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Appealing to fear: A Meta-Analysis of Fear Appeal Effectiveness and Theories

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Abstract

Fear appeals are a polarizing issue, with proponents confident in their efficacy and opponents confident that they backfire. We present the results of a comprehensive meta-analysis investigating fear appeals' effectiveness for influencing attitudes, intentions, and behaviors. We tested predictions from a large number of theories, the majority of which have never been tested meta-analytically until now. Studies were included if they contained a treatment group exposed to a fear appeal, a valid comparison group, a manipulation of depicted fear, a measure of attitudes, intentions, or behaviors concerning the targeted risk or recommended solution, and adequate statistics to calculate effect sizes. The meta-analysis included 127 papers (9% unpublished) yielding 248 independent samples (N_{Total} = 27,372) collected from diverse populations. Results showed a positive effect of fear appeals on attitudes, intentions, and behaviors, with the average effect on a composite index being random-effects $\overline{d}$ = 0.29. Moderation analyses based on prominent fear appeal theories showed that the effectiveness of fear appeals increased when the message included efficacy statements, depicted high susceptibility and severity, recommended one-time only (vs. repeated) behaviors, and targeted audiences that included a larger percentage of

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female message recipients. Overall, we conclude that (a) fear appeals are effective at positively influencing attitude, intentions, and behaviors, (b) there are very few circumstances under which they are not effective, and (c) there are no identified circumstances under which they backfire and lead to undesirable outcomes.

Keywords

Fear appeals; risk; health communication; meta-analysis

Fear appeals are persuasive messages that attempt to arouse fear by emphasizing the potential danger and harm that will befall individuals if they do not adopt the messages' recommendations (Dillard, 1996; Maddux & Rogers, 1983). Although these messages are often used in political, public health, and advertising campaigns in the hopes of reducing risky attitudes, intentions, or behaviors, their use is often a polarizing issue. Whereas some practitioners are confident in the power of fear appeals to persuade audiences (e.g., CDC, 2014; Xu et al., 2015), others are adamant that such messages are counterproductive (e.g., Drug Free Action Alliance, 2013; Ruiter et al., 2014). The fear appeal literature reflects this disagreement, and empirical studies, literature reviews, and meta-analyses conducted over the past six decades have offered a diverse array of perspectives on the topic. Although some meta-analytic examinations have found positive effects of fear appeals on some outcomes (Witte & Allen, 2000), others have found null effects (de Hoog et al., 2007) or even negative effects (Peters et al., 2012). In the current paper, we present the results of a comprehensive meta-analysis of fear appeal research with two goals in mind. Our first goal was to compile the largest available meta-analytic database of fear appeal research and estimate average effects. Our second goal was to test a variety of theoretical predictions, many of which have never been examined meta-analytically, and to organize them within a framework that takes into account characteristics of a fear appeal's message, recommended behavior, and audience.

A Message-Behavior-Audience Framework of Fear Appeals

Existing theories about fear appeals have focused on either the content of the *message*, the nature of the *behavior* recommended by the communication, or the characteristics of the *audience* receiving the message. However, all three of these aspects (message, behavior, and audience) are important and were considered in the framework that guided this review. This integrative framework gave our meta-analysis a broader scope beyond past analyses of fear appeals. Specifically, each prior meta-analysis has only tested theories relevant to the message portion of our framework, and thus was only able to address a limited set of questions pertaining to fear appeal effectiveness (for a description of prior meta-analyses, see Table 1) (Boster & Mongeau, 1984; de Hoog et al., 2007; Earl & Albarracin, 2007; Floyd et al., 2000; Milne et al., 2000; Peters et al., 2012; Sutton, 1982; Witte & Allen, 2000). By adopting this more holistic view of fear appeals, we connected existing models that are generally treated as separate and examined novel hypotheses about fear appeal effectiveness that have previously gone untested. Further, the current meta-analysis used a

substantially larger meta-analytic database than prior analyses, thus providing us with more precision to test relevant hypotheses.

The Content of Fear Appeals

Six prominent theories make predictions about the impact of message characteristics on fear appeal effectiveness[1]: The linear model of fear appeals (e.g., Witte & Allen, 2000), the curvilinear model of fear appeals (e.g., Hovland et al., 1953), the health belief model (Rosenstock, 1966; Becker, 1974; Becker et al., 1977; Becker et al., 1978; Rosenstock, 1974), the parallel process model (Leventhal, 1970), the extended parallel process model (Witte, 1992; Witte, 1998), and the stage model (de Hoog et al., 2007). These theories concern the level of depicted fear within messages, the use (or omission) of efficacy statements within messages, and the level of depicted susceptibility and/or severity within messages.

Amount of depicted fear

Perhaps the most central aspect of a fear appeal message is the amount of fear it is intended to arouse in message recipients. We will refer to this as depicted fear to emphasize that it reflects a property of the message's content, rather than the subjective state of fear that message recipients experience.[2] Two competing theories make predictions about amount of depicted fear, which we will refer to as the linear model (e.g., Witte & Allen, 2000) and the curvilinear model (Hovland et al., 1953; Janis, 1967; Janis & Feshbach, 1953; McGuire, 1968; McGuire, 1969). Both theoretical perspectives conceptualize depicted fear as a source of motivation, such that exposure to depicted fear increases motivation to adopt the message's recommendations (Hovland et al., 1953; Witte & Allen, 2000). Further, both models predict that low levels of depicted fear will be relatively less motivating and thus less effective than moderate levels of fear. However, the linear model predicts that depicted fear has a positive and monotonic influences on attitudes, intentions, and behaviors, such that high depicted fear is more effective than moderate depicted fear (e.g., Witte & Allen, 2000). In contrast, the curvilinear model predicts that high depicted fear elicits defensive avoidance, a reaction in which message recipients disengage from the message, avoid further exposure to the message, and/or derogate the message because it is too frightening (Higbee, 1969; Hovland et al., 1953; Janis, 1967; 1968; Janis & Feshbach, 1953; Janis & Leventhal, 1968;

[1]We use the term *effectiveness* to indicate whether exposure to a fear appeal message resulted in more persuasion than a comparison condition. Thus, a fear appeal is considered effective if the effect size comparing treatment to control is significantly positive. Consequently, when testing moderation, fear appeals will be considered more effective for one level of a moderator versus another if the average effect size for the first level of the moderator is significantly larger than the average effect size for the second level of the moderator. In other words, when we compare *fear appeal effectiveness* for a moderator, we are comparing whether treatment led to more persuasion relative to control for one level of a moderator versus another level of that moderator.

[2]Our framework addresses the relation between *fear appeals* and outcomes of interest (e.g., intentions) rather than the relation between *fear* and outcomes of interest. Although many fear appeal theories discuss fear, empirical studies typically test the impact of fear appeal messages on outcomes, and subsequently infer that message effects were mediated by experienced fear even though fear itself is rarely measured (for a discussion, see Popova, 2012, p.466). Indeed, only 71 of the 248 studies in the current meta-analysis measured fear directly, and such measures were typically treated as manipulation checks rather than independent variables or mediators. We are therefore careful to discuss the influence of depicted message characteristics rather than subjectively experienced states (e.g., depicted fear versus experienced fear). This distinction applies to prior meta-analyses and primary studies as well, though the distinction is rarely made. We would like to thank an anonymous reviewer for encouraging us to frame our results in line with this distinction.

McGuire, 1968; 1969; Millman, 1968). Consequently, the curvilinear theory predicts that high levels of depicted fear should be less effective than moderate levels of depicted fear.

The linear and curvilinear models have been tested in prior meta-analyses, and the linear model has consistently been supported by existing data, whereas the curvilinear model has not (e.g., Witte & Allen, 2000). One drawback to prior investigations of the linear and curvilinear models is that the analyses included comparisons from studies that used two levels of depicted fear, even though it is difficult to equate levels of depicted fear across different studies – what may qualify as moderate depicted fear in one study may qualify as low depicted fear in a different study. Thus, an appropriate test of the linear and curvilinear models requires depicted fear to be manipulated with at least three levels within the same study to ensure that moderate depicted fear is operationalized as an intermediate level between extremes. We therefore tested the linear and curvilinear models in the current meta-analysis by comparing the effects of high versus moderate depicted fear, using only studies that manipulated depicted fear across several levels. The linear model predicts that high depicted fear will be more effective than moderate depicted fear, whereas the curvilinear model predicts that high depicted fear will be less effective than moderate depicted fear.

Efficacy statements

According to the health belief model (HBM; Rosenstock, 1966; Becker, 1974; Becker et al., 1977; Becker et al., 1978; Rosenstock, 1974), the stage model (e.g., de Hoog et al., 2007), the parallel process model (PPM; Leventhal, 1970), and the extended parallel process model (EPPM; Witte, 1992; Witte, 1998), fear appeals “work only when accompanied by… efficacy messages” (Witte & Allen, 2000, p.606). An efficacy message is a statement that assures message recipients that they are capable of performing the fear appeal’s recommended actions (self-efficacy) and/or that performing the recommended actions will result in desirable consequences (response-efficacy). The HBM, stage model, PPM, and EPPM suggest that when message recipients are presented with a threat (i.e., depicted fear), resulting feelings of vulnerability lead them to evaluate whether or not adopting the message’s recommendations will protect them from the threat-related negative consequences. If recipients decide that adopting the recommended action(s) will protect them, the fear appeal should be more effective. As efficacy statements provide this assurance, fear appeal messages that include statements about self- or response-efficacy should be more effective than fear appeal messages that include neither (de Hoog et al., 2007; Witte & Allen, 2000).

There are two forms of the efficacy statement hypothesis. The strong hypothesis is that fear appeals without efficacy statements will produce negative effects (i.e., will backfire). The weak hypothesis is that fear appeals without efficacy statements will produce weaker (i.e., less positive or null) effects relative to fear appeals with efficacy statements. Three meta-analyses have tested whether the inclusion of efficacy statements in fear appeals leads to increased effectiveness, and all found support for the weak hypothesis (de Hoog et al., 2007; Mongeau, 1998; Witte & Allen, 2000). However, those studies were conducted using less comprehensive meta-analytic databases, and thus the current synthesis can provide a more thorough assessment of the strong and weak hypotheses.

Depicted susceptibility and severity

According to the stage model (de Hoog et al., 2007), the effectiveness of fear appeals should depend on their levels of depicted susceptibility and severity. A message high in depicted susceptibility emphasizes the message recipient's personal risk for negative consequences (e.g., "One of fourteen women is destined to develop breast cancer during her life. So every woman may get breast cancer. You also run that risk!"; Siero et al., 1984), whereas a message low in depicted susceptibility does not personalize risk (e.g., "One of fourteen women is destined to develop breast cancer during her life."; Siero et al., 1984). A message high in depicted severity describes the negative consequences of not taking action (e.g., "Breast cancer is a serious disease of which many women die, contrary to, for example, cancer of the uterus, where 90% to 95% recover."; Siero et al., 1984), whereas a message low in depicted severity portrays manageable consequences (e.g., "If breast cancer is detected at an early stage it can be cured in a number of cases, contrary to, for example, lung cancer where 90% die of it."; Siero et al., 1984). According to this model, high depicted severity (but not susceptibility) should improve attitudes, whereas high depicted susceptibility (but not severity) should improve intentions and behaviors. Consequently, only the combination of high-depicted susceptibility and severity should improve attitudes, intentions, and behaviors. A previous meta-analysis found mixed results concerning these predictions (de Hoog et al., 2007). Specifically, messages with high depicted severity positively influenced attitudes, intentions, and behaviors, whereas messages with high depicted susceptibility positively influenced intentions and behaviors but not attitudes. We tested these hypotheses on our more comprehensive database.

The Recommended Behavior

Three prominent theories make predictions about the impact of the recommended behaviors on fear appeal effectiveness: Robertson's single action theory (Robertson, 1975; Rothman, Martino, Bedell, Detweiler, & Salovey, 1999), prospect theory (Rothman et al., 1999; Rothman & Salovey, 1997; Tversky & Kahneman, 1981) and terror management theory (Goldenberg & Arndt, 2008; Pyszczynski, Greenberg, & Solomon, 1999; Shehryar & Hunt, 2005; Solomon, Greenberg, & Pyszczynski, 1991). These theories concern whether the recommended behavior is a one-time or recurring activity, involves detection or prevention/promotion, occurs immediately or after a delay, can enhance self-esteem, and is intended to replace a self-esteem enhancing behavior.

One-time versus repeated behaviors

According to Robertson (1975; also see Rothman et al., 1999), persuasive messages should be more successful when they recommend one-time behaviors (e.g., getting vaccinated) compared to behaviors that must be repeated over an extended period of time (e.g., exercising). As it takes less effort to do something once than many times, people are likely to be more compliant when a single behavior is recommended. Using this principle, we compared the effectiveness of fear appeals recommending one-time versus repeated behaviors.

Detection versus prevention/promotion behaviors

According to prospect theory, negative outcomes can be categorized as incurring a loss or foregoing a gain, and losses tend to be more psychologically impactful than foregone gains of objectively equal magnitude (Tversky & Kahneman, 1981). Several researchers have extended the logic of prospect theory to fear appeals, hypothesizing that fear appeals should be more effective when recommending detection behaviors relative to prevention/promotion behaviors (Rothman, Martino, Bedell, Detweiler, & Salovey, 1999; Rothman & Salovey, 1997). Detection behaviors are enacted to obtain information about potential risk factors or existing health issues (e.g., being screened for cancer), and thus engaging in a detection behavior increases risk for incurring a loss (e.g., acquiring the unwanted and undesirable information that one has cancer). In contrast, prevention/promotion behaviors are enacted to obtain desirable outcomes (e.g., exercising to lose weight or avoid weight gain), and thus engaging in prevention/promotion behaviors does not increase risk for incurring a loss (e.g., exercising will only bring one closer to the desired outcome of losing weight or avoiding weight gain, so there is no potential for loss by engaging in exercise). Fear appeals are loss-framed messages because they emphasize negative consequences, and loss-framed information makes people more willing than usual to take risks (Meyerowitz & Chaiken, 1987; van't Riet et al., 2014). Therefore, although fear appeals should be effective for both detection and prevention/promotion behaviors, they should be particularly effective for detection behaviors because the loss-framed nature of the message should make people more willing than usual to take on the risk of the detection behavior (Meyerowitz & Chaiken, 1987; Rothman, Martino, Bedell, Detweiler, & Salovey, 1999; Rothman & Salovey, 1997; van't Riet et al., 2014).

Mentioning death, self-esteem relevance, and time delays

Many fear appeals explicitly mention death (89 of the 248 studies in our meta-analysis), and terror management theory (TMT) makes three predictions about this factor. According to TMT, when people are reminded of their mortality by being exposed to the concept of death, they often become motivated to buffer their self-esteem to reduce mortality related anxiety (Goldenberg & Arndt, 2008; Pyszczynski et al., 1999; Shehryar & Hunt, 2005; Solomon et al., 1991). Some fear appeals recommend behaviors that can enhance self-esteem (e.g., dieting, which can improve body image; Goldenberg & Arndt, 2008), whereas others attempt to persuade people to stop engaging in behaviors that enhance self-esteem (e.g., tanning, which can also improve body image; Janssen et al., 2013). When fear appeals mention death, message recipients should increase commitment to behaviors that enhance self-esteem, regardless of whether the fear appeals encourage or discourage those behaviors. Consequently, fear appeals recommending self-esteem enhancing behaviors (e.g., dieting) should be more effective when they mention death than when they do not. In contrast, fear appeals recommending the cessation of behaviors that enhance self-esteem (e.g., tanning abstinence) should be less effective when they mention death than when they do not.

TMT also posits that reminders of death activate two types of defensive responses: Short-term proximal defenses and long-term distal defenses. Proximal defenses involve refuting information to avoid considering one's death, whereas distal defenses involve buffering one's self-esteem and pursuing long-term goals (e.g., a healthy lifestyle; Goldenberg &

Arndt, 2008). Consequently, fear appeals that mention death should be more effective if there is a delay between fear appeal exposure and occurrence of the outcome, rather than if outcomes occur immediately after exposure when proximal defenses are still active (e.g., Greenberg et al., 1990; Shehryar & Hunt, 2005).[3]

The Audience

Two prominent theories make predictions about the impact of the audience on fear appeal effectiveness: Regulatory fit theory (Higgins, Pierro, & Kruglanski, 2008; Kurman & Hui, 2011; Lockwood, Marshall, & Sadler, 2005) and the transtheoretical model (Prochaska & DiClemente, 1983; Prochaska et al., 1992; Prochaska & Velicer, 1997). These predictions concern whether the message's audience is primarily female (versus male), from a collectivist culture (versus an individualistic culture), and already attempting to change risk behaviors (versus not).

Gender and culture

According to regulatory fit theory, people can be promotion or prevention focused, placing greater value on either the pursuit of positive outcomes or on the avoidance of negative outcomes, respectively (Higgins et al., 2008; Kurman & Hui, 2011; Lockwood et al., 2005). Message frames that match the promotion versus prevention tendencies of the audience are more persuasive (Cesario, Higgins, & Scholar, 2008), and fear appeals are definitionally prevention-framed messages because they emphasize what one should do to avoid negative outcomes. Consequently, prevention-focused populations should be more persuaded by fear appeals relative to promotion-focused populations. Cultural research in the area of regulatory focus has found that women tend to be more prevention focused than men, and members of collectivist groups tend to be more prevention focused than members of individualist ones (Kurman & Hui, 2011; Lockwood, Marshall, & Sadler, 2005). Therefore, fear appeals should be particularly effective for female (versus male) and collectivist (versus individualist) audiences.

Early versus late stages of change

According to the transtheoretical model, people engaging in risky behaviors can be classified as belonging to an early stage (the model's precontemplation, contemplation, and preparation stages) or a late stage (the model's action and maintenance stages) in the change process (Prochaska & DiClemente, 1983; Prochaska et al., 1992; Prochaska & Velicer, 1997). According to the early-effectiveness hypothesis, fear appeals should be more effective for individuals in the early (vs. late) stages because the former require motivational appeals to understand that a threat exists and to increase commitment to adopting desirable behaviors and/or abandoning undesirable behaviors. In contrast, late stage individuals are already committed to behavior change and do not require such motivational appeals (DiClemente et al., 1991; Nabi et al., 2008; Prochaska & DiClemente, 1983; Prochaska et

[3]TMT theories also predict a higher order interaction between mentions of death, time delays, and self-esteem, such that the predicted effects of self-esteem discussed above become stronger after a delay (Goldenberg & Arndt, 2008). Of the 12 conditions represented by this prediction (2 death × 3 delay × 2 self-esteem), four had zero observations in our meta-analysis. Thus, we are only able to test the simpler predictions concerning self-esteem and time delay in isolation.

al., 1992). The late-effectiveness hypothesis competes with the early one, and predicts that success at behavior change is associated with increases in self- and response efficacy (Cho & Salmon, 2000). As a result, exposure to a fear appeal should lead individuals who have already enacted change to process the fear appeal in the context of their high response efficacy (Cho & Salmon, 2006). Consequently, the late-effectiveness hypothesis predicts that fear appeals should be more effective for late stage relative to early stage individuals.[4] To test the early-effectiveness and late-effectiveness hypotheses, we classified each study's sample as belonging to one of the transtheoretical model's first three stages or last two stages. We then compared the effectiveness of fear appeals for individuals in the early versus late stages.

The Present Research

We compiled the largest meta-analytic database of fear appeals to date to examine the effectiveness of fear appeals for changing attitudes, intentions, and behaviors, and also to test moderator predictions made by a variety of influential fear appeal theories. Each of these theories tends to focus on one of three things – the content of the *message*, the type of *behavior* recommended by the communication, or the characteristics of the *audience* receiving the message (see Table 1 for a full list of theories and related hypotheses). Of the 16 fear appeal hypotheses discussed, only seven have been tested in prior meta-analyses, and all of them fall under the message aspect of our framework (Table 1). Thus, the present research represents the first meta-analytic test for nine of the 16 hypotheses and the first meta-analytic test for any hypotheses related to the behavior and audience aspects of our framework.

Methods

Review and Inclusion Criteria

To locate studies, we conducted a search of the *PsycInfo* and *Medline* databases using the keywords (risk *or* fear *or* shock *or* severity *or* susceptibility) AND (persuasion *or* appeal *or* argument *or* tactic *or* campaign *or* communication *or* intervention). To supplement these database searches, we examined the reference lists of previous fear appeal meta-analyses, review articles, and chapters. We also contacted researchers to request unpublished data and sent requests to the e-mail lists of the *Society of Behavioral Medicine*, the *Society for Personality and Social Psychology*, the *European Health Psychology Society*, and the *American Academy of Health Behavior*. Our search extended through February 2015 and yielded 430 potentially eligible articles, which were subsequently screened for inclusion in the current meta-analysis based on several inclusion criteria. For inclusion in this meta-analysis, studies had to meet the following eligibility criteria:

[4]Although many researchers investigate stage progression in the transtheoretical model (the process by which people move from one stage of the model to the next; Prochaska & DiClemente, 1983), this outcome is not directly relevant for our investigation because we are examining the effect of fear appeals on attitudes, intentions, and behaviors. It is possible that individuals would be classified as moving from one stage of the model to the next due to changes in attitudes, intentions, or behaviors, but such classification decisions are not the focus of the present study. The transtheoretical model also includes three dimensions other than the stages of change — the processes of change, self-efficacy, and decisional balance. Although we test predictions derived from the transtheoretical model more broadly, we limited our predictions to the areas that are relevant to fear appeal audiences (stages of change).

1. Studies were included if they contained an experimental research design in which a treatment group was exposed to a message designed to induce fear (i.e., a fear appeal).

2. Studies were included if they contained a comparison group. The comparison group could have been a group that was not exposed to any message, a group that was exposed to a message that was not designed to induce fear, or a message that was designed to induce less fear than the treatment group's message. When a study included more than one potential comparison groups, we opted to compare the highest depicted fear condition with the lowest depicted fear condition, prioritizing them in the following order: No message comparison group, neutral message comparison group, and low depicted fear comparison group. Thus, for a study containing a low depicted fear group and a neutral message group, we used the neutral message group as the comparison group. Overall, all results should be interpreted as the effect of exposure to messages designed to depict relatively high levels of fear compared to conditions designed to depict relatively lower levels of fear (including no fear).[5]

3. Studies were included if they experimentally manipulated depicted fear across groups. Studies were excluded if they used correlational research designs or provided all groups with the same level of depicted fear.

4. Studies were included if they measured one or more of the following variables as an outcome in both the treatment and comparison groups: Attitudes, intentions, or behaviors.

5. Studies were excluded if they did not contain appropriate statistics (e.g., F ratios, means and standard deviations, frequencies, or exact p values) for calculating an effect size representing the difference of outcomes for treatment versus comparison groups. If a study was otherwise eligible but did not contain appropriate statistics (e.g., it provided path coefficients from a structural equation analysis but did not supply means and standard deviations for treatment and comparison groups), we attempted to contact the study's authors to retrieve usable data such as means and standard deviations. We contacted authors of 39 papers for this purpose: Three provided us with the requested data, six responded but could not provide us with the relevant data, and the rest did not respond to multiple contact requests.

Of the 430 reports considered for inclusion in this meta-analysis, 127 met our inclusion criteria (9% unpublished), providing 248 statistically independent samples with a total N of

[5]A number of papers did not provide the full text of the messages that were presented to each group, which made it impossible to determine if comparison groups labeled with the terms neutral message or control message were actually presented with neutral messages or with low depicted fear messages. Similarly, groups labeled with the term low depicted fear may have actually been presented with a neutral message but were nonetheless labeled as low fear because they were designed to induce relatively less fear than the experimental group. Thus, we could consistently compare relative levels of depicted fear across studies (more depicted fear vs. less depicted fear), but not absolute levels of fear (high depicted fear vs. low depicted fear vs. no depicted fear). Consequently, no message groups, neutral message groups, and low depicted fear groups were all considered appropriate comparison groups. Further, it was generally not possible to combine different potential comparison groups because information about standard deviations for the outcomes of each group was often lacking from reports, which made it unfeasible to calculate correct standard errors for combined comparison groups.

27,372 participants in the treatment and comparison groups combined. Samples ranged in age from 9-87 years (M = 22.77 years, SD = 9.24 years) and were on average 66% female (SD = 33%). An average of 81% of each sample had completed high school (SD = 37%). Further, samples were on average 71% White or European-American (SD = 34%), 14% Asian or Asian-American (SD = 31%), 8% Black or African-American (SD = 18%), and 5% Hispanic/Latino(a) (SD = 14%).

Coding of Outcomes (Effect Size Calculation)

We calculated a single effect size per sample that compared attitudes, intentions, and behaviors for the treatment group relative to the comparison group. First, for each sample we recorded all measures of attitudes, intentions, and behaviors. For each outcome, we calculated the standardized mean difference between treatment and comparison groups correcting for sample size bias (Johnson & Eagly, 2014, p. 686). Effect sizes (d) were calculated based on provided F-ratios, t-tests, odds ratios, or means and standard deviations. To produce d for any odds ratios, we divided the log of the odds ratio by 1.81 (Haddock, Rindskopf, & Shadish, 1998; Hasselblad & Hedges, 1995).

Note that outcomes could have concerned the negative behavior/issue targeted by the fear appeal (e.g., attitudes toward smoking) or the fear appeal's recommendations (e.g., attitudes toward smoking cessation). Effect sizes were calculated such that higher positive values indicate the treatment group scored higher in the message's direction. For example, if a study used anti-smoking messages, a positive d would indicate that the treatment group (relative to the comparison group) had more negative attitudes toward smoking or more positive attitudes toward smoking cessation. Thus, a positive effect size indicates the fear appeal worked, whereas a negative effect size indicates the fear appeal backfired.

The majority of samples (k = 170) included only one type of dependent measure (attitudes, intentions, or behaviors), but some samples included two types (k = 61) or all three (k = 17). Therefore, after calculating d for each outcome in a sample, we averaged all d values together to form a single effect size per sample that represents positive change in the direction advocated by the fear appeal. Further, if a sample included two or more measures of the same outcome type (e.g., attitudes toward smoking and attitudes toward smoking cessation), each was included in the average and weighted equally (the number of samples with multiple attitude, intention, and behavior measures was respectively k = 18, k = 24, and k = 12). This approach is justified on several grounds. First, for studies that included all three types of outcomes (attitudes, intentions, and behaviors), Cronbach's alpha for the composite measure was .87, indicating that the three types of measures are highly internally consistent. Further, prior research has demonstrated that composite measures combining attitudes, intentions, and behaviors are a valid outcome of interest when investigating the relative persuasiveness of messages (O'Keefe, 2013). We therefore combined all attitude, intention, and behavior measures within each sample to form a single effect size per sample, which is how the results will be presented in the present manuscript. However, we also conducted all analyses separately for attitude, intention, and behavior measures; these results are presented in Appendix A and are consistent with the results based on the combined measure. Several hypotheses made specific predictions about attitudes, intentions, or

behaviors, and for those hypotheses (see Table 1), we present the relevant outcomes of interest in the body of the manuscript.

Of note, attitudes were most commonly measured with semantic differential scales (e.g., positive/negative, beneficial/harmful, wise/foolish, etc.; Roskos-Ewoldsen, Yu, & Rhodes, 2004; Nabi et al., 2008) and Likert style scales (e.g., agreement with statements such as, "I don't like speeding"; Cauberghe et al, 2009, p. 280). Intentions were frequently measured with Likert style scales (e.g., agreement with statements such as, "In the immediate future, I plan to find someone who will teach me to do an accurate breast self-examination"; Roskos-Ewoldsen et al., 2004, p. 58) and questions with dichotomous response options (e.g., "In the future, I intend to stop spending time outside strictly for the purpose of getting a tan," with responses *Yes* and *No*; McMath & Prentice-Dunn, 2005, p.629). Finally, behaviors were often measured dichotomously with self-report questions (e.g., "As a direct result of this message, did you seek help?" with responses *Yes* and *No*; Smalec & Klingle, 2000, p. 45) or behavioral observation data (e.g., information obtained from medical records; Ordoñana et al., 2009).

Coding of Potential Moderators

To test each hypothesis from the message, behavior, and audience portions of our framework, we coded several relevant variables (moderator codes for each paper included in the meta-analysis are displayed in Table 2). The first author trained two independent coders, who then coded all study characteristics relevant to each report. Intercoder reliability was calculated on 20% of the overall database using Cohen's kappa (κ) for categorical variables and Pearson's r for continuous variables. Agreement for all variables was good: Categorical variables had average κ = .93 (SD = .06, minimum = .80), and continuous variables had average r = .92 (SD = .12, minimum = .73). Disagreements were resolved by discussion and further examination of the studies.

Moderators related to message content—To test hypotheses concerning the message content, we coded messages' amount of depicted fear, inclusion (or absence) of efficacy statements, and levels of depicted susceptibility and severity.

Amount of depicted fear: To test the linear and curvilinear hypotheses, we coded whether studies included a moderate depicted fear group. To qualify, studies had to contain at least three experimental groups that were exposed to different levels of depicted fear. Thus, a study containing a high depicted fear group, a moderate depicted fear group, and a low depicted fear group would be included, whereas a study containing a high depicted fear group, a low depicted fear group, and a neutral control group would not. As noted above, an appropriate test of the linear and curvilinear hypotheses requires a comparison between high and moderate depicted fear; thus, the moderate group must represent a level of depicted fear between high and low (rather than between high and none). In the entire database (k = 248), 21 samples included more than two experimental groups exposed to varying levels of depicted fear. To test the linear and curvilinear hypotheses, we calculated effect sizes (d) comparing outcomes for the highest versus middle depicted fear groups (the calculation of these effect sizes followed the same procedure detailed above for the calculation of

treatment versus comparison effect sizes). The moderate depicted fear groups (total N = 1,626) were not included in other analyses (the studies and corresponding effect sizes included in this analysis can be found in Table 3)

Efficacy statements: For each article, we dichotomously coded whether or not an efficacy message was embedded in the fear appeal. The efficacy message could have focused on self-efficacy (e.g., emphasizing that people have a built-in urge for physical activity and this basic human physical need will make it easy to begin a regular exercise program; Wurtele & Maddux, 1987), response-efficacy (e.g., emphasizing that exercise leads to higher levels of high-density lipoprotein and thus prevents heart attacks; Wurtele & Maddux, 1987), or both (e.g., highlighting that condoms substantially reduce the risk of HIV transmission if used correctly and are easy to use consistently; Witte & Morrison, 1995).

Depicted susceptibility and severity: For each article, we coded whether depicted severity was manipulated to be higher in the treatment group relative to the comparison group (e.g., the treatment group received a message emphasizing the drastic consequences of not wearing bicycle helmets; Rodriguez, 1995) and whether depicted susceptibility was manipulated to be higher in the treatment group relative to the comparison group (e.g., the treatment group received a message focusing on how coffee consumption will likely lead the message recipient to develop fibromyalgia; Lieberman & Chaiken, 1992).

Moderators related to behavior characteristics—To test hypotheses concerning the targeted behavior, we coded whether the fear appeals recommended behaviors that were one-time or recurring and whether the behavior was a detection or prevention/promotion behavior. We also coded whether death was mentioned when discussing the behavior, whether the behavior was measured immediately versus after a delay, and whether the recommended behaviors was self-esteem enhancing or self-esteem hindering.

One-time versus repeated behaviors: We coded whether the recommended behaviors concerned one-time-only instances (e.g., signing up for a stress management training; Das et al., 2003) or would need to be enacted over an extended period of time (e.g., regularly using child safety devices when traveling by car; Chang et al., 1989).

Detection versus prevention/promotion: For each article, we coded if the recommended behavior was a detection behavior (e.g., getting tested for syphilis; Fukada 1975) or a prevention/promotion behavior (e.g., attending a training to prevent repetitive stress injury; Pengchit, 2010). We initially attempted to code prevention and promotion behaviors separately. However, due to the nature of these constructs, it was often difficult to discern how participants would construe a behavior (e.g., did participants conceptualize exercising as promoting a healthy BMI or preventing obesity?). As the relevant hypothesis solely concerned fear appeals being more effective when recommending detection (vs. prevention/promotion) behaviors, promotion and prevention behaviors were collapsed into a single code.

Mentioning death, self-esteem relevance, and time delays: We created a dichotomous code for whether or not the message explicitly used the word *death*. Messages dealing with

behaviors or issues that could clearly lead to death were still coded as non-death if the word death was not explicitly mentioned within the message itself (e.g., messages about smoking or HIV/AIDS that did not explicitly mention death as one of the potential consequences; Insko et al., 1965; McMath & Prentice-Dunn, 2005; Raleigh, 2002; Witte & Allen, 2000). This decision allowed for a more stringent test of TMT hypotheses, and provided an even distribution of death versus non-death conditions, which avoids the potential confound of death messages always being about more severe topics than non-death messages.

Self-esteem relevance: We coded whether the recommended behavior was self-esteem hindering or self-esteem enhancing. Self-esteem hindering behaviors were intended to replace existing behaviors that allowed message recipients to derive self-esteem. Samples were coded as containing a self-esteem hindering behavior if the researchers specifically measured self-esteem for the existing behavior being targeted by the fear appeal and described the sample as high (e.g., high driving-related self-esteem; Taubman Ben-Ari et al., 2000), if the sample was designated as committed to the existing behavior (e.g., smokers that were highly committed to smoking; Priolo & Milhabet, 2008), or if the existing behavior is one that people typically engage in to improve self-esteem and/or physical attractiveness (e.g., tanning or bulimia; Janssen et al., 2013; Smalec & Klingle, 2000).

In contrast, self-esteem enhancing behaviors have the potential to provide individuals with self-esteem. Samples were coded as containing a self-esteem enhancing behavior if the recommended behavior is commonly associated with the pursuit of improved self-esteem and/or physical attractiveness (e.g., fear appeals recommending a healthy diet to decrease BMI; Goldenberg & Arndt, 2008). Samples were also coded as self-esteem enhancing when fear appeals targeted behaviors that the audience had clearly already made the choice to forego (e.g., antismoking ads directed at non-smokers; Insko et al., 1965) because message recipients should generally be able to derive self-esteem by continuing to avoid engaging in the discouraged behavior (e.g., non-smokers who are told that smoking is bad and smoking abstinence is good should feel as though their decision to abstain from smoking reflects positively on them). Thus, studies were coded as self-esteem enhancing if the recommended behavior could improve self-esteem via the pursuit of physical attractiveness (e.g., exercise; Wurtele & Maddux, 1987), if the addressed behavior was not relevant for the sample (e.g., anti-smoking ads for non-smokers; Insko et al., 1965; Smart & Fejer, 1974), if the sample was designated as not committed to the behavior in question (e.g., smokers that were not committed to smoking; Priolo & Milhabet, 2008), or if the researchers specifically measured self-esteem related to the existing behavior being targeted by the fear appeal and described the sample as low (e.g., low driving-related self-esteem; Taubman Ben-Ari et al., 2000).

Time delay: We coded the amount of time between the fear appeal and the measurement of the outcome variable using three discrete categories: (a) The measure occurred the same day as the fear appeal exposure (e.g., Taubman Ben-Ari et al., 2000; Cho & Salmon, 2006; Nabi et al., 2008; Smart & Fejer, 1974; Stainback & Rogers, 1983); (b) the measure occurred one to fourteen days after fear appeal exposure (e.g., Berkowitz, 1998; Kirscht et al., 1978; Muthusamy et al., 2009); and (c) the measure occurred more than fourteen days after fear appeal exposure (e.g., Bagley & Low, 1992; Smith & Stutts, 2003; Witte & Morrison, 1995).

We used categories because delayed outcomes often occurred within a specified range – e.g., participants returned to the lab during the following two weeks, but the exact number of days was not specified.

Moderators related to the audience—To test hypotheses concerning the audience portion of our framework, we coded the gender composition of the sample, whether the sample was from a collectivist or individualist country, and the transtheoretical model stage of change that was applicable to the sample.

Gender composition: We coded the percent of the sample that was female.

Collectivism and individualism: We dichotomously coded whether each study's sample came from a primarily collectivist culture (e.g., East Asian cultures like South Korea, Japan, and Taiwan; Chu, 1966; Fukada, 1973; 1975; 1988; Kim et al., 2009) or a primarily individualist culture (e.g., Western cultures like Australia, Canada, and the United States; Beck, 1984; Brouwers & Sorrentino, 1993; Dahl et al., 2003; Hill & Gardner, 1980; Jones & Owen, 2006; LaTour & Tanner, 2003; Lewis et al., 2010; Smart & Fejer, 1974).

Stage of change: We coded the transtheoretical model's stage of change that was most applicable to the audience. As most studies did not specifically measure this variable, we designed a conservative coding scheme to ensure we could include the maximum number of reports in this analysis while avoiding misclassifications. The early-effectiveness and late-effectiveness hypotheses both make predictions that compare individuals in the first three stages of the model (precontemplation, contemplation, and preparation) versus the last two stages of the model (action and maintenance). Thus, we created a dichotomous code indicating whether the sample was in the early or late stages of the model.

Samples were considered precontemplation if there was a clear indication that it was a sample merely at risk for a given behavior (e.g., participants who were designated as noncompliant with safe sex recommendations; Raleigh, 2002), or participants were being persuaded about a fictitious or not well-known disease/risk for which they had clearly not been engaging in protective action beforehand (e.g., hypoglycemia; de Hoog et al., 2008). We excluded samples in which the participants may have been in the precontemplation stage but for which there were no pretest measures available (e.g., if the sample was given a message about drinking and driving but there were no baseline measures available to indicate whether or not the sample had engaged in drunk driving in the past; Shehryar & Hunt, 2005). Samples were considered contemplation or preparation if there was a clear indication that they were already preparing to engage in the recommended action (e.g., a sample of women under 50 years old who had not yet received mammograms, but the majority of whom stated they intended to receive mammograms after age 50; Jones & Owen, 2006). Samples were classified into the action/maintenance category if participants had explicitly been engaging in the recommended behavior (e.g., a message promoted breast self-exams and 80% of the sample indicated they already performed breast self-exams regularly; Siero, Kok, & Pruyn, 1984) or if they were recruited from a population that would definitionally be in this stage (e.g., patients receiving treatment in alcohol rehabilitation clinics; Brown, 1979).

Results

All analyses were conducted in R using the meta-analytic software package metafor, version 1.9.4 (Viechtbauer, 2010). We conducted all analyses using random- and fixed-effects analyses. As both types of analyses produced comparable results, we present the random-effects analyses.

Distribution of Effect Sizes

We first analyzed the distribution of effect sizes in our sample to determine whether there were biases in study retrieval and inclusion. Figure 1 displays a forest plot for our meta-analytic database, and Figure 2 displays the corresponding funnel plot. In a forest plot, each study is represented by a horizontal line that indicates the confidence interval for the study's effect size. By examining a forest plot, it is possible to assess the precision of effect size estimates from each study. Further, forest plots can also be used to assess the distribution of effect sizes across studies. As can be seen in the forest plot, the precision of effect size estimates varies across studies, with most studies displaying moderate precision. Further, the distribution of effect sizes appears to be roughly continuous and normal, which indicates a lack of inclusion bias. If no retrieval or inclusion bias is present in a meta-analytic database, the distribution of effect sizes in the funnel plot should be centered on and symmetric around the mean effect size, with smaller variability toward the top of the figure. If retrieval or inclusion biases are present, then the distribution should be asymmetric around the mean effect size. As can be seen in the figure, the distribution appears quite symmetric with smaller variability toward the top of the plot. We conducted a formal test of funnel plot asymmetry known as Begg and Mazumdar's rank correlation test, which is a non-parametric correlation of the effect sizes with their corresponding standard errors (Begg & Mazumdar, 1994). If this correlation is significantly different from zero, there is evidence of inclusion bias. The rank correlation was $r = -.02$, $p = .67$. Thus, there is no evidence of retrieval or inclusion bias.

Another way of testing for biases is to use the normal quantile plot method (Wang & Bushman, 1999). In a normal quantile plot, the observed values of a variable are plotted against the expected values given normality. If the sample of effect sizes is from a normal distribution, data points cluster around the diagonal; if the sample of effect sizes is biased by publication practices or eligibility criteria, data points deviate from the diagonal (Wang & Bushman, 1999). As can be seen from Figure 3, the effect sizes followed a straight line and generally fell within the 95% confidence interval of the normality line, and thus there is no evidence of retrieval or inclusion bias.

Average Effect Size and Between-Effects Variability

The average weighted effect size comparing outcomes for treatment to comparison groups was $d = 0.29$ with a 95% CI of [0.22, 0.35]. Therefore, fear appeals have a significant and positive effect on outcomes. That is, relative to participants in comparison groups, participants in treatment groups (i.e., those exposed to relatively high levels of depicted fear) had attitudes, intentions, and behaviors that were more in line with the position advocated by

the fear appeal. There was also significant heterogeneity among effect sizes $Q(247) = 1,287$, $I^2 = 85.11$, $p < .0001$.

For studies that included a manipulation check of subjectively experienced fear, we coded this variable and calculated d for treatment versus comparison groups using the same methods employed for primary outcomes. We included all measures that asked respondents to report their current levels of fear (e.g., Cauberghe, De Pelsmacker, Janssens & Dens, 2009; Cho & Salmon, 2006; Nabi et al., 2008). Based on the 71 samples that included such manipulation checks, fear appeals were generally successful at inducing experienced fear, such that treatment groups reported more fear than comparison groups, $d = 1.00$ (95% CI: [0.83, 1.18]), $Q(70) = 697$, $I^2 = 90.67$, $p < .0001$. Importantly, this result should be taken as an estimate of how much fear was induced by the particular messages used in this sample, rather than an estimate of how much fear is induced by fear appeal messages in general.

Moderator Tests

To test our hypotheses of interest (see Table 1), we primarily conducted moderator analyses by calculating weighted effect sizes and corresponding 95% CIs for each level of our moderator variables (i.e., we meta-analyzed samples within each moderator level separately to produce an overall effect size estimate for that level). If the CIs for two moderator levels are not overlapping, then those levels of the moderator are significantly different from each other. In contrast, if the CIs are overlapping, then those levels of the moderator are not different from each other. We also conducted moderated meta-regressions to analyze all moderator variables; the results were the same as the 95% CI analyses and are thus not presented here. Table 5 displays average weighted effect sizes and corresponding 95% CIs for all levels of our moderator variables.

Study Characteristics—For descriptive purposes, we recorded the following for each sample: (a) Study source (journal article, unpublished dissertation or thesis, or conference paper); (b) institution of the paper's first author (university/college, research center); (c) the sampled population (general population, college students, high school students, children, other); (d) whether participants were run individually or in groups; (e) the study setting (laboratory, field); (f) the specificity of the message – whether the message targeted a single specific outcome (e.g., signing up for a training to prevent stress-related illness; Das et al., 2003), multiple specific outcomes (e.g., consuming calcium and performing weight-bearing exercises to prevent osteoporosis; Klohn & Rogers, 1991), or multiple non-specific outcomes (e.g., general recommendations to improve diet and increase exercise without mentioning specific dietary concerns or specific forms of exercise; Kirscht & Haefner, 1973); (g) whether the study measured subjective fear; (h) the type of media used to present the message (text information, pictures/videos); (i) whether the message targeted a health relevant outcome; and (j) the domain of the study's targeted issue (dental hygiene, driving safety, HIV/STDs, drinking/drugs, smoking, cancer prevention, disease prevention, general safety, environment/society, other). As can be seen in Table 4, none of these methodological factors moderated fear appeal effectiveness – within each factor, 95% CIs for each factor level overlap for all levels of all factors. In addition to these factors, we also recorded publication year, average age of participants, and sample size. Separate meta-regressions for

each of these three variables revealed that none were related to fear appeal effectiveness: b = −0.0029 (SE = 0.0022, p = .18, 95% CI: [−0.0072, 0.0013]), b = −0.0046 (SE = 0.0039, p = .23, 95% CI: [−0.0122, 0.0030]), and b = 0.0000 (SE = 0.0002, p = .91, 95% CI: [−0.0003, 0.0003]), respectively for publication year, average age of sample, and sample size.

Tests of message content hypotheses

Message content: Depicted fear—To test the linear and curvilinear hypotheses, we calculated an average weighted effect size comparing groups that were exposed to moderate depicted fear versus high depicted fear. The linear hypothesis predicts that this effect size should be positive and significant, whereas the curvilinear hypothesis predicts that this effect size should be negative and significant. The combined effect size was $d = -0.05$ with a 95% CI of [−0.34, 0.24] and Q(20) = 154 ($I^2 = 92.89$, $p < .0001$). Therefore, outcomes did not differ for groups exposed to moderate versus high depicted fear. Instead of supporting either the linear or curvilinear hypothesis, this result suggests that depicted fear may have a maximum effective value, beyond which there is no impact of depicting additional fear. This finding may have implications for practitioners using fear appeals - i.e., once a message depicts moderate fear, there is no value in depicting additional fear, but depicting additional fear will not lead to negative effects.

One caveat is that this analysis was only based on 21 samples. However, to our knowledge, this is the largest and most valid test of the linear and curvilinear hypotheses to date. Specifically, to ensure that the test concerned high depicted fear versus moderate depicted fear, we only included studies with at least three levels of depicted fear. Given that we obtained an overall positive effect of depicted fear when comparing treatment and comparison groups, the results here can be interpreted as supporting a modified version of the linear hypothesis. Specifically, depicted fear has significant positive effects, but depicted fear cannot be effectively manipulated indefinitely and results in diminishing returns beyond a certain point (rather than negative effects causing the message to backfire, as suggested by the curvilinear hypothesis). However, given the limited sample size, this conclusion should be confirmed in future research.

Message content: Efficacy statements—The strong and weak efficacy hypotheses both predict that inclusion of efficacy statements in a fear appeal will lead to increased effectiveness. The results support this hypothesis: Fear appeals were more effective when they included efficacy statements (95% CI: [0.31, 0.55]) than when they did not (95% CI: [0.13, 0.29]). However, the strong hypothesis predicts that fear appeals without efficacy messages will backfire and produce negative effects, whereas the weak hypothesis predicts that fear appeals without efficacy statements will simply produce less positive or null effects. The results clearly support the weak efficacy hypothesis and disconfirm the strong efficacy hypothesis. Thus, fear appeals are effective with or without efficacy statements, but the inclusion of efficacy statements is associated with increased effectiveness. These results confirm the conclusions of prior meta-analyses concerning the use of efficacy statements (de Hoog et al., 2007; Peters et al., 2012; Witte & Allen, 2000).

Message content: Depicted susceptibility and severity—The first hypothesis concerning depicted susceptibility and severity states that fear appeals high in depicted severity (but not depicted susceptibility) will positively influence attitudes but will not influence intentions or behaviors. The 95% CIs indicated that fear appeals that were only high in depicted severity had positive effects for attitudes (95% CI: [0.06, 0.37]) and intentions (95% CI: [0.20, 0.39]) but not behaviors (95% CI: [−0.08, 0.42]) (see Appendix A for the results of all analyses done separately for attitudes, intentions, and behavior). Although this hypothesis was not supported, our results partially replicated a previous meta-analytic finding in which high depicted severity influenced all three outcome measures (de Hoog et al., 2007). The second hypothesis is that fear appeals high in depicted susceptibility (but not severity) will positively influence intentions and behaviors but will not influence attitudes. The 95% CIs indicated that fear appeals that were only high in depicted susceptibility had positive effects for intentions (95% CI: [0.15, 0.59]) and behaviors (95% CI: [0.01, 0.88]) but not attitudes (95% CI: [−0.51, 1.47]). Therefore, this hypothesis was supported. The third hypothesis is that fear appeals with high depicted severity and high depicted susceptibility will positively influence attitudes, intentions, and behaviors. The 95% CIs confirmed this prediction and indicated that fear appeals high on both moderators had positive effects for attitudes (95% CI: [0.05, 0.38]), intentions (95% CI: [0.23, 0.47]), and behaviors (95% CI: [0.24, 0.63]). Further, the 95% CI for the focal outcome in our meta-analysis (the average of attitude, intention, and behavior outcomes) also supported this result: [0.28, 0.50]. Thus, when testing all three hypotheses, fear appeals generally had positive effects on attitudes, intentions, and behaviors when they were high in depicted severity and/or susceptibility.

Tests of the recommended behavior hypotheses

Recommended behavior: One-time versus repeated behaviors—According to Robertson's (1975) single action theory, fear appeals that attempt to persuade people about one-time behaviors (e.g., getting vaccinated) should be more effective than fear appeals that attempt to persuade people about repeated behaviors (e.g., exercising multiple times per week every week). The results supported this hypothesis, such that fear appeals recommending one-time behaviors (95% CI: [0.30, 0.56]) were more effective than fear appeals recommending repeated behaviors (95% CI: [0.14, 0.29]). However, it is worth noting that fear appeals were effective for both types of recommended behaviors, and they were simply more effective for one-time behaviors.

Recommended behavior: Detection versus prevention/promotion behaviors—Based on hypotheses derived from prospect theory, several researchers have hypothesized that fear appeals should be more effective when recommending detection behaviors relative to prevention/promotion behaviors. The results did not support this hypothesis, as fear appeals recommending detection behaviors (95% CI: [0.21, 0.49]) and prevention/promotion behaviors (95% CI: [0.20, 0.38]) were equally effective.

Recommended behavior: Death and self-esteem—Based on predictions from TMT, fear appeals that mention death (versus not) should be more effective when the recommended behavior is self-esteem enhancing but less effective when the recommended

behavior is self-esteem hindering. The results did not support these predictions, as fear appeals were equally effective when they mentioned death and recommended a self-esteem hindering behavior (95% CI: [−0.41, 0.18]), did not mention death and recommended a self-esteem hindering behavior (95% CI: [0.00, 0.96]), mentioned death and recommended a self-esteem enhancing behavior (95% CI: [0.11, 0.67]), or did not mention death and recommended a self-esteem enhancing behavior (95% CI: [−0.04, 0.47]). Thus, neither self-esteem hypotheses derived from TMT was supported.

Recommended behavior: Death and delay—A separate prediction derived from TMT is that fear appeals that mention death will be more effective if the recommended behavior is measured after a delay rather than immediately. These predictions were not supported. When fear appeals mentioned death, they were equally effective for outcomes that occurred the same day (95% CI: [0.04, 0.27]), between one and fourteen days after fear appeal exposure (95% CI: [0.21, 1.37]), or more than fourteen days later (95% CI: [0.19, 0.51]). Similarly, when fear appeals did not mention death, they were equally effective for outcomes that occurred the same day (95% CI: [0.25, 0.44]), between one and fourteen days after fear appeal exposure (95% CI: [−0.29, 0.33]), or more than fourteen days later (95% CI: [0.03, 0.88]). Therefore, the death and delay hypothesis was not supported.

Tests of the audience hypotheses

Audience: Gender—Based on predictions derived from regulatory fit theory, fear appeals should be more effective for women than men. We tested this hypothesis via meta-regression, using percent of the sample that was female as a predictor of effect size. This analysis produced a small but significant effect, $b = 0.0031$ ($SE = 0.0012$, 95% CI for the slope: [0.0007, 0.0055]), $p < .0001$. Therefore, for every 10% increase in the percent of the sample that is female, fear appeal effectiveness increases by approximately $d = 0.03$. Thus, the hypothesis was supported: Fear appeals are more effective for audiences with a larger percentage of female message recipients than male message recipients.

Audience: Collectivism versus individualism—Based on predictions derived from regulatory fit theory, fear appeals should be more effective for collectivist samples than individualist samples. The results did not support this hypothesis. Fear appeals were equally effective in studies conducted in collectivist countries (95% CI: [0.27, 0.66]) and individualist countries (95% CI: [0.19, 0.33]).

Audience: Stages of change—Based on the early-effectiveness hypothesis, fear appeals should be more effective for samples that occupy the first three stages of the stages of change model relative to the last two stages. In contrast, the late-effectiveness hypothesis predicts the opposite. Neither hypothesis was supported by the data because audiences in the early stages (95% CI: [0.21, 0.40]) and late stages (95% CI: [0.14, 0.54]) were equally impacted by fear appeals.

General Discussion

Fear appeals are effective. The present meta-analysis found that fear appeals were successful at influencing attitudes, intentions, and behaviors across nearly all conditions that were

analyzed. Even when a moderator was unrelated to fear appeal effectiveness, fear appeals were still more effective than comparison treatments. Further, there was not one level of any moderator that we tested for which fear appeals backfired to produce worse outcomes relative to the comparison groups. These results are striking given the wide range of theories that attempt to specify conditions under which fear appeals should be ineffective or counter-productive (e.g., the curvilinear model, the strong efficacy hypothesis, the stage model) and given the numerous practitioners who make bold claims stating that fear appeals are futile or even dangerous (e.g., Drug Free Action Alliance, 2013; Kok et al., 2014; Ruiter et al., 2014). Rather, fear appeals consistently work, and through our meta-analysis we were able to identify various factors that can enhance their effectiveness to make them work even better. We believe that these results make important contributions to theory, practice, and policy.

A Message-Behavior-Audience Framework of Fear Appeals

We structured our review around a framework that considers three important aspects of any fear appeal communication: The message's content, the recommended behavior, and the audience. This model is meant to be an organizing thread to help connect existing theories and research, and to identify areas in need of future research. Specifically, we believe this framework is useful for several reasons. First, each aspect (message, behavior, and audience) has the potential to vary independently of the others and may impact the communication's effectiveness in ways scholars must consider. Second, this structure connects and organizes seemingly unrelated theories and hypotheses concerning fear appeals, including the linear model, the stage model, and hypotheses derived from prospect theory. Specifically, we found that fear appeals were more effective when the message depicted relatively high amounts of fear, included an efficacy message, and stressed susceptibility and severity related to the concerns being addressed (i.e., factors concerning the message). We also found that fear appeals were more effective when they recommended one-time only behaviors (i.e., a factor concerning the recommended behavior) and when audiences included a higher percentage of women (i.e., a factor concerning the audience).

Our framework also highlights that prior research has strongly focused on one particular aspect of fear appeals somewhat to the exclusion of the other aspects. Specifically, the bulk of prior research on fear appeals has investigated questions about the message's content – indeed, of the prior meta-analyses on fear appeals, all of them addressed questions related to the message's content while overlooking questions related to the recommended behavior and audience. However, this bias is clearly not due to a lack of interesting or potentially important effects concerning the behavior or audience, as significant effects emerged pertaining to each. Thus, we hope that our framework will help generate interest in research directed toward these previously under-studied aspects of fear appeal effectiveness.

Limitations

Four specific limitations are worth mentioning. First, as discussed in the introduction, the present results concern fear appeals rather than fear. That is, our meta-analysis did not compare people who were subjectively afraid to people who were subjectively unafraid, but rather we compared groups that were exposed to more or less fear inducing content. Consequently, all comparisons between the treatment and comparison groups must be

interpreted as effects of exposure to depicted levels of fear rather than effects of fear per se. However, this feature is not unique to our analyses, and prior meta-analyses of fear appeals are subject to the same considerations (e.g., Boster & Mongeau, 1984; de Hoog et al., 2007; Peters et al., 2012; Sutton, 1984; Witte & Allen, 2000). As researchers and practitioners alike are typically concerned with how to design effective communications, knowledge of the effectiveness of fear appeals is quite useful.

Relatedly, although we were able to determine that the treatment groups generally experienced more subjective fear than the comparison groups by analyzing fear-related manipulation check questions, the majority of samples included no assessment of subjective fear ($k = 177$, which is 71% of samples in our database). This is a serious limitation of the existing literature for three reasons. First, if fear appeals are presumed to have an effect on outcomes by instilling fear in message recipients, it is important to verify that these messages actually evoke fear, and that it is the evoked fear that mediates the relation between message presentation and response. Indeed, many fear appeals may evoke emotions in addition to fear (e.g., disgust, anger), and these other emotions may partially (or in some cases fully) mediate the effects of fear appeals. Second, the lack of subjective fear measures makes it difficult (if not impossible) to equate fear appeal intensity across studies. What one research team refers to as low fear may represent what another research teams refers to as moderate fear or a control condition. However, the inclusion of subjective measures of fear in response to fear appeals would enable researchers to equate fear appeal intensity across studies and more precisely investigate effects via well-calibrated levels of fear. Finally, the lack of subjective fear measures makes it difficult for researchers interested in the effects of fear (rather than fear appeals) to investigate relevant hypotheses meta-analytically. All three of these issues can be easily resolved by including measures of subjective fear in future studies on fear appeals, and we therefore urge researchers to do so.

Third, our meta-analysis exclusively included experimental studies. As experiments often allow for increased internal validity at the cost of decreased external validity, it will be important for future research to investigate whether the present results generalize to naturalistic settings. For example, do fear appeals produce the same effects when used in real-world public health campaigns as they do when used in highly controlled experimental studies? Although we expect the results will generalize to such settings, future research will be necessary to definitively test this question.

The final limitation of note concerns the coding of variables in the current meta-analysis. Specifically, to test hypotheses related to TMT, studies were coded as either containing the word death or not. However, some studies did not include full texts for fear appeal messages, and thus it is possible that some messages did contain the word death but were nonetheless coded as not containing this word (however, studies were only coded as containing the word death if a portion of the message's text was available that showed this word). Overall, it is likely that such miscodings would attenuate potential differences across conditions.

Future Directions

Experimental manipulations and mechanisms—The present meta-analysis only included experimental studies that compared treatment and comparison groups, and thus

internal validity is good when considering the effects of relatively high versus low depicted fear. However, meta-analyses are a correlational research design, and thus many of the moderator analyses we conducted should be interpreted with this in mind. For example, does using fear appeals to target one-time behaviors versus recurring behaviors actually cause the fear appeals to be more effective, or are fear appeals that target one-time behaviors systematically different from fear appeals that target recurring behaviors along some other dimension that results in the observed difference? Future experimental work will be necessary to address such questions, and we therefore encourage researchers to experimentally test our moderator findings concerning variables that were not manipulated in the primary studies.

It is also important for future research to uncover the mechanisms behind the moderation effects we identified. For example, why are fear appeals more effective for one-time behaviors? A number of the hypotheses that we substantiated are relatively agnostic concerning mechanisms, and this is a serious gap in the current fear appeal literature. To truly understand fear appeal effectiveness, it is necessary to know why they work. This knowledge could then be used to design more effective fear appeals, and it could potentially be used for other types of communications as well. Although some of the theories investigated do discuss mechanism to some degree (e.g., EPPM; Witte, 1992), our updated review of the literature is consistent with conclusions from prior reviews that these mechanisms are often under-studied and are in need of additional research (e.g., Popova, 2012).

Relatedly, future research could benefit from developing methods to manipulate perceptions of certain variables that were found to be significant moderators. For example, fear appeals were more effective for one-time behaviors, but this knowledge is currently of little use to researchers or practitioners who address recurring behaviors. However, this knowledge could become useful if methods were developed to successfully re-frame recurring behaviors as one-time behaviors. Such methods would also allow for experimental tests of the relevant dimensions and mechanisms (e.g., test whether fear appeals can be made more effective for a particular behavior if the behavior is framed as one-time rather than recurring).

Linear effect of fear—Another important question to address in future research concerns the linear and curvilinear hypotheses tested in the present study. Strictly speaking, we did not find support for either model. High levels of depicted fear did not lead to different outcomes than moderate depicted fear, suggesting that high and moderate depictions of fear produce similar results. However, the reason for this is unclear – were the high fear messages unsuccessful at evoking more subjective fear than the moderate messages, or is there simply a point beyond which additional fear (depicted or subjective) confers no benefit? To explore these possibilities, future studies should examine a large range of depicted fear along with measures of subjectively experienced fear.

Integration of findings—Finally, we believe that an additional benefit of our framework is its ability to guide researchers in generating future research questions. As mentioned, organizing the existing literature under this framework highlights the relative dearth of research addressing the behavior and audience aspects of the model relative to the message

aspect. A number of interesting questions have yet to be explored in these areas. For example, are fear appeals more effective if they address behaviors concerning the self or close others (e.g., one's children, romantic partners), public or private behaviors (e.g., exercising at a gym versus alone), or socially desirable or undesirable behaviors? Further, are fear appeals differentially effective for target populations that differ in age, education, social class, or personality? Such questions have received relatively little attention, but they have the potential to inform fear appeal theory and practice.

Additionally, what kinds of interactions exist when crossing aspects of message, behavior, and audience? We investigated two such questions in the present study with the hypotheses related to terror management theory – i.e., message content (presence versus absence of the word death) crossed with the recommended behavior (self-esteem enhancing versus hindering behaviors, immediate versus delayed outcomes). Although neither of these hypotheses was supported, the potential to test these types of interactions prompts the question of which variables may interact, particularly variables from separate aspects of the model. For example, might fear appeal effectiveness be moderated by interactions of culture (a factor of the audience) with the kind of behavior addressed by the fear appeal? Cross-cultural differences have rarely been explored in the effectiveness of fear appeals, and it is possible that cultural sensitivity to a behavior/issue may moderate the effectiveness of fear appeals addressing that behavior/issue. For example, East Asian countries have extremely low HIV prevalence rates and thus may be less susceptible to fear appeals on that topic relative to other topics. Whether this is true and whether it interacts with related findings is an empirical question that could be fruitfully explored in future research.

Importantly, aspects other than message content, behavior, and audience may moderate the effectiveness of fear appeal communications. However, based on our review of the literature, there simply appeared to be too little research on other aspects to include them in the current framework. Three potential aspects worth noting are the source of the communication, the subjective experience of the message recipient, and the channel used to transmit the message. First, based on a well-established body of literature in persuasion demonstrating that aspects of a message's source can influence the persuasiveness of the message (Briñol & Petty, 2009; Kumkale et al., 2010; Pornpitakpan, 2004; Wilson & Sherrell, 1993), the source of a fear appeal communication should be an important moderator for fear appeal effectiveness. For example, fear appeals from benevolent groups (e.g., a respected government institution, a close personal friend) may be more effective than fear appeals from self-interested groups (e.g., corporations or other for-profit entities). However, most empirical studies did not detail source information in a manner that allowed us to test such hypotheses. Further, many fear appeals are delivered in the form of public service announcements, and thus there is relatively little variation across existing studies on this dimension. Second, drawing on our previous distinction between fear appeals and fear, the subjective experience of the message recipient should be an important aspect of fear appeal communications. Although most empirical studies simply do not measure participants' subjective states, such measures could be very informative to test a variety of interesting questions. For example, is fear the only emotion evoked by fear appeals? If not, what other negative emotions are evoked (e.g., disgust, shame, guilt, anger), and are they partially responsible for the effectiveness of fear appeals? Similarly, perhaps the effects of fear

appeals are simply driven by induced negative affect or high arousal, and the specific experience of fear is superfluous? Future research using measures of subjective experience are needed to address these questions. The paucity of existing research addressing source characteristics and subjective experience led us to not include these as aspects of the current review framework, but they would be welcome additions in the future. Third, consistent with the focus of the persuasion literature on source, message, audience, and channel of communication as key components to understand in the persuasion process (Shannon & Weaver, 1949), are certain channels of communication more likely to be effective in delivering fear appeals? For example, are graphic videos more likely to be effective than audio fear appeals without video? How do social media channels (generally more linked to liked peers) differ from mass media in effectiveness of delivered fear appeals?

Conclusion

To conclude, fear appeals are effective, and our synthesis organized and identified factors that make them even more effective. Specifically, fear appeals are particularly effective when the communication depicts relatively high amounts of fear, includes an efficacy message, stresses severity and susceptibility, recommends one-time only behaviors, and targets audiences that include a larger percentage of female message recipients. We formed these conclusions by meta-analytically testing a wide variety of influential fear appeal theories using the largest and most comprehensive fear appeals database to date. We believe our analysis has provided a thorough overview of the state of the literature and also generated a variety of important and exciting future directions.

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Appendix A

In the body of the manuscript, we presented random-effects analyses for a combined measure averaging across attitudes, intentions, and behaviors. Here, we present the analyses done separately for each type of measure.

First, the overall average effect size comparing treatment to comparison groups separately for attitudes, intentions, and behaviors was respectively $d = 0.23$ (95% CI: [0.11, 0.34]), $d = 0.31$ (95% CI: [0.24, 0.38]), and $d = 0.27$ (95% CI: [0.13, 0.42]). The heterogeneity statistics for each measure were respectively Q(109) = 614 ($I^2 = 86.52$, $p < .0001$), Q(162) = 615 ($I^2 = 75.48$, $p < .0001$), and Q(69) = 733 ($I^2 = 92.37$, $p < .0001$).

To examine the linear and curvilinear hypotheses for each outcome, we computed the average weighted effect size comparing outcomes for high fear versus moderate fear groups. For attitudes, intentions, and behaviors, the results were respectively $d = 0.05$ (95% CI: [−0.27, 0.36]), $d = -0.09$ (95% CI: [−0.29, 0.11]), and $d = -0.04$ (95% CI: [−0.63, 0.56]). The heterogeneity statistics for each measure were respectively Q(7) = 19 ($I^2 = 66.10$, $p = .009$), Q(8) = 19 ($I^2 = 65.95$, $p = .01$), and Q(9) = 118 ($I^2 = 96.12$, $p < .0001$).

To examine the gender hypothesis, we regressed outcomes onto the percent of the sample that was female. The results for attitudes, intentions, and behaviors were respectively b = 0.0019 (SE = 0.0022, 95% CI for the slope: [−0.0024, 0.0061], p = .38, k = 72), b = 0.0043 (SE = 0.0013, 95% CI for the slope: [0.0016, 0.0069], p = .002, k = 119), and b = 0.0037 (SE = 0.0028, 95% CI for the slope: [−0.0018, 0.0091], p = .19, k = 49).

The results for all categorical moderator analyses are presented in Table A.1.

Table A.1

Random-effects moderator analyses done separately for attitudes, intentions, and behaviors.

			Attitudes			Intentions			Behaviors		
MBA Aspect	**Variable**	**Level**	***d***	**95% CI**	***k***	***d***	**95% CI**	***k***	***d***	**95% CI**	***k***
Message	Efficacy statements	Included	.39	[.13, .64]	38	.40	[.30, .49]	61	.43	[.20, .66]	32
		Excluded	.14	[.04, .25]	72	.27	[.17, .36]	100	.14	[−.05, .33]	38
	Depicted susceptibility and severity	Both	.22	[.05, .38]	33	.35	[.23, .47]	62	.44	[.24, .63]	29
		Susceptibility	.48	[−.51, 1.47]	6	.37	[.15, .59]	18	.45	[.01, .88]	2
		Severity	.22	[.06, .37]	62	.29	[.20, .39]	68	.17	[−.08, .42]	34
		Neither	.19	[−.05, .43]	9	.20	[−.10, .49]	7	.02	[−.22, .26]	4
Behavior	One-time versus repeated	One-time	.38	[.17, .59]	48	.46	[.35, .57]	48	.49	[.24, .74]	26
		Repeated	.11	[−.00, .22]	62	.24	[.16, .33]	115	.15	[−.02, .33]	44
	Detection versus promotion/prevention	Detection	.22	[.03, .42]	16	.46	[.33, .58]	35	.23	[−.15, .61]	12
		PP	.22	[.10, .35]	94	.27	[.19, .34]	128	.28	[.12, .45]	58
	Death and self-esteem	SEE, DP	.10	[−.32, .51]	6	.36	[.14, .58]	8	.61	[−.30, 1.53]	5
		SEE, DA	−.10	[−.33, .14]	4	.35	[.14, .56]	20	−.74	[−1.48, .01]	3
		SEH, DP	−.29	[−.87, .29]	7	.05	[−.23, .32]	14	−.02	[−.62, .59]	4
		SEH, DA	.42	[.01, .83]	1	.54	[.13, .95]	4	.39	[−1.56, 2.35]	2
	Death and delay	DP, same day	.03	[−.13, .19]	33	.21	[.10, .32]	49	.35	[−.11, .82]	11
		DP, 1–14 days	.10	[−.41, .60]	1	–	–	–	.95	[.33, 1.57]	4
		DP, 14+ days	.68	[.37, .98]	4	.22	[−.10, .55]	2	.21	[.06, .36]	9
		DA, same day	.36	[.20, .51]	54	.37	[.27, .46]	91	.27	[.03, .52]	23
		DA, 1–14 days	−.15	[−.31, .02]	9	.34	[.04, .65]	12	−.17	[−.46, .13]	13
		DA, 14+ days	.44	[−.57, 1.45]	6	.25	[.05, .45]	8	.48	[.11, .85]	10
Audience	Culture	Collectivist	.08	[−.18, .34]	10	.51	[.32, .70]	22	.41	[.10, .71]	14
		Individualist	.24	[.12, .36]	100	.27	[.20, .35]	141	.24	[.07, .41]	56
	Stages of change	Early	.32	[.17, .47]	69	.31	[.22, .39]	98	.24	[.05, .43]	46
		Late	.42	[.07, .77]	9	.22	[.03, .42]	21	.61	[−.32, 1.53]	5

Note: SE = Self-esteem. DP = Death present in message. DA = Death absent in message. PP = Promotion/prevention. SEE = Self-esteem enhancing recommended behaviors. SEH = Self-esteem hindering recommended behaviors. d = Standardized mean effect size estimated meta-analytically for the indicated moderator level. 95% CI = The 95% confidence interval for d. k = The number of studies for each moderator level. Dash (−) indicates there were no observations at a particular moderator level.

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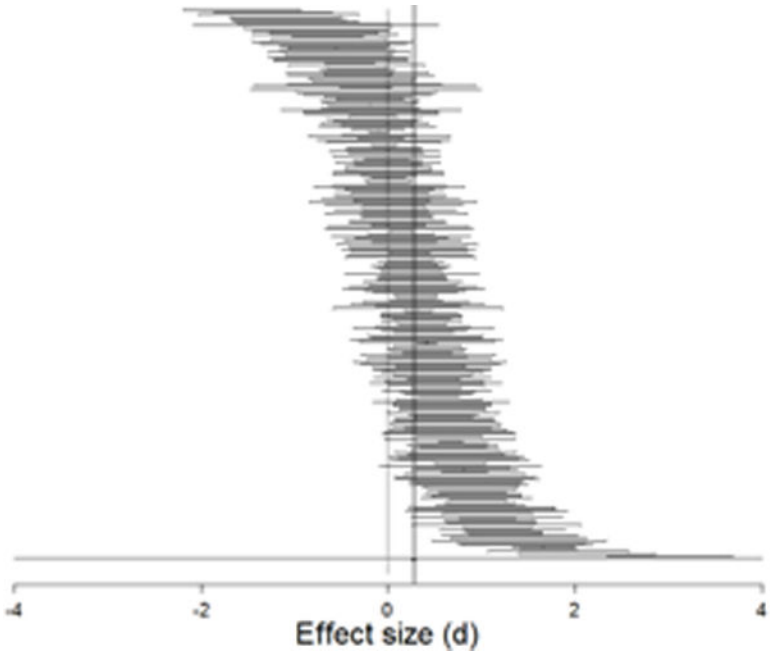

Figure 1.

Forest plot of the effect sizes.

Note: This forest plot includes point estimates and confidence intervals for all studies in the manuscript. The solid vertical line represents the combined effect size (d = .29).

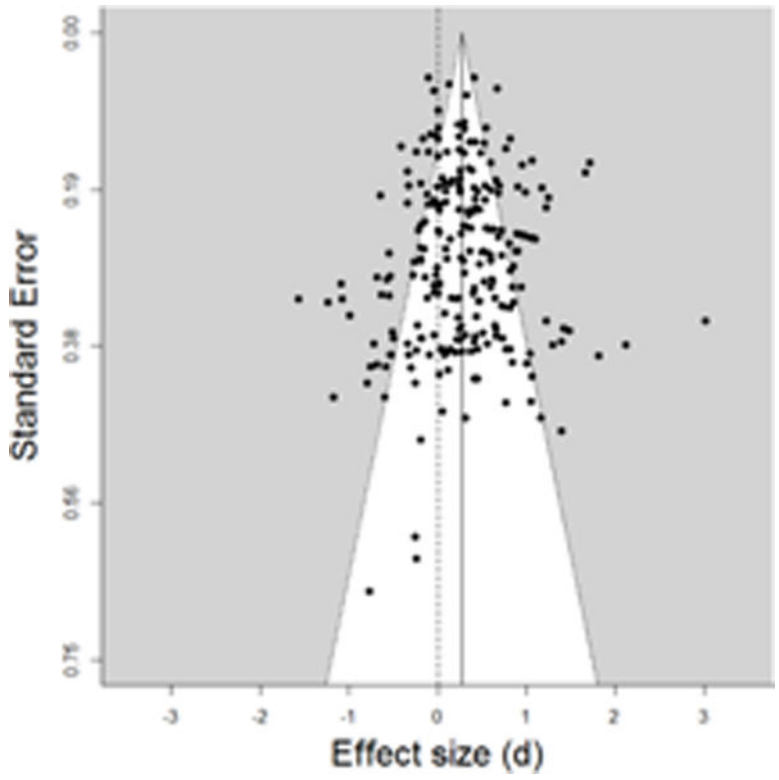

Figure 2.
Funnel plot of effect sizes.
Note: Effect size (*d*) is plotted on the x-axis and standard error on the y-axis. The solid vertical line represents the combined effect size (*d* = .29). The dotted line represents the x-intercept (x = 0) for a reference line. The white region represents the inside of the 95% pseudo confidence interval, whereas the shaded region represents the outside (i.e., the area of statistical significance).

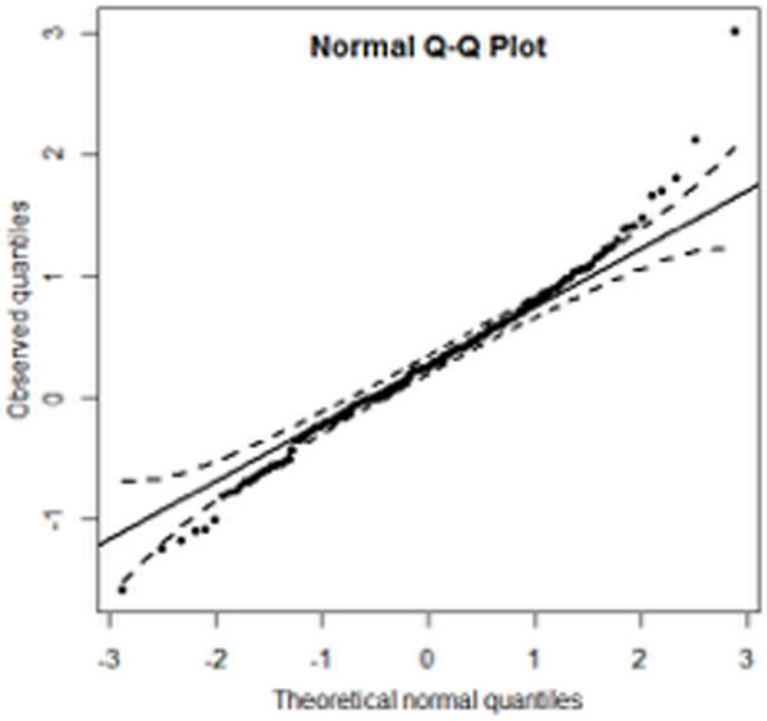

Figure 3.
Normal quantile plot.
Note: The dashed lines represents a 95% confidence band. The line on the diagonal indicates normality.

Table 1

Theories and hypotheses tested.

MBA Aspect	Theory	Hypothesis	Current Meta-Analysis	Relevant Prior Meta-Analyses
Message	LM	High depicted fear will lead to better outcomes than moderate depicted fear	Partial support	Boster & Mongeau (1984) Sutton (1982) Witte & Allen (2000)
	CM	High depicted fear will lead to worse outcomes than moderate depicted fear	Not supported	
	ES	Strong: Fear appeals that lack efficacy statements will produce negative effects	Not supported	de Hoog et al. (2007) Earl & Albarracin (2007) Floyd et al. (2000) Milne et al. (2000) Peters et al. (2012) Witte & Allen (2000)
	ES	Weak: Fear appeals that lack efficacy statements will produce weaker effects (less positive or null) relative to fear appeals that include efficacy statements	Supported	
	SM	Fear appeals with high depicted severity (and low depicted susceptibility) will positively influence attitudes but will not influence intentions or behaviors	Partial support	
	SM	Fear appeals with high depicted susceptibility (and low depicted severity) will positively influence intentions and behaviors but will not influence attitudes	Supported	de Hoog et al. (2007) Floyd et al. (2000) Milne et al. (2000)
	SM	Fear appeals with high depicted severity and high depicted susceptibility will positively influence attitudes, intentions, and behaviors	Supported	
Behavior	RSAT	Fear appeals will be more effective for one-time versus repeated behaviors	Supported	None
	PT	Fear appeals will be more effective for detection versus promotion/prevention behaviors	Not supported	
	TMT	When fear appeals recommend an SEE behavior, fear appeals that mention death should be more effective than fear appeals that do not	Not supported	
	TMT	When fear appeals recommend an SEH behavior, fear appeals that mention death should be less effective than fear appeals that do not	Not supported	
	TMT	Fear appeals that mention death (versus not) will be more effective for delayed outcomes	Not supported	
Audience	RFT	Fear appeals will be more effective for female versus male audiences	Supported	None
	RFT	Fear appeals will be more effective for collectivist versus individualist audiences	Not supported	
	TM	Early: Fear appeals will be more effective for people in early TM stages of change	Not supported	
	TM	Late: Fear appeals will be more effective for people in late TM stages of change	Not supported	

Note: LM = Linear Model. CM = Curvilinear Model. ES = Efficacy Statements. SM = Stage Model. RSAT = Robertson's Single Action Theory. PT = Prospect Theory. TMT = Terror Management Theory. RFT = Regulatory Focus Theory. TM = Transtheoretical Model. SEE = Self-esteem enhancing. SEH = Self-esteem hindering.

Table 2

Effect sizes, sample sizes, and moderator codes for each sample in the meta-analysis.

Paper	*d*	N	AIB	Eff	Sev	Sus	OR	DPP	DP	SE	Delay	%F	IC	SOC
Bagley & Low, 1992	.08	41	B	Y	Y	N	R	PP	N	—	L	66	I	E
Bang, 1994	−.11	223	AI	N	Y	N	R	PP	Y	—	S	54	I	—
Beach, 1966	.38	28	I	N	Y	N	O	PP	Y	—	L	—	I	E
Beck & Davis, 1978														
1: Low Interest	−.05	31	A	N	Y	N	R	PP	N	—	S	42	I	—
2: High Interest	1.03	31	A	N	Y	N	R	PP	N	—	S	42	I	—
Beck, 1984	.77	226	I	N	Y	N	O	PP	N	—	S	47	I	—
Berkowitz, 1998														
1: Low Sensation-Seeking, Message Choice	.02	48	AIB	Y	Y	Y	R	PP	N	—	M	62	I	E
2: Low Sensation-Seeking, No Message Choice	−.23	34	AIB	Y	Y	Y	R	PP	N	—	M	62	I	E
3: High Sensation-Seeking, Message Choice	.21	42	AIB	Y	Y	Y	R	PP	N	—	M	62	I	E
4: High Sensation-Seeking, No Message Choice	.01	48	AIB	Y	Y	Y	R	PP	N	—	M	62	I	E
Brouwers & Sorrentino, 1993	.25	149	IB	Y	Y	Y	O	D	Y	—	S	69	I	—
Brown, 1979	1.81	38	A	N	Y	N	R	PP	N	—	S	0	I	L
Burnett, 1981	1.06	76	AI	N	Y	N	O	PP	N	—	S	—	I	—
Calantone & Warshaw, 1985	.96	180	B	Y	Y	N	O	PP	N	—	S	—	I	—
Carey, 1990	.00	118	I	N	Y	N	O	PP	Y	—	S	—	I	—
Chang et al., 1989	−.10	1425	B	N	Y	N	R	PP	N	—	S	—	I	E
Cho & Salmon, 2006	.42	239	IB	N	Y	Y	R	PP	Y	SEH	S	61	I	—
Chu, 1966														
1: Low Efficacy	.36	240	B	N	Y	Y	O	PP	Y	—	M	—	C	—
2: Medium Efficacy	.52	242	B	Y	Y	Y	O	PP	Y	—	M	—	C	—
3: High Efficacy	1.71	231	B	Y	Y	Y	O	PP	Y	—	M	—	C	—
Cooper et al., 2014														
1: Appearance	.09	98	I	—	Y	Y	R	PP	N	SEH	S	65	I	E
2: Cancer	−.33	98	I	—	Y	Y	R	PP	Y	SEH	S	65	I	E
Dabbs & Leventhal, 1966	.68	120	AIB	Y	Y	Y	O	PP	Y	—	S	—	I	E
Dahl et al., 2003	.80	68	B	N	Y	N	R	PP	Y	—	S	—	I	—
Das et al., 2003														

Paper	*d*	N	AIB	Eff	Sev	Sus	OR	DPP	DP	SE	Delay	%F	IC	SOC
1: Study 1, Weak Arguments, Low Vulnerability	-1.09	52	A	Y	Y	N	O	PP	N	—	S	—	I	—
2: Study 1, Weak Arguments, High Vulnerability	1.39	37	A	Y	Y	N	O	PP	N	—	S	—	I	—
3: Study 1, Strong Arguments, Low Vulnerability	2.12	45	A	Y	Y	N	O	PP	N	—	S	—	I	—
4: Study 1, Strong Arguments, High Vulnerability	−.63	43	A	Y	Y	N	O	PP	N	—	S	—	I	—
5: Study 2, Weak Arguments, Low Vulnerability	−.33	28	A	Y	Y	N	O	PP	N	—	S	—	I	—
6: Study 2, Weak Arguments, High Vulnerability	.11	28	A	Y	Y	N	O	PP	N	—	S	—	I	—
7: Study 2, Strong Arguments, Low Vulnerability	−.26	23	A	Y	Y	N	O	PP	N	—	S	—	I	—
8: Study 2, Strong Arguments, High Vulnerability	.23	32	A	Y	Y	N	O	PP	N	—	S	—	I	—
9: Study 3, Weak Arguments	−.50	31	AB	Y	Y	Y	O	PP	N	—	S	—	I	—
10: Study 3, Strong Arguments	.99	29	AB	Y	Y	Y	O	PP	N	—	S	—	I	—
de Hoog et al., 2005	.59	118	AIB	Y	Y	Y	O	PP	N	—	S	69	I	—
de Hoog et al., 2008														
1: Study 1, Low Source Credibility	.41	30	AI	N	Y	Y	O	D	N	—	S	71	I	—
2: Study 1, High Source Credibility	.25	30	AI	N	Y	Y	O	D	N	—	S	71	I	—
3: Study 2, Weak Arguments	.51	32	AI	N	Y	Y	O	D	N	—	S	75	I	—
4: Study 2, Strong Arguments	.65	32	AI	N	Y	Y	O	D	N	—	S	75	I	—
Dembroski et al., 1978														
1: Black Communicator	.22	40	A	Y	Y	Y	R	PP	N	—	—	52	I	E
2: White Communicator	1.48	40	A	Y	Y	Y	R	PP	N	—	—	52	I	E
Dijkstra & Bos, 2015	−.01	118	IB	Y	Y	N	R	PP	Y	—	L	56	I	E
Duke et al., 2014														
1: Threat vs. Control	.41	1540	IB	N	Y	N	R	PP	N	—	L	53	I	E
2: Threat + SE vs. SE	.67	970	IB	Y	Y	N	R	PP	N	—	L	53	I	E
Evans et al., 1968	−.53	49	B	N	Y	N	R	PP	N	—	M	—	I	E
Evans et al., 1970	.35	156	IB	Y	Y	N	R	PP	N	—	M	—	I	E
Feenstra et al., 2014	.32	1128	AIB	N	Y	N	R	PP	N	—	L	52	I	E
France et al., 2014														
1: Threat vs. Control	.65	141	I	N	Y	N	R	PP	N	—	S	100	I	E
2: Threat + SE vs. SE	.48	213	I	Y	Y	N	R	PP	N	—	S	100	I	E
Frandsen, 1963	.13	1080	A	N	Y	N	R	PP	N	—	S	—	I	—
Fukada, 1973	.30	345	IB	Y	Y	N	O	D	N	—	S	57	C	—

Paper	*d*	N	AIB	Eff	Sev	Sus	OR	DPP	DP	SE	Delay	%F	IC	SOC
Fukada, 1975														
1: Low Efficacy, Low Source Credibility	−.19	76	AIB	N	Y	Y	O	D	N	—	S	100	C	—
2: Low Efficacy, High Source Credibility	.58	76	AIB	N	Y	Y	O	D	N	—	S	100	C	—
3: High Efficacy, Low Source Credibility	.31	76	AIB	Y	Y	Y	O	D	N	—	S	100	C	—
4: High Efficacy, High Source Credibility	.89	76	AIB	Y	Y	Y	O	D	N	—	S	100	C	—
Fukada, 1983a	.94	48	AIB	N	Y	N	O	D	N	—	L	100	C	—
Fukada, 1983 (2)														
1: No Forewarnings	.99	76	I	N	Y	Y	O	D	N	—	S	100	C	—
2: Topic Content Forewarning	.72	76	I	N	Y	Y	O	D	N	—	S	100	C	—
3: Persuasive Intent Forewarning	.58	76	I	N	Y	Y	O	D	N	—	S	100	C	—
4: Fear Arousal Forewarning	1.08	76	I	N	Y	Y	O	D	N	—	S	100	C	—
5: Topic Content & Fear Arousal Forewarnings	.94	76	I	N	Y	Y	O	D	N	—	S	100	C	—
6: Topic Content & Persuasive Intent Forewarnings	1.10	76	I	N	Y	Y	O	D	N	—	S	100	C	—
7: Persuasive Intent & Fear Arousal Forewarnings	.64	76	I	N	Y	Y	O	D	N	—	S	100	C	—
8: All Three Forewarnings	.55	76	I	N	Y	Y	O	D	N	—	S	100	C	—
Fukada, 1988														
1: Receive Counterargument	.86	42	I	N	Y	N	O	D	N	—	S	100	C	—
2: Don’t Receive Counterargument	.4	42	I	N	Y	N	O	D	N	—	S	100	C	—
Fukada, 1991	−.18	30	A	N	N	N	R	PP	N	—	M	100	C	—
Gleicher & Petty, 1992	.23	336	A	Y	Y	Y	R	PP	N	—	—	—	I	—
Goldenbeld et al., 2008														
1: Males	−.05	42	AI	Y	Y	N	R	PP	Y	—	S	0	I	—
2: Females	.73	32	AI	Y	Y	N	R	PP	Y	—	S	100	I	—
Griffeth & Rogers, 1976	1.17	137	IB	Y	Y	N	R	PP	Y	SEE	S	—	I	—
Hass et al., 1975	.60	56	I	N	Y	N	R	PP	N	—	S	—	I	—
Hendrick et al., 1975														
1: Study 1, Fear Reduction	.15	40	AI	N	N	N	O	PP	N	—	S	100	I	—
2: Study 1, No Fear Reduction	.72	40	AI	N	N	N	O	PP	N	—	S	100	I	—
3: Study 2	.24	122	AI	N	N	N	O	PP	N	—	S	100	I	—
Hill & Gardner, 1980														
1: Repressors	−.59	27	B	N	Y	N	O	D	N	—	S	0	I	—

Paper	*d*	N	AIB	Eff	Sev	Sus	OR	DPP	DP	SE	Delay	%F	IC	SOC
2: Sensitizers	.44	25	B	N	Y	N	O	D	N	—	S	0	I	—
Hoeken & Geurts, 2005	−.34	149	I	N	Y	N	R	PP	N	—	S	83	I	—
Horowitz & Gumenik, 1970	.26	112	A	N	Y	N	R	PP	Y	—	S	—	I	—
Horowitz, 1969														
1: Single Exposure	.37	60	A	N	Y	N	R	PP	Y	—	S	0	I	—
2: Multiple Exposures	.10	60	A	N	Y	N	R	PP	Y	—	M	0	I	—
Insko et al., 1965														
1: Males	.00	72	AI	N	Y	Y	R	PP	N	SEE	S	0	I	—
2: Females	.00	72	AI	N	Y	Y	R	PP	N	SEE	S	100	I	—
Janis & Feshbach, 1954														
1: Low Anxiety	−.14	80	AB	N	Y	N	R	PP	N	—	M	—	I	—
2: High Anxiety	−.68	51	AB	N	Y	N	R	PP	N	—	M	—	I	—
Janis & Terwilliger, 1962	−.72	31	A	N	Y	N	R	PP	Y	—	S	19	I	—
Janssens & De Pelsmacker, 2007														
1: Non-Drivers	−.04	95	A	N	Y	N	R	PP	Y	SEE	S	—	I	—
2: Drivers	.01	89	A	N	Y	N	R	PP	Y	—	S	—	I	—
Johnston, 2006														
1: No Pre-Test	.57	60	A	Y	Y	Y	O	PP	N	—	S	38	I	E
2: Pre-Test	.58	60	A	Y	Y	Y	O	PP	N	—	S	38	I	E
Jones & Owen, 2006														
1: Ages 18–39	.00	44	I	Y	Y	N	R	D	N	—	S	100	I	E
2: Ages 40–49	.00	44	I	Y	Y	N	R	D	N	—	S	100	I	E
3: Ages 50+	−.19	61	I	Y	Y	N	R	D	N	—	S	100	I	L
Kareklas & Muehling, 2014														
1: No Verbal, Control vs. Visual	.25	112	AI	N	Y	N	R	PP	Y	—	S	44	I	E
2: Verbal, Control vs. Visual	.10	112	AI	N	Y	N	R	PP	Y	—	S	44	I	E
Keller & Block, 1996														
1: Self-Reference	−.01	51	I	Y	Y	Y	R	PP	Y	—	S	—	I	E
2: Other-Reference	.84	47	I	Y	Y	N	R	PP	Y	—	S	—	I	E
Keller, 1999														
1: Don’t Use Condoms	−.68	27	I	Y	Y	N	R	PP	Y	—	S	100	I	E

Paper	*d*	N	AIB	Eff	Sev	Sus	OR	DPP	DP	SE	Delay	%F	IC	SOC
2: Regularly Use Condoms	.66	34	I	Y	Y	N	R	PP	Y	SEE	S	100	I	L
Kim et al., 2009	.00	183	B	N	N	N	R	PP	N	—	L	53	C	—
Kirscht & Haefner, 1973														
1: One Exposure	.22	30	B	N	N	N	R	PP	N	—	L	58	I	—
2: Two Exposures	.06	28	B	N	N	N	R	PP	Y	—	L	58	I	—
3: Three Exposures	−.10	27	B	N	N	N	R	PP	Y	—	L	58	I	—
Kirscht et al., 1978	1.23	109	B	N	Y	N	R	PP	Y	SEE	M	100	I	E
Kleinot & Rogers, 1982														
1: Low Efficacy	.77	22	I	N	Y	Y	R	PP	Y	—	S	—	I	E
2: High Efficacy	1.16	22	I	Y	Y	Y	R	PP	Y	—	S	—	I	E
Klohn & Rogers, 1991	.68	85	I	N	Y	N	R	PP	N	SEE	S	100	I	E
LaTour et al., 1996	.29	305	AI	N	Y	N	O	PP	N	—	S	100	I	—
LaTour & Tanner, 2003	.13	124	AI	N	Y	N	O	D	N	—	S	43	I	—
Leventhal & Niles, 1964	.45	209	AI	Y	Y	N	O	D	N	—	S	—	I	E
Leventhal & Watts, 1966														
1: Smokers	−1.57	52	B	Y	Y	N	O	D	N	—	S	—	I	E
2: Non-Smokers	−.02	48	B	Y	Y	N	O	D	N	SEE	S	—	I	—
Leventhal et al., 1965														
1: No Prior Vaccination	.60	59	AI	Y	Y	Y	O	PP	N	—	S	—	I	E
2: Prior Vaccination	.36	88	AI	Y	Y	Y	O	PP	N	—	S	—	I	L
Leventhal et al., 1967	.53	106	I	Y	Y	N	R	PP	N	—	S	—	I	E
Levin et al., 2007	−.41	222	I	N	Y	N	R	PP	N	—	S	—	I	E
Lewis et al., 2008														
1: Male, Low Involvement	.23	35	A	N	Y	N	R	PP	Y	SEE	L	0	I	L
2: Male, High Involvement	.44	36	A	N	Y	N	R	PP	Y	—	L	0	I	E
3: Female, Low Involvement	.91	65	A	N	Y	N	R	PP	Y	SEE	L	100	I	L
4: Female, High Involvement	.87	65	A	N	Y	N	R	PP	Y	—	L	100	I	E
Lewis et al., 2010	−.08	270	I	N	N	N	R	PP	N	—	S	66	I	—
Li, 2002														
1: Low Outcome	.27	28	AI	N	Y	Y	O	D	N	—	S	44	I	E
2: High Outcome	.45	29	AI	Y	Y	Y	O	D	N	—	S	44	I	E

Paper	*d*	N	AIB	Eff	Sev	Sus	OR	DPP	DP	SE	Delay	%F	IC	SOC
Liberman & Chaiken, 1992														
1: Low Relevance	.35	86	I	N	N	Y	R	PP	N	—	S	100	I	—
2: High Relevance	.35	86	I	N	N	Y	R	PP	N	SEE	S	100	I	—
Lwin & Malik, 2014														
1: With Wii	.10	199	AI	N	Y	N	R	PP	N	SEE	L	42	C	E
2: Without Wii	−.24	199	AI	N	Y	N	R	PP	N	SEE	L	42	C	E
McMath & Prentice-Dunn, 2005	1.06	196	I	Y	Y	N	R	PP	N	SEH	S	74	I	E
Meijnders et al., 2001a														
1: Weak Arguments	−.27	54	AI	N	Y	N	O	PP	N	—	S	50	I	—
2: Strong Arguments	.47	54	AI	N	Y	N	O	PP	N	—	S	50	I	—
Meijnders et al., 2001b														
1: Weak Arguments	.46	40	A	Y	Y	N	O	PP	N	—	S	67	I	—
2: Strong Arguments	.47	40	A	Y	Y	N	O	PP	N	—	S	67	I	—
Morales et al., 2012														
1: Study 1 (Methamphetamine Use)	.42	104	I	N	N	N	R	PP	Y	—	S	—	I	—
2: Study 2 (Sun Safety)	.43	94	I	N	N	N	R	PP	N	SEH	S	—	I	—
3: Study 3 (BPA Products)	−.20	54	I	N	Y	N	O	PP	—	—	S	—	I	—
Morris et al., 2014														
1: Study 1, UV Photo	.31	31	IB	N	Y	Y	R	PP	Y	SEH	S	100	I	E
2: Study 1, No UV Photo	−.53	28	IB	N	Y	N	R	PP	Y	SEH	S	100	I	E
3: Study 2, Appearance Focus	1.05	24	I	N	N	Y	R	PP	Y	SEH	S	100	I	E
4: Study 2, Health Focus	−.30	27	I	N	N	Y	R	PP	Y	SEH	S	100	I	E
5: Study 2, No Photo	−.51	33	I	N	N	N	R	PP	Y	SEH	S	100	I	E
Muthusamy et al., 2009														
1: No Efficacy Message	−.20	124	AIB	N	Y	Y	R	PP	N	—	M	68	C	E
2: Efficacy Message	.08	124	AIB	Y	Y	Y	R	PP	N	—	M	68	C	E
Ordoñana et al., 2009														
1: No Efficacy Message	.59	45	IB	N	Y	Y	O	PP	N	—	L	83	I	E
2: Efficacy Message	.52	47	IB	Y	Y	Y	O	PP	N	—	L	83	I	E
Pengchit, 2010	1.25	124	B	Y	Y	Y	O	PP	N	—	S	—	I	—
Pepper & Nettle, 2014														

Paper	*d*	N	AIB	Eff	Sev	Sus	OR	DPP	DP	SE	Delay	%F	IC	SOC
1: Study 1	−.22	72	IB	N	—	—	R	PP	Y	SEE	S	46	I	E
2: Study 2	.14	66	IB	N	N	Y	R	PP	Y	SEE	S	40	I	E
Powell, 1965														
1: Threat to Listener	−.52	28	A	N	N	N	O	PP	Y	—	S	0	I	—
2: Threat to Family	.84	28	A	N	N	N	O	PP	Y	—	S	0	I	—
3: Threat to Nation	.01	24	A	N	N	N	O	PP	Y	—	S	0	I	—
Priolo & Milhabet, 2008														
1: Study 1, Smokers Committed to Quitting	.72	60	I	N	—	—	R	PP	Y	SEE	S	85	I	E
2: Study 1, Smokers Not Committed to Quitting	−.16	60	I	N	—	—	R	PP	Y	SEH	S	85	I	E
3: Study 2, Smokers Committed to Smoking	−.55	60	I	N	—	—	R	PP	Y	SEH	S	85	I	E
4: Study 2, Smokers Not Committed to Smoking	.49	60	I	N	—	—	R	PP	Y	SEE	S	85	I	E
Radelfinger, 1965	.90	131	I	Y	Y	N	O	PP	N	—	S	—	I	E
Raleigh, 2002														
1: Males, Low Response Costs	−.19	17	I	Y	N	Y	R	PP	N	—	S	0	I	E
2: Males, High Response Costs	−.25	13	I	N	N	Y	R	PP	N	—	S	0	I	E
3: Females, Low Response Costs	−.24	11	I	Y	N	Y	R	PP	N	—	S	100	I	E
4: Females, High Response Costs	−.78	10	I	N	N	Y	R	PP	N	—	S	100	I	E
Ramirez & Lasater, 1976	.00	462	B	Y	Y	N	R	PP	N	—	S	—	I	E
Ramirez & Lasater, 1977	.30	196	B	Y	Y	N	R	PP	N	—	S	—	I	E
Rippetoe & Rogers, 1987	.69	128	I	Y	Y	Y	R	D	N	—	S	100	I	E
Rodriguez, 1995														
1: Bicycle Safety	.98	124	A	N	Y	N	R	PP	Y	—	S	—	I	E
2: Drinking	.54	125	A	N	N	Y	R	PP	Y	—	S	—	I	E
3: Tetanus Vaccine	.42	120	A	N	Y	Y	O	PP	N	—	S	—	I	—
Rogers & Deckner, 1975														
1: Study 1	.25	116	AIB	N	Y	N	R	PP	N	—	S	—	I	E
2: Study 2	.38	152	AI	Y	Y	N	R	PP	N	—	S	—	I	E
Rogers & Mewborn, 1976														
1: Low Efficacy	−.04	44	I	Y	Y	Y	R	PP	N	—	S	—	I	—
2: High Efficacy	.41	44	I	N	Y	Y	R	PP	N	—	S	—	I	—
Rogers & Thistlethwaite, 1970														

Paper	*d*	N	AIB	Eff	Sev	Sus	OR	DPP	DP	SE	Delay	%F	IC	SOC
1: Smokers	.47	40	I	Y	Y	N	R	PP	N	—	S	—	I	E
2: Non-Smokers	.82	40	I	Y	Y	N	R	PP	N	SEE	S	—	I	—
Rosen et al., 1982														
1: Low Self-Esteem	.14	28	I	N	Y	Y	O	PP	Y	—	S	49	I	E
2: High Self-Esteem	−.24	28	I	N	Y	Y	O	PP	Y	—	S	49	I	E
Rosenthal, 1997														
1: Peptic Ulcers	.01	70	AI	N	N	Y	O	PP	N	—	S	—	I	—
2: Heart Disease	.26	70	AI	N	N	Y	O	PP	N	—	S	—	I	—
Roskos-Ewoldsen et al., 2004														
1: Low Efficacy	−.19	55	AI	N	N	Y	R	D	Y	—	S	100	I	—
2: High Efficacy	.10	55	AI	Y	N	Y	R	D	Y	—	S	100	I	—
Ruiter et al., 2003	.17	130	AI	N	Y	Y	R	D	Y	—	S	100	I	—
Schmitt & Blass, 2008	.56	30	AI	N	Y	N	R	PP	Y	SEE	S	—	I	—
Schoenbachler & Whittler, 1996	.00	248	AI	N	Y	N	R	PP	Y	—	S	—	I	—
Self & Rogers, 1990														
1: Low Efficacy	−.55	42	I	N	Y	Y	R	PP	N	—	S	55	I	—
2: High Efficacy	.64	42	I	Y	Y	Y	R	PP	N	—	S	55	I	—
Shehryar & Hunt, 2005														
1: Study 1, Low Commitment to Drunk Driving	.01	45	A	N	Y	N	R	PP	Y	SEE	S	57	I	—
2: Study 1, High Commitment to Drunk Driving	-1.07	45	A	N	Y	N	R	PP	Y	SEH	S	57	I	—
3: Study 2, Low Commitment to Drunk Driving, No Delay	−.79	25	A	N	Y	N	R	PP	Y	SEE	S	57	I	—
4: Study 2, High Commitment to Drunk Driving, No Delay	.12	25	A	N	Y	N	R	PP	Y	SEH	S	57	I	—
5: Study 2, High Commitment to Drunk Driving, Delay	−1.17	25	A	N	Y	N	R	PP	Y	SEH	S	57	I	—
Shelton & Rogers, 1981														
1: Low Empathy	.85	56	I	Y	Y	N	R	PP	N	—	S	—	I	—
2: High Empathy	.26	56	I	Y	Y	N	R	PP	N	—	S	—	I	—
Shen, 2011	.59	174	A	N	Y	N	R	PP	N	—	S	66	I	L
Siero et al., 1984	.24	269	B	N	Y	Y	R	D	Y	—	L	100	I	L
Skilbeck et al., 1977														
1: Single Exposure	−.99	40	B	N	Y	N	R	PP	N	SEE	M	100	I	E

Paper	*d*	N	AIB	Eff	Sev	Sus	OR	DPP	DP	SE	Delay	%F	IC	SOC
2: Multiple Exposures	−1.23	46	B	N	Y	N	R	PP	N	SEE	M	100	I	E
Smalec & Klingle, 2000														
1: Low Efficacy	−.60	22	B	N	Y	Y	O	PP	N	SEH	S	81	I	L
2: High Efficacy	1.40	22	B	Y	Y	Y	O	PP	N	SEH	S	81	I	L
Smart & Fejer, 1974														
1: Marijuana, Non-Users	−.05	856	I	N	Y	Y	R	PP	N	SEE	S	—	I	—
2: Marijuana, Users	−.17	249	I	N	Y	Y	R	PP	N	—	S	—	I	E
3: Fictional Drug	1.66	194	I	N	Y	Y	R	PP	N	—	S	—	I	—
Smerecnik & Ruiter, 2010														
1: Low Efficacy	−.19	30	I	N	Y	N	R	PP	Y	—	S	65	I	L
2: High Efficacy	.76	30	I	Y	Y	N	R	PP	Y	—	S	65	I	L
Smith & Stutts, 2003														
1: Males, Overall	.29	79	B	N	Y	N	R	PP	Y	—	L	0	I	—
2: Females, Overall	.38	76	B	N	Y	N	R	PP	Y	—	L	100	I	—
3: White Subjects	.51	61	B	N	Y	N	R	PP	Y	—	L	49	I	—
4: Hispanic Subjects	.29	55	B	N	Y	N	R	PP	Y	—	L	49	I	—
5: African-American Subjects	.41	24	B	N	Y	N	R	PP	Y	—	L	49	I	—
Stainback & Rogers, 1983														
1: Immediate Post-Test	.65	38	I	Y	Y	Y	R	PP	N	SEE	S	—	I	—
2: Delayed Post-Test	1.30	38	I	Y	Y	Y	R	PP	N	SEE	S	—	I	—
Stark et al., 2008														
1: Lozenges	.24	90	AI	N	Y	N	R	PP	N	—	S	73	I	E
2: Reduced-Exposure Cigarettes	.42	90	AI	N	Y	N	R	PP	N	—	S	73	I	E
3: Oral Tobacco	.34	90	AI	N	Y	N	R	PP	N	—	S	73	I	E
Stephenson & Witte, 1998	.47	92	AI	Y	Y	N	R	PP	N	SEH	S	56	I	E
Struckman-Johnson et al., 1990														
1: Males	−.10	96	I	N	—	—	R	PP	N	—	S	0	I	—
2: Females	−.03	95	I	N	—	—	R	PP	N	—	S	100	I	—
Sturges & Rogers, 1996														
1: Kids, Low Coping	.02	30	I	N	Y	Y	R	PP	N	SEE	S	50	I	—
2: Kids, High Coping	.43	37	I	Y	Y	Y	R	PP	N	SEE	S	50	I	—

Paper	*d*	N	AIB	Eff	Sev	Sus	OR	DPP	DP	SE	Delay	%F	IC	SOC
3: Teens, Low Coping	.05	23	I	N	Y	Y	R	PP	N	SEE	S	50	I	—
4: Teens, High Coping	.32	22	I	Y	Y	Y	R	PP	N	SEE	S	50	I	—
5: Adults, Low Coping	−.34	31	I	N	Y	Y	R	PP	N	SEE	S	50	I	—
6: Adults, High Coping	.27	38	I	Y	Y	Y	R	PP	N	SEE	S	50	I	—
Tanner et al., 1991	.81	60	I	N	—	—	R	PP	N	—	S	—	I	—
Taubman Ben-Ari et al., 2000														
1: Study 1, Low Driving-Related Self-Esteem	1.06	27	I	N	Y	N	R	PP	Y	SEE	S	0	C	—
2: Study 1, High Driving-Related Self-Esteem	.08	27	I	N	Y	N	R	PP	Y	SEH	S	0	C	—
3: Study 2, Low Driving-Related Self-Esteem	−.76	27	B	N	Y	N	R	PP	Y	SEE	S	0	C	—
4: Study 2, High Driving-Related Self-Esteem	.20	28	B	N	Y	N	R	PP	Y	SEH	S	0	C	—
ter Horst et al., 1985	−.12	107	B	Y	Y	Y	O	PP	N	—	S	—	I	E
Thornton et al., 2000	−.65	112	I	N	Y	N	R	PP	N	—	S	—	I	L
Umeh & Stanley, 2005	−.04	100	I	Y	Y	N	R	PP	N	—	S	0	I	—
Umeh, 2012														
1: Low Credibility Source	.06	134	I	Y	Y	N	R	D	Y	—	S	100	I	—
2: High Credibility Source	.25	134	I	Y	Y	N	R	D	Y	—	S	100	I	—
Venkatesan, 2010	3.01	72	A	Y	N	Y	O	PP	N	—	L	100	I	E
Weinstein et al., 1990	.24	264	I	Y	Y	Y	O	D	Y	—	S	—	I	—
Welbourne et al., 2008	.00	308	A	N	Y	N	R	PP	Y	—	S	—	I	—
Wheatley & Oshikawa, 1970														
1: Low Anxiety	.30	49	A	N	N	N	O	PP	Y	—	S	—	I	—
2: High Anxiety	−.14	47	A	N	N	N	O	PP	Y	—	S	—	I	—
Will et al., 2009	.54	352	AB	Y	Y	N	O	PP	N	—	S	80	I	E
Witte & Morrison, 1995	−.32	122	AIB	Y	Y	Y	R	PP	N	—	L	45	I	—
Witte et al., 1998	.03	96	AIB	N	Y	Y	R	PP	N	—	S	100	I	—
Wong & Cappella, 2009														
1: Low Efficacy	−.01	277	I	N	Y	N	R	PP	Y	—	S	47	I	E
1: High Efficacy	.81	278	I	Y	Y	N	R	PP	Y	—	S	47	I	E
Wurtele & Maddux, 1987														
1: No Efficacy Message	1.42	40	I	N	N	Y	R	PP	N	SEE	M	100	I	E
2: Self-Efficacy Message	−.11	40	I	Y	N	Y	R	PP	N	SEE	M	100	I	E

Paper	*d*	N	AIB	Eff	Sev	Sus	OR	DPP	DP	SE	Delay	%F	IC	SOC
3: Response-Efficacy Message	.75	40	I	Y	N	Y	R	PP	N	SEE	M	100	I	E
4: Both Efficacy Messages	1.22	40	I	Y	N	Y	R	PP	N	SEE	M	100	I	E
Wurtele, 1988	.82	49	IB	Y	N	Y	R	PP	N	—	M	100	I	E
Yoon & Tinkman, 2013														
1: Low Past Threat, Nonhumor Ads	−.28	48	AI	N	Y	N	R	PP	Y	SEH	S	—	I	E
2: Low Past Threat, Humor Ads	.60	48	AI	N	Y	N	R	PP	Y	SEH	S	—	I	E
3: High Past Threat, Nonhumor Ads	.62	48	AI	N	Y	N	R	PP	Y	SEH	S	—	I	E
4: High Past Threat, Humor Ads	−.58	48	AI	N	Y	N	R	PP	Y	SEH	S	—	I	E

Note: *d* = Standardized mean effect size. N = Sample size for treatment plus comparison. AIB = Whether *d* was based on attitude (A), intention (I), and/or behavior (B) outcomes. EFF = Whether an efficacy statement was included (Y) or not (N). Sev = Whether the treatment message was manipulated to be higher in depicted severity than the comparison message (Y) or not (N). Sus = Whether the treatment message was manipulated to be higher in depicted susceptibility than the comparison message (Y) or not (N). OR = Whether the recommended behavior was one-time (O) or repeated (R). DPP = Whether the recommended behavior was detection (D) or prevention/promotion (PP). DP = Whether the word death was present in the message (Y) or not (N). SE = Whether the recommended behavior was self-esteem enhancing (SEE) or self-esteem hindering (SEH). Delay = Whether the outcome followed exposure to the message by less than 24 hours (S), 1–14 days (M), or more than 14 days (L). %F = Percent of sample that was female (0–100%). IC = Whether the sample was from an individualist (I) or collectivist (C) culture. SOC = Whether the sample was in the early (E) or late (L) stages of change. Dash (–) indicates the variable was not relevant for the study.

Table 3

Effect sizes and sample sizes for each sample included in the linear versus curvilinear test.

			d			
FirstAuthor	**N_H**	**N_M**	**Combined Outcomes**	**Attitudes**	**Intentions**	**Behaviors**
Beck & Davis, 1978						
1: Low Interest	14	15	.28	.28	–	–
2: High Interest	14	16	−.45	−.45	–	–
Burnett, 1981	36	43	.51	.73	.28	–
Chu, 1966						
1: Low Efficacy	100	125	1.06	–	–	1.06
2: Medium Efficacy	112	121	−.18	–	–	−.18
3: High Efficacy	120	112	.36	–	–	.36
Hill & Gardner, 1980						
1: Repressors	11	13	−.07	–	–	−.07
2: Sensitizers	15	14	.65	–	–	.65
Leventhal et al., 1965						
1: No Prior Vaccination	22	34	.09	–	–	.09
2: Prior Vaccination	29	30	−2.58	–	–	−2.58
Ramirez & Lasater, 1976	231	231	.00	–	–	.00
Schoenbachler & Whittler, 1996	125	123	.00	.00	.00	–
Skilbeck et al., 1977						
1: Single Exposure	25	18	.58	–	–	.58
2: Multiple Exposures	17	18	−.43	–	–	−.43
Smart & Fejer, 1974						
1: Marijuana, Non-Users	122	119	−.26	–	−.26	–
2: Marijuana, Users	414	441	−.03	–	−.03	–
Yoon & Tinkman, 2013						
1: Low Past Threat, Nonhumor Ads	24	24	−.13	−.23	−.04	–
2: Low Past Threat, Humor Ads	24	24	.30	.41	.19	–
3: High Past Threat, Nonhumor Ads	24	24	.19	.11	.26	–
4: High Past Threat, Humor Ads	24	24	−.48	−.64	−.32	–

			d			
FirstAuthor	**N_H**	**N_M**	**Combined Outcomes**	**Attitudes**	**Intentions**	**Behaviors**
Thornton et al., 2000	56	57	−.72	–	−.72	–

Note: *d* = Standardized mean effect size. N_H = Sample size for the high depicted fear group. N_M = Sample size for the medium depicted fear group. Combined outcomes = Average of all attitude, intention, and behavior measures. Dash (–) indicates the variable was not relevant for the study. The attitude, intention, and behavior measures are analyzed separately in Appendix A.

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Table 4

Moderator analysis results for methodological variables.

Variable	Level	*d*	95% CI	*k*
Study source	Journal article	.28	[.21, .35]	226
	Other	.32	[.00, .63]	22
Institution of first author	University or college	.29	[.21, .36]	228
	Research center	.25	[−.05, .55]	14
Sampled population	General population	.14	[.00, .29]	45
	University students	.34	[.24, .43]	145
	High school students	.35	[.09, .60]	17
	Children	.25	[−.03, .53]	13
	Other	.18	[−.04, .39]	24
Participants run in groups	Yes	.30	[.21, .38]	135
	No	.32	[.20, .43]	75
Study setting	Laboratory	.25	[.15, .35]	137
	Field	.31	[.22, .41]	107
Message specificity	Single specific target	.30	[.22, .39]	182
	Multiple specific targets	.22	[.02, .42]	26
	Multiple non-specific targets	.26	[.10, .42]	35
Measured fear in the study	Yes	.30	[.18, .41]	71
	No	.28	[.20, .36]	177
Media of message	Text information	.36	[.25, .47]	93
	Pictures/videos	.20	[.09, .31]	73
Health related message	Yes	.28	[.20, .35]	202
	No	.31	[.13, .49]	43
Study domain	Dental hygiene	.06	[−.16, .28]	14
	Driving safety	.11	[−.10, .33]	27
	HIV/STDs	.37	[.20, .54]	33
	Drinking/drugs	.49	[.25, .74]	20
	Smoking	.26	[.13, .40]	40
	Cancer prevention	.16	[−.01, .34]	26
	Disease prevention	.40	[.19, .61]	51
	General safety	.22	[.03, .40]	13
	Environment/society	.24	[.02, .45]	13
	Other	.39	[.11, .68]	11

Note: *d* = Standardized mean effect size estimated meta-analytically for the indicated moderator level. 95% CI = The 95% confidence interval for *d*. *k* = The number of studies for each moderator level.

Table 5

Moderator analysis results for categorical moderators.

MBA Aspect	Variable	Level	*d*	95% CI	*k*
Message	Efficacy statements	Included	.43	[.31, .55]	92
		Excluded	.21	[.13, .29]	154
	Depicted susceptibility and severity	Both	.39	[.28, .50]	78
		Susceptibility	.43	[.08, .79]	20
		Severity	.23	[.13, .33]	125
		Neither	.12	[−.03, .27]	17
Behavior	One-time versus repeated	One-time	.43	[.30, .56]	82
		Repeated	.21	[.14, .29]	166
	Detection versus promotion/prevention	Detection	.35	[.21, .49]	40
		PP	.27	[.20, .35]	208
	Death and self-esteem	SEE, DP	.39	[.11, .67]	15
		SEE, DA	.22	[−.04, .47]	23
		SEH, DP	−.11	[−.41, .18]	18
		SEH, DA	.48	[.00, .96]	6
	Death and delay	DP, same day	.16	[.04, .27]	70
		DP, 1–14 days	.79	[.21, 1.37]	5
		DP, 14+ days	.35	[.19, .51]	14
		DA, same day	.34	[.25, .44]	124
		DA, 1–14 days	.02	[−.29, .33]	18
		DA, 14+ days	.46	[.03, .88]	13
Audience	Culture	Collectivist	.47	[.27, .66]	29
		Individualist	.26	[.19, .33]	219
	Stage of change	Early	.30	[.21, .40]	150
		Late	.34	[.14, .54]	30

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Note: SE = Self-esteem. DP = Death present in message. DA = Death absent in message. PP = Promotion/prevention. SEE = Self-esteem enhancing recommended behaviors. SEH = Self-esteem hindering recommended behaviors. *d* = Standardized mean effect size estimated meta-analytically for the indicated moderator level. 95% CI = The 95% confidence interval for *d*. *k* = The number of studies for each moderator level.