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Testing the Effects of Certain versus Hypothetical Language in Health Risk Messages

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Abstract

This paper tests how the certainty or hypotheticality conveyed through language can be harnessed to enhance the effectiveness of targeted messaging about health risks. We conducted two experiments with adult smokers ($n = 317$) and middle school youth ($n = 321$) from low-income communities in the context of pictorial cigarette warning labels. We manipulated hypotheticality of risk through verb modality: 1. non-modal (*present tense, e.g., smoking causes cancer*), and modal/hypothetical (2. *may*, 3. *can*, and 4. *will*). For adult smokers, definitive (present tense) wording led to greater health risk beliefs, compared to hypothetical wording, among adult males but not females. For youth, contrary to what might seem intuitive, the more hypothetical *may* verb modality was more effective than the present tense language in promoting health risk beliefs. Among youth, greater health risk beliefs were also associated with reduced susceptibility to use cigarettes. No differences in negative affect by hypotheticality of language were found for either population. We discuss these findings in relation to the theoretical implications for the concept of hypotheticality and the application of construal level theory to strategic health communication.

Keywords

construal level theory; hypothetical language; health risks; warning labels; tobacco

Construal level theory explains that proximity influences how abstractly we think about a target or topic (Liberman & Trope, 2008; Trope & Liberman, 2010). The concept of proximity, or psychological distance, includes a number of different dimensions of distance, including temporal, spatial, social and hypothetical distance (Bar-anan, Liberman, Trope, & Algom, 2007). Construal level theory suggests that items can be simultaneously close or far on each of these dimensions, and that each dimension of distance relates to how abstractly we think about something (Bar-anan, et al., 2007). For example, an event happening tomorrow (close in temporal distance) seems more concrete than one happening next year (far in temporal distance).

Hypothetical distance, or hypotheticality, refers to how close or far something is in terms of its certainty—how definite or real it is. Construal level theory defines hypothetically close items as definitely occurring, while hypothetically distant items have greater uncertainty or a lower probability of occurring (Liberman & Trope, 2008; Wakslak & Trope, 2009). Hypotheticality can be expressed through language. For example, the message “cigarettes cause cancer” is closer in hypothetical distance than the message “cigarettes may cause cancer,” because the former is more definite. While messages can communicate more than one parameter of distance simultaneously, we focus on hypothetical distance in the current study.

This study tests whether the hypotheticality of language can be used to enhance the effectiveness of targeted messaging about health risks, making clear distinctions between modal verbs to inform theory and guide practitioners. The context for this investigation is pictorial warning labels on cigarette packages. The analysis explores how two factors, distance to the health risks and self-reported sex category (SRSC), influence these patterns. First, we explore the concept of hypotheticality and describe how it relates to health messages, SRSC, and cognitive development. Next, we propose a series of theoretically-driven hypotheses and research questions. We present findings from adult smokers and largely non-smoking middle school youth (who are at much greater psychological distance to the long-term health risks of cigarette smoking) in juxtaposition to one another. We conclude with a discussion of the theoretical and practical implications of these results, as well as recommendations for future research.

Hypothetical Language and Health Risk Messages

A distance cue in a message is a text, audio, pictorial, or moving pictorial element that communicates how close or far an item is (Katz & Byrne, 2013). Hypothetical distance cues include words or imagery associated with certainty or probabilistic likelihood (Katz & Byrne, 2013; Wakslak & Trope, 2009). Research has been conducted on the certainty of language as it relates to public understanding of scientific findings and health topics (Murray, Ezzati, Lopez, Rodgers, & Vander Hoorn, 2003). For example, research on household cleaning products found that risks are more believable when the warning

language is more definite (Heaps & Henley, 1999). On the other hand, the concept of hedging, or utilizing weaker language to express uncertainty about findings, has been found to improve trust in the source of the message and confidence in preventive measures (Jensen et al., 2011; Niederdeppe et al., 2014). In other words, while expressing nuance or presenting conflicting findings is more distant in hypotheticality, it is also perceived as more credible.

One way to hedge a claim or manipulate the hypotheticality of language is through the use of modal verbs, as these verbs communicate different levels of likelihood (Jensen, 2008). While it seems evident that “may” and “can” make statements more conditional than language without these modal verbs, the verb “will” presents a more complex case. The modal verb “will” can be interpreted by the message recipient as conveying a definitive risk (interpreted as “definitely will”) or a future risk (“will someday”). Prior research on tobacco companies has noted that corporations may avoid the use of the verb “will” because it is *binding*, or commits to a future action (Brown-Johnson & Rubin, 2015). Therefore, “will” may communicate a greater level of certainty than “may” and “can.”

Construal level theory can help researchers understand why “will” is still more conditional than the present tense, even if it presents a greater level of certainty than “may” and “can.” As mentioned above, the construal level theory concept of psychological distance has several parameters of distance, including temporal, social, spatial, and hypothetical. These different dimensions of distance have been found to scale in different ways and have different properties, even as they are often connected at similar levels of distance (Bar-anan et al., 2007; Trope & Liberman, 2010). The verb “will” is removed from the current moment in time. An event that *will occur* necessarily *will occur* in the future; otherwise it would be occurring already. It may be binding, but it is not as certain as if it were already occurring. Thus, the recipient interprets “will” as definitive, but with some temporal distance, which construal level theory suggests renders the statement at greater overall psychological distance and more hypothetical than definitive, non-modal statements (present tense) (Bar-Anan, et al., 2007; Trope & Liberman, 2010). After all, if something is already occurring, then there is absolutely no chance that it will not happen; if something “will occur,” there is still a chance that something could happen to prevent it.

In this work, we focus on hypothetical distance, not temporal distance, and we handle the complexity of the “will” verb by distinguishing it from “may” and “can” in all of our predictions and analyses, while conceptually recognizing that it is still more hypothetical (due to the connections between parameters of distance mentioned above) than the present tense, which is definitely occurring at this moment (and therefore has no chance of not occurring). We focus on this concept of hypotheticality in this paper, and we interpret other distinctions with regard to distance through the concept of hypotheticality. Therefore, because “will” is temporally more distant than the present tense, we understand it as hypothetically more distant than present tense.

Using Hypotheticality to Convey Risk

There is a lack of research on how varying the use of modal verbs in health messages influences their effectiveness, and studies in this area can contribute to our understanding of health communication by suggesting the best way to convey varying levels of certainty and timing of risk so that the message has its intended effect. Pictorial cigarette warning labels provide both a theoretically and a practically important context for thinking about the influence of hypotheticality of language on risk perceptions. Theoretically, the serious health risks associated with cigarette use are probabilistic (not all users of the product will suffer serious health problems resulting from cigarette smoking), develop over time and emerge later in life for many people, particularly youth who may not have tried smoking at all (far in temporal distance). At the same time, tobacco warning labels often express health risks in concrete, immediate terms (smoking causes lung cancer and heart disease) and in the case of pictorial labels, by using concrete images (diseased lungs, cancerous lips, etc.). In other words, the actual health risks associated with cigarette smoking are more distant in the future and therefore have increased hypotheticality relative to their pictorial expression. By testing how modal verbs influence message effects in this context, researchers can highlight relationships that apply when the presentation of the hypotheticality of risk is otherwise unclear or contains conflicting cues.

Issues of hypotheticality and certainty of language also have regulatory implications. While there has been extensive research conducted on cigarette warning labels that feature pictorial images (Hammond, 2011; Kees, Burton, Andrews, & Kozup, 2011; Noar et al., 2016), implications of the hypotheticality of the language used in these messages and the influence on risk perceptions and other key outcomes has been underexplored. Nevertheless, over time regulators throughout the world have mandated tobacco warning labels using more and more definitive language, and these changes have raised objections from the tobacco industry. Hillamo, Crosbie, and Glantz (2014) document how tobacco companies did not initially oppose text warnings that included modal language (*Caution: cigarette smoking may be hazardous to your health*), but that they changed their strategy as the warnings became more definitive.

The WHO Framework Convention on Tobacco Control does not include linguistic recommendations regarding the hypotheticality of tobacco warnings; however, many countries use definitive, non-modal language. For example, Australia, which has some of the strongest regulation, uses only labels with non-modal language (more definite language) when mentioning health risks (e.g., “smoking causes blindness;” “smoking damages your gums and teeth;” see Tobacco Labelling Resource Centre, 2018; World Health Organization, 2018).

Identifying linguistic strategies that improve the effectiveness of cigarette warning labels has strong implications for both public health communications and regulatory practice, especially in the United States, as the FDA reconsiders its policies with regard to tobacco labeling (Byrne, et al., 2014). One specific concern is that the FDA will likely need to demonstrate that any graphic warning labels it requires constitute the least restrictive infringement on the commercial speech rights of the manufacturers (R.J. Reynolds Tobacco

Company, et al., v. United States Food and Drug Administration, et. al., 1:11 cv-01, 2011). More definite language could be seen as more constitutionally restrictive than conditional language, as the former conveys that the product has a direct, current, causal relationship to a particular health risk. To be sure, *any* mandated warning overrides a tobacco company's presumed preference not to denigrate its own product. But in this context, hypothetical or future-oriented language could be deemed less restrictive on the ground that it contradicts the companies' views to a lesser degree; the companies' claim that the health effects of smoking are nuanced, long-term, and uncertain. Thus, a key question is whether the modal, more hypothetical and less constitutionally restrictive language can address the public health goals as effectively as messages that use non-modal (current and causal) language.

Intuitively, one might expect the non-modal, definitive message "cigarettes cause cancer" to generate greater negative emotions and higher risk perceptions among adult smokers, compared to the more hypothetical language, *cigarettes (will/ can/ may) cause cancer*. This prediction hinges on the fact that the act of smoking is at close psychological distance and therefore the consequences are closer and seem more likely to happen. A concrete and proximal statement that conveys health consequences of a behavior that a person regularly performs would likely make the warning personally relevant. We thus propose:

- *H1*: Adult smokers who view the warning statements with non-modal language (present tense) will report *higher* levels of negative affect (H1a) and health risk beliefs (H1b) than participants who view the warning statements with more hypothetical modal verbs (may, can, and will).

Pictorial cigarette warning labels induce greater cognitive elaboration (i.e., including thoughts about health risks) and negative emotional response (i.e., sadness, guilt, and fear) than text-only warnings (Brewer et al., 2016; Noar et al., 2016). There has been a strong case in the literature for the role of negative emotional response (i.e., fear) to pictorial warnings as a mediating factor leading to quit intentions (Byrne, et al., 2014; Kees et al., 2011). While fewer studies provide evidence that pictorial warning labels influence quit intentions via health risk beliefs, several studies have found that health risk beliefs are associated with increased quit intentions (Noar et al., 2016). Thus, we predict:

- *H2*: Negative emotional response (H2a) and health risk beliefs (H2b) will mediate the relationship between each hypothetical modal verb (may, can, and will) and intentions to quit using cigarettes among adult smokers.

Hypotheticality and Youth

Cognitive changes that occur throughout childhood gradually move youth from concrete to more abstract ways of thinking (Honig & Mennerich, 2012). We might think of this as a *youth abstraction index*, or a continual progression from a state of perceptual-bounded, concrete thought to an increasing ability to consider more conceptual, abstract ways of thinking. By middle school, the age that many Americans begin to smoke (Centers for Disease Control, 2018a), youth have escaped perceptual-boundedness, and can think more conceptually (Wackman & Wartella, 1977). For example, prior research has shown that adolescents can recognize that an environmental message about "going green" refers to

conservation, rather than turning the color green, which is how a young child thinks about it (Honig & Mennerich, 2012). Furthermore, youth display more creative and flexible thought when primed to think more abstractly (Lieberman, Polack, Hameiri, & Blumenfeld, 2012).

From the perspective of hypothetical language, middle school youth can make a distinction between the non-modal language that conveys certainty and more hypothetical modalities, such as *may*, even as the ability to connect between hypotheticals and to link current actions to future consequences continues to develop throughout adolescence (Garcia, Rosenberg, & Siddiqui, 2011; Green, 1979). Prior research has charted how the developmental progression of youth predicts their ability to understand hypothetical language and make certainty distinctions accordingly (Green, 1979). However, previous work has not juxtaposed youth and adults regarding how this relates to the actual temporal distance from the health consequence and has not yet tested how youth perceive hypotheticality in pictorial labels.

As mentioned above, we expect to find that the present tense language is most effective among adults. However, based on construal level theory, we predict a different pattern for non-smoking youth. Previous research shows that individuals report events less likely to occur at a higher level of abstraction and have shown a lower level of risk perception, less intention to protect themselves from the harm, and lower levels of anxiety about the risk (Chandran & Menon, 2004). Therefore, when processing information more abstractly, the risk seems farther in hypotheticality (less likely). Construal level theory suggests that hypothetical language matches how people think about risks that are farther in temporal and social distance (Trope & Liberman, 2010). To our knowledge, it is not yet known whether messages with hypothetical language are more effective than messages with more certain language when risks are farther in distance.

Middle school aged youth are farther in both temporal and hypothetical distance from the actual health consequences of cigarette use, as they are young and the vast majority have not tried a cigarette. Additionally, youth are socially farther from the pictorial representations on the packages, as the images typically feature adult smokers or very young children accompanying the adult smokers as secondary victims. The risks of diseased lungs, cancerous lips, and a stroke, imagery commonly employed in pictorial warning labels, are far more hypothetically distant for youth than they are for adult smokers. As youth think about the risks in a more distant way, construal level theory predicts more hypothetical language will match the way they think about them (Trope & Liberman, 2010). If a match in the hypotheticality of language and hypotheticality of negative health outcomes is important, the more hypothetical modalities (will, may, can) could yield higher levels of response on our output variables than the non-modal present tense. In the absence of known research testing this, we offer a research question:

- *RQ1:* Will middle school youth who view warning statements with non-modal language (present tense) report different levels of negative affect (RQ1a) or health risk beliefs (RQ1b) than participants who view the warning statements with more hypothetical (may/can/will) modal verbs?

As with the adults, we also predict the following about relationships between emotions, cognitions, and intentions:

- *H3*: Negative emotional response (H3a) and health risk beliefs (H3b) will mediate the relationship between each hypothetical modal verb (may, can, and will) and susceptibility to use cigarettes among middle school youth.

Hypothetical Language, Risk Perceptions, and Self-Reported Sex Category (SRSC)

Recent years have witnessed increased interest in gender differences in marketing and behavioral research (Meyers-Levy & Loken, 2015). For instance, the National Institutes of Health (NIH) now mandates that scientific review of research proposals involving human subjects consider how research teams plan to examine potential differences by biological sex and take that information into account in weighting the merits of the research (National Institutes of Health, 2018). We acknowledge that gender remains a contested construct, and revisit these tensions at the end of the paper. Prior research documents that SRSC is associated with differences in risk perceptions (Lundborg & Andersson, 2008).

There are several potential explanations for SRSC differences, including differences in how risk is conceptualized among males and females and how cultural factors influence sex roles, norms, and values (Byrnes, Miller, & Schafer, 1999; Lundborg & Andersson, 2008). One explanation is that SRSC can influence how one interprets uncertainty when making risk assessments (Johnson & Slovic, 1995). In a study on e-cigarette labeling adult males reported *lower* risk perceptions after exposure to a hypothetically distant warning label, while nonsmoking adult females reported *higher* risk perceptions after exposure to the hypothetically distant warning label than non-smoking men (Katz, et al., 2017). In general, adult females report greater certainty in their perception that something is risky (Lundborg & Andersson, 2008), which may explain this finding.

Further evidence for this can be found in studies of how adult males and females view products such as low-tar cigarettes and heated tobacco products that have been marketed by tobacco companies as reduced risk products (but do not actually result in reduced risk to users) (Hamilton et al. 2004). In one such study, males rated these products lower in health risks compared to regular cigarettes, while females did not, controlling for other demographic and tobacco use factors (Hamilton et al., 2004). One explanation is that females perceived greater certainty that these products were risky, even though they were advertised as reduced-harm. It is also possible that females knew more about them or trusted the advertisements less. That said, hypotheticality has not been fully explored with risk perceptions, tobacco labeling, and SRSC.

Research on SRSC and health risk perceptions has not examined the differential responses to hypothetical language; the research has primarily focused on differences in how males and females interpret warnings and how different warnings appear to be more or less effective for males vs. females. For example, in a study of young adults (age 18–24), O’Hegarty et al. (2006) separated analyses based on SRSC and found that there were no differences in overall risk perceptions to labels that contained non-modal language, although females did have a stronger response to labels that mentioned a baby. Similarly, Vardavas et al. (2009) found that female youth (age 13–18) responded more strongly than males to labels that

mentioned a baby or children. The mention of a baby or children does not relate to the hypotheticality of the label, per se, but rather it is relevant to warning label content, as two of the current and two of the proposed cigarette warning labels in the U.S. feature content or images related to pregnancy or children.

Researchers have also found differences by SRSC in perceptions of health risks associated with cigarette use and responses to those risks. In a study of smokers, Mannocci et al. (2014) found that adult females were more aware that smoking causes wrinkles than were males. Adult males, on the other hand, were more likely than females to report a quit attempt because of the warnings, while females reported they were more likely than males to reduce the number of cigarettes and to abstain from purchasing their favorite package if it had gruesome images (Mannocci et al., 2014). Thrasher et al (2012) also suggest that pictorial labels that match the sex and race of the viewer might be more effective than labels that do not match.

Given the observed associations between SRSC and risk perceptions, as well as the lack of information on how these concepts relate to hypotheticality, it is important to consider whether or not SRSC will interact with the hypotheticality of language on the warning labels to influence key output variables. In response, we examine:

- *RQ2:* Will the hypotheticality of language on pictorial warning labels elicit different levels of negative affect or health risk beliefs among male versus female adult smokers?
- *RQ3:* Will the hypotheticality of language on pictorial warning labels elicit different levels of negative affect or health risk beliefs among male versus female middle school youth?

Method

Recruitment Procedures and Study Participants

Low SES populations are a priority for tobacco control due to disproportionately high rates of cigarette use (Family Smoking Prevention and Tobacco Control Act, 2009). We reached socioeconomically disadvantaged (low SES) adults in urban and rural areas of the Northeast through a combination of (a) identifying locations with a median annual household income under \$35K, according to census data; (b) scouting locations for appropriate sites; and (c) partnering with community organizations serving low SES populations who could assist with advertising and hosting the study. In order to include low SES middle school youth (grades 6–8), we consulted publicly available data to identify qualifying schools with 40–100% of students receiving free or reduced-price lunches.

The Institutional Review Boards at Cornell University and the University of Minnesota approved all relevant aspects of the study. Data collection took place in a mobile research laboratory featuring five private work stations. The mobile research laboratory is similar to an 26 foot long “U-Haul” style moving vehicle in terms of size, shape and separation of the driving cab. However, it was specially designed and built to be a climate controlled laboratory. The lab has five TOBII eyetracker/computer stations, with privacy screens for

each. The space can comfortably fit one or two research assistants and five study participants.

To reach adults, we parked the mobile research lab in highly visible locations at town centers or host organizations. Then, depending on the site, we used a combination of street intercept methods, word-of-mouth, on-site advertising via flyers and posters, and worked with local representatives and organizations to advertise to their customers or clientele. In large urban areas, we identified up to three different sites for recruitment, while in smaller communities we visited only one site. Signage explained that adults who were regular smokers could participate in the study and receive \$20 in compensation. Data collection sessions occurred during the daytime and early evening. After providing informed consent, participants verified their smoking status using one of two biochemical procedures: a CoVita carbon monoxide detector (requiring a score of 7 ppm or above for participation) or, in the rare case of extreme difficulty breathing or other restrictions, we offered participants an Alere saliva test detecting the presence of the nicotine metabolite cotinine. Verified participants were permitted to continue the study. Upon completion, adults were debriefed and paid for their time and input.

To reach youth, we worked with qualifying schools and the primary contact (principals and/or teachers) to arrange permission to conduct the study during school hours. When needed, we also coordinated with district-level officials. Depending on district policy, schools selected one of two incentive options: \$10 gift cards for the participating students or a \$10 per-student payment to the school to support school-identified priorities. A few weeks prior to our arrival, the schools distributed our IRB-approved, opt-out consent forms to the parents. Middle school students were not required to be smokers to participate and no biochemical assessment of smoking status was performed. On the day of the study, we asked eligible students (those not opted out) to assent to participate and sign a form accordingly. We escorted them to the lab where they took the study, were debriefed and, if applicable, compensated with a gift card.

There were 317 adult participants. More participants identified their SRSC as male ($n = 175$; 55.2%) than as female ($n = 134$; 42.3%), while 2.5% ($n = 8$) chose not to answer the question. 58.4% ($n = 185$) identified themselves as White, 35.3% ($n = 112$) identified as Black or African American, and 13.9% ($n = 44$) selected a non-White or non-Black race category. 14.5% ($n = 46$) of participants identified themselves as Hispanic. The average age of participants was 39.66 ($S.D. = 14.25$). Over half of participants, 58.4%, indicated a total yearly household income of less than \$20,000 per year, and 62.8% utilized SNAP food voucher services.

There were 321 youth participants. Over half of participants identified themselves as male ($n = 165$; 51.4%), 46.4% as female ($n = 149$), and 2.2% ($n = 7$) of participants chose not to answer the question or choose a category. Participants were primarily in 7th grade ($n = 155$, 48.3%) or 8th grade ($n = 148$, 46.1%), with 5.3% ($n = 17$) in 6th grade, and one not answering. About half (51.4%, $n = 165$) identified themselves as White, 41.7% ($n = 134$) identified as Black or African American, and 8.1% ($n = 26$) indicated they were Hispanic or Latino/a. Participants ranged in age from 11 to 15 ($M = 13.08$, $S.D. = .80$). Regarding

tobacco use, 7.2% ($n_{\text{yes}} = 23$) reported that they had tried a traditional cigarette, while 3.1% ($n = 10$) reported having used one in the past 30 days. 45.5% of participants ($n = 146$) reported living with a smoker.

Study Procedures

We randomized respondents in each population (adult smokers or youth) to one of the four experimental conditions. At each work station, the participant was seated in front of an LCD eyetracking monitor (Tobii T60XL), which was used to deliver the stimulus materials in their assigned condition and track visual attention to various elements of the stimuli (not a focus of the analysis and thus not described in further detail). Members of the research team read the overall study instructions aloud to participants while the instructions appeared on the screen. After viewing the stimulus materials, we handed each participant an iPad with the post-test questionnaire, delivered through the Qualtrics iOS application which participants read and answered on their own, with the exception of a few adults and students who desired assistance with reading the questions. They averaged between 25 and 35 minutes to complete the study.

Design and Stimuli

Respondents in all four randomized conditions viewed images of cigarette boxes depicting the FDA full-color pictorial warnings, proposed in 2011, with the hypotheticality of the text varied (Figure 1). When originally proposed by the FDA, three of these labels used the *can* verb tense, while the remaining six used the present tense. However, in developing the stimuli, we altered the labels to match the experimental manipulations. The participants were seated 64 cm from the screen, and the angle, size and distance were arranged to be proportional to how they would appear if the packages were held at arms-length (Byrne et al., 2019). Participants were also instructed to keep their eyes on the screen for all of the images. Each participant viewed nine different images within their condition, which appeared in random order and advanced after 10 seconds. Therefore, viewing the images took each participant 90 seconds.

All participants viewed images of boxes featuring the three most popular cigarette brands (Marlboro, Camel, and Newport) with the nine warnings placed on the top 50% of the packages. We counter-balanced the pairings of warning labels on brands. The four language conditions were as follows: 1. non-modal (cigarettes cause cancer), 2. *can* (cigarettes can cause cancer), 3. *may* (cigarettes may cause cancer), and 4. *will* (cigarettes will cause cancer). A professional graphic artist created the label variations for all study stimuli.

Measures

After viewing the stimuli, participants responded to items measuring dependent variables and demographic data. We measured negative affect first and then randomized blocks of the remaining dependent variable questions and the order of the questions within each block. We concluded the survey with smoking status and demographic information. For youth participants, we adapted all items to account for variations in literacy levels (at a 4th grade reading level). A bivariate correlation matrix is available in online supplemental materials (Table S1).

Negative affect.—Participants responded to eight items adapted from the Positive and Negative Affect Schedule (PANAS-X) (Watson & Clark, 1999). The prompt was, “After looking at the pictures of cigarette packs, I felt...” [*afraid, angry, annoyed, sad, disturbed, grossed-out, scared, and guilty*] (randomly ordered). They responded: 1= *not at all* to 5= *extremely*. The eight measures were highly correlated and loaded on one component for adults and two components for youth in a principle factor analysis, with *angry* and *annoyed* representing a different component. Nonetheless, because inter-item correlations were high for both youth and adults, we averaged all eight measures to form a negative affect scale (adults: $\alpha = .89$, $n = 313$, $M = 2.72$, $SD = 1.03$; youth: $\alpha = .82$, $n = 314$, $M = 2.50$, $SD = .92$). As discussed below, we acknowledge that for youth, our measure of negative affect captures a multifaceted construct. The descriptive statistics by condition for adults are: present tense ($n = 81$, $M = 2.74$, $SD = 1.01$); will ($n = 79$, $M = 2.68$, $SD = .98$); can ($n = 76$, $M = 2.77$, $SD = 1.06$); and may ($n = 77$, $M = 2.69$, $SD = 1.10$). For youth, they are: present tense ($n = 82$, $M = 2.54$, $SD = .94$); will ($n = 72$, $M = 2.48$, $SD = .90$); can ($n = 80$, $M = 2.53$, $SD = 1.00$); and may ($n = 80$, $M = 2.45$, $SD = .83$).

Old risk beliefs (adults).—Using an approach developed in Byrne, et al. (2019), we developed two risk belief scales for adults (old risk beliefs and new risk beliefs). The old risk beliefs scale measures beliefs associated with health effects that have been part of the Surgeon General’s cigarette warnings for years. The adult smokers in our study have likely been previously exposed to these messages on cigarette packages, and therefore we deemed it important to separate out these items. Adapted from PATH, we asked adult participants, “Based on what you know or believe, does smoking cigarettes cause... [*babies to be born with low birth weight from the mother smoking during pregnancy, heart disease in smokers, lung cancer in smokers, and lung disease, such as emphysema, in smokers*]?” (Hyland, et al., 2017). Responses included: *Yes*, *No*, and *Not sure*, and we dichotomized these to separate *Yes* responses (1) and all other responses (0). We totaled the *Yes* responses to form an additive index ($n = 317$, range = 0–4, $M = 3.56$, $SD = 0.94$). The descriptive statistics by condition are: present tense ($n = 81$, $M = 3.63$, $SD = .94$); will ($n = 81$, $M = 3.52$, $SD = .95$); can ($n = 77$, $M = 3.57$, $SD = .91$); and may ($n = 78$, $M = 3.53$, $SD = .96$).

New risk beliefs (adults).—The new risk beliefs scale includes questions, adapted from the PATH survey, that measure beliefs associated with health effects that are mentioned as part of the FDA’s proposed graphic warning labels for cigarettes but that were not included in the Surgeon General’s warnings (Hyland, et al., 2017). We asked adult participants, “Based on what you know or believe, does smoking cigarettes cause... [*children to have breathing problems from secondhand smoke, lung disease in nonsmokers from secondhand smoke, stroke in smokers, and mouth cancer in smokers*]”. Responses were *Yes*, *No*, and *Not Sure*, and we dichotomized and summed these items as we did with old risk beliefs ($N = 317$, range = 0–4, $M = 3.25$, $SD = 1.16$). The descriptive statistics by condition are: present tense ($n = 81$, $M = 3.31$, $SD = 1.18$); will ($n = 81$, $M = 3.27$, $SD = 1.12$); can ($n = 77$, $M = 3.21$, $SD = 1.17$); and may ($n = 78$, $M = 3.21$, $SD = 1.20$).

Health risk beliefs (youth).—We used a single index of health risk beliefs among youth, assuming limited prior exposure to the existing Surgeon General’s warning labels. We

assessed their beliefs that smoking cigarettes is related to: cancer, heart disease, hole in throat, stroke, lung disease, asthma, problems in babies whose moms smoke, and health problems in nonsmokers. Responses included: *definitely not*, *probably not*, *probably yes*, and *definitely yes*, and we dichotomized these to separate *definitely yes* responses (1) and all other responses (0). *Definitely yes* responses were totaled across the 8 items ($n = 320$, range = 0–8, $M = 6.0$, $SD = 2.64$). The descriptive statistics are: present tense ($n = 82$, $M = 5.70$, $SD = 2.58$); will ($n = 75$, $M = 5.93$, $SD = 2.85$); can ($n = 81$, $M = 5.80$; $SD = 2.86$; and may ($n = 82$, $M = 6.56$; $SD = 2.17$).

Quit Intentions (adults).—We measured intentions to quit smoking by adapting three items from the National Adult Tobacco Survey (Centers for Disease Control and Prevention, 2018b) and applying the transtheoretical model's "stages of change" approach (Prochaska & Velicer, 1997). The items were: "Do you want to quit smoking cigarettes for good?" [*Yes/No*]; "Do you have a time frame in mind for quitting?" [*Yes/No*], "Do you plan to quit smoking cigarettes for good... (*In the next 7 days, In the next 30 days, In the next 6 months, In the next year, More than 1 year from now*)?" We dichotomized our measure of quit intentions, such that those individuals who reported they wanted to quit and had a time-frame in mind for quitting, and who planned to quit in the next 7 days or 30 days were coded as "1" ($n = 54$, 17%). All other participants were coded as "0" ($n = 316$, $M = .17$, $SD = .38$). The descriptive statistics by condition are: present tense ($n = 81$, $M = .19$, $SD = .39$); will ($n = 81$, $M = .17$, $SD = .38$); can ($n = 76$, $M = .16$; $SD = .37$; and may ($n = 78$, $M = .17$; $SD = .38$).

Susceptibility to use cigarettes (youth).—We measured susceptibility to use cigarettes by asking five items adapted from validated instruments developed by Pierce, Choi, Gilpin, Farkas, and Merritt (1996) and Jackson (1998). These measures were: *Do you think that... you will smoke a cigarette soon?*, *you will smoke a cigarette in the next year?*, *you will be smoking cigarettes in high school?*, *in the future you might try a cigarette?*, And *if one of your best friends offered you a cigarette would you smoke it?* Response choices ranged from 1 = *definitely not* to 4 = *definitely yes*. We considered youth who answered anything other than "definitely not" to any question as susceptible to smoking. This approach makes sure that if there is a chance they may engage in any of a number of smoking behaviors, they are counted as susceptible to smoking (Altman, et al, 1996), as any willingness to consider tobacco use in the future via this measure is associated with an increased likelihood of starting to smoke (Pierce et al., 1996). In total, 38% ($n = 122$) of the sample was determined susceptible to smoking cigarettes ($n = 321$; $M = .38$, $SD = .49$). The descriptive statistics are: present tense ($n = 82$, $M = .44$, $SD = .50$); will ($n = 76$, $M = .34$, $SD = .48$); can ($n = 81$, $M = .40$; $SD = .49$; and may ($n = 82$, $M = .34$; $SD = .48$).

Self-Reported Sex Category.—We asked all respondents, "Which of the following best describes you?" offering "male," "female," and "prefer not to answer" as response categories.

Control Variables.—We included a wide variety of demographic characteristics and a number of other factors known to influence our dependent variables and/or predict

behavioral intentions to quit smoking in the models testing the effects of hypotheticality on negative affect and health risk beliefs. For adults, these items included nicotine dependence (FTND; Fagerström, Russ, Yu, Yunis, & Foulds, 2012), and past attempts to quit smoking (past 12 months).

For youth, we controlled for prior smoking behavior by asking, *Have you ever tried smoking a cigarette, even one or two puffs?* ($n = 23, 7.2\%$). We also measured sensation seeking, using 3-items from a scale adapted for youth (Jensen, Weaver, Ivic & Imboden, 2011) ($\alpha = .72, M = 2.03, SD = .71$). Respondents also described their home environment and demographics using measures adapted from the 2014 NYTS (Centers for Disease Control, 2018b). For home smoking environment, we asked participants (yes/no), *Does anyone who lives with you smoke cigarettes?*

Analysis Plan

We tested study hypotheses with a series of planned multivariable regressions using ordinary least squares (OLS). We assigned the non-modal (present tense) condition to be the reference group, and examined will, can, and may conditions as separate predictors in the model, to test H1 and RQ1. As specified above, we controlled for several covariates that are known to be predictive of our output variables, such as nicotine dependence for adults (FTND; Fagerström, Russ, Yu, Yunis, & Foulds, 2012) and sensation seeking for youth (Jensen, Weaver, Ivic & Imboden, 2011). Even though participants were randomly assigned to condition, we selected to control for these factors in order to gain precision in our average treatment effects (Altman, 2005; Dolan, Green & Lin, 2016). In the interest of transparency, we also report the unadjusted unstandardized regression coefficients and standard errors as notes on our regression tables.

We tested H2 and H3 using the PROCESS macro (model 4) for SPSS (Hayes, 2013). The two mediators were entered simultaneously, with *may* entered as the predictor, and *can* and *will* entered as covariates (Hayes, 2013). For RQ2 and RQ3, we tested for an interaction between SRSC and condition using OLS regression. Once we established these interactions, we ran split-pairwise analyses to identify key differences by condition, within each SRSC, as reported.

Results

Adults who viewed the non-modal language did not differ from those who viewed more hypothetical language on negative affect, old health risk beliefs, or new health risk beliefs (Table 1). Therefore, H1a and H1b were not supported. For youth, there were no differences between the reference group and any condition on negative affect (RQ1a). However, testing RQ1b, youth who viewed the *may* modal language reported higher health risk beliefs than those who viewed non-modal language ($B = .88, B_{unst} = .41; p = .03$) (Table 2). Therefore, while H1b was not supported for adults, there were differences for youth between the *may* and non-modal language conditions. A few covariates were significant in the multivariable regression models, although we do not review those further as they are not our theoretical focus.

In a series of post-hoc analyses, we re-ran the regressions with each of the modal verbs set as the reference category to determine whether there were any differences between other verb modalities. There were no differences in negative affect or health risk beliefs between the other verb modalities for adults or youth. For youth, the means show that *may* yielded the highest health risk beliefs, the non-modal yielded the lowest, and *will* and *can* were in the middle. The difference between *may* and *can* approached significance among youth, $B = .76 (.41)$; $p = .07$.

We used PROCESS (Hayes, 2013) to determine whether hypotheticality of language had an indirect effect on intentions to quit smoking (adults; H2a and H2b) or susceptibility to use cigarettes (youth; H3a and H3b) via negative affect or health risk beliefs. Dummy variables for the will, can, and may verb conditions were entered separately into the mediation model, with the comparison reference category set as the present tense. Neither H2a nor H2b were supported for adults; H3a was not supported but H3b was supported for youth. Specifically, when *May* was compared to the present tense, PROCESS revealed a significant indirect effect (point estimate = $-.13$; 95% confidence interval $-.28$ to $-.02$) of hypotheticality on susceptibility to use cigarettes via health risk beliefs, a result consistent with full mediation (Figure 2). Youth who viewed *may* (versus those who saw non-modal labels) experienced higher health risk beliefs, which predicted lower susceptibility to smoke cigarettes. Findings for health risk beliefs were equivalent whether or not negative affect was in the model.

Next, we conducted analyses to explore the role of SRSC (RQ2 and RQ3). First, we ran a series of OLS regressions with non-modal language/male set as the reference group and testing the interaction between randomized conditions and SRSC. Regression tables are available in supplemental materials (Tables S2, S3). We included only those control variables that were significant in the main effects model. Interaction terms were statistically significant in predicting health risk beliefs for both adults and youth. Therefore, we probed these interactions by examining the differences within each sex through pairwise analyses, facilitating a comparison of all possible differences between conditions within each sex. The key differences for health risk beliefs by gender are illustrated in figures available in the supplemental materials (Figures S1 and S2). For adult males, those who viewed the non-modal (present tense) had higher old health risk beliefs than those who viewed *may* ($p = .03$) and *will* ($p = .01$) conditions, and higher (approaching significance) new health risk beliefs than those who viewed the *may* condition ($p = .07$). For male youth, *will* yielded lower health risk beliefs than *may* ($p = .02$), and lower (approaching significance) health risk beliefs than the non-modal (present tense) condition ($p = .06$). For female youth, the *may* modality ($p = .02$) and the *will* modality ($p = .03$) yielded higher health risk beliefs than the non-modal language.

Discussion

Review of Findings

We tested four different conditional language conditions, arguing that the non-modal condition was the most definite, and the *will*, *can* and *may* conditions were greater in hypotheticality, either due to increased uncertainty (*can* and *may*) or increased temporal distance (*will*). We tested for direct effects of this conditional language on negative affect

and health risk beliefs, and indirect effects on behavioral intentions to quit smoking cigarettes (adults) or susceptibility toward cigarette use (youth).

The most important finding in this study is that youth who viewed the labels with the more hypothetically distant *may* modality reported greater health risk beliefs than youth who viewed the non-modal, definitive labels, which are closer in hypotheticality. Greater health risk beliefs predicted lower susceptibility toward cigarette use for youth, a pattern of results consistent with a fully mediated, indirect effect on this outcome. It may seem counterintuitive that risk beliefs should be lower when the health effect is hedged. However, this finding is consistent with the theoretical predictions of construal level theory. As argued above, the health risks associated with cigarette use are psychologically distant (temporally, socially, and hypothetically) for youth. According to construal level theory, when the psychological distance rendered in one's mind matches the psychological distance portrayed in the message, the arguments in the message are likely to be more effective (Katz & Byrne, 2013). We reason that the more hypothetical *may* language likely matched the way youth thought about the labels and their related perceptions of risk because they are likely thinking about these risks in very abstract ways. As a result, more hypothetical *may* language is a better match than non-modal language for them from the perspective of psychological construal. As mentioned above, youth who viewed the modal verbs *will* and *can* had health risk beliefs that were in the middle of *may* and the non-modal language (present tense). While this suggests directionality, *can* and *will* did not yield significantly different health risk beliefs from the present tense label.

In this study, manipulating modal language on warnings did not influence negative affect for either youth or adults. One explanation is that the manipulation was simply a change in text (the different conditions all featured the same full-color pictorial images, keeping the size constant across all conditions). This differs from prior research that has compared full-color pictorial images to text-only options and found significant differences in negative affect (Noar et al., 2016). It may be that size and image versus text manipulations influence smokers via negative affect while textual content manipulations exert effects primarily via changes in health risk beliefs (Byrne, et al., 2019). However, the fact that we observed effects on health risk beliefs and not emotional reactions is particularly noteworthy. Most prior studies of GWLs have found limited evidence for effects on health risk beliefs (e.g., Noar et al., 2016). These studies have not examined hypotheticality, suggesting a promising avenue for increasing health risk beliefs.

Participants also responded differently to the labels based on SRSC. For adult males, the more definite language yielded stronger health risk beliefs than the *may* condition, as well as stronger old health risk beliefs than the *will* condition. We observed no such differences for adult females. These findings are consistent with prior research on e-cigarette labeling, wherein males reported higher risk perceptions after exposure to a hypothetically close warning label, compared to a hypothetically distant label, while females did not (Katz, et al., 2017).

The pattern was quite different among youth. Female youth in the *may* and *will* conditions reported greater health risk beliefs than female youth in the non-modal (present tense)

condition, while male youth in the *may* condition reported greater health risk beliefs than male youth in the *will* condition. These differences appear to hinge on how young males and females process statements using the *will* modality. *Will* can be interpreted as definitely occurring, but time-delayed. It may be that males and females weigh the certainty and time delay differently in processing risk information. As mentioned above, prior research has found that females do perceive certainty of risk differently than males (Hamilton et al., 2004; Lundborg & Anderson, 2008). This current work suggests they may perceive hypothetical distance differently as well.

Theoretical Implications

We demonstrate the importance of considering how the hypotheticality of language in strategic messages influences key outcome variables, such as risk perceptions and behavioral antecedents. While there has been increasing interest in construal level theory and strategic communication, much of this prior work has focused on other parameters of distance, such as temporal, social, or spatial distances (Chandran & Menon, 2004; Nan, Zhao, Yang, & Iles, 2014). In general, the concept of hypotheticality has received less attention in prior research than other parameters of distance (see Trope & Liberman, 2010, for review). This work is significant in highlighting the importance of the certainty of language in relation to how risk is perceived, and the potential to target messages and use modal verbs strategically. It adds new and, on its face, somewhat counterintuitive evidence that health message designers should consider the concept of hypotheticality as they develop and test their messages. It also emphasizes the value of considering theoretical predictions derived from construal level theory in the strategic design of health promotion messages.

This research also highlights the importance of considering how close or far a message recipient is to experiencing the harms associated with a particular behavior. Often, we assume that behaviors have a particular level of risk that is fixed and determined by public health practitioners. However, the hypotheticality of risk conveyed in a strategic message should be considered from the perspective of the message recipient - the lens of how psychologically close or far the behavior and subsequent risk are to the recipient. In the case that the risk is construed more abstractly, or at greater distance, a message that accounts for this greater level of hypotheticality may be more effective in fostering appropriate assessments of risk.

While significant differences were found between the present tense and the modal verb *may* among youth, we do not find the same difference between the present tense and the modal verb *can*. Theoretically, this is important because it suggests that *may* is farther in hypotheticality than *can*. One possible reason for this is that *can* might communicate greater agency. In addition to the possibility of something happening, *can* also suggests a greater ability to make it happen, and is therefore, closer in hypothetical distance than *may*.

SRSC is an underexplored topic within the literature on construal level theory and in regard to the concept of hypotheticality. This research suggests that SRSC may be an important factor to consider in this theoretical framework. At the same time, it also raises many important questions about factors driving the pattern of observed differences, which could have been driven by culture (gender norms, roles, and expectations), biological differences,

or a combination of the two. The current study is not equipped to address these critical questions.

The vast majority of research on hypotheticality and concepts associated with construal level theory has been conducted with adults (for youth, see Liberman et al., 2012). The current study underscores the potential value in also investigating the concept of hypotheticality in relation to youth, as we have done in this work. This is particularly relevant to the case of tobacco-related messaging, as youth are a priority population for tobacco control.

In considering whether these findings provide any guidance to tobacco health message design, it is important to recognize that the more hypothetical language (particularly “may”) was demonstrated to have useful outcome effects with youth, while the present tense was more useful for increasing risk beliefs for adult males (though not females). On the one hand, hypothetical language may better reflect the probabilistic nature of epidemiological causal evidence, in that even health effects clearly linked to cigarette smoking (in terms of scientific evidence) are not guaranteed to happen to all people in every case. On the other hand, pictorial warning labels are an efficiently targeted communication strategy for adult smokers, in that smokers would see the warnings both at the point of purchase and the point of product use (each time they take out a cigarette to smoke). They are less efficiently targeted to (non-smoking) youth, who may see them in promotional displays and when in proximity to smokers but not in the course of regular activity. These findings do suggest that research testing the effectiveness of messaging targeting youth smoking prevention via other platforms could explore the use of “may” language in describing the long-term health effects of cigarette smoking.

Limitations and Future Research

We acknowledge several limitations of this work. First, this study utilizes SRSC as a key variable. It is important to recognize the complexity of biological sex and to clarify the binary way research has traditionally considered this concept (Frohard-Dourlent, Dobson, Clark, Doull, & Saewyc, 2017), though this approach is changing. Johnson, Greaves, and Repta (2009) have outlined how the concepts of sex and gender are often not afforded the multidimensionality they deserve. They explain, “sex is a multi-dimensional biological construct that encompasses anatomy, physiology, genes, and hormones... (while) gender is a multi-dimensional social construct that is culturally based and historically specific.” (p. 3). We asked respondents to report whether or not they identified as male or female, which we label self-reported sex category (SRSC), and we offered participants the opportunity to opt-out of this binary selection (“prefer not to answer”) in an effort to acknowledge the complexity. While our approach is consistent with other past work, we recognize this is an evolving topic and a limitation of our work is the simple way we measure SRSC. As such, we are likely not capturing the complicated interplay of cultural expectations, roles, identity, and/or biology as it relates to gender.

As with much of the research on strategic messages, we measured key outcomes after only a brief and directed exposure to the stimuli. This facilitated comparing warning label language in a very controlled setting with hard-to-reach study populations. However, future research

might investigate the effectiveness of package language within a more naturalistic setting and consider opportunities for longer exposure to these stimuli.

We recognize that whenever youth are asked to report their behavior, there is a possibility for social desirability effects, wherein they respond in ways they think are more acceptable to the adult researchers (Crandall, Crandall, & Katkovsky, 1965). We measured their tobacco use behavior after they viewed the stimuli, and therefore, we recognize one limitation is that youth may have under-reported their tobacco use and susceptibility to use cigarettes in the future.

We measured the same concepts in both the adults and the youth; however, the measures used for these two populations differed slightly in wording and response choices to accommodate developmental differences. We used a composite index for health risk beliefs with the youth, rather than separating old and new health risk beliefs, as we did for the adult smokers.

With both adults and youth, only those cases in which the participant was certain in their health risk belief (“yes” for adults and “definitely yes” for youth) were counted as having that belief. The adults had a “don’t know” option, while the youth had a “probably yes” and “probably no” option, and both of these responses expressing uncertainty were coded the same way as “No.” While this makes sense conceptually, we do acknowledge that these are not strictly equivalent. We also note that our measures of health risk beliefs did not directly ask about the severity or susceptibility of the health outcomes associated with cigarettes.

Additionally, for the primarily nonsmoking youth, we used susceptibility toward cigarette use as the behavioral antecedent measure. Future research should test whether observed indirect effects on smoking susceptibility influence actual smoking behavior. Inter-item correlations were high for both adults and youth on the individual PANAS-X questions, and therefore, we combined these items into averaged, negative affect scales. For adults, these very different emotions (i.e. anger vs. scared) loaded on one component in a principal factor analysis. However, for youth they loaded on two components, which reduces to one without angry and annoyed. Therefore, one limitation of this measure is that our negative affect scale for youth is a multidimensional construct, combining a more general negative emotion with anger/annoyance. Future research should consider measuring discrete emotions separately.

Future research should also seek to determine whether modal verbs operate differently when placed on warnings that do not contain graphic images. Does seeing concrete imagery alongside conditional language change the overall hypotheticality? It may have brought the labels, overall, closer in hypotheticality, suppressing the effect of hypothetical language, or it may have exacerbated differences by highlighting discrepancies between the images (concrete) and conditions with hypothetical language (more distal). Additionally, the theoretical relationships in this work should be tested on other topics with messaging that includes conflicting hypothetical cues (i.e. sun protection behaviors and sexual practices). Finally, future research should explore the relationship between modal verbs and the concept of uncertainty, including whether people select to avoid uncertainty by tuning out the

messages, rejecting them, or misinterpreting them and whether the uncertainty confuses people or provides them with hope.

Conclusion

The current study explored how the hypotheticality of language can be harnessed to target strategic messages and highlighted the importance of considering how proximally the recipient is mentally representing the health topic of concern. Non-modal language yielded higher health risk beliefs among adult males, but the more hypothetical *may* modality led to higher health risk beliefs among youth, who are psychologically more distant from the health consequences. Future work should continue to assess how the strategic use of modal verbs could enhance the effectiveness of health messages.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1. Experimental Stimuli in the Non-Modal, Definitive Language Condition

Note: We rotated the order and warning/brand combination of brands within conditions. All four conditions featured the graphic warning labels; only the text changed. The text for the nine warnings was as follows: 1. WARNING: Cigarettes (Will Be/ May Be/ Can Be/ Are) Addictive. 2. WARNING: Tobacco Smoke (Will/ May/ Can) Harm(s) Your Children. 3. WARNING: Cigarettes (Will/ May/ Can) Cause Fatal Lung Disease. 4. WARNING: Cigarettes (Will/ May/ Can) Cause Cancer. 5. WARNING: Cigarettes (Will/ May/ Can) Cause Strokes and Heart Disease. 6. WARNING: Smoking During Pregnancy (Will/ May/ Can) Harm(s) Your Baby. 7. WARNING: Smoking (Will/ May/ Can) Kill(s) You. 8. WARNING: Tobacco Smoke (Will/ May/ Can) Cause(s) Fatal Lung Disease in Nonsmokers. 9. WARNING: Quitting Smoking Now (Will/ May/ Can) Greatly Reduce(s) Serious Risks to Your Health.

Figure 2.
Indirect Effect of Hypotheticality on Susceptibility Toward Cigarette Use via Health Risk Beliefs (Youth)

Table 1

Regression Models Predicting Negative Affect, Old and New Health Risk Beliefs (Adults)

	Negative Affect	Old Health Risk Beliefs	New Health Risk Beliefs
Condition (versus non-modal, definitive)			
Will	.00 (.16)	-.14 (.15)	-.02 (.19)
May	-.04 (.16)	-.15 (.15)	-.12 (.19)
Can	-.07 (.16)	-.11 (.15)	-.15 (.19)
Covariates			
Age	.02 (.00) ***	.00 (.00)	-.00 (.01)
Male (versus female/other)	-.41 (.12) ***	-.02 (.11)	-.12 (.14)
Other sex (versus female/male)	-.23 (.36)	-.69 (.33) *	-1.11 (.43) *
Hispanic	.16 (.19)	-.19 (.18)	.07 (.23)
Black	.36 (.13) **	-.15 (.12)	-.10 (.15)
Other race (non-White/non-Black)	.06 (.19)	.04 (.18)	.05 (.23)
\$10,000-\$20,000	-.10 (.16)	.26 (.15) +	.21 (.19)
\$20,000+	.02 (.15)	.25 (.14) +	.06 (.18)
High school graduate (versus not high school graduate)	.02 (.13)	.13 (.12)	.21 (.15)
College graduate (versus not college graduate)	.01 (.21)	.07 (.19)	.07 (.24)
Nicotine dependence	.06 (.03) *	-.05 (.02) *	-.01 (.03)
Previous quit attempt	.29 (.12) *	.22 (.11) *	.29 (.14) *
Emergency Food	.09 (.13)	.01 (.12)	-.06 (.16)
WIC (Women, Infants, and Children Program) recipient	-.05 (.15)	-.08 (.14)	.06 (.18)
SNAP (Supplemental Nutrition Assistance Program) recipient	.04 (.14)	.29 (.13) **	.21 (.16)
Constant	1.59 (.29) ***	3.45 (.27) ***	3.03 (.35) ***
Adjusted R²	.13	.05	.01
N	304	306	306

Note. Cells present unstandardized regression coefficients and standard errors. All models are ordinary least squares (OLS) regressions.

Note. The unstandardized regression coefficients and standard errors for these models without covariates included are as follows: Negative affect [Will: -.06 (.16); May: -.05 (.17); Can: .03 (.17)]. Old Health Risk Beliefs [Will: -.11 (.15); May: -.10 (.15); Can: -.06 (.15)]. New Health Risk Beliefs [Will: -.04 (.18); May: -.10 (.19); Can: -.10 (.19)].

+ p .10,

* p .05,

** p .01,

*** p .001.

Table 2

Regression Models Predicting Negative Affect and Health Risk Beliefs (Youth)

	Negative Affect		Health Risk Beliefs	
Condition (v. non-modal, definitive)				
Will	-.13 (.15)		.23 (.42)	
May	-.07 (.14)		.88 (.41)	*
Can	-.00 (.14)		.19 (.41)	
Covariates				
Age	-.05 (.07)		-.07 (.19)	
Male (versus female/other)	-.19 (.11)	+	-.10 (.31)	
Other sex (versus female/male)	.60 (.39)		.39 (1.13)	
Hispanic	-.21 (.19)		.46 (.56)	
Black	.03 (.11)		-.53 (.30)	+
Other (non-White/non-Black race)	.01 (.13)		-.71 (.38)	+
Previous smoking	-.43 (.22)	+	-.83 (.63)	
Smoking environment	.10 (.11)		-.17 (.31)	
Sensation seeking	-.09 (.08)		-.25 (.22)	
Constant	3.40 (.91)	***	7.62 (2.59)	**
Adjusted R²	.01		.02	
N	311		317	

Note. Cells present unstandardized regression coefficients and standard errors. All models were ordinary least squares (OLS) regressions.

Note. The unstandardized regression coefficients and standard errors for these models without covariates included are as follows: Negative affect [Will: -.07 (.15); May: -.09 (.15); Can: -.01 (.15)]. Health Risk Beliefs [Will: .24 (.42); May: .87 (.41)*; Can: .11 (.41)].

+
p .10,

*
p .05,

**
p .01,

p .001.