THE USE OF SOCIAL MEDIA FOR DELIVERING CANCER RISK REDUCTION
MESSAGES: AN EXAMINATION OF THE PERSUASIVE EFFECTS OF WEBSITE TYPE
AND MESSAGE SOURCE

By

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A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

Media and Information Studies - Doctor of Philosophy

2014

ABSTRACT

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The use of social media for health promotion has become increasingly common, but
research has shown that many public health departments are not using the technologies to their
full potential (Thackeray, Neiger, Smith, & Van Wagenen, 2012). In an effort to examine the
ideal method of using social media for delivering health promotion messages, a 2 X 4 between-
subjects factorial experiment was conducted. Specifically, a cancer risk reduction message was
shown to participants via YouTube, Facebook, Twitter, or a blog post. Additionally, the source
of the message was varied, with the communicator identified as either a health professional or a
peer. Using the Elaboration Likelihood Model [ELM] (Petty & Cacioppo, 1986) and Media
Richness Theory (Dennis & Kinney, 1998), the impact of these two variables on elaboration,
comprehension, credibility, attitudes, and behavioral intentions was examined.

Results indicated that health professionals were seen as more competent than layperson
sources, but not as having more trustworthiness or goodwill. In turn, perceptions of
trustworthiness and goodwill had significant, positive effects on attitudes toward cancer risk
reduction, which were also related to behavioral intentions. Hypotheses related to the ELM
suggested that the nature of elaboration is complex, as it played various moderating roles on the
credibility-attitude relationship and the attitude-behavioral intentions relationship. Finally, results
indicated that the type of social media used was significantly related to message comprehension
and attitudes, with YouTube consistently leading to the most positive results. Altogether, this

study provides suggestions for the optimal use of social media for health promotion messages, but also points to several important areas for future research. A full test of the ELM is warranted to determine the contributors to and the role of cognitive elaboration, as well as to examine factors that help to increase the credibility dimensions of trustworthiness and goodwill. Studies examining this context are valuable for capitalizing on the potential of social media technologies and for moving public health into the modern communication sphere.

This dissertation is dedicated to the memory of Grandma Jolly and Uncle Paul, who fought bravely against cancer and have inspired me to do the same.

ACKNOWLEDGMENTS

First and foremost, I have to thank my patient and encouraging husband, John. Thank you for putting up with my occasional grumpiness throughout the writing of this dissertation and for always reminding me that I had the ability to actually pull this off. You're the best. I'm also incredibly grateful for my family—Mom, Dad, and Heather—who have never doubted anything I ever tried, and who have been especially helpful in keeping me grounded and reminding me to have fun every once in a while. Thanks especially to you, Mom and Dad, for brainwashing me to be a lifelong Michigan State fan and for pointing me toward this amazing school. MSU has been a fantastic home for me, and I am thankful for the wonderful mentors and colleagues I have worked with during my time here. Thank you to Pam Whitten, who challenged me to do the work I wanted to do and gave me so many amazing opportunities. Sandi Smith, thank you for guiding me through the crazy world of academia ever since I was a bright-eyed and naïve seventeen-year-old. Had it not been for your influence, I'm not sure I would have ever decided to get a PhD. Thanks also to Wei Peng and Kelly Brittain, who provided wonderful feedback on my dissertation and helped it to become the project that it is today. I am grateful as well to my fellow grad students who helped me to fine-tune my survey and dissertation (especially you, Jenny Cornacchione), and to Alicia Mall, who agreed to be the face of my dissertation without hesitation and compensation. Finally, I have to thank my dog Chewie, who kept me company during the lonely writing days, made me smile with his goofiness, and forced me to go out and see the sun every once in a while.

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Introduction

In the United States, there are over 13 million living people who have received a diagnosis of cancer (American Cancer Society, 2013b). It is a hugely widespread disease that affects virtually everyone in their lifetime, either through direct experience or through relationships with patients. This prevalence has sparked efforts to decrease incidence of the disease and examine behaviors that reduce individual cancer risk. Researchers have found that many components of living a healthy lifestyle, such as eating a nutritious diet and engaging in exercise, also help to lower one's risk of being diagnosed with cancer (National Cancer Institute, 2013). Hence, efforts to promote these behaviors are important if public health professionals hope to control cancer incidence and decrease the number of cases overall.

Particularly valuable tools for modern health promotion are social media sites, as they allow access to widespread populations and require relatively little upfront effort. These represent a significant departure from traditional Web 1.0 information-based sites, which rely on static content, limited to no interactivity, and typically small, segmented audiences. Social media sites, conversely, offer many opportunities for interactivity, boast large user bases, and allow for targeted communication, which make them powerful tools for delivering messages to various audiences (Cormode & Krishnamurthy, 2008). Public health professionals have been discussing the potential of social media sites for several years (e.g., Heldman & Schindelar, 2013; Thackeray, Neiger, Hanson, & McKenzie, 2008), but researchers have still uncovered little about the effects of social media in health campaigns and their use for encouraging healthy behaviors. If cancer risk reduction efforts are to be successful in a modern media environment, it is important to examine how health practitioners can best use social media technologies in their health promotion efforts. Thus, this research seeks to examine the use of social media for

delivering a cancer risk reduction message, with the ultimate goal of determining the ideal method of communicating information while using these tools.

To study this topic area, the same message was delivered using four different types of social media (i.e., Facebook, YouTube, Twitter, blog post) and two different types of sources (i.e., health professional vs. layperson), with participants randomly directed to one of eight possible iterations. Based on Media Richness Theory (Dennis & Kinney, 1998) and the Task-Fit Hypothesis (Hollingshead, Mcgrath, & O'Connor, 1993), the effects of different types of social media on message comprehension (i.e., retention of facts communicated in the message) were examined. Additionally, this study explored the effects of social media and communicator type on attitudes and behavioral intentions toward cancer risk reduction. For the purposes of this research, *attitudes* reflect "the degree to which a person has a favorable or an unfavorable evaluation of the behavior in question" (Ajzen & Madden, 1986, p. 454) and *behavioral intentions* are the "immediate antecedent of any behavior" (Ajzen & Madden, 1986, p. 454), with a stronger intention reflecting a greater likelihood of performing the behavior in question. Together, these concepts provide insight as to the persuasiveness of the message that was delivered. Outcome behaviors of interest in this research include actions that help to reduce cancer risk, including engaging in physical activity, eating a healthy diet, and protecting oneself from the sun, among others (National Cancer Institute, 2013).

This research also draws upon the Elaboration Likelihood Model [ELM] (Petty & Cacioppo, 1986) and source credibility research (e.g., McCroskey & Teven, 1999) to examine the impact of using health professional or layperson sources in social media messages. Specifically, it examines the comparative credibility of each type of source in terms of perceptions of trustworthiness, expertise, and goodwill. Based on the ELM, this research also

explores the role of source credibility under conditions of high or low *elaboration*, or the extent of issue-relevant thinking. The ELM suggests that if individuals engage in issue-relevant thinking, then the source of the message will be of little importance, as individuals focus instead on the characteristics of the message itself (Petty & Cacioppo, 1984). This prediction was tested in terms of its effects on attitudes and behavioral intentions toward cancer risk reduction behaviors. Thus, altogether, this study explores how social media and communicator type have effects on credibility, comprehension, attitudes, and behavioral intentions. The relationships of interest to this study are illustrated in Figure 1, with hypothesized relationships indicated with a solid line and relationships suggested by research questions indicated by dotted lines. The following sections will discuss in more detail the rationale for this research, highlighting the burden of cancer, the state of online health information, the theoretical background of this research, and specific research questions and hypotheses.
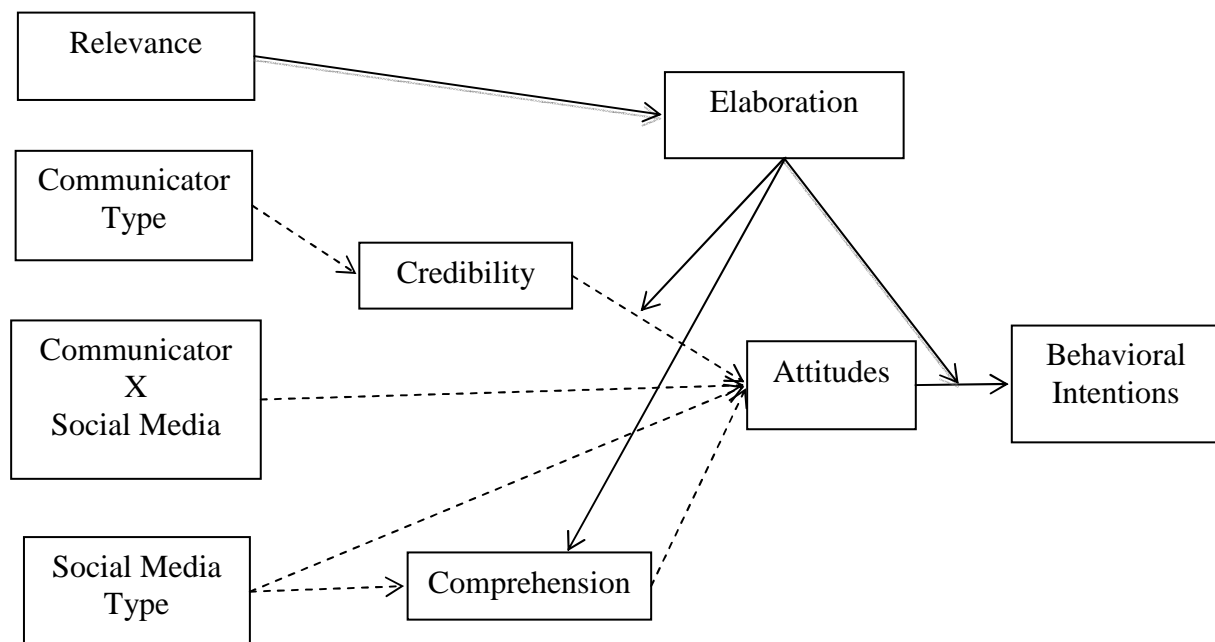
Figure 1: Suggested relationships among variables of interest

Chapter 1: Background and Literature Review

Cancer Prevalence, Risk Reduction, and Detection

Cancer is a disease that has an alarmingly high prevalence in our country; males have a one in two and females have a one in three chance of developing cancer in their lifetime (American Cancer Society, 2013b). Cancer screening and detection efforts, such as mammograms, colonoscopies, or prostate specific antigen (PSA) tests, are thus incredibly important for catching diseases early and improving outcomes among such individuals (American Cancer Society, 2013a). However, detection efforts can only address a problem that already exists. In an effort to combat the widespread prevalence of cancer and decrease rates of diagnosis, researchers have begun to examine ways of preventing or reducing individuals' risk of getting cancer. Such research distinguishes between *risk factors*, which are factors that increase one's chance of getting cancer, and *protective factors,* which decrease one's chance of getting cancer. Additionally, there are two forms of risk factors: *modifiable* risk factors and *genetic* risk factors. Modifiable factors refer to behaviors that individuals can change to reduce their risk (National Cancer Institute, 2013).

Among others, the National Cancer Institute (2013) lists the following as modifiable risk factors that may affect one's risk for cancer: tobacco use, diet, physical activity, obesity, alcohol consumption, and exposure to radiation that occurs from inadequate sun protection. Smoking alone is estimated to be the cause of at least 30% of cancer deaths in the United States, whereas poor diet, inactivity, and obesity may account for one third of cancer deaths (American Cancer Society, 2013c). Alcohol consumption has also received special attention in research, as it has been shown to increase one's risk of oral, esophageal, breast, colon, and liver cancer (American Cancer Society, 2013c). Clearly, despite the widespread prevalence of cancer, research to date

suggests that it is not an inevitable diagnosis and that efforts can be made to decrease one's risk. Specifically, health professionals recommend that individuals engage in at least 150 minutes of moderate to vigorous physical activity per week, eat a healthy diet that is low in fat and containing plentiful fruits and vegetables, quit or refrain from starting smoking, engage in moderate alcohol consumption that averages out to no more than one drink per day for women or two drinks for men, and avoid midday sun and/or wear sunscreen (Mayo Clinic, 2012).

The simple identification of risk factors is not enough to prevent cancer in the general population, however. Many individuals engage in factors that can increase one's cancer risk, either knowingly or unknowingly. Approximately 19% of adults engage in cigarette smoking (Centers for Disease Control, 2013a), and 51.5% of adults consider themselves to be regular drinkers (Centers for Disease Control, 2013b). Moreover, approximately 23% of adults have engaged in binge drinking (over five drinks on a single day) within the past year, and more than 9% had done so at least 12 times (Centers for Disease Control, 2012a). Almost 50% of adults do not meet either aerobic or strength training guidelines for physical activity, and only 30% of American adults fall within a healthy weight range (Centers for Disease Control, 2012a). This staggering obesity statistic is less surprising considering that over 37% of adults report consuming fruit less than once a day, and approximately 23% consume vegetables less than once daily (Centers for Disease Control, 2013c). Finally, recent data suggests that 30% of American adults do not follow *any* protective measures to reduce sun exposure and prevent skin cancer (National Center for Health Statistics, 2010). Together, these statistics suggest that much needs to be done to increase individuals' cancer risk reduction behavior, especially in the United States.

Although a focus on cancer risk reduction is generally scarce among health communication campaigns, interventions to increase cancer detection behaviors have been

relatively common in the literature. Recent media efforts to increase mammograms, for example, have used radio programming (Hall, Rim, Johnson-Turbes, Vanderpool, & Kamalu, 2012), and text messaging (Lakkis, Atfeh, EL-Zein, Mahmassani, & Hamadeh, 2011), and have been associated with increased awareness of breast cancer screening (Hall et al., 2012) and mammography usage (Lakkis et al., 2011). A particularly notable example of media influence on detection behaviors is the televised screening and awareness campaign centered on Katie Couric's colonoscopy, which led to a significant increase in colonoscopies across the country (Cram et al., 2003). An effort in Scotland to increase awareness and detection of mouth cancer used television advertisements and led to an increased awareness of the signs of the disease (Eadie, MacKintosh, MacAskill, & Brown, 2009). These studies suggest that it is feasible to use health communication campaigns to increase cancer-associated behaviors.

There have also been many public health efforts to encourage behaviors related to cancer risk reduction, including physical activity, healthy eating, and smoking cessation, but few have addressed these behaviors specifically in a cancer risk reduction context. The World Health Organization published a bulletin stating their intention to devote efforts to oral cancer prevention, but did not state specific plans or projected outcomes for this effort (Petersen, 2009). A recently published study utilized a web-based randomized controlled trial to encourage cancer prevention behaviors among adolescents, and found that exposure to the intervention resulted in significant decreases in cancer risk behaviors (Lana, Faya-Ornia, & López, 2014). Another study examining the persuasiveness of physical activity messages framed in a breast cancer prevention context led to increased intentions to engage in physical activity (Jalleh, Donovan, Slevin, & Lin, 2009), showing the potential for work in this area. Aside from this research, however, the scholarly literature in this area is generally scarce. The exception to this rule is the case of skin

cancer, which has been the subject of many preventive campaigns aiming to increase sunscreen use. Such campaigns have been shown to be successful in terms of increasing protective behaviors (Montague, Borland, & Sinclair, 2001; Sinclair & Foley, 2009), and demonstrate that public health messages devoted to cancer risk reduction can achieve success. Overall, however, we know little about the effectiveness of delivering public health messages that are specifically framed in the context of cancer risk reduction.

One area that scholars know even less about is the feasibility of promoting cancer risk reduction among young adults. A recent American College Health Assessment found that about 30% of college students had smoked cigarettes within the past month and about 1/3 had consumed five or more drinks in a single sitting within the previous two weeks. Additionally, about 65% of college students reported having only 0-2 servings of fruit and vegetables a day (American College Health Association, 2013)—less than the government's recommended servings of 2.5 to 3 cups of vegetables and 2 cups of fruit per day for this age group (United States Department of Agriculture, 2014). Finally, only about 30% of college students reported meeting the guidelines of moderate physical activity for at least 150 minutes per week, while less than 50% reported regularly using sunscreen (American College Health Association, 2013). Clearly, there is work to be done in this population in terms of increasing protective behaviors.

Although cancer is rare among young adults and college students, the development of healthy behaviors at this age may lead to maintenance of these behaviors throughout their entire lifetime—one longitudinal study, for example, found that adolescents who engaged in a high level of physical activity were more likely to continue engaging in a high level when they reached adulthood (Telama et al., 2005). The challenge for this population, then, is convincing them that their behaviors now can have an impact on their lifetime cancer risk, and to

subsequently encourage them to engage in risk-reducing activities. As suggested by Campbell and McClain (2013), "Today's young adults are at risk of becoming the newly diagnosed cancer patients and their spouses who in the future will continue to believe that cancer is more rare and more deadly than the statistics indicate" (p. 621). These authors argue for a lifespan approach to cancer education, which reduces information gaps from an early age and encourages preventive behaviors over a lifetime, as many young adults have "a tendency to disconnect early adult experiences (i.e., sexual partners and STDs) with health in later life" (p. 621). One potential method of educating this young population and delivering health messages is through the use of online media, as college students are frequent Internet users (Derbyshire et al., 2013). The following section will discuss research in the area of online health information and its special relevance to the cancer context.

Online Health Information

Health-related websites generate a significant amount of Internet traffic; WebMD alone (2013) has reported that they receive 138.0 million unique monthly visitors. Pew Internet has found that 72% of Internet users had looked online for health information within the past year, and that about half of online health searches are on behalf of another person (Fox & Duggan, 2013). Although the majority of online health information experiences occur because individuals are looking for information about a specific health condition (Fox & Duggan, 2013), research has found that just over 30% of online health information seekers are looking online for more general information about living a healthy lifestyle (Weaver III et al., 2010). Specifically, studies have found that 27% of online health searches are about losing or controlling weight (Fox & Duggan, 2013) and that individuals search for information about quitting smoking about 8,000,000 times per year (Ayers, Althouse, Johnson, & Cohen, 2014). Thus, it is clear that the

Internet is a common source for individuals looking to engage in healthy behaviors and hence has potential for communicating information about cancer risk reduction.

Websites are a particularly rich source for cancer-specific information, which has led many researchers to perform research regarding the predictors and effects of seeking online cancer information. Shim (2008) found that individuals who had a higher perceived cancer risk were more likely to seek out cancer information online, and that viewing this information was associated with more knowledge about cancer prevention and detection. A study with college-aged women found that 44% had actively sought out breast cancer prevention information online, showing an interest in seeking this type of information among young adults and, importantly, the population of interest for this research (Kratzke, Amatya, & Vilchis, 2014). Interestingly, research has found a positive association between the amount of general online health information seeking and fatalistic views about cancer prevention (Lee, Niederdeppe, & Freres, 2012). Although claims of causation cannot be made from this research, it may be the case that current online resources are promoting a view that there is nothing to be done to decrease one's risk of cancer, or instead focus more on cancer detection than on risk reduction. Alternatively, online information about cancer risk reduction may be simply too difficult to read or ineffective at promoting behavior change. One study examining breast cancer websites found that over three-quarters actually provided information about preventing or detecting cancer, but that most did not use theoretically-based methods of encouraging these healthy behaviors (Whitten, Smith, Munday, & LaPlante, 2008). Another study examining prostate cancer information found that the average site required at least a high school or late high school reading level, and that few websites were considered to be culturally sensitive (Friedman & Kao, 2008). Together, these studies suggest that there is work to be done in terms of improving cancer risk

reduction content online. One potential method of improving and distributing online cancer risk reduction information is through the use of social media tools, which are the focus of this research and will be discussed in the following section.

Social Media and Healthcare

Although the phrase "social media" has been defined in many different ways, perhaps the most popular definition can be attributed to Kaplan and Haenlein (2010), who wrote that social media refers to "a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of User Generated Content" (p. 61). For the purposes of this research, an easier-to-understand description of social media is put forth, which is simply a list of the various technologies that are considered to be "social media," namely: social networking sites (e.g., Facebook, LinkedIn), blogs (e.g., tumblr, Blogger), microblogs (e.g., Twitter), wikis (e.g., Wikipedia), link sharing sites (e.g., reddit), and photo or video sharing platforms (e.g., Pinterest, Instagram, and YouTube). Although this list is not all-encompassing, it does cover the most popular forms of social media that are in use today. Recent research has found that 78% of American Internet users—which constitute 86% of all Americans (Pew Internet and American Life Project, 2013)—watch or download online videos (Purcell, 2013), 72% use social networking sites, 18% use Twitter (Brenner & Smith, 2013), 15% use Pinterest, 13% use Instagram, 6% use Tumblr (Duggan & Brenner, 2013), and 6% use reddit (Duggan & Smith, 2013). These technologies are especially relevant for young adults, the subject of this research. Among Internet users aged 18-29, 89% use social networking sites, 30% use Twitter (Brenner & Smith, 2013), 92% watch videos on video-sharing sites like YouTube (Purcell, 2013), and 13% use the blogging site Tumblr (Duggan & Brenner, 2013). Due to the expansive reach of these technologies, many individuals have sought

to capitalize on social media and use it within the realm of health promotion.

As mentioned in the definition of social media, these technologies rely on user-generated content. This content is a rich, often freely-available data source that can provide valuable information about the health status, attitudes, and behaviors of populations. Some researchers, for example, have used Twitter to monitor the prevalence and spread of influenza, finding that mentions of the flu corresponded with Centers for Disease Control statistics (Signorini, Segre, & Polgreen, 2011). Others have mined Twitter for sentiments regarding antibiotics (Scanfeld, Scanfeld, & Larson, 2010), dental pain (Heaivilin, Gerbert, Page, & Gibbs, 2011), and concussions (Sullivan et al., 2012). Similar content analyses have been done using data from Facebook, such as studies that have examined communication within cancer- (Bender, Jimenez-Marroquin, & Jadad, 2011) and diabetes-related groups (De la Torre-Díez, Díaz-Pernas, & Antón-Rodríguez, 2012; Greene, Choudhry, Kilabuk, & Shrank, 2011). Still another study examined social bookmarking sites for information about prostate cancer screening, and found that sites provided inconsistent information regarding detection procedures (Friedman, Koskan, & Rose, 2011), while another examination of Twitter messages related to breast and cervical cancer screening found that only a minority of these messages promoted screening for women (Lyles, Lopez, Pasick, & Sarkar, 2013). These content analyses are useful for demonstrating the current ways in which individuals use social media, but tell us little about individuals' perceptions toward or reasons for using social media for health. Such information is essential for those who seek to use social media tools within health promotion, as it would aid in targeting messages and hypothesizing outcomes.

Recent research has found that over 30% of online health information seekers have specifically used social networking sites to gain information, while only 15% reported

contributing health-related comments (Thackeray, Crookston, & West, 2013). This follows trends observed across the wider Internet, which have shown that many users simply "lurk" or contribute content only sporadically on social networking sites (Brandtzaeg & Heim, 2011). This does not suggest, however, that content posters are the only ones benefitting from social media-related health content. Research has found that both those who "lurk" and those who post report benefits of online health communities, with no significant differences found between the two types of contributors in terms of outcomes like social support and loneliness (Malik & Coulson, 2011). Among those who do post health-related content online, Pew Research found that 40% had posted comments or stories, whereas 19% posted specific health questions, sometimes with the intent of getting direct feedback from a health professional (Susannah Fox & Duggan, 2013). Individuals with poorer health (Oh, Lauckner, Boehmer, Fewins-Bliss, & Li, 2013), who are living with chronic conditions, who are caregivers for loved ones (S Fox, 2011), or who have regular healthcare providers (Thackeray et al., 2013) are more likely to use social networking sites for health. Thus, it appears to be that individuals for whom healthcare is a particularly salient issue are the current users of social media for health. How, then, can social media be used to target the more general population for the purposes of health promotion?

Public health professionals have begun to theorize about and experiment with the ways to use social media for health promotion. Several pieces have been written providing how-to guides for public health professionals and statements of the potential of these technologies for the health realm (e.g.,Heldman & Schindelar, 2013; McNab, 2009; Thackeray et al., 2008). However, a survey of state public health departments found that just 60% used one or more social media applications, with Twitter being the most common tool used. These departments generally use social media to distribute information about staying healthy, but have few followers and almost

no interaction with their audiences (Thackeray et al., 2012). Use among local health departments is even lower, with just 24% using Facebook and 8% using Twitter (Harris, Mueller, & Snider, 2013). One study found that just 12% of local health departments actually responded to messages posted on their Facebook page (Fallon & Schmalzried, 2013), while other research found that only 1% of health departments' tweets were responses to other users (Neiger, Thackeray, Burton, Thackeray, & Reese, 2013). Together, these studies suggest that current social media use in public health does not fully draw upon the potential of these technologies, and that more guidance is needed as to how to use them in an effective manner. The proposed study seeks to examine the use of various social media technologies in a health promotion context, examining the differences between various forms of social media in terms of attitudinal, comprehension, and behavioral outcomes in an effort to gain insight about the best use of these technologies. This research also considers the source of social media messages as an important persuasive factor, which will be discussed in the following sections.

Source Credibility

When considering the source of social media messages, it is valuable to differentiate between what Hu and Sundar call the "selecting source" and the "original source" (Hu & Sundar, 2010). The selecting source refers to the technological form of communication—in the case of this study, the type of social media used to deliver the message (i.e., Twitter, Facebook, blog, or YouTube). The original source refers to the person or entity actually communicating the message, or the visible communicator. This study is primarily concerned with the credibility of the original source, which has been measured and defined in many different ways throughout the literature. McCroskey and Young (1981) define the construct as the "attitude toward a source of communication held at a given time by a receiver" (p. 24), though the attitude is not assumed to

be a unidimensional construct. Instead, it is common in research to use the "factor model" for measuring the construct, which posits that credibility is composed of various dimensions that add to or detract from an individuals' credibility (McComas & Trumbo, 2001). Variables that have been used previously to measure credibility include: perceived expertise, bias, fairness, truthfulness, accuracy, amount of use, depth or completeness of message, prior knowledge and message quality (Eastin, 2001). McCroskey and Teven (1999) suggest that credibility is composed of three dimensions: competence, goodwill, and trustworthiness. Competence refers to and individuals "knowledge or expertise in a given area," trustworthiness refers to "the degree of trust the receiver has with the source," and goodwill, sometimes called caring, is the "the degree to which a person perceives that a source has the person's best interests at heart" (Paulsel, McCroskey, & Richmond, 2006, p. 70). These three dimensions were found to be valid measures via confirmatory factor analysis for interpersonal, public, and political sources, and have been used extensively in research. Importantly, this framework has been tested in research on health messages delivered via the web and found to be both reliable and valid (Kim, 2011; Westerman, Spence, & Van De Heide, 2014), suggesting that this multidimensional approach is well-suited to the study of social media health messages.

Although researchers have arrived at an acceptable definition and measurement of credibility, the advent of the Internet has changed study in this field dramatically. Flanagin and Metzger (2011) describe these changes well:

> By increasing access to information and to the tools required to provide it, digital media allow for a tremendous number of information sources with varying levels of expertise. As a result, much of the information available online is not and cannot be vetted by professional gatekeepers. Moreover, whereas credibility was once granted by these

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gatekeepers largely on the basis of the source's credentials and official authority, the

interactive nature of digital media provides widescale access to information from

uncredentialed and unknown sources. (p. 49)

To account for this lack of gatekeeping, Internet users have developed strategies for assessing the

credibility of information they encounter. Recent research has suggested that, when evaluating

online information, users often turn to social tools for developing perceptions of the source,

whether through rating systems or social networking sites (Metzger, Flanagin, & Medders,

2010). Others rely on cognitive heuristics, which are "information processing strategies that

ignore information to make decisions more quickly and with less effort than more complex

methods" (Metzger & Flanagin, 2013, p. 214). In some cases, individuals make snap judgments

about the credibility of information simply based on the design of the website. Others use a

reputation or authority heuristic, which means they ascribe more credibility to a source whose

name or position they recognize, or who is determined to have significant authority (Metzger &

Flanagin, 2013).

In the case of online health information, research has found that this reputation heuristic

holds, as sources with more expertise (i.e., health professionals) have been found to be more

credible than non-expert sources (i.e., laypeople with no specialized knowledge of the topic)

(Eastin, 2001). However, these effects may not hold in the case of social media sites. Hu and

Sundar (2010) found that layperson sources were more credible than health professionals for

messages delivered on a bulletin board or homepage, which are composed of user-generated

content. Conversely, a health professional source was seen as more credible on a basic

informational website (Hu & Sundar, 2010). Together, these findings suggest that websites with

norms of peer interaction may not be ideal spaces for "expert" sources. Other research using the

factor model of credibility has found that expert sources were perceived to have more expertise

for online content, unsurprisingly, but that layperson sources were believed to possess more

trustworthiness (Willemsen, Neijens, & Bronner, 2012). This may be due to the fact that

layperson sources are perceived to have *experiential credibility,* or firsthand knowledge or

experience with the topic (Metzger & Flanagin, 2011). To recognize the complexity of this issue

and the dissonant research findings in this area, the following research questions will be

explored:

> RQ1a: Are there differences in the perceived competence of health professional and
>
> layperson sources?
>
> RQ1b: Are there differences in the perceived trustworthiness of health professional and
>
> layperson sources?
>
> RQ1c: Are there differences in the perceived goodwill of health professional and
>
> layperson sources?

Results from tests of this research question will provide valuable information regarding the ideal

ways of communicating health messages via social media. What remains to be examined,

however, is the impact of various sources on persuasive outcomes—namely, changes in attitudes

and behavioral intentions.

The Elaboration Likelihood Model

The Elaboration Likelihood Model (ELM) (Petty & Cacioppo, 1984), a general dual-

process theory of attitude change, has often been used when examining the effects of source-

related message cues on outcomes. The ELM states that the amount of "elaboration" an

individual engages in in response to a given message, defined as critical thinking containing

issue-relevant thoughts, can vary according to situational and individual characteristics (Petty &

Cacioppo, 1984). Factors influencing the amount of elaboration include an individual's need for cognition or tendency to enjoy thinking, the amount of distraction present when a message is delivered, the amount of background information they possess, and—especially important for this study—the relevance of the topic (O'Keefe, 2008). When individuals find a message to be personally relevant, they engage in a high amount of elaboration, otherwise known as *central route processing* (Petty & Cacioppo, 1984)*.* Relevance, which has been similarly conceptualized as *ego involvement* or *issue involvement*, is defined as "the extent to which an advocacy has 'intrinsic importance' or 'personal meaning'" (Petty & Cacioppo, 1986, p. 145). Individuals find an issue relevant if it is expected "to have significant consequences for their own lives" (p. 145). In such instances, individuals pay attention to the message, scrutinize it closely, and draw inferences about the validity of the argument (Petty & Cacioppo, 1986). Central route persuasion is hence marked by extensive issue-relevant consideration of the topic at hand, with individuals influenced by the *valence* of the topic and the strength of the message's arguments. Valence refers to whether a message's position is proattitudinal or counterattitudinal to the recipient, with the assumption being that proattitudinal messages will lead to more favorable opinions. Additionally, if messages have quality arguments, sound reasoning, and/or good evidence, then individuals have more favorable opinions (O'Keefe, 2008).

Conversely, when individuals do not see the topic of a given message as personally relevant, they engage in a low level of elaboration, or *peripheral route processing.* This is characterized by more automatic and heuristic processing of the message, with message receivers usually employing a simple decision rule to evaluate the message (Petty & Cacioppo, 1986). In cases of peripheral route processing, individuals are influenced by factors such as how much they like the source, the reactions of others to the message (O'Keefe, 2008), positive or negative

affect, the number of arguments, or, relevant to this research, the credibility of the source (Petty & Cacioppo, 1984). It is important to note, however, that the amount of elaboration is in fact on a continuum. The dichotomous distinction of peripheral and central route processing simplifies the study of elaboration by allowing researchers to place individuals into two groups, but does not completely capture the variation in elaboration that occurs naturally. Because the ELM suggests that elaboration should be indicative of the relevance of a topic, the following hypothesis is put forth:

H1: Relevance will be positively related to the presence of issue-relevant elaboration.

Moving on from the antecedents to elaboration, Petty and Cacioppo (1984) put forth specific predictions regarding the impact of message source on persuasion (i.e., attitudes and behavioral intentions) and processing, while considering the role of elaboration. They suggest that, when individuals engage in a low amount of elaboration, a positively-viewed source enhances persuasion regardless of the actual message content. In many cases, the source can serve as a basic acceptance or rejection cue of the message. Conversely, under conditions of high elaboration and relevance, individuals pay attention to argument quality and are more persuaded by strong arguments, regardless of source factors. There is one caveat in the case of high elaboration, however: in instances where the source is relevant to the argument itself, such as if a professor at a university is arguing for tuition decreases, source factors become part of the argument and are considered equally. Thus, in most cases, if a source is seen as more credible, the message will be more persuasive under conditions of low elaboration. However, if the individual is highly motivated to process the message, then there will likely be no effects of source credibility on persuasive outcomes.

At this point, a brief discussion of persuasion is warranted, as it is a complex topic

explored extensively by research. An especially helpful conceptualization of the concept of "persuasion" was put forth by Miller (1980), who stated that there are three outcomes of the persuasive process: response shaping, response reinforcing, and response changing. Response shaping refers to teaching new behaviors or forming new attitudes, which is heavily affected by individuals' prior knowledge of the topic. Response reinforcing is the act of encouraging an already-existing behavior or supporting an already-held attitude. Finally, response changing is what is often reflected in conceptions of persuasion, as it refers to changing an existing behavior or attitude. For this study, all three persuasive outcomes are possible. Individuals may not be aware of ways to decrease their cancer risk and thus develop new attitudes toward risk reduction behaviors (response shaping), they may already actively engage in cancer risk reduction behaviors and increase their commitment to doing so (response reinforcing), or they may currently engage in behaviors that increase cancer risk, such as smoking, and choose to quit (response changing). All three outcomes are ideal for this context, and are helpful to consider when examining the outcomes of health communication.

The specific persuasive outcomes predicted by the ELM have varied in the literature. The most commonly-discussed outcome is attitude change regarding the topic of the delivered message (i.e., response changing), as this is most in line with the original predictions of the ELM (Mongeau & Stiff, 1993). Research has demonstrated that those who follow the central route experience attitude changes that are more persistent, resistant to change, and predictive of behaviors than those who experience attitude change as a result of the peripheral route (Petty, Haugtvedt, & Smith, 1995). Studies in the health realm using the ELM have found, for example, that messages with a source perceived to be credible result in more positive attitudes (Berry & Shields, 2014). Another health messaging study went one step further, finding that the credibility

of a source had a significant effect on behavioral intentions to engage in exercise (Jones,

Sinclair, & Courneya, 2003). Other research based on the ELM has found that an individuals'

involvement regarding a message about organ donation had a significant affect on attitudes,

which in turn affected behavioral intention to sign an organ donor card (Skumanich &

Kintsfather, 1996). Especially relevant to this research, a study seeking to increase cancer

screening behaviors found that messages based on the ELM that sought to increase relevance led

to increased intentions to engage in the recommended behaviors (Guo, 2013). Thus, the literature

to date suggests that individuals' persuasion route, either central or peripheral, as well as

perceptions of source credibility, will have an impact on both attitudes and behavioral intentions.

Specifically, research has suggested that attitudes regarding a specific message inform and lead

to behavioral intentions, with studies demonstrating a causal relationship between the two

variables (Skumanich & Kintsfather, 1996). ELM research has even found that individuals

engaging in issue-relevant elaboration (i.e., taking the central route) demonstrate a stronger

relationship between attitudes and behaviors (Petty et al., 1995b). Based on these discussed

findings, the following hypotheses are put forth:

> H2a: Elaboration will moderate the effects of *competence* on attitudes toward cancer risk
>
> reduction, such that there will be a stronger relationship between competence and
>
> attitudes for those who engage in issue-relevant elaboration than for those who do not.
>
> H2b: Elaboration will moderate the effects of *trustworthiness* on attitudes toward cancer
>
> risk reduction, such that there will be a stronger relationship between trustworthiness and
>
> attitudes for those who engage in issue-relevant elaboration than for those who do not.
>
> H2c: Elaboration will moderate the effects of *goodwill* on attitudes toward cancer risk
>
> reduction, such that there will be a stronger relationship between goodwill and attitudes

for those who engage in issue-relevant elaboration than for those who do not.

H3: Attitudes toward cancer risk reduction will have a positive relationship to behavioral

intentions to engage in cancer risk reduction behaviors.

H4: Elaboration will moderate the effects of attitudes on behavioral intentions, such that

there will be a stronger relationship between the two variables for those who engage in

issue-relevant elaboration than for those who do not.

As a follow-up test to hypothesis two, this study also seeks to examine if credibility has a direct

effect on attitudes toward cancer risk reduction. Previous research has found that credibility has

an effect on health-related attitudes and intentions, absent of any measure of elaboration (Berry

& Shields, 2014; Jones et al., 2003). Thus, the next research question is posed:

RQ2: Does credibility have an effect on attitudes toward cancer risk reduction?

Medium Effects

Aside from the original source, or person, communicating the message, it is also

important to consider the technological medium through which a message is conveyed. In 1964

Marshall McCluhan said "the medium is the message," suggesting that the means through which

a message is communicated has an effect on perceptions (McLuhan, 1964). Media Richness

Theory (Dennis & Kinney, 1998), originally developed for use in organizational communication,

suggests that media differ in terms of the amount of "richness" they possess, or the amount of

cues (e.g., audio, visual, text) that can be communicated through their use. Richer media,

presumably, allow for more information to be transmitted and lead to decreased ambiguity in

communication (Dennis & Kinney, 1998). Kaplan and Haenlein (2010) classified various forms

of social media according to their richness, suggesting that text-based forms like blogs and wikis

are low in richness, social networking sites and "content communities" like YouTube are

medium in richness due to the addition of audio and visual cues, and virtual social or gaming worlds are high in richness, simply because they seek to emulate face-to-face interactions through control of characters. Based on these classifications, a prediction could thus be made that text-based forms of social media (e.g., Twitter, blogs) will be less effective at communicating information than audio- and visual-based forms of social media (e.g., YouTube). However, there are other relevant factors to consider when examining the effects of social media type.

In health promotion, an important variable to examine is message comprehension—if individuals do not remember or understand the message communicated, then it is safe to say that they are not going to experience any attitude or behavior changes as a result. Research based in Media Richness Theory has found that richer media lead to more message comprehension (Archer, Head, Wollersheim, & Yuan, 1996), suggesting that the use of audio and visual cues is optimal for communicating health messages. However, other research found that richer media had no effect on memorability (Yuan, Head, & Du, 2003), perhaps because visual and audio cues may distract the viewer from the overall message. This is the foundation of the Task-Media Fit hypothesis, which suggests that if a task uses richer media than is necessary, it may only serve to distract from the content (Hollingshead et al., 1993). In a situation where the primary objective is to communicate straightforward information about health, multimedia may draw attention away from the overall message. Hence, due to conflicting findings and theoretical predictions, the following research question will be examined:

RQ3: Does the amount of message comprehension differ based on the form of social

media used due to differences in media richness?

For health messages, it is also important to examine the effect of comprehension on attitudes and behavioral intentions. The ELM suggests that comprehension is a reflection of an

individual's *ability* to process a given message, which in turn has an effect on the amount of elaboration that occurs. Thus, a higher amount of recall of a given message should reflect a greater amount of elaboration (Petty & Cacioppo, 1986), as suggested by the following hypothesis:

H5: Message comprehension will be positively related to issue-relevant elaboration.

As mentioned previously, individuals who engage in a high amount of elaboration have more persistent attitude changes that are more predictive of behavior (Petty et al., 1995b). Thus, it is reasonable to suspect that comprehension may be positively related to attitude change. However, the literature in this area has been mixed. Early research found little evidence of a relationship between message recall and attitude strength (For a discussion, see Eagly & Chaiken, 1993; Petty & Brinol, 2010), perhaps due to little variation in comprehension in lab studies (Carpenter & Boster, 2013). Still other persuasion research has found such a correlation to exist (Chattopadhyay & Alba, 1988; Haugtvedt & Petty, 1992; Haugtvedt & Wegener, 1994), especially under conditions of low personal involvement (Haugtvedt & Wegener, 1994). Because of these dissonant findings, the following research question is proposed:

RQ4: Is message comprehension related to attitudes toward cancer risk reduction?

Research has also explored the direct effects of medium type on attitudes and behavioral intentions. Hu and Sundar (2010) found that websites were most persuasive, in terms of attitude change, than were bulletin boards for delivering health messages, followed by blogs, home pages, and the Internet in general. One potential reason for this finding is related to gatekeeping, or the media's "process of culling and crafting countless bits of information into the limited number of messages that reach people each day" (Shoemaker & Vos, 2009, p. 1). In Hu and Sundar's research, individuals thought that blogs and homepages had very little gatekeeping,

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which leads to more uncertainty regarding the information communicated. Conversely, websites and bulletin boards were seen as having both editorial and collective gatekeeping, which led to more confidence in the information gained (Hu & Sundar, 2010). Based on this research, one would suspect that social media, which rely on consumer-generated content and hence have little gatekeeping, would have little effect on attitudes. Because there is a perception that anyone can post content on social media, individuals may be more skeptical of the content and thus unlikely to change their attitudes. However, the norms of social media have changed in recent years. Individuals are starting to visit social media sites for health information (Thackeray et al., 2013) and health-related social support (Oh et al., 2013), demonstrating more confidence in the channel. Additionally, recent research has found that videos, like those found on YouTube, were more effective than text-based information at increasing both intentions and behaviors related to environmental cancer risk reduction (Perrault & Silk, 2014). These findings suggest that individuals may be decreasingly skeptical of social media based health content. The following research question will explore this issue and determine the utility of using various social media to communicate persuasive messages:

RQ5: Does the type of social media used have an impact on attitudes toward cancer risk reduction?

It is also possible that there is an interaction between type of medium and communicator in terms of persuasive outcomes, such that expert or layperson sources are more persuasive on specific forms of social media. Due to the lack of research in this area, a final, exploratory research question is posed:

RQ6: Is there an interaction effect between communicator and type of medium on attitudes toward cancer risk reduction?

Thus, altogether, this research seeks to examine if and how cancer risk reduction messages delivered via social media can persuade individuals to change their attitudes and behaviors. By varying the form of social media and the source of the message, it provides valuable insight regarding how practitioners can best use these technologies in health promotion in order to maximize persuasive effects. Additionally, this study provides insight regarding the utility of the ELM for making predictions in this context and the role of elaboration in viewing cancer risk reduction messages. A summary of the discussed research questions and hypotheses is provided in Table 1.

Chapter 2: Methods

This study utilized an online experiment to deliver cancer risk reduction messages to respondents and assess their reactions. The experiment manipulated the independent variables of social media type and communicating source in an effort to determine the ideal message delivery strategy in terms of impact on persuasive outcomes (i.e., attitudes and behavioral intentions), as well as to examine the role of several moderating variables.

Recruitment and Participants

Participants were recruited from a respondent pool of college students at Michigan State University. In exchange for their participation, students were offered course credit or extra credit, depending on the preferences of their instructors. Those who chose not to participate were offered alternative assignments by their instructors. College students are a valuable sample for this study because they are avid users of social media, as previously discussed. Hence, this age group represents a likely audience for any social media based interventions. Additionally, college students are an important group to target for cancer risk reduction messages, as they are still young enough to begin enacting healthy behaviors that would hopefully become habitual in years to come. Ideally, these preventive behaviors taken early in life will lead to a decrease in cancer prevalence in the future.

To determine the required sample size, a statistical power analysis was completed using the software *G*Power*. Sample size calculations were conducted for the various statistical tests required by this research (see "Analyses" section for more information), with a power level set at 0.80 with a predicted small-to-medium effect size, as there is no consensus in previous literature to provide guidance on a more exact effect size. Based on these analyses, the determined sample size was 384, which was required to analyze the differences between the four types of social

media using ANOVA, while also allowing for equal size groups.

Experimental Design

This between-subjects experiment utilized a 2 x 4 factorial design, varying the

communicator and type of social media of the cancer risk reduction messages. The eight study

groups are illustrated in Table 2. Respondents were randomly assigned to one of eight groups

through the use of online survey software. At the beginning of the experiment, respondents were

asked questions aimed to establish their involvement and experience with cancer and cancer risk

reduction, as well as their use of various forms of social media. Then, they were asked about any

cancer risk behaviors that they might currently engage in, which were used as control variables

in statistical analysis due to potential for reactance. After, they were shown the cancer risk

reduction message, which was adapted from a resource created by Mayo Clinic (2012), which

contains tips for preventing cancer. The message used the following basic script, regardless of

the social media form:

> Hi, I'm [Dr. Olivia Eaton with MSU HealthTeam OR Olivia Eaton, your student health
>
> liaison at Michigan State]. Today, I want to give you five quick tips about reducing your
>
> risk of cancer. First, you want to make sure that you avoid any forms of tobacco or quit if
>
> you currently smoke. The National Cancer Institute estimates that 30% of cancer deaths
>
> are due to smoking, so it is important to cut those behaviors out of your life while you're
>
> still young. Second, try to eat a healthy diet. Aim for lots of fruits and vegetables, and
>
> avoid food that is high in fat. This will provide you with lots of nutrients and also help
>
> you to maintain a healthy weight. Third, drink alcohol only in moderation. Regular
>
> drinking increases your risk of several different types of cancer, including breast and
>
> colorectal cancer. Fourth, get active! Any amount of physical activity helps, but you

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should aim to get at least 30 minutes of moderate physical activity a day. And last,

protect yourself from the sun by using sunscreen, avoiding tanning beds, and staying in

the shade, especially during midday. So, to sum up, to reduce your risk of cancer you

should avoid tobacco, eat a healthy diet, drink alcohol only in moderation, engage in

physical activity, and protect yourself from the sun. Follow these tips, and you will not

only be healthier in general, but you will set yourself up for healthy habits that will

reduce your risk of cancer across your entire lifetime.

The same individual portrayed both the health professional and the student, which helped to

avoid any potential confounds due to differences in physical appearance. The basic script of the

message was modified only as needed to fit the various forms of social media. For example,

abbreviations were used to fit 140-character limits in Twitter. The YouTube video was

embedded within the survey, and the other messages were presented as screen captures from the

social media sites. Respondents were told what form of social media the message was from to

eliminate any potential confusion, and a manipulation check asked respondents what form of

social media was used and who the communicator was in order to ensure that they attended to

the study manipulations. Examples of these cancer risk reduction messages can be viewed in

Appendix A.

While viewing or reading the message, respondents were prompted to describe their

thoughts and reactions as a thought-listing exercise that measured elaboration and provided

insight as to which route individuals were taking (i.e., central or peripheral). After moving to a

new page in the survey, respondents were asked about the perceived credibility of the message

source, and were also quizzed on the content of the message in order to assess comprehension.

Next, they were asked about their attitudes toward cancer risk reduction and their behavioral

intentions to engage in the prescribed behaviors. The experiment ended with demographic questions. The specific measures used are described in detail in the following section.

Measures

The questionnaire for this survey is provided in Appendix B, and measures and items used for key variables are described in the following paragraphs. There are several personal factors that could have an effect on responses to cancer risk reduction messages, and were thus included as statistical controls. Items were chosen to capture if respondents engaged in the behaviors addressed in the message, including smoking, excessive drinking, healthy eating, physical activity, and sun protection. These questions were taken from the Centers for Disease Control Youth Risk Behavior Survey and adapted as needed to fit a college student population (2012b). The Youth Risk Behavior survey has been used extensively and has been shown to have adequate test-retest reliability among high school populations (Centers for Disease Control and Prevention, 2004).

In this study, for each health behavior, respondents were asked to indicate numerically the amount of times they engaged in that behavior, either in the past week or month, and also given a Likert-style question to indicate how frequently they engaged in that behavior. This differs from the original survey, which gave respondents a range of instances in which they engaged in the behavior (e.g., "1 or 2 days"). This change was made in order to provide continuous data, which facilitated the required statistical analyses. Correlations between the Likert-style questions and the free-response items were analyzed in order to establish convergent validity. For each risk behavior, the correlation indicated a large effect based on Cohen's (1988) conventions, ranging from $r=.62$ (for fruit and vegetable intake) to $r=.75$ (for smoking). Thus, it was concluded that this form of measurement was valid.

In addition to health behaviors, respondents were also asked about their current use of the four types of social media examined: Facebook, YouTube, Twitter, and blogs. Again, for these items, respondents were asked to provide the amount of times they used each form of social media on the previous day, and were also given a multiple choice item that indicated their frequency of use. Because this frequency item was not continuous, responses were collapsed into two categories: heavy users of social media (used it more than three times per day) and others. A point-biserial correlation between this dichotomized variable and the write-in variable of amount of visits was assessed to determine convergent validity. Correlations between these measures were moderate, ranging from $r=.30$ (for Facebook) to $r=.51$ (for Twitter), providing evidence for the convergent validity of these measures of social media use. Because these measures were developed for this study, smaller correlations were deemed acceptable indications of validity.

Items measuring the construct of *personal relevance* were adapted from previous research using the ELM in a study about AIDS (Flora & Maibach, 1990), and were thus edited to reflect the cancer context of this research. Four items measured individuals' personal relevance, which respondents indicated their agreement with by choosing a response on a 5-point Likert scale ranging from "strongly disagree" to "strongly agree." Responses to these items were averaged to form an index of personal relevance. The four statements included, "I think about cancer a great deal," "I consider myself at risk of developing cancer," "Cancer is a personally relevant topic for me," and "I actively seek the most recent information about cancer." Previous research has demonstrated that this scale has good reliability, with alpha scores including 0.75 (Perse, Nathanson, & McLeod, 1996) and 0.86 (Flora & Maibach, 1990). For this study, the scale's alpha score was 0.76, and a confirmatory factor analysis indicated a good fit (CFI=0.999, RMSEA=.024).

To assess the amount of *elaboration,* or critical thinking, that occurred among respondents, they were asked to engage in "thought listing," which involves reporting their reactions to the message as they are having them. This procedure is common in research with the ELM (for a discussion, see Petty & Cacioppo, 1986) and allows for detailed data regarding individuals' thought processes. To examine the presence of issue-relevant thinking, which is indicative of elaboration, the free-text responses were content analyzed. Entire responses were used as the unit of analysis, and the coding scheme was dichotomous: responses were coded as issue-relevant thoughts or non-issue relevant thoughts. If there was any indication among the response that the individual thought critically about the message, then it was coded as issue-relevant elaboration. Examples of issue-relevant responses included "A lot of good information was presented," and "It all makes perfect sense to me that these things would help you avoid cancer." Examples of non-issue relevant responses include "none," and "there is not a good use of hashtags to let people know what each tweet is about." Reliability of the coding scheme was determined by assessing agreement between two coders using 10% of the sample. The scheme had excellent reliability, as percent agreement was 97.5% and Cohen's kappa was 0.79. Additionally, following the procedure of previous research (Frewer, Howard, Hedderley, & Shepherd, 1999), the number of words was counted per response to indicate the extent of elaboration. A moderate correlation between the amount of words and the issue-relevant coding, determined by Cohen's (1988) conventions, indicates that these are both valid, though imperfect, measures of elaboration ($r(385)=0.29$, $p < .001$).

Source credibility was assessed using McCroskey's scale containing the dimensions of trustworthiness, competence, and goodwill/caring (McCroskey & Teven, 1999). Previous research has demonstrated alpha scores ranging from 0.85 to 0.92 for each subscale (McCroskey

& Teven, 1999), showing good reliability. This scale consists of eighteen items capturing these three dimensions, which can be seen in the survey in Appendix B. Each item consists of a seven point semantic differential scale anchored by bipolar adjectives, such as "intelligent/ unintelligent," "honest/dishonest," and "untrustworthy/trustworthy." After appropriate items were reverse-coded, a confirmatory factor analysis was completed in order to identify any bad items. This CFA suggested that two items needed to be removed from the goodwill scale, which resulted in a factor structure with good fit (CFI=1.00, RMSEA=.000, Chi-square goodness of fit=0.693, df=2, p=.707). One item each was removed from the competence and trustworthiness scales to reach a good model fit (For competence, CFI=.999, RMSEA=.024, Chi-square goodness of fit=6.079, df=5, p=.299; For trustworthiness, CFI=.984, RMSEA=.097, Chi-square goodness of fit=22.731, df=5, p=.000). After dropping these items, the scales had excellent internal reliability: α =.88 for competence, α=.90 for trustworthiness, and α=.87 for goodwill. Responses to these items were averaged to form an index of credibility perceptions for each of the three dimensions.

To assess message *comprehension*, respondents were given a list of tips for reducing cancer risk and asked to indicate which were mentioned in the cancer risk reduction message. For each correct answer chosen, they were given one point. For every incorrect answer chosen, one point was subtracted. Because there were five possible correct answers and three possible incorrect answers, the highest score possible was 5, while the lowest score possible was -3. Respondents were also asked to indicate the source of the message and the form of social media used in order to perform a manipulation check. Overall, 93% of individuals recalled the social media form correctly, whereas 83% of respondents recalled the message source correctly.

Items assessing *attitudes* toward cancer prevention and the behaviors recommended in

the message were adapted for this research based on previous literature (Ajzen & Madden, 1986) and survey development guidelines (Ajzen, 2006; Francis et al., 2004). Respondents were asked about their attitudes toward taking steps to prevent cancer, engaging in 30 minutes per day of physical activity, eating a nutritional diet, stopping or avoiding starting smoking, avoiding excessive alcohol consumption, and protecting themselves from the sun. For each action, respondents are asked to indicate their attitudes using 7-point semantic differential scales, with endpoints including "difficult/easy, "harmful/beneficial," and "unpleasant/pleasant" and "useless/useful." Previous studies utilizing this item development method have achieved good internal reliability of scales (e.g., Ajzen & Madden, 1986; Armitage, 2005; Gatt & Sammut, 2008). After appropriate items were reverse-coded and inter-item reliability was established, responses to the items were averaged to form an index of attitudes toward the given behavior. Alpha scores for this study were acceptable, with the following reliabilities: preventing cancer, $\alpha=.729$; eating a healthy diet, $\alpha =.615$; engaging in exercise, $\alpha =.672$; moderating alcohol intake, $\alpha =.749$; quitting or avoiding smoking, $\alpha =.703$; and protecting oneself from the sun, $\alpha=.736$. Because these items were developed for this study, lower alpha reliabilities (around 0.70) were considered acceptable, as is commonly done for exploratory measures (Hinkin, 1998).

Items assessing *behavioral intention* were adapted for this research based on the same literature used to develop the attitude scales. Respondents were asked to indicate their intentions to engage in each of the five actions prescribed in the message, as well as to generally prevent cancer, by responding to a series of three items for each action. Using a 7-point scale ranging from "Strongly disagree" to "Strongly agree," respondents indicate if they "expect to," "will try to," and "want to" engage in each of the behaviors. The text describing the behaviors was edited for each item to avoid repetitiveness and respondent burnout—for example, two items assessing

nutritious eating included "I will try to eat healthier in the weeks to come" and "I want to eat a well-balanced, nutritional diet in the weeks to come." Previous research using this item development strategy has achieved good internal reliability of scales (e.g., Ajzen & Madden, 1986; Armitage, 2005; Gatt & Sammut, 2008). After inter-item reliability was established, responses to the three items for each behavior were averaged to form an index of behavioral intentions. Alpha reliabilities for these scales were as follows: preventing cancer, $\alpha =.904$; engaging in exercise, $\alpha =.883$; eating a healthy diet, $\alpha =.898$; moderating alcohol intake, $\alpha=.929$; quitting or avoiding smoking, $\alpha =.941$, and protecting oneself from the sun, $\alpha =.934$.

Data Analysis

Research question one explored the differences in perceived credibility (i.e., competence, trustworthiness, and goodwill) between health professional and layperson communicators. To compare means between these two sources for all three dimensions, independent samples t-tests were used. The results from this test provided information regarding the statistical significance of a difference between the two groups (layperson and health professional sources) for the three dimensions of credibility (trustworthiness, competence, and goodwill/caring).

Hypothesis one predicted that relevance would be positively related to elaboration. Using the dichotomous elaboration variable (relevant/not relevant thoughts) and the index created from averaging responses to the cancer relevance measure, a point-biserial correlation was calculated. Additionally, the correlation between the elaboration response word count and the relevance measure was also calculated as a way of providing additional insight into results.

Hypothesis two predicted that elaboration moderated the effect of credibility on attitudes. A hierarchical multiple regression was calculated to examine effects on various attitudinal outcomes. The first block of the regression contained control variables of current health risk

behaviors (i.e., smoking, physical activity, diet, alcohol consumption, sun protection), which were likely to have an impact on attitudes. The second block contained the continuous variables of credibility scores for the three dimensions (trustworthiness, competence, and goodwill, mean-centered to facilitate the testing of interactions), the dichotomous elaboration variable, and three interaction terms of credibility*elaboration created by multiplying the variables. Six different outcome variables were assessed representing the six behaviors of interest: cancer risk reduction in general, healthy eating, physical activity, limited alcohol intake, smoking, and sun protection. Simple slopes analyses were used to probe any interactions found.

Hypothesis three proposed a positive relationship between attitudes and behavioral intentions. This hypothesis was tested using a hierarchical linear regression with control health behaviors in the first block and attitudes in the second block. Six regressions were calculated, with behavioral intentions for each of the six cancer risk reduction behaviors used as dependent variables.

Hypothesis four predicted that elaboration would moderate the effects of attitudes on behavioral intentions, such that the association would be stronger for those who engaged in issue-relevant elaboration. To assess this, a hierarchical linear regression was calculated with control health behaviors in the first block, the dichotomous elaboration and mean-centered attitude behaviors in the second block, and an interaction term created by multiplying elaboration and attitude in the third block. As in the previous hypothesis, six regressions were calculated for each of the relevant cancer risk reduction behaviors. Simple slopes analyses were completed to obtain further detail about any significant interactions found.

Research question two concerned the effect of credibility on attitudes toward cancer risk reduction. This was analyzed using a hierarchical linear regression, with health behaviors used as

controls in the first block. The second block contained the three credibility variables of trustworthiness, competence, and goodwill. Six different outcome variables were assessed representing the six behaviors of interest: cancer risk reduction in general, healthy eating, physical activity, limited alcohol intake, smoking, and sun protection.

The third research question concerned the effect of type of social media (i.e., selecting source) on message comprehension. Because there were four types of social media, a one-way ANOVA was used to assess differences between groups and determine if the means were significantly different from one another. Additionally, follow-up contrast analyses were completed to probe for effects between types of social media that had large mean differences.

Hypothesis five predicted that message comprehension would be positively related to elaboration. This was examined through a point-biserial correlation, testing the relationship between the dichotomous elaboration variable and the continuous comprehension variable.

Research question four concerned the relationship between message comprehension and attitudes toward cancer risk reduction. To assess this, a hierarchical multiple regression was calculated to examine effects on various attitudinal outcomes. The first block of the regression contained control variables of current health risk behaviors (i.e., smoking, physical activity, diet, alcohol consumption, sun protection), which were likely to have an impact on attitudes. The second block contained the continuous comprehension measure. Six different regressions were calculated in order to capture the six cancer risk reduction behaviors of interest.

The final two research questions (five and six) concerned the effects of communicator type and type of social media on attitudes. Because of the need for testing an interaction and including control variables, a two-way ANCOVA was calculated. Because each condition had both a social media and a communicator type manipulation, both independent variables were

entered into the model to test RQ5 and RQ6. For RQ6, an interaction term for social media and communicator type was added. Health behaviors and social media use variables were used as covariates in order to act as statistical controls. Estimated marginal means were examined to probe significant differences between forms of social media.

Experimental Pilot Testing

To test experimental materials and perform initial reliability analyses of instruments, a small pre-test of the online experiment was conducted (*n*=39). Responses from this pretest indicated acceptable reliability for all scales, including cancer involvement, credibility (for each subscale), attitudes, and behavioral intentions. Additionally, there were significant correlations between the two measures used for each control health behavior, such that the numerical values reported for each instance of engaging in the behavior were correlated with their responses on the Likert-style item assessing their frequency of engaging in the behavior. These analyses were repeated for the final sample, as the purpose of these initial analyses was simply to uncover any significant problems before larger data collection occurred.

The only problem uncovered by this initial test concerned the manipulations of the message source. Consistently, respondents provided inaccurate responses regarding the profession of the individual who delivered the message. Specifically, student sources were often mistaken for doctors. To correct this before larger data collection, the messages for both health professionals and students were prefaced with a description of the speaker, indicating their name and if they were a student or doctor (e.g., "This message is delivered by Olivia Eaton, a student at MSU"). Additionally, the materials were altered to clearly indicate if the speaker was a "Student at MSU" or a "health professional from MSU." Respondents were able to accurately recall the type of social media used, so no changes were required to the materials for that

purpose. Overall, these improvements increased accuracy in the final sample, as 83.2% of individuals recalled the source correctly. In the health professional condition, 82.7% correctly identified the type of source, as well as 83.7% in the student condition.

Chapter 3: Results

Participant Characteristics

The final sample for this study consisted of 387 individuals with an average age of 20.9 years. Of all participants, 73% were female and 74% were Caucasian, 19% were Asian, 6% were Black, and 1% were American Indian/Alaska Native. Only 0.8% of participants had been diagnosed with cancer, while 71.8% had had a family member (blood relative) diagnosed. 50.6% had a grandparent diagnosed, 31.5% had an aunt, uncle, cousin, niece or nephew diagnosed, 14.2% had a parent diagnosed, 1.6% had a sibling diagnosed, and 0.3% had a child diagnosed. Thus, the participants had a variety of experiences with cancer. They were also active users of social media: 97.2% stated that they used Facebook, 75.7% used Twitter, 78.3% watched YouTube videos, and 44.4% read blogs. Of these four types of social media, 50.4% said that they used Facebook the most, while 38.8% said they used Twitter most often.

The participants also reported on their health behaviors related to cancer risk reduction, which were used as statistical controls for many analyses. On average, participants reported smoking cigarettes on 1.33 days of the past 30 days, with 87.9% reporting that they had not smoked at all. Participants reported engaging in excessive alcohol consumption (i.e., five or more drinks in a single sitting) an average of 3.21 days in the previous month, with almost 30% doing so at a frequency that averaged to at least once a week. Respondents ate fruit about seven times in the past seven days and vegetables 8.3 times within the past seven days. The average amount of days spent engaging in at least 30 minutes of physical activity was 3.52 over the previous week. Finally, over 50% of respondents reported wearing sunscreen on sunny days only "never" or "rarely." Based on these responses, it is safe to conclude that the majority of respondents were not actively engaging in behaviors to reduce their risk of cancer in a way that

meets suggested minimum levels, such as for exercise and sun protection, whereas many others were engaging in activities that would increase their risk of cancer (i.e., excessive alcohol consumption, smoking). Descriptive statistics for all study variables are listed in Table 3.

Credibility, Attitudes, and Behavioral Intentions

Research question one asked if there were perceived credibility differences between health professional and layperson sources, in terms of trustworthiness, competence, and goodwill. An independent samples t-test yielded a statistically significant differences between health professional (M=5.79, SD=1.03$)$ and layperson (M=5.31, SD=0.93) sources in terms of perceived competence: $t(385)$=4.85, $p<.001$, η^2=.05. No statistically significant differences were found for goodwill (health professional: M=5.29, SD=1.06; layperson: M=5.15, SD=1.04) or trustworthiness (health professional: M=5.64, SD=0.99; layperson: M=5.46, SD=0.98).

Hypothesis one predicted a positive relationship between relevance and issue-relevant elaboration. A point-biserial correlation yielded a non-significant result, $r(385)$=.06, p=.239. The correlation between the elaboration word count and relevance was also non-significant, $r(385)$=.05, p=.370. Thus, the hypothesis was not supported.

Hypothesis two predicted that elaboration would moderate the effects of competence, trustworthiness, and goodwill on attitudes, such that there would be a stronger relationship for individuals engaging in issue-relevant elaboration. This hypothesis was tested using hierarchical linear regression, with control variables in the first block, the dichotomous elaboration variable and three mean-centered credibility variables in the second block, and interaction variables in the third block. Overall, the hypothesis was partially supported, as results differed depending on the attitude examined. For smoking attitudes, the interaction of trustworthiness and elaboration was significant, as was the interaction of goodwill and elaboration (see Table 4).
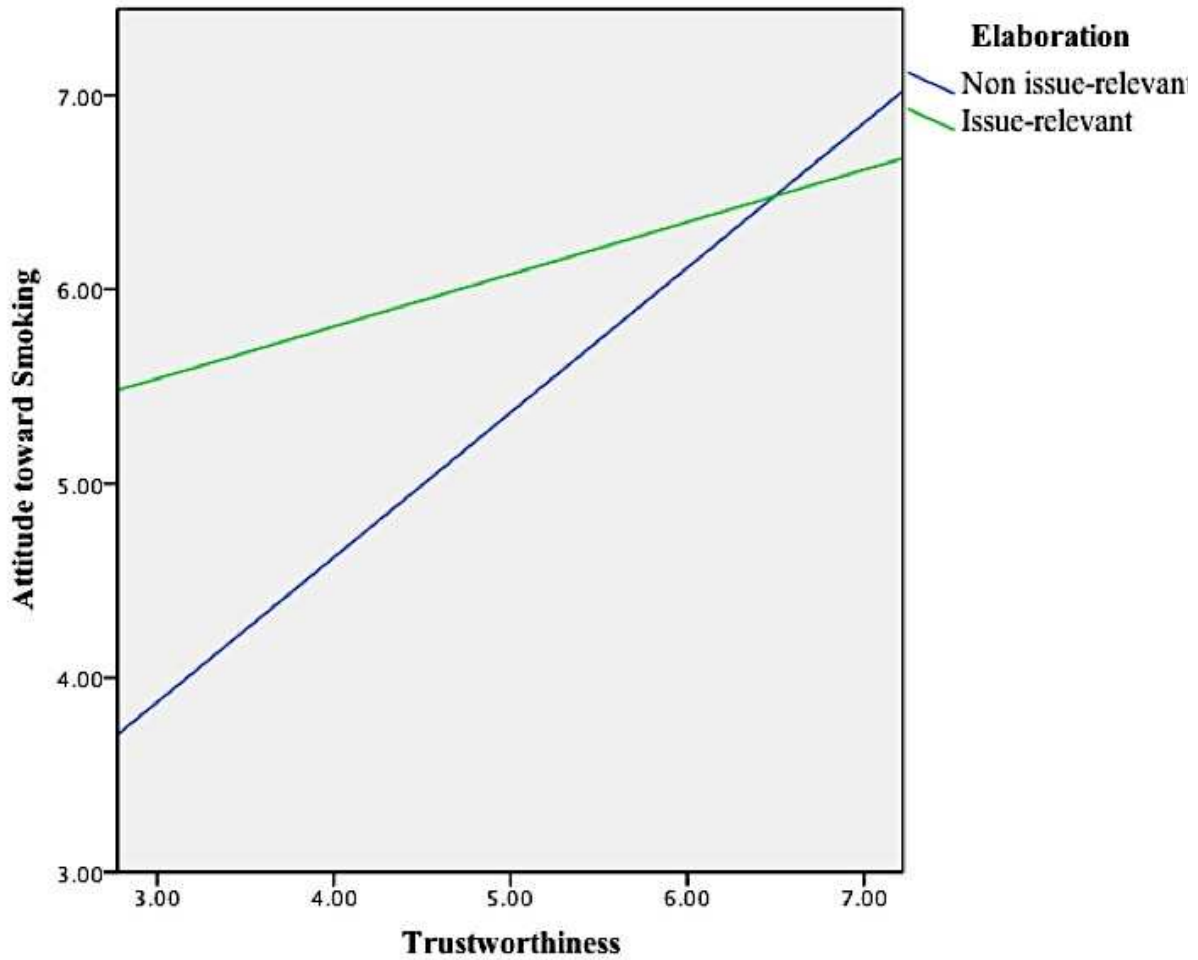
Figure 2. Interaction effect of trustworthiness and elaboration on attitudes toward smoking

An examination of simple slopes, displayed in Figure 2, revealed that trustworthiness was a stronger predictor for those without issue-relevant elaboration (β=.627) than for those with issue-relevant elaboration (β=.226). Additionally, simple slopes analysis revealed that goodwill was a stronger predictor for those without issue-relevant elaboration (β=.367) than for those with issue-relevant elaboration (β=.195), as shown in Figure 3. These results are consistent with the hypothesis' predictions. An interaction effect between goodwill and elaboration was also found for attitudes toward a healthy diet (see Table 5). Simple slopes analysis (see Figure 4) suggested that the effect of goodwill on attitudes toward smoking was stronger for those with issue-relevant elaboration (β=.315) than for those without (β=.210). This result is in the opposite

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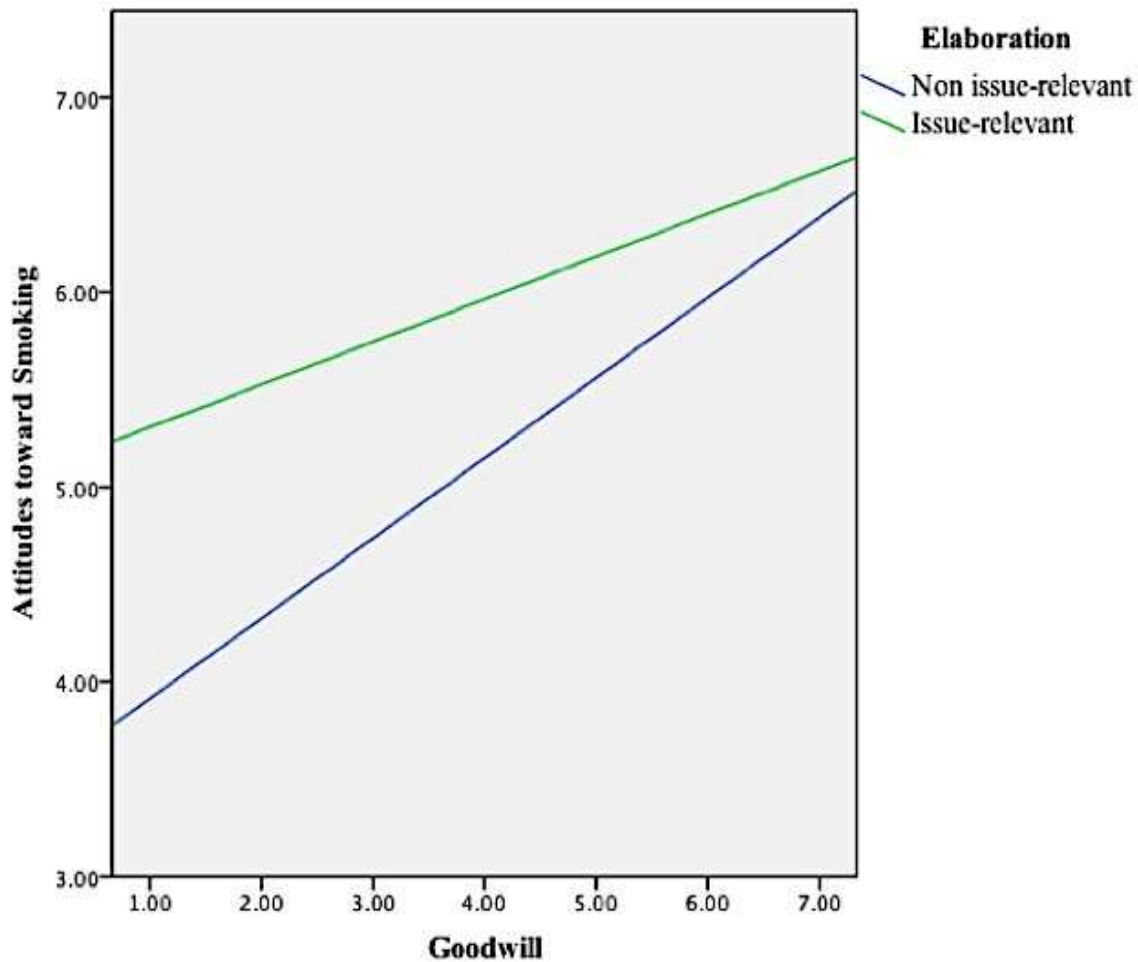
Figure 3. Interaction effect of goodwill and elaboration on attitudes toward smoking

direction than predicted, thus leading to partial support for the hypothesis. No other interactions

were found for risk reduction attitudes.

     Hypothesis three predicted that there would be a positive relationship between attitudes

toward cancer risk reduction and behavioral intentions to engage in cancer risk reduction. This

hypothesis was tested using a hierarchical linear regression with control health behaviors in the

first block. Results demonstrated that attitudes were significantly related to behavioral intentions

for all six outcome variables (see Tables 6-11). Thus, hypothesis three was supported.

     Hypothesis four predicted that elaboration would moderate the effects of attitudes on

behavioral intentions, such that the relationship would be stronger for those engaging in
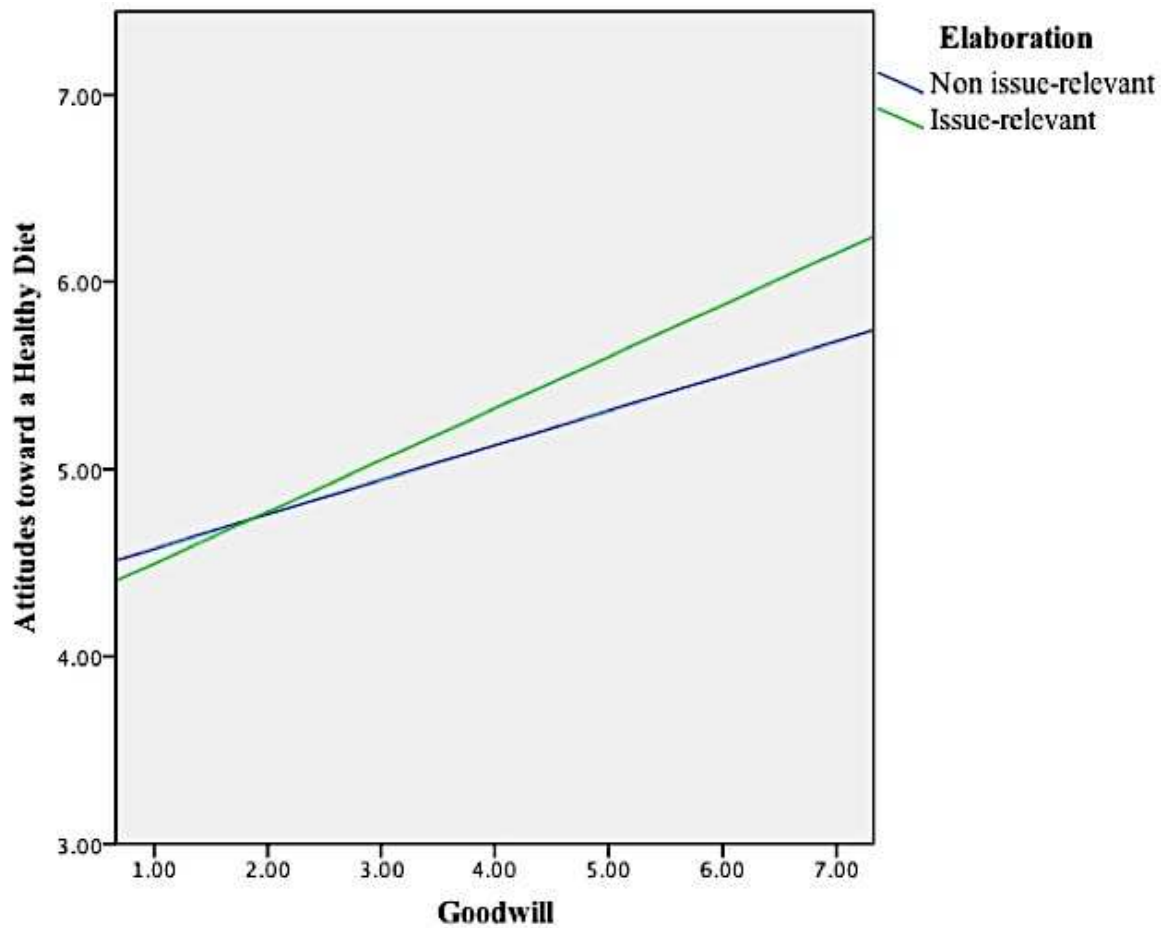
Figure 4. Interaction effect of goodwill and elaboration on attitudes toward a healthy diet

issue-relevant elaboration. This hypothesis was not supported, though significant interaction

effects were found in the opposite direction than was predicted. Elaboration moderated the

effects of attitudes on behavioral intentions toward cancer risk reduction in general, exercise, and

diet (see Tables 12-14). Simple slopes analyses indicated that the relationship between attitudes

toward risk reduction and behavioral intentions was stronger for those who did not engage in

issue-relevant elaboration (β=.769) than for those who did (β=.492) (Figure 5). Similarly, for

exercise, the relationship between attitudes and behavioral intentions was stronger for those who

did not report issue-relevant thoughts (β=.799) than for those who did (β=.508) (Figure 6). Last,
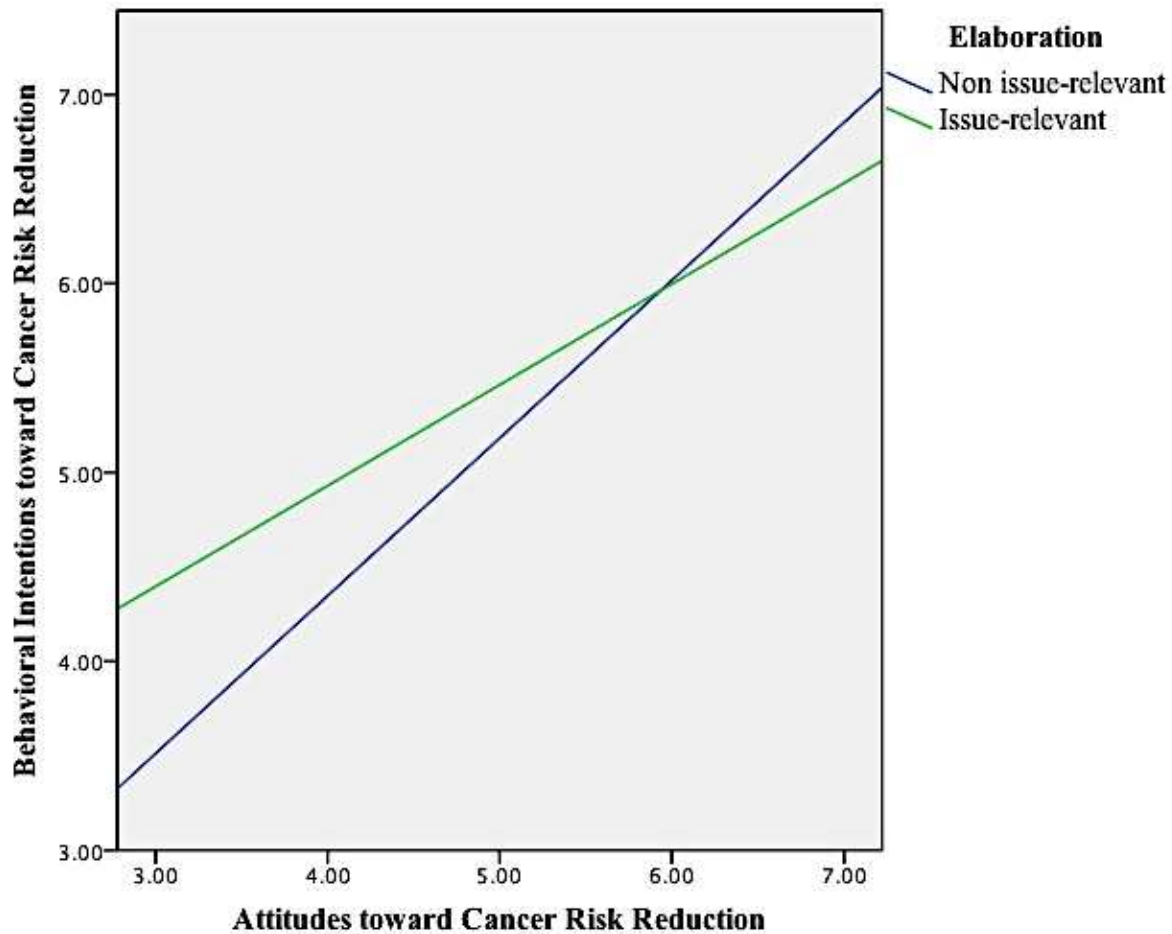
Figure 5. Interaction effect of elaboration and attitudes on behavioral intentions to engage in cancer risk reduction

for attitudes towards diet, the relationship to intentions was once again stronger for those who did not engage in issue-relevant thoughts (β=.790) than for those who did (β=.527) (Figure 7).

Research question two concerned direct effects of credibility on attitudes toward cancer risk reduction. A hierarchical multiple regression tested the effects of all three dimensions of credibility on the six different attitudes, after controlling for current health behaviors. After controls, trustworthiness was found to be the sole significant predictor among the three credibility dimensions for attitudes toward cancer prevention (sr^2=.19), smoking (sr^2=.11), exercise (sr^2=.16), healthy diet (sr^2=.17), and alcohol consumption (sr^2=.10) (see Tables 15-19).
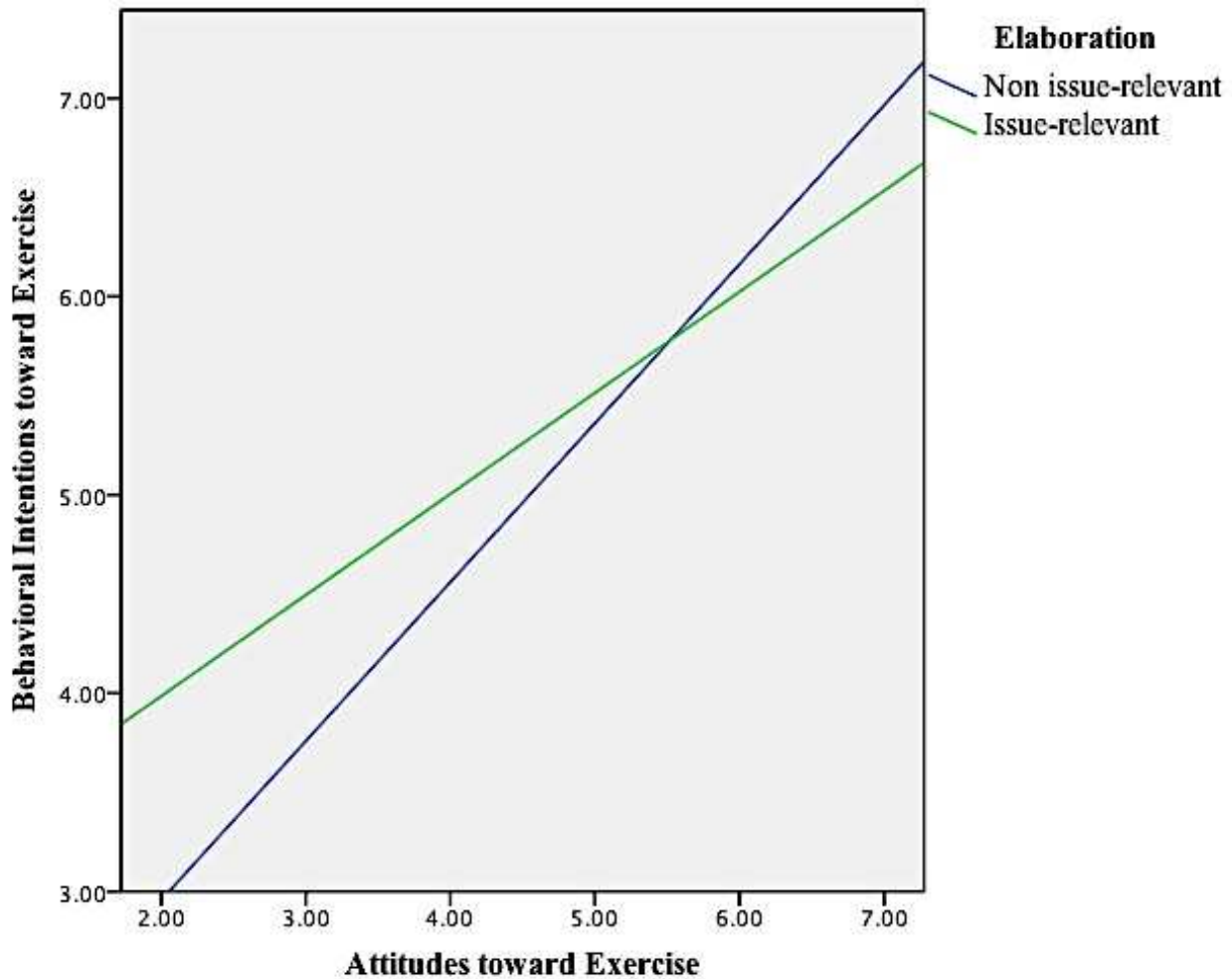
Figure 6. Interaction effect of elaboration and attitudes on behavioral intentions to exercise

For attitudes toward sun protection, only goodwill emerged as a significant predictor ($sr^2=.09$) (Table 20). Thus, credibility was positively related to attitudes toward cancer risk reduction.

Social Media Effects and Comprehension

The aim of research question three was to examine differences in comprehension across the four types of social media. A one-way ANOVA yielded a non-significant result, suggesting no differences between Facebook, Twitter, YouTube, and blogs. However, an examination of the means pointed to a large difference between YouTube ($M=3.60$, $SD=1.49$) and Twitter ($M=3.10$, $SD=1.49$) in terms of comprehension, so a contrast analysis was completed to compare these two
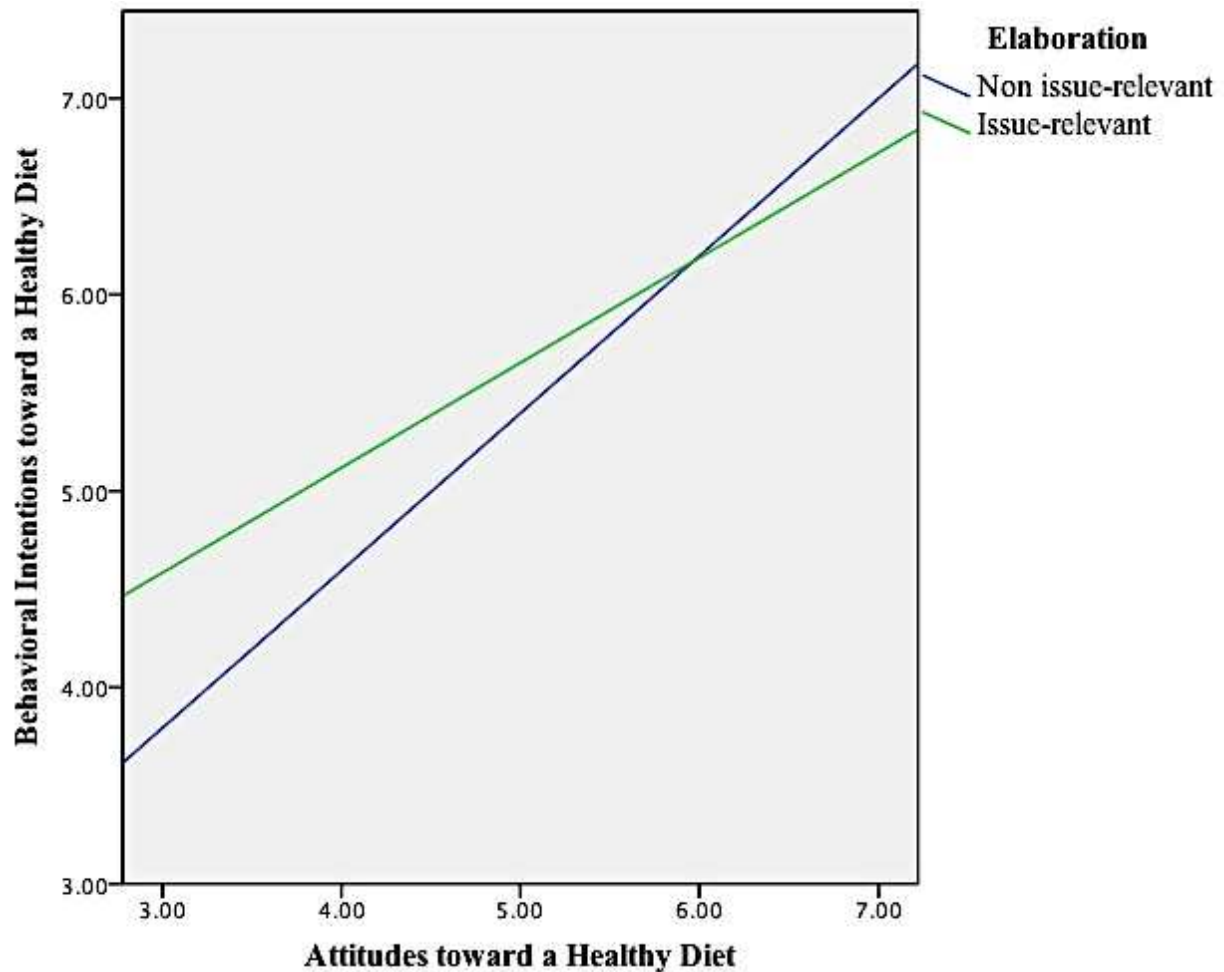
Figure 7. Interaction effect of elaboration and attitudes on behavioral intentions to eat a healthy diet

groups. The test yielded a significant result, $t(383)=-2.20$, $p < .05$. Thus, if considering just YouTube and Twitter, YouTube leads to significantly higher levels of comprehension.

Hypothesis five predicted that comprehension would be positively related to elaboration. This hypothesis was supported, $r(385)=.15$, $p < .01$. Comprehension scores were higher for those who engaged in issue-relevant elaboration (*M*=3.41, *SD*= 1.53) than those who did not (*M*=2.76, *SD*=1.48). Research question four explored if comprehension was related to attitudes toward cancer risk reduction. To examine this question, a hierarchical multiple regression was completed as in previous analyses, with health behaviors used as controls in the first block. After

controls, comprehension had a significant positive effect on attitudes toward cancer risk reduction (sr^2=.26), smoking (sr^2=.23), exercise (sr^2=.13), and a healthy diet (sr^2=.17) (see Tables 21-24). It was not significantly related to attitudes toward sun protection or alcohol consumption.

Research question five concerned whether the type of social media had an impact on attitudes toward cancer risk reduction. This hypothesis was tested using a one-way analysis of covariance (ANCOVA), which allowed for the inclusion of health behaviors and social media use as covariates. Across all of the attitudes examined, only attitudes toward cancer risk reduction were related to the type of social media, $F(3,373)$=3.522, $p < .05$ (Table 25). A calculation of effect size, however, showed that social media type only accounted for 2% of the variation in attitudes toward cancer prevention (ω^2=.02). Follow-up tests were conducted to examine pairwise differences among the adjusted means for social media type. The Bonferroni procedure was used to control for Type I error across the pairwise comparisons (.05/6=.008 significance level), and results revealed a significant difference between YouTube (M=5.94) and Facebook (M=5.58), in terms of their estimated marginal means (see Table 26). Social media was not found to have an effect on attitudes toward sun protection, smoking, exercise, diet, or moderating alcohol use. Additionally, there were no interaction effects between type of social media and message communicator, which was the subject of research question six.

Chapter 4: Discussion

The goal of this study was to examine the effects of social media and communicator type on outcomes related to cancer risk reduction. In this experiment, individuals were shown a cancer risk reduction message that was delivered via YouTube, Facebook, Twitter, or a blog post, and was communicated by a layperson or health professional source. Primary results (see Figure 8, with only significant relationships included) indicated that health professionals were more credible than layperson sources, but only for one dimension of credibility: competence.
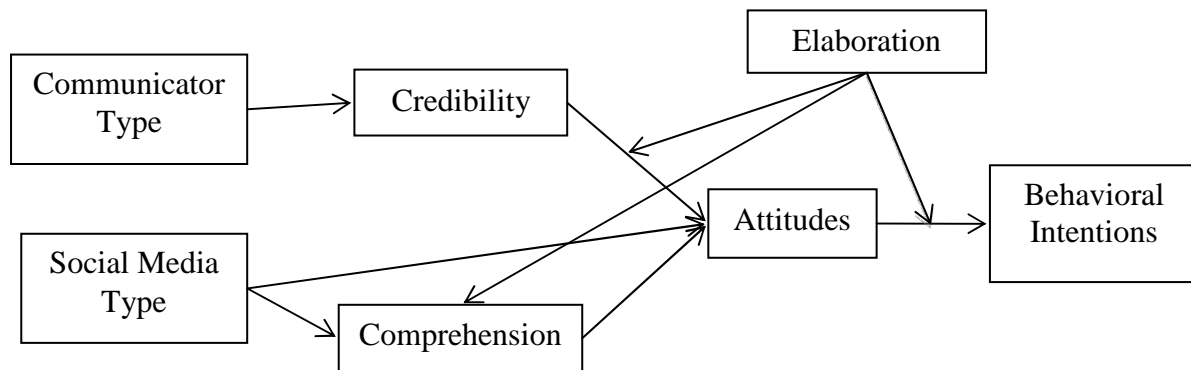

Figure 8. Illustration of statistically significant relationships found

Credibility had a direct effect on attitudes, though this relationship was also moderated by elaboration in a manner that differed according to the attitude being examined. In turn, attitudes had strong and consistent effects on behavioral intentions, but these relationships were again moderated by elaboration. In a finding that was opposite than predicted, individuals who did not engage in issue-relevant elaboration had stronger attitude-behavioral intention relationships. Regarding type of social media, it was found that the form of social media had an effect on comprehension, which then had an effect on attitudes toward cancer risk reduction. Overall, these findings indicate that both the communicator and the form of social media are important to consider when delivering health promotion messages, and bring to light important areas for

further research if health educators hope to use these new technologies effectively. These findings will be discussed in more detail below.

Source Effects: Communicator Credibility and Elaboration

The first research question for this study concerned differences in credibility between health professional and layperson sources. A significant difference in perceived competence emerged between health professional and layperson sources, such that health professionals were seen as having higher levels of competence than layperson sources. Considering the fact that the individual communicating the message, the content of the message itself, and the affiliation of the individual was kept constant, it is clear that the mere addition of a white lab coat and the title "Dr." before an individual's name is all that is needed to lead to higher levels of perceived credibility. This finding is in line with previous research that has found that individuals engage in heuristic processing when evaluating online sources (Metzger & Flanagin, 2013), specifically when it comes to expertise. Thus, this result is not altogether surprising.

These results are different, however, from Hu and Sundar's (2010) findings, which demonstrated that layperson sources were seen as more credible on social-based sites. The proposed mechanism behind this relationship was *homophily*, or a sense among participants that the communicator was similar to themselves, which in turn increased the source's credibility. Because this study was done with a college student population, and the layperson source self-identified as a college student, it is surprising that this homophily finding was not replicated. It may be due to differences in the way credibility was measured, as Hu and Sundar used a scale that measured whether the message itself was accurate and believable. McCroskey's measure (McCroskey & Teven, 1999), conversely, specifically refers to the communicator, so this may have required the respondent to think more critically about the individual communicating it.

Such a critical examination of the source would likely lead an individual to assume a health professional was more competent, whereas a measure of the message itself would have relied on more heuristic-based assessments (Metzger & Flanagin, 2013). Thus, future research may benefit from examining both message-based and source-based credibility, as these measures may be assessing different perceptions that could, in turn, have varying effects on other variables.

The lack of differences between sources in terms of trustworthiness is also not in line with previous research, which has found that layperson sources are seen as more trustworthy than expert sources (Willemsen et al., 2012). In this case, the context may be the reason for the lack of significant findings. Willemsen et al. performed their research using online product reviews, which is a lower-stakes context than health information and could potentially involve conflicts of interest. The message delivered in this study, conversely, was a health promotion message based in medical research that was delivered in the spirit of public service. Because trustworthiness reflects an individuals' motivation for sharing information (Willemsen et al., 2012), and neither the doctor nor the layperson source stood to gain from delivering the message, respondents may have assumed they were both trustworthy, as evidenced by the high levels of trustworthiness reported overall. Conversely, the lack of findings may be explained by a recent study that found that the presence of medical equipment (e.g., a stethoscope) increased the perceived trustworthiness of health professionals (Jiwa, Millett, Meng, & Hewitt, 2012). Perhaps the lack of a medical context in the delivered messages diminished the trustworthiness of the health professional source, thus leading them to be statistically equivalent to a layperson in terms of this credibility dimension. Finally, it could also be the case that the lack of differences is simply a study artifact. The layperson source, although self-identified as a university student, was said to be affiliated with the university health system. Because this is a reputable

organization, the student source may have been seen as trustworthy by association.

Regardless of any differences or non-differences found, perhaps the most interesting finding in this area is the level of perceived credibility ascribed to the sources. The mean levels of credibility across both types of sources were high for competence (M=5.55, SD=1.01), trustworthiness (M=5.55, SD=0.99), and goodwill (M=5.22, SD=1.05)—significantly above the midpoint of the scale for each dimension, according to a post-hoc one-sample t-test ($p < .001$ for each). Previous research using the same credibility framework to examine health messages delivered via social media reported lower levels of credibility overall (Westerman, Spence, & Van Der Heide, 2014), indicating perhaps that views toward health information delivered in this manner are shifting to be more favorable toward health-related sources. Although the results of this study are not by any means conclusive evidence of the perception of social media message sources, they do suggest that the use of these technologies for delivering health information warrants further study and use. Specifically, further research needs to explore the intricacies of how to better increase credibility aside from manipulating the type of source, considering the effects that credibility had on attitudes in this study.

Analyses for RQ2 indicated that the dimension of trustworthiness alone had an effect on attitudes toward cancer prevention in general, smoking, exercise, engaging in a healthy diet, and alcohol consumption. For attitudes toward sun protection, only goodwill had a significant effect. It is unfortunate that no significant differences between types of sources emerged for these two dimensions of credibility, as it is thus difficult to determine factors that contribute to increased trustworthiness and goodwill—information that would be valuable considering that these two dimensions accounted for 9-19% of the variance in attitudes examined. Although these aren't extremely high numbers, they do suggest that credibility plays an important role in individuals'

perceptions. Previous research has demonstrated that the three dimensions of credibility are associated with patient satisfaction (Richmond, Smith Jr, Heisel, & McCroskey, 2002; Wrench & Booth‐Butterfield, 2003), which, though not directly applicable to this study, is important for the future use of social media for communicating health messages. Clearly, it would be beneficial for future research to examine factors that increase the trustworthiness and goodwill of sources associated with social media messages. Research has examined this to some extent, finding that, for doctor-patient communication, responsiveness led to increased credibility on all three dimensions (Richmond et al., 2002), as did the use of humor by physicians (Wrench & Booth‐Butterfield, 2003). The informal and interactive nature of social media sites makes them great facilitators for humor and responsiveness, so there is potential to increase credibility using these tactics and, consequently, increase positive attitudes.

Another important factor to consider when examining the effects of credibility is that of elaboration, which was examined by hypothesis two. Specifically, this hypothesis predicted that elaboration would moderate the effects of credibility on attitudes, such that credibility would have a stronger effect for those who did not engage in issue-relevant elaboration. The results regarding this hypothesis are somewhat puzzling, as the moderating relationship changed depending on the outcome attitude being examined. For attitudes toward smoking, elaboration moderated the effects of trustworthiness and goodwill in the direction predicted. However, for attitudes toward a healthy diet, the proposed relationship was stronger for individuals who engaged in issue-relevant elaboration. It is possible that these observed differences are due to individuals' previous knowledge regarding their status as modifiable risk factors. This study did not assess knowledge of cancer risk reduction behaviors prior to seeing the message, but research has consistently found that individuals are very aware of the link between smoking and cancer:

In fact, several studies have shown awareness of smoking as a potential risk factor to be considerably higher than awareness of the effects of fruit or vegetable intake, or being overweight (Redeker, Wardle, Wilder, Hiom, & Miles, 2009; Stryker, Moriarty, & Jensen, 2008). Wardle, Waller, Brunswick, and Jarvis (2001) found that over 90% of respondents knew that smoking was a risk factor for lung cancer, while only about 40% knew about the association of fruit and vegetable consumption with bowel cancer. These findings suggest that the discussion of diet as a potential risk factor may have been novel information for the respondents, which could have in turn had an effect on the proposed relationship. Returning to the conceptualization of persuasion put forth by Miller (1980), the introduction of novel information implies an outcome related to response shaping. The processes involved in response shaping are different than those related to response changing, as is typical in a smoking context, which could explain the different effects of elaboration based on the behavior of interest. Future research may consider examining both prior knowledge and behaviors to determine which of the three persuasive outcomes are occurring, as it may help to explain these dissonant findings.

In their discussion of source factors as they relate to the ELM, Petty and Cacioppo (1984) suggest that qualities of the communicator may play a role for those taking the central route (i.e., those who engaging in issue-relevant elaboration) if these qualities are particularly important to the message itself. They write:

> Interestingly, a consideration of source factors may be part of a person's attempt to evaluate the issue-relevant information when elaboration likelihood is high. For example, under some circumstances a source may serve as a persuasive argument (e.g., a physically attractive source may provide persuasive visual testimony as to the effectiveness of a beauty product)…The important point is that when elaboration

likelihood is high, source information does not serve as a simple acceptance or rejection

cue, but may be considered along with all other available information in the subject's

attempt to evaluate the true merits of the arguments and position advocated. (p. 671)

In the case of a message communicating that diet has an impact on cancer risk, the presence of

uncertainty and lack of background information may have led those engaging in issue-relevant

elaboration to consider the qualities of the source as evidence of the quality of the argument. If

the source was seen as credible, this may have led to increasingly positive attitudes toward the

message, as suggested by Petty and Cacioppo (1984). Other researchers have found that, under

conditions of high involvement, credibility perceptions affect attitudes toward a message if

individuals are presented with an ambiguous argument (Chaiken & Maheswaran, 1994). Because

the message in this study simply told individuals that they should eat a healthy diet to reduce

their risk of cancer, but did not provide any further details or evidence, it could fit into the

"ambiguous" category—especially considering a potential lack of background knowledge on the

subject. Thus, overall, it is possible that the nature of the topic may determine the moderating

role of elaboration. An interesting path for future research would be to explore the ways in which

particularly novel or unknown information has an effect on the ELM's predictions, as these

results suggest that a lack of prior knowledge may lead to observed relationships opposite to

those that are predicted by the theory.

Another important aspect of the ELM is the assumption that elaboration occurs when a

topic is personally relevant for the individual. This assumption, tested via hypothesis one, was

not supported. Using two different measures of elaboration, including a count of words

expressed in the thought-listing exercise, and coding of issue-relevant responses, a significant

correlation was not found. The reasons why this occurred are unclear. There does not seem to be

a measurement issue, as the cancer relevance measure had good internal reliability and model fit as tested by CFA. The elaboration coding had good inter-rater reliability and the two measures of elaboration were significantly related to one another. Thus, it appears to simply be the case that an individual's cancer relevance score did not have an impact on their engagement in issue-relevant elaboration after viewing the message. It is possible that this is due to a lack of variance in the relevance variables: the mean score for relevance was at almost the midpoint of the scale (M=3.06), suggesting a lack of strong feelings one way or another. This is possibly due to the fact that young adults see cancer as less relevant, as they are are unlikely to be diagnosed, and represents a challenge of working with this population. Perhaps efforts to increase relevance, such as by citing statistics or encouraging an lifetime view of cancer risk, may help to address this problem. Regardless of the reasoning behind the lack of findings, however, an unfortunate consequence is that there is little insight as to factors that increase the likelihood of elaboration. Yet, other findings from this study suggest that issue-relevant elaboration may not be as crucial as previously thought for changing behaviors.

Results from hypothesis three indicated consistently strong relationships between attitudes and behavioral intentions for each of the six behavioral measures. These results are not surprising, as this relationship has been consistently demonstrated in previous research (Glasman & Albarracín, 2006), but the moderating effect of elaboration on this relationship is interesting. Hypothesis four predicted that those engaging in issue-relevant elaboration would demonstrate a stronger relationship between attitudes and behavioral intentions. The results suggested that the exact opposite was true—the relationship between the two variables was stronger for those who did report any relevant elaboration about the message content. This result is especially puzzling because the moderating role of elaboration in the attitude-behavior relationship has been well-

established and routinely supported in ELM research (e.g., Mongeau, 1989; Petty, Cacioppo, & Schumann, 1983; Petty, Haugtvedt, & Smith, 1995).

One potential explanation is that the health-related context of the attitudes and behaviors led to these unexpected findings. Changing one's exercise and dietary behaviors, for example, requires significant effort and commitment. It is possible that those who did not engage in issue-relevant elaboration, and were thus not thinking critically about the message, failed to grasp the difficulty of actually performing the cancer risk reduction tasks. Conversely, individuals who did report issue-relevant elaboration thought critically about the life changes associated with engaging in these behaviors. For this reason, the strength of their behavioral intentions was lower, even if they recognized the value of engaging in the behaviors. This interpretation is reminiscent of research on self-efficacy, which refers to perceptions of "how capable one is of performing the behavior" in question (Strecher, DeVellis, Becker, & Rosenstock, 1986, p. 74). It is possible that self-efficacy was higher for those who engaged in peripheral route processing, which led to the stronger attitude-behavior relationship. Research examining self-efficacy has found that self-efficacy is associated with both heuristic and systematic (i.e., central route) processing, but that it is better associated with heuristic judgments (Trumbo, 1999), which is in line with this interpretation. It would be valuable to further explore this link, as it is a potentially meaningful idea for health promotion that increased elaboration leads to lower self-efficacy.

Together, the findings related to the effect of communicator and the role of elaboration suggest that health information communicated on social media sites leads to many unexpected outcomes that may not be in line with previous theoretical predictions. The results regarding the types of social media sites, discussed in the next section, were also somewhat surprising and thus have important implications for health promotion.

Medium Effects: Social Media Form and Comprehension

This study also explored the impact that the type of social media has on comprehension and attitudinal outcomes. First, it was found that elaboration was positively associated with comprehension. This is in line with the predictions of the ELM (Petty & Cacioppo, 1986) and demonstrates that individuals who think more critically about a message are more likely to remember details. This finding is unsurprising, but further complicates the issue of elaboration and its value in the persuasion process. Thus far, issue-relevant elaboration has been shown to negatively affect the attitude-behavior relationship, to have differential effects on the credibility-attitude relationship, and to positively affect comprehension—making it difficult to determine if issue-relevant elaboration should be encouraged in a health promotion context. Clearly, this warrants further research that will help to elucidate the role of elaboration in persuasion in a social media context, as many of the findings of this research are not in line with the original predictions of the ELM. Perhaps the social media environment, which encourages quick browsing, high interactivity, and communal authorship, is changing the way in which traditional persuasion processes work.

Social media also has an effect on the extent of message comprehension. Results indicated that, when comparing just YouTube and Twitter to one another, YouTube leads to significantly higher comprehension scores. The most obvious interpretation of this finding is in line with Media Richness Theory (Dennis & Kinney, 1998), which posits that that increased cues lead to more message comprehension. Because YouTube adds audio and visual cues that Twitter does not facilitate, it allows individuals to better remember the given message. However, the findings are not directly supportive of this interpretation. YouTube was significantly better than Twitter in terms of increasing comprehension, but statistically equivalent to blogs and Facebook,

which are text-only media. Additionally, previous research has found that adding videos to text-based information has no effects on knowledge gained (Perrault & Silk, 2014). Thus, it makes more sense that there is something about Twitter that leads to *less* message comprehension as compared to the other forms of social media. A study by Counts and Fisher (2011) found that individuals reading tweets remember less than 70% of what they see, as measured by a very simple recall test (i.e., "Did you see this tweet?" Yes/No). This is likely explained by the fact that the average viewing time for a tweet was found to be less than three seconds. These findings, combined with the results from this study, suggest that Twitter may not be the optimal form of social media for delivering health-related messages, as comprehension is key for changing health behaviors, especially when considering the effects it has on attitudes.

Results from research question four indicated that comprehension was positively related to attitudes toward cancer risk reduction, smoking, exercise, and eating a healthy diet. These findings, combined with the strong associations between attitudes and behavioral intentions, point to the importance of encouraging message comprehension. The observed relationship between comprehension and attitudes is in line with previous research (e.g., (e.g., Chattopadhyay & Alba, 1988; Haugtvedt & Wegener, 1994), but the reasons why this relationship was found are still unclear. The most obvious interpretation is simply that individuals cannot agree with a message if they do not remember it, assuming they find the message to be believable. Thus, lower comprehension is associated with less positive attitudes. This simple explanation, however, does not take into account the research that has not found a message recall-attitude correlation (see Eagly & Chaiken, 1993). There could instead be a third variable playing a role in the relationship, such as perceived interest in the message. Counts and Fisher (2011) found that individuals were more likely to remember tweets that they found personally interesting. Taking

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that finding one step further, it makes sense that individuals would have more positive attitudes toward messages they find interesting. A valuable direction for future research would be to examine aspects of messages that enhance recall and strengthen the relationship between recall and attitudes, as such information would be valuable for individuals who wish to deliver persuasive health messages.

This study also explored if the type of social media has any direct effects on attitudes toward cancer risk reduction. Results indicated that the type of social media did have effects for attitudes toward just one of the outcome variables: attitudes toward cancer risk reduction in general. Once again, YouTube yielded the most encouraging results, leading to more positive attitudes than the other forms of social media—though the only statistically significant difference was between YouTube and Facebook. Because this is a newer area of research, there are few previous studies that can shed light on these findings. It is possible that the observed difference was simply due to the mediating role of comprehension, as YouTube was also found to lead to highest levels of comprehension, which in turn led to more positive attitudes. To determine if this was this case, a post-hoc ANCOVA was calculated with comprehension as a covariate, to see if the effects of social media still remained. Even after including this control variable, the main effect of social media was still observed. Thus, it appears as though some characteristic of social media itself leads to changes in individuals' attitudes toward health behaviors.

As previously discussed, Hu and Sundar (2010) hypothesized that perceived gatekeeping explained differences in attitudes across various forms of online media. If individuals perceive that there is less gatekeeping, they have less trust in the message and are thus less likely to be persuaded. This mechanism may also explain the difference between YouTube and Facebook in terms of their impact on attitudes. Although anyone can create and upload a YouTube video or

write a Facebook post, there are functional differences related to gatekeeping. A YouTube video requires a significant amount of work and technical knowledge, which could discourage less reputable or motivated sources. Hence, the YouTube message may have been seen as more believable than the Facebook message. Again, this points to a need to examine medium credibility in addition to source credibility, as that may have played a role in the effects on attitudes. It is important to point out, however, that YouTube was not significantly better than Twitter or blogs, so this explanation may not be justified—especially when considering the low amount of gatekeeping associated with tweets. If an interaction between source and social media type had been found, it might have shed light on the instances in which certain websites were more persuasive than others, but this was not the case. Although a tentative argument can be made that YouTube is the ideal form of social media in for increasing comprehension and encouraging attitude change, much remains to be researched in this growing area.

Limitations

The primary limitation of this study is that it is cross-sectional in design and did not occur within the controlled environment of a lab. Although any implications drawn about causality were based on the order in which participants responded to stimuli, and thus reflect accurate temporality, they should still be interpreted with caution. Regarding measurement, this study explored behavioral intentions, but had no measures of actual behaviors. Research has demonstrated that the correlation between intentions and behaviors is over $r=.50$ (Sheeran, 2002), which demonstrates that intentions are an adequate measure for examining the impact of health messages, but are by no means perfect. Future research could improve upon this by having participants log information regarding health behaviors for longitudinal studies. Additionally, the lack of a correlation between relevance and elaboration is concerning and suggests an alternative

measure of elaboration may be warranted. Although this study used two different methods of measuring elaboration, it may be beneficial to code the number of issue-relevant thoughts, rather than the mere presence of issue-relevant thoughts. Such a method would allow for more variation in the elaboration variable and could lead to more statistically significant findings. Another limitation is that this study relied upon a student sample, which may not be generalizable to the wider population. It would be especially beneficial to test the message used among an older population, as cancer risk reduction is likely a more salient issue for such individuals.

It is also important to note that, although this study used screenshots from social media sites or isolated YouTube videos, an important aspect of social media—interactivity—was not part of the manipulations. Although the screenshots and videos were intended to imitate the actual social media contexts, commenting, "liking," and/or retweeting were not enabled in order to control the experimental manipulations. Future research might consider building interactivity into experiments, such as by using comments by confederates or allowing participants to interact with the messages and recording responses. Such efforts would allow the researchers to observe the effects of social media in a more natural environment.

Chapter 5: Implications and Future Research

This research represents an important step forward for the study of social media and health. There is a lack of controlled, experimental research in this context (Whitten, Lauckner, & Cornacchione, 2012), so any results about the utility of using these technologies for health communication are valuable, especially considering their widespread use by public health departments (Thackeray et al., 2012). This line of research, if pursued further, is important for bringing public health promotion into a modern context and for capitalizing on the powerful communication tools now available. Social media sites allow unprecedented access to widespread and diverse populations, and their potential for health promotion contexts has yet to be fully explored. Although the results of this study are by no means a straightforward guide to using social media in health, they do provide insight regarding the processes of health communication in this context. Additionally, this study suggests several areas for further exploration and inquiry, which will be addressed in the following sections.

Implications for Health Communication Theory

Although this study was not a full test of the Elaboration Likelihood Model, the results do suggest that some of the model's predictions may not hold in this specific context. A particularly surprising result was the fact that relevance was not related to issue-relevant elaboration, which is a core tenet of the ELM (Petty & Cacioppo, 1986). This lack of a finding may simply be because the measurement of elaboration was not sophisticated enough to capture the full spectrum of elaboration that occurs. Other researchers, for example, have examined elaboration by coding the valence and number of thoughts provided in thought-listing exercises (Smith & Shaffer, 1991). Such an approach to measurement would produce much more variance and may have led to more significant findings. These results also raise the possibility that other,

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unmeasured variables have a stronger effect than relevance on elaboration. Prior knowledge of a message topic has previously been hypothesized to impact elaboration, as it affects an individuals' ability to process the message (Petty & Cacioppo, 1984). Previous knowledge of cancer risk reduction was not measured for this study, and could reasonably have had an effect considering the complex nature of cancer-related messages. The results also suggest that there are additional variables that may have an effect on the persuasion processes predicted by the ELM. Specifically, the nature of the message topic, and its novelty or ambiguity, could change the effects of elaboration on the credibility-attitude relationship, as well as on the attitude-behavioral intention relationship. Again, this suggests that prior knowledge plays an important role in how individuals respond to messages, pointing to the need for a full test of the ELM to determine if the model holds for this context.

Additionally, this study also brings to light questions about the utility of Media Richness Theory (Dennis & Kinney, 1998) for this context. At first glance, the results suggest that the richest form of media, YouTube, led to the most favorable outcomes. However, the statistical equivalence of YouTube with other text-only forms of social media suggests that it is not the number of cues that led to the technology's relative advantage. Instead, it is possible that the norms of use or the contexts of social media use are more important in terms of determining outcomes. YouTube videos and blog posts, for example, encourage attention and close inspection, because they are typically displayed in isolation, as opposed to in a feed. Facebook and Twitter, on the other hand, allow users less control over the content that they see, as updates are pushed to users as they are published. The more friends an individual has, or the more people they follow, the more divided their attention is and the likelier it is that individual posts will get buried in their newsfeed (Hodas & Lerman, 2012). This likely results in less attention to

individual posts and less comprehension of messages, as has been demonstrated in previous research (Counts & Fisher, 2011). Thus, it may be valuable to approach these different patterns of use from a theoretical lens, examining the ways in which individuals' interactions with technology and the social norms surrounding those interactions have an effect on their responses. The body of work on health information seeking vs. scanning (Kelly et al., 2010; Niederdeppe et al., 2007) may offer interesting insight, especially because sites like Twitter and Facebook likely encourage more passive scanning (obtaining information through routine exposure to communication sources), whereas blog posts and YouTube are likely to be associated with more purposive seeking. Thus, an examination of these variables could be important for determining the ways in which individuals may attend to and respond to health messages on social media.

Implications for the Use of Social Media in Health

The results of this research lead to several practical implications for using social media in health promotion. First, the results suggest that social media websites are indeed a viable tool for delivering health messages, specifically those related to cancer risk reduction. Overall assessments of credibility suggest that individuals who view social media messages have high perceptions regarding goodwill, trustworthiness, and competence, regardless of the communicator. Health professionals, at a first glance at the results, are the ideal message source because they were perceived to be significantly more competent than layperson sources. However, the lack of a relationship between competence and any of the outcome attitudes suggests that perceived competence may not be that important of a variable. Instead, increasing perceptions of trustworthiness and goodwill would be more worthwhile. The results from this study suggest that individuals perceived no difference between layperson and health professional sources on these two dimensions, but this may be due to the fact that the layperson source was

affiliated with a reputable health organization. So, while layperson sources are viable for delivering health promotion messages, it would be valuable to indicate that they are affiliated with a recognizable organization to increase perceptions of trustworthiness.

Regarding the effects of social media types, an important finding is that there seem to be more similarities between types of social media than there are differences. This suggests that individuals looking to use social media for health promotion have choices regarding their method of message delivery. This allows health practitioners the freedom to choose a form of social media that is well-suited to their current resources and most used by their target audience. The few differences that were found between social media types, however, suggest that YouTube is the ideal method of delivering health messages. YouTube was associated with higher levels of comprehension among participants, as well as stronger attitudes toward cancer risk reduction behaviors. It is important to consider, however, that YouTube videos require significantly more effort and time than the other forms of social media, so they may not always be feasible in a health promotion environment. If that were the case, then it would be valuable to avoid Twitter or Facebook, as these forms of social media were significantly less effective than YouTube in terms of increasing comprehension and attitudes, respectively. A blog post, then, seems to be the next most valuable method for distributing a somewhat complex cancer risk reduction message. However, as mentioned in the previous section, these types of social media are likely to require purposive information seeking. Thus, embedding links to YouTube videos or blog posts within Facebook or Twitter may be an ideal way to make passive information seekers more likely to encounter the messages while maximizing persuasive impact. Although such a strategy was not examined by this study, it seems plausible that it is an ideal method of combining the positive qualities of different types of social media.

Conclusion

The primary aim of this research was to provide empirical evidence of how to best use social media for distributing cancer risk reduction messages. The results of the study, however, showed that the nature of persuasion in this context is complex, and there are few black-and-white rules about the best form of social media or type of communicator to use. Perhaps the most important takeaway, then, is the fact that health messages delivered via social media can be taken seriously, as the communicators were rated as credible and many respondents showed critical thinking about the message through issue-relevant elaboration. This important finding establishes the validity of social media for use in public health contexts, and the results point to several areas for future research, including studies that explore ways to increase credibility and comprehension, that test the validity of the ELM for this context, and that utilize log-based or pre-and-post test research to better explore the behavioral effects of messages. Studies such as these will be essential for the effective use of new media technologies in the public health realm, and could have important implications for reaching wide audiences with health communication messages.

APPENDICES

A Doctor's Perspective: Cancer Risk Reduction

Post on January 20, 2014 by Dr. Olivia Eaton

Dr. Olivia Eaton
MSU HealthTeam

Today, I want to give you five quick tips about reducing your risk of cancer:

1. Avoid any forms of tobacco or quit if you currently smoke. The National Cancer Institute estimates that 30% of cancer deaths are due to smoking, so it is important to cut those behaviors out of your life while you're still young.

2. Try to eat a healthy diet. Aim for lots of fruits and vegetables, and avoid food that is high in fat. This will provide you with lots of nutrients and also help you to maintain a healthy weight.

3. Drink alcohol only in moderation. Regular drinking increases your risk of several different types of cancer, including breast and colorectal cancer.

4. Get active! Any amount of physical activity helps, but you should aim to get at least 30 minutes of moderate to vigorous physical activity a day.

5. Protect yourself from the sun by using sunscreen, avoiding tanning beds, and staying in the shade, especially during midday.

So, to sum up, to reduce your risk of cancer you should avoid tobacco, eat a healthy diet, drink alcohol only in moderation, engage in physical activity, and protect yourself from the sun. Follow these tips, and you will not only be healthier in general, but you will set yourself up for healthy habits that will reduce your risk of cancer across your entire lifetime.

Figure 9. Health professional blog post

A Student's Perspective: Cancer Risk Reduction

Post on January 20, 2014 by Olivia Eaton

Olivia Eaton
*Student at MSU and Health
Liaison for MSU
HealthTeam*

Today, I want to give you five quick tips about reducing your risk of cancer:

1. Avoid any forms of tobacco or quit if you currently smoke. The National Cancer Institute estimates that 30% of cancer deaths are due to smoking, so it is important to cut those behaviors out of your life while you're still young.

2. Try to eat a healthy diet. Aim for lots of fruits and vegetables, and avoid food that is high in fat. This will provide you with lots of nutrients and also help you to maintain a healthy weight.

3. Drink alcohol only in moderation. Regular drinking increases your risk of several different types of cancer, including breast and colorectal cancer.

4. Get active! Any amount of physical activity helps, but you should aim to get at least 30 minutes of moderate to vigorous physical activity a day.

5. Protect yourself from the sun by using sunscreen, avoiding tanning beds, and staying in the shade, especially during midday.

So, to sum up, to reduce your risk of cancer you should avoid tobacco, eat a healthy diet, drink alcohol only in moderation, engage in physical activity, and protect yourself from the sun. Follow these tips, and you will not only be healthier in general, but you will set yourself up for healthy habits that will reduce your risk of cancer across your entire lifetime.

Figure 10. Layperson blog post

Figure 11. Health professional tweets

Figure 11 (Cont'd)

Dr. Olivia Eaton @DocOliviaEaton   Jan 20
3: Drink alcohol in moderation. Regular drinking increases your risk
of several types of cancer, including breast and colorectal cancer.
Expand   ← Reply   🗑 Delete   ★ Favorite   ••• More

Dr. Olivia Eaton @DocOliviaEaton   Jan 20
4: Get active! Any amount of physical activity helps, but aim to get at
least 30 min of moderate physical activity a day.
Expand   ← Reply   🗑 Delete   ★ Favorite   ••• More

Dr. Olivia Eaton @DocOliviaEaton   Jan 20
5: Protect yourself from the sun by using sunscreen, avoiding
tanning beds, & staying in the shade, especially during midday.
Expand   ← Reply   🗑 Delete   ★ Favorite   ••• More

Dr. Olivia Eaton @DocOliviaEaton   Jan 20
To sum up, to reduce your cancer risk: Avoid tobacco, eat a healthy
diet, alcohol in moderation, exercise, & protect yourself from the sun.
Expand   ← Reply   🗑 Delete   ★ Favorite   ••• More

Dr. Olivia Eaton @DocOliviaEaton   Jan 20
Follow these tips & you will not only be healthier, but will also start
habits that will reduce your cancer risk across your entire lifetime
Expand   ← Reply   🗑 Delete   ★ Favorite   ••• More

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Figure 12. Layperson tweets

Figure 12 (Cont'd)

Olivia Eaton @OliviaEatonMSU   Jan 20
3: Drink alcohol in moderation. Regular drinking increases your risk
of several types of cancer, including breast and colorectal cancer.
Expand   ← Reply   🗑 Delete   ★ Favorite   ••• More

Olivia Eaton @OliviaEatonMSU   Jan 20
4: Get active! Any amount of physical activity helps, but aim to get at
least 30 min of moderate physical activity a day.
Expand   ← Reply   🗑 Delete   ★ Favorite   ••• More

Olivia Eaton @OliviaEatonMSU   Jan 20
5: Protect yourself from the sun by using sunscreen, avoiding
tanning beds, & staying in the shade, especially during midday.
Expand   ← Reply   🗑 Delete   ★ Favorite   ••• More

Olivia Eaton @OliviaEatonMSU   Jan 20
To sum up, to reduce your cancer risk: Avoid tobacco, eat a healthy
diet, alcohol in moderation, exercise, & protect yourself from the sun.
Expand   ← Reply   🗑 Delete   ★ Favorite   ••• More

Olivia Eaton @OliviaEatonMSU   Jan 20
Follow these tips & you will not only be healthier, but will also start
habits that will reduce your cancer risk across your entire lifetime
Expand   ← Reply   🗑 Delete   ★ Favorite   ••• More

Dr. Olivia Eaton

Public Figure
Doctor with MSU HealthTeam.

About

Dr. Olivia Eaton
January 20

Today, I want to give you five quick tips about preventing and reducing your risk of cancer:

1. Make sure that you avoid any forms of tobacco or quit if you currently smoke. The National Cancer Institute estimates that 30% of cancer deaths are due to smoking, so it is important to cut those behaviors out of your life while you're still young.

2. Try to eat a healthy diet. Aim for lots of fruits and vegetables, and avoid food that is high in fat. This will provide you with lots of nutrients and also help you to maintain a healthy weight.

3. Drink alcohol only in moderation. Regular drinking increases your risk of several different types of cancer, including breast and colorectal cancer.

4. Get active! Any amount of physical activity helps, but you should aim to get at least 30 minutes of moderate to vigorous physical activity a day.

5. Protect yourself from the sun by using sunscreen, avoiding tanning beds, and staying in the shade, especially during midday.

So, to sum up, to reduce your risk of cancer you should avoid tobacco, eat a healthy diet, drink alcohol only in moderation, engage in physical activity, and protect yourself from the sun. Follow these tips, and you will not only be healthier in general, but you will set yourself up for healthy habits that will reduce your risk of cancer across your entire lifetime.

Like · Comment · Share

Figure 13. Health professional Facebook post

Olivia Eaton

Public Figure
Student at MSU and Liaison for MSU HealthTeam

About

Olivia Eaton
January 20

Today, I want to give you five quick tips about preventing and reducing your risk of cancer:
1. Make sure that you avoid any forms of tobacco or quit if you currently smoke. The National Cancer Institute estimates that 30% of cancer deaths are due to smoking, so it is important to cut those behaviors out of your life while you're still young.
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3. Drink alcohol only in moderation. Regular drinking increases your risk of several different types of cancer, including breast and colorectal cancer.
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So, to sum up, to reduce your risk of cancer you should avoid tobacco, eat a healthy diet, drink alcohol only in moderation, engage in physical activity, and protect yourself from the sun. Follow these tips, and you will not only be healthier in general, but you will set yourself up for healthy habits that will reduce your risk of cancer across your entire lifetime.

Like · Comment · Share

Figure 14. Layperson Facebook post

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APPENDIX B: STUDY QUESTIONNAIRE

Thank you for participating in this research! The purpose of this questionnaire is to assess your responses to and attitudes toward cancer-related health messages. First, we would like to assess your experiences with cancer, if you have had any at all.

Have you ever been diagnosed with cancer?
- ○ Yes
- ○ No

If yes, when were you diagnosed? (MM/YYYY) _____

If yes, what type of cancer(s)? _____

Have you ever had a family member (blood relative) diagnosed with cancer?
- ○ Yes
- ○ No
- ○ Don't know

If yes, what is your relationship to this individual? If you have multiple family members diagnosed with cancer, please choose as many as apply.
- ❏ Parent
- ❏ Sibling
- ❏ Grandparent
- ❏ Aunt, Uncle, Cousin, Niece, or Nephew
- ❏ Child

If yes, what type(s) of cancer? _____

Please indicate the degree to which you agree with each of the following statements by choosing the corresponding response ranging from "Strongly disagree" to "Strongly Agree."

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I think about cancer a great deal.	○	○	○	○	○
I consider myself at risk for developing cancer.	○	○	○	○	○
Cancer is a personally relevant topic for me.	○	○	○	○	○
I actively seek the most recent information about cancer.	○	○	○	○	○

Next, we would like to ask you questions about your own health-related behaviors. As a reminder, your responses are confidential and you are free to skip any question with which you are uncomfortable.

During the past 30 days, on how many days did you smoke cigarettes?

How frequently would you say that you smoke cigarettes?
❍ Never
❍ Rarely
❍ Sometimes
❍ Often
❍ All of the Time

During the past 30 days, on how many days did you have at least one drink of alcohol? _____ days

During the past 30 days, on how many days did you have five or more drinks of alcohol in a row, that is, within a couple hours? _____ days

How frequently would you say that you have five or more alcoholic drinks in a row?
❍ Never
❍ Rarely
❍ Sometimes
❍ Often
❍ All of the Time

During the past 7 days, how many times did you eat fruit (do not count fruit juice)? Make sure that you count each instance of fruit intake. For example, if you ate fruit twice a day, then your response would be 14.
_____ times

How frequently would you say that you eat fruit?
❍ Never
❍ Rarely
❍ Sometimes
❍ Often
❍ All of the Time

During the past 7 days, how many times did you eat vegetables (consider fresh, frozen, or canned vegetables, or green salad)? Make sure that you count each instance of vegetable intake. For example, if you ate vegetables twice a day, then your response would be 14.
_____ times

How frequently would you say that you eat vegetables?
- ⭘ Never
- ⭘ Rarely
- ⭘ Sometimes
- ⭘ Often
- ⭘ All of the Time

During the past 7 days, on how many days were you physically active for a total of at least 30 minutes per day? (Add up all the time you spent in any kind of physical activity that increased your heart rate and made you breathe hard some of the time.)
_____ days

How frequently would you say that you engage in at least 30 minutes of physical activity a day?
- ⭘ Never
- ⭘ Rarely
- ⭘ Sometimes
- ⭘ Often
- ⭘ All of the time

When you are outside for more than one hour on a sunny day, how often do you wear sunscreen with an SPF of 15 or higher?
- ⭘ Never
- ⭘ Rarely
- ⭘ Sometimes
- ⭘ Most of the time
- ⭘ Always

How often do you drink caffeinated beverages?
- ⭘ Never
- ⭘ Rarely
- ⭘ Sometimes
- ⭘ Often
- ⭘ All of the Time

How often do you get at least 8 hours of sleep?
- ⭘ Never
- ⭘ Rarely
- ⭘ Sometimes
- ⭘ Often
- ⭘ All of the Time

How often do you get an annual flu shot?
- ○ Never
- ○ Rarely
- ○ Sometimes
- ○ Often
- ○ All of the Time

We are also interested in your use of various technologies and social tools, as these could be potential outlets for distributing cancer-related messages.

Do you currently use or browse any of the following websites/tools? (Choose all that apply)
- ❑ Facebook
- ❑ Twitter
- ❑ Blogger, Tumblr, Wordpress, or another blogging site
- ❑ YouTube

How often do you use Facebook?
- ○ More than 3 times per day
- ○ 1-3 times per day
- ○ 4-6 times per week
- ○ 1-3 times per week
- ○ Less than once a week

How many times did you check Facebook yesterday? (Please estimate to the best of your knowledge) _____ times

How often do you use Twitter?
- ○ More than 3 times per day
- ○ 1-3 times per day
- ○ 4-6 times per week
- ○ 1-3 times per week
- ○ Less than once a week

How many times did you check Twitter yesterday? (Please estimate to the best of your knowledge) _____ times

How often do you use Blogger, Tumblr, Wordpress, or another blogging site?
- ○ More than 3 times per day
- ○ 1-3 times per day
- ○ 4-6 times per week
- ○ 1-3 times per week
- ○ Less than once a week

How many times did you visit a blog yesterday? (Please estimate to the best of your knowledge)
_____ times

How often do you use YouTube?
○ More than 3 times per day
○ 1-3 times per day
○ 4-6 times per week
○ 1-3 times per week
○ Less than once a week

How many times did you view a YouTube video yesterday, either on the site itself or displayed on another website? (Please estimate to the best of your knowledge)
_____ times

Of the following websites/tools, which do you use the most?
○ Facebook
○ Twitter
○ Blogger, Tumblr, Wordpress, or another blogging site
○ YouTube
○ I don't use any of these websites

RESPONDENT SAW ONE OF THE FOLLOWING EIGHT CONDITIONS:

1. Next, you will see a message related to cancer delivered by Dr. Olivia Eaton, a health professional from MSU. This message has been taken from YouTube. It may take a moment to load, so please be patient and allow it to show up on the page. Then, please watch and listen carefully, and type any reactions, questions, or thoughts you have about the message in the box below.

[YOUTUBE HEALTH PROFESSIONAL MESSAGE HERE]

What reactions, questions, or thoughts do you have about this message?
_____

2. Next, you will see a message related to cancer delivered by Olivia Eaton, a student at MSU. This message has been taken from YouTube. It may take a moment to load, so please be patient and allow it to show up on the page. Then, please watch and listen carefully, and type any reactions, questions, or thoughts you have about the message in the box below.

[YOUTUBE LAYPERSON MESSAGE HERE]

What reactions, questions, or thoughts do you have about this message?
_____

3. Next, you will see a message related to cancer delivered by Dr. Olivia Eaton, a health professional from MSU. This message is a series of screenshots taken from the below individual's Twitter feed. It may take a moment to load, so please be patient and allow it to show up on the page. Then, please read it carefully, and type any reactions, questions, or thoughts you have about the message in the box below.

[TWITTER HEALTH PROFESSIONAL MESSAGE HERE]

What reactions, questions, or thoughts do you have about this message?
_____

4. Next, you will see a message related to cancer delivered by Olivia Eaton, a student at MSU. This message is a series of screenshots taken from the below individual's Twitter feed. It may take a moment to load, so please be patient and allow it to show up on the page. Then, please read it carefully, and type any reactions, questions, or thoughts you have about the message in the box below.

[TWITTER LAYPERSON MESSAGE HERE]

What reactions, questions, or thoughts do you have about this message?
_____

5. Next, you will see a message related to cancer delivered by Dr. Olivia Eaton, a health professional from MSU. This message is a screenshot taken from a Facebook page. It may take a moment to load, so please be patient and allow it to show up on the page. Then, please read it carefully, and type any reactions, questions, or thoughts you have about the message in the box below.

[FACEBOOK HEALTH PROFESSIONAL MESSAGE HERE]

What reactions, questions, or thoughts do you have about this message?
_____

6. Next, you will see a message related to cancer delivered by Olivia Eaton, a student at MSU. This message is a screenshot taken from a Facebook page. It may take a moment to load, so please be patient and allow it to show up on the page. Then, please read it carefully, and type any reactions, questions, or thoughts you have about the message in the box below.

[FACEBOOK LAYPERSON MESSAGE HERE]

What reactions, questions, or thoughts do you have about this message?
_____

7. Next, you will see a message related to cancer delivered by Dr. Olivia Eaton, a health professional from MSU. This message is a screenshot taken from a blog post. It may take a moment to load, so please be patient and allow it to show up on the page. Then, please read

it carefully, and type any reactions, questions, or thoughts you have about the message in the box below.

[BLOG HEALTH PROFESSIONAL MESSAGE HERE]

What reactions, questions, or thoughts do you have about this message?
_____

8. Next, you will see a message related to cancer delivered by Olivia Eaton, a student at MSU. This message is a screenshot taken from a blog post. It may take a moment to load, so please be patient and allow it to show up on the page. Then, please read it carefully, and type any reactions, questions, or thoughts you have about the message in the box below.

[BLOG LAYPERSON MESSAGE HERE]

What reactions, questions, or thoughts do you have about this message?
_____

In this part of the survey, we are interested in your thoughts about and responses to the message you were just shown. On the scales below, indicate your feelings about the person who communicated this message.

The person who delivered this message is:

	1	2	3	4	5	6	7
Intelligent:Unintelligent	○	○	○	○	○	○	○
Untrained:Trained	○	○	○	○	○	○	○
Cares about me:Doesn't care about me	○	○	○	○	○	○	○
Honest:Dishonest	○	○	○	○	○	○	○
Has my interests at heart:Doesn't have my interests at heart	○	○	○	○	○	○	○
Untrustworthy:Trustworthy	○	○	○	○	○	○	○
Inexpert:Expert	○	○	○	○	○	○	○
Self-centered:Not self-centered	○	○	○	○	○	○	○
Concerned with me:Not concerned with me	○	○	○	○	○	○	○
Honorable:Dishonorable	○	○	○	○	○	○	○
Informed:Uninformed	○	○	○	○	○	○	○
Moral:Immoral	○	○	○	○	○	○	○
Incompetent:Competent	○	○	○	○	○	○	○

	1	2	3	4	5	6	7
Unethical:Ethical	○	○	○	○	○	○	○
Insensitive:Sensitive	○	○	○	○	○	○	○
Bright:Stupid	○	○	○	○	○	○	○
Phony:Genuine	○	○	○	○	○	○	○
Not understanding:Understanding	○	○	○	○	○	○	○

Who was the person delivering this message? _____

What was this person's profession?
- ○ Doctor
- ○ Student
- ○ Salesperson
- ○ Professor

What website or tool was used to deliver this message?
- ○ Facebook
- ○ Twitter
- ○ YouTube
- ○ Blog

The message you just saw gave you several tips for reducing your risk of cancer. Which of the following tips were mentioned specifically in the message? Choose as many as apply.
- ❑ Get at least 8 hours of sleep per night
- ❑ Avoid caffeine
- ❑ Drink moderately or not at all
- ❑ Eat lots of fruits and vegetables
- ❑ Quit smoking
- ❑ Get your annual flu shot
- ❑ Wear sunscreen
- ❑ Engage in physical activity

For the questions below, indicate your feelings about the behaviors listed.

Taking steps to prevent cancer is:

	1	2	3	4	5	6	7
Difficult:Easy	○	○	○	○	○	○	○
Harmful:Beneficial	○	○	○	○	○	○	○
Pleasant:Unpleasant	○	○	○	○	○	○	○
Useful:Useless	○	○	○	○	○	○	○

Engaging in at least 30 minutes of physical activity per day is:

	1	2	3	4	5	6	7
Easy:Difficult	○	○	○	○	○	○	○
Beneficial:Harmful	○	○	○	○	○	○	○
Pleasant:Unpleasant	○	○	○	○	○	○	○
Useless:Useful	○	○	○	○	○	○	○

Eating a well-balanced, nutritional diet is:

	1	2	3	4	5	6	7
Difficult:Easy	○	○	○	○	○	○	○
Beneficial:Harmful	○	○	○	○	○	○	○
Unpleasant:Pleasant	○	○	○	○	○	○	○
Useless:Useful	○	○	○	○	○	○	○

Engaging in zero to moderate alcohol consumption is:

	1	2	3	4	5	6	7
Difficult:Easy	○	○	○	○	○	○	○
Harmful:Beneficial	○	○	○	○	○	○	○
Unpleasant:Pleasant	○	○	○	○	○	○	○
Useful:Useless	○	○	○	○	○	○	○

Quitting or avoiding starting smoking is:

	1	2	3	4	5	6	7
Difficult:Easy	○	○	○	○	○	○	○
Beneficial:Harmful	○	○	○	○	○	○	○
Pleasant:Unpleasant	○	○	○	○	○	○	○
Useless:Useful	○	○	○	○	○	○	○

Protecting yourself from the sun is:

	1	2	3	4	5	6	7
Easy:Difficult	○	○	○	○	○	○	○
Harmful:Beneficial	○	○	○	○	○	○	○
Pleasant:Unpleasant	○	○	○	○	○	○	○
Useful:Useless	○	○	○	○	○	○	○

For this next group of questions, please indicate how strongly you agree with the following statements by choosing the corresponding response ranging from "Strongly Disagree" to "Strongly Agree."

	Strongly Disagree	Disagree	Somewhat Disagree	Neither Agree nor Disagree	Somewhat Agree	Agree	Strongly Agree
I expect that I will take steps to reduce my risk of cancer.	❍	❍	❍	❍	❍	❍	❍
I will try to engage in an average of 30 minutes per day of physical activity in the weeks to come.	❍	❍	❍	❍	❍	❍	❍
I want to eat a well-balanced, nutritional diet in the weeks to come.	❍	❍	❍	❍	❍	❍	❍
I will try to avoid excessive alcohol consumption in the weeks to come.	❍	❍	❍	❍	❍	❍	❍
I will try to take steps to reduce my cancer risk.	❍	❍	❍	❍	❍	❍	❍
I expect to increase my level of physical activity in the weeks to come.	❍	❍	❍	❍	❍	❍	❍
I will try to eat healthier in the weeks to come.	❍	❍	❍	❍	❍	❍	❍
I expect to quit or refrain from starting smoking in the weeks to come.	❍	❍	❍	❍	❍	❍	❍
I want to avoid excessive alcohol consumption in the weeks to come.	❍	❍	❍	❍	❍	❍	❍
I expect to wear sunscreen in the weeks	❍	❍	❍	❍	❍	❍	❍

to come, if necessary.							
I want to avoid smoking in the weeks to come.	○	○	○	○	○	○	○
I want to take steps to reduce my risk of cancer.	○	○	○	○	○	○	○
I will try to protect myself from the sun in the weeks to come.	○	○	○	○	○	○	○
I want to start exercising for a half hour each day in the weeks to come.	○	○	○	○	○	○	○
I expect to eat more fruits and vegetables in the weeks to come.	○	○	○	○	○	○	○
I expect to drink only moderately in the weeks to come.	○	○	○	○	○	○	○
I will try to quit or refrain from starting smoking in the weeks to come.	○	○	○	○	○	○	○
I want to protect myself from the sun in the weeks to come.	○	○	○	○	○	○	○

In this last section, we have a few questions about your demographic information.

What is your age? _____

What is your gender?
○ Male
○ Female
○ Transgender

What is your approximate household income?
○ Less than $10,000
○ $10,000 to 29,999
○ $30,000 to 49,999
○ $50,000 to 69,999
○ $70,000 to 89,999

❍ $90,000 to 109,999
❍ $110,000 to 149,999
❍ $150,000 or more

Are you Spanish/Hispanic/Latino?
❍ No
❍ Yes, Mexican, Mexican American, Chicano
❍ Yes, Puerto Rican
❍ Yes, Cuban
❍ Yes, other Spanish/Hispanic/Latino

What is your race? Please select all that apply.
❑ White
❑ Black or African American
❑ American Indian or Alaska Native
❑ Asian
❑ Native Hawaiian or other Pacific Islander
❑ Other race (Please indicate): _____

Thank you for participating in this research! Your responses will help us to better deliver cancer-related messages. Please continue to the next page to see important information about this study.

The goal of this study was to examine how you respond to messages delivered via social media and communicated by different types of individuals. The individual you saw, Olivia Eaton, is a fictional person who is in no way affiliated with Michigan State University or MSU HealthTeam. Although the messages you saw are based on research on cancer risk reduction and provided you with accurate information, it was not approved or endorsed by MSU HealthTeam. If you would like to read more information about reducing your risk of cancer, visit http://www.cancer.gov/cancertopics/prevention.

Table 1:

Summary of Research Questions, Hypotheses, and Results

RQ/Hypothesis	Analyses	Results
RQ1: Are there differences in the perceived source credibility of health professional and layperson sources in terms of their trustworthiness, expertise, and goodwill?	Independent samples t-test	Health professionals perceived as more competent, no differences for trustworthiness or goodwill
H1: Relevance will be positively related to issue-relevant elaboration.	Correlations	Not supported: No relationship found
H2: Elaboration will moderate the effects of credibility on attitudes toward cancer risk reduction, such that there will be a stronger relationship between credibility and attitudes for those who do not engage in issue-relevant elaboration than for those who do.	Hierarchical multiple regressions w/control variables and interaction terms, simple slopes	Partially supported: For smoking, relationship between credibility and attitudes was stronger for those w/o issue-relevant elaboration. For engaging in a healthy diet, the relationship was in the opposite direction.
H3: Attitudes toward cancer risk reduction will have a positive relationship to behavioral intentions toward cancer risk reduction behaviors.	Hierarchical multiple regressions	Supported: Significant relationship found between attitudes and intentions for all risk reduction behaviors
H4: Elaboration will moderate the effects of attitudes on behavioral intentions, such that there will be a stronger relationship for those who engage in issue-relevant elaboration than for those who do not.	Hierarchical multiple regressions w/control variables and interaction terms, simple slopes	Not supported: Relationship between attitudes and intentions was stronger for those who did not engage in issue-relevant elaboration
RQ2: Does credibility have an effect on attitudes toward cancer risk reduction?	Hierarchical multiple regressions w/control variables	Trustworthiness and goodwill were related to attitudes, competence was not

Table 1 (Cont'd)

RQ3: Does the amount of message comprehension differ based on the form of social media used?	One-way ANOVA, contrast analyses	No sig. results from ANOVA, but contrast analyses showed sig. difference between YouTube and Twitter, with YouTube leading to more comprehension
H5: Message comprehension will be positively related to issue-relevant elaboration.	Correlations	Supported: Higher scores for those who engaged in issue-relevant elaboration
RQ4: Is message comprehension related to attitudes toward cancer risk reduction?	Hierarchical multiple regressions w/control variables	Comprehension had sig. positive effects on attitudes
RQ5: Does the type of social media used have an impact on attitudes toward cancer risk reduction?	Two-way ANCOVA	Social media had effect on attitudes toward cancer risk reduction, with YouTube leading to sig. stronger attitudes than Facebook
RQ6: Is there an interaction effect between communicator and type of medium on attitudes toward cancer risk reduction?	Two-way ANCOVA w/interaction terms	No interaction effects found

Table 2:

Experimental Groups

	Facebook	**Twitter**	**YouTube**	**Blog**
Health professional	Group 1	Group 3	Group 5	Group 7
Layperson	Group 2	Group 4	Group 6	Group 8

Table 3:

Descriptive Statistics for Study Variables

Variable	*M*	*SD*	*Frequency (%)*
Cancer relevance (5-pt scale)	3.06	0.78	—
Competence (7-pt scale)	5.55*	1.01	—
Goodwill (7-pt scale)	5.22*	1.05	—
Trust (7-pt scale)	5.55*	0.99	—
Retention (range: -3-+5)	3.32	1.54	—
Attitudes toward cancer prevention (7-pt scale)	5.74*	0.94	—
Attitudes toward sun protection (7-pt scale)	5.56*	1.13	—
Attitudes toward quitting smoking (7-pt scale)	6.14*	1.18	—
Attitudes toward exercise (7-pt scale)	5.69*	1.03	—
Attitudes toward eating a healthy diet (7-pt scale)	5.62*	0.92	—
Attitudes toward drinking moderately (7-pt scale)	5.11	1.23	—
Behavioral intentions toward cancer prevention (7-pt scale)	5.84*	1.02	—
Behavioral intentions toward sun protection (7-pt scale)	5.21*	1.51	—
Behavioral intentions toward quitting smoking (7-pt scale)	6.09*	1.29	—
Behavioral intentions toward exercise (7-pt scale)	5.85*	1.03	—
Behavioral intentions toward eating a healthy diet (7-pt scale)	5.96*	0.93	—
Behavioral intentions toward drinking moderately (7-pt scale)	5.20*	1.50	—
Respondents engaging in issue-relevant elaboration	—	—	85.0% (*n*=329)

Table 3 (Cont'd)

Health professional source	—	—	49.4% (*n=191*)
Layperson source	—	—	50.6% (*n=196*)
YouTube condition	—	—	24.3% (*n=94*)
Facebook condition	—	—	25.8% (*n=100*)
Twitter condition	—	—	24.8% (*n=96*)
Blog condition	—	—	25.1% (*n=97*)
Mean is sig. above the midpoint of the scale (p < .05)			

Table 4:

Summary of Hierarchical Regression Analysis for Credibility and Elaboration Predicting Attitudes toward Smoking (N=384)

Variable	Model 1			Model 2			Model 3		
	B	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Smoking behaviors	-0.38	0.08	-.25***	-0.38	0.07	-.25***	-0.38	0.07	-.23***
Elaboration				0.56	0.15	.17***	0.46	0.16	.14**
Competence				0.12	0.10	.11	0.21	0.34	.18
Trustworthiness				0.24	0.12	.20*	0.90	0.34	.75**
Goodwill				0.00	0.08	.00	-0.47	0.22	-.42*
Elaboration x Competence							-0.10	0.36	-.08
Elaboration x Trustworthiness							-0.79	0.36	-.60*
Elaboration x Goodwill							0.55	0.24	.45*
Adjusted R²		.06			.18			.20	
F for change in *R²*		25.32***			14.38***			4.55**	
				Overall model: *F(8,376)=12.81***					

Note: Competence, trustworthiness, and goodwill were centered at their means.

p < .05. **p* < .01. ***p* < .001

Table 5:

Summary of Hierarchical Regression Analysis for Credibility and Elaboration Predicting Attitudes toward a Healthy Diet (N=385)

Variable	Model 1			Model 2			Model 3		
	B	$SE\ B$	β	B	$SE\ B$	β	B	$SE\ B$	β
Vegetable consumption	0.18	0.06	.17**	0.15	0.05	.15**	0.15	0.05	.14**
Fruit consumption	0.28	0.06	.26***	0.25	0.05	.24***	0.25	0.05	.23***
Elaboration				0.19	0.11	.08	0.16	0.12	.06
Competence				-0.02	0.08	-.02	0.13	0.26	.14
Trustworthiness				0.33	0.09	.35***	0.65	0.26	.70*
Goodwill				0.01	0.06	.01	-0.42	0.17	-.48*
Elaboration x Competence							-0.16	0.27	-.16
Elaboration x Trustworthiness							-0.40	0.27	-.39
Elaboration x Goodwill							0.50	0.18	.52**
Adjusted R²		.13			.25			.27	
F for change in R^2		30.85**			16.40***			3.11*	
	Overall model: *F(9,376)=16.54***								

Note: Competence, trustworthiness, and goodwill were centered at their means; *p* < .05. **p < .01. ***p < .001

Table 6:

Summary of Hierarchical Regression Analysis for Attitudes Predicting Behavioral Intentions toward Cancer Risk Reduction (N=386)

Variable	Model 1			Model 2		
	B	$SE\ B$	β	B	$SE\ B$	β
Smoking behaviors	-0.14	0.07	-.10*	-0.06	0.06	-.05
Excessive alcohol consumption	-0.09	0.05	-.08	-0.07	0.04	-.07
Fruit consumption	0.22	0.07	.19**	0.18	0.06	.16**
Vegetable consumption	0.10	0.07	.09	0.11	0.06	.09
Exercise behaviors	0.04	0.05	.04	-0.04	0.04	-.04
Sun protection behaviors	0.08	0.04	.09	0.06	0.04	.07
Attitudes toward cancer risk reduction				0.55	0.05	.51***
Adjusted R^2		.10			.35	
F for change in R^2		7.97***			146.86***	
Overall model: *F*(7,379)=30.43***						

*p < .05. **p < .01. ***p < .001

Table 7:

Summary of Hierarchical Regression Analysis for Attitudes Predicting Behavioral Intentions toward Sun Protection (N=386)

	Model 1			Model 2		
Variable	B	$SE\ B$	β	B	$SE\ B$	β
Sun protection behaviors	0.55	0.06	.41***	0.44	0.06	.33***
Attitudes toward sun protection				0.56	0.06	.41***
Adjusted R^2		.17			.33	
F for change in R^2		79.60***			95.50***	
	Overall model: $F(2,384)=97.32***$					

p < .05. **p* < .01. ***p* < .001

Table 8:

Summary of Hierarchical Regression Analysis for Attitudes Predicting Behavioral Intentions toward Smoking (N=384)

Variable	Model 1			Model 2		
	B	*SE B*	*β*	*B*	*SE B*	*β*
Smoking behaviors	-0.74	0.08	-.44***	-0.59	0.07	-.35***
Attitudes toward smoking				0.40	0.05	.36***
Adjusted R²		.19			.31	
F for change in *R²*		92.03***			68.96***	
Overall model: *F*(2,382)=88.66***						

p < .05. **p* < .01. ***p* < .001

Table 9:

Summary of Hierarchical Regression Analysis for Attitudes Predicting Behavioral Intentions toward Exercise (N=386)

	Model 1			Model 2		
Variable	B	$SE\ B$	β	B	$SE\ B$	β
Exercise behaviors	0.32	0.05	.31***	0.08	0.05	0.08
Attitudes toward exercise				0.52	0.05	.52***
Adjusted R^2		.09			.31	
F for change in R^2		40.13***			121.03***	
Overall model: $F(2,384)=86.83$***						

p < .05. **p* < .01. ***p* < .001

Table 10:

Summary of Hierarchical Regression Analysis for Attitudes Predicting Behavioral Intentions toward a Healthy Diet (N=386)

	Model 1			Model 2		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Vegetable consumption	0.18	0.06	.17**	0.03	0.05	.02
Fruit consumption	0.20	0.06	.19**	0.10	0.05	.10*
Attitudes toward eating a healthy diet				0.56	0.05	.55***
Adjusted R^2		.09			.35	
F for change in R^2		19.95***			152.04***	
Overall model: $F(3, 382)=69.23$***						

p < .05. **p* < .01. ***p* < .001

Table 11:

Summary of Hierarchical Regression Analysis for Attitudes Predicting Behavioral Intentions toward Moderate Alcohol Consumption (N=384)

	Model 1			Model 2		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Excessive alcohol consumption	-0.68	0.07	-.45***	-0.36	0.07	-.24***
Attitudes toward moderate alcohol consumption				0.55	0.06	.46***
Adjusted R²		.20			.36	
F for change in *R²*		97.24***			96.56***	
	Overall model: $F(2,382)=109.03$***					

p < .05. **p* < .01. ***p* < .001

Table 12:

Summary of Hierarchical Regression Analysis for Interaction of Elaboration and Attitudes Predicting Behavioral Intentions toward Cancer Risk Reduction (N=386)

Variable	Model 1			Model 2			Model 3		
	B	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Smoking behaviors	-0.14	0.07	-.10*	-0.06	0.06	-.05	-0.08	0.06	-.06
Excessive alcohol consumption	-0.09	0.05	-.08	-0.07	0.04	-.07	-0.08	0.04	-.08
Fruit consumption	0.22	0.07	.19**	0.18	0.06	.16**	0.17	0.06	.15**
Vegetable consumption	0.10	0.07	.09	0.11	0.06	.09	0.11	0.06	.09
Exercise behaviors	0.04	0.05	.04	-0.04	0.04	-.04	-0.03	0.04	-.03
Sun protection behaviors	0.08	0.04	.09	0.06	0.04	.07	0.06	0.04	.07
Attitudes toward cancer risk reduction				0.55	0.05	.51***	0.80	0.11	.74***
Elaboration				0.08	0.12	.03	0.03	0.12	.01
Attitudes x Elaboration							-0.31	0.12	-.26*
Adjusted R²		.10			.35			.36	
F for change in *R²*		7.97***			73.53***			6.53*	
				Overall model: *F*(9,377)=24.75***					

*p < .05. **p < .01. ***p < .001

Table 13:

Summary of Hierarchical Regression Analysis for Interaction of Elaboration and Attitudes Predicting Behavioral Intentions toward Exercise (N=386)

Variable	Model 1			Model 2			Model 3		
	B	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Exercise behaviors	0.32	0.05	.31***	0.09	0.05	0.08	0.09	0.05	.08
Attitudes toward exercise				0.52	0.05	.51***	0.77	0.12	.76***
Elaboration				0.07	0.13	0.02	-0.04	0.13	-.01
Attitudes X Elaboration							-0.29	0.12	-.27*
Adjusted R²		.09			.31			.32	
F for change in *R²*		40.13***			60.56***			5.66*	
				Overall model: $F(4,382)=45.36$***					

*p < .05. **p < .01. ***p < .001

Table 14:

Summary of Hierarchical Regression Analysis for Interaction of Elaboration and Attitudes Predicting Behavioral Intentions toward a Healthy Diet (N=386)

Variable	Model 1			Model 2			Model 3		
	B	$SE\ B$	β	B	$SE\ B$	β	B	$SE\ B$	β
Vegetable consumption	0.18	0.06	.17**	0.02	0.05	.02	0.03	0.05	.03
Fruit consumption	0.20	0.06	.19**	0.11	0.05	.10*	0.10	0.05	.09
Attitudes toward eating a healthy diet				0.55	0.05	.54***	0.76	0.10	.75***
Elaboration				0.15	0.11	.06	0.09	0.11	.04
Attitude X Elaboration							-0.26	0.11	-.23*
Adjusted R^2		.09			.35			.36	
F for change in R^2		19.95***			77.21***			5.85*	
				Overall model: *F*(5, 380)=43.74***					

*p < .05. **p < .01. ***p < .001

Table 15:

Summary of Hierarchical Regression Analysis for Credibility Predicting Attitudes toward Cancer Risk Reduction (N=386)

Variable	Model 1			Model 2		
	B	$SE\ B$	β	B	$SE\ B$	β
Smoking behaviors	-0.14	0.06	-.11*	-0.13	0.05	-.11*
Excessive alcohol consumption	-0.03	0.05	-.03	-0.07	0.04	-.08
Fruit consumption	0.07	0.06	.07	0.04	0.05	.04
Vegetable consumption	-0.01	0.06	-.01	-0.02	0.05	-.02
Exercise behaviors	0.14	0.05	.15**	0.07	0.04	.08
Sun protection behaviors	0.04	0.02	.05	0.02	0.04	.02
Competence				0.11	0.08	.12
Goodwill				-0.02	0.06	-.03
Trustworthiness				0.40	0.09	.42***
Adjusted R²		.04			.28	
F for change in R^2		3.35**			43.23***	
	Overall model: $F(9,377)=17.38***$					

*p < .05. **p < .01. ***p < .001

Table 16:

Summary of Hierarchical Regression Analysis for Credibility Predicting Attitudes toward Smoking (N=384)

	Model 1			Model 2		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Smoking behaviors	-0.38	0.08	-.25***	-0.38	0.07	-.25***
Competence				0.10	0.10	.09
Goodwill				-0.01	0.08	-.01
Trustworthiness				0.28	0.12	.24*
Adjusted R^2		.06			.15	
F for change in R^2		25.32***			14.32***	

Overall model: $F(4,380)=17.73$***

p < .05. **p* < .01. ****p* < .001

Table 17:

Summary of Hierarchical Regression Analysis for Credibility Predicting Attitudes toward Exercise (N=386)

Variable	Model 1			Model 2		
	B	*SE B*	*β*	*B*	*SE B*	*β*
Exercise behaviors	0.45	0.05	.44***	0.39	0.05	.38***
Competence				0.03	0.08	.03
Goodwill				-0.03	0.07	-.03
Trustworthiness				0.36	0.10	.35***
Adjusted R^2		.19			.30	
F for change in *R^2*		91.00***			22.12***	
Overall model: *F*(4,382)=43.09***						

p < .05. **p* < .01. ***p* < .001

Table 18:

Summary of Hierarchical Regression Analysis for Credibility Predicting Attitudes toward a Healthy Diet (N=385)

	Model 1			Model 2		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Vegetable consumption	0.28	0.06	.26***	0.26	0.05	.24***
Fruit consumption	0.18	0.06	.17**	0.15	0.05	.15**
Competence				-0.03	0.08	-.03
Goodwill				0.01	0.06	.01
Trustworthiness				0.34	0.09	.37***
Adjusted R^2		.13			.25	
F for change in *R*^{2}		30.85***			20.82***	
Overall model: *F*(5,380)=26.75***						

p < .05. **p* < .01. ***p* < .001

Table 19:

Summary of Hierarchical Regression Analysis for Credibility Predicting Attitudes toward Moderate Alcohol Consumption (N=384)

Variable	Model 1			Model 2		
	B	*SE B*	*β*	*B*	*SE B*	*β*
Alcohol consumption	-0.56	0.06	-.47***	-0.61	0.06	-.49***
Competence				-0.03	0.10	-.05
Goodwill				0.10	0.08	.08
Trustworthiness				0.25	0.12	.20*
Adjusted R²		.22			.27	
F for change in *R²*		109.37***			9.30***	
Overall model: *F*(4,380)=36.10***						

*p < .05. **p < .01. ***p < .001

Table 20:

Summary of Hierarchical Regression Analysis for Credibility Predicting Attitudes toward Sun Protection (N=386)

	Model 1			Model 2		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Sun protection behaviors	0.20	0.05	.20***	0.18	0.05	.18***
Competence				0.07	0.10	.06
Goodwill				0.16	0.08	.15*
Trustworthiness				0.17	0.12	.15
Adjusted R²		.04			.14	
F for change in *R²*		16.10***			16.33***	
		Overall model: $F(4,382)=16.75$***				

p < .05. **p* < .01. ****p* < .001

Table 21:

Summary of Hierarchical Regression Analysis for Comprehension Predicting Attitudes toward Cancer Risk Reduction (N=386)

Variable	Model 1			Model 2		
	B	*SE B*	*β*	*B*	*SE B*	*β*
Smoking behaviors	-0.14	0.06	-.11*	-0.11	0.06	-.09
Excessive alcohol consumption	-0.03	0.05	-.03	-0.04	0.05	-.04
Fruit consumption	0.07	0.06	.07	0.10	0.06	.09
Vegetable consumption	-0.01	0.06	-.01	-0.01	0.06	-.01
Exercise behaviors	0.14	0.05	.15**	0.13	0.05	.14**
Sun protection behaviors	0.04	0.04	.05	0.04	0.04	.05
Message comprehension				0.16	0.03	.26***
Adjusted R²		.04			.10	
F for change in R^2		3.35**			146.86***	
Overall model: *F*(7,379)=7.11***						

p < .05. **p* < .01. ****p* < .001

Table 22:

Summary of Hierarchical Regression Analysis for Comprehension Predicting Attitudes toward Smoking (N=384)

	Model 1			Model 2		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Smoking behaviors	-0.38	0.08	-.25***	-0.35	0.07	-.23***
Message comprehension				0.18	0.04	.24***
Adjusted R^2		.06			.11	
F for change in R^2		25.32***			23.67***	
Overall model: *F*(2,382)=25.24***						

*p < .05. **p < .01. ***p < .001

Table 23:

Summary of Hierarchical Regression Analysis for Comprehension Predicting Attitudes toward Exercise (N=386)

Variable	Model 1			Model 2		
	B	*SE B*	*β*	*B*	*SE B*	*β*
Exercise behaviors	0.45	0.05	.44***	0.45	0.05	.43***
Message comprehension				0.09	0.03	.13**
Adjusted R^2		.19			.20	
F for change in R^2		91.00***			7.81**	
Overall model: *F*(2,384)=50.21***						

p < .05. **p* < .01. ****p* < .001

Table 24:

Summary of Hierarchical Regression Analysis for Comprehension Predicting Attitudes toward a Healthy Diet (N=385)

Variable	Model 1			Model 2		
	B	*SE B*	*β*	*B*	*SE B*	*β*
Vegetable consumption	0.28	0.06	.26***	0.27	0.06	.26***
Fruit consumption	0.18	0.06	.17**	0.19	0.06	.18**
Message comprehension				0.10	0.03	.17***
Adjusted R^2		.13			.16	
F for change in R^2		30.85***			12.78***	
	Overall model: *F*(3,382)=25.46***					

*p < .05. **p < .01. ***p < .001

Table 25:

Analysis of Covariance for Attitudes toward Cancer Risk Reduction by Type of Social Media

Source	SS	df	MS	F	p
Sun protection behaviors	0.43	1	0.43	0.51	.474
Smoking behaviors	3.37	1	3.37	4.04	.045
Excessive alcohol consumption	0.65	1	0.65	0.78	.378
Fruit consumption	0.58	1	0.58	0.69	.407
Vegetable consumption	0.06	1	0.06	0.07	.791
Exercise behaviors	6.99	1	6.99	8.37	.004
Facebook use	0.01	1	0.01	0.01	.913
Twitter use	0.29	1	0.29	0.35	.555
Blog use	1.17	1	1.17	1.40	.238
YouTube use	0.56	1	0.56	0.67	.413
Social Media type	8.83	3	2.943	3.52	.015
Error	311.72	373	0.84		
Total	13079.75	387			

Table 26:

Pairwise Comparisons and Effect Sizes of Attitudes toward Cancer Risk Reduction by Social Media Type

| Group | Model 1 | | Adjusted Mean Differences (Effect sizes are included in parentheses) | | | |
	Mean	Adjusted mean	1	2	3	4
1. YouTube	5.92	5.94	_ _			
2. Twitter	5.85	5.85	0.09	_ _		
3. Facebook	5.62	5.58	0.35* (0.42)	0.26	_ _	
4. Blog	5.56	5.60	0.34	0.25	-.01	_ _

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