

Mental Health Implications of Fire Service Membership

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Abstract

The primary goal of the current study was to add to the literature regarding mental health implications of fire service membership. Paid-professional firefighters ($n = 94$) were compared with workers from non-emergency-service occupations ($n = 91$) with respect to posttraumatic symptomatology as well as other symptoms of mental illness. The results suggested that firefighters self-reported greater posttraumatic symptomatology than comparison participants as measured by the Impact of Events Scale–Revised. In addition, the firefighters reported more distress on several subscales of the Symptom Checklist 90–Revised. Specifically, firefighters scored higher than the non-emergency-service participants on self-reported interpersonal sensitivity, anxiety, hostility, and psychoticism. Contrary to the original hypotheses, no links were evident between years of service and posttraumatic/mental health symptoms. Overall, this project suggests that firefighters are at substantially higher risk for traumatic stress symptoms as compared with other workers who do not work within the emergency services. In addition, it is suggested that previous reports of additional mental health symptoms experienced by firefighters may actually be more consistent with secondary reports of posttraumatic symptomatology. A secondary goal of this study was to provide exploratory data regarding potential links between firefighters' mental health and self-reported personality characteristics. These data suggest that neuroticism may play a special role in the prediction of posttraumatic symptomatology for firefighters.

Keywords

traumatic exposure, personality, critical incident stress, posttraumatic stress disorder, mental health, firefighters, neuroticism

Firefighters are a specialized population within the more broadly defined emergency services field. Fire service workers are regularly exposed to both physical and psychological risks, and as a result, firefighting can be considered a high-risk occupation with respect to traumatic stress exposure. Firefighters are trained in fire suppression and also increasingly in rescue and emergency medical services. As such, firefighters may engage in multiple roles, including the roles of paramedic and emergency medical technician. Previous literature has discussed the psychological implications of traumatic exposure in the workplace and suggests that emergency workers may experience more job stress than workers in many other types of professions (Brown, Mulhern, & Joseph, 2002; Corneil, Beaton, Murphy, Johnson, & Pike, 1999; Emmons & Diener, 1986; Haslam & Mallon, 2003). In particular, researchers have considered the implications of regular exposure to critical incidents and have found that critical incident exposure may be linked to a variety of traumatic events. Such events include personal loss or injury (e.g., a threat to self or a coworker's safety), traumatic stimuli (e.g., gruesome victim incidence, body handling, completed suicides, and/or mass casualty accidents), failure of rescue efforts, and/or human error resulting in the death of a coworker or patient (Beaton, Murphy, Johnson, Pike, & Corneil, 1999; Harris, Baloglu, &

Stacks, 2002). Additional events that have been linked to traumatic stress reactions include multiple overlapping responses, significant media attention, dangerous fire-suppression scenarios, and contact with a dead or severely injured child (Beaton et al., 1999; Goodman, Corcoran, Turner, Yuan, & Green, 1998; Harris et al., 2002). Suggested outcomes associated with this type of exposure include the development of posttraumatic stress disorder (PTSD) as well as a variety of other mental health symptoms (e.g., depression, anxiety, substance use).

Prevalence

Several studies have addressed the prevalence of traumatic exposure and PTSD in the emergency services. In one study, Corneil et al. (1999) reported similar prevalence rates of PTSD for Canadian and U. S. professional firefighters (17%

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vs. 22% as measured by the Impact of Events Scale), although the two groups differed in type and frequencies of exposure in the previous year. Similar rates were also reported for Japanese (17.7%) and German professional (18.2%) and trainee (16.3%) firefighters, using different measures (Heinrichs et al., 2005; Mitani, Fujita, Nakata, & Shirakawa, 2006; Wagner, Heinrichs, & Ehlert, 1998). Lower prevalence rates were found in Australian professional and volunteer firefighters (7%) and in trainee firefighters (12%; Bryant & Guthrie, 2007; Regehr, Hill, & Glancy, 2000).

Links Between Stress and Personality

The question of whether particular personality characteristics can predict the development of mental health symptomatology is often the primary question asked by practitioners in the emergency services field (e.g., management and union executive); consequently, previous research has considered links between particular personality traits and mental health for emergency service workers. For example, Hui et al (2001) found that for military rescuers who reported higher levels of neuroticism, higher levels of posttraumatic symptoms were also reported. Dougall, Hyman, Hayward, McFeeley, and Baum (2001) found that an optimistic disposition predicted less self-reported stress, less use of avoidant coping strategies, greater use of problem-focused coping, and more available social support for crash rescue workers. Regehr, Goldberg, Glancy, and Knott (2002) found that in their sample of paramedics, a tendency to be demanding, controlling, or manipulative in relationships; suspicious; hostile; and/or isolated predicted previous use of mental health stress leave. Although these studies provide some guidance in this area, the literature linking personality characteristics and mental health symptomatology for firefighters is limited; consequently, continued research in this area is required to help clarify the picture.

Present Hypotheses

The present study was intended to provide additional research in the area of mental health implications related to fire service membership. Previous research (e.g., Corneil et al., 1999) provides strong evidence for posttraumatic symptomatology for firefighters as compared with population norms. However, the possibility remains that the differences found in this research resulted from a sampling bias as opposed to a true difference. Consequently, a gap in the literature remains with respect to the self-reported mental health of firefighters as compared with a group of similar comparison participants. The present research attempted to address this gap by comparing a group of paid-professional firefighters with a similar group of comparison participants, living and working within the same environment (described further in the "Participants" section below). Specifically, this project was intended to investigate three primary hypotheses. The first hypothesis

suggests that firefighters would self-report higher levels of posttraumatic symptoms as compared with non-emergency-service participants. Similarly, the second hypothesis suggests that firefighters would self-report higher levels of other similar mental health symptoms as compared with non-emergency-service participants. The third hypothesis suggests that firefighters' self-reported traumatic stress symptomatology would be related to the total years of service as a firefighter, when controlling for age.

In addition to the primary hypotheses, the present study was intended to provide exploratory research with respect to the relationship between personality characteristics and mental health for firefighters as well as how these links are similar, or different, from the links that exist for the comparison participants. In particular, given that neuroticism has been shown to be an important predictor in previous research (Hui et al., 2001), the relationship between this personality characteristic and mental health symptomatology, including posttraumatic stress, was of interest in this study.

Method

Procedure

A fire department from Northern British Columbia, Canada, agreed to participate in our study. The fire department had 119 members, 11 administrative staff, 11 emergency 911 call center employees, and 97 full-time career firefighters. The second author administered the questionnaires to each of the four fire halls, for each of the four shifts. At the beginning of each data collection, the participants were introduced to the study and informed as to the nature and procedure of the research. After the recruitment process was accomplished, each participant was asked to complete an informed consent sheet and a demographic questionnaire followed by the NEO-Five Factor Inventory (NEO-FFI), the Impact of Events Scale-Revised (IES-R), and the Symptom Checklist 90-Revised (SCL-90-R).

For the comparison group, a population of male workers, as similar to the experimental group as possible on important variables such as age, education, and work schedule, was recruited from the same community in Northern British Columbia. To determine similarity of these samples, we ensured that these groups were not significantly different with respect to age, years of service, or ethnicity. In addition, the occupations of the participants suggested similar income-related socioeconomic status. However, it should be noted that given firefighters' positive standing within the community, the firefighting sample may have been slightly higher on this variable. Recruitment for the comparison group was accomplished primarily through a snowball approach. Initial participants were recruited from a convenience sample known to the researchers, and these individuals were then asked to suggest other possible participants. All procedures for the

control group paralleled those used with the firefighter group. Participation for both groups was voluntary; however, in exchange for participation, a five-dollar contribution was made to the provincial Burn Fund on behalf of the participant.

Measures

The IES-R (Weiss & Marmar, 1997) was used to evaluate the participant's level of PTSD symptomatology. Previous research with this scale has demonstrated good internal reliability ($r = .87$; Zilberg, Weiss, & Horowitz, 1982). The IES-R has also demonstrated strong test-retest reliability (r ranging from .78 to .82) and internal consistency (Newman, Kloupek, & Keane, 1996; $\alpha = .83$; Simons, Gaher, Jacobs, Meyer, & Johnson-Jimenez, 2005). Buchanan, Anderson, Uhleman, and Horwitz (2006) state that a raw score on the IES-R greater than 26 should be considered the criterion for PTSD.

The SCL-90-R (Derogatis, 1994) was used to evaluate levels of reported symptoms on 9 different symptom scales. Previous research has provided evidence of the validity (e.g., Schmitz, 1999) and reliability of the SCL-90 (r ranging from .77 to .90; e.g., Derogatis, 1994; $\alpha = .98$; e.g., Sun, Zhang, & Fu, 2007).

The NEO-FFI-Revised (Costa & McCrae, 1992) is a 60-item, 5-point scale that has demonstrated strong reliability and validity (internal consistency .76-.90; Costa & McCrae, 2003; Rush et al., 2004) and provides an indication for five domains of personality, including openness to experience, agreeableness, conscientiousness, neuroticism, and extroversion.

Results

Demographic Characteristics of the Respondents

In this study, 100% of the respondents ($N = 185$) were male, given that the participant fire department had no female members. The mean age of the firefighters was 42.04 ($n = 94$) years with an average of 16.06 years of service. The mean age of the comparison group was 43.77 ($n = 91$) with an average of 17.84 years of service. There were no significant differences between the two groups on age [$t(183) = -1.398$; $p = .164$] or years of service [$t(182) = -1.182$; $p = .239$]. Both groups were primarily Caucasian, with 3 individuals self-reporting as First Nations (1 firefighter, 2 comparisons) and 3 individuals self-reporting as Other (1 firefighter, 2 comparisons). For additional demographic information, see Table 1.

Data Treatment

Prior to any data analyses with this data set, all participants with extreme outliers on the IES-R were removed. Several individuals in the firefighting group were known to have

Table 1. Demographic Participant Information

Variable	Level	FF (n)	FF (%)	CP (n)	CP (%)
Education	High school	20	21.2	39	42.9
	Some college or university	55	58.5	31	34.1
	Graduated college	12	12.7	17	18.7
	Graduated university	07	07.4	03	03.3
Marital status	Married	81	91.0	73	80.2
	Separated	02	02.1	05	05.5
	Divorced	10	10.6	06	06.6
Children	Never married	01	01.0	07	07.7
	None	10	10.6	16	17.6
	One	12	12.8	09	09.9
	Two	40	42.5	41	45.1
	Three	23	24.5	14	15.5
	Four or Five	08	08.5	08	08.8
Health	Six or more	01	01.0	02	02.2
	Above average	02	02.1	01	01.1
	Average	20	21.3	26	28.6
	Below average	31	33.0	26	28.6
	Poor	41	43.0	38	41.0

Note: FF = Firefighter; CP = Comparison.

current PTSD claims under way. Consequently, it was important that individuals substantially above the average in each case be removed to protect the integrity of the other data and to ensure that our data reflected the currently working population. Outliers were identified using box plot analysis, and only outliers that fell in the extreme range were removed. All extreme outliers fell at the upper ends of the range, given that many participants reported little to no posttraumatic symptomatology. For the firefighting group, 10 participants were removed from the data set for scores in the extreme range on the IES-R. For the comparison group, 11 participants were removed from the data set for scores in the extreme range. All subsequent analyses, for all questionnaires, were completed following the removal of these outliers.

Hypotheses Regarding Posttraumatic Stress Symptoms (PTSS)

Wagner (2009) suggests that the IES-R subscales may not be appropriate for use with a firefighting population; consequently, in place of subscale level analyses, a between-groups (firefighting; comparison) one-way ANOVA was completed using overall IES-R score as the dependent variable. Additionally, given the reported importance of neuroticism in the prediction of posttraumatic symptomatology (e.g., Hui et al., 2001), neuroticism was included as a covariate in these analyses. The results suggested that, when controlling for neuroticism, the firefighter sample ($M = 2.49$; $SE = .18$) self-reported

Table 2. Means (*M*) and Standard Deviations (*SDs*) for SCL-90-R

Group	Subscale	<i>M</i>	<i>SD</i>
Firefighters	Somatization	54.48	10.81
	Obsessive-Compulsive	59.93	08.41
	Interpersonal sensitivity	59.43	09.37
	Depression	57.91	09.93
	Anxiety	54.52	11.21
	Hostility	58.99	10.08
	Phobic anxiety	53.27	08.68
	Paranoia	55.48	10.63
	Psychoticism	58.41	10.28
Controls	Somatization	54.65	09.89
	Obsessive-Compulsive	58.15	09.73
	Interpersonal sensitivity	56.49	09.80
	Depression	56.16	09.97
	Anxiety	51.66	10.42
	Hostility	53.76	10.56
	Phobic anxiety	52.71	08.17
	Paranoia	53.35	10.53
	Psychoticism	54.52	09.72

Note: SCL-90-R = Symptom Checklist 90–Revised.

more posttraumatic symptomatology than comparison participants [$M = 1.43$; $SE = .18$; $F(1, 51.49) = 17.67$; $p < .001$], where M is the mean and SE is the standard error.

Hypotheses Regarding SCL-90-R

In an effort to manage Type 1 error through the use of an omnibus test as well as allow for multiple responses from a single respondent, participants' SCL-90-R subscale scores were entered into a 2 (group) \times 9 (subscale) repeated-measures general linear model analysis that revealed a significant multivariate Group \times Subscale effect when controlling for neuroticism [Wilks's $\lambda = .89$; $F(8, 173) = 2.64$; $p = .009$, $\epsilon^2 = .109$]. Given the significant finding of the omnibus test, follow-up ANOVAs were completed to find the location of the revealed differences; in each univariate analysis, neuroticism continued to be included as a covariate. Firefighters were found to score higher than the comparison participants on self-reported interpersonal sensitivity [$F(1, 180) = 6.02$; $p = .015$], anxiety [$F(1, 180) = 4.62$; $p = .033$], hostility [$F(1, 180) = 14.15$; $p < .001$], and psychoticism [$F(1, 180) = 9.15$; $p = .003$]. For a complete listing of means and standard deviations see Table 2.

Links Between Years of Service and Mental Health

A partial correlation matrix controlling for age was completed using years of service and firefighters' overall IES-R scores. Similarly, a partial correlation matrix controlling for age was completed with years of service and the 9 subscales of the SCL-90-R (somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety,

paranoia, and psychoticism). Using an alpha of $p \leq .01$ to help manage Type 1 error, no significant relationships were evident.

Links Between Personality and Mental Health

Exploratory multiple regressions were completed separately for the firefighter and comparison samples with respect to both the overall IES-R score and the SCL-90-R subscales. In each of these regressions, the five personality characteristics measured by the NEO-FFI-R (neuroticism, agreeableness, conscientiousness, openness to experience, extroversion) were entered into a best-fit model regression as predictor variables, with the independent mental health subscales used as criterion variables for the respective analyses. Given a paucity of research in this area resulting in an exploratory research question, all subscales of the NEO-FFI-R were included in this analysis. In the first analysis, the five personality factors were used in a best-fit model regression to predict the IES-R overall score; this process was then completed for each of the subscales on the SCL-90-R. Given a significant outcome for the overall model, interpretation at the personality factor level was then deemed to be appropriate and subsequently completed. To help control for Type 1 error, all regressions were interpreted using a conservative alpha of $p \leq .01$.

For the firefighters, the results of the IES-R regression suggested that the overall model was significant. It was subsequently determined that neuroticism was a significant predictor of self-reported symptoms of posttraumatic symptomatology; no other personality characteristic acted as a significant predictor of overall IES-R score. For the comparison sample, none of the personality characteristics measured by the NEO-FFI-R significantly predicted self-reported traumatic stress as measured by the IES-R.

With respect to the SCL-90-R, the pattern of results was similar for both the firefighter and comparison samples. For each regression, the overall models were significant at .01, with the exception of the comparison sample's somatization score, which was significant at .05. For both group's scores on the subscales obsessive-compulsive, depression, anxiety, phobic anxiety, and psychoticism, neuroticism was the only significant predictor. Somatization was significantly predicted by neuroticism for the firefighters and was nearly significant for the comparison participants ($p = .017$). Paranoid ideation was positively predicted by neuroticism and negatively predicted by agreeableness for both the firefighter and comparison samples. Differences in the regression patterns of the two groups were evident for interpersonal sensitivity, where both neuroticism and agreeableness (negative) were both significant predictors for the firefighters; in contrast, this variable was only predicted by neuroticism for the comparison sample. With respect to hostility, this variable was negatively predicted by agreeableness and conscientiousness in the firefighter

sample, whereas for the comparison sample, neuroticism was, once again, the only significant predictor.

Conclusions

Limitations of the Current Study

The present study has several limitations, including the use of self-report data as the sole method of data collection, without additional means of data corroboration (e.g., clinical interview). This project also neglected to include an assessment of social desirability or negative affectivity, other factors that may have influenced reporting. Furthermore, it must be acknowledged that the present data did not include an assessment of nontraumatic occupational stressors, stressors that may have a substantial impact on all stress-related reporting, including reporting about posttraumatic symptomatology. Consequently, the present data do not allow clarity with respect to whether firefighters' self-reported symptoms were more closely linked with posttraumatic stress or rather with general dysphoria.

Other limitations of the present study include the convenience nature of the comparison sample, a sample that was not directly matched on an individual basis with the firefighting participants (i.e., not matched for age, socioeconomic status, etc.). This limitation suggests that the comparison sample may not clearly comprise a distinct group that is directly comparable to the firefighter sample. Furthermore, it is possible that the firefighter sample used in our study is not representative of other firefighters with respect to traumatic exposures and/or other variables. For example, the participant fire department did not have any female service members; consequently, the current sample includes only male firefighters and, therefore, cannot be considered reflective of the current fire service as a whole. Similarly, the generalizability of these data may be limited by the small urban center in which the data were collected. However, it is suggested that the present results may not be limited by our sample in that the traumatic exposure of service members in large urban centers is often intensified, likely magnifying the current differences. Finally, the present data provide a cross-sectional look at firefighters' posttraumatic symptoms and, consequently, cannot be used to determine causal connections.

Mental Health Impacts of Fire Service Membership

The present study was completed with a broad purpose of adding to the available literature regarding the mental health impacts of serving in the emergency response services, in particular the fire services. With this purpose in mind, our results suggest that, in contrast to similar comparison participants, firefighters are at higher risk of self-reported PTSS. These findings are supported by previous literature that has

found PTSD rates in the emergency services to be approximately 1.5 to 2 times higher when compared with normative data (e.g., Corneil et al, 1999). However, when comparing PTSS with normative data, the possibility remains that higher scores may be a function of a third variable such as participant selection bias. In contrast, the present results cannot be attributed to a community participant selection variable given that both groups were recruited from the same community. Consequently, the present data provide additional evidence that the higher risk of PTSS associated with fire service membership is not the result of a participant selection bias.

In addition to increased PTSS symptoms, the present data suggest that firefighters self-report more symptoms of interpersonal sensitivity, anxiety, hostility, and psychoticism. The pattern of the present data appears to suggest that previous reports of additional mental health symptoms experienced by firefighters (e.g., D'Andrea, Abney, & Swinney, 2004; McCaslin et al., 2005) may actually be more consistent with secondary reports of posttraumatic symptomatology. That is, for the current data, all mental health symptoms for which firefighters scored higher than the comparison sample appeared to be reflective of at least one PTSD criterion (e.g., hostility, interpersonal sensitivity, intrusive thoughts [psychoticism]). In addition, for those mental health symptoms that would be less likely to be considered consistent with the criteria for PTSD (e.g., somatization, obsessive-compulsive), no differences between the groups were observed.

Links With Years of Service

Contrary to our third hypothesis, no relationship was evident between self-reported posttraumatic symptomatology of firefighters and number of years of service provided. This finding is consistent with previous research completed in the United States (Corneil et al., 1999) but to our knowledge has not been replicated with a Canadian sample. The present lack of relationship between years of service and self-reported PTSS may be a reflection of three separate possibilities. First, no independent measure of traumatic exposure was included in the present study; consequently, the present data may reflect the inappropriateness of using years of service as a proxy for this variable. Second, it may be that a threshold-type effect occurs with individuals regularly exposed to very traumatic events. That is, perhaps witnessing one very traumatic event is enough to create an individual response for PTSS, and subsequent events do not increase traumatic stress with the same degree of magnitude. Third, this lack of relationship may be reflective of using measures designed for a specific purpose. That is to say, current measures of traumatic stress are, by and large, intended for evaluating the symptoms of PTSD. The clinical criteria for PTSD, by definition, consider the impact of a single event. When considering the posttraumatic symptomatology of emergency service

members, a single traumatic event may not be an appropriate criterion. There may be an inherent difficulty in using current measures to evaluate posttraumatic symptomatology of individuals regularly exposed to serious human trauma.

Links Between Mental Health and Personality

A secondary purpose of the present study was to provide exploratory data linking posttraumatic symptomatology and personality characteristics. Our data suggest that for firefighters, neuroticism (a generalized proneness toward psychological distress) predicts self-reported symptoms of posttraumatic stress. Alternately, this pattern was not evident for the comparison sample. Therefore, consistent with previous literature regarding emergency service workers (Hui et al., 2001), the present study suggests that the characteristic neuroticism may be a particularly important characteristic for prediction of subsequent posttraumatic stress for firefighters.

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