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# Short and Sweet: The Persuasive Effects of Message Framing and Temporal Context in Antismoking Warning Labels

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Current warning labels on cigarette packages are generally focused on long-term losses that can be incurred if one continues smoking. This study compares the effects of these labels against warning labels that stress short-term losses of smoking as well as labels that stress short- and long-term benefits that can be obtained when one quits smoking. A 2 (message frame: gain vs. loss) × 2 (temporal context: short vs. long term) between-subjects experiment was conducted among 132 smokers, with attitude toward quitting smoking and intention to quit smoking, as well as information-seeking behavior and message recall, as the dependent variables. Findings were in line with theory regarding message framing and temporal discounting, showing enhanced effects of gain over loss frames and short-term over long-term consequences on warning labels for attitudes and intentions. In addition, an interaction between message frame and temporal context was found. Especially, gain-framed messages showed stronger effects on intentions to quit smoking than loss-framed messages when warning labels concerned short-term outcomes. Findings suggest that current warning labels, with an emphasis on long-term negative health outcomes, should be reconsidered.

Within the European Union the use of warning labels is mandatory on all tobacco products. Each package should contain the general text “Smoking (can) kill(s)” or “Smoking seriously harms you and others around you” and has to be supplemented with one of 14 additional messages, such as “Smoking causes fatal lung cancer” (European Commission, n.d.a, n.d.b). Although some researchers have claimed to have found support for the use of these messages (e.g., Hammond, Fong, McDonald, Brown, & Cameron, 2004; Huang, Chaloupka, & Fong, 2014), other researchers have refuted the effectiveness of threatening messages stressing the negative consequences of smoking (e.g., Ruiter, Kessels, Peters, & Kok, 2014). In support of this criticism a meta-analysis showed that health messages that induce threat are not effective unless they are supplemented by a strong sense of efficacy on the receivers’ end (Peters, Ruiter, & Kok, 2013). Consequently, it is useful to search for alternative message strategies that bypass the use of threat.

## Gains Versus Losses

Warning labels usually emphasize losses that can be incurred over time if one continues smoking (e.g., it causes cancer).

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However, in order to circumvent the potentially negative effects of threat induction, it may be more fruitful to communicate immediate gains associated with quitting smoking (e.g., it saves money).

Framing theory (Rothman & Salovey, 1997) explains how differentially framed health messages influence decisions people make. In short, and of particular relevance to the current study, it postulates that prevention behaviors (e.g., smoking cessation) should be promoted through gain-framed messages that emphasize benefits associated with healthy behavior instead of loss-framed messages that stress costs associated with unhealthy behavior. A meta-analysis showed that physical activity, skin cancer prevention, as well as smoking cessation are influenced more strongly by gain-framed than loss-framed messages, but no framing effects were found for other behaviors, such as dieting and safe sex (Gallagher & Updegraff, 2012).

Why framing effects are stronger for some behaviors than others remains to be definitively established, but explanations are sought in risk perceptions and uncertainty associated with the behavior and the match between message frames and one’s motivational orientation (i.e., a promotion or prevention focus; Covey, 2014; Updegraff & Rothman, 2013). Moreover, it is thought that a match between the chosen frame and perceptions of risk, uncertainty, or someone’s motivational orientation results in higher levels of message elaboration, which consequently leads to higher message effectiveness (for a review, see Updegraff & Rothman, 2013). However, of importance to the current study is that on average a gain frame advantage for smoking cessation has been found (Gallagher & Updegraff, 2012).

Another reason why messages that emphasize the benefits associated with healthy behavior may be more effective than

messages that stress the costs of unhealthy behavior can be found in the extended parallel process model (Witte, 1992). According to the extended parallel process model, messages that communicate the negative consequences of unhealthy behavior result in an appraisal of threat and can by extension evoke feelings of fear (Cox & Cox, 2001). To reduce feelings of fear, people are thought to engage in one of two courses of action. When efficacy is high people will engage in adaptive actions, such as initiating a quit attempt. However, when efficacy is low people will not adopt the desired health behavior but will choose to control the feeling of fear by engaging in defensive processes (e.g., defensive avoidance; Witte, 1992; Witte & Allen, 2000). In line with this, several studies have found that smokers more efficiently disengage attention from highly threatening than low-threatening or nonthreatening stimuli (Kessels, Ruiter, & Jansma, 2010; Maynard, Munafò, & Leonards, 2013). Thus, for a significant proportion of smokers a fear-eliciting message that stresses negative outcomes of smoking is likely to be ineffective. In sum, based on theory regarding message framing and fear appeals, the following hypothesis is proposed:

Hypothesis 1: Warning labels that stress gains will be more persuasive than warning labels that stress losses.

### Temporal Discounting

Besides stressing benefits or costs, health outcomes as communicated in warning labels can reflect immediate (short-term) or delayed (long-term) results of (quitting) smoking. The majority of messages approved by the European Commission (n.d.b.) pertain to long-term health outcomes (e.g., “Stopping smoking reduces the risk of fatal heart and lung diseases”). Only two messages concern more immediate consequences of smoking (i.e., “Smoking when pregnant harms your baby” and “Smoking is highly addictive, don’t start”). In general, however, people prefer immediate rewards over delayed rewards. This is logical from an economical and an evolutionary perspective (Green & Myerson, 2004), as time delays introduce uncertainties that reduce the value of an outcome (Hardisty & Weber, 2009).

The tendency to devalue outcomes when they occur further in the future is called *temporal discounting* (Baker, Johnson, & Bickel, 2003). Research has shown that these discounting effects are even stronger for smokers (Baker et al., 2003; Mitchell, 1999). In addition, research has shown that for people who weigh immediate consequences more strongly than future consequences, messages that stress short-term outcomes of health behavior result in higher risk perceptions and stronger intentions to engage in healthy behavior than those that stress long-term outcomes (Kees, 2010). In line with this, qualitative research among young (non)smokers points to the importance of instant gratification and a lack of salience for the long-term health consequences of smoking (McKenna & Williams, 1993).

Taken together, it follows that, among smokers, more immediate consequences associated with (quitting) smoking should be higher in subjective value and therefore bear more weight on behavioral choices compared to future outcomes. This results in the following hypothesis:

Hypothesis 2: Warning labels that stress short-term outcomes of (quitting) smoking will be more persuasive than warning labels that stress long-term outcomes.

### Gain–Loss Asymmetry in Temporal Discounting

Rational economic models predict that all future outcomes should be discounted at the same rate. Receiving a positive outcome (i.e., gain) immediately is instantly gratifying, and people should only be willing to delay this if it is compensated for with the promise of an even more desirable future outcome (e.g., a gain of €150 in a year over €100 now). The promise of an immediate undesirable outcome, however, is very unattractive, and, following rational economic models, people should be willing to pay extra to delay this loss (e.g., a loss of €150 in a year, over €100 now; Hardisty & Weber, 2009). However, multiple studies have established an asymmetry in the discounting rates for gains and losses (Benzion, Rapoport, & Yagil, 1989; Estle, Green, Myerson, & Holt, 2006; Hardisty & Weber, 2009; Thaler, 1981). Hardisty and Weber (2009) found that although receiving \$250 immediately was equal to receiving \$337.50 in 1 year, receiving a loss of \$250 now was roughly equal to receiving a loss of \$265 in 1 year. The same asymmetry was found for health gains and losses. Although the subjective value of gains declines quite rapidly over time, the same cannot be said for losses, as losses appear to be (almost) equally negative whether they occur instantaneously or in the future. This difference in discounting of gains and losses is known as the *sign effect* (Thaler, 1981) and may also have implications for health communication (Green & Myerson, 2004).

Several studies have systematically investigated how message framing interacts with the temporal context of health outcomes to affect health behavior. In a study on alcohol consumption, an interaction between message frame and temporal context was found, such that those who received a message that stressed short-term gains consumed less alcohol (per occasion) in the month following message exposure than those who received a message that stressed short-term losses. The benefit of gain- over loss-framed messages disappeared when long-term consequences were stressed, as long-term gain- and loss-framed messages were equally effective (Gerend & Cullen, 2008). This follows from the sign effect (Thaler, 1981); that is, the subjective value of gains declines quite rapidly over time, whereas for losses this is much less the case, minimizing the advantage of gains over losses for long-term health outcomes. Other more recent studies (De Bruijn & Budding, 2016; De Bruijn, Spaans, Jansen, & van’t Riet, 2016) have found interactions between message framing and temporal context that counter the findings by Gerend and Cullen (2008), and still others have been unable to find significant interactions between message framing and temporal context (Bernstein, Wood, & Erickson, 2016; Nan, Zhao, Yang, & Iles, 2014).

Taking into account the mixed findings in this field it is imperative to systematically study how message frames interact with temporal context to influence motivation. The goal of our study therefore is to add to theory on message framing and temporal discounting as well as inform health communication practice.

Based on theory regarding message framing, temporal discounting, and the sign effect, the following is hypothesized:

Hypothesis 3: Message frames and temporal context will interact to influence smoking-related outcomes, such that the difference in persuasiveness between messages that stress gains and losses will be larger when messages pertain to short-term compared to long-term outcomes.

## Method

### Participants and Design

A total of 140 smokers were randomly assigned to one of four conditions in a 2 (message frame: gain vs. loss)  $\times$  2 (temporal context: short term vs. long term) between-subjects online experiment. Because of extreme outlier scores for attitude, six participants were removed from the sample. In addition, one participant was removed because of potential insight into the hypotheses, and another was removed because this person did not complete the experiment on the same day. This resulted in a sample of 132 smokers ( $M$  age = 22.42,  $SD$  = 1.85; 63 men). Analyses on the full sample resulted in the same conclusions.

Smokers were recruited outside several (applied) university buildings while they were smoking. In addition, smokers were recruited from the personal network of one of the authors, and snowball sampling was used by asking participants to invite other smokers. Participants were told that they could win one of three gift coupons worth €10 by taking part in the study. The education level of the largest proportion of participants was university (56.06%; 32.58% bachelor's degree, 23.48% master's degree), 31.06% were students at the higher vocational level, and 12.88% were students at the middle vocational level. An ethics committee approved the procedure of the study.

### Pretest

We conducted a pretest to select eight outcomes of (quitting) smoking that would optimally distinguish between message frame (i.e., gain vs. loss) and temporal context (i.e., short vs. long term). For this purpose, 10 outcomes (five short-term and five long-term outcomes) of smoking were preselected from the literature (Leshner & Cheng, 2009; Tasso, Monaci, Trentin, & Rosabianca, 2005) and framed as benefits of quitting smoking and losses associated with continued smoking, resulting in a total of 20 outcomes used in the pretest (see Appendix A).

A sample of 32 smokers ( $M$  age = 22.78,  $SD$  = 1.70; 15 men) participated in the pretest (but not the main study). They were told that they would be presented with a number of consequences of (quitting) smoking, that these consequences could be positive or negative, and that the consequences could pertain to short-term (within 6 months) or long-term (after several years or later in the future) smoking outcomes. To determine which messages would optimally distinguish between gain and loss frames we measured two constructs, namely, valence and threat. To measure *valence* we asked participants to rate the consequences of (quitting) smoking from negative to positive (1 = *negative effect*, 7 = *positive effect*). In addition, participants were asked how *threatening* they perceived the consequences to

be (1 = *not at all threatening*, 7 = *highly threatening*). With regard to temporal context, participants were asked what they thought the expected *time frame* of the outcomes was (1 = *short-term effect*, 7 = *long-term effect*) and how *relevant* they thought the outcomes were for them in their stage of life (1 = *very irrelevant at this moment*, 7 = *very relevant at this moment*; see Appendix B).

Based on the ratings for valence and temporal context, the two most suitable outcomes for each of the four conditions were selected. The goal was to select outcomes of (quitting) smoking that would vary maximally between framing conditions on perceived valence and between temporal context conditions on the perceived time frame of outcomes. The selected short-term messages pertained to (a) one's stamina and how this would deteriorate or improve and (b) the amount of money one would spend or save if one would continue or quit smoking, respectively. The long-term messages pertained to how one would get either (a) black or clean lungs and (b) rotten or healthy teeth if one would continue or quit smoking, respectively.

### Message Frame

Analyses on the averaged valence scores confirmed that messages that stressed losses were perceived as more negative ( $M_{\text{adj}} = 1.37$ ,  $SD = 0.39$ ) than messages that stressed gains ( $M_{\text{adj}} = 6.54$ ,  $SD = 0.54$ ),  $F(1, 31) = 1290.91$ ,  $p < .001$ ,  $\eta^2 = .98$ . And loss-framed messages were perceived as more threatening ( $M_{\text{adj}} = 5.38$ ,  $SD = 0.65$ ) than gain-framed messages ( $M_{\text{adj}} = 2.17$ ,  $SD = 1.27$ ),  $F(1, 31) = 119.60$ ,  $p < .001$ ,  $\eta^2 = .79$ . No other effects were significant (all  $F$ s  $< 1.64$ ,  $ps > .211$ ).

### Temporal Context

As expected, a main effect of temporal context arose on the averaged ratings of perceived time frame of the outcomes,  $F(1, 31) = 229.14$ ,  $p < .001$ ,  $\eta^2 = .88$ . Short-term outcomes of (quitting) smoking were perceived to occur sooner ( $M_{\text{adj}} = 2.17$ ,  $SD = 0.98$ ) than long-term outcomes ( $M_{\text{adj}} = 6.01$ ,  $SD = 0.75$ ). In addition, short-term consequences of (quitting) smoking were perceived to be more relevant ( $M_{\text{adj}} = 5.77$ ,  $SD = 0.84$ ) than long-term outcomes ( $M_{\text{adj}} = 3.02$ ,  $SD = 1.17$ ),  $F(1, 31) = 88.91$ ,  $p < .001$ ,  $\eta^2 = .74$ . No other effects were significant (all  $F$ s  $< 2.34$ ,  $ps > .136$ ).

These results indicate that appropriate messages were selected to manipulate message frame and temporal context in the experiment.

### Stimulus Material

Based on the pretest, stimulus materials were developed that resembled Dutch cigarette packages as closely as possible. For this purpose, 12 cigarette brands (e.g., Marlboro Red, L&M Red, Camel, Kent Click) were selected. The warning labels on these cigarette packages were replaced with the experimental messages.

### Procedure

Participants were invited to participate in the online experiment via e-mail. Participants were told that the aim was to research brand preferences and that for this purpose they would be

presented with multiple pairs of cigarette packages and would be asked to indicate their brand preference for each pair. After providing their consent, participants were asked to answer several questions pertaining to demographics and other background variables (i.e., gender, age, field of study, education level, preferred tobacco brand).

Following this, within each condition participants were exposed to 12 pairs of cigarette packages. Both packages in each pair contained one of the two warning labels for that condition; consequently, each of the two messages was shown six times (see Figure 1). For each pair of cigarette packages participants were asked to indicate which of the two brands they would prefer if they had to choose. Each of the selected brands was presented twice, once on the left with one of the messages and once on the right with the other message. In each of the conditions the same 12 brand pairs were shown; however, the order in which the pairs were shown was randomized. This innovative smoking preferences procedure ensured that participants would be exposed to the warning labels multiple times in an unobtrusive way, reducing potential demand awareness. After the smoking preferences task the dependent variables were assessed (i.e., attitudes toward quitting and intentions to quit, information-seeking behavior, and recall, in this order).

### Measures

In line with Nan and colleagues (2014), attitudes and intentions were measured to assess the persuasiveness of the different warning labels. In addition, information-seeking behavior was assessed, as this is a known determinant of preventive behaviors (for a review, see Lambert & Loisele, 2007). Last, message recall was assessed (Jones, Sinclair, & Courneya, 2003; Updegraff & Rothman, 2013).

### Attitude

Attitude toward quitting smoking was measured with five items (Latimer et al., 2012; Moorman & van den Putte, 2008). Participants were asked whether they thought quitting smoking was 1 = *unhealthy* to 7 = *healthy*, 1 = *bad* to 7 = *good*, 1 = *unwise* to 7 = *wise*, 1 = *harmful* to 7 = *beneficial*, 1 = *unpleasant* to 7 = *pleasant* ( $M = 5.41$ ,  $SD = 1.63$ ;  $\alpha = .90$ ).

### Intention

Intentions to quit smoking were assessed by means of five statements (1 = *fully disagree*, 7 = *fully agree*): “I am willing to quit smoking within the next 3 months,” “I intend to quit smoking within the next 3 months,” “I plan to quit smoking within the next 3 months,” “I will try to quit smoking within the next 3 months,” “I expect to have quit smoking in 3 months” ( $M = 3.58$ ,  $SD = 2.05$ ;  $\alpha = .97$ ; Gibbons, Gerrard, Ouellette, & Burzette, 1998; Latimer et al., 2012; Moorman & van den Putte, 2008).

### Information-Seeking Behavior

To measure information seeking, we asked participants whether, after the study, they wanted to be redirected to a website with information regarding quitting smoking. A total of 17 (12.88%) participants indicated that they wanted to be referred to this website.



**Fig. 1.** Two pairs of cigarette packages featuring both of the gain-framed short-term consequences of quitting smoking (i.e., top pair: “If you quit smoking, your stamina will improve”; bottom pair: “If you quit smoking, this will save you a lot of money”).

### Aided Message Recall

Participants were provided with the eight messages used in the experiment and were asked to indicate which two messages they had seen. The answers were recoded to 0 (both incorrect), 1 (one correct), and 2 (both correct). Those who provided more than two answers were coded as 0 ( $M = 1.55$ ,  $SD = 0.66$ ).

### Manipulation Check

To examine whether the manipulations were successful, at the end of the study we presented participants with the messages corresponding to their experimental condition. The same questions were used as in the pretest to check whether the manipulations were successful.

### Nicotine Dependence

Level of nicotine addiction was assessed by means of the two-item Heaviness of Smoking Index (Heatherton, Kozlowski, Frecker, Rickert, & Robinson, 1989): “On average, how many

cigarettes do you smoke each day?" (1 = 0–5, 2 = 6–10, 3 = 11–20, 4 = 21–30, 5 = 31 or more) and "How many minutes after you wake up in the morning do you light your first cigarette?" (1 = maximum of 5 minutes, 2 = 6–30 minutes, 3 = 31–60 minutes, 4 = 61–120 minutes, 5 = more than 120 minutes). The second item was reverse coded ( $r = .70$ ;  $M = 1.92$ ,  $SD = 1.00$ ).

## Results

### Randomization

To check whether random assignment to conditions was successful, first, we conducted a multivariate analysis of variance (ANOVA) with frame and temporal context as the independent variables and age and nicotine dependence as the dependent variables. No differences existed between conditions on these variables (all multivariate  $F$ s  $< 1.34$ ,  $ps > .267$ ; all univariate  $F$ s  $< 1.70$ ,  $ps > .195$ ). Second, to check the distribution between conditions for gender and education level, we conducted chi-square tests. The conditions did not differ in the number of men in each condition,  $\chi^2(3, N = 132) = 3.85$ ,  $p = .278$ , or in the educational level of participants,  $\chi^2(9, N = 132) = 14.13$ ,  $p = .118$ . Based on these analyses we can therefore assume that randomization was successful.

### Manipulation Checks

#### Message Frame

Two ANOVAs were conducted with frame and temporal context as the independent variables and valence and threat as the dependent variables. As expected, a main effect was found for message frame on perceived valence,  $F(1, 128) = 1893.90$ ,  $p < .001$ ,  $\eta^2 = .94$ . People in the gain-framed conditions rated the messages as significantly more positive ( $M = 6.53$ ,  $SD = 0.83$ ) than those in the loss-framed conditions ( $M = 1.23$ ,  $SD = 0.53$ ). Neither the main effect of temporal context,  $F < 1$ , nor the interaction between message frame and temporal context was significant,  $F(1, 128) = 2.37$ ,  $p = .126$ ,  $\eta^2 = .02$ . With regard to threat, again a main effect of frame was found,  $F(1, 128) = 61.44$ ,  $p < .001$ ,  $\eta^2 = .32$ . The outcomes in the loss-framed conditions were perceived to be more threatening ( $M = 4.48$ ,  $SD = 1.46$ ) than those in the gain-framed conditions ( $M = 2.50$ ,  $SD = 1.41$ ). There was no main effect of temporal context,  $F(1, 128) = 1.68$ ,  $p = .197$ ,  $\eta^2 = .01$ , and no interaction between frame and temporal context,  $F < 1$ .

#### Temporal Context

Two ANOVAs were conducted, with time frame and relevance as the dependent variables, to examine whether the manipulation of temporal context was successful. As expected, a significant main effect of temporal context was found on perceived time frame,  $F(1, 128) = 139.65$ ,  $p < .001$ ,  $\eta^2 = .52$ . Those who were in the short-term conditions indeed perceived the consequences as occurring in the nearer future ( $M = 2.59$ ,  $SD = 1.55$ ) than those in the long-term conditions ( $M = 5.63$ ,  $SD = 1.41$ ). There was no main effect of message frame,  $F < 1$ , and no interaction between frame and temporal context,  $F(1, 128) = 2.48$ ,  $p = .117$ ,  $\eta^2 = .02$ . For relevance a main effect of temporal context was found,  $F(1, 128) = 36.46$ ,  $p < .001$ ,  $\eta^2 = .22$ . Those in the short-

term conditions experienced the outcomes as more relevant ( $M = 5.20$ ,  $SD = 1.61$ ) than those in the long-term conditions ( $M = 3.35$ ,  $SD = 1.88$ ). Contrary to the pretest, there was also a borderline significant effect of message frame,  $F(1, 128) = 3.90$ ,  $p = .050$ ,  $\eta^2 = .03$ . Those in the gain-framed conditions perceived the outcomes as more relevant ( $M = 4.61$ ,  $SD = 1.81$ ) than those in the loss-framed conditions ( $M = 3.90$ ,  $SD = 2.08$ ). No interaction between both factors was found,  $F(1, 128) = 1.58$ ,  $p = .211$ ,  $\eta^2 = .01$ .

### Main Analyses

#### Attitude

In line with Hypothesis 1, the ANOVA showed a main effect of message frame,  $F(1, 128) = 6.76$ ,  $p = .010$ ,  $\eta^2 = .05$ . Those who were exposed to gain-framed messages had a more positive attitude toward quitting smoking ( $M = 5.79$ ,  $SD = 1.17$ ) than those exposed to loss-framed messages ( $M = 5.03$ ,  $SD = 1.93$ ). Similarly, a main effect of temporal context was found,  $F(1, 128) = 9.91$ ,  $p = .002$ ,  $\eta^2 = .07$ . Confirming Hypothesis 2, those who were exposed to short-term outcomes associated with (quitting) smoking showed a more positive attitude toward quitting smoking ( $M = 5.86$ ,  $SD = 1.12$ ) compared to those exposed to messages stressing long-term outcomes ( $M = 4.98$ ,  $SD = 1.92$ ). Contrary to Hypothesis 3, however, no interaction was found between temporal context and framing,  $F(1, 128) = 1.35$ ,  $p = .248$ ,  $\eta^2 = .01$  (see Table 1).

#### Intention

An ANOVA with intention as the dependent variable showed a main effect of temporal context,  $F(1, 128) = 45.40$ ,  $p < .001$ ,  $\eta^2 = .26$ . Those in the short-term conditions showed stronger intentions to quit smoking ( $M = 4.60$ ,  $SD = 1.99$ ) than those in the long-term conditions ( $M = 2.59$ ,  $SD = 1.57$ ). In addition, a main effect of message frame was found,  $F(1, 128) = 24.55$ ,  $p < .001$ ,  $\eta^2 = .16$ . Those exposed to gain-framed messages showed a stronger intention to quit smoking ( $M = 4.33$ ,  $SD = 1.96$ ) compared to those exposed to loss-framed messages ( $M = 2.81$ ,  $SD = 1.86$ ).

In line with Hypothesis 3, these main effects were qualified by a significant interaction between temporal context and message frame,  $F(1, 128) = 4.58$ ,  $p = .034$ ,  $\eta^2 = .04$  (see Table 1 and Figure 2). As predicted, short-term messages stressing gains resulted in stronger intentions to quit smoking than short-term messages stressing losses,  $t(63) = 4.70$ ,  $p < .001$ ,  $d = 1.18$ . This was also the case for gain-versus loss-framed messages that stressed long-term outcomes, although the effect size was considerably smaller,  $t(65) = 2.14$ ,

**Table 1.** Means ( $SD$ ) for attitudes and intention to quit smoking

Frame	Attitudes		Intentions	
	Temporal context		Temporal context	
	Short	Long	Short	Long
Gain	6.04 (0.94)	5.51 (1.34)	5.53 (1.57)	3.01 (1.42)
Loss	5.65 (1.28)	4.50 (2.24)	3.51 (1.89)	2.21 (1.63)

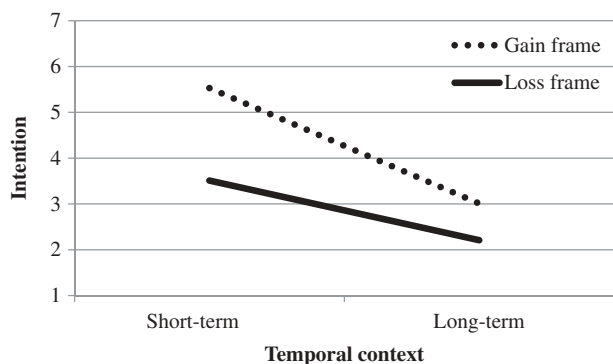


Fig. 2. Intention to quit smoking.

$p = .037$ ,  $d = 0.53$ . When we compared the effectiveness of both gain-framed messages, we indeed found that they were more effective when they pertained to short-term compared to long-term outcomes,  $t(65) = 6.89$ ,  $p < .001$ ,  $d = 1.71$ . The same was true for the loss-framed messages, although again the effect size was smaller,  $t(63) = 2.99$ ,  $p = .004$ ,  $d = 0.75$ . In sum, the findings were in line with Hypothesis 3, that the persuasive value of gains over losses is stronger for short-term compared to long-term outcomes.

#### Information-Seeking Behavior

The hierarchical logistic regression analysis showed no main effect of temporal context,  $\beta(0.57) = -1.01$ ,  $p = .076$ , odds ratio (OR) = 0.37, confidence interval (CI) [0.12, 1.11]. The same was true for message frame,  $\beta(0.55) = -0.62$ ,  $p = .261$ , OR = 0.54, CI [0.19, 1.58]. Hypotheses 1 and 2 were therefore not confirmed. Nor was there an interaction between message frame and temporal context in Step 2 of the analysis,  $\beta(1.16) = 0.12$ ,  $p = .917$ , OR = 1.13, CI [0.12, 10.99], disconfirming Hypothesis 3.

#### Aided Recall

Last we tested whether message recall was differentially affected by the messages. There were, however, no main effects of temporal context,  $F(1, 128) = 1.75$ ,  $p = .188$ ,  $\eta^2 = .01$ ; message frame,  $F < 1$ , and no interaction between both,  $F(1, 128) = 2.03$ ,  $p = .157$ ,  $\eta^2 = .02$ . Recall was therefore not affected by different messages.

#### Discussion

The goal of the current study was to investigate the interactive effects of framing and temporal context in warning labels on cigarette packages. It was expected that messages that stressed gains associated with quitting smoking would be more effective than messages that communicated losses related to continued smoking. This difference was expected to be especially pronounced for messages stressing short-term consequences, as delayed versus immediate gains are discounted more steeply than delayed versus immediate losses. To test these assumptions, we developed an innovative smoking preferences paradigm that allowed us to unobtrusively expose smokers to warning labels while limiting demand characteristics.

For attitudes as well as intentions to quit smoking, main effects of framing and temporal context were found. In line with theory regarding message framing (Rothman & Salovey, 1997), and confirming Hypothesis 1, a gain-framed message resulted in more positive attitudes and intentions to quit smoking compared to a loss-framed message. In addition, supporting Hypothesis 2, it was found that messages that stressed short-term consequences of (quitting) smoking were more effective in generating positive attitudes toward quitting smoking and intentions to quit smoking compared to messages that stressed long-term consequences. This last finding lends support to theory on temporal discounting in the domain of health communication (Green & Myerson, 2004). In partial confirmation of Hypothesis 3, for intentions, but not attitudes (possibly because of a ceiling effect), the main effects were qualified by an interaction between message frame and temporal context, providing evidence of a sign effect (Thaler, 1981). More specifically, it was found that gain-framed messages had a stronger influence on intentions to quit smoking compared to loss-framed messages, but although the effect size was large for short-term outcomes ( $d = 1.18$ ) it was medium for long-term outcomes ( $d = 0.53$ ). This aligns with and extends prior work on the discounting of gains versus losses (Gerend & Cullen, 2008). The current study is the first to provide evidence of asymmetry in the discounting of gains and losses in warning labels on cigarette packages among smokers.

With regard to message recall, no significant effects of the warning labels were found. This may be explained by the design of the study, in which participants were unobtrusively exposed to short messages in a smoking preferences paradigm that asked participants to focus on brand names (to determine their preference) instead of warning labels.

The findings regarding information-seeking behavior may represent a general unwillingness to seek information about quitting smoking among our participants. In the group with the most interest in information about quitting smoking (i.e., short-term gain-framed outcomes), 22.86% wanted to be redirected to the website. In the other groups this was 13.33% or less. Future research should therefore further explore potential behavioral effects of framed warning labels with a varied temporal context.

In our study, health outcomes of (quitting) smoking were selected based on target group perceptions of the expected time frame of health outcomes. This approach aligns with a recent study by De Bruijn and Budding (2016) but contrasts with the study by Gerend and Cullen (2008), in which the same outcomes were used for the short- and long-term messages but were framed to occur sooner or later in the future. Although the current approach is thought to result in higher levels of message credibility, future research may investigate whether our findings generalize beyond the outcomes studied. In addition, as the warning labels that are currently used in practice emphasize losses, it may be of interest to examine the role of perceived novelty of short-term gains as an alternative explanation for the current findings.

Furthermore, it is important to note that the current study predominantly included young, highly educated smokers with relatively low levels of nicotine dependence. To be able to generalize, future studies may consider a representative sample of smokers. Also, differences between age groups might be

examined, as one's orientation toward the future (e.g., preference for long-term goals) increases with age (Steinberg et al., 2009). Research by Reimers, Maylor, Stewart, and Chater (2009) showed a near-linear decline in delay discounting with increasing age. A study by Read and Read (2004) nuanced this pattern by showing that young people ( $M$  age = 25) indeed discount more compared to middle-aged people ( $M$  age = 44) but found that discounting again increases in later life ( $M$  age = 75). More research is needed to find out whether health messages that stress long-term versus short-term outcomes vary in effectiveness for different age groups.

### Conclusion

The current study adds to understanding of how message frames interact with the temporal context of outcomes to motivate people to engage in healthy behavior. The findings indicate that the European Commission should reconsider the use of warning labels that stress long-term health problems that result from continued smoking. The current study suggests that, rather, at least among younger, highly educated smokers, it seems more effective to communicate short-term benefits associated with quitting smoking.

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**Appendix A: Positive and Negative Short- and Long-Term Smoking Outcomes**

Temporal context	Message frame	
	Loss	Gain
Short term	If you smoke, your stamina will reduce.* If you smoke, this will cost you a lot of money.* If you smoke, this will make you unattractive to your social environment. If you smoke, you will get a negative image. If you smoke, you will smell bad.	If you quit smoking, your stamina will improve.* If you quit smoking, this will save you a lot of money.* If you quit smoking, this will make you attractive to your social environment. If you quit smoking, you will get a positive image. If you quit smoking, you will smell better.
Long term	If you smoke, you will get black lungs.* If you smoke, your lungs will get damaged. If you smoke, you will hurt your health. If you smoke, you will hurt the health of the people around you. If you smoke, you will get rotten teeth.*	If you quit smoking, you will get clean lungs.* If you quit smoking, your lungs will last longer. If you quit smoking, you will advance your health. If you quit smoking, you will advance the health of the people around you. If you quit smoking, you will get healthy teeth.*

Note. Asterisks indicate the smoking outcomes that were used in the experiment.

**Appendix B: Means (SD) for Perceived Valence, Time Frame, Relevance, and Threat of Outcomes of (Quitting) Smoking**

Outcome	Message frame							
	Loss				Gain			
	Valence	Time frame	Relevance	Threat	Valence	Time frame	Relevance	Threat
Stamina*	1.53 (0.67)	2.31 (1.06)	5.47 (1.08)	5.28 (0.92)	6.53 (0.76)	2.16 (1.25)	5.50 (1.14)	1.97 (1.28)
Financial costs*	1.25 (0.44)	2.13 (1.26)	6.03 (0.93)	5.47 (0.92)	6.63 (0.61)	2.09 (1.33)	6.06 (0.95)	2.47 (1.78)
Attractiveness to social environment	2.00 (1.02)	2.38 (1.31)	4.75 (1.55)	4.88 (1.26)	6.19 (1.00)	2.03 (1.31)	4.97 (1.58)	1.81 (1.26)
Image	2.25 (1.27)	2.81 (1.42)	4.53 (1.63)	4.69 (1.49)	6.19 (1.03)	2.16 (1.35)	4.84 (1.69)	1.91 (1.25)
Smell	1.75 (1.02)	2.13 (1.34)	4.91 (1.67)	4.31 (0.93)	6.16 (1.27)	2.16 (1.53)	4.84 (1.74)	2.22 (1.48)
Cleanliness of lungs*	1.28 (0.58)	6.28 (0.92)	2.94 (1.61)	5.50 (0.88)	6.56 (0.67)	6.09 (0.96)	3.06 (1.37)	2.06 (1.29)
Damage to lungs	1.31 (0.59)	6.31 (0.97)	3.44 (1.78)	6.13 (0.83)	6.50 (0.72)	6.38 (0.87)	3.44 (1.50)	2.41 (1.60)
Health of person	1.38 (0.61)	5.47 (1.39)	3.84 (1.39)	5.28 (0.96)	6.72 (0.52)	5.16 (1.87)	4.44 (1.34)	2.19 (1.49)
Health of social environment	1.66 (1.10)	4.47 (2.03)	4.13 (1.64)	5.50 (0.76)	6.31 (0.82)	4.59 (2.20)	3.97 (1.53)	2.19 (1.64)
Teeth*	1.41 (0.62)	5.94 (1.24)	2.94 (1.34)	5.28 (1.00)	6.44 (0.72)	5.72 (1.02)	3.13 (1.34)	2.19 (1.42)

Note. Asterisks denote the health outcomes of smoking that were used in the experiment.