



Short communication

Perceived stress and substance use in methadone-maintained smokers

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ABSTRACT

Background: In methadone maintenance treatment programs (MMTPs), 80–90% of participants smoke cigarettes. Patients in MMTPs are at particular risk for life stress, and nicotine, as well as other substances like alcohol, benzodiazepines, cocaine, marijuana, and opiates have been shown to reduce the effects of stress. Use of these addictive substances to cope with stress may precipitate illicit opiate relapse in MMTP patients. In the current study, we examined the relationship between perceived stress and substance abuse.

Methods: Participants were 315 cigarette smokers recruited from nine MMTPs for a smoking cessation study. Logistic regression was used to evaluate the adjusted association of perceived stress with dichotomous indicators of hazardous alcohol use and recent substance use at baseline.

Results: After controlling for demographic and smoking-related variables, perceived stress was associated positively and significantly with the likelihood of screening positive for hazardous drinking or alcohol-related problems (OR = 1.13, 95%CI 1.02; 1.25), with the likelihood of recent cocaine use (OR = 1.18, 95%CI 1.02; 1.37), and with the likelihood of recent benzodiazepine use (OR = 1.24, 95%CI 1.07).

Conclusions: Perceived stress may be a marker of patients' risk for illicit substance use, a known risk factor for illicit opiate relapse. These findings indicate that cigarette use might not be sufficient in managing stress and methadone-maintained persons turn to other substances for relief.

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1. Introduction

Cigarette smoking remains a common problem in the US, with 19.3% of adults currently smoking (King et al., 2011), but in methadone maintenance treatment programs (MMTPs), 80–90% of participants smoke (Best et al., 1998; Clarke et al., 2001; Richter et al., 2001; Stark and Campbell, 1993). Reasons for this higher rate might be biological (Frosch et al., 2000; Pontieri et al., 1996; Schmitz et al., 1994; Spiga et al., 2005; Story and Stark, 1991), but MMTP patients also often have chronic life stress due to economic challenges, and high rates of unemployment, homelessness, lack of insurance, and history of incarceration (Galea and Vlahov, 2002; Shah et al., 2000) that may contribute. Cigarettes may be used to cope with perceived stress (Koob and Nestler, 1997; Parrott, 1995a,b) and perceived stress is implicated as a barrier to quitting smoking (Cohen and Lichtenstein, 1990).

In addition to the high prevalence of smoking, methadone-maintained persons may use a variety of other substances,

including alcohol, cocaine, marijuana, and non-medical prescriptions drugs (e.g. benzodiazepines; Brewer et al., 1998; Khosla et al., 2011; Kolar et al., 1990; Wasserman et al., 1998). Methadone-maintained smokers may use other substances as a coping strategy to reduce stress (see Sinha, 2001, 2008) for reviews). Alcohol, cocaine, and marijuana use has been correlated with perceived stress in adolescents and adults (Cole et al., 1990; Siqueira et al., 2001; Young et al., 1995) and in cigarette smokers (e.g. Steptoe et al., 1996). However, the link between perceived stress and use of substances in MMTP patients is understudied. This ongoing substance use not only has health effects, but also has been shown to jeopardize opiate abstinence in methadone-maintained persons (Shah et al., 2006; Termorshuizen et al., 2005; Wasserman et al., 1998).

In the current study, we focused on methadone-maintained smokers and their perceived stress, in particular, their personal coping resources and their cognitively mediated emotional response to stressors (Cohen et al., 1983; Lazarus, 1977, 2006). As such, perceived stress represents a person's perceived ability to exert control over important aspects of his/her life and sense of self-confidence in overcoming challenges. Although limited, there are mixed data suggesting perceived stress increases risk for heroin use in individuals in MMTPs, with one study implicating perceived

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stress as a factor (Niaura et al., 1988) and one suggesting it is not (Wasserman et al., 1998). We hypothesized that perceived stress in an MMTP sample would be positively correlated with use of alcohol, benzodiazepines, cocaine, and marijuana, as well as ongoing illicit opiate use.

2. Methods

2.1. Participants

Participants were 315 adult outpatient cigarette smokers recruited from nine MMTPs in the northeast U.S. for a smoking cessation study (Caviness et al., 2013a,b). Eligibility criteria included: (1) being over 18 years of age; (2) being a current, regular smoker (at least 10 cigs/day for the past 3 months); (3) speaking English or Spanish; (4) having received methadone for at least the last month; (5) agreeing to be available for 12 months; and, (6) willingness to set a quit date seven days after the baseline assessment. Individuals were excluded from participation if they: (1) were suffering from any unstable medical condition which would preclude use of the nicotine patch (e.g. uncontrolled hypertension), had an active skin condition (e.g. psoriasis) or history of skin allergy; (2) were currently using smokeless tobacco, nicotine replacement therapy, or other smoking cessation treatment; and (3) were pregnant or nursing.

2.2. Procedures

The baseline survey included a variety of measures in addition to assessing ethno-racial status, education level, marital, and employment status.

2.2.1. Alcohol use disorders identification test—alcohol consumption questions. AUDIT-C (Bush et al., 1998) is a shortened version of the AUDIT (Babor and Grant, 1989) used to identify persons screening positive (3 or higher for women and 4 or higher for men) for hazardous drinking or active alcohol-related problems over the past year (Bradley et al., 2003, 1998).

2.2.2. Fagerstrom test for nicotine dependence. FTND (Heatherton et al., 1991) measured severity of nicotine dependence.

2.2.3. Perceived stress scale. PSS (Cohen et al., 1983), the 4-item PSS assessed the degree to which individuals perceive their environment and experiences as stressful during the past month. PSS scores range from 0 to 16; the items assess: (1) perceived ability to control important aspects of one's life; (2) confidence in handling personal problems; (3) sense that things are "going your way"; and (4) feelings as though problems are piling up so high that they cannot be overcome.

2.2.4. Timeline followback interview. TLFB (Sobell and Sobell, 1996), a semi-structured interview that uses a calendar-guided approach (Fals-Stewart et al., 2000), assessed mean cigarettes/day and use of cocaine and opiates in the past 30 days. Because most participants reported no use during the past 30-days these indicators were dichotomized to compare any recent use to no recent use.

2.2.5. Addiction severity index – drug module. ASI (McLellan et al., 1985, 1980) was used to measure days of benzodiazepine and cannabis use during the past 30 days. These indicators were also dichotomized to contrast any recent use to no recent use.

2.3. Statistical analysis

Logistic regression was used to evaluate the adjusted association of perceived stress with dichotomous indicators of hazardous alcohol use and recent substance use. Covariates in all models included gender, age, ethnicity, educational attainment, employment status, severity of nicotine dependence, and mean cigarettes/day. Robust Huber–White standard errors were used for all tests of significance and 95% confidence interval estimates.

3. Results

3.1. Descriptive analyses

Participants averaged 39.9 (± 9.6) years of age, 156 (49.5%) were male, 250 (79.4%) were non-Latino White, 8 (2.5%) were African-American, 38 (12.1%) were Latino, and 19 (6.0%) were of other ethno-racial origins (see Table 1). Participants smoked an average of 19.6 (± 8.5) cigarettes/day and their mean Fagerstrom FTND score was 5.7 (± 2.2). Fifty-two (16.6%) participants screened positive for hazardous drinking or alcohol use disorders. Twenty-seven (8.6%) participants reported recent opiate use, the same number reported recent cocaine use, 75 (23.8%) reported recent use of marijuana,

Table 1
Background characteristics ($n = 315$).

| | Mean (\pm SD) or n (%) |
|---------------------------------|-----------------------------|
| Years age | 39.9 (± 9.6) |
| Gender (male) | 156 (49.5%) |
| Race/ethnicity | |
| Non-Latino White | 250 (79.4%) |
| African-American | 8 (2.5%) |
| Latino | 38 (12.1%) |
| Other ethnic minority | 19 (6.0%) |
| Education attainment (years) | 11.8 (± 2.1) |
| Employed (yes) | 69 (21.9%) |
| Mean cigarettes/day | 19.6 (± 8.5) |
| Fagerstrom FTND | 5.7 (± 2.2) |
| AUDIT-C+ (yes) | 52 (16.6%) |
| Recent opiate use (yes) | 27 (8.6%) |
| Recent cocaine use (yes) | 27 (8.6%) |
| Recent marijuana use (yes) | 75 (23.8%) |
| Recent benzodiazepine use (yes) | 30 (9.5%) |
| Perceived stress | 6.96 (± 3.4) |

and 30 (9.5%) reported recent benzodiazepine use. Mean score on the PSS was 6.96 (± 3.4).

3.2. Associations of perceived stress and substance use

After adjusting for demographic characteristics, nicotine dependence severity, and mean cigarettes/day, perceived stress was associated positively and significantly with the likelihood of screening positive for hazardous drinking or alcohol-related problems on the AUDIT-C (OR = 1.13, 95%CI 1.02; 1.25, $p < .05$), with the likelihood of recent cocaine use (OR = 1.18, 95%CI 1.02; 1.37, $p < .05$), and with the likelihood of recent benzodiazepine use (OR = 1.24, 95%CI 1.07; 1.43, $p < .01$). Directionally, persons with higher perceived stress were also more likely to report recent opiate (OR = 1.12, 95%CI 0.97; 1.29, $p > .05$) and marijuana (OR = 1.07, 95%CI 0.98; 1.16, $p > .05$) use, though these associations were not significant at the conventionally accepted .05 level (see Table 2 for summary).

4. Discussion

We found that greater perceived stress was associated with ongoing substance use in methadone-maintained smokers. MMTP patients are at risk for elevated perceived stress due to a variety of economic challenges, physical disability, family and relational problems, and legal difficulties (Galea and Vlahov, 2002; Hayaki et al., 2005; Shah et al., 2000; Stein and Friedmann, 2002). Cigarettes might be used to cope with this stress. However, our findings indicate that cigarettes might not be sufficient in managing stress and therefore, these individuals turn to other substances for relief.

We hypothesized that perceived stress would be directly correlated with hazardous alcohol use and frequency of benzodiazepine, cocaine, marijuana, and opiate use. Results revealed that perceived stress was correlated with alcohol use severity and cocaine use. These findings are notable because in methadone-maintained persons, use of alcohol and cocaine has been shown to precipitate relapse of illicit opiate use (Shah et al., 2006; Termorshuizen et al., 2005). Our results showed that use of benzodiazepines was also positively correlated with perceived stress. Benzodiazepines are commonly used in methadone-maintained populations (e.g. >40% in one large, multi-site study; Iguchi et al., 1993). These substances might be used together to manage affect (Ross et al., 2005), or more deleteriously, this combination may produce a subjective "high" not induced by methadone alone (Lintzeris and Nielsen, 2010). The link between benzodiazepine use and stress is particularly concerning because methadone-related deaths are often linked to the

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