HHS Public Access

Author manuscript

Soc Cogn. Author manuscript; available in PMC 2021 April 06.

Published in final edited form as:

Soc Cogn. 2019 June ; 37(3): 314–340. doi:10.1521/soco.2019.37.3.314.

Beneath the surface: Abstract construal mindset increases receptivity to metaphors in health communications

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Abstract

Widespread messages use metaphoric language and imagery to prompt recipients to interpret health-related concepts in terms of dissimilar, familiar concepts (e.g., "*fight* the *war* on cancer"). When do these messages work? According to Conceptual Metaphor Theory, thinking metaphorically involves looking past concepts' superficial differences to identify their similarities at a structural level. Thus, we hypothesized that when people's general construal mindset is oriented to focus on information's abstract meaning, not its concrete details, they would process a metaphor's target health concept in ways that correspond to the dissimilar concept. Accordingly, after priming an abstract, but not concrete, construal mindset: framing sun exposure as enemy confrontation (vs. literally) increased cancer risk perceptions and sun-safe intentions (Study 1; *N*=186); and framing smoking cessation as an arduous journey (vs. literally) increased appreciation of quitting difficulties and interest in cessation tools (Study 2; *N*=244). We discuss practical and theoretical implications for improving health communication.

Keywords

Health communication; conceptual metaphor; construal mindset

Many health-related concepts—such as *fitness*, *addiction*, and *willpower*—are difficult to grasp because they refer to entities and processes that most people cannot directly observe or that they imagine occurring in the distant future, if at all. To educate and encourage healthy lifestyle behaviors, medical professionals and health communicators publicize vivid metaphors comparing such concepts to superficially dissimilar concepts that are easier to visualize (Akers, Gordon, Reyna, & Severson, 2014; Krieger, Parrott, & Nussbaum, 2011; Mukherjee, 2011; Reisfield & Wilson, 2004; Sontag, 1978). Such metaphors appear in diverse outlets including public service announcements, product marketing, news reports, social campaigns, and educational materials. For example, a current commercial depicts

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nicotine addiction as a pestering acquaintance, while a brochure at a student health center likens unprotected sex to reckless driving.

Do such widespread metaphors have the intended effects on health cognition? As we will see, the evidence is mixed. On the one hand, metaphoric messages can be more effective than equivalent literal messages at informing recipients of the severity of risks and the efficacy of certain responses. On the other hand, metaphors can have minimal impact and even backfire. A complete answer, then, will model when people take up a provided metaphor to think about their health, and when they instead interpret a metaphor as merely decorative.

Useful here is Conceptual Metaphor Theory's claim that using metaphor to understand one concept (called the *target*) in terms of another (the *source*) requires looking past those concepts' superficial differences to identify their similarities at a structural level (Holyoak & Thagard, 1995; Kövecses, 2010; Lakoff & Johnson, 1980). In the example above, *sex* (the target) and *vehicle operation* (the source) have different surface attributes (e.g., sex rarely involves signal lights or tollbooths). Thus, to understand sex using this metaphor, one needs to look beyond the concepts' distinctive details and see how they share an underlying structure: Both can be exciting but require vigilance.

Based on this theorizing, we hypothesized that metaphors in health communications will be persuasive when recipients are generally oriented to see the forest, but not when they are focused on the trees. More precisely, we predict that when people are primed with a construal mindset that generally orients them toward the abstract meaning of available information (vs. concrete details), they will be more likely to process a target health risk, their goal-relevant resources, and the need for preventative action in ways that correspond to a provided metaphor's source. We report converging tests of this hypothesis across the domains of sun safe practices (Study 1) and smoking cessation (Study 2).

Metaphor's influence on cognition

Conceptual Metaphor Theory's key insight is that metaphor is more than a mere figure of speech; it is a cognitive device that people can use to understand a target in terms of a superficially dissimilar source that is relatively more familiar and easy to visualize.

At a mechanism level, metaphor use supports understanding by conceptually mapping the target's elements onto structurally similar elements of the source to which it is compared. Through this mapping, people transfer select bits of source knowledge as a framework for interpreting and relating to the target. For example, to understand *recovery* metaphorically as a *journey*, one maps the concepts' corresponding elements to interpret, for example, health choices as *branching paths*, difficulties as physical *obstacles*, and a personal trainer as a *guide*. As important, metaphor use *downplays* in attention distinctive attributes of the two concepts that do not share a structural correspondence (e.g., many journeys involve bug spray; recovery does not).

Supporting this account, dozens of studies show that manipulating *metaphoric framing*—comparing a message that provides metaphoric language and/or imagery with an equivalent

literal or alternative-metaphoric message—causes recipients to process target information in ways that correspond to their source knowledge, even if they are not consciously aware of thinking with metaphor (Landau, 2017; Landau, Robinson, & Meier, 2014; Ottati, Renstrom, & Price, 2014). To mention just two illustrative findings: When a commentary framed a stock market trend as an intentional agent (e.g., "the market *leaped* and *bounded higher*"), but not as an inanimate object, participants expected that trend to continue along its current trajectory in the same manner that living agents move deliberately toward destinations (Morris, Sheldon, Ames, & Young, 2007); a news report that framed a crime problem as a virus (vs. an aggressive beast) led participants to generate solutions that were diagnostic and reform-oriented (vs. punitive) (Thibodeau & Boroditsky, 2011). It is important to acknowledge that such framing effects provide only indirect evidence for the theorized mechanism whereby a mapping highlights and downplays select bits of target knowledge. Still, a strong empirical case is made by several studies showing reliable patterns of moderation and discriminant validity that would be expected only if a metaphoric framing led recipients to understand its target in terms of its source (Landau, 2017).

Researchers are beginning to extend metaphoric framing effects to health outcomes, discussed next.

Health metaphor efficacy

Mounting evidence suggests that there is considerable potential to using metaphor to improve the power of health messages. Metaphors can positively change attitudes toward health threats such as cancer in general (Hauser & Schwarz, 2015), cervical cancer (Spina, Arndt, Landau, & Cameron, 2018), and influenza (Scherer, Scherer, & Fagerlin, 2015). Metaphors also help people grasp correlates of psychological health and well-being, including depression (Keefer, Landau, Sullivan, & Rothschild, 2014), authentic self-expression (Landau et al., 2011), and meaning in life (Baldwin, Landau, & Swanson, 2018).

Nevertheless, health metaphors can be inert and even backfire by reinforcing misconceptions (Hauser & Schwarz, 2015; Keefer et al., 2014). A critical next step is to look beyond direct effects to specify the cognitive factors moderating the productivity (and counter-productivity) of health metaphors.

Two theory-driven moderation hypotheses have been tested to date. The *source resonance* hypothesis states that if a message's metaphor prompts recipients to understand the target in terms of the source, it will influence target processing differently depending on recipients' pre-existing source knowledge (Landau, Arndt, & Cameron, 2018). In one demonstration, Landau et al. (2018) exposed some participants to phrases and imagery comparing ultraviolet radiation (UV) to a personified sun intent on harming them. Those with a strong pre-existing fear of enemy confrontation responded with increased worry about skin cancer risk and strengthened intentions to use sun protection. Those lower in enemy fear showed the opposite effect, responding to the enemy metaphor with lower levels of worry and protection intentions. When the message framed the same facts in a literal manner, individual differences in enemy fear did not predict these outcomes. Source resonance also

moderates the persuasiveness of metaphoric messages related to cervical cancer (Spina et al., 2018).

The *metaphoric fit* hypothesis models the interaction between the framing of an elusive problem and the framing of a candidate solution (Landau et al., 2018). For example, a metaphoric message that frames a health risk in terms of a dissimilar hazard will be more persuasive if it also frames the recommended prevention behavior as metaphorically addressing that hazard (vs. in literal terms or using another metaphor), even though this metaphoric fit is irrelevant in a literal sense. In one demonstration (Keefer et al., 2014), when an article framed depression metaphorically as a problem of being physically down (vs. a literal description of feeling negatively), an anti-depressant medication framed as metaphorically elevating ("*lift* you *up*") was seen as effective, whereas an anti-depressant framed with another metaphor (e.g., "*brighten* your *dark* mood") was seen as a dud. Metaphoric fit also moderates the efficacy of messages about cancer in motivating prevention behaviors (Hauser & Schwarz, 2015).

The current research: Moderation by construal mindset

The research just reviewed shows that metaphors can promote health, but only under certain conditions. However, there is a striking lacuna in this work. Prior investigations presuppose that message recipients automatically respond to a provided metaphor by reinterpreting its target in line with its source. That assumption lies behind the two moderation hypotheses described in the previous section, as they both concern how, specifically, source knowledge is applied to process the target. Yet there are likely many real-world contexts where recipients interpret such metaphors simply as colorful figures of speech and visual tropes rather than as cues to reinterpret the target. In an initial effort to model when a provided metaphor "catches" or not, we examined whether construal mindset moderates metaphoric framing effects.

An abstract construal mindset orients the individual toward the general, abstract meaning of a stimulus, whereas a concrete construal mindset focuses attention on details (Trope & Liberman, 2010). To illustrate, imagine that Claire is hosting a party. If she adopts an abstract mindset, she focuses on the party's relevance for broad ideas such as strengthening friendships and growing as a person; in a concrete mindset, she focuses instead on the party's particulars, such as planning the menu and printing the guest list.

We theorized that individuals adopting an abstract mindset will be primed to step back and encode a concept's structure—the relations among its parts. Hence, they will be more likely to appreciate how one concept provides a useful framework for understanding another, even though they look different on the surface. In contrast, a concrete mindset is more likely to focus people's attention on concepts' distinctive details and thus overlook their shared structure. This theorizing yields our primary hypothesis: Participants initially primed with an abstract mindset would respond to a metaphoric message by processing the target in ways that correspond with their source knowledge; in contrast, participants in a concrete mindset would not respond to a metaphor with source-consistent target processing.

Many studies show that manipulations of construal influence processing of diverse stimuli (Trope & Liberman, 2010; Vallacher & Wegner, 1987). In one set of studies (Hansen et al., 2016), participants observed a model performing a paper-folding task. When the model was distant in time or space—conditions shown to increase a stimulus's perceived abstractness—participants focused on the model's broad goal but generated their own idiosyncratic movements to achieve the same end. When the same model was psychologically near (concrete construal), participants engaged in more literal imitation of the model's specific movements.

Despite abundant construal effects, prior studies provide only indirect evidence that construal mindset moderates adoption of a provided metaphor (A. Markman, personal communication, May 2018). When children and adults are led to represent tasks and problems in terms of distinctive details (e.g., perceptual features), they have trouble appreciating their underlying relational structure. Hence, they struggle to transfer procedures learned in one domain to analogous problems in other domains (Bassok & Holyoak, 1989; Gentner & Markman, 1997; Gentner, Rattermann, Markman, & Kotovsky, 1995; Goswami, 1996). For instance, construing the solar system in terms of planets' surface attributes (e.g., Mars is red) blocks children from transferring that system's structure (small objects orbiting a large object) as a template for understanding novel systems, such as the atom (Vosniadou & Ortony, 1989). Similarly, when objects being compared are very rich in detail, the salience of surface attributes blocks adults from identifying their common structural denominator (Markman & Gentner, 1993).

Even more pertinent, Jia and Smith (2013) showed that one type of construal manipulation moderated the effects of metaphoric framing. They replicated Morris et al.'s (2007) aforementioned finding that participants inferred that stock market trends framed as intentional agents (vs. objects) would continue to "move" in their current direction. Going a step further, they showed that this effect held only when the stock market had been portrayed as psychologically distant. When participants were instead primed to construe the stock market in a concrete manner (by portraying it as spatially near), the message's metaphor had no effect on their forecasts.

Although these effects are illuminating, important questions remain. First, Jia and Smith (2013) focused on economic metaphors, so it is an open question whether construal manipulations moderate the efficacy of metaphors used in health communications. Second, they manipulated construal of the target *per se* (the New York Stock Exchange), whereas the current hypothesis concerns the effect of a *general construal mindset* oriented toward abstract meaning verses concrete details. This is an important extension because people receive abundant health messages through media such as the radio, internet, and billboards as they go about daily tasks that engage them in abstract or concrete mental processes, and the influence of these messages could depend on these shifting mindsets (we elaborate on these practical applications in the General Discussion). By understanding the impact of construal mindsets on metaphor receptivity, we can begin to identify messaging strategies that strengthen the power of health communications.

Samples and Reporting

Study 1 tests the potential moderating role of construal mindset in the context of health communications about sun safe practices. Young adults are an important population to target for sun-safe behavior given they often engage in high UV exposure and face escalating levels of skin cancer risk (Christenson et al., 2005). Therefore, for Study 1, we recruited students enrolled in introductory psychology courses who received partial course credit.

Study 2 is a conceptual replication in the context of smoking cessation. Because it is difficult to recruit an adequate sample of light and intermittent smokers among student populations, we recruited adult samples from Amazon's Mechanical Turk (Buhrmester, Kwang, & Gosling, 2011).

Our procedure for terminating data collection was straightforward. For Study 1, conducted in the laboratory, we collected data until the end of the semester with the goal of obtaining at least 30 observations per condition, as recommended by Simmons, Nelson, and Simonsohn (2011). We had the same minimum cell size goal for Study 2 (online), and continued collecting data until compensation funds were exhausted.

We conducted all studies in a single wave and analyzed data only after the sample size target was met. All measures collected and conditions presented are reported in the paper. The data for these studies have been made publicly available, and may be found at the following OSF repository: https://osf.io/76pxg/

Study 1: *Skin cancer risk as enemy confrontation*

The incidence of skin cancer is increasing more rapidly than any other form of preventable cancer (Siegel, Miller, & Jemal, 2015), yet only 30% of American adults report regularly using sunscreen or wearing sun-protective clothing (Buller et al., 2011). These trends highlight the need to improve current health communications and their delivery so that they persuade people about the risks of unprotected sun exposure and motivate them to engage in protective behaviors.

Study 1 conceptually extends the aforementioned studies showing that a message framing UV exposure metaphorically as a confrontation with an interpersonal enemy was more effective than an equivalent literal message at increasing risk-related worry and sun protection intentions (Landau, et al., 2018).

Here, we test whether this effect is contingent on recipients' prior construal mindset. Our guiding theorizing suggests that when a health message compares UV exposure to enemy confrontation, recipients primed to think at an abstract level will see how those concepts share a similar structure: because both can cause unanticipated bodily harm, sometimes through undetectable means, immediate protection is necessary. Hence, we predicted they would see a greater health risk and need for protection than those who read about the same information framed literally. When recipients are instead primed to think at a concrete level, the enemy metaphor's benefits would disappear.

Method

Participants and Design

Participants were 194 Midwestern undergraduates. Data from eight participants were excluded from analysis (one reported that English was not their primary language and had difficulty understanding instructions; three expressed strong suspicion about the purpose of the study; one was a friend of the experimenter and knew that the cover story was fabricated; one failed to complete the mindset induction task; one clicked through the materials without reading them; and one was an outlier who scored more than 3 standard deviations above the sample mean on critical dependent measures). Thus, the final sample ($N = 186$) included 94 men and 92 women ages 18 to 25 ($M = 19$, $SD = 0.96$) who identified as White (79%), Asian (10.2%), Black (6.5%), or Other (4.3%). Ethnicity was asked separately, with 8.1% reporting Latino and 91.9% reporting non-Latino.

After providing informed consent, participants were presented with filler questionnaires and then randomly assigned to one of four conditions in a 2(Mindset: abstract vs. concrete) × 2(UV risk framing: enemy-metaphoric vs. literal) factorial design.

Mindset Manipulation

Following random assignment, participants completed one of two versions of a thought generation task validated in prior research to manipulate general construal mindset (Trope & Liberman, 2010). All participants were shown the same series of 40 words (e.g., “SODA”; “SPORT”) and were asked to provide a response for each word. Participants in the *concrete mindset* condition ($n = 91$) were instructed to type a word that is an example of each provided word (e.g., “SOCCER” is an example of a “SPORT”), while those in the *abstract mindset* condition ($n = 95$) were asked to type a word that each provided word is an example of (e.g., a “SPORT” is an example of “ENTERTAINMENT”). In this way, participants in the *concrete* condition are primed to focus on specific examples of concepts, whereas those in the *abstract* condition are primed to think of concepts’ higher-order meanings.

UV Risk Framing Manipulation

Next, participants viewed a “Skin Cancer and Sun Protection” information page that described in purposefully scientific terms the relationship between UV exposure and skin cancer, accompanied with technical illustrations of anatomy and cell mutation. This page was intended to set the stage for participants to receive a message that summarized, in lay terms, the nature and significance of UV risk.

One group ($n = 91$) was randomly assigned to receive an *enemy-metaphoric* message in which an image of a sun bearing a menacing facial expression was paired with the following text:

> “You know how sometimes people will get it in their heads to hurt someone else, and nothing seems to stop them? That is what the sun is like. It is not your friend, it is your enemy. It is out to get you. As soon as you walk outside in the sun, it starts attacking your skin with UV rays. The sun is out to destroy your skin cells and blood vessels. The sun has the power to really hurt you, and it won’t be stopped by

clouds or snow or cold air. It keeps piercing and zapping your skin, weakening your resistance to skin cancer."

The remaining 95 participants read a parallel message, matched in length and tone, portraying UV risk in *literal* terms. An unadorned sun image was paired with the following text:

"You know how some things are bad for people, and they keep putting people's health at risk? That is what the sun is like. The sun keeps life going, but its rays create a serious health risk that you should be concerned about. They can lead to skin damage on your body. As soon as you walk outside in the sun, you skin absorbs UV rays. This switches on unhealthy changes in your skin cells and blood vessels. Even on days that are cloudy, snowy, or cold, UV exposure leads to skin damage and puts you at risk for skin cancer."

Skin Cancer Risk

Two items were adapted from Cameron (2008) to assess perceptions of skin cancer risk: "I think my chance of getting skin cancer at some time in the future is…"; "If I don't use sun protection regularly, I think my chance of getting skin cancer at some time in my life would be…" Responses were made on a 7-point scale (1 = *Almost Zero*; 2 = *Very Small*; 3 = *Small*; 4 = *Moderate*; 5 = *Large*; 6 = *Very Large*; 7 = *Almost Certain*) and averaged to form composite scores ($r = .66$, $p < .001$; $\alpha = .80$).

Sun Protection Intentions

Four items were adapted from the Sun Protective Behaviors Index (Cokkindides et al., 2001) to assess sun protection intentions: "During the summer, when you are going outside on a sunny day for more than 15 minutes, how often do you plan to… Apply sunscreen regularly? Wear sunglasses? Wear a hat? Wear a long-sleeved shirt and long skirt or pants?" Responses were made on a 5-point scale (1 = *Never*; 2 = *Rarely*; 3 = *Sometimes*; 4 = *Often*; 5 = *Always*) and averaged ($\alpha = .49$[1]).

Results

Skin Cancer Risk

Submitting skin cancer risk scores to a 2(Mindset) × 2(UV Risk framing) ANOVA returned the predicted interaction, $F(1, 182) = 6.46$, $p = .01$, partial-$\eta^2 = .03$, one-tailed 95% CI = [0.004, 0.087] (Mindset main effect: $F(1, 182) < 1$, $p = .63$, partial-$\eta^2 = .001$, one-tailed 95% CI = [~0.000, 0.023]; Risk framing main effect: $F(1, 182) = 7.70$, $p = .006$, partial-$\eta^2 = .04$, one-tailed 95% CI = [0.007, 0.096]). In order to determine the power to detect an effect of this magnitude, a compromise power analysis was conducted for the overall interaction using the program GPower (Erdfelder, Faul, & Buchner, 1996). Findings suggest that sufficient power ($\pi = 0.76$) was obtained with partial-$\eta^2 = .03$ and the current sample size.

[1]As is typical of measures assessing multiple health behaviors, the four behaviors exhibited limited internal consistency at a level that is comparable to those observed in prior research with the Sun Protective Behaviors Index (e.g., Cameron, 2008). The behaviors have additive protective effects, and the combined item ratings provide a cumulative index of sun protection that one intends to adopt.

The pattern of means presented in Figure 1 and pairwise comparisons (Fisher's LSD) revealed that, when participants were primed to think at an abstract construal level, an enemy-metaphoric versus literal framing of UV risk increased perceived skin cancer risk (n = 50, M = 4.66, SD = 1.17 vs. n = 45, M = 3.78, SD = 1.14; p < .001, d = .77, 95% CI = [0.33, 1.20]). In contrast, when participants were prompted to think at a concrete level, the metaphoric framing did not increase perceived risk compared to the literal framing (n = 41, M = 4.16, SD = .90 vs. n = 50, M = 4.12, SD = 1.23; p = .87, d = .04, 95% CI = [−0.38, 0.45]).

Pairwise comparisons within levels of Risk framing showed that, when UV risk was framed metaphorically as an enemy confrontation, participants perceived a higher personal risk of skin cancer if they were primed with an abstract versus concrete mindset (p = .03, d = .48, 95% CI = [0.05, 0.90]). In contrast, when UV radiation was framed in literal terms, the mindset manipulation had no effect (p = .14, d = .29, 95% CI = [−0.12, 0.70]).

Sun Protection Intentions

Submitting sun protection intention scores to the same analysis returned a marginally significant interaction, $F(1, 181) = 3.62$, p = .06, partial-η^2 = .02, one-tailed 95% CI = [~0.00, 0.06]. (For both main effects, $F(1, 181) < 2.15$; degrees of freedom are different because one participant skipped these items). Again, the power to detect an effect of this size was determined to be sufficient at 0.69.

The pattern of means in Figure 2 and pairwise comparisons revealed that, when participants were primed to think abstractly, framing UV risk metaphorically as an enemy (vs. literally) significantly increased their intentions to protect their skin when going outside (n = 49, M = 2.93, SD = .79 vs. n = 45, M = 2.64, SD = .61; p = .03, d = .43, 95% CI = [0.02, 0.85]). In contrast, when thinking concretely, participants exposed to a metaphoric versus literal framing had statistically equivalent intentions (n = 41, M = 2.62, SD = .46 vs. n = 50, M = 2.68, SD = .67; p = .64, d = .11, 95% CI = [−0.30, 0.52]).

Looking within levels of Risk framing, when UV risk was metaphorically compared to enemy confrontation, participants primed with an abstract (vs. concrete) mindset reported stronger intentions to protect their skin (p = .02, d = .51, 95% CI = [0.08, 0.93]). In contrast, when UV rays were framed in literal terms construal mindset had no effect (p = .64, d = .06, 95% CI = [−0.34, 0.47]).

Discussion

As predicted, when participants were primed to generally process information at an abstract level, a health message using metaphor to compare UV exposure to an enemy confrontation (vs. an equivalent literal message) increased their perceived risk of skin cancer as well as their intention to protect their skin with sunscreen, sunglasses, and clothing. In contrast, the enemy metaphor had no effect on risk perceptions or sun protection intentions when participants were primed with a generally concrete construal mindset.

These findings are consistent with our broad theoretical claim that health metaphors can be more effective than equivalent literal messages *when* the context allows recipients to appreciate that the metaphor's source and the target health risk share an underlying structure *despite* their surface-level differences. An abstract construal mindset would appear to offer this facilitative context. Study 2 goes further to model whether an abstract mindset would similarly foster receptivity to a health metaphor in a different domain: interest in smoking cessation.

Study 2: *Smoking cessation as a long journey*

Although there has been considerable progress over the last couple of decades in reducing tobacco use, it is striking that smoking remains the largest and most preventable contributor to serious illness and mortality (CDC, 2010). Educational and intervention campaigns still meet with mixed success. Many campaigns focus at least to some extent on increasing motivations to quit, and yet these motivations may not be the most critical target: Over two-thirds of smokers report wanting to quit smoking and over half report having made at least one attempt to quit in the past year (Babb, Malarcher, Schauer, Asman, & Jamal, 2017). Motivations to use cessation tools and resources such as quit guides, text-messaging programs, and support services could be more fruitful targets for intervention and particularly given growing evidence of their efficacy (Hartmann-Boyce, Lancaster, & Stead, 2014; Stead, Carroll, & Lancaster, 2017; Whittaker, McRobbie, Bullen, Rodgers, & Gu, 2016).

Challenges identified by smokers point to the importance of persuading smokers to seek assistance to help them quit. Some smokers find the prospect of quitting too daunting, with anxiety and distress over the prospect of quitting emerging as discouraging barriers (Leventhal & Zvolensky, 2015). Others are overconfident in their abilities and fail to recognize their vulnerability and need for assistance (Weinstein, Slovic, & Gibson, 2004). Within the context of smoking cessation, then, overcoming these often anxious, defensive, or overly optimistic cognitions is a critical step toward quit decisions, goal-setting and pursuit, and behavior change (van Koningsbruggen, Miles, & Harris, 2018) .

One presumptive approach to addressing such cognitions and preparing smokers to quit is to encourage them to conceive of cessation as a metaphorical journey. Indeed, at the time of writing, numerous assistance-based websites, from www.quit.com to www.icanquit.com to www.smokefree.gov to www.lung.org, metaphorically compare quitting to a journey. Qualitative studies of online smoke-free related posts also show that a journey is a predominant metaphor for characterizing the cessation process (Akers et al., 2014).

Why might the journey metaphor be useful in this context? From the perspective of Conceptual Metaphor Theory, the source knowledge associated with journeys should facilitate productive engagement with the challenges of cessation. People know that on a journey, the path stretching out in front of them visually connects one's current location ("here") with one's intended destination ("there"), which bolsters the sense that current goal-directed activities are necessary for eventually reaching the destination (Landau, Oyserman, Keefer, & Smith, 2014). This positions people to appreciate that interest in quitting today is

a first step toward eventually being smoke-free. Further, people know that journeys are generally arduous and protracted. For most people, walking to the mailbox or driving to the local grocery store does not qualify as a "journey." Rather, a journey is commonly understood to require a sustained effort and the attendant modesty about one's ability to do it alone (at the very least one often needs the help of a map if not a guide). This positions people to expect hardship in cessation efforts, often in the form of relapse, and highlights the utility of cessation aids.

Yet despite the ubiquitous framing of cessation as a journey, research has not examined whether this metaphor is helpful and the conditions that might facilitate a productive impact. The present analysis highlights that an abstract construal mindset should open people up to appreciating the relevance of source knowledge related to journeys for the target domain of cessation, despite their surface dissimilarities. Study 2 was designed to test this hypothesis. Specifically, the study tested predictions that reading a journey-metaphoric (vs. literal) message while in an abstract (vs. concrete) mindset will increase acceptance of the difficulties in quitting smoking (i.e., reduced confidence that one could easily quit on one's own) and interest in supportive quit tools. Interest in cessation tools was assessed with three complementary measures: (1) time spent reading information about cessation tools; (2) self-reported interest in using the tools; and (3) the monetary valuing of cessation tools as reflected by the dollar amount that one is willing to pay for the tools (Olson & Smith, 2001).

Study 2 also sought to inform a potentially limiting condition on the efficacy of a journey metaphor for promoting cessation-related cognitions. Cravings, or urges, have long been identified as a powerful force in drug addiction broadly and smoking specifically (Cox, Tiffany, & Christen, 2001; Cronk & Piasecki, 2010; Sayette & Dimoff, 2016; Shiffman et al., 2002). When smokers are experiencing relatively weaker cravings, they tend to be more open to information and stimuli that reduce smoking (Arndt et al., 2013; Niaura, Shadel, Brit & Abrams, 2002); whereas people experiencing relatively stronger cravings are more close-minded to cessation appeals and show stronger desire to continue smoking (Sayette & Hufford, 1997; Sayette, Loewenstein, Kirchner, & Travis, 2005). As such, though an abstract mindset might facilitate the effect of a journey metaphor on cessation cognitions, such an interactive influence is likely to be thwarted by high levels of cravings. Thus, Study 2 also examined whether an abstract construal mindset and metaphor interaction would occur when people are experiencing low, but not high, levels of cravings.

Method

Participants and Design

Participants were adult smokers recruited through Amazon's Mechanical Turk (MTurk). Individuals ($N = 728$) first completed a screening survey to determine their age and smoking status. Respondents over the age of 18 who reported smoking cigarettes occasionally or daily ($N = 295$) were invited to participate in the full study. Of those invited, 256 (86.8%) started the survey. Of those who started the survey, 11 (4.3%) stopped their participation prior to reading the smoking cessation message and 245 (95.7%) completed the study. The final sample included 139 men, 105 women, and 1 identifying with an "other" gender. They

ranged in age from 19 to 70 (M = 33.86, SD = 9.67) and identified as Non-Hispanic White (80.0%), Hispanic or Latino (8.6%), Asian (4.1%), Black (4.1%), or Other (4/.1%).

Participants provided informed consent to participate in an online study described as exploring views about health issues. The study was presented using Qualtrics software (Provo, Utah), which randomly assigned participants to one of four conditions in a 2(Mindset: abstract vs. concrete) × 2(Cessation framing: journey-metaphoric vs. literal) factorial design. Participants first completed a measure of current cravings, which served as the moderator variable, and then completed the mindset manipulation, read the cessation framing message, and completed the dependent measures of quitting confidence and interest in cessation tools.

Current Cravings Measure

The measure of current cigarette cravings included three items: “I have a desire for a cigarette right now”; “If it were possible, I would probably smoke right now”; and “I have an urge for a cigarette,” taken from Cox, Tiffany, and Christen (2001). Participants responded to each item on a continuous, sliding scale ranging from 0 (*Strongly disagree*) to 100 (*Strongly agree*). Item ratings were averaged to generate composite scores (α = .97).

Mindset and Cessation Framing Manipulations

Mindset was manipulated with the thought generation task used in Study 1. After completing the task, participants viewed a brief message comprised of bullet-pointed statements about smoking cessation.

Participants randomly assigned to the *journey-metaphoric* condition viewed the following bullet-pointed message:

- Quitting smoking is a journey.
- The destination of the journey is being smoke free, and you can see that destination in front of you.
- You are the traveler moving along a path, trying to reach this destination. Each time you resist the craving for a cigarette, that’s a step forward along the path. The next time you do the same and don’t give in to the urge to smoke, that’s another step forward.
- With each step, you get closer to your destination of being smoke free. When you give in to cravings, you fall into a rut and it can be difficult to move forward.
- The journey will have obstacles and temptations to smoke, but there are guides to help you continue on the path.
- You can see your progress as the distance you’ve covered from when you started your smoke-free journey.

Participants randomly assigned to the *literal framing* condition viewed a parallel message about smoking cessation, matched in length and tone, describing cessation in straightforward literal terms:

- Quitting smoking is a challenge.
- The ultimate goal is being smoke free, and you can imagine what that would be like.
- You are a person trying to achieve this goal, trying to stop smoking. Each time you resist the craving for a cigarette, that's an accomplishment. The next time you do the same and don't give in to the urge to smoke, that's another accomplishment.
- With every time you resist a craving, you are increasing your chances of achieving your goal of being smoke free. When you give in to cravings, you strengthen those cravings, which decreases your chances of achieving your goal.
- The process will be difficult with temptations to smoke, but there are resources that can help you.
- You can think about your success in terms of how many cigarettes you've smoked since you made the choice to quit.

Measure of Quitting Confidence

Next was a 5-item measure of quitting confidence used in prior research (e.g., Gwaltney et al., 2001). The measure began with the item: "How confident are you that you can quit smoking?" The remaining items followed the stem, "How confident are you that you would keep from smoking in each of the following situations?" and included: "When you've had a difficult day"; "When you are with family members or friends who are smoking"; "When you are sad or depressed"; and "When you are talking or socializing." Responses ranged from 1 (*Not at all confident*) to 5 (*Extremely confident*), and were averaged to generate composite scores (α = .84).

Measures of Interest in Smoking Cessation Tools

Participants viewed the home webpage of smokefree.gov, a website developed by the National Cancer Institute. The home page features smoking cessation tools such as a step-by-step Quit Guide (a text-messaging program), tips from former smokers, and links to information about topics related to quitting. Participants were encouraged to take a few minutes to look over the page and the information provided.

Interest was assessed in three ways. First, the survey program recorded the amount of *time spent viewing the cessation tools information* before proceeding to the next screen.

Second, participants completed a three-item measure assessing *interest in cessation tools*: "I would download tools to help me quit, like the free Quit Guide for my cellphone"; "I would like to learn more about topics related to quitting"; and "I would like to get tips from former smokers on how to quit". Item ratings ranged from 1 (*Strongly disagree*) to 5 (*Strongly agree*) and were averaged (α = .84).

Third, participants completed a *willingness to pay* measure. The instructions read, "If these resources were not offered for free, how much would you pay for them? Using your mouse,

drag the pointer bar below to the *highest* dollar amount (up to $100) that you would be willing to pay for these resources. If you have access to free or discounted resources, please imagine that you did not have free or discounted access, and that you had to pay out of pocket." The sliding scale ranged from $0 to $100. Due to skew, responses were log-transformed for the statistical analyses.

Results

Hypotheses were tested using SPSS 24 (IBM Inc. 2016) and the PROCESS macro (Hayes, 2016). PROCESS Model 3 was used to specify a moderation model that included the main and interaction effects of cessation framing, mindset, and cravings on the dependent variable. Each model specified cessation framing (coded as −1 for literal framing, 1 for metaphoric framing) as *X*, mindset (coded as −1 for abstract mindset, 1 for concrete mindset) as *M*, and cravings (mean-centered) as *W*.

Interaction effects were probed using tests of the conditional effects of cessation framing within the abstract versus concrete mindset conditions and at low (−1 *SD*) versus high (+1 *SD*) craving levels. Models yielding one or more significant interaction involving cravings were probed using PROCESS tests of conditional effects. Three-way interaction effects were further evaluated using the Johnson-Neyman technique to identify regions of significance of the conditional effects across varying levels of cravings. When the model yielded a significant Mindset × Cessation framing interaction and no interaction effects involving cravings, the significant two-way interaction was further examined using simple effects analyses for regression models.

All three-way interactions were subjected to a compromise power analysis which revealed that sufficient power (>.90) was achieved to detect the found effects.

Quitting Confidence

Analysis of the moderation model revealed a main effect of Cravings, $B = -.01$, $SE = .002$, $\beta = -.31$, $t(237) = -5.03$, $p < .001$, 95% CI = [−.014, −.006] with stronger cravings predicting lower confidence; and a Mindset × Cravings interaction, $B = -.004$, $SE = .002$, $\beta = -.12$, $t(237) = -1.98$, $p = .049$, 95% CI = [−.008, .000]. Both effects were superseded by a significant Mindset × Cessation framing × Cravings interaction; $B = -.004$, $SE = .002$, $\beta = -.13$, $t(237) = -2.15$, $p = .033$, 95% CI = [−.008, .000]. No other main and interaction effects approached statistical significance.

Tests of the conditional effects of the Mindset × Cessation framing interaction at varying levels of cravings revealed that, consistent with predictions, the interaction effect was significant when cravings were low (95% CI = [.06, .40]) but not when cravings were high (95% CI = [−.21, .13]). Figure 3A illustrates these effects.

When cravings were low, the journey-metaphoric frame (relative to the literal frame) tended to reduce quitting confidence when it was read while in an abstract mindset (95% CI = [−.47, .05]). In contrast, and unexpectedly, the journey-metaphoric frame increased quitting confidence when it was read while in a concrete mindset (95% CI = [.01, .48]). As

anticipated, quitting confidence was uniformly low across the experimental conditions when cravings were high. The Mindset × Cessation framing interaction effect was significant for those with craving scores below 44.76 (comprising 36.7% of the sample) and the effect was increasingly strong with lower craving scores (see Figure 3B).

Time Spent Viewing the Cessation Tools Information

The moderation model analysis of time spent viewing the cessation tools information revealed a combination of 2-way interaction effects or trends: a Mindset × Cessation framing interaction; $B = -5.49$, $SE = 2.80$, $\beta = -.12$, $t(237) = -1.96$, $p = .051$, 95% CI = [−11.01, .03]; a Cravings × Mindset interaction, $B = .26$, $SE = .09$, $\beta = .18$, $t(237) = 2.78$, $p = .006$, 95%CI = [.08, .44]; and a Cravings × Cessation framing interaction, $B = -.17$, $SE = .09$, $\beta = -.12$, $t(237) = -1.85$, $p = .065$, 95% CI = [−.36, .01]. The main and 3-way interaction effects did not approach statistical significance.

Tests of conditional effects revealed that the observed interaction effects were driven by a significant cessation framing effect for those with low cravings and an induced abstract mindset, which contrasted with non-significant cessation framing effects for all other conditions (see Figure 4). For participants with low cravings and an abstract mindset, the journey-metaphoric frame (relative to the literal frame) increased the time spent reading about the cessation tools (95% CI = [1.21, 24.65]). In contrast, the cessation framing effects on viewing time were not significant for those low in cravings and in a concrete mindset or for those with high cravings regardless of their induced mindset.

Interest in the Cessation Tools

The moderation model analysis revealed a main effect of cravings on interest in the cessation tools, with higher cravings predicting greater interest ($B = .005$, $SE = .002$, $\beta = .13$, $t(237) = 1.98$, $p = .049$, 95% CI = [.00, .01]). The predicted Mindset × Cessation framing interaction was significant ($B = -.17$, $SE = .07$, $\beta = -.16$, $t(237) = -2.48$, $p = .014$, 95% CI = [−.32, −.04]). No other main or interaction effects approached statistical significance.

Simple effects analyses (Figure 6) revealed that the Mindset × Cessation framing interaction was driven by contrasting trends in the cessation framing effects for participants induced into an abstract versus concrete mindset (see Figure 5). For participants induced into an abstract mindset, the journey-metaphoric frame (relative to the literal frame) tended to increase interest in the cessation tools; $t = 1.90$, $p = .058$. For participants with a concrete mindset, however, the journey-metaphoric frame tended to reduce interest in the cessation tools; $t = -1.70$, $p = .091$.

Willingness to Pay for the Cessation Tools

Analysis of the moderation model revealed a Mindset × Cessation framing × Cravings interaction trend; $B = .002$ $SE = .001$, $\beta = .12$, $t(237) = 1.77$, $p = .079$, 95% CI = [−.0003, .005], with no other main or interaction effects approaching statistical significance.

Tests of the conditional effects of the Mindset × Cessation framing interaction at varying levels of cravings revealed that, consistent with predictions, the interaction effect was

significant when cravings were low (95% CI = [−.23. −.02]) but not when cravings were high (95% CI = [−.09, .12]). Figure 6A illustrates these effects. When cravings were low, the journey-metaphoric frame (relative to the literal frame) tended to increase the amount participants were willing to pay for the tools when it was read while in an abstract mindset (95% CI = [−.01, .30]), whereas it tended to decrease willingness to pay for the tools when it was read while in a concrete mindset (95% CI = [−.25, .04]). This Mindset × Cessation framing interaction effect was significant ($p < .05$) for those with cravings scores below 41.58 (comprising 33.5% of the sample) and the effect was increasingly strong with lower craving scores (see Figure 6B).

Discussion

These findings extend those of Study 1 by providing further evidence that construal mindset can shift the influence of a metaphor on health cognitions and behavior, and furthermore by demonstrating an important boundary condition for these effects. As predicted, a metaphoric message framing the challenges of smoking cessation as a long journey was generally more effective than a literal message in lowering confidence in one's ability to quit on one's own and increasing interest in cessation tools when the message was read in an abstract mindset, but not a concrete mindset. Importantly, and as predicted, these effects arose primarily among those experiencing weak or minimal cravings to smoke. For those experiencing strong cravings, quit confidence was generally low and uninfluenced by the mindset or message framing manipulations. Further, the manipulations did not alter the amount of time these smokers spent viewing the information about cessation tools or their willingness to pay for these tools, although they did have the predicted interactive effects on their general interest in the tools.

The findings contribute new evidence that a general construal mindset can enhance receptivity to a metaphorically-framed health message. However, they also suggest that a concrete mindset can lead to a metaphoric message having unintended, "boomerang" effects on health cognitions and behavior. For both quitting confidence and willingness to pay for cessation tools, the interactive effects of mindset and metaphor observed for participants with low cravings were driven not only by the impact of an abstract mindset in enhancing these responses to the metaphoric message, but also by the impact of a concrete mindset in reducing these responses to the metaphoric message. It might be that, when cravings are low, a concrete mindset can help smokers defensively dismiss the personal relevance of the emotionally evocative, metaphoric message that quitting is hard. Prior research has demonstrated that a concrete mindset exacerbates overly optimistic predictions of performance on challenging tasks whereas an abstract mindset reduces such inflated optimism (Yan & Hou, 2014). Consistent with this pattern of effects, our findings suggest that this confidence-enhancing effect of a concrete mindset occurs when a cessation message metaphorically underscores how hard it is to quit smoking.

The moderating influences of cravings on the mindset and metaphoric effects converge with prior evidence that people are relatively immune to the influences of cessation appeals when they are experiencing strong urges to smoke (Arndt et al., 2013; Niaura et al., 2002; Sayette & Hufford, 1997; Sayette et al., 2005). The power of cravings to overwhelm the effects of

quit appeals, and particularly brief messages with limited potency such as the ones tested here, underscores the importance of considering cravings when delivering cessation communications. Smokers are likely to be more receptive to such information when their cravings are reduced or controlled, such as by recent smoking, the use of another nicotine delivery product (e.g., electronic cigarettes, patches, or gum), or the use of stress-reduction activities. In addition, smokers might be more receptive to cessation information and appeals when they are in environments devoid of strong triggers to smoke (e.g., a room free of smoking-related stimuli in a smoke-free building), and at times of the day when cravings tend to be low.

Overall, the findings suggest that the use of a journey metaphor in a cessation message could motivate smokers to take the initial steps towards quitting, but only if the message is processed while in an abstract mindset and without the interference of smoking cravings.

General Discussion

The widespread use of metaphor in health communication presumably reflects a cross-cutting assumption that such framing will encourage people to take steps to protect or enhance their health. Yet both health-relevant scholarship beginning in the 1970s (e.g., Sontag, 1978) and emerging research (e.g., Hauser & Schwarz, 2015) reveal that metaphors might not be a straightforward panacea for health behavior change. Social-cognitive research and specifically Conceptual Metaphor Theory lend additional insight by elaborating the underlying complexity involved with processing metaphoric communication.

The present research considered at a theoretical level that one reason why metaphor in a health communication may fall flat, and even backfire, is that people fail to appreciate the structural similarity between the knowledge associated with the target health domain and the superficially dissimilar metaphorical source. In so doing, they might fail to transfer their source knowledge to interpret the target health risk and the steps they need to take to protect themselves. In these cases, the metaphor is interpreted as a mere figure of speech or even a distraction.

The present research offered converging tests of a potential solution: Manipulating people's general construal mindset to focus on the abstract meaning of available information rather than the concrete details. Although there were some nuances to the specific effects that were observed, overall, consistent patterns suggested an important role of an abstract (vs. concrete) construal mindset in fostering outcomes consistent with a metaphoric framing of a health challenge.

The studies demonstrated these effects not only for health cognitions (perceived risk in Study 1, quit confidence and cessation tool interest in Study 2), but also for action readiness (sun protection intentions in Study 1, willingness to pay for cessation tools in Study 2), and behavior (time spent reading about cessation tools in Study 2). The effects were also shown to generalize in several ways:

- Across two populations (undergraduates who are at particular risk for the dangers of unprotected sun exposure [Christenson et al., 2005] and a national, online sample of adult smokers);
- When participants are first provided with information that might challenge their understanding of the health risk or not (i.e., the scientifically oriented description of UV risks in Study 1 versus no such information in Study 2);
- Across two metaphors that are commonly used in health communications (confrontation with an interpersonal enemy and a journey) that each have their own nuances (e.g., the metaphor in Study 1 had some positive information in mentioning the sun keeps life going).

Taken together, the findings provide convergent support for the theoretical ideas that guided the present studies. Although the actual mechanisms of assimilation were not tested directly, the findings are consistent with the possibility that an abstract mindset offers a mental context that facilitates appreciation of the structural similarity between the metaphor and the health situation, thereby fostering the transfer of source knowledge that structures how one thinks and feels about a pressing health concern.

Just as importantly, and as revealed in Study 2, a concrete mindset could engage a type of boomerang effect on some outcomes. For example, smokers in Study 2 who were induced into a concrete mindset became more confident in their ability to quit and attributed less monetary value to cessation tools when exposed to the metaphorical journey message. In effect, these smokers became more optimistic about their abilities to quit and to do so without the help of support resources. These effects warrant further study because unrealistic optimism, perhaps as a defensive shroud covering up vulnerability, contributes to smoking persistence (Weinstein et al., 2004).

Toward an understanding of conceptual and practical aspects of metaphoric health communication

The present findings build from previous research (e.g., Jia & Smith, 2013) to offer generative insights into the nature and potential of communicating with metaphor. They invite consideration of how factors that impact construal mindset, and thus moderate the potency of metaphoric communications, can arise from the message itself, the broader health context, and even more incidentally.

Health media messages may themselves have features that cue construal mindsets. Consider a brochure on oral health that encourages readers to set implementation intentions, or “if-then” plans that spell out in advance when and how to initiate goal-directed action (e.g., “Whenever you have toothpaste in hand, stop and reach for the floss first”). Although this is a well-evidenced step towards goal achievement (Gollwitzer & Sheeran, 2006), automating action in this manner focuses attention on concrete aspects of one’s surroundings. If that same brochure features an imaginative metaphor (e.g., “Gingivitis is a bank robber”), readers may fail to look beyond the concepts’ obvious surface differences and reinterpret the health target in terms of the source.

The broader heath context may also feature situational determinants of construal mindset that lead metaphors to have more or less impact. In health care settings, for example, patients might be more responsive to a metaphoric message after their doctor describes their health condition with a focus on structural relationships within the body rather than specific details such as symptoms and treatment options.

It is also worth considering the various demands that even the most well-intentioned person can face in the context of treatment or other health scenarios. Indeed, the idea of abstract and concrete construals was largely introduced to the social psychological literature with the classic insights of Vallacher and Wegner's (1987) action identification theory. From this perspective, factors, such as task difficulty, can influence the mindset that people adopt. In health contexts, many of the behaviors in which people engage can present considerable mental if not willpower challenges (Mann, DeRidder, & Fujita, 2013). From the cognitive taxation of medication adherence regimens to the overall complexity of dietary guidelines, perceived difficulties in implementing healthy actions could push people to concrete mindsets and thereby interfere with receptivity to recommendations offered in metaphoric health messages.

Relatedly, temporal construal theory (Trope & Lierberman, 2010) teaches us that events farther along the temporal horizon tend to be considered with abstract mindsets whereas those in the more immediate future are broached with concrete mindsets. It may be that abstract mindsets have a general tendency, perhaps akin to self-affirmation procedures (e.g., Harris & Epton, 2009), to lower defensiveness toward threatening health information, opening the reader up to consider risky behaviors in relation to future health states and begin the process of setting and striving for future health goals (van Koningsbruggen et al., 2018). Thus, when thinking abstractly about the future, people may be better able to confront the risks by which they would otherwise be threatened, and thus be more receptive to metaphoric communications.

By enabling people to move from an abstract consideration of a nebulous future health issue to a more salient consideration of imminent risk probability, metaphors could then foster, ironically in light of the present analysis, a mindset that is more characteristic of a concrete oriented construal (Wakslak & Trope, 2009). This would suggest an interesting dynamic process in which abstract construal facilitates metaphoric receptivity, which in turn, fosters a more concrete risk appraisal. At the same time, this connection to temporal factors raises further complexities with potential for important insights. People often intend to quit smoking not today but tomorrow. They often order the bacon double cheeseburger today with plans of ordering the salad tomorrow. Thus, metaphoric health messages might be especially effective in adjusting thinking about the longer-term health behavior changes that are contemplated abstractly, but challenged to have similar impact when an individual is faced with the more concrete consideration of immediate decisions.

Such cautionary reminders point to the importance of overcoming these barriers by developing health communication strategies that foster mindsets that support the relevant mapping between the metaphoric source and the health target. Useful suggestions come from cognitive research on analogical reasoning. It may be beneficial to make the

comparison between the metaphoric source and the health target explicit, as opposed to presenting a subtle metaphoric comparison and expecting recipients to "unpack" its implications. When Gick and Holyoak (1980) presented participants with the medical problem of how to target a tumor without destroying surrounding tissue, participants appropriately drew from a previously encountered military strategy scenario when explicitly reminded to reflect on the scenarios' structural similarities, yet very few participants spontaneously appreciated how aspects of the medical problem fit into the structure transferred over from the military scenario. It was in light of these findings that we designed our metaphoric messages to explicitly describe how UV exposure is akin to confronting an enemy, and how quitting smoking features the ups and downs of an arduous journey. A health communication featuring a subtler metaphoric comparison may be less effective at changing online health cognition.

It may also be helpful to choose a source that shares more surface attributes with the target (e.g., comparing flossing to cleaning dishes) rather than one that is highly dissimilar (e.g., comparing flossing to national security). Studies show that if a target problem and the source analog are sufficiently similar on the surface, people can spontaneously draw analogies based on just a few cues (Gilovich, 1981; Holyoak & Koh, 1987).

Of course, the aforementioned possibilities emanate, at least to some degree, from aspects of the health situation. Yet other situations not obviously related to health could incidentally cue construal mindsets that, in turn, moderate receptivity to metaphor. A metaphoric radio message could have more impact when heard while planning a garden (i.e., in an abstract mindset) than while following a recipe for a new dish (i.e., in a concrete mindset). The increasingly ubiquitous practice of media multi-tasking, such as using a smartphone while watching TV, has been shown to promote a concrete mindset (Kazakova, Cauberghe, Pandelaere, & De Pelsmacker, 2015), suggesting that metaphoric messages will be less impactful for those who are multi-tasking than for those who are engaged in a single media task. These are just two examples of how wide-ranging situations could influence mindset and in turn facilitate or undermine metaphorical message impact.

Conclusion

Health professionals and the lay public commonly rely on metaphors to communicate elusive ideas about health. The question is how exposure to a metaphoric message might open up new ways of understanding and relating to health concerns. Conceptual Metaphor Theory suggests an answer: A metaphoric message can, under facilitating conditions, prompt recipients to *think* metaphorically about a health concept, which consists in mapping it onto something that looks different on the surface but shares an underlying structure. We tested the outcome of this theoretical process by experimentally inducing construal mindsets known to facilitate or block this structure mapping processing before presenting metaphoric messages or literal messages about skin cancer risk and smoking. We predicted and found that individuals under an abstract mindset responded to the metaphoric message by changing their health attitudes and intentions in ways that correspond with commonplace knowledge of the metaphors' source. Critically, metaphor exposure had no benefits for individuals induced to think at a concrete level. By highlighting the importance of one contextual factor

—general construal mindset—the current research helps to fill out the picture of how metaphors matter for health cognition. Looking ahead, it will be important to examine the theoretical implications of connecting construal mindsets to metaphoric processing and how these implications can be harnessed to better support people in making decisions that improve their health and well-being.

Acknowledgments

This research was supported in part through a grant from the National Cancer Institute, R01CA185378.

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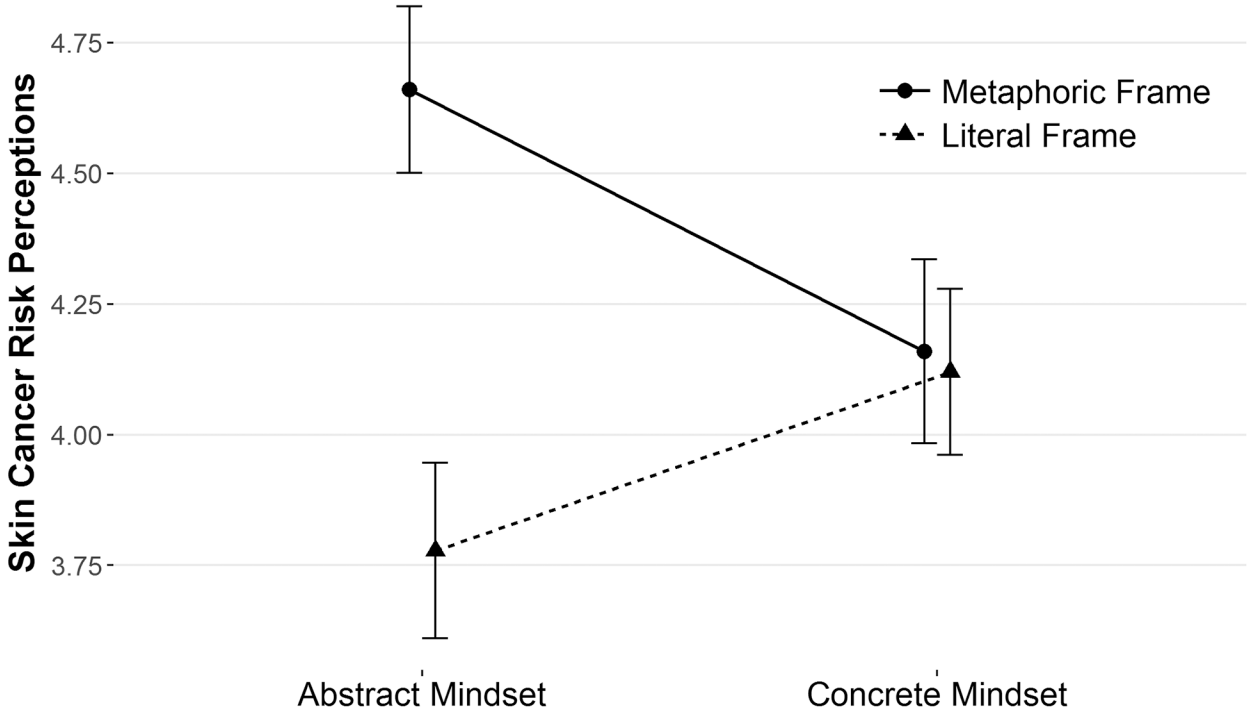

Figure 1.
Skin cancer risk perceptions as a function of construal mindset and UV risk framing (Study 1). Note: Error bars represent standard errors around group means.

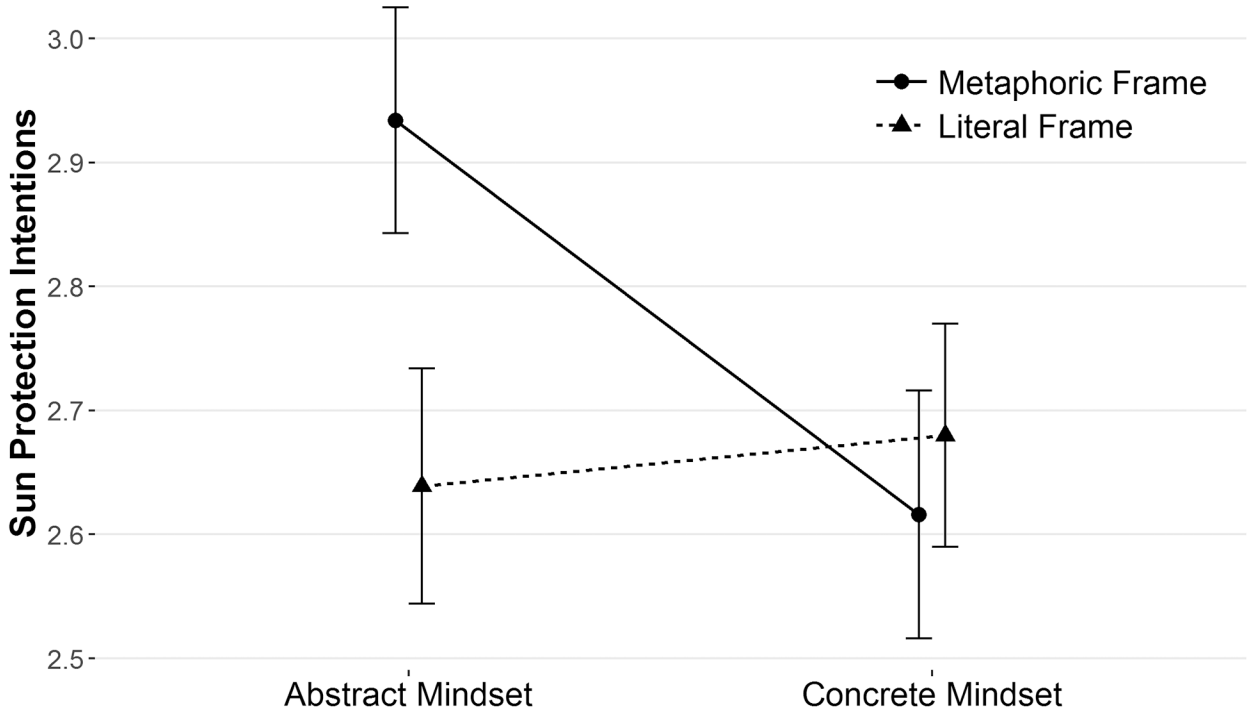

Figure 2.
Sun protection intentions as a function of construal mindset and UV risk framing (Study 1).
Note: Error bars represent standard errors around group means.

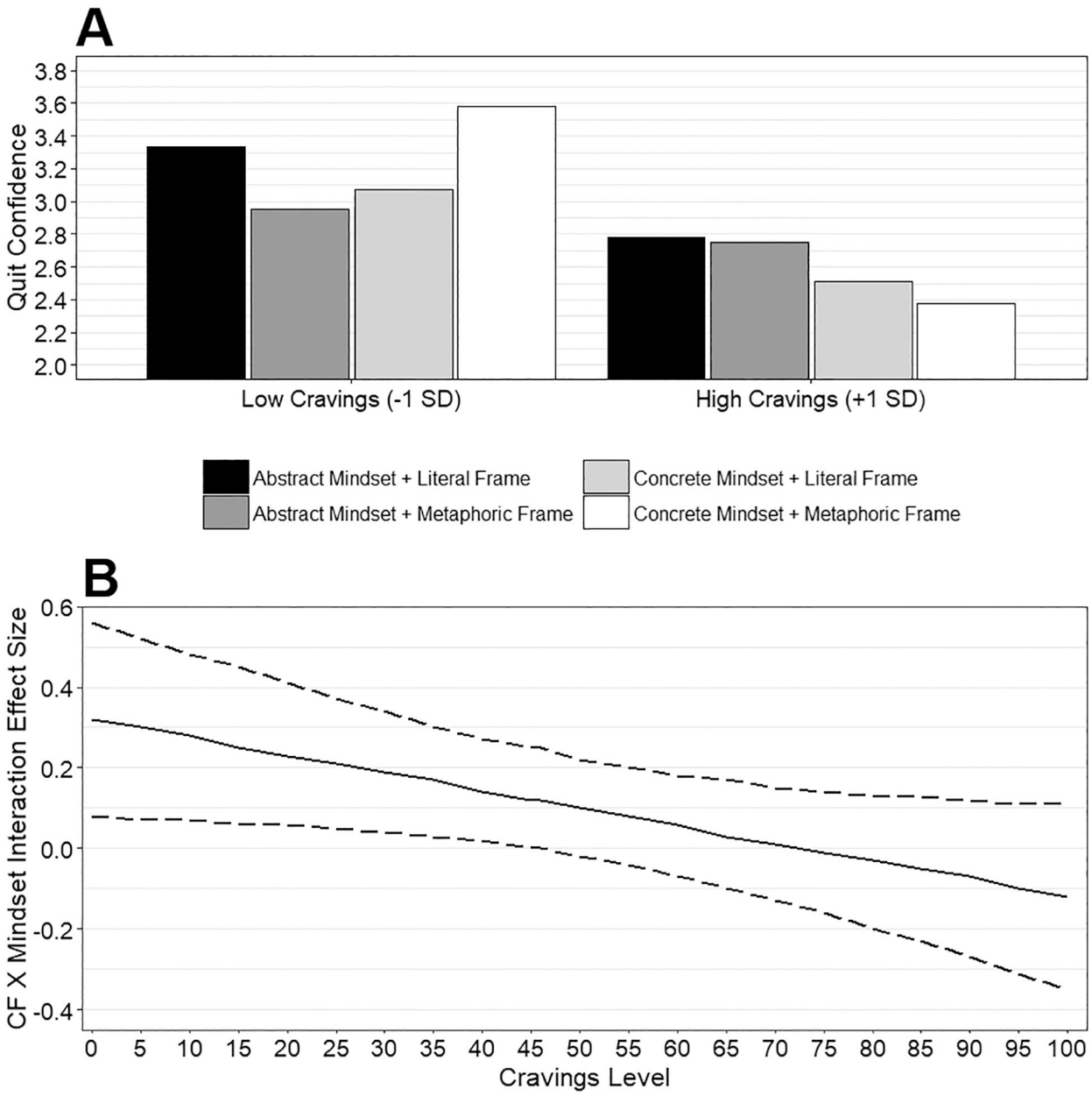

Figure 3.

Quit confidence as a function of construal mindset, cessation framing, and cravings (Study 2). Panel A depicts the conditional effects of the Mindset × Cessation framing interaction at low (−1 SD) and high (+1 SD) levels of cravings. Panel B graphs the Mindset × Cessation framing effect on quitting confidence by cravings level. CF = Cessation framing. The horizontal line at 0 indicates no Mindset × Cessation framing effect. A significant effect is present when this line does not fall between the 95% CI lines.

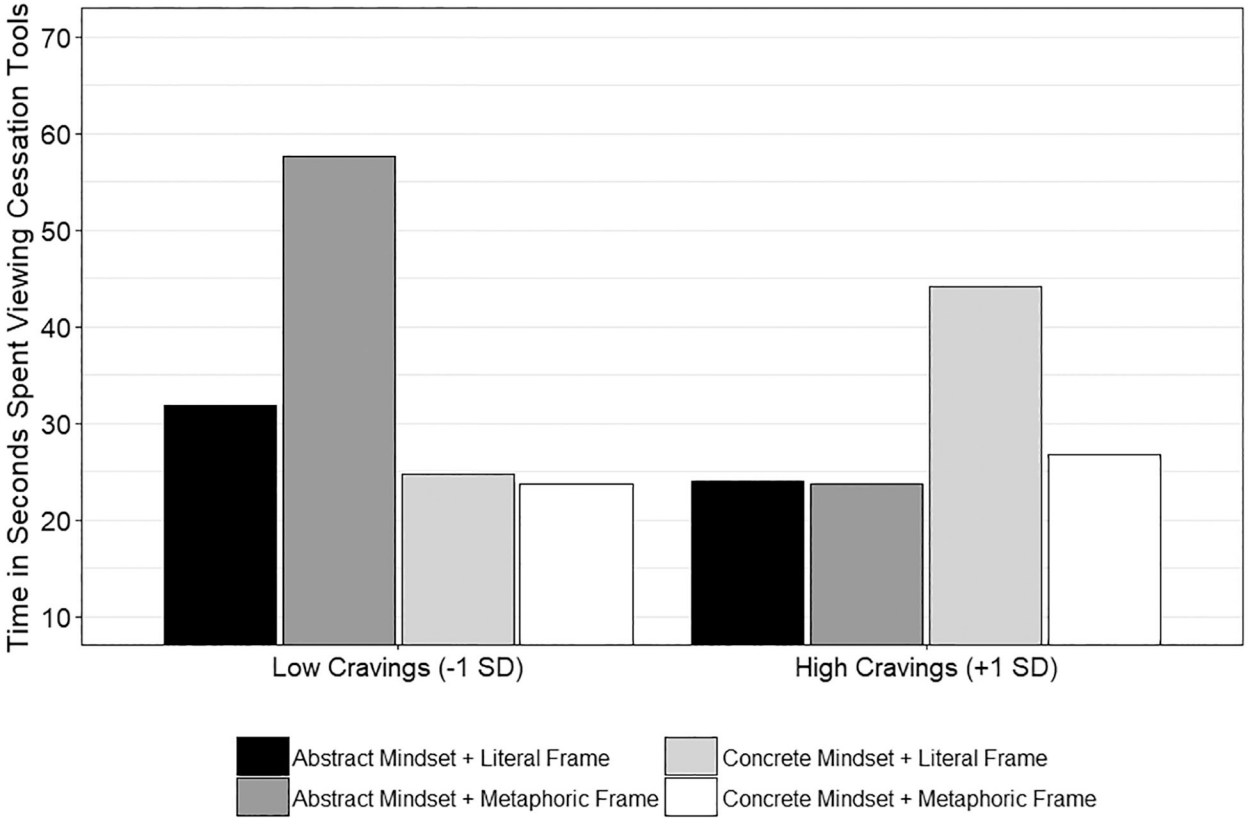

Figure 4.

Time spent viewing cessation tools information as a function of construal mindset, cessation framing, and cravings (Study 2).

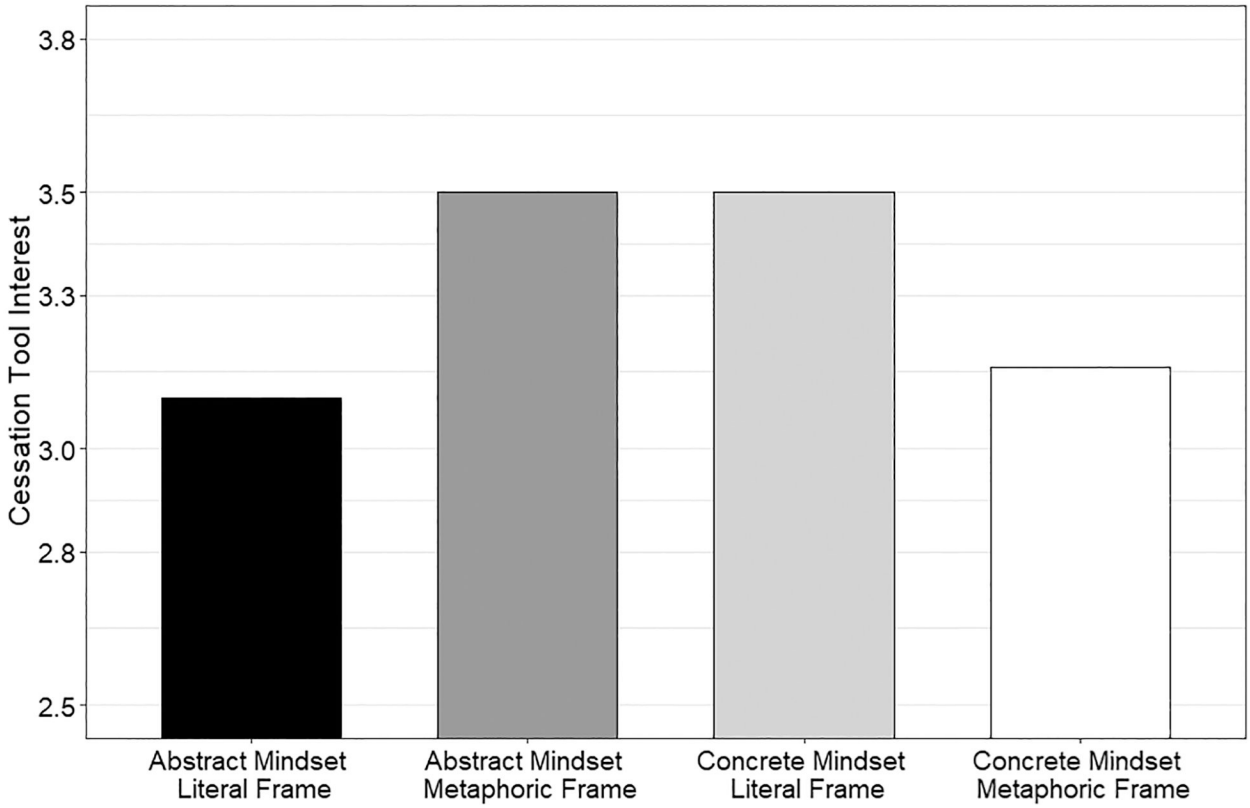

Figure 5.
Interest in cessation tools as a function of construal mindset and cessation framing (Study 2).

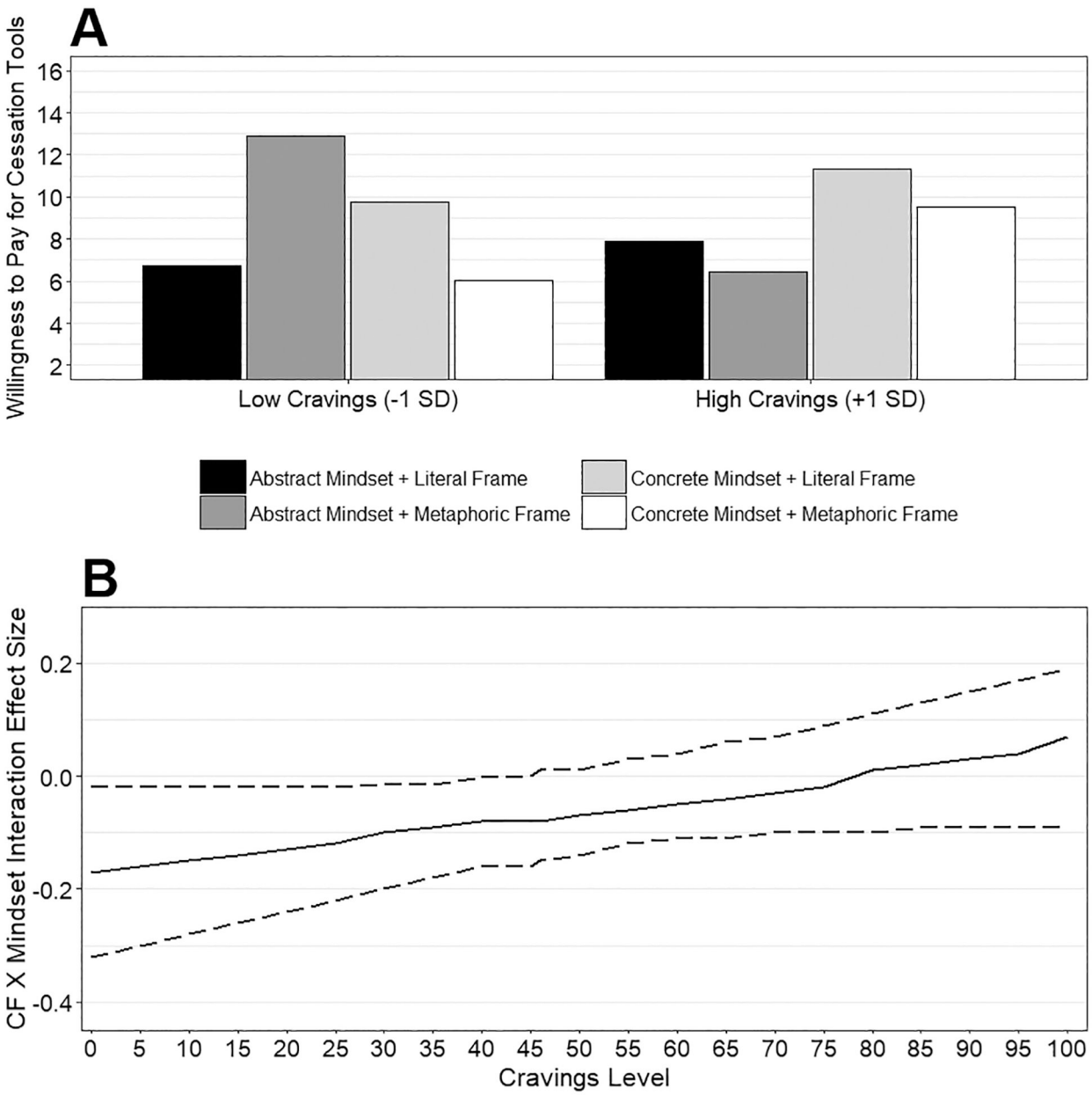

Figure 6.

Willingness to pay for cessation tools as a function of construal mindset, cessation framing, and cravings (Study 2). Panel A depicts the conditional effects of the Mindset × Cessation framing interaction at low (−1 SD) and high (+1 SD) levels of cravings. Panel B graphs the Mindset × Cessation framing effect on quitting confidence by cravings level. CF = Cessation framing. The horizontal line at 0 indicates no Mindset × Cessation framing effect. A significant effect is present when this line does not fall between the 95% CI lines.