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Emotional Appeals and Norms: How Normative Perceptions Moderate the Persuasive Impacts of Discrete Emotional Appeals within Tobacco Pictorial Warnings in China

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ABSTRACT

Tobacco pictorial warnings could employ a variety of emotional appeals to enhance effectiveness; however, little research exists to guide the selection of discrete emotional appeals. Further, it remains unclear how contextual pro-smoking norms might influence the persuasive impacts of discrete emotional appeals within pictorial warnings, especially in China, where the overall smoking rate and social acceptance remain high. To fill these gaps, this study leveraged the largest set of pictorial warnings ($K = 510$) tested to date. Using a randomized large-K multiple-message design, we evaluated the impacts of disgust, fear, self-anger, contempt, shame, and hope appeals among Chinese adult male smokers ($N = 2,306$) on perceived message effectiveness (PME). Results showed that fear, self-anger, shame, and hope appeals significantly increased PME, while disgust and contempt appeals appeared less effective. Importantly, the PME of nearly all emotional appeals – except hope appeals – was weakened for Chinese adult male smokers with higher pro-smoking normative perceptions, highlighting the importance of considering local contextual influences when implementing pictorial warnings.

Pictorial warnings represent a promising tobacco control strategy to encourage cessation attempts and to prevent smoking initiation (Hammond, 2011), such as when implemented as graphic warning labels on cigarette packs or delivered as media campaign messages. As a subtype of pictorial warnings, cigarette pack graphic warnings typically depict health consequences of tobacco use and exposure in a visceral and vivid way (Cunningham, 2022), and their superiority over text-only warnings has been well documented (Noar, Hall, et al., 2016). However, limited research exists to guide the selection of discrete emotional appeals within pictorial warnings, with a few exceptions (e.g., Cochran et al., 2018). In particular, existing research overwhelmingly emphasized the role of negative emotions (e.g., Bekalu et al., 2019). Pictorial warnings that elicit high levels of negative emotional reactions are associated with higher perceived message effectiveness (PME) (Sutton et al., 2019), which is one of the key predictors of cessation intentions and behaviors (Cappella, 2018, Noar et al., 2020). However, less work has distinguished discrete emotional appeals nor emphasized the potential of positive emotions (for exceptions, see Durkin et al., 2018).

Moreover, although many have studied the mediating roles of *individual*-level negative emotional reactions to pictorial warnings (e.g., individuals' post-exposure states of fear, disgust, and anger), few have examined and differentiated the impact of discrete emotional appeals as *message*-level properties of pictorial warnings (e.g., message-level variations in the deployment of different emotional appeals), let alone producing empirical evidence to inform the selection of one discrete

emotional appeal over another. Utilizing the largest set of pictorial warnings ($K = 510$) tested to date on perceived message effectiveness, this study evaluated pictorial warnings with various discrete emotional appeals, including fear, disgust, self-anger, shame, contempt, and hope appeals, among current adult male smokers in China.

As of 2018, China has over 300 million current smokers, and smoking prevalence is much higher in men than women (50.5% versus 2.1%; Global Adult Tobacco Survey, 2018). To curb tobacco consumption around the globe, the WHO Framework Convention on Tobacco Control (FCTC) provided recommendations to implement warning labeling for tobacco products in countries that agree to follow FCTC guidelines (Cunningham, 2022). However, adherence to such guidelines is unsatisfactory in China: only textual warning labels are currently mandated. Considering the well-documented effectiveness of graphic warning labels (Noar, Hall, et al., 2016, Ratih & Susanna, 2018), the delay in their implementation in China is a lost opportunity to motivate smoking cessation. This study, therefore, offers important practical guidance for selecting effective emotional appeals within pictorial warnings in China.

Importantly, this study also calls for the need to contextualize anti-smoking interventions that employ discrete emotional appeals. China's longstanding cultural practices and current societal norms are more pro-tobacco than many other countries. Smoking is perceived as widely popular, and tobacco products are an essential part of the gifting culture in China (Mullin et al., 2011). Thus, empirical findings in contexts

where the smoking rate is low and smoking is denormalized are not guaranteed to guide pictorial warnings implementation in high-burden tobacco-use countries, such as China. Since smoking is a social behavior, anti-tobacco strategies should factor in perceived social influences that can affect smokers' behaviors and acceptance of tobacco control messages (Amonini et al., 2015). We consider perceived social norms regarding smoking—both descriptive and injunctive norms—as essential contextual factors that may alter the effectiveness of discrete emotional appeals within pictorial warnings.

Leveraging pictorial warnings to improve tobacco control in China

The need to control the tobacco epidemic in China is urgent, as China ranks globally with the highest burden of tobacco use while many other countries have seen a steady decline in tobacco use. In China, the smoking rate has been extremely high: 50.5% of male adults are current smokers, while 2.1% of female adults smoke in 2018 (Global Adult Tobacco Survey, 2018). Meanwhile, knowledge about the hazards of smoking is low in general (Zhang et al., 2019). As the Chinese population shrinks and ages, delayed smoking cessation will lead to preventable morbidities and mortalities while imposing unnecessary burdens on individuals, families, and the already strained healthcare system. The opportunity window to adopt effective tobacco control interventions before the population of current smokers reaches seniority is narrowing. Thus, implementing evidence-based tobacco control strategies, such as pictorial warning labels on tobacco packaging, as strongly recommended by the WHO FCTC, is now more crucial than ever.

As a specific type of pictorial warning message, graphic warning labels imposed on cigarette packages are cost-effective interventions to communicate the health risks associated with tobacco use. Though the exact content varies, graphic warning labels often present visceral and realistic images portraying the harms of tobacco use (e.g., bleeding brains, diseased lungs, opening in the neck, swollen gum tissues), conveying the health risks and their magnitude (Cunningham, 2022). They are rated as informative and factual as textual warning labels (Popova et al., 2018) and can serve as prominent sources of health knowledge and motives for smoking cessation (Hammond, 2011). Recent evidence shows that graphic warning labels were more effective than text-only labels in a) attracting attention, b) triggering stronger cognitive and affective reactions, c) promoting more negative attitudes toward smoking, and d) encouraging more quitting (Noar, Hall, et al., 2016). Similar benefits are observed in longitudinal observational studies across different countries (Noar, Francis, et al., 2016). However, the extant evidence was gathered predominantly in high-income countries with lower smoking rates (Wakefield et al., 2013), and findings regarding the efficacy of graphic warning labels in China are only recently emerging (Bresnahan & Zhuang, 2016, Li et al., 2014, Reid et al., 2017, Wu et al., 2015). More empirical evidence is needed to inform the implementation of graphic warning labels in China, especially with regard to the selection of discrete emotional appeals. Beyond cigarette pack warning labels, studying emotional appeals within pictorial warnings in

general, can also inform message design in tobacco control campaigns in China.

Differentiating message-level emotional appeals from individual-level emotional reactions

Health pictorial warnings can employ a variety of emotional appeals to enhance effectiveness. Moving beyond the valence of emotions, scholars have been advocating the importance of discrete emotional appeals when investigating emotion-based influences in persuasion (Dillard & Peck, 2001, Nabi, 2010). The discrete emotion perspective postulates that distinct emotions, including emotions with the same valence, can be identified by unique patterns of cognitive appraisals, therefore leading to differential action tendencies and unique effects (Ellsworth & Smith, 1988, Izard, 1977, Lazarus, 1991). Empirically, Dillard and Peck's (2000) work has shown that each discrete emotion in response to public service announcements (PSAs) had a unique effect on the perceived message effects of the viewed PSA. However, studies on health warning labels tend to lump multiple emotional reactions together, often all negative in valence, into a single index (e.g., Hall et al., 2018, Li et al., 2020). Grouping multiple emotions together thus loses the opportunity to tease out their respective unique effects (Dillard & Peck, 2001, Nabi, 2010). For instance, in a study that experimentally manipulated negative emotional appeals within graphic warning labels, disgust but not anxiety appeals reduced motivated attention to smoking cues, demonstrating the importance of distinguishing discrete emotional appeals (Cochran et al., 2018).

Conceptually, *individual-level* discrete emotional reactions toward health warnings also need to be distinguished from *message-level* discrete emotional appeals. Limited research exists to guide the selection of discrete emotional appeals within pictorial warnings, as the literature typically focuses on emotional reactions as individual-level variables mediating the impacts of pictorial warnings (e.g., versus text-only warnings) on persuasive outcomes such as PME. Although it is important to establish individual-level emotional processes as one of the key underlying mechanisms to account for pictorial warnings' superiority over text-only warnings, such data cannot directly speak to the effectiveness of message-level discrete emotional appeals. To help clarify the distinction between individual-level and message-level effects, we use fearful emotional reactions and fear appeal messages as examples. On one hand, one could potentially study the relationship between a psychological state and a persuasive outcome, for instance, the effects of the individual-level emotional reaction of fear toward pictorial warnings on PME. On the other hand, scholars could also investigate the effects of variations in messages' properties on a given persuasive outcome, for instance, the relationship between the variations of fear appeal deployed in pictorial warnings (e.g., depictions of damaged organs and dead bodies) and PME. In the case of the current study, we aim to estimate the effects of various message-level emotional appeals on participants' PME.

Thus, this study follows the discrete emotion perspective and examines the differential persuasive effects of a range of message-level emotional appeals relevant to tobacco pictorial

warnings, including fear, disgust, self-anger, shame, contempt, and hope appeals. We seek to tackle two theoretical questions: first, whether variations in emotional appeals can effectively predict PME, which is one of the key factors in predicting quitting intentions and behaviors (Cappella, 2018, Noar et al., 2020); and second, whether and how the effectiveness of these emotional appeals might be moderated by smokers' normative perceptions, given the strong pro-tobacco social norms and persistent cigarette-gifting culture in China (Mullin et al., 2011).

Importantly, the recommendation to adopt a multilevel modeling perspective in the message effects research (Kim & Cappella, 2019, Slater et al., 2015) facilitates progress in the study of message-level emotional appeals. For instance, in the case of PME, research designs leveraging crowdsourcing have used a large number of messages as stimuli (i.e., a large- K multiple-message design) and operationalize a particular message's PME score (not a participant's self-reported PME score toward a message) through aggregating individual self-report PME ratings across the participants randomly assigned to that message (Bigsby et al., 2013, Morgan et al., 2020). When researchers later analyze how such aggregate message-level PME scores affect persuasive outcomes (e.g., quitting intentions), the relationships thus obtained are no longer between an *individual*-level psychological state and the persuasive outcome. Echoing this point, O'Keefe (2020) explicitly cautions against analyzing *individual*-level relationships between each participant's reported PME score and persuasive outcomes while advocating for focusing on *message*-level aggregate PME scores and outcomes in formative campaign research.

Admittedly, although such an analytical approach can advance the study of emotional appeals, it cannot directly reveal manipulable, specific content or format features to facilitate message design. Given this caveat, the theoretical and practical value of adopting this approach in the current study is two-fold: First, it can screen multiple emotional appeals to isolate those most impactful on the target persuasive outcome (e.g., PME), thereby efficiently identifying promising directions for subsequent research to uncover manipulable features; second, this approach can help identify scope conditions that amplify or weaken the effectiveness of each emotional appeal (e.g., perceived social norms), a theoretical question worth pursuing even without the feasibility to uncover specific, manipulable design features. Thus, this study focuses on the effects of *message*-level emotional appeals. Bearing these research questions in mind, we briefly review the existing literature on discrete emotional appeals in the context of pictorial health warnings below, including fear, disgust, self-anger, shame, contempt, and hope appeals.

Fear appeal

Though extensive debates remain regarding the notion of a "basic emotion" in affective science, fear has been thought of as one of the more universal core emotions experienced by human beings (Keltner et al., 2019, Prinz, 2004, Russell, 2003, Scarantino & Griffiths, 2011). As a negative discrete emotion with a high level of arousal, fear arises from a threat that is perceived to be significant and personally important (Lazarus,

1991). Fear appeal often evokes fear by presenting threat messages containing information regarding severity or uncontrollability. The subjective experience of a scary feeling induces an urge to protect, leading to adaptive coping such as attitudinal and behavioral changes to avert threats, when efficacy is high (Witte, 1992, Witte & Allen, 2000). Fear appeal is therefore considered an effective leverage in persuasion when used properly (Tannenbaum et al., 2015). It is widely implemented in tobacco control efforts through depictions of health (e.g., death, cancer) and social (e.g., loss of family members) consequences of smoking (Farrelly et al., 2003, Laroche et al., 2001, Sutton et al., 2019) and has been observed to increase health-related persuasion success, including smoking cessation attitudes, intentions, and behaviors (e.g., Dijkstra & Bos, 2015, Durkin et al., 2018, Laroche et al., 2001, Tannenbaum et al., 2015). Based on the extant literature, this study predicts that pictorial warnings employing fear appeal will increase PME.

H1: *Pictorial warnings that employ stronger fear appeals will predict higher PME.*

Disgust appeal

Disgust, a feeling of being "grossed out" (Nabi, 2002), may arise when one perceives a noxious object or idea, such as a dead body, and is evolutionarily linked to the protection of organisms from ingesting harmful substances. Because disgust promotes immediate avoidance actions that distance oneself from the offensive object and the threat (Lazarus, 1991, Rozin et al., 1999), it has been leveraged to enhance persuasive health messages. Message effects research has shown that disgust appeals effectively attract attention, motivate information processing, and increase perceived message effectiveness (Cochran et al., 2018, Leshner et al., 2009, 2011, Morales et al., 2012). In the context of pictorial tobacco warnings, disgust appeals generate revolting feelings through depictions of tobacco-damaged organs, gore, or chemical constituents (e.g., dead animals soaked in formaldehyde) (Alderman et al., 2010, Leshner et al., 2011). Such disgust appeals are found to increase support for tobacco control policies among nonsmokers (Halkjelsvik, 2014), improve tobacco-related message encoding and recognition (Leshner et al., 2009), and reduce motivated attention to smoking cues (Cochran et al., 2018). Thus, we expect pictorial warnings that implement disgust appeals to be also effective in our study context.

H2: *Pictorial warnings that employ stronger disgust appeals will predict higher PME.*

Shame appeal

Shame is a self-conscious feeling of embarrassment or humiliation evoked by negative self-evaluations. Self-conscious emotions are characterized by their focus on an individual's self-representation, allowing for reflective self-evaluation

(Tangney, 1999, Tracy & Robins, 2004). As self-reflection occurs, self-conscious emotions like shame provide immediate feedback on social and moral acceptability. For example, when we transgress or err, shame may ensue to evoke self-punishment. As a result, shame can influence moral choices and lead to attempts to remedy, deny, avoid, or escape the shame-inducing situation (Tangney, 1998, Tangney et al., 2007). Stemming from the perceived social unacceptability and stigma attached to smoking, shameful feelings have been identified as one of the important factors that influence smokers' thoughts and behaviors of quitting; shame-based messages have also produced higher issue awareness and better message recall and evaluation as well as smoking cessation outcomes (Amonini et al., 2015, Brown-Johnson & Prochaska, 2015). However, given that shameful feelings are often accompanied by a sense of worthlessness and powerlessness, shame appeals may lower perceived self-control of the negative situation and promote maladaptive responses (Brown-Johnson & Prochaska, 2015, Tangney et al., 2007). Moreover, empirical evidence is still needed to guide the application of shame appeal in pictorial warnings in China. Drawing on the mixed evidence, we explore the effectiveness of shame appeals.

RQ1: *Will pictorial warnings that employ shame appeals predict higher or lower PME?*

Self-anger appeal

Anger involves an unpleasant experience caused by a provocation, hurt, or threat and is associated with an action tendency to remove the obstruction against a personal goal (Ellsworth & Smith, 1988, Lazarus, 1991). Notably, we distinguish two types of anger in this study: anger toward the self versus the pictorial warnings. Usually, the blocking of a personal goal is caused by another person. However, people can also be angry at themselves (Ellsworth & Tong, 2006). As another self-conscious emotion, self-anger arises when one reflects on the self and perceives the self as to blame for the unpleasant experience (Ellsworth & Tong, 2006, Frijda, 2007, Kuppens et al., 2003). This kind of inward hostility feelings may lead to accepting beliefs, attitudinal and behavioral changes to withdraw from negative situations and experiences (Ellsworth & Tong, 2006). Recent evidence also shows that these emotions of inward hostility, like guilt, are particularly successful in encouraging healthy behaviors or reducing risky behaviors, though more research in this direction is still needed (Xu & Guo, 2018). In the context of tobacco control, pictorial warnings that may generate self-anger (e.g., depictions of children harmed by one's smoking) may also produce higher PME. On the other hand, appealing to such self-hate may decrease the effectiveness of pictorial warnings if an anger-inducing message elicits negative reactions to the persuasive message, such as affective reactance (Hall et al., 2018) or destructive self-evaluation and maladaptive beliefs about oneself (Szeto et al., 2022). In the current study, we focus on message-level self-anger appeal, which has not been

thoroughly examined in the literature, controlling for affective reactance such as anger toward the pictorial warnings.

RQ2: *Will pictorial warnings that employ self-referential anger appeal predict higher or lower PME?*

Contempt appeals

Although little attention has been given to how messages that evoke contempt feelings against smokers themselves influence PME, there are good reasons to believe that contempt appeals deserve more careful investigation. Contempt arises when one perceives community ethics violations and can lead to rejection and social exclusion of the person or the group being blamed (Fischer & Roseman, 2007, Hutcherson & Gross, 2011). Smokers and the tobacco industry are often the object of contempt (Alderman et al., 2010, Echabe et al., 1994). Though very few studies have systematically investigated the effects of contempt appeal, the emotion of contempt may have persuasive potential and has been found to influence voting intentions (Roseman et al., 2020). Following this line of thinking, tobacco control messages that can evoke contempt toward smokers themselves as a group should lead to negative attitudes toward smoking as well as rejection of smoking behaviors. However, other evidence showed that self-conscious emotions like contempt might not have a significant impact in health contexts. For example, Becheur and Das (2018) found that self-conscious emotions did not significantly influence risky behaviors like drunk driving. Moreover, given that graphic warning labels could elicit more intense affective reactions compared to text-only warning labels (Noar, Hall, et al., 2016), it is also possible that such self-condemning contempt appeal could trigger reactance, leading to a decrease in PME. Adding to that, if one perceives no ability or no interest in influencing the negative situation, contempt feelings may lead to ignoring or disparaging the blamed person or group to reduce the negative experiences without changing the person's own behaviors (Fischer & Roseman, 2007). Considering the mixed evidence, we offer an initial exploration of whether pictorial warnings that evoke contempt feelings toward smokers themselves can aid tobacco control efforts.

RQ3: *Will pictorial warnings that employ contempt appeals predict higher or lower PME?*

Hope appeal

Hope, a feeling of fearing the worst but yearning for better, is evoked when one desires to achieve an important and desirable future outcome in the face of adversity. It helps cope with negative emotions and motivates goal-directed actions (Lazarus, 1991, Snyder, 2002). Although hope received limited attention in persuasion research before, growing evidence supports the effectiveness of hope-based persuasion in various health communication contexts (e.g., Chadwick, 2015, Nabi

& Myrick, 2019). Pioneering work has also suggested that hope feelings can be particularly beneficial for tobacco control (Yang et al., 2019). Hope appeal messages have been leveraged to strengthen persuasion in promoting vaccine intentions and communal support during public health crises (e.g., Lu & Yuan, 2022, Tian et al., 2021). According to Chadwick (2015), a hope appeal message typically emphasizes an opportunity to achieve a desirable future outcome that is important, possible, and consistent with one's goals. Moreover, hope appeal messages present recommended action or feasible pathways to achieve that desired outcome. Thus, pictorial warnings that evoke hope may a) provide coping mechanisms for undoing negative experiences related to smoking cessation, b) offer motivations to pursue the goals of quitting smoking, and c) promote a sense of efficacy by presenting cessation assistance and benefits of quitting. For these reasons, we explore the effectiveness of hope appeal in pictorial warnings among Chinese male smokers.

RQ4: Will pictorial warnings that employ hope appeals predict higher or lower PME?

Considering contextual social influences: moderation by norm perceptions

Longstanding cultural practices and current societal norms favorable to smoking represent a barrier to effective tobacco control in China. The tradition of giving cigarettes as gifts remains a challenging factor for tobacco control in China, where social norms tend to treat smoking as more acceptable than in other countries with lower smoking rates (Mullin et al., 2011). Smoking norms could be considered as contextual influences when implementing pictorial warnings because it is a source of information retrievable and applicable when people decide to smoke or not. The social environment of smoking, and the perception of it, is an often-neglected factor when studying anti-smoking messages (Amonini et al., 2015). In this study, we examined two types of perceived social norms: a) perceived *descriptive norms*, i.e., what most others are doing, and b) perceived *injunctive norms*, i.e., what is commonly approved or disapproved of (Cialdini et al., 2006).

Taking into consideration the powerful contextual influences of social norms, the effectiveness of emotional appeals within pictorial warnings may vary depending on the interaction between the types of emotional responses elicited and the preexisting normative perceptions an individual holds about smoking (Reynolds et al., 2015, Tangney et al., 2007). For instance, if smoking is perceived as prevalent (i.e., high descriptive norms) and approved by others (i.e., high injunctive norms), such pro-smoking normative perceptions can likely overshadow the effectiveness of pictorial warnings that employ emotional appeals. That is, although certain discrete emotional appeals in pictorial warnings could be highly effective in promoting anti-smoking behaviors, contextual influences, such as perceptions of social norms favorable to tobacco use, could attenuate the persuasion effects of the emotional appeals.

Perceived social norms may moderate the effects of self-conscious emotions such as shame, self-anger, and inward contempt, given that the central feature of these self-conscious emotions is their relevance to self-representation and self-evaluation against internal or external standards. Because of such self-reflection, self-conscious emotions often respond to situations invoking notions about social and moral acceptability. For instance, feelings of inward hostility (e.g., self-anger, shame) may be triggered when we transgress (Tangney, 1999, Tracy & Robins, 2004). As such, these self-conscious emotions play an essential role in regulating one's beliefs, perceptions, and behaviors motivated by social norms and expectations (Robins & Schriber, 2009, Tangney, 1999). In line with this argument, neuroimaging evidence has identified the crucial roles played by the medial prefrontal cortex in self-conscious emotions, as these emotions often invoke mentalizing about the social rewards and sanctions followed by complying or violating norms (Krendl & Heatherton, 2017).

This makes it possible for social norms to condition the effects of persuasive messages appealing to these self-conscious emotions. For example, Jacobson et al. (2020) observed that messages with guilt appeals were perceived as more persuasive when accompanied by goal-consistent injunctive norm frames. Thus, in the context of tobacco control, the effectiveness of pictorial warning labels appealing to these self-conscious emotions, such as shame, contempt, or anger about self not living up to the societal code of conduct, may be further enhanced by preexisting anti-smoking social norms. In contrast, in a society with pro-tobacco social norms and longstanding cultural practices of gifting tobacco products, such as China, the effectiveness of pictorial warning labels based on these self-conscious emotions might be weakened.

Compared to self-conscious emotions, fear and disgust are deemed less self-focused and involve less self-reflection (Tangney, 1999). However, the extant literature suggests that social norms may still affect the effectiveness of fear and disgust appeals, subsequently influencing individuals' intentions to engage in pro-health behaviors. Emerging empirical evidence supports the interplay between social norms and persuasive fear appeal messages. For example, the inclusion of individual cues of pro-vaccine social norms in fear appeal messages bolstered message evaluation and vaccine intentions (Liu et al., 2022). Fear appeal messages based on injunctive social norms can motivate the adoption of risk mitigation measures (Lim et al., 2022).

Though studies on the interaction effects between disgust appeal and social norms are currently lacking, social norms may also influence the effectiveness of disgust appeal. Notably, one of the important elicitors of disgust feelings across cultures is violations of morality or social norms (Curtis & Biran, 2001, Oaten et al., 2009, Rozin et al., 1999). What is deemed disgusting and to be avoided depends on the social norm in a given culture. In a culture with an anti-tobacco social norm, smoking is likely considered more disgusting, making the message appealing to such feelings more resonating. In contrast, pictorial tobacco warning labels based on disgust feelings might be less effective if smoking is predominantly perceived as prevalent and acceptable in a society, such as in China.

Furthermore, to our knowledge, limited research has investigated the interplay between a hope appeal persuasive message and social norm. Compared with self-conscious emotions, the appraisals of hopeful feelings involve less heightened self-evaluations or self-reflection against internal or external standards, as hope appeals emphasize important and desirable future outcomes consistent with one's goals as well as efficacy information to achieve that goal despite adversity (Chadwick, 2015). Therefore, we speculate that hope appeals are less likely to be moderated by perceived norms. However, the speculated interaction effect between perceived social norms and disgust and hope appeals need to be empirically tested. Overall, given the relative scarcity of empirical research examining the interplay between perceived social norms and emotional appeals in the context of pictorial tobacco warnings in China, we carried out exploratory analyses.

RQ5: *RQ Do perceived descriptive norms (RQ5a) and injunctive norms (RQ5b) related to smoking moderate the effects of emotional appeals in predicting PME?*

Method

All message stimuli, the questionnaire of the online experiment, replication data and script can be found in the Open Science Framework repository (link: https://osf.io/k7vyg/?view_only=4c32b8b125af4070a971ffa8fa345f06).

Participants

To recruit participants from the target population, an online sample of smokers from mainland China ($N = 2,306$, mean age = 37 years) was recruited through the Qualtrics online panel. Qualified participants were male adults (18 years and older) who had smoked at least 100 cigarettes in their lifetime and currently smoking every day or some days. Over half of the sample had a college or higher degree (59.32%, $n = 1,368$). Most of the sample reported monthly household income above 7,000 RMB (93.71%, $n = 1,843$), well above China's average income (National Bureau of Statistics of China, 2022).

Randomized large- K multiple-message design

After initial screening, qualified participants took part in a survey-based experiment where participants first reported demographics and other pre-treatment covariates, including perceived social norms of smoking in China, and then viewed a randomly selected set of six pictorial warnings from the stimuli pool ($K = 510$). Using a large pool of message stimuli (i.e., the large- K multiple-message design) mitigates case-category confounding and improves generalizability with respect to (a) the effects of populations of messages with various instantiations of a discrete emotional appeal and (b) the impacts of real-world messages that have public health consequences (Kim & Cappella, 2019, Slater et al., 2015). After viewing each message, participants reported emotional responses (disgust, fear, anger at self, anger toward the image,

contempt for other smokers, hope) and PME toward the pictorial warning. The dataset included a total of 13,836 data points. The mean number of raters per message was 27.13 ($SD = 5.31$, range: 13 to 42).

Notably, the six pictorial warnings were randomly selected for each participant and presented in a random order to that participant. The large stimuli pool and randomized assignment of pictorial warnings to participants allowed us to derive message-level emotional appeal scores beyond individual-level emotional reactions. For a given pictorial warning, we created message-level emotional appeal scores by averaging individual-level emotional reactions across the set of participants who were randomized to evaluate that message (Figure 1). These emotional appeal scores are thus message-level aggregated scores, not any specific individual's psychological reaction anymore. This approach has been utilized and validated in previous research to measure message-level properties (for example, see Bigsby et al., 2013, Morgan et al., 2020). Modeling such aggregated scores as the key independent variables in a randomized design allowed us to eliminate the effects of person-specific confounders, including demographics, stage of change, and nicotine dependence, as well as systematic biases of order effects (Morgan et al., 2020). This analytical strategy thus provides more accurate inferences on the effects of message variables—i.e., discrete emotional appeals in this study..

It is worth noting that we did not manipulate specific emotion-eliciting content or format elements. This is because manipulating a particular visual content feature to alter one emotional appeal but not others is methodologically challenging, given that multiple emotional appeals typically co-occur in pictorial tobacco warnings. For example, while manipulating the portrayal of a diseased lung may alter a warning message's fear appeal, it is likely also to change the same message's disgust appeal. Given our interest in studying pictorial warnings high in external validity and useful to inform tobacco control policies in China, we opted to adopt the randomized large- K multiple-message design that allows for modeling the effects of a range of emotional appeals simultaneously, while adjusting for the influences of each other in real-word pictorial warning messages.

Message stimuli

Our stimuli corpus (see Appendix B for examples of each emotional appeal) consisted of pictorial warnings that have been implemented in several anti-tobacco campaigns and cigarette packs with a variety of appeals, arguments, and visual representations. We included pictorial warnings used in various educational campaigns in China through several rounds of internet searches ($k = 304$). Cigarette graphic warning labels from other Asian countries, including Malaysia, Singapore, and Brunei, were also collected ($k = 27$). Pictorial warnings from Western countries, when featuring Asian or no human characters, were also collected from several sources: a) a subset of graphic warning labels examined by Sutton et al. (2019) ($k = 60$); and b) pictorial

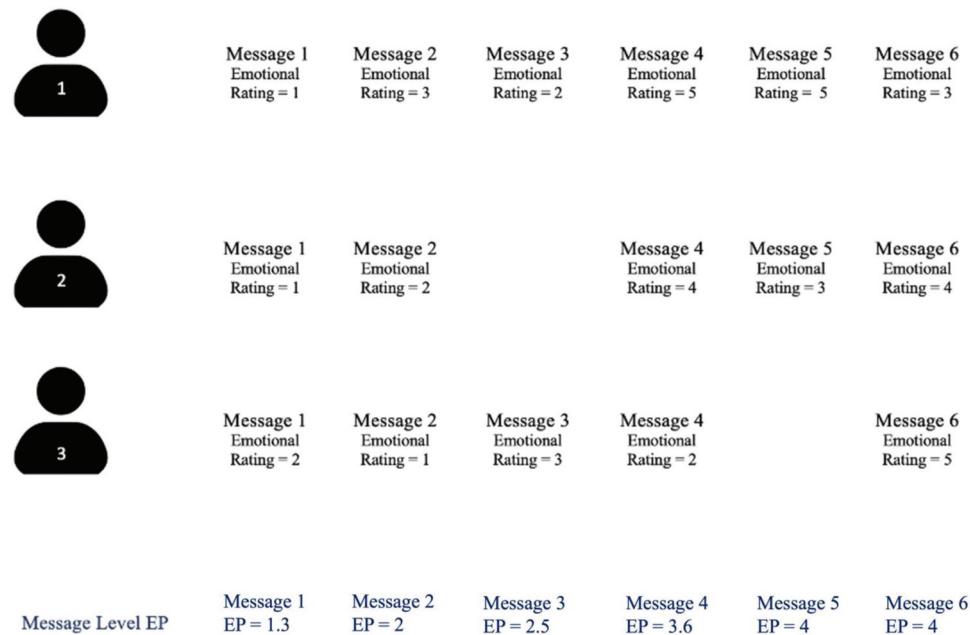


Figure 1. Calculating message-level Emotional Appeal (EP) scores.

warnings adopted by online campaigns, including the *The Real Cost* campaign, *The Truth Initiative*, and government agencies (e.g., the U.S. CDC, the California state government) ($k = 119$). We screened out messages that feature non-Asian characters and with low production qualities. Textual statements written in English were replaced with Chinese translations and edited using Photoshop to reserve formatting features. This is the largest set of tobacco pictorial warnings ($K = 510$) tested to date, which covers a range of emotional appeals with a variety of message themes and stylistic features within the same topic (i.e., anti-tobacco). This allows messages to vary in the presence and magnitude of multiple emotional appeals and increases variations in PME.

Measures

Individual-level emotional response. After each message exposure, participants rated their emotional reactions. They were asked to respond to the question: “While viewing this image, I felt . . .” “. . . disgusted” ($M = 3.20$, $SD = 1.15$), “. . . afraid” ($M = 3.40$, $SD = 1.11$), “. . . angry at oneself for being a smoker” ($M = 3.38$, $SD = 1.09$), “. . . contempt at smokers in general” ($M = 3.01$, $SD = 1.18$), “. . . shameful about myself” ($M = 3.49$, $SD = 1.04$) and “hopeful” ($M = 3.24$, $SD = 1.11$) on a five-point Likert scale (1 = *strongly disagree*; 5 = *strongly agree*). Similarly, affective reactance was gauged by responses to the question, “While viewing this image, I felt angry at this image that is pressing me to quit” ($M = 2.99$, $SD = 1.20$). These individual-level emotional responses were then used to create message-level emotional appeal scores, which we discuss in the next section.

Perceived message effectiveness (PME). For each pictorial warning, six items were used to measure its perceived message effectiveness on a five-point Likert scale (1 = *strongly disagree*; 5 = *strongly agree*) (modified from Morgan et al., 2020, Sutton

et al., 2019). Participants were asked if a pictorial tobacco warning (1) “put thoughts in my mind about wanting to avoid smoking,” (2) “put thoughts in my mind about wanting to smoke (*Reversely coded*),” (3) “is convincing,” (4) “is important to me,” (5) “is effective overall,” and (6) “made me feel like staying away from smoking.” For the two items gauging thoughts pertaining to smoking—thoughts about quitting smoking and thoughts about wanting to smoke—we calculated the difference between these two items, divided the difference score by two, and then added three to rescale to a five-point scale (Bigsby et al., 2013). Then a measure for PME was created by averaging the rescaled thoughts and other perception items (5-point Likert scale, $M = 3.58$, $SD = 0.73$, $\alpha = .82$). This specific approach has exhibited predictive validity and reliability in prior work (e.g., Bigsby et al., 2013, Kim et al., 2016).

Perceived descriptive norms. Prior to message exposure, on a 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*), participants were asked to respond to four items to indicate their agreement or disagreement: (1) “Most people who are similar to me smoke”; (2) “Most people around me smoke”; (3) “Smoking is a very common behavior in China”; (4) “In Chinese society, most people smoke.” The four items were averaged to create a perceived descriptive norm scale ($M = 3.38$, $SD = 0.76$, $\alpha = .78$).

Perceived injunctive norms. Prior to message exposure, on a 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*), participants were asked to respond to another four items: (1) “People who are important to me approve of my smoking”; (2) “People I look up to approve of my smoking” (3) “Chinese society, in general, considers smoking an acceptable behavior”; (4) “Chinese people generally believe in some situations smoking should be expected.” The four items were averaged to create a perceived injunctive norm scale ($M = 3.68$, $SD = 0.71$, $\alpha = .73$).

To control for variables that may affect participants' evaluation of pictorial tobacco warnings, we included the Fagerström test for nicotine dependence ($M = 24.51$, $SD = 5.37$, $\alpha = .72$, see Heatherton et al., 1991) and stage of change (11-point Ladder of Contemplation, ranging from $0 = I \text{ have no thoughts about quitting smoking}$ to $10 = I \text{ am taking action to quit smoking}$, $M = 6.65$, $SD = 2.52$, see Biener & Abrams, 1991) as covariates, all measured prior to message exposure. No serious multicollinearity was found (all VIF scores < 2).

Calculating message-level emotional appeal scores

The aggregation procedure of message-level emotional appeal scores has two steps. In Step 1, we obtained individual-level emotional reactions by measuring participants' emotional reactions to the shown pictorial warning messages, as discussed in the previous section. For example, in Figure 1, the hypothetical Participant 1, Participant 2, and Participant 3 all viewed hypothetical Message 1. Both Participant 1 and Participant 2 gave Message 1 an emotional rating of 1, and Participant 3 gave Message 1 a rating of 2.

Then in Step 2, we aggregated ratings of the human judgments to measure the presence and magnitude of each discrete emotional appeal (Figure 1). For each of the 510 pictorial warning messages, and emotion by emotion, we averaged the individual-level emotional reactions obtained in Step 1 across the set of smokers randomized to evaluate a particular pictorial warning as the message-level emotional appeal. For example, as illustrated in Figure 1, hypothetical Message 1's Emotional Appeal score of 1.3 was calculated by averaging across the individual-level emotional ratings from Participant 1, Participant 2, and Participant 3. Thus, after the aggregation, the Emotional Appeal scores are message-level aggregated scores. These aggregated scores were then entered to replace individual emotional reactions as the key continuous independent variables to predict perceived message effectiveness.

Importantly, we note that we adopted a method that deviates from some past message effects research. Instead of turning to a separate sample to calculate message-level discrete emotional appeals scores (e.g., Kim & Cappella, 2019), we used the same sample to obtain our aggregated message-level scores and to estimate their effects. Nevertheless, we argue that our approach is still valid. The aggregated message-level emotional appeals variables in our study remain distinct from an individual's own ratings, as an individual's ratings fundamentally differ from the mean rating of the subsample. Moreover, this approach has been adopted by previous scholars for similar purposes. For example, Morgan et al. (2020) also utilized a similar design and aggregated individual-level ratings to create continuous message-level variables, which were then used to test effects on other outcomes within the same sample. Therefore, our randomized large- K multiple-message design still provides useful evidence on the impacts of discrete emotional appeals.

Statistical analyses

Because each respondent provided multiple evaluations of messages and each message was shown to multiple participants, the evaluation data points were doubly nested under

the respondents as well as under the messages. Two cross-classification random intercept models were fitted to decompose the message-level effects and to estimate the respective impacts of each message-level discrete emotional appeal on PME: one unconditional model and one conditional model (Table 1). To adjust for within-subject clustering (multiple exposures for a given participant) and within-message clustering (multiple evaluations of a given pictorial warning), message and participant IDs were included as random intercepts, while all message-level emotional appeal scores were entered as fixed effects. In the conditional model, individual-level covariates, including age, income, number of children, marriage status, party affiliation, stage of change, nicotine dependence, and descriptive and injunctive norm perceptions, were included as covariates. In contrast, no covariates were included in the unconditional model. In these models, all aggregated message-level emotional appeals scores were used in place of individual-level emotional reactions to ensure that obtained relationships reflected the effects of message-level emotional appeals on PME, including scores of disgust appeal, fear appeal, self-anger appeal, contempt appeal, self-shame appeal, hope appeal, and message-level reactance. Unlike conventional experimental designs, each message-level emotional appeal was operationalized as a continuous rather than categorical variable. Our analytical strategy can thus help identify the effects of a particular emotional appeal on PME while adjusting for the influences of potentially co-occurring emotional appeals in the same pictorial warning.

We included individual-level covariates in the conditional model for two purposes: (a) to improve estimation efficiency since our randomized design already removed systematic confounding from individual-level characteristics and (b) to demonstrate the differences in estimated effects of message-level emotional appeals versus individual-level emotional reactions. We presented models with and without control variables: we expect that adjusting for individual characteristics would **not** substantially change the estimated coefficients for emotional appeals, should such coefficients reflect the impacts of message-level emotional appeals rather than individual-level responses in a randomized design. In contrast, including such covariates or not should alter estimated coefficients for individual-level emotional reactions, which are correlated with other individual-level characteristics.

To examine the moderating effects of normative perceptions, interaction terms between individual-level perceived norms and message-level emotional appeal scores were entered as fixed effects and PME as the outcome. Because we were examining cross-level interactions, *Centering Within Cluster* (CWC) is preferable (Enders & Tofghi, 2007). The message-level emotional appeal scores were cluster-mean centered prior to the analyses—that is, for each participant and each emotional appeal, we subtracted from each message's emotional appeal score the mean of that emotional appeal's scores across the six messages a participant has seen. This within-subject estimator can help reveal how within-person variations in exposure to a particular emotional appeal affected PME. Similar to within-subject experimental designs, this within-subject estimator can improve causal inference efficiency. We also entered the cluster means of a given emotional



Table 1. Multilevel random-effects models predicting perceived effectiveness from all message-level emotional appeal scores.

| | <i>Perceived Effectiveness</i> | |
|--------------------------|--------------------------------|-------------------------------|
| | Unconditional Model | Conditional Model |
| Disgust appeal | 0.007 (−0.044, 0.057) | 0.005 (−0.046, 0.055) |
| Fear appeal | 0.147*** (0.102, 0.192) | 0.149*** (0.104, 0.194) |
| Anger (self) appeal | 0.062* (0.003, 0.121) | 0.062* (0.003, 0.121) |
| Anger (label) appeal | −0.085*** (−0.133, −0.037) | −0.090*** (−0.138, −0.043) |
| Contempt appeal | −0.067* (−0.118, −0.016) | −0.069** (−0.120, −0.018) |
| Self-shame appeal | 0.099** (0.040, 0.159) | 0.101*** (0.041, 0.160) |
| Hope appeal | 0.050* (0.009, 0.091) | 0.046* (0.005, 0.087) |
| Age | | 0.003** (0.0002, 0.006) |
| Income | | 0.013 (−0.012, 0.038) |
| Children | | 0.049* (0.001, 0.097) |
| Education | | −0.048 (−0.099, 0.003) |
| Nicotine addiction | | 0.010*** (0.005, 0.015) |
| Stage of change | | 0.043*** (0.034, 0.052) |
| Living together | | −0.064 (−0.223, 0.095) |
| Married | | 0.162*** (0.077, 0.246) |
| Separated | | −0.282 (−0.665, 0.102) |
| Divorced | | 0.190 (−0.151, 0.532) |
| Widowed | | −0.752** (−1.236, −0.267) |
| Youth League | | 0.004 (−0.053, 0.061) |
| Communist Party | | −0.041 (−0.101, 0.019) |
| Democratic Party | | −0.039 (−0.364, 0.286) |
| Other political identity | | 0.107 (−0.018, 0.233) |
| Descriptive norm | | 0.211*** (0.172, 0.250) |
| Injunctive norm | | 0.023 (−0.015, 0.060) |
| Constant | 2.797*** (2.617, 2.978) | 1.071*** (0.785, 1.357) |

Note. *b* represents unstandardized regression weights. The lower and upper limits of a 95% confidence interval are reported within parentheses. Observation number = 13836. Age, income, number of children, marriage status, party affiliation, stage of change, nicotine dependence, and descriptive and injunctive norm perceptions were included as covariates in the Conditional Model. Marriage status was coded as five dummy variables with 0 = not married serving as the reference group. Party affiliation was also coded as four dummy variables with 0 = nonpartisan as the reference group. **p* < .05, ***p* < .01, ****p* < .001.

appeal as an additional predictor in the model to obtain the between-subject relationship (Enders & Tofghi, 2007). As a reminder, each cluster mean was not a participant's averaged self-reported responses for a particular type of discrete emotion; rather, each cluster mean was the averaged message-level emotional appeal scores across the six messages randomly shown to the participant—and each message's emotional appeal score was itself aggregated from multiple participants'

self-reported emotional responses for that message. This CWC approach partitions each interaction effect into within- and between-subject components, and the within-subject component will better reflect the desired causal interpretation—that is, for individuals with higher versus lower normative perceptions, how the effects of a specific emotional appeal would change, when the comparisons were made within the set of pictorial warnings evaluated by the same individual. The same

set of control variables were included in all analyses. The statistical programming language *R* (version 4.1.1) was used for all analyses.

Results

Validation analyses

We first show the differences between the message- and individual-level effects by presenting two sets of models: one estimating the effects of message-level emotional appeals on PME ([Table 1](#)), the other estimating the effects of individual-level emotional reactions on PME ([Appendix C](#)). Clearly, the results of the two sets of models are different. For example, in the individual-level model ([Appendix C](#)), message-receivers' feelings of disgust were negatively associated with PME ($b = -0.011$, $p = .021$, 95% CI = -0.020 to -0.002), suggesting that the more disgust a participant felt in reaction to a pictorial warning, lower the message's PME rating was. However, in the message-level model ([Table 1](#)), disgust appeals were not significantly associated with PME; if anything, the sign for the coefficient was positive ($b = 0.005$, $p = .857$, 95% CI = -0.046 to 0.055). In addition, though several emotional reactions and emotional appeal scores yielded seemingly similar results on PME, the interpretations are different. For instance, on the one hand, the association between individual-level fearful reactions and PME ([Appendix C](#)) suggests that the more fearful a participant felt toward a pictorial warning, the more effective the participant rated the message ($b = 0.104$, $p < .001$, 95% CI = 0.094 to 0.113). The effects of aggregated fear appeal scores on PME ($b = .149$, $p < .001$, 95% CI = .104 to .194), on the other hand, indicated the effectiveness of fear appeal as a message-level property ([Table 1](#)).

In addition, these results showed that the models presenting the effects of message-level emotional appeals offer a more conservative test: overall, estimated coefficients of emotional appeals were smaller in magnitude ([Table 1](#)) than individual-level models.

Discrete emotional appeals predicting PME

In models presenting the effects of message-level emotional appeals, adjusting for individual covariates did not change the results substantively ([Table 1](#)). Results from these conditional models with covariates are summarized below.

Pictorial warnings that employed fear appeal ($b = 0.149$, $p < .001$, 95% CI = 0.104 to 0.194), appeals that elicited self-referential anger about being a smoker ($b = 0.062$, $p = .039$, 95% CI = 0.003 to 0.121), self-shame appeal ($b = 0.101$, $p < .001$, 95% CI = 0.041 to 0.160), and hope appeal ($b = 0.046$, $p = .027$, 95% CI = 0.005 to 0.087) all significantly increased PME. H1 was supported, and RQ1, RQ2, and RQ4 were answered. In contrast, pictorial warnings that featured a disgust appeal did not significantly affect PME ($b = 0.005$, $p = .857$, 95% CI = -0.046 to 0.055). H2 was not supported. Pictorial warnings that employed contempt appeal were counterproductive and reduced PME ($b = -0.069$, $p = .009$, 95% CI = -0.120 to -0.018). RQ3 was answered.

The moderation effects of social norm perceptions

RQ5 concerns the potential moderation effects of descriptive and injunctive norm perceptions. Results suggested that both types of norm perceptions can significantly weaken certain emotional appeals' influences on PME ([Appendix A](#)). As depicted in [Figure 2](#), higher descriptive norm perceptions—perceiving that smoking was common in a society—significantly dampened the effectiveness of fear appeal ($b = -0.069$, $p < .001$, 95% CI = -0.108 to -0.030), disgust appeal ($b = -0.074$, $p < .001$, 95% CI = -0.115 to -0.033), self-anger appeal ($b = -0.097$, $p < .001$, 95% CI = -0.147 to -0.047), and self-shame appeal ($b = -0.062$, $p = .024$, 95% CI = -0.115 to -0.008). Higher injunctive norm perceptions – perceiving that smoking was acceptable – also significantly weakened the effectiveness of fear appeal ($b = -0.101$, $p < .001$, 95% CI = -0.137 to -0.065), disgust appeal ($b = -0.064$, $p < .001$, 95% CI = -0.102 to -0.026), self-anger appeal ($b = -0.128$, $p < .001$, 95% CI = -0.175 to -0.081), and self-shame appeal ($b = -0.107$, $p < .001$, 95% CI = -0.157 to -0.057), as shown in [Figure 3](#). On the other hand, the effectiveness of hope appeal was not significantly influenced by either descriptive ($b = 0.004$, $p = .857$, 95% CI = -0.041 to 0.050) or injunctive norm ($b = 0.002$, $p = .912$, 95% CI = -0.040 to 0.045) perceptions. Further, high levels of norm perceptions can worsen the counterproductive effects of contempt appeals: descriptive ($b = -0.092$, $p < .001$, 95% CI = -0.140 to -0.044) and injunctive ($b = -0.060$, $p = .009$, 95% CI = -0.105 to -0.015) norm perceptions further exacerbated the counterproductive effects of contempt appeals on PME.

Discussion

Our findings advance the inquiry on how to select and leverage discrete emotional appeals within pictorial warnings in curbing the tobacco epidemic in China. Though a considerable body of research has documented the persuasive power of negative emotions in promoting cessation intentions and behaviors (e.g., Hammond, 2011, Noar, Hall, et al., 2016), current research has not yet spent much effort teasing out the unique effects of discrete emotion appeals. Moreover, the extant research heavily focuses on emotional reactions as *individual-level* mediators on persuasive outcomes, such as PME, which cannot directly speak to the effectiveness of *message-level* discrete emotional appeals. Our study provides more credible causal evidence on the impacts of discrete emotional appeals, using the largest set of pictorial tobacco warnings studied to date and an analytical strategy to measure message-level emotional appeals from individual emotional reactions and estimate their respective impacts on PME accordingly. Informed by the extant scholarship on persuasive discrete emotional appeals, this study challenges and advances the current literature in four ways: 1) answering the scholarly call to examine discrete emotion appeals, 2) conceptually and analytically differentiating message-level emotional appeals from individual-level emotional reactions, 3) providing empirical evidence for the selection of discrete emotional appeals for tobacco control in China, and 4) highlighting the moderation effects of perceived social norms in a country

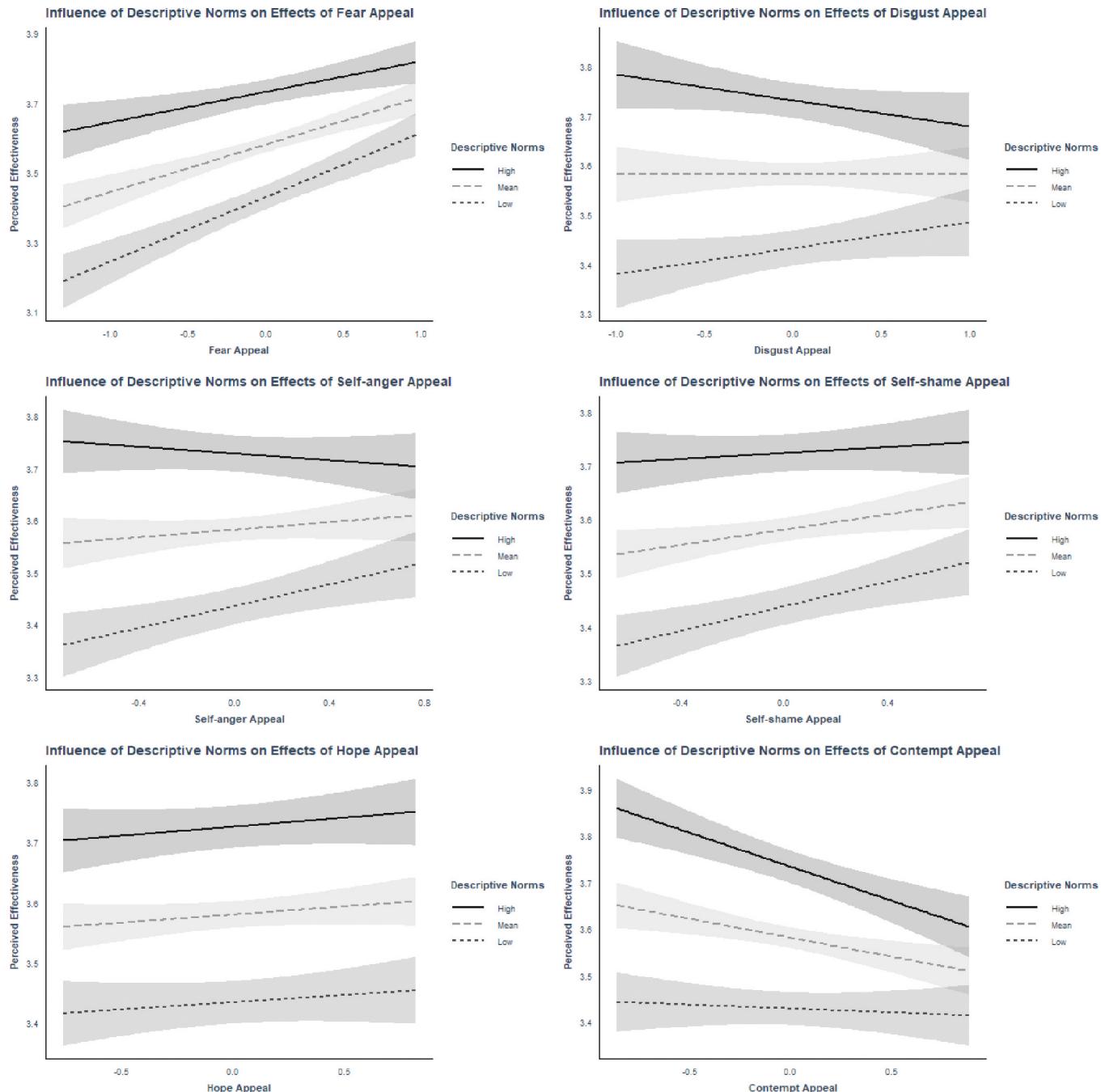


Figure 2. Descriptive norms moderating the effectiveness of message-level emotional appeals predicting per-message perceived effectiveness (PME).

where pro-tobacco norms and a vibrant cigarette-gifting culture remain prevalent.

We first showcased the potential of employing fear appeals among Chinese male smokers, which is in line with the extant evidence supporting the effectiveness of fear appeals in tobacco control messaging (Durkin et al., 2018; Tannenbaum et al., 2015). Contrary to the prevailing view, we showed that pictorial warnings that utilize disgust appeal might not be effective among Chinese male smokers. Previous research has found that adding a disgust appeal to tobacco control messages already presenting threatening information can attenuate persuasion, although presenting disgust alone was more effective

than control messages absent emotional appeals (Leshner et al., 2009, 2011). Our results further questioned the effectiveness of disgust appeal in a country with high tobacco use.

Importantly, we also documented the potency of positive emotional appeals – pictorial warnings using hope appeal produced encouraging outcomes. This is in line with emerging research on the persuasive potential of hope appeal in health communication (Chadwick, 2015). Hope appeal messages often present efficacy-boosting information, which could be particularly useful for guiding quitting behaviors. We also encourage future research to explore other positive emotional appeals, for example,

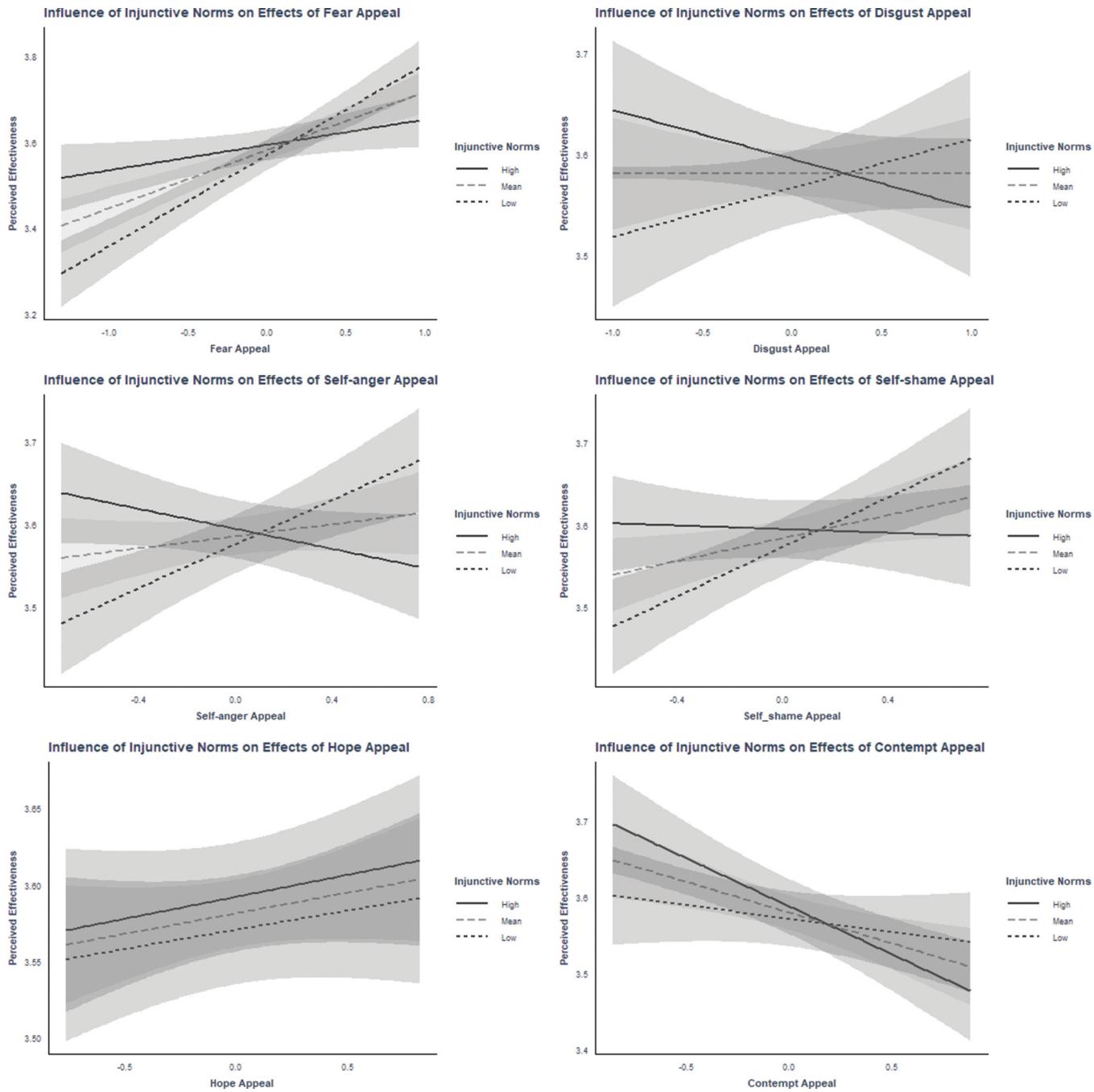


Figure 3. Injunctive norms moderating the effectiveness of message-level emotional appeals predicting per-message perceived effectiveness (PME).

those eliciting feelings of compassion and being touched (Oliver et al., 2021) or humor (Reis et al., 2019). In general, our findings stressed the importance to tease out the unique effects of respective discrete emotional appeals in health persuasion.

This study also offers important practical insights on the selection of discrete emotional appeals within pictorial tobacco warnings in China. Notably, pictorial warnings featuring shame appeal and self-anger appeal were perceived as highly effective, controlling for appeals eliciting anger directed at message sources. These results encourage more research on tobacco control messages appealing to emotions

of self-consciousness and introspection, such as shame, guilt, and self-anger. It is important to note that these self-conscious emotions might be especially effective in collectivist cultures like China, where the interdependence between the self and others is culturally valued and compliance with social norms is more socially endorsed compared to individualistic cultures (Markus & Kitayama, 1991). In line with this reasoning, a recent study also found that health warning labels featuring secondhand harm were rated as most effective in China (Nian et al., 2021), possibly due to emotions such as shame and self-anger. Thus, our results highlight the need for more research on how smokers across cultural

contexts may react differently to emotional appeals within tobacco control messages.

Importantly, our findings on the moderating effects of social norm perceptions underscore the need to contextualize tobacco control messaging utilizing discrete emotional appeals. Norm perceptions were found to influence the relationships between most emotional appeals and PME. Both descriptive and injunctive norm perceptions significantly decreased the effectiveness of almost all emotional appeals, except for hope appeal. Further, high levels of smoking norm perceptions exacerbated the counterproductive effects of contempt appeal. Such interaction effects indicate that it is important to consider the contextual social environment when implementing emotional appeals in tobacco pictorial warnings. In particular, hope appeal appears less influenced by social norms, thus having higher generalizability across contexts with varying smoking-related social norms. This suggests that hope appeal should be considered in China to improve tobacco control messaging in areas with particularly strong pro-tobacco norms, such as rural areas. These findings also underline the importance of leveraging communication campaigns and policy tools (e.g., smoke-free mandates) to reduce pro-tobacco norms in tandem with the implementation of pictorial warnings employing fear, self-anger, and shame appeals.

This study is limited in several ways. First, our sample is not a probabilistic sample of Chinese smokers, as it only includes male adult smokers and is slanted toward smokers with higher socioeconomic status. Most participants live in urban settings (93.7%) with a high monthly income above 7000 RMB (79.9%), and more than half of them have at least a college degree (59%). We focused on male smokers because, in China, 50.5% of male adults are current smokers, while only 2.1% of female adults smoke in 2018 (Global Adult Tobacco Survey, 2018). Although we were not able to recruit more male smokers from rural areas and low-socioeconomic groups, the current rate of smoking remains high in urban areas and high-socioeconomic groups. Our study can inform tobacco control messaging for this group. Future research is encouraged to examine potential rural-urban and socioeconomic differences in responses to emotion-based pictorial warnings. Second, we used single items to measure emotional ratings. Although single items have been used in prior research (Heerdink et al., 2019; Sutton et al., 2019) and can help reduce participant fatigue, we encourage future research to use multi-item scales to improve measurement properties.

Additionally, although our randomization design and aggregation procedure considerably improved causal inference for the effects of message-level emotional appeals, our results cannot pinpoint concrete content features that produced these emotional appeals. Instead, our results helped identify the most impactful emotional appeals among a range of candidates, thus pointing subsequent research on specific design features to the more promising directions. The logical next step is to further study what manipulable content or format features can reliably produce emotional appeals found effective. Lastly,

given the complexity of real-world pictorial warnings, the possibility remains that other unmeasured factors might confound the observed effects of emotional appeals. Using a large stimuli pool helped mitigate such confounding, although we cannot eliminate this possibility.

Conclusion

To curb the tobacco epidemic, antismoking messaging to date has relied heavily on fear appeals. Employing the largest set of pictorial warnings tested to date, this study adopted a randomized large- K multiple-message design and multilevel modeling to evaluate a range of alternative emotional appeals to inform the selection of effective emotional appeals in China. We showed the persuasive potentials of fear, shame, self-anger, and hope appeals, while disgust and contempt appeals appeared as less effective, or even counterproductive, among Chinese adult male smokers. This study demonstrates that both descriptive and injunctive pro-smoking norms could decrease the effectiveness of emotional appeals. These findings stress the need to consider unique social and cultural contextual influences when implementing emotional appeals in tobacco pictorial warnings. To maximize the effectiveness of pictorial warnings as a policy tool for tobacco control in China, such as in communication campaigns or implemented as cigarette pack warning labels, we emphasize the need to combine the most effective emotional appeals with interventions that can de-normalize tobacco use.

Alt text: an illustration of the calculation of message-level emotional appeal scores, presenting hypothetical values for three participants' self-reported emotional responses to six hypothetical messages. The emotional appeal score of each message was averaged across the participants who were randomized to the given message.

Alt text: Six panels of interaction plots showcasing the moderating effects of descriptive norm perceptions on the effectiveness of six emotional appeals predicting perceived message effectiveness. Descriptive norm decreased the effectiveness of fear, shame, disgust, self-anger, and contempt appeal, but not hope appeal.

Alt text: Six panels of interaction plots showcasing the moderating effects of injunctive norm perceptions on the effectiveness of six emotional appeals predicting perceived message effectiveness. Injunctive norms decreased the effectiveness of fear, shame, disgust, self-anger, and contempt appeal, but not hope appeal.

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