University of Groningen

The Effects of Repeated Exposure to Graphic Fear Appeals on Cigarette Packages

Dijkstra, Arie; Colin, Bos,

Published in:
Psychology of Addictive Behaviors

DOI:
[10.1037/adb0000049](https://doi.org/10.1037/adb0000049)

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2015

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Dijkstra, A., & Colin, B. (2015). The Effects of Repeated Exposure to Graphic Fear Appeals on Cigarette Packages: A Field Experiment. *Psychology of Addictive Behaviors*, 29(1), 82-90.
<https://doi.org/10.1037/adb0000049>

Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

The Effects of Repeated Exposure to Graphic Fear Appeals on Cigarette Packages: A Field Experiment

Arie Dijkstra
University of Groningen

Colin Bos
Wageningen University

Experimental studies on the effects of graphic fear appeals on cigarette packages typically expose smokers in a single session to a fear appeal, although in practice the exposure is always repeated. The present study applied an improved study design with repeated exposure to fear appeals on cigarette packages. In this field-experiment, 118 smokers were assigned to 1 of 2 conditions with either graphic fear appeals or textual warnings on their cigarette packages. During 3 weeks, fear and disgust were assessed 6 times. The intention to quit smoking after 3 weeks and quitting activity during the 3 weeks were the dependent measures. The effects of 3 pretest individual difference moderators were tested: disengagement beliefs, number of cigarettes smoked a day, and readiness to quit. Three weeks of exposure to the graphic fear appeals led to a stronger intention to quit, but only when smokers scored low on disengagement beliefs, or were heavier smokers. In addition, smokers low in disengagement more often reported to have cut down on smoking in the graphic condition. There were no indications of habituation of fear and disgust over the 3 weeks. The effects of graphic fear appeals depended on smokers' characteristics: The moderators may explain the mixed findings in the literature. The lack of habituation may be caused by the renewal of the graphics every few days. The used field-experimental design with natural repeated exposure to graphics is promising.

Keywords: smoking, fear appeals, graphic warnings, textual warnings, repeated exposure

One public health measure to fight the problem of smoking tobacco is the use of graphic warning labels on cigarette packages, mostly accompanied by text warnings. These graphic warning labels (or graphic fear-appeals), typically depict smoke-blackened lungs, nonhealing wounds, or fattened arteries. The present study applies an improved research design that has not been used before: A field-experiment in which smokers are exposed for 21 days to new graphic warning labels on their cigarettes packages or to the default textual messages that are applied now for several years in the Netherlands.

At present, there are indications from several types of studies that graphic fear appeals on cigarette packages can be effective. First, survey data from pretest–posttest designs generally show desired changes after the graphic fear-appeals are implemented, such as an increase in quit related cognitive responses to warnings (Borland et al., 2009), and an increase in the number of calls to a quit line (Miller, Hill, Quester, & Hiller, 2009). Second, retrospective data show that smokers acknowledge that the graphic fear appeals stimulated them to quit. For example, 19% of the smokers perceived a cessation related benefit from the graphics (Hammond, Fong, McDonald, Brown, & Cameron, 2004), and 26.5% of former

smokers indicated that the graphical warnings had helped them to remain abstinent (Hammond, McDonald et al., 2004). Third, participants are asked to rate the graphic fear appeals they are provided with on hedonic valence (Nascimento et al., 2008) and several emotions (Timmers & Van der Wijst, 2007), often in an experimental design with meaningful control groups (Peters et al., 2007; Peterson, Thomsen, Lindsay, & John, 2010; Sabbane, Lowrey & Chebat, 2009). These experimental data indicate, among other things, that graphic fear appeals sometimes are better recalled (Peterson et al., 2010), induce fear that is transferred into intention to quit (Kees, Burton, Andrews, & Kozup, 2010), and make smoking become less attractive (Kees et al., 2010; Stark, Kim, Miller, & Borgida, 2008; Thrasher et al., 2007). Thus, the cumulated evidence that graphic fear appeals may be effective is substantial.

However, there are some issues that warrant further study of the effects of fear appeals regarding tobacco smoking (also see Ruiter & Kok, 2005). First, the research designs used to study fear appeals are not always strong: Several studies use nonexperimental designs, and when experimental designs are used they are typically testing the effects of a single exposure. A single exposure is a very limited test of the effects of graphic fear appeals in practice. Second, several studies suggest that smokers display defensive responses toward the graphic fear appeals that may inhibit their effects (Erceg-Hurn & Steed, 2011; Harris, Mayle, Mabbott, & Napper, 2007; Kessels, Ruiter, & Jansma, 2010; Leshner, Bolls, & Thomas, 2009; Leshner, Vultee, Bolls, & Moore, 2010). This possibility might even result in some smokers completely discarding the idea of quitting smoking (Dijkstra, 2009). This would be a serious side effect of fear appeals.

This article was published Online First January 26, 2015.

Arie Dijkstra, Department of Social Psychology, University of Groningen; Colin Bos, Marketing and Consumer Behavior Group, Wageningen University.

Correspondence concerning this article should be addressed to Arie Dijkstra, University of Groningen, Social Psychology, Grote Kruisstraat 2/1, 9712 TS, Groningen, the Netherlands. E-mail: arie.dijkstra@rug.nl

All in all, at present it is still important to increase our insight into the effects of fear appeals on cigarette packages in practice. In the present study, we attempt to bring the methodology of studying these fear appeal one step further by: (a) applying an *experiment in the field*, and (b) in which *repeated exposure* to fear appeals on cigarette package is the experimentally induction.

Repeated Exposure

Smokers are confronted with the on-pack graphics several times a day, depending on individual habits. The effects of this repeated exposure to fearful stimuli may be different from the initial exposure (McCaul, Mullens, Romanek, Erickson, & Gatheridge, 2007). Over time, effects of fearful stimuli may diminish or completely disappear (Foa & Kozak, 1986). With regard to repeated exposure to graphic fear appeals no conclusive evidence is available, although there are indications that on the population level the effects “wear out” (Borland et al., 2009; Miller et al., 2009). However, Nascimento et al. (2008) found no difference in ratings of emotional valence of well-known graphic fear-appeals and unknown pictures that “approximately matched those of the warning labels,” suggesting no habituation (also see Harmon-Jones & Allen, 2001).

On the other hand, repeated exposure might lead to increased effects: To the extent that repeated exposure to graphic fear appeals leads to repeated fearful thoughts, it may have similar effects as worry (McCaul et al., 2007), which may stimulate quitting (Dijkstra & Brosschot, 2003). That is, smokers may develop sensitized responses to the graphic fear appeals: Their reactions become stronger when they are repeatedly exposed (Beck & Shipherd, 1997). Indeed, on the basis of ratings of different health warnings, Sabbane et al. (2009) suggested that “graphic visuals [on cigarette packages] might take time to be effective tools.”

In conclusion, beforehand it is not clear what the effects of repeated exposure will be; will the effects increase or decrease over time? In the present study, the exploratory duration of the repeated exposure to graphic fear-appeals on cigarette packages will be 3 weeks, first, because this seems feasible (e.g., given the participants’ burden). Second, it is expected that in a 3 week period a relevant number of exposures will have occurred. During these weeks fear and disgust will be assessed six times to study the development of emotional reactions toward the graphics.

Individual Differences

To study the effects of fear appeals on cigarette packages, it might be important to consider segments in the target populations, as the effectiveness may differ for smokers from different segments (Berg et al., 2011; Hammond, 2011; Peters, Ruiter, & Kok, 2013). That is, according to the most used psychological model on fear-appeal effects, the Extended Parallel Process Model (EPPM; Witte, 1992; Witte & Allen, 2000), fear-appeals lead to intended psychological and behavioral change only when specific conditions are met. According to the EPPM a fear-appeal only can be effective, first, when an individual perceives a threat: He or she feels susceptible to an impending severe negative outcome (e.g., lung cancer). This perceived threat, then, leads to the experience of fear, and the motivation to look for effective solutions, which will lead to the second condition for change: A fear appeal only can be effective when an individual perceives efficacy: The individual

perceives the recommended behavior (i.e., smoking cessation) as effective in averting the threat, and he or she feels able to engage in that behavior successfully. When both appraisals are present—perceived threat and perceived efficacy of the recommended behavior—the fear appeal may induce change (e.g., smoking cessation; Peters, Ruiter, & Kok, 2013). This process is called danger-control. However, this desired process may not be activated or may be inhibited. First, when the fear-appeal does not induce perceived threat, nothing will happen as there seems no need to change. This might happen when the fear-appeal is too weak to induce a threat, or when the recipient blocks or biases the information from the fear-appeal. Second, when the fear-appeal does induce a threat but perceived efficacy is low, the individual cannot engage in danger-control. In this case he or she will engage in fear-control processes, aiming to lower the fear (e.g., denying or avoiding the threatening information). In this study, three individual difference variables related to perceived threat and perceived efficacy, as conceptualized in the EPPM, will be addressed.

The first individual difference variable concerns smokers’ disengagement beliefs (Bandura, 1986; Dijkstra, 2009): Disengagement beliefs are thoughts that serve to reduce the fear of negative consequences caused by smoking. For example, “I know heavy smokers who live long.” Disengagement beliefs may disturb the threatening quality of the fear-appeal, thereby blocking the development of perceived threat. Strong endorsement of disengagement beliefs has been shown to be related to a lower intention to quit and less quitting activity (Dijkstra & Den Dijker, 2005; Kleinjan et al., 2006; Olshavsky & Summers, 1974). It is expected that disengagement beliefs will moderate the effects of the graphic fear appeals (Dijkstra, 2009): Only in smokers with low disengagement the graphic fear appeals will form a threat appraisal that can induce further change.

The second individual difference that will be tested is the number of cigarettes smoked a day. This variable may moderate the effects of the graphic fear appeals in different ways: On the one hand, when lighter smokers think that their risk on negative health effects is relatively low, compared with heavy smokers (Ayanian & Cleary, 1999), their perceived threat may not be sufficiently strong to further support the persuasion process. Therefore, only heavy smokers may perceive a sufficient level of threat, and will start to change. On the other hand, when heavier smokers think the task of smoking cessation is difficult to them (Dijkstra & De Vries, 2000), they may not be able to form a sufficient level of perceived efficacy, and the persuasion process will stop. Only lighter smokers will perceive a sufficient level of efficacy, and will start to change. Although we cannot predict what the strongest moderation mechanism will be, we do expect that level of smoking is relevant in the present context of fear appeals on cigarette packages through its effects on perceived threat or perceived efficacy.

The third individual difference that will be tested is the smokers’ readiness to change (Prochaska, DiClemente, & Norcross, 1992). Smokers with low readiness to change—who are not aware of the severe negative consequences of smoking—seem to experience a low level of threat. A graphic fear-appeal may induce this threat and start the change process. Indeed, our own research showed that smokers in the precontemplation stage benefitted from information on the negative effects of smoking (in combination with brief information on the positive effects of quitting; Dijkstra, Conijn, & De Vries, 2006). In addition, one earlier study showed that only

smokers with low readiness increased their intention when they were presented with a fear-appeal (Wong & Cappella, 2009). Smokers with *high* readiness to quit already acknowledge the threat; that is why they are planning to quit. Thus, it is expected that especially in smokers with low readiness to quit there is room for fear appeals to increase the perceived threat.

The Present Study

The aim of this field-experimental study is to test the effects of repeated exposure to graphic fear appeals over a period of 3 weeks and compare them to that of the default textual warnings that are printed on packages of cigarettes in the Netherlands. During the 3 weeks, fear and disgust will be monitored, and after 3 weeks the intention to quit and quitting activity during the past 3 weeks will be assessed. Pretest scores on disengagement beliefs, the number of cigarettes normally smoked a day, and readiness to quit will be tested as moderators.

Method

Participants and Design

There were 118 participants who were recruited through social media (e.g., Hyves and Facebook) and by advertisements in free local papers. Participants were told that the study was about graphic fear appeals on cigarette packages. They were informed that the complete study would take place online and that they would be contacted via e-mail. In addition, participants were told that they had a chance of winning 1 of 20 €20,- coupons. Participants were in order of registration alternately assigned to one of two conditions (text vs. graphic) with a pretest, six process measurements during the experimental exposure, and a subsequent posttest (see Figure 1).

Manipulations

Participants were assigned to either the textual or graphical condition. In the textual condition participants were exposed for 21

days to the textual cigarette warning labels that are depicted on all cigarette packages in the Netherlands since May, 2002. There are 14 different text labels and each package contains two different labels, covering 30% of the front, 40% of the back, and 10% of one side of the cigarette package. These warning labels contain textual statements; 10 about the negative consequences of smoking (e.g., "Smoking kills"), and 4 related to quitting smoking (e.g., "Quitting smoking lowers the risk for heart disease").

In the graphical condition participants were exposed to graphic warning labels. For this study, five of the Australian graphic warning labels were used, which cover 90% of the back and 30% of the front of a cigarette package. The English text warnings, which accompany the graphics, were translated into Dutch. Participants were asked to place the graphic labels on their cigarette packages themselves, completely covering the original textual statements.

At the start of the study, participants in the graphical condition received a package of stickers by post, on request together with a plastic holding case for a cigarette package. The advantage of this plastic case was that participants would only have to replace the stickers five times during the study, which is the number of different fear appeal pictures used. In contrast, participants who did not use the plastic case were asked to (re)place stickers every time a new pack of cigarettes was opened. In addition, participants in the graphical condition received an instruction sheet with information on the sequence and intervals of the (re)placement of the stickers.

Measurements

Pretest. Demographic information was gathered (age, sex, and level of education) as well as smoking behavior and smoking history, which were assessed with questions regarding the number of years smoked, the amount of cigarettes smoked a day, and the number of past quit attempts. To assess readiness to change participants also indicated which of the nine following statements best fitted their future quitting plans (Dijkstra, Conijn, & De Vries, 2006): (a) I am planning to quit within 10 days; (b) I am planning to quit within 1 month; (c) I am planning to quit within 6 months; (d) I am planning to quit within 12 months; (e) I am planning to quit within 5 years; (f) I am planning to quit within 10 years; (g) I am planning to quit sometime in the future but not within 10 years; (h) I am planning to keep on smoking but to cut down; and (i) I am planning to keep on smoking and not to cut down.

The intention to quit smoking at pretest was assessed by using two items on 7-point scales (Dijkstra & Den Dijker, 2005; $r(118) = .67, p < .05$): "How strong is your intention to quit smoking in the coming month?" (1 = *not strong at all* to 7 = *very strong*), and "How strong is your intention to quit smoking in the coming 6 months?" (1 = *not strong at all* to 7 = *very strong*). The pretest intention score was the mean score on both items.

Disengagement beliefs were measured using 11 items. These items were validated and tested by Dijkstra, De Vries, Kok, and Roijackers (1999). After a first general statement ("Smoking can make me ill, but . . ."), smokers scored different reasons why it is all right to smoke (e.g., "I know heavy smokers who live long"). Participants were asked to score these items on a 5-point scale from 1 = *I don't agree* to 5 = *I do agree*. One item was removed from the original scale: The item "air pollution is just as un-

Figure 1. The field-experimental designs with repeated exposure during 21 days.

healthy,” was left out because nowadays people in the Netherlands do not consider air pollution as a significant threat anymore. The mean item score was used as the disengagement beliefs-score (Cronbach's α .79). The higher the score, the more they can be expected to be motivated to defend their smoking behavior.

Repeated measurements. All participants were asked by e-mail to fill in a short Internet questionnaire six times during the study (the 3rd, 6th, 9th, 12th, 15th, and 18th day). For participants in the graphic fear appeal condition each questionnaire consisted of three items: “To what extent were you disgusted by the images on your cigarette pack?”, “To what extent did you feel anxiety because of the images on your cigarette pack?” on a 7-point scale (1 = *not at all* to 7 = *very much*), and “How carefully did you look at the images on your cigarette pack?” on a 7-point scale (1 = *not careful at all* to 7 = *very careful*). The latter question was meant as a simple measure of attention allocation. Participants in the textual condition received the same questionnaires, but the phrase “the images on your cigarette pack” was replaced by “the text(s) on your cigarette pack.”

Posttest. The intention to quit smoking was measured in the same way as during the pretest ($r(104) = .75, p < .05$). In addition, participants were asked, “During the past 21 days, since you joined this study, have you been refraining from smoking for at least 1 day?” (yes/no), and, “. . . have you changed your smoking (smoked more, smoked less, or smoked the same).”

Results

Sample Characteristics

There were 118 smokers who provided the pretest data (text condition $n = 57$, graphic condition $n = 61$). Fifty-six percent was female, the mean age was 37.4 years ($SD = 13.8$), 19.5% had a lower level of education, 41.5% a medium level, and 39% a higher level of education. They smoked 13.2 cigarettes a day ($SD = 9.8$), and their mean score on the disengagement beliefs was 3.31 ($SD = 0.66$). The mean number of past quit attempts was 2.6 ($SD = 9.4$); 27% indicated to never have tried to quit, 24% had been engaged in one quit attempt, whereas 49% had been engaged in more than one quit attempt. Regarding readiness to quit, 16.9% was planning to quit within 6 months, 47.2% planned to quit within 10 years, but not within the next 6 months, whereas the remaining 35.6% was not planning to quit within 10 years or was planning to keep on smoking. This low readiness to change of the sample was also indicated by the low mean intention to quit at pretest, which was 2.2 ($SD = 1.55$) on a scale from 1 to 7.

Condition Comparability

The participants in both conditions were compared on pretest gender, level of education, age, number of cigarettes smoked a day, number of past quit attempts, readiness to change, disengagement beliefs, and pretest intention to quit. For categorical variables χ^2 analyses were used, for continuous variables analysis of variance (ANOVA). On all these variables the conditions did not differ significantly ($p > .16$), suggesting that the starting position of the smokers in both conditions was similar.

Manipulation Check

We assessed whether the conditions led to the expected differences in change processes: levels of fear and disgust and attention allocation. In the graphical condition, participants scored significantly higher on reported anxiety ($M = 3.06, SD = 0.21$) than in the textual condition ($M = 1.61, SD = 0.12$; $F(1, 112) = 34.97, p = .001$). The same goes for reported disgust; participants in the graphical condition scored significantly higher ($M = 3.45, SD = 0.22$) than in the textual condition ($M = 1.66, SD = 0.13$; $F(1, 112) = 46.67, p = .001$). In addition, more attention seemed to be allocated to the graphics ($M = 5.18, SD = 0.19$) than to the texts ($M = 2.83, SD = 0.26$; $F(1, 112) = 54.37, p = .001$). The actual application of the stickers in the graphic condition was not assessed.

Effects on Anxiety and Disgust

Data on reported anxiety and disgust were gathered on six subsequent occasions. The correlation between both one-item measures ranged from .74 to .87. Therefore, for each of the six occasions both measures were combined to form six subsequent scores on negative emotions. The number of missing data on these variables ranged from 11 to 26 over the six occasions.

A repeated measures analysis was used to test whether negative emotions changed over time and whether these changes differed for the text and the graphic condition. For this analysis, complete data were available for only 70 participants (graphical condition $n = 37$; textual condition $n = 33$). Before conducting the repeated measures analysis, these 70 participants were compared with the 48 who did not provide complete data on pretest disengagement beliefs, intention to quit, age, number of cigarettes a day, number of quit attempts, gender, level of education, and condition. There were no significant differences (all $ps > .14$).

The repeated measures analysis taking both conditions together revealed that the reported negative emotions did not change significantly over the six measurements ($p = .11$). Thus, there was no significant increase and no significant decrease in negative emotions. In addition, the patterns of negative emotions over the six measurements did not they change differentially in the text and the graphic condition ($p = .58$). However, there was a main effect of condition on negative emotions, $F(1, 68) = 29.04, p < .001$, indicating that over all six measurement the graphic condition induced stronger negative emotions ($M = 3.47$ vs. $M = 1.58$).

Attrition Analyses

With regard to the first dependent variable, intention to quit after 3 weeks, complete data were available from 104 (88%) of the 118 respondents at pretest. With regard to the two measures of quitting activity, 101 smokers provided their responses (85.6%). The 104 and the 101 respondents were compared with the nonrespondents on the same variables as used to test the condition comparability. None of the tests were significant (smallest $p = .09$, all others $> .20$), suggesting that the respondents did not differ much from the participants in the originally recruited sample. In addition, the conditions did not differ significantly ($p > .32$) on the number of nonrespondents at posttest.

Effect on Intention to Quit

There were 104 participants provided a posttest intention score. The main effect of condition on intention to quit was not significant ($p = .31$). Therefore, moderation was tested. Three two-way interactions were tested using analysis of covariances (ANCOVAs) with intention to quit after 21 days as dependent variable and intention to quit at pretest, the number of cigarettes smoked a week and the number of past quit attempts as covariates: Condition $\times$ Disengagement beliefs; Condition $\times$ Number of cigarettes, and Condition $\times$ Readiness to change. The latter interaction was not significant (also when readiness to change was recoded into a three-level measure of stage of change and treated as a factor). The first two interactions were significant ($p < .05$), also when they were combined into one saturated model, Condition $\times$ Disengagement beliefs, $F(1, 96) = 4.41$; $p < .05$; Condition $\times$ Number of cigarettes, $F(1, 96) = 4.3$; $p < .05$. This indicates that the interactions existed independently of each other.

To search for the meaning of the first interaction, a group of participants scoring low and a group of participants scoring high on disengagement beliefs were modeled using the complete dataset, by decreasing and increasing the mean-centered scores on disengagement beliefs with 1 *SD*, respectively (Cohen, Cohen, Aiken, & West, 2003). This method has important benefits compared with the median split method, as it avoids making a theoretically arbitrary cut-off point on a continuous scale, and does not lower the statistical power because of reducing the number of participants.

Figure 2 shows the means on intention to quit in both conditions, in the case of low and high scores on disengagement. The statistical analyses showed that in the case of high disengagement scores, the effect of condition was not significant ($p > .48$). However, in the case of low disengagement scores, the effect of condition was significant, $F(1, 97) = 5.47$, $p = .021$: participants in the graphic condition reported a higher intention to quit compared with the text condition. In addition, the correlation between disengagement and intention to quit (while partialing out pretest intention) was significant in the graphic condition only, $r(49) = -.31$, $p = .027$. Only in this condition, weaker endorsement of disengagement beliefs was related to a stronger intention to quit.

To search for the meaning of the interaction between condition and number of cigarettes, the same procedure was fol-

Figure 2. The effects of graphics and texts on the intention to quit are moderated by disengagement beliefs.

lowed. Figure 3 shows the means on intention to quit in both conditions, in the case of low and high scores on the number of cigarettes normally smoked. The effects of condition were studied in the case of a lower number of cigarettes smoked and a higher number of cigarettes smoked using the same procedure as above. The statistical analyses showed that in the case of a higher number of cigarettes, the effect of condition was significant, $F(1, 98) = 4.72$, $p = .032$: Participants in the graphic condition showed to a higher intention to quit compared with the text condition. As shown in Figure 3, the intention to quit in the latter condition was particularly low.

In the case of a lower number of cigarettes, the effect of condition was not significant ($p > .50$). In addition, the correlation between number of cigarettes smoked and intention to quit (while partialing out pretest intention) approached significance in the text condition only, $r(49) = -.25$, $p = .074$. Only in this condition, there was a trend for heavier smokers having lower intentions to quit.

Effects on Quitting Activity

Of the 101 smokers from whom self-report data on smoking behavior were available, 22 (21.8%) reported to have "refrained from smoking for at least one day" (21.8%); 14 (28%) in the text condition and 8 (15.7%) in the graphic condition. The main effect of condition, using a logistic regression analysis with number of cigarettes smoked and number of past quit attempts as covariates, was not significant ($p = .14$). Therefore, moderation was tested (including both covariates in the models). The three interactions between condition on the one hand, and disengagement beliefs, number of cigarettes smoked, and readiness to change on the other hand, were not significant ($p > .12$); not in a combined saturated model and not in separately tested models ($p > .12$).

Effects on Cutting Down

Of the 101 smokers from whom self-report data on smoking behavior were available, 21 (20.8%) reported to have cut down on smoking since the start of the study; 9 (18%) in the text condition and 12 (23.5%) in the graphic condition. The main effect of condition, using a logistic regression analysis with the same covariates as above, was not significant ($p = .50$). Therefore, moderation was tested. The interactions between condition and number of cigarettes smoked, and between condition and readiness to change were not significant ($p > .21$).

However, the interaction between condition and disengagement beliefs was significant, odds ratio (OR) = 0.23 (confidence interval [CI] 0.06–0.94), $p = .041$, only in the separately tested model. Using the procedure outlined above, in the case of high disengagement there was no significant difference between the conditions ($p = .27$). However, in the case of low disengagement the effect of condition was significant, OR = 5.80 (CI 1.33–25.24), $p = .019$. As can be seen in Figure 4 (showing raw percentages from median split), in the graphic condition more smokers reported to have cut down on smoking (40% vs. 20.8%).

Discussion

The results showed that repeated exposure to graphic fear appeals supported the process of behavior change only in subgroups

Figure 3. The effects of graphics and texts on the intention to quit are moderated by the number of cigarettes smoked.

of smokers. In smokers low in disengagement before exposure, the graphic fear-appeals led to a higher intention to quit and a higher percentage of smokers cutting down. Thus, only when the graphic fear appeal information was not biased and disturbed by disengagement beliefs, smokers perceived a relevant level of threat that eventually led to the danger-control process. On the basis of EPPM we must assume that these smokers already had a sufficient level of perceived efficacy. Thus, both conditions for effects of fear-appeals were met in smokers with low disengagement beliefs: (a) the fear-appeals induced perceived threat; (b) in smokers who already perceived a sufficient level of perceived efficacy (Peters, Ruiter, & Kok, 2013). These results also imply that adherence to disengagement beliefs inhibited the effects of the graphics, which is in line with the notion that disengagement beliefs function to lower the negative affect caused by the graphics (Dijkstra, 2009), and function in the fear-control process (Witte, 1992).

Besides disengagement beliefs, the number of cigarettes normally smoked also moderated the effects of the graphics: The graphics led to a higher intention to quit, only in heavy smokers. It may be that in lighter smokers the graphic fear appeal did not lead to perceived threat because these smokers think that their risk on the graphically depicted negative outcomes is relatively lower (compared with heavy smokers) because of their lower exposure to tobacco. The significant effect of the graphics in heavy smokers must be viewed against the background of the low intention to quit of heavy smokers in the textual condition. This condition represents the default situation of smokers in the Netherlands (Dijkstra & Den Dijker, 2005): The higher the number of cigarettes smoked a day, the lower the intention to quit.

We assume that the low intention of heavy smokers is functional: Their heavy smoking indicates a stronger need for smoking in the combination with a relatively higher risk for negative outcomes (compared with lighter smokers). To cope with this ambivalent situation they may use defensive self-regulatory processes to hold off, ignore, or avoid information on the dangers of smoking, which may lead to their low intention to quit. In the stable default situation (textual messages have been implemented already for years) this may have worked for them. However, the graphic fear-appeals seemed to be able to penetrate these defensive self-regulatory processes, probably because of their vividness (Taylor & Thompson, 1982) and novelty (Krugman, Fox, Fletcher, Fischer, & Rojas, 1994). In the framework of the EPPM these

graphics seemed to have induced a level of perceived threat that was sufficient to stimulate the process of danger-control.

More important, the above effects of the graphics in heavy smokers were present independently of the effect of disengagement beliefs, suggesting the involvement of other defense mechanisms: Besides cognitive reappraisal—in the present study through the use of disengagement beliefs—van 't Riet and Ruiter (2013) conceptualize avoidance, denial, and suppression as defense mechanisms.

Similar as in smokers with low disengagement beliefs, we must assume that in heavy smokers both conditions for effects of fear-appeals were met: (a) the fear-appeals induced perceived threat, and (b) in smokers who already perceived a sufficient level of perceived efficacy (Peters, Ruiter, & Kok, 2013). This is in line with predictions of Peters, Ruiter, and Kok (2013), that in (sub) populations who already have a sufficient level of perceived efficacy, a fear appeal in isolation (i.e., without providing efficacy information) can be expected to be effective.

Although these results suggest that graphic fear-appeals can be effective in subgroups, this does not mean that in other subgroups they had no psychological effects; that they were inert. One possibility is that the lack of effect is caused by a defensive reaction induced by the graphics. Such reactions are well documented (Liberman & Chaiken, 2003) in smokers (Harris et al., 2007; Kessels et al., 2010), and this possibility underlines the risk for possible drawbacks of graphic fear-appeals (Ruiter & Kok, 2005). When applied on a larger scale—as graphic fear-appeals on tobacco packages are—they might have substantial negative effects on the population level. From a health promotion perspective, the core question is whether the positive effects on quitting outweigh the negative effects on quitting.

An innovative aspect of the present experiment was that smokers were exposed to the graphics on their packages more than once or brief (i.e., 21 days). Only McCaul et al. (2007) studied the effects of repeated exposure to fear appeals regarding smoking, although their procedure did not concern exposure to the fear appeals on cigarette packages: Their participants were instructed to expose themselves to cards displaying the graphics four times a day during seven subsequent days.

In our experiment, the graphics were put on the cigarette packages (or on a box with the cigarette package in it), implying that the potential exposure was related to the number of cigarettes

Figure 4. The effect of graphics and texts on the proportion of smokers who have cut down on smoking during the past 21 days is moderated by disengagement beliefs.

smoked (on average 13 a day, in our sample). It was expected that repeated exposure would lead to changes in how the graphics are perceived. More specifically, the levels of negative affective reactions might change over time; they might increase (sensitization) or decrease (habituation). No significant changes over time were detected over the six measurements. Although the level of fear and disgust were higher in the graphic condition compared with the textual condition, they were stable over time, as in the textual condition. In the textual condition it may be argued that smokers were used to the texts; habituation had occurred as they are exposed to the textual messages for several years already.

It should be noted that in the graphic condition, smokers were provided with five different types of pictures they were instructed to apply on their packages subsequently. As a result they were exposed only a few days to one type of picture. It may be that this refreshing of the pictures attenuated the process of habituation; attracting renewed attention with new pictures (Krugman et al., 1994). This process might have supported a process of sensitization, but this did not seem to be the case. In practice, when graphic fear-appeals on cigarette packages are implemented, smokers will be exposed randomly to a number of pictures. It may be that when a limited number of pictures are applied, habituation takes longer than a few weeks. Carefully and frequently monitoring smokers' reactions toward the graphics once they are implemented may show what happens in the practice of graphic fear-appeals on tobacco packages. From the perspective of health promotion, the results of this monitoring may be used to decide whether new pictures need to be applied or not.

The participant sample included smokers with low, medium, and high readiness to change but this individual attribute did not influence the effects of the graphics. It was predicted that especially in those with low readiness fear-appeals could be effective. The lack of a moderating effect is not in line with the notion that smokers in different stages of change differ qualitatively (Prochaska, DiClemente, & Norcross, 1992). When it comes to our graphic fear-appeals, the short term reactions of smokers with different levels of readiness to quit looked similar. However, it is still possible that in smokers with high readiness the graphic fear appeal had no effect because they already acknowledge the threat, whereas in smokers with low readiness the graphic fear appeal activated a defensive reaction (fear-control) that inhibited the danger-control process (Cho & Salmon, 2006).

This study has some limitations and features that should be taken into account when interpreting its outcomes. To start with, smokers in the control group were exposed to the default textual labels, with most labels referring to the potential negative outcomes of smoking. Thus, smokers in the control condition were not exposed to nothing but they received "treatment as usual." This means that this study does not test whether graphical warnings on packages work against a baseline of no warnings, but whether graphics add effectiveness to textual warnings.

In addition, although the ecological validity of the present experiment was enhanced (a) by applying it in the field and, (b) by repeated exposure, still several aspects differ from the practice of implemented graphic fear-appeals on tobacco packages. The main difference is the fact that the participants were not embedded in a broader cultural and social environment that was also exposed to the same graphics (also see Strahan et al., 2002). That is, when graphic fear-appeals are introduced, not only the individual is

exposed to the graphics, but smokers as well as nonsmokers communicate personally and in the media about the introduction and about the graphics. Observing others' reactions means that a social norm develops that may undermine or support the individual effects of the graphics. In addition, changes in social norms may lead to changes in availability of (information on) quitting methods. Thus, in the present study such spin-off effects that codetermine the effects of graphic fear-appeals were not addressed. Related to this issue of broader social or societal effects is that our effects only concern smoking cessation (intentions); not prevention of initiation of smoking in youngsters or relapse prevention in ex-smokers.

Another relevant aspect of this study concerns its measurement. The data from this study were based on self-reports of smokers. Because this study can be classified as "low demand" (no personal contact, no strict commitments), there is little reason for participants to lie, and self-reports on smoking behavior can be considered to be valid (Glasgow et al., 1993; Velicer, Prochaska, Rossi, & Snow, 1992). Furthermore, the intention to quit as dependent variable is not a perfect measure of future behavior: It is clear that not all people live up to their intentions and the intention-behavior gap is renowned (Webb & Sheeran, 2006). However, it is the best predictor of behavior available, and in earlier studies on smoking cessation intention it was a robust predictor of quitting activity, up to 14 months later (Dijkstra & Den Dijker, 2005; Dijkstra, De Vries, Kok, & Roijackers, 1999).

One relevant uncertainty in this study concerns the extent to which the smokers followed our instructions to use the stickers; on all their tobacco packages during the 21 days, including the refreshing of pictures. We did not assess whether the participants complied with the instructions, and therefore, we cannot rule out that a substantial proportion of the participants in the graphics condition did not stick the pictures on their packages. However, the significant effects we found of the graphics indicate at least some relevant level of exposure to the graphic fear-appeals. Still, future studies using a similar design with repeated exposure should further improve the assessment of compliance and exposure in the graphic condition.

In conclusion, the graphic fear appeals were only effective in subgroups of smokers, which was only revealed because potential moderators were assessed and tested. The effects of the moderators can be understood through the EPPM in which two conditions have to be met for fear appeals to be effective: Recipients must perceive the threat but also must perceive a sufficient level of efficacy. Therefore, on the basis of EPPM the effects of a fear-appeal in isolation (so, without providing efficacy information) depend on the starting position of the population regarding perceived efficacy (Peters, Ruiter, & Kok, 2013). This leads us to recommend the use of graphic fear-appeals on cigarette packages only when smokers have easy access to (information on) means to quit. Thus, graphic fear-appeals may be used in concert with other measures and facilities that support quitting smoking.

Future research may further increase our understanding of the effects of graphic fear appeals on cigarette packages by further theorizing and testing the same and other moderators. In addition, the present study showed that a field-experimental paradigm with repeated exposure to fear appeals on cigarette packages is feasible, although future studies may further improve and refine the procedures.

References

- Ayanian, J. Z., & Cleary, P. D. (1999). Perceived risks of heart disease and cancer among cigarette smokers. *Journal of the American Medical Association*, 281, 1019–1021. <http://dx.doi.org/10.1001/jama.281.11.1019>
- Bandura, A. (1986). *Social foundations of thought and action; a social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.
- Beck, J. G., & Shipherd, J. C. (1997). Repeated exposure to interoceptive cues: Does habituation of fear occur in panic disorder patients? A preliminary report. *Behaviour Research and Therapy*, 35, 551–557. [http://dx.doi.org/10.1016/S0005-7967\(97\)00010-7](http://dx.doi.org/10.1016/S0005-7967(97)00010-7)
- Berg, C. J., Thrasher, J. F., Westmaas, J. L., Buchanan, T., Pinsker, E. A., & Ahluwalia, J. S. (2011). College student reactions to health warning labels: Sociodemographic and psychosocial factors related to perceived effectiveness of different approaches. *Preventive Medicine*, 53, 427–430. <http://dx.doi.org/10.1016/j.ypmed.2011.09.006>
- Borland, R., Wilson, N., Fong, G. T., Hammond, D., Cummings, K. M., Yong, H. H., . . . McNeill, A. (2009). Impact of graphic and text warnings on cigarette packs: Findings from four countries over five years. *Tobacco Control*, 18, 358–364. <http://dx.doi.org/10.1136/tc.2008.028043>
- Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences* (3rd ed.). Mahwah, NJ: Erlbaum.
- Cho, H., & Salmon, C. T. (2006). Fear appeals for individuals in different stages of change: Intended and unintended effects and implications on public health campaigns. *Health Communication*, 20, 91–99. http://dx.doi.org/10.1207/s15327027hc2001_9
- Dijkstra, A. (2009). Disengagement beliefs in smokers: Do they influence the effects of a tailored persuasive message advocating smoking cessation? *Psychology & Health*, 24, 791–804. <http://dx.doi.org/10.1080/08870440801998962>
- Dijkstra, A., & Brosschot, J. (2003). Worry about health in smoking behaviour change. *Behaviour Research and Therapy*, 41, 1081–1092. [http://dx.doi.org/10.1016/S0005-7967\(02\)00244-9](http://dx.doi.org/10.1016/S0005-7967(02)00244-9)
- Dijkstra, A., Conijn, B., & De Vries, H. (2006). A match-mismatch test of a stage model of behaviour change in tobacco smoking. *Addiction*, 101, 1035–1043. <http://dx.doi.org/10.1111/j.1360-0443.2006.01419.x>
- Dijkstra, A., & Den Dijker, L. (2005). Physical threat and self-evaluative emotions in smoking cessation. *Journal of Applied Social Psychology*, 35, 1859–1878. <http://dx.doi.org/10.1111/j.1559-1816.2005.tb02199.x>
- Dijkstra, A., & De Vries, H. (2000). Self-efficacy with regard to different tasks in smoking cessation. *Psychology & Health*, 15, 501–511.
- Dijkstra, A., De Vries, H., Kok, G., & Roijackers, J. (1999). Self-evaluation and motivation to change: Social cognitive constructs in smoking cessation. *Psychology & Health*, 14, 747–759. <http://dx.doi.org/10.1080/08870449908410762>
- Erceg-Hurn, D. M., & Steed, L. G. (2011). Does exposure to cigarette health warnings elicit psychological reactance in smokers? *Journal of Applied Social Psychology*, 41, 219–237. <http://dx.doi.org/10.1111/j.1559-1816.2010.00710.x>
- Foa, E. B., & Kozak, M. J. (1986). Emotional processing of fear: Exposure to corrective information. *Psychological Bulletin*, 99, 20–35. <http://dx.doi.org/10.1037/0033-2909.99.1.20>
- Glasgow, R. E., Mullooly, J. P., Vogt, T. M., Stevens, V. J., Lichtenstein, E., Hollis, J. F., . . . Vogt, M. R. (1993). Biochemical validation of smoking status: Pros, cons, and data from four low-intensity intervention trials. *Addictive Behaviors*, 18, 511–527. [http://dx.doi.org/10.1016/0306-4603\(93\)90068-K](http://dx.doi.org/10.1016/0306-4603(93)90068-K)
- Hammond, D. (2011). Health warning messages on tobacco products: A review. *Tobacco Control*, 20, 327–337. <http://dx.doi.org/10.1136/tc.2010.037630>
- Hammond, D., Fong, G. T., McDonald, P. W., Brown, K. S., & Cameron, R. (2004). Graphic Canadian cigarette warning labels and adverse outcomes: Evidence from Canadian smokers. *American Journal of Public Health*, 94, 1442–1445. <http://dx.doi.org/10.2105/AJPH.94.8.1442>
- Hammond, D., McDonald, P. W., Fong, G. T., Brown, K. S., & Cameron, R. (2004). The impact of cigarette warning labels and smoke-free bylaws on smoking cessation: Evidence from former smokers. *Canadian Journal of Public Health*, 95, 201–204.
- Harmon-Jones, E., & Allen, J. J. B. (2001). The role of affect in the mere exposure effect: Evidence from psychophysiological and individual differences approaches. *Personality and Social Psychology Bulletin*, 27, 889–898. <http://dx.doi.org/10.1177/0146167201277011>
- Harris, P. R., Mayle, K., Mabbott, L., & Napper, L. (2007). Self-affirmation reduces smokers' defensiveness to graphic on-pack cigarette warning labels. *Health Psychology*, 26, 437–446. <http://dx.doi.org/10.1037/0278-6133.26.4.437>
- Kees, J., Burton, S., Andrews, J. G., & Kozup, J. (2010). Understanding how graphic pictorial warnings work on cigarette packaging. *Journal of Public Policy & Marketing*, 29, 265–276. <http://dx.doi.org/10.1509/jppm.29.2.265>
- Kessels, L. T. E., Ruiter, R. A. C., & Jansma, B. M. (2010). Increased attention but more efficient disengagement: Neuroscientific evidence for defensive processing of threatening health information. *Health Psychology*, 29, 346–354. <http://dx.doi.org/10.1037/a0019372>
- Kleinjan, M., van den Eijnden, R. J., Dijkstra, A., Brug, J., & Engels, R. C. M. E. (2006). Excuses to continue smoking: The role of disengagement beliefs in smoking cessation. *Addictive Behaviors*, 31, 2223–2237. <http://dx.doi.org/10.1016/j.addbeh.2006.02.012>
- Krugman, D. M., Fox, R. J., Fletcher, J. E., Fischer, P. M., & Rojas, T. H. (1994). Do adolescent attend to warnings in cigarette advertising? An eye-tracking approach. *Journal of Advertising Research*, November/December, 3, 9–52.
- Leshner, G., Bolls, P., & Thomas, E. (2009). Scare 'em or disgust 'em: The effects of graphic health promotion messages. *Health Communication*, 24, 447–458. <http://dx.doi.org/10.1080/10410230903023493>
- Leshner, G., Vultee, F., Bolls, P. D., & Moore, J. (2010). When a fear appeal isn't just a fear appeal: The effects of graphic anti-tobacco messages. *Journal of Broadcasting & Electronic Media*, 54, 485–507. <http://dx.doi.org/10.1080/08838151.2010.498850>
- Liberman, A., & Chaiken, S. (2003). Defensive processing of personally relevant health messages. In P. Salovey & A. J. Rothman (Eds.), *Social psychology of health* (pp. 118–129). New York, NY: Psychology Press.
- McCaul, K. D., Mullens, A. B., Romanek, K. M., Erickson, S. C., & GATHERIDGE, B. J. (2007). The motivational effects of thinking and worrying about the effects of smoking cigarettes. *Cognition and Emotion*, 21, 1780–1798. <http://dx.doi.org/10.1080/02699930701442840>
- Miller, C. L., Hill, D. J., Quester, P. G., & Hiller, J. E. (2009). Impact on the Australian Quitline of new graphic cigarette pack warnings including the Quitline number. *Tobacco Control*, 18, 235–237. <http://dx.doi.org/10.1136/tc.2008.028290>
- Nascimento, B. E. M., Oliveira, L., Vieira, A. S., Joffily, M., Gleiser, S., Pereira, M. G., . . . Volchan, E. (2008). Avoidance of smoking: The impact of warning labels in Brazil. *Tobacco Control*, 17, 405–409. <http://dx.doi.org/10.1136/tc.2008.025643>
- Olshavsky, R. W., & Summers, J. O. (1974). A study of the role of beliefs and intentions in consistency restoration. *Journal of Consumer Research*, 1, 63–70. <http://dx.doi.org/10.1086/208582>
- Peters, E., Romer, D., Slovic, P., Jamieson, K. H., Wharfield, L., Mertz, C. K., & Carpenter, S. M. (2007). The impact and acceptability of Canadian-style cigarette warning labels among U.S. smokers and non-smokers. *Nicotine & Tobacco Research*, 9, 473–481. <http://dx.doi.org/10.1080/14622200701239639>
- Peters, G. J. Y., Ruiter, R. A. C., & Kok, G. (2013). Threatening communication: A critical re-analysis and a revised meta-analytic test of fear appeal theory. *Health Psychology Review*, 7, S8–S31.

- Peterson, E. B., Thomsen, S., Lindsay, G., & John, K. (2010). Adolescents' attention to traditional and graphic tobacco warning labels: An eye-tracking approach. *Journal of Drug Education, 40*, 227–244. <http://dx.doi.org/10.2190/DE.40.3.b>
- Prochaska, J. O., DiClemente, C. C., & Norcross, J. C. (1992). In search of how people change. Applications to addictive behaviors. *American Psychologist, 47*, 1102–1114. <http://dx.doi.org/10.1037/0003-066X.47.9.1102>
- Ruiter, R. A. C., & Kok, G. (2005). Saying is not (always) doing: Cigarette warning labels are useless. *European Journal of Public Health, 15*, 329. <http://dx.doi.org/10.1093/eurpub/cki095>
- Sabbane, L. I., Lowrey, T. M., & Chebat, J. C. (2009). The effectiveness of cigarette warning label threats on nonsmoking adolescents. *Journal of Consumer Affairs, 43*, 332–345. <http://dx.doi.org/10.1111/j.1745-6606.2009.01142.x>
- Stark, E., Kim, A., Miller, C., & Borgida, E. (2008). Effects of including a graphic warning label in advertisements for reduced-exposure products: Implications for persuasion and policy. *Journal of Applied Social Psychology, 38*, 281–293. <http://dx.doi.org/10.1111/j.1559-1816.2007.00305.x>
- Strahan, E. J., White, K., Fong, G. T., Fabrigar, L. R., Zanna, M. P., & Cameron, R. (2002). Enhancing the effectiveness of tobacco package warning labels: A social psychological perspective. *Tobacco Control, 11*, 183–190. <http://dx.doi.org/10.1136/tc.11.3.183>
- Taylor, S. E., & Thompson, S. C. (1982). Stalking the elusive vividness effect. *Psychological Review, 89*, 155–181. <http://dx.doi.org/10.1037/0033-295X.89.2.155>
- Thrasher, J. F., Rousu, M. C., Anaya-Ocampo, R., Reynales-Shigematsu, L. M., Arillo-Santillán, E., & Hernández-Avila, M. (2007). Estimating the impact of different cigarette package warning label policies: The auction method. *Addictive Behaviors, 32*, 2916–2925. <http://dx.doi.org/10.1016/j.addbeh.2007.05.018>
- Timmers, R., & van der Wijk, P. (2007). Images as anti-smoking fear-appeals: The effect of emotion on the persuasion process. *Information Design Journal, 15*, 21–36. <http://dx.doi.org/10.1075/idj.15.1.04tim>
- van 't Riet, J., & Ruiter, R. A. C. (2013). Defensive reactions to health-promoting information: An overview and implications for future research. *Health Psychology Review, 7*, S104–S136. <http://dx.doi.org/10.1080/17437199.2011.606782>
- Velicer, W. F., Prochaska, J. O., Rossi, J. S., & Snow, M. G. (1992). Assessing outcome in smoking cessation studies. *Psychological Bulletin, 111*, 23–41. <http://dx.doi.org/10.1037/0033-2909.111.1.23>
- Webb, T. L., & Sheeran, P. (2006). Does changing behavioral intentions engender behavior change? A meta-analysis of the experimental evidence. *Psychological Bulletin, 132*, 249–68. <http://dx.doi.org/10.1037/0033-2909.132.2.249>
- Witte, K. (1992). Putting the fear back into fear appeals: The extended parallel process model. *Communications Monographs, 59*, 329–349. <http://dx.doi.org/10.1080/03637759209376276>
- Witte, K., & Allen, M. (2000). A meta-analysis of fear appeals: Implications for effective public health campaigns. *Health Education & Behavior, 27*, 591–615. <http://dx.doi.org/10.1177/109019810002700506>
- Wong, N. C. H., & Cappella, J. N. (2009). Antismoking threat and efficacy appeals: Effects on smoking cessation intentions for smokers with low and high readiness to quit. *Journal of Applied Communication Research, 37*, 1–20. <http://dx.doi.org/10.1080/00909880802593928>

Received April 16, 2014

Revision received October 27, 2014

Accepted November 13, 2014 ■