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Nicotine Dependence as a Moderator of Message Framing Effects on Smoking Cessation Outcomes

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Abstract

Background—The persuasiveness of gain-framed and loss-framed messages for smoking cessation may vary by smokers' characteristics. Preliminary research in non-treatment-seeking smokers has shown that level of nicotine dependence moderates the effects of framed smoking messages on quit intentions and smoking cessation attitudes. Nicotine dependence as a potential moderator of message framing effects on actual smoking outcomes among treatment-seeking smokers remains to be determined.

Purpose—This secondary analysis of data from a smoking cessation trial (*Psychol Addict Behav.* 2007; 21: 534–544) examined nicotine dependence as a moderator of message framing effects on smoking cessation success.

Methods—Dependence scores were dichotomized into high and low dependence (n=249).

Results—Among high-dependent smokers, gain-framed messages were associated with higher levels of smoking abstinence both during and post-treatment than loss-framed messages. There was no differential effect of gain- versus loss-framed messages among low-dependent smokers.

Conclusion—These preliminary findings suggest that the effectiveness of message framing interventions for treatment-seeking smokers may vary by smokers' level of nicotine dependence.

Keywords

Smoking cessation; Tobacco; Message framing; Nicotine dependence

Introduction

According to prospect theory, individuals' willingness to incur risks to avoid undesirable or to pursue desirable outcomes depends on how information is framed [1, 2]. Choices emphasizing benefits (i.e., gain-framed) may persuade individuals to engage in low-risk, relatively certain behaviors. Conversely, alternatives emphasizing costs (i.e., loss-framed) may convince individuals to engage in risky, less certain behaviors. Thus, framing a message in gain versus loss terms may have different effects on behavior despite both appeals being factually equivalent.

Prospect theory has implications for health decisions. It has been proposed that the persuasiveness of loss-and gain-framed messages depends on the type of behavior [3]. Gain-framed messages may be more convincing for health behaviors that have relatively certain outcomes (i.e., prevention of disease) such as applying sunscreen, obtaining surgical procedures, engaging in physical exercise, and promoting dental hygiene [4–10]. On the other hand, loss-framed messages may be more persuasive for behaviors with reasonably uncertain outcomes (i.e., possible detection of illness) such as HIV testing and mammography screening [11–13]. While several studies demonstrate message framing effects according to behavior type, a recent meta-analysis of message framing studies revealed that as a whole, the effects of gain-framed messages on health prevention behaviors are small [14].

Research on the persuasiveness of gain-versus loss-framed smoking messages also is mixed [14]. While some studies have demonstrated either an advantage of loss-framed smoking messages or no differential effect of smoking message frames [15, 16], there are several other studies that have shown an advantage of gain-framed messages for increasing positive smoking cessation attitudes, intentions to quit or not initiate smoking, quit attempts, and the likelihood of smoking abstinence [1, 17–19].

In light of these findings and the recent message framing study meta-analysis, research has begun to refine the optimal conditions for using gain- and loss-framed messages beyond behavior type [20]. This research considers how characteristics of message recipients and how they think and feel about a behavior potentially moderate the effectiveness of framed messages [21]. Moderating variables identify for whom or under what circumstances a treatment works best [22]. Common themes to emerge from this research are that gain-framed messages may be more persuasive for individuals who maintain positive perceptions of behavior and are motivated by positive outcomes [20, 23].

Preliminary moderators of framed smoking message effects have been identified. Gain-framed smoking messages may be more persuasive among smokers low in need for cognition (i.e., utilize more peripheral processing of information) [18], among female smokers who perceive low smoking cessation risks [24], and among promotion-focused adolescents (i.e., sensitive to advancement opportunities) [25]. On the other hand, loss-framed messages may be more convincing among smokers with high self-efficacy and prevention-focused adolescents (i.e., sensitive to hazard occasions) [25].

A study by Moorman and van den Putte [26] suggests that nicotine dependence and quit intentions may also moderate the effects of framed smoking messages. Gain-framed messages were associated with a greater increase in quit intentions and positive attitudes toward smoking cessation among non-treatment-seeking smokers with either low nicotine dependence or weak baseline intentions to quit. In contrast, loss-framed messages were more persuasive for smokers' with both high dependence and strong quit intentions. The results appear to contradict the tenets of prospect theory that would suggest that gain-framed messages would be more persuasive in high-dependent and motivated smokers. Quitting

smoking is a prevention-based behavior, and gain-framed messages may be more convincing when people are focused on the potential benefits of a behavior. Moorman and van den Putte [26] proposed that gain-framed messages were more effective for low-intended or low-dependent smokers because they had low issue involvement and were not motivated to process smoking cessation messages systematically. While this suggestion is consistent with previous research demonstrating that people with low issue involvement are best persuaded by gain-framed messages [3], information processing was not assessed directly in this study. Smoking behavior was also not measured leaving to question whether nicotine dependence moderates the effects of framed messages on actual smoking cessation behavior.

The current investigation sought to further examine nicotine dependence as a potential moderator of message framing effects with actual smoking cessation outcomes in a treatment-seeking sample of smokers. It was hypothesized that gain-framed smoking messages would be more persuasive for promoting smoking cessation among high nicotine-dependent smokers than loss-framed messages. In particular, it was anticipated that high-dependent smokers exposed to gain-framed smoking messages would demonstrate greater smoking abstinence and a delayed latency to first smoking lapse compared with high-dependent smokers exposed to loss-framed smoking messages. It was further anticipated that the pattern of findings among low-dependent smokers might not be consistent with the results obtained with non-treatment-seeking smokers by Moorman and van den Putte [26].

Method

Participants

This is a secondary analysis of data from a randomized controlled trial of message framing for smoking cessation with open-label bupropion slow release therapy (300 mg/day) designed to examine whether messages emphasizing the benefits of quitting (i.e., gain-framed) versus the losses of continued smoking (i.e., loss-framed) would be more persuasive in promoting early smoking cessation success [1]. Eligibility requirements included being at least 18 years of age, smoking at least 10 cigarettes per day for at least 1 year, and having a baseline expired air carbon monoxide (CO) level of at least 10 parts per million (ppm). Participants were excluded for current serious neurologic, psychiatric, or medical illness, and current alcohol dependence. The 249 participants (129 women, 120 men) were primarily white (81.9%), had a mean (SD) age of 42.65 (11.54) years, smoked an average (SD) of 22.61 (9.32) cigarettes per day for a mean (SD) of 25.00 (2.06) years, and had a mean (SD) Fagerström Test for Nicotine Dependence (FTND) score of 5.41 (2.07; range = 1–10).

Procedure

All participants received bupropion slow release therapy (300 mg/day) for a 7-week period (1 week prequit and 6 weeks postquit) and were randomly assigned to receive either gain-framed or loss-framed messages. The intervention consisted of two brief videos, handouts, and a water bottle and air freshener with printed slogans on them. After their quit date, participants attended biweekly research appointments for 6 weeks to complete questionnaires and receive medication refills and gain-or loss-framed smoking cessation messages. “If no one smoked, 430,000 lives would be saved in the United States each year” was an example of a gain-framed message. The comparable loss-framed message stated: “Because people smoke, 430,000 lives are lost in the United States each year.” More detail about the intervention provided is available in the original article describing this study [1].

Measures

Fagerström Test for Nicotine Dependence

This 6-item scale is a standardized measure of nicotine dependence that is associated with biochemical measures of smoking and number of years smoked [27]. It yields scores ranging from 0 to 10. In the present study, nicotine dependence was dichotomized into high and low dependence (0–5 = low dependence, 6–10 = high dependence) in accordance with the suggested scoring system that 6 or more is indicative of high dependence [28].

Intentions to Quit Smoking

This 2-item measure, designed for this study, assessed the strength of smokers' intentions to quit smoking within the next 6 weeks and 6 months on a 5-point Likert scale (1 = not at all strong, 5 = extremely strong) [18]. Intentions were measured before and after the message framing intervention (i.e., at intake and the day before quitting).

Smoking Behavior

Timeline followback (TLFB) [29–31] methodology was used to assess the number of cigarettes smoked per day within the past 30 days at baseline and the preceding weeks at biweekly appointments. Five primary smoking outcomes were examined: (1) continuous 6-week abstinence from the quit date, (2) point prevalence abstinence over the last 7 days of the 6-week treatment period, (3) latency to smoking lapse during the 6-week treatment period defined as the number of days since the quit day to the first instance of self-reported smoking, (4) point prevalence abstinence over the last 7 days at 12-week follow-up, and (5) point prevalence abstinence over the last 7 days at 24-week follow-up. Smoking abstinence was coded categorically (0 = abstinent, 1 = smoking) and defined as self-reported abstinence during the specified postquit treatment period and an expired air CO level ≤ 10 ppm [32]. Participants who dropped out or missed multiple appointments were coded as smoking. Data for a single missed appointment were coded abstinent if participants reported not smoking and had expired air CO levels ≤ 10 ppm at the sessions before and after the missed appointment.

Statistical Analysis

To test the model by Moorman and van den Putte [26], logistic and Cox regression analyses were conducted to evaluate the combined effects of message framing condition and nicotine dependence on (1) continuous smoking abstinence during treatment, (2) point prevalence abstinence during and after treatment, and (3) latency to smoking lapse. Regression models were fitted in steps. In step 1, message framing condition and nicotine dependence were entered. In step 2, the 2-way interaction of message framing condition and nicotine dependence was entered. Post hoc probing of significant interactive effects was then conducted using χ^2 analyses.

Results

Continuous Smoking Abstinence

As shown in Table 1, there was a significant interaction of message framing condition and nicotine dependence on the likelihood of continuous smoking abstinence 6 weeks following the quit date (Wald = 5.50, $p=.02$; odds ratio [OR], 0.25; 95% confidence interval [CI], 0.08–0.80). Among high-dependent smokers, post hoc probing revealed that those exposed to gain-framed messages were more likely to be continuously abstinent (36%) than those exposed to loss-framed messages (15%) ($\chi^2 (1)=6.89$, $p=.01$; see Fig. 1). There was no

differential effect of gain-versus loss-framed messages on continuous smoking abstinence among low-dependent smokers ($\chi^2(1)=0.39, p=.53$).

Point Prevalence Smoking Abstinence

Message framing condition and dependence did not have an interactive effect on point prevalence abstinence at 6 weeks (Wald = 1.11, $p=.29$; OR, 0.58; 95% CI, 0.21–1.61). However, there was a significant interaction of message framing condition and dependence on point prevalence abstinence at 12-week follow-up (Wald = 4.03, $p<.05$; OR, 0.28; 95% CI, 0.08–0.97) and a non-significant difference at 24-week follow-up (Wald = 3.83, $p=.05$; OR, 0.22; 95% CI, 0.05–1.00). Among high-dependent smokers, exposure to gain-framed messages was associated with a greater likelihood of being abstinent than exposure to loss-framed messages (26% vs. 12%, $\chi^2(1)=3.82, p=.05$; 19% vs. 7%, $\chi^2(1)=4.02, p<.05$; see Fig. 1). There was no differential effect of message framing condition on point prevalence abstinence at follow-up among low-dependent smokers ($\chi^2(1)=0.70, p=.40$; $\chi^2(1)=0.57, p=.45$).

Latency to Lapse

There was a non-significant interaction of message framing condition and dependence on latency to first smoking lapse (Wald = 3.30, $p=.07$; OR, 0.57; 95% CI, 0.31–1.05). Among high-dependent smokers, exposure to gain-framed messages was associated with a longer latency to smoking lapse (OR, 0.57; 95% CI, 0.31–1.05) than exposure to loss-framed messages (OR, 0.67; 95% CI, 0.43–1.04), both of which were non-significant.

Discussion

Gain- and loss-framed smoking messages were associated with relatively similar rates of smoking abstinence among low-dependent smokers. Among high-dependent smokers, however, levels of smoking abstinence varied by message framing condition. High-dependent smokers exposed to loss-framed smoking messages had the lowest rates of smoking abstinence across all time-points. Higher nicotine dependence is a predictor of poor smoking cessation outcomes, so it would be expected that high-dependent smokers would have had lower smoking abstinence rates than low-dependent smokers [33]. High-dependent smokers exposed to gain-framed messages, however, had relatively similar abstinence rates to that of low-dependent smokers. These results suggest that gain-framed smoking messages may be more protective against smoking relapse among high-dependent smokers than loss-framed messages and are consistent with other message framing studies that have shown an advantage of gain-framed messages for promoting smoking cessation [1, 17–19].

These findings differ from a previous study that showed that loss-framed messages were more persuasive for increasing quit intentions and positive smoking cessation attitudes among high-dependent smokers [26]. Differences between the two study samples may account for the disparate findings. The prior study examined the effects of framed smoking messages in a sample of smokers much younger, less nicotine dependent, and less interested in quitting smoking than the current investigation. For instance, participants in the prior study smoked an average of 11.4 ± 8.7 cigarettes per day, had a mean age of 21.7 ± 2.7 years, a mean Heaviness of Smoking Index (HSI) (i.e., nicotine dependence level) score of 1.2 ± 1.0 on a scale from 0 to 4, and low average quit intentions of 2.6 ± 2.0 on a scale from 1 to 7. In contrast, smokers in the current study were older (42.7 ± 11.5 years), smoked twice as many cigarettes per day on average (22.6 ± 9.3), had higher levels of nicotine dependence (HSI score: 3.6 ± 1.3), and stronger intentions to quit smoking ($4.3\pm .7$; scale from 1 to 5). Although the prior study reported different message framing effects for “low” and “high” nicotine dependence, these dependence levels could more accurately be construed as low to

moderate. In contrast, smokers' nicotine dependence levels in this study are in the moderate to high range.

These sample differences have important implications. Older, more dependent smokers have likely experienced greater smoking consequences and may perceive greater benefits of quitting smoking than do younger, less dependent smokers. Health concerns are among the leading motives for smoking cessation [34]. It is well documented that heavier smoking and greater nicotine dependence are associated with more negative health consequences [35]. Higher scores on the Fagerström Tolerance Questionnaire (FTQ) and the FTND (i.e., more severe dependence) have been identified as risk factors for developing chronic obstructive pulmonary disease and any type of cancer [36, 37]. Moreover, treatment-seeking smokers are often in poorer health [32, 33]. Thus, high-dependent smokers who seek treatment may construe quitting smoking as more effective for health improvement and/or maintenance than do low-dependent smokers. Consistent with the tenets of prospect theory, when people are focused on the potential benefits of a behavior, gain-framed messages may be more persuasive. More research on this preliminary hypothesis in high-dependent smokers is warranted.

The mechanism by which gain-framed messages may have been more persuasive for high-dependent smokers remains to be determined. We did not test mechanisms in the current study. However, examining participants' beliefs and attitudes about smoking and smoking cessation provide some indication of potential mechanisms that should be investigated in future research. High-dependent smokers endorsed greater anticipated difficulty remaining abstinent ($p=.03$), stronger perceived smoking cessation risks ($p=.02$), and more positive beliefs about smoking ($p=.001$), which suggests that they had lower quitting self-efficacy than low-dependent smokers. Loss-framed messages are proposed to convey a greater sense of threat than gain-framed messages, and presenting threatening information to individuals who perceive themselves less capable of averting the threat may result in defensive processing (i.e., avoidance or rejection of message) [16, 38]. Thus, poor smoking abstinence rates among high-dependent smokers exposed to loss-framed messages may have been due to defensive message processing. On the other hand, presenting gain-framed smoking messages to high-dependent smokers may have facilitated message acceptance. This hypothesis and the results of this study are preliminary. More research on potential mechanisms that may account for differential framing effects in high- and low-dependent smokers is warranted.

An additional study limitation should be noted. The model fitting analyses used in this study may have increased the likelihood of committing type I error. An alpha level of .05 was deemed appropriate for the analyses given the exploratory nature of the study. However, this limitation should be considered when interpreting the finding that nicotine dependence moderated the effects of framed smoking messages.

This study is the first to provide preliminary support for the hypothesis that nicotine dependence may moderate message framing effects on smoking cessation outcomes among treatment-seeking smokers. These findings suggest that how smoking messages are framed may be an important target for improving cessation outcomes among high-dependent smokers who are seeking treatment. More research is needed to better understand the potential role that nicotine dependence and other smoking characteristics may play as moderators of message framing effects.

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References

1. Toll BA, O'Malley SS, Katulak NA, et al. Comparing gain- and loss-framed messages for smoking cessation with sustained-release bupropion: A randomized control trial. *Psychol Addict Behav*. 2007; 21:534–544. [PubMed: 18072836]
2. Tversky A, Kahneman D. The framing of decisions and the psychology of choice. *Science*. 1981; 211:453–458. [PubMed: 7455683]
3. Rothman AJ, Salovey P. Shaping perceptions to motivate healthy behavior: The role of message framing. *Psychol Bull*. 1997; 121:3–19. [PubMed: 9000890]
4. Detweiler JB, Bedell BT, Salovey P, Pronin E, Rothman AJ. Message framing and sunscreen use: Gain-framed messages motivate beach goers. *Health Psychol*. 1999; 18:189–196. [PubMed: 10194055]
5. Latimer AE, Rench TA, Rivers SE, et al. Promoting participation in physical activity using framed messages: An application of prospect theory. *Br J Health Psychol*. 2008; 13:659–681. [PubMed: 17925060]
6. Levin IP, Schnitker SK, Thee SL. Information framing effects in social and personal decisions. *J Exp Soc Psychol*. 1988; 24:520–529.
7. Marteau TM. Framing information: Its influence upon decisions of doctors and patients. *Br J Soc Psychol*. 1989; 28:89–94. [PubMed: 2706433]
8. McNeil BJ, Pauker SG, Sox HC, Tversky A. On the elicitation of preferences for different therapies. *N Eng J Med*. 1982; 306:1259–1262.
9. Wilson DK, Kaplan RM, Schneiderman L. Framing of decisions and selections of alternatives in health care. *Soc Behav*. 1987; 2:51–59.
10. Rothman AJ, Martino SC, Bedell B, Detweiler JB, Salovey P. The systematic influence of gain- and loss-framed messages on interest in and use of different types of health behaviors. *Pers Soc Psychol Bull*. 1999; 25(11):1355–1369.
11. Kalichman SC, Coley B. Context framing to enhance HIV-antibody-testing messages targeted to African American women. *Health Psychol*. 1995; 14:247–254. [PubMed: 7641666]
12. Banks SM, Salovey P, Greener S, et al. The effects of message framing on mammography utilization. *Health Psychol*. 1995; 14:178–184. [PubMed: 7789354]
13. Schneider TR, Salovey P, Apanovitch AM, et al. The effects of message framing and ethnic targeting on mammography use among low-income women. *Health Psychol*. 2001; 20:256–266. [PubMed: 11515737]
14. O'Keefe DJ, Jensen JD. The relative persuasiveness of gain-framed and loss-framed messages for encouraging disease prevention behaviors: A meta-analytic review. *J Health Commun*. 2007; 12(7):623–644. [PubMed: 17934940]
15. Bono Santos E, Rodríguez Torronteras A. Two systems of persuasion to quit smoking. A controlled trial. *Aten Primaria*. 1991; 8:12–16. [PubMed: 1912206]
16. Van 't Riet J, Ruiter RAC, Werrij MQ, de Vries H. The influence of self-efficacy on the effects of framed health messages. *Eur J Soc Psychol*. 2008; 38:800–809.
17. Toll B, Martino S, Latimer A, et al. Randomized trial: Quitline specialist training in gain-framed vs standard-care messages for smoking cessation. *J Natl Cancer Inst*. 2010; 102:96–106. [PubMed: 20056957]
18. Steward WT, Schneider TR, Pizarro J, Salovey P. Need for cognition moderates responses to framed smoking-cessation messages. *J Appl Soc Psychol*. 2003; 33:2439–2464.
19. Schneider T, Salovey P, Pallonen U, et al. Visual and auditory message framing effects on tobacco smoking. *J Appl Soc Psychol*. 2001; 31:667–682.
20. Latimer AE, Salovey P, Rothman AJ. The effectiveness of gain-framed messages for encouraging disease prevention behavior: Is all hope lost? *J Health Commun*. 2007; 12:645–649. [PubMed: 17934941]

21. Rothman, AJ.; Wlaschin, JT.; Bartels, RD.; Latimer, A.; Salovey, P. How persons and situations regulate message framing effects: The study of health behavior. In: Elliot, AJ., editor. *Handbook of approach and avoidance motivation*. New York: Psychology Press; 2008. p. 475-488.
22. Kraemer HC, Wilson GT, Fairburn CG, Agras WS. Mediators and moderators of treatment effects in randomized clinical trials. *Arch Gen Psychiatry*. 2002; 59(10):877–883. [PubMed: 12365874]
23. Myers-Levy J, Maheswaran D. Exploring message framing outcomes when systematic, heuristic, or both types of processing occur. *J Cons Psychol*. 2004; 14(1–2):159–167.
24. Toll BA, Salovey P, O'Malley SS, Mazure CM, Latimer A, McKee SA. Message framing for smoking cessation: The interaction of risk perceptions and gender. *Nicotine Tob Res*. 2008; 10:195–200. [PubMed: 18188760]
25. Zhao G, Pechmann C. The impact of regulatory focus on adolescents' response to antismoking advertising campaigns. *J Mark Res*. 2007; 44:671–687.
26. Moorman M, van den Putte B. The influence of message framing, intention to quit smoking, and nicotine dependence on the persuasiveness of smoking cessation messages. *Addict Behav*. 2008; 33:1267–1275. [PubMed: 18584971]
27. Heatherton TF, Kozlowski LT, Frecker RC, Fagerström KO. The Fagerström Test for Nicotine Dependence: A revision of the Fagerström Tolerance Questionnaire. *Br J Addict*. 1991; 86:1119–1127. [PubMed: 1932883]
28. Fagerström KO, Kunze M, Schoberberger R, et al. Nicotine dependence versus smoking prevalence: Comparisons among countries and categories of smokers. *Tob Control*. 1996; 5(1):52–56. [PubMed: 8795860]
29. Brown RA, Burgess SA, Sales SD, Whiteley JA, Evans DM, Miller IM. Reliability and validity of a smoking timeline follow-back interview. *Psychol Addict Behav*. 1998; 12:101–112.
30. Sobell, LC.; Sobell, MB. *Timeline follow-back: A technique for assessing self-reported alcohol consumption*. Rockville, MD: The Humana Press Inc; 1992.
31. Sobell, LC.; Sobell, MB. *Alcohol consumption measures*. 2nd ed.. Bethesda, MD: National Institute on Alcohol Abuse and Alcoholism; 2003.
32. SRNT Subcommittee on Biochemical Verification. Biochemical verification of tobacco use and cessation. *Nicotine Tob Res*. 2002; 4:149–159. [PubMed: 12028847]
33. Hyland A, Borland R, Li Q, et al. Individual-level predictors of cessation behaviours among participants in the International Tobacco Control (ITC) Four Country Survey. *Tob Control*. 2006; 15 Suppl 3:iii83–iii94. [PubMed: 16754952]
34. Duncan CL, Cummings SR, Hudes ES, Zahnd E, Coates TJ. Quitting smoking: Reasons for quitting and predictors of cessation among medical patients. *J Gen Intern Med*. 1992; 7(4):398–404. [PubMed: 1506945]
35. National Cancer Institute. Changes in cigarette-related disease risks and their implications for prevention and control. *Smoking and Tobacco Control Monograph*. Monograph 8 1997. Bethesda, MD: National Cancer Institute; 1997.
36. Deheinzeln D, Lourenço MTC, da Costa CL, Younes RN. The level of nicotine dependence is an independent risk factor for cancer: A case control study. *Clinics*. 2005; 60:221–226. [PubMed: 15962083]
37. Jimenez-Ruiz CA, Masa F, Miravittles M, et al. Smoking characteristics: Differences in attitudes and dependence between healthy smokers and smokers with COPD. *Chest*. 2001; 119:1365–1370. [PubMed: 11348940]
38. Witte K. Putting the fear back into fear appeals—the Extended Parallel Process Model. *Commun Monogr*. 1992; 59(4):329–349.

Fig. 1.
Smoking outcomes by message framing condition and nicotine dependence level.
Continuous abstinence = 6 weeks of non-smoking since the quit date; PP abstinence = 7
days of non-smoking within the past week

Table 1

Logistic and Cox regression analyses of smoking outcomes (n=249)

Smoking outcome	Wald	p	OR (95% CI)	Step χ^2	Nagelkerke R^2
Continuous abstinence ^a					
Step 1:				2.56 (2)=0.28	.02
Message framing condition	1.58	.21	1.43 (0.82–2.49)		
Nicotine dependence	0.95	.33	0.76 (0.43–1.32)		
Step 2:				5.68 (1)=0.02	.05
Condition * Dependence	5.50	.02	.25 (0.08–0.80)		
PP abstinence at 6 weeks					
Step 1:				2.98 (2)=0.23	.02
Message framing condition	0.14	.71	1.10 (0.66–1.83)		
Nicotine dependence	2.81	.09	0.65 (0.39–1.08)		
Step 2:				1.11 (1)=0.29	.02
Condition * Dependence	1.11	.29	0.58 (0.21–1.61)		
PP abstinence at 12 weeks					
Step 1:				2.97 (2)=0.23	.02
Message framing condition	0.35	.56	1.20 (0.66–2.16)		
Nicotine dependence	2.56	.11	0.61 (0.34–1.12)		
Step 2:				4.18 (1)=0.04	.04
Condition * Dependence	4.03	.045	0.28 (0.08–0.97)		
PP abstinence at 24 weeks					
Step 1:				1.03 (2)=0.60	.01
Message framing condition	0.51	.48	1.30 (0.64–2.64)		
Nicotine dependence	0.50	.48	0.77 (0.38–1.58)		
Step 2:				4.07 (1)=0.04	.04
Condition * Dependence	3.83	.050	0.22 (0.05–1.00)		
Latency to smoking lapse					
Step 1:				0.63 (2)=0.73	N/A
Message framing condition	0.44	.51	1.11 (0.82–1.49)		
Nicotine dependence	0.22	.64	0.93 (0.69–1.26)		

Smoking outcome	Wald	p	OR (95% CI)	Step χ^2	Nagelkerke R^2
Step 2:				3.32 (1)=0.069	N/A
Condition * Dependence	3.30	.069	0.57 (0.31–1.05)		

^aContinuous abstinence = 6 weeks of non-smoking since the quit date; PP abstinence = 7 days of non-smoking within the past week