

THE ROLE OF IDENTITY AND BANDWAGON CUES IN GRAPHIC HEALTH WARNING
MESSAGES ON SOCIAL MEDIA: AN EYE-TRACKING APPROACH

by

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(Under the Direction of Jiaying Liu)

ABSTRACT

Public health organizations are increasingly relying on social media to disseminate health-related information and encourage positive health behavior changes among hard-to-reach young people. However, there is limited evidence on how the various heuristic cues brought about by the different technological affordances of social media may influence the processing and interpretation of persuasive health messages distributed through these platforms and their downstream influences, especially in the context of graphic smoking warnings (GHW). Informed by the MAIN model, this study assesses the effects of two agency cues, identity and bandwagon cues, in GHWs on non-smokers' message perceptions, attitudes and behavioral intentions, and examines the potential mediating roles of attention and discrete negative emotions. Participants ($n = 223$) viewed four Facebook post mock-ups, varying exemplars' racial identities as well as the number of "Likes", with their eye-tracking and self-report data collected. This study sheds light on the role of social identification and endorsement among young non-smokers' attitudes and intentions toward smoking in computer-mediated communication.

INDEX WORDS: Graphic health warning, social media, non-smoker, MAIN model, identity cues, bandwagon cues, eye-tracking

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TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	iv
LIST OF TABLES	vi
LIST OF FIGURES.....	vii
 CHAPTER	
1 INTRODUCTION.....	1
2 LITERATURE REVIEW.....	5
3 METHOD.....	25
4 RESULTS.....	34
5 DISCUSSION	43
6 CONCLUSION	58
REFERENCES.....	59
 APPENDICES	
A APPENDIX A. MEASURES.....	85
B APPENDIX B. EXPERIENT STIMULI	93

LIST OF TABLES

	Page
Table 1: Means and Standard Deviations for Message-Level DVs Across Four Conditions	35
Table 2: Means and Standard Deviations for Individual-Level DVs Across Four Conditions.....	37
Table 3: Means and Standard Deviations for all Mediators Across Four Conditions.....	39

LIST OF FIGURES

	Page
Figure 1: Message Impact Framework.....	19
Figure 2: Conceptual Model of the Study	24
Figure 3: Warning Image & Social Endorsement Areas of Interests (AOI)s Marked	29

CHAPTER 1

INTRODUCTION

With the new advances in technologies, public health organizations are increasingly turning to social media as an important channel to deliver health messages, particularly when targeting previously hard-to-reach young audiences (Centers for Disease Control and Prevention [CDC], 2018; Mendoza-Herrera, 2020; Newberry, 2021; Ventola, 2014). The affordances of social media allow for active participation and interactions among users in contexts where health information can be easily and effectively shared (Korda & Itani, 2013). Additionally, data such as user engagement metrics and comments from these platforms can also be instantaneously tracked and monitored, allowing real-time adjustment and tailoring of messaging strategies to improve content efficacy and maximize reach (Hair et al., 2017; Vallone et al., 2016). “*The Real Cost*” campaign, aimed at reducing tobacco youth in teens, launched by the Food and Drug Administration (FDA) in 2014, serves as a good case in point. Heavily utilizing social media channels to complement traditional media buy-in message dissemination, “*The Real Cost*” campaign successfully raised youth awareness of the costs that come with smoking by emphasizing observable health consequences of tobacco use (CDC, 2018). Evaluation of *The Real Cost* campaign indicated a 30% decrease in smoking initiation among youth exposed to the campaign messages, preventing an estimated 350,000 youth from smoking initiation (Duke et al., 2019).

Graphic health warnings (GHW) represent a prominent type of public health messages using images and texts to depict potential negative consequences of risk behavior engagement

(Ayres et al., 1989; Schubert et al., 2021; White et al., 2008). GHWs are often placed on product packages, advertisements, point-of-sale displays, and online platforms to combat marketing influence from manufacturers of tobacco, alcohol, cannabis, sugary beverage, and energy drink products, to name a few. Scholars have emphasized the importance of GHWs and suggested that health educators and practitioners should think and act like marketers, exploiting all possible marketing strategies to “sell” or “market” health to their audience (Kaiserman, 1993). From a communication perspective, message senders often carefully tailor message content, format, features, and dissemination channels to accommodate the needs of receivers and maximize message effectiveness (Driver, 1987; O’Keefe, 2016). A substantial amount of health communication research has focused on examining message strategies that can be optimally applied to GHWs to divert people from risk behaviors (e.g., Gainsbury et al., 2015; Sutton et al., 2019; Xiao & Benbasat, 2015).

The use of graphic exemplars, i.e., images of people on GHWs, to represent concerned or interested people who demonstrate a particular problem, deliver a testimonial, or express a particular view on health risks (Brosius, 1999; Zillmann, 2006), is found to be an effective message strategy to evoke emotional reactions toward the health hazards described in warning texts (Sutton et al., 2019). Focus group research on the effectiveness of GHWs revealed that participants made frequent references to demographic cues of the exemplar images when making sense of the warning content; racial status of the exemplar has been cited as a salient social influence factor that affects participants’ perceptions of the GHWs (Bigman et al., 2016). For instance, they raised concerns about stereotypes and stigma about particular racial groups on GHWs, which they believed could impact the persuasiveness of the message to the audience. How the racial identity cues of exemplars on GHWs, especially in relation to message receivers’

own racial status identification, affects people's perceptions and interpretations of GHWs is less known. Understanding this question is important, especially considering that GHWs often depict negative, undesirable consequences that happen to the exemplars. Social identification with exemplars similar to oneself, therefore, may effectively elevate message receivers' perceived vulnerability and severity, but on the other hand, may also trigger denial, avoidance, and even counterarguing, warranting further research.

Additionally, as discussed above, regulatory authorities and public health organizations are increasingly relying on various types of social media to distribute health information and collect feedback from the public. In the social media environment, processing, interpretation, and effectiveness perceptions of GHW messages are subject to an array of additional sources of influence from social others. For example, social media users can express their thoughts and opinions about health messages by posting comments, indicate endorsement by using the "thumb up" symbol (i.e., the "like" function), or voluntarily retransmit the messages to others by using the "share" or "retweet" functions (Hilverda et al., 2018; Srivastava et al., 2018). These system-generated social media virality metrics can signal the extent to which the messages are socially approved or endorsed by other users, thus influencing later viewers' information processing, message perceptions, and behavioral intentions (Kim, 2018). To my knowledge, so far, no study has examined the effect of these social cues in the context of GHW messages. Given the increasing reliance on social media to disseminate and evaluate public health messages, further research is needed to advance our understanding in this area.

Based on the background and prior research described above, and informed by the Modality-Agency-Interactivity-Navigability (MAIN) model (Sundar, 2008) and Message Impact Framework (Noar et al., 2015), this study aims to fill in the gaps and examine how social

influence, manifested as cues that signal identity similarity and aggregate endorsement on social media, may affect message recipients' cognitive and emotional responses, as well as the downstream message efficacy and individual behavior change outcomes in the context of GHW messages. Given that the richest load of research on GHWs is found in the behavior area of smoking (Sankaran et al., 2015), the current study experimentally examines social influence cues embedded in a social media post of smoking GHWs using a mock social media interface. To more accurately gauge viewers' cognitive responses toward GHWs, this study will unobtrusively track participants' eye-movements during message exposure. In the next sections that follow, I will review prior literature examining smoking GHWs before detailing the theoretical frameworks and the variables that are the foci of the study. Then, hypotheses will be presented with a conceptual model, followed by the justifications for the methods.

CHAPTER 2

LITERATURE REVIEW

Smoking Health Warnings

Smoking has detrimental health consequences, including a number of cancers and other diseases that damage almost every organ in the human body (CDC, 2021). Despite its deadly impact, tobacco use is highly preventable, with abundant studies showing the effectiveness of health education and warning that deter smoking (American Cancer Society, 2020). Mandated health warning messages on tobacco products are a “useful, effective, and inexpensive” method to promote smoking prevention and cessation (Kaiserman, 1993). Hammond et al. (2006) reported that people who live in countries with government-mandated smoking labels had better health knowledge regarding the negative implications of smoking. Warnings with pictures, i.e., graphic health warnings (GHW), were reported to be more persuasive and effective as a tool to promote smoking prevention and cessation compared to text-only warnings (Hammond, 2011). A plethora of research has explored the effectiveness of GHW labels on tobacco products and observed positive effects on smoking cessation (Hammond et al., 2003; Hammond et al., 2004) and deterrence of smoking initiation among non-smokers (Hwang et al., 2018; Noar et al., 2015) above and beyond textual messages. The presence of graphic depictions of negative imagery such as dead bodies or diseased body parts, or suffering of children and babies, often maximally engages smokers’ attention and evokes intense affective responses such as fear, disgust, anger, guilt, or sadness, contributing to their intention to quit (Cameron & Williams, 2015; Gibson et al., 2015; Kees et al., 2010; Sutton et al., 2019).

Despite the general effectiveness of GHWs, however, there are ongoing concerns regarding the lack of awareness and low perceived relevance to the negative health consequences of smoking among young cigarette users (Kaplan, 2019). Young smokers, especially those “experimenter smokers,” i.e., people who have smoked fewer than 100 cigarettes in their lifetime, do not consider themselves as being vulnerable to health risks associated with cigarette smoking and could not relate themselves to the stated health issues, hindering persuasiveness of the GHWs in this population (U.S Food and Drug Administration, 2018).

Tailoring visual exemplars presented in GHWs to resemble the target population based on demographic cues bears the potential to increase perceived relevance and risk perceptions (Erceg-Hurn & Steed, 2011; Goldstein et al., 2021; Hayashi et al., 2018). For example, Tharp-Taylor et al. (2012) observed that the match of self-identified race and the race of exemplars increased the perceived effectiveness of the messages. Miller et al. (2011) found differences in interpretation of anti-smoking warnings based on gender and age. However, a caveat remains regarding the potential backfiring effects elicited by the negatively framed GHWs, and the suffering illustrated by exemplars similar to the audience themselves (Kaplan, 2019). The mixed findings related to the role of utilizing exemplars tailored to the target audience’s characteristics call for further examination in order to increase the effectiveness of smoking GHWs among young, experimenter smokers.

Delivering Warning Messages via Social Media

The Food and Drug Administration (FDA)’s previous effort to toughen smoking warning messages through the inclusion of graphics was defeated in court in 2012. A panel of judges ruled that the agency could not compel the tobacco companies to slap grisly images on cigarette packs, suggesting the necessity of undertaking further research to support a new rulemaking

(Bayer et al., 2013). In March 2020, FDA issued 11 new GHWs that feature textual warning statements with vivid images of adverse health outcomes caused by cigarette smoking, including type 2 diabetes, heart disease, head and neck cancer, fatal lung disease in non-smokers, erectile dysfunction, and some more (FDA, 2021). As expected, in April 2021, the court issued an order to postpone the effective date of the final rule to be in October 2022, due to excessive industry lobbying and lawsuits. As the tobacco industry prepares to thwart the GHW efforts again, FDA has also been actively collecting scientific evidence, calling for public comments about the new GHWs, and promoting the visibility of the GHWs via social media.

In recent years, public health organizations and authorities like the FDA and CDC (Centers for Disease Control and Prevention) have been increasingly relying on online and social media to distribute health information to the public (CDC, 2020; FDA, 2019). CDC uses Facebook, Twitter, and YouTube to proactively reach out to social media users who are potential beneficiaries of their health information (CDC, 2020). Since 2009, CDC's Facebook profile followers have gradually increased from 53,124 to 2,124,046 by 2020 (CDC, 2021). This number goes even higher when adding the several other Facebook pages operated by the CDC, including CDC Global (190,075 followers), NIOSH National Institute for Occupational Safety and Health (154,500), CDC Tobacco Free (143,603), and many more (CDC, 2021). The FDA also posts anti-smoking videos, podcasts, blogs, widgets, etc. on various social media platforms including Facebook and Twitter, which serve as the leading channels for information dissemination, followed by Pinterest, Flickr, and YouTube (FDA, 2021).

There are several reasons behind the public health organizations' decision to adopt social media as their tools for distributing warning messages. First, they want to directly counter the overflowing marketing influence from tobacco advertisements on social media. Tobacco

companies post excessive amounts of cigarette ads on social media; 90% of tweets about e-cigarettes turned out to be commercial ads generated by the tobacco industry (Huang et al., 2014). Tobacco companies use their websites and social media as a marketing tool and a bonding bridge with their customers, calling for robust tobacco control communications to mitigate such influence on social media as the commercial industry advances its promotions (CDC, 2018). Moreover, younger generations spend most of their time on the Internet and social media, making these platforms the most ideal channels to expand reach among the priority population of tobacco control (CDC, 2018). According to a survey conducted by the Pew Research Center (2019), 90% of social media users in the U.S. were between the ages of 18 and 29. Facebook serves as young adults' primary information source, with roughly half of them obtaining news information from Facebook, including health-related news and knowledge (Gottfried & Shearer, 2016). CDC is also actively expanding their paid media strategies to digital advertising to target youth and young adults (CDC, 2018). Finally, the flexible interactivity affordances between media technology and users (i.e., medium interactivity) and among users (i.e., human interactivity) of social media (Chung & Nah, 2009) allow the regulatory authorities to directly collect responses and gauge opinion climate about the GHWs from the target audience (Lloyd et al., 2018). Social media are therefore ideally positioned to disseminate GHW messages to and collect feedback from the previously hard-to-reach youth and young adult population.

The unique environment and functions of social media put forth a new set of considerations that have implications on how GHW messages are processed and perceived. Specifically, besides the content information of the health message itself, other social media users' preferences, opinions, and thoughts can be easily accessed and visible on social media, creating explicit and implicit social influence that can sway people's beliefs, attitudes, and

behaviors (Zhang et al., 2013). Research observed that social media users often actively attend to and strongly trust the various social cues from online others, as signals of norms, to guide their own preferences and behavioral decisions (Latkin & Knowlton, 2015). Ayres et al. (1989) posited that warning messages are deemed more effective when social pressure exists, influencing participants' tendency to conform; if the recommended behavior is performed by similar social others, even greater changes in attitudes and behaviors will be observed through strengthened perceived social approval.

The MAIN Model and Agency Cues

The Modality-Agency-Interactivity-Navigability (MAIN) model (Sundar, 2008) served as the primary theoretical framework to guide the current study. The MAIN model bases its premise on the unreliability of source information in Internet-based media. Unlike traditional media, where the audience can relatively easily evaluate the credibility of a person or organization that produces and disseminates information, information obtained from digital media (e.g., a piece of information shared by a random friend on Facebook, which was beforehand distributed by a possible-sham news website) involves several layers of sources that make its origin extremely murky (Sundar, 2008). For young people specifically, Sundar (2008) noted that compared to other populations, they are more influenced by the unprecedented interactivity among users of new media rather than the actual content provided.

According to Sundar (2008), to navigate in the context of social media where source information is often uncertain and blurry, people rely on various heuristic cues, triggered by technological affordances of the emerging computer-media media, to gauge the credibility of information sources and inform their decisions. Among these heuristic cues, agency cues, especially the identity and bandwagon cues are most relevant to inform my questions of interests

in the current study.

Agency cues refer to heuristic cues that help make source attribution. Compared to the other heuristic cues, agency cues provide more direct and relevant, albeit often biased, hints to indicate the source of given information (Sundar, 2008). For example, when the actual source information is obscured in the new media environment, the social presence of a spokesperson or an exemplar presented alongside the target information being delivered can serve as an agency cue, hinting and leading the audience to attribute the spokesperson as the source (particularly when there is no other attributed source for a given piece of information), which can influence how the target information is subsequently processed. The identity and bandwagon agency cues serve as the foci of the current investigation.

Identity Cues. Advances in digital technologies permit users to “experiment” with their identities, communicate their identities to other people, and identify similar others who have aligned values and goals among the real and imagined online others, to reflect their sense of personal agency in the computer-mediated communication environment (Sundar, 2008). Given the nature of information source online, i.e., anonymity and aggregated authorship, identity cues, such as if the information is retweeted by a known peer, or if the information is narrated by an individual with similar characteristics or likable qualities with the viewer, can substantially influence the viewer’s judgment about the content quality of the information (Lin et al., 2016; Walther et al., 2010). For younger generations specifically, when encountering identity cues aligned well with their own characteristics and values, motivated by their “inherent egocentrism” (Sundar, 2008, p. 85), they are more likely to focus on their perceived affiliation with peers than the information itself (Lee, 2006).

The operating mechanism of identity cues described above echoes the “in-group bias”

concept posited by Tajfel and Turner (2004) in their social identity theory (SIT). According to SIT, individuals constantly compare their in-groups with relevant out-groups and strive to establish a particular self-image (Tajfel & Turner, 2004). Hornsey (2008, p. 603) described that social identity is endowed when people start making distinctions between “us and them” after undergoing interpersonal and intergroup interactions, drawing on Tajfel and Wiles (1963)’s argument. The more a person’s identification intensifies within a specific group or categorization, the more likely they will conform to the norms or aggregated behavioral decisions that their in-group possesses (Turner & Reynolds, 2012). When people are exposed to reactions of their “similar others” (e.g., opinions, judgments, attitudes, and behaviors), it is highly likely that they feel more confident or even obligated to agree and respond in the same way (Turner & Reynolds, 2012). In other words, in the context of persuasive communication, messages presented by in-group, similar others, are likely to exert stronger influence compared to when they are delivered by out-group counterparts.

Applying these ideas to the current study, GHWs often contain “concrete, vivid, and emotionally arousing” exemplars (Zillmann, 1999) that illustrate sufferings or the severe health consequences associated with engaging in risk behaviors. This provides an ideal opportunity for the current study to examine whether in-group vs. out-group identity cues attached to these exemplars, based on observable characteristics (such as race, gender, age, etc.), can enhance or reduce the persuasive message effects of GHWs. For example, Hayashi et al. (2018) manipulated race and gender characteristics of exemplars on cigarette packs and found that when people perceived an exemplar to be more “similar to them,” they felt more relevant, which in turn led to more engagement and conformity towards the recommended behavior.

Amongst various visual features associated with the exemplars that may trigger people’s

perceived similarities and in-groups and out-group perceptions as part of their mental schema, racial features are often considered the most salient cues to inform individuals' racial consciousness, and activate their process of relating to or distancing from the presented exemplars (Valentino et al., 2002). This is likely related to humans' outward appearance tied to ancestry and geographic origin such as skin color, hair texture, facial shapes, and other observable physical features, that becomes immediately observable and noticeable when one is presented with an exemplar. Visual engagement of these features activates the process of individuals slotting the exemplars into predefined categories of human difference, such as the racial groups, bringing salience to this heightened difference for human judgement. Racial cues are particularly prominent in the United States, where racial issues have been historically contentious, and recently more intensified against the drastically changing sociocultural environment caused by the global pandemic (Addo, 2020). Roberts and Rizzo (2020) proposed the Minimal Groups Phenomenon (MGP) explanation to account for the saliency of racial differences in the U.S. According to MGP, Americans are born with assigned, socially constructed racial ingroups, which they automatically support and intuitively trust by showing more forgiveness and loyalty toward their racial in-groups (i.e., "cooperative alliances") (Roberts & Rizzo, 2020, p. 478). Such a strong sense of internalized in-group social cohesiveness can easily turn into racial-specific biases and social norms, which can profoundly affect one's attitudes and behaviors when it comes to race-related issues. For example, White adults were found to perceive the same ambiguous facial expressions of their racial ingroups (i.e., Whites) to be happy, but their racial outgroups' (i.e., Blacks) to be angry (Dunham, 2011).

It is worth noting that, however, as discussed earlier, GHWs are a special type of persuasive health message – it is almost always negatively framed and depicts undesirable,

emotionally evocative negative consequences that happen to the exemplars (e.g., a famous example of FDA's previous smoking GHWs depicts a man exhaling cigarette smoke through a tracheotomy hole in his throat). In other situations, it is intuitive to imagine that the enhanced in-group identity cues may increase message persuasiveness and facilitate desired behavior change through instilling a sense of enhanced relevance, involvement, and salience to the target audience. However, it remains unclear how the identity cues may operate under situations where severe negative consequences happened to the exemplars are depicted, which may potentially threaten, rather than enhance one's valued self-identity, thus triggering counterarguments. A focus-group study conducted by Bigman et al. (2016) revealed that participants frequently referred to the race of exemplars on GHWs unprompted, and these racial identifications were related to message effectiveness evaluations across diverse populations. In view of this, the current study aims to examine the effect of racial identity cues on smoking GHWs on message evaluation and individual behavioral outcomes.

Bandwagon Cues. The bandwagon heuristics are another type of agency cue. They are particularly powerful because they reflect users' "collective endorsement" of the media content (Sundar, 2008). Simply put, people tend to favor something just because the majority others have already liked it. Advanced social media technology enables easy access to aggregate social endorsement information that reflects others' thoughts, decisions, and behaviors through engagement metrics such as the number of "likes" and user-generated comments (Sundar, 2008). Bandwagon cues can be understood as a type of "informational social influence" or "informational norm" coined by Deutsch and Gerard (1955). Informational social influence is defined as "an influence to accept information obtained from another as evidence about reality" (Deutsch & Gerard, 1955, p. 629). In other words, under uncertain, ambiguous situations,

individuals tend to automatically seek information about others' choices and go along with the group majority, with the underlying assumption that collective wisdom is more likely to be correct and reflects an accurate view of social reality. Research evidence accumulates to suggest the powerful influence of aggregate endorsement information. For example, Lord et al. (2001) found that people relied on informational norms when evaluating product quality. Such effect was observed to be stronger when the group reached a condition of homophily, i.e., when group members perceive each other as similar based on shared characteristics such as age, gender, race/ethnicity, education status, etc. (Yuan & Gay, 2006). Lee et al. (2011) also found that aggregate group majority choice of online shopping significantly increased individual consumers' intentions to shop online.

Most relevant to the current study, Rieh and Hilligoss (2008) observed that young adult college students are particularly vulnerable to online bandwagon cues when seeking information and making decisions online. According to Rieh and Hilligoss (2008), young adulthood presents the transition from childhood to adulthood. At this stage, people focus on pursuing autonomy and exploring their own identities by pulling away from family and seeking group membership in the outside social environment. When they make a judgment about a given piece of information, source expertise may not truly matter; instead, they prefer to rely on the collective judgment of social others, to enhance their confidence about the accuracy of decision making and satisfy their psychological needs of obtaining social approval from others (Rieh & Hilligoss, 2008). Lin et al. (2016) was also informed by the MAIN model and examined bandwagon cues, operationalized as the number of retweets, as one of the primary information cues to shape opinions and attitudes on social media. They found that the number of retweets was positively correlated with source credibility, whether the tweet was generated by a stranger or a peer.

The current study extends the examination of bandwagon cues to the context of smoking GHWs on social media. I examine how exposure to aggregate social endorsement information, operationalized as the number of likes left by previous social media users, may affect people's message effectiveness perceptions and individual behavioral outcomes.

GHW Effects on Message- and Individual-Level Outcomes

Prior studies have examined the effects of anti-smoking messages by looking at message-level and individual-level outcomes. Perceived message effectiveness has long been considered as an essential evaluation in formative research before messages are introduced to the public (Dillard et al., 2007), and has been found to consistently predict changes in people's quitting intentions and smoking behaviors (e.g., Brennan et al., 2014; Brewer et al., 2016; Grummon et al., 2020). Warning messages containing social endorsement cues (i.e., bandwagon cues) are found to increase message effectiveness (Racicot & Wogalter, 1992; Rogers et al., 2000; Strahan et al., 2002). In addition, given the potential backfiring effect that may be produced by the in-group identity cues in GHWs where exemplars will be depicted as suffering from the negative health consequences, counterarguing towards the GHWs (i.e., the process of negatively elaborating and actively generating rebuttals to the GHWs; Fransen et al., 2015; Ringold, 2002) will also be examined as another message-level outcome in this study. Informed by the functions of agency cues in the MAIN model, and the review of the prior research evidence, the following research questions and hypotheses are advanced:

RQ1: Will GHWs with in-group identity cues (i.e., the race of participant and GHW exemplar matches with one another) lead to higher or lower (a) perceived message effectiveness evaluations and (b) counterarguing, compared to GHWs with out-group identity cues (i.e., the race of participant and GHW exemplar mismatches with one

another)?

H1: GHWs with higher bandwagon cues (i.e., a large number of likes) will produce (a) higher perceived message effectiveness evaluations, and (b) less counterarguing, compared to GHWs with lower bandwagon cues (i.e., a small number of likes).

RQ2: How do identity and bandwagon cues interact to produce changes in (a) perceived message effectiveness evaluations and (b) counterarguing toward the GHWs?

With regard to GHW exposure's effects on individuals, previous research has highlighted the importance of examining health related outcomes such as one's attitude toward smoking, behavior or behavioral intention to smoke or quit, as well as communicative outcomes including their intention to discuss the GHW information with others (Brewer et al., 2016). A great number of previous studies have observed strong effects of cigarette graphic warning labels on smoking and nonsmoking young adults' attitudes toward smoking, such that more exposure to the GHWs led to a more negative attitude toward smoking (Macy et al., 2016; Noar et al., 2015; Rooke et al., 2012; Sabbane et al., 2009; Süssenbach et al., 2013). Given that attitudes serve as a critical antecedent to intentions and behaviors in various health contexts (O'Keefe, 2015), I proposed to examine attitude as one of our individual-level outcomes in the current study.

The individual outcome of intention given its proxy role to the corresponding behavior is also to be examined. Considering the relatively young age of the study population (i.e., young adults at 18-25 years old, thus relatively fewer smoking experimenters in this group), there was a focus on participants' intention to initiate smoking in the next six months.

In addition to health-related outcomes, communication-related outcomes are another group of crucial variables highly relevant in the context of graphic warning image exposure. For

those who are not current smokers (the population of interest in this study), the effects of GHW exposure are two-fold: whether such exposure would deter them to not smoke, and whether it would motivate them to intervene others' smoking behaviors. As a matter of fact, most of the existing anti-smoking campaigns or interventions targeted mainly on smokers, whereas nonsmoker population remains a largely untapped resource to help smokers quit (Barrington-Trimis et al., 2020). Research has observed the effectiveness of nonsmokers exerting their social influence on smokers and providing emotional and instrumental support (e.g., assisting smokers to obtain quitting aids) to their smoker friends or family members (Patten et al., 2017). On social media, such intervention can be conducted through direct communication channel (such as instant messaging) or privately sharing the anti-smoking information to the smokers. On Facebook specifically, direct personal communication is enabled through the built-in function "private messaging," which allows for one-on-one chat or sharing without having to post on public walls, and is considered a type of "particularistic communication" (Brown et al., 2017, p. 143). Brown et al. (2017) explored people's desire to privately communicate about a Facebook post but only through the lens of cultural differences (i.e., individualism vs. collectivism). In the context of cigarette smoking, Shin and Lu (2021) explored how smokers influence non-smokers through positive reinforcement and pro-smoking injunctive norms; yet they did not observe the interaction in the expected direction. To my knowledge, no study has investigated non-smokers' intervention on smokers through sharing anti-smoking information using private messaging.

In addition to computer-mediated communication, social media users can also decide to share and transmit information they view online to individuals offline through direct interpersonal communication. Hafstad et al. (1996) observed that after exposure to anti-smoking campaign messages, participants who spent longer time conversing with their peers and families

about the messages showed a more positive attitude toward the campaign and were more willing to quit smoking. Strahan et al. (2002) noted that whether or not anti-smoking labels can promote interpersonal communication on this topic should be considered as a critical assessment dimension evaluating the effectiveness of tobacco package warning labels. Hall et al. (2015) observed that GHWs on cigarette packages which received higher social endorsement led to more social discussions and interactions about graphic warnings.

In sum, this study aims to examine the effects of identity and bandwagon cues on four types of individual-level outcomes, which are attitude (behavioral), intention to initiate smoking (behavioral), intention to intervene in others' smoking behavior (communicative), and interpersonal communication about the GHWs (communicative). I put forth the following research questions and hypotheses:

RQ3: Will GHWs with in-group identity cues lead to greater or lower (a) attitude, (b) intention to initiate smoking, (c) intention to intervene a smoker, and (d) interpersonal communication, compared to GHWs with out-group identity cues?

H2: GHWs with higher bandwagon cues will produce less (a) favorable attitude and (b) intention to initiate smoking, and greater (c) intention to intervene a smoker and (d) interpersonal communication, compared to GHWs with lower bandwagon cues.

RQ4: How do identity and bandwagon cues interact to produce changes in (a) attitude, (b) intention to initiate smoking, (c) intention to intervene a smoker, and (d) interpersonal communication?

The Mediating Role of Cognitive Response

Informed by the Message Impact Framework (MIF; Noar et al., 2015; see *Figure 1*), for

warning messages to effectively influence any subsequent cognition, intention, or behavior changes, attention serves as a crucial first step. Specifically, the framework suggests that different GHW characteristics affect the extent to which the warning attracts viewers' attention, and the level of attention attracted determines subsequent recall and other reactions towards the warning. Warning reactions, together with potential social interactions about the warnings, will, in turn, affect beliefs, attitudes, and ultimately intentions and behaviors. According to Sundar (2008), agency cues exert influence through eliciting the cognitive response about whether the identified or perceived source is reliable or not, which in turn, can affect perceived credibility. Both the MAIN model and the MIF framework are used to investigate the mediating role of cognitive responses between message characteristics and message- and individual-level outcomes. Therefore, the current study examines attention as the cognitive response elicited by GHW characteristics. To capture attention more accurately, eye-tracking method is utilized to record participants' attention and viewing patterns during GHW exposure.

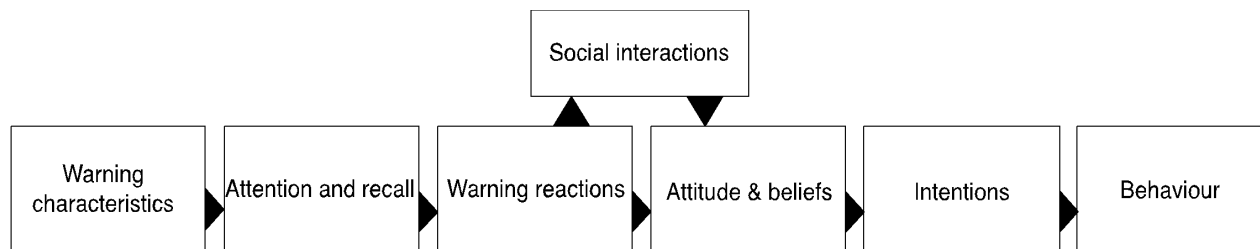


Figure 1. Message Impact Framework

Eye-tracking to Capture Attention. Eye-tracking has been used in health communication research to address various topics (e.g., social media pages, health messages, warnings on health ads, online health information, packaging of tobacco and other drugs, etc.) (King et al. 2019). It allows researchers to observe one's visual behaviors through tracking the locations and movements of eyes when exposed to stimuli presented on an electronic display screen (e.g., online information, advertisements, video contents) (Meernik et al., 2016). It

strengthens measurement validity and accuracy by reducing memory distortions or bias typically associated with self-reported measures (Meernik et al., 2016).

King et al. (2019)'s review of communication research utilizing the eye-tracking method concluded the important mediating role of visual attention between message features and people's cognition and behavior changes, such that the longer fixation time spent in the message features of interest, the better message and individual behavior change outcomes are likely to be achieved. In the context of tobacco GHWs, Mays et al. (2019) measured participants' visual attention to the warning area by having them physically point the cursors to specific areas of an e-cigarette ad image that participants believed they were attentive to. This research, for instance, relied on the eye-tracking method to allow for more immediate, real-time, unobtrusive, and objective assessment of participants' visual attention patterns within the warning area of interests (AOIs). The current study, therefore, also utilizes the eye-tracking approach to gauge the extent to which the identity and bandwagon cues may attract viewers' attention and examine how it is linked to the subsequent message-level and individual-level outcomes. Informed by the MIF framework, and based on the findings of prior research, the following hypotheses are posited:

H3: Attention will mediate the relationships between identity cues and (a) message-level outcomes, and (b) individual-level outcomes.

H4: Attention will mediate the relationships between bandwagon cues and (a) message-level outcomes, and (b) individual-level outcomes.

The Mediating Role of Affective Response

Affective response is an emotional reaction to a situation or context (Lazarus, 1991). In addition to exerting influence through enhanced attention, GHW message characteristics can also

elicit affective responses to trigger the dominoes effect on cognition and behavior changes that follow. Affective response can serve as a powerful source of motivation contributing to behavior changes (Li, 2013). In the context of GHWs research, emotional responses were often found to predict smoking cessation (Hammond et al., 2004). Vivid, emotionally-evocative messages are often perceived by the audience as more persuasive and convincing via the strong affective responses being triggered in them (Bigman et al., 2016). Given the nature of GHWs, i.e., depicting negative, undesirable consequences and risks, negative valence emotions are often provoked by this type of message. In this study, I focus on examining three discrete negative emotions, i.e., anger, disgust, and fear, which were emphasized by previous studies as most relevant in the context of GHWs on cigarette packages (Hammond et al., 2004).

Anger. Anger is a negative emotion often triggered by “unpleasant or undesired” events (Carver & Harmon-Jones, 2009, pg. 183). In the context of GHWs, viewers who looked at vivid graphics, compared to text-only warnings, were observed to experience greater anger (Erceg-Hurn and Steed, 2011; LaVoie et al., 2017). Jeong et al. (2021) found that there was a significant interaction effect of fear and anger on the anti-smoking attitude of nonsmokers, compared to smokers, who were not responsive to anti-smoking messages. Although anger was deemed as an important mediator between warning messages and smoking intentions, it was often examined within a broader category of negative emotions as a subordinate concept, and was rarely investigated as a distinctive, discrete emotion in smoking GHW studies (Gibson et al., 2015; Hall et al., 2018). For instance, Jeong et al. (2021) examined the impact of anger on the effectiveness of anti-smoking campaigns only as a secondary outcome associated with fear appeals. Thus, previous research did not effectively examine the specific effects of anger on the persuasiveness of GHWs especially its potential mediating role, and the current study attempts to fill in this gap.

Disgust. Disgust was also found as one of the most important negative emotions associated with the persuasiveness of health warning messages in previous studies (Kemp et al., 2020; Tugrul, 2013). Disgust is often associated with a desire to “expel or obliterate” in response to an immoral act, for instance, after viewing innocent victims suffer (Pechmann & Reibling, 2006, p.906; Roseman et al., 1994). Pechmann and Reibling (2006) found that anti-smoking ads that displayed sufferings of young people from tobacco-related diseases elicited disgust, which in turn, led to reduced intention toward smoking among adolescents. In a related vein, Kemp et al. (2019)’s eye-tracking experiment examining adolescents’ attention to disgust-stimulating anti-smoking messages found that disgusting visuals drew more attention to the warning image compared to non-disgusting visuals. The study called for more investigations on disgust imagery on smoking warning labels considering that most of the previous studies focused primarily on TV commercials, not graphic warning labels. Li et al. (2021) also looked at cigarette-specific disgust arousals provoked by smoking GHWs and observed their significant role in alleviating the negative effect of smoking-related cues on smokers’ urge to smoke.

Fear. The role of fear appeal in smoking prevention and cessation has historically been of great prominence in the field of health communication and education (Vardavas et al., 2009). According to Ruiter et al. (2014)’s summary work of six meta-analytic studies on fear appeals, graphic warnings on cigarette packages were the most frequently examined health context in fear appeal studies. Fear-inducing anti-smoking messages can increase smokers’ risk perceptions and often lead to stronger intention to quit smoking, compared to messages without fear elements (Dijkstra & Bos, 2015; Hammond et al., 2006). Fear was the also found to be the most dominant emotion among several negative emotions such fear, anxiety, and indifference elicited by GHW in a study that examined the deterrent effect of GHW among adolescents (Adebiyi et al., 2016).

Nonetheless, recent studies have increasingly expressed hesitance toward the excessive or inappropriate use of fear appeals, which might increase the likelihood of recipients arguing against a message and cause backfiring (Kok et al., 2017; Simpson, 2017). Some researchers proposed some boundary conditions when fear appeals can be more effective than backfiring, e.g., when people have more than a moderate level of self-efficacy (Kok et al., 2017; Peters et al., 2013). In view of the importance of the discrete emotion of fear in the anti-smoking, especially GHW literature, I also examine fear to better understand its role in the current study context.

Therefore, in the current study, in addition to examining attention as a potential mediator, I also propose to explore the mediating role of three discrete emotions, i.e., anger, disgust, fear, on participants' message- and individual-level changes. The following hypotheses are posited:

H5: Negative emotions (anger, disgust, and fear) will mediate the relationships between identity cues and (a) message-level outcomes, and (b) individual-level outcomes.

H6: Negative emotions (anger, disgust, and fear) will mediate the relationships between bandwagon cues and (a) message-level outcomes, and (b) individual-level outcomes.

Figure 2 presents the conceptual model of the study.

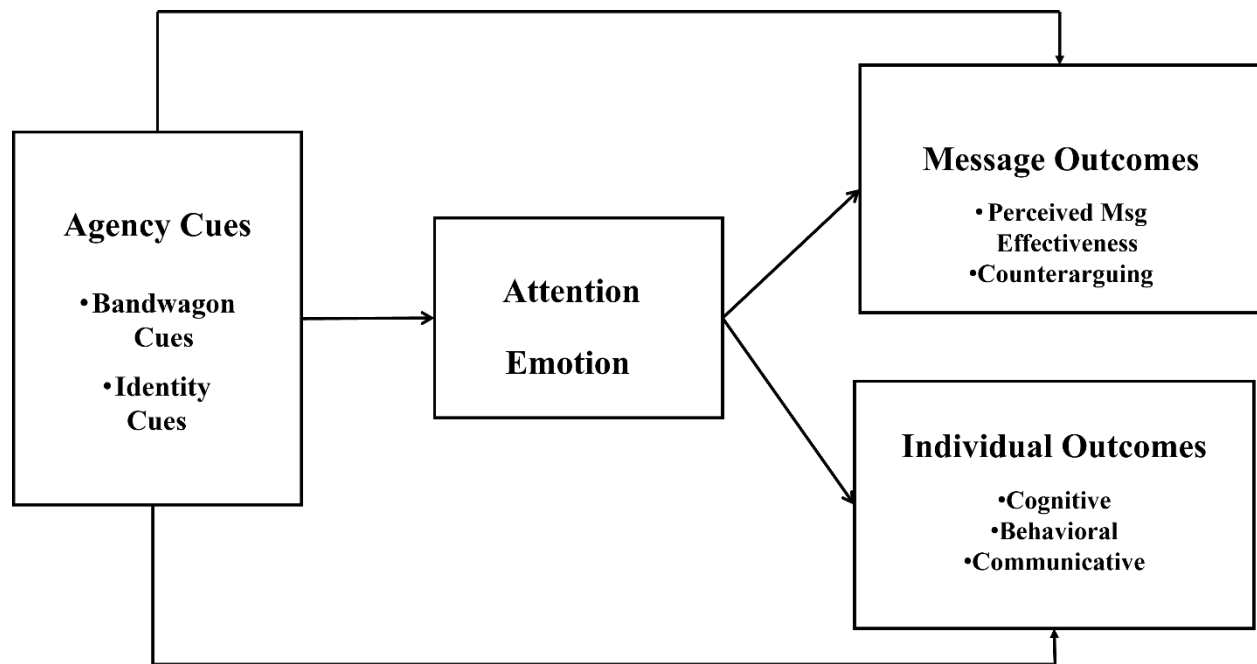


Figure 2. Conceptual Model of the Study

CHAPTER 3

METHOD

Participants

Participants were recruited from UGA Department of Communication Studies' SONA research pool. A priori power analysis utilizing the mean weighted effect size found for the GHW-intention relationship ($d = .54$) based on Noar et al. (2016)'s meta-analysis on the effects of smoking GHW indicated that, at least a total of 214 participants were needed to ensure 80% chance of detecting the medium effect size between the four experimental groups as significant at the 5% level, two-tailed (Faul et al., 2009). To participate in the study, participants were required to be 1) over age 18, 2) self-identify as White/Caucasian, and 3) not a current smoker (i.e., have not smoked a cigarette, even one or two puffs during the past 30 days). This study only collected data from White/Caucasian participants to simplify the racial identity cue random assignment procedure and increase the feasibility of collecting more than 200 participants' lab-based eye-tracking data within a limited time, considering that 66.7% enrolled students at UGA are White, but only 8.2% are Black or African American (Data USA, n.d.).

Regarding participants' smoking status requirement, "not current smokers" are chosen as the target population because majority of the college-aged young adults are either non-smokers or only experimental smokers, and very few are considered established, heavy smokers (U.S Department of Health and Human Services, 2012). Out of 236 participants who completed the entire lab session, 13 were excluded due to failure to pass the eye-calibration test.

Study Design and Procedures

An in-person lab-based experiment with a 2 (bandwagon cues: high vs. low) $\times$ 2 (identity cues: in-group vs. out-group) between-subjects factorial design using an eye-tracking approach was conducted. Participants signed up for a time slot for an eye-tracking session after conforming their eligibility for participation. Upon registration for a session, they were given a URL link to the pre-survey with questions including the basic demographic features (i.e., age, gender, race and ethnicity, education, and household income) and the current smoking status via email. On the scheduled date, participants came to the Communication Studies Eye-tracking Lab at the designated time. Upon entering, participants were instructed with the eye-tracking procedures step by step in detail. They were informed that they would expect to view some social media posts downloaded from FDA's Facebook page and remained unaware of the study purpose. All sessions were conducted in a quiet research laboratory room. Each participant viewed four mock Facebook posts during the eye-tracking session, with an automatic empty screen (with a crosshair in the middle) for a few seconds in between. After message exposure, they completed a post-survey, where the major outcome variables were collected, with their own, or provided laptop by the lab. After they completed the post-survey, they were debriefed, thanked, and dismissed. The whole procedure took no more than 30 minutes. Participants were granted two research credits after completion as a compensation.

Stimuli

The study exposed participants to four cigarette smoking GHWs, adapted from the recently released GHWs by the FDA (FDA, 2021). Each stimulus contained a vivid photo depicting a highly undesirable health consequence that smoking causes, along with one sentence warning text ("e.g., Warning: smoking accelerates natural aging of your skin and causes

wrinkles”). The four negative consequences included accelerating aging, head/neck cancer, throat cancer, and erectile dysfunction. These stimuli were presented in a format of a Facebook post operated by the FDA. Each GHW was placed in the existing frame of the Facebook post, which encompassed the same font, size, and social endorsement features to optimize ecological validity. All participants reviewed the four negative consequences, with only the identity and bandwagon cues varying across conditions.

The race of the exemplar being presented in the GWHs was used as the identity cue manipulation in this study. For each negative health consequence demonstrated by the exemplars, there were two sets of stimuli prepared: White/Caucasian exemplar and Black/African American exemplar. Participants (all recruited as White/Caucasians) were randomly assigned to either stimuli set, with those assigned to the former viewing GHWs with matched or in-group identity cues, and those assigned to the latter viewing GHWs with mismatched or out-group identity cues. To operationalize bandwagon cues, two sets of stimuli were differentiated between having a high number of likes or a low number of likes. Following prior practice (Borah & Xiao, 2018; Phua & Ahn, 2014), the number of likes reflected the actual numbers of likes that CDC’s Facebook posts had received: the high bandwagon cue was operationalized as numbers as high as 26,000 and low as numbers no more than 10 (CDC, 2021; CDC Tobacco Free, 2021). Within the same condition, the number of likes and the timestamp on each post were slightly modified to be different from one other, to make the posts look more real.

In sum, there were four conditions, corresponding to four different sets of stimuli used in this research: (1) Condition A: In-group cues × High bandwagon cues; (2) Condition B: In-group cues × Low bandwagon cues; (3) Condition C: Out-group cues × High bandwagon cues; and (4) Condition D: Out-group cues × Low bandwagon cues. Experiment stimuli for each condition are

presented in *the Appendix B*.

Measures

Manipulation Checks. To examine if the experimental manipulations of the two focal variables, identity and bandwagon cues, were successful, we included the following manipulation check measures. To confirm the identity cues were perceived as intended, participants were asked to recall with the prompt, “What was the race of the people in the Facebook posts you just viewed?”. Participants were allowed to select one or more categories from nine racial categories including “Caucasian American or White” and “African American or Black” (see Appendix A for the full list of answer options). In addition, a background homophily scale (McCroskey & Richmond, 1975) was used to assess the perceived similarities between the participants and the characters in the images, based on a 7-point scale ranging from 1 (*Very different*) to 7 (*Exactly the same*), with items such as “Overall speaking, the people featured in the Facebook posts I just saw are culturally different/similar to me” ($\alpha = .67$). To determine whether bandwagon cue manipulation worked, participants were asked to evaluate the number of likes by answering the question “Did the Facebook posts you just read have a high (or low) number of ‘likes’?” on a 5-point scale, ranging from 1 (*Extremely low*) to 5 (*Extremely high*).

Eye-Tracking Measures. A Tobii Pro Nano screen-based eye-tracker with a sampling rate of 60 Hz mounted on a 15.6-inch laptop (Dell XPS 15 with a screen resolution of 1920 × 1080 pixels) was used. Participants were seated in front of the laptop 60-65 cm away. Before the actual exposure of experimental stimuli, each participant went through the calibration process. Their eye calibrations were verified eligible only when their five test calibrations pass the validation criteria within the average error of .5 degrees and 6.3 mm in eye position. They followed five consecutive targets/points with their eyes to do so. Two areas of interests (AOIs):

were identified *a priori*: 1) the image component of the warning with its background (warning image AOI), and 2) the area that displays the number of “likes” of the post (social endorsement AOI). The two AOIs are marked with shaded colors in *Figure 3*.

For each AOI, total fixation duration was assessed as the eye-tracking metrics. Fixations are the moments when eyes remain briefly static when our visual system attends to objects of interests (Liu et al., 2021; King et al., 2019). *Total fixation duration* (dwell time; O’Malley et al., 2011) is the sum of the total amount of time in milliseconds that a participant spent viewing the stimuli. It functions to indicate the salience of visual objects within an AOI or a stimulus (King et al., 2019). Total fixation duration (TFD) was assessed in milliseconds and later converted to seconds for data analysis and interpretation.



Figure 3. Warning Image & Social Endorsement Areas of Interests (AOI)s Marked

Smoking Status. Current smoking status was assessed based on the National Survey on Drug Use and Health's standard current smoking definition (NSDUH-S) using the following 'Yes or No' question: "Have you ever smoked part or all of a cigarette?" (Ryan et al., 2012; Substance Abuse and Mental Health Services Administration, 2008). Those who answered "yes" to the first question will be classified as ever smokers, whereas the respondents who answered "no" were classified as never smokers (Ryan et al., 2012). Ever smokers were then asked the next question: "During the past 30 days, have you smoked part or all of a cigarette?" Those who answer "yes" were defined as current smokers (Ryan et al., 2012). All participants ($n = 223$) in the experiment met the eligibility requirement of being a current non-smoker.

Attention. Attention was measured using eye-tracking measures. Specifically, the total fixation duration metric was used to indicate the viewers' attention in this study (King et al., 2019; Mackert et al., 2013; O'Malley et al., 2011). Longer accumulated seconds of the total fixation duration indicated greater attention (King et al., 2019).

Negative Emotions. In line with previous research on smoking GHWs, we examined three types of discrete negative emotions, i.e., anger, disgust, fear, for each image, with the following instruction: "How much did the warning on the Facebook post make you feel...", on a 5-point Likert scale ranging from 1 = "*Not at all*" to 5 = "*Extremely*" with three adjectives for each construct (Brewer et al., 2016; Hammond et al., 2004). Fear was assessed with the words of "afraid", "scared", and "frightened", $\alpha s = .88 - .95$ (Brewer et al., 2016). Disgust was assessed with "grossed", "disgusted", and "sickened", $\alpha s = .86 - .90$ (Harmon-Jones et al., 2016). Anger was measured with "irritated", "angry", and "annoyed", $\alpha s = .85 - .91$ (Dillard & Shen, 2007).

Perceived Message Effectiveness. Perceived message effectiveness was measured on a three-item scale adapted from Mutti et al. (2016) for each image (which respectively corresponds

to one of the four themes, i.e., accelerated aging, head/neck cancer, throat cancer, and erectile dysfunction) across all conditions. The items asked whether the warning would: (1) “make people feel more concerned about the health risks of using cigarettes”; (2) “help prevent young people from starting to use cigarettes”; and (3) “make smokers want to quit”. Each item was measured with a 5-point Likert scale from 1 = “*Strongly disagree*” to 5 = “*Strongly agree*”. As it was a per-image outcome, we had four reliability statistics for each theme. The range of Cronbach’s alpha for each image was from .81 to .90 (Cronbach’s α = .97 in Mutti et al., 2016). We then averaged the means of the four PME scales for each condition, to be used in the final analyses.

Counterarguing. Similar to the PME measures, counterarguing was also measured as a per-image outcome, using a three-item scale for each image/theme across all conditions adapted from Clayton et al. (2020). The scale was originally developed by Silvia (2006). The items included: “Did you criticize the message you just saw while you were viewing it?” “Did you think of points that went against what was being said while you were viewing the message?” and “While viewing the message, were you skeptical of what was being said?” Each item was measured on a 5-point-Likert scale ranging from 1 = “*No, not at all*” to 5 = “*Yes, very much*”. Cronbach’s alpha across the four images ranged from .71 to .88 (Clayton et al., 2020; Clayton et al., 2019; Silvia, 2006). We then averaged the means of the four counterarguing scales for each condition, to be used in the final analyses.

Attitude. Attitude was measured by asking the participants to indicate on a semantic differential scale about their smoking in the next six months, with anchors including “bad-good”, “unenjoyable-enjoyable”, “unpleasant-pleasant”, “foolish-wise” and “harmful-good” on a 7-point scale (Hennessy et al., 2012). Cronbach’s α for this per-individual variable was .81.

Intention to Intervene Others' Smoking Behavior. One's intention to intervene a smoker's behavior through privately sharing the post to a smoker was measured with a single item question: "If you see this post on Facebook, how willing would you be to send it or share it privately with a smoker you know?" on a 5-point-Likert scale from 1 = "Very unlikely" to 5 = "Very likely".

Intention to Initiate Smoking. Intention to initiate smoking was measured using a three-item scale adapted from Davis et al. (2009) and Blanton et al. (2014). The items included "Do you think you might smoke a cigarette in the next 6 months?" and "If a friend offered you a cigarette, would you think about smoking it?" Both items were measured on a 5-point Likert scale ranging from 1 = "*Definitely no*" to 5 = "*Definitely yes*"; Cronbach's alpha was .72.

Intention to Have Interpersonal Communication. Intention to have conversations about GHWs was measured per message with a four-item scale adapted from Thrasher et al. (2016) and Brewer et al. (2016). The items asked the participants how much they were willing to (1) talk to their *family members* about the warning message; (2) talk to their *friends* about the warning message; (3) talk to their *family members* about the health risks mentioned in the warning message; and (4) talk to your *friends* about the health risks mentioned in the warning message. Each item was measured on a 5-point-Likert scale from 1 = "*Not at all likely*" to 5 = "*Extremely likely*". The range of Cronbach's alpha across four themes was between .88 and .94.

Demographics. Participants' age, gender, race/ethnicity, parents' education level, and household income were measured in the pre-survey (Fontanella, 2021). Questions for each demographic feature are presented in Appendix A.

Data Analysis

To test RQ1 – RQ4, and H1 – H2, a two-way MANCOVA with the interaction term

between the two independent variables, identity cues and bandwagon cues, was examined against two groups of dependent variables, message-level and individual-level outcomes. After observing significance from the omnibus test, separate two-way ANCOVAs with the interaction term were conducted. To examine H3 – H6, the PROCESS macro (Hayes, 2012, 2017), specifically Model 4 (Mediation), was utilized to examine the proposed mediation pathway between the two types of agency cues and the message-level and individual-level outcomes based on 5,000 bootstrapped resamples and 95% confidence intervals. Demographic variables (i.e., age, gender, parental education, and household income) served as covariates in all the analyses.

CHAPTER 4

RESULTS

Manipulation Check

For the identity cues, among the participants who considered the characters in the images as Caucasian American or White, 91.67% (110 out of 120) were from the “in-group identity cue” conditions (Conditions A & B); similarly, 98.26% (113 out of 115) of those who perceived the characters in the images as African American or Black were from the “out-group identity cue” conditions (Conditions C & D). In other words, the identity cue manipulation was perceived as intended by the overwhelming majority in each of the conditions. In addition, the result of a planned contrast following a significant one-way ANOVA omnibus test ($F(3, 219) = 2.68, p = .048, \eta^2 = .04$) indicated that participants in the “ingroup identity cue” conditions were significantly more likely to perceive the characters in the image to have a similar background ($M = 4.18, SD = 1.02$) than those who were in the “outgroup identity cue” conditions ($M = 3.90, SD = 1.05$), $t(219) = 1.99, p = .047$.

For the bandwagon cues, a planned contrast following a significant omnibus test of a one-way analysis of variance (ANOVA), $F(3, 219) = 417.50, p < .001, \eta^2 = .85$, demonstrated that participants in the “high bandwagon cue” conditions (Conditions A & C) rated the number of likes to be significantly higher ($M = 4.21, SD = .61$) compared to those who viewed the “low bandwagon cue” images (Conditions B & D; $M = 1.33, SD = .62$), $t(219) = 35.28, p < .001$.

Therefore, the experimental manipulation of the two focal variables in this study, i.e., the identity and bandwagon cues, was successful.

The Effects of Identity and Bandwagon Cues on Message-Related Outcomes

With RQ1 and H1, I wanted to examine the respective main effects of identity and bandwagon cues on the two message-related outcomes: (a) perceived message effectiveness (PME) evaluations and (b) counterarguing. The means and standard deviations for all message-related dependent variables across the four conditions are summarized in Table 1.

Table 1

Means and Standard Deviations for Message-Level DVs Across Four Conditions

		Conditions							
Measures		Cond A		Cond B		Cond C		Cond D	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Message-	PME	3.53	.95	3.62	.83	3.58	.82	3.60	.06
Level	Counterargue	1.60	.69	1.50	.64	1.29	.37	1.41	.53

Note: Cond A: In-group $\times$ High bandwagon, Cond B: In-group $\times$ Low bandwagon, Cond C: Out-group $\times$ High bandwagon, Cond D: Out-group $\times$ Low bandwagon

I first conducted a one-way multivariate analysis of variance (MANOVA), with experimental conditions as the fixed factor and PME and counterarguing as the dependent variables. The overall model was significant, Wilks' $\lambda = .03$, $F(3, 219) = 3340.01$, $p < .001$. Given the significance of the overall test, the univariate main effects were examined with a series of one-way ANCOVAs, adjusting for covariates including age, gender, parental education, and household income. The results from the omnibus tests indicated that experimental conditions had a significant effect on counterarguing ($F(3, 214) = 2.72$, $p = .046$. but not on PME ($F(3, 214) = .12$, $p = .95$). For RQ1, planned contrasts revealed that identity cues did not significantly affect

PME ($F(1, 216) = .001, p = .97$), but had a significant effect on counterarguing ($F(1, 216) = 6.03, p = .015$). Specifically, participants who were exposed to GHWs with in-group identity cues were significantly more likely to counterargue ($M = 1.55, SD = .66$), compared to out-group identity cues ($M = 1.36, SD = .46$). For H1, planned contrasts demonstrated that bandwagon cues did not have a significant effect on either PME ($F(1, 216) = .34, p = .56$) or counterarguing ($F(1, 216) = .12, p = .73$). H1 was not supported.

RQ2 asked if there was an interaction effect of identity and bandwagons cues on PME and counterarguing toward GHWs. A two-way multivariate MANOVA revealed that the interaction term did not have any significant effect on the outcomes (Wilks' $\lambda = .99, F(2, 218) = 1.04, p = .35$). A two-way ANCOVA with the interaction term controlling for the covariates also confirmed that there was no significant interaction effect on either PME ($F(1, 214) = .01, p = .91$) or counterarguing ($F(1, 214) = 2.00, p = .16$).

The Effects of Identity and Bandwagon Cues on Individual-Related Outcomes

The next set of hypotheses and research questions aimed to examine the effects of identity (RQ3) and bandwagon cues (H2), and their interaction effects (RQ4) on individual-level outcomes: (a) attitude toward smoking (attitude), (b) intention to initiate smoking (intention to smoke), (c) intention to privately send or share the warning messages to a smoker (intention to intervene), and (d) intention to talk about the warning messages with their significant others (interpersonal communication). The means and standard deviations for all individual-related dependent variables across the four conditions are summarized in Table 2.

Table 2

Means and Standard Deviations for Individual-Level DVs Across Four Conditions

		Conditions							
Measures		Cond A		Cond B		Cond C		Cond D	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Individual -Level	Attitude	1.16	.47	1.14	.39	1.24	.57	1.21	.54
	Intention to Smoke	1.19	.34	1.22	.45	1.42	.60	1.41	.54
	Interpersonal Communication	2.82	1.20	2.79	1.19	2.72	1.22	2.62	1.06
	Intention to Intervene	2.27	1.34	2.35	1.24	1.93	1.05	1.89	.94

Note: Cond A: In-group $\times$ High bandwagon, Cond B: In-group $\times$ Low bandwagon, Cond C: Out-group $\times$ High bandwagon, Cond D: Out-group $\times$ Low bandwagon

A one-way multivariate analysis of variance (MANOVA), with experimental conditions as the fixed factor and the above individual-level outcomes as the dependent variables suggested an overall significant model, Wilks' $\lambda = .82$, $F(4, 211) = 11.85$, $p < .001$. The omnibus tests from the following one-way ANCOVAs (adjusting for covariates including age, gender, parental education, and household income) indicated that experimental conditions had a significant effect on intention to smoke ($F(3, 214) = 2.83$, $p = .04$), and intention to intervene ($F(3, 214) = 2.81$, $p = .04$). The experimental conditions did not affect attitude ($F(3, 214) = .51$, $p = .68$) or interpersonal communication ($F(3, 214) = .24$, $p = .87$). Further planned contrasts to examine the main effects of identity cues (RQ3) demonstrated that identity cues did not significantly affect non-smokers' attitude toward smoking ($F(1, 216) = .97$, $p = .33$) and intention to have interpersonal communication about the warning messages ($F(1, 216) = .63$, $p = .43$). However, they had a strong direct effect on intention to initiate smoking ($F(1, 216) = 8.57$, $p = .004$). A

close scrutiny revealed that, participants exposed to GHWs with in-group identity cues had significantly lower intention to smoke in the future ($M = 1.21$, $SD = .40$) compared to those who viewed GHWs with out-group identity cues ($M = 1.41$, $SD = .57$). Results also revealed that identity cues significantly affected participants' intention to privately send warning messages to intervene others' smoking behaviors ($F(1, 216) = 8.42$, $p = .004$), such that in-group identity cues led to higher intention to intervene ($M = 2.31$, $SD = 1.28$), compared to out-group identity cues ($M = 1.91$, $SD = .99$). For H2, we expected that GHWs with higher number of "likes" (i.e., bandwagon cues) will produce (a) less favorable attitude toward smoking, (b) less intention to smoke, (c) greater intention to intervene a smoker, and (d) greater intention to have interpersonal communication about the GHWs, compared to GHWs with lower number of "likes". Planned contrasts demonstrated that there was no significant effect across all individual-level outcomes: (a) attitude ($F(1, 216) = .55$, $p = .46$), (b) intention to smoke ($F(1, 216) = .00$, $p = .996$), (c) intention to intervene ($F(1, 216) = .01$, $p = .94$), and (d) intention to have interpersonal communication about the warning messages ($F(1, 216) = .11$, $p = .78$). Therefore, H2 was not supported. Additionally, interaction effect of the two independent variables on the four individual-level outcomes was not significant (RQ4) after conducting a two-way ANCOVA: (a) attitude ($F(1, 214) = .03$, $p = .86$), (b) intention to smoke ($F(1, 214) = .004$, $p = .95$), (c) intention to intervene ($F(1, 214) = .09$, $p = .77$), and (d) intention to have interpersonal communication about the messages ($F(1, 214) = .01$, $p = .93$).

Mediation Analyses

I proposed two mediational pathways to understand the relationships between the two types of agency cues and (a) message-level outcomes and (b) individual-level outcomes, i.e., through cognitive responses as indicated by individuals' fixation patterns (H3 and H4) and

through negative affective response as assessed by their self-report negative discrete emotions (H5 and H6). The means and standard deviations of all mediators across the four conditions are displayed in Table 3.

Table 3

Means and Standard Deviations for all Mediators Across Four Conditions

		Conditions							
	Measures	Cond A		Cond B		Cond C		Cond D	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Attention	TFD_image	8.12	2.31	7.92	2.37	8.15	2.59	9.49	2.99
	TFD_likes	.87	.51	.61	.67	.84	.54	.44	.46
Negative Emotions	Disgust	2.86	.71	2.83	.71	2.50	.82	2.68	.82
	Anger	1.92	.68	1.90	.77	1.60	.55	2.08	.82
	Fear	2.41	.85	2.28	.85	2.13	.77	2.61	.92

Note: Cond A: In-group $\times$ High bandwagon, Cond B: In-group $\times$ Low bandwagon, Cond C: Out-group $\times$ High bandwagon, Cond D: Out-group $\times$ Low bandwagon

Model 4 (Mediation) in PROCESS macro (Hayes, 2012, 2017) was conducted to examine the mediational pathways. I expected attention (i.e., fixation patterns as measured by eye-tracking) would mediate between identity cues and the two message-level outcomes (H3a) and the four individual-level outcomes (H3b).

Total fixation duration (TFD), as noted earlier, is the sum of total amount of time in milliseconds that viewers spend viewing the stimuli and indicates attention in this current study. Identity cues were significantly associated with TFD of warning image AOI ($F(1, 220) =$

5.03, $p = .026$), whereas bandwagon cues had a significant relationship with TFD of social endorsement AOI, $F(1, 220) = 19.59, p < .001$). For H3, the total fixation duration (TFD) in the warning image AOI was examined as the mediator between the identity cues and the dependent variables. Mediation of TFD in the warning image AOI between the identity cues and the two message-level outcomes, PME and counterarguing, was not observed to be significant. For the individual-level outcomes, results revealed that the TFD in the warning image AOI significantly mediated effects of identity cues and one of the individual-level outcomes: attitude (Indirect ES = .0274, 95% CI [.0037, .0630]). Specifically, GHWs with out-group identity cues attracted greater attention to the graphic image AOI ($M = 8.81s, SD = 2.86$) compared to GHWs with in-group identity cues ($M = 8.02s, SD = 2.33$), and greater attention led to a more favorable attitude toward smoking ($\beta = .19, p = .005$). However, no significant mediation effect of TFD in the warning image AOI was observed between identity cues and intention to smoke (Indirect ES = -.0419, 95% CI [-.1093, .0031]), intention to intervene (Indirect ES = -.0419, 95% CI [-.1087, .0034]), or intention to have interpersonal communication (Indirect ES = -.0085, 95% CI [-.0683, .0487]). Therefore, H3b was partially supported.

H4 aimed to examine if attention would mediate the relationships between bandwagon cues and the two groups of outcomes (i.e., H4a: message- and H4b: individual-level outcomes). PROCESS Model 4 mediation tests demonstrated that TFD in the social endorsement AOI significantly mediated the relationships between bandwagon cues and the two individual-level outcomes: intention to intervene (Indirect ES = .1082, 95% CI [.0270, .2577]) and intention to have interpersonal communication (Indirect ES = .1207, 95% CI [.0292, .2523]). Specifically, participants in conditions of higher bandwagon cues had on average longer TFDs in the social endorsement AOI ($M = .86s, SD = .53$) compared to those in the conditions of lower bandwagon

cues ($M = .53s$, $SD = .58$; $F = 18.92$, $p < .001$), and TFDs in the social endorsement AOI were positively associated with intention to intervene ($\beta = .15$, $p = .021$) as well as greater intention to discuss about the messages with others ($\beta = .16$, $p = .015$). TFD in the social endorsement AOI did not mediate between bandwagon cues and PME (Indirect ES = .0505, 95% CI [-.0011, .1269]), counterarguing (Indirect ES = -.0096, 95% CI [-.0719, .0237]), attitude (Indirect ES = .0053, 95% CI [-.0198, .0454]), and intention to initiate smoking (Indirect ES = -.0063, 95% CI [-.0460, .0356]).

H5 hypothesized that negative affective responses will mediate the relationship between identity cues and message- (H5a) and individual-level (H5b) outcomes. First, identity cues significantly led to disgust ($F(1, 216) = 7.43$, $p = .007$), but not for the other two negative emotions: fear or anger. For the mediation paths for each dependent variable, PME was significantly mediated by disgust (Indirect ES = -.1099, 95% CI [-.2062, -.0269]), such that compared to out-group identity cues ($M = 2.59$, $SD = .82$), in-group identity cues produced greater disgust ($M = 2.84$, $SD = .71$), which led to greater PME ($\beta = .36$, $p < .001$). However, disgust did not significantly mediate the relationship between identity cues and counterarguing (Indirect ES = -.1105, 95% CI [-.0510, .0200]). Regarding individual-level outcomes, disgust significantly mediated the relationship between identity cues and intention to intervene others' smoking behavior (Indirect ES = -.0787, 95% CI [-.1697, -.0089]). Specifically, GHWs with in-group identity cues produced more disgust, compared to those with out-group cues ($F(1, 216) = 7.43$, $p = .007$), and disgust was positively associated with intention to intervene ($\beta = .21$, $p = .002$). Disgust also mediated between identity cues and intention to have interpersonal communication about the warning messages (Indirect ES = -.1406, 95% CI [-.2815, -.0344]), such that in-group cues led to more disgust and greater disgust was associated with higher

intention to have interpersonal communication about the messages ($\beta = .28, p < .001$). No indirect effect via disgust was observed for identity cues on attitude (Indirect ES = $-.0058$, 95% CI $[-.0220, .0396]$) and intention to smoke (Indirect ES = $.0013$, 95% CI $[-.0259, .0283]$).

It was also expected that negative emotions would mediate the relationship between bandwagon cues and the same message- (H6a) and individual-level (H6b) outcomes. Disgust and fear did not mediate any relationship between bandwagon cues and all message- and individual-level outcomes. Among the three negative discrete emotions, only anger was found to be a significant mediator between the relationships of bandwagon cues and some dependent variables. For the message-level outcomes, anger significantly mediated the relationships between bandwagon cues and PME (Indirect ES = $.0484$, 95% CI $[.0062, .1095]$) as well as counterarguing (Indirect ES = $.0340$, 95% CI $[.0008, .0850]$). Higher bandwagon cues led to lower anger ($M = 1.76, SD = .64$) compared to lower bandwagon cues ($M = 2.00, SD = .80$; $F(1,216) = 5.93, p = .016$), and lower anger was associated with lower PME ($\beta = .18, p = .006$) as well as lower counterarguing ($\beta = .18, p = .007$). For individual-level outcomes, anger mediated between bandwagon cues and intention to intervene others' smoking behavior (Indirect ES = $.0538$, 95% CI $[.0055, .1279]$), with lower bandwagon cues leading to greater anger compared to higher bandwagon cues, and greater anger leading to greater intention to intervene ($\beta = .17, p = .012$). Anger was not found to be a significant mediator for the effects of bandwagon cues on other individual-level outcomes including attitude, intention to smoke, and intention to have interpersonal communication about the warning messages.

CHAPTER 5

DISCUSSION

Graphic health warning messages have established proven effectiveness in smoking cessation and prevention (Noar et al., 2015). In recent years, public health organizations such as the FDA or CDC are increasingly utilizing social media as a tool to disseminate and promote health-related information among hard-to-reach young adults. Yet, less is known about how different heuristics afforded by the various technological features on social media may impact young people's perceptions and behaviors in the context of smoking warning messages.

Informed by the Modality-Agency-Interactivity-Navigability (MAIN) model, the current study aimed at better understanding the effectiveness of two agency cues (i.e., identity and bandwagon cues) in smoking GHWs on social media. Findings illustrated that these cues were associated with different message- and individual-level outcomes when participants viewed racial in-group vs. out-group and high "likes" vs. low "likes" cues. In the sections that follow, I provide discussions about the results and reflect on the theoretical and practical implications of the study findings.

Effects of Identity Cues on Message- and Individual-Level Outcomes

This study observed that identity cues had a significant effect on counterarguing such that participants (all Caucasian Americans in this study) who were exposed to GHWs with racial in-group identity cues (i.e., Caucasian American exemplars) were significantly more likely to counterargue, compared to those who were exposed to racial out-group identity cues (i.e., African American exemplars). This finding seems to be aligned with the notion that people are

more likely to actively argue against messages if they sense that the messages attack or threaten the freedom of themselves, or those that they can easily relate to or perceive as in-groupers (McQueen et al., 2011). In previous studies, perceived similarity and liking toward a character or an exemplar in a message are often found to be associated with lower counterarguing, particularly when there is enhanced identification with the character (Dal Cin et al., 2004; McQueen et al., 2011). In the current study context however, given the unique, strongly negative consequences illustrated in the warning messages, participants who viewed GHWs that demonstrated diseases and suffering of people that are similar to themselves, may have provoked a strong sense of self-protection and defense, leading to more counterarguing. The vivid visual illustration of the health consequences (such as neck cancer) may have further strengthened such effects. For perceived message effectiveness, the identity cues, however, did not produce any significant differences in this outcome. In other words, in the context of GHWs, warning images using racial in-group identity cues, manifested as the match between the viewer and the exemplar's racial identities, may not significantly increase the perceived effectiveness of the messages, but may instead backfire and provoke more counterarguments. This interesting finding calls for future research to further understand the implications and optimal use of tailoring in the context of warning message design. For the African American population specifically, studies on tailored health communication have focused primarily on the context of health interventions or raising awareness to advancing health promotion programs (Kreuter et al., 2003) which provides general educational guidelines of the approach, but not sufficient quantifiable, concrete empirical evidence that can effectively facilitate implementation. Therefore, message effects research that can offer empirical, actionable evidence to support the use of tailored health communication in GHW message design for the African American population is critical.

In terms of individual-level outcomes, it was observed that racial in-group cues on GHWs led to lower intention to initiate smoking and greater intention to intervene by sharing the post containing the warning information to a smoker. To put it more concretely, people who viewed warning images describing suffering from those who they perceived as of greater resemblance and similarity to themselves, were more likely to not initiate smoking in the foreseeable future. They were also more likely to actively engage in the behavior of intervening in others' smoking behaviors through sharing the warning message to them via Facebook. It is also likely that the smoker to whom the participants were planning to send the post was also a perceived racial in-group member, thus sharing a warning message describing the health consequences of smoking experienced by similar others (in relation to the receiver/smoker) were considered by the senders (i.e., participants) as more effective, which may have increased participants' intention to share, as compared to when they viewed images describing racial out-group members. However, this remained speculation as our data did not collect relevant information for this examination.

Combining the above results together, the study revealed an interesting pattern related to the effects of identity cues: when people were exposed to warning messages describing suffering or misery of those who they perceived as similar to themselves, they were more likely to argue against these messages, presumably as a natural reaction in response to threats to freedom and ego, and strong motivation to defend for their current practices (Hong & Sun, 2017). On the other hand, interestingly, despite their tendency to counterargue, they were indeed more influenced in the direction intended by the messages (i.e., anti-smoking) by having a lower intention to smoke, and by indicating a greater likelihood of sharing this message with a smoker they know, as compared to if they were visually exposed to the health consequences of smoking demonstrated by racial out-group smokers. These interesting patterns were to some extent

explained by some of the mediational mechanisms I examined, which will be detailed in the next section.

Contrary to the expectation, the effects of bandwagon cues were not observed to be significant for either message level- or individual level- outcomes. It may be that among the two types of agency cues, identity and bandwagon cues, that both operate under the powerful scheme of social influence, similarity in social identity as opposed to popularity information (which had no social sanction concerns attached to it), were more fundamental to people's internalized values and were thus more likely to produce meaningful impacts to their cognitions and behaviors. This echoes what Hayashi et al. (2018) advocated in their study that the racial identification of core, salient characteristic features that the target population are most likely to resonate with, is crucial in the effective implementation of segmentation strategies in the anti-smoking GHW settings. Based on the findings, racial identity cue may be such a salient and internalized characteristic that needs further examination and utilization in GHWs. Additionally, the observed findings may also be partly attributed to our experimental manipulation. Identity cues were manipulated through visuals, which occupied a substantially larger area in the stimuli, and were thus of greater visual salience, as compared to the bandwagon cue manipulation, which only contained a number and a very brief visual (i.e., the "thumb-up" icon), not immediately noticeable as compared to the racial identity cues. As can be observed from the eye-tracking measures, warning image AOI, the area where the identity cues were varied, resulted in much longer TFDs, when compared to that of the social endorsement AOI, which only attracted brief TFDs of on average less than a second across conditions. It is worth noting that the two cues were manipulated in a way to imitate the actual Facebook post aiming to increase the ecological validity of the study. Future experiment study may benefit from manipulating the two cues in

different ways to account for the unintended, but potential “disadvantaged” representation of one cue over the other.

Cognitive and Affective Mediation Pathways

Cognitive Mediational Pathways. In addition to examining the direct effects of identity and bandwagon cues, this study also tested the indirect effects of the two focal variables on the outcomes through cognitive (i.e., attention) and affective (i.e., emotion) pathways. Specifically, I observed that, attention, measured by the eye-tracking parameter of total fixation duration (TFD) in the *a priori* hypothesized AOIs on the stimuli, significantly mediated the relationships between the two agency cues and some of the message- and individual-level outcomes.

For example, the TFD in the warning image AOI served as a mediator between the identity cues and attitude toward smoking, although there was no direct effect observed between identity cues and attitude. This study found that racial out-group identity cues attracted greater attention to the graphic image AOI compared to GHWs with racial in-group identity cues, and greater attention then led to a more favorable attitude toward smoking. It was possible that there was a novelty bias, where people attended to unfamiliar or unexpected stimuli with greater cognitive efforts (Kätsyri et al., 2016); specifically, viewers tended to have a lower perceived similarity, thus greater unfamiliarity, when exposed to racial out-group exemplars, and such “novel” stimuli registered for greater attention and mental salience. However, it was interesting to observe that the greater attention, i.e., the longer duration time in the warning image AOI containing the racial outgroup exemplar (vs. the ingroup exemplar), in turn, led to more favorable attitude toward smoking. This may be because that the more elaborative processing of the racial outgroup exemplars in the warning image AOI made people more likely to perceive that the negative health consequences being described in the images were less likely to be

applicable to themselves or those who they considered as racial similar or in-groupers, lowering their risk perceptions thus increasing the favorable attitude toward smoking. This aligns with findings from a prior study which concluded that perceived similarity between viewers and the protagonist who engaged in a risky behavior and experienced the negative outcomes associated with that behavior, was positively associated with the viewers' risk perceptions (Igartha & Fiuza, 2018).

For bandwagon cues, although I did not observe any direct effects of bandwagon cues on the proposed outcomes, the TFD in the social endorsement AOI on the post significantly mediated the relationship between bandwagon cues and a couple of individual-level outcomes: interpersonal communication about the warning messages and intention to intervene a smoker through sharing the messages. Specifically, participants in conditions of higher bandwagon cues had on average longer TFDs in the social endorsement AOI compared to those in the conditions of lower bandwagon cues; the TFDs in the social endorsement AOI were in turn positively associated with both intention to intervene and intention to discuss about the messages with others. These findings corroborated results from previous studies that people tended to focus their attention more on the social endorsement information (i.e., "Likes" area) of a visual post on Facebook when the number of likes was deemed high, due to the perceptions that higher popularity may lend a greater anchor or guidance to form subjective evaluations (Kim & Yang, 2017; Metzger & Flanagin, 2013; Sundar et al., 2009). Greater attention to the high social endorsement cues in turn led to greater intention to intervene and to discuss about the messages with others. This finding may be explained by the possibility that higher social endorsement cues can significantly increase the perceived credibility and importance of the warning messages

(Borah & Xiao, 2018), which enhanced viewers' confidence to share the messages with a smoker and likelihood to converse with others about the health information in the messages.

Affective mediational pathways. With regard to the discrete emotion mediators, it was observed that disgust significantly mediated the relationship between identity cues and PME (i.e., message-level outcome), intention to intervene other's smoking behavior (i.e., individual-level outcome), and intention to have interpersonal communication with others about the messages (i.e., individual-level outcome). The findings indicated that compared to racial out-group cues, the racial in-group cues led to greater affective responses of disgust, which in turn led to greater PME, greater intention to intervene, and to have interpersonal communication with others. These findings to some extent corroborated our speculation earlier that, people tended to relate to those who were perceived as more similar to themselves. Therefore, when viewers were exposed to images of their racial in-groupers suffering from the negative consequences of smoking, they were more likely to experience negative emotions such as disgust. These results were also consistent with and further expanded understanding informed by previous studies that cigarette GHWs frequently elicited feelings of disgust (Cho et al., 2018; Gibson et al., 2015; Li et al., 2020; Wang et al., 2015). It was likely then that such a feeling would in turn increase people's risk perceptions and message effectiveness perceptions, motivate them to come forward and intervene other's risky smoking behaviors, and prompt them to talk about the warning information with others as a coping mechanism (Kupfer & Ginger-Sorolla, 2016; Schaller, 2014). It is interesting to note that, while previous studies observed that Facebook posts that elicited positive emotions tended to promote public social media engagement from the users, such as status update or posting on the public walls (Bazarova et al., 2013), this study provided some initial evidence that negative emotions elicited by social media posts such as disgust may

increase more private engagement on social media. Given the unique nature of health warning messages (i.e., negative, threatening content), I did not measure positive emotions in this study, and thus cannot speak directly to the comparison of positive versus negative emotions on social media engagement. This interesting pattern awaits further examinations in future studies.

In addition to disgust, it was found that anger significantly mediated the relationship between bandwagon cues and PME and counterarguing (i.e., message-level outcomes). To be more concrete, the higher number of “likes” led to less anger, which led to less counterarguing and lower PME. The negative relationship between levels of social endorsement and anger observed in the current study was consistent with a recent study which found that social media users tended to report lower levels of anger toward offensive content on social media when they perceived that the content received high social endorsement by others (Li et al., 2020). The same study noted a significant mediator role of anger such that higher social endorsement led to less anger, which in turn decreased people’s defensiveness towards the social media content, echoing our finding that lower anger led to less counterarguing against the post.

On the other hand, the lowered anger levels, as a result of viewing the higher bandwagon cues, also led to significantly lower PME in the current study. This finding can be somewhat counterintuitive given that the results associated with the two message-level outcomes, i.e., counterarguing and PME, exhibited different patterns and opposite implications for the message effects. A possible explanation for this observation was potentially related to the role anger served in the two processes. While the lowered anger may have effectively reduced people’s motivation to defend, as an action-oriented discrete emotion (Contractor et al., 2015; Frijda et al., 1989) when anger’s levels dampen, the corresponding arousals and heightened intensity elicited by the negative warning messages, which were often important for forming message

effectiveness perceptions, would diminish as well. In other words, the reduced levels of anger may serve a role that can simultaneously suppress both people's desire to rebuttal, as well as the intensity of emotional arousal, a known antecedent to PME (Dillard & Nabi, 2006; Gerend & Maner, 2011).

In terms of individual-level outcomes, the current findings suggested that anger mediated between bandwagon cues and intention to intervene others' smoking behavior, with lower bandwagon cues leading to greater anger, which in turn produced greater intention to privately send the warning messages to a smoker. This finding made intuitive sense, such that the higher the anger, the greater likelihood the non-smoking viewers will be stimulated to intervene others' smoking behavior.

Theoretical Contributions

This study was informed by and provided empirical evidence to support some of the major propositions of the MAIN model (Sundar, 2008) in a lab experiment setting. While the MAIN model was primarily proposed to address the issue of credibility in the digital age when murky sources of information abound, it also significantly contributed to advancing our understanding by detailing the abilities of the various technological affordances to cue cognitive heuristics pertaining to the assessments of online information, including persuasive messages embedded in an online environment. This presents exciting opportunities for message effects scholars to examine the unique and combined effects of message characteristics and external or social influences exerted by the online media environment. The current study was among such effort to examine the persuasive message effects in a social media environment using a randomized controlled experiment. The findings confirmed that, first of all, the viewers were able to notice and correctly interpret as intended the bandwagon and identity cues, which are two

primary agency cues according to the MAIN model, and these cues were able to substantially influence their processing of health messages mocked up as Facebook posts, as well as their cognitions and behavioral intentions regarding the health behavior of interest.

Additionally, although the MAIN model proposed different types of cues that may influence people's information assessment online, it was unclear, however, through which mechanisms these cues exert the observed influence. Present study findings contributed to the theory by examining both the cognitive and affective mediational pathways through which identity and bandwagon cues took effects. Using both the objective eye-tracking attention measures and the self-reported discrete emotion measures, this study revealed interesting underlying mediational mechanisms of how each of the agency cues was able to influence the persuasive outcomes (either at the message- or individual-level), through distinct cognitive and affective pathways, corroborating prior studies' conclusions that attention and negative emotions are crucial for GHWs to take effects, particularly in the social media environment where all types of cues compete for people's limited attentional and affective resources (Huang et al., 2014). For findings associated with the mediational pathways specifically, I observed that two of the four negative emotions we examined, i.e., anger and disgust, served indispensable roles in mediating the effects of the agency cues on persuasion outcomes, especially the message-level outcomes. Interestingly, while these two discrete emotions were often broadly considered as belonging to the overarching term of "negative emotions" in most of the previous studies on GHWs (e.g., Brewer et al., 2016; Noar et al., 2015), the findings provided empirical evidence that they exhibited distinct patterns in their influence on different persuasion outcomes. It would be a fruitful future direction to examine more discrete negative emotions such as guilt, sadness, and other emotional responses relevant in the GHW context, as independent sources of influence that

can impact the effectiveness and outcomes associated with GHW exposure, in the social media context.

Practical Contributions

This study sheds light on the potential effective strategies of promoting health messages such as GHWs in a social media setting. Although a nontrivial amount of research has advocated using social media such as Twitter, Facebook, and Instagram to promote dissemination and voluntary retransmission of health-related information to youth and young adults, in order to impact their health decision-making and behaviors, very few studies have examined the concrete messaging strategies to for effective implementation. Most importantly, most studies did not take into consideration of both the persuasive message features and the unique social media features, in their investigations on online health information promotion. This study has focused on two influential agency cues that have important social influence implications, and provided detailed analyses and a set of empirical evidence regarding how to best utilize the new media affordances to optimize health message effectiveness in the social media setting, at both the message- and the individual behavior- level. It has also added additional evidence attesting to the importance of tailoring and segmentation in the health communication context (Hayashi et al., 2018; Slater, 2010). Findings from this study regarding the unique patterns of mediation pathways can be used in tailored social media campaigns or the GHW social media promotion, to inform how to best tailor the exemplars facilitated by precise targeting on these platforms (e.g., intensified disgust may need to be avoided for users associated with certain demographics that are known to have low tolerance to such features, to minimize potential counterarguing). Further exploring racial identity cues (or other visually salient ingroup cues) in GHW design to promote the perceptions

of similarity and relevance and enhance viewers' capacity to related and identify with the exemplars in the GHWs can be a promising future direction in GHW research.

This research is also meaningful in that it provided some initial evidence about the possibility of motivating non-smokers to intervene smokers' behaviors through sharing health information on social media. The study utilized the non-smoking college student population as our sample and observed that properly strategizing the agency cues in the Facebook posts can significantly increase their intention to share the warning message privately to a smoker they know. This finding was important particularly considering that most of the current smoking cessation campaigns or interventions focused solely on changing smokers themselves, not sufficiently acknowledging the importance of intervention and support that can be provided by the non-smokers (Alpert, 2009). The current study demonstrated the possibility of mobilizing nonsmokers and tapping this underutilized resource to increase GHWs' effectiveness and reach on social media, as well as to aid smoking cessation in the future.

Limitations

Due to the unbalanced representations of Caucasian and other racial populations in our research subject pool, I was not able to examine the effects of identity and bandwagon cues on message-level and individual-level outcomes associated with GHW exposure from the perspective of other populations such as African American participants. The findings thus should be interpreted within the Caucasian American populations and could not be generalizable to all populations. This indicates opportunities for further investigations in the future. Another limitation associated with using the current participant pool was that I could not involve adolescents in the study, especially the teenager group, although there was an established high risk of initiating and developing daily smoking habits among non-smoking teenage groups and

needed urgent attention from scholars and public health practitioners (Jeong et al., 2011; O’Loughlin et al., 2015).

Additionally, based on participants’ open-ended recall responses, it was clear that they recognized that the Facebook posts presented as our experimental stimuli were created by the FDA, which was often mentioned as a trustworthy source of health-related information. However, the credibility of the information source was not measured in this study, which can also be interpreted as a representation of the “*authority heuristic*” (i.e., also one of the agency cues) through the MAIN model (Sundar, 2008). Borah and Xiao (2018), for instance, examined the interaction effects of perceived source credibility and the number of “likes” on Facebook message effectiveness. This leaves room for further investigation on the possible interaction effects between the authority heuristic and other cues such as the two types of agency cues examined in this study, to more accurately assess how message effects are influenced by various types of additional cues on social media under the theoretical framework of the MAIN model.

Stimuli creation was also another potential limitation of this study, given that a few participants reported in their open-ended response that the warning images seemed to be poorly photoshopped.

Finally, although I conducted manipulation checks to ensure that the racial in-group versus outgroup perceptions and the corresponding differences in perceived similarity were indeed induced through our experimental manipulation, it was also important to examine participants’ prior racial related perceptions and examine how these trait-like variables may interact with the experimentally manipulated identity cues to influence outcomes. We have included the measures of Old-Fashioned Racism Scale (ORFS) & Modern Racism Scale (MRS) and the Color-Blind Racial Attitudes Scale (CoBRAS) in the pre-survey (McConahay, 1986;

Neeville et al., 2000) in the study for the purpose of conducting exploratory analysis. Preliminary analyses suggested that the bivariate correlations between the ORFS, MRS, and CoBRAS and the focal variables were not significant. Given the scope of the current study, further analyses related to the three race perception scales were not performed. However, further analyses employing these scales will be conducted as the immediate next step of this study. Moreover, sociopolitical contexts of current situations such as the heightened mistrust on public health organizations due to the COVID-19 pandemic were not considered or inquired in this study. Participants' political stances also were not included in the scope of the current study, which warrants future examinations.

Future Directions

Broadly speaking, not only related to the research of GHWs on social media, but in the wider area of computer-mediated communication, it is important to consider the interaction effects of different agency cues afforded by the new media technology, given that these cues always exist and are present simultaneously in the social media environment. In the present study, I did not detect any interaction effects between the identity and bandwagon cues, which suggests a potential avenue for future investigation. As briefly mentioned earlier, other relevant cues, such as authority heuristic or social presence heuristic (e.g., socioemotional information that enhances credibility), can also be incorporated into the design of future studies to examine other possible combinations or interactions in the future (Sundar, 2008).

The limitation on the scope of the current population can be also addressed in the future. I am planning on a follow-up replication study relying on online survey panels that would allow oversampling of African American participants, to examine the effects of bandwagon and identity cues on message persuasiveness.

Finally, as noted earlier, I observed different mediation patterns of discrete negative emotions, depending on the agency under investigation. Therefore, it is also expected to explore other discrete negative emotions such as guilt, sadness in the context of smoking GHWs in the future (Rowe & Fitness, 2018).

CHAPTER 6

CONCLUSION

This study investigated the effects of identity and bandwagon cues on Facebook posts in the context of anti-smoking graphic warning messages using both eye-tracking and self-reported measures. It was observed that warning posts with in-group exemplars led to more counterarguing; but less intention to initiate smoking and greater intention to intervene others' smoking behaviors by sharing the warning contents with a smoker. Examining the mediational mechanisms, out-group cues led to greater attention, which in turn, led to less intention to intervene other's smoking behaviors. Higher number of "likes" led to greater attention, which increased one's intention to discuss about the warning contents others. Negative discrete emotions (i.e., anger and disgust) were also found to mediate the relationships between the two agency cues and message- and individual-level outcomes, such that more intense feelings of disgust led to more intention to intervene a smoker or have interpersonal conversations about the warning messages when exposed to in-group cues. When high social endorsement cue was present, viewers experienced less anger, which in turn led to less counterarguing, but at the same time, also lower perceived message effectiveness. Taken together, this study highlights important findings about social media heuristics that young adults rely on to process and interpret GHWs in the context of social media. It also advances our mechanistic understanding about how social identification and endorsement cues may influence young adult non-smokers' perceptions of smoking warnings, their smoking-related cognitions and intentions, through cognitive and affective pathways.

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Appendix A: Measures

Demographics

1. Gender

Instructions: What is your gender?

(1= Male; 2= Female; 3 = Transgender; 4 = Other (Please specify))

2. Race

Instructions: What is your race?

(1 = Caucasian American or White; 2 = American Indian or Alaska Native; 3 = Asian; 4 = African American or Black; 5 = Hispanic or Latino; 6 = Middle Eastern or North African; 7 = Native Hawaiian or Other Pacific Islander; 8 = Some other race, ethnicity, or origin (Please specify))

3. Parents' education level

Instructions: What is the highest degree or level of education your parents have completed?

(1 = Some High School; 2 = High School; 3 = Bachelor's Degree; 4 = Master's Degree; 5 = Ph.D. or higher; 6 = Trade School; 7 = Prefer not to say)

4. Household income

Instructions: What is your annual household income?

(1 = Less than \$25,000; 2 = \$25,000 - \$50,000; 3 = \$50,000 - \$100,000; 4 = \$100,000 - \$200,000; 5 = More than \$200,000; 6 = Prefer not to say)

Bandwagon Cues

1. Did the Facebook posts you just read have a high (or low) number of ‘likes’?

(1 = Extremely low; 2 = Somewhat low; 3 = Average; 4 = Somewhat high; 5 = Extremely high)

Identity Cues

1. What was the race of the people in the Facebook posts you just viewed?

(1 = Caucasian American or White; 2 = American Indian or Alaska Native; 3 = Asian; 4 = African American or Black; 5 = Hispanic or Latino; 6 = Middle Eastern or North African; 7 = Native Hawaiian or Other Pacific Islander; 8 = Some other race, ethnicity, or origin; 9 = Cannot recall)

2. Background Homophily Scale

Instructions: The person on the Facebook post that I just saw...

(1 = Very different ... 7 = Exactly the same)

1. Has status different from like mine ... Has status like mine

2. Is from a different social class ... Is from the same social class

3. Is culturally different ... Is culturally similar

4. Does not have an economic situation like mine ... Has an economic situation like mine

5. Is not from my age group ... is from my age group.

Emotional Response

Instructions: Try to think about how you felt while initially viewing this post just now, and

answer the following question: While viewing this Facebook post, I felt...

(1 = Strongly disagree; 2 = Disagree; 3 = Neither disagree nor agree; 4 = Agree; 5 = Strongly agree)

1. Afraid

2. Scared

- | | |
|----------------|-------------|
| 3. Frightened | 8. Angry |
| 4. Grossed out | 9. Annoyed |
| 5. Disgusted | 10. Worried |
| 6. Sickened | 11. Anxious |
| 7. Irritated | 12. Nervous |

Intention to Initiate Smoking

Instructions: Please rate the likelihood of your tobacco use with the following statements:

(1= Definitely no; 2 = Probably no; 3 = Might or might not; 4 = Probably yes, 5 = Definitely yes)

1. Do you think you might smoke a cigarette in the next 6 months?
2. Do you think you will be smoking cigarettes 5 years from now?
3. If a friend offered you a cigarette, would you think about smoking it?

Interpersonal Communication

Instructions: Please rate the extent to which you agree or disagree with the following statements regarding this post. After viewing this post:

(1 = Not at all likely; 2 = Somewhat unlikely; 3 = Neither likely nor unlikely; 4 = Somewhat likely; 5 = Extremely likely)

1. How much are you willing to talk to your family members about the smoking warning message after viewing today's posts?
2. How much are you willing to talk to your friends about the smoking warning message after viewing today's posts?
3. How much are you willing to talk to your family members about the health risks of smoking after viewing today's posts?

4. How much are you willing to talk to your friends about the health risks of smoking after viewing today's posts?

Perceived Message Effectiveness

Instructions: Please indicate the extent to which you agree or disagree with the following statements about this post.

The post would...

(1 = Strongly disagree; 2 = Disagree; 3 = Neither disagree nor agree; 4 = Agree; 5 = Strongly agree)

1. make people more concerned about the health risks of smoking cigarettes.
2. help prevent young people from starting to smoke cigarettes.
3. make cigarette smokers want to quit.

Counterarguing

Instructions: Please indicate how much you would agree with the following statements about the warnings you viewed from the Facebook posts.

When you were viewing the post,

(1 = No, not at all; 2 = A little; 3 = Moderately; 4 = A lot; 5 = Yes, very much)

1. Did you criticize the message you just saw while you were watching it?
2. Did you think of points that went against what was being said while you were watching the message?
3. While watching the message, were you skeptical of what was being said?

Attitude

Instructions: My using cigarettes in the next six months would be...

(1 - 2 - 3 - 4 - 5 - 6 - 7)

1. Bad ... Good
2. Unenjoyable ...Enjoyable
3. Unpleasant ...Pleasant
4. Foolish ...Wise
5. Harmful ... Good

Intention to Intervene a Smoker

Instructions: If you see this post on Facebook, how willing would you be to...

(1 = Very unlikely; 2 = Unlikely; 3 = Neither likely nor unlikely; 4 = Likely; 5 = Very likely)

1. send it or share it privately with a smoker you know?

Race Perception Scale

1. Old-Fashioned Racism Scale (ORFS) and the Modern Racism Scale (MRS)

Instructions: Please give your honest rating about the degree to which you personally agree or disagree with each statement. Please be as open and honest as you can; there are no right or wrong answers.

(1 = Strongly disagree; 2 = Disagree; 3 = Neither disagree nor agree; 4 = Agree; 5 = Strongly agree)

<ORFS>

1. *Black people are generally not as smart as whites.
2. I favor laws that permit black persons to rent or purchase housing even when the person offering the property for sale or rent does not wish to rent or sell it to blacks.
3. Generally speaking, I favor full racial integration.
4. *I am opposed to open or fair housing laws.
5. *It is a bad idea for blacks and whites to marry one another.

6. *If a black family with about the same income and education as I have moved next door, I would mind it a great deal.

7. *It was wrong for the United States Supreme Court to outlaw segregation in its 1954 decision.

<MRS>

1. *Discrimination against blacks is no longer a problem in the United States.

2. It is easy to understand the anger of black people in America.

3. *Blacks have more influence upon school desegregation plans than they ought to have.

4. *Blacks are getting too demanding in their push for equal rights.

5. *Blacks should not push themselves where they are not wanted.

6. *Over the past few years, blacks have gotten more economically than they deserve.

7. *Over the past few years, the government and news media have shown more respect to blacks than they deserve.

Note: an asterisk indicates a reverse coded item.

2. Color-Blind Racial Attitudes Scale (CoBRAS)

Instructions: Below is a set of questions that deal with social issues in the United States (U.S.).

Please give your honest rating about the degree to which you personally agree or disagree with each statement. Please be as open and honest as you can; there are no right or wrong answers.

(1 = Strongly disagree; 2 = Disagree; 3 = Neither disagree nor agree; 4 = Agree; 5 = Strongly agree)

1. Everyone who works hard, no matter what race they are, has an equal chance to become rich. White people in the U.S. have certain advantages because of the color of their skin. Race is very important in determining who is successful and who is not.

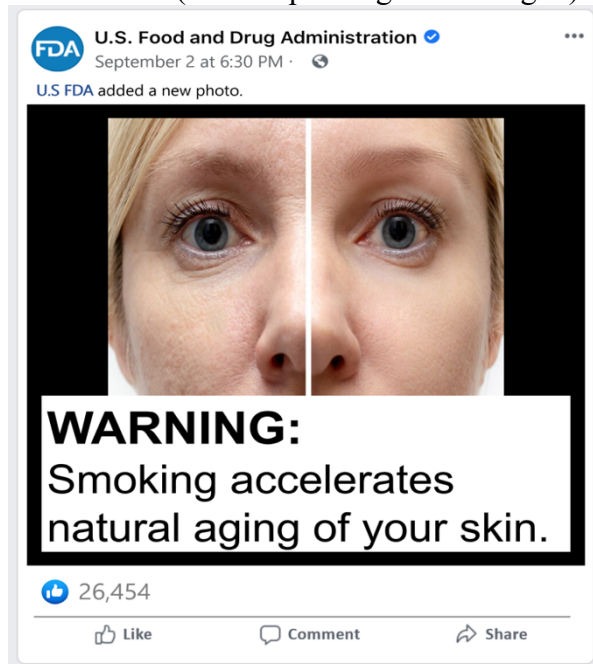
2. *Race plays a major role in the type of social services (such as type of health care or daycare) that people receive in the U.S.
3. It is important that people begin to think of themselves as American and not African American, Mexican American or Italian American.
4. *Due to racial discrimination, programs such as affirmative action are necessary to help create equality.
5. Racism is a major problem in the U.S.
6. *Race is very important in determining who is successful and who is not.
7. Racism may have been a problem in the past, but it is not an important problem today.
8. *Racial and ethnic minorities do not have the same opportunities as White people in the U.S.
9. White people in the U.S. are discriminated against because of the color their skin.
10. Talking about racial issues causes unnecessary tension.
11. *It is important for political leaders to talk about racism to help work through or solve society's problems.
12. *White people in the U.S. have certain advantages because of the color of their skin.
13. Immigrants should try to fit into the culture and adopt the values of the U.S.
14. English should be the only official language in the U.S.
15. *White people are more to blame for racial discrimination in the U.S. than racial and ethnic minorities.
16. Social policies, such as affirmative action, discriminate unfairly against White people.
17. *It is important for public schools to teach about the history and contributions of racial and ethnic minorities.

18. Racial and ethnic minorities in the U.S. have certain advantages because of the color of their skin.
19. Racial problems in the U.S. are rare, isolated situations.
20. *Race plays an important role in who gets sent to prison.

Note: an asterisk indicates a reverse coded item.

Appendix B. Experiment Stimuli

Condition A (In-Group × High Bandwagon)



Theme 1. Accelerating Aging



Theme 2. Head/Neck Cancer

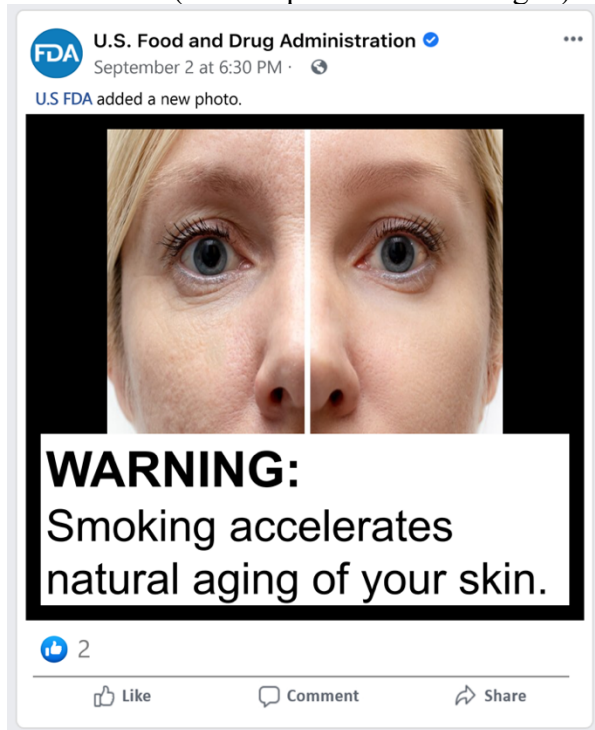


Theme 3. Throat Cancer

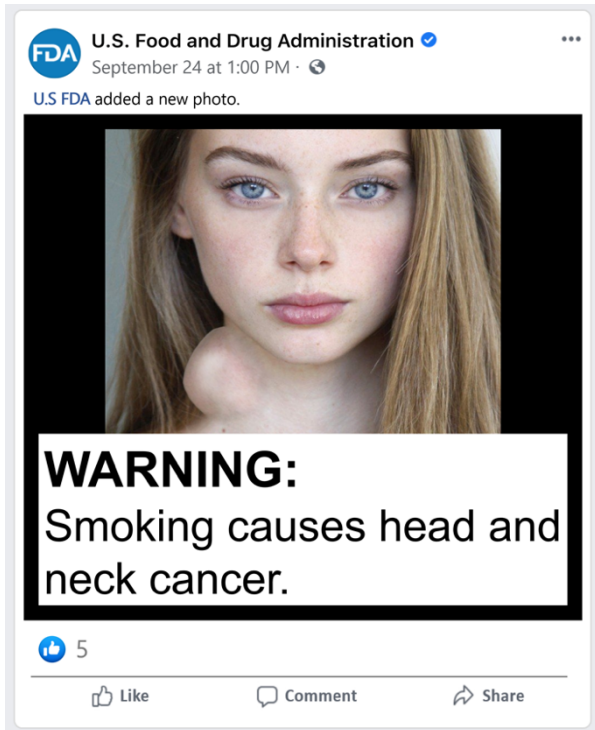


Theme 4. Erectile Dysfunction

Condition B (In-Group × Low Bandwagon)



Theme 1. Accelerating Aging



Theme 2. Head/Neck Cancer



Theme 3. Throat Cancer

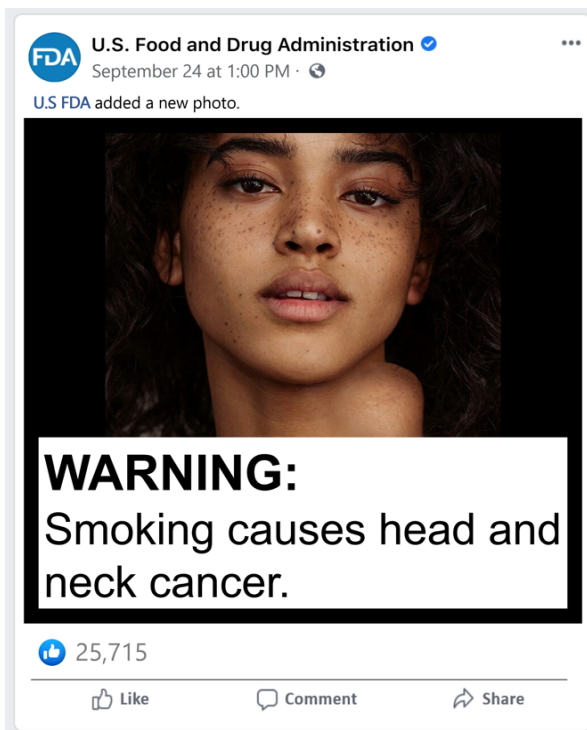


Theme 4. Erectile Dysfunction

Condition C (Out-Group × High Bandwagon)



Theme 1. Accelerating Aging



Theme 2. Head/Neck Cancer



Theme 3. Throat Cancer

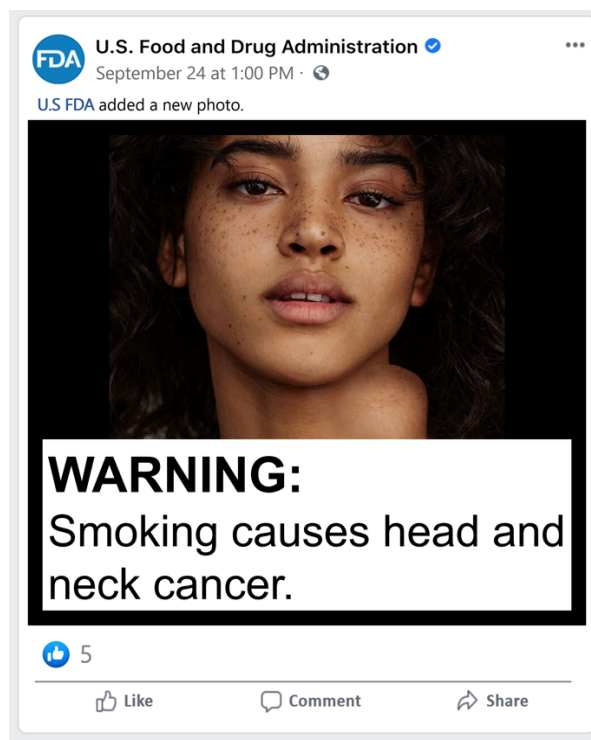


Theme 4. Erectile Dysfunction

Condition D (Out-Group × Low Bandwagon)



Theme 1. Accelerating Aging



Theme 2. Head/Neck Cancer



Theme 3. Throat Cancer



Theme 4. Erectile Dysfunction