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Preaching to the choir? The influence of personal relevance on the effects of gain- and loss-framed health-promoting messages

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Abstract

This article examines the moderating influence of personal relevance on the persuasive effects of gain- and loss-framed messages. We assessed current behaviour as a proxy for personal relevance, provided 169 participants with gain- and loss-framed messages advocating skin self-examination (SSE) and assessed intention to engage in SSE as the outcome measure. The results showed that loss-framed information was more persuasive than gain-framed information, but only for low-relevance participants. This suggests that loss-framed information might be mainly effective for recipients who need little persuading and, in fact, runs the risk of 'preaching to the choir'.

Keywords

Message framing, personal relevance, defensiveness, motivated reasoning

Persuasive health messages can be framed in terms of the benefits of engaging in healthy behaviour (gain frame), or in terms of the costs of failing to engage in healthy behaviour (loss frame). Empirical studies have shown that gain- and loss-framed messages can have different effects on individuals' self-protective actions and motivation to perform healthy behaviours, even when the persuasive information in gain- and loss-framed health messages is factually equivalent (Rivers et al., 2005; Rothman et al., 2006; Rothman and Salovey, 1997). However, studies also show inconsistent results with regard to which type of framing is more persuasive (for meta-analyses see Kuhberger, 1998; O'Keefe and Jensen, 2006; 2007). One influential approach to the study of message framing has been to focus on the function of the recommended behaviour, making a distinction between behaviours that serve to prevent an illness (like exercising or quitting smoking) and behaviours that serve to detect an illness (like skin self-examination or obtaining a mammography). According to Rothman and Salovey (1997), people perceive disease-prevention behaviours

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as relatively safe, because they minimize the chance of falling ill. In contrast, people perceive disease-detection behaviours as inherently risky because they entail the possibility of finding out that one is ill. Drawing from Prospect Theory (Kahneman, 2003; Kahneman and Tversky, 1984), Rothman and Salovey (1997) go on to suggest that gain-framed information is more persuasive when advocating disease-prevention behaviours, because gain-framed information makes people risk-avers and thus more likely to engage in relatively safe disease-prevention behaviours. In contrast, they suggest that loss-framed information is more persuasive for disease-detection behaviours, because loss-framed information makes people willing to take risks and thus more likely to engage in relatively risky disease-detection behaviours. A recent meta-analysis showed, however, that for behaviours serving to detect an illness, gain- and loss-framed messages were not differentially persuasive (O'Keefe and Jensen, 2006). For prevention-behaviours, a small advantage of gain-framed messages was found, but this effect only occurred in a limited amount of studies on dental health (O'Keefe and Jensen, 2007). Thus, in contrast to Rothman and Salovey's reasoning, and despite an impressive body of literature, it is currently unclear how professionals should frame health-promoting messages.

To explore the reasons for these inconsistent results, research is needed that investigates *under which circumstances* gain- or loss-framed information is more persuasive. Research investigating possible moderating variables that can explain differences in the effects of gain- and loss-framed messages is indispensable to deepening our understanding of message framing's effects on persuasion (O'Keefe and Jensen, 2006; Van 't Riet et al., 2010b). Currently, several potential moderators of message-framing effects have been identified, such as for instance mode of information processing (Meyers Levy and Maheswaran, 2004), regulatory focus (Cesario et al., 2004) and body consciousness (Hevey et al., 2010). One variable that has until now not received attention from scholars is the personal relevance of the gain- and loss-framed messages for the recipient. Because personal relevance has been shown to play an important part in the way people process and respond to health-promoting information (Block and Williams, 2002; Croyle et al., 1993; Good and Abraham, 2007; Kessels et al., 2010; Kunda, 1987), the present study investigated the moderating influence of personal relevance on the effects of gain- and loss-framed health-promoting messages. More particularly, we hypothesized that low-relevance recipients might be more easily persuaded by loss-framed versus gain-framed messages, whereas high-relevance recipients might be more easily persuaded by gain- versus loss-framed messages.

Personal relevance and threatening messages

In general, health-promoting messages are targeted at people who currently behave in an unhealthy way. For those people, the information holds personal relevance. For people with a healthy lifestyle, on the other hand, the relevance of health-promoting information is generally low. It would make little sense, for instance, to inform non-smokers about the dangers of smoking. In the present study, health-promoting messages are thought to be personally relevant when the recipient currently engages in unhealthy behaviour. In this case, the message has meaningful information for the recipient, who is recommended to adopt new and healthy behaviour patterns. Previous studies have also adopted this operationalization of personal relevance, for instance investigating the effects of messages communicating the dangers of caffeine consumption to frequent (high relevance) and infrequent (low relevance) coffee drinkers (eg, Liberman and Chaiken, 1992; Reed and Aspinwall, 1998).

It is a common finding that threatening health-promoting information is most effective for low-relevance recipients (ie, people who already behave in a healthy way), but least

effective for high-relevance recipients (ie, people who currently behave in an unhealthy way) (eg, Berkowitz and Cottingham, 1960; Block and Williams, 2002; Croyle et al., 1993; Ditto and Lopez, 1992; Jemmot et al., 1986; Kunda, 1987; for an overview see Good and Abraham, 2007). Berkowitz and Cottingham (1960), for instance, demonstrated that highly threatening messages advocating the use of safety belts in cars were especially persuasive for participants who drove cars only once in a while. For participants who frequently drove cars, and for whom the message thus held actual personal relevance, high-threat messages were not more persuasive than low-threat messages.

Other research also shows that personal relevance and message threat may interact to produce persuasive outcomes. Kunda (1987, Experiment 3) provided participants with information about the link between caffeine and breast cancer. Her results showed that those participants for whom the information had personal relevance (ie, women who regularly drank coffee) were less persuaded than low-relevance participants (ie, women who did not regularly drink coffee or male participants). In a second study (Kunda, 1987, Experiment 4), using a weaker and presumably less threatening message, no differences between high- and low-relevance participants were found. A closer inspection of the study means reveals that for low-relevance women, there were no differences between high- and low-threat messages. For high-relevance women, however, the low-threat message was more persuasive than the high-threat message. These findings suggest that levels of message threat and personal relevance may interact to produce persuasive outcomes. However, whereas the results of Berkowitz and Cottingham's (1960) study suggest that high-threat messages are more persuasive than low-threat messages for low-relevance recipients, Kunda's (1987) results suggest a similar interaction but different simple effects: low-threat messages were more persuasive than high-threat messages for high-relevance recipients. Given the strong support for the effectiveness of threatening messages in some studies (Witte and Allen, 2000) and the evidence that high-threat messages can backfire in other studies (Earl and Albarracín, 2007), it seems likely that high-threat messages are more persuasive than low-threat messages for low-relevance recipients, whereas low-threat messages are more persuasive than high-threat messages for high-relevance recipients.

One reason for the fact that low-threat messages are more persuasive than high-threat messages for high-relevance recipients may be the fact that those recipients are more likely to deny and dismiss the high-threat information (Brown and Smith, 2007; Liberman and Chaiken, 1992). These responses are often referred to as 'defensive' (Block and Williams, 2002; Good and Abraham, 2007; Kessels et al., 2010; Liberman and Chaiken, 1992; Van 't Riet and Ruiter, in press) and are assumed to be the consequence of motivated reasoning, a reasoning process that is biased to hold on to prior beliefs and to justify current behaviour (Keller and Block, 1999). People often respond defensively when stimulus information is incompatible with their existing beliefs (Kunda, 1990). When information is both personally relevant *and* threatening, recipients are particularly motivated to react defensively (Kessels et al., 2010).

Personal relevance and message framing

Investigating the role of potential moderators of framing effects is important to increase our knowledge of the way message framing can influence perceptions, attitudes and behaviour. The present research set out to investigate the moderating influence of personal relevance on the effects of gain- and loss-framed messages. Importantly, previous research suggests that loss-framed information results in greater negative affect (Chang, 2005; Millar and Millar, 2000; Schneider et al., 2001; Shen and Dillard, 2007) and is perceived as more threatening (Van 't Riet et al., 2010a; 2010b) than gain-framed information. Therefore, we expected that recipients would react to loss-framed messages

in a similar way as to high-threat messages. More specifically, we expected that for low-relevance participants, the loss-framed messages would be more persuasive than the gain-framed messages on account of the greater threat that the loss-framed messages entail (Hypothesis 1). On the other hand, we expected high-relevance participants to be motivated to process the messages defensively and therefore to be more readily persuaded by the low-threat gain-framed message than by the high-threat loss-framed message (Hypothesis 2).

In the present research, we investigated these hypotheses using framed messages promoting skin self-examination (SSE). Because skin cancer incidence is increasing rapidly and constitutes a significant health concern (American Cancer Society, 2008a), early detection of skin-cancer symptoms is of great importance. If cancer is diagnosed early, the patient has a greater chance of successful treatment (American Cancer Society, 2008b). Skin self-examination refers to the act of inspecting one's skin with the aim of detecting possible skin-cancer related symptoms. Especially when performed frequently, preferably once a month, it can be an effective way to detect skin cancer at an early stage (American Cancer Society, 2008b). The present study investigated whether the persuasiveness of communications promoting skin self-examination can be improved by message framing. As in previous research (Block and Williams, 2002; Kessels et al., 2010; Kunda, 1987), the extent to which participants already engaged in SSE was assessed as a measure of personal relevance. Because current behaviour might be closely associated with intention to perform the behaviour and self-efficacy to perform the behaviour, we also assessed these variables and used them as covariates in the analyses.

Method

Participants

One hundred and sixty-nine university students voluntarily participated in the experiment in exchange for €5. Most of the participants were female (149 versus 20 males). Age ranged from 17 to 25 years, with a mean age of 20.3 years (SD = 1.7).

Procedure and design

This study used a one-factorial (frame: gain frame vs. loss frame) between-participants design. Participants were seated in individual booths where they could participate in the experiment using a desk-top computer, and were told that they were about to participate in a study aimed at testing health education materials that had been designed to be used 'on the Internet'. First, participants' current level of SSE, intention to perform SSE and self-efficacy to perform SSE were assessed. Next, participants were provided with a persuasive message about performing SSE. The persuasive message was either gain- or loss-framed. Participants were randomized into the gain- and loss-framed conditions by means of a computerized random number generator. After reading the persuasive message, participants completed the dependent measures, were debriefed and received their fee.

Baseline measures

To measure participants' baseline levels of *skin self-examination*, one item asked participants how often they performed SSE on a 7-point scale (1 = never; 7 = several times a week) (M = 2.36; SD = 1.45; Range: 1–7). To assess participants' baseline *intention to perform skin self-examination*, one item asked participants to indicate whether they planned to examine their skin once a month from now on (1 = no, definitely not; 7 = yes, definitely) (M = 3.73; SD = 1.34; Range: 1–7). To measure participants' baseline *self-efficacy to perform skin self-examination*, one item asked participants: 'If you would try to perform skin self-examination once a month, would you be able to do this?' (1 = no, definitely not; 7 = yes, definitely) (M = 5.46; SD = 1.26; Range: 1–7).

Persuasive message

For the present study, we designed short gain- and loss-framed messages of 214 and 223 words, respectively. The gain-framed messages stressed the benefits of performing SSE (gain frame) whereas the loss-framed message stressed the costs of not performing SSE. For instance, the gain-framed message stressed that 'when you check your skin for changes once a month, you can detect skin cancer in an early stage' and that 'the chances of being cured are much greater if skin cancer is detected early'. In contrast, it was stated in the loss-framed message that 'when you do not check your skin for changes once a month, you might detect skin cancer in a late stage' and that 'the chances of being cured are much smaller if skin cancer is detected late'. The full texts are available from the authors upon request.

Post-message measures

To assess whether the loss-framed message was perceived as more threatening than the gain-framed message, one item asked participants to indicate the extent to which they found the message threatening (1 = Not threatening at al; 7 = Very threatening).

Intention to engage in skin self-examination was assessed by five items that were adopted from previous research (Van 't Riet et al., 2010b), asking participants to indicate whether they agreed with the statements: 'I intend to examine my skin once a month *in the coming six months*', 'I intend to examine my skin once a month *in the future*', and 'I am thinking about examining my skin once a month', all on 7-point scales (1 = I definitely do not agree; 7 = I definitely agree). In addition, they were asked to indicate how likely it would be that they would examine their skin once a month in the coming six months, and how likely it would be that they would examine their skin once a month in the future, both on a 7-point scale (1 = Very unlikely; 7 = Very likely). From these five items an average score was calculated (α =.94).

Statistical analysis

We used regression analyses to test the main effects of frame (coded as 0 = gain frame; 1 = loss frame), SSE, intention and self-efficacy and the frame by SSE interaction term on intention. To ensure that multicollinearity did not affect the results, individual scores on the baseline measures were centred (ie, by subtracting the mean from each score). In case of a significant interaction effect, simple slope analyses were conducted to investigate the nature of the interaction (see Aiken and West, 1991). In all analyses, the semi-partial correlation (*sr*) was used as a measure of effect size and was interpreted according to guidelines by Cohen (1992), stating that *sr* = .10 corresponds with a small effect size, *sr* = .30 corresponds with a medium effect size, and *sr* = .50 corresponds with a large effect size. The used statistical package was SPSS 15.0.

Results

Perceived threat

Results of the linear regression analyses showed that the loss-framed message was perceived as more threatening than the gain-framed message (M_{loss} = 4.28; M_{gain} = 3.17), β = .38, $t(166)$ = 5.26, $p < .001$, *sr* = .38. There was no significant effect of SSE or the frame by SSE interaction term on perceived threat, *p*s > .17. Table 1 shows the means and standard deviations of perceived threat in the gain- and loss-framed message condition, as well as the means and standard deviations of all other measures.

Intention

Frame did not have a significant contribution to the prediction of intention (M_{loss} = 4.19; M_{gain} = 4.27), β = .05, $t(163)$ = 1.02, p = .31). Baseline SSE did predict intention such that participants who performed SSE more frequently had a stronger intention to perform skin self-examination in the future, β = .26, $t(163)$ = 5.22, $p <$ .001, *sr* = .23. Also, baseline intention, β = .62,

Table 1. Descriptives of all measures for the gain- and loss-framed message conditions

	Gain-frame message condition (*N*=88)		Loss-frame message condition (*N*=81)	
	M	SD	*M*	SD
Age	20.67	1.80	19.89	1.56
Baseline SSE	2.43	1.42	2.30	1.48
Baseline intention	3.82	1.29	3.64	1.40
Baseline self-efficacy	5.63	1.06	5.27	1.42
Post-test perceived threat	3.17*	1.28	4.28*	1.46
Post-test intention	4.27	1.29	4.19	1.42
Gender (percentage female)	87.5%		88.9%	

*Perceived threat was the only measure for which there was a significant ($p<0.05$) difference between the gain- and loss-framed message condition

$t(163) = 12.53$, $p < .001$, $sr = .54$, and baseline self-efficacy, $\beta = .16$, $t(163) = 3.46$, $p = .001$, $sr = .15$, had significant effects on post-test intention to perform SSE. In addition, there was a significant interaction between frame and SSE, $\beta = .15$, $t(162) = 2.48$, $p = .01$, $sr = .11$. Supporting Hypothesis 1, simple slope analyses revealed that, for participants who frequently engaged in SSE (ie, one SD above the SSE mean), and for whom the information was of low personal relevance, the loss-framed message was more persuasive than the gain-framed message; $\beta = .15$, $t(162) = 2.49$, $p = .01$, $sr = .11$. For participants who did not frequently engage in SSE (ie, one SD below the SSE mean), and for whom the information was of high personal relevance, there was no significant difference between the gain- and the loss-framed message; $\beta = -.06$, $t(162) = -1.01$, $p = .31$, $sr = -.04$ (Figure 1)[1]. Thus, no support for Hypothesis 2 was found.

Additional analyses were run to investigate whether baseline intention and baseline self-efficacy moderated the effect of frame or the frame by baseline SSE interaction effect. Unexpectedly, in addition to the frame by baseline SSE interaction, we found an interaction between frame and baseline intention, $\beta = -.17$, $t(161) = -2.10$, $p < .05$. For participants with a weak baseline intention, loss-framed information was more persuasive than gain-framed information, $\beta = .14$, $t(161) = 2.27$, $p < .05$, whereas for participants with a strong baseline intention, frame had no significant effect on intention, $\beta = -.06$, $t(161) = -.87$, $p = .39$.

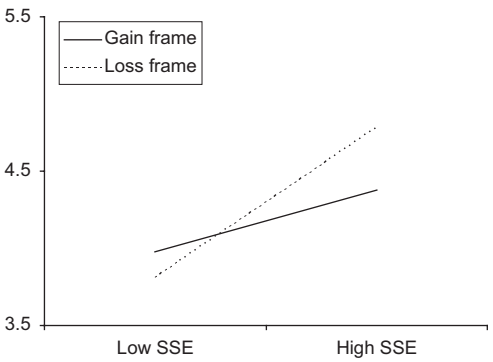

Figure 1. Regression slopes arising from the relationship between skin self-examination and intention for participants in the gain- and loss-framed information conditions

Discussion

Research has shown that loss-framed health-promoting messages are perceived as more threatening than gain-framed messages (Cox and Cox, 2001; Van 't Riet et al, 2010a; 2010b). Whereas highly threatening health-promoting messages can effectively motivate people to engage in healthy behaviour (Witte and Allen,

2000), it has also been found that high-threat messages can result in defensive reactions (Brown and Smith, 2007; Liberman and Chaiken, 1992). Particularly recipients for whom the issue holds personal relevance have been shown to be likely to react defensively to threatening health-promoting information (Berkowitz and Cottingham, 1960; Block and Williams, 2002; Croyle et al, 1993; Ditto and Lopez, 1992; Jemmot et al., 1986; Kunda, 1987; for an overview see Good and Abraham, 2007). In the present research, we therefore investigated the combined effects of personal relevance and message framing. The results supported Hypothesis 1, showing that, for low-relevance participants, loss-framed messages were more persuasive than gain-framed messages. The results did not support Hypothesis 2, showing that there was no significant difference between gain- and loss-framed messages for high-relevance participants. One explanation for this finding may be that the perceived threat associated with the messages was not strong enough. Although the loss-framed message was perceived as significantly more threatening than the gain-framed message, it was still rated only moderately threatening (ie, around the mid-point of a 7-point scale). Future research may employ more threatening information or might make use of message modalities that are more conducive to conveying threats, such as graphic material or videos (cf. Ruiter et al., 2001).

Previous research has identified several moderators of message-framing effects (eg, Cesario et al., 2004; Meyers Levy and Maheswaran, 2004; Hevey et al., 2010) but has so far failed to consider the importance of personal relevance and message threat. The present study shows that personal relevance can influence the effects of gain- and loss-framed messages.

More broadly, these results suggest that the different levels of perceived threat may be among the most important differences between gain- and loss-framed messages. This implies that the literature on motivated reasoning and defensiveness can be used to generate hypotheses about the effects of gain- and loss-framed messages. Future research may explore the role of a number of other factors, besides personal relevance, that can induce recipients to react defensively to health-promoting information and thus influence the effects of gain- and loss-framed information. For example, a previous study employing gain- and loss-framed messages combined with information about exemplars (anecdotes about individuals dealing with the health issue), found that loss-framed messages advocating sunscreen use were more persuasive than gain-framed messages, but only for those recipients who did not perceive themselves to be similar to the person described in the exemplar. Gain-framed messages, on the other hand, were more persuasive for recipients who perceived themselves to be highly similar to the person in the exemplar (Hoffner and Ye, 2009). It is possible that recipients low in similarity perceived less personal relevance and were therefore less likely to react defensively to the message, rendering the loss-framed information more persuasive. A high similarity, on the other hand, may have resulted in a high perceived personal relevance, triggering defensive reactions and rendering the gain-framed information more persuasive. In another recent study, loss-framed information advocating organ donation was shown to be more persuasive than gain-framed information for those recipients who perceived the act of donating as not particularly risky. For recipients who did perceive a high risk, there were no differences between the gain- and loss-framed conditions (Cohen, 2010). It is possible that in this case, a high perceived risk associated with the act of donating may have resulted in a motivation to process the information defensively, which decreased the persuasiveness of the loss-framed information. Future research should investigate the interesting possibilities that similarity to people described in exemplars and the perceived risk associated with a particular course of action can result in defensiveness and can therefore moderate the effects of message-framing on persuasion.

Our results suggest that, to a neutral and unbiased decision maker, highly threatening information might be more powerful than non-threatening information. One explanation for this effect is the idea of 'negativity bias', the assumption that people pay more attention to negative information than to factually equivalent positive information (Fiske, 1980; Kanouse, 1984). Because people perceive the world as predominantly positive, negative information will trigger more attention (Lau, 1985). Increased attention can lead to more systematic processing, which, in case of convincing arguments, leads to more persuasion (Chaiken et al., 1989). In addition, research on fear appeals suggests that persuasive messages containing negative information may be effective, to the extent that the negative information increases participants' perception of threat (Witte, 1992). According to Witte, at least some level of perceived threat is needed for participants to be motivated to pay attention to the message. The problem with health-promoting messages is that recipients are rarely neutral and unbiased decision makers. Smoking cessation interventions are by definition aimed at smokers, and efforts to increase fruit and vegetable consumption are predominantly aimed at those who do not meet the current standards for healthy nutrition. The results of the present research suggest that in those participants (ie, for whom the health-promoting information is personally relevant), high-threat information will not be more persuasive than low-threat information. Thus, one might say that many high-threat health-promoting messages, including loss-framed messages, run the risk of 'preaching to the choir'.

Given the results of the present study, it seems that the potential power of threatening loss-framed messages is wasted on high-relevance recipients because they are prone to defensive processing. However, there might be a way to reduce recipients' motivation to react defensively to high-threat health-promoting messages and induce them to process the information in an unbiased way. Research has suggested that an important reason why health-promoting information can be threatening is that it challenges peoples' views of themselves as 'adaptively and morally adequate' (Steele, 1988: 262). That is, for a smoker who is confronted with information about the dangers of smoking, accepting the information would mean accepting that he or she has not behaved in an adaptive and healthful way, which poses a threat to his/her notion of self-integrity (Steele, 1988). By reacting defensively, the recipient's perceived self-worth can be maintained. However, if the recipients' motive to see themselves as adaptively and morally adequate is satisfied in some other way, defensive reactions to the health-promoting information can be limited (Steele, 1988; Reed and Aspinwal, 1998; Sherman et al., 2000). Many studies indeed show that, by affirming recipients' sense of self prior to or just after exposing them to threatening information, the need for defensiveness can be reduced and recipients process the information in a more open and less biased way (Harris and Napper, 2005; Harris et al., 2007; Sherman et al., 2000). This suggests that threatening loss-framed messages may be effective if they are accompanied by a self-affirmation procedure. Indeed, a recent study found that loss-framed anti-smoking messages resulted in more anger, less positive thoughts and less perceived message strength than gain-framed messages in a no self-affirmation control condition (Zhao and Nan, 2010). However, when participants had been subjected to a self-affirmation procedure, gain- and loss-framed messages did not yield different levels of defensive processing, suggesting that self-affirmation can increase the persuasive power of loss-framed messages. Analyses of smoking intention, the main outcome measure, did not reveal a significant interaction however. Future research should further investigate the combined influence of message framing and self-affirmation for high-relevance participants to explore whether self-affirmation can reduce people's inclination to react defensively and can thus render

loss-framed health-promoting messages more effective than gain-framed messages.

The present study was subject to certain limitations. One limitation was the fact that we used a student sample. Future research should investigate whether similar effects can be obtained in the general population. Also, it has been argued that the effects of threatening messages in the real world might differ substantially from effects in laboratory settings (Hastings et al., 2004). Therefore, research is needed that investigates whether the present findings can be replicated in a field study. A second limitation was the fact that we did not include a behavioural follow-up, making it impossible to assess behavioural effects. Future research should investigate the long-term behavioural effects of personal relevance and message threat. Third, we measured the extent to which participants engaged in the unhealthy behaviour as a measure of personal relevance and, although we controlled for intention and self-efficacy to perform SSE, we cannot completely rule out the possibility that the influence of personal relevance may have been due to other possible confounding factors. Previous research, for instance, has shown that health-related behaviours may be positively associated with self-esteem (Lowery et al., 2005). It is therefore possible that participants who frequently performed skin self-examination had higher self-esteem and that this variable influenced their reactions to the health-promoting information. Replicating our results with a manipulation of personal relevance, for instance by providing participants with fake test results (Croyle et al., 1993; Ditto and Lopez, 1992), would provide stronger support for our hypotheses. Also, the present study examined only one health behaviour: skin self-examination. Possibly, other mechanisms are at work for other health behaviours. Future research should investigate the influence of personal relevance on message-framing effects in other domains. A final limitation is the fact that we did not include a control group. Without a control group, it is hard to tell whether an effect of framing is due to a beneficial effect of one frame or a 'boomerang effect' of the other (Hoffner and Ye, 2009). Previous message-framing research in the domain of skin cancer prevention showed that both gain- and loss-framed information increased intentions to use sunscreen relative to a control-group (Hoffner and Ye, 2009). Still, future research should include a control group to be able to investigate whether personal relevance a message threat can interact to produce boomerang effects.

Despite these limitations, our findings underline the importance of personal relevance in persuasion. They suggest that loss-framed information can be persuasive, but is especially likely to be effective for those recipients who already engage in healthful behaviour. This being the case, threatening health-promoting information, including loss-framed messages, runs the risk of 'preaching to the choir'.

Notes

1. We chose this procedure, using baseline SSE as a continuous variable in the regression analyses, because it has greater power than a procedure in which the effect of frame is estimated in subgroups based on a median-split. Subgroup analyses using a median split (high relevance: $N = 85$; low relevance: $N = 83$) yielded similar results, however, with no effect of frame in the high-relevance group, $\beta = -.05$, $t(81) = -.67$, $p = .50$, $sr = -.05$, and a significant advantage of loss-framed information in the low-relevance group, $\beta = .16$, $t(79) = 2.62$, $p = .01$, $sr = .16$.

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References

Aiken LS and West SG (1991) *Multiple Regression: Testing and Interpreting Interactions*. New York: Sage.

American Cancer Society (2008a) *Cancer Facts and Figures 2008*. Atlanta: American Cancer Society.

American Cancer Society (2008b) *Skin Cancer Prevention and Early Detection*. Atlanta: American Cancer Society.

Berkowitz L and Cottingham DR (1960) The interest value and relevance of fear arousing communications. *The Journal of Abnormal and Social Psychology* 60: 37–43.

Block LG and Williams P (2002) Undoing the effects of seizing and freezing: Decreasing defensive processing of personally relevant messages. *Journal of Applied Social Psychology* 32: 803–833.

Brown SL and Smith EZ (2007) The inhibitory effects of a distressing anti-smoking message on risk perceptions in smokers. *Psychology and Health* 22: 255–268.

Cesario J, Grant H and Higgins ET (2004) Regulatory fit and persuasion: Transfer from 'Feeling Right'. *Journal of Personality and Social Psychology* 86: 388–404.

Chaiken S, Liberman A and Eagly AH (1989) Heuristic and systematic information processing within and beyond the persuasion context. In: Uleman J and Bargh J (eds) *Unintended Thought*. New York: Guilford, 212–252.

Chang C (2005) The moderating influence of ad framing for ad-self-congruency effects. *Psychology and Marketing* 22: 955–968.

Cohen, J. A. (1992). A power primer. *Psychological Bulleting, 112,* 155–159.

Cohen EL (2010) The role of message frame, perceived risk, and ambivalence in individuals' decisions to become organ donors. *Health Communication* 25: 758–769.

Cox D and Cox AD (2001) Communicating the consequences of early detection: The role of evidence and framing. *Journal of Marketing* 65: 91–103.

Croyle RT, Sun Y and Louie D (1993) Psychological minimization of cholesterol test results: Moderators of appraisal in college students and community residents. *Health Psychology* 12: 503–507.

Ditto PH and Lopez DF (1992) Motivated skepticism: Use of differential decision criteria for preferred and non-preferred conclusions. *Journal of Personality and Social Psychology* 63: 568–584.

Earl A and Albarracín D (2007) Nature, decay, and spiraling of the effects of fear-inducing arguments and HIV counseling and testing: A meta-analysis of the short- and long-term outcomes of HIV-prevention interventions. *Health Psychology* 26: 496–506.

Fiske ST (1980) Attention and weight in person perception: The impact of negative and extreme behaviour. *Journal of Personality and Social Psychology* 38: 889–906.

Good A and Abraham C (2007) Measuring defensive responses to threatening messages: A meta-analysis of measures. *Health Psychology Review* 1: 208–229.

Harris PR and Napper L (2005) Self-affirmation and the biased processing of threatening health-risk information. *Personality and Social Psychology Bulletin* 31: 1250–1263.

Harris PR, Mayle K, Mabbott L and Napper L (2007) Self-affrimation reduces smokers' defensiveness to graphic on-pack cigarette warning labels. *Health Psychology* 26: 437–446.

Hastings G, Stead M and Webb J (2004) Fear appeals in social marketing: Strategic and ethical reasons for concern. *Psychology and Marketing* 21: 961–986.

Hevey D, Pertl M, Thomas K, Maher L, Craig A, Ni Chuinneagain S (2010) Body consciousness moderates the effect of message framing on intentions to use sunscreen. *Journal of Health Psychology* 15: 553–559.

Hoffner C and Ye J (2009) Young adults' responses to news about sunscreen use and skin cancer: The role of framing and social comparison. *Health Communication* 24: 189–198.

Jemmot JB, Ditto PH and Croyle RT (1986) Judging health status: Effects of perceived prevalence and personal relevance. *Journal of Personality and Social Psychology* 50: 899–905.

Kahneman D (2003) A perspective on judgment and choice: Mapping bounded rationality. *American Psychologist* 58: 697–720.

Kahneman D and Tversky A (1984) Choices, values, and frames. *American Psychologist* 39: 341–350.

Kanouse DE (1984) Explaining negativity biases in evaluation and choice behaviour: Theory and research. In: Kinnear TC (ed.) *Advances in Consumer Research* (Vol. 11). Provo, UT: Association for Consumer Research, 703–708.

Keller PA and Block LG (1999) The effect of affect-based dissonance versus cognition-based dissonance on motivated reasoning and health-related persuasion. *Journal of Experimental Psychology: Applied* 5: 302–313.

Kessels LTE, Ruiter RAC and Jansma BM (2010) Increased attention but more efficient disengagement: Neuroscientific evidence for defensive

processing of threatening information. *Health Psychology* 29: 346–354.

Kuhberger A (1998) The influence of framing on risky decisions: A meta-analysis. O*rganizational Behaviour and Human decision Process* 75: 23–55.

Kunda Z (1987) Motivated inference: Self-serving generation and evaluation of causal theories. *Journal of Personality and Social Psychology* 53: 636–647.

Kunda Z (1990) The case for motivated reasoning. *Psychological Bulletin* 108: 480–498.

Lau RR (1985) Two explanations for negativity effects in political behaviour. *American Journal of Political Science* 29: 119–138.

Liberman A and Chaiken S (1992) Defensive processing of personally relevant health messages. *Personality and Social Psychology Bulletin* 18: 669–679.

Lowery SE, Kurpius SER, Befort C, Blanks EH, Sollenberger S, Nicpon MF et al. (2005) Body image, self-esteem, and health-related behaviours among male and female first year college students. *Journal of College Student Development* 46: 612–623.

Meyers Levy J and Maheswaran D (2004) Exploring message framing outcomes when systematic, heuristic, or both types of processing occur. *Journal of Consumer Psychology* 14: 159–167.

Millar MG and Millar K (2000) Promoting safe driving behavior: The influence of message framing and issue involvement. *Journal of Applied Social Psychology* 30: 853–866.

O'Keefe DJ and Jensen JD (2006) The advantages of compliance or the disadvantages of noncompliance? A meta-analytic review of the relative persuasive effectiveness of gain-framed and loss-framed messages. In: Beck CS (ed.) *Communication Yearbook 30* (Vol. 30). Mahwah, NJ: Lawrence Erlbaum Associates, 1–44.

O'Keefe DJ and Jensen JD (2007) The relative persuasiveness of gain-framed and loss-framed messages for encouraging disease prevention behaviors: A meta-analytic review. *Journal of Health Communication* 12: 623–644.

Reed B and Aspinwall LG (1998) Self-affirmation reduces biased processing of health-risk information. *Motivation and Emotion* 2: 99–130.

Rivers SE, Salovey P, Pizarro DA, Pizarro J and Schneider TR (2005) Message framing and pap test utilization among women attending a community health clinic. *Journal of Health Psychology* 10: 65–77.

Rothman AJ and Salovey P (1997) Shaping perceptions to motivate healthy behaviour: The role of message framing. *Psychological Bulletin* 121: 3–19.

Rothman AJ, Bartels RD, Wlaschin J and Salovey P (2006) The strategic use of gain- and loss-framed messages to promote healthy behaviour: How theory can inform practice. *Journal of Communication* 56: s202–s220.

Ruiter RAC, Abraham C and Kok G (2001) Scary warnings and rational precautions: A review of the psychology of fear appeals. *Psychology and Health* 16: 613–630.

Schneider TR, Salovey P, Apanovitch AM, Pizarro J, McCarthy D, Zullo J et al. (2001) The effects of message framing and ethnic targeting on mammography use among low-income women. *Health Psychology* 20: 256–266.

Shen L and Dillard JP (2007) The influence of behavioral inhibition/approach systems and message framing on the processing of persuasive health messages. *Communication Research* 34: 433–467.

Sherman DAK, Nelson LD and Steele CM (2000) Do messages about health risks threaten the self? Increasing the acceptance of threatening health messages via self-affirmation. *Personality and Social Psychology Bulletin* 26: 1046–1058.

Steele CM (1988) The psychology of self-affirmation: Sustaining the integrity of the self. In: Berkowitz L (ed.) *Advances in Experimental Social Psychology, Vol. 21: Social Psychological Studies of the Self: Perspectives and Programs*. New York, NY: Academic Press, 261–302.

Van 't Riet, J., & Ruiter, R. A. C. (2011). Defensive reactions to health-promoting information: an overview and implications for future research. *Health Psychology Review, document in press*. DOI: 10.1080/17437199.2011.606782.

Van 't Riet J, Ruiter RAC, Smerecnik C and De Vries H (2010a) Examining the influence of self-efficacy on message-framing effects: Reducing salt consumption in the general population. *Basic and Applied Social Psychology* 32: 165–172.

Van 't Riet J, Ruiter RAC, Werrij MQ and De Vries H (2010b) Self-efficacy moderates message-framing effects: The case of skin cancer detection. *Psychology and Health* 25: 339–349.

Witte K (1992) Putting the fear back into fear appeals: The extended parallel process model. *Communication Monographs* 59: 329–349.

Witte K (1994) Fear control and danger control: A test of the extended parallel process model (EPPM). *Communication Monographs* 61: 113–134.

Witte K and Allen M (2000) A meta-analysis of fear appeals: Implications for effective public health campaigns. *Health Education and Behavior* 27: 591–615.

Zhao X and Nan X (2010) Influence of self-affirmation on responses to gain- versus loss-framed antismoking messages. *Human Communication Research* 36: 493–511.