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Evaluating the influences of social support and smoking cues on daily smoking abstinence among socioeconomically disadvantaged adults

Joseph J.C. Waring^{a,*}, Emily T. Hébert^a, Adam C. Alexander^a, Darla E. Kendzor^{a,b}, Michael S. Businelle^{a,b}

^aOklahoma Tobacco Research Center, Stephenson Cancer Center, University of Oklahoma Health Sciences Center, Oklahoma City, OK, United States

^bDepartment of Family and Preventive Medicine, University of Oklahoma Health Sciences Center, Oklahoma City, OK, United States

Abstract

Introduction: Perceived social support and smoking cues, such as cigarette availability, are important factors that affect smoking cessation outcomes. However, very few studies examine the influences of social support and smoking cues on lapse during a quit attempt.

Methods: Socioeconomically disadvantaged smokers participating in a smoking cessation program at a safety net hospital completed smartphone-based ecological momentary assessments (EMAs) for two consecutive weeks (1-week pre-quit through 1-week post-quit). A mixed-effects logistic regression model was used to evaluate whether perceived support to quit smoking, perceived pressure to quit smoking, and situational cues (i.e., being offered a cigarette) were related to the likelihood of reporting smoking cigarettes on any EMA within a day.

Results: Perceived social pressure and support to quit were not related to daily smoking status. Participants were more likely to smoke on days when they were offered a cigarette compared to days when no such event occurred ($OR = 3.31$ [95% CI = 1.21, 9.06]). This effect was also significant after adjusting for perceived social pressure to quit and support to quit ($OR = 3.38$ [95% CI = 1.23, 9.31]).

Conclusion: The results suggest that being offered a cigarette negatively impacts smoking cessation. The results reinforce the need for including cigarette refusal skills in smoking cessation

*Corresponding author at: Oklahoma Tobacco Research Center, 655 Research Parkway, Suite 400, Oklahoma City, OK 73104, United States. joseph-waring@ouhsc.edu (J.J.C. Waring).

Contributors

DK and MB designed the parent study. JW and EH formulated the research questions and hypotheses and conducted the secondary data analyses for this study. JW and EH also prepared the 1st draft of the manuscript. All authors revised the 1st draft and approved the final manuscript.

Ethical approval

Informed consent was obtained from all individual participants included in the study. Procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments (or comparable ethical standards). The study procedures for the parent and present study were approved by the Oklahoma University Health Sciences Center.

Declaration of Competing Interest

All authors declare that they have no competing interests.

treatment to reduce the likelihood of smoking lapse among socioeconomically disadvantaged adults.

Keywords

Smoking cessation; Social support; Smoking cues; Ecological momentary assessment

1. Introduction

Tobacco use remains the leading cause of preventable death in the U.S. (United States Department of Health and Human Services, 2014). While the prevalence of smoking has declined to 15.5% among adults in the general U.S. population, 25.3% of low socioeconomic status (SES) adults continue to smoke (Jamal, Phillips, Gentzke, et al., 2018). Numerous studies have shown that low SES adults are less likely to quit smoking and remain abstinent long-term than high SES adults (Businelle, Kendzor, Reitzel, et al., 2010; Kendzor, Businelle, Costello, et al., 2010) despite comparable numbers of quit attempts (Kotz & West, 2009). Therefore, additional research is needed to identify factors that are associated with cessation and relapse among low SES adults.

Perceived social support has been shown to reduce smoking and improve cessation rates (Lawhon, Humfleet, Hall, et al., 2009; Mermelstein, Cohen, Lichtenstein, et al., 1986; Murray, Johnston, Dolce, et al., 1996; Rice, Templin, Fox, et al., 1996), mainly when individuals are provided with emotional (i.e., material resources or direct aid), informational (i.e., offering advice or information), and instrumental support (i.e., material resources or direct aid; Barrera, 1986; Westmaas, Bontemps-Jones, & Bauer, 2010). Likewise, ecological momentary assessment (EMA) studies, which is a method of data collection that repeatedly assesses an individual's thoughts, emotions, and behaviors in near real-time (Shiffman, Stone, & Hufford, 2008), have found similar findings. For instance, an EMA study by Scholz, Stadler, Ochsner, et al. (2016) found that a concurrent increase in perceived emotional and instrumental support after the quit day resulted in a decrease in smoking, and a similar EMA study by Lüscher, Stadler, and Scholz (2017) also found that on days when participants provided and received emotional and instrumental support they smoked fewer cigarettes. Overall, these EMA studies suggested that momentary changes in perceived emotional and instrumental support were associated with smoking fewer cigarettes within a day, but no EMA study examined whether perceived social support was associated with smoking lapse after making a quit attempt. Also, the studies by Lüscher et al. (2017) and Scholz et al. (2016) were done using a sample of Swedes, who were primarily married and employed, and their findings may not extend to low SES adults who are less socially integrated and have less social support than high SES adults (Hiscock, Bauld, Amos, et al., 2012).

Situational cues have also been shown to influence smoking cessation (Businelle, Ma, Kendzor, et al., 2016; Shiffman, Paty, Gnys, Kassel, & Hickcox, 1996). For example, Shiffman, Paty, Gnys, et al. (1996) found that smoking lapse was more likely to occur in situations where there were other smokers nearby. Recently, an EMA study by Businelle et al. (2016) found that interacting with other people who were currently smoking and cigarette

availability was predictive of imminent smoking lapse, and other EMA studies also showed that cigarette availability and being around smokers substantially increased the odds of smoking lapse (Bolman, Verboon, Thewissen, et al., 2017; Koslovsky, Hébert, Swartz, et al., 2018). However, no EMA study has directly examined the impact of being offered a cigarette during the early phase of a smoking cessation attempt, which may be a strong cue for smoking lapse.

The purpose of this present study is to evaluate the influence of smoking-specific social support (i.e., perceived support to quit smoking and perceived pressure to quit smoking) and being offered a cigarette on daily smoking among low SES adults participating in a smoking cessation program at a safety net hospital. Based on prior literature, we hypothesize that an increase in perceived social support would be associated with lower odds of smoking lapse, and being offered a cigarette would increase the odds of smoking lapse. Findings from this study will clarify how EMA can be used to measure momentary changes in perceived social support and situational cues, which may also impact smoking lapse, and may highlight the importance of increasing social support and reducing cigarette availability after the quit attempt for low SES adults.

2. Methods

2.1. Participants and procedure

The smartphone-based EMA data used for this analysis comes from a randomized controlled trial of a smoking cessation intervention at a safety net hospital conducted in Dallas, TX between August 2011 and April 2013 (for details, see parent study Kendzor, Businelle, Poonawalla, et al., 2015). In short, a total of 146 socioeconomically disadvantaged smokers, were randomly assigned to either a usual care treatment group (UC) or a contingency management treatment group (CM). Individuals in the UC treatment group received group counseling and pharmacotherapy—nicotine replacement therapy, varenicline, or bupropion. The CM treatment group received the same treatment as the UC, with the addition of weekly financial incentives for biochemically verified smoking abstinence. Participants used smartphones to complete EMAs (1 daily diary assessed at a set time and four daily random assessments) for two consecutive weeks (1-week pre-quit – 1-week post-quit). Each morning, 30 min after the participant's designated wake-up time, a daily diary assessment was prompted on the smartphone. The remaining four daily EMAs were prompted throughout the day at random times during waking hours.

3. Measures

3.1. Demographics

At baseline, participants reported demographic and smoking characteristics including age, sex, race, years of education, annual household income, and the heaviness of smoking index, which is a validated measure of nicotine dependence (Heatherton, Kozlowski, Frecker, et al., 1991). Because most participants identified as either non-Hispanic White or Black, race/ethnicity was dichotomized into non-Hispanic White and Hispanic or non-White.

3.2. Social support and smoking cues

During the 7-day post-quit period, participants reported perceived social support and smoking cues during the daily diary. Each EMA assessed whether the participant was pressured to quit smoking (My friends and family pressured me to quit smoking yesterday [1, strongly disagree to 5, strongly agree]), received support to quit smoking (My friends and family supported me in my attempt to quit smoking yesterday [1, strongly disagree to 5, strongly agree]), and was offered a cigarette on the previous day (Did anyone offer you a cigarette yesterday [yes, no]).

3.3. Smoking status

EMAs captured daily smoking status during the 7-day post quit period. The daily diary assessed smoking status for the previous day (Did you smoke any cigarettes yesterday?). Random EMAs assessed the number of smoked cigarettes since the last EMA. Participants who reported smoking cigarettes on any EMA within a day were categorized as smoking that day.

4. Data analytic strategy

Data were included if participants responded to at least one post-quit daily diary, and eight participants were dropped from the analyses because they did provide at least one data entry point during the one-week post-quit period. Descriptive statistics for the analytical sample were generated and expressed as either continuous or categorical variables. For the primary analyses, three separate mixed-effects logistic regression models were conducted to examine the relationship between (1) being supported to quit smoking and daily smoking lapse; (2) being pressured to quit smoking and daily smoking lapse; and (3) being offered a cigarette and daily smoking lapse. A final mixed-effects logistic regression model included all three variables in the same model as independent predictors of smoking lapse. All mixed-effects logistic regression models adjusted for age (years), sex (male or female), race/ethnicity (non-Hispanic White or Hispanic/non-White), years of education, heaviness of smoking at baseline, treatment group, and smoking status the day before, and included a random intercept to account for individual differences across participants, utilizing a scaled identity covariance structure. All analyses were conducted using Stata version 15 (StataCorp, 2017).

5. Results

Participants in the total sample ($N = 146$) completed 774 out of 966 daily diary assessments over the 7-day post quit period (80.1%, $M = 5.6$ EMAs per participant). Participants in the analytic sample ($N = 138$) were predominantly female (58.7%) and Black (63.8%). Most participants reported an annual household income of less than \$16,000 (67.1%) per year and had 12 years of education. Additional participant characteristics are presented in Table 1.

Mixed-effects logistic regression models using EMA data revealed that being offered a cigarette during the quit attempt increased the odds of smoking within a day by 3.31-fold (95% Confidence Interval [95% CI] = 1.21, 9.06). The effect was also significant after adjusting for perceived support to quit smoking and pressure to quit smoking (OR = 3.38

[95% CI = 1.23, 9.31]). Perceived social pressure to quit and support to quit were not significantly related to daily smoking status ($p > .05$). Results from the final mixed-effects logistic regression model are shown in Table 2.

6. Discussion

This study examined the influence of smoking-specific social support (i.e., support to quit smoking and pressure to quit smoking) and being offered a cigarette on daily smoking among low SES adults making a quit attempt. Our hypotheses were partially supported; perceived social support was not associated with smoking lapse, but smoking cues, or being offered a cigarette, was associated with smoking lapse.

Our findings support previous work by Businelle et al. (2016) and Shiffman et al. (1996), who found that environmental cues, such as cigarette availability and interactions with other smokers, were related to lapse. Though this study cannot identify the individual or party that offered individuals cigarettes during a quit attempt, research has shown that people who are not trying to quit smoking sometimes attempt to sabotage others by smoking around them and offering cigarettes (Thompson, Thompson, Thompson, et al., 2003). Alternatively, offering and sharing cigarettes can also be perceived as a gesture of kindness (Rich & Xiao, 2012), even when individuals are trying to quit smoking. Refusing these cigarettes may be difficult because doing so could be perceived as impolite and may negatively impact social relationships. Regardless, during a quit attempt, being offered a cigarette is an unanticipated opportunity to smoke, and previous experimental work has shown that smoking may be more appealing in this scenario (Schlagintweit, Greer, Good, et al., 2015).

Previous EMA studies showed that higher levels of emotional and instrumental support decreased cigarette smoking (Lüscher et al., 2017; Scholz et al., 2016), but our findings indicate that receiving support from friends and family is not associated with abstaining from smoking within a day. These discrepant findings might reflect sample differences between the present study and the studies by Lüscher et al. (2017) and Scholz et al. (2016). The studies by Lüscher et al. (2017) and Scholz et al. (2016) were done using a sample of Swedes, who were primarily married and employed; whereas this sample was mostly low SES Blacks who were primarily single and not employed (Kendzor et al., 2015). Research has shown that Blacks, compared to Whites, report fewer closer friends and receive less emotional social support from friends (Griffin, Amodeo, Clay, et al., 2006), and in general, low SES adults are socially isolated and have limited access to and often inadequate sources of social support (Hiscock et al., 2012). Though research shows that social support interventions for smoking cessation are efficacious (Ford, Clifford, Gussy, et al., 2013), much caution may be needed when developing these interventions for low SES populations, particularly low SES Black adults, because they may have very few sources of social support, and the support given may be limited or poor quality.

Findings from this study should be interpreted cautiously because the sample size was small and social support was only measured once daily, which meant that participants recalled whether they received support to quit smoking or were pressured to quit smoking yesterday. Recall bias may explain why perceived social support was not associated with smoking lapse

within the day. Future studies should randomly assess social support throughout the day, which would reduce recall bias and better evaluate the association between social support and daily smoking status. Overall, our findings indicate that smoking cessation programs for low-income adult cigarette smokers should involve skilled-based training that helps individuals respond to family members' and friends' smoking and train individuals to politely, but authoritatively, refuse gifted cigarettes—these strategies can be based on the techniques taught to adolescents who are minorities or who are involved in high-risk peer groups (Nichols, 2006; Yu, 2011). Interventions should also teach strategies to low-income adults for avoiding other smokers during the early stages of a quit attempt.

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HIGHLIGHTS

- Perceived social support to quit smoking is not related to daily smoking status.
- Perceived pressure to quit smoking is not related to daily smoking status.
- Being offered a cigarette increases the odds of smoking within a day by 3.31-fold.
- The results reinforce the need for including cigarette refusal skills in treatment.

Table 1Participant characteristics ($N = 138$).

	Mean (Standard Deviation[SD]) or N (%)
Age (years)	52.11 (SD = 7.1)
Gender	
Male	57 (41.3%)
Female	81 (58.7%)
Race	
White	37 (26.8%)
Black	88 (63.8%)
Other	13 (9.4%)
Annual household income	
< \$5000	45 (32.6%)
\$5000 to \$15,999	49 (35.5%)
> \$16,000	36 (26.1%)
Education (years)	12 (SD = 2)
Heaviness of smoking index	3.25 (SD = 1.3)
Treatment group	
Usual care	63 (45.6%)
Contingency management	75 (51.4%)

Table 2

Mixed-effects logistic regression of odds of daily smoking by social support and smoking cues ($N = 138$).

	Odds Ratio (OR)	Standard Error (SE)	<i>p</i>	95% Confidence Interval (95% CI)
Offered a cigarette	3.39	1.75	0.02	1.23, 9.31
Supported to quit	0.79	0.15	0.20	0.54, 1.14
Pressured to quit	1.23	0.22	0.25	0.87, 1.74

Note: The model was adjusted for age (years), sex (male or female), race/ethnicity (non-Hispanic White or Hispanic/non-White), years of education, the heaviness of smoking at baseline, treatment group, and smoking status the day before.