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SOURCE EFFECTS OF HEALTH INFORMATION AND DIGITAL HEALTH LITERACY AMONG COLLEGE STUDENTS: AN ELABORATION LIKELIHOOD MODEL PERSPECTIVE

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SOURCE EFFECTS OF HEALTH INFORMATION AND DIGITAL HEALTH LITERACY AMONG COLLEGE STUDENTS: AN ELABORATION LIKELIHOOD MODEL PERSPECTIVE

A Thesis
Submitted to the Graduate Faculty of the Louisiana State University and Agricultural and Mechanical College
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The Department of Mass Communication

by
Julia Morton
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ABSTRACT

While advertising and persuasion is a widely researched area in mass communication, the impact of health marketing on consumer behavior remains a relatively new arena. The complex health information landscape online is comprised of both public health organizations seeking to improve health behaviors as well as businesses seeking to sell their products or services. It is well documented in the communication literature that the source of information can impact the recipient in a multitude of ways. Digital health literacy is undoubtedly an essential skill for anyone interacting with health information online, spurring the question, do individuals with low and high digital health literacy respond to health advertising in different ways? Thus, the first goal of this study is to understand the impact of the source intent of health information on behavior and behavioral intentions using the Elaboration Likelihood Model as a framework. The second goal of this study is to further understand how digital health literacy moderates the relationship. An online survey experiment with a 2 (source: public health vs. commercial intent) x 2 (content: sleep debt vs. sun exposure) between-subjects posttest design was conducted among college student participants. Results showed that the public health source was more credible than the commercial source. There were also differences depending on health literacy. Participants with lower digital health literacy were more likely to purchase the product, and exhibited higher psychological reactance than their higher digital health literacy peers.
CHAPTER 1. INTRODUCTION

Consumers are spending more and more time online. The Center for the Digital Future at USC Annenberg issued a study about digital habits in 2017 that estimated 92% of Americans are internet users, and they spend an average of 23.6 hours online per week (Central for the Digital Future, 2017). More specifically, consumers are using the internet to seek out health information. Data show that 72% of internet users have searched for a health-related topic online (Fox & Duggan, 2013). In a 2013 study conducted by PEW, one in three Americans used the internet to diagnose a medical condition (Fox & Duggan, 2013). Regardless of the severity of the health condition, the internet was the first place younger generations looked to obtain information (Chu et al., 2017). This type of online research has the power to drive offline health behaviors. Of those who looked online for health advice, 46% said the information they found pushed them to seek attention from a medical professional. It is also likely that online health advertising causes consumers to purchase more health-related products.

The healthcare and pharmaceutical industries spent $2.52 billion on digital advertising in 2017 alone (eMarketer, 2018). This is more than double the 2011 expenditures. In addition, the market value of the health and wellness industry was $167 billion in 2017 (Euromonitor, 2018). While data suggest that consumers are spending more and more money on health and wellness related products, the individual impact of advertising in the online health space has received little research. Online health advertising may negatively shift health behavior, which is likely to be especially prevalent within more vulnerable members of the population who have lower digital health literacy skills. Health-related content often requires a higher reading level and knowledge than other information, suggesting that literacy level is an essential element to how consumers
respond to persuasive health communications (Manganello & Clayman 2011).

Therefore, Elaboration Likelihood Model (ELM) will provide a framework for the study to further understand how health literacy is related to cognitive processing. The incorporation of the ELM is important because a significant portion of health literacy research does not include a theoretical framework (Khorowjerdi, 2016). Although ELM has not been frequently applied to health literacy research, the model is a natural fit. Both health literacy and the ELM look at individual responses to media, including their motivation and ability to find and understand messages (Chiang & Jackson, 2013). The research in this paper will be the first to directly incorporate the two areas to further understand the impact of online health media on health behavior.

The central tenet of ELM is that human beings have limited cognitive ability available to them at any given point (Petty & Cacioppo, 1986). Instead of assessing the central arguments of a persuasive message (the central route), humans develop heuristics or peripheral cues (peripheral route) to assist in determining whether or not they agree with a message. The source of information is considered a peripheral cue employed by individuals to determine whether or not they believe a persuasive message (Petty & Cacioppo, 1986).

The evaluation of source credibility is also a widely studied area of mass communication. However, the proliferation of online information has also spurred researchers to investigate source credibility evaluation of internet users and how source credibility evaluation differs while online. Such processes are arguably more important in the online world because nearly anyone with an internet connection can share information regardless of their credentials, a notion that is especially concerning when it comes to health topics.

While using the source of information as a cue may seem to be an effective method,
Callister (2000) argues that the internet makes traditional methods of credibility evaluation, such as the government or level of expertise, ineffective when there are too many possible sources available. Under Callister’s view, traditional media employs a filtering process that digital media does not and thus, there are too many sources for source cues to be an effective method of determining credibility. Therefore, the source of health information online is not inherently linked to whether the information is good nor bad, and consumers of the information may be ineffectively utilizing certain cues to determine information quality.

A meta-analysis of source credibility research from 1950 - 2004 identified the central findings and gaps in the research (Pornpitakpan, 2004). Results of the analysis suggest that while variations in methods are particularly present, most research shows that high credibility sources are more persuasive than low credibility sources. However, source credibility research is not as straightforward as originally assumed, as many different interaction effects have been found, some that support the notion that high credibility sources are not always the most effective. Two of Pornpitakpan’s suggestions for future research link to the current study. First, more research should be conducted on the interaction of credibility and demographics of the recipient. While health literacy is not a demographic characteristic, research has closely linked health literacy to certain demographics. Second, the author found that future research is warranted on corporate credibility, especially including the interaction of other factors. The current study aims to address both research gaps.

The purpose of this thesis is to further understand how college students process persuasive health communication messages and to determine whether digital health literacy is related to behavioral intentions depending on the source of a persuasive health communication message. The study will compare behavioral intentions after reading a persuasive blog post
where half of the participants will be exposed to a blog post from a public health source and the other half of the participants will be exposed to a blog post from a commercial health source. Digital health literacy and level of elaboration will also be measured to determine if those with varying levels of digital health literacy will use different levels of elaboration when exposed to the two different sources of health information.
CHAPTER 2. LITERATURE REVIEW

The Elaboration Likelihood Model

According to Cialdini, the author of *Influence: The Psychology of Persuasion*, the definition of persuasion is simply “getting people to say yes.” Another defines persuasion as, “a symbolic process in which communicators try to convince other people to change their attitudes or behavior regarding an issue through the transmission of a message, in an atmosphere of free choice” (Perloff, 2003, p. 8). Persuasion is not limited to one segment of society, but rather it is used in many different industries: advertising, politics, fundraising, small businesses, and public health. Persuasion is also not a new concept; evidence of advertising has been found in early civilizations (Tellis & Ambler, 2007). Yet, questions still remain about how persuasion works, why it works, and under what circumstances. The Elaboration Likelihood Model of Persuasion (ELM) was an attempt for academia to answer these questions, as well as understand the factors that contribute to a strong link between attitude and behavior.

The ELM stemmed from research in psychology and seeks to understand the different ways individuals process the same media message, which they theorize can in turn impact behavior. The creators of the model, Petty and Cacioppo, originally articulated its structure in 1986 because they sought to further outline the “basic processes underlying the effectiveness of persuasive communications” (p. 125). Petty and Cacioppo define elaboration as, “the extent to which a person thinks about the issue-relevant arguments contained in a message” (p. 128). The model posits two routes to processing a communication message, the central route and the peripheral route. Central route processing means that the individual spends more time thinking about the content of the message and its arguments. The central route occurs when the individual
is motivated and has the ability to process the information. Motivation includes personal relevance, need for cognition, and personal responsibility. Ability includes freedom from distraction, repetition, prior knowledge, and comprehensibility.

The peripheral route occurs when the individual is neither motivated and/or unable to process the information. Those who utilize the peripheral route use cues to evaluate the message instead of argument processing. Cues are aspects of the message that are not directly related to the argument but can still influence attitude. Individuals can use cues to infer how likely they are to agree with the message without having to expend the level of cognitive effort required for central route processing. The source of a message is typically regarded as a peripheral cue. Other cues include positive or negative affect, attractiveness, use of expert sources, or the number of arguments present (Petty & Cacioppo, 1986).

While a person can be persuaded by either route, there are differences in terms of the type of attitude that is formed, as well as strength and duration. Those who use the central route form attitudes, either positive or negative that are stronger and more resistant to change when presented with alternative viewpoints in the future. Those who use peripheral route processing experience relatively temporary attitude changes that are susceptible to influence when presented with alternative persuasive viewpoints. They are also more likely to retain their initial attitude that existed before presented with a message. The authors emphasize that pure central route processing and pure peripheral route processing are two extremes that rarely, if ever, occur outside of the theoretical realm. Therefore, elaboration is generally thought of as on a continuum (Petty & Cacioppo, 1986).
Personal Relevance and Prior Knowledge

Certain factors cause someone to be more or less likely to elaborate on a message. Personal relevance is an important motivator to message elaboration, especially with a personal topic such as health. Personal relevance is defined as when someone “expects the issue to have significant consequences for their own lives” (Apsler & Sears, 1968, pg. 162). Personal relevance in relation to a specific issue is not stagnant. For instance, information about college tuition may be relevant as you are in high school or college, but not once you are older. Some information may have high relevance to a specific person, such as a chronic condition they suffer from, and other information is even more temporary, such as a purchase decision (Petty & Cacioppo, 1986).

For example, Frewer and colleagues found that level of perceived personal relevance was impacted by the source of information, (Frewer et. al., 1999). Specifically, participants who viewed a message about genetically modified foods from a consumer organization had lower personal relevance than participants who viewed a message from a government organization. Personal relevance in turn impacted the degree to which they were persuaded by the message. Those that had lower personal relevance had lower rejection to genetically modified foods than those who had higher personal relevance. Thus, the message was most effective in changing attitudes when personal relevance was high, a finding that is consistent with the ELM.

Prior knowledge is another factor that can increase elaboration likelihood, and it is related to personal relevance. If an issue is personally relevant, it is highly likely that they also have increased knowledge on the topic. According to the Petty and Cacioppo, these individuals are also more able to provide counter-arguments to persuasive messages because of their greater knowledge and level of elaboration. The opposite is also true. When someone has little
knowledge or personal relevance to a topic, cues become a more frequent method to process information. Petty and Cacioppo note that they found interaction effects in terms of personal relevance and argument quality. When the message had a strong argument, increased personal relevance produced an increase in attitude strength, but when the argument was weak, increased personal relevance produced a significant decrease in attitudes.

For example, a study by Averbeck and colleagues investigated the impact of personal relevance in response to health information (Averbeck, 2011). The study used the Heuristic-Systematic Model as its framework, which is similar to the ELM in that it considers two different types of processing, systematic and heuristic. Systematic processing is essentially the same as central route processing, and heuristic processing is essentially the same as peripheral route processing. Results showed that participants with greater prior knowledge increased their systematic processing and participants with less prior knowledge increased heuristic processing. These results are in line with the ELM, and also very important in terms of the communication of health messages.

Petty and Cacioppo (1986) also argue that if an attitude is formed from a communication, those that use the central route will have more enduring beliefs compared to those that use the peripheral route. Attitudes formed from central route processing will also be more resistant to counter arguments than attitudes formed from peripheral route processing. Not only does central route processing lead to a more persistent attitude, they also determined that attitudes formed by central route processing are better predictors of behavior than attitudes formed from peripheral route processing (Petty, Cacioppo, & Schumann, 1983). According to the authors, this process works because central route processing essentially builds a stronger schema
in your mind. The schema that develops is also more “internally consistent, accessible, enduring, and resistant” (Petty & Cacioppo 1986, p. 176).

This assumption is important in terms of digital health literacy because of the large amount of health information online that often conflicts itself. For instance, A meta-analysis on the topic conflicting health information illustrated that studies have shown a range of 18-80% of patients have seen conflicting health information about medication, and most people have seen conflicting nutrition information (Carpenter et al., 2016). The same study found that conflicting health information can be found both when actively searching for information as well as passively. Conflicting information does not only originate online, but can come from other sources such as print or even physicians themselves; however, the rising use of the internet for health is the main cause for an increase in concern. The most common negative impact is confusion because receivers don’t know how to remedy conflicting information and have to decide which source they determine as the most credible.

**Source Credibility**

Source credibility is a widely studied area of mass communication research with a long history (Pornpitakpan, 2004). One of the earliest investigations of the impact of source on perceived credibility and behavioral intentions was published in 1951 by Hovland and Weiss. The study presented participants with two identical messages concerning various modern day issues. One condition had a high credibility source and the other low. The results found the expected main effect where high credibility sources were rated as significantly more trustworthy than low credibility sources across topics. Opinions regarding the topic were measured both before and after reading the communication. Results showed that the high credibility source was
also significantly more persuasive than the low credibility source. However, one interesting finding was that the retention of factual information showed no difference between conditions.

Early studies of source seemed to clearly show that high credibility sources produced stronger persuasion than low credibility sources. Yet, in 1986 Petty and Cacioppo wrote “one aspect of persuasion research that has disappointed reviewers of the field is that even variables that were expected to be quite simple in their effects on attitude change have instead proved to be quite complex. We also noted that perhaps the most dramatic example of this was the conflicting results of research on features of the message source” (p. 186). Decades of research have revealed that main effect studies of source credibility generally reveal the same results of Hovland and Weiss (1951), but that once researchers introduce other variables, interesting interaction effects have been found (Pornpitakpan, 2004). Therefore, the Elaboration Likelihood model serves as an effective theory for explaining such variances.

For example, a study conducted by Petty, Cacioppo, and Goldman (1981) found that source cues were a more important determinant of attitudes when participants were placed in a low relevance condition compared to participants placed in a high relevance condition. In the low relevance condition, increasing the source expertise generated better attitudes towards the argument, no matter how they manipulated the message quality. However, when the message had high relevance, source expertise had no impact on the attitudes of the participants, yet argument quality was an important factor. Thus, when participants experienced less personal relevance to a message and thus less likely to centrally process persuasive messages, they are more likely to use source cues in their evaluation of the message. In these cases, more credible sources are more likely to enhance the effectiveness of the message and less credible sources are more likely to decrease the effectiveness of the message. This occurs regardless of message quality. However,
in cases of high personal relevance and therefore high motivation, message quality becomes a more important factor of persuasion because participants are scrutinizing the message itself, and source of information becomes a less important factor of persuasion. In addition, those in a high motivation condition are more likely to compare the information in the argument to their memory (Petty, Cacioppo, & Goldman, 1981).

Petty and Cacioppo also investigated the process that occurs when an individual has moderate knowledge of a topic. They found that in these cases, or when someone is not sure how personally relevant the topic is, they will typically use the source to help them to determine how much cognitive effort they want to spend to analyze the message (Petty & Cacioppo, 1981). They will also use the source to consider the extent to which the message requires them to actively scrutinize the argument, which also results in a variance of elaboration likelihood.

A study by Dhalakia and Sternthal (1997) further revealed the complicated and unexpected relationship between source credibility and behavior. They found that neither the source credibility or the timing of the behavioral request had a significant effect on attitudes, contradicting previous research. In their case, they presented information about a federal bill where once source was an expert and the other source was an individual who was merely interested in the topic. A marginally significant interaction effect was found where the high credibility source produced more positive attitudes toward the bill when they administered the attitude measure previous to the behavioral request. However, the low credibility source produced a more positive attitude when they administered the behavioral request before administering the attitude measure.

Thus, their study showed that timing is another factor that can contribute to effectiveness of source credibility, and suggest that depending on the source, marketers should consider when
they ask people to take a desired action. They suggest that if a marketer’s goal is to change behavior via changing their attitude, then it becomes more critical to increase source credibility. However, if the intent is to induce a behavior directly, it is possible that a highly credible source could undermine persuasion.

Another interaction between source credibility and behavior is thought confidence (Tormala, Brinol, & Petty, 2006). Researchers manipulated both argument quality and source credibility. Findings showed that thought confidence was higher in the high credibility condition and lower in the low credibility condition. When researchers manipulated argument quality, the opposite effect occurred. Thought confidence was actually higher in the weak argument condition rather than the low argument condition. Thus, they found that when the argument was strong and participants had mostly favorable thoughts, then the high credibility source was more persuasive, but when the argument was weak and participants had mostly unfavorable thoughts, low source credibility was found to be more persuasive than the high credibility source.

Source has also been related to reading time of blog posts. A study by Winter & Kramer (2012) manipulated the source of science blog posts to measure reading time and information selection behavior. A blog containing expert and non-expert sources was developed, and participants behavior on the website was recorded. The study found that the expert source was selected more frequently and read for a longer period of time. Therefore, the results show that participants used source cues determine whether to read the post and how long to read it for. Articles that were two-sided and contained a negative slant were also read for longer. The authors used reading time as a measure of readers interest in the topic.
Influence of Source In Health Communication Research

The connection between source information and health behavior has also been widely investigated in the field of health communication, and similarly complex results have been found. Some studies have found more “normal” results. For instance, Jones et al. (2003) conducted an experiment where the main manipulations were the source and frame of a health message designed to promote exercise behavior. Participants who were presented with a health communication message from a credible source (a doctor) were much more likely to elaborate on the message than participants who were presented with a non-credible source (a high school student). In addition, those in the credible source condition were more likely to have intentions of increasing their exercise compared to those in the non-credible source condition.

However, some health communication studies have some unexpected findings. For instance, Holder (1972) conducted a study among maternity patients to determine how various characteristics of health information impacted immediate behavior, including source characteristics. The two sources were a nurse and a housewife, and they asked the women to complete multiple tasks, some while still in the hospital, such as filling out a postcard, and others once they went home. Although the patients perceived the nurse as having greater expertise, the housewife was able to cause more women to take more of the many different intended behavior while in the hospital.

When the researcher studied long term effects, no differences were found in terms of the source of information. At the time, these findings were counterintuitive because it makes more sense to comply with behavior from the more expert source. The paper concludes with the statement that the effects of source information can be complex and involves many factors. One explanation could be that the women found the housewife more relatable than the nurse, or that
there was greater perceived similarity. Holder’s study illustrates that although health information requires expertise, researchers should not assume expert sources have higher rates of behavior change than non-expert sources.

Research has also compared the differences comparing celebrity sources and physician sources of health information. For instance, a study found that respondents rated celebrity authored health information higher in credibility than doctor authored health information (Emmers-Sommer & Teran, 2019). The study included four conditions where two topics were designed to be relevant for male participants and two topics were designed to be relevant for female participants. Some results supported the ELM.

The more the participants in the study viewed the celebrity source as credible, the more the participants elaborated on the message. In addition, the more participants elaborated on any of the four messages, the more likely they were to take action. However, in the female related topic conditions, women elaborated more on the celebrity message, but had stronger behavioral intentions with the doctor message. An explanation may be that celebrity message tend to be more engaging which impacts cognitive processing of the message, but that a health-professional message generates greater action than celebrity messages. While the source of health information is an important cue for receivers, there are more factors at play than the name of the author. Specifically, branding of the source and of the health information is another important consideration.

While branding has recently gained greater importance in the literature, Vallone and colleagues (2017) argue that it has long been an important persuasive technique to influence health behavior, referencing the Marlboro Man. The Marlboro man was a brand who changed the smoking behavior of an entire generation. While he is an example of negative health behavior,
the same persuasive techniques can be used to promote healthy behaviors, which is especially crucial for organizations to differentiate themselves in a crowded marketplace. Branding helps to create long term value for an organization, a notion termed “brand equity.” Results of their study showed that increased brand equity generated greater intentions to quit smoking after exposure to an anti-smoking campaign. The authors suggest that future research on the effectiveness of nonprofit and for-profit branding should be investigated, especially in the context of online information.

Research has also looked at persuasiveness of non-profit versus for profit sources. Hammond (1987) conducted research to investigate the effectiveness of a campaign by the Kellogg Company that promoted their cereal as a high fiber meal to help reduce the risk of cancer. The National Cancer Institute (NCI) allowed Kellogg to use their brand to increase the credibility of the message, but the NCI had concerns about the impact of the campaign on the NCI brand. Results showed that participants viewed the non-profit source, the NCI, with higher credibility than the for-profit source, Kellogg. Yet, when participants saw the message with both the NCI and Kellogg as the source, the perceived credibility was the same as the NCI alone.

Therefore, the presence of the Kellogg brand in the campaign did not alter the perceived credibility of the message when NCI was included. Despite the differences, the research did not show a correlation between source credibility and the acceptance of the message. However, the combination of both sources produced greater behavioral intentions compared to when the NCI was the only source present. Another manipulation of the study was source medium, and found that the print information had higher credibility than broadcast media. Branding and source of information have been linked to both cognitive processing and behavioral intentions, but
research connecting the source of information and other cognitive processes such as psychological reactance, have received less attention.

**Psychological Reactance**

First articulated by Brehm (1966), psychological reactance theory explains why certain persuasive communications can backfire. The theory argues that certain messages that provide behavioral recommendations can threaten one’s behavioral freedom, which generates psychological reactance, or the arousal to regain freedom. To regain freedom, the receiver may attitudinally reject the message or they may perform the opposite behavior than what was suggested by the message. The greater the threat, the greater the psychological reactance. While psychological reactance is not formally part of the ELM, Petty and Cacioppo discussed the implications of persuasive intent (1986).

Petty and Cacioppo theorize that individuals cognitively respond to knowledge of persuasive intent as a threat, and may respond one of three ways. The first way is that they will use the intent as a source cue and immediately reject the message without analyzing it. The second way is that the cue will cause them to scrutinize the message even more closely. The third way is to cause them to counter argue the message to a greater degree. It was found that when personal relevance is high, telling participants the persuasive intent of the message before exposure was more powerful in decreasing agreement with the message compared to when personal relevance was low (Petty & Cacioppo, 1979). Participants in the high relevance condition also produced greater counter-arguments in order to reject the message and regain their freedom.
Resistance to persuasion, or psychological reactance, is another crucial consideration, especially in terms of persuasive health messages. A study analyzed the impact of the source of an anti-smoking editorial in a newspaper (Kim, 2017). Results showed that when the receiver held politically congruent beliefs as the news source they reported the piece as being less biased compared to when the receiver held less congruent beliefs with the source. The same study also showed that perceived bias of the source and threat to freedom were linked to the level of psychological reactance. When the receiver perceived greater bias in the argument they felt a higher threat to freedom, thus they experienced greater psychological reactance. The results of this study show that the source of health information can impact the level of psychological reactance even when the message itself stays the same.

Brehm (1966) argued that reactance itself could not be measured, but Dillard and Shen (2005) show that it can be operationalized as a measure of both negative cognitions and anger. They argue that these outcomes are important to measure when analyzing the effectiveness of persuasive health communications. Dillard and Shen also measured reactance among two different health topics -- promotion of flossing and binge drinking. The health message about flossing produced a greater attitude-behavioral link than the health message about binge drinking. The authors speculate that is due to the significant and contradicting messages about drinking (those warning against its harmful effects and messages that promote drinking as socially desirable).

The specific threshold that causes a health message to generate greater psychological reactance is unknown; however it can be speculated that health messages that give its audiences less choice in the matter generate greater reactance (Rains & Turner, 2007). For example, Rains and Turner (2007) found that messages requiring students to participate in a health prevention
program generated more psychological reactance than messages that did not include such a requirement. There is a vast amount of literature on the source of health information, but few studies have bridged the gap between the research on persuasive communication and health literacy.

*Digital Health Literacy*

While digital health literacy comes from public health research, interaction with media is a key component of the literature. The Elaboration Likelihood Model is frequently applied to persuasive health messages, but its application to health literacy has been limited (Chiang & Jackson, 2013). The large quantity of literature in both fields provides a solid framework for this study to speculate about the relationship between the two areas, such that the source of the health information has a varying impact on the receiver depending on their level of digital health literacy.

Norman and Skinner (2006) defined digital health literacy as, “the ability to seek, find, understand, and appraise health information from electronic sources and apply the knowledge gained to addressing or solving a health problem” (Norman & Skinner, 2006, p. 2). The notion of digital health literacy comes from the study of traditional health literacy. Title V of the Patient Protection and Affordable Care Act (2010) defines health literacy as “the degree to which an individual has the capacity to obtain, communicate, process, and understand basic health information and services to make appropriate health decisions” (Patient Protection and Affordable Care Act, 2010, p. 1252). As noted in both definitions, digital and traditional health literacy go beyond basic reading and writing skills by looking at an individual’s ability to problem solve health conditions and implement solutions in their lives. Digital literacy
incorporates the ability to use the internet as a tool and seeks to understand motivational factors in seeking health information (Bodie & Dutta 2008). While digital health literacy has become a salient topic, its links to research in persuasion are weak.

Norman and Skinner (2006) proposed the eHealth literacy “Lily Model” which outlines the six components of digital health literacy, three of which are analytic – (traditional literacy, information literacy, media literacy), and three of which are context-specific – (health literacy, science literacy and computer literacy).

Traditional literacy refers to ability to understand basic prose and to write and speak coherently. Information literacy is knowledge about potential resources to consult on a specific topic and develop a strategy to access them, which includes search strategies. Media literacy entails the ability to think about different types of media, its relationship its audience and economic considerations. Health literacy is one's ability to understand healthcare institutions and to engage with them. It also includes the ability to read basic health information and perform basic numerical tasks. Computer literacy is the ability to properly use digital technology. Finally, scientific literacy is ability to understand the nature of science, its methods, application, and limitations. Digital health literacy is unique because it requires capabilities in each of these areas. While individuals do not need to be experts in each component, a certain level of competence in each is important because these skills work together when using eHealth literacy skills (Norman & Skinner, 2006).

Research on health literacy began in the 1990s after a National Assessment of Adult Literacy revealed that a significant portion of adults living in the United States struggled to use and understand print materials with accuracy (Rudd, 2015). The NAAL measures literacy by asking adults to complete various practical tasks in English. The most recent version of the
NAAL was published in 2003 and found that 12% of adults had proficient health literacy, 53% had intermediate health literacy, 22% had basic health literacy, and 14% had below basic health literacy (Kutner et al., 2006). The results also showed that socio-demographic characteristics greatly impacted the literacy level of participants.

Women had higher health literacy levels than males, with 16% of men and only 12% of women having below basic health literacy. Results also showed racial and ethnic differences, with White and Asian/Pacific Islanders having higher health literacy than Black, Hispanic, American Indian/Alaska Native, and multiracial adults. Hispanic adults had the lowest health literacy level on average compared to the other racial/ethnic groups. In addition, adults aged 65 and older had lower health literacy than their younger counterparts. Level of education also impacted health literacy, with only 3% of adults who obtained a bachelor’s degree in the below basic health literacy group compared to 49% of adults who did not attend or complete high school.

At its inception, health literacy research focused on the levels of access to devices and to the internet within the population, connecting the lack of access to poor health outcomes (Neter & Branin, 2012). The theory argued that poor health literacy stemmed from lack of access to devices to receive health information. That is, individuals who did not own or have access to the internet would have lower health literacy levels than individuals who did have access to a device, or more frequent access to a device. However, According to PEW, 89% of adults used the internet in 2018, and health literacy is still not equal among the population.

Research now shows that access to information itself does not equal ability to understand it (Stellefson et al. 2011). Thus, a new question in the field arises. Why do individuals respond to health information differently? Low literacy levels can cause problems in many ways, but they
are particularly concerning when it comes to health because researchers have developed a strong body of literature that links poor health literacy to poor health outcomes (Rudd, 2015).

Health literacy has been related to search strategies and the method individuals use to seek out health information. A study by Neter and Branin (2012) found that participants with high digital health literacy consulted more written materials including books, newspapers, magazines, and the internet compared to participants with a low digital health literacy level. The high digital health literacy group also significantly utilized more scrutiny, caution, and evaluation of their information. The researchers evaluated search strategies employed by the two groups, including following links, asking questions on internet forums, and following recommendations of families and physicians. Participants with high digital health literacy were more likely to use all of the strategies compared to the low digital health literacy group. Digital health literacy also impacted the way participants interacted with medical professionals. High digital health literacy participants felt more confident and able to speak to their doctors compared to the low digital health literacy groups about information that they found online (Neter & Brainin, 2012). Thus, a reasonable hypothesis is that a relationship exists between source and someone’s health literacy.

Health Literacy and Healthcare Institutions

The relationship between health literacy and healthcare institutions is also important. Low health literacy has been linked with higher healthcare costs (Manganello et al., 2017), and can also decrease an individual’s ability to manage a chronic disease (van der Heide et al., 2018). Low health literacy can cause problems at with managing health at home, specifically in terms of numeracy skills. Individuals with low numeracy skills may take the incorrect dose of medication
and struggle to understand and interpret nutrition labels (Manganello & Clayman, 2011). Use of online information has also shifted the relationship between medical professionals and their patients.

One concern about the use of the internet for health is opting to use online resources instead of consulting a medical professional (Tonsaker et al., 2017). Medical professionals, friends and family, and peers suffering from the same health condition are still the most used resource when someone experiences a serious health issue, meaning that the majority of these conversations are in fact taking place offline (Fox and Duggan, 2013). However, certain groups are more likely to consult their doctors, such as women over 50, non-Hispanic whites, adults with at least some college education, and individuals with health insurance (Fox and Duggan, 2013). Therefore, those who are more likely to consult others offline for a serious health issue are also likely to have higher health literacy.

One reason for using online health information rather than speaking directly to a medical professional is convenience. It is typically much easier to search for information online than it is to navigate the complex healthcare system and take the time to wait in line to visit a health professional (Tonsaker et al., 2014). Not only does the internet make it easier to access health information, but it has also changed the way our healthcare system operates mainly because health professionals are no longer in control of the distribution of health information (Tonsaker et al., 2014). Anyone can post health information on their website, blog, social media account, or in emails, and there are few ways to regulate online content. Often, health content that is shared is not backed by scientific research (Hitlin & Olmstead, 2018). Thus, the ability to find and decipher legitimate health information online is crucial to successful navigation of the health landscape. Therefore, the application of persuasion models such as the ELM are crucial in
understanding why and how such information, or at least the source of information in general, is crucial for future research. Information that is not backed by research or lacks support for conclusions may negatively affect those with lower health literacy to a greater extent than those with higher health literacy.

While online health information poses challenges to the population, it is impossible and unfair to ignore its benefits. Many patients will use the internet for health information to complement conversations with their doctors or other medical professionals, to seek information about embarrassing conditions, to join online communities, and to seek out illness-specific information (Tonsaker et al., 2014). A 2009 study by Van Uden-Kraan and colleagues explored physician’s outlook on their patients use of online health information finding that physicians have moderately positive attitudes toward their patients use of health information, recognizing both the benefits and drawbacks. In addition, 53% of the physicians found staying up to date with reliable websites to recommend to patients difficult. While the physicians felt competent in their ability to correct their patients who were exposed to misguided guided information, the physicians in the study rarely aided their patients with navigating online health information. Much of the research has to do with navigating health information in general, but what about cases where information is shared for the purpose of selling a health related product? As discussed in the introduction, marketers spend vast amounts of money in the health space to persuade readers to purchase a product or service. Therefore, the relevant research on health advertising must also be discussed.
**Health Literacy and Advertising**

Although health literacy and advertising have received little research, one area where research exists is direct-to-consumer (DTC) prescription drug advertising. DTC advertising is designed to increase consumer demand of drugs by requesting them from their doctors. In one study that looked at DTC disclosures and health literacy, Ho-Young al. (2014) found that individuals with higher health literacy were less likely to be impacted by their level of optimism bias, which is the tendency for people to believe they are less likely to have a negative health event compared than others, in regards to intentions to seek additional risk information. In other words, individuals with high health literacy and high optimism bias were still likely to seek more risk information, while individuals with low health literacy and high optimism bias were unlikely to seek more risk information. This research illustrates the different impacts health advertising has on individuals with different levels of health literacy and warrants further investigation in other areas of corporate healthcare.

Chiang and Jackson (2013) theorize that the level of health literacy will determine whether or not individuals utilize central or peripheral route processing. Individuals with low e-health literacy may be more likely to engage in peripheral processing, and individuals with high e-health literacy may be more likely to engage in central route processing of health messages. In cases of central route processing, the media consumer will be better educated from exposure to health messages. However, in cases of peripheral route processing caused by lower health literacy, media consumption may cause unnecessary requests of medical professionals as a direct consequence of not centrally processing and understanding the messages central argument and its relationship to their personal health.
Considering the literature discussed, I pose the following six hypotheses.

**H1**: The public health sources will have higher credibility than the commercial sources.

**H2**: Participants who rate the source as more credible have higher behavioral intent.

**H3**: Digital health literacy will moderate the source effects in terms of (a) level of cognitive processing, (b) measured behavior, and (c) behavioral intent.

**H4**: Greater prior knowledge will be associated with higher levels of (a) elaboration and (b) behavioral intent.

**H5**: Greater perceived personal relevance will be associated with higher levels of (a) elaboration and (b) behavioral intent.

**H6**: Participants in the commercial conditions will have higher levels of reactance to the message than participants in the public health conditions.
An online survey experiment using Qualtrics software was conducted. The study was a 2 (source: commercial brand vs. public health) x 2 (topic: sun vs. sleep) between-subjects posttest design. In some analyses, digital health literacy was used as an additional factor, yielding a 2 (source: commercial brand vs. public health) x 2 (topic: sun vs. sleep) x 2 (digital health literacy: high vs. low) design in some instances. Participants were recruited using a student participation pool through the Media Effects Lab at Louisiana State University. All participants were students in the departments of Mass Communication and Political Science, which is important because it may have caused the participants in this study to have media literacy skills compared to their peers. Participants received course credit in return for their participation. Approval through the university Institutional Review Board was obtained prior to launching the survey experiment (see Appendix G). The survey took participants about 10 - 15 minutes to complete. Once data was collected, results were analyzed using SPSS 25.

Health Literacy and College Students

As previously mentioned, research on health literacy shows that there is a positive correlation between education and health literacy level among adults (Kutner et al., 2006). Research also shows that health literacy skills tend to improve as people get older, but begin to decline around 40 years of age, which suggests that college students are still developing their health literacy skills (Kutner et al., 2003). However, that does not mean that college students have high digital health literacy levels. A meta-analysis of health literacy research among college
students found that their skills and abilities varied widely and that there is room for improvement of college studies abilities to navigate health information online (Stellefson et al., 2011).

One study by Escoffery and colleagues (2005) found that 89% of the college students they surveyed reported they were not always able to find their desired health information online. Another study of college students found that students underperformed on the health literacy assessment even though the average GPA among participants was above a 3.0 and 84% were juniors or seniors (Hanik & Stellefson, 2011). Another study found that college students had difficulty determining the danger of purchasing pharmaceuticals from an online pharmacy (Ivanitskaya et al., 2010). The pharmacies professional website was the main reason for being mislead.

Interestingly, gender also plays a role in how college students use online health information. Multiple studies of college students online health behavior included in the meta-analysis supported the notion that females were more likely to use the internet for informational purposes, such as self-diagnosis conditions, and males were more likely to use the internet for consumer health products and services (Stellefson et al., 2011).

It is important to note that in general college students consider themselves to be in good health. Seventy two percent of college students reported their health as either “very good” or “good” in 2017 (NCHA, 2018). They also have institutional support from universities. The most common health topics students receive from their college or university include sexual assault/relationship violence (82.3%), alcohol and drug use (79%), depression/anxiety (64.1%), stress reduction (62.6%), and physical activity (60.5%) (NCHA, 2017).

While students are not typically regarded as a vulnerable population, their recent independence from their parents, increased stress, and exposure to drugs and alcohol, risks of
sexual violence, and mental health make them an important group consider in health literacy research who should not be ignored (Center for Disease Control, 2016). College students are also better able to improve their health literacy than the general adult population due to their access to resources. Thus, college students were the focus of this study.

Participants

A total of 166 students participated and completed the study. Eighty four percent were female, 14.5% were male, 1 identified as gender non-binary and 1 preferred not to specify. The average age was 20 years old and ranged from age 18 to 27. The slight majority of students were seniors (31.7%), 31.3% were juniors, 20.7% were sophomores, and 16.5% were freshman. The sample was 82.5% white, 10.8% black or African American, 1.2% Native American or Alaskan Native, 3% Asian, and 4.2% Hispanic or Latino. On average, the participants found the internet to be both an important ($M = 4.10$, $SD = .732$) and useful ($M = 4.34$, $SD = .701$) source of health information.

Procedure

Participants were told that they were to read health-related information and answer follow-up questions. Once they agreed to the consent form, participants were administered an initial questionnaire that asked basic demographic questions and the health literacy items. Participants were asked how familiar they were with a group of health topics as well as how relevant they believed those health topics were to them. They were then randomly assigned to one of the four conditions and given one minute to read the blog post before they were allowed to proceed to the next page. Reading time was recorded.
Directly after reading, participants were given a thought-listing measure. Specifics about the method used are described in the measures section of this paper. After thought-listing, participants received a elaboration self-report measure and a credibility measure. Participants were also asked a set of ten behavioral intention questions. The questions were specific to the health information they read. Participants in each topic were also asked if they could recall the author as well as what the author asked them to do in reference to the message’s specific call to action. These questions were used as manipulation checks, which are discussed below. Finally, participants were asked two reactance self-report measures and then thanked for their time.

Stimuli

Blog posts are important to include in academic research because they are a crucial aspect of modern day online marketing. Marketers create blog posts to increase organic search rankings, to establish themselves within their industry, and to drive traffic from their social media platforms to their organization’s website. According to HubSpot, 55% of marketers say that creating blog posts is their top inbound marketing priority (HubSpot, 2018). While blog posts are not typically paid advertisements, blog posts are an essential element to digital marketing yet have received little attention from academic research.

The use of blog posts in ELM research has been limited; however some studies do exist. For example, one study looked at the impact of source characteristics and the selection of science related blog posts (Winter & Kramer, 2012). They found that in general, readers spent more time reading the expert blog post compared to the non-expert blog post. Participants who had a higher need for cognition selected two-sided versus one-sided arguments compared to those with a
lower need for cognition. These results suggest that blog posts can produce differences in regards to aspects of the ELM.

Source Manipulation

In addition to including two topics, the source was also manipulated. Half of the participants viewed a public health source while the other half viewed a commercial source. Two variations were used to manipulate the source. The first was the presence of a brand logo in the top right corner that stated the full name of the brand. The second was a different call to action in the final sentence of the post. The public health conditions only asked the reader to change their behavior, and the commercial conditions asked for both behavior change and the purchase of their product to help achieve that goal. The remainder of both posts within the same topic conditions were identical.

The sun exposure related brand was Nivea, a skincare company, and the sleep deprivation related brand was Nature Made, a nutritional supplement company. The public health brand for both topics was the National Institutes of Health (NIH). The sleep condition post was titled “The Risks of Sleep Debt,” and the sun condition post was titled “The Risks of Sun Exposure.” Both discussed relevant information about the risks of each and provided the behavioral solutions. The full posts can be found in the Appendix A of this paper.

To decrease confounding variables, all the blog posts were of relatively equal length and reading level. Reading level was measured using the Flesch reading ease scale and Flesch-Kincaid grade level categorization. The average grade level was 8.75 with a range of 8.6 - 8.9 (see Table 1).
Table 1. Reading Level of Blog Posts

<table>
<thead>
<tr>
<th>Condition</th>
<th>Word Count</th>
<th>Flesch reading ease scale</th>
<th>Flesch-Kincaid grade level</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Sleep NIH</td>
<td>333</td>
<td>62.1</td>
<td>8.6</td>
</tr>
<tr>
<td>(2) Sleep Nature Made</td>
<td>328</td>
<td>60.7</td>
<td>8.9</td>
</tr>
<tr>
<td>(3) Sun NIH</td>
<td>328</td>
<td>62.6</td>
<td>8.7</td>
</tr>
<tr>
<td>(4) Sun Nivea</td>
<td>329</td>
<td>62.4</td>
<td>8.8</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>329.4</strong></td>
<td><strong>61.9</strong></td>
<td><strong>8.7</strong></td>
</tr>
</tbody>
</table>

In addition to the source manipulation, the purpose of the health topic manipulation was due to the many variables that may impact persuasion according to ELM, such as personal relevance and prior knowledge on the topic. As a result, the literature has produced various results depending on the nature of the health topic (Dillard & Shen, 2005). Therefore, the inclusion of the two topics will increase the generalizability of the results. Sleep deprivation and sun exposure were chosen as topics because they are both relevant topics to college students.

Given the other factors included in the ELM, it was also important to identify the level of prior knowledge participants felt they had about the given topics. Participants were asked about a total of five health topics including the two involved in the study on a scale from 1 - 7. On average, participants identified the risks of poor diet as the topic they were the most familiar with ($M = 5.85, SD = 1.17$). They felt relatively knowledgeable about the risks of sun exposure ($M = 5.65, SD = 1.34$). The average level of prior knowledge on sleep deprivation was slightly lower ($M = 4.95, SD = 1.5$).
It was also important to measure how relevant the participants felt the health topics were to them, given that is a critical assumption of the current study. Although participants rated the risks of sleep deprivation lower on the prior knowledge scale, they rated it the highest on the personal relevance scale ($M = 5.24, SD = 1.6$). Risks of sun exposure was slightly lower ($M = 4.94, SD = 1.6$), but higher than the remaining two health topics (risks of binge drinking and risks of vaping). The risks of a poor diet was also rated high on personal relevance ($M = 4.95, SD = 1.7$).

Given the nature of skin cancer, it was also important to assess the number of participants who have had the disease impact their own families. About thirty seven ($n = 62$) of participants reported having a either a family member or themselves having skin cancer, 22% ($n = 37$) of whom happened to be assigned one of the sun conditions.

**Measures**

**Source Credibility**

A single item was used to measure perceived credibility. Participants were asked “In your opinion, how credible is the author?” The scale ranged from (1) not credible to (7) credible.

**Measured Behavior**

Three measurements were used to assess behavior. First, it was measured whether or not the participant clicked the link to learn more. Second, it was measured how long the participant spent reading the blog post. How long spent reading a blog post may help understand the level of scrutiny given to the message.
Behavioral Intentions

The behavioral intent questions were on a 7-point scale ranging from (1) extremely unlikely to (7) extremely likely. All participants were asked about their likelihood of adopting the recommended behavior in the blog post. This question was deliberately broad so that it could be compared across topic conditions. Participants were then asked questions depending on their topic condition. Sleep condition participants were asked how likely they were to, sleep 8 - 10 hours per night, regulate their sleep schedule, increase the number of hours they sleep each night, and purchase Nature Made sleep aid. Participants in the sun condition were asked how likely they were to avoid sunlight in the middle of the day, wear sunscreen daily, decrease the amount of time they spend in the sun daily, and purchase Nivea sunscreen. The questions about purchasing Nature Made sleep aid and Nivea sunscreen were used to determine purchase intention.

Participants were also asked about their information-seeking behavior. They were asked how likely they are to search for more information, research products that can make sleeping/avoiding sun exposure easier, consult a medical professional, speak to your family about the risks, and speak to your friends about the risks.

A single item was also calculated for the behavioral intentions. Before calculating mean scores, the items from each topic were combined. Therefore, results for some of the behavioral questions were not divided by topic. The item was calculated using a mean score. Reliability analysis of the 10-items yielded a Cronbach’s $\alpha = .85$, so no items were deleted.

Digital Health Literacy
The eHEALS (Norman and Skinner, 2006b) self-report scale was used to determine the digital health literacy of participants. eHEALS is the oldest and more widely used digital health literacy scale. It has also been validated among college student participants (Nguyen et al., 2016). eHEALS asks about their perceived knowledge, skills, and ability to evaluate health information. It consists of 8 items and the scale ranges from (1) strongly disagree to (5) strongly agree. Norman and Skinner suggest asking participants two additional questions; one about the perceived usefulness of online health information and a second about the perceived importance of online health information.

Reliability analysis yielded a Cronbach’s α=.88 and no items were eliminated. Past literature uses a sum calculation to create scores ranging from 8 - 40, so the SUM function was utilized in SPSS to calculate each participants eHEALS scores. Next, a mean split was conducted in order to achieve a nominal variable with two levels - low and high health literacy. The mean eHEALS score was 30.69, which suggests a satisfactory level of health literacy among participants. Scores ranged from 10 - 40 (SD= 5.59). Participants with a score of 10 - 30.69 below were placed in the low DHL category, and participants with a score of 30.70 - 40 were placed in the high DHL category. As a result, 71 participants had low DHL and 95 had high DHL.

**Level of Elaboration**

Two measures were included to assess level of elaboration. A self-report scale and the thought-listing method was used in tandem to assess participants level of elaboration. The self-report scale will determine how much participants themselves believe they were scrutinizing the
argument. The thought-listing procedure will be used to determine the number of elaborative thoughts they produce in response to the blog post.

Elaboration Self Report

The self-report scale was created by Reynolds (1997). It is a 12-item scale that asks participants about how much they were thinking about the argument in the message and their thoughts while reading it. Response options ranged from (1) strongly agree to (7) strongly disagree. Six items were reverse coded. Reliability analysis yielded a Cronbach’s α=.85 and no items were eliminated. Mean scores were calculated for each participant to determine their self-report elaboration score. The full scale can be found in the appendix.

Thought-listing

The thought listing procedure has been frequently used in ELM research to assess elaboration (Cacioppo, von Hippel, & Ernst, 1997). The following instructions were modified from Petty and Cacioppo (1997).

I am now interested in what you were thinking about during the last few minutes. You might have had ideas all favorable to the recommendation, all opposed, all irrelevant... or a mixture of the three. Any case is fine; simply list what it was that you were thinking during the last few minutes. Please to use the form below to record your thoughts and ideas. Simply write down the first idea that comes to mind in the first box, the second idea in the second box, etc. You should try to record only those ideas that you were thinking during the last few minutes. Please state your thoughts and ideas as concisely as possible ... a phrase is sufficient. Ignore spelling, grammar, and punctuation. You have 3 minutes to write down your thoughts. The arrow key to proceed will be active after 1 minute.

Two independent coders unaware of the hypotheses categorized the individual thoughts. They were each trained prior to conducting the procedure. They also received a codebook that contained definitions, examples of thoughts, and the blog posts (see Appendix F).
Thirty percent of the sample was cross-coded by both participants. In this stage, they were asked to assess four different components: Relevance, elaboration, attitude, and advertisement. First in the relevance category, the coders were asked to identify whether the thought was relevant to the article or not relevant at all. Irrelevant thoughts were coded as zeros for the remaining categories. Second, they were asked to assess whether the relevant thoughts suggested central processing or peripheral processing. Coders were told to input a zero if it was unclear. Third in the the attitude section, coders were asked to assess whether the thought was in agreement with the post, neutral, or a counter-argument. Fourth, coders were asked to identify thoughts that made note that the post was an advertisement or that the intent of the source was to sell their product.

Inter-coder reliability was assessed using Krippendorff’s Alpha and produced $\alpha=.95$ for relevance, $\alpha=.59$ for elaboration, $\alpha=.33$ for attitude, and $\alpha=.86$ for advertisement. Due to the low reliability for elaboration and attitude, which were key variables, the thought-listing data were not further analyzed. Implications are discussed in the limitations section of this paper. The coders were sent the remaining data to code for the remaining variables, which were relevance, elaboration, and advertisement.

**Prior Knowledge and Personal Relevance**

A single item was used to assess level of prior knowledge. Participants were asked “How relevant would the following information be to you?” A single item was also used to assess level of perceived personal relevance. Participants were asked “how familiar are you with the following topics?” Both items were on a scale from 1-7.
Reactance Self-Report

Two self-report measurements for reactance were included per the recommendations of Dillard & Shen (2005). The first is the threat to freedom measure. The scale asks respondents if they agree with four items and ranges from (1) strongly disagree to (7) strongly agree. Items include statements such as “the message tried to make a decision for me,” and “the message threatened my freedom to choose.” Reliability analysis yielded a Cronbach’s $\alpha=.81$. No items were eliminated. The freedom threat items were averaged to calculate the freedom threat variable.

The second index was an anger measure, which asked participants to indicate the degree to which they felt four different emotions while reading the blog post. The four feelings included angry, annoyed, irritated, and aggravated. Responses ranged from (1) None of this feeling to (7) A great deal of this feeling. Reliability analysis yielded a Cronbach’s $\alpha=.95$. No items were eliminated. The anger items were averaged to calculate the anger variable.

Manipulation Checks

Participants were asked who the author of the blog post was to ensure the source had an impact on them. A chi-square test was conducted and revealed a significant effect in both the sun ($\chi^2 (2, N=79) = 41.58, p<.001$), and sleep ($\chi^2 (2, N=87) = 38.41, p<.001$) conditions. Results are shown in Table 2. In both cases, respondents were better able to recall the commercial conditions. Specifically, 51.2% of respondents in the sleep NIH condition recalled the author, and 26.8% selected that they did not know. In the Nature Made condition 87% were able to recall the author, and only 8.7% selected that they did not know. In the sun NIH condition, 62.9% were able to correctly recall the source, and 16.7% didn’t know. In the Nivea condition,
86.5% recalled the author and 13.5% did not know. Results suggests that the source manipulation was significant, but not completely successful.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Correct</th>
<th>Incorrect</th>
<th>Didn’t Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sleep NIH</td>
<td>51.2%</td>
<td>22.0%</td>
<td>26.8%</td>
</tr>
<tr>
<td>Sleep Nature Made</td>
<td>87.0%</td>
<td>4.3%</td>
<td>8.7%</td>
</tr>
<tr>
<td>Sun NIH</td>
<td>61.9%</td>
<td>21.4%</td>
<td>16.7%</td>
</tr>
<tr>
<td>Sun Nivea</td>
<td>86.5%</td>
<td>0%</td>
<td>13.5%</td>
</tr>
</tbody>
</table>

A second manipulation check was conducted to identify if the call-to-action manipulation was successful. A chi-square test was conducted to determine if participants in the commercial conditions checked the purchase intention option significantly more than participants in the public health intention conditions. Two chi-square tests were conducted and revealed significant differences in both the sleep ($\chi^2 (3, N=87) = 23.14, p<.001$) and sun ($\chi^2 (3, N=79) = 10.36, p<.01$) conditions. Results are shown in Table 3. 100% of participants in both sleep conditions selected 8-10 hours of sleep per night. In the Nature Made condition, 52.2% of participants selected that the author wanted them to purchase a sleep supplement. Two participants in each sleep condition selected “other, please identify.” In both sun conditions, 100% of participants selected “wear sunscreen daily,” but only 40.5% of participants in the Nivea condition selected that the author wanted them to purchase Nivea sunscreen. In other words, all participants correctly identified the CTA that didn’t involve a purchase, but not as many identified the CTA that involved purchase of a specific product. Results suggest that the intent aspect of the
manipulation was also significant, but again, ability to recognize the marketing intent of each post was lower than expected.

Further analysis revealed that of participants who selected the sleep purchase intention, 55.8% had high health literacy and 44.2% had low health literacy. Of those who selected the sun purchase intention, 55.9% had high health literacy, and 44.1% had low health literacy. This finding suggests that those with higher digital health literacy were more likely to recognize the purchase intention of the author than those with lower levels of digital health literacy.

Table 3. Intent Manipulation Check

<table>
<thead>
<tr>
<th>Condition</th>
<th>Behavioral Intention</th>
<th>Purchase Intention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Selected</td>
<td>Selected</td>
</tr>
<tr>
<td>Sleep NIH</td>
<td>100%</td>
<td>4.9%</td>
</tr>
<tr>
<td>Sleep Nature Made</td>
<td>100%</td>
<td>52.2%</td>
</tr>
<tr>
<td>Sun NIH</td>
<td>100%</td>
<td>9.5%</td>
</tr>
<tr>
<td>Sun Nivea</td>
<td>100%</td>
<td>40.5%</td>
</tr>
</tbody>
</table>

*Note: The question was “select all that apply.” Rows will add up to greater than 100%.*
CHAPTER 4. RESULTS

Hypothesis 1 stated that participants will rate the public health source as more credible than the commercial source. To test hypothesis 1, a two-way factorial ANOVA was conducted using topic and source as independent variables and credibility as the dependent variable. Although hypothesis 1 did not specifically ask about the topic, it was included in the analysis to provide additional insight. A main effect was found for source, \( F(1, 162) = 7.84, p<.01, \rho \eta^2 = .046 \). Participants rated the public health source (\( M = 5.51, SE = .14 \)) as more credible than the commercial source (\( M = 4.93, SE = .14 \)). Therefore, hypothesis 1 was supported.

A main effect was also found for topic, \( F(1, 162) = 12.89, p<.001, \rho \eta^2 = .074 \). Participants rated the sun conditions (\( M = 5.59, SE = .15 \)) as more credible than the sleep conditions (\( M = 4.85, SE = .14 \)). However, the interaction effect between source and topic was not significant, \( F(1, 162) = 1.47, p>.05, \rho \eta^2 = .009 \). Figure 1 illustrates the interaction and shows that the source of the information made a larger difference in credibility in the sleep conditions than the sun conditions. Specifically, the sleep public health condition had an average credibility of 5.26 (\( SE = .21 \)), but the sleep commercial condition credibility dropped to 4.43 (\( SE = .19 \)). However, the sun public health condition had an average credibility of 5.76 (\( SE = .20 \)), and the sun commercial condition had an average credibility of 5.43 (\( SE = .21 \)).
Hypothesis 2 stated that participants who rate the source as more credible will have higher behavioral intent. Several linear regression analyses were conducted. The two topics were analyzed independently of each other due to the nature of the behavioral intent questions, which asked participants specifically about the topic they read about. Credibility was significantly and positively correlated to “adopt the recommended behavior in the blog post” in both the sleep ($R^2 = .19, b = .437, t = 4.51, p < .001$) and sun ($R^2 = .142, b = .143, t = 3.56, p < .01$) conditions.

Hypothesis 3 stated that effects of the source type on a) elaboration, b) measured behavior, and c) behavioral intentions will be moderated by digital health literacy. The first effect was elaboration. To test hypothesis 3a, a three-way factorial ANOVA was conducted with source, topic, and health literacy as the independent variables and elaboration as the dependent variable. No significant literacy main effect was found. Participants with higher digital health literacy elaborated slightly more ($M = 4.59, SE = .09$) than participants with lower digital health literacy.
literacy ($M = 4.45, SE = .10$), but the difference was not-significant, ($F(1, 156) = 1.03, p > .05, \eta^2 = .01$). Another non-significant finding was that participants with lower reported health literacy slightly increased their level of elaboration in the commercial conditions ($M = 4.50, SE = .14$) compared to the public health conditions ($M = 4.41, SE = .15$), but participants with higher reported health literacy decreased the level of elaboration in the commercial condition ($M = 4.55, SE = .13$) compared to the public health condition ($M = 4.64, SE = .13$), ($F(1, 153) = .437, p > .05, \eta^2 = .003$). As illustrated in Figure 2, low digital health literacy participants did not increase their elaboration to a level that surpassed the high digital health literacy participants level of elaboration in either the commercial or public health condition. In the commercial condition, participants elaborated about the same, but in the public health condition, there was a small mean difference.

![Estimated Marginal Means of Elab_Score](image)

Figure 2. Level of Elaboration by Source and DHL, ($F(1, 153) = .437, p > .05, \eta^2 = .003$).
However, a significant two-way interaction effect was found between the source and topic of the information, $F(1, 156) = 4.16, p < .05, \eta^2 = .02)$. As illustrated by Figure 3, participants assigned a public health condition reported greater elaboration in the sleep condition ($M = 4.69, SE = .14$), but in the commercial condition participants reported greater elaboration in the sun condition ($M = 4.64, SE = .14$). Although the sun commercial condition was higher ($M = 4.64, SE = .14$), it still did not surpass the level of elaboration in the sleep public health condition ($M = 4.69, SE = .14$). Because no source and health literacy interaction effect was found, hypothesis 3a was not supported. The three-way interaction between the source, topic, and digital health literacy was also not significant, $F(1, 156) = 2.73, p > .05, \eta^2 = .02$.

![Estimated Marginal Means of Elab_Score](image)

Figure 3. Level of Elaboration by Source and Topic, $F(1, 156) = 4.16, p < .05, \eta^2 = .026$.

The second effect in hypothesis 3 was measured behavior, which was measured by the reading time the blog post. Another three-way factorial ANOVA was conducted to determine if
the source, topic, or level of health literacy impacted the reading time of the post. Source, topic and digital health literacy were the independent variables and reading time was the dependent variable. Because of the nature of the reading time variable, z-scores were calculated and two outliers were found. They were temporarily excluded from the dataset, creating a mean reading time of 137 seconds ($SD = 107.94$). No significant main effect of health literacy was detected, although low digital health literacy participants ($M = 120.7, SE = 6.39$) did spend less time reading the blogs than high digital health literacy participants ($M = 132.3, SE = 5.52$), $F(1, 153) = .173, p=.173, \eta^2 = .012$. A significant interaction effect between source and digital health literacy was also not found, $F(1, 153) = .002, p>.05, \eta^2 = .000$. Therefore, hypothesis 3b was not supported.

However, a significant three-way interaction effect was found between source, topic, and health literacy on measured behavior, $F(1, 153) = 4.20, p<.05, \eta^2 = .027$. In the public health condition, high DHL participants spent more time reading the sleep condition, but low DHL participants spent more time reading the sun condition. In the commercial conditions, there were little differences in the sleep commercial condition between high and low DHL participants, but high DHL participants spent more time reading the sun commercial condition. As also seen in Table 4, the source of information created a larger mean difference in low DHL participants than in high DHL participants for each topic.
The third effect in hypothesis 3 was behavioral intention. To assess hypothesis 3c, a factorial ANOVA was conducted where source and digital health literacy were independent variables and behavioral intention mean score was the dependent variable. Results showed a non-significant interaction effect between source and digital health literacy, $F(1, 160) = .142, p > .05, \eta^2_p = .009$. Therefore, hypothesis 3c was not supported. As illustrated by Figure 4, participants with low digital health literacy reported slightly higher behavioral intentions in the commercial condition ($M = 3.92, SE = .197$) than in the public health condition ($M = 3.76, SE = .20$), but participants with high digital health literacy had slightly higher behavioral intentions in the public health condition ($M = 3.65, SE = .17$) than the commercial condition ($M = 3.37, SE = .17$). There was also a non-significant main effect for source where the public health condition ($M = 3.71, SE = .13$) did result in slightly higher behavioral intention than the commercial condition ($M = 3.64, SE = .13$), $F(1, 160) = .119, p > .05, \eta^2_p = .001$. 

### Table 4. Mean Scores of Reading time Posts by Source, Topic and Health Literacy Interaction.

<table>
<thead>
<tr>
<th>Source</th>
<th>Topic</th>
<th>DHL Low</th>
<th>DHL High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Health</td>
<td>Sleep</td>
<td>106.58</td>
<td>141.42</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(12.07)</td>
<td>(11.77)</td>
</tr>
<tr>
<td></td>
<td>Sun</td>
<td>*135.00</td>
<td>*122.63</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(13.59)</td>
<td>(10.32)</td>
</tr>
<tr>
<td>Commercial</td>
<td>Sleep</td>
<td>128.71</td>
<td>129.55</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(11.77)</td>
<td>(10.53)</td>
</tr>
<tr>
<td></td>
<td>Sun</td>
<td>112.65</td>
<td>135.61</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(13.59)</td>
<td>(11.49)</td>
</tr>
<tr>
<td><strong>Mean differences</strong></td>
<td>Sleep</td>
<td><strong>22.13</strong></td>
<td><strong>11.87</strong></td>
</tr>
<tr>
<td></td>
<td>Sun</td>
<td><strong>22.35</strong></td>
<td><strong>12.98</strong></td>
</tr>
</tbody>
</table>

* = within row comparisons significant at the .05 level.
Hypothesis 4 stated that participants with higher prior knowledge will have higher levels of (a) elaboration and (b) behavioral intent. Two regression analyses were conducted to test hypothesis 4a. Prior knowledge was the independent variable and elaboration was the dependent variable. Results showed that prior knowledge was not significantly associated with level of elaboration in both the sleep ($R^2 = .08, b = .05, t = .79, p > .05$) and sun ($R^2 = .012, b = -.62, t = .972, p > .05$) conditions. Therefore, hypothesis 4a was not supported.

Regression analyses were also conducted to test hypothesis 4b. Prior knowledge was significantly and negatively correlated with compliance with the request to increase the number of hours of sleep each night ($R^2 = .059, b = -.294, t = -2.70, p < .01$). In the sun conditions, prior knowledge was significantly and positively related to intentions for decreasing the amount of
time spent in the sun daily ($R^2 = .09, b = .317, t= 2.858, p<.01$). Therefore, hypothesis 5b was supported, but only in the sun condition.

Hypothesis 5 stated that participants with higher personal relevance will have higher (a) levels of elaboration and (b) behavioral intent. Regression was also used to test 5a. Personal relevance was significantly and positively correlated with elaboration in the sleep ($R^2 = .08, b = .162, t= 2.73, p<.01$) but not the sun ($R^2 = .00, b = -.010, t = -163, p >.05$) condition. Therefore, hypothesis 5a was partially supported.

In terms of behavioral intentions, personal relevance was significantly and positively correlated to consulting a medical professional ($R^2 = .252, b = .310, t = 2.39, p<.05$) in the sleep condition, but was not significantly correlated with any behavioral intentions in the sun condition. Hypothesis 5b was partially supported where personal relevance was significantly correlated to only one behavioral intention in the sleep condition; however personal relevance did not increase either elaboration or behavioral compliance in the sun condition.

Hypothesis 6 stated that participants in the commercial condition will have higher levels of reactance to the message. Independent samples t-tests were used to determine if the source of the information impacted the level of reactance to test hypothesis 6. First, a t-test with source as the independent and anger scores as the dependent variable was conducted. Results showed that the public health condition generated higher anger scores ($M= 2.07, SD=1.50$) than the commercial conditions ($M=1.75, SD = 1.15$), but the differences were not significant, $t(164) =1.57, p>.05$. A second t-test was conducted with freedom threat scores as the dependent variable. Freedom threat scores were higher in the public health condition ($M= 3.07, SD= 1.06$) compared to the commercial condition ($M=2.97, SD= 1.30$), but again, the test was not significant, $t(164) = 4.89, p>.05$. Therefore, hypothesis 6 was not supported.
Further tests for reactance were conducted to determine if the topic and health literacy impacted reactance. First, an independent samples t-test was conducted to test the effects of topic. Results showed that anger was higher in the sleep condition ($M = 2.01$, $SD = 1.45$) than the sun condition ($M = 1.80$, $SD = 1.22$), but it did not reach significance, $t(164) = .944$, $p > .05$. Freedom threat was also higher in the sleep condition ($M = 3.17$, $SD = 1.27$) than the sun condition ($M = 2.85$, $SD = 1.06$), but the difference also did not reach significance, $t(164) = 1.76$, $p > .05$.

An independent samples t-test was also conducted with health literacy as the independent variable and anger as the dependent variable. Participants with lower digital health literacy ($M = 2.58$, $SD = 1.51$) had significantly higher anger scores than participants with higher digital health literacy ($M = 1.54$, $SD = 1.06$), $t(162) = 3.966$, $p < .001$, but there was no significant difference for freedom threat, $t(162) = .664$, $p > .05$. A two-way factorial ANOVA was also performed with source and digital health literacy as independent variables and anger as a dependent variable. An interaction effect was not found, $F(1, 160) = .575$, $p > .05$, $\eta^2 = .027$. Although the interaction was non-significant, Figure 5 illustrates the difference in anger by digital health literacy. In addition, Figure 5 shows that the source impacted anger scores for low digital health literacy participants to a greater degree than the source impacted anger scores for high digital health literacy participants. A factorial ANOVA was also conducted with freedom threat as a dependent variable and source and digital health literacy as independent variables. Neither the source main effect ($F(1, 160) = .122$, $p > .05$, $\eta^2 = .001$) and digital health literacy main effect ($F(1, 160) = .434$, $p > .05$, $\eta^2 = .003$) on freedom threat were significant. The two-way interaction between source and digital health literacy on freedom threat was also not significant ($F(1, 160) = .035$, $p > .05$, $\eta^2 = .000$).
Figure 5. Anger by Digital Health Literacy and Source. Participants with low digital health literacy reported significantly higher anger scores than high digital health literacy participants, (F(1, 160) = .575, p>.05, $\eta^2 = .027$).
CHAPTER 5. DISCUSSION AND CONCLUSION

The goal of the current study was to understand source effects of persuasive health blog posts on individuals with low versus high digital health literacy. The findings of this study illustrated how the type of source and topic of the information impact individuals depending on their level of perceived health literacy.

The first unexpected finding of this study was uncovered in the manipulation checks, which revealed that respondents were better able remember who the source of the blog post was in the commercial conditions compared in the public health conditions. This finding suggests that the source effects were more powerful in the commercial conditions. The specific reason underlying this difference cannot specifically be found within the existing data as specific questions about the respondents familiarity and attitudes with the brands used were not asked.

However, it may be the case that participants were generally more familiar with the Nivea and Nature Made brand than the NIH brand. The commercial brands can be found in most stores across the United States, but interaction with the NIH may have been more limited. Greater exposure to the commercial brand may have caused participants to remember the commercial source better in this study. Future research could investigate the impact of the specific brand by additionally measuring brand perceptions and familiarity to determine if the same effect is found with all commercial and public health sources or were specific to the brands used in the current study.

To assess credibility, hypothesis 1 predicted that the public health source, the National Institutes of Health, would have higher credibility than the two commercial sources, Nature Made and Nivea. Results showed that participants viewed the public health source as
significantly more credible than the commercial sources, which is in line with the previous literature on source effects (Hammond, 1987). This finding shows that credibility assessments are not necessarily broken down in the modern digital age, and that in the context of a health-related blog post, the literature that was published before the internet can still apply to online information.

Another important implication of the credibility testing was that the sleep conditions exhibited a greater difference between the two sources than the sun conditions. Results showed that the commercial source decreased credibility in the sleep conditions more than in the sun conditions. Therefore, the source effects were stronger in the sleep condition. Previous literature has found different effects based on the health topic (Dillard & Shen, 2005), so the topic differences in this study are not out of place within the literature. While the results did not explicitly uncover the reason behind the topic differences, taking better of of your skin and changing your sleep habits are inherently different health behaviors and may elicit different cognitive processing. In addition, sunscreen as a commercial product is inherently different from taking a sleep supplement.

One possible explanation for the topic differences were that respondents reported knowing less about the risks of sleep debt. Prior knowledge is issue specific, and will vary depending on the issue present, which may explain the differences seen between topics. The risks of sun exposure is a more frequently discussed topic, and could result in greater skepticism about the author of health content. According to the ELM, lower prior knowledge increases reliance on source cues. It would be interesting for future research to also ask participants about levels of self efficacy to help explain topic variances.
Hypothesis 2 found that credibility was significantly and positively related to behavioral intent, specifically when participants were asked how likely they were to “adopt the recommended behavior in the blog post.” This finding supports previous research on source credibility and attitude change, as it is logical that individuals will only engage in behavior change they believe the author was both credible and had logical reasons for engaging in the behavior change.

To assess if digital health literacy moderated source effects, Hypothesis 3 found an interaction effect between the source and topic on level of elaboration. In the public health condition, participants elaborated on the sleep condition more than the sun condition; however in the commercial condition, participants elaborated more on the sun condition than the sleep condition. In total, the sleep commercial condition had the highest level of elaboration, which is an interesting finding since the sleep commercial condition also had the lowest credibility. In addition, the sleep conditions had higher elaboration than the sun conditions. A possible explanation for this finding is that participants in this study had lower prior knowledge about the risks of sleep debt than the risks of sun exposure, but higher personal relevance to sleep. It is likely, especially considering it was a sample of college students, that participants recognized they didn’t have as much prior knowledge yet higher personal relevance, so as a result they were more likely to want to learn more in the sleep condition resulting in greater elaboration.

The study hypothesized that digital health literacy would impact elaboration. Although non-significant, participants with higher digital health literacy elaborated slightly more than participants with lower digital health literacy. Another non-significant finding was that participants with lower health literacy actually slightly increased elaboration in the commercial conditions while participants with lower health literacy decreased elaboration in commercial
conditions. In the context of the previous research on the ELM and health literacy, it makes sense that individuals with lower health literacy would expend less cognitive effort in reading health information. However, because participants in this study were college students, the differences in cognition may not have been as extreme as with other populations that have obtained less education. Participants with lower health literacy may have been more interested in using a commercial product to help with behavioral change, suggesting these individuals are more prone to engaging with material that has a commercial intention resulting in greater persuasion.

Another interesting yet non-significant finding from hypothesis 3 was that lower health literacy participants spent on average 12 seconds less reading the blog post than high health literacy participants. As stated in methods, reading time may suggest how much scrutiny is given to the message. While a main effect of health literacy on reading time was not found, a significant interaction effect was found between health literacy, source, and topic. Among low DHL participants, the commercial source increased reading time in the sleep condition but decreased reading time in the sun condition. The opposite was true for high DHL participants where the commercial source decreased reading time in the sleep condition and increased reading time in the sun condition.

High DHL participants may have recognized the advertising motivation more clearly and were therefore less interested in reading the information in the sleep condition. However, it is possible that the Nivea condition increased elaboration because it provided a more recognizable brand. Again, because brand perceptions were not measured in this study such a conclusion cannot be confirmed by the data. The results regarding measured behavior further supports the finding that lower digital health literacy individuals may scrutinize the message to a lesser degree and that digital health literacy may be a factor of the ELM when assessing the impact of
persuasive health messages. In addition, the same table showed that low DHL participants had a greater change in reading time between sources than did high DHL participants, which also suggests that low DHL individuals are more likely to engage in source-related peripheral route processing to decide how much effort to expend analyzing the material.

The third aspect of hypothesis 3 looked at behavioral intentions. The source and participants DHL did not significantly influence behavioral intentions. However, it was surprising that participants with low DHL had slightly higher behavioral intentions than participants with high DHL. The reason was likely due to the commercial condition and not the public health condition. Low DHL participants had higher behavioral intentions in the commercial condition than high DHL participants did in the commercial condition, whereas the differences between public health conditions were smaller. Although these results were not significant, an explanation for low DHL participants having higher overall behavioral intentions was that they were more persuaded by the commercial condition than those with higher levels of digital health literacy.

The implications of this small difference are interesting and should be further investigated in a different population. It could pose for challenges for public health organizations as well as ethical concerns for commercial organizations. Health-related digital advertising is subject to greater scrutiny and regulation than other industries, so commercial organizations are limited in terms of how they are allowed to target customers. However, knowledge around general characteristics of individuals with low digital health literacy combined with knowledge that these individuals may be subject to greater persuasion could allow commercial organizations to target individuals with low digital health literacy. Public health organizations, government
agencies, and related companies such as Google should consider these ethical concerns when addressing issues surrounding the targeting of health advertising.

In regards to the ELM, Some of the findings regarding prior knowledge and personal relevance supported ELM while others did not. Prior knowledge was not significantly correlated with elaboration, which does not support the ELM. Prior knowledge was also only positively correlated with one of the behavioral intention questions in the sun condition, which was decreasing the amount of time spent in the sun daily. While there was only one significant finding, the results from this study don’t show that prior knowledge was a significant factor in persuasion of the messages.

In terms of personal relevance, this factor did increase elaboration in the sleep but not the sun condition. Participants who rated the risks of sleep debt as highly relevant are likely to also be sleep deprived or have issues getting enough sleep on a regular basis. Because sleep deprivation was also more relevant to participants in general than sun conditions, it is logical that personal relevance was a stronger factor in the sleep condition. Additionally, personal relevance was only significantly correlated with a single behavioral intention, consulting a medical professional. Thus, the results of this study also do not support the idea that personal relevance is a significant factor in persuasiveness of the message because personal relevance was not correlated with most of the behavioral intentions.

The final hypothesis posed that the commercial condition would increase reactance; however results showed the opposite. While not significant, the public health conditions generated higher anger and freedom threat scores. It may be that participants felt more pressure for behavioral compliance when presented with a more credible source. Anger and freedom threat were also higher in the sleep conditions. As already discussed, it may be that achieving
more sleep is more difficult than decreasing sun exposure, which may result in greater frustration and lower feelings of self-efficacy.

Results showed that participants with lower digital health literacy had higher anger scores than participants with higher digital health literacy. This difference was found in each condition. In addition, as seen by Figure 4, the source had a steeper impact on anger scores for low digital health literacy participants than high digital health literacy participants. This is an important finding that may generate cause for concern in terms of public health practices. Messages geared toward behavior change that is difficult may require greater amounts of the argument dedicated to decreasing reactance, especially when the organization desires to create behavior change in low digital health literacy individuals. This also suggests greater peripheral route processing by low DHL participants related to emotional response.

Theoretical Implications

The results of this study add to the theoretical literature by introducing a new variable related to health messages. It also combines two bodies of literature in separate fields by showing a relationship between the two. Specifically, that source effects may be stronger for individuals with low digital health literacy because they are less likely to scrutinize or elaborate on the message. In addition, commercial messages may be more persuasive than public health related messages for low digital health literacy individuals. Finally, greater anger was seen in individuals with lower health literacy, especially in the public health conditions.

Because health literacy is a variable specifically related to health persuasion, it may be that different factors are required depending on the topic of the persuasion. Although it is impossible to include every possible variable in a theoretical model, health literacy is an
important factor that complements the ELM and adds to the depth of its framework. Some of the findings discussed did not support the ELM, while others did. The purpose of providing a framework is to identify the possible variables that could impact persuasion, so each variable will not necessarily predict or be correlated with persuasion in every situation.

Therefore, adding health literacy adds to the possible explanations that contribute to health related persuasion. Future research in health persuasion should include the eHealth literacy scale and investigate if there are significant differences with other topics and sources depending on digital health literacy level. Although the current study did not show huge differences between health literacy levels, it may be due to the fact that college participants were used so the average health literacy was adequate. Research on college students and health literacy shows that levels of health literacy vary widely, as students come from various backgrounds and are still learning how to manage their health on their own.

Especially when looking at topic specific areas such as health communication, it is critical that literature from other academic areas such as public health continue to be read and understood by communication researchers. In modern life, media is part of nearly every aspect of our health and it may only continue to grow. Therefore, the relationship between public health literature and health communication is crucial for understanding the behavior of individuals within the healthcare context as well as self-treatment. The more people rely on the internet and search engines to manage their own health, combined with the increased cost of healthcare, people may be more independent in making decisions about their health. The results of self-reliance should be continually monitored and incorporated into mass communication theories.

In the mass communication field, there is debate about whether older theories still apply in the internet age. The position here is that the ELM is still a useful structure for understanding
online health persuasion, but further variables may be required to increase the external validity of a study. More factors are often present online than in the traditional media space and online experiences are more individual. For instance, individuals with higher digital health literacy may not have been interested in interacting with commercial brands for health-information to begin with, as our media is often self-selected. Experiments will always have limited external validity, but expanding upon theoretical models may aid in increasing external validity. These complex interactions may require mass communication researchers expand their theories to other disciplines to a greater degree, such as incorporating research from information-selection (Winter & Kramer, 2012).

Practical Implications

There are a number of practical implications that can be gleaned from the results. It is important for public health institutions to understand the impact of their brand in general as well as on lower digital health literacy participants. As noted in the literature review, Vallone and colleagues (2017) argued for the importance of branding in health communication as a way to generate behavior change, citing the successful Marlboro Man campaign in generating cigarette purchases. From the point of view of generating strong brand equity, such as in Marlboros case, utilizing source credibility is an effective method of behavior change.

While using brand equity to change health behavior may be successful, the usefulness of brand credibility in terms of persuasion is still conflicted. It may be important for public health brands to invest in branding and brand recognition for their organization, so that receivers are more aware of who they are and their brand. One can also argue that brand recognition is important in the cluttered digital space and is required to stand out from the competition. In
addition, because source effects were higher for low digital health literacy participants, brand recognition may be more important to reach and persuade these individuals.

While branding is typically regarded as crucial for these reasons, the ELM challenges the use of peripheral cues for persuasion. The ELM posits that peripheral processing results in less enduring beliefs that are more susceptible to change, should attitude change occur. Therefore, both commercial organizations and public health institutions alike should be mindful about relying on source credibility and branding too heavily if they intended to create long lasting behavior change or generate a repeat customer. Therefore, the most effective method for organizations to instigate long-term behavior change may be to use both methods of persuasion in tandem. Thus, building brand equity while also creating content that is focused on the central argument is crucial. Higher brand equity and credibility may also help receivers decide how much cognitive effort to expend on the information, further defending the importance of appealing to both peripheral and central processing. It would also be ideal for measurement of campaign effectiveness to also look at long-term effects to understand whether or not the persuasion resulted in a long-lasting change.

Commercial brands should recognize that their brands may generate less reactance when using online health information, so attempting to mitigate reactance may be of less importance than for public health brands. However, both institutions should recognizing that low digital health literacy individuals still exhibited higher reactance to both sources. Therefore, both types of health organizations may want to reduce language that may spur anger and freedom threat. It may also be more important for brands related to sleep to mitigate reactance than brands related to the sun. It would be interesting for future research to investigate if different types of frames or ad copy instigates greater reactance in individuals depending on their health literacy level. Such
research may be of greater concern for organizations seeking to reach individuals who may have lower levels of health literacy.

Another area of concern is that the use of source cues may result in the receiver to gain less out of the media message. Callister (2000) argued that source cues are not longer the most effective way to judge health information due to the vast amount of sources online, and the findings of the current study showed that the source effects were slightly stronger for low DHL individuals. According to Callister, low digital health literacy individuals may be making improper judgments of health information. Others have raised concerns as well, such as Emmers-Sommer and Teran (2019), who questioned the use of celebrities to promote health behaviors. They reasoned that individuals who were persuaded by the fact that a celebrity was sharing the information would result in individuals who only had a surface understanding of a health topic resulting in taking the improper action, such as asking for a unnecessary test.

Such requests could increase demands on an already overwhelmed medical system, and could mean that low digital health literacy individuals are generally learning less than their peers from the same media message. Some additional consequences may include feeling more confusion when faced with conflicting health information online or taking action such as purchasing an unnecessary or potentially harmful product. Future research should investigate the impact of utilizing source cues to evaluate a media message on both the individual as well as in relation to healthcare institutions.
Limitations

There were a few main limitations in this study. The first two have to do with measurement of concepts. The first main limitation was that the thought listing data was not utilized in the analysis due to the low inter-coder reliability. Although the elaboration self-report measure has been effectively used to assess elaboration in past literature, counting the number of issue relevant thoughts provides further dimension to the analysis. Thought-listing also extends the study beyond self-report data. Not using the thought-listing data also impacted the reactance measure. Dillard and Shen’s (2005) frequently used method for measuring reactance requires a combination of anger and number of counterarguments; however, only self-reported anger was used in this study. Analyzing the number of counterarguments may have produced different results. Therefore, the current study is limited due to being solely based on self-report data.

A second limitation was that a digital health literacy test was not administered to participants, but rather self-report ability was used. General health literacy tests exist, but the development of a digital health literacy that can be included in online survey experiments has yet to be validated to the authors knowledge. Research shows that college students tend to overestimate their digital health literacy skills, so the digital health literacy scores were limited to only being self-report data, not a test of actual ability.

A third limitation was that credibility, a main measurement of the study, was measured using a single-item. It is best for research to use multi-item scales to decrease the chance of random error in the study. In addition, using a multi-item scale allows the researcher to assess a concept in multiple different ways. Because this study did not include a credibility scale, it is limited to the single item question, and it may have increased random error.
A fourth limitation is related to the content of the blog posts. In the sleep conditions, there was a clear distinction between the public health and commercial posts; the sleep public health condition did not include any notion of purchase behavior. However, in the sun public health condition, a mention of purchasing sunscreen was still evident. The difference in the sun commercial condition was that the post specifically mentioned Nivea sunscreen, while the public health post did not. This difference in terms of the topics is externally valid, as information regarding decreasing risk of sun exposure will always include a mention of wearing sunscreen, it still poses as an internal limitation.

A fifth limitation is in regards to the manipulation checks, were not as successful as hoped. A likely reason is that some participants took the survey on mobile phones. For those who did, the brand logo would not have been on the screen for as long because the participant had to scroll in order to read the content. By contrast, participants who took the survey on a desktop were exposed to the brand for much longer. It is possible that participants who used mobile had greater difficulty in recalling the source, which was a crucial manipulation to the study. Therefore, this poses as a major limitation. Future research that relies on online experiments should consider excluding mobile participants from their studies to protect against these types of variances, especially those that may disrupt crucial elements of the stimuli. Because not all participants were able to recall the author, it is possible that the source did not influence their answers or behavior in the dependent variable measures, which was a crucial assumption in the study.

A sixth limitation of this study is that a college student sample was used. Past research shows that health literacy is strongly linked to level of education. Due to the college student sample, the participants in the current study had generally high health literacy. Therefore, it is
likely that the type effects of this study would be even stronger with participants who have lower levels of health literacy. It is also important that the current study included mass communication and political science students, which further limits the results of the current study to a specific type of college student. However, if significant differences were found among college students, future research could study different types of populations with traditionally lower health literacy.

A seventh limitation of this study to consider is gender. Eighty-four of the current study was female. Past research on health literacy has shown that men and women have different online behavior where women are more likely to use it for health information and men are more likely to use the internet for health products (Stellefson et al., 2011). Therefore, it is reasonable to assume that a sample that consisted of more males would alter the results of this study. Future research should further investigate the impact of source effects depending on gender, especially studies that wish to compare the effects of public health to commercial sources.

**Future Research**

There are many different areas for future research. First, future research should incorporate other health topics as and other brands to expand the generalizability of the results. The current study only included two topics, two commercial brands, and a single public health brand. It is possible that these variations will create different effects as this study as well as previous research show that the specific health topic produces different results. For example, future research could look at the source effects of topics such as mental health, disease prevention, exercise, nutrition, other supplements and more.

There is also an opportunity for future research in terms of source effects and emotional response. Media messages crafted in such a way may produce different emotional responses in
people with varying levels of digital health literacy. Some may be more impacted by the number of risks, the length, how narrative the information is, and the solution provided than the other. These effects may also be seen differently depending on health literacy, as seen by the differences found in anger.

Another area of possible future research is the connection between health literacy and need for cognition, as it is unclear whether or not the two concepts are linked. The research on health literacy shows that those with higher levels of health literacy are more likely to conduct future research and use more sources in their investigation, which suggests a connection to a higher need for cognition. However, it is unclear whether or not the research behavior is satisfying an interest, need, or perceived importance of understanding health material. It is also possible that the act of conducting future research is fulfilling each of those purposes or needs at the same time, but perhaps to varying degrees.

The medium of the message could also be an interesting independent variable to introduce. Online health marketing comes in many forms including video, email marketing, search engine ads, and banner ads. Future research could test the source effects in terms of the format because it is very plausible that source effects are either emphasized or de-emphasized by the format. Time is another factor. For instance, when an individual becomes part of a brand’s email list, they are exposed to repeatedly to the brands products and messaging. It is possible that strength of the source effects and repetition have a different impact on individuals with different levels of health literacy.

Conclusion
The results of the current study are based on the effect of the source and source intentions of health information. Health literacy studies developed in part due to research that showed some members of industrialized nations were unable to perform basic tasks to a satisfactory level. Since then, past research has shown that college students have even struggled with locating health information online. The mean health literacy score in this study was a 30.69 out of 40, which suggests generally high digital health literacy. However, 42% of participants in the current study fell below that mark, which shows that there is a group of students who are have more trouble locating and assessing health information than their peers.

These findings don’t necessarily show that college students are not capable enough, but that the digitization of health information puts greater strain on the individual to dissect and judge a high quantity of information. In other words, the world of health information is complex to navigate, even among those with arguable the greatest resources on the planet. Even more, health brands, which includes public health and commercial organizations, push information on the consumer attempting to change their health habits and purchase behavior, leaving the individual to make sense of it. Some may be more able than others to centrally process the information, resulting in some different responses to the persuasion.

Health communication researchers must continue to assess the impact of online health information and marketing on both the individual and population level so that the institutions involved may have a deeper understanding of how their efforts impact individuals on a cognitive, behavioral, and even emotional level. It is especially critical considering health marketing in both the public health and commercial arena will only continue to grow, thus as those changes arise researchers must continue to incorporate them into their work. It is crucial that communication researchers continue to work with researchers in the medical and public health
fields to contribute to the understanding of the impact of online health information. This future research will help governmental, public health, and commercial institutions advance their interests ethically through their mass media campaigns, and will ultimately empower the individual when it comes to their health.

It is impossible to determine whether or not online health information helps or harms the consumer because dichotomies only exist in theory. In reality, the answer is likely to be that it depends. The results of this study show that online health information likely creates segments of the population who are more vulnerable to commercial intentions, but also empowers some to improve their health behavior. The use of online health information has raised concerns among public health researchers because of the difficulty of finding and appraising online health information and properly implementing the information in one’s life. Some have also theorized that online health information has created new divides where their previously were not. The current study does not rectify the differences between the two sides of the coin, but perhaps the answer is not simple. This study suggests the two ideas exist in tandem. It is my hope that future research uncovers ways to increase individuals and institutions ability to engage in health-related media in a way that can empower both parties to become healthier through the use of digital media.
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NCHA. (2018). Percentage of college students in the U.S. who rated their health as excellent or very good as of fall 2017. In *Statista - The Statistics Portal*.


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Patient Protection and Affordable Care Act Of 2009, § 5001 (2009).


APPENDIX A. TREATMENT CONDITIONS

Condition 1

Risks of Sleep Debt

It’s okay to miss out on sleep some nights, but a routine of poor sleep habits for weeks or months on end can have a dramatic and negative effect on your life. Sleep deprivation occurs when you do not get enough sleep to feel awake and alert in your daily life. It is recommended that adults aged 18 to 64 years old get 8 to 10 hours of sleep per night. If you do not get the recommended amount for an extended period of time, then you may accumulate sleep debt. The greater the sleep debt, the greater the health consequences.

Lack of sleep can disrupt your ability to function in your everyday life. Individuals who do not sleep enough are often irritable and depressed. They also have a difficult time learning new concepts, can be forgetful, lack motivation, and experience increased cravings for carbohydrates. Sleep deprivation can also have more serious health consequences such as a weakened immune system and increased risk of respiratory diseases. It can also cause increased body weight, and impact your body’s ability to maintain proper blood pressure, sugar levels, and inflammation.

Luckily, the body naturally sends signals when we are in need of more sleep. In the modern world, many of us are taught to ignore them. Substances such as caffeine can even keep us from receiving those signals. We sleep best when we allow the body to become accustomed to a specific sleep pattern by sleeping and waking at the same times each day. However, life can easily get in the way and we are unable to maintain a regimented schedule.

Still, it is critical that you prioritize your sleep. If you have accumulated sleep debt, finally giving your body the sleep it needs will improve your mood and decrease your risk for health issues. Make sleep a priority in your life to help regulate your sleep schedule and ensure you get a full 8 to 10 hours of sleep per night! Click to learn more!
Risks of Sleep Debt

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Still, it is critical that you prioritize your sleep. If you have accumulated sleep debt, finally giving your body the sleep it needs will improve your mood and decrease your risk for health issues. Nature Made Melatonin can help regulate your sleep schedule and ensure you get a full 8 to 10 hours of sleep per night! Click to learn more!
Risks of Sun Exposure

Did you know that the sun can cause damage to your skin in as little as 15 minutes? Almost 5 million people in the United States are treated for skin cancer each year, and it is the most common type of cancer in the United States. Skin cancer is typically treatable, however, it can be fatal and is often expensive to treat. You may enjoy spending a lot of your time in the sun, especially during the warmer months, but you may be causing yourself more harm than you realize. While sun exposure has its benefits, the sun's rays begin to damage your skin very quickly, which is often overlooked. Many believe sun exposure is an essential source of vitamin D, but only 10 to 15 minutes a day is enough. It’s likely that you have experienced a sunburn in your life. A single bad sunburn during your youth doubles your risk of skin cancer later in life. While your skin does have the ability to repair itself, that ability decreases as your age.

Sun exposure can cause extra cells to grow on your skin, often called tumors or lesions. These tumors can either be cancerous or non-cancerous. Overexposure to the sun is known to increase the risk of skin cancer. Skin cancer is deadly only in the most severe cases, as many patients are able to recover when the cancer is detected early enough. Sun exposure can also cause less severe yet undesirable issues such as decreased skin quality and premature wrinkles.

The good news is that most issues caused by sun exposure are preventable, but you need to take daily action to protect your skin. Caring for your skin at an earlier age will protect it from a lifetime of damage and ensure you’ve developed proper sun care habits. When possible, avoid direct sunlight during its harshest hours in the middle of the day. Always be sun smart by wearing sunscreen daily. Click to learn more!
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The good news is that most issues caused by sun exposure are preventable, but you need to take daily action to protect your skin. Caring for your skin at an earlier age will protect it from a lifetime of damage and ensure you’ve developed proper sun care habits. When possible, avoid direct sunlight during its harshest hours in the middle of the day. Always be sun smart by wearing Nivea sunscreen daily. Click to learn more!
I would like to ask you for your opinion and about your experience using the Internet for health information. For each statement, select the response that best reflects your opinion and experience right now.

How useful do you feel the internet is in helping you in making decisions about your health?

Not useful at all (1)
Not useful (2)
Unsure (3)
Useful (4)
Very Useful (5)

How important is it for you to be able to access health resources on the internet?

Not important at all (1)
Not important (2)
Unsure (3)
Important (4)
Very important (5)

eHEALS Scale

Please indicate the degree to which you agree with the following statements:

(1) Strongly Disagree (5) Strongly Agree

<table>
<thead>
<tr>
<th>I know what health resources are available on the internet.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>I know where to find helpful health resources on the internet.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I know how to find helpful health resources on the internet.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I know how to use the internet to answer questions about my health.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I know how to use the health information I find on the internet to help me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I have the skills I need to evaluate the health resources I find on the internet.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I can tell high quality health resources from low quality health resources I find on the internet.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
I feel confident in using the information from the internet to make health decisions.

How **relevant** would the following information be to you?

(1) Very Irrelevant   (7) Very Relevant

<table>
<thead>
<tr>
<th>Topic</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risks of sleep deprivation</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Risks of vaping</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Risks of binge drinking</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Risks of poor diet</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Risks of sun exposure</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

How **familiar** are you with the following topics?

(2) Very Unfamiliar   (7) Very Familiar

<table>
<thead>
<tr>
<th>Topic</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risks of sleep deprivation</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Risks of vaping</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Risks of binge drinking</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
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<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Risks of sun exposure</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

Please select any conditions that have affected either you or a close relative (select all that apply)

- Lung cancer (1)
- Alcoholism (2)
- Skin cancer (3)
- Anxiety (4)
- Depression (5)
- None of the above (6)
APPENDIX C. POST-QUESTIONNAIRE

*Thought Listing*

I am now interested in what you were thinking about during the last few minutes. You might have had ideas all favorable to the recommendation, all opposed, all irrelevant... or a mixture of the three. Any case is fine; simply list what it was that you were thinking during the last few minutes. Please to use the form below to record your thoughts and ideas.

Simply write down the first idea that comes to mind in the first box, the second idea in the second box, etc. You should try to record only those ideas that you were thinking during the last few minutes. Please state your thoughts and ideas as concisely as possible ... a phrase is sufficient. Ignore spelling, grammar, and punctuation.

You have 3 minutes to write down your thoughts. The arrow key to proceed will be active after 1 minute.

Thought #1 ________________________________________________
Thought #2 ________________________________________________
Thought #3 ________________________________________________
Thought #4 ________________________________________________
Thought #5 ________________________________________________
Thought #6 ________________________________________________
Thought #7 ________________________________________________
Thought #8 ________________________________________________
Thought #9 ________________________________________________
Thought #10 _______________________________________________

If you have any additional thoughts, please enter them below:
**Elaboration Self-Report Scale**

Please indicate the degree to which you agree with the following statements about your thought process while reading the blog post.

(1) Strongly disagree    (7) Strongly Agree

<table>
<thead>
<tr>
<th>Statement</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attempting to analyze the issues in the message</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not very attentive to the ideas</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deep in thought about the message</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unconcerned with the ideas</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extending a good deal of cognitive effort</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distracted by other thoughts not related to the message</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not really exerting your mind</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doing your best to think about what was written</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reflecting on the implications of the arguments</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resting your mind</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Searching your mind in response to the ideas</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Taking it easy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


**Freedom threat**

Please specify the degree to which you agree with the following statements:

<table>
<thead>
<tr>
<th></th>
<th>(2) Strongly disagree</th>
<th>(7) Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>This message tried to make a decision for me.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>The message tried to pressure me.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>The message threatened my freedom to choose</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>The message tried to manipulate me</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

**Anger Measure**

Please indicate the degree to which you felt the following emotions while reading the blog post.

<table>
<thead>
<tr>
<th></th>
<th>(1) None of this feeling</th>
<th>(7) A great deal of this feeling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did you feel angry while viewing this message?</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Did you feel annoyed while viewing this message?</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Did you feel irritated while viewing this message?</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Did you feel aggravated while viewing this message?</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX D. QUESTIONNAIRE FOR SLEEP CONDITIONS

Please answer the following questions about the blog post.

Who was the author?

The National Institute of Health  (1)  
Nature Made  (2)  
Other (Please Identify)  (3)  
I don't know  (4)

What did the author ask you to do? You may select more than one.

Get 8 - 10 hours of sleep per night  (1)  
Purchase a sleep supplement  (2)  
Other (Please Identify)  (3)  
I don't know  (4)

Which of the following was stated in the blog post?

One night of poor sleep has negative health consequences  (1)  
Poor sleep over the long term can weaken your immune system  (2)  
Poor sleep habits is linked to being disorganized  (3)  
Bad sleep can cause cardiac issues  (4)

In your opinion, how credible is the author?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
</table>
| Not credible | o | o | o | o | o | o | o | Credible
Please indicate how likely you are to do the following behaviors.

(1) Extremely Unlikely   (7) Extremely Likely

<table>
<thead>
<tr>
<th>Behavior</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adopt the recommended behavior in the blog post.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sleep 8 - 10 hours per night.</td>
<td></td>
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<td>Regulate your sleep schedule.</td>
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<td>Increase the number of hours you sleep each night.</td>
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<tr>
<td>Purchase Nature Made sleep aid</td>
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<tr>
<td>Search for more information about the risks of sleep debt</td>
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<td>Research products that can make sleeping easier</td>
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<tr>
<td>Consult a medical professional regarding the risks of sleep debt during your next visit</td>
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<tr>
<td>Speak to your family about the risks of sleep debt</td>
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<td>Speak to your friends about the risks of sleep debt</td>
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</tbody>
</table>
APPENDIX E. QUESTIONNAIRE FOR SUN CONDITIONS

Please answer the following questions about the blog post.

Who was the author?

The National Institute of Health (1)
Nivea (2)
Other (Please Identify) (3)
I don't know (4)

What did the author ask you to do? You may select more than one.

Avoid direct sunlight in the middle of the day (1)
Wear sunscreen daily (2)
Purchase Nivea sunscreen (3)
Other (Please Identify) (4)
I don't know (5)

Which of the following was stated in the blog post?

One bad sunburn doesn't do any harm (1)
Skin cancer is the most common type of cancer in the U.S. (2)
Children get skin cancer (3)
People rarely get skin cancer (4)

In your opinion, how credible is the author?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Credible</th>
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<tbody>
<tr>
<td>Not</td>
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<td>credible</td>
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</tbody>
</table>

Please indicate how likely you are to do the following behaviors.

(1) Extremely Unlikely  (7) Extremely Likely
<table>
<thead>
<tr>
<th>Behavior</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adopt the recommended behavior in the blog post</td>
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<tr>
<td>Avoid sunlight in the middle of the day</td>
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<tr>
<td>Wear sunscreen daily</td>
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<tr>
<td>Decrease the amount of time you spend in the sun each day</td>
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<tr>
<td>Purchase Nivea sunscreen</td>
<td></td>
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</tr>
<tr>
<td>Search for more information about the risks of sun exposure</td>
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</tr>
<tr>
<td>Research products that can avoid over exposure to the sun</td>
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<td></td>
</tr>
<tr>
<td>Consult a medical professional regarding the risks of sun exposure during your next visit</td>
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<td></td>
</tr>
<tr>
<td>Speak to your family about the risks of sun exposure</td>
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<td></td>
</tr>
<tr>
<td>Speak to your friends about the risks of sun exposure</td>
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</tbody>
</table>
Health Information Survey Codebook

Thank you for agreeing to be on this project! For this research, I am investigating responses to different types of health information using a survey experiment. Your role is to code qualitative data. As part of the experiment, participants were asked to read a blog post (all conditions are at the end of this document). Half of the participants read about the risks of sun exposure and the other half read about the risks of sleep debt. Both blog posts encouraged the reader by minimizing the risks of the associated diseases by practicing better preventative health habits. After reading, they were asked to list all of the thoughts they had while reading the blog post. Their directions were as follows:

I am now interested in what you were thinking about during the last few minutes. You might have had ideas all favorable to the recommendation, all opposed, all irrelevant... or a mixture of the three. Any case is fine; simply list what it was that you were thinking during the last few minutes. Please to use the form below to record your thoughts and ideas.

Simply write down the first idea that comes to mind in the first box, the second idea in the second box, ect. You should try to record only those ideas that you were thinking during the last few minutes. Please state your thoughts and ideas as concisely as possible ... a phrase is sufficient. Ignore spelling, grammar, and punctuation.

You have 3 minutes to write down your thoughts. The arrow key to proceed will be active after 1 minute.

Overview

Step #1 is the thought relevant or irrelevant?

Step #2 Are the relevant thoughts central or peripheral?

Step #3 Is the thought in agreement, neutral, or a counter-argument?

Step #4 Ad recognition?

1. Relevance

Is the thought representative of their experience reading the article?

<table>
<thead>
<tr>
<th>Label</th>
<th>Value</th>
<th>Explanation</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevant</td>
<td>1</td>
<td>They are responding to the article in some way</td>
<td>“Sunscreen”</td>
</tr>
</tbody>
</table>

Table cont'd.
2. Thought Elaboration

For this section, you will consider the depth of their thinking in relation to the central argument. It does not matter if the thought is negative or positive.

*Anything that was in the irrelevant category leave blank*

<table>
<thead>
<tr>
<th>Label</th>
<th>Value</th>
<th>Explanation</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>1</td>
<td>Thoughts that are relevant to the central argument. Shows they are deliberating and thinking through the argument of the material. Includes thoughts relating the material to themselves. Also includes counterarguments.</td>
<td>“Sunscreen is very important” “I should regulate my sleep schedule” “I don’t have time to sleep that much”</td>
</tr>
<tr>
<td>Peripheral</td>
<td>2</td>
<td>Thoughts that are not relevant to the central argument. They require less effort. Thoughts of this nature include - comments about the source, the length, colors, or is just completely irrelevant to the specific topic. Source comments do fall in this category - such as a comment on the brand.</td>
<td>“That was a long minute” “Didn’t really read it” “I am hungry right now” “This is an ad”</td>
</tr>
<tr>
<td>Neither</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Label</strong></td>
<td><strong>Value</strong></td>
<td><strong>Explanation</strong></td>
<td><strong>Example</strong></td>
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<td>------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Agree</td>
<td>1</td>
<td>The thought is in agreement with the argument. The thought wishes to comply with</td>
<td>“I should sleep more”</td>
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<tr>
<td></td>
<td></td>
<td>the recommendation or is positive about the information presented. <strong>Evidence</strong></td>
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<tr>
<td></td>
<td></td>
<td><em>of behavior compliance or agreeing with the recommendation</em></td>
<td></td>
</tr>
<tr>
<td>Neither</td>
<td>0</td>
<td>The thought is neither positive or negative about the argument. <strong>No evidence</strong></td>
<td>“Sleep 8 - 10 hours”</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>either way</em></td>
<td></td>
</tr>
<tr>
<td>Counter-argument</td>
<td>-1</td>
<td>These thoughts are those that disagree with the statement by providing an</td>
<td>“I don't have time to get that much sleep”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>explanation of why they are unable to comply. <strong>Saying they won't comply</strong></td>
<td>“I have to walk to class in the sun”</td>
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<td></td>
<td></td>
<td><strong>Gives a reason why they won’t</strong></td>
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</table>

3. Advertisement

Did the participant note that the content was an advertisement, marketing, or trying to sell them something?

<table>
<thead>
<tr>
<th><strong>Label</strong></th>
<th><strong>Value</strong></th>
<th><strong>Example</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>1</td>
<td>“This is an ad”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“They are just trying to sell a product”</td>
</tr>
<tr>
<td>No</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX G. IRB APPROVAL

ACTION ON PROTOCOL APPROVAL REQUEST

TO: Meghan Sanders
    Mass Communication

FROM: Dennis Landin
       Chair, Institutional Review Board

DATE: February 1, 2019

RE: IRB# 4186

TITLE: Health Marketing Intentions, Behavior, and Digital Health Literacy


Review type: Full ___ Expedited X ___ Review date: 2/1/2019

Risk Factor: Minimal ___ Uncertain _____ Greater Than Minimal ______

Approved ___ X ___ Disapproved ______

Approval Date: 2/1/2019 Approval Expiration Date: 1/31/2020

Re-review frequency: (annual unless otherwise stated)

Number of subjects approved: 250

LSU Proposal Number (if applicable):

By: Dennis Landin, Chairman

PRINCIPAL INVESTIGATOR: PLEASE READ THE FOLLOWING –
Continuing approval is CONDITIONAL on:

1. Adherence to the approved protocol, familiarity with, and adherence to the ethical standards of the Belmont Report, and LSU’s Assurance of Compliance with DHHS regulations for the protection of human subjects*

2. Prior approval of a change in protocol, including revision of the consent documents or an increase in the number of subjects over that approved.

3. Obtaining renewed approval (or submittal of a termination report), prior to the approval expiration date, upon request by the IRB office (irrespective of when the project actually begins); notification of project termination.

4. Retention of documentation of informed consent and study records for at least 3 years after the study ends.

5. Continuing attention to the physical and psychological well-being and informed consent of the individual participants, including notification of new information that might affect consent.

6. A prompt report to the IRB of any adverse event affecting a participant potentially arising from the study.


8. SPECIAL NOTE: When emailing more than one recipient, make sure you use bcc.

*All investigators and support staff have access to copies of the Belmont Report, LSU’s Assurance with DHHS, DHHS (45 CFR 46) and FDA regulations governing use of human subjects, and other relevant documents in print in this office or on our World Wide Web site at http://www.lsu.edu/irb
VITA

Julia Morton was born in New Orleans, LA to the parents of Gerard and Carroll Morton. She attended Louise S. McGehee High School where she discovered her initial passion for research and writing. She then moved to Spartanburg, South Carolina where she attended Wofford College and obtained a Bachelor’s in Government in May 2017. She entered the Manship School of Mass Communication in August 2017. Her time at Manship combined with her internship in digital marketing inspired her idea for this thesis.