit job autonomy and act as a factor that increases fatigue due to heavy workload. Firefighters were the only ones with censure for standard days and non-execution. These standard daily routines act as factors that can lower autonomy and job satisfaction.

Table 1B. Comparison and analysis with similar job functions in Korea.

	Fire Department ⁸⁾	Police Agency ⁹⁾	Korea Coast Guard (Vessel) ¹⁰⁾	Korea Coast Guard (Rescue) ¹¹⁾	Prison Officer ¹²⁾
Number of items in the standard daily routine	14	3	2	9	2
Penalty	O	X	X	X	X
Fixed training	O	X	X	O	X

Training method	Running on duty	Run off duty	Running on duty	Run off duty	Running on duty
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2.3. Comparison and analysis with overseas firefighters

<Table 1-3> compares and analyzes the standard daily routine of firefighters in Korea and the standard daily routine of firefighters in developed countries. Excluding the UK's standard daily routine, which consists of team meetings (Tea-time), the items of the standard daily routine of domestic firefighters appeared to be the largest. The fact that there are many items performed during the same time can limit job autonomy and act as a factor that increases fatigue due to heavy work. Compared to foreign firefighters, the standard daily routine of domestic firefighters was the only one that did not guarantee rest time. This makes it difficult to maintain physical condition due to heavy workload, and can act as a factor that hinders job satisfaction.

Table 1C. Comparison and analysis with foreign firefighters.

	Korea ⁸⁾	U.S.A. ¹³⁾	Germany ¹⁴⁾	U.K. ¹⁵⁾	Japan ¹⁶⁾
Presence of a break	X	O	O	O	O
Presence of physical training	O	O	O	O	O
Penalty	O	X	X	X	X
Number of items in the standard daily routine	14	9	8	14	13
Fixed training	O	X	X	X	X

As a result of comparing and analyzing the standard daily schedule of public officials in similar series and specific positions in Korea and overseas firefighters, the current standard daily schedule of firefighters is subdivided into many items, and there are fixed standard daily routines for each time zone. In addition, there are matters that give a penalty when not implemented. This may cause unnecessary administrative waste due to overlapping with the fixed standard routine when dispatching and performing tasks other than standard days and hinders the maintenance of physical condition of firefighters. Rest periods were not specified in the standard work schedule. It is included in mealtimes according to the 「Work Rules for Firefighters」⁸⁾, and it is structured so that normal break time is not guaranteed if dispatched during mealtimes according to the characteristics of the working environment.

3. RESEARCH DESIGN AND PROCESS

3.1. Research model

In order to analyze the relationship between the standard daily routine and organizational commitment of firefighters, demographic factor H1 (position, years of service) was set as control variables, job autonomy factor H2 and job satisfaction factor H3 were set as independent variables, and organizational commitment was set as the dependent variable.

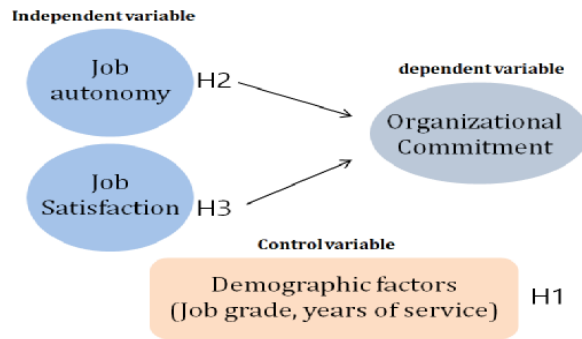


Figure 1. Research model.

As shown in the figure above, in this study, the sample size was determined using the G-Power 3.1 Program prior to the survey to derive meaningful results. In addition, the SPSS for windows 28.0 program was used to analyze the basic questions of the survey, and the independent t-test, chi-square test, and anova test were used as methods.

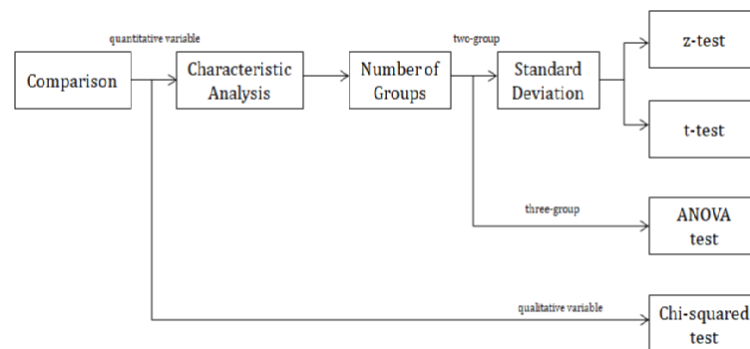


Figure 2. Schematic diagram of data analysis method.

3.2. Research hypothesis

This study is a study to substantively analyze the relationship between the standard daily routine of firefighters and organizational commitment, and the following hypotheses were established prior to the analysis.

H1 Control variable demographic and sociological factors Hypothesis H1-1 There will be no difference between the performance of the current standard daily schedule and organizational commitment according to position.

Hypothesis H1-2 According to the current standard work schedule, the higher the working years, the lower the organizational commitment.

Hypothesis H1-3 There will be a relationship between rank and service years.

H2 Independent variable as a job autonomy factor Hypothesis H2 Job autonomy according to the current standard work schedule will affect organizational commitment.

H3 Independent variables as a job satisfaction factor Hypothesis H3 Job satisfaction according to the performance of the current standard work schedule will affect organizational commitment.

3.3. Survey sample size design

In order to analyze the analysis methods of anova, independent t-test, and chi-square test, the significant sample size of the questionnaire was measured using the G-power 3.1 Program. To use regression analysis, the

statistical test was set as Linear multiple regression: Fixed model, R2 deviation from zero. As a result of calculating the sample with a significance level of .05, a moderate effect size of .03, and a power of 0.95, a sample of at least 177 people was required as shown in <Figure 3>.

<Figure 3> is a snipped image of the process of analyzing the sample size through the G-power 3.1 Program.

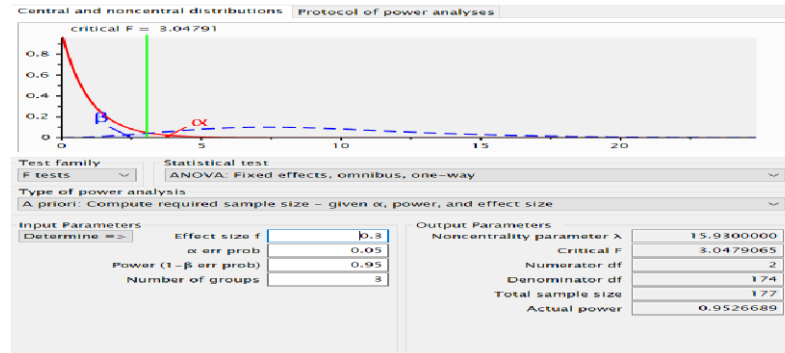


Figure 3. ANOVA test sample size calculation.

As shown in <Table 2>, the minimum sample size is the independent T test (176), the chi-square test (122), and the Anova test (177). Therefore, the minimum sample size required for the study was based on the ANOVA test, which is the largest size among the calculated values. As for the small sample size, about 200 people were selected as the final sample size in consideration of insincere responses (10-20%) during the survey.

Table 2. Independent t test, J square test, anova test sample size.

Analysis	Sample Size	Sample Size Confirmed
<i>t-test</i>	176	200
<i>Chi-squared</i>	122	
<i>ANOVA</i>	177	

3.4. Survey design for firefighters nationwide

<Figure 4> is the design for the composition of the questionnaire in this study. First, prior research and literature review on the standard daily routine of firefighters were conducted. In addition, the standard daily routine of domestic and foreign firefighters was compared and analyzed. Based on previous studies, the questionnaire was composed, and 207 firefighters from across the country were randomly selected and the questionnaire was conducted. 200 copies were finally confirmed, excluding 7 copies including insincere responses, and problem recognition and problems were derived based on the survey results. Afterwards, the results of the empirical analysis of the questionnaires targeting firefighters nationwide were comprehensively analyzed to derive the improved final standard daily schedule.

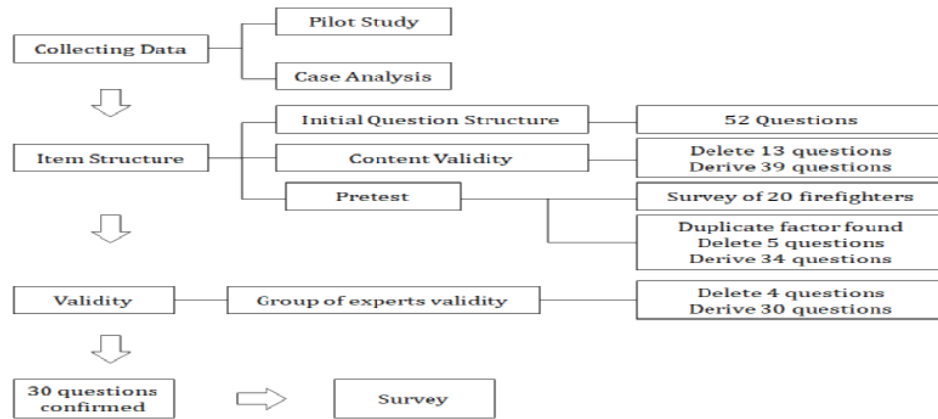


Figure 4. Survey design for firefighters nationwide.

4. RESEARCH RESULTS AND ANALYSIS

4.1. Descriptive statistics by survey question

In order for the empirical analysis of this survey to be a meaningful study, the sample size derived through the G-power 3.1 Program based on demographic status, job autonomy statistics, job satisfaction statistics, and organizational commitment statistics as shown in <Table 3> It was randomly distributed to about 200 public officials to identify problems with the current standard date.

<Table 3-1> shows the current status of demographic respondents. The male sample was 172 (86%) and the female sample was 28 (14%). This can be said to be similar when considering the male to female ratio of firefighting organizations. Among the respondents, the sample below the fire chief was 36 (18%), and the fire brigade head and above were 164 (82%). The samples of office and field officers were 16% and 84%, respectively, with 32 and 168, respectively. Finally, those who have worked for less than 10 years are 141 (70.5%), and those who have been working for more than 10 years are 59 (29.5%).

Table 3A. Demographic respondent status.

	Male	Female	Rank above a Fire Sergeant	Rank below the Fire Lieutenant	Desk job	Field worker	Over 10 years of service	Less than 10 years of service
Participants	172	28	36	164	32	168	59	141
Ration	86%	14%	18%	82%	16%	84%	29.5%	70.5%

<Table 3-2> is a table of job autonomy descriptive statistics. There were 6 questions on job autonomy, and each item was composed of a Likert scale (1 to 5 points), so that the lower the job autonomy, the closer to 1 point, and the higher the job autonomy, the closer to 5 points.

Table 3B. Job autonomy technical statistical table.

	Job autonomy 1	Job autonomy 2	Job autonomy 3	Job autonomy 4	Job autonomy 5	Job autonomy 6
Frequency	200	200	200	200	200	200
Average	1.95	1.95	2.04	2.03	2.00	1.80
Standard deviation	0.950	0.925	0.918	0.929	0.891	0.814

<Table 3-3> is the job satisfaction description statistics table. There were 7 questions about job autonomy, and each item was composed of a Likert scale (1 to 5 points), so that the lower the job satisfaction, the closer to 1 point, and the higher the job satisfaction, the closer to 5 points.

Table 3C. Job satisfaction skill statistical table.

	Job satisfaction 1	Job satisfaction 2	Job satisfaction 3	Job satisfaction 4	Job satisfaction 5	Job satisfaction 6	Job satisfaction 7
Frequency	200	200	200	200	200	200	200
Average	2.11	2.15	2.08	2.09	2.08	2.17	2.10
Standard deviation	0.950	0.925	0.918	0.929	0.891	0.814	0.917

<Table 3-4> is a statistical table of organizational commitment skills. The questions about organizational commitment were 5 questions, and each item was composed of a Likert scale (1 to 5 points), so that the lower the organizational commitment, the closer to 1 point, and the higher the organizational commitment, the closer to 5 points.

Table 3D. Statistical table of organizational commitment skills.

	Organizational commitment 1	Organizational commitment 2	Organizational commitment 3	Organizational commitment 4	Organizational commitment 5
Frequency	200	200	200	200	200
Average	2.05	2.14	2.10	2.31	2.15
Standard deviation	0.979	0.957	0.992	0.993	0.989

In order to identify the relationship between job autonomy, job satisfaction, and organizational commitment, a survey was conducted on firefighters nationwide. As a result, the average of job autonomy, job satisfaction, and job commitment was close to 2 points, which is lower than 3 points, and the current standard date and implementation result It can be seen as the basis that has a negative effect on firefighters.

4.2. Current standard date and empirical analysis

1) Differences in organizational commitment according to the performance of the standard daily schedule by position

An independent t-test was conducted to find out if there was a difference in organizational commitment according to the position. As a result, $t = 3.796$, $p = 0.366$, which was high based on the significance level ($p < 0.05$), so it was not statistically significant. Therefore, the alternative hypothesis was rejected and the null hypothesis was adopted, and it was judged that there was no difference in organizational commitment by position. As a result, it can be said that there is no significant difference in the degree of organizational commitment below the fire chief and above the fire brigade.

Table 4. Independent t test (N=200).

Separation		Dependent Variable			t(p)
		N	Average	Standard deviation	
Independent Variable	Rank below the Fire Lieutenant	164	2.25	0.86	3.796 (0.366)
	Rank above a Fire Sergeant	36	1.66	0.78	

* $p < .05$, ** $p < .01$, *** $p < .001$

An ANOVA test was conducted to find out whether there was a difference in the average of the current standard work schedule according to the number of years worked. As a result, $F=12.567$, $p < 0.001$, which was low based on the significance level ($p < 0.05$), was statistically significant. Therefore, the null hypothesis was rejected and the alternative hypothesis was accepted. As a result of the scheffe test, there was a difference in organizational commitment between less than 1 year a and more than 2 yearsc . The average score was 2.52 for less than 1 year and 1.87 for more than 2 years. Both groups had an average of 3 or less, showing low organizational commitment. However, the organizational commitment of firefighters who experienced the current standard routine for more than 2 years was lower, indicating a difference in average between the two groups. It was found that the group that performed the current standard day for a long time showed low organizational commitment. Longer execution of the current standard routine means more experience. The fact that the degree of organizational commitment was measured lower in the experienced group can be seen as indicating a problem with the standard routine.

Table 5. ANOVA test (one-way analysis of variance) (N=200).

Separation		Dependent Variable					
		n	Average	Standard deviation	F	p	post-hoc
Independent Variable	Less than a 1 yeara	65	2.52	0.86	12.567	<0.001***	a>c
	More than a 1 year Less than 2 yearsb	35	2.23	0.68			

	Mare than 2 yearsc	100	1.87	0.85			
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3) Relation between position and number of years of service

A cross-analysis was conducted to find out the relationship between job title and number of years of service. As a result of the analysis, $\chi^2 = 89.035$, $p < 0.001$. Since it appeared low based on the significance level ($p < 0.05$), it was statistically significant, so the null hypothesis was rejected and the alternative hypothesis was adopted. Therefore, it can be said that there is a correlation between job title and service years response category. Fire chiefs with less than 10 years of experience showed the highest frequency with 139 (69.5%). On the other hand, 34 people (17.0%) with more than 10 years of experience in the fire department showed the second highest frequency.

Table 6. Chi-square test (crosstabulation) (N=200).

Separation	Frequency(%)		Sum
	Less than 10 years of service	Over 10 years of service	
Rank below the Fire Lieutenant	139 (69.5)	25 (12.5)	164 (82.0)
Rank above a Fire Sergeant	2 (1.0)	34 (17.0)	36 (18.0)
χ^2 (p)	89.035(<0.001)***		

$p < 0.05$, $p < 0.01$, $p < 0.001$.

4) Relationship between job autonomy and job commitment

Multiple linear regression analysis was conducted to find out whether job autonomy according to the performance of the standard work schedule affects organizational commitment. The analysis utilized stepwise. As a result of the analysis, $F = 95.596$ ($p < 0.001$) indicates that this regression model is suitable. $adj. R^2 = 0.487$, showing 48.7% explanatory power. The multiple likelihood was 1.579. This result can be regarded as significant because the multiple covariance value is considered significant if it is less than 10. Job autonomy 5 had a significant effect on organizational commitment as the null hypothesis was rejected and the alternative hypothesis was accepted as $\beta = 0.431$ ($p < 0.001$).

Table 7. Multiple Linear Regression Analysis (Job Autonomy - Job Commitment).

Variable	Unstandardized Coefficients		Standardized Coefficients	t(p)	TOL	VIF
	B	SE	B			
(Constant)	.667	.116		5.756		
Job autonomy 5	.431	.063	0.438	6.866***	.633	1.579
Job autonomy 1	.317	.059	0.344	5.391***	.633	1.579
F(p)	95.596***					
R^2 adj.	.487					
Durbin-Watson	2.015					

*p<.05, **p<.01, ***p<.001

5) Relationship between job satisfaction and job commitment

Multiple linear regression analysis was conducted to explore whether job satisfaction according to standard work schedules affects organizational commitment according to standard work schedules. The analysis utilized stepwise. As a result of the analysis, $F=139.938$ ($p<.001$) indicates that this regression model is suitable. $adj. R^2 = 0.682$, showing 68.2% explanatory power. The multiplicity value was 6.104. A multiple covariance value of less than 10 can be considered significant. Job satisfaction 6 had a significant effect on organizational commitment as the null hypothesis was rejected and the alternative hypothesis was accepted as $\beta=0.255$ ($p<.05$).

Table 8. Multiple Linear Regression Analysis (Job Satisfaction-Job Commitment).

Variable	Unstandardized Coefficients		Standardized Coefficients	t(p)	TOL	VIF
	B	SE	β			
(Constant)	.309	.097		3.188		
Job satisfaction 6	.255	.094	.269	2.698**	.164	6.104
Job satisfaction 2	.345	.077	.342	4.459***	.277	3.614
Job satisfaction 5	.261	.093	.261	2.815**	.188	5.314
F(p)	139.938***					
$R^2_{adj.}$.682					
Durbin-Watson	2.147					

*p<.05, **p<.01, ***p<.001

6) Relationship between job autonomy-job satisfaction and organizational commitment

Through the questionnaire, job autonomy, job commitment, and organizational commitment according to standard days and performance were identified through a Likert scale (1 to 5 points). Looking at the relationship between job autonomy, job satisfaction, and organizational commitment according to standard work and performance through the tables and explanations above, it was found that the independent variables, job autonomy and job satisfaction, had a positive (+) effect on organizational commitment.

According to the results of the survey, job autonomy and job satisfaction averaged 2.11 and job autonomy according to the standard daily schedule, and organizational commitment was 2.15, which was less than 3 points on average for all three items. Therefore, it is self-evident that the current standard daily routine hinders job autonomy and job satisfaction, ultimately hindering organizational commitment. These results indicate the need to improve organizational commitment through current standardization and improvement.

In this study, the standard date and basic data were prepared by specifying the problems and improvement directions of the current standard date, which were explored through empirical analysis with a sample of national firefighters. The improved standard days are shown in <Table-9>. Team meetings are a time for coordinating team

schedules, such as understanding the individual duties of the team on the day and establishing a team self-training plan after shifts and equipment checks. Team plan execution refers to matters related to team self-training, responsible administrative work, and physical training decided after the team meeting. Physical training is up to 1 hour. In the case of mobilization and local adaptation training for firefighting objects, etc., it is considered that the work team's own training was conducted on the same day. However, if the team leader determines that review related to field activities is necessary immediately after dispatch, an on-site review meeting may be held and, if necessary, training may be conducted concurrently. Break time, unless there is a special reason, is to comply with Article 20 (preparation for dispatch) of the 「Work Rules for Fire Officials」. On a daytime (up to 1 hour) and nighttime (up to 3 hours) basis, individual and team work other than dispatch is suspended, and it is used for personal leisure purposes. However, additional break time may be granted at the discretion of the team leader if it is necessary to recover the physical condition of the crew outside of the legal standards. During the 23:00~07:00 night patrol and stand by times, night patrols must be conducted at least once. However, it may be omitted in cases where there is a possibility that a dispatch gap may occur.

Table 9. Improved standard daily schedule.

Work details(9 or 21 Cycles)		Time	Work details(24 Hours On-call)
Day shift	Equipment operation training (Handover)	08:50~09:00	Equipment operation training (Handover)
	Team meetings and stand by	09:00~12:00	Team meetings and stand by
	Lunch and break time	12:00~13:00	Lunch and break time
	Stand by and daily work	13:00~17:40	Stand by and daily work
Night shift	Equipment operation training (Handover)	17:40~18:00	Equipment operation training (Handover)
	Dinner and break time	18:00~19:00	Dinner and break time
	Stand by and Team plan execution	19:00~22:00	Stand by and Team plan execution
	A night patrol and break time	23:00~ 07:00	A night patrol and break time
	Breakfast	07:00~08:50	Breakfast

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