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## Duty-related incidental stress and the coping method in new firefighters

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#### =Abstract =

**Purpose:** This study aimed to investigate duty-related incidental stress, coping method, and stress factors in 133 new firefighters.

**Methods:** A self-reported questionnaire was administrated to 133 new firefighters between April and May 2010. It consisted of 33 and 62 items concerning duty-related incident stress and coping methods, respectively. Data were analyzed by using the t-test, analysis of variance, Pearson correlation coefficient analysis, and multiple regression analysis.

**Results:** New firefighters experienced the most stress when inappropriately dispatched. Duty-related incidental stress correlated with active ( $r = .420, p < .001$ ) and passive coping ( $r = .450, p < .001$ ). Also active coping statistically correlated with passive coping ( $r = .890, p < .001$ ). Influencing factors of duty-related incidental stress were passive coping ( $t = 2.12, p < .05$ ), experience of having a co-worker in a dangerous situation ( $t = 3.30, p < .001$ ), having less than 6 months of work experience ( $t = 2.30, p < .05$ ), and experience of having oneself in a dangerous situation ( $t = 2.05, p < .05$ ).

**Conclusion:** New firefighters need to be provided with training on active coping to prevent posttraumatic stress disorders and, social support immediately after an inappropriate and stressful dispatch.

**Key words:** Duty-related incidental stress, Coping, New firefighters, Posttraumatic stress

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## =국문초록=

**연구 목적:** 본 연구는 목적은 신입소방대원 직무 관련 출동 스트레스, 대처방법과 직무관련 출동 스트레스의 영향요인을 알아보고자 하는데 있다.

**연구 방법:** 직무관련 출동 스트레스원은 Beaton 등(1998)이 사용한 33개 문항의 VAS(Visual Analogue Scale)을 사용하여 측정하였고 대처 방식 척도는 이장호와 김정희(1988)의 62문항으로 구성된 질문지를 사용하였다. 수집된 자료는 SPSS WIN 14.0 program을 이용하여 t-test와 ANOVA, Pearson correlation coefficient과 다중 회귀 분석을 실시하였다.

**연구 결과:** 잘못된 신고로 인한 출동이 가장 빈번하게 노출되는 스트레스원(95건, 71.4%)이고 이때 가장 많은 스트레스(3.84)를 받는 것으로 나타났다. 직무관련 출동 스트레스는 적극적 대처( $r = .420, p < .001$ )와 소극적 대처( $r = .450, p < .001$ )에서, 적극적 대처는 소극적 대처( $r = .890, p < .001$ )에서 통계적으로 유의한 강한 상관관계를 나타냈다. 직무관련 출동 스트레스 영향요인은 수동적 대처( $t = 2.12, p < .05$ ), 동료가 부상이나 죽음위험을 경험할 경우( $t = 3.30, p < .001$ ), 근무기간이 6개월 이내( $t = -2.30, p < .05$ ), 본인이 부상이나 죽음경험을 한 경우( $t = 2.05, p < .05$ )로 나타났다.

**결 론:** 외상 후 스트레스 장애로 진행되지 않도록 적극적 대처에 대한 교육과 중재의 제도개선이 요구되고 사회적 지지와 지속적인 관심이 필요하다.

**국문중심단어:** 직무관련 출동스트레스, 대처, 신입소방대원, 외상 후 스트레스

## I. Introduction

Firefighters experience emotional trauma, physiological symptom, and traumatic experience as the secondary traumatic stress when their lives are threatened or when they are exposed to traumatic incident such as gruesome injuries or badly disfigured bodies and patients. They suffer from this traumatic stress every time due to nature of their job as firefighters [1]. As stated, paramedics and firefighters are more stressful during the routine duty than infrequently experienced disasters-related traumatic dispatch such as seeing co-worker's serious injuries/deaths, their own injuries, victims in terrible accident,

and patients of cardiac arrest were in need of CPR (Cardiopulmonary resuscitation) [2]. Also, as duty-related stress accumulated, it showed relation to fatigue, burnout and secondary traumatic stress, which led to increased drug and alcohol consumption and caused physical symptom of cardiovascular problem and so on [3]. From the study of Korean firefighters' traumatic experience, witnessing a gruesome corps was the most common experience, more frequent life-threatening calls resulted in higher risk for posttraumatic stress disorder and also, more frequent traumatic experiences lead to increase complaints of posttraumatic stress disorder [4,5].

According to Statistics Korea, emergency medical service calls were increased to

469,037 (45.3%), rescue calls were increased to 302,208 (30.9%) compared to 10 years ago. Fire manpower was also increased from 27,604 (2004) to 39,519 (2014) due to high demand of fire fighter's duties (2014) [6]. According to study of Hagh-Shenas et al [7], nonprofessional helpers without formal training got higher scores on posttraumatic stress disorder compared to professional firefighters with formal rescue training after a terrible bomb blast. New firefighters who were initially exposed to traumatic incident are more vulnerable to traumatic stress than experienced firefighters.

Many previous researches revealed the PTSD (Post traumatic stress disorder) in the firefighters, but there are only few studies about new firefighters who have never been exposed to traumatic incident before. Therefore, this study investigates the frequency, stress degree, and factors affecting the duty-related incident stress so that it can be helpful to make the basic data to improve the program for preventing and mediating the new firefighters' posttraumatic stress.

## II. Methods

### 1. Subject and data gathering

The study done from April to May, 2010 had 133 new firefighters among the trainees in national fire service academy who had a work experience less than 3 years and consented to the study.

## 2. Instrument and data analysis

The items of duty-related incident stress was developed by Beaton et al [2]. They translated 33 items on a 0 to 10 point and use Visual Analogue Scale (VAS). Cronbach's alpha for the items was .982.

Criterion of coping method was composed of active coping (27 items) and passive coping (35 items) from Lee & Kim [8]. It has 62 items with 4 Likert-type scale. Cronbach's alpha for the items was .973.

The duty-related incident stress of general characteristics was analysed with t-test and ANOVA after the analysis of frequency. The analysis of frequency was used for frequency of the duty-related incident stress and stress degree. Pearson correlation coefficients test was conducted to assess the correlation of the duty-related incident stress and coping method. And the multiple regression analysis was carried out to confirm the effective variable of the duty-related incident stress. Data were run through SPSS/Win 21.0 version.

## III. Results

### 1. The duty-related incident stress of general characteristics

Demographic characteristics of participants was male (112, 84.2%), single (111, 83.5%), 26~30 years old (103, 77.4%), college graduates (75, 56.4%), fire field (70, 52.6%), 7~12 months of Employment period (74, 55.6%), 0~5 Case of terrible incident (109, 82%), no

experience in danger (99, 74.4%), no experience of having colleagues in danger (102, 76.7%), and experience of having victims in danger (67, 50.4%). The duty-related incident stress according to the general characteristics showed significant difference in experience of having colleagues in danger ( $p=.020$ ) and experience of having victims in danger ( $p=.040$ ) (Table 1).

## 2. The frequency and stress degree of the duty-related incident stress

This research showed that new firefighters get the most severe stress ( $3.84\pm 3.42$ ) when they have an inappropriate dispatch (95, 71.4%) caused by wrong notification.

The next highest stress degree of the duty-related incident stress was rendering aid to the patients attempted suicide, drug abusers, psychotic patients, and suicides by hanging.

Table 1. The duty-related incident stress of general characteristics (N=133)

Variable		N (%)	Mean $\pm$ SD	t/F (p)
Gender	Male	112 ( 84.2)	63.21 $\pm$ 81.05	-1.11 (.280)
	Female	21 ( 15.8)	83.81 $\pm$ 67.49	
Age	23~25	11 ( 8.3)	59.36 $\pm$ 77.19	0.64 (.530)
	26~30	103 ( 77.4)	70.46 $\pm$ 83.08	
	30~34	19 ( 14.0)	48.89 $\pm$ 55.86	
Marital status	Marrige	22 ( 16.5)	73.86 $\pm$ 75.13	0.48 (.630)
	Single	111 ( 83.5)	64.99 $\pm$ 80.21	
Education	High school	6 ( 4.5)	7.67 $\pm$ 8.55	1.76 (.180)
	College	52 ( 39.1)	68.13 $\pm$ 68.40	
	University	75 ( 56.4)	70.00 $\pm$ 87.56	
Work field	Rescue	11 ( 8.3)	92.09 $\pm$ 106.50	0.76 (.470)
	EMT*	52 ( 39.1)	68.40 $\pm$ 64.43	
	Fire	70 ( 52.6)	60.99 $\pm$ 79.19	
Employment period	Within 6 M <sup>†</sup>	39 ( 29.3)	76.31 $\pm$ 86.77	0.315 (.850)
	7~12 M <sup>†</sup>	74 ( 55.6)	62.91 $\pm$ 80.37	
	13~18 M <sup>†</sup>	16 ( 12.0)	63.06 $\pm$ 63.45	
	19~36 M <sup>†</sup>	4 ( 3.0)	49.75 $\pm$ 35.85	
Case of terrible calls	0~5 times	109 ( 82.0)	63.83 $\pm$ 82.72	1.29 (.280)
	5~10 times	16 ( 12.0)	79.82 $\pm$ 82.55	
	11~50 times	8 ( 6.0)	108.50 $\pm$ 62.96	
Experience of self danger	Yes	34 ( 25.6)	70.50 $\pm$ 72.89	0.34 (.730)
	No	99 ( 74.4)	65.07 $\pm$ 81.55	
Experience of colleague danger	Yes	31 ( 23.3)	104.48 $\pm$ 93.45	2.73 (.020)
	No	102 ( 76.7)	54.90 $\pm$ 70.88	
Experience of victim danger	Yes	67 ( 50.4)	85.76 $\pm$ 82.17	2.91 (.040)
	No	66 ( 49.6)	46.86 $\pm$ 72.46	
Total		133 (100.0)	66.61 $\pm$ 79.47	

\* EMT: Emergency medical technician, <sup>†</sup> M: months

And suicides by hanging, psychotic patients, the new firefighters <Table 2>. dead patients of cardiac arrest who needed CPR gave the higher stress than average degree to

**Table 2. The frequency and stress degree of the duty-related incident stress (N=133)**

Item	Frequency	Severity
	N (%)	(Mean±SD)
1. Witness duty related death of colleague	34 (24,8)	1,50±3,07
2. Colleague firefighter fire fatality (not witness)	62 (46,6)	2,62±3,42
3. Experience career ending injury (self)	34 (25,6)	1,38±2,75
4. Serious injury to colleague	42 (31,6)	1,71±2,96
5. Third degree burn (self)	33 (24,8)	1,41±2,80
6. Fire incident with multiple death	43 (32,3)	1,98±3,18
7. Exposure to hazardous chemicals	37 (27,3)	1,49±2,85
8. Multiple casualty motor vehicle accident (>5 deaths)	39 (29,3)	1,64±2,90
9. Multiple casualty motor vehicle accident (1~4 deaths)	59 (44,4)	2,47±3,32
10. Sudden infant death incident	44 (33,1)	1,83±3,06
11. Render aid to adult stabbing victim	60 (45,1)	2,11±2,94
12. Render aid to dangerous psychiatric patient	69 (51,9)	2,89±3,27
13. Completed suicide hanging	69 (51,9)	3,05±3,53
14. Completed gun shot suicide	35 (26,3)	1,45±2,83
15. Render aid to mutilated adult/attempted homicide	37 (27,8)	1,83±3,34
16. Attempted domestic homicide victim	38 (28,6)	1,62±3,01
17. Render aid to adult gun shot victim of gang violence	41 (30,8)	1,59±2,71
18. Render aid-attempted suicide/drug overdose	74 (55,6)	2,78±3,05
19. Fire incident with multiple burn victims	53 (39,8)	2,16±3,03
20. Render aid to seriously injured adolescent	48 (36,1)	1,84±2,83
21. Render aid to seriously injured child	47 (35,3)	1,92±2,98
22. Render aid to seriously injured friend/relative	38 (28,6)	1,54±2,79
23. Experience musculoskeletal strain (self)	60 (45,1)	2,16±2,79
24. Experience head injury (self)	37 (27,8)	1,53±2,90
25. Fracture of extremity (self)	36 (27,1)	1,46±2,82
26. CPR*-patient in cardiac arrest	65 (48,9)	2,79±3,31
27. CPR*/full arrest-family present	52 (39,1)	2,22±3,19
28. Adult (DOA†)-natural death	63 (47,4)	2,34±3,02
29. Death of patient after long resuscitation	57 (42,9)	2,34±3,16
30. Adult death on arrival (DOA†)-multiple wound/injuries	51 (38,3)	2,04±3,03
31. Render aid to sexual assault victim	38 (28,6)	1,48±2,78
32. Treat injured patient who resembles self/spouse	39 (29,3)	1,51±2,74
33. Inappropriate dispatch	95 (71,4)	3,84±3,42

\*CPR: Cardiopulmonary resuscitation, †DOA: Dead on arrival

### 3. Correlation between the duty-related incident stress and active/passive coping

The result of research showed that the duty-related incident stress correlated with active coping ( $r = .420, p < .001$ ) and passive coping ( $r = .450, p < .001$ ). Also active coping statistically correlated with passive coping

( $r = .890, p < .001$ ). The higher duty-related incident stress they get, the more active/passive coping they do. And the more active coping they do, the more passive coping, too (Table 3).

Table 3. Correlation between the duty-related incident stress and active/passive coping (N=133)

	Duty-related incident stress	Active coping	Passive coping
Duty-related incident stress	1		
Active coping	.420 (.000)	1	
Passive coping	.450 (.000)	.890 (.000)	1

Table 4. Effective variable of the duty-related incident stress (N=133)

Variable	B	SE	$\beta$	t	p	Adjusted R <sup>2</sup>	F
Constant	15.77	35.48		0.45	.660		
Work field (rescue/EMT <sup>*</sup> )	-14.55	24.66	-0.09	-0.60	.560		
Work field (rescue/fire)	-22.50	24.32	-0.14	-0.93	.360		
Employment period (within 6 M <sup>†</sup> /7~12 M <sup>†</sup> )	-34.68	15.05	-0.22	-2.30	.020		
Employment period (within 6 M <sup>†</sup> /13~18 M <sup>†</sup> )	-26.26	23.03	-0.11	-1.14	.260		
Employment period (within 6 M <sup>†</sup> /19~36 M <sup>†</sup> )	-41.62	36.25	-0.09	-1.15	.250		
Cases of terrible call (0~5/5~10 times)	0.15	19.62	0.00	0.01	1.000	.268	4.996
Cases of terrible call (0~5 times/11~50 times)	-7.71	32.20	-0.02	-0.24	.810		
Experience of self danger (No/Yes)	36.91	18.04	0.20	2.05	.040		
Experience of colleague danger (No/Yes)	63.98	19.39	0.34	3.30	.000		
Experience of victim danger (No/Yes)	-22.99	14.02	-0.15	-1.64	.100		
Active coping	0.23	0.86	0.05	0.27	.790		
Passive coping	1.57	0.74	0.37	2.12	.040		

\*EMT: Emergency medical technician, †M: months

#### 4. Effective variable of the duty-related incident stress

This following <Table 4> shows the result of multiple regression analysis for effective variable of the duty-related incident stress of 133 new firefighters.

We could not find any multicollinearity problem. VIF (Variation inflation factor) was lower than 10, also regression model was significant ( $F = 4.996$ ,  $p < .001$ ), and adjusted R-squared ( $R^2$ ) was .268.

The duty-related incident stress was affected by passive coping ( $t = 2.12$ ,  $p = .040$ ), experience of having a colleague in dangerous situation ( $t = 3.30$ ,  $p < .001$ ), within 6months of work experience ( $t = -2.30$ ,  $p = .020$ ) and experience of having oneself in dangerous situation ( $t = 2.05$ ,  $p = .040$ ) <Table 4>.

## IV. Discussion

This study investigates the frequency, stress degree, and factors affecting the duty-related incident stress and effective variable of the stress from 133 new firefighters.

The research said that they get the most severe stress when they have an inappropriate dispatch caused by wrong notification, thereby making the firefighters. It is similar to J. Brown et al [9] study that malicious call is one of the most stressful factors to them. This result means that there are still lots of inappropriate dispatch caused by wrong

notification, and it makes the firefighters stressful.

By revising framework act on fire services, act on 119 rescue and emergency services through imposing two million won fine to people who make prank calls, malicious calls have decreased a little bit but still needs continuous publicity [10,11]. Therefore, it should be provided for high-quality service that firefighters can response where really required on the basis of advanced civil consciousness through continuous public relations with improvement of a system.

The next highest stress degree of the duty-related incident stress were rendering aid to the patients attempted suicide, drug abusers, psychotic patients, and suicides by hanging. And suicides by hanging, psychotic patients, and dead patients of cardiac arrest who needed CPR gave the higher stress than average degree to the new firefighters. A study from Beaton et al [2] showed that natural death is more frequent than cardiac arrest needed CPR. On the other hand, in Korea, there is more rendering aid to the patients attempted suicide than natural death or cardiac arrest from disease. New firefighters can get stress from seeing death, but seeing patients who attempted suicide by hanging or drug abusers could be more shocking and stressful. The result from Oh & Lim [3], Wagner et al [12] showed that repeated exposure duty-related incident stress can cause secondary traumatic stress. Therefore, a systematic complement that includes new firefighters's healing camp

program, PTSD education, and counselling through National emergency management agency should be implemented.

The research result showed that the higher duty-related incident stress lead to more active/passive coping, and the most influential factor for stress was passive coping. The Baek [13] study of experienced firefighters showed that passive coping is the affecting factor of traumatic stress. The result of Brown et al [9] showed that the main factor of traumatic stress was avoidance action, and also Yu & Park [14] and Yang et al [4] study said that they did passive coping more when they met traumatic stress. The result of Baek [15] showed that social support from colleagues or superior is one the most effective variable, so they can reduce the duty-related incident stress through mediation with active coping. From Yang et al [4] and Shin [5] studies, firefighter's traumatic stress caused by repeated exposure to traumatic dispatches was at such a high level that is beyond self-management. Therefore, organizational interventions such as psychological counseling and social support could be effective immediately following the traumatic dispatches.

This study found that if new firefighters have experienced danger of themselves or colleagues, it has an effect on the serious stress. Firefighters suffer from psychological distress like sense of guilty and doubt about job when the co-workers die from negligent accident [16]. Not only witnessing a co-worker's death but also repetitive dispatch in

danger can cause a severe stressor. The research result of Ploeg & Kleber [17] showed that acute stressor was one of the variables affects negative aspects. The study from Mitani et al [18] showed that traumatic event experience affects mental and physical health in the long term and PTSD, and job stress were correlated with emotional exhaustion and depersonalization among the subscales of burnout.

## V. Conclusion

This study is a descriptive survey investigating the duty-related incident stress, coping method and factors affecting the stress of 133 new firefighters. Duty-related incident stress according to the general characteristics had significant difference between the experience of having colleagues in danger and the experience of having victims in danger. New firefighters experience the most severe stress when they are dispatched from a false notification. The duty-related incident stress correlated with active coping and passive coping. Also active coping statistically correlated with passive coping. The dutyrelated incident stress was affected by passive coping, experience of having a colleague in dangerous situation, within 6 months of work experience and experience of having oneself in dangerous situation.

National emergency management agency ran health care camp to diminish the PTSD, but it should be the regular system not a



temporary event to all the firefighters in high risk group. Especially new firefighters need to get a special care and continued interest through improvement of a system such as vacation or counseling service immediately after a stressful dispatch to avoid burnout or PTSD.

I suggest the following on the basis of this study :

- 1) Through repetitive research, it needs to be verified and investigated of various variables that affected the duty-related incident stress this study didn't identify.
- 2) It needs a longitudinal study of PTSD caused by the duty-related incident stress.

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