

Article

Confirmatory Factor Analysis of the Alcohol Use Disorders Identification Test and the Revised, Short-Form Drinking Motives Questionnaire Among Firefighters

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Abstract

Extant research has documented elevated rates of alcohol use among the fire service. While some studies have sought to examine the role of drinking motives in firefighter alcohol use, findings are limited by a lack of exploration into the validity of established alcohol use measures among this population. The present study explored the factor structure of the Alcohol Use Disorders Identification Test (AUDIT) and the revised, short-form Drinking Motives Questionnaire (DMQ-R-SF) among a large sample of career firefighters in the southern U.S. ($N = 679$). Participants were included in this secondary analysis if they reported any lifetime alcohol use and completed the measures of interest. Confirmatory factor analyses supported the established three-factor AUDIT and four-factor DMQ-R-SF. SEM results indicated that coping-motivated alcohol use was statistically significantly positively associated with each AUDIT subscale (i.e., hazardous consumption, dependence symptoms, and harmful consequences). Notably, conformity-motivated alcohol use was inversely associated with hazardous consumption. Findings underscore the importance of understanding and addressing alcohol use among firefighters, particularly drinking to cope with negative affect.

Keywords: firefighter; alcohol; drinking; coping



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1. Introduction

Firefighters demonstrate uniquely elevated rates of alcohol use compared to the general population. A national study of firefighters found that more than 85% reported drinking alcohol in the past month, compared to only 50.6% of U.S. adults [1–3]. Further, more than 50% of firefighters in this national survey reported episodic heavy drinking in the past month (i.e., binge drinking, defined as consuming more than five drinks on one occasion), whereas only 21.7% of U.S. adults report comparable drinking behavior [1,3]. Among firefighters in this study who reported binge drinking, the majority (72.5%) reported doing so on multiple occasions in the past month [1].

Firefighter cultural norms surrounding drinking likely contribute to such pervasive alcohol use among firefighters. A recent national study of firefighters' perceptions related to various drinking behaviors demonstrated that firefighters' "acceptable" levels of alcohol

consumption exceeded federally recommended guidelines [3,4]. For example, male career firefighters who drink alcohol reported that consuming approximately 3–4 drinks on one occasion was acceptable, despite this equating to heavy alcohol use per the National Institute of Alcohol Abuse and Alcoholism (NIAAA) definition. Additionally, career firefighters reported that rates of binge drinking among firefighters were greater than 50%, and a majority of firefighters who drink alcohol reported that drinking until intoxicated was acceptable as long as it does not “interfere with responsibilities” [4]. Lastly, male volunteer firefighters who reported past-month heavy drinking (i.e., an average of three or more drinks per day) reported an average acceptable duration between their last drink and start of their next shift to be only 6.7 h [4]. These notable deviations in perceived norms about drinking underscore the importance of understanding and addressing firefighter culture as it relates to problematic alcohol use.

Research has consistently demonstrated that firefighters report drinking to cope with, avoid, or “numb” negative affect [5,6]. In a large study of municipal firefighters, post-traumatic stress symptoms were statistically significantly positively associated with hazardous alcohol consumption, alcohol-related problems, and coping-motivated alcohol use (i.e., drinking to cope; [6]). Further, coping-motivated alcohol use was strongly positively associated with hazardous alcohol consumption and alcohol-related problems, underscoring the interrelatedness of alcohol consumption, coping motives, and related problems [6]. Alcohol consumption serves as a direct link between emotional and physical health problems, as evidenced by recent work which demonstrated a statistically significant association between firefighters’ alcohol consumption and cardiometabolic risk [7].

Firefighters are a largely understudied population compared to military or college samples; however, alarming rates of alcohol use are evident. Current research among firefighters, while designed to inform clinical work, is limited by the variety of measures used. The complexity of drinking behavior is evidenced by the various definitions for problematic drinking, hazardous drinking, binge drinking, and/or heavy episodic drinking. Many cited studies rely upon standard drink amounts to categorize behavior, while others utilize standardized measures and cutoff points. For example, one study reported that the rate of problematic alcohol use is 63.0% among male firefighters and 64.2% among women, per the clinical cutoff for the Alcohol Use Disorders Identification Test consumption subscale [8]. While certainly informative, it is difficult to compare this finding to the estimated 50% rate of binge drinking among firefighters determined by the quantity of standard drinks consumed [1]. Thus, with numerous measures utilized to assess drinking behavior, it is challenging to summarize findings across studies. Extant research is further hindered by the lack of established validity of these measures among firefighter samples.

Therefore, the present study aims to explore the validity of established measures of alcohol use and drinking motives among a large sample of career firefighters. We examined the Alcohol Use Disorders Identification Test (AUDIT; [9]) and the short-form, revised Drinking Motives Questionnaire (DMQ-R-SF; [10]) as these measures have been extensively employed among a variety of populations and their factor structures were recently examined among a military sample [11]. First, we hypothesized that the three-factor structure of the AUDIT (i.e., hazardous consumption, dependence symptoms, and harmful consequences of alcohol use) would be supported. Second, we hypothesized that the four-factor structure of the DMQ-R-SF (i.e., coping-, conformity-, enhancement-, and socially motivated alcohol use) would be supported. Third, we hypothesized that coping-motivated alcohol use would be uniquely associated with each AUDIT subscale, given extant research among firefighters documenting robust associations between coping-motivated alcohol use and alcohol use severity (e.g., [5,6]).

2. Methods

2.1. Participants

The current study is a secondary analysis of data from a larger project examining stress and health behaviors among firefighters [12]. Overall study inclusion criteria required participants to be over age 18, be currently working as a firefighter, and consent to complete the online questionnaires. A subset of data was utilized by analyzing responses from firefighters who reported lifetime alcohol use and who provided complete responses to the AUDIT and DMQ-R-SF. For the present analysis, participants included 679 career firefighters (94.3% men; $M_{\text{age}} = 38.6$, $SD = 8.6$), all of whom provide Emergency Medical Services (EMS) in addition to fire suppression. Please see Table 1 for sociodemographic and job characteristics of this sample.

Table 1. Participant sociodemographic and career-related characteristics.

Variable	n	Valid%
Gender		
Men	640	94.3%
Women	39	5.7%
Race		
White	529	77.9%
Black or African American	75	11.0%
Other	51	7.5%
American Indian or Alaskan Native	12	1.8%
Asian	11	1.6%
Native Hawaiian or other Pacific Islander	1	0.1%
Ethnicity		
Hispanic or Latinx	177	26.1%
Not Hispanic or Latinx	502	73.9%
Relationship Status		
Married	460	67.7%
Single	129	19.0%
Divorced	53	7.8%
Living with partner	35	5.2%
Widowed	2	0.3%
Education		
8th grade	2	0.3%
Partial completion of high school or GED equivalent	2	0.3%
High school graduate	56	8.2%
Partial completion of college	320	47.1%
College graduate	299	44.0%
Meeting criteria for:		
Probable AUD diagnosis ¹	193	28.4%

Note. $N = 701$; ¹ Probable AUD diagnosis was considered a score of 8 or greater for men and 7 or greater for women on the Alcohol Use Disorders Identification Test (AUDIT; [9]).

2.2. Procedure

Participants were recruited for the parent study from a large metropolitan fire department in the southern U.S. All firefighters in the department were notified via their continuing education (CE) portal of an opportunity to participate in an online research survey for CE credit. Upon clicking the link, firefighters were provided with a description of the survey and the choice to review the informed consent form, which informed them that the study was completely voluntary and they could discontinue participation at any time without penalty. Those who consented by clicking “yes” to indicate their interest in participating were directed to the survey in Qualtrics. The total survey duration was

estimated to be 30–45 min. The study protocol was approved by the relevant Institutional Review Board and participating fire department.

2.3. Measures

Demographic Questionnaire: Participants self-reported sociodemographic and career-related information, such as age, gender, marital status, and number of years in the fire service.

Alcohol Use Disorders Identification Test (AUDIT; [9]): The AUDIT is a well-established 10-item screening instrument designed to identify problematic alcohol use [9,13]. Total scores range from 0 to 40, and the generally accepted cutoff to identify potentially hazardous drinking is 8 or greater [9]. Hazardous consumption is measured by the sum of the first three items, which inquire about drinking frequency and quantity. Dependence symptoms are assessed via the subsequent three items, which evaluate difficulty controlling drinking, difficulty managing other responsibilities due to drinking, and morning drinking. The remaining four items evaluate harmful consequences of alcohol use by inquiring about guilt after drinking, difficulty remembering after a night of heavy drinking, alcohol-related injuries to oneself or others, and others' concern about the individual's drinking. The AUDIT has demonstrated good psychometric properties [9,14–17]. In the present study, the internal consistency was good for the AUDIT total score ($\alpha = 0.85$) and dependence symptoms ($\alpha = 0.86$), and acceptable for hazardous consumption ($\alpha = 0.73$). Harmful consequences demonstrated questionable internal consistency ($\alpha = 0.68$); however, this is understandable as the participants in this sample report a range of drinking behavior and widely varied levels of alcohol-related problems.

Drinking Motives Questionnaire Revised Short Form (DMQ-R-SF; [10]): The DMQ-R-SF is a 12-item self-report measure designed to assess frequency of drinking due to specific reasons for consuming alcohol. Drinking motives are separated into four subscales: coping (i.e., drinking to avoid or reduce negative emotions), enhancement (i.e., drinking to enhance positive emotions), conformity (i.e., drinking to adhere to social norms/expectations and to avoid rejection), and social (i.e., drinking to enhance social situations). Each subscale consists of three items summed to produce scores ranging from 3 to 9. The subscales can be further categorized as internal (coping and enhancement) and external (conformity and social) motives, as well as positive (enhancement and social) and negative (coping and conformity) motives [10]. The latter two are also referred to as approach and avoidant motives, respectively. The DMQ-R-SF has been validated across samples varying by age, gender, and nationalities [10,18,19]. The internal consistency was excellent for socially motivated alcohol use ($\alpha = 0.92$), good for conformity ($\alpha = 0.87$)- and coping-motivated alcohol use ($\alpha = 0.86$), and acceptable for enhancement-motivated alcohol use ($\alpha = 0.71$).

2.4. Data Analytic Strategy

We used SPSS Version 28.0 to identify a subset of participants from the parent study who reported lifetime alcohol use and provided complete responses to the AUDIT and DMQ-R-SF. We employed independent-sample t-tests to examine demographic differences between the subset of participants selected for the present analysis versus those who did not respond to any items in the AUDIT or DMQ-R-SF ($n = 506$) or who provided partial responses ($n = 17$). There were no statistically significant demographic differences observed between the subset of participants selected from the parent study compared to those who did not respond to the alcohol measures of interest or who provided incomplete responses ($N = 523$).

Among the subset of participants included in the present analysis ($N = 679$), we first examined data normality and correlations across demographic variables and the AUDIT and

DMQ-R-SF subscales. Age, hazardous consumption, and enhancement- and socially motivated alcohol use appeared normally distributed. As anticipated, dependence symptoms, harmful consequences of alcohol use, and conformity-motivated alcohol use appeared positively skewed (values > 2.0), with kurtosis statistics indicating heavier right-sided tails (values > 7.0). To account for this non-normality, we employed a robust maximum likelihood (MLR) estimator and have reported results accordingly [20]. Next, we conducted a confirmatory factor analysis (CFA) to examine the factor structure of the AUDIT and DMQ-R-SF among firefighters using MPlus Version 8.7 [21] to address our first and second hypotheses. Finally, for our third hypothesis, we employed structural equation modeling (SEM) to examine the interrelatedness of drinking motives on AUDIT subscales. In this model, item distributions were treated as continuous and the same MLR estimator was utilized.

Model fit was assessed with consideration given to absolute fit indices, including the normed chi-square (χ^2/df) and standardized root mean square residual (SRMR), with an SRMR ≤ 0.08 indicative of good model fit. Relative indices, such as the comparative adjustment index (CFI) and the Tucker–Lewis index (TLI), were evaluated with values > 0.90 indicating acceptable model fit. Additionally, the root mean square error of approximation (RMSEA) was reviewed as an index not based on centrality, with values < 0.05 indicative of good fit and values ≤ 0.08 indicative of acceptable model fit [22,23].

3. Results

3.1. Bivariate Correlations

All AUDIT and DMQ-R-SF subscales were positively correlated with one another, as expected. Many of the correlations between subscales ranged from low to moderate (r 's = 0.32 to 0.55). Notably, only a slight correlation was observed between hazardous consumption and conformity-motivated alcohol use ($r = 0.20$), and between dependence symptoms and socially motivated alcohol use ($r = 0.25$). Expectedly high correlations were observed between dependence symptoms and harmful consequences of alcohol use ($r = 0.83$), as well as between enhancement- and socially motivated alcohol use ($r = 0.75$). Please see Table 2 for descriptive statistics and bivariate correlations. Of note, the reported alcohol use severity in this sample per the mean AUDIT score was similar to other large firefighter samples [24].

Table 2. Descriptive statistics and bivariate correlations of study variables.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Age	--												
2. Gender	0.03	--											
3. Relationship Status	0.21 ***	0.09	--										
4. Educational Attainment	0.02	0.06	0.05	--									
5. Years in the Fire Service	0.87 ***	0.01	0.20 ***	0.07	--								
6. AUDIT Total	−0.07	−0.04	−0.11 **	−0.01	−0.04	--							
7. AUDIT Hazardous Consumption	−0.05	−0.01	−0.08 *	0.01	−0.02	0.82 ***	--						
8. AUDIT Dependence Symptoms	−0.07	−0.04	−0.10 **	−0.02	−0.05	0.85 ***	0.44 ***	--					
9. AUDIT Harmful Consequences	−0.06	−0.06	−0.10 *	−0.03	−0.04	0.87 ***	0.50 ***	0.83 ***	--				
10. DMQ-R-SF Coping	−0.05	−0.13 **	−0.06	−0.02	−0.03	0.53 ***	0.42 ***	0.46 ***	0.48 ***	--			
11. DMQ-R-SF Conformity	−0.05	−0.01	−0.03	−0.03	−0.03	0.35 ***	0.20 ***	0.36 ***	0.37 ***	0.53 ***	--		

Table 2. Cont.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
12. DMQ-R-SF Enhancement	−0.08 *	−0.05	−0.11 **	−0.04	−0.11 **	0.51 ***	0.53 ***	0.34 ***	0.39 ***	0.55 ***	0.40 ***	--	
13. DMQ-R-SF Social	−0.11 **	−0.03	−0.09 *	−0.01	−0.11 **	0.42 ***	0.45 ***	0.25 ***	0.32 ***	0.47 ***	0.40 ***	0.75 ***	--
Mean	38.63	0.94	0.73	3.86	13.30	6.32	4.92	0.69	0.70	3.77	3.41	4.51	4.88
Standard Deviation	8.60	0.23	0.44	1.12	8.82	4.66	2.34	1.70	1.48	1.37	1.01	1.46	1.80

Note. $N = 679$. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$. Gender coded as 1 = men, 0 = women. Relationship status coded as 1 = married or living with partner, 0 = single, widowed, divorced. AUDIT = Alcohol Use Disorders Identification Test [9]; DMQ-R-SF = Drinking Motives Questionnaire—Revised, Short Form [10].

3.2. Confirmatory Factor Analysis

In the initial confirmatory factor analysis (CFA), we examined the three-factor AUDIT with the four-factor DMQ-R-SF, as hypothesized. This model demonstrated acceptable fit ($\chi^2 = 515.944$, $df = 188$, $p < 0.001$; CFI = 0.934; TLI = 0.919; RMSEA = 0.051, 90% CI [0.045, 0.056], SRMR = 0.069). All items loaded onto each factor appropriately, and standardized loadings ranged from 0.411 to 0.944, except for one item assessing harmful consequences of alcohol use whose estimate was 0.207 (“Have you or someone else been injured because of your drinking?”). Please see Table 3 for all standardized and unstandardized factor loadings. The majority of latent variable subscales were statistically significantly correlated with one another, demonstrating low to robust associations (r 's = 0.23 to 0.63).

Table 3. DMQ-R-SF and AUDIT unstandardized (unstd.) and standardized (std.) factor loadings.

Scale/Subscale/Item	Unstd. Loading	Std. Loading
DMQ-R-SF Coping Motives		
2. Because it helps you when you feel depressed or nervous	1.000	0.799
6. To forget about your problems	1.025	0.860
10. To cheer up when you're in a bad mood	1.112	0.797
DMQ-R-SF Conformity Motives		
5. So you won't feel left out	1.000	0.761
11. To be liked	0.837	0.824
12. To fit in with a group you like	1.059	0.944
DMQ-R-SF Enhancement Motives		
1. Because you like the feeling	1.000	0.706
3. To get high	0.415	0.486
9. Because it's fun	1.156	0.839
DMQ-R-SF Social Motives		
4. Because it helps you enjoy a party	1.000	0.827
7. Because it makes social gatherings more fun	1.153	0.912
8. Because it improves parties and celebrations	1.196	0.942
AUDIT Hazardous Consumption		
1. How often do you have a drink containing alcohol?	1.000	0.543
2. How many standard drinks do you have on a typical day when you are drinking?	1.045	0.651
3. How often do you have six or more standard drinks on one occasion?	1.684	0.933

Table 3. *Cont.*

Scale/Subscale/Item	Unstd. Loading	Std. Loading
AUDIT Dependence Symptoms		
4. . . . found that you were not able to stop drinking once you had started?	1.000	0.815
5. . . . failed to do what was normally expected of you because of drinking?	0.862	0.889
6. . . . needed a first drink in the morning to get yourself going after a heavy drinking session?	0.684	0.829
AUDIT Harmful Consequences		
7. . . . had a feeling of guilt or remorse after drinking?	1.000	0.896
8. . . . been unable to remember what happened the night before because you had been drinking?	0.848	0.810
9. Have you or someone else been injured because of your drinking?	0.094	0.207
10. Has a relative, friend, doctor, or other health care worker been concerned about your drinking or suggested you cut down?	0.287	0.411

Note. DMQ-R-SF = Drinking Motives Questionnaire—Revised, Short Form [10]. AUDIT = Alcohol Use Disorders Identification Test [9]; in the current table, AUDIT items #4–8 are prefaced with “How often in the last year have you...”.

Notably, results also indicated a very strong correlation between the enhancement- and socially motivated alcohol use subscales ($r = 0.91$, $se = 0.02$, $p < 0.001$). To promote parsimony, we therefore examined a three-factor model for the DMQ-R-SF: coping, conformity, and positive drinking motives (i.e., socially and enhancement-motivated alcohol use). The model demonstrated acceptable fit ($\chi^2 = 574.807$, $df = 194$, $p < 0.001$; CFI = 0.924; TLI = 0.909; RMSEA = 0.054, 90% CI [0.049, 0.059], SRMR = 0.077); however, each index of model fit was slightly worse than the four-factor model. Similarly, a strong correlation was observed between AUDIT subscales of dependence symptoms and harmful consequences of alcohol use ($r = 0.99$, $se = 0.03$, $p < 0.001$). Therefore, we examined a two-factor model for the AUDIT by combining dependence symptoms with harmful consequences of alcohol use. This model demonstrated acceptable fit ($\chi^2 = 520.065$, $df = 194$, $p < 0.001$; CFI = 0.935; TLI = 0.922; RMSEA = 0.050, 90% CI [0.045, 0.055], SRMR = 0.070); however, each index of model fit was similar or slightly worse than the model examining the three-factor AUDIT. Because the patterns of results remained consistent, we report on the original four-factor DMQ-R-SF and three-factor AUDIT.

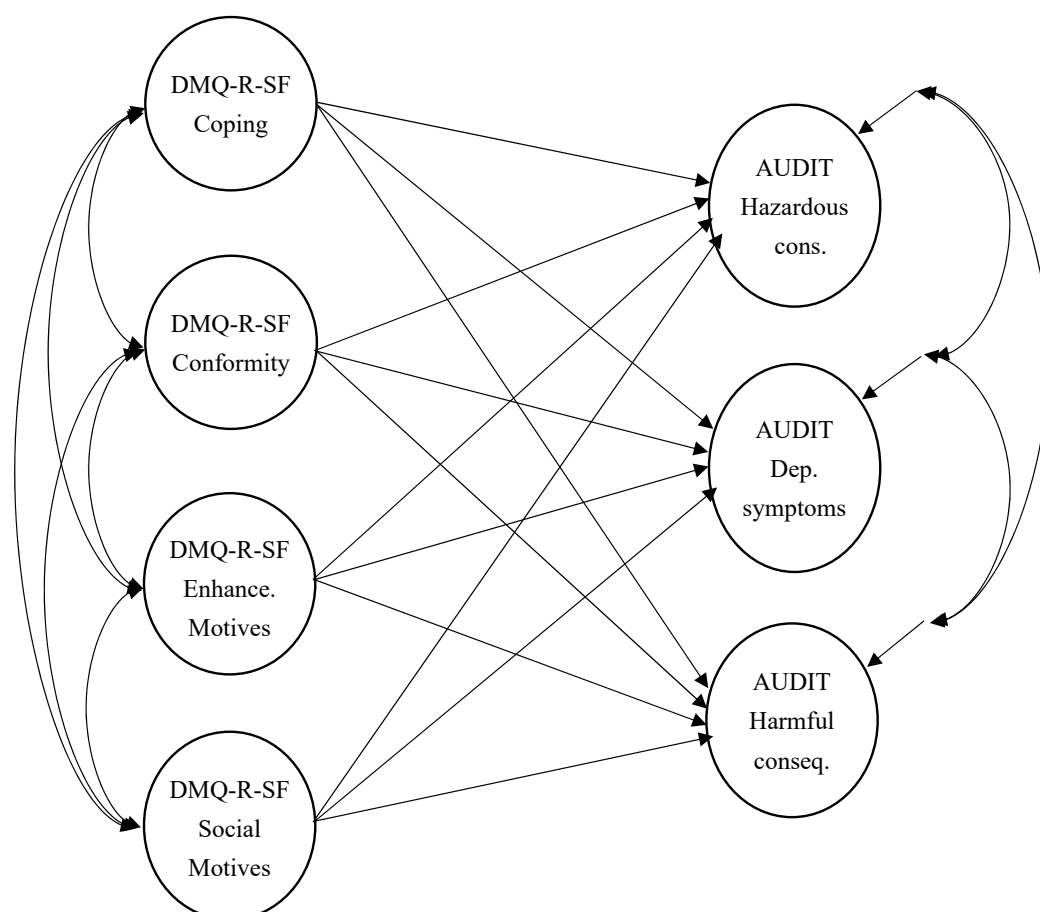
3.3. Structural Equation Model

Structural equation modeling was subsequently employed to examine the associations between the four-factor DMQ-R-SF on the three-factor AUDIT, as proposed in our third hypothesis. All four alcohol use motives were positively associated with one another, as were the three AUDIT subscales. Coping ($\beta = 0.216$, 95% CI [0.050, 0.542])- and enhancement-motivated alcohol use ($\beta = 0.775$, 95% CI [0.324, 1.420]) were statistically significantly positively associated with and accounted for 44% of the variance in hazardous consumption. Coping-motivated alcohol use was the only drinking motive positively associated with dependence symptoms ($\beta = 0.426$, 95% CI [0.351, 0.972]) and harmful consequences of alcohol use ($\beta = 0.456$, 95% CI [0.352, 0.936]), and the four DMQ-R-SF subscales together accounted for 29% and 33% of their variances, respectively. Please see Table 4 for all latent variable associations between subscales in the structural equation model. Figure 1 depicts a visual representation of the relationships examined by the structural equation model.

Table 4. Structural equation model for the unstandardized and standardized associations between drinking motives and AUDIT subscales.

Variable	<i>B</i>	<i>SE</i>	β	90% CI	r^2
AUDIT Hazardous Consumption					0.44
DMQ-R-SF Coping Motives	0.296 *	0.126	0.216	[0.09, 0.50]	
DMQ-R-SF Conformity Motives	−0.163	0.098	−0.097	[−0.32, −0.003]	
DMQ-R-SF Enhancement Motives	0.872 **	0.280	0.775	[0.41, 1.33]	
DMQ-R-SF Social Motives	−0.274	0.219	−0.256	[−0.63, 0.09]	
AUDIT Dependence Symptoms					0.29
DMQ-R-SF Coping Motives	0.662 ***	0.159	0.426	[0.40, 0.92]	
DMQ-R-SF Conformity Motives	0.176	0.178	0.092	[−0.12, 0.47]	
DMQ-R-SF Enhancement Motives	0.362	0.225	0.284	[−0.01, 0.73]	
DMQ-R-SF Social Motives	−0.301	0.188	−0.249	[−0.61, 0.01]	
AUDIT Harmful Consequences					0.33
DMQ-R-SF Coping Motives	0.669 ***	0.162	0.456	[0.40, 0.94]	
DMQ-R-SF Conformity Motives	0.149	0.160	0.082	[−0.11, 0.41]	
DMQ-R-SF Enhancement Motives	0.226	0.241	0.187	[−0.17, 0.62]	
DMQ-R-SF Social Motives	−0.117	0.202	−0.102	[−0.45, 0.22]	

Note. *B* = unstandardized coefficients; *SE* = standard error; β = standardized coefficient. AUDIT = Alcohol Use Disorders Identification Test [9]; DMQ-R-SF = Drinking Motives Questionnaire—Revised, Short Form [10]. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

**Figure 1.** Structural equation model of drinking motives on AUDIT subscales. Note: $N = 679$. AUDIT = Alcohol Use Disorders Identification Test [9]; DMQ-R-SF = Drinking Motives Questionnaire—Revised, Short Form [10]. AUDIT subscales include hazardous consumption, dependence symptoms, and harmful consequences of alcohol use.

4. Discussion

The present study sought to explore the factor structure of two commonly used measures of alcohol use and drinking motives among a large sample of firefighters. Given the elevated rates of alcohol use among firefighters, we considered the role of cultural norms and drinking to cope with negative affect. The three-factor AUDIT and four-factor DMQ-R-SF model demonstrated good fit, supporting our hypothesis regarding the utility of these measures among firefighter samples. However, the results also indicated a very strong correlation between the enhancement- and socially motivated alcohol use subscales. Despite the four-factor model demonstrating better fit, it is possible that there is substantial overlap between enhancement- and socially motivated alcohol use among firefighters. Further research is needed to explore the intricacies of positive drinking motives among firefighters in various situational contexts, such as socializing. It is possible that dimensional traits, such as introversion–extroversion, have a further moderating effect on these drinking motives. Similarly, dependence symptoms and harmful consequences of alcohol use demonstrated a very strong correlation. While we report results on the three-factor AUDIT given the similar model fit statistics, future work is needed to explore the utility of separating dependence symptoms (i.e., difficulty stopping drinking once started, failure to fulfill responsibilities due to drinking, and morning drinking after a night of heavy consumption) from harmful consequences of alcohol use (i.e., feeling guilt or remorse, inability to remember what happened while drinking, injuring oneself or others due to drinking, and others expressing concern about one's drinking), and whether an underlying construct may better capture problematic alcohol use among firefighters.

Results of the structural equation model were consistent with extant findings documenting associations between hazardous consumption, alcohol-related problems, and drinking motives among firefighters (e.g., [6]). As expected, coping-motivated alcohol use was statistically significantly positively associated with hazardous consumption, dependence symptoms, and harmful consequences of alcohol use, underscoring the need to further assess firefighters' tendency to drink to avoid or numb their negative emotions. Notably, enhancement-motivated alcohol use was also associated with hazardous consumption, suggesting that firefighters may engage in greater levels of drinking to amplify positive emotions, in addition to coping motives to reduce or "numb" negative emotions.

Given the associations between coping motives and alcohol use severity, it is imperative to consider firefighter mental health as further context when addressing alcohol use. This is particularly important due to the exceedingly high rates of trauma among firefighters [25], with an estimated 91.5% of firefighters reporting trauma exposure and nearly one-third reporting exposure to three or more potentially traumatic events [26]. A recent study of firefighters documented that 38.8% met criteria for probable alcohol use disorder, and the severity of alcohol use was associated with PTSD and depression symptoms [27]. Similar work among firefighters with probable AUD found that 18.3% met criteria for probable post-traumatic stress disorder (PTSD), a rate nearly five times greater than the prevalence of current PTSD among the general population [28,29]. Indeed, PTSD symptoms have been shown to be positively associated with the number of drinks consumed per week among early career firefighters [30]. Additionally, a national study of female career firefighters demonstrated that those who reported problematic drinking were 2.5 more likely to report PTSD symptoms or to have received a diagnosis of depression [31]. Taken together, these findings highlight the importance of future research to further our understanding of firefighter alcohol use within a greater mental health context.

Although the goal of the present study necessitated the use of self-report measures, findings are limited by a lack of clinician-administered assessments, secondary independent reporting (e.g., a spouse or significant other), or biomedical tests to corroborate reported

alcohol use. Additional limitations include the potential for self-selection bias, whereby firefighters with more severe alcohol use may have not participated or underreported their consumption, as well as the use of cross-sectional data, which precluded our ability to draw causal inferences regarding the direction of alcohol use motives and AUDIT subscales. For example, it is unclear whether coping-motivated alcohol use precedes hazardous consumption, or whether there is a bidirectional effect. Lastly, the sample consisted predominately of white, non-Hispanic men from a single fire department, thus limiting the generalizability of our findings to a more racially, ethnically, and gender-diverse sample.

Future research is needed to explore demographic factors that may provide greater information regarding differences in alcohol use across gender [32], racial and ethnic groups [1,2,31,33], and marital status [34]. Additional research is necessary to consider job-related factors that may affect firefighter alcohol consumption, including years of service [1,2,31], career or volunteer status [4,35], and on-the-job injuries [31]. Improved understanding of contextual factors that may exacerbate or mitigate firefighter alcohol use will support screening, prevention, and intervention efforts for this population, such as personalized feedback/psychoeducation during academy training, targeted peer support initiatives, and culturally informed clinical care.

Extant research has sought to gain greater understanding of firefighter alcohol use, yet overarching conclusions have been limited by the variety in measurement, as well as a lack of established validity in commonly used measures. The present study closes this gap by providing evidence to support the three-factor structure of the AUDIT and four-factor structure of the DMQ-R-SF among a sample of career firefighters in the southern U.S. Our findings suggest that drinking motives may have the greatest impact on hazardous alcohol consumption, compared to other AUDIT subscales. These motives are related to affect, with firefighters in this sample reporting drinking to cope with negative mood or drinking to enhance positive emotion reporting higher levels of hazardous consumption. Alcohol use among firefighters remains a notable clinical concern, and future research is needed to explore the impact of firefighters' cultural norms and perceptions surrounding alcohol use, as well as contextual differences related to demographics and mental health.

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