

Are Vivid (Vs. Pallid) Threats Persuasive? Examining the Effects of Threat Vividness in Health Communications

Jérôme Blondé and Fabien Girandola

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ABSTRACT

Q1

15 Beginning in May 2016, European Commission health directives introduced new warning messages on all cigarette packages sold in the member states of the European Union. Through explicit words (e.g., “Smoking can kill your unborn child”) and a corresponding picture (e.g., tumors, damaged bodies, etc.), these warnings were intended to be vivid depictions of the consequences of tobacco use. It was assumed that such a strategy would discourage individuals from starting to or continuing to smoke by making cigarette packs less attractive and by drawing their attention to tobacco-induced risks. Likewise, numerous health communications use vivid stimuli, such as shocking and punchy pictures or poignant personal testimonials, to describe as vividly as possible the threats that individuals may encounter by acting recklessly. Although the effects of threatening communications have been widely explored, few studies have specifically focused on the effects of threat vividness. Are vivid threats really likely to prompt a greater acceptance of health recommendations? Across three experiments, the present work addresses this issue.

The effects of threatening communications on persuasion

Q2 40 Threatening communications are defined as persuasive strategies exposing relevant threats (e.g., smoking kills) as an incentive to adopt protective recommendations (e.g., eating fruits and vegetables). For more than six decades, considerable attention has been paid to the effects of threatening communications on persuasion (for reviews, see Ruiters, Kessels, Peters, & Kok, 2014; Shen & Dillard, 2014). It is now acknowledged that using threatening information contributes to substantial changes in attitude, intention, and behavior. More specifically, high-threatening messages have been shown to cause greater acceptance of recommended actions than low-threatening messages. Similarly, most meta-analyses (e.g., Tannenbaum et al., 2015; Witte & Allen, 2000) confirmed a positive relationship between the inclusion of strong threats and compliance (see Table 1). The more threatening a persuasive message, the greater the acceptance at both attitudinal and behavioral levels. For instance, the meta-analysis of Tannenbaum et al. (2015) concluded that there are no or few conditions in which threatening communications are ineffective or likely to foster resistance effects. In addition, it is worthwhile to note that recommendation efficacy (i.e., the capacity of suggested recommendations to protect from the threat) constitutes a key construct in the effects of threatening communications. Indeed, a large number of empirical works have shown that adding threatening information to effective recommendations contributes to a stronger persuasion, compared to less or noneffective recommendations (e.g., Eppright, Hunt, Tanner, & Franke, 2002; Peters, Ruiters, & Kok, 2013; Will, Sabo, & Porter, 2009; Witte, 1994; Witte & Allen, 2000; Wong & Cappella, 2009). When exposed to high-threatening communications, people are indeed motivated to adopt recommendations that could provide a sufficient sense of protection against the threat. However, if suggested recommendations are inappropriate or useless to guarantee such need for protection, people are less inclined to adopt them. Despite extensive literature, very few studies have yet considered the effects of threatening communications taking account of the specific influence that threat vividness, irrespective of the threat itself, may have on their overall persuasiveness. However, this appears to be of high importance, mostly because health

Table 1. Main findings of meta-analyses on threatening communications (classified by year).

	Year	k	Effect sizes		
			Attitude	Intention	Behavior
Boster & Mongeau	1984	—	$r = .21$	—	$r = .10$
Mongeau	1998	—	$r = .20$	—	$r = .17$
Witte & Allen	2000	98	$r_1 = .15; r_2 = .12$	$r_1 = .14, r_2 = .17$	$r_1 = .13, r_2 = .14$
Milne et al.	2000	21	—	$r_1 = .10, r_2 = .16$	$r_1 = .10, r_2 = .13$
Floyd et al.	2000	65	—	$r_1 = .39, r_2 = .41$	$r_1 = .37, r_2 = .34$
Earl & Albarracin	2007	76	—	—	$d = -.43$
DeHoog et al.	2007	105	$d_1 = .16, d_2 = .14$	$d_1 = .21, d_2 = .36$	$d_1 = .42, d_2 = .27$
Peters et al.	2013	8	—	—	$d = .11$
Tannenbaum et al.	2015	248	$d_1 = .22, d_2 = .48$	$d_1 = .29, d_2 = .37$	$d_1 = .17, d_2 = .45$

Note. Cells with a dash refer to nonavailable data or nonperformed analyses. k = number of studies included in the meta-analysis; d and r corresponds to the indicators of standardized mean effect sizes; when indicators were accompanied with numeric values, 1 means that threat was manipulated via severity and 2 via vulnerability.

communications are known to frequently use vivid materials as a means to hold people's attention on threatening information. As such, we could reasonably expect the effects of threatening communications to be modulated by how vivid threat-related information is depicted. Moreover, the fact that very little is known about threat vividness is somewhat paradoxical, as threat vividness has been extensively utilized as a way of manipulating the threat in numerous studies (e.g., Arthur & Quester, 2004; Brown & Locker, 2009; Latour & Tanner, 2003; Morales, Wu, & Fitzsimons, 2012; Stephenson & Witte, 1998; Umeh, 2012; Witte, 1994). For instance, Witte (1994) tested the effects of HIV-related threats by comparing neutral pictures showing clinical tests (as low threat) to real photographs of patients in an advanced stage of the disease (as high threat). In this case, this is not strictly a manipulation of the threat but of its vividness, which leads us to wonder whether Witte's findings would have been the same by manipulating only the threat. Accordingly, the main objective of the current research is to examine whether threat vividness could have an effect per se, regardless of the threat, and whether it contributes to a greater acceptance. Another aim of our work is to assess the vividness effects, taking into account the strength of the threat. By addressing these issues, this work seeks to bring a more complex and comprehensive look at classic social-psychological questions and to contribute to a greater understanding of this well-known and widely used persuasive strategy.

The vividness effect

In their regularly cited book chapter, Nisbett and Ross (1980) defined vividness as the degree to which information is perceived "to attract and hold our attention and excite the imagination to the extent that it is emotionally interesting, concrete and imagery-provoking, and proximate in a sensory, temporal, or spatial way" (p. 45). In other words, vividness refers

to the capacity of information to be appealing, noticeable, colorful, attention grabbing, and likely to elicit emotion and imagery. However, such a definition, although rather common among researchers, appears to be somewhat large and unclear, in part because it makes the delineation of vividness with other similar concepts, such as salience, imagery, concreteness, or direct experience, more difficult. In parallel, as Taylor and Thompson (1982) had already noticed more than 30 years ago, the too large variety of operationalizations that has been used so far—such that the use of pictures versus no pictures (e.g., Block & Keller, 1997; Childers & Houston, 1984; Edell & Staelin, 1983; Kisielius & Sternthal, 1984, 1986; Shedler & Manis, 1986; Stafford, 1996), concrete versus abstract words (e.g., Burns, Biswas, & Babin, 1993; Collins, Taylor, Wood, & Thompson, 1988; Smith & Shaffer, 2000; Wilson, Northcraft, & Neale, 1989), concrete versus abstract pictures (e.g., Babin & Burns, 1997; Petrova & Cialdini, 2005), or narrative versus statistical information (e.g., deWit, Das, & Vet, 2008; Keller & Block, 1997)—has made our understanding of vividness even more confusing. Indeed, these various types of manipulations, although supposed to offer a manipulation of the same construct, could have embraced different concepts than just vividness. In the current research, we suggest that vividness can be specifically described through two dimensions: concreteness and clarity (i.e., the capacity to clearly visualize what the information represents; for similar accounts, see Blondé & Girandola, 2016; Bone & Ellen, 1992; MacInnis & Price, 1987). Indeed, when taking a close look at the relevant literature, it appears that authors' definitions consistently refers to concreteness and clarity as the most specific components of vividness that may demarcate it from other concepts. Thus, measures and manipulation of vividness that we employ in this research are developed accordingly.

Many studies have examined the effects of vividness on persuasion. Although no broad consensus has been

reached, most of them showed that the more a message uses vivid stimuli (i.e., pictures, concrete words), the more the recipient is likely to hold a positive attitude and express greater intention to behave as wanted (e.g., Amos & Spears, 2010; Bailey et al., 2015; Dillard & Main, 2013; Rook, 1986, 1987). In a similar vein, the recent meta-analysis of Blondé and Girandola (2016) supported that finding. Synthesizing results from 43 independent reports, this analysis revealed a positive effect of vividness on attitude and intention. To explain such effects, several cognitive processes have been highlighted, such as memory recall (Nisbett & Ross, 1980; Reyes, Thompson, & Bower, 1980), cognitive elaboration (Kisielius & Sternthal, 1984, 1986; MacGill & Anand, 1989), mental imagery (Berry & Carson, 2010; Broemer, 2004), and attention (Frey & Eagly, 1993).

However, are the effects of vividness always beneficial? Broadly speaking, vividness is not information but a property of information. Its influence depends on the initial effects of information with which it is associated and cannot be assessed apart from it. In this respect, the congruency hypothesis (Guadagno, Rhoads, & Sagarin, 2011) established that vividness effects depend on whether vivified information is on-thesis (i.e., relevant to the main arguments) or off-thesis (i.e., irrelevant to the main arguments). Similarly, the valence-availability hypothesis (Kisielius & Sternthal, 1984, 1986) proposed that vividness affects attitude as a function of the valence of vivified information. Vividness has improving effects when associated with positive information but detrimental effects when associated with negative information. Based on these hypotheses, we argue that the effects of threat vividness are shaped by the initial persuasive effects of the threat to which it is attached: If the threat has capacity to be persuasive, making it more vivid should increase its impact on people's responses; however, if the threat cannot bring about people to changing, depicting it with vivid information should not have any particular influence. Hence, although we may anticipate an overall effect that vivid (vs. pallid) threats increase acceptance of health recommendations, we hypothesize that such an effect would occur only when the threats are high. Indeed, high threats have been shown to produce positive changes in people's attitudes and behaviors, as consistently supported in a myriad of studies and meta-analyses (Tannenbaum et al., 2015). Thus, making them more vivid would increase their persuasiveness. By contrast, because a vast majority of studies on threatening communications have shown that low threats can exert only a limited influence on persuasion, we expect vividness to produce no additional effects in this instance.

Table 2. Means, standard deviations, and correlations across all studies.

	<i>M</i>	<i>SD</i>	1	2	3
1. Cognitive responses					
Study 1	0.23	0.52	—		
Study 2	0.41	0.55	—		
Study 3	0.10	0.54	—		
2. Attitude					
Study 1	5.98	0.76	.56	—	
Study 2	5.52	1.14	.41	—	
Study 3	5.32	0.91	.16	—	
3. Intention					
Study 1	4.00	1.59	.45	.57	—
Study 2	2.69	1.73	.41	.51	—
Study 3	4.26	1.56	.43	.44	—

Overview of the current studies

In the current work, we present three studies.¹ In Study 1, we compared the effects of two conditions of vividness with respect to a strong health threat. Subsequent studies aimed to expand Study 1 by varying the strength of threats. As threats were characterized by two components (Rogers, 1983; Witte, 1992), namely, severity (i.e., gravity of threats) and vulnerability (i.e., probability of the threat's occurrence), we tested our hypotheses on both of them. Accordingly, in Study 2, we manipulated vividness and severity, whereas Study 3 was designed to manipulate vividness and vulnerability. Across all studies, the acceptance of recommendations was measured at three levels: cognitive (i.e., cognitive responses), affective (i.e., attitude), and behavioral (i.e., behavioral intention). As each level was closely related to each other, we expected identical effects on each. Means, standard deviations, and correlations between the three dependent variables across all the studies are displayed in Table 2.

Study 1

Study 1 was designed to be an initial examination of our predictions. We compared two versions of an identical health message varying as a function of two levels of threat vividness. Threat was not manipulated but we used a high threat in both versions. Given that, we expected more persuasiveness from a vivid threat than from a pallid threat.

Method

Participants, design, and procedure

Forty-two undergraduate students, ranging in age from 17 to 24 years ($M = 18.71$, $SD = 1.69$), took part in this study for course credit. Each participant was tested individually and randomly assigned to one of the two

experimental conditions (threat vividness: pallid vs. vivid). Upon arrival, participants were instructed to read a persuasive message on the health consequences of sun exposure. The message included information about the risks of skin cancer and how sunrays could cause them, and a final action recommendation about how to protect oneself (“Have your skin examined regularly by your usual physician or a dermatologist”). The threat had been identified as strongly severe after performing a pilot study testing different relevant threats. Furthermore, it should be noted that the topic of sun exposure was of great relevance for our participants who all lived in areas particularly affected by sun exposure (i.e., the south of France). Accordingly, we assumed that threat was high in personal vulnerability. Once the message had been fully read, participants were instructed to respond to our measures. Before leaving, they were thanked and quickly debriefed.

Independent variable

Threat vividness. We manipulated threat vividness by either including a color picture of the threat in the message (vivid condition) or not (pallid condition). This picture was a set of eight small photographs of skin tumors and was embedded next to the text, which was exactly identical for both experimental versions. Note that the manipulation was pretested and achieved expected effects.

Dependent variables

Cognitive responses. Cognitive responses were given using a thought-listing task (Cacioppo, Hoppel, & Ernst, 1997). Participants had to write down all the thoughts they had about the recommendation. Six separate boxes were provided for each thought. Immediately after listing the thoughts, participants were asked to rate each of them on their perceived favorableness (i.e., favorable, nonfavorable, or neutral).

Attitude. Adapted from DeHoog et al. (2005) and DeHoog, Stroebe, and deWit (2008), attitude toward the action recommendation was measured with five items: “good–bad,” “useful–unnecessary,” “ineffective–effective,” “important–unimportant,” “positive–negative” ($\alpha = .86$). Participants responded to all items on -3 (negative valence) to $+3$ (positive valence) rating scales (note that, for ease of understanding, data were adjusted for a scale from 1 to 7).

Intention. Also based on DeHoog et al. (2005) and DeHoog, Stroebe, and deWit (2008), behavioral intention was measured using a single item that asked participants whether they intended to apply the

recommendation soon. Participants responded on a 7-point rating scale.

Results

We reported descriptive statistics (i.e., means, standard deviations, medians, ranges, and coefficients of variation) in Table 3.

Manipulation check

Four items measured threat vividness (“While you were reading the message: Had you a clear picture in your mind of what [the threat] is? Was it easy to imagine what [the threat] is? Had you a concrete picture in your mind of what [the threat] is? Was it easy to visualize what [the threat] is?”; $\alpha = .93$) on 7-point rating scales. As revealed by a large effect ($d = 2.08$), the pallid threat ($M = 3.02$, $SD = 1.06$) was rated as less vivid than the vivid threat ($M = 5.26$, $SD = 1.15$).

Cognitive responses

An index of cognitive responses was created by computing the difference between the number of favorable and unfavorable thoughts divided by the total number of thoughts (see Wheeler, Briñol, & Hermann, 2007). We found that threat vividness exerts a medium effect, such that participants in the vivid threat condition generated more favorable cognitive responses than did those in the pallid threat condition.

Table 3. Descriptive statistics from Study 1.

	Overall data ^a	Pallid threat ^b	Vivid threat ^c
Cognitive responses			
<i>M</i>	0.23	0.06	0.39
<i>SD</i>	0.52	0.53	0.46
<i>Mdn</i>	1.13	0.00	0.33
Range	-1-1	-1-1	-0.33-1
Coeff. of variation	.42	.50	.33
Attitude			
<i>M</i>	5.98	5.76	6.17
<i>SD</i>	0.76	0.82	0.66
<i>Mdn</i>	6.00	6.00	6.20
Range	4-7	4-7	5-7
Coeff. of variation	.13	.14	.11
Intention			
<i>M</i>	4.00	3.40	4.55
<i>SD</i>	1.59	1.50	1.50
<i>Mdn</i>	4.00	3.50	5.00
Range	1-7	1-6	2-7
Coeff. of variation	.40	.44	.33

Note. Coeff. = coefficient.

^a $N = 42$.

^b $n = 20$.

^c $n = 22$.

325 **Attitude**

On the score of attitude, results showed a medium effect of threat vividness ($d = .59$). Participants in the vivid threat condition reported a greater attitude toward the recommendation ($M = 6.17$, $SD = 0.66$) than in the pallid threat condition ($M = 5.76$, $SD = 0.82$).

330 **Intention**

Our results indicated large differences ($d = .77$) between the two conditions of threat vividness, such that the vivid threat led to greater intention to adopt the recommendation ($M = 4.55$, $SD = 1.50$) than did the pallid threat ($M = 3.40$, $SD = 1.50$).

335 **Discussion**

Study 1 was an initial test of the effects of threat vividness at a high level of threat. As expected, the vivid threat was more persuasive than the pallid one; respondents exhibited more positive thoughts toward the action recommendation, as well as greater attitude and intention to perform it.

340 **Study 2**

Although Study 1 showed that threat vividness boosts acceptance of health recommendations, it is worth noting that the threat was chosen to be high. Study 2 was designed to replicate and extend Study 1 to know whether beneficial effects of vividness remain at a low level of threat. In line with our hypotheses, we predicted that the vividness effects would occur only when the threat is high because, in this condition, the threat is assumed to have beneficial effects. When the threat is weak, making it more vivid would not affect recommendation acceptance in that low threats have been found to have weak influence on persuasion. Concretely, we manipulated threat by varying threat severity (i.e., low vs. high) whereas vulnerability was kept consistently strong in all conditions. Moreover, a limitation in Study 1 was the way we manipulated vividness. By comparing a text with or without a picture, we might have operationalized differences between textual and visual materials and not vividness. Indeed, because research has widely shown that pictorial stimuli are processed and recalled more easily and quickly than verbal stimuli and thereby, following the “availability heuristic,” can be more influential on attitude and judgment (Tversky & Kahneman, 1973), it could be reasoned that our findings would not result from differences in terms of threat vividness but would reflect the beneficial effects

of processing pictorial versus verbal information. Accordingly, in this new study, we were careful to manipulate vividness using pictorial stimuli only.

Method

Participants, design, and procedure

Ninety-three undergraduate students, ranging in age from 17 to 36 years ($M = 19.49$, $SD = 2.85$), took part in this study for course credit. Participants were tested individually and randomly assigned to one of the four experimental conditions of a 2 (threat vividness: pallid vs. vivid) \times 2 (threat severity: low vs. high) factorial design. Apart from modifications due to the manipulation of severity, the procedure and messages were identical to those of Study 1.

Independent variables

Threat severity. Threat severity was manipulated by varying the health consequences of sun exposure that were depicted in the preventive message. Based on a pilot study in which 12 threats were tested, we selected the less severe (“sunburn”) and the most severe (“skin cancer”). Thus, two versions of the health message were created.

Threat vividness. We manipulated threat vividness through the use of pictures showing the threat. These were identified after conducting a pilot study in which 12 different pictures were tested (i.e., six for sunburn and six for skin cancer). The two pallid pictures were high in abstractness and represented graphics and unclear medical schemes, whereas the vivid pictures corresponded to concrete and real photographs of sunburn or skin tumor. As in the previous study, the picture was included right next to the text.

Dependent variables

The dependent variables were identical to the ones used in the previous study.

Results

Descriptive statistics are displayed in Table 4.

Manipulation checks

Our data revealed large differences between the two conditions of threat vividness ($d = 2.50$). As desired, participants rated the threat as less vivid in the pallid threat condition ($M = 2.55$, $SD = 1.32$) than in the vivid threat condition ($M = 5.64$, $SD = 1.15$). In addition, we checked our manipulation of threat severity using three

Table 4. Descriptive statistics from Study 2.

	Overall data ^a	Low severity		High severity	
		Pallid threat ^b	Vivid threat ^c	Pallid threat ^d	Vivid threat ^e
Cognitive responses					
<i>M</i>	0.41	0.45	0.31	0.22	0.65
<i>SD</i>	0.55	0.49	0.55	0.62	0.44
<i>Mdn</i>	0.50	0.50	0.33	0.00	0.83
Range	-1-1	-1-1	-1-1	-1-1	-0.50-1
Coeff. of variation	.39	.34	.42	.51	.27
Attitude					
<i>M</i>	5.52	5.33	5.34	5.22	6.18
<i>SD</i>	1.14	1.14	0.91	1.46	0.71
<i>Mdn</i>	5.80	5.40	5.40	5.80	6.20
Range	2.60-7	2.60-7	3.80-7	2.80-7	4.40-7
Coeff. of variation	.21	.21	.17	.30	.11
Intention					
<i>M</i>	2.69	1.95	2.71	2.54	3.48
<i>SD</i>	1.73	1.41	1.43	1.75	2.01
<i>Mdn</i>	2.00	1.25	2.25	2.00	3.75
Range	1-7	1-6	1-5	1-7	1-7
Coeff. of variation	.64	.72	.53	.69	.58

Note. Coeff. = coefficient.

^a*N* = 93.

^b*n* = 22.

^c*n* = 24.

^d*n* = 23.

^e*n* = 24.

415 questions: “Do you think [the threat] is severe/serious/
harmful?” ($\alpha = .93$) on 7-point rating scales. Similar to
threat vividness, our results indicated a large effect of
severity ($d = 2.87$). Participants have been found to
estimate the low-severe threat as less severe ($M = 3.70$,
420 $SD = 1.18$) than the high-severe threat ($M = 6.46$,
 $SD = 0.68$).

Cognitive responses

First, our results showed that threat severity had no
main effect on cognitive responses ($d = 0.11$), whereas
425 threat vividness produced a small main effect ($d = 0.29$).
More importantly, we also found a Vividness \times Severity
interaction (see Figure 1) with a medium effect size
($d = 0.55$). In the condition of high severity, as revealed
by a large effect ($d = 0.80$), participants reported more
430 favorable responses toward the recommendation when
the threat was vivid ($M = .65$, $SD = .44$) than when it
was pallid ($M = .22$, $SD = .62$). In the condition of
low severity, threat vividness had only a small effect
($d = 0.27$).

Attitude

435 On the score of attitude, the analyses of variance yielded
small main effects of threat severity ($d = 0.34$) and threat
vividness ($d = 0.46$). Furthermore, a small-to-medium
interaction effect emerged ($d = 0.46$; see Figure 2). When
440 severity was high, there were moderate differences

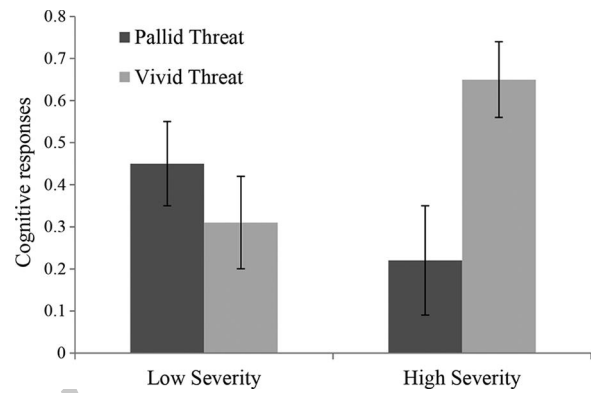


Figure 1. Cognitive responses toward the recommendation as a function of threat vividness and severity. Note. Error bars represent standard errors.

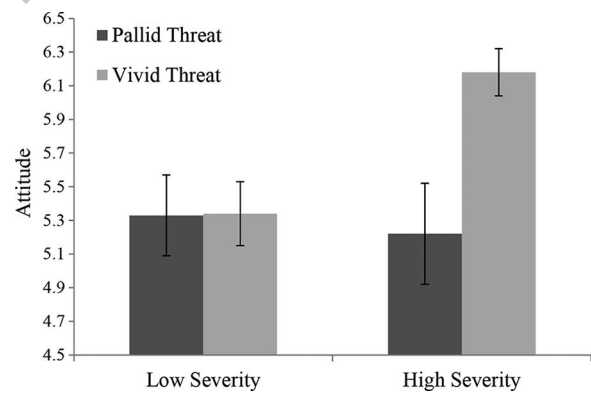


Figure 2. Attitude toward the recommendation as a function of threat vividness and severity. Note. Error bars represent standard errors.

between the conditions of threat vividness ($d = .63$), such
that participants exposed to the vivid threat ($M = 6.18$,
 $SD = 0.71$) reported greater attitude toward the
recommendation than did those exposed to the pallid
445 threat ($M = 5.22$, $SD = 1.46$). When severity was low,
we found a very small effect of threat vividness ($d = .009$).

Behavioral intention

Results showed a medium main effect of threat vivid-
ness ($d = .51$) and a small main effect of threat severity
($d = .41$). Unfortunately, a very small interaction effect
450 was found ($d = 0.06$).

Discussion

Study 2 replicated results of Study 1, such that a vivid
threat caused a greater response than a pallid threat
did. However, in this study we also showed that this
455 effect mainly depended on the strength of the threat.

When it was high, participants exposed to the vivid threat reported a more positive cognitive responses and a more favorable attitude toward the action recommendation than did those exposed to the pallid threat. When low, threat vividness produced very small effects.

Study 3

In addition to threat severity, vulnerability is the second component of threat. It refers to the likeliness to experience negative outcomes of reckless actions. In the two previous studies, vulnerability was assumed to be high. In this study, we examined the effects of threat vividness when vulnerability was low versus high. Severity was consistently high in all conditions. We hypothesized a large effect of threat vividness in the condition of high vulnerability and only a very small effect in the condition of low vulnerability.

Method

Participants, design, and procedure

Seventy-seven undergraduate students, ranging in age from 18 to 25 years ($M = 20.60$, $SD = 1.43$), took part in this study for course credit. Participants were tested individually and randomly assigned to one of the four experimental conditions of a 2 (threat vividness: pallid vs. vivid) $\times 2$ (vulnerability: low vs. high) factorial design. Although the overall procedure was similar to that of Studies 1 and 2, we added a supplementary manipulation of vulnerability that was performed before the exposure to the message and changed the health topic (as sun exposure was of high personal relevance for all participants). In this study, the message was about risks related to mobile phone use. The threat was “cancer of the nose–throat–ear area” and had been identified as highly severe on the basis of a pilot study testing several threats. The recommendation suggested participants “not to call more than 10 minutes per day.” Contrary to the previous studies, this recommendation was pretested and specifically selected to be moderately effective. By doing so, it allowed testing the impact of our variables without being influenced by a too effective recommendation. In the pilot study, we used two items as measures of recommendation efficacy: “I think that [the recommendation] is effective/useful to protect against waves emission from mobile phones” ($\alpha = .98$). The 7-point rating scales were provided to participants for responding to each of these items. Note that these items were included in the pilot study only.

Independent variables

Vulnerability. To manipulate vulnerability, we used a false feedback procedure (see DeHoog, Stroebe, & deWit, 2008). Before being exposed to the health message, participants were asked to perform a test on a computer, presented as a “quiz” asking them some questions about their habits and behaviors with their mobile phone (e.g., “Generally, how many messages do you send during an ordinary day?”). Once participants completed the test, they were provided a general report revealing a profile of their mobile phone user status, supposedly calculated on the basis of their responses. In fact, two versions of this report were created beforehand according to the experimental condition in which each participant was assigned a “low-risk” status (low-vulnerability condition), stating that “according to your responses, your score is low; the way you use your mobile phone does not represent any particular risk for your health,” and a “high-risk” status (high-vulnerability condition) where it was said that “according to your responses, your score is high; the way you use your mobile phone represents strong risks for your health). In addition, the experimenter strengthened each feedback with informal remarks. A pilot study confirmed the validity of this procedure to elicit varied degrees of vulnerability.

Threat vividness. As in the previous study, we manipulated threat vividness by presenting either an abstract (i.e., a medical radiograph of a tumor) or a concrete (i.e., photograph of a person with a tumor) picture portraying the threat. These were selected through a pilot study in which 10 different pictures were tested.

Dependent variables. The dependent variables were identical to the ones in the previous studies.

Results

Overall descriptive statistics are reported in Table 5.

Manipulation checks

First, we checked that threat vividness was successfully manipulated. As expected, large differences ($d = 1.12$) have been found between the pallid threat ($M = 3.99$, $SD = 1.63$) and the vivid threat ($M = 5.53$, $SD = 0.99$). We also checked vulnerability by asking participants to rate on 7-point scales how vulnerable they felt to the threat: “Personally, what is the likelihood that you experience [the threat]?” “Personally, do you think that you are likely to experience [the threat]?” ($\alpha = .88$). We

Table 5. Descriptive statistics from Study 3.

	Overall data ^a	Low vulnerability		High vulnerability	
		Pallid threat ^b	Vivid threat ^c	Pallid threat ^d	Vivid threat ^e
Cognitive responses					
<i>M</i>	0.10	0.02	-0.07	-0.01	0.44
<i>SD</i>	0.54	0.59	0.34	0.59	0.43
<i>Mdn</i>	0.00	0.00	0.00	0.00	0.50
Range	-1-1	-1-1	-0.75-0.50	-1-1	-0.67-1
Coeff. of variation	.49	.58	.32	.58	.30
Attitude					
<i>M</i>	5.32	5.27	5.24	4.99	5.80
<i>SD</i>	0.91	0.62	1.11	0.99	0.75
<i>Mdn</i>	4.00	5.00	5.20	5.00	5.80
Range	1-7	4.20-6.40	2.60-7	3.20-7	4.80-7
Coeff. of variation	.17	.12	.21	.20	.13
Intention					
<i>M</i>	4.26	4.00	3.94	3.85	5.26
<i>SD</i>	1.56	1.23	1.25	1.84	1.49
<i>Mdn</i>	4.00	4.00	4.00	3.50	5.00
Range	1-7	2-6	1-5	1-7	2-7
Coeff. of variation	.37	.31	.32	.48	.28

Note. Coeff. = coefficient.

^a*N* = 93.

^b*n* = 21.

^c*n* = 17.

^d*n* = 20.

^e*n* = 19.

found a large effect of vulnerability ($d = 1.37$). Participants in the low-vulnerability condition perceived themselves as less vulnerable ($M = 3.33$, $SD = 1.34$) than did those in the high-vulnerability condition ($M = 4.96$, $SD = 1.08$).

Cognitive responses

On cognitive responses, our results showed that threat vividness had a small main effect ($d = .36$), whereas vulnerability caused a medium main effect ($d = .49$). More important, we observed an interaction effect ($d = .55$), indicating that, when vulnerability was high, threat vividness produced a medium effect ($d = .63$), such that the exposure to a vivid threat resulted in more favorable cognitive responses ($M = .44$, $SD = .43$) than the exposure to a pallid threat ($M = -.01$, $SD = .59$). When vulnerability was low, threat vividness produced a very small effect on cognitive responses ($d = 0.04$).

Attitude

No main effect of vulnerability ($d = 0.17$), but a small-to-medium main effect of threat vividness ($d = 0.45$), was found. Our results also indicated an interaction between our variables ($d = 0.51$). Although threat vividness has been found to have a very small effect when vulnerability was low ($d = 0.03$), results showed, however, that participants, when vulnerability was high, reported more favorable attitude in the vivid threat condition ($M = 5.80$, $SD = 0.75$) than participants did in

the pallid threat condition ($M = 4.99$, $SD = 0.99$), as revealed by a medium effect ($d = 0.67$).

Intention

Our results showed a small-to-medium main effect of threat vividness ($d = 0.47$) and a small effect of vulnerability ($d = 0.41$). We also found an interaction on intention ($d = .51$), yielding a medium effect of threat vividness ($d = .70$) when vulnerability was high. In this condition, participants exposed to the vivid threat expressed greater intention ($M = 5.26$, $SD = 1.49$) than did those exposed to the pallid threat ($M = 3.85$, $SD = 1.84$). Once again, when vulnerability was low, differences were very small ($d = .04$).

Discussion

Results of this third study were consistent with our predictions and mirrored findings of the previous study. When highly vulnerable to the threat, participants presented with a vivid threat reported more favorable cognitive responses, attitude, and intention toward the recommendation than did those in the condition of low vivid threat. However, when low vulnerable, threat vividness had only a very small effect.

General discussion

The main objective of the current studies was to examine the effect of threat vividness on the acceptance of health recommendations. Taken together, our data showed that when exposed to vivid threats, compared with pallid threats, participants reported more positive reactions toward action recommendations, whether it was on cognitive responses, attitude, or behavioral intention. Thus, exposing threats in a clear and concrete manner leads people to accept more information that can guarantee their protection.

Another objective of the current research was to test the premise that vividness effects would be moderated by the strength of the threat and would occur only in a condition of high threat. Across studies, we confirmed such a hypothesis, with respect to the two components of threat, namely, severity and vulnerability. When high, presenting a threat is likely to incite people to change, as literature has extensively evidenced. Thus, enhancing its vividness activates such persuasiveness by making vivified information salient and accessible (Kisielius & Sternthal, 1984, 1986). By contrast, when a threat is low, exposing it with vivid materials only engenders very small effects as the low threat is perceived as worthless. On a broader front, we contend that

625 vividness has no persuasive effects per se but activates
 the persuasive effects of information to which it is
 attached. This is the reason why information without
 persuasive value can exert only a very limited influence
 when increasing its vividness. Conversely, pallidness
 630 has the capacity to inhibit the potential influence of
 information. As persuasive as it is, information
 delivered via pallid stimuli cannot influence persuasion.

Theoretical implications

635 The current investigation makes a crucial contribution
 to our understanding of threatening communications
 by distinguishing the effects of the threat from those
 of its vividness. Indeed, we showed that a threat may
 have mixed persuasive effects depending on how vividly
 it is presented. But beyond their distinct effects, we also
 640 demonstrated the complementarity between threat and
 vividness. Information needs to be highly threatening
 to motivate people to action, but vividness should also
 be at its highest to reveal that information as visible
 and clear as possible and to enable the effects to be
 645 active. In contrast, vividness requires that information
 to which it is attached be threatening enough to exert
 a given influence. As a consequence, a threat and its
 vividness interact to produce a common effect.

Beyond that, our findings allow reinterpreting results
 650 of past studies that have used vividness as a way of
 manipulating the threat. For example, let's consider
 the seminal experience of Janis and Feshbach (1953),
 which aimed to examine the influence of threats on
 the adoption of health recommendations (i.e., brushing
 655 teeth regularly). Their messages were presented to
 students in the form of oral communications lasting
 about 15 minutes. Three communications were tested:
 a low-threat message, including graphics; a moderate-
 threat message, including drawings of damaged teeth;
 660 and a high-threat message, including terrifying pictures
 of very poor teeth. At the end of the study, a negative
 relation appeared between the level of threat and the
 resulting compliance with the recommendations: the
 higher the threat, the less persuasive the message.
 665 Accordingly, the authors concluded that the effects of
 threats are detrimental. Although first in the field, these
 findings were surprising, especially given that few
 studies have succeeded to replicate them (Higbee,
 1969). Nevertheless, as we have pointed out for Witte's
 670 study, the way they manipulated the threat refers to
 threat vividness and not to the threat itself. Based on
 our findings, we suggest that these negative effects could
 have been due to high vividness supposedly combined
 with a low threat. Although no measures were included,
 675 it is entirely possible that the threat was not high in

vulnerability and that, coupled with high vividness, it
 resulted in counterproductive effects, as our findings
 have shown. Therefore, by not accounting for specific
 effects of threat vividness and distinguishing it from
 the effects of the threat itself, research and theoretical
 680 models were destined to be inaccurate and incomplete.

Practical implications

Making threatening information more vivid when
 designing health advertising campaigns is a common
 and frequently used strategy. As we already mentioned,
 685 the new pictorial warnings that have been embedded
 on cigarette packages constitute a good illustration.
 Indeed, these attempt to persuade smokers to quit by
 showing them what tobacco-induced risks look like
 through very explicit pictures. Overall, the literature has
 690 shown that such warnings are effective in reducing smok-
 ing behaviors, relative to text-only warnings (for a meta-
 analysis, see Noar et al., 2016). Despite the fact that viv-
 idness has been surprisingly little evoked, we believe that
 it has, however, the potential to be a crucial explaining
 695 factor. Our findings indeed provide support that depict-
 ing the threat with vivid stimuli, such as explicit words or
 pictures, is effective in bringing people into adopting
 healthier lifestyles. Thus, we think that this should be
 more considered by health message designers. In certain
 700 promotion health campaigns, it is not rare to observe that
 the threat is neither clearly nor concretely evoked. Recei-
 vers should implicitly infer the exact threat. Based on the
 present findings, it is somewhat unlikely that these cam-
 paigns can achieve expected changes, given that threaten-
 705 ing information need to be made vivid to be influential.

That being said, and perhaps more important, appro-
 710 priate precautions should be taken when including vivid
 information in implementing health interventions. As
 our data evidenced, the nature of the threat needs also
 to be considered. No threatening information could
 promote adaptive changes, no matter how vivid, if not
 perceived as highly serious and self-relevant. Therefore,
 we urge health professionals to think first about how to
 convince people about the seriousness of the threat and
 715 their personal vulnerability to face the threat. Other-
 wise, any health communications would run the risk
 of having no impact in changing unhealthy behaviors.

Limitations and futures directions

The current studies have several notable limitations. 720
 One is that we did not integrate recommendation
 efficacy in our experimental designs. Although we
 ensured having moderate-efficacious recommendations
 in Study 3, we did not test whether low- versus high-

725 protective recommendations could alter the effects of
 threat vividness. Nonetheless, as we noted in the
 introduction, it has been found repeatedly that threats
 differentially affect acceptance depending on how much
 coping information is effective to protect (e.g., Eppright
 730 et al., 2002). Thus, futures studies should be conducted
 to assess whether recommendation efficacy comes into
 play in the effects of threat vividness. Another limitation
 is that our dependent variables were restricted to rec-
 ommendation acceptance. First, as we know that
 735 defensive reactions have strong implications in the
 effects of threatening messages (Van't Riet & Ruiter,
 2013), it would have been valuable to measure them
 in order to appreciate whether and how vividness
 simultaneously influences defensiveness and enhances
 persuasion. Second, another variable that would have
 740 been important to include relates to actual behavior.
 Although difficult to appraise, changing behavior
 remains the ultimate intention of persuasive strategies.
 Observing changes in terms of self-reported behavioral
 745 intention does not mean that behavior changed as well
 (Webb & Sheeran, 2006). Besides, threatening commu-
 nications often show positive effects on attitudes and
 intentions but have lower effects on actual behavior
 (Peters, Ruiter, & Kok, 2013). Thus, it would be interest-
 750 ing in further studies to examine whether the benefits of
 threat vividness could persist at the behavioral level.
 Another limitation is that vividness has been manipu-
 lated in two ways only, namely, the presence of a picture
 versus no picture and an abstract versus concrete
 755 picture. Other kinds of manipulation could have been
 used (e.g., abstract vs. concrete words, statistical vs.
 testimonial information). Regarding participants, it is
 also important to note that our sample sizes were
 relatively low and that, similarly to the majority of
 760 studies on vividness (see Blondé & Girandola, 2016),
 participants to our studies were all students, which
 can pose some issues with regard to generalization of
 our findings to other populations.

Last, one important limitation is that we did not
 765 provide any insights in understanding underlying
 mechanisms that could explain the effects of threat
 vividness. Although multiple processes could be
 proposed (e.g., attention, memory recall), we suggest
 that one relevant process that should be explored in
 770 future research is mental imagery. Indeed, it is clear that
 vividness can facilitate the capacity to generate mental
 imagery (Bugelski, 1983; Paivio, 1971; Paivio & Csapo,
 1973; Richardson, 1983). Furthermore, mental imagery
 has been shown to exert a strong influence on per-
 775 suasion (e.g., Anderson, 1983; Babin & Burns, 1997;
 Escalas, 2004; Keller & McGill, 1994; Petrova & Cialdini,
 2005; for a review, see Petrova & Cialdini, 2008). For

example, Petrova and Cialdini (2005) have shown that
 advertising with instructions to imagine the item being
 sold are likely to cause more favorable thoughts toward
 780 promoted products and increase purchasing intentions.
 In addition, research has revealed that mental imagery
 can ease the accessibility to information likely to pro-
 duce positive effects on evaluations and behavioral
 intentions (Dahl & Hoeffler, 2004; Zhao, Hoeffler, &
 785 Dahl, 2009) and lead people to be less sensitive to the
 strength of arguments (Escalas, 2004). Regarding health
 communications, the ease with which people can
 imagine consequences of behaving in risky ways is likely
 to improve the overall evaluation of preventative behav-
 790 iors (Berry & Carson, 2010; Broemer, 2004). Hence, we
 suggest that the effects of threat vividness on the accept-
 ance of action recommendations could be due mainly to
 increased mental imagery of the threat. That said, these
 795 predictions are just speculations, but we hope that our
 contribution will encourage studies to address them.

Note

1. Note that different participants were invited for each
 800 study.

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