Impact of Stress on Subway Station Workers' Health Concern and Dietary Behavior in the Seoul Metro

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ABSTRACT

This study examined the effects of job stress on the dietary habits of subway station personnel experiencing a high level of stress. The participants were 209 subway station workers who completed a survey as part of the baseline data collection. The questionnaire consisted of general items and questions regarding their health concerns and lifestyle, dietary habits and behaviors, diet practice, and job stress. The general characteristics of the subjects and their dietary habits in relation to job stress, vegetative behavior, and practice of dietary guidelines were assessed by χ^2 analysis or ANOVA. The most stressful aspects of the job were related to organizational culture and compensation. In the high stress group, the frequency of coffee ingestion and junk food consumption were significantly higher than in the other groups ($p<0.05$). Nine out of the 21 Korean dietary action guides were related to the job stress level, including eating a variety of foods, eating less fat, maintaining a balanced diet, and trying to exercise ($p<0.05$). In the case of the high stress group, there is a high possibility of developing an undesirable eating habit, that can cause health problems. Therefore, it will be necessary to implement education and publicity programs on the proper management of eating habits, together with stress control measures, for occupational groups with high stress intensity such as station workers.

Key words: subway station workers, stress, health concerns, dietary behaviors, eating habits

INTRODUCTION

The station staff actively respond to customers' needs and complaints in order to improve customer convenience at the station and perform customer-facing tasks with the goal of promptness, accuracy, friendliness, and safety to ensure customer satisfaction from beginning to end of their journey (Kim DY 2015). The primary concern when designing the present research was to limit the sample of subway station workers to those whose jobs needed physiological and psychological adaptations to cope with occupational stress. Because of the nature of their job, station workers not only have a poor working environment due to factors such as a dark underground environment, electromagnetic waves, and noise, but also encounter various risk factors, ranging from irregular working hours and shift work to mental health problems, which have even led to suicide by subway commuter train in some cases (Cho UC 2006; Kim JW 2009). Thus, the characteristics of the work of the station staff,

including irregular sleeping and eating patterns due to shift work, increased demand for emotional labor from customers, and managing the prevention of large accidents, all contribute to mental and physical stress. Thus, there is a growing need for job stress management among railway workers. In the past, research on stress in railway workers has focused train operators (Cho UC 2006; Park TS *et al* 2013; Lee JH 2014). However, the staff working in the stations are also exposed to the highly stressful environment and there is little research into job stress among these workers, even though they perform various stressful tasks.

The intrinsic risk of job stress negatively affects the health levels, diet-related attitudes and habits, and quality of life of individual workers, and causes a serious social burden as a result of the associated decreases in productivity and job commitment due to low job satisfaction and increases in industrial accidents (Chang SJ *et al* 2005). It was revealed in a study by Choi SY (2011) that the higher the job stress, the higher the frequency of alcohol consumption in a study of health concerns and lifestyle habits related to job stress in men who work in Jeonju city. In a study about stress of local public officials by Kim EJ & Lim JY (2010), it was found

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that the group with higher job stress consumed more alcohol and displayed more negative behaviors after drinking.

Excessive job stress often leads to unhealthy consumption habits such as excessive drinking, binge eating, and increased intake of irritating foods. Because of inappropriate dietary habits including, but not limited to, overeating, malnutrition, excessive intake of animal fats, excessive consumption of spicy foods, and irregular meals, major health problems such as chronic diseases and obesity are emerging in modern societies (Kim JY 2005). The results of a previous study on the relationship between job stress and dietary habits showed that the group with higher job stress preferred spicier foods compared to the group with lower job stress, and the rates of binge eating and instant food consumption were also significantly higher (Kim DY 2010). In addition, a study by Joo HE (2009) showed that the lower the stress, the higher the interest in cholesterol, indicating that the less stressed group was more willing to maintain their health through proper eating habits. This result highlights the need for attention in this area to increase the interest of the high-stress group in their own health, in terms of cholesterol. The results of this study show that the stressors and working patterns have an influence on the eating habits of the high-stressed occupational group. The purpose of this study was to provide basic data to inform the effective management of job stress and encouragement of correct dietary habits by analyzing the actual situation regarding eating habits in relation to job stress.

STUDY METHODS

1. Participants and Procedures

Before the formal survey, we conducted a pilot test with fifteen workers at subway stations of the Seoul Metro to identify any ambiguous questions. Based on the feedbacks of the fifteen workers, we modified certain questions to make them more comprehensible before conducting the formal survey. This study used convenience sampling method as one of the non probability sampling which is attempt to obtain a sample convenient elements because the samples is available in the right place. The survey was undertaken in stations of the Seoul Metro system from October to December 2017. The participants of this study were subway station workers, and a total of 230 questionnaires were distributed. Twenty-one res-

ponses that had many missing values and were not carefully answered were excluded. The final sample included 209 valid questionnaires from the investigated respondents (valid response rate: 90.9%). This study was approved by the Institutional Review Board (IRB #: SMWU-1710-HR-0900).

2. Questionnaire Development and Measurement

The survey in this study was developed using questionnaire and measurement scales adopted from previous studies (Chang SJ *et al* 2005; Joo HE 2009; Kim JW 2009; Lee MA 2011). The details are as follows.

1) Health concerns

Three items were used to measure the subway station workers' health concerns: self-reported health status and degree of health concern, as well as other sources of health information. Self-reported health status was evaluated using a nominal scale with the levels unhealthy, moderate, and healthy. For the degree of health concern, a nominal scale with the levels of low, moderate and high concern was used. Prior sources of health information that came from printed media, TV or the Internet, nutrition experts, family, or friends were also used.

2) Lifestyle habits

Seven measurement items were used to measure lifestyle habits. Items included smoking (yes/no), frequency of alcohol-drinking, exercise patterns, sleep patterns, frequency of caffeine intake, and health food supplement usage (yes/no). In terms of smoking, drinking, and exercise, we also asked why the respondents felt they practice those habits.

Dietary behaviors and eating habits: These following items measured eating habits and behaviors. Frequency of breakfast intake, time taken over a meal, junk food intake, and snacking was evaluated. Other items asked about participants' reasons for skipping breakfast, and junk food intake.

3) Practice levels of Korean Dietary Action Guides

The 21 items concerning the practice level of Korean Dietary Action Guides were based on "Dietary guidelines for adults' by the Korean Ministry of Health and Welfare in 2007. Items were statements such as "I eat a variety of vegetables every day", "I know and maintain a healthy weight", and "I try to have balanced meals with rice and side dishes."

Participants responded to each item using a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree).

4) Job stress assessment

The 24 items concerning job stress were modified items from the job stressor scale developed by Chang SJ *et al* (2005), adapted for use with subway station workers. Seven subscales were used to measure subway station workers' stress levels: high job demand (4 items), lack of job autonomy (4 items), interpersonal conflicts (3 items), lack of job security (2 items), low satisfaction with organization system (4 items), lack of reward (3 items), and rigid organizational culture (4 items). Each item consisted of a statement expressing a feeling or opinion about an aspect of working life, and participants were asked to rate the extent to which they agreed with this statement on a four-point Likert scale from 1 (strongly disagree) to 4 (strongly agree). Subscale scores were calculated using the conversion method for each area, as shown in the following equation, and the total score for overall job stress was calculated by summing the converted scores of the 7 subscales and dividing by 7 again (Fig. 1). We useduse this formula to avoid distribution bias in the measured values by compensating for the problem that the scores of some areas may be over-reflected when the job stress factors are represented as one score. In this way, the measurement values closest to the normal distribution can be obtained, such that, the higher the job stress score, the higher the overall job stress.

3. Statistical Analysis

All data were analyzed using SPSS (ver. 23.0) for Windows. Frequency analysis and technical analysis were conducted to examine the general characteristics of the subjects. In order to investigate the differences in eating habits, dietary behaviors, and attitudes in relation to job stress, χ^2 analysis was used for items measured on a nominal scale, and ANOVA was used for items measured on Likert scale. When significant differences were found, post hoc tests were performed using Duncan's multiple range test.
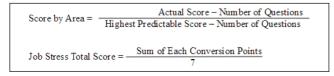
RESULTS

1. Demographic Characteristics

The demographic characteristics of the subway station workers included gender, work experience (years), and current position within the company (Table 1). Analysis showed that the majority of respondents were male (74.6%). The minimum number of months worked was 3 months the maximum was 34 years and 7 months, and the average length of working years was about 15 years. In terms of the seniority level within the company, 4.8% of participants were at the case of the senior level (grade 3) 4.8%, while 51.1% were at the middle level (grades 4~6).

2. Job Stress Group Classification and Job Stress Score

Using the formula in Fig. 1, participants were classified according to the level of job stress. In order to divide into 3 levels of stress group, Sampling distribution was identified and then class interval was determined. In detail, the distribution of stress scores was identified, and then 3 class interval was determined with stress scores mean. In result, the frequency of participants was apportioned almost equally among 3 groups. Based on 43.17, stress scores mean, 39.67 and 46.64

Fig. 1. Formula for job stress group classification.

$$\text{Score by Area} = \frac{\text{Actual Score} - \text{Number of Questions}}{\text{Highest Predictable Score} - \text{Number of Questions}}$$

$$\text{Job Stress Total Score} = \frac{\text{Sum of Each Conversion Points}}{7}$$

Table 1. Demographic characteristics of the participants

Variables		n(%)
Gender	man	156(74.6)
	woman	53(25.4)
Seniority level (Grade)	7th	92(44.0)
	4th~6th	107(51.1)
	3rd	10(4.8)
Work experience (mon, yr)	<2	49(23.4)
	2~15	52(24.9)
	16~25	44(21.1)
	>25	64(30.6)
	Min	3 mon
	Max	34 yr 7 mon
	Mean	15 yr

were decided as class marks for low, and high stress level groups. Participants (n=71, 34%) who were placed in the low-stress level group was determined with the stress scores lower than 39.67. The moderate-stress level group (n=69, 33%) was determined with stress scores of 39.67~46.67. Lastly, 69 samples (33%) were assigned to the high-stress level group base on stress scores higher than 46.67 (Table 2).

Table 3 shows the results of the job stress score. Of the seven domains of the job stress assessment, the staff-reported scores were highest for "lack of job autonomy" (2.83), followed by "system unfairness" (2.62), and "lack of reward" (2.51); scores were lowest for "interpersonal conflicts" (1.97). In all seven domains, it was found that the job stress scores were significantly higher in those with higher level of stress.

Table 2. Job stress group classification & average job stress score

	Group	Score range	n(%)
Job stress group classification	Low level	<39.67	71(34.0)
	Moderate level	39.67~46.67	69(33.0)
	High level	>46.67	69(33.0)
Job stress score (total score: 100)	Average	Min	Max
	43.27±11.19	9.52	76.19

3. Health Concerns and Lifestyle according to Job Stress Level

Table 4 shows the analysis of the associations between job stress level and health status and health concern among survey subjects. There was a statistically significant difference among the three groups (p<0.001). More than half (52.1%) of the low-stress group reported themselves as healthy. However, only 23.2% and 15.9% of the moderate- and high-stress groups reported themselves as healthy. Thus, the higher the job stress, the less people think that they are healthy. Moreover, the rate of reporting oneself as unhealthy increased from 8.5% in the low-stress group to 14.5% and 26.1% in the moderate-and high-stress groups respectively.

Comparing the levels of health concern among the job stress-level groups, there was no significant difference and 61.7% of the staff were very interested in health. Additionally, looking at specific lifestyle habits, the percentage of non-smokers to smokers was 85.2%, the highest frequencies of alcohol consumption were once every two weeks (27.8%) and once a week (30.1%), and there was no difference according to level of stress. In the case of coffee consumption, the statistics revealed that 44.9% of the high-stress group drank coffee more than three times per day, the ratio of coffee consumption was more than 2 times significantly higher than the other groups (p<0.05). Finally, 45.0% exercised 1 to 2 times per week, while sleeping time was 5

Table 3. Job stress score of the seven domain according to the level of job stress   (n=209)

Job stress domain	Job stress level[1]				F-value(p-value)
	Total mean	Low	Moderate	High	
Job demand	2.36±0.48	2.05±0.44[a]	2.38±0.37[b]	2.67±0.42[c]	40.594(.000[***])
Lack of job autonomy	2.83±0.39	2.69±0.38[a]	2.81±0.33[a]	3.00±0.38[b]	12.817(.000[***])
Interpersonal conflicts	1.97±0.42	1.74±0.44[a]	1.96±0.23[b]	2.22±0.42[c]	29.373(.000[***])
Job insecurity	2.23±0.69	1.78±0.62[a]	2.18±0.50[b]	2.74±0.59[c]	49.204(.000[***])
System unfairness	2.62±0.50	2.20±0.37[a]	2.63±0.32[b]	3.03±0.40[c]	91.585(.000[***])
Lack of reward	2.51±0.55	2.07±0.36[a]	2.49±0.39[b]	2.98±0.45[c]	91.808(.000[***])
Rigid organizational culture	2.09±0.45	1.81±0.37[a]	2.03±0.31[b]	2.45±0.42[c]	56.005(.000[***])

[1] Descriptor: Ratings on a scale from 1 (strongly disagree) to 4 (strongly agree).
[**] p<0.01.
[a~c] Different letters indicate significant difference by Ducan's multiple range test.

Table 4. Health concern and lifestyle according to the level of job stress

Variables		Job stress level				χ^2 (p-value)
		Total	Low	Moderate	High	
Health condition	Unhealthy	34(16.3)	6(8.5)	10(14.5)	18(26.1)	27.608[1] (.000***)
	Moderate	111(53.1)	28(39.4)	43(62.3)	40(58.0)	
	Healthy	64(30.6)	37(52.1)	16(23.2)	11(15.9)	
Health concern	Little	5(2.4)	0(0.0)	3(4.3)	2(2.9)	4.887 (.275)
	Moderate	75(35.9)	22(31.0)	28(40.6)	25(36.2)	
	High	129(61.7)	49(69.0)	38(55.1)	42(60.9)	
Smoking	Yes	31(14.8)	12(16.9)	7(10.1)	12(17.4)	1.798 (.407)
	No	178(85.2)	59(83.1)	62(89.9)	57(82.6)	
Frequency of alcohol consumption (times/week)	None	44(21.1)	13(18.3)	15(21.7)	14(20.3)	6.783 (.560)
	1~2/two weeks	58(27.8)	15(21.1)	20(29.0)	23(33.3)	
	1	63(30.1)	28(39.4)	20(29.0)	15(21.7)	
	2~3	35(16.7)	11(15.5)	10(14.5)	14(20.3)	
	≥4	11(5.3)	4(5.6)	4(5.8)	3(4.3)	
Frequency of coffee intake (times/day)	None	28(13.4)	8(11.3)	14(20.3)	6(8.7)	14.229 (.046*)
	1~2	118(56.5)	46(64.8)	40(57.9)	32(46.4)	
	≥3	63(30.1)	17(23.9)	15(21.8)	31(44.9)	
Frequency of exercising (times/week)	None	34(16.3)	10(14.1)	9(13.0)	15(21.7)	9.889 (.129)
	1~2	94(45.0)	31(43.7)	38(55.1)	25(36.2)	
	3~4	65(31.1)	21(29.6)	18(26.1)	26(37.7)	
	≥5	16(7.7)	9(12.7)	4(5.8)	3(4.3)	
Sleeping time (hour/day)	<5	10(5.3)	3(4.2)	2(2.9)	5(7.2)	3.608 (.462)
	5~6	95(45.5)	32(45.1)	28(40.6)	35(50.7)	
	7~8	102(48.8)	36(50.7)	37(56.5)	29(42.0)	
	≥9	2(1.0)	0(0.0)	2(2.9)	0(0.0)	

* $p<0.05$, *** $p<0.001$.
[1] Fisher's exact test was used to examining the significance of the association between the three kinds of classification.

to 6 hours and 7 to 8 hours for 45.5% and 48.8% of participants, respectively, and there were no differences according to stress-level group.

4. Dietary Behaviors and Eating Habits according to Job Stress

Table 5 shows the results of dietary behaviors and eating habits according to the level of job stress. In terms of breakfast frequency, 42.6% of all respondents said they eat breakfast at least five times per week, and the low-stress group had the highest percentage of respondents who eat breakfast at least five times per week ($p<0.05$). In terms of time taken over a meal, only 4.3% of the participants reported that their average meal lasted over 30 minutes, with 10~15 minutes reported by 23.4% of participants. Also, there was no difference in time spent over a meal according to stress level. In terms of junk food preference, the most frequent response was a "moderate" liking for it (48.8%). In the high-stress

Table 5. Dietary behavior and eating habits according to the level of job stress

Dietary behavior and eating habits		Total	Job stress level			χ^2 (*p*-value)
			Low	Moderate	High	
Frequency of breakfast intake (times/week)	None	57(27.3)	14(19.7)	27(39.1)	16(23.2)	18.123[1] (.046)
	1~2	26(12.4)	7(9.9)	9(13.1)	10(14.5)	
	3~4	37(17.7)	14(19.7)	10(14.5)	13(18.8)	
	≥5	89(42.6)	36(50.7)	23(33.3)	30(43.5)	
Time taken over a meal (min)	5~10	50(23.9)	19(26.8)	18(26.1)	13(18.8)	8.340 (.207)
	10~15	101(48.3)	28(39.4)	32(46.4)	41(59.4)	
	15~20	49(23.4)	22(31.0)	14(20.3)	13(18.8)	
	≥30	9(4.3)	2(2.8)	5(7.2)	2(3.0)	
Junk food preferences	Dislike	48(23.0)	16(22.5)	14(20.3)	18(26.1)	1.962 (.743)
	Moderate	102(48.8)	34(47.9)	38(55.1)	30(43.5)	
	Like	59(28.2)	21(29.6)	17(24.6)	21(30.4)	
Frequency of junk food intake (times/week)	None	20(9.6)	10(14.1)	4(5.8)	6(8.7)	17.478 (.025*)
	1~2/ two weeks	38(18.2)	13(18.3)	10(14.5)	15(21.7)	
	1	57(27.3)	18(25.4)	28(40.6)	11(15.9)	
	2~3	81(38.8)	26(36.6)	26(37.7)	29(42.1)	
	≥4	13(6.2)	4(5.6)	1(1.4)	8(11.6)	
Frequency of snacking (times/day)	None	52(24.9)	18(25.4)	17(24.6)	17(24.6)	5.177 (.524)
	1	124(59.3)	43(60.7)	45(65.2)	36(52.2)	
	2	25(12.0)	7(9.9)	6(8.7)	12(17.4)	
	≥3	8(3.8)	3(4.2)	1(1.5)	4(5.8)	
Total		209	71(100.0)	69(100.0)	69(100.0)	

* *p*<0.05.
[1] Fisher's exact test was used to examining the significance of the association between the three kinds of classification.

group, 42.1%, and 11.6% consumed junk food 2~3, and 4 times per week, respectively and both figures were significantly higher than in the low- and moderate-stress groups (*p*<0.05). In terms of snacking intake, the majority (59.6%) answered that they would eat snacks once a day, but there was no difference according to stress-level groups.

5. Practice of Korean Dietary Action Guides according to the Level of Job Stress

Table 6 shows the level to which the survey subjects practice each of the Korean dietary action guides. Of the 21 items, "when making food, treat food hygienically" (3.77),

and "consider cleanliness and hygiene when purchasing foods or eating out" (3.73) received the highest average scores, indicating that they were the most practiced action guide. On the other hand, "try to eat three meals a day" (2.69), and "try to trim the fat off when eating meat" (2.69) received the lowest scores, showing that they were practiced least.

Comparing eating habits according to stress-level group, the action guide "try to eat whole grains and variety of grains", "try to eat a variety of seasonal fruits every day", "try to eat dairy products such as milk, yogurt, and cheese for snacks", and "try to move a lot in daily life" were practiced significantly more by the low-stress group compared to the high-

Table 6. Practice level of Korean dietary action guides according to level of job stress

Korean dietary action guide[1]	Practice level according to level of job stress[2]				F-value (p-value)
	Total	Low	Moderate	High	
1. Try to eat whole grains and variety of grains	3.22±0.83[3]	3.47±0.96ᵃ	3.07±0.77ᵇ	3.13±0.74ᵇ	3.522(.043*)
2. Try to eat colorful variety of vegetables every day	2.96±0.88	3.31±1.01ᵃ	2.97±0.78ᵃ	2.61±0.83ᵇ	2.987(.037*)
3. Try to eat a variety of seasonal fruits every day	3.35±0.94	3.74±0.95ᵃ	3.19±0.86ᵇ	3.12±0.62ᵇ	3.300(.049*)
4. Try to eat dairy products such as milk, yogurt, and cheese for snacks	3.00±0.94	3.23±0.94ᵃ	2.91±0.87ᵇ	2.86±0.97ᵇ	3.219(.042*)
5. Try to move a lot in daily life	3.55±0.83	3.86±0.84ᵃ	3.33±0.81ᵇ	3.35±0.80ᵇ	2.847(.046*)
6. Try to exercise for 150 minutes per week (5 days a week, 30 minutes a day)	3.42±1.13	3.68±1.03ᵃ	3.58±1.08ᵃ	2.99±1.23ᵇ	2.830(.035*)
7. Know and maintain healthy weight	3.04±1.01	3.00±1.13	2.96±0.95	3.16±0.95	0.766(.466)
8. Try to adjust energy intakes with amount of physical activity	2.72±0.94	2.82±0.96	2.68±0.93	2.65±0.94	0.611(.544)
9. Consider cleanliness and hygiene when purchasing foods or eating out	3.73±0.68	3.87±0.72ᵃ	3.85±0.67ᵃ	3.47±0.63ᵇ	2.720(.043*)
10. Try to cook or order proper amount of foods	3.32±0.82	3.44±0.86	3.28±0.84	3.23±0.75	1.225(.296)
11. Try to handle foods hygienically when cooking	3.77±0.70	3.77±0.68	3.78±0.73	3.75±0.72	0.031(.969)
12. Try to eat three meals a day	2.69±1.04	2.83±1.17	2.49±0.92	2.74±0.99	1.991(.139)
13. Try to maintain balanced diet with proper amounts of rice and various side dishes	3.07±0.82	3.27±0.87ᵃ	3.16±0.78ᵃ	2.77±0.80ᵇ	3.066(.034*)
14. Try to use less salt or soy sauce when making food	3.08±0.91	3.04±0.96	3.13±0.91	3.07±0.86	0.168(.845)
15. Try to make soup less or not salty at all	3.00±0.94	3.01±0.90	3.06±0.98	2.91±0.95	0.423(.656)
16. Try not to add salt or soy sauce when eating meals	3.19±0.97	3.21±1.15	3.19±0.93	3.17±0.80	0.026(.974)
17. Try to make kimchi with less salt	2.96±0.84	2.99±0.92	2.97±0.73	2.93±0.86	0.091(.913)
18. Try to trim the fat off when eating meat	2.69±0.95	2.73±0.94	2.51±0.83	2.84±1.04	2.255(.107)
19. Try to eat less fried foods	3.04±0.99	3.17±1.06ᵃ	3.17±0.92ᵃ	2.78±0.95ᵇ	3.642(.028*)
20. Try to use less oil during cooking	3.08±0.83	3.14±0.30	2.94±0.78	3.14±0.79	1.363(.258)
21. For men: try not to drink more than two drinks a day For women: try not to drinks more than a drink a day	3.21±1.16	3.18±1.18	3.22±1.14	3.23±1.18	0.033(.968)

* $p < 0.05$.
[1] Based on Ministry of Health and Welfare (2007). Revision of Dietary Guidelines for Korean adults. Ministry of Health and Welfare, Sejong-si, Korea.
[2] Descriptor: Ratings on a scale from 1 (strongly disagree) to 5 (strongly agree).
[3] Mean±S.D.
ᵃ,ᵇ Different letters indicate significant difference by Ducan's multiple range test.

stress group ($p < 0.05$). "Try to eat colorful variety of vegetables every day", "try to exercise for 150 minutes per week", "consider cleanliness and hygiene when purchasing foods or eating out", "try to maintain balanced diet with proper amounts of rice and various side dishes", and "try to eat less fried food" were practiced significantly less by the high-stress group compared to the low- and moderate-stress groups ($p < 0.05$).

DISCUSSION

The purpose of this study was to investigate the degree of stress and the related eating habits of subway station workers who are exposed to intensely stressful environments. As a result of analyzing the seven areas of job stress, the highest level of stress was experienced when respondents felt they lacked job autonomy, were dissatisfied with the organizational system, or they were not sufficiently rewarded for their work. These areas are related to organizational culture and rewards. the organizational rigidity and low wages have always been recognized as problem of the civil service organization in Korea (Lee MA 2011; Yoon MS & Kim SH 2014; Yim JS & Lee JJ 2016). In a study on the job stress factors of firefighters by Yoon MS & Kim SH (2014), "lack of autonomy" and "system unfairness" were the main stressors. In addition, a study by Yim JS & Lee JJ (2016), which examined job stress among factory workers, and another by Lee MA (2011) on job stress factors in metalworkers, workers in Korea were found to have a many complaints about the organizational system. Similarly, the staff members in this study also seem to experience a relatively high level of job stress due to poor management in their various roles. Despite their various roles, the lack of autonomy seems to represent a high level of job stress, as all authority is delegated to the upper levels of management. As a result, the stress that workers experience is due to various other factors such as job characteristics, work environment characteristics, organizational atmosphere, and business conflict with their bosses or colleagues. Thus it is highly likely to lead to unhealthy eating habits and lifestyles, and active management is needed to combat this (Kim HK 1995; Kim DH & Kim HD 2002; Kang KW *et al* 2010).

Participants were divided into three groups based on their level of job stress (low -, moderate-, high-stress groups), and it was found that the scores of the high-stress group were significantly higher compared to those of the other groups for each job stress domain. In the study of Joo HE (2009), the group with the highest stress in the police organization had significantly higher job demands, job autonomy, conflicts, and job instability, as well as less satisfaction the organizational system, inadequate compensation, and workplace culture factors. The result were similar for this study, and it can be deduced that the public servants in the public service sector are stressed in various aspects of their jobs as their jobs are more stressful overall.

In terms of the level of concern about health, the overall level of interest was very high, and consumed alcohol once per week or, every two week, and there was no difference between the stress-level groups. However, in the high-stress group, the frequency of coffee ingestion was more significantly higher than in the other groups (*p*<0.05). Drinking coffee was also responsive to stress in previous studies (Mattioli AV *et al* 2008; Im SY & Jeong GC 2017). Researching occupational stress and coffee consumption, Conway TL *et al* (1981) also found that habitual coffee drinking was positively associated with chronic tendencies to experience high level of stress. The high workload and heavy responsibilities may explain this associated between increased consumption coffee and high stress levels.

In terms of eating habits according to job stress level, the frequencies of eating breakfast was higher in the low-stress group than in the moderate- and high-stress groups, in contrast, junk foods consumption was significantly higher in the stress group than in the moderate- and low-stress group. The results of a study by Park MS & Park KA (2014) suggest that stress may be associated with irregular eating habits. Chung *et al* (2007) also found that high stress may have a negative effect on regular eating habits, despite that it may, conversely, increase the frequency of eating breakfast. In addition, Israel P *et al*'s (1994) study also emphasized that people with inadequate eating habits have high stress scores and that eating habits are important in stress management.

In terms of junk food consumption, our finding is consistent with several previous survey studies that asked people about their food choices when stressed and found that people reported an increase in consumption of sweet, highly caloric, high fat food (Steptoe A *et al* 1998; Oliver G & Wardle J 1999; Wardle J *et al* 2000; Cartwright M *et al* 2003). People who ate high caloric, sweet and fatty foods when stressed reported feeling happier while eating them. Eating those foods did not, however, decrease their anxiety (Polivy J *et al* 1994). These results suggest that proper practice of food intake in daily life can maintain a healthy diet regardless of the intensity of stress. It is therefore important that dietary education for workers is continued.

The results of the comparison of eating habits according to stress level indicated that the low-stress group practiced having a variety of or whole grains, having a variety of

seasonal fruits, choosing dairy products for snacks significantly more than the high stress group (*p*<0.05). They also indicate that the high-stress group practices eating vegetables and less fried foods, and keeping a balanced diet significantly less than the other groups. Two items related to exercise or activity, such as "Try to move a lot in daily life", the low-stress group showed a significantly higher level of practice compared with the high-stress group (*p*<0.05). The results showed that the lower the stress, the higher the scores for Korean dietary action guides concerning healthy foods and a balanced diet, body weight, fruit and vegetable intake, dairy product intake, and the lower the intake of fatty foods. Also, the low-stress group reported a higher level of activity and regular exercise than the high-stress group.

Oliver G & Wardle J (1999) found that stressed subjects reported a decrease in the consumption of fruits and vegetables in stressful circumstances. Another previous survey of what foods people choose when stressed found that people chose more highly caloric and fatty foods (Polivy J *et al* 1994; Epel E *et al* 2001). A study about stress related to the practice of the health behaviors by Hudd S *et al* (2000) analyzed that the consumption patterns of "stressed" college students are different from those of less stressed students in several ways.

Those who had high levels of stress were more likely to practice a number of unhealthy behaviors. "Stressed" students drank or consumed more soda or junk foods than "less stressed" students and there were also significant differences in the exercise patterns of the two groups. Respondents with higher levels of stress were significantly less likely to exercise regularly. "Less-stressed" respondents were also significantly more likely to consume fruits and vegetables. In addition, Lee MA (2011) showed that the group with lower job stress was more likely to consume milk and dairy products, and Joo HE (2009) showed that the less stressed, the more interested they were in cholesterol, according to a study of the difference in cholesterol perception among police officers. In other words, cholesterol is known to be bad for health, so they try to eat less fried food (which has high cholesterol content); thus, less stressed groups are better able to care for proper diet management than highly stressed groups.

CONCLUSIONS

In summary, the results of this study showed that 9 items were significantly related to the level of stress and the level to which Korean dietary action guides are practiced. The lower the intensity of stress, the higher the level of practice of action guides relation to considering cleanliness and hygiene when purchasing foods or eating out, having meals regularly, eating without salt if possible and alcohol abstinence. The results of this study show that the higher the job stress, the more difficult it is to practice health care and correct eating habits. Therefore, in the case of station staff, it is necessary to recognize the importance of correct eating habits in intensely stressful environments and to find ways to manage and reduce stress by changing various job characteristics related to stress reduction, health care, and nutrition, and it will be necessary to create a pleasant work environment that can reduce stress, by providing a management program to the staff members.

It is also uncommon for service workers to be aware of their eating habits. Therefore, a cafeteria specialized in healthy diet menus would be a special environment not only to provide meals, but also it should be able to serve as a place for nutrition counseling, the reduction of stress, disease prevention and health promotion. Next, it is also important to prevent diarrheal diseases by improving the eating habits of workers. Diverse and extensive research into dietary habits of employees should be done consistently in the future.

The results of this study suggest that there is a significant relationship between the degree of stress and eating habits and dietary habits, but it has some limitations, such that we cannot accurately assess the causal relationship between stress status and eating habits. There are several reasons for that. First, individuals may differ in sensitivity to stress, as more sensitive persons producing stronger correlations. Such differences could include differential sensitivity to specific types of stress. Second, people differ in the way they alter a given behavior in response to stress. For example, some people may increase the number of coffees they drink but continue to drink a small-sized coffee each time, while others may drink the same number of coffee as they would be under low stress but take larger sizes. Finally, people may differ in their methods for coping with stress; some may drink more alcohol as stress increases, whereas others may drink more coffee. Future research will be needed to explore these possibilities and determine their separate contributions in terms of individual differences.

Despite its limitations, the present study was conducted to investigate the effects of stress and stress management of the occupational groups with high levels of stress, because they are likely to have undesirable eating habits when the stress is high. Overall, it would be sufficient to emphasize the need to educate and promote proper eating habits. In addition, it can be said that this study provided basic data on dietary life and nutrition management of special occupational groups in terms of the dietary characteristics and practices of subway station staff. Future research should be conducted to directly identify the causal relationship between stress and eating habits and to develop a practical dietary plan that will help to relieve stress.

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