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# The Message As A Seed: Predicting The Diffusion Of Anti-Smoking Arguments From Message Construal

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# The Message As A Seed: Predicting The Diffusion Of Anti-Smoking Arguments From Message Construal

## **Abstract**

For many years, mass media health campaigns have strived to change population health-related attitudes and intentions. While it is important to assess the direct effects of exposure to health campaign messages on these campaign outcomes, it is equally valuable to examine whether messages can be further propagated into the public communication environment. When people decide to replicate (replication) the core arguments used in campaign messages as they diffuse them to additional campaign targets, this enhances the reach of a campaign. Moreover, when people extend (extension) the core arguments of campaign messages by diffusing arguments in the same category as the campaign theme but those not specifically targeted in campaign messages, this increases the diversity of campaign-relevant communication. This dissertation aimed to examine how exposure to anti-smoking campaign messages influences patterns of replication and extension with four experimental studies.

The first two studies examined whether message exposure can lead to replication and extension. Then, guided by construal level theory, the latter two studies examined whether different message characteristics and mindsets can increase or decrease patterns of extension. Study 1 found that exposure to why appeal messages (messages about reasons to quit smoking) and how appeal messages (messages about methods to quit smoking) influenced people to choose arguments that were targeted by the messages they were exposed to, to send to smokers. Study 2 focused on whether exposure to these messages influenced the selection of arguments that were consistent with the appeals (why and how), but were not targeted by the messages participants were exposed to, and found partial support. Study 3 found that exposure to why appeal messages with proximal temporal frames could hinder the selection of non-targeted why arguments. However, no support was found for the hypothesis that inducing different construal mindsets could increase or decrease the selection of non-targeted arguments (Study 4).

The studies provided empirical tests of replication and extension—both outcomes that are important for advancing campaign effects. They also delved into the research question of whether certain message characteristics can promote or undermine the pattern of extension. Study results can inform campaign developers about which message strategies could be successful in further propagating campaign-relevant information into the public communication environment.

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THE MESSAGE AS A SEED: PREDICTING THE DIFFUSION OF  
ANTI-SMOKING ARGUMENTS FROM MESSAGE CONSTRUAL

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Degree of Doctor of Philosophy

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THE MESSAGE AS A SEED:  
PREDICTING THE DIFFUSION OF  
ANTI-SMOKING ARGUMENTS  
FROM MESSAGE CONSTRUAL

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## **ABSTRACT**

### **THE MESSAGE AS A SEED: PREDICTING THE DIFFUSION OF ANTI-SMOKING ARGUMENTS FROM MESSAGE CONSTRUAL**

Stella J. Lee

Robert C. Hornik

For many years, mass media health campaigns have strived to change population health-related attitudes and intentions. While it is important to assess the direct effects of exposure to health campaign messages on these campaign outcomes, it is equally valuable to examine whether messages can be further propagated into the public communication environment. When people decide to replicate (replication) the core arguments used in campaign messages as they diffuse them to additional campaign targets, this enhances the reach of a campaign. Moreover, when people extend (extension) the core arguments of campaign messages by diffusing arguments in the same category as the campaign theme but those not specifically targeted in campaign messages, this increases the diversity of campaign-relevant communication. This dissertation aimed to examine how exposure to anti-smoking campaign messages influences patterns of replication and extension with four experimental studies.

The first two studies examined whether message exposure can lead to replication and extension. Then, guided by construal level theory, the latter two studies examined whether different message characteristics and mindsets can increase or decrease patterns



of extension. Study 1 found that exposure to why appeal messages (messages about reasons to quit smoking) and how appeal messages (messages about methods to quit smoking) influenced people to choose arguments that were targeted by the messages they were exposed to, to send to smokers. Study 2 focused on whether exposure to these messages influenced the selection of arguments that were consistent with the appeals (why and how), but were not targeted by the messages participants were exposed to, and found partial support. Study 3 found that exposure to why appeal messages with proximal temporal frames could hinder the selection of non-targeted why arguments. However, no support was found for the hypothesis that inducing different construal mindsets could increase or decrease the selection of non-targeted arguments (Study 4).

The studies provided empirical tests of replication and extension—both outcomes that are important for advancing campaign effects. They also delved into the research question of whether certain message characteristics can promote or undermine the pattern of extension. Study results can inform campaign developers about which message strategies could be successful in further propagating campaign-relevant information into the public communication environment.

## TABLE OF CONTENTS

<b>LIST OF TABLES</b> .....	x
<b>LIST OF FIGURES</b> .....	xi
<b>Introduction</b> .....	1
<b>Literature Review</b> .....	4
<b>Campaign Message Effects and Interpersonal Communication</b> .....	4
<b>Core Concepts and Tenets of the Construal Level Theory</b> .....	12
<b>Construal Level Theory and Prediction of Thoughts and Language</b> .....	15
<b>Construal Level Theory and Message Effects</b> .....	18
<b>Overview of Studies</b> .....	23
<b>Study 1 Introduction</b> .....	27
<b>Pre-Study – Pilot to Select Arguments</b> .....	28
<b>Method</b> .....	28
Pooling arguments. ....	28
Mechanical Turk pilot .....	28
Analysis to choose arguments .....	29
<b>Study 1: The Effect of Exposure to Why and How Messages on</b> .....	32
<b>Selection of Targeted Arguments</b> .....	32
<b>Hypotheses</b> .....	32
<b>Method</b> .....	32
Study design .....	32
Participants .....	33
Stimuli .....	33
Argument choice measure .....	36
Analysis .....	37
<b>Results</b> .....	39
<b>Discussion</b> .....	39
<b>Study 2: The Effect of Exposure to Why and How Messages on</b> .....	41
<b>Selection of Non-targeted Arguments</b> .....	41
<b>Hypotheses</b> .....	42
<b>Method</b> .....	42
Study design .....	42

Stimuli.....	43
Argument choice measure.....	44
Analysis.....	45
<b>Results</b> .....	45
<b>Discussion</b> .....	46
<b>Study 3: The Joint Effect of Temporal Frames and Message Appeals</b> .....	49
<b>on Non-targeted Argument Selection</b> .....	49
<b>Hypotheses</b> .....	51
<b>Method</b> .....	52
Study design.....	52
Participants.....	54
Stimuli.....	54
Argument choice measure.....	57
Analysis.....	57
<b>Results</b> .....	57
<b>Discussion</b> .....	59
<b>Study 4: The Joint Effect of Word Task and Message Appeals on</b> .....	63
<b>Non-targeted Argument Selection</b> .....	63
<b>Hypotheses</b> .....	64
<b>Method</b> .....	64
Study design.....	64
Participants.....	65
Stimuli.....	65
Construal level word task.....	65
Argument choice measure.....	66
Analysis.....	66
<b>Results</b> .....	66
<b>Discussion</b> .....	67
<b>General Discussion</b> .....	70
<b>Summary of Results</b> .....	70
<b>Implications</b> .....	71
<b>Limitations</b> .....	76
<b>Future Directions</b> .....	79
<b>Conclusion</b> .....	81

<b>APPENDICES</b> .....	82
<b>REFERENCES</b> .....	88

## LIST OF TABLES

Table 1. Examples of high vs. low construal characteristics .....	13
Table 2. Message characteristics pertaining to high versus low construal .....	22
Table 3 Rating score means and standard deviations for why and how arguments .....	30
Table 4. Study 1 means and standard deviations for the number of targeted arguments chosen (out of five) .....	39
Table 5. Study 2 means and standard deviations for the number of non-targeted why and how arguments chosen .....	45
Table 6. Study 3 means and standard deviations for the number of non-targeted why and how arguments chosen .....	57
Table 7. Study 4 means and standard deviations for the number of non-targeted why arguments chosen .....	66

## LIST OF FIGURES

Figure 1. Replication and extension.....	8
Figure 2. Example of Study 1 why and how messages.....	35
Figure 3. Example of Study 1 exposure procedure.....	36
Figure 4. Example of Study 1 argument choice measure and argument set .....	37
Figure 5. Study 3 conditions and number of participants .....	54
Figure 6. Study 3 example messages by conditions .....	56

## **Introduction**

For decades, mass communication health campaigns have strived to change a variety of health-related behaviors, such as drug use, tobacco use, exercise, and fruit and vegetable consumption. As such, most health communication research has focused on examining how exposure to campaign messages can influence intention and behavior change. Recent research has also explored how interpersonal communication around campaign messages can help or hurt the effect of campaign exposure on outcomes such as attitudes and intentions. However, researchers have seldom focused on how interpersonal communication may be able to propagate campaign-relevant information to campaign targets.

This dissertation aimed to examine how exposure to campaign messages influences people to replicate (replication) or extend (extension) the core arguments used in campaign messages as they diffuse them to additional campaign targets (Cappella, 2002). Replication refers to whether people choose to transmit the same arguments targeted in campaign messages to campaign targets. Extension means arguments that people choose to diffuse are in the same category as the campaign theme (e.g., reasons to quit smoking), but were not specifically targeted in campaign messages. Examining how replication and extension can be shaped in response to message exposure can provide insight into how campaign messages can trigger the spread of more campaign-relevant communication into the public communication environment. Ultimately, outcomes of replication and extension are significant because they are both expected to contribute to improved campaign outcomes of intention and behavior change. Replication ensures that core information targeted by campaign messages reaches a larger audience, thereby

increasing the potential to move more people in the campaign's intended direction. Extension increases the diversity of campaign-relevant communication which in turn can strengthen campaign effects via mechanisms of repeated exposure (i.e., exposure to a number of different arguments that encourage health behavior change) and tailoring (i.e., an argument that was not targeted by messages, but tailored to a specific campaign target). In sum, message exposure-induced propagation processes may enhance campaign effects by extending the span of exposure to message-specific information, and by expanding the depth of message-relevant information.

Through four studies, this dissertation attempted to examine how exposure to anti-smoking messages can influence people's choice of arguments to send to smokers (i.e., campaign targets). Guided by principles of construal level theory (Trope & Liberman, 2010), Study 1 tested whether exposure to messages influenced people to choose the specific arguments targeted by the messages they were exposed to, to send to smokers (replication). Study 1 found that exposure to messages increased the likelihood of choosing targeted arguments to transmit to smokers. Study 2 began to examine extension by testing whether exposure to messages prompted people to choose arguments that were in the same category as the message themes, but were not specifically targeted by the messages they were exposed to. Study 2 found evidence that supported this hypothesis. Study 3 then investigated the research question of whether manipulating different message characteristics could influence the pattern of extension. That is, whether manipulating certain message characteristics could boost or hinder the choice of non-targeted arguments to send to smokers. Study 3 results indicated that exposure to certain message characteristics could hinder the choice of non-targeted arguments. Finally, Study



4 explored whether different modes of processing (high vs. low construal mindsets) could also encourage or discourage the choice of non-targeted arguments to send to smokers. However, Study 4 did not find any significant results. Nonetheless, the studies provide confirmation that exposure to messages can indeed influence the ways people choose arguments to transmit to others, whether they are the same ones targeted by the messages or ones that are in the same category as the message theme, but not targeted by messages. Study 3 in particular indicated that the use of certain message characteristics can actually hinder the flow of campaign-relevant information from reaching others. This opens up further future research directions for investigating the relationship between certain message characteristics and outcomes of propagation, which will be able to provide campaign developers with knowledge about which message strategies can facilitate the successful propagation of message content through the public communication environment.

## Literature Review

### Campaign Message Effects and Interpersonal Communication

Scholarly interest in examining mass communication effects in concert with interpersonal communication effects has burgeoned since Katz and Lazarsfeld's, *Personal Influence* (1955), which affirms the importance of social networks and our conversations with others in diffusing information and adopting new behaviors. In line with this tradition, current research on public health campaigns has also begun to acknowledge that mass media campaign messages are not received in a void, but accepted within the context of conversation with others. The dominant framework used to conceptualize the role of interpersonal communication in public health campaigns is to view interpersonal communication as a moderator of campaign effects or a mediator of campaign effects (Southwell & Yzer, 2007). Briefly, interpersonal communication as a mediator of mass media campaigns suggests two roles of interpersonal communication: extending campaign reach and inducing behavior change. First, interpersonal communication may expose a target individual to the campaign message (i.e., diffuse the campaign message) when that individual has not yet seen the campaign message, thus extending the campaign's reach. Whether people diffuse the core arguments of campaign messages to others around them has yet been directly tested, but research in other contexts, such as national news events suggest that news tends to travel rapidly through social networks (Larsen & Hill, 1954). Second, campaign exposure might lead a person to talk with others about the campaign message, and discover positive or negative norms or attitudes regarding the target behavior and lead them towards or away from behavior change. For example, it has been demonstrated that anti-smoking campaign messages

influence smoking cessation intention and behavior via discussion about campaigns, which suggests a mediating role of interpersonal communication (van den Putte, Yzer, Southwell, de Bruijn, & Willemsen, 2011). Similarly, analysis of the Truth Campaign found that campaign exposure led to campaign-related conversation which in turn had a positive effect on youth anti-smoking beliefs (Hwang, 2012). Interpersonal communication as a moderator indicates that it can amplify or dampen campaign effects. For instance, the effect of exposure to an HIV-prevention campaign on HIV testing was stronger for respondents who had discussed HIV with others (Rimal, Limaye, Roberts, Brown, & Mkandawire, 2013), indicating the moderating role of interpersonal communication on campaign effects. In an experimental setting, those who watched an HPV vaccine ad and talked about it subsequently held more positive attitudes towards getting the HPV vaccine compared to those who only watched the ad (Dunlop, Kashima, & Wakefield, 2010).

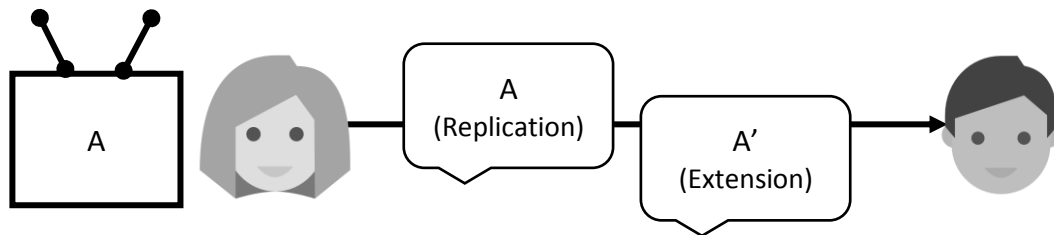
In addition to literature that establishes the importance of the presence of interpersonal communication in realizing campaign effectiveness, the call for an understanding of *how* and *when* interpersonal communication can mediate or moderate campaign effects (Southwell & Yzer, 2009) has also led to studies that examine the mechanism and conditions under which interpersonal communication exerts influence in the process of campaign effects. For example, some studies have explored more specific elements of conversations such as, conversational valence and conversation partner characteristics (e.g., David, Cappella, & Fishbein, 2006; Dunlop, 2011; Hendriks, Bruijn, Meehan, & Putte, 2016; Hendriks, de Bruijn, & van den Putte, 2012; Richards, 2014) as part of an effort to determine the conditions for when interpersonal communication

matters for behavior change. For instance, Hendriks and colleagues (2012) demonstrated that anti-alcohol message exposure led to negative conversations about alcohol consumption, which in turn increased intentions to refrain from binge drinking. In this study, dyad participants were randomly assigned to two conditions where in one condition the participants watched an anti-alcohol message while the other condition did not. All participants were asked to talk about alcohol and binge drinking after watching or not watching the message. The study was able to show that exposure to an anti-drinking campaign message affected intention to refrain from binge drinking through conversational valence which was measured as how favorable or unfavorable participants recalled their conversation about alcohol to be. In a similar vein, Brennan and colleagues (Brennan, Durkin, Wakefield, & Kashima, 2016) were able to examine conversations that ensued after exposure to anti-smoking messages in a more naturalistic context, where participants were asked to watch anti-smoking messages at home and later asked to recall the content of conversations about the messages. Results suggested that conversations with favorable appraisals of the messages and those with quitting talk had positive effects on intention change. In contrast, it was also found that conversation could undermine message effects (David et al., 2006) if the conversation is dominated by conversation partners unfavorable to the messages' arguments. The study found that adolescents who chatted with their peers after watching anti-drug ads, exhibited weaker anti-marijuana beliefs than those who did not chat with their peers. This effect was mainly due to high sensation-seeking adolescents and those who are at more risk of using marijuana uttering more pro-drug comments than did low sensation-seeking adolescents and those with lower risk status.

In sum, recent research has explicated the way in which interpersonal communication can influence campaign effects by focusing on how certain components of interpersonal communication contribute to shaping campaign outcomes. Nonetheless, there are two gaps in this line of research. First, research has focused less on the role of interpersonal communication as a propagation mechanism, but more on whether it can affect immediate campaign outcomes such as attitude and intention change. Treating interpersonal communication as another consequential behavior that can promote the diffusion of campaign themes or other related information matters because it allows examination of whether campaign messages can penetrate society widely with varying chain reactions of further communication. This can ultimately contribute to potentially larger campaign outcomes because it expands the reach and diversity of campaign-related information. This focus on propagation corresponds well with the “media as meme” paradigm (Cappella, 2002). Cappella argues that media stories, like genes, are successful when they replicate themselves across a broader social environment. This is similar to the role of interpersonal communication acting as a mediator of campaigns by diffusing campaign themes and arguments to a broader audience (Southwell & Yzer, 2007). However, this notion has yet been empirically tested. For example, whether exposure to campaign messages influences people to replicate the core message to others around them is yet unknown (replication). Another characteristic of a gene is variation, where genes do not only replicate themselves, but also propagate variants of themselves. Interpersonal communication may also serve as a mechanism similar to variation when other information in the same category as the campaign themes are passed on by people who have been exposed to campaign messages (Adamic, Lento, Adar, & Ng, 2016; Cappella,

2002). For example, if a campaign message targets certain arguments about reasons to carry out a health behavior, people exposed to these messages may also diffuse other arguments that are about reasons to carry out a health behavior, but were not targeted specifically by the messages. I call this “extension” rather than “variation” to better capture the notion that a campaign theme can be extended via the diffusion of arguments that are of the same category as the campaign theme. Extension is important because it can broaden the range of public communication about campaign target behaviors, which can lead to enhanced campaign outcomes (Hornik, 2002; Hornik & Yanovitzky, 2003). I aim to examine interpersonal communication as a propagation mechanism by examining outcomes of replication and extension. Figure 1 represents these outcomes visually.

Figure 1. Replication and extension



A second gap in literature is that research has seldom delved into how different campaign messages can shape outcomes such as replication or extension. From the viewpoint of campaign developers, knowing how certain campaign message characteristics can shape post-exposure replication and extension is important because it can ultimately predict which message strategies would produce patterns of propagation conducive to campaign outcomes. While previously mentioned research on

conversational valence (e.g., Brennan et al., 2016; Hendriks et al., 2012) does not tap into outcomes of replication and extension, they explicate a mechanism for how interpersonal communication may promote or hinder campaign outcomes. However, they are descriptive in a sense that they cannot predict whether favorable or unfavorable conversations will result. Examining talk about campaign messages as a function of conversation partners provides some element of prediction (e.g., David et al., 2006; Hendriks et al., 2016; Richards, 2014), but campaign developers have little or no control over who people will converse with. In contrast, message characteristics are directly controllable components of a campaign. Examining how exposure to campaign message characteristics can influence outcomes of replication and extension will aid campaign developers' decisions in selecting campaign messages that will propagate successfully.

There are a few studies that delve into how certain message characteristics can drive replication (see Cappella, Kim, & Albarracín, 2015 for theoretical overview). For example, an analysis of New York Times health news articles revealed that articles with high informational utility and positive sentiment were shared more with others via email or social media (H. S. Kim, 2015). An experimental study found that participants who were exposed to content with high arousal emotions (e.g., amusement, anxiety) were more willing to share the content with others than those exposed to content with low arousal emotions (e.g., sadness, contentment) (Berger, 2011). These studies demonstrate that message characteristics such as, informational utility, positive sentiment, and arousal emotions help messages replicate to a larger audience via people's retransmission behaviors. However, these studies do not examine whether these message characteristics can promote the diffusion of extensions of the message content (i.e., extension).

While there are no studies that delve into the connection between message characteristics and extension, a handful of studies have examined the effect of message characteristics on characteristics of interpersonal communication, such as conversational valence. For example, Dunlop, Cotter, and Perez (2014) found that highly emotional ads (coded for being emotionally intense and powerful) were more successful than low emotion ads in generating interpersonal pressure. Also, smokers who reported receiving interpersonal pressure as a result of family and friends watching a high emotion ad were more likely to have salient quitting thoughts compared to those who were pressured by family and friends who saw a low emotion ad. Although these results indirectly indicate that message characteristics such as emotionality may affect the strength of interpersonal pressure, it is difficult to know what characterizes the interpersonal pressure generated by high emotion ads. Also, the cross-sectional nature of the data render causal inference difficult. To date, there are only two studies that explore how message characteristics affect post-message exposure conversational valence with experiments. Hendriks and colleagues (2014) examined whether messages with different types of emotions (fear, disgust, humor) affect the valence of conversations that happen after exposure to those messages. The study found that while a fear appeal message about anti-binge drinking elicited negative conversational valence towards binge drinking, other appeals were not related to conversational valence. However, a limitation is that the study did not examine the valence of conversations directly, but asked participants for their perceptions of conversational valence as a proxy. This is problematic because perceived conversational valence may reflect other cognitions, such as one's own attitudes or intentions towards binge drinking, instead of the objective conversation that occurred. Dunlop and



colleagues (2010) also examined whether message format (narrative vs. advocacy) could influence positive opinion sharing and favorability in post-exposure conversations. While positive opinion sharing was measured by content analyzing utterances of participants, conversation favorability was measured by asking participants to recall the tone of their conversations. Thus, research on the relationship between message characteristics and interpersonal communication characteristics has been scarce, and the outcome of interest has been limited to conversational valence. Moreover, studies have relied solely on recall or perceptions of conversations. To address this gap in research, I aim to examine how different message types can influence outcomes of replication and extension by capturing how people choose arguments to send to other people around them.

In predicting how certain messages can shape the diffusion and evolution of message-relevant information, I argue that construal level theory (Trope & Liberman, 2010) can provide a useful framework. In other words, I believe it can guide questions about how the nature of messages can affect the type of arguments an individual who is exposed to those messages will prefer to transmit to others. Briefly, construal level theory (CLT) is a theory that posits that people construe external stimuli such as actions and objects either abstractly or concretely. This mindset (construal level) of representing things abstractly or concretely has been shown to have an effect on a variety of outcomes such as, object evaluation, behavior change, and self-control (Soderberg, Callahan, Kochersberger, Amit, & Ledgerwood, 2015). Based on this line of research, I put forth the claim that exposure to certain messages can induce construal mindsets, which ultimately have the potential to affect the content of subsequent arguments people will choose to transmit to others. I first start with a review of the core concepts and principles

of CLT, and illustrate two lines of research: Literature that describes how construal level can impact the content and form of salient thoughts and language and research that operates on assumptions that certain message characteristics can elicit different construal level. I attempt to connect these two lines of research together which ultimately leads to my crucial hypotheses that the construal level of primary messages will shape post-exposure preference for construal-related arguments to transmit to others.

### **Core Concepts and Tenets of the Construal Level Theory**

CLT mainly asserts that people tend to construe, or mentally represent objects and actions at either an abstract (high construal) or concrete (low construal) level. A high level construal refers to relatively abstract, broad, and superordinate representations, whereas a low level construal represents an emphasis on concrete, detailed, and subordinate features. Trope and Liberman (2010) offer two criteria to distinguish which features of an object or event should be considered as high level construal or low level construal. The first criterion is centrality, which reflects the fact that changing a high level feature will impact the meaning of the object or event more than when changing a low level feature. For example, the meaning of a lecture would change more if the speaker (high level) is changed than when the room (low level) is changed. The second criterion is subordination, where the meaning of a low level feature depends more on the high level feature rather than vice versa. Following the previous example, when an individual is deciding whether to attend a lecture or not, the room the lecture is held in only becomes important when the topic is interesting. Some operationalizations of high versus low construal include desirability versus feasibility; attitudes versus past behavior;

primary features versus secondary features, and broad categories versus exemplars (Carrera, Muñoz, Caballero, Fernández, & Albarracín, 2012; A. Y. Lee, Keller, & Sternthal, 2010; Yan & Sengupta, 2013). Soderberg and colleagues (2015) provide a more detailed list of high versus low construal examples derived from an extensive meta-analysis of studies on CLT which is summarized and described in Table 1 of this manuscript. Taking desirability versus feasibility as an example, when one is in a high construal level mindset, or in other words, when one construes an action or object at a high level, the value of the action or object’s end state (‘why’ one should carry out an action or desirability components of an object) is considered more; whereas when one construes these at a low level, the means to reach the end state (‘how’ one should perform an action or feasibility components of an object) are considered more. Another important concept of CLT is psychological distance. Psychological distance is the extent to which an event or object is temporally, spatially, socially, and hypothetically removed from one’s own experience. That is, an object or event is psychologically distant if it occurs in the future, in a remote location, to others less like oneself, or with a small probability.

Table 1. Examples of high vs. low construal characteristics

High construal	Low construal
Desirability concerns	Feasibility concerns
Broad categories	Exemplars or narrow categories
Gestalts	Details
Words	Pictures
Primary features	Secondary features
Broad traits	Specific behaviors
Dispositional information	Situational information
Aggregate information	Individualized information
Overarching goals, values, or ideologies	Situation-specific demands

*Note.* From Soderberg et al., 2015, p. 526

Based on these two core concepts of construal and psychological distance, the most important proposition of CLT is that psychological distance has a bi-directional relationship with the level of mental construals (Liberman, Trope, & Wakslak, 2007; Trope & Liberman, 2010). To elaborate, numerous studies have found that people tend to think about psychologically distant objects (e.g. temporally, spatially, socially, hypothetically distant) in higher levels of construal, and when primed with higher levels of construal, tend to recall distant objects. As a brief example, Fujita and colleagues discovered that participants who watched a video and were led to believe the actions in the video took place in a spatially distant location, described the actions in the video in more abstract and general language than those who watched the same video but believed the actions occurred in a spatially near location (Fujita, Henderson, Eng, Trope, & Liberman, 2006). Specifically, participants who thought the actions occurred from a remote place described those actions in more abstract terms such as adjectives that refer to broader dispositional characteristics rather than concrete terms which include verbs that visibly describe situation specific details (Semin & Fiedler, 1988). Not only have studies found the direct link between psychological distance and construal level (i.e., that people think of distant objects and events in abstract and broad ways), but they have also found that the relationship between psychological distance and construal level has downstream consequences for decision-making and prediction. For example, participants who were instructed to think about buying a DVD player this week (near future) had higher evaluations of the DVD player when a presented message about the DVD player emphasized a feasibility feature (i.e., manual is easy to use) than when the message emphasized a desirability feature (i.e., DVD player is made with environmentally friendly

materials), while those instructed to think about buying a DVD player 3 months from now (distant future) had higher evaluations of the DVD player when the presented message was desirability-focused than when the message was feasibility-focused (Fujita, Eyal, Chaiken, Trope, & Liberman, 2008). These results can be explained by the fact that participants give more weight to desirability features because distant psychological distance induces a high construal level mindset while a low construal level mindset induced by proximal psychological distance makes participants more susceptible to feasibility concerns. A meta-analysis of CLT studies found a medium-sized effect of psychological distance on construal level (Hedges'  $g=.475$ ), and this effect size did not vary by different fields or authors. In addition, a medium-sized effect (Hedges'  $g=.526$ ) was also found for the downstream consequences of construal level (Soderberg et al., 2015), which suggests that the propositions of CLT are highly robust.

### **Construal Level Theory and Prediction of Thoughts and Language**

Based on the concepts and tenets of CLT, research has also delved into examining how high versus low construal may affect the content and form of thoughts and language. Scholars have examined whether construal levels influence the preference for certain content and the salience of particular thoughts by manipulating psychological distance. Most studies focus on psychological distance because psychological distance is known to influence construal mindsets. When it comes to the content of language and thoughts, most research has dealt with prominent high versus low level construal features such as desirability versus feasibility. For example, Young (2015) found that participants who viewed health messages about exercise, healthy eating, and stress reduction from a source

manipulated to be more similar in attitudes and demographic characteristics (close social distance) listed more feasibility-related health beliefs (low construal) than those who were manipulated so that they understood the message source to be dissimilar (far social distance) to them. The reverse pattern emerged for desirability-related health beliefs (high construal), where participants listed more desirability beliefs when they believed the message source to be dissimilar to themselves. It can be said that the perception of social proximity of the message source led to a low construal mindset which increased the salience of low construal features such as feasibility-related thoughts (e.g., “Set a time every day to just spend on exercise and have a support group to help you get motivated.”). Similarly, Lutchyn and Yzer (2011) found that those who were asked to think about eating fruits and vegetables in the near future (tomorrow and three months from now) listed more feasibility beliefs (e.g., “It is hard because it can be expensive”) while those who thought about performing the behavior in the distant future (six months from now and five years from now) listed more desirability beliefs (e.g., “Getting proper nutrient is important”). Another study examined whether people craft messages differently depending on the audience size they are considering (Joshi & Wakslak, 2014). Based on CLT, the authors theorized that people will construct more high construal level messages when they believe the audience is large. The rationale is that a communicator addressing a large audience must craft broad or general messages in order to successfully target many different types of individuals; the very reason high level construals are functionally utilized (Trope & Liberman, 2010). Also, people may link larger audiences with increased distance (i.e., increased social and spatial distance), which in turn will elicit a high construal from communicators, and result in high construal level messages.

One of the experiments manipulated audience size (one vs. 20 people) and asked participants to select arguments to persuade the audience to recycle. Participants asked to persuade 20 people selected more desirability arguments than those who were asked to persuade one individual. These results were also replicated in the context of spatially near versus distant audiences (Joshi, Wakslak, Raj, & Trope, 2016).

On one hand, some studies have focused on the form of language and thoughts by examining whether psychologically distant objects or events are talked about in more linguistically abstract terms, since psychological distance elicits an abstract mindset (e.g., Bhatia & Walasek, 2016; Huang, Burtch, Hong, & Polman, 2016; Snefjella & Kuperman, 2015). For instance, Snefjella and Kuperman (2015) analyzed a large corpus of Twitter messages and found that the linguistic concreteness of tweets mentioning a city decreased as the distance between the tweet author and the city mentioned in the tweet increased. Parallel results were found with regard to temporal distance (tweets mentioning time periods that range from “1 year ago” to “999 years ago”) and social distance (tweets mentioning groups of people that range from socially distant [e.g., foreigners, visitors] to socially close [e.g., family, friends] people) where the concreteness of tweets decreased as social and temporal distance increased. Bhatia and Walasek (2016) come to similar conclusions with an analysis of New York Times articles mentioning elections, where they found that the concreteness of articles decreased as the distance between the date the article was written and the date of the election mentioned in the article increased. In addition to large scale textual analyses, a number of experimental studies have also predicted the form of language based on CLT. For example, the previously mentioned study about audience size consideration also found that those asked to select arguments to

persuade a larger audience to buy an imaginary product chose more linguistically abstract arguments than those asked to persuade a smaller audience (Joshi & Wakslak, 2014). In addition, when asked to describe their daily life at school to incoming students geographically far away (spatially distant), participants used more abstract words in their descriptions than those asked to address students who were geographically close (spatially near) (Joshi et al., 2016).

To summarize, an induction of high or low construal (by manipulating psychological distance) is shown to drive the content (desirability vs. feasibility) of salient thoughts and the form (abstract vs. concrete) of language. This implies that if certain message characteristics can align with high or low construal, exposure to these messages will make construal-related content or form salient in people's minds.

### **Construal Level Theory and Message Effects**

Researchers have started to apply CLT to message effect studies under the assumption that a variety of message characteristics can be conceptualized as high or low construal features. This line of research mainly focuses on the effect of a message's construal level on message evaluation and persuasion. A majority of message effects studies based on CLT can be classified into two broad categories: 1) Research that examines how certain message topic and design combinations can be more effective than other combinations; and 2) studies that explore how messages can be tailored to certain individual characteristics. Both lines of research build off the premise that a construal level match across message components or message components and individual characteristics will lead to better persuasive outcomes. A comprehensive list of message



characteristics that are assumed to align with high versus low construal are organized in Table 2 from a review of the literature. First, scholars have hypothesized that messages will be more persuasive when the message features of the same construal level are combined together, as consistency of mental representation may improve message processing (e.g., Chandran & Menon, 2004; J. Kim & Nan, 2016; Pounders, Lee, & Mackert, 2015; White, MacDonnell, & Dahl, 2011). For example, White and colleagues (2011) hypothesized that gain frames, distant temporal frames, and why appeals activate a high construal mindset, while loss frames, proximal temporal frames, and how appeals induce a low construal mindset, and predicted that combining message characteristics consistent in their construal level will lead to greater persuasion than when message characteristics inconsistent in construal level are combined together. The conceptualization of distant temporal frames and why appeals into high construal is straightforward, as temporal frames are related to temporal distance and why appeals (i.e., appeals about reasons to carry out a behavior) tap into desirability concerns of CLT. What may be less apparent is how gain frames align with high construal, while loss frames activate a low construal. The authors argue that gain frames may activate a broad abstract mindset (high construal level) because attaining desirable goals requires guarding against errors of omission, while loss frames may activate a detailed concrete mindset (low construal level) as addressing the threats implied by loss requires guarding against errors of commission. In line with hypotheses, their experiment found that people who were shown loss frame/how appeal messages (i.e., “Think about what will be *lost*. Think about *ways* to make a difference”) and those exposed to gain frame/why appeal messages (i.e., “Think about what will be *gained*. Think about *reasons* to make a difference”)

exhibited more recycling behavior than before exposure to messages, while the recycling behavior of those in the loss frame/why appeal message condition and gain frame/how appeal message condition did not differ from their baseline behavior. In a separate experiment, this study also found that when the temporal frame of a message was more proximal (i.e., Recycle for a better Calgary *today*), participants reported more positive recycling intentions in response to the loss frame than the gain frame, while when the temporal frame was distant (i.e., Recycle for a better Calgary *tomorrow*), participants reported more positive recycling intentions in response to the gain frame than the loss frame. In a similar vein, Kim and Nan (2016) found that a present-oriented message (framing benefits of HPV vaccine as immediate) paired with a narrative format was more persuasive in increasing HPV vaccine intentions while a future-oriented message (framing benefits of HPV vaccine as long-term) was more effective when it was presented in a non-narrative format. Study hypotheses were formulated based on the authors' conceptualization of narratives as low construal features (as narratives are concrete and specific representations of characters and events) and non-narratives as high construal features. This study also provided support for the logic of matching construal level within messages since construal-consistent combinations such as pairing present-orientation (proximal temporal distance) and narratives (low construal) were more effective than inconsistent combinations.

Second, studies have hypothesized that if certain individual characteristics can be aligned with construal level, then matching the construal level of individual characteristics and the message may lead to more effective persuasion (e.g., Han, Duhachek, & Agrawal, 2016; A. Y. Lee et al., 2010; Nenkov, 2012; Semin, Higgins, de

Montes, Estourget, & Valencia, 2005). For instance, studies have noted that the individual characteristic of regulatory focus orientation can be mapped onto the dimension of construal level (A. Y. Lee et al., 2010; Semin et al., 2005). Promotion focused people move towards their goals in a broad manner to maximize fulfillment, and try to ensure not to miss any ‘hits’ (high construal level) while prevention focused people try to not make ‘mistakes’ and are concerned with security (low construal level) (Semin et al., 2005). It was also found that priming promotion orientations correlated strongly with measures of construal level (e.g., creating broad categories; abstract action/behavior identification) (A. Y. Lee et al., 2010). It is then possible to hypothesize that while low construal messages (e.g., messages with proximal temporal frames, feasibility information, or concrete language) will be more effective in persuading prevention focused people, while high construal messages (e.g., messages with distant temporal frames, desirability information, or abstract language) will fit promotion focused people more. A study found that participants with a promotion focus expressed higher intention to exercise in response to a sports promotion message written abstractly than a message written concretely, while those with a prevention focus indicated higher intention to exercise in response to a concrete message than an abstract message (Semin et al., 2005). In the context of advertising, Lee and colleagues (2010) found that promotion-primed people had higher brand attitudes in response to an advertisement for an elliptical that emphasized desirability features and reasons to use the product (e.g., ensures muscle building) than one that emphasized feasibility features and ways to use the product (e.g., multiple incline settings), while prevention-primed people had higher brand attitudes for the feasibility advertisement than the desirability advertisement.

In conclusion, a considerable amount of research has been devoted to predicting message effectiveness based on assumptions that certain message characteristics map onto high versus low construals. Study results that demonstrate the effectiveness of matching the construal level within messages and across messages and individual characteristics provide evidence that different message characteristics can map onto high versus low construal. If this is so, then exposure to different message characteristics could influence the content and form of salient construal-related thoughts which could ultimately affect the way people choose arguments to transmit to others.

Table 2. Message characteristics pertaining to high versus low construal

High construal	Low construal	References
Why appeals	How appeals	(Han et al., 2016; H. Kim, Rao, & Lee, 2009; A. Y. Lee et al., 2010; White et al., 2011)
Distant temporal frame	Proximal temporal frame	(Carrera et al., 2012; Chandran & Menon, 2004; J. Kim & Nan, 2016; Nenkov, 2012; Pounders et al., 2015; White et al., 2011)
Independent frame Non-narratives/Base-rate information	Interdependent frame Narratives/Case-risk information	(Pounders et al., 2015) (Fujita et al., 2008; J. Kim & Nan, 2016; Yan & Sengupta, 2013)
Gain frame	Loss frame	(Chandran & Menon, 2004; Pounders et al., 2015; White et al., 2011)
Guilt, shame appeals Novel topics	Sadness, fear appeals Familiar topics	(Trope & Liberman, 2010) (Trope & Liberman, 2010)

## **Overview of Studies**

As an exploratory attempt to predict how message content will be replicated or extended within a construal category by people exposed to messages, I examined argument choices as an outcome. Specifically, guided by CLT principles, I aimed to examine whether people's patterns of choosing arguments to send to smokers differ as a function of the type of anti-smoking messages they were exposed to. Through four studies, I focused on two types of content: Why appeals and how appeals. In the context of anti-smoking messages, why appeals refer to appeals that provide reasons to quit smoking, while how appeals refer to appeals that provide ways to quit smoking. These appeals were chosen primarily because the two appeals, in concept, respectively capture high versus low construals. According to CLT (Trope & Liberman, 2010), desirability attributes that are about the value of an action's end state are high level construal features, while feasibility attributes which are related to means to achieve an end state are low level construal features. Why appeals can be perceived as high level construals because they tap into desirability attributes, i.e., the value of an action's end state or 'why' one should perform a behavior (Eyal, Sagristano, Trope, Liberman, & Chaiken, 2009). How appeals are relatively low-level construal because they concern the means to an end (feasibility) by focusing on 'how' one should perform a behavior (Lutchyn & Yzer, 2011). In addition, many anti-smoking campaign messages commonly utilize these two types of appeals (Davis, Nonnemaker, Farrelly, & Niederdeppe, 2011; Durkin, Brennan, & Wakefield, 2012) because why and how appeals are aimed at changing attitudes and self-efficacy respectively, which are known determinants of behavior change according to the theory of planned behavior (Fishbein & Ajzen, 2010). For

example, the Food and Drug Administration's (FDA) "The Real Cost" tobacco prevention campaign ([www.hhs.gov/TheRealCost](http://www.hhs.gov/TheRealCost)) centers around reasons not to smoke such as, addiction, harmful chemicals and health consequences. The American Legacy Foundation's "Ex Campaign" (<https://www.becomeanex.org/>) focuses on providing methods useful for quitting such as identifying triggers and getting support from family and friends.

Using why and how appeal messages in Study 1, I first examined replication by testing the simple hypothesis of whether people choose to send smokers the exact same arguments used in the messages they were exposed to. Specifically, I tested whether those exposed to certain why appeal (how appeal) messages will choose to transmit the same why arguments (how arguments) targeted by the messages they were exposed to, compared to those who were not exposed to messages. The tendency to prefer specific targeted why or how arguments can be explained by propositions of CLT where it can be argued that why (how) appeals induce a high (low) construal which could reinforce people to choose the arguments used in why (how) appeals.

However, an alternative explanation for replication could be that of accessibility, in which participants could be choosing arguments targeted by the messages they were exposed to simply because the arguments are salient in memory. The purpose of Study 2 was to address this alternative explanation by testing whether participants exposed to why appeal messages choose more why-related arguments that were not directly targeted in the messages than those not exposed to any messages. This hypothesis is based on the notion that why (how) appeal messages would elicit a high (low) construal level which would influence one to prioritize why-related (how-related) arguments, even when they

are not explicitly targeted in the messages. The design of Study 2 thereby shifts away from replication, and expands the inquiry into whether certain message appeals can influence extension, i.e., the choice of arguments that are of the same category as the message theme, but were not targeted by messages.

Nonetheless, even if the hypothesis of Study 2 is confirmed, it is still difficult to argue that construal level is driving these results; it might be due to an increase in the accessibility to simply why-related (how-related) memory or beliefs, rather than an accessibility to a high (low) construal mindset. Therefore, Study 3 aims to uncover whether construal level is the mechanism underlying Study 2 by inducing construal level with message design characteristics unrelated to the message appeals (why or how). If certain message design characteristics can induce construal level consistent with the construal of message appeals, then the effect of message appeals on argument choice may be increased. Or on the other hand, if the construal of a message design characteristic and message appeal do not match, the effect of message appeals on argument choice could be reduced. Study 3 advances the test for whether construal level underlies argument choice, but also ventures into the seldom examined research question of whether certain combinations of message appeals and design can be more conducive to propagating certain types of arguments. Study 3 manipulates the message characteristic of temporal frames because it aligns well with CLT's concept of psychological distance and has been researched sufficiently in the message effects domain (see Table 2).

Finally, Study 4 provides further evidence by inducing construal level with a manipulation entirely separate from messages—a word task validated to induce high versus low construal mindsets (Fujita, Trope, Liberman, & Levin-Sagi, 2006a). Parallel

to the logic of Study 3, if a construal level consistent with message appeals boosts argument choice, or if an inconsistent construal level hinders argument choice, results will provide evidence that construal level is indeed the underlying mechanism of the effect of message appeals on argument choice. Study results will also demonstrate that different information processing modes (i.e., high vs. low construal mindsets) can boost or hinder the relationship between message exposure and the pattern of arguments chosen for diffusion.



## **Study 1 Introduction**

The simplest claim derived from CLT is that if a message has a high versus low construal level, the construal level will be carried over into arguments that will be chosen for diffusion. If a message has a high (low) construal level feature, it will elicit a high (low) construal level among those exposed to the message, which will reinforce them to prefer diffusing high (low) construal level arguments which have been targeted in the messages. Study 1 exposed participants to anti-smoking messages with why versus how appeals, and examined whether participants chose the exact same arguments used in the messages to send to smokers. Study 1 also effectively tested whether exposure to messages influences people to transmit message-specific arguments to others around them (i.e., replication). This is an aspect that has not been tested by previous research; previous studies have either assumed that talk about specific health campaign messages occurs (Dunlop et al., 2010). Moreover, other studies that studied the content of talk have focused mainly on appraisals of messages or talk about quitting smoking in general, rather than message-specific information (Brennan et al., 2016; Dunlop, 2011; Dunlop et al., 2014).

## Pre-Study – Pilot to Select Arguments

A pilot study was conducted to select why and how arguments that are relatively comparable in their likelihood to be chosen by people. This step was carried out to ensure that any observed differences in the tendency to choose arguments across conditions could be attributed only to message exposure, and not to arguments' inherent likelihood of being chosen. This was also an essential step to take since messages were constructed based on the arguments that were chosen.

### Method

**Pooling arguments.** A range of why and how arguments regarding tobacco cessation were garnered from government agency sponsored smoking cessation webpages such as the Centers for Disease Control and Prevention's (CDC) "Tips From Former Smokers" webpage (<https://www.cdc.gov/tobacco/campaign/tips/index.html>) and the National Cancer Institute's (NCI) "Smokefree.gov" webpage (<https://www.smokefree.gov>). A total of 19 why arguments and 20 how arguments about smoking cessation were collected. For example, one of the why arguments addressed benefits to the immune system as a reason to quit smoking (i.e., "*Quitting smoking strengthens your immune system, making you less likely to get sick.*"). One of the how arguments stated a method of avoiding smoking triggers to quit smoking (i.e., "*Identifying triggers that make you want to smoke and avoiding those triggers can help you quit smoking.*").

**Mechanical Turk pilot.** Amazon's Mechanical Turk (Mturk: [mturk.com](http://mturk.com)) workers ( $N=23$ ) were invited to rate the why and how arguments on their likelihood to be chosen

to send to smokers. The number of 23 workers was chosen based on previous research that found that 23 to 25 raters were enough to evaluate messages accurately (M. Kim & Cappella, 2014). For each argument, workers were asked: “*If you had to send arguments to smokers, how likely would you choose this argument about quitting smoking to send to smokers?*” Each argument was rated on a scale of one (*Very unlikely*) to five (*Very likely*). The order of all arguments (why and how) was randomized so that why and how arguments were interspersed among themselves.

**Analysis to choose arguments.** For each argument (19 why and 20 how arguments), raters’ individual ratings were averaged to create a rating score for each argument. How arguments tended to have lower scores (ranging from 2.43-4.04) than why arguments (ranging from 3.13-4.48). For the purposes of Study 1, a set of 10 why arguments and a set of 10 how arguments were chosen in a way that minimized the difference between set aggregate average ratings. For example, when ordered by rating scores, the top 10 how arguments were chosen while why arguments that had a similar range as the top 10 how arguments were chosen to minimize set differences. The average rating score for the 10 why arguments ( $M=3.80, SD=0.22$ ) was not significantly different from that of the 10 how arguments ( $M=3.78, SD=0.15$ );  $t(18)=.21, p=.84$ . In addition, Studies 2, 3, and 4 required 15 why and 15 how arguments. Similarly chosen 15 why ( $M=3.79, SD=0.34$ ) and 15 how arguments ( $M=3.66, SD=0.22$ ) did not differ significantly in their average scores;  $t(28)=1.25, p=.22$ . Arguments used for the studies and their respective rating scores are listed in Table 3.

Table 3 Rating score means and standard deviations for why and how arguments

Why arguments	Mean	SD	How arguments	Mean	SD
Quitting smoking will protect your friends and family from second hand smoke exposure.	4.17	0.72	Using medications or nicotine replacement therapy (NRT) can improve your chances of quitting.*	4.04	0.82
You can lead a more energetic life if you quit smoking.	4.17	0.94	Reminding yourself of your reasons for quitting will make quitting smoking easier.*	3.91	0.95
Quitting smoking will prevent your skin from ageing prematurely.	4.13	0.92	Doing smoke-free activities with your family and friends can help you quit smoking.*	3.87	0.97
Quit smoking and you'll be able to breathe better and cough less.*	4.13	0.76	Celebrating quit milestones will keep you motivated and focused on your quit goal.*	3.83	0.78
Quitting smoking strengthens your immune system, making you less likely to get sick.*	4.04	0.71	Identifying triggers that make you want to smoke and avoiding those triggers can help you quit smoking.*	3.78	1.24
Quitting smoking can lower your risk of type 2 diabetes.*	3.96	1.07	When trying to quit smoking, moderate physical activity can help you get through cravings.*	3.74	1.01
If you quit smoking, food will taste better and smell better.*	3.96	1.19	You can easily join an ex-smoker community to get advice on how to quit.*	3.74	0.96
Quitting smoking will keep your mouth healthy.*	3.78	1.04	Avoid cravings by having healthy snacks on hand, and you'll be able to quit smoking.*	3.7	0.93
You'll set a good example and show your family that a life without cigarettes is possible.*	3.7	1.29	Enrolling in an online quit smoking program or plan can help you quit smoking.*	3.7	0.93
Quitting smoking can reduce your risk of blindness.*	3.7	1.18	Keeping words of inspiration around the house will help you quit smoking.*	3.48	1.2
Quitting smoking can reduce your muscle aches and pains.*	3.65	1.19	Chewing on something will reduce cravings and help you quit smoking.*	3.43	0.99
Quitting smoking can reduce your risk of bone fractures.*	3.61	1.16	Throwing away all cigarette-related items will help you quit smoking.	3.43	1.27

Your home and car won't smell anymore if you quit smoking.*	3.43	1.16	Setting a quit date will make you more motivated to quit smoking.	3.43	1.16
If you quit smoking, you won't have to worry about when you can smoke next or where you can or can't smoke.	3.22	1.24	Asking your family and friends to not give you a cigarette will help you quit smoking.	3.39	1.31
Quitting smoking will keep your hearing sharp.	3.13	1.22	Going to smoke-free places where you can't smoke will help you quit smoking.	3.35	1.23

*Note.* \* indicates arguments used in Study 1.

## **Study 1: The Effect of Exposure to Why and How Messages on Selection of Targeted Arguments**

### **Hypotheses**

**H1a.** Participants exposed to why messages will choose more why arguments targeted in the messages to send to smokers than those not exposed to messages.

**H1b.** Participants exposed to how messages will choose more how arguments targeted in the messages to send to smokers than those not exposed to messages.

### **Method**

**Study design.** A three condition (why message condition; how message condition; control condition) experiment was conducted online using the Qualtrics survey platform (qualtrics.com). Participants ( $N=300$ ) were randomized to one of three conditions, where participants assigned to the why message condition were exposed to five why messages randomly chosen from a pool of 10 why messages, while participants assigned to the how message condition were exposed to five how messages randomly chosen from a pool of 10 how messages. Participants exposed to messages answered argument choice measures after exposure, while participants in the control group answered argument choice measures without being exposed to any messages. All participants answered demographics questions after answering argument choice measures.

**Participants.** Three hundred participants who had not smoked at least a 100 cigarettes in their life (non-smokers) were recruited from the MTurk crowd-source platform to participate in this online experiment. Non-smokers were recruited because they were expected to be more motivated to send smokers arguments about quitting smoking, while current smokers may lack the motivation to do so. In addition, former smokers may be motivated to send smokers arguments about quitting smoking, but may have more solid ideas or opinions about quitting smoking which may render them less susceptible to any message exposure. Participants' mean age was 35.93 ( $SD=12.26$ ), and 56.67% of participants were female. The sample was 71% White, 11% African American, and 17.99% Other. Fewer than 1% had less than a high school education (0.33%), 7% had completed high school, 28.67% had some college education, and 64% had a college degree or more.

**Stimuli.** The pools of 10 why messages and 10 how messages were constructed based on the 10 why arguments and 10 how arguments chosen through the pilot study. Each message centered on a why argument (or how argument) that explains reasons to quit smoking (or explains ways to quit smoking). Each message stated its argument verbatim and included additional information that explained the argument further. The why messages included the statement: "Why should you quit smoking?" to emphasize why-related (high construal level) aspects of the messages, while the how messages included the statement: "How can you quit smoking?" to highlight how-related (low construal level) aspects of the messages (Han et al., 2016; A. Y. Lee et al., 2010). For example, the why message constructed based on the why argument, "*Quitting smoking strengthens your immune system, making you less likely to get sick*" read as: "Why should

*you quit smoking? Quitting smoking strengthens your immune system, making you less likely to get sick. Quitting smoking stops damage to the immune system and makes it easier to fight off infections.*” The how message constructed based on the how argument, “*Identifying triggers that make you want to smoke and avoiding those triggers can help you quit smoking*” was: “*How can you quit smoking? Identifying triggers that make you want to smoke and avoiding those triggers can help you quit smoking. Avoiding activities or feelings linked with smoking, such as drinking coffee or feeling down will help you quit smoking.*” Samples of messages used in Study 1 are included in Figure 2. Participants in the treatment conditions (why message condition and how message condition) were exposed to five messages randomly selected from their assigned category message pool of 10 messages in random order. Figure 3 shows an example of what a participant is exposed to. This multiple-message design can provide stronger evidence about the generalization of message effects (O’Keefe, 2015) as each participant will receive a different set of messages from the category he/she was assigned to. In addition, exposure to five messages allowed for repeated exposure to construal level features which could lead to enhanced effects (Hornik, 2002; S. J. Lee et al., 2016). External validity is also extended as campaign targets in the real world are commonly not exposed to a single message, but multiple messages.



Figure 2. Example of Study 1 why and how messages

Why message	How message
<p style="text-align: center;"><b>WHY</b> should you quit smoking?</p> <p><input checked="" type="checkbox"/> Quitting smoking will help you breathe better and cough less. Quitting smoking stops the inflammation and irritation in lungs which can lead to easier breathing.</p>	<p style="text-align: center;"><b>HOW</b> can you quit smoking?</p> <p><input checked="" type="checkbox"/> Identifying triggers that make you want to smoke and avoiding those triggers can help you quit smoking. Avoiding activities or feelings linked with smoking, such as drinking coffee or feeling down will help you quit smoking.</p>
<p style="text-align: center;"><b>WHY</b> should you quit smoking?</p> <p><input checked="" type="checkbox"/> If you quit smoking, food will taste better and smell better. Quitting smoking can regain the sensitivity of taste buds and the nose so that food tastes and smells better.</p>	<p style="text-align: center;"><b>HOW</b> can you quit smoking?</p> <p><input checked="" type="checkbox"/> Avoid cravings by having healthy snacks on hand, and you'll be able to quit smoking. Cravings can start when blood sugar is low so having snacks on hand can reduce cravings.</p>

Figure 3. Example of Study 1 exposure procedure

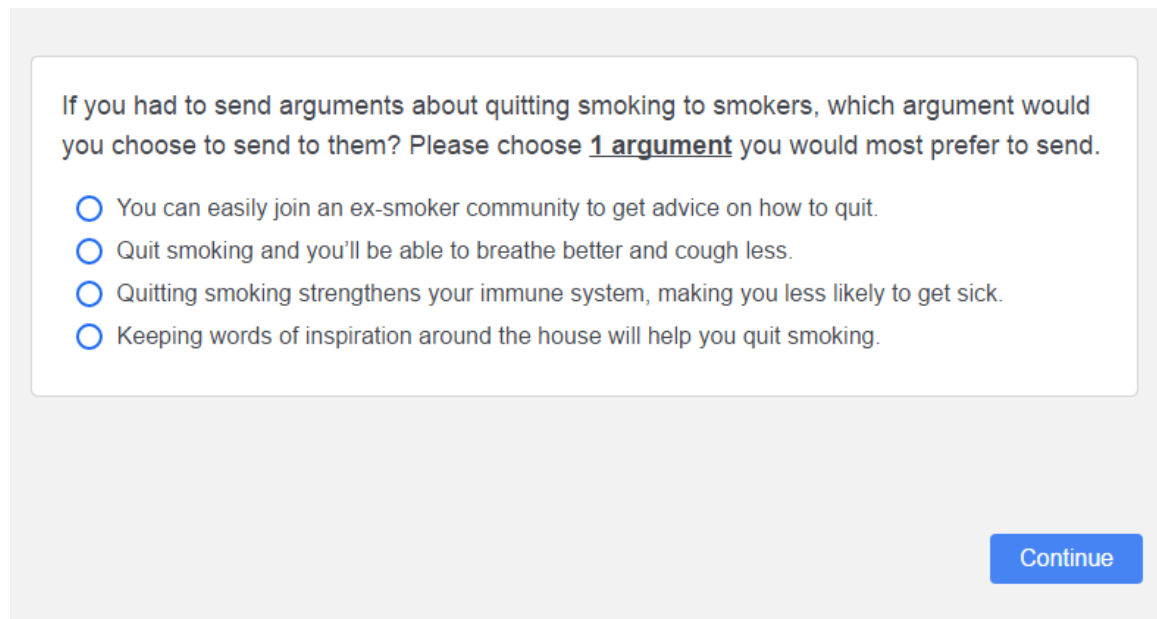


*Note.* Figure 3 shows an example of what participants in the why message condition received.

**Argument choice measure.** Participants' argument choice was measured by asking participants to choose five arguments they would send to smokers from a pool of 20 arguments. The provided pool of 20 arguments was comprised of the 10 arguments targeted in the 10 why messages and the 10 arguments targeted in the 10 how messages. In other words, the pool included 10 arguments that were the same arguments used in the

10 why messages and 10 arguments that were the same arguments targeted in the 10 how messages. The 20 arguments were presented in five sets of four arguments, where participants were instructed to choose one argument for each set (*“If you had to send arguments about quitting smoking to smokers, which argument would you choose to send to them? Please choose 1 argument you would most prefer to send.”*). Each set presented two why arguments and two how arguments from respective pools of why arguments and how arguments in random order. Figure 4 presents an example of what the measure and a set of arguments looked like.

Figure 4. Example of Study 1 argument choice measure and argument set



The image shows a screenshot of a survey question. The question text is: "If you had to send arguments about quitting smoking to smokers, which argument would you choose to send to them? Please choose **1 argument** you would most prefer to send." Below the question are four radio button options: "You can easily join an ex-smoker community to get advice on how to quit.", "Quit smoking and you'll be able to breathe better and cough less.", "Quitting smoking strengthens your immune system, making you less likely to get sick.", and "Keeping words of inspiration around the house will help you quit smoking." A blue "Continue" button is located at the bottom right of the question box.

**Analysis.** To address hypotheses H1a and H1b, the number of targeted arguments (i.e., the same five arguments targeted in the messages each participant saw) chosen in the treatment group (those exposed to why/how appeal messages) must be compared to a control condition that does not expose participants to any messages, but produces comparable estimates of targeted arguments chosen. However, it is important to note that

this true control condition is technically not observable because there is no way by design we can know the number of exact arguments participants in the control condition will choose because control condition participants are not exposed to any messages. In other words, the number of targeted arguments the control condition participants chose is not identifiable because the standard for computing targeted arguments does not exist. The number of targeted arguments chosen can only be computed by counting the number of common arguments between those the participant chose and those that were present in the messages the participant was exposed to. This is impossible to do for the observed control condition because participants in this condition were not exposed to any messages. Instead, the expected value of the number of targeted arguments chosen for the true control condition can be estimated by conceptualizing it to be the number of matched arguments people would have chosen if the messages had no effect at all. This expected value can be derived from the observed control condition where it is half the average number of why (or how) arguments participants in the observed control condition choose (See proof in Appendix 1). Therefore, two-sample t-tests comparing the number of targeted why (how) arguments chosen and the expected value of targeted why (how) arguments chosen by the true control condition were conducted. The maximum score of 5 could only be achieved if the respondent chose all the arguments reflected in the messages he or she had seen, and, the algorithm had assigned each of those arguments to one of the choice sets. In practice this ‘perfect’ assignment situation rarely happened so, in fact the expected upper limit was lower (3.89).

## Results

Table 4. Study 1 means and standard deviations for the number of targeted arguments chosen (out of five)

Why message condition	How message condition	Control condition
$M^W=1.93$ ( $SD=1.03$ )	$M^H=1.72$ ( $SD=1.24$ )	$M^W=1.2$ ( $SD=0.79$ )
		$M^H=1.3$ ( $SD=0.79$ )

*Note.*  $M^W$  indicates the number of targeted why arguments chosen.  $M^H$  indicates the number of targeted how arguments chosen.

Table 4 presents means and standard deviations for the number of targeted arguments chosen by condition. Participants exposed to why messages ( $n=91$ ) significantly chose more targeted arguments than the estimated number of targeted why arguments chosen by the true control condition ( $n=95$ );  $t(168.72)=5.41, p<.01$ . In parallel, those exposed to how messages ( $n=114$ ) chose more targeted arguments than the estimated number of targeted how arguments chosen by the true control condition;  $t(194.44)=2.97, p<.01$ . Therefore, both H1a and H1b were supported.

## Discussion

The primary purpose of Study 1 was to examine whether participants choose arguments that were addressed in messages they were exposed to in the context of diffusing information to other smokers. For both participants that received why or how messages, this hypothesis was confirmed. Study 1 results demonstrate that exposure to messages influences people to choose arguments to send to smokers that are addressed specifically in the messages; an assumption that has not been directly tested in previous research. These results can be explained by CLT where it can be that highlighting high

(low) construal level aspects of why one should quit smoking (how one can quit smoking) reinforces people to choose the arguments that were targeted by the messages. On the other hand, these results can also be explained by the fact that exposure to messages increased memory about those specific arguments or that additional information about the arguments included in the messages increased arguments' likelihood to be deemed as suitable arguments to pass along. Study 2 addresses this limitation by examining argument choice of construal level-defined categories.

## **Study 2: The Effect of Exposure to Why and How Messages on Selection of Non-targeted Arguments**

The limitation of Study 1 is that even though participants chose more why (how) arguments used in the why (how) messages they were exposed to than true control group estimates, these results can be explained by memory effects instead of construal level. It is possible that encoded memory of the messages (and the arguments targeted by the messages) influenced the selection of arguments. To address this limitation, Study 2 expands its scope to examining whether exposure to why or how messages affects people's preference for arguments that were not targeted in the messages, but match CLT-defined categories of arguments such as, why vs. how arguments.

Based on propositions of CLT, it can be argued that while a why message will elicit a high construal mindset, a how message will elicit a low construal mindset. It has been found that people induced into a high construal mindset tend to value desirability features more than feasibility features while the reverse pattern arises for those in a low construal mindset (Fujita et al., 2008; Liberman & Trope, 1998). If a high (low) construal mindset increases the weight given to high (low) construal level attributes, such as desirability, goals, and values (feasibility, means) then an individual induced into a high (low) construal mindset would come to prefer arguments in line with those attributes, even when those arguments are not specifically targeted within the messages. Therefore, it can be hypothesized that participants exposed to why (how) messages will choose more why-related (how-related) arguments not targeted within the messages than those who were not exposed to any messages at all.

In addition to further testing CLT claims in the message research domain, Study 2 aims to provide evidence that message exposure may stimulate campaign theme-relevant talk beyond simple diffusion of campaign messages. As shown in Study 1, exposure to campaign messages contributes to the flow of information where those exposed to campaign messages become willing to send message-specific information (arguments) to smokers around them (Southwell & Yzer, 2007). Study 2 advances this notion by proposing the possibility that message exposure may stimulate diffusion of new types of information (i.e., extension) consistent with the campaign theme (Hornik & Yanovitzky, 2003). This has practical implications for campaign effects since additional exposure to other information consistent with campaign themes may enhance campaign effects. For example, while some arguments espoused by campaign messages may not resonate with campaign targets, other theme-consistent arguments put forth by people around them may influence their attitudes and intentions, thereby augmenting campaign effects.

## **Hypotheses**

**H2a.** Participants exposed to why messages will choose more non-targeted why arguments to send to smokers than those not exposed to any messages.

**H2b.** Participants exposed to how messages will choose more non-targeted how arguments to send to smokers than those not exposed to any messages.

## **Method**

**Study design.** A three condition (why message condition; how message condition; control condition) experiment was carried out online using the Qualtrics survey platform.



Participants ( $N=300$ ) were randomly assigned to one of the three conditions. Participants were either exposed to five why messages randomly chosen from a pool of 15 why messages (why message condition) or five how messages also randomly chosen from a pool of 15 how appeal messages (how message condition) or not exposed to any messages (control condition). Those exposed to messages answered argument choice measures following message exposure, while those in the control condition only answered the argument choice measures. It is important to note that in contrast to Study 1, the argument choice measures used for Study 2 did not include the arguments that were targeted by the messages participants were exposed to as answer choices.

**Participants.** Three hundred participants who had not smoked at least a 100 cigarettes in their life (non-smokers) were recruited from MTurk's crowd-source platform to participate in this online experiment. Participants' mean age was 35.14 ( $SD=12.41$ ), and 54.67% of participants were female. The sample was 72.67% White, 8.6% African American, and 20.33% Other. Fewer than 1% had less than a high school education (0.67%), 8.67% had completed high school, 29% had some college education, and 61.67% had a college degree or more.

**Stimuli.** In addition to the 10 why messages and 10 how messages used in Study 1, five additional messages for each appeal were created to construct a pool of 15 why messages and 15 how appeal messages. These messages each addressed arguments that were chosen through the pilot study and adopted the same message features used by Study 1 messages. Participants in the treatment conditions (why message condition and how message condition) were exposed to five messages randomly selected from their

assigned category message pool of 15 messages in random order. The format of the treatments was equivalent to what Study 1 participants had received.

**Argument choice measure.** Parallel to Study 1, participants in all conditions were instructed to choose five arguments they would send to smokers from a pool of 20 arguments. The provided pool of arguments was comprised of 10 why arguments and 10 how arguments that did *not* overlap with the arguments targeted in the messages participants are exposed to. This way, the measure effectively restricted participants' choice of arguments to those that they had not been exposed to but are of the same category (why vs. how) of arguments that were addressed in the messages. A non-overlap was ensured by first constructing a pool of all 15 why arguments and 15 how arguments used in Study 2. Using Javascript, the survey was programmed so that when participants were exposed to five randomly chosen why (how) messages, the argument choice measure would include the 10 remaining why (how) arguments from the pool of 15 why (how) arguments (that were not targeted in the messages they were exposed to), and 10 how (why) arguments randomly chosen from the pool of 15 how (why) arguments (see Appendix 2 for Javascript). Participants in the control condition received 10 randomly chosen why arguments from the pool of 15 why arguments and 10 randomly chosen how arguments from the pool of 15 how arguments. In the same manner as Study 1, the 20 arguments were presented in five sets of four arguments, where participants were instructed to choose one argument for each set (*"If you had to send arguments about quitting smoking to smokers, which argument would you choose to send to them? Please choose 1 argument you would most prefer to send."*). Each set presented two why arguments and two how arguments from respective pools of why arguments and how

arguments in random order. When coding argument choice as 1 if it was a why argument and 0 if it was a how argument, the alpha for this five-item argument choice measure was .55 for the control condition (using the Kuder-Richardson formula for binary scales). This means that there is an individual difference in the tendency for people to choose why arguments or how arguments. It is also true that control condition respondents, overall, favored why over how arguments by a small margin (53.6% to 46.4%), as shown below in Table 5.

**Analysis.** To address hypothesis H2a, the number of why arguments chosen by why message condition participants was compared to that of control condition participants. Similarly, to address hypothesis H2b, the number of how arguments chosen by how message condition participants was compared to that of control condition participants.

## Results

Table 5. Study 2 means and standard deviations for the number of non-targeted why and how arguments chosen

Why message condition	How message condition	Control condition
$M^W=3.37$ ( $SD=1.52$ )	$M^H=2.44$ ( $SD=1.54$ )	$M^W=2.68$ ( $SD=1.49$ )
		$M^H=2.32$ ( $SD=1.49$ )

*Note.*  $M^W$  indicates the number of why arguments chosen.  $M^H$  indicates the number of how arguments chosen.

Table 5 presents means and standard deviations for the number of non-targeted why and how arguments chosen by condition. Participants exposed to why messages ( $n=117$ ) significantly chose more why arguments that were not targeted by the messages

they were exposed to than participants who were not exposed to any messages ( $n=101$ );  $t(216)=3.34, p<.01$ . In contrast, the number of how arguments chosen was not significantly different across participants exposed to how messages ( $n=82$ ) and those who were not exposed to any messages;  $t(181)=0.54, p=.59$ . Results supported H2a, but not H2b.

## **Discussion**

Study 2 hypothesized that when participants are exposed to messages of high (low) construal, they will become more inclined to choose arguments that are of high (low) construal even when those arguments are not specifically targeted in the messages. This effect was only observed for those exposed to why messages (H2a), but not those exposed to how messages (H2b). Results indicated that exposure to why messages may enhance campaign effects by motivating people to diffuse other why-relevant information or arguments to campaign targets. These results also partially support the underlying explanation of CLT by demonstrating an increased tendency to choose arguments of high construal (why) when exposed to messages of high construal (why). However, Study 2 results could be interpreted differently; that it is not a high construal level elicitation driving results, but that exposure to why messages merely activated thoughts related to values and desirability. To address this limitation, Study 3 aimed to induce a construal level mindset by manipulating message features unrelated to the message appeals.

Before moving on to Study 3, it is worthwhile to address the asymmetrical results of only why (but not how) message exposure exerting an effect on argument choice. These results could be attributed to the context of anti-smoking messages and tobacco

cessation behavior. Most anti-smoking communication campaigns focus on reasons to quit smoking or not to smoke (Davis et al., 2011), and these campaigns target a broader audience that involves both non-smokers and smokers. On the other hand, messages about how to quit smoking are only relevant to those who do smoke. Therefore, the study population of non-smokers might have been only movable in a why direction because of this familiarity with campaign messages emphasizing desirability aspects and because reasons to quit/not smoke are more relevant to themselves. This speculation indicates that the application of CLT to health behavior change contexts may not be universal, but behavior specific. For example, Lutchyn and Yzer (2011) found that while participants instructed to think about eating fruits and vegetables in the far future reported more desirability (why) beliefs than those thinking about the behavior in the near future, this effect was not found for condom use behavior. The authors attribute this pattern to the familiarity of behaviors where the heavy focus of public health campaigns and educational efforts on the desirability aspects of condom use may have made these beliefs well-rehearsed, and led to null effects of temporal distance. Thus the level of prior experience or knowledge about health behaviors may contribute to patterns of results inconsistent with construal level theory (Snefjella & Kuperman, 2015).

Another explanation regards the nature of tobacco use and cessation behavior itself. Since tobacco use is an addictive behavior, tips on how to quit smoking may seem rather secondary to reasons to quit smoking; while participants in the study may appreciate sending reasons to quit smoking as helpful because it may affect decisions to quit, noting methods on how to quit smoking may seem largely irrelevant if it is perceived that addiction is taking control of tobacco use behavior (Fishbein & Ajzen,

2010). Thus, it may be that the study population envisions smokers to have a mentality of wanting to quit because of numerous reasons that may still be valuable to reiterate, but finding it very difficult due to addiction, which may make people judge how arguments to be not as helpful. This assumption can be somewhat corroborated with the argument pilot results where ratings for the original pool of 20 how arguments (range: 2.43-4.04) were generally lower than the original pool of 19 why arguments (range: 3.13-4.48). Of course, it is important to note that these arguments garnered from websites do not represent the entire population of why and how arguments, and therefore this explanation should be considered as post-hoc. Although speculative, either explanation highlights the need to carefully consider behavior-specific knowledge and background when applying CLT to health behavior change contexts.

### **Study 3: The Joint Effect of Temporal Frames and Message Appeals on Non-targeted Argument Selection**

Study 2 demonstrated that participants exposed to why appeal messages chose more why arguments that were not targeted by the messages they were exposed to in comparison to those who were not exposed to any messages. This may indicate that construal level is an underlying mechanism since those exposed to high construal appeal messages (why messages) chose more arguments of high construal (why arguments) even when those arguments were not targeted in the messages they were exposed to. However, these results can be explained with other theories. For example, spreading activation, which refers to how the activation of one concept in memory can increase the probability that another connected concept is also activated (Dinauer & Fink, 2005; Judd, Drake, Downing, & Krosnick, 1991) can explain these results. It may well be that exposure to why appeal messages activated or increased accessibility to why-related memory or beliefs which in turn led to more why-related arguments chosen, *not* because a high construal mindset became salient.

To address this challenge to inference, Study 3 manipulated a message design element unrelated to why versus how appeals, but related to construal level, and examined whether the joint effect of this design element and appeals would affect argument choice in a way that is consistent with CLT. At the same time, Study 3 advances the research question of whether certain message characteristics can promote or hinder the selection of campaign theme-relevant arguments for diffusion. Study 3 manipulated the design element of temporal frames because it aligns well with the notion of temporal distance in CLT and has been researched most extensively in the context of

message effects research (see Table 2). In this study, temporal frames were manipulated by referencing periods of time in the near vs. distant future or present vs. future (Chandran & Menon, 2004; White et al., 2011). Temporal distance is assumed to evoke a high construal mindset. Then, when a distant temporal frame is aligned with why appeals, this may boost selection of non-targeted why arguments because of the consistency in construal level. Or when why appeals are presented with proximal temporal frames, the tendency to choose why arguments may be hindered because of inconsistent construal level. The same logic can apply to how appeals where selection of argument choice may be amplified when appeals are paired with proximal temporal frames, but not when they are paired with distant temporal frames. This logic is similar to message effect studies that examine the effect of a construal level match or mismatch within messages on persuasion (Pounders et al., 2015; White et al., 2011).

It is important to note that this augmentation or reduction in argument selection can only be detected in a relative sense, by comparing conditions that differ in how messages are constructed. Study 3 aimed not only to examine construal matched (e.g., why appeals with distant temporal frames) and mismatched messages (e.g., why appeals with proximal temporal frames), but also with additional control messages that did not include temporal frames (e.g., why appeal messages without temporal frames). Most previous studies have only compared conditions that differ in whether construal level is matched or mismatched (J. Kim & Nan, 2016; White et al., 2011). However, it is important to go a step beyond and compare matched and mismatched messages to another control message that only uses one of the features. This step is important for theoretical and practical reasons. Theoretically, an additional control message will offer



more information about how construal level comes into play. For example, compared to a why control message condition, results can show whether a distant temporal frame boosts argument selection (why-distant temporal frame condition > why control condition) or whether a proximal temporal frame hinders effects (why-proximal temporal frame condition < why control condition) or whether both happen. While examining construal matched versus unmatched conditions will only provide evidence for whether matching construal is better than not matching construal, an additional control condition will help explain the underlying mechanism of the pattern of results. In terms of practicality, campaign developers may not only be interested in whether certain combinations of message features work well in further propagating message-related arguments, but also how it may compare to messages that use only one type of feature. Therefore, Study 3 examines the hypotheses below.

### **Hypotheses**

**H3a.** Participants exposed to why messages with distant temporal frames will choose more non-targeted why arguments to send to smokers than those exposed to why messages without any temporal frames.

**H3b.** Participants exposed to why messages with proximal temporal frames will choose fewer non-targeted why arguments to send to smokers than those exposed to why messages without any temporal frames.

**H3c.** Participants exposed to how messages with proximal temporal frames will choose more non-targeted how arguments to send to smokers than those exposed to how messages without any temporal frames.

**H3d.** Participants exposed to how messages with distant temporal frames will choose fewer non-targeted how arguments to send to smokers than those exposed to how messages without any temporal frames.

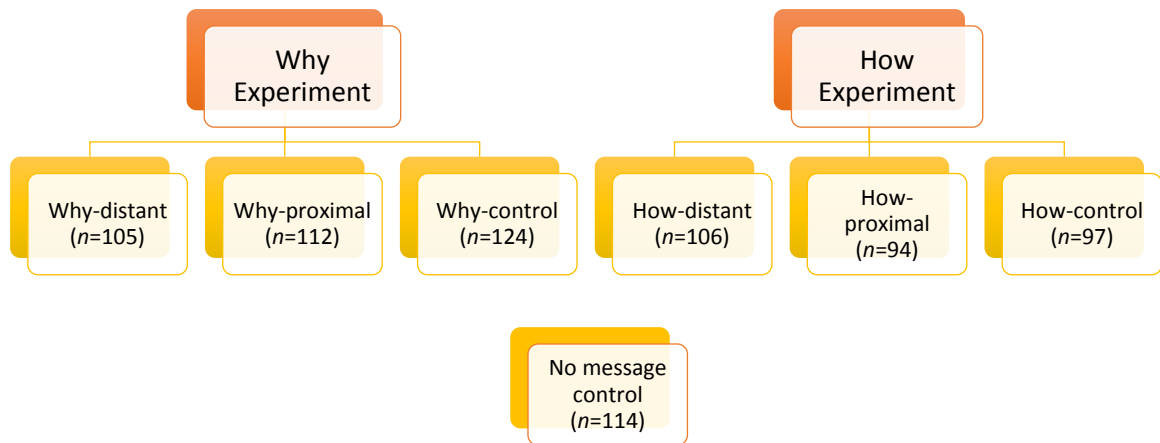
## **Method**

**Study design.** Two parallel experiments were designed to address the four hypotheses. The first experiment addressed hypotheses H3a and H3b by manipulating temporal frames in why messages, and measuring non-targeted why argument choice (why experiment). The second experiment addressed hypotheses H3c and H3d by manipulating temporal frames in how messages, and measuring non-targeted how argument choice (how experiment). Both experiments were hosted on the Qualtrics survey platform. Figure 5 describes the conditions of the why and how experiments, and the number of participants per condition. The why experiment addressed the effect of exposure to why appeal messages on selection of non-targeted why arguments. This experiment consisted of four conditions to which participants were randomly assigned to: 1) Why-distant temporal frame condition; 2) Why-proximal temporal frame condition; 3) Why-control condition; 4) No message control condition (which is shared across the why and the how experiments). Participants assigned to the why-distant temporal frame condition were exposed to five randomly chosen why messages presented with distant temporal frames from a pool of 15 why-distant temporal frame messages. Participants assigned to the why-proximal temporal frame condition were exposed to five randomly chosen why messages presented with proximal temporal frames from a pool of 15 why-proximal temporal frame messages. Participants assigned to the why-control condition

were exposed to five randomly chosen why messages presented without any proximal temporal frames from a pool of 15 why-control messages. Participants assigned to the no message control condition were not exposed to any messages. Participants answered the same argument choice measures used in Study 2 after exposure to messages (or without any exposure).

The how experiment addressed the effect of exposure to how appeal messages on selection of non-targeted how arguments. This experiment consisted of four conditions to which participants were randomly assigned to: 1) How-distant temporal frame condition; 2) How-proximal temporal frame condition; 3) How-control condition; 4) No message control condition (shared). Participants assigned to the how-distant temporal frame condition were exposed to five randomly chosen how messages presented with distant temporal frames from a pool of 15 how-distant temporal frame messages. Participants assigned to the how-proximal temporal frame condition were exposed to five randomly chosen how messages presented with proximal temporal frames from a pool of 15 how-proximal temporal frame messages. Participants assigned to the how-control condition were exposed to five randomly chosen how messages presented without any proximal temporal frames from a pool of 15 how-control messages. Participants assigned to the no message control condition were not exposed to any messages. Participants answered the same argument choice measures used in Study 2 after exposure to messages (or without any exposure).

Figure 5. Study 3 conditions and number of participants



**Participants.** Seven hundred and fifty-two participants who had not smoked at least a 100 cigarettes in their life (non-smokers) were invited from Mturk’s platform to participate in Study 3. Participants’ mean age was 36.29 ( $SD=12.71$ ), and 64.63% of participants were female. The sample was 74.87% White, 9.44% African American, and 15.69% Other. Fewer than one percent had less than a high school education (0.27%), 8.78% had completed high school, 26.46% had some college education, and 64.49% had a college degree or more.

**Stimuli.** Temporal frames were manipulated using two features. First, a day vs. year frame was used following previous research by Chandran and Menon (2004). Taking why messages as an example, the distant temporal frame messages included the statements: “EVERY YEAR a significant number of smokers quit smoking and enjoy the

benefits of doing so” and “EVERY YEAR people quit smoking and [why argument; e.g., breathe better and cough less]”. The proximal temporal frame messages included the statements: “EVERY DAY a significant number of smokers quit smoking and enjoy the benefits of doing so” and “EVERY DAY people quit smoking and [why argument; e.g., breathe better and cough less]”. Second, a reference to the present or distant future was added to the messages which was adopted from research by White and colleagues (2011). The distant temporal frame messages included the statement: “Quit smoking for a better YEAR TO COME”, while the proximal temporal frame messages included the statement: “Quit smoking for a better TODAY”. Control messages retained the information by the messages with temporal frames, but were presented without references to temporal distance by removing “EVERY DAY” or “EVERY YEAR” from the day vs. year frames, and by omitting the explicit reference to either quit smoking for a better today or a better year to come. The how messages also used the day vs. year frame and an explicit reference to the present or future, but the content was altered to reflect how appeals. Figure 6 presents examples of messages by conditions.

Figure 6. Study 3 example messages by conditions

	Why	How
Distant temporal frame	<p style="text-align: center;"><b>WHY</b></p> <p style="text-align: center;">should you quit smoking?</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> <b>EVERY YEAR</b> a significant number of smokers quit smoking and enjoy the benefits of doing so.</li> <li><input checked="" type="checkbox"/> <b>EVERY YEAR</b> people quit smoking and breathe better and cough less.</li> </ul> <p style="text-align: center;">Quitting smoking stops the inflammation and irritation in lungs which can lead to easier breathing.</p> <p style="text-align: center;">Quit for a better <b>YEAR TO COME!</b></p>	<p style="text-align: center;"><b>HOW</b></p> <p style="text-align: center;">can you quit smoking?</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> <b>EVERY YEAR</b> a significant number of smokers quit smoking and so can you.</li> <li><input checked="" type="checkbox"/> <b>EVERY YEAR</b> smokers quit smoking by identifying triggers that make them want to smoke and avoiding those triggers.</li> </ul> <p style="text-align: center;">Avoiding activities or feelings linked with smoking, such as drinking coffee or feeling down will help you quit smoking.</p> <p style="text-align: center;">There are ways to start quitting <b>THIS YEAR!</b></p>
Proximal temporal frame	<p style="text-align: center;"><b>WHY</b></p> <p style="text-align: center;">should you quit smoking?</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> <b>EVERY DAY</b> a significant number of smokers quit smoking and enjoy the benefits of doing so.</li> <li><input checked="" type="checkbox"/> <b>EVERY DAY</b> people quit smoking and breathe better and cough less.</li> </ul> <p style="text-align: center;">Quitting smoking stops the inflammation and irritation in lungs which can lead to easier breathing.</p> <p style="text-align: center;">Quit for a better <b>TODAY!</b></p>	<p style="text-align: center;"><b>HOW</b></p> <p style="text-align: center;">can you quit smoking?</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> <b>EVERY DAY</b> a significant number of smokers quit smoking and so can you.</li> <li><input checked="" type="checkbox"/> <b>EVERY DAY</b> smokers quit smoking by identifying triggers that make them want to smoke and avoiding those triggers.</li> </ul> <p style="text-align: center;">Avoiding activities or feelings linked with smoking, such as drinking coffee or feeling down will help you quit smoking.</p> <p style="text-align: center;">There are ways to start quitting <b>TODAY!</b></p>
Control	<p style="text-align: center;"><b>WHY</b></p> <p style="text-align: center;">should you quit smoking?</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> A significant number of smokers quit smoking and enjoy the benefits of doing so.</li> <li><input checked="" type="checkbox"/> People quit smoking and breathe better and cough less.</li> </ul> <p style="text-align: center;">Quitting smoking stops the inflammation and irritation in lungs which can lead to easier breathing.</p>	<p style="text-align: center;"><b>HOW</b></p> <p style="text-align: center;">can you quit smoking?</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> A significant number of smokers quit smoking and so can you.</li> <li><input checked="" type="checkbox"/> Smokers quit smoking by identifying triggers that make them want to smoke and avoiding those triggers.</li> </ul> <p style="text-align: center;">Avoiding activities or feelings linked with smoking, such as drinking coffee or feeling down will help you quit smoking.</p>

**Argument choice measure.** Study 3 utilized the same argument choice measure that was used in Study 2. As a reminder, participants were instructed to choose one argument they would like to send to smokers out of four arguments five times (sets). Each set contained two why arguments and two how arguments randomly pooled from a pool of arguments that did not overlap with the arguments that were targeted in the messages participants were exposed to. For the why experiment, the dependent variable was the number of non-targeted why arguments chosen, while the dependent variable for the how experiment was the number of non-targeted how arguments chosen. The alpha of this five-item measure for the no message control condition was .59.

**Analysis.** To address H3a, H3b, H3c, and H3d, an analysis of variance was conducted for both experiments to first determine whether there was any overall significant difference across conditions in the number of non-targeted why arguments chosen or the number of non-targeted how arguments chosen. When needed, planned contrasts were used to compare each condition to the control message conditions (why-control condition and how-control condition) to examine the pattern of effects.

## Results

Table 6. Study 3 means and standard deviations for the number of non-targeted why and how arguments chosen

	Distant temporal frame	Proximal temporal frame	Control	No message control
Why experiment	$M^W=3.28^{a,b}$ ( $SD=1.40$ )	$M^W=2.91^{a,c}$ ( $SD=1.42$ )	$M^W=3.44^b$ ( $SD=1.53$ )	$M^W=2.65^c$ ( $SD=1.53$ )
How experiment	$M^H=2.72^{d,e}$ ( $SD=1.53$ )	$M^H=2.72^d$ ( $SD=1.43$ )	$M^H=2.86^d$ ( $SD=1.52$ )	$M^H=2.35^e$ ( $SD=1.53$ )

*Note.* Entries within a row which share a superscript are not significantly different from one another at  $p<.05$ .  $M^W$  indicates the number of non-targeted why arguments chosen and  $M^H$  indicates the number of non-targeted how arguments chosen.

Table 6 shows the mean number of non-targeted why and how arguments chosen by conditions. An analysis of variance revealed that there was a significant difference in the number of non-targeted why arguments chosen across why experimental conditions;  $F(3, 451)=6.88, p<.01$ . Planned contrasts showed that the number of non-targeted why arguments chosen was not significantly different for participants exposed to why messages with distant temporal frames and those exposed to why control messages (H3a);  $F(1, 451)=0.73, p=.39$ . However, those exposed to why messages with proximal temporal frames significantly chose fewer non-targeted why arguments than those exposed to why control messages (H3b);  $F(1, 451)=7.70, p<.01$ . In addition, participants exposed to why control messages significantly chose more non-targeted why arguments than participants who were not exposed to any messages, thereby replicating Study 2 results;  $F(1, 451)=17.27, p<.001$ .

For the how experimental conditions, the analysis of variance was marginally significant;  $F(3, 407)= 2.24, p=.08$ . Planned contrasts indicated that the number of non-targeted how arguments chosen was not significantly different across those exposed to how-distant messages and those exposed to how-control messages (H3c);  $F(1, 407)=0.43, p=.51$ . The outcome also did not differ by those exposed to how-proximal messages and those exposed to how-control messages (H3d);  $F(1, 407)=0.37, p=.55$ . However, participants exposed to the how-control messages significantly chose more non-targeted how arguments than those who were not exposed to any messages;  $F(1, 407)=5.87, p<.05$ .



## Discussion

Study 3 found that exposure to why messages with distant temporal frames were not different than why messages without reference to temporal distance in increasing participants' likelihood of choosing non-targeted why arguments to send to smokers. On the other hand, why messages with proximal temporal frames turned out to decrease participants' tendency to choose non-targeted why arguments compared to why messages without any temporal frames. In parallel, distal frames also were marginally more likely than proximal frames to increase preference for why arguments ( $p=.07$ ). Study 3 also found that the temporal character of the how messages had no significant influence on the number of non-targeted how arguments chosen. Still, it was found that exposure to how messages (how-distant, how-proximal, how-control messages) did significantly increase participants' tendency to choose non-targeted how arguments to send to smokers compared to those who were not exposed to any messages (marginally significant for how-distant messages;  $p=.07$ ). Such results imply that at least for why appeal messages, while adding distant temporal frames to why appeal messages will encourage a preference for more non-targeted why arguments to be shared with smokers, the addition of proximal temporal frames may actually hinder the diffusion of other why-related arguments from reaching smokers compared to messages that don't use any temporal frames at all. For how appeal messages, results indicate that exposure to how appeal messages can indeed stimulate a preference for non-targeted how arguments to transmit to smokers. This result is inconsistent with Study 2 results since Study 2 failed to show that exposure to how messages increased selection of non-targeted how arguments. However, this inconsistency may be attributed to the different messages used by Studies

2 and 3. While the how messages from Study 2 only featured the argument itself and a “HOW can you quit smoking” statement, Study 3 messages included additional information such as the fact that many smokers were able to quit smoking using the methods suggested by the how arguments. The increase in the amount of information delivered could explain why Study 3 how messages were successful in influencing the preference for non-targeted how arguments, but not Study 2 messages.

Regarding the why experiment results, the pattern of results help explain how construal level can affect the number of non-targeted why arguments chosen to send to smokers. Interestingly, results imply that adding a distant temporal frame with why appeals will not boost the tendency to select non-targeted why arguments. This result can be explained somewhat with some studies that have delved into how psychological distances interact with each other (K. Kim, Zhang, & Li, 2008; Maglio, Trope, & Liberman, 2013). For example, previous research showed that when manipulating an event’s social distance (an event for self vs. other) and its temporal distance (an event for tomorrow vs. one year later) together, participants’ perceived distance of an event for when an event was both socially distant and temporally distant was the same as when only one distance dimension was manipulated (i.e., either social distance or temporal distance) (K. Kim et al., 2008). This means that people do not perceive objects or events as being more far away when two distance dimensions are added, but perceive them to be farther away as much as when one distance dimension is induced. One explanation for this is that the induction of one distance decreases sensitivity to another distance induction, thereby leading to a subadditive effect (Maglio et al., 2013). Thus, while Study 3’s context is slightly different because it pairs construal (why appeal) and psychological

distance (temporal frames) together, its results may be explained by this subadditive effect. For the why appeal messages with distant temporal frames, psychological distance could have been induced by why appeals since research has shown that a high construal level leads to thoughts of distant objects and events (Trope & Liberman, 2010). Then this induction of distance could have reduced sensitivity to the distant temporal frame in the messages, leading to no difference in the number of non-targeted why arguments chosen compared to those exposed to why control messages.

On the other hand, the addition of temporal frames did not lead to any additive or subtractive effect on choosing non-targeted how arguments compared to how-control messages. This may have been because participants were already be predisposed towards why arguments (which could be attributed to prolonged exposure to health campaign messages that emphasize reasons to quit smoking or the perception of the addictive nature of tobacco consumption behavior). Participants may have not been motivated to process how messages and react sensitively to different temporal frames embedded in the messages. This coincides with a previous study that found that people chose more why arguments about recycling (reasons to recycle) than how arguments (ways to recycle) to send to others when thinking about a larger audience (distant psychological distance) compared to a small audience (proximal psychological distance), and that this effect was driven by those who were more motivated to persuade the audience about recycling (Joshi & Wakslak, 2014).

Results from the why experiment provide some evidence that construal level may underlie the effect of message exposure on argument choice because preference for why arguments was reduced when the construal of messages was inconsistent (i.e., why

appeals and proximal temporal frames). However, could there be an alternative explanation for these results? For example, could the statement “EVERY DAY a significant amount of people quit smoking and enjoy the benefits of doing so” from the why-proximal frame messages have been interpreted by participants to be unbelievable? Or could the statement “Quit for a better TODAY” have been interpreted as urging people to quit today, and provoke reactance? These interpretations could have led to lesser appreciation of the messages and why appeals, and could have influenced participants to choose fewer non-targeted why arguments than why control messages. Nevertheless, these concerns can be ameliorated by the fact that participants’ perceived effectiveness of the why-proximal frame messages ( $M= 3.88$ ;  $SD= .62$ ) was not significantly different from that of why-control messages ( $M= 3.81$ ;  $SD= .58$ );  $t(234)=-.88$ ,  $p=.38$ . This perceived effectiveness measure was included to provide a rationale for showing participants messages, and asked participants whether each message was “believable” and “convincing” on a scale of one (*Strongly disagree*) to five (*Strongly agree*) ( $\alpha=.80$  for why experiment conditions that received messages) (Zhao, Strasser, Cappella, Lerman, & Fishbein, 2011). While this post-hoc analysis can offer some support for construal level as a mechanism, other explanations such as the one described above could undermine the construal level logic. This is because there could be other explanations for how messages can exert an influence, especially since the manipulated construal level (temporal frames) lies within the messages. Study 4 aimed to address this limitation by inducing construal level with a task that is separate from the messages themselves.

#### **Study 4: The Joint Effect of Word Task and Message Appeals on Non-targeted Argument Selection**

Study 3 demonstrated that the combination of certain message appeals and design can influence the selection of arguments, while also providing further evidence that construal level underlies these effects. However, as mentioned above, because the additional construal level (temporal frames) is manipulated within the messages, there may be alternative explanations as to how this combination of features influenced argument selection. Therefore, Study 4 aims to replicate Study 3 results by inducing a construal level consistent with or inconsistent with message appeals using a task that is separate from the message itself. Since Study 3 did not exhibit any significant effects when manipulating temporal frames for how messages, Study 4 focused on why messages. To elaborate, if a participant is induced into a high construal mindset with a separate manipulation beforehand and then exposed to why messages, then the tendency to choose more non-targeted why arguments may be boosted because the why messages might be processed more fluently due to consistency of construal level. While this was not the case in Study 3 as the number of non-targeted why arguments chosen by participants exposed to why-distant temporal frame messages was the same as those exposed to why control messages, Study 4 tests this inquiry again. Or similar to Study 3, when people are exposed to why messages after a separate task induces them into a low construal mindset, the number of chosen non-targeted why arguments could be reduced due to inconsistency of construal level. If this pattern of results is seen in Study 4, we will be able to conclude with stronger confidence that construal level is the mechanism underlying the effect of message exposure on argument selection. In addition, the results

may also support the claim that one's mindset (abstract vs. concrete) at the time of processing a message can exert an effect on post-exposure argument choice patterns. This has practical implications since a variety of processing styles such as regulatory focus, decision status mindsets, and coping styles have been linked to construal level (Han et al., 2016; Nenkov, 2012; Semin et al., 2005).

## **Hypotheses**

**H4a.** Participants who are exposed to why messages after completing a high construal level task will choose more non-targeted why arguments to send to smokers than those only exposed to why messages.

**H4b.** Participants who are exposed to why messages after completing a low construal level task will choose fewer non-targeted why arguments to send to smokers than those only exposed to why messages.

## **Method**

**Study design.** A three condition online experiment was conducted for Study 4. Participants were randomly assigned to three conditions: 1) High construal task condition; 2) Low construal task condition; 3) No task condition. Participants assigned to the first condition first completed a word task designed to induce a high construal mindset (Fujita, Trope, Liberman, & Levin-Sagi, 2006b), and were then exposed to five why messages randomly chosen from a pool of 15 why messages. Participants assigned to the second condition completed a word task designed to induce a low construal mindset, followed by exposure to five why messages randomly chosen from a pool of 15

why messages. Participants assigned to the third condition did not complete any tasks, and were only exposed to five why messages randomly chosen from a pool of 15 why messages. After exposure, all participants answered the argument choice measure.

**Participants.** Participants who had not smoked at least a 100 cigarettes in their life (non-smokers) were invited from Mturk’s platform to participate in this study ( $N=446$ ) which was hosted on the Qualtrics survey platform. Participants’ mean age was 35.63 ( $SD=12.35$ ), and of 68.61% of participants were female. The sample was 75.56% White, 10.99% African American, and 13.44% Other. No one had less than a high school education, 7.40% had completed high school, 29.60% had some college education, and 63.00% had a college degree or more.

**Stimuli.** For the pool of why messages, Study 4 used the pool of 15 why control messages from Study 3.

**Construal level word task.** Construal level mindsets were manipulated by asking participants to engage in a series of word tasks known to induce high or low construal level mindsets (Fujita, Trope, Liberman, & Levin-Sagi, 2006b; S. J. Katz, Byrne, & Kent, 2016). In this task, participants were provided with a series of words ( $n=20$ ) such as, “RESTAURANT”, “MOUNTAIN”, and “COLLEGE”. Participants assigned to the high construal level condition were asked to generate a word that they think each provided word is an example of (high construal word task). For example, a valid response to the above words would be “BUSINESS”, “NATURE”, “EDUCATION”, respectively as restaurants can be thought of as an example of business; mountain an example of nature; and college an example of education. In contrast, participants assigned to the low construal level condition were provided with the same list of words but asked to generate

a word they think is an example of the provided word (low construal word task). For example, an appropriate response to the above words would be “APPLEBEES”, “MOUNT EVEREST”, “UPENN” respectively as Applebees can be thought of as an example of restaurant; mount Everest an example of mountain; and UPenn an example of college. The full list of words and instructions used in the superordinate word task and the subordinate word task can be seen in Appendix 3.

**Argument choice measure.** Study 4 used the same argument choice measure that was used in Studies 2 and 3. Participants were asked to choose arguments that they would send to smokers out of a pool of why arguments that were not targeted by the messages they were exposed to and a pool of how arguments. The number of non-targeted why arguments was the dependent variable of interest. In Study 3, the alpha for this scale was .59 among those in the no message control group.

**Analysis.** To address H4a and H4b, an analysis of variance was conducted to see whether the number of non-targeted why arguments differed across the three conditions. If needed, planned contrasts were to be used to compare each condition (high construal word task and low construal word task) to the condition without any word task.

## Results

Table 7. Study 4 means and standard deviations for the number of non-targeted why arguments chosen

High construal word task	Low construal word task	No word task
<i>M</i> =2.96 ( <i>SD</i> =1.44)	<i>M</i> =3.06 ( <i>SD</i> =1.56)	<i>M</i> =2.82 ( <i>SD</i> =1.55)

The average number of non-targeted why arguments chosen by each condition are presented in Table 7. An analysis of variance found that the number of non-targeted why



arguments chosen did not differ significantly across the three conditions;  $F(2, 443)=0.91$ ,  $p=.40$ . Therefore, Study 4 found no support for H4a and H4b.

## **Discussion**

Study 4 aimed to replicate Study 3 results by manipulating construal level with a word task separate from messages. However, regardless of which word task participants completed before exposure to why messages, the average number of non-targeted why arguments chosen was not significantly different from that of participants who were only exposed to why messages.

The results did not match the hypothesized effects derived from theory and that were expected given prior published studies. There may be a number of reasons for why effects did not manifest. First, the original word task for inducing high versus low construal instructs participants to answer 40 words (Fujita, Trope, et al., 2006b), not 20 words as implemented by Study 4. Study 4 had randomly selected 20 words out of the original list of 40 words, and asked participants to answer 20 words in order to prevent participant fatigue. This reduction in words may have contributed to a weak induction of construal level or no induction at all. Considering the fact that participants spent a median time of 3.4 minutes on the superordinate word task and 3.7 minutes on the subordinate word task, the manipulation may not have been enough to adequately induce high and low construal mindsets. To date, the only published study that has examined message processing after inducing a high versus low construal level was a study by Katz and colleagues (2016), which used the full list of 40 words to induce a high versus low construal among university students. That study reported success and showed that

participants induced into a high construal before reading messages that restricted choice had significantly lower perceptions of threat to freedom than those who were induced into a low construal (S. J. Katz et al., 2016). The lack of parallel effects in the current study may relate to manipulation strength, but could also relate to the difference in outcomes or the difference in populations from the previously published study.

Another possibility is that even if the word task managed to induce high versus low construal mindsets, the effects may have dissipated as time went by, which is plausible since participants are exposed to five messages before responding to the argument choice measure. The study on how construal level influences processing of threatening messages (S. J. Katz et al., 2016) exposed participants to only one message, which may have allowed the construal level induction to fully exert its effects on message processing. It is important to note that most studies that have utilized the word task to induce high or low construal level have measured outcomes right after the word task (Fujita, Trope, et al., 2006b; Hansen & Trope, 2013; Lerner, Streicher, Sachs, Raue, & Frey, 2015). For example, one study asked participants to judge risk probabilities for a variety of events (e.g., flu, cancer, fall) right after inducing a high versus low construal using the word task, and found that people induced into a high construal level had lower risk estimates than those induced into a low construal level (Lerner et al., 2015). In a similar vein, this word task was shown to affect why vs. how argument choice without any message exposure in a previous pilot conducted by the author. Specifically, participants who completed the high construal word task with 20 words chose more why-related arguments ( $M=4.43$ ,  $SD=1.35$ ) than those who completed the low construal word task ( $M=4.04$ ,  $SD=1.21$ );  $t(166)= 1.99$ ,  $p<.05$  when asked to choose six arguments out of

a list of seven why arguments and seven how arguments. Although the outcome measure of argument choice is different from what was used in Study 4, this result supports some speculation that it may have been difficult to keep a persistent high versus low construal mindset throughout message exposure. Future research may benefit by strengthening the word task manipulation, and considering shorter exposure to messages to enable the construal level mindset to persist through the processing of messages.

## General Discussion

### Summary of Results

Study 1 examined whether participants exposed to why appeal messages and how appeal messages choose the exact arguments targeted by the messages they saw to send to smokers around them. Study results showed that participants exposed to why appeal messages and those exposed to how appeal messages chose more targeted arguments than those who were not exposed to any messages. These results demonstrated that replication occurs; that exposure to messages influences people to choose arguments targeted in the messages to send to campaign targets (i.e., smokers). While evidence for replication was established, whether construal level was a mechanism of the effects was unclear. Study 2 attempted to strengthen the claim that construal level underlies the effect of exposure to messages on argument choice by examining extension—whether participants choose arguments in the same construal category as the appeals, but not targeted by the messages they were exposed to. Study 2 found that while participants exposed to why appeal messages chose more non-targeted why arguments than those not exposed to any messages, participants exposed to how appeal messages did not choose more non-targeted how arguments than those not exposed to any messages. Studies 3 and 4 aimed to provide further support for the mechanism of construal while simultaneously exploring the research question of how different message characteristics and mindset tasks can affect extension. Study 3 found that adding a proximal temporal frame to why appeal messages reduced selection of non-targeted why arguments compared to why appeal messages without temporal frames. Why appeal messages with distant temporal frames however influenced people to select as many non-targeted why arguments as why appeal

messages without temporal frames. In contrast, the addition of temporal frames to how appeal messages did not boost or hinder the selection of non-targeted how arguments. Study 4 manipulated high versus low construal with a word task separate from why appeal messages to replicate Study 3 results. However, the number of chosen non-targeted why arguments did not differ across participants who were exposed to why messages after completing a high construal word task, participants who were exposed to why messages after completing a low construal word task, and participants who were only exposed to why messages.

## **Implications**

The four studies have noteworthy implications for communication research and CLT research. Communication research on the relationship between campaign effects and interpersonal communication has tended to focus on interpersonal communication only in relation to how it will affect campaign outcomes such as attitude and intention change (e.g., Brennan et al., 2016; Dunlop, 2011; Dunlop et al., 2014). While direct effects are important, this emphasis neglects another essential role of interpersonal communication—propagation. People exposed to campaign messages have the potential to deliver core arguments of messages to campaign targets who haven't been exposed to the messages (replication) and to pass on extensions of the message arguments to campaign targets (extension). In the end, successful replication matters because it propagates campaign themes to a larger audience, which maximizes the potential for campaigns to change the behaviors of a larger population. Study 1 demonstrated that exposure to why and how messages influences people to prefer targeted why and how

arguments for propagation to campaign targets. While this seems like an obvious and simple hypothesis, previous research had not empirically tested this notion of replication. Successful extension means that a campaign message can propagate more campaign theme-relevant information beyond campaign-specific information. When campaign messages can trigger people to prefer a variety of campaign theme-relevant information for propagation to campaign targets, opportunities for behavior change increase because other information may resonate better with campaign targets than only the specific arguments addressed by campaign messages. Or campaign-specific information coupled with various other information may change campaign target behaviors better because of repeated exposure to a variety of arguments (Hornik, 2002; Montoya, Horton, Vevea, Citkowicz, & Lauber, 2017). Study 2 and Study 3 collectively found that exposure to why and how appeal messages prompted people to select non-targeted why and how arguments to send to smokers. Thus, in the context of anti-smoking messages with why and how appeals, results indicate that exposure to these messages can influence people to disseminate a variety of campaign-relevant information to campaign targets.

In addition to examining replication and extension as outcomes, Study 3 explored how different message characteristics may influence patterns of extension under the guidance of CLT principles. Extant research has rarely delved into how different message characteristics could shape the propagation of message-relevant information, despite campaign messages being the most controllable components of campaigns. Moreover, the handful of studies that do examine similar relationships such as the relationship between message characteristics and conversational valence tend to rely on participants' recall or perceptions of interpersonal communication (Dunlop et al., 2010; Hendriks et al., 2014).

The four studies presented here overcome this drawback by directly measuring how participants choose arguments to send to smokers. In particular, Study 3 found that the addition of proximal temporal frames to why appeal messages could reduce selection of non-targeted why arguments while the addition of distant temporal frames did not. This implies that exposure to why appeals with proximal temporal frames could weaken the propagation of why-related discourse, which could be detrimental to campaigns trying to emphasize reasons to carry out a specific behavior. Study 3 thus contributes to communication research by demonstrating that exposure to certain combinations of message topic and design could lead to a reduction of topic-relevant interpersonal communication—an effect most campaign developers would want to avoid.

The studies also have significant implications for CLT. First, the studies provide implications for considering CLT as a guiding theory for communication research. It is important to consider what the current studies' set of results suggest for using CLT as a theoretical framework overall. While Study 1 and Study 2 results could be explained with CLT, other mechanisms could underlie results as discussed previously. The more crucial test of CLT comes from Study 3 and Study 4, where temporal distance and construal were manipulated via messages and a word task. However, out of the studies' six hypotheses, support for only one hypothesis was found (H3b). While these results may seem discouraging, it may help to put these results into some context. For Study 3's hypothesis that predicted that exposure to why-distant messages would boost selection of non-targeted why arguments (H3a), support was not found. Nonetheless, as mentioned before, these results are consistent with recent CLT research on the interaction across two domains of psychological distance or construal, where the addition of two dimensions of

psychological distance or construal could lead to subadditive effects. In addition, while support was not found for the two hypotheses related to how appeals (H3c, H3d), I speculated that the particular characteristics of smoking behavior itself could have nullified the effects of construal level. I hypothesized that participants' tendencies to favor or pay attention to why appeals in the context of smoking behavior could have led to effects only manifesting for why appeals but not for how appeals (Lutchyn & Yzer, 2011). Therefore it may be that definitive predictions cannot be made from CLT alone when applying its principles to health behaviors. Study 4 did not find evidence for a reduction in why argument choice when priming people with low construal using a word task before exposure to why appeal messages. I attributed this null finding to the weak manipulation strength and the long duration of exposure to messages. As a whole, I would like to argue that behavioral peculiarities and differences in methods and participants could explain the pattern of results that did not quite line up with CLT. Quite alternatively, it could be that the theory's predictive validity is weak, but numerous psychology studies attest to its robustness (Soderberg et al., 2015; Trope & Liberman, 2010). As CLT applications to communication research are in its initial stages, it is important to acknowledge other sources of influence that may yield results inconsistent with the theory, but it is too early to dismiss the theory entirely.

Second, the studies have extended CLT research by examining its propositions in a *social* context. Existing CLT studies have mainly examined how construal level or psychological distance can affect ego-relevant evaluations or decisions, i.e., decisions that the participant would make for herself. For example, research shows that induction of a high construal leads to a decreased preference for immediate over delayed rewards



(Fujita, Trope, et al., 2006b). This preference is ego-relevant because it is a participant's own preference for rewards. The outcome of replication and extension examined in the current studies are *social* decisions/preferences because participants are not choosing for themselves, but for *other* people. Study results have demonstrated that construal level could even affect preferences or decisions that take other people into perspective, a notion that has not been tested widely (except for Joshi & Wakslak, 2014; Joshi et al., 2016).

Finally, Studies 3 and 4 explored the domain of interaction across construal levels and psychological distance. CLT has remained somewhat agnostic about how construal level or psychological distance would interact. For example, only a few studies have examined how the induction of two types of psychological distance would influence decisions and evaluations (e.g., Huang et al., 2016; K. Kim et al., 2008). Study 3 advances this line of inquiry by examining whether the induction of both construal level (why appeal message) and psychological distance (temporal frames) affect the selection of arguments differently compared to when there is only an induction of construal level (why messages without temporal frames). Results (no significant difference in the number of non-targeted why arguments chosen by participants exposed to why-distant temporal frame messages and those exposed to why messages without any temporal frames) partially provided support for the premise that the induction of one type of distance decreases sensitivity to another type of distance, thereby leading to a subadditive effect (K. Kim et al., 2008; Maglio et al., 2013).

## Limitations

One limitation of the current studies is that the studies were conducted with experiments that had highly restrictive settings that may make results difficult to generalize to real world situations. For example, participants did not converse with real people (as mostly done in previous research such as, Brennan et al., 2016; Dunlop et al., 2010; Hendriks et al., 2016, 2012, 2014), but were asked to choose arguments given a hypothetical scenario (i.e., *If you had to choose arguments to send to smokers..*). However, it is important to note that the current studies were not interested in co-viewing messages or the back-and-forth nature of interpersonal communication about messages, but in how exposure to messages could influence the propagation of message-relevant information. In this sense, the results are still applicable to a real-world two-step situation where for example, a person exposed to a campaign message then proceeds to write a fellow smoker an email that contains message-relevant information. The current studies could have examined actual conversations after exposure to messages, to see whether the conversations afterwards contain more message-relevant talk. However, focusing on initiation (i.e., sending arguments to smokers) captures the concepts of replication and extension better than examining actual conversations, because conversations are not only a function of exposure to messages but also exposure to the content that a conversational partner will provide.

Another limitation is that the argument choice measure used in the current studies typically had alphas slightly lower than .6. While this may seem low compared to alphas of established scales (Streiner, 2003), considering the fact that each participant received different sets of arguments, this alpha is not entirely unacceptable. Moreover, an alpha

close to .6 with only five items should be considered as solid evidence that there is a preference for either why or how arguments, since an alpha increases as the number of items increase. Nonetheless, to increase the alpha of the argument choice measure, future research can consider providing participants with a fixed set of arguments, or increasing the number of argument sets from five sets to seven or eight sets.

Finally, it is worth considering some threats to inference and explanations for null effects. In Study 3 where the temporal frames of messages were manipulated, the argument and temporal frames were kept independent by using separate explicit references to time. However, most health communication research has focused on temporal frames that are incorporated into the arguments, such that an outcome of a behavior is framed to occur immediately or in the distant future (J. Kim & Nan, 2016; Zhao, Nan, Iles, & Yang, 2015; Zhao & Peterson, 2016). Although these studies have focused on the persuasiveness of the messages, they report success in finding differences across those exposed to proximal and distal frames, which leads to the concern of whether the temporal frames used in the current studies were credible and compelling. However, this is likely not a concern since the mean perceived effectiveness of the messages with temporal frames were all above the midpoint of the scale; why-distant frame messages ( $M=3.85$ ,  $SD=.57$ ), why-proximal frame messages ( $M=3.88$ ,  $SD=.62$ ), how-distant frame messages ( $M=3.72$ ,  $SD=.6$ ), how-proximal frame messages ( $M=3.62$ ,  $SD=.55$ ). Another concern regards experimenter demand effects, where it is possible that participants could have thought that choosing targeted or non-targeted arguments in the same category of appeals is appropriate behavior, and acted accordingly. This could be possible since participants are repeatedly exposed to a number of messages with cues

such as “WHY should you quit smoking” and “HOW can you quit smoking”. However, the fact that exposure to how messages in Study 2 failed to increase the number of non-targeted how arguments chosen ameliorates this concern since messages would be effective in affecting argument choice regardless if there were any demand effects. One aspect of the study design does provide an explanation for null effects and demands careful consideration in future studies. The argument choice measure instructions used in the current studies asked participants to choose arguments they would send to smokers. Asking participants to think about (implicitly, non-specific) smokers could have elicited a high construal since smokers are an abstract group of people in contrast to a specific smoker whom the participant knows personally. There is indeed some evidence that people construe a large audience at a high construal level and a small audience at a low construal level (Barasch & Berger, 2014; Joshi & Wakslak, 2014). Because of this, it is possible that results in line with CLT only manifested for the why appeal messages (high construal) in Study 3 but not for the how appeal messages (low construal). Therefore, future research needs to factor in the aspect of how participants construe the recipients of the chosen arguments. For example, future studies could test whether participants exposed to how-distant frame messages select fewer non-targeted how arguments than those exposed to how-control messages when using an argument choice measure that instructs participants to choose arguments for one smoker or a specific smoker that participants know.

## **Future Directions**

The current studies examined how different message characteristics can affect novel outcomes of replication and extension. This line of research opens opportunities for future research on a variety of message characteristics that could influence the diffusion and evolution of message-related discourse. For example, while the temporal frames utilized in the current studies were simply references to the near or distant future (Chandran & Menon, 2004; White et al., 2011), other research, as mentioned above, define temporal frames as whether an outcome is framed to occur immediately or in the long-term (e.g., J. Kim & Nan, 2016; Zhao et al., 2015; Zhao & Peterson, 2016). It will be worthwhile to examine whether the temporal framing of outcomes influences the choice of arguments as was shown in Study 3. In addition to temporal frames, future research can consider how a variety of other message characteristics can influence the diffusion of why and how arguments since previous research has uncovered message characteristics that align with high versus low construal (see Table 2). For example, future research could test whether why appeal messages are more successful in influencing people to propagate more why arguments when they are paired with gain frames or with non-narratives. Or more in line with current study results, future research could observe a decreased tendency to propagate why arguments for participants exposed to why appeal messages with loss frames or with narratives. While the attempt to directly manipulate a construal level mindset (Study 4) did not manifest results as hypothesized, it may still be valuable to replicate Study 4 with a stronger manipulation and less exposure to messages. Or instead of a construal level word task, priming participants with dispositions that have been proven to align with construal level such as regulatory focus

(prevention vs. promotion) and coping styles (problem-based vs. emotional) could lead to results consistent with CLT. These inquiries may also have more practical implications since they would indicate that individuals' cognitive styles can also play a role in predicting message exposure-induced diffusion of information. In addition, future research can apply this line of research to different health behaviors. In the current studies' context of smoking behavior and anti-smoking messages, results did not follow CLT predictions for how messages. I speculated that this may be because there is a tendency for people to favor or prioritize why-related aspects of smoking behavior over how-related aspects of smoking behavior. Therefore, studying health behaviors for which people place equal emphasis on why-related aspects and how-related aspects could produce CLT-consistent effects. For example, future research could apply this framework to behaviors such as exercise, fruit and vegetable consumption, and HPV vaccination, where the desirability and feasibility aspects of these behaviors may be perceived as equally important to people. Finally, future research can advance this line of research by moving beyond argument choice and examining outcomes such as actual message production or sharing through digital media. For example, future research could ask participants to write their own messages to smokers around them after exposure to anti-smoking messages. A content analysis of the written messages could reveal a pattern of more or less message-specific or message-relevant information. This way, it will be able to consider whether a preference for certain arguments to propagate indeed generalizes to propagation behavior itself.

## **Conclusion**

The current studies examined how exposure to anti-smoking messages can influence the diffusion of message-specific and message-relevant information to message targets. They also examined how the message characteristic of temporal frames can boost or hinder these diffusion effects by applying tenets of CLT. Study results demonstrated that indeed exposure to messages influences people to transmit message-specific arguments (replication), and deliver a variety of message-relevant arguments (extension) to campaign targets. It was also found that temporal frames could significantly affect this pattern of diffusion. These results call for further attention to the outcomes of replication and extension, and deeper investigation of how different message characteristics may contribute to the increase and decrease of the flow of information in the social environment.

## APPENDICES

### Appendix 1. Study 1 proof for estimating the expected value of the number of targeted arguments chosen by the true control condition

#### Overview of problem

	Treated	Control
Targeted argument score	$O_T$	$O_C$

- $O_C$  is technically not observable because there is no way by design we can know the number of targeted arguments participants in the observed control condition will choose because we do not provide control condition participants with any messages.
- However, the expected value for  $O_C$  can be estimated by conceptualizing it to be the score (# of targeted arguments chosen) people would have gotten if the messages had no effect at all. This can be calculated by using the tendency of people in the observed control condition to choose why arguments over how arguments.

#### Calculation

- Let  $p$ =select why arguments;  $1-p$ =select how arguments.
- In the treatment conditions where participants are provided with 5 sets of 4 arguments (2 randomly chosen why arguments and 2 randomly chosen how arguments from pools of 10 each) there are three possibilities of how the targeted arguments can be displayed across the 5 sets. Also, if there were no effect of the message then the probability of choosing a matched argument by chance in each of those scenarios would be:
  - [1, 1, 1, 1, 1]: probability of choosing targeted argument (e.g., if in why message condition) would be  $p/2 * 5$
  - [2, 1, 1, 1, 0]: probability of choosing targeted argument would be  $p + p/2 + p/2 + p/2 + 0 = p/2 * 5$
  - [2, 2, 1, 0, 0]: probability of choosing matched argument would be  $p + p + p/2 + 0 + 0 = p/2 * 5$
- In conclusion, the expected value of  $O_C$  can be estimated as half of how many why arguments people in the observed control condition choose on average (i.e.,  $1/2 * O_C$ ).



## Appendix 2. Study 2 Javascript for non-targeted argument choice measure (Why message condition)

```
Qualtrics.SurveyEngine.addOnload(function()
{
    function shuffle(array) {
        for (var i = array.length-1; i > 0; i--) {
            var j = Math.floor(Math.random() * (i+1));
            var temp = array[i];
            array[i] = array[j];
            array[j] = temp;
        }
        return array;
    }

    Array.prototype.diff = function(a) {
        return this.filter(function(i) {return a.indexOf(i) < 0;});
    };

    var msgi = "${e://Field/order}";
    var msgitemp = msgi.substr(0);
    var msgiarray = msgitemp.split("|");
    var msginumarray = msgiarray.map(Number);
    var dargnumArray=[1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15
];
    var findargnumArray = dargnumArray.diff(msginumarray);
    var fargnumArray=[1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15
];

    var dargArray=["Quit smoking and you'll be able to breathe better and cough
less.", "Quitting smoking strengthens your immune system, making you less likely to
get sick.", "Quitting smoking can lower your risk of type 2 diabetes.", "If you quit
smoking, food will taste better and smell better.", "Quitting smoking will keep your
mouth healthy.", "You'll set a good example and show your family that a life without
cigarettes is possible.", "Quitting smoking can reduce your risk of blindness.",
"Quitting smoking can reduce your muscle aches and pains .", "Quitting smoking can
reduce your risk of bone fractures.", "Your home and car won't smell anymore if you
quit smoking.", "If you quit smoking, you won't have to worry about when you can
smoke next or where you can or can't smoke. ", "Quitting smoking will keep your
hearing sharp.", "Quitting smoking will protect your friends and family from second
hand smoke exposure.", "You can lead a more energetic life if you quit smoking.",
"Quitting smoking will prevent your skin from ageing prematurely."];
    var fargArray=["Using medications or nicotine replacement therapy (NRT)
can improve your chances of quitting.", "Reminding yourself of your reasons for
quitting will make quitting smoking easier.", "Doing smoke-free activities with your
family and friends can help you quit smoking.", "Celebrating quit milestones will
keep you motivated and focused on your quit goal.", "Identifying triggers that make
```

you want to smoke and avoiding those triggers can help you quit smoking.", "When trying to quit smoking, moderate physical activity can help you get through cravings.", "You can easily join an ex-smoker community to get advice on how to quit.", "Avoid cravings by having healthy snacks on hand, and you'll be able to quit smoking.", " Enrolling in an online quit smoking program or plan can help you quit smoking.", "Keeping words of inspiration around the house will help you quit smoking.", "Chewing on something will reduce cravings and help you quit smoking.", "Throwing away all cigarette-related items will help you quit smoking.", "Setting a quit date will make you more motivated to quit smoking.", "Asking your family and friends not to give you a cigarette will help you quit smoking.", "Going to smoke-free places where you can't smoke will help you quit smoking."];

```
shuffle(findargnumArray);  
shuffle(fargnumArray);
```

```
Qualtrics.SurveyEngine.setEmbeddedData("argi1",findargnumArray[0]);  
Qualtrics.SurveyEngine.setEmbeddedData("argi2",findargnumArray[1]);  
Qualtrics.SurveyEngine.setEmbeddedData("argi3",fargnumArray[0]);  
Qualtrics.SurveyEngine.setEmbeddedData("argi4",fargnumArray[1]);  
Qualtrics.SurveyEngine.setEmbeddedData("argi5",findargnumArray[2]);  
Qualtrics.SurveyEngine.setEmbeddedData("argi6",findargnumArray[3]);  
Qualtrics.SurveyEngine.setEmbeddedData("argi7",fargnumArray[2]);  
Qualtrics.SurveyEngine.setEmbeddedData("argi8",fargnumArray[3]);  
Qualtrics.SurveyEngine.setEmbeddedData("argi9",findargnumArray[4]);  
Qualtrics.SurveyEngine.setEmbeddedData("argi10",findargnumArray[5]);  
Qualtrics.SurveyEngine.setEmbeddedData("argi11",fargnumArray[4]);  
Qualtrics.SurveyEngine.setEmbeddedData("argi12",fargnumArray[5]);  
Qualtrics.SurveyEngine.setEmbeddedData("argi13",findargnumArray[6]);  
Qualtrics.SurveyEngine.setEmbeddedData("argi14",findargnumArray[7]);  
Qualtrics.SurveyEngine.setEmbeddedData("argi15",fargnumArray[6]);  
Qualtrics.SurveyEngine.setEmbeddedData("argi16",fargnumArray[7]);  
Qualtrics.SurveyEngine.setEmbeddedData("argi17",findargnumArray[8]);  
Qualtrics.SurveyEngine.setEmbeddedData("argi18",findargnumArray[9]);  
Qualtrics.SurveyEngine.setEmbeddedData("argi19",fargnumArray[8]);  
Qualtrics.SurveyEngine.setEmbeddedData("argi20",fargnumArray[9]);
```

```
Qualtrics.SurveyEngine.setEmbeddedData("arg1",dargArray[findargnumArray[0]-1]);  
Qualtrics.SurveyEngine.setEmbeddedData("arg2",dargArray[findargnumArray[1]-1]);  
Qualtrics.SurveyEngine.setEmbeddedData("arg3",fargArray[fargnumArray[0]-1]);  
Qualtrics.SurveyEngine.setEmbeddedData("arg4",fargArray[fargnumArray[1]-1]);  
Qualtrics.SurveyEngine.setEmbeddedData("arg5",dargArray[findargnumArray[2]-1]);
```

```
Qualtrics.SurveyEngine.setEmbeddedData("arg6",dargArray[findargnumArra
y[3]-1]);
Qualtrics.SurveyEngine.setEmbeddedData("arg7",fargArray[fargnumArray[2]
-1]);
Qualtrics.SurveyEngine.setEmbeddedData("arg8",fargArray[fargnumArray[3]
-1]);
Qualtrics.SurveyEngine.setEmbeddedData("arg9",dargArray[findargnumArra
y[4]-1]);
Qualtrics.SurveyEngine.setEmbeddedData("arg10",dargArray[findargnumArr
ay[5]-1]);
Qualtrics.SurveyEngine.setEmbeddedData("arg11",fargArray[fargnumArray[4]
-1]);
Qualtrics.SurveyEngine.setEmbeddedData("arg12",fargArray[fargnumArray[5]
-1]);
Qualtrics.SurveyEngine.setEmbeddedData("arg13",dargArray[findargnumArr
ay[6]-1]);
Qualtrics.SurveyEngine.setEmbeddedData("arg14",dargArray[findargnumArr
ay[7]-1]);
Qualtrics.SurveyEngine.setEmbeddedData("arg15",fargArray[fargnumArray[6]
-1]);
Qualtrics.SurveyEngine.setEmbeddedData("arg16",fargArray[fargnumArray[7]
-1]);
Qualtrics.SurveyEngine.setEmbeddedData("arg17",dargArray[findargnumArr
ay[8]-1]);
Qualtrics.SurveyEngine.setEmbeddedData("arg18",dargArray[findargnumArr
ay[9]-1]);
Qualtrics.SurveyEngine.setEmbeddedData("arg19",fargArray[fargnumArray[8]
-1]);
Qualtrics.SurveyEngine.setEmbeddedData("arg20",fargArray[fargnumArray[9]
-1]);
```

```
});
```

### **Appendix 3. Study 4 instructions and words used in the construal level word task**

#### **Instructions for superordinate word task (high construal)**

The first task we would like to complete is about words and cognitions. In this task, you will be provided with a series of words. Your task will be to write a word that you think each provided word is an example of.

That is, ask yourself the question, “[Provided word] is an example of what?” and then write down the answer you come up with. For instance, if we gave you the word “POODLE,” you might write down “DOGS” or even “ANIMALS,” as a poodle is an example of a dog or animal. Be creative and try to come up with the most general word for which the provided word is an example.

#### **Instructions for subordinate word task (low construal)**

The first task we would like to complete is about words and cognitions. In this task, you will be provided with a series of words. Your task will be to write down a word that is an example of this word.

That is, ask yourself the question, “An example of [provided word] is what?” and write down the answer you come up with. For example, if we gave you the word “DOGS,” you might write down “POODLE” or even “PLUTO” (the Disney character). Be creative, and try to think of as specific an example of the category as you can.

#### **Word list**

Words used in Study 4	Other words included in original word task
DANCE	SODA
MAIL	COMPUTER
KING	PROFESSOR
MOUNTAIN	PASTA
SHOE	BOOK
RESTAURANT	TABLE
LUNCH	MOVIE
GAME	PEN
NEWSPAPER	SENATOR
BEER	TRAIN
SPORT	ACTOR
PHONE	SOAP
TRUCK	FRUIT
TREE	BAG
COLLEGE	CANDY
COIN	GUITAR
WHALE	POSTER

PAINING	SOAP OPERA
SINGER	RIVER
WATER	MATH

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