Need for Cognition Moderates Responses to Framed Smoking-Cessation Messages[1]

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Smoking-cessation messages usually emphasize the costs of continuing to smoke (loss-framed). However, prospect theory suggests that messages that instead emphasize the benefits of quitting smoking (gain-framed) could be more effective than loss-framed messages because smoking cessation is likely viewed as a cancer-prevention behavior with a certain rather than a risky outcome. In this study, smokers at public events read brochures containing brief gain- or loss-framed smoking-cessation messages. The influence of framing was moderated by participants' need for cognition (NFC). Individuals lower in NFC had greater intention to quit after reading a gain-framed message than after reading a loss-framed message—a finding consistent with our predictions—whereas framing did not affect the persuasiveness of messages among people higher in NFC.

Curtailing cigarette smoking remains a top national health priority (United States Department of Health and Human Services, 2000). Numerous techniques to reduce smoking rates have been introduced, including restrictions on advertising, bans on smoking in places of public accommodation, taxation of cigarettes,

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and a multibillion dollar lawsuit settlement against the tobacco industry. Yet, despite these efforts and decades of research and warnings, 26% of men and 21% of women in the United States continue to smoke (Centers for Disease Control and Prevention, 1998), and the rates among adolescents may be even higher. Thus, understanding how best to persuade people to quit smoking or to obtain help quitting is crucial.

Many anti-smoking messages emphasize the negative consequences of continuing to use tobacco. For example, the warnings from the Surgeon General, placed on all cigarette packs and advertisements, point out the various illnesses or birth defects that may result from smoking. The effectiveness of these warnings is not clear (Krugman, Fox, & Fischer, 1999; Malouff, Schutte, Frohardt, Deming, & Mantelli, 1992). Some evidence has suggested that smoking cessation may be promoted better with messages emphasizing the benefits of not smoking, rather than the costs of continued smoking (e.g., Rothman & Salovey, 1997; Schneider, Salovey, Pallonen, et al., 2001). This message emphasis on costs versus benefits is referred to as *message framing* (Rothman & Salovey, 1997; Wilson, Purdon, & Wallston, 1988).

Research on framed health messages is guided by prospect theory (Tversky & Kahneman, 1981), which in the context of describing the relation between objective outcomes and their subjective values argues that people are willing to take risks when considering potential losses or negative outcomes, but prefer to avoid risks when considering potential gains or benefits. In other words, focusing on losses motivates people to pursue options with risky or uncertain outcomes. Focusing on gains motivates people to pursue alternatives with definite or certain outcomes.

The key to the successful application of this theory involves understanding what constitutes a risky, relative to a more certain, outcome. Health behaviors can be organized by the degree of uncertainty associated with them (Rothman & Salovey, 1997). Detection behaviors, such as mammography screening, primarily involve risky or uncertain outcomes because a person may discover that he or she is ill. Thus, individuals are usually more motivated to perform detection behaviors if they are exposed to loss-framed messages that emphasize the costs of not engaging in the behavior than if they are exposed to gain-framed messages that emphasize the benefits of engaging in the behavior (Banks et al., 1995; Meyerowitz & Chaiken, 1987; Schneider, Salovey, Apanovitch, et al., 2001).

In contrast, prevention behaviors (e.g., sunscreen use at the beach) usually have a certain or definite outcome. Engagement in these behaviors reduces one's chances of developing an illness. Thus, people are usually more motivated to perform prevention behaviors if they are exposed to gain-framed messages than if they are exposed to loss-framed messages (Detweiler, Bedell, Salovey, Pronin, & Rothman, 1999; Schneider, Salovey, Pallonen, et al., 2001).

Smoking cessation is most appropriately seen as a prevention behavior with a certain outcome because quitting smoking is unambiguously associated with a reduction in the risk of future illness. Therefore, gain-framed messages should be more effective than loss-framed messages in promoting smoking-cessation behaviors. Previous research has supported this hypothesis. Schneider, Salovey, Pallonen, et al. (2001) presented smoking and nonsmoking college students with a video message in which the visual and audio tracks were framed to emphasize gains or losses. Gain framing, as opposed to loss framing, either the visual elements or the audio voiceover led to significantly greater shifts in smoking beliefs and attitudes. Furthermore, among smokers, there were significant reductions in smoking 6 weeks after exposure to the gain-framed videos. These findings support the notion that smoking cessation, construed as a prevention behavior, is promoted most effectively with gain-framed messages.

Factors Underlying Framing

Although the differential effectiveness of loss and gain framing has been supported in health behavior research, the psychological mechanisms underlying the persuasiveness of messages framed in particular ways remains unclear. One possible mechanism is mode of processing. There are two proposed modes to processing persuasive information (Chaiken, 1980, 1987; Petty & Cacioppo, 1981, 1986; for thorough reviews, see Chaiken, Wood, & Eagly, 1996; Petty & Wegener, 1998). The *central* route to persuasion involves carefully and systematically considering the content of a message and evaluating the merits of the arguments. Stronger arguments lead to more persuasion than do weaker arguments. In contrast, the *peripheral* route to persuasion involves the use of simple message cues, rather than systematically weighing the arguments. With this route, people evaluate a message's persuasiveness more superficially, using variables such as the total number of arguments, perceived expertise of the message source, and the affective tone of the message. The peripheral route requires fewer cognitive resources than does the central route. Thus, people tend to engage in peripheral processing when they are either unable or not motivated to use the more effortful central route.

Maheswaran and Meyers-Levy (1990) proposed that loss- and gain-framed messages are differentially effective, depending on the mode of processing. When they are processing more systematically, or centrally, people are more persuaded by loss-framed as opposed to gain-framed messages because negative information receives greater weight and influence when one is systematically integrating information to form an attitude (Kanouse, 1984; Lau, 1985; Weinberger, Allen, & Dillon, 1981). In contrast, when they are processing messages via a peripheral route, people make use of simple cues, including the affective tone of a message. Thus, gain-framed messages, with their more positive

affective tone, lead to greater persuasion by associating the desired behavior with pleasant affect.

Maheswaran and Meyers-Levy (1990) tested this hypothesis by manipulating participants' involvement with a message promoting cholesterol screening. When college-aged participants read messages that described people their age as being at risk for coronary heart disease, they had more favorable attitudes toward cholesterol screening if they heard a loss-framed as opposed to a gain-framed message. Presumably, participants in this condition were motivated to process the information centrally. In contrast, when the message emphasized the risk of heart attacks among senior citizens, the college-aged participants had more positive attitudes toward cholesterol screening after exposure to a message with gain framing, as opposed to loss framing. In this condition, it was hypothesized that participants used peripheral processing because the message was not as directly relevant to them. Thus, those purportedly utilizing central processing were more persuaded by loss-framed messages, and those thought to be utilizing peripheral processing were more persuaded by gain-framed messages.

This interaction between mode of processing and framing may underlie the findings with detection and prevention behaviors (Salovey & Wegener, 2003). Because detection behaviors make salient the threat of illness, participants may be motivated to engage in more systematic processing when exposed to messages promoting these behaviors and, thus, be more persuaded by loss-framed messages. In contrast, prevention messages may be processed only peripherally because they do not contain an inherent and immediate threat and thus are better promoted with gain-framed messages.

It may be possible to test the influence of mode of processing and framing on behavior by looking at individual differences. People vary in their tendency to use central or peripheral modes of processing. Cacioppo, Petty, and colleagues developed a Need for Cognition (NFC) scale to measure these tendencies (Cacioppo & Petty, 1982; Cacioppo, Petty, Feinstein, & Jarvis, 1996; Cacioppo, Petty, & Kao, 1984). Individuals who are high in NFC, as opposed to those low in NFC, are "thought to be more likely to expend effort on information acquisition, reasoning, and problem solving to cope with a wide variety of predicaments in their world" (Cacioppo et al., 1996, p. 199). In other words, individuals high in NFC are more likely than those low in NFC to process persuasive information via the central route, whereas people low in NFC are more likely than those high in NFC to attend to peripheral cues.

If mode of processing underlies framing effects, as suggested by Maheswaran and Meyers-Levy (1990), then individuals high in NFC should be more persuaded by loss-framed messages, but individuals low in NFC should be more persuaded by gain-framed messages. The present study tests this hypothesis.

Smokers drawn from a community sample were asked to read a short message promoting smoking cessation. The messages were framed to emphasize the benefits of quitting smoking (gain framed) or the costs of failing to quit smoking (loss framed). After reading the message, participants filled out measures assessing NFC and their intention to quit.

Overall, we expect that gain-framed messages will be more effective than loss-framed messages in motivating smoking-cessation intentions, replicating previous findings (Schneider, Salovey, Pallonen, et al., 2001). However, we also expect the influence of framing to be moderated by NFC. Individuals low in NFC, processing the messages more peripherally, will be influenced by the affective tone of the message and, thus, will be especially persuaded by the positively toned, gain-framed message, as opposed to the negatively toned, loss-framed message. In contrast, individuals high in NFC, processing the messages more systematically, will pay careful attention to arguments, will weight negative information more heavily than positive information (Kanouse, 1984; Lau, 1985; Weinberger et al., 1981) and, thus, will not be as influenced by the gain-framed message and, in fact, could be more persuaded by loss-framed than gain-framed information.

Method

Participants

This experiment targeted individuals who were current cigarette smokers (N = 863; 446 women, 401 men, 16 did not specify gender). Table 1 provides demographic information about the participants. The average age was 34 years (range = 18 to 73 years), and the majority of participants were White (n = 759). Participants reported smoking an average of 18.4 cigarettes per day (range = 1 to 80 cigarettes). Although the majority (75%) had tried to quit smoking at some point in the past, few were currently using the nicotine replacement patch or nicotine gum. Demographic variables did not influence the findings, so they will not be discussed further.

Data were gathered at various outdoor locations and public events where smoking was permitted (e.g., county fair, beach, racetrack). A booth was set up at each event with flyers inviting smokers over 18 years of age to fill out a short survey in exchange for either a scratch-off lottery ticket or $1. Individuals could approach the booth and volunteer to participate in the study, in which case they were asked to show an experimenter their package of cigarettes to verify their smoking status. In addition, individuals who were seen smoking were approached and invited to participate.

Table 1

Participants' Demographic Information

	N	%		*N*	%
Gender			Level of schooling		
Male	401	46.5	Less than 12th grade	62	7.2
Female	446	51.7	High school diploma	305	35.3
No response	16	1.9	Some college	307	35.6
			College degree or more	160	18.5
			No response	29	3.4
Race			Cigarettes smoked per day		
White	759	87.9	1-10	242	28.0
African American	34	3.9	11-20	424	49.1
Hispanic	14	1.6	21-30	118	13.7
Asian	11	1.3	31-40	62	7.2
American Indian	4	0.5	More than 40	13	1.5
Other	18	2.1	No response	4	0.5
No response	23	2.7			
Age (in years)			Attempted to quit smoking		
18-25	274	31.7	No	210	24.3
26-35	206	23.9	Yes	648	75.1
36-45	219	25.4	No response	5	0.6
46-55	113	13.1			
56-65	28	3.2	Used the nicotine patch		
65 and older	8	0.9	No	842	97.6
No response	15	1.7	Yes	10	1.2
			No response	11	1.3
			Used nicotine gum		
			No	829	96.1
			Yes	8	0.9
			No response	26	3.0

Procedure

After agreeing to participate, individuals were assigned randomly[3] to one of two framing conditions.[4] Participants were seated, given a brochure, asked to answer the questions on the first page, then instructed to open the brochure and read the message carefully, and finally, to break open a sealed flap and answer the questions beneath the flap. Experimenters checked to ensure that participants appeared to read the messages and requested that participants not interact with one another.

Materials

The brochure had a trifold design and was printed on legal-sized paper. The first page was entitled "Festival Study" and contained a paragraph that provided instructions for filling out the survey and affirmed that participation in the study was voluntary. Included on this page were demographic questions, smoking status questions, and several pre-manipulation measures. The second page contained a framed message about quitting smoking. All messages presented similar information; only the emphasis was altered. Gain-framed messages focused on the benefits of quitting smoking (e.g., "1 in 5 lives could be saved in the U.S. if people didn't smoke. In fact, not using tobacco is the best way to save lives. Air that is free of cigarette smoke is also free of over 4,000 chemicals and 43 known carcinogens."). Loss-framed messages emphasized the costs of not quitting (e.g.,

[3]Participants originally were assigned to conditions individually. However, this procedure was changed after collecting data at two sites. In some cases, groups of friends entered the study together. It was possible for these friends to discuss their differently framed messages after filling out the brochure and leaving the table. Because the study design included several behavioral measures to be completed at a later time, any discussion could affect these outcome variables. To control for this possibility, we changed the randomization procedure so that all participants in a group were assigned to the same condition. Unexpectedly, this alteration was related to intention to quit smoking, which was assessed in the brochure itself. Participants had somewhat greater intention to quit under the original procedure ($M = 2.78$, $SD = 1.17$) than under the revised procedure ($M = 2.60$, $SD = 1.10$), $F(1, 856) = 5.42$, $p < .05$. However, the change in procedure did not interact with the influence of framing or NFC on intention to quit smoking. Therefore, all analyses on these measures are collapsed across randomization procedure.

[4]We had thought it possible that messages designed to accommodate participants' level of NFC might be more persuasive. Thus, two versions of the gain-framed message and two versions of the loss-framed message were created originally. For each frame, one version contained a simple message and one contained a complex message. Simple messages included a picture of a celebrity, framed cartoons, and relatively simple sentences, whereas complex messages included no pictures and presented detailed information on quitting, including relevant statistics. A manipulation check, in which respondents were asked to indicate if the information in the brochure challenged them to think a lot, indicated that participants perceived the difference in the complexity of the message versions, $F(1, 853) = 4.01$, $p < .05$. However, this manipulation had no influence on message persuasiveness and did not interact with message framing or NFC. As such, analyses were collapsed across message complexity.

"1 in 5 deaths occur in the U.S. because people smoke. In fact, tobacco use is the leading preventable cause of death. Cigarette smoke contains over 4,000 chemicals and 43 known carcinogens."). The complete text for all messages is provided in Appendix A. The third page, underneath a flap in the brochure, contained more questions to be completed after reading the message. These measures included manipulation checks, the NFC scale, perceived temptations to smoke, and intention to quit.

Measures

Pre-manipulation measures. Pre-manipulation measures first asked for demographic information (age, gender, race, and education). We then obtained a smoking history by asking individuals how many cigarettes they smoked in a day, if they ever had tried to quit, and if they currently were using a nicotine-replacement patch or chewing gum. The remaining questions were all assessed on 5-point scales. (The exact text for each question is presented in Appendix B.)

Participants indicated their intention to quit smoking in the next year. Their perceived risk of smoking was assessed by asking how likely, compared to others, they thought it was they would get a smoking-related illness at some point in their lives. Finally, the perceived benefits of quitting smoking were obtained by asking participants how likely they felt quitting could reduce their chances of developing a smoking-related illness.

Participants were somewhat intent on quitting in the next year ($M = 3.11$, $SD = 1.18$), saw smoking as a somewhat risky behavior ($M = 3.34$, $SD = 1.08$), and thought quitting smoking was beneficial ($M = 3.85$, $SD = 1.18$). Despite random assignment, participants' perceptions of the benefits of quitting differed by condition. The individuals assigned to read a loss-framed message thought quitting was more beneficial ($M = 3.94$, $SD = 1.15$) than did those assigned to read a gain-framed message ($M = 3.76$, $SD = 1.20$), $F(1, 860) = 5.16$, $p < .05$. Controlling for this difference did not influence the results, except where noted.

Post-manipulation questions. Participants were asked to respond, using 5-point scales, to a series of questions designed to assess a number of relevant constructs. These post-manipulation questions are presented in Appendix B. Three questions served as manipulation checks. Participants rated the tone of the message, whether they felt reassured by the information, and whether they believed the information. Framing was expected to influence participants' perceptions of message tone and reassurance, but not their perceptions of believability.

Three questions assessed temptations to smoke because past research has found that gain-framed messages reduce such perceptions (Schneider, Salovey, Pallonen, et al., 2001). Participants indicated whether they thought cigarettes relieve tension, whether second-hand smoke bothers others, and whether it is difficult to refuse when someone offers a cigarette. These items did not form a coherent scale (Cronbach's $\alpha = .28$) and, consequently, were analyzed separately.

Three questions assessed NFC. The items were adapted from questions on the short form of the NFC scale (Cacioppo et al., 1984). They were selected because they were among the items with the highest factor loadings (Cacioppo & Petty, 1982) and were understandable to samples of the target population for this study. Participants indicated whether they preferred tasks requiring less thought, rather than tasks challenging their thinking abilities; whether they disliked the responsibility of handling situations requiring a great deal of thinking; and whether they tried to anticipate and avoid situations where they would have to think in depth about something. Responses on the three items were significantly correlated, had adequate internal consistency ($\alpha = .76$), and were combined to create one NFC score. The scale was flipped then so that higher scores were associated with greater NFC.

Three questions were included to assess health motivation and expectancies, which we thought might mediate the influence of framing on intention to quit smoking. Participants' motivations to quit smoking were assessed by asking how interested they were in quitting. Their expectation that they could quit (self-efficacy) was measured by asking how confident they were that they could quit smoking. Finally, the expectation that quitting smoking would improve health (response efficacy) was measured by asking about the degree to which participants felt that quitting smoking could reduce their chances of developing a smoking-related illness.

Participants' intention to quit smoking in the next 3 months was assessed. Individuals were asked whether they intended to quit smoking, whether they intended to use nicotine-replacement products to help them quit, and whether they intended to obtain information on how to quit smoking. Responses on the three items were significantly intercorrelated. An overall intention measure, with adequate internal consistency ($\alpha = .76$), was created by averaging responses to the three questions.[5]

Results

Manipulation Checks

Several questions were designed to confirm that participants encoded framed messages differently. After reading the message, participants were asked about

[5]We also included several measures to see if framing would influence actual behavior. Upon returning his or her brochure, each participant was given a pre-addressed, stamped postcard, which could be mailed in for free samples of Nicorette® gum and a pamphlet on "Tips for Quitting Smoking." Participants also were given a coupon for two free pieces of Nicorette® gum that could be redeemed only that day at a specific time and location at the outdoor event. Thus, participants had to be motivated to find the location and to pick up the gum at the specified time. All participant materials were linked by a unique identifier. Experimental manipulations, including framing, had no systematic impact on participants' completion of these actions.

its tone. As expected, participants who read gain-framed brochures thought the message was more positive ($M = 4.23$, $SD = 0.99$) than did participants who read loss-framed brochures ($M = 3.73$, $SD = 1.30$), $F(1, 852) = 40.05$, $p < .001$. Participants also indicated how reassured they felt after reading the message. As expected, participants who read a gain-framed message were more reassured than were those who read a loss-framed message (gain frame, $M = 3.25$, $SD = 1.16$; loss frame, $M = 3.04$, $SD = 1.17$), $F(1, 846) = 6.39$, $p < .05$. Responses on these two measures were correlated ($r = .41$, $p < .01$).

Finally, participants were asked to indicate how believable the messages were. As expected, framing had no significant effect on message believability (gain frame, $M = 4.23$, $SD = 1.00$; loss frame, $M = 4.30$, $SD = 0.97$), $F(1, 853) = 1.39$, *ns*.

Outcome Measures

NFC was assessed after reading the messages and, thus, could have been affected by message differences. However, analyses reveal that NFC scores were similar for participants in both the loss-framed ($M = 2.95$, $SD = 1.02$) and gain-framed conditions ($M = 2.83$, $SD = 1.12$), $F(1, 855) = 3.09$, $p = .08$. The marginal significance of the analysis is driven mostly by the large number of participants; the actual difference in means is only one tenth of a scale point.

Intention to quit smoking. In initial analyses, participants' intention to quit smoking did not differ between the gain-framed ($M = 2.73$, $SD = 1.19$) and loss-framed conditions ($M = 2.65$, $SD = 1.08$), $F(1, 856) = 1.03$, *ns*. Because post-message intention was (unsurprisingly) related to pre-message intention to quit and pre-message perceptions of the benefits of quitting smoking varied systematically by framing condition, we added these two items as covariates in an ANCOVA. This produced a marginal framing difference, $F(1, 849) = 3.37$, $p = .07$. Participants tended to have greater intention to quit after reading gain-framed messages ($M = 2.75$, $SE = 0.05$) than after reading loss-framed messages ($M = 2.63$, $SE = 0.05$), consistent with earlier work (Schneider, Salovey, Pallonen, et al., 2001). However, caution must be used when interpreting this small difference because the statistical significance of the effect is driven primarily by the large number of participants.

Hierarchical linear regression was used to examine the interaction of framing and NFC on intention to quit.[6] Table 2, Step 1 shows that although the main effects (framing and NFC) explained a significant portion of the variance in

[6]The analyses presented in the text do not control for preexisting differences on conceptually related variables. The NFC × Framing interaction results were similar when the regression analyses included pre-message perceptions of the benefits of quitting smoking, which varied systematically by framing condition, and participants' pre-message intention to quit, which was related to the outcome measures.

Table 2

Regression Analysis of Framing and Need for Cognition (NFC) as Predictors of Intention to Quit Smoking

Predictor	*b*	*SE b*	β	*t*	*p*	Model R^2
Step 1						
NFC	-0.18	0.04	-.17	-4.93	.00	
Framing	-0.06	0.08	-.03	-0.82	.41	.029**
Step 2						
NFC	-0.26	0.05	-.24	-5.37	.00	
Framing	-0.59	0.22	-.26	-2.65	.01	
NFC × Framing	0.18	0.07	.26	2.52	.01	.036**

**$p < .01$.

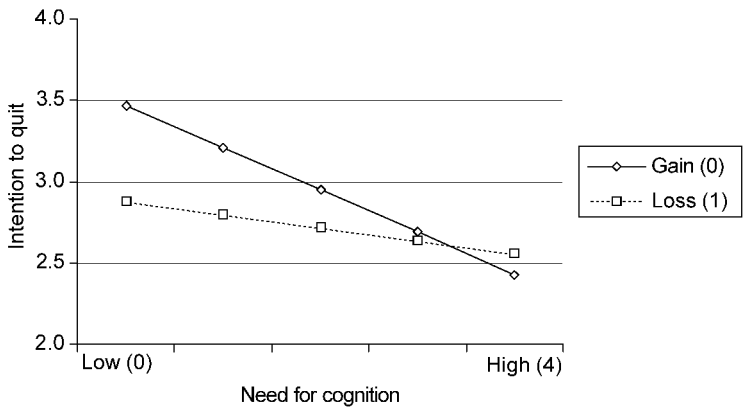

Figure 1. Intention to quit as a function of frame (gain or loss) and need for cognition.

intention to quit ($R^2 = .03$), $F(2, 853) = 12.78$, $p < .01$, it is NFC that accounted for this effect. Step 2 added the NFC × Framing interaction term, which enhanced reliably the ability to predict intention to quit ($\Delta R^2 = .01$), $F(1, 852) = 6.36$, $p < .02$. The hypothesis about the interaction of framing and NFC was supported. Figure 1 shows that, although individuals lower in NFC generally were more persuaded to quit smoking than were those higher in NFC, this was particularly true if participants read a gain-framed message.

Table 3

Regression Analysis of Framing and Need for Cognition (NFC) as Predictors of Responses to the Item "Second-Hand Smoke Bothers Others"

Predictor	*b*	*SE b*	β	*t*	*p*	Model R^2
Step 1						
NFC	-0.01	0.03	-.01	-0.26	.79	
Framing	0.03	0.07	.02	0.48	.63	.000†
Step 2						
NFC	-0.07	0.05	-.07	-1.52	.13	
Framing	-0.35	0.21	-.17	-1.70	.09	
NFC υ Framing	0.13	0.07	.21	1.99	.05	.005*

†*ns*. *$p < .05$.

Temptations to smoke. The three items assessing temptations to smoke were not internally consistent as a scale, and so were examined individually. Framing and NFC only influenced scores on the item asking whether second-hand smoke bothers others. Table 3, Step 1 shows that regressing the item on framing and NFC did not yield reliable effects ($R^2 = .00$), $F(2, 851) = 0.14$, *ns*. However, adding the interaction term in Step 2 improved the validity of the model ($\Delta R^2 = .01$), $F(1, 850) = 3.94$, $p < .05$, although these associations are quite small.

Figure 2 shows that the impact of framing and NFC on thoughts about second-hand smoke corresponded to our hypothesis. Participants lower in NFC tended to be more likely to acknowledge the bothersome nature of second-hand smoke after reading gain-framed, compared to loss-framed, messages. In contrast, participants higher in NFC tended to acknowledge the problems with second-hand smoke more after reading loss-framed than gain-framed messages.

Health motivation and expectancies. We assessed three constructs related to health motivation and expectancies—interest in quitting, self-efficacy, and response efficacy—but there were no reliable effects for response efficacy. Table 4 displays the results of regression analyses for interest in quitting. Here again, the main effects of framing and NFC did not explain a significant portion of the variance ($R^2 = .01$), $F(2, 852) = 1.94$, *ns*. However, when the NFC × Framing interaction term was added, the model was significant ($\Delta R^2 = .01$), $F(1, 851) = 3.99$, $p < .05$. Our hypothesis was supported, as seen in Figure 3, although the effect is small. Participants lower in NFC tended to express more interest in quitting after reading a gain-framed message than after reading a loss-framed message; whereas participants higher in NFC were more

Table 4

Regression Analysis of Framing and Need for Cognition (NFC) as Predictors of Interest in Quitting

Predictor	*b*	*SE b*	β	*t*	*p*	Model R^2
Step 1						
NFC	-0.07	0.04	-.06	-1.70	.09	
Framing	0.09	0.09	.04	1.10	.27	.005†
Step 2						
NFC	-0.14	0.05	-.12	-2.60	.01	
Framing	-0.37	0.25	-.15	-1.50	.14	
NFC × Framing	0.16	0.08	.21	2.00	.05	.009*

†*ns*. *$p < .05$.

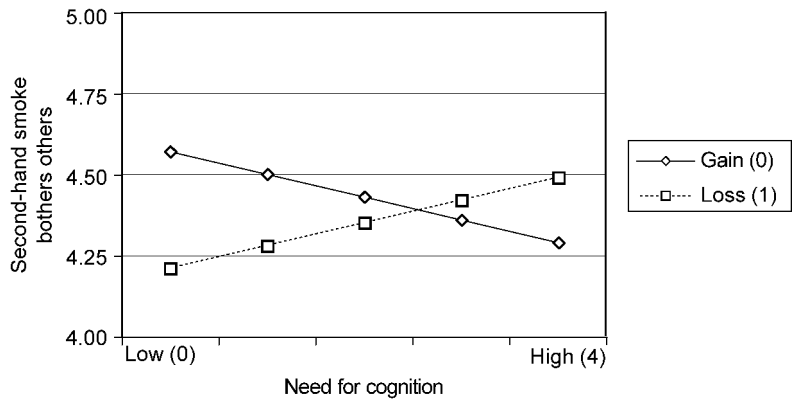

Figure 2. Responses to the item "Second-hand smoke bothers others" as a function of frame (gain or loss) and need for cognition.

interested in quitting after reading a loss-framed message, compared to a gain-framed message.

Table 5 shows that although the main effects did not explain a significant portion of the variance in self-efficacy ($R^2 = .01$), $F(2, 850) = 2.27$, *ns*, the Framing × NFC interaction did ($\Delta R^2 = .01$), $F(1, 849) = 5.82$, $p < .02$. Consistent with our hypothesis, Figure 4 shows that participants lower in NFC were more confident that they could quit if they read a gain-framed, as opposed to a

Table 5

Regression Analysis of Framing and Need for Cognition (NFC) as Predictors of Self-Efficacy

Predictor	*b*	*SE b*	β	*t*	*p*	Model R^2
Step 1						
NFC	0.09	0.04	.07	2.13	.03	
Framing	-0.02	0.09	-.01	-0.27	.79	.005†
Step 2						
NFC	-0.00	0.06	-.00	-0.03	.98	
Framing	-0.63	0.27	-.24	-2.36	.02	
NFC × Framing	0.21	0.09	.26	2.41	.02	.012*

†*ns*. *$p < .05$.

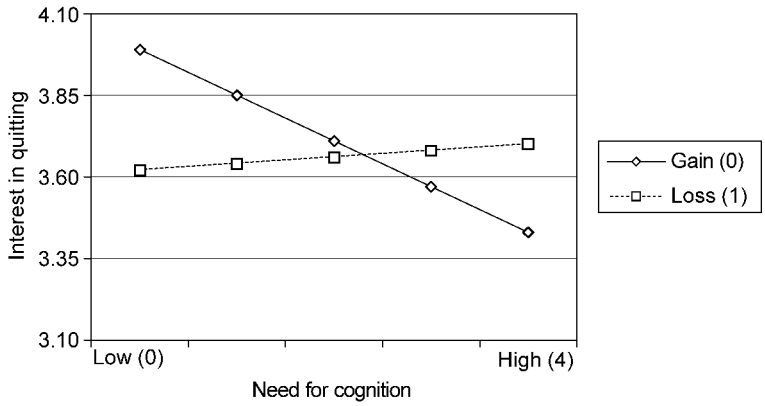

Figure 3. Interest in quitting as a function of frame (gain or loss) and need for cognition.

loss-framed, message, but participants higher in NFC tended to be more confident they could quit if exposed to a gain-framed compared to a loss-framed message. Once again, though, the interaction effect is reliable but small.

Mediation analysis. Health motivation and expectancies were considered a possible mediator of framing effects. Therefore, we averaged the two health expectancy variables that showed a relationship to framing and NFC, interest in quitting, and self-efficacy ($r = .20, p < .01$), and employed a procedure suggested by Baron and Kenny (1986) to test for mediation. We used multiple regression to

Table 6

Regression Models Testing Health Expectancies as a Mediator of the Effects of the Framing × Need for Cognition (NFC) Interaction on Intention to Quit Smoking

Predictor	*b*	*SE b*	β	*t*	*p*
Model 1: DV = Health expectancies					
Framing υ NFC[a]	0.18	0.06	.30	2.81	.01
Model 2: DV = Intention to quit smoking					
Health expectancies	0.50	0.04	.44	14.28	.00
Model 3: DV = Intention to quit smoking					
Framing υ NFC[a]	0.18	0.07	.26	2.52	.01
Model 4: DV = Intention to quit smoking					
Health expectancies	0.49	0.04	.43	14.26	.01
Framing υ NFC[a]	0.08	0.07	.12	1.30	.19

Note. DV = dependent variable.

[a]Models that contain the Framing × NFC interaction also include the main effects (Framing, NFC) as predictors.

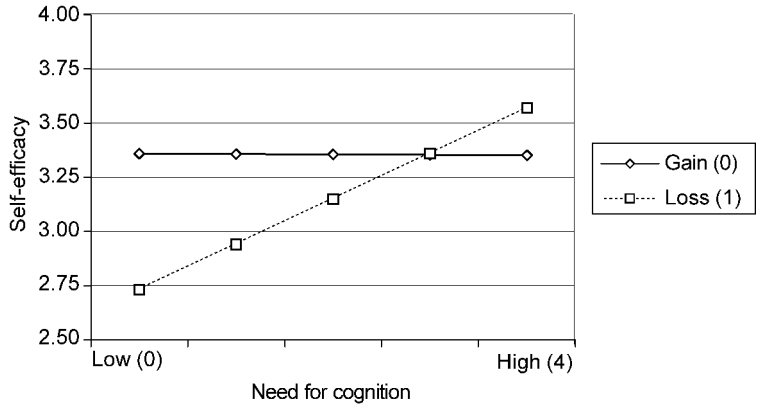

Figure 4. Self-efficacy as a function of frame (gain or loss) and need for cognition.

establish that the NFC × Framing interaction predicted health expectancies (Table 6, Model 1), that health expectancies predicted intention to quit (Table 6, Model 2), and that the NFC υ Framing interaction predicted intention to quit

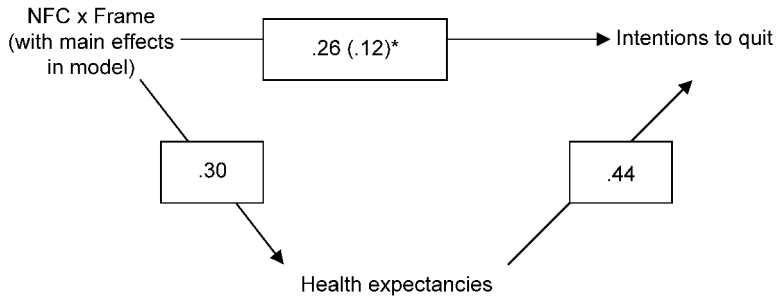

Figure 5. Path diagram of relationships among the Framing × Need for Cognition interaction, health expectancies, and interest in quitting. *Note.* Numbers in boxes are βs. Number in parentheses is the β when health intention is included in the model. The change in β is significant ($p < .01$).

(Table 6, Model 3).[7] The significant relationships among these three variables are depicted in Figure 5. To establish mediation, we then computed a final model (Table 6, Model 4) that examined whether the NFC × Framing interaction would still influence intention to quit if health expectancies were also included as a predictor. Adding health expectancies to the model caused the beta of the NFC υ Framing interaction term to drop from .26 (Model 3) to .12 (Model 4). This reduction is significant (Sobel test = 2.91, $p < .01$), and suggests that health expectancies mediate the influence of framing and NFC on intention to quit smoking.

Discussion

This study examined whether NFC moderated the impact of framed smoking-cessation messages on intention to quit. Anti-smoking messages typically emphasize the costs of failing to quit smoking (loss frame), as opposed to emphasizing the benefits of quitting (gain frame). However, prospect theory argues that the effectiveness of gain- and loss-framed messages depends on the perceived riskiness of the choice option promoted (Tversky & Kahneman, 1981). Thus, a disease-prevention behavior with a certain outcome (e.g., smoking cessation) is better promoted by emphasizing the benefits of quitting (Rothman & Salovey, 1997; Schneider, Salovey, Pallonen, et al., 2001). The current study showed only minor support for this prediction. Gain-framed, as opposed to loss-framed, messages produced marginally greater intention to quit after controlling for differences on pre-message items.

[7]The main effects of framing and NFC were included in all mediation regression models that had as a predictor the NFC × Framing interaction.

However, understanding the influence of framing was significantly improved by examining its interaction with a person's NFC. Individuals high in NFC are more likely to process information systematically, or centrally, compared to those low in NFC, who are more likely to process information peripherally (Cacioppo et al., 1996). This distinction between high and low NFC individuals is potentially important because mode of information processing can affect responses to framing, as demonstrated in this and other research (Maheswaran & Meyers-Levy, 1990).

Individuals who pay careful attention to and evaluate a message systematically are expected to be more persuaded by a loss-framed message than by a gain-framed message because negative information is weighted more heavily when forming an attitude through scrutiny of information (Kanouse, 1984; Lau, 1985; Maheswaran & Meyers-Levy, 1990; Weinberger et al., 1981). In contrast, individuals who pay less attention to a message process the information peripherally and rely on simple cues (e.g., tone) to guide their response. In this case, gain framing, as opposed to loss framing, is expected to be more persuasive because the gain-framed message associates positive affect with the desired behavior (Maheswaran & Meyers-Levy, 1990). Consistent with these earlier findings, we found that participants lower in NFC showed greater intention to quit smoking after reading a gain-framed pamphlet than a loss-framed pamphlet. However, intention to quit among participants higher in NFC were relatively unaffected by framing.

In addition, participants' opinions about second-hand smoke, their interest in quitting, and their self-efficacy about quitting were affected by NFC and frame. For all three variables, the observed pattern of results was consistent with our hypothesis. People lower in NFC had more interest and confidence in quitting and thought that second-hand smoke was more bothersome after reading a gain-framed, as opposed to a loss-framed, pamphlet. In contrast, people higher in NFC had more interest and confidence in quitting and thought that second-hand smoke was more bothersome if they read a loss-framed, compared to gain-framed, message. Furthermore, the health expectancy variables—interest and self-efficacy—mediated the effect of the NFC × Framing interaction on participants' intention to quit smoking.

For most dependent variables, the Framing ט NFC interaction was driven by the particular persuasiveness of gain-framed messages for people lower in NFC. However, the effects for self-efficacy were driven by less confidence among lower NFC participants who read loss-framed messages. This anomalous finding may be a result of the reassuring nature of gain-framed messages. Most smokers in this study had tried quitting on at least one previous occasion and, thus, many were aware of the challenges that would come with an additional attempt. The lack of reassurance in loss-framed messages may have made the quitting process seem overwhelming, particularly among those participants in the study most sensitive to framing effects (i.e., those lower in NFC).

The findings from this study could be seen as contradicting previous research. For example, Rothman, Martino, Bedell, Detweiler, and Salovey (1999) found significant framing differences among individuals high in NFC, but not among those low in NFC. However, participants in that study evaluated messages about a fictitious disease, an activity that by nature may have appealed more to individuals who enjoy thinking deeply. Other investigations have reported more pronounced framing effects when individuals were highly involved in an issue (Millar & Millar, 2000; Rothman, Salovey, Antone, Keough, & Martin, 1993), yet in the current work, stronger effects were observed for individuals lower in NFC, who presumably were not processing the message as deeply as those higher in NFC.

These may not be discrepant findings. Although greater involvement in an issue can lead to more systematic processing of a message (as predicted by Maheswaran & Meyers-Levy, 1990), this may not always be true. In some situations, greater involvement might simply make people attend more carefully to superficial cues. For example, in the study by Rothman et al. (1993), undergraduates in a classroom were presented with messages promoting sunscreen use. Women, who were more highly involved in the issue, were more persuaded by gain-framed than loss-framed messages; but men, who were less involved, were unaffected by frame. In this case, involvement may have differentiated between superficial message processing (high involvement) and minimal processing (low involvement). When a similar study was then conducted in an environment that made the issue salient to everyone (i.e., on a beach), gain-frame advantages were observed for both women and men (Detweiler et al., 1999).

Previous work has shown that a high level of thinking about an issue leads to stronger attitude change (Petty, Haugtvedt, & Smith, 1995), yet the current study found that individuals lower in NFC were more persuaded by the messages than were those higher in NFC. There are two possible explanations for this paradox. First, given the prevalence of anti-smoking messages, it is possible that individuals higher in NFC already have thought through many of the advantages and disadvantages of smoking cessation. As such, the persuasive arguments in the messages may have had only limited impact.

Second, central and peripheral processes can (and often do) operate simultaneously (Petty & Wegener, 1998). Involvement in an issue or a preference for deep thinking affects the relative use of these different processes. Given the frequency of anti-smoking messages and the context in which this study was conducted (e.g., the beach), there may have been a general bias among participants to use peripheral processing to evaluate the messages. As such, NFC simply may have moderated the degree of this processing bias: People lower in NFC engaged primarily in peripheral processing, whereas people higher in NFC used both central and peripheral processes.

The tendency to process messages peripherally represents a limitation to this study's public health implications. Attitude change from peripheral processing is

relatively weak (Petty et al., 1995), which could explain, in part, the small impact of framing and NFC on intentions to quit smoking and their failure to affect actual behavior. However, these results might also provide an indication of the difficulties in creating highly involving anti-smoking messages. Because many smokers have heard frequently about the dangers of smoking and the need to quit, it may be difficult to design smoking-cessation messages that capture people's attention and interest and lead consequently to large reductions in actual smoking. Future work will need to investigate how smoking-cessation messages can be designed to promote central processing.

Additional studies should also focus on the role that novelty might play in the effectiveness of gain-framed messages over loss-framed messages. Smokers may be particularly likely to tune out loss-framed messages because the arguments seem redundant with those heard in the many anti-smoking campaigns focusing on the costs of not quitting.

Finally, the effectiveness of framed messages on smoking cessation might be improved by assessing individuals' perceptions of the risks of quitting. Although smoking cessation is a prevention behavior, some individuals might perceive the act as involving uncertainties.

Anti-smoking messages typically have been loss framed. This study demonstrates that these appeals are not equally effective for all people. Among individuals likely to process the information peripherally, a gain-framed approach may more successfully enhance motivations to quit.

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Appendix A

Text for the Messages

Gain-Framed/Complex Message

1 in 5 lives could be saved in the U.S. if people didn't smoke. In fact, not using tobacco is the best way to save lives. Air that is free of cigarette smoke is also free of over 4,000 chemicals and 43 known carcinogens. Like radon and asbestos, tobacco is considered a carcinogen by the Environmental Protection Agency. The chances for quitting smoking successfully are improved with the use of nicotine replacement, like gum or patches.

What are the benefits of quitting smoking? Your teeth are whiter and your hair and clothes smell better. Your nerve endings begin to regenerate, and you'll have increased ability to smell and taste. Blood circulation improves and your lung function increases. Coughing and sinus congestion clear up, and breathing is easier. The cilia regrow in your lungs, increasing their ability to handle mucus and infection.

As you can see, if you quit smoking, you'll gain these benefits and be healthy. Quitting smoking means you'll regain many health benefits you've lost by smoking.

Biomedical research shows that your attempts to quit smoking are more likely to succeed if you use nicotine replacements, like gum or patches. You're also more likely to be able to quit if you seek information about how to quit.

Getting help from nicotine gum is better than trying to stop on your own. If you stop smoking, it can save your life. *Get your nicotine gum and send away for helpful hints today!*

Loss-Framed/Complex Message

1 in 5 deaths occur in the U.S. because people smoke. In fact, tobacco use is the leading preventable cause of death. Cigarette smoke contains over 4,000 chemicals and 43 known carcinogens. Like radon and asbestos, tobacco is considered a carcinogen by the Environmental Protection Agency. The chances for quitting smoking are reduced without the use of nicotine replacement, like gum or patches.

What are the costs of continued smoking? Your teeth keep getting more yellow, and your hair and clothes stink. Your nerve endings don't get a chance to regenerate, and you'll continue to lose your ability to smell and taste. Blood circulation remains poor, and your lung function continues to decrease. Coughing and sinus congestion get worse, and breathing becomes more difficult. The cilia in your lungs continue to degenerate, decreasing their ability to handle mucus and reduce infection.

As you can see, if you keep smoking, you'll have these problems and could get sick. Continued smoking means you'll add to the many health damages you've suffered by smoking.

Biomedical research shows that your attempts to quit smoking are more likely to fail if you don't use nicotine replacements, like gum or patches. You're also less likely to be able to quit if you don't seek information about how to quit.

Trying to stop on your own is not as good as getting help from nicotine gum. If you continue to smoke, it can cost your life. *Get your nicotine gum and send away for helpful hints today!*

Gain-Framed/Simple Message

(*Note.* The brochure also included cartoon pictures consistent with the framing of this message. For example, a drawing of a mouth with glistening white teeth was included near text describing whiter teeth as a benefit of quitting smoking.)

Judd Hirsch says NO to Cigarettes. After years of smoking on- and off-screen, he's finally quit with the help of nicotine replacements. He can't remember feeling as good as he does today. If you quit, you could know the feeling of better health now.

Currently, half of adults who have ever smoked have already quit. In fact, 2 out of 3 regular smokers want to quit.

What are the benefits of quitting smoking? Teeth are whiter and clothes smell fresher. Smelling and taste improve. Blood circulation improves, and lungs are cleaner so breathing is easier.

As you can see, if you quit smoking, you'll gain these benefits and be healthy. Quitting smoking means you'll regain many health benefits you've already lost by smoking.

Your attempts to quit smoking are more likely to succeed if you use nicotine replacements, like gum or patches. You're also more likely to be able to quit if you seek information about how to quit.

Getting help from nicotine gum is better than trying to stop on your own. If you stop smoking, it can save your life. *Get your nicotine gum and send away for helpful tips today!*

Loss-Framed/Simple Message

(*Note.* The brochure also included cartoon pictures consistent with the framing of this message. For example, a drawing of a mouth with yellowed teeth was included near text describing yellowed teeth as a cost of continued smoking.)

Judd Hirsch says NO to Cigarettes. After years of smoking on- and off-screen, he's finally quit with the help of nicotine replacements. He can't

remember feeling as good as he does today. If you don't quit, you won't know the feeling of better health now.

Currently, half of adults who have ever smoked have already quit. In fact, 2 out of 3 regular smokers want to quit.

What are the costs of continued smoking? Teeth are more yellow and clothes stink. Smelling and taste won't improve. Blood circulation gets worse, and lungs get dirtier so breathing is difficult.

As you can see, if you keep smoking, you'll have these problems and could get sick. Continued smoking means you'll add to the many health damages you've suffered by smoking.

Your attempts to quit smoking are more likely to fail if you don't use nicotine replacements, like gum or patches. You're also less likely to be able to quit if you don't seek information about how to quit.

Trying to stop on your own is not as good as getting help from nicotine gum. If you continue to smoke, it can cost your life. *Get your nicotine gum and send away for helpful tips today!*

Appendix B

Wording for Brochure Items and the Corresponding Scale Endpoints

Item	Scale endpoints	
	1	5
Pre-Manipulation		
Do you plan to quit smoking this year?	*definitely no*	*definitely yes*
Compared to others, how likely do you think you are to get a smoking-related illness at some point in your life?	*not at all likely*	*extremely likely*
How likely do you feel your quitting smoking can reduce your chances of developing a smoking-related illness?	*not at all likely*	*extremely likely*
Post-Manipulation		
Manipulation checks:		
The tone of the information I just read was . . .	*negative*	*positive*
I felt reassured after reading this information.	*strongly disagree*	*strongly agree*
I believe the information on this brochure.	*strongly disagree*	*strongly agree*
Temptations to smoke:		
Smoking cigarettes relieves tension.	*strongly disagree*	*strongly agree*
Second-hand smoke bothers others.	*strongly disagree*	*strongly agree*
It is difficult to refuse when someone offers me a cigarette.	*strongly disagree*	*strongly agree*
Need for cognition:		
I'd rather do something requiring less thought than something that challenges my thinking abilities.	*strongly disagree*	*strongly agree*
I don't like to have the responsibility of handling a situation that requires a lot of thinking.	*strongly disagree*	*strongly agree*
I try to anticipate and avoid situations where I will be likely to have to think in depth about something.	*strongly disagree*	*strongly agree*

(*appendix continues*)

Appendix B (Continued)

Item	Scale endpoints	
	1	5
Health motivation and expectancies:		
How interested are you in quitting smoking?	*not at all interested*	*extremely interested*
How confident are you that you can quit smoking?	*not at all confident*	*extremely confident*
How likely do you feel your quitting smoking can reduce your chances of developing a smoking-related illness?	*not at all likely*	*extremely likely*
Intentions:		
Do you intend to quit smoking in the next three months?	*definitely not*	*definitely yes*
Do you intend to use nicotine replacements to help you quit smoking in the next three months?	*definitely not*	*definitely yes*
Do you intend to obtain information to help you quit smoking in the next three months?	*definitely not*	*definitely yes*