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The Effects of Graphic Warning Labels' Vividness on Message Engagement and Intentions to Quit Smoking

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Abstract

The current study examined the effects of manipulating the level of vividness through the presence of various textual and visual components in the context of tobacco warning labels. An online experiment was conducted (N=2165) to examine whether increasing the vividness of warning labels, using narrative and non-narrative components, increased engagement with the messages, and the subsequent effects of vividness and engagement on intentions to quit smoking. Results showed that more vivid warning labels led to increased engagement, which in turn was linked to increased intentions to quit smoking. Specifically, the indirect effect of vividness on intentions to quit smoking was largely driven by the emotional component of engagement. Indirect effects of cognitive engagement were only apparent at higher levels of vividness.

Keywords

Vividness; Engagement; Emotion; Tobacco; Graphic warning labels

In their seminal book, Nisbett and Ross (1980) argued that vividly presented information has greater impact than pallid and abstract information. Their argument was primarily conceptual, but its flexibility and promise for the study of persuasion led to a high volume of empirical work testing the vividness hypothesis. The studies that followed yielded contradictory results with vivid messages not always increasing persuasion, and in some cases even impairing it (Taylor & Thompson, 1982). One manipulation of vividness that did produce fairly consistent results is the use of exemplars (Allen & Preiss, 1997). Providing audiences with anecdotes or personal story lines (Zillman, 2002) increased vividness by examining the impact of events on specific individuals (Knobloch-Westerwick, 2015), and tended to lead to greater acceptance of persuasive messages than providing pallid, impersonal, and often statistical information. Meta-analyses show that these studies usually operationalized vividness through a binary comparison of narratives against non-narratives (Shen et al., 2015).

We carried out a more complex operationalization of vividness (Frey & Eagly, 1993; Block & Keller, 1997) testing the accumulative effect of various vividness components. Possible

components making exemplification more or less vivid and engaging were developed consistent with the context of tobacco warning labels—our testing context. The use of warning labels is central to educational efforts to increase the public’s knowledge about the risks of smoking (Goodman, 2014), a persistent public health problem that remains a main source of preventable deaths in the United States (Holford et al., 2014). More than 60 countries around the world have adopted enhanced warning labels combining text and visuals (CCS, 2014; IGTC, 2013). These graphic warning labels have been found to be more effective than the textual warning labels currently used in the United States (Gibson et al., 2015; Hammond, 2011; Noar et al., 2015), but scholars have stressed the need for more research on what makes the graphic labels more persuasive, and what components will make a given graphic label more persuasive than other graphic labels (Argo & Main, 2004).

Specifically, the current study manipulated the vividness level of tobacco warning labels, through different combinations of textual and visual components of tobacco warning labels, and tested their effectiveness in an online experiment. To better understand the mechanism underlying the effect of vividness, we attempted to increase vividness by using engaging personal narratives of varying degrees of concreteness, emotionality, and proximity. In the context of narrative messages, we expected vividness to influence smoking intentions through emotional and attentional engagement with labels.

Theoretical Framework

The Vividness Effect

“Information may be described as vivid, that is as likely to attract and hold attention and to excite the imagination to the extent that it is (a) emotionally interesting, (b) concrete and imagery-provoking, and (c) proximate in a sensory, temporal or spatial way” (Nisbett & Ross, 1980, p. 45). Vivid messages are expected to be more persuasive as they are easier to imagine (McGill & Anand, 1989) and to provide a more intensive reading experience than non-vivid messages (MacKenzie, 1986). Researchers who have tested the vividness effect hypothesis have found mixed and sometimes contradictory results (Keller & Lehmann, 2008). Some have found that vividness increases persuasion and leads to attitude change (Coyle & Thorson, 2001; Reyes, Thompson, & Bower, 1980), but others have found it to be a distraction that impairs persuasion (Frey & Eagly, 1993). Scholars have attempted to identify moderators that may explain these inconsistent findings. For example, vividness may increase persuasion when enough cognitive resources are available and decrease it otherwise (Block & Keller, 1997). Moreover, vividness manipulations have stronger effects when the core argument is made more vivid, and weaker when the manipulation adds distracting information (Smith & Shaffer, 2000).

Another possible explanation for the inconsistency of these findings is a difference in the operationalization of the concept. Vividness has been operationalized in many different ways across studies, often focusing on only one dimension from Nisbett & Ross’s definition: emotionality (MacInnis & Price, 1987), concreteness and detail (Taylor & Thompson, 1982), proximity (Sherer & Rogers, 1984), or sensory breadth (Fortin & Dholakia, 2005). Such studies also tended to use only two conditions – a vivid message and a non-vivid message. Moreover, some scholars have focused only on intrinsic textual features, while others looked

into the interaction between message characteristics and audience traits (for a meta-analysis, see: Taylor & Thompson, 1982). For example, proximity might be achieved through information that provides sensorial immediacy (an intrinsic textual feature), but it might also be achieved when the reader and character share biographical information, as is the case when events occur in the reader's hometown (spatial proximity). Because public health messages in general and anti-smoking messages specifically often target large and heterogeneous audiences (e.g., all smokers within a population), the current study focuses on intrinsic textual features of vividness that are not dependent on the audience's traits.

There are several ways to increase vividness of cigarette package warning labels. Most notably, many countries in recent years have used colorful pictures of damaged body parts that were expected to create a sense of threat and disgust in viewers and were found to be effective in studies comparing them to text-only labels (Noar et al., 2015). A set of such graphic warning labels proposed by the U.S. Food and Drug Administration (FDA) was rejected by the District of Columbia court in March 2012 (*R. J. Reynolds Tobacco Co v. FDA*, 2012). The court argued that warning labels should be factually accurate and that FDA should provide evidence that the labels will advance its interest in reducing the number of Americans who smoke (Almasy, 2013; Goodman, 2014). Therefore, we designed a new set of warning labels for this study, that are based on personal stories of real people who were harmed by tobacco smoking (gathered from previous anti-smoking campaigns such as the Center for Disease Control and Prevention's "Tips From Former Smokers"). The warning labels tested here did not present abstract images of damaged body parts, but rather "testimonial pictures" of real victims of smoking. Factually accurate consequences attributable to the consumption of tobacco are core to the labels we designed. In some versions of the labels, the images are also accompanied by direct quotations from people that appear in the image. These narrative versions of graphic warning labels are expected to be particularly engaging and persuasive due to the introduction of exemplars and their stories (Hinyard & Kreuter, 2007). The use of exemplars is hypothesized to increase vividness and enhance the effectiveness of the labels (Knobloch-Westerwick, 2015).

Narrative Persuasion and Exemplification Theory

Motivated to defend their freedom of choice and the desire to retain their autonomy, people tend to resist persuasion attempts (Brehm & Brehm, 1981) and produce counter-arguments, especially when the messages are highly relevant to them (Petty & Cacioppo, 1986). For example, smokers who are exposed to anti-smoking messages may feel threatened and become defensive and resistant, even if they intend to quit smoking. Moreover, to preserve their self-identity and avoid cognitive dissonance, smokers might avoid such messages to begin with (Festinger, 1957). However, studies outside of the anti-smoking literature have consistently shown that narrative messages may provide one avenue through which behavior change campaigns can reduce the amount of avoidance, resistance and counter-arguing elicited by its messages (Dal Cin, Zanna, & Fong, 2004; Moyer-Gusé, 2008).

Narratives are stories with an identifiable beginning, middle and end providing information about causally-related events, scenes, characters, conflicts and resolutions (Hinyard & Kreuter, 2007; Dahlstrom, 2010). The processing of narrative messages can elicit

motivations and goals that are different than what typically occur when audiences process expository messages. Engaged audiences who care about the story and characters process the narrative information more carefully, and their interest in the story reduces the motivation and cognitive resources that they have available for questioning and resisting the arguments presented in the narrative, given that these resources are focused on following the story and its events (Slater & Rouner, 2002). Engagement with a narrative involves both attentional and emotional elements. The former can be demonstrated by the way people are swept away from the real world and are ‘transported’ into story worlds, directing their cognitive resources to the story (Gerrig, 1993; Green & Brock, 2000). The latter can be observed in the ways through which people are affected by and interact with characters, for example, through identification (Cohen, 2001; Oatley, 1994). Both types of engagement with plots and characters reduces counter-arguing, shapes attitudes, beliefs and intentions that are consistent with the story’s arguments, increases perceived vulnerability (for example, to health threats), encourages people to expose themselves to content they would usually avoid, and increases attention and enjoyment (De Graaf, Hoeken, Sanders, & Beentjes, 2011; Green & Brock, 2000; Tal-Or & Cohen, 2010).

Although studies of narrative messages have typically examined the effects of relatively long stories, the stories investigated in the current study are constrained by the size of the warning labels used on cigarette packages. The narratives used are thus limited to single images and short textual descriptions. Nevertheless, researchers have found that short narratives often have comparable effects on audiences, operating through similar psychological mechanisms (Chen, 2015). Moreover, according to exemplification theory (Zillman, 1999), the mere presence of a specific character can make a message more persuasive, and this effect is heightened when they are presented in an emotional way, and when their story illustrates the potential consequences of events or behaviors to the reader (Aust & Zillman, 1996; Zillman, 2002). Though short, the stories used in the current study are emotionally evocative and shed light on the consequences of smoking tobacco in a factually accurate way, and are thus expected to be effective despite their size and length.

The current study therefore examines the impact of varying the level of vividness of warning labels on smokers’ engagement with the messages and their subsequent effects on intentions to quit smoking. Several components of vividness were manipulated. We hypothesized that messages with increased levels of vividness (i.e., level of concreteness, emotionality and proximity) would increase engagement with the message. We expected that participants who were exposed to more vivid labels would more easily engage with the warning label by imagining the health effects being described, could see themselves in the character’s shoes (in the conditions containing the personal stories or the images), follow the events, and get emotionally involved (Cohen, 2001; Green & Brock, 2000; Nisbett & Ross, 1980). It was hypothesized that vividness components would have a cumulative effect on engagement, such that as the level of vividness of a message increased, so would engagement with the message.

The messages we designed gave a central place to the personal experience of the person harmed by their tobacco use but also tested whether messages with more vivid elements in the narratives would be more influential than those with fewer. Past research has not tested

whether the presence of multiple vividness components would enhance effectiveness linearly or not. Instead, we entertained the possibility that too many components may reduce the effect on engagement either through excessive load, or simple distraction through the presence of irrelevant vivid elements. In the current case, we sought to employ vivid features relevant to the core argument of the message and keep their number and intensity reasonable. Vividness was therefore operationalized as a multi-categorical variable with increasing engagement as the level of vividness increased. Therefore:

H1—Messages that include a greater number of vivid components will be more engaging than messages containing less vividness components.

Engagement with a message leads to intentions to behave in ways consistent with the message's claims (e.g., Green & Brock, 2000). The cigarette package warning labels convey the message that smoking is dangerous and has adverse health effects, with the aim of encouraging smokers to quit smoking. Therefore:

H2—The more people engage with the message, the higher their intentions to quit smoking will be.

The third hypothesis argued for an indirect effect of vividness on intentions to quit through engagement, based on the previous two hypotheses:

H3—Engagement mediates the relationship between vividness and intentions to quit, such that increases in vividness will lead to increased engagement, which subsequently will lead to increased intentions to quit smoking.

Additionally, we wanted to explore whether the effect of vividness differs for the emotional and attentional components of engagement. The absence of previous data on these two components leads to a research question rather than a directional hypothesis:

RQ1—Will the effect of vividness on intentions to quit through engagement be different for the emotional components versus the attentional components of engagement?

Method

Participants

A total of 2165 people (1157 females; 1806 whites) between the ages of 18 and 60 ($M=38.76$, $SD=11.03$) participated in the online study in exchange for monetary compensation.¹ Participants were recruited via Survey Sampling International.² Participants were eligible to take part in the study only if they were current smokers who had smoked at least 100 cigarettes during their entire lives. Participants' average position on the Contemplation Ladder (Biener & Abrams, 1991; see readiness to quit in measures section)

¹The sample size was reduced to 2165 from 2290 due to a technical error in two conditions, where the wrong image was presented to some participants. In one condition, 56 participants were excluded from analysis and 69 were excluded in the second condition.

²Participants were recruited from the Survey Sampling International (SSI) U.S. panel that contains more than two million individuals who, while varying in characteristics, cannot be considered representative of the U.S. population.

was 6.16 (SD=2.78). On average, participants had made 2.63 quitting attempts in the year before the study (SD=7.11).³

Procedure

Participants were randomly assigned to one of 14 conditions, which differed in the format of the graphic warning labels (the number and type of vividness components) shown to participants. After answering questions about their smoking behavior, they were exposed to three sets of images of cigarette packages, one at a time, each set consisting of three different angles of the same package (back, front and side view). Each set of images appeared for at least four seconds (average viewing time varied by conditions, ranging from 16–30 seconds) before users could move on to the next page of the survey. Participants then completed a questionnaire, including demographic information, and were debriefed before receiving compensation for their participation.⁴ All procedures were approved by an Institutional Review Board.

Materials

The simple warning packages (i.e., pallid messages with no vividness components) included the brief text-only warnings used today in the U.S, such as “Surgeon General’s Warning: Smoking Causes Lung Cancer, Heart Disease, Emphysema, and May Complicate Pregnancy”. The vividness of the warning labels was manipulated by varying five features. Not all potential combinations of vividness features were tested in the study for two reasons. First, the vast number of possible combinations would make for an overly complex study design and set of analyses. Second, to maintain ecological validity, some combinations that did not make practical sense (e.g., presenting identifying information in the absence of an image) were excluded. We acknowledge the fact that maintaining ecological validity requires some methodological compromises, and it might come at the expense of an incomplete factorial design. Our decision to keep the messages ecologically valid still allowed us to test core aspects of the theory, while evaluating social, political, and behavioral implications drawn from the findings. The vividness features used were:

1. Testimonial image – manipulating the degree of proximity, emotionality and concreteness by presenting an evocative colorful image of a victim of tobacco smoking, where damage is clearly discernable through physical harm (e.g., an emaciated dying patient) or visual indicators of medical treatment (e.g., medical equipment, hospital environment).
2. Identifying information – manipulating concreteness by providing the name of the victim and the age at which she or he was affected by tobacco (e.g., “Terrie: Died from cancer at age 53”).

³When comparing samples of the same age range of 18–60, our sample is younger than the one obtained by CDC’s National Adult Tobacco Survey (NATS) in 2013–2014 (mean age= 38.76 in our sample vs. 41.7 in the NATS), and includes more female participants (53.4% vs. 48.8%). It also includes less people with education level of high-school or lower (25.8% vs. 48.4%), more whites (83.0% vs. 77.2%) and less blacks (9.3% vs. 14.4%). In regard to smoking it has more daily smokers (82.8% vs. 75.8%), as well as a higher average score on readiness to quit (80.8% vs. 77.8% at least think about quitting smoking). Detailed comparison of the two samples can be obtained from the authors.

⁴Participants were exposed to a second set of images and questions after the part reported in this study, and filled out another questionnaire five weeks after the first one. These data are not reported in the current analysis.

3. Non-testimonial explanatory statement – manipulating the concreteness, proximity and emotionality by describing the specific effects of and mechanisms through which smoking damages the body, implying a well-defined and plausible health threat for the reader (e.g., “Smoking is a major cause of heart disease. Smoking causes blockages in the body’s arteries. These blockages can lead to chest pain and heart attacks. Smokers have more heart attacks and repeat heart attacks than non-smokers”).
4. Testimonial explanatory statement – manipulating the emotionality and concreteness by intensifying the general argument about the adverse health effects of tobacco with a direct quotation from the victim, providing advice to other smokers or a first-hand description of her or his experience (e.g., “Smoking kills half of all lifetime smokers. Terrie died from cancer caused by smoking. Terrie had some advice for other smokers: Please quit... I don’t want anyone to have to go through what I went through”).
5. Contextual information – manipulating the emotionality of the message by providing a background story about tobacco companies’ intentional deception of the public regarding the health effects of smoking. Specifically, the statements we used about health effects on smokers and non-smokers and about addictiveness of tobacco products were based on the 2006 U.S. District Court for the District of Columbia’s ruling (Cappella, Maloney, Ophir, & Brennan, 2015); for example, “For decades, tobacco companies claimed that there was no proof smoking causes cardiovascular disease”. Such claims were expected to induce angry reactions from smokers, because a specific party is identified as being intentionally responsible for harm produced (Chapple, Ziebland, & McPherson, 2004).

Fourteen warning label conditions were created, using different combinations of the vividness items (Table 1). The conditions were coded for their vividness level, by summing the number of vivid elements in each condition, which ranged from zero (no vividness items, represented by the currently used labels) to four (highly vivid, four items; it was not possible to create a warning label that contained all five of the vividness items specified above, given that a warning label could carry either a non-testimonial explanatory statement or a testimonial explanatory statement, but not both). Vividness was treated as a multi-categorical variable; that is, the change in vividness from one to two items, from two to three items and from three to four items was not assumed to necessarily have the same effect on engagement, and thus allowed for a non-linear association. However, in order to test the plausibility of the simplifying assumption that each additional component contributed equally to the level of vividness, analyses of covariance (controlling for readiness to quit) and post-hoc comparisons were conducted to test the impact on engagement of different combinations of the various vividness elements, within vividness levels. Of 12 comparisons, 11 supported our argument, showing no differences between different combinations within the same vividness level. The complete testing of comparisons between levels may be obtained from the authors.

Figure 1 presents an example of warning labels from five different conditions, demonstrating the change from no vividness items up to four items. Table 1 summarizes the differences between cigarette packages by conditions.

Colorful images of cigarette packages carrying health warning labels were crafted for the study using a graphic editor software. Three angles of the same cigarette package were presented simultaneously in a vertical array (725×2080 pixels for the three angles, each placed above the other). In Condition 1 (the zero vividness items conditions), participants were exposed to three different packages each focusing on a different health theme, which were randomly selected from the pool of four text-only warning labels that currently appear on packs. Participants in all other conditions were also exposed to images of three different packages which each carried warning labels focusing on a different health theme, although the three themes were randomly selected from the set of five themes mandated as warning statements in the Family Smoking Prevention and Tobacco Control Act and used in the FDA's graphic warning labels policy (FDA, n.d.). The themes we used were: smoking kills; smoking causes fatal lung diseases; smoking causes stroke and heart diseases; cigarettes are addictive; and second hand smoke can cause fatal lung diseases. Images and personal stories were used with permission from U.S. Centers for Disease Control and Prevention and under license from Health Canada. All images and quotations were obtained from persons who themselves had suffered the ravages of smoking and had decided to make their conditions known to a broader public.

Measures

Engagement with the warning labels, through emotional connection and attention, was measured as the average of ten items: five items were adapted from the transportation scale and modified to fit a short story (Green & Brock, 2000): "I was affected emotionally", "I was involved mentally", "The images and words were difficult to put out of my mind", "The images and words were relevant to my everyday life" and "My thoughts wandered away from the images and words to other things" (reversed). Two additional items were used from the interpersonal reactivity index for assessing empathy (Davis, 1980): "I felt concerned" and "I was touched". One more item was created to assess sympathy, a feature of engagement with characters (Moyer-Gusé, 2008): "I felt sympathy". Two more items were created to assess attention to the message: "My attention was fully captured" and "My thoughts were about the images and words only". The reversed item from the transportation scale ("My thoughts wandered away from the images and words only") was excluded from analysis due to a very low loading in factor analysis, which might indicate that it was confusing for participants who may have not noticed the change in direction. The engagement scale averaged the answers to nine items, each measured on a scale ranging from 1 (*not at all*) to 4 (*very much*) ($M = 2.73$, $SD = 0.81$, $\alpha = 0.92$). We tested the possibility that the messages had a different effect on emotional and attentional engagement. The engagement scale was thus divided into two sub-scales based on face-validity: empathy and sympathy ("I felt concerned", "I felt sympathy", "I was affected emotionally", "I was touched", $M = 2.65$, $SD = 0.91$, $\alpha = 0.89$), and transportation and attention ("I was involved mentally", "My attention was fully captured", "My thoughts were about the images and words only", "The images and words were difficult to put out of my mind", "The images

and words were relevant to my everyday life”, $M = 2.79$, $SD = 0.80$, $\alpha = 0.84$). The two subscales correlated strongly ($r = 0.80$).

Intention to quit smoking was measured by averaging six items (adapted from Gibson et al., 2015, $\alpha = 0.88$) that employed a Likert-type scale from 1 (*definitely will not*) to 4 (*definitely will*). The questions concerned intentions to quit smoking in the upcoming 30 days, and specifically asked participants whether they intended to: try to quit smoking; reduce the number of cigarettes smoked in a day; quit smoking completely; call a Quit-line; buy a nicotine replacement product; and enroll in a smoking cessation program if it was available at minimal cost and easy access.

Readiness to quit was measured before exposure to the messages using the Contemplation Ladder (Biener & Abrams, 1991). Participants are asked to state their position on readiness to quit smoking, with possible responses ranging from 0 (*I have no thoughts about quitting smoking*) to 10 (*I am taking action to quit smoking*).

Results

Descriptive Statistics

Overall, across all conditions, engagement with the warning labels was moderately high ($M = 2.73$, $SD = 0.81$). Intentions to quit were moderate on average ($M = 2.35$, $SD = 0.72$). Pearson’s correlation tests for the relationships between the examined variables revealed that as expected, engagement was moderately and positively correlated with intentions to quit smoking, $r(2,161) = 0.54$, $p < 0.01$. The correlations between vividness and engagement and vividness and intentions to quit were explored in the hypotheses tests.

Hypotheses Tests and Research Questions

To test hypotheses 1–3, an indirect effects analysis was conducted using Hayes’s (2009) approach, assessing confidence intervals with bootstrapping using Preacher and Hayes’s (2008) SPSS macro. In this approach, significant direct effects (c paths; see Baron & Kenny, 1986) are unnecessary for the establishment of indirect effects (Preacher & Hayes, 2008). The analysis tested a model containing both direct and indirect effects of vividness on intentions to quit.

Since engagement was observed and not manipulated, it is possible that the causal order of the proposed mediation model is incorrect, i.e., that both vividness and intentions to quit led to higher engagement. In order to test the proposed mediation model while reducing this concern about causal direction, the model was tested controlling for readiness to quit, which was measured before the treatments were given to participants, and is known to be highly correlated with intentions to quit smoking (Kim, Bigman, Leader, Lerman, & Cappella, 2012).

H1 predicted that the messages with more vivid elements would be more engaging. According to the analysis, the inclusion of two or more vividness items leads to increased engagement with the messages. Including two vividness items resulted on average in an increase of 0.13 units in engagement ($p = 0.007$, controlling for readiness to quit), including

three items resulted on average in an increase of 0.32 units in engagement ($p < 0.001$) and including four items resulted on average in an increase of 0.27 units in engagement ($p < 0.001$). Thus, H1 was supported by the analysis, though the effects of vividness on engagement became significant only after adding at least two vividness items.

H2 predicted that the more engaged people were with the messages, the higher their intentions would be to quit smoking. Controlling for baseline readiness to quit, engagement had a moderate positive effect on intentions to quit smoking ($b = 0.37$, $p < 0.001$), supporting H2.

H3 predicted a positive indirect effect of vividness on intentions to quit through engagement, where an increase in vividness was hypothesized to lead to increased engagement and subsequently to increased intentions to quit smoking. The indirect analysis shows a significant positive indirect effect of vividness on intentions to quit through engagement, though the effect becomes statistically significant only after adding at least two vividness items (coefficients are compared to zero-level of vividness, Table 2). The effect of adding three items was a little stronger than the effect of adding four items, though another iteration of the model in which four items served as the referent category, revealed that the difference between three and four items was not significant ($b = -0.019$, 95% CIs[0.069, 0.174], [0.057, 0.145]). Since vividness only had a significant indirect effect on intentions to quit at the level of two or more vividness elements the analysis partially supports the indirect effect hypothesized in H3 (Table 2).

RQ1 tested whether the effect of vividness on intentions to quit through engagement would be different when examining the sub-scales of the emotional and attentional components of engagement. A mediation analysis was conducted, where both emotional and attentional engagement sub-scales were assessed simultaneously as mediators of the effect of vividness on intentions to quit smoking, controlling for baseline readiness to quit.

With both emotional and attentional engagement in the model, the direct effect of vividness on intentions to quit smoking was not significant at any level of vividness. For emotional engagement, the effect of vividness on engagement was significant for any increase in the number of vividness items: adding one vivid element ($b = 0.145$, $p = 0.014$), two elements ($b = 0.244$, $p < 0.001$), three elements ($b = 0.513$, $p < 0.001$) and four elements ($b = 0.284$, $p < 0.001$). The indirect effect of vividness on intentions to quit through emotional engagement was significant at all levels of vividness, but strongest for adding three vividness items (Table 3). All coefficients are in comparison to zero-level of vividness.

For attentional engagement, the effect of vividness on engagement was much smaller and significant only for increasing the amount of vividness by three ($b = 0.181$, $p = 0.008$) or four ($b = 0.147$, $p = 0.020$) elements. Attentional engagement had a significant effect on intentions to quit ($b = 0.07$, $p = 0.003$). The indirect effect of vividness on intentions to quit through attentional engagement was significant only for three or four vividness items (Table 3). Again, the indirect effect of adding three vividness items was the strongest, with coefficients compared to zero-level of vividness. The indirect effects through attentional engagement were substantially and significantly weaker than the indirect effects through

emotional engagement, as the bias-corrected bootstrapping-based confidence intervals did not overlap at any of the vividness levels (see Table 3).⁵ The difference is driven by both the effects of vividness on each type of engagement and the effect of each type of engagement on intentions to quit. Figure 2 presents the results of the mediational analysis for emotional and attentional engagement as mediators of the effect of vividness on intentions to quit.

Post-hoc analyses

Several analyses were conducted in addition to our a priori hypothesis tests, to further examine the results of the study. First, to assess whether the effect of vividness was exclusively driven by the inclusion of images in the warning labels, we tested the indirect effect of vividness on intentions to quit through emotional and attentional engagement separately for conditions with and without images. The patterns of vividness effects remained the same, except that with no images, vividness influenced intentions through emotional engagement only when moving from no vividness to one vividness item. These results indicate that vividness had a significant positive indirect effect on intentions to quit, above and beyond the effects of images; however, they do not suggest the vividness effect occurs independently of image use. Rather, it means that when images are present, textual vividness has an incremental effect on engagement and an indirect effect on intentions to quit, above and beyond the effects of the images. We could not analyze the effect of textual vividness in the absence of images, since identifying statements appeared only when images were present and thus conditions without images were limited to include only up to two vividness items.

Second, since conditions with four vividness items generally did not perform as well as conditions with three items, and since all conditions with four items had an equivalent condition without the contextual information in the three items category, we tested for the possibility that addition of the contextual information (anger at the tobacco companies' falsehoods) reduced the effectiveness of the warning label. Comparing pairs of conditions that differed only by the inclusion of contextual information, we found no significant differences in their effects on both emotional and attentional engagement. Additionally, an independent-samples t-test showed no significant differences on average between conditions with or without the contextual information on intentions to quit ($p = 0.810$), emotional engagement ($p = 0.490$) and attentional engagement ($p = 0.443$). Thus, the effect of increasing vividness through the addition of contextual information consistently led to smaller, yet not significantly different, effects.

Discussion

Vividness had long been recognized as a potential message characteristic that may increase engagement and persuasion. In this study, we tested the effects of increasing the level of vividness through the use of textual and visual components, both through personal stories

⁵Bootstrapping confidence intervals were used due to the assumption that indirect coefficients were not normally distributed. Structural equation modeling and Wald tests of parameter constraints that do make normality assumptions were also used to test the differences using null hypotheses, showing significant differences as well. The full results of the structural equation modeling can be obtained from the authors.

that provided the readers with exemplification to the dire consequences of smoking and non-testimonial information. The most vivid messages in our study presented participants with the personal impact smoking has on people's health and well-being, attaching a face, a name and testimonial or non-testimonial explanations to an otherwise abstract threat. The analysis showed that increasing the number of vividness items used had a positive effect on the emotional component of engagement with the labels, but less so on the attentional component of engagement, except for in the absence of images. Generally, more vivid versions of the messages led to increased engagement, which in turn lead to increased intentions to quit smoking.

The study also compared the effects of exemplar-based testimonial explanations and non-testimonial ones. It provides evidence that by employing more vivid versions of warning labels, with or without exemplars, emotional engagement with the label's content can be enhanced. In turn, such engagement mediates the relationship between vividness and intentions to quit. Across vividness levels, the indirect effect of vividness through attentional engagement was significantly weaker than the effect through emotional engagement. These findings should be interpreted in the context of the study stimuli. Though short in length (and thus not expected to create a large variance in attention), the messages were designed to be emotionally intense, which might explain why the emotional engagement effects were stronger than the attentional ones. Other studies using longer narratives could demonstrate stronger effects of vividness on attentional engagement than shown in our study.

Deploying more vivid elements in the labels produced no direct effects on intentions as measured here. However, the fact that emotional engagement and to a lesser extent attentional engagement mediated the association between vividness and intentions to reduce smoking is a positive outcome due to the theoretical discussions of the importance of engaging the audience. As in many mediational analyses, one limitation of this study is the threat to the validity of the order of the effect, as engagement and intention to quit were observed at the same time (after exposure to stimuli) and engagement was not manipulated. However, reducing this threat, we controlled for participants' interest in quitting (measured before exposure to the stimuli) in all analyses, such that our results are consistent with the suggested causal direction.

Our work has made some strong assumptions about components of vividness by treating each element as having equivalent weight. Such an assumption may not be correct in the current context or in other contexts, and the different components deserve to be evaluated separately in future analyses of these and other data. One reason for doing so is efficiency. Identifying which elements carry the weight of effects on engagement will allow the designers of future warning labels policies to give more attention to the most effective elements. Our measures of engagement were obtained through self-report measures, in an attempt to capture the allocation of cognitive and emotional resources to the messages. Subsequent work should seek to verify these findings using measures closer to the presumed underlying concept (e.g., visual attention through eyes-on-screen, or activation of attentional regions of the brain).

Nevertheless, the current study provides promising results. Our study offers evidence that health warning labels for tobacco products that are factually accurate (i.e., through the use of image and stories from real people) can be both emotionally engaging and persuasive. Despite the use of only short messages, increasing the vividness of the warning labels through the inclusion of factual images and stories had a positive influence on engagement, and indirectly, on intentions to quit smoking. These findings suggest that future warning label policies, including in the United States, should consider the inclusion of labels that tell the stories of real people as a means of increasing persuasiveness.

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Figure 1. The manipulation of vividness. Image and story of Terrie used with permission from US Centers for Disease Control and Prevention. The illustration shows only one angle for each condition, but participants were exposed to all angles of each package (front, back, and side view). The word “BRAND” and the phrase “20 Class A Cigarettes” appeared in all conditions. The size of the pack was the same across conditions.

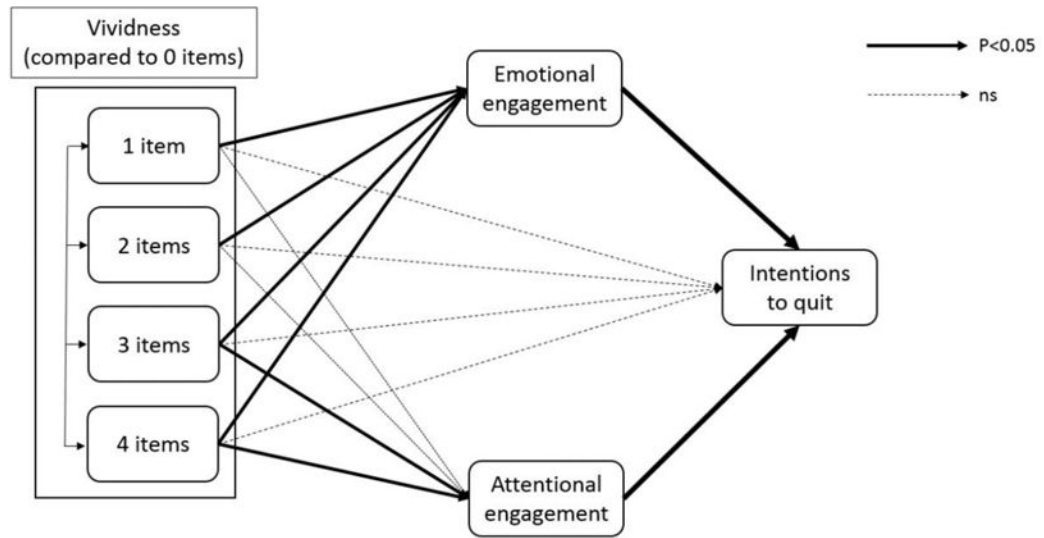


Figure 2. The indirect effects of vividness on intentions to quit through emotional and attentional engagement. Bold lines represent a significance level of $p < 0.05$, dashed lines represent non-significant (ns) effects where $p > 0.05$. The correlation between emotional and attentional engagement ($r = .80$) was estimated but omitted visually for brevity.

Table 1

Variations in the Use of Vividness Elements by Conditions

Experimental condition	Vividness element				Vividness level
	Testimonial image	Identifying statement ^a	Non-testimonial explanatory statement	Testimonial explanatory statement	
1					0
2				X	1
3	X				1
4		X			1
5			X		1
6		X		X	2
7			X	X	2
8	X				2
9	X		X		2
10	X				2
11	X	X		X	3
12	X	X		X	3
13	X	X		X	4
14	X	X	X		4

Note. The labels used in condition 1 contained a non-testimonial text message, as currently used on cigarette packages in the U.S. Participants were randomly shown three warning labels out of four in condition 1, and three out of five in all other conditions, with each label presenting a different theme (e.g., addiction, fatal lung disease).

^aIdentifying statements (name, age and health status) appeared only on warning labels that included images.

Table 2

Unstandardized Coefficients for the Indirect Effect of Vividness Level on Intentions to Quit Smoking through Engagement

	Number of vividness items	95% CI		
		<i>B</i>	LL	UL
1		0.025	-0.011	0.063
2		0.050	0.015	0.086
3		0.120	0.069	0.174
4		0.101	0.057	0.145

Note. All coefficients are compared to the baseline level of zero vividness items (condition 1), controlling for readiness to quit smoking. *B* = unstandardized regression coefficient; 95% CI = 95% confidence interval; LL = lower limit 95% confidence interval; UL = upper limit 95% confidence interval.

Table 3

Unstandardized Coefficients for the Indirect Effect of Vividness Level on Intentions to Quit Smoking through Emotional and Attentional Engagement

Number of vividness items	<i>B</i>	95% CI	
		LL	UL
Emotional engagement			
1	0.041	0.010	0.076
2	0.069	0.038	0.106
3	0.146	0.102	0.200
4	0.123	0.082	0.166
Attentional engagement			
1	0.005	-0.007	0.009
2	0.003	-0.003	0.013
3	0.013	0.003	0.030
4	0.010	0.002	0.026

Note. All coefficients are compared to the baseline level of zero vividness items (condition 1), controlling for readiness to quit smoking. *B* = unstandardized regression coefficient; 95% CI = 95% confidence interval; LL = lower limit 95% confidence interval; UL = upper limit 95% confidence interval.