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Differences in Drinking Patterns, Occupational Stress, and Exposure to Potentially Traumatic Events among Firefighters: Predictors of Smoking Relapse

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Abstract

Background and Objectives—Despite the increased awareness regarding the risks of cigarette smoking, this behavior continues to be a serious public health concern. As such, the goal of the current study was to examine risk factors for smoking relapse among individuals employed through fire service.

Methods—In this report, drinking changes, trauma exposure, and occupational stress were compared among firefighters (N = 81) who reported a relapse to cigarette smoking (n = 27), a lifetime former history of smoking (n = 27), or no history of smoking (n = 27). Mechanisms behind tobacco relapse occurring after employment in fire service were explored.

Results—Firefighters who relapsed to smoking, when compared to their nonsmoking peers, had higher rates of weekly alcohol consumption throughout their first year of fire service and had greater increases in drinking from preacademy to postacademy.

Conclusions and Scientific Significance—Gaining a better understanding of these behaviors within this understudied and high-risk population may provide valuable information that can be used in designing future relapse prevention strategies as well as smoking cessation interventions.

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Declaration of Interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this paper.

Despite the known health problems associated with cigarette smoking and the increasing financial costs related to continued tobacco use, individuals who smoke have difficulty remaining abstinent. Estimates indicate that out of approximately 70% of smokers wishing to quit, less than 5% are successfully able to do so.¹ The risk factors associated with high lapse and relapse rates observed after a quit attempt include stress,² concurrent alcohol use,³ tobacco withdrawal and craving,⁴ and negative affect.⁵ Although a large percentage of relapsed smokers (35–100%) retrospectively attribute the lapse to “stress” or “negative affect,”⁵ ecological momentary assessment data⁶ are not always supportive of the accuracy of this attribution. On the contrary, a great deal of research has implicated co-occurring alcohol use as a reliable predictor of cessation failure.⁷ Yet, how these purported predictors of relapse to tobacco use influence smoking progression among individuals in high-stress occupations, including those with high-frequency exposures to potentially traumatic stressors, remains unknown.

In addition to life-threatening situations such as response to fire and chemical or hazardous materials incidents, firefighters deal with a wide variety of work-related stressors, including emergency medical care to adults and children, response to large-scale disasters, body recovery, and dangerous work settings. There are also smaller but potentially malevolent stressors, including economic threats, equipment failures, and co-worker conflicts within this profession. Often, little to no warning or psychological preparation precedes the onset of new stressors. Very few studies have examined the cumulative impact of these multiple stressors on firefighter smoking and drinking behaviors, and almost no published data assess stressors prospectively. Cross-sectional research has shown disproportionate levels of substance abuse,⁸ relationship disturbances,⁹ and posttraumatic stress disorder (PTSD) symptomology¹⁰ among emergency responders. Compared to other high-risk occupations, the co-occurrence of PTSD and alcohol use disorders are also consistently high within military samples.¹¹ Among police officers, data suggest a higher likelihood of engagement in heavy drinking episodes compared to the general population,¹² with these drinking rates not being predicted by exposure to critical incidents or symptoms of PTSD.¹² Among firefighters, however, estimated rates of PTSD symptoms and alcohol abuse have range widely from 6–37%^{10,13} and 30–50%,^{8,14} respectively.

In addition to the psychological or social consequences of employment in fire service, approximately 100 firefighters die each year in the line of duty.¹⁵ Disturbingly, half of these deaths are related to cardiovascular issues.¹⁶ Although many cardiovascular-related fatalities are attributed to high levels of physical exertion or other cardiac toxins,¹⁶ existing literature has demonstrated a strong link between the engagement in smoking¹⁷ and heavy drinking¹⁸ behaviors as meaningful and malleable risk factors for cardiovascular dysfunction. Taken together, co-occurring smoking and drinking behaviors of firefighters remains a grossly understudied domain. This is particularly surprising given the high-prevalence rates of problematic drinking among this population,⁸ as well as the established association between alcohol consumption and progression to smoking that is observed in the civilian literature.^{3,17}

Given these risks for cardiovascular dysfunction and the observed increase in self-reported smoking in our complete sample of firefighter recruits, we examined whether relapse to

cigarette smoking was related to increased levels of drinking, stress, and exposure to potentially traumatic events (PTEs) during the first year of fire service. It was hypothesized that levels of alcohol use, number of PTEs, and occupational stress would be higher among the firefighters who relapsed to smoking.

METHODS

Procedure

As part of a larger NIH-funded longitudinal research project (“Pathways to Risk and Resilience in Firefighter Recruits”; PI: Gulliver), firefighter cadets were recruited for participation from fire training academies in seven cities across North America. Of the 177 face-to-face interviewer-administered annual interviews available at the time of this report, 27 firefighters that acknowledged relapse to tobacco use at the 1-year interviews were matched on demographic variables to form comparison groups of 27 former smokers and 27 never smokers (total $N = 81$). The two comparison samples were selected to test whether current cigarette smokers experienced disproportionate increases in variables of interest when compared to their nonsmoking peers. As further described and broken down in Table 1, participants were predominantly male (93.8%) and White with a mean age of 27 years. All participants signed an informed consent, completed a battery of structured interviews and self-report assessments, and agreed to be contacted for future follow-up assessments.

Measures

Tobacco Use—A modified version of the Fagerström Test for Nicotine Dependence (FTND-2)¹⁹ assessed smoking status and the number of cigarettes smoked each day. The FTND is a brief self-report instrument designed to correlate with physiological measures of nicotine tolerance. The FTND has demonstrated adequate internal consistency (Cronbach’s alpha = .64) and strong test–retest reliability ($r = .88$).²⁰

Alcohol Use and Lifetime Tobacco Use—The Timeline Follow-Back/Form 90 assessment technique (TLFB; Form 90)²¹ employs a guided retrospective account of daily alcohol use and lifetime histories of other substances of abuse, including tobacco. The TLFB has high test–retest reliability across a variety of populations.^{21,22} Within this study, weekly frequency of drinking episodes was measured for the 13 weeks before joining the Fire Training Academy and the 52 weeks (364 days) following Fire Training Academy graduation.

Occupational Stress—The Sources of Occupational Stress (SOOS)²³ is a 57-item measure that assesses occupational stressors specific to firefighters and emergency response personnel. A 13-item revised version was used for this study. Recent revisions of the SOOS have indicated that this measure is a reliable and valid assessment of occupational stress among firefighters.²⁴

Personality—The Multidimensional Personality Questionnaire-Brief Form (MPQ-BF)²⁵ is a 155-item self-report measurement of personality at both the lower order trait and broader structural levels. For the purpose of this study, the Primary Trait Scales (eg, well-being,

social potency, achievement, social closeness, stress reaction, alienation, aggression, control, harm avoidance, traditionalism, absorption) were analyzed as a measure of stable traits and temperament. The MPQ-BF has demonstrated good internal consistency (Cronbach's alpha = .75 to .84) and is positively correlated with other self-report measures of personality.²⁵

Family History of Substance Use—A revised version of the Family Interview of Genetic Studies (FIGS)²⁶ was employed as a method for obtaining second-hand substance use diagnostic information regarding the first- and second-degree relatives of each firefighter. Within the addiction literature, the FIGS has been successfully used as a measure of these constructs.²⁷

Work-Related Trauma—The Firefighter Work Experiences Questionnaire (under development by the second and sixth authors) is a clinician-administered questionnaire that assesses experience dimensions for 11 categories of firefighter-specific PTEs. These categories include: witnessing a line of duty injury/death, personal injury, being called to the scene of a terrorist incident/man-made disaster/natural disaster, being called to the scene of an incident involving a child or an accident in which a firefighter knew the victim, working on a scene with multiple casualties, and working at scene where the firefighter felt that their life was in danger. Categories are endorsed through a response of “yes” or “no.”

RESULTS

Of those who were identified as relapsed cigarette smokers following their first year of fire service, 100% had reported a history of tobacco use at their baseline interviews. In contrast, no firefighters within this subsample reported active cigarette smoking at the time of enrollment in this study and there were no reported cases of new onset to smoking. This represents a dramatic increase in relapse to smoking during firefighters' first full year of fire service (Table 2).

Participants' demographic characteristics were analyzed via one-way analysis of variance (ANOVA) and revealed that the three groups were not significantly different with respect to demographics or veteran status (all $ps > .20$). To examine potential baseline group differences on preacademy levels of drinking, personality traits, and family history of alcohol and drug misuse, additional one-way ANOVAs were conducted. These analyses revealed no significant differences (all $ps > .05$). As expected, however, a one-way ANOVA indicated a significantly greater frequency of weekly drinking episodes, $F(1, 78) = 5.50, p < .01$, among firefighters who reported daily cigarette smoking at the 1 year follow-up. Scheffé's multiple comparison tests were employed, which revealed that weekly frequency of drinking was greater for currently smoking firefighters ($M = 1.6, SD = 1.1$) when compared to the former ($M = .86, SD = .7$) and never smoking ($M = .89, SD = .8$) groups.

To gain information regarding possible increases in drinking following entry into fire service, change scores ($TLFB_{\text{year 1 data}} - TLFB_{\text{baseline data}}$) were created and compared between groups. As seen in Fig. 1, findings revealed that firefighters within the active smoking group had a greater increase in the frequency of their weekly drinking after graduation from fire academy, $F(1, 78) = 3.14, p < .05$. However, post hoc analyses

(Scheffé's multiple comparison tests) indicated that this difference was only present for relapsed smokers ($M = .47$, $SD = 1.2$) when compared to never smokers ($M = -.41$, $SD = 1.7$; $p < .05$). Contrary to our hypotheses, no significant differences were found on measures of occupational stress, $F(1, 78) = .231$, $p = .79$, or exposure to PTEs, $F(1, 78) = .500$, $p = .61$.

DISCUSSION

This preliminary report examined the association between smoking relapse, patterns of drinking, and occupational stress in a firefighter sample. The primary aim was to examine group differences and potential predictors of smoking relapse among firefighters over their first year of fire service. For this project, self-report and clinician-administered measurements of alcohol use, occupational stress, and exposure to potentially traumatic events (PTEs) were measured. As expected, and consistent with findings from civilian populations,³ smoking relapse was associated with a higher frequency of weekly drinking among daily cigarette smokers. Results were not significant, however, with respect to occupational stress or exposure to potentially traumatic events.

To our knowledge, this study is the first to assess the possible bidirectional influence of cigarette smoking and alcohol consumption within a sample of firefighters. With respect to the relationship between these substances, relapsed smokers drank more frequently than the former smokers and never smokers during their first year of fire service. When compared to their never smoking peers, change scores for the relapsed smokers also revealed significant increases in weekly frequency of drinking throughout their first year as a firefighter compared to preacademy drinking levels. This finding is consistent and may be associated with the addiction literature where co-occurring alcohol use has been implicated in the decreases of short-term smoking cessation success²⁸ as well as abstinence after 2 years.²⁹

The nonsignificant findings with respect to occupational stress and PTEs, while surprising, may be a consequence of several factors. First, these findings are from a preliminary analysis using a subsample of data from a larger NIH-funded longitudinal research project. Thus, results may be influenced by the small sample size that was used for these analyses. In addition, firefighters included in this sample had only been employed by fire service for 1 year. As more time passes and careers become more developed, exposure to a wider variety of occupational stressors and potentially traumatic work-related events will likely occur. A future goal will be to reevaluate smoking status and drinking progression among these firefighters after final data collection from this larger project has been completed.

Within this study's complete sample of firefighters, over 15% of firefighters reported regular smoking at the end of year one, which is close to the national average of 20.6%.¹⁷ This smoking rate is particularly alarming given that this sample was reportedly tobacco-free upon entry to fire service and that this occupational group has an increased risk of cardiovascular-related deaths.¹⁶ Taken together with this subsample's increase of weekly drinking from preacademy to year one of fire service, the probability of health-related risks is increased. Presumably, this increase in drinking could also be related to the smoking relapse rates that were found within the smoking group. Future research is needed to more closely examine the changes in cigarette-related craving and nicotine withdrawal that are

likely occurring within this subsample, and how these changes relate to their motivation to smoke. Future studies may also benefit from examining the role of station specific peer influences and attitudes towards smoking behaviors. More specifically, because cigarette smoking is usually discouraged at a high majority of fire stations, understanding the added impact of this on prolonged abstinence would be important.

In summary, this is an important first step towards the investigation of cigarette smoking among firefighters. However, important limitations need to be considered. For instance, biochemical verification of smoking status was not measured nor was changes in other variables of smoking relapse. The assessment schedule did not query the exact time points for the relapse to smoking as well as a family history of tobacco use, which are opportunities for future investigation. An additional limitation is that the current sample was largely White and predominately male, preventing meaningful analyses of potential gender and/or ethnic group differences. Despite these limitations, however, this study was successful in offering a preliminary examination of the association between smoking and drinking behaviors in a population afflicted by high levels of job-related deaths due to cardiovascular difficulties. Gaining a better understanding of these behaviors within this understudied population may provide valuable information that can be used in designing future treatments and smoking cessation interventions.

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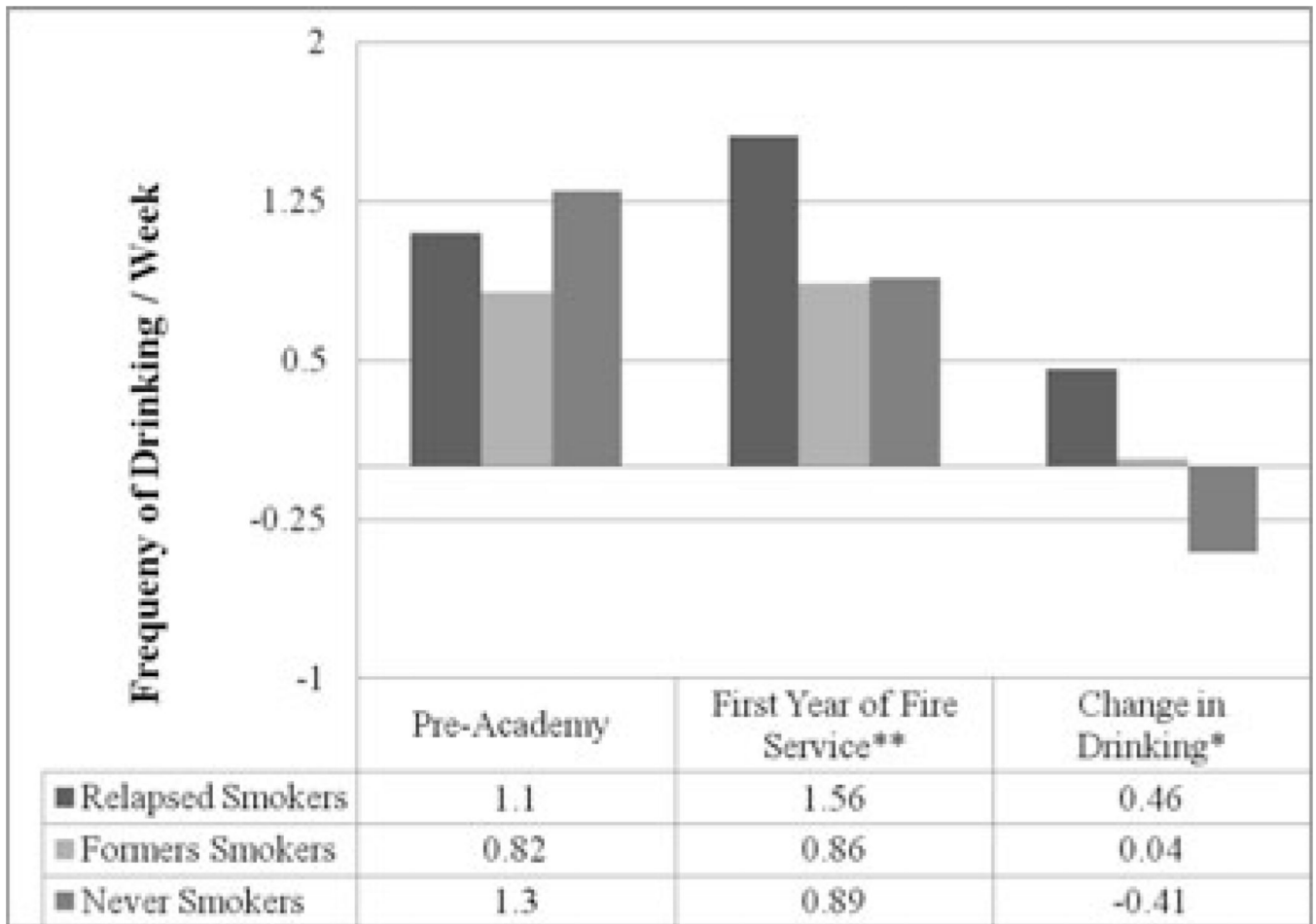


FIGURE 1.
 Weekly frequency of firefighter drinking as measured by the timeline follow back.
 * $p < .05$; ** $p < .01$.

TABLE 1Firefighter demographics ($N = 81$)

Variable	Current smokers	Former smokers	Never smokers
Age (<i>M, SD</i>)	26.67 (4.0)	27.37 (3.7)	27.08 (4.3)
Gender (% female)	0	11.1	5.4
Ethnicity (% White)	66.7	66.7	67
Marital status (% never married)	70.4	74.1	70.4
Veteran status (% veteran)	33.3	25.9	14.8
FIGS—Alcohol (% positive)	4	4	14
*FIGS—Drugs (% positive)	11	4	4

*Family Interview for Genetic Studies.

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TABLE 2Nicotine dependence, potentially traumatic events (PTEs), & occupational stressors ($N = 81$)

Variable	Current smokers	Former smokers	Never smokers
†Baseline FTND (<i>M, SD</i>)	0(0)	0(0)	0(0)
†Year 1 FTND (<i>M, SD</i>)	.48 (1.1)*	0(0)	0(0)
‡Year 1 PTEs (<i>M, SD</i>)	2.85 (1.7)	3.11 (1.3)	3.26 (1.5)
§Year 1 SOOS (<i>M, SD</i>)	20.38 (8.4)	21.30 (7.5)	20.00 (5.4)

*
 $p < .001$;

† Fagerström Test for Nicotine Dependence-2;

‡ Firefighter Work Experiences;

§ Sources of Occupational Stress.

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