



Full length article

## Post-quit stress mediates the relation between social support and smoking cessation among socioeconomically disadvantaged adults



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### ABSTRACT

**Objective:** Social support interventions have demonstrated limited effectiveness for preventing smoking relapse. The stress-buffering hypothesis may be a useful framework by which to understand social support in smoking cessation interventions. The current study evaluated the interrelations among social support, stress, and smoking cessation in both moderation and mediation models.

**Methods:** Participants ( $N=139$ ) were enrolled in a smoking cessation study at the safety-net hospital in Dallas, Texas. During the week prior to a scheduled quit attempt, general social support was measured using the Interpersonal Support Evaluation List (ISEL) questionnaire and smoking-specific social support was measured via repeated smartphone-based ecological momentary assessments (EMA). Post-quit stress was repeatedly assessed via smartphone. Logistic regression analyses evaluated potential interaction effects of pre-quit social support and post-quit stress on the likelihood of achieving biochemically-verified 7-day point prevalence abstinence at 4 weeks post-quit. Mediation models were evaluated to determine if post-quit stress mediated the association between pre-quit social support and smoking cessation.

**Results:** Participants were predominantly Black (63.3%) and female (57.6%); and 55% reported an annual household income of <\$12,000. Analyses indicated that pre-quit social support did not significantly interact with post-quit stress to influence smoking cessation. However, post-quit stress did mediate associations between social support variables and smoking cessation.

**Conclusions:** Findings indicated that social support impacts smoking cessation through its influence on post-quit stress among socioeconomically disadvantaged adults participating in cessation treatment. Increasing social support for the specific purpose of reducing stress during a quit attempt may improve smoking cessation rates in disadvantaged populations.

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### 1. Introduction

Although public health efforts have resulted in dramatic decreases in smoking prevalence, smoking remains the leading preventable cause of death in the U.S. (US Department Health and Human Services, 2014). Individuals of lower socioeconomic status have substantially higher rates of smoking (Centers for Disease Control and Prevention, 2014), are more dependent on cigarettes, and have a harder time quitting smoking than individuals of higher

socioeconomic status (Businelle et al., 2010; Fernandez et al., 2006; Kendzor et al., 2012; Wetter et al., 2005). Notably, socioeconomic disadvantage is also associated with lower social support (Campbell et al., 1986; Cohen et al., 1999; John-Henderson et al., 2015; Murray et al., 1995) and having less social support is associated with a reduced likelihood of smoking cessation (Hanson et al., 1990; Lawhon et al., 2009; Mermelstein et al., 1986; Murray et al., 1995). Surprisingly, interventions that have aimed to increase social support have had limited success (Tsoh et al., 2015) at increasing smoking cessation (Hogan et al., 2002; May and West, 2000). One explanation for this might be the absence of a theoretical framework to guide the manner in which support is delivered and utilized during a cessation attempt (see Hogan et al., 2002; May and West, 2000; Westmaas et al., 2010).

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The Stress-Buffering Hypothesis (Cohen and Wills, 1985) posits that social support may buffer against the adverse impact of perceived stress on health. Cohen and Wills (1985) discussed the potential for both interactions and main effects of social support on health. In their main effect model, persons with low social support may have higher levels of perceived stress and poor health outcomes, while persons with high social support may have lower levels of perceived stress and more positive health outcomes. In the interaction model, the effect of stress on health depends on the level of perceived social support. Specifically, in those with low levels of social support, stress may have greater negative impacts on health, whereas in those with high levels of social support, the effect of stress on health may be attenuated. This conceptual framework may be useful for understanding how social support might influence perceived stress during a quit attempt, and ultimately how social support may impact smoking cessation. Indeed, Creswell et al. (2015) recently showed that greater social support was associated with reduced relapse risk among weight-concerned women, and that this relationship was mediated by reductions in withdrawal symptoms (but not depression) over time. Continued research is needed to understand the influence of social support on smoking cessation across populations, and to determine the role of stress specifically.

Research has shown that individuals of low socioeconomic status (SES) experience more stressors than higher SES adults (Hatch and Dohrenwend, 2007; Lantz et al., 2005; Mcleod and Kessler, 1990), and numerous studies have indicated that perceived stress is related to smoking relapse (Cohen and Lichtenstein, 1990; Kassel et al., 2003; Siahpush and Carlin, 2006). For example, perceived stress (Cohen and Lichtenstein, 1990), financial stress (Kendzor et al., 2010; Siahpush and Carlin, 2006), and physiological indicators of stress (Al'absi, 2006) have each been shown to predict smoking relapse. In fact, many individuals attribute their relapse, at least in part, to perceived stress (Shiffman, 1982).

In summary, little attention has been paid to the stress-buffering hypothesis in relation to smoking cessation outcomes. The purpose of the current study was to test the potential stress buffering effects of several aspects of social support on smoking cessation in a socioeconomically disadvantaged, and primarily African American, safety-net hospital sample. Moderation and mediation analyses were conducted to evaluate the interrelations among social support, perceived stress, and smoking cessation among individuals making a quit attempt. Specifically, we hypothesized that the association between stress and smoking cessation would be attenuated with high social support levels, while the association between stress and smoking cessation would be stronger under lower levels of social support. We additionally hypothesized that stress would mediate the association between social support and smoking cessation, such that greater social support would lead to lower perceived stress and thereby increase the likelihood of smoking cessation. Findings will inform the development and adaptation of smoking cessation interventions for socioeconomically disadvantaged smokers.

## 2. Methods

### 2.1. Procedure

A total of 222 potential participants were approached regarding their interest in participating in a smoking cessation intervention study at the orientation session of a safety net hospital smoking cessation program between August, 2011 and April, 2013. Of those screened, 69 did not meet inclusion criteria, 7 were enrolled but did not return after the baseline visit, and 7 did not have complete data for the current study analyses, leaving an analytic sample

of 139 participants (For more information about the parent study see Kendzor et al., 2015). Informed consent was obtained from interested individuals, and they were screened for eligibility on-site either while they were waiting to be seen by the physician or after their physician appointment. Individual screening took place in a private room in the clinic. Participant eligibility for the current study did not influence eligibility for the hospital smoking cessation program. The *Rapid Estimate of Adult Literacy in Medicine* (REALM; Davis et al., 1993) was administered to ensure that all participants were able to read at > sixth grade level (i.e., required to complete EMA and self-report questionnaires). Expired carbon monoxide (CO) was measured to verify smoking status. Additional inclusion criteria were: 1) age  $\geq 18$  years, 2) smoking  $\geq 5$  cigarettes per day, 3) willing to quit smoking within 7 days of enrollment, and 4) willingness/ability to attend 6 sessions. All participants were asked to complete in-person weekly assessments from 1 week pre-quit through 4 weeks post-quit. Participants completed self-report questionnaires on a laptop computer; and expired CO, weight, and height were measured in a private room to ensure confidentiality. Participants were provided with an LG Optimus Android smartphone for ecological momentary assessments (EMAs) and instructed on the use of the phone. Participants were asked to complete smartphone assessments 5 times daily (1 daily diary each morning, 4 random assessments per day) from 1 week pre-quit through 1 week post-quit. Participants were instructed to quit smoking at bedtime or 10:00 pm (whichever occurred first), on the evening prior to their second scheduled weekly session of the Parkland smoking cessation program.

### 2.2. Intervention

**2.2.1. Usual care.** Safety net hospital patients were offered all recommended components of an intensive tobacco treatment intervention (Fiore et al., 2008). Participants attended an initial clinic orientation and educational session, followed by weekly group support sessions facilitated by social workers. Participants were seen by a physician or other prescribing healthcare professional on a weekly or as needed basis to receive pharmacotherapy.

**2.2.2. Usual care plus financial incentives for smoking abstinence.** Participants had the opportunity to earn small weekly incentives in the form of gift cards, if they (1) self-reported abstinence during the past 12 h on the quit day, or self-reported abstinence during the past 7 days at each weekly visit from 1 week through 4 weeks after the quit date; and (2) provided an expired CO sample consistent with abstinence. Participants earned a \$20 gift card to a popular retail chain in exchange for biochemically confirmed abstinence on the quit date. An escalating schedule was employed, such that the amount of the incentives increased by \$5 with each weekly successive abstinent visit through 4 weeks after the quit date. Participants who were non-abstinent at any visit were eligible to earn incentives for abstinence at the next visit, although the amount was reset to \$20.

### 2.3. Measures

**2.3.1. Sociodemographic variables.** Several sociodemographic variables were assessed including age, gender, race/ethnicity, education, years of smoking, and cigarettes smoked per day at baseline. Note that race/ethnicity was dichotomized into non-Hispanic White and Black/other racial/ethnic minority because the vast majority of participants were either non-Hispanic White or Black.

**2.3.2. Social support.** General social support over the past week was measured on the quit date using the Interpersonal Support Evaluation List (ISEL). The ISEL is a 12-item self-report measure of the

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