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Comparing Cognitive Performance, Mood and Emotion Regulation in Firefighters with and without PTSD

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Firefighters are among the first groups who deal with injuries from accidents. They are significantly at risk for disorders such as PTSD. This study aimed to compare the cognitive performance, mood and emotion regulation in firefighters with and without PTSD. This study, from July to October 2016, utilized a descriptive, causal-comparative approach and the statistical population consisted of all firefighters in Isfahan. The selection criterion in this study was work experience for one consecutive year. The sample included 40 firefighters with and without post-traumatic stress disorder (PTSD) selected by a random cluster sampling. In so doing, 11 fire stations in Isfahan were randomly selected from 24 stations. The firefighters at each of these stations were divided into two groups; with PTSD and without PTSD, based on their answers to the Mississippi questionnaire. The measuring instruments were the Color Tracking Test, the London Tower test, subscales of the Wechsler memory test, Beck Depression Inventory, and Garnofsky's Emotion Regulation questionnaires. The collected data were analyzed by SPSS 22 software by Mean Standard Deviation analysis, Shapiro-Wilk's normality, and multivariate analysis of variance ANOVA tests. The results showed that there were significant differences between the

scores of cognitive performance, mood and emotion regulation in firefighters with and without PTSD (p< .01). In addition, there were significant differences in firefighters, with and without PTSD (p< .01), between the scores of the time and error in first-try of attention, B and C levels of executive functions, digit span total score and forward digit span of working memory, mood and subscales of emotion regulation including positive re-evaluation, reaching a perspective and subjective rumination.

Keywords: firefighter, posttraumatic stress disorder, cognitive performance, mood, emotion regulation

Nowadays, industrialization of human societies, creation of productive work environments and the increasing growth of technology have exposed human beings to a variety of physical and financial risks and threats. These issues have affected people's lives and activities in their workplace, outdoor, home and other places. Along with these changes, various health and service organizations and institutions such as fire stations for medical emergencies have been established to mitigate the effects of these threats. Among these institutions are firefighting centers that are designed to save human life and property. In fact, firefighters must perform their duty to save lives in the most critical and harmful environmental and work conditions.

Studies have shown that most illnesses and causalities of firefighters are directly or indirectly related to the stressful nature of their work (Mead, 2018). Therefore, it ranks the fifth highest stress and risky job in the United States (Duran, Bishopp & Woodhams, 2019). It is important to examine firefighters' mental status as their function influences their health as well as the health of others in the society (Lessan, Ghofranipour, Birashk & Faghihzadeh, 2003).

In an accident, firefighters are one of the first major groups ready on the scene to perform the necessary action to cure injuries. These individuals constantly face the deaths or injuries

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of others and are significantly at risk of PTSD (Duran et al., 2019). PTSD is a psychiatric disorder that is mainly caused by exposure to trauma (Donnelly, Bradford, Davis, Hedges & Klingel, 2016). This disorder has been reported in those who have either experienced severe mental or physical stress or heard about it from others. Sometimes the nature of one's job is so that it puts individuals under stress, makes them incapable of avoiding stress, or forces them to endure it. This puts them under immense stress and being exposed to such conditions can increase the risk of PTSD syndrome. Research findings on police officers, firefighters, doctors, medical students, emergency nurses and the intensive care unit (ICU) have shown that most of them experience PTSD due to dealing with important sources of stress such as high-risk events or patients' deaths (Narimani, Zahed & Basharpour, 2008).

Due to the understanding of the emergence of PTSD in these individuals and the nature of their work, it seems necessary to intervene in critical situations at the fire departments. Moreover, while post-traumatic effects during personal injury experiences such as arousal and irritability are not present when observing others' traumatic events (Armstrong, Shakespeare-Finch & Shochet, 2016), any observed trauma can lead to negative perceptions about emotional and cognitive responses (Rodrigues, Paiva, Dias & Cunha, 2018). The individuals affected by the accident can be vulnerable to and at risk of PTSD (Narimani, Ariapouran, Abolghasemi & Ahadi, 2010). PTSD can cause some damage not only in the psychological domain including mood and emotion but also in the level of cognitive and neuropsychological functions including attention, memory and executive functions. Therefore, it is necessary to investigate

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different aspects of PTSD, especially in the cognitive and emotional dimensions.

According to observations and clinical interviews, individuals with PTSD feel isolated or alienated from their surroundings. They may be ready at any time and may respond to internal or external cues rapidly, which may provoke their anger (Rajabi, Roshan & Jamilian, 2012).

The various aspects of a traumatic event including biological change and its interaction with psychological traits have been extensively investigated. From an applied perspective, the scope of traumatic event recognition is a relatively new domain having been around for nearly two decades (Taheri et al., 2011).

Research has shown that individuals with a personal and family experience of mood disorders are more likely to develop PTSD than those without it. Individual psychological differences can affect the development of PTSD in those exposed to trauma (Narimani et al., 2008).

In recent decades, the role of emotion regulation in psychopathology has been increasingly emphasized (Seligowski, Lee, Bardeen & Orcutt, 2015). Emotional dysregulation, which leads to the occurrence and persistence of psychological trauma by disrupting the natural process of emotional processing, is applied to the study of post-traumatic stress disorder (Tull, Barrett, McMillan & Roemer, 2007). A large number of studies have shown that traumatic stress syndrome is associated with limited and inflexible access to emotion regulation strategies as well as difficulty in emotion regulation. Traumatic stress syndrome is often characterized by unsuccessful attempts to avoid emotional experiences. Although deficits in emotion regulation affect a wide range of psychological disorders (Maguen et al., 2009), this feature is recognized as a prominent

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feature in the context of post-traumatic stress disorder and leads to overestimation of threat, reduced assessment of coping resources, and emotional responses to environmental stressors. The difficulty in emotion adjustment is about 70% of people experiencing injury and predicts post-traumatic stress disorder (Mazloum, Yaghoubi & Mohammadkhani, 2014).

Moreover, studies have shown that people with post-traumatic stress disorder suffer from attention, memory, and analytical problems (Taheri et al, 2011). The findings of these studies revealed that PTSD impaired normal memory functioning and led to error in information processing and retrieval. It seems that considerable changes take place in the cognitive functions of people with post-traumatic stress disorder. For example, increased bias is seen in remembering trauma cases. On the other hand, the results of previous research show that there is a positive and constant relationship between the severity of PTSD and memory impairment. This relationship is in terms of overall memory performance, biographical memory and even memory bias (Moradi, Salimi & Fathi Ashtiani, 2010).

One of the most common cognitive states of anxiety disorders including traumatic stress disorder is attention disorder or selective information processing (Violanti, Mnatsakanova, Fekedulegn, Hartley & Andrew, 2018). Affected people have a tendency to process threat-related information selectively (Grupe et al., 2019). These patients tend to choose the concept of threat that is due to automated mechanisms of processing the threat information in ambiguous subjects with two implicit meanings. These patients' attention bias only focuses on the symptoms of PTSD, which indicates the specificity of the threat and risk

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schemas and their association with actual experiences and life in past events (Touzandejani, 2008).

Many studies have also shown neuropsychological deficits in post-traumatic stress disorder (Dietch et al., 2019). It is very important to consider executive functions as the core of these capabilities and its role in normal functioning. In people with PTSD, in addition to over-arousal and constant monitoring of environmental stimuli related to injury, the nervous system balance is impaired. As such, because of the injury, this persistent pattern of over-stimulation of the nervous system impairs one's ability to process adaptive information in the form of executive functions (Noohi, Miraghaei & Heidari, 2015).

Overall, considering the traumatic working conditions of fire personnel and the few studies on the neurological status of these individuals, this study aimed to investigate the effects of occupational conditions on the psychological status of these individuals. It was also attempted to assess psychological disorders such as post-traumatic stress disorder in some of the staff's cognitive and emotional status in the areas of attention, working memory, executive functions, and mood and emotion regulation in firefighters with and without post-stress disorder.

Method

This is a fundamental-descriptive post facto study. The statistical population of this study consisted of all firefighters in the city of Isfahan, Iran. This research included 24 firefighting stations with an average of 24 firefighters in each station, which led to a total population of 576. The selection criterion in this study was work experience for one consecutive year. In this study, due to the large size of the population and lack of access to all, cluster random sampling was used to determine the sample size.

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Accordingly, out of 24 firefighting stations in Isfahan, 11 stations were randomly selected and then at each station, a number of firefighters were randomly selected. Thus, the sample of this study included firefighters at stations number one, three, five (Operations Command unit), six, seven, eight, fourteen, sixteen, twenty, twenty-two, and twenty-four in Isfahan with a total of 40 individuals.

In this study, the researcher randomly selected a number of fire stations using their mentioned numbers and attended the stations. At each station, some firefighters were randomly asked to complete the Mississippi questionnaire. After collecting the questionnaires and considering that the total range of a person's scores will be from 35 to 175 and a score of 107 and above indicates the presence of post-traumatic stress disorder in the person, people with post-traumatic stress disorder and non-traumatic individuals were separated. Forty patients with and without PTSD were randomly selected and administered the Beck Depression and Garnofsky's Emotion Inventory tests. Then, the color tracking test, the London Tower test, and working memory subscales were administered. Tests on the sample lasted from July to October 2016.

In the present study, six standard questionnaires were used as data collection tools.

Instruments

Mississippi Questionnaire

This questionnaire is a self-report scale, developed by Keane, Caddell & Taylor in 1988, which assesses the severity of symptoms of PTSD. This is a 35-item scale and the total range of scores ranged from 35 to 175, with a score of 107 and above

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indicating PTSD. Goudarzi (2003) validated this scale in Iran and reported the Cronbach's alpha coefficient to be .92. To determine the simultaneous validity of this scale, the three instruments of life events list, post-traumatic stress disorder list and Padua list were used. The correlation coefficients of the Mississippi scale are reported to be 23., 82. and 75.. The subscales of the test include pervasive memories, difficulty in interpersonal communication, inability to emotionally control the self, and lack of depression. The Cronbach's alpha coefficient for the instrument in this study was .891.

Color-Tracking Test

John Partington developed the color-tracking test in 1938 using divided attention as a subscale of the Latter-Partington Adult Performance Scale. The purpose of this test is to evaluate the speed of attention and visual-spatial search. Factors such as mental flexibility and speed of movement improve a person's performance, but brain injury, alcoholism, substance abuse and Alzheimer reduce it. In the Tavakoli, Barekatain & Emsaki study (2015), the reliability of the scale was .91 by test-retest. The reliability of this instrument in this study was estimated at .87 by Cronbach's alpha coefficient.

The London Tower test

This test was first introduced by Shallis in 1982 to evaluate one of the executive functions of the brain; namely planning. This test measures the areas of planning, predictive power of future events, the ability to move from start to the goal stage, and the ability to recognize that the goal has been achieved, working memory, inhibition, attention and problem solving. One of the most important tools for measuring executive action is planning

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and organizing. In the study of Lezak, Howieson & Loring (2004), the validity of this test was .79. The reliability of this instrument in this study was estimated at .87 by Cronbach's alpha coefficient.

The Test of Working Memory Subscales

This test was developed by David Wechsler in 1945 and measures only the short-term memory of verbal materials. The third modified version of the test had 18 subscales (11 initial subscales and 7 optional subscales) and eight of them have a scored index. The score of the working memory index considered in this study was calculated from the subscales of digits and letters order. In the study of Saed, Roshan & Moradi (2008), the reliability coefficients of Cronbach's alpha for subscales ranged from .65 to .85 and for indices from .75 to .86. Simultaneous validity of the test with the Cognitive Failure Questionnaire and the Attention Behavior Rating Scale was reported to be .90. The reliability of this instrument in this study was estimated at .81 by Cronbach's alpha coefficient.

The Beck Depression Inventory (Second Edition)

The second edition of Beck Depression Inventory is a revised form of the Beck Depression Inventory, developed in 1974, to measure the items that the examinees selected; one of four options for each item, and showed the severity of his or her depression. This scale has been translated into Farsi and its validity and reliability have been evaluated. Internal consistency of the test was .87 for Iranian students and .73 for test-retest reliability (Qasemzadeh, Mojtabaee, KaramGhadiri & Ebrahim

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Khani, 2005). The reliability of this instrument in this study was estimated at .93 by Cronbach's alpha coefficient.

Cognitive Emotional Adjustment Questionnaire

Garnofsky et al. developed the Cognitive Emotional Adjustment Questionnaire in 2001 to examine adaptive cognitive strategies after experiencing life-threatening events. These strategies include four negative self-blame strategies, rumination, catastrophizing and blaming others, and five positive strategies of acceptance, positive attention, reflecting on planning, positive reassessment, and reaching a perspective. In Besharat and Bezazian's study (2014), the reliability of the test was from .70 to .83 and the validity for each of the scales of self-blame, admission, subjective rumination, positive re-focus, catastrophic and blaming others .73, .80, .77, .75, .86, .79, .85, .87 was calculated and confirmed. The reliability of this instrument in this study was estimated at .95 by Cronbach's alpha coefficient.

Results

According to Table 1, there are significant differences between firefighters with and without PTSD with regard to the variables of attention, executive function, working memory, depression, and cognitive emotion regulation. Therefore, an appropriate statistical test was used to compare the two groups. In order to select the appropriate statistical test for comparison of the groups, the normality of the data distribution in both groups must first have been examined. As shown in Table 1, the results of the Shapiro-Wilks test for all variables, except a few, in both groups were greater than .05. Therefore, it can be said that the assumption of normality of the research variables is confirmed.

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Table 1

Mean Standard Deviation and Shapiro Wilks Test Results for Research in Terms of Group Membership

			Groups of PTSD (n=20)				Groups of Non-PTSD (n=20)			
			Mean	SD	Z	Sig.	Mean	SD	Z	Sig.
Attention	CTT1	Time	52.20	12.75	.995	.862	41.95	15.03	.785	.078
		Error	.45	.51	.964	.637	.05	.22	.923	.493
		Approximate error	.35	.48	.996	.878	.10	.30	.931	.559
	CTT2	Time	89.60	9.23	.810	.138	86.95	34.59	.828	.162
		Color error	.45	.75	.834	.179	.15	.48	.908	.382
		Number error	.00	.00	.875	.015	.05	.22	.797	.097
		Approximate error	.10	.30	.925	.125	.00	.00	.899	.078
Executive Functions	London tower A level		11.60	.50	.818	.062	10.45	3.15	.769	.020
	London tower B level		11.55	.75	.964	.637	9.50	4.27	.993	.972
	London tower C level		11.20	1.15	.833	.086	9.15	4.15	.927	.577

Working Memory	Digit and letter order	7.40	2.96	.929	.149	7.50	1.70	.942	.258
	Digit span total score	12.15	2.36	.948	.332	14.20	2.50	.827	.161
	Forward digit span	6.30	1.45	.970	.747	8.15	2.10	.929	.545
	Backward digit span	5.85	1.46	.898	.037	6.05	1.57	.888	.263
Mood		38.60	16.14	.922	.107	27.35	7.13	.913	.073
Emotion Regulation **Positive Strategies**	Admission	10.30	5.49	.801	.103	9.95	3.45	.971	.850
	Positive re-focus	10.05	3.76	.961	.824	12.00	14.39	.898	.071
	Re-focus on planning	13.20	5.51	.937	.612	15.45	4.48	.950	.714
	Positive re-evaluation	11.25	3.95	.963	.798	15.35	4.63	.887	.051
	Reaching a Perspective	11.25	4.68	.874	.200	14.35	4.52	.911	.488
Negative Strategies	self-blame	8.80	2.53	.949	.722	7.60	2.60	.933	.176
	subjective rumination	10.95	4.48	.933	.573	7.75	2.59	.929	.149
	Catastrophic	9.15	5.65	.916	.145	7.30	3.74	.921	.102
	Blaming others	8.25	3.91	.863	.272	7.30	3.09	.941	.252

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Table 2

Results of Multivariate Analysis of Variance in the Two Groups of PTSD and non-PTSD firefighters

	Effect	Value	F	Hypothesis df	Error df	Sig	Partial Eta Squared	Observed Power[c]
Group Membership	Pillai's Trace	.885	4.794[b]	24.000	15.000	.001	.885	.996
	Wilks' Lambda	.115	4.794[b]	24.000	15.000	.001	.885	.996
	Hotelling's Trace	7.670	4.794[b]	24.000	15.000	.001	.885	.996
	Roy's Largest Root	7.670	4.794[b]	24.000	15.000	.001	.885	.996

Table 3

Results of ANOVA for Comparing Attention, Executive Function, Working Memory, Mood and Emotion Regulation between Firefighters with and without PTSD

			Sum of Squares (Between Groups)	Sum of Squares (Within Groups)	Df (Between Groups)	Df (Within Groups)	Mean Square (Between Groups)	Mean Square (Within Groups)	f	sig
Attention	CTT1	Time	1050.62	7386.15	1	38	1050.62	194.37	5.40	**.02**
		Error	1.60	5.90	1	38	1.60	.16	10.30	**.00**
		Approximate error	.62	6.35	1	38	.62	.17	3.74	.06
	CTT2	Time	70.22	24389.75	1	38	70.22	641.84	.10	.74
		Color error	.90	15.50	1	38	.90	.41	2.20	.14
		Number error	.02	.95	1	38	.02	.03	1.00	.32
		Approximate error	.10	1.80	1	38	.10	.05	2.11	.15
Executive Functions	London tower A level		13.22	193.75	1	38	13.22	5.10	2.59	.12
	London tower B level		43.02	357.95	1	38	43.02	9.42	4.46	**.04**

Working Memory		London tower C level	42.02	353.75	1	38	42.02	9.31	4.51	**.04**
		Digit and letter order	.10	221.80	1	38	.10	5.84	.02	.90
		Digit span total score	42.03	225.75	1	38	42.03	5.94	7.07	**.01**
		Forward digit span	34.23	124.75	1	38	34.23	3.28	10.43	**.00**
		Backward digit span	.40	87.50	1	38	.40	2.30	.17	.68
		Mood	1265.62	5921.35	1	38	1265.82	155.83	8.12	**.01**
Emotion Regulation	1.1.1 Positive Strategies	Admission	1.23	801.15	1	38	1.23	21.08	.06	.81
		Positive re-focus	38.03	652.95	1	38	38.03	17.18	2.21	.15
		Re-focus on planning	50.63	976.15	1	38	50.63	25.69	1.97	.17
		Positive re-evaluation	168.10	706.30	1	38	168.10	18.59	9.04	**.01**
		Reaching a Perspective	96.10	806.30	1	38	96.10	21.22	4.53	**.04**
	1.1.2 Negative Strategies	self-blame	14.40	250.00	1	38	14.40	6.58	2.19	.15
		subjective rumination	102.40	510.70	1	38	102.40	13.44	7.62	**.01**
		Catastrophic	34.23	874.75	1	38	34.23	23.02	1.49	.23
		Blaming others	9.03	473.95	1	38	9.03	12.47	.72	.40

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Table 2 shows that the significance level of the Lambda Wilks and the other tests were lower than .05. Therefore, there was a significant difference between firefighters with and without PTSD. Eta coefficients showed that 89% of the dependent variables variance was due to group membership (P≤ .05). The statistical power of nearly 1 indicates the adequacy of sample size and excellent statistical accuracy for evaluating the research hypothesis. Results indicated that there was a significant difference between the two groups (firefighters with and without PTSD) in at least one of the variables (P ≤ .05). In order to more accurately compare between firefighters with and without PTSD each of the variables was examined.

Based on the findings in Table 3, in comparison between PTSD firefighters and non-PTSD firefighters, the two subscales of time and error at attention variable, B and C levels of the London Tower test at executive functions variable, level of digit span total score and forward digit span at working memory subscales, level of depression at mood variable, level of cognitive emotion regulation strategies in three subscales: positive re-evaluation, reaching a perspective and subjective rumination at emotion regulation variable, smaller than 0.05 were found to be significant. Therefore, it can be concluded that there is a significant difference between firefighters with and without PTSD at time of the first exercise and also testing error, B and C levels of the Tower of London test, digit span total score and forward digit span, mood and positive re-evaluation, reaching a perspective and subjective rumination (p ≤.05). This is based on the findings that firefighters with PTSD spent more time in the first exercise and also had more testing error on the color-tracking test. Firefighters with PTSD took higher scores than non-PTSD firefighters on B and C levels of the Tower of London test score.

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The finding also indicated that the firefighters with PTSD had more score on the digit span total score and forward digit span on the test of working memory subscales. The findings showed that depression was higher in firefighters with PTSD than non-PTSD and the extent of positive re-evaluation and reaching a perspective in firefighters without PTSD and subjective rumination in firefighters with PTSD was high.

Discussion

The nature of firefighting is so that firefighters have to endure severe physical and psychological stress. As reported in studies by Sun, Lee, Huang and an (2020), Narimani et al (2008) and other previous research, they suffer from disorders such as PTSD due to exposure to important sources of stress such as high-risk events or the death of others. It was observed that trauma can also lead to cognitive and emotional disorders. Based on the available findings, it is concluded that the prevalence of PTSD has caused problems among firefighters. These problems include disorders of attention, mood, and emotion regulation.

There is no doubt that firefighting staff are more vulnerable than others based on occupational traumatic conditions and the need to intervene in critical situations (Narimani et al., 2010). This vulnerability can lead to many problems, including attention deficit disorder. As in the diagnostic criteria of PTSD, concentration disorder has been mentioned (American Psychiatric Association, 2013), and in the research by Moslehi, Shahbazi, ArabAmeri and Tahmasbi (2019), one of the major disorders related to PTSD is concerned with problems about attention deficit. In this study, according to Table 3, attention deficit and focus on tasks were observed. Firefighters with PTSD

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spent more time performing the first exercise and also had more testing error. Therefore, it can be concluded that PTSD has caused some problems in firefighters' attention. Firefighters with PTSD are plagued with problems such as repetitive, involuntary and annoying memories of traumatic events, repetitive distressing dreams, and negative cognition. Therefore, a combination of these can lead to poor attention in these individuals. Information processing time is longer in affected firefighters and their performance is slower. Their attention is also associated with greater error. These have been the effects of their daily stress and frequent exposure to unpleasant events. As firefighters are trained to act quickly and efficiently in critical situations, the complexity of the situation has little impact on their performance. Therefore, it is recommended that the status of these types of attention disorders be evaluated in a specialized manner.

According to Sahragard, Alipour, Zare, Roshan & Movadi (2018), one of the important neuropsychological features in mood and anxiety disorders is impairment at executive functions. Numerous studies have shown that this feature is one of the major cognitive deficits in people with PTSD but employees of the fire departments are constantly experiencing stressful and traumatic working conditions. Some of them are due to the fear of failing to achieve their goal of saving peoples' lives and property. They are always training subjects such as goal-setting in movement, planning, time management, response reflection (ability to think before action), and components of executive functions. Proper executive functions are required of a firefighter to properly perform duties at the time of the incident. The results in Table 4 show a significant difference between the scores of executive functions in firefighters with PTSD and without PTSD. Contrary

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to the expectations of this study the average scores of firefighters with PTSD, in B and C exercises, were higher than those without PTSD. As observed in the attention test that improved with the complexity of the test of these subjects, the same results were observed in the scores of executive functions. The firefighters in exercises B and C, which are more difficult than exercise A, performed better than others without PTSD. Given their difficult day-to-day missions and varied training to increase their efficiency in difficult conditions, they performed even better in complex conditions.

As Sahragard et al. (2018) reported that PTSD is associated with significant deficits in cognitive function. There is also a cognitive impairment in the attention and function of verbal memory. Recent studies have reported specific deficiencies in memory processes associated with learning and encryption. This study examined only working memory, the results of which showed that there was a significant difference between the working memory scores of firefighters with and without PTSDs (see Table 5). Firefighters with post-traumatic stress disorder compared to firefighters without received lower scores on digit span total score and forward digit span subscales. Therefore, it can be concluded that firefighters with PTSD, due to more severe experience of stress during fire or accident operations, performed poorly and did not have the necessary skills to inhibit non-essential information and keep the information active. This can lead to a lower level of performance. One of the skills necessary for firefighters to operate properly in the events is to maintain necessary information and prevent unnecessary information. Therefore, due to the necessity of timely, prompt and accurate intervention of these people in critical situations that are part of

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their daily training, PTSD does not affect their working memory; although anxiety and stress are among the factors affecting working memory. Therefore, it is recommended to investigate and evaluate their memory in larger samples.

The prevalence of PTSD is high, with approximately two-thirds of these patients having two other concurrent disorders. Depression is one of the most common diseases associated with this disorder. Various studies have reported the association of PTSD with depression at 26% to 65%. In Alghamdi, Hunt & Thomas's (2015) study, exposure to traumatic events increased the risk of PTSD, depression and anxiety. Green's findings (1991) also showed that the most common symptom associated with PTSD is anxiety and depression. The results of this study are consistent with those of Sajio, Ueno & Hashimoto (2012), Smith et al. (2011), Alghmadi et al. (2015) and Rajabi et al. (2012). In this study, according to the results of Table 6, it was observed that mood scores in patients with PTSD were lower than those without PTSD. In other words, depression in firefighters with PTSD is higher than those without PTSD. For individuals with PTSD, one of the most common symptoms of depression is feeling guilty about surviving when others are dead or about what they needed to do to survive. This is also a common symptom of firefighters. They often have mental conflicts about what happened at the time of an accident and what they needed to do to save lives, which in turn makes them more depressed in a cycle of failure.

According to a study by Samimi and Hassani (2015), people with PTSD have difficulty regulating emotion. In this regard, nine cognitive strategies have been mentioned, which are generally divided into adaptive and incompatible strategies. People with PTSD inconsistently use extreme strategies.

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Research has shown that more problems with emotion regulation are associated with more severe symptoms in people with post-traumatic stress disorder, and the more people use maladaptive strategies to regulate their emotions, the more severe the symptoms of PTSD. In the present study, according to results of Table 7 among the positive and negative emotion regulation styles, the subjective rumination style in firefighters with PTSD and positive re-evaluation and reaching a perspective styles in firefighters without PTSD were more frequently used. People like firefighters with PTSD repeatedly review events related to the time of the accident. Affected people have a tendency to recall trauma-related substances. Due to the extreme experience of the accident, they unintentionally and repeatedly recall components of the accident. According to the results of Table 7, firefighters with PTSD review what happened at the time of the accident and what they needed to do. This constant use of negative emotion regulation styles weakens their emotion regulation. It can also be concluded that the absence of post-traumatic stress disorder in firefighters can be effective in more use of positive emotion regulation including positive re-evaluation and reaching a perspective styles. These people have more abilities to attend to the positive aspects of events, remembering pleasant experiences and understanding values of dealing with events.

One of the limitations of this study is the fact that firefighting is one of the critical jobs in maintaining the lives and property of the people. The results should be generalized with caution because tests were not conducted with a larger sample and other variables affecting their mental health, including personality traits, quality of life, and so on. Finally, it is recommended to

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conduct periodic evaluations to assess the mental health of these individuals, to conduct training classes for stress management skills and emotion regulation, and to conduct therapeutic courses to prevent or treat disorders including post-stress disorder in this organization. It is also recommended that due to the time limitation of this study, longitudinal studies with larger sample sizes should be conducted and the necessary educational and therapeutic programs should be considered to prevent these disorders and diseases.

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