

COUNTERING INDOOR TANNING ARGUMENTS: AN EXPERIMENT USING SKIN
CANCER PREVENTION MESSAGES

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ABSTRACT

DANNIELLE E. KELLEY: Countering indoor tanning arguments: An experiment using skin cancer prevention messages
(Under the direction of Dr. Seth M. Noar)

Many prevention efforts have focused on informing young women of the negative health effects associated with indoor-tanning. However, young women are typically aware of the cancer risks associated with indoor-tanning and continue to tan despite this knowledge. A vast amount of misinformation about the benefits of indoor-tanning has been identified, suggesting the need for a novel prevention approach. This dissertation details a systematic approach to the development and testing of indoor-tanning prevention messages, guided by Inoculation Theory.

To understand the indoor-tanning communication environment and prevalence of misinformation, a systematic content analysis of pro-tanning websites was conducted. Guided by results from the content analysis, three message types were created: 1) inoculation, 2) one-sided, and 3) control. Messages were tested qualitatively with young adult women in cognitive interviews ($N=8$), and quantitatively in an online pilot experiment ($N=177$). Messages were selected based on this formative research and tested in a longitudinal online messaging experiment with young adult women ($N=649$ baseline; $N=324$ one-week follow-up).

The content analysis revealed two domains of misinformation: safety and health. Within safety, the most prevalent claims were: 1) controlled indoor-tanning, and 2) government regulation of indoor-tanning. Within health, the most common claims were: 1) achieving a base tan for future sun protection, and 2) indoor-tanning as a good source of vitamin D. Controlled

tanning and vitamin D messages were most effective across conditions and thus selected for testing in the experiment.

At baseline, the inoculation and one-sided conditions reported fewer positive health outcome expectations and more negative health outcome expectations, compared to the control condition. The inoculation condition rated messages higher in perceived effectiveness, reported lower intentions to tan indoors and more cognitive processing compared to one-sided and control conditions. At one-week follow-up, the one-sided condition reported an increase in positive outcome expectations and intentions to indoor tan, while the inoculation condition reported decreases in positive outcome expectations and intentions, and more counterarguing and cognitive processing relative to the one-sided condition.

Results indicate that inoculation messages are a promising approach for addressing misinformation about the benefits of indoor-tanning. Implications for indoor-tanning prevention efforts, inoculation theory, and health communication are discussed.

To Gill, Grandma Pearl, and Mom

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CHAPTER 1

Introduction

The rising prevalence of melanoma and other skin cancers in young adults is a major public health concern. Melanoma is the second most common form of cancer in young adult women aged 20-29 (Siegel et al., 2012). Further, those diagnosed with melanoma are 13 times more likely than those never diagnosed to develop melanoma again later during their lifetime (Bradford, Freedman, Goldstein, & Tucker, 2010). Experts attribute melanoma and other skin cancers (e.g. basal and squamous cell carcinoma) primarily to preventable causes – in particular, exposure to UV light (Bleyer & Barr, 2009). Every day, over a million people in the United States tan indoors at a tanning salon, facilities that outnumber McDonalds and Starbucks in some of America's major urban areas (Levine et al., 2005; Hoerster et al., 2009). A recent systematic review and meta-analysis of indoor tanning (IT) prevalence from 1999-2013 (N=2,240) indicated that 55% of U.S. university students used an IT device at some point during their lifetime, and 43% reported exposure within the past year (Wehner et al., 2014). Among these students, women reported higher lifetime (range: 45-93% vs. range: 14-66%) and past year (22 -65% vs. 16-38%) exposure relative to men. Further, this review estimated that 419,245 (about 12%) of annual new skin cancer diagnoses in the U.S. were attributable to IT.

In response to the mounting evidence of the risks of IT, the Surgeon General made the reduction of harms from IT a goal in the recent Call to Action to Prevent Skin Cancer (2014). In particular, one section of the call asks public health advocates to develop, disseminate, and

evaluate messages to reduce IT frequency. More recently, the Food and Drug Administration (FDA) has proposed a nationwide ban on tanning for minors (i.e. younger than 18-years-old). However, this call to action and proposed ban come only after decades of dubious claims from the IT industry have freely disseminated to the population and perpetuated through social networks. Since then, some claims have been withdrawn after formal complaints from the Federal Trade Commission (FTC) regarding the industry's dissemination of false health and safety claims in a 2010 "tanning HYPE" advertising campaign.¹ However, the industry continues to promote misleading health and safety benefits of tanning bed use in a way that is strikingly similar to pre-regulation cigarette advertisements (Greenman & Jones, 2010). Implications of these marketing tactics are particularly relevant for indoor tanning prevention and reduction efforts as prevention messages will be placed in an environment where prevention and conflicting promotion messages will directly compete for receivers' attention. Understanding the types of various claims and magnitude of dissemination are critical pieces of information that will likely assist prevention efforts.

Literature Review

Indoor Tanning Interventions

A limited number of intervention studies have addressed the issue of IT. Of fourteen identified intervention studies which have sought to reduce IT rates, only four focused on developing and evaluating messages to reduce IT (Evans & Mays, 2016; Greene & Brinn, 2003;

¹ The "tanning HYPE" campaign asserted numerous health claims about indoor tanning such as tanning beds offered better way to increase vitamin D absorption than taking supplements and also misrepresented the safety of IT by stating that IT is approved by the government. However, these claims are false as research does not show that the benefit of the little vitamin D absorbed from indoor tanning exceeds the harms (e.g. skin cancer) associated with tanning bed use (Balk, 2014) and while the FDA has approved tanning beds for the sole purpose of "tanning the skin" (21 C.F.R. § 878.4635 (2014)), the FDA has not approved the use of tanning beds for health purposes.

Lazovich et al., 2013; Mays & Zhao, 2016). Two additional studies focused on messages to change the social preference for tanned skin (Cox et al., 2009; Routledge, Arndt, & Goldenberg, 2004). The remaining nine studies focused on reducing IT through various tailored behavior change techniques such as workbooks (Hillhouse, Turrisi, Stapleton, & Robinson, 2008; J. J. Hillhouse & Turrisi, 2002), motivational interviewing (Turrisi, Mastroleo, Stapleton, & Mallett, 2008), instructional sessions and handouts (Ng et al., 2012), UV photography (Gibbons, Gerrard, Lane, Mahler, & Kulik, 2005), and a tailored interactive website (Hillhouse et al., 2016; Stapleton et al., 2015). Further, two of the four message-focused interventions (Lazovich et al., 2013; Mays & Zhao, 2016) used extensive formative research to craft their intervention and message materials. Mays and Zhao employed a message approach based on prospect theory in which they framed messages for harm reduction in terms of what may be gained from refraining from IT, and what may be lost by engaging in IT (i.e., health or appearance consequences), among a sample of women who indicated they had tanned within the past year (2015). Lazovich and colleagues developed materials for mothers and daughters to discourage or prevent IT. Materials encouraged conversations between mothers and daughters about the health consequences of IT (Lazovich et al., 2013). While both of these studies have made great contributions to IT message development and are promising approaches, the broad utility of such messages is unclear as the IT audience is heterogeneous (Hillhouse & Turrisi, 2012; Kelley et al., 2016; Pagoto & Hillhouse, 2008; Stapleton, Turrisi, & Hillhouse, 2008), and these studies focused on either harm reduction among current users (Mays & Zhao, 2016) or prevention or reduction through encouraging conversations between parents and children (Lazovich et al., 2013). The extent to which these two studies considered the pro-tanning marketing environment at the time is unclear.

Cappella described the importance of combining three types of theories for effective message design (Cappella, 2003). Specifically, Cappella posits that theories of behavioral influence (e.g. Social Cognitive Theory) tell the message designer what content to focus on. Theories of information processing (e.g. Elaboration Likelihood Model) provide guidance as to how the messages may be understood based on audience characteristics, psychological processes, and contextual factors, and appropriate combinations of these. Theories that focus on audience responses to different message designs, referred to here as theories of message effects, provide message creators with recommendations for message construction based on format (e.g., narrative structure) and emphasis (e.g. prospect theory/ gain-loss framing, or emotional appeal). Theories of message effects are much more explicit in instruction of how to construct messages, while theories of information processing focus more so on how messages are interpreted based on characteristics of the message recipient and content of the message, and theories of behavioral influence focus on the interaction of various person-centered constructs (i.e. attitudes) and behaviors. Of the ten interventions that identified a theoretical foundation for development, seven relied solely on theories of behavioral influence and three relied on theories of message effects. None of the interventions used theories of information processing to understand how messages would be received and interpreted by the audience, which may be a critical aspect of developing effective messages to reduce IT. Further, while many of these studies focused on the health harms and appearance consequences of indoor tanning, none explicitly sought to correct misinformation regarding indoor tanning, making the deconstruction and correction of indoor tanning misinformation an area of prevention for which research is greatly needed. Thus, much is left to be understood about how to effectively design and disseminate messages to reduce IT rates and address the Surgeon General's Call to Action.

Inoculation theory has promising potential to address the issue of IT, as its unique formulation lends itself to the deconstruction of misinformation through the use of two-sided messaging in a way that can speak to an audience with a diverse set of beliefs and attitudes regarding an issue or behavior (Ivanov, 2012). Inoculation messages induce a feeling of threat to the receiver's attitudes and/or beliefs about the message topic that can be internal (e.g. "do I hold the correct attitude towards this issue or behavior?") or external (e.g. "It is likely that someone will try to change my current attitudes regarding this issue or behavior") (Compton & Pfau, 2005; Ivanov, 2017; Pfau et al., 2005). Inoculation theory offers guidance in terms of message construction and a growing body of research has elaborated on how various psychological mechanisms operate to achieve desired message effects. This theory may also allow insight into how various audience members interpret messages by assessing how levels of involvement operate through various hypothesized mechanisms of inoculation theory, such as counterarguing and word of mouth communication. A number of studies have sought to understand how inoculation messages work for those who already hold the preferred attitudes (i.e. sustaining non-smoking attitudes for smoking prevention over time (Pfau & Van Bockern, 1994)), as well as for those with neutral (i.e. ambivalent) or negative attitudes (i.e. unhealthy attitudes) (Ivanov, 2017; Ivanov et al., 2016; Niederdeppe, Heley, & Barry, 2015; Pfau et al., 1997; Wong & Harrison, 2014; Wood, 2007). However, this theory has not been widely used in health communication, and thus deserves further exploration, as the current standard of one-sided message strategies in health communication may be limited in the context of an issue surrounded by decades of misinformation and perpetuated false claims.

Misinformation and the Utility of Inoculation Theory

One of the many reasons for which inoculation theory is a promising framework for health communication campaigns is that it acknowledges the fact that we live in a free and instant information society. If channels of communication and information dissemination through said channels were restricted, as they are in totalitarian governments, inoculation may not be necessary or effective because information and attitudes would be mostly homogenous and met with congruent messaging. However, in a system where freedom of speech is a highly valued constitutional right, contradicting opinions and information flow freely through communication channels, and while systems are in place to retroactively refute or correct mis- or dis-information, the damage has already been done. Social psychological research has revealed insight into natural human susceptibility to readily accept misinformation (Gilbert, Tafarodi, & Malone, 1993; Lewandowsky, Ecker, Seifert, Schwarz, & Cook, 2012). Following a Spinozan philosophy, individuals more readily accept information, allowing attitudes and subsequent ideas to develop around the topic, and only then, after these ideas or initial attitudes have been formed, validity filters are applied (Gilbert et al., 1993; Rapp, Jacovina, Andrews, Rapp, & Braasch, 2014). According to Spinozan philosophy, individuals are perfectly capable of refuting or disagreeing with new information, but this process is much more demanding than the process of accepting new information. Refuting new information requires one to: be motivated and able to refute the information; logically assess the information and the implicated alternatives/counter viewpoints; and have access to at least some correct information, be it through one's personal experiences, or exposure to other information sources (e.g. news or information, either from other outlets, or through social networks).

However, even if misinformation is corrected, research has shown that pre-existing beliefs and attitudes about an issue, or in this case – a behavior, still have an impact, even after a factual correction of misinformation (Thorson, 2016). Compounding this issue is the ease with which information spreads through various communication channels. Considering the heterogeneity of the indoor tanning audience (Hillhouse, Turrisi, & Kastner, 2000; Kelley et al., 2016; Pagoto & Hillhouse, 2008; Stapleton et al., 2008), prevention messages are likely to compete with a variety of pro-tanning messages that span numerous communication formats and differ in content. Much is left to be understood about the most effective and sustaining message format for indoor tanning prevention and reduction messages.

Inoculation theory offers a promising approach for correction of misinformation. Inoculation messages are hypothesized to heighten motivation for message processing as well as provide strong anti-tanning arguments in response to existing pro-IT arguments, thus making correct information readily available and presented in the context of existing counter viewpoints. The origins of the theory, constructs, and application to this project are described below.

Inoculation theory

Inoculation theory originated from a series of studies conducted by Lumsdaine and Janis in the early 1950's which showed that, while one-sided messages (messages that ignore opposing arguments) and two-sided messages (messages that acknowledge opposing arguments) were both effective at protecting attitudes and promoting resistance, the effects of two-sided messages were better sustained over time relative to one-sided messages (Lumsdaine & Janis, 1953). This was a promising finding, but the mechanisms that made two-sided messages more effective were not uncovered in Lumsdaine and Janis' research. It was not until the early 1960's that these mechanisms would become a topic of research interest when social psychologist, Dr. William

McGuire, expanded upon Lumsdaine and Janis' findings by applying an analogic theoretical perspective to the utility of two-sided messages. Using medical inoculation as an analogy, McGuire described inoculation theory as synonymous to a flu shot (1961). Following the analogy, a medical inoculation works by injecting a weakened dose of a virus into the patient, thus allowing the patient to develop an immunity response to the virus. In the context of persuasive communication, the weakened dose of the virus is introduced during pretreatment messages, which provides an argument counter to the desired argument, but in such a way that is not strong enough to be persuasive. This message also contains examples of refutations to counterarguments, thus analogous to the body's production of antibodies with the introduction of a virus (Ivanov, 2012).

McGuire (1961) further explained the application of inoculation relative to existing methods of persuasion at the time by pointing to some of the weaknesses of existing efforts, which ignored or did not acknowledge a competing point of view. Specifically, forced or unanticipated exposure to conflicting messages is analogous to the issue of one being exposed to a virus (which is often unknown until symptoms present). Since the individual has not encountered this virus (competing point of view) previously, he or she has not yet developed a defense or resistance to it and will likely not have the skill to do so, making the person vulnerable to infection (attitude change). McGuire expanded upon the analogy by offering two possible scenarios for resistance: the first is analogous to a healthy diet and exercise – this is “supportive” therapy (similar to the purpose of vitamins) intended to strengthen health/resistance to a small dose of a virus (competing attitude). Alternatively, the more effective pathway to resistance is forced exposure to the virus, thus allowing the individuals to develop immunity over time, so in the case that they are exposed to a real-world dose of the virus, the individuals are

better protected and able to handle the exposure without compromising their health (attitude).

This extension grew from the effects witnessed in prisoners of war. The general approach was to teach the values and beliefs of the American way, without exposing soldiers to the viewpoints of the enemy. This did not bode well, as many succumbed to the persuasion of the enemy while being held captive, turning away from pro-American attitudes. This was because the soldiers were only given the one-sided, pro-American view. Had they undergone training in the form of inoculation, they may have been less susceptible to this attitude change (McGuire, 1961).

Mechanisms of Persuasion

The initial conceptualization of inoculation theory rested largely on two process mechanisms – threat and counterarguing. Threat refers to the “shock” or realization that others may hold different attitudes and that at some point, existing attitudes are susceptible to being challenged, thus motivating an individual to build defenses to uphold their attitudes (Ivanov, 2017). Threat is introduced implicitly in inoculation messages as a weakened counter-argument (or argument opposed to the purpose of the prevention message) (McGuire, 1961). Threat is the mechanisms that *motivates* the receiver to develop defenses to future attacks, and inoculation messages provide an example of how to defend or maintain a healthy attitude in the face of an attack (Ivanov, 2017). Counter-attitudinal arguments are purposefully weakened (much like the introduction of a weakened virus via vaccination) as to not overwhelm or inadvertently persuade the message receiver in favor of the counter-attitudinal position. McGuire later added an explicit threat to messages, called a forewarning, which informed message receivers that their viewpoints would be challenged (McGuire & Papageorgis, 1962). This threat is meant to encourage individuals to develop defenses (counterarguments against future counter-attitudinal attacks, which is facilitated by presentation of strong arguments to refute the weakened counter-

attitudinal arguments initially presented (Ivanov, 2017), thus modeling a strong argument against future counter-attitudinal attacks.

Although threat is an integral piece of the inoculation process, a meta-analysis of inoculation processes (Banas & Rains, 2010) did not find threat to be a significant predictor of inoculation outcomes. Further, more recent studies have pointed to issues with the measurement of threat (Ivanov, Burns, et al., 2016; Richards & Banas, 2015), indicating that the current measurement of threat is not sensitive enough. The current study will not measure threat for three reasons. The first is that the measurement of threat is likely not specific enough for the indoor tanning context. Second, applying a measure of threat may confound results of the experiment by priming participants to the preferred attitudes (i.e. anti-tanning, in the context of the present study) (Compton & Ivanov, 2012). Third, the level to which tanners and non-tanners are involved with the actual behavior of indoor tanning is highly debatable as the driving motivation behind indoor tanning is achieving a culturally defined norm of attractiveness, which favors tanned skin. Further, a recent study of college females revealed that 99.4% of women were well aware of the health effects associated with indoor tanning, yet, 69% of these women said they would continue to tan, citing reasons related to convenience and the confidence that having a tan provides (Yang & Han, 2016). Various studies have found that many who tan are aware of the risks, and endorse appearance reasons and convenience as expectations associated with tanning (Kelley et al., 2016; Noar, Myrick, Morales-Pico, & Thomas, 2014; Noar et al., 2015). Additionally, studies have found social and cultural norms of attractiveness as motivators for tanning behavior (Cox et al., 2009; Day, Wilson, Hutchinson, & Roberts, 2016; Gillen & Markey, 2012; Stapleton, Turrisi, & Hillhouse, 2008). It is likely that indoor tanning itself is not the motivation to use a tanning bed— the involvement (mechanism described below) lies within

goals of achieving culturally defined norms of attractiveness, which in the U.S. has much to do with tanned skin. Therefore, instead of measuring threat directly, the current study adheres to O'Keefe's recommendations to make the features of the message clear in order to define the threat manipulation (O'Keefe, 2003). Thus, inoculation messages will contain an explicit counter-argument (i.e. pro-tanning argument), and the one-sided and control messages will be void of any such argument. Regardless of how involved someone is with indoor tanning, inoculation messages are likely to make the issue of indoor tanning salient, thus enabling receivers to access or develop attitudes and beliefs about indoor tanning behavior (Pfau et al., 2005).

Over five decades of research have exposed other mechanisms of persuasion that are inherent to inoculation theory (Ivanov, 2017). Involvement, often conceptualized as how important a given issue is to an individual, is one of these mechanisms. Until fairly recently, inoculation messages were thought to only be effective for those who were at least moderately involved in a topic area (Compton & Pfau, 2005). However, a meta-analysis of the processes of inoculation theory (Banas & Rains, 2010) did not find results to support this assertion, and studies have shown that inoculation messages may be effective across the spectrum of negative, neutral, and positive attitudes, indicative of involvement (Ivanov, Rains, et al., 2016; Wood, 2007). Involvement has been found to directly affect the process of persuasion (Pfau, Tusing, Koerner, et al., 1997), moderate the process by affecting other mechanisms (e.g. counterarguing) differentially at varying levels of involvement, and mediate the process of persuasion by enhancing the effect of inoculation through other mechanisms (Banas & Rains, 2010; Ivanov, 2017).

Considering the nuances with involvement and indoor tanning, involvement for the present study will instead be conceptualized as previous indoor tanning experience. The aforementioned conceptualization of involvement is novel in the context of inoculation theory, in which inoculation serves to maintain preferred *attitudes* and motivate counterarguing towards *issues* for which people hold attitudes and beliefs towards. The present study takes a novel approach by trying to understand the use of inoculation theory when the “issue” is a behavior. This approach also introduces a new way to consider the presence of threat, as well as what is being inoculated against. For those who have tanned, the presence of counterarguing a pro-tanning message, and ultimately a reduction in intentions to tan serve as indicators of the presence of threat as motivation to argue against a behavior one participates in and reduce intentions to continue that behavior. For those who have tanned, the goal of inoculation is to protect receivers from believing misinformation regarding indoor tanning that may be encountered, as well as preventing escalation of indoor tanning behavior, and reducing or stopping the behavior altogether. For those who have never tanned, counterarguing and reduced intentions to tan are also indicative of threat, and inoculation in this context is conceptualized as true prevention.

Self-efficacy is an instrumental, but less understood, construct in the inoculation process (Banas & Rains, 2010; Compton & Pfau, 2005; Ivanov, 2017). Like involvement, self-efficacy can act independently, or as a moderator or mediator. Similar to the conceptualization of self-efficacy in Social Cognitive Theory (Bandura, 1977), higher levels of self-efficacy often lead to desirable outcomes (e.g. successful avoidance of indoor tanning bed use), and is often impacted by messaging efforts (i.e. messages that provide clear arguments against and alternatives to indoor tanning may increase levels of self-reported self-efficacy). While the findings regarding

self-efficacy in the context of inoculation theory are non-conclusive, it is of interest to explore this mechanism in the current study. Thus, self-efficacy will be measured to understand the role of this mechanism in the context of indoor tanning.

Interpersonal communication, or post-inoculation talk, is another mechanism that has been found to have significant implications for how inoculation message operate (Compton, Dillard, & Shen, 2013; Compton & Pfau, 2009; Ivanov, 2017; Ivanov et al., 2012). The effects of interpersonal communication on campaign outcomes is also a topic of interest in the literature, as the influence of interpersonal communication is not exclusive to inoculation messages (Southwell & Yzer, 2007, 2009; van den Putte, Yzer, Southwell, de Bruijn, & Willemsen, 2011). When faced with information that conflicts with an individual's own attitudes and beliefs, interpersonal communication may be away to affirm the individual's attitudes and beliefs, or an effort to understand new information (Compton & Pfau, 2009; Southwell & Yzer, 2007). Interpersonal communication may also be the product of messages increasing individuals' perceived knowledge of a given topic area (Southwell & Torres, 2006). In the context of indoor tanning, in which an abundance of misinformation has been disseminated (Balk et al., 2015; Greenman & Jones, 2010), the presentation of two sides of the indoor tanning argument may lead some to seek confirmation of their existing attitudes and beliefs (especially for those who have previously indoor tanned), or may embolden others to share what they learn about misleading claims with friends or others who indoor tan. The current study will explore the role of interpersonal communication by assessing actual communication about messages, as well as intended communication about messages.

Application to Indoor Tanning Prevention Messages

The inoculation approach is promising for behaviors for which an abundance of marketing claims exists with varying degrees of validity, for devices such as indoor tanning. These claims have appeared across a variety of communication channels (Cho, Hall, Kosmoski, Fox, & Mastin, 2010; Freeman, Francis, Lundahl, Bowland, & Dellavalle, 2006; Greenman & Jones, 2010; Kwon et al., 2002; McWhirter & Hoffman-Goetz, 2015a; Team & Markovic, 2006), thereby increasing the likelihood that these claims will be encountered at some point, if such encounters have not happened already. Further complicating the issue of indoor tanning is the fact that indoor tanning is a behavior that is the result of culturally defined norms of attractiveness, which in the U.S. largely include tanned skin (Cox et al., 2009). Since trying to address issues of culturally constructed ideals with messages is a lofty goal, inoculation messages offer a unique approach to addressing this issue from a different angle. Specifically, considering the theory of cognitive dissonance, it is likely that these pieces of misinformation regarding indoor tanning serve the purpose of assuaging the psychological discomfort that arises from participating in a known harmful behavior (i.e. indoor tanning) to achieve an overarching goal (i.e. attractiveness) (Festinger, 1962).

Project Scope

This project used a systematic design in which the information from one study informed the subsequent study. Young, Caucasian women represent the target population for this project because research has demonstrated that they exhibit the highest levels of IT behavior (Guy, Berkowitz, Watson, Holman, & Richardson, 2013) and are experiencing concomitant increases in melanoma incidence (Ghiasvand et al., 2017; Holman & Watson, 2013; Lazovich et al., 2016; Panning, Smith, Spohn, & van Wesenbeeck, 2016; Purdue, Freeman, Anderson, & Tucker, 2008; Yang & Han, 2016). Following the inoculation approach to message design, extensive formative

research was conducted to understand the state of the pro-tanning communication environment, as well as to develop, test, and modify messages before conducting the full message-testing experiment (Ivanov, 2017). Chapters two through four are complete with introduction, methods, results, and discussion sections. Tables and figures immediately follow respective chapters, while appendices and references can be found at the end of the document.

Chapter two describes the content analysis of pro-indoor tanning content using a systematic approach to sample content from Google.com. This chapter serves as the foundation for message development as results informed message content for inoculation, one-sided, and control messages.

Chapter three describes the qualitative and quantitative process of message development and pre-testing. The chapter first describes the process of message development. Message development was then followed by qualitative research via cognitive interviews in order to understand how members of the target audience (young adult women) interpreted messages, as well as to understand the natural language used to describe or talk about indoor tanning and ways in which messages could be made more clear and persuasive. The second part of message development involved a quantitative online pilot messaging experiment, which enabled the researcher to understand how messages were performing according to the mechanisms of inoculation theory.

Chapter four describes the experimental test of inoculation, one-sided and control messages. This chapter highlights the differences between inoculation and one-sided messages, as well as the potential for the application of inoculation messaging strategies in the context of indoor tanning.

Chapter five provides an overall discussion of the research presented in the preceding chapters, as well as study limitations, future directions for research, and overall conclusions.

CHAPTER 2

Understand the Pro-tanning Communication Environment: A Content Analysis

Introduction

For over a decade, there has been great concern about misleading information regarding indoor tanning promoted by tanning salons and other indoor tanning entities. In 2008, the FTC filed a formal complaint in regards to the “tanning hype” campaign promoted by the Indoor Tanning Association (ITA), a registered non-profit industry with the stated purpose to “advance the business growth and image of the indoor tanning industry, and the welfare of its membership.” (Balk JB, 2015; FTC, 2008). This “tanning hype” campaign sought to discredit warnings about the dangers of indoor tanning by explicitly stating the warnings against indoor tanning were “myths” or “scams,” followed by a direct refutation of the myth. This campaign aired across several channels including: television, newspapers, posters, and websites (FTC, 2008). In many ways, this campaign used an inoculation approach to encourage consumers to tan indoors by seeking to assuage any concerns brought about by research on the harms of indoor tanning. Below is an example from one of the campaign websites, www.sunlightscam.com:

“SCAM: Indoor tanning is more dangerous than tanning in the sun

TRUTH: Just the opposite is true. Unlike tanning outdoors, indoor tanning is designed to match your skin type and desired tan in a well-regulated, controlled environment. Consequently, the vast bulk of scientific research indicates that indoor tanning is a safer alternative to tanning outdoors.”

Other prominent claims featured in this campaign included: indoor tanning as a source of vitamin D, which prevents various diseases; discrediting the association between indoor tanning and melanoma; indoor tanning as a safer alternative to outdoor tanning (as in the example above); government approval of indoor tanning; and control of indoor tanning as safe tanning (FTC, 2008). Shortly after the FTC complaint, the campaign was pulled and since then, indoor tanning campaigns and advertisements have primarily focused on price promotion and appeals to appearance (e.g., “bronze glow”). However, the claims set forth by the industry have persisted across media channels ever since. In their report for the New York State Office of the Attorney General, Balk et al. presented exhibitory evidence of false claims about health benefits and the safety of indoor tanning found on a selected sample of tanning salon websites. This study seeks to expand upon the efforts of Balk et al. (2012) by providing perspective on the prevalence and saturation of common indoor tanning claims, in relation to other motivations for tanning such as appearance and relaxation, using a systematic quantitative content analysis of websites found using pro-tanning search terms on Google.com.

Indoor Tanning Communication Environment

Understanding the communication environment that surrounds a given issue is a critical, yet often overlooked, step for message construction, especially as it relates to health communication and public health campaigns. Such an assessment provides the message designer a glimpse into the pro-risk behavior messages that the target audience is most frequently exposed to, as well as the most prevalent pieces of misinformation that could be addressed with a public health campaign. A survey of the communication environment can also provide insight as to the contextual factors (i.e. communication source, type of website - .com, .org) which may influence,

support, or modify existing beliefs or behaviors, helping the researcher to better understand the target population and potential counter-messaging strategies.

In fact, there are a variety of dangerous health behaviors for which misinformation abounds. Approaching content with a theoretical framework enables the content analyst to infer from the content possible consequences of exposure as well as motivations behind the production of the content (Riff, Lacy, & Fico, 2014). Given these advantages, the present study is developed with Inoculation Theory as a foundation. Dr. William McGuire developed inoculation theory (McGuire, 1961) based on Lumsdaine and Janis (1952) fundamental research on the utility of two-sided refutational messages over traditional one-sided messages (Lumsdaine & Janis, 1953). The term “inoculation” reflects the mechanisms of the theory, which operates similarly to the mechanisms of vaccination. In order to protect individuals from the harms of mis- or disinformation, the inoculation approach states that the misinformation must first be presented as a weak argument, and then directly refuted with a strong argument that shows why the misinformation is, in fact, false. Therefore, the first and most critical step in protecting people from the effects of misinformation, or claims, is to understand what the claims are and the extent to which these claims are perpetuated in the communication environment.

Assessing the communication environment can be done using a variety of methods such as surveys, direct observation, interviews, or content analysis. Content analysis allows for the most objective and unobtrusive analysis as it eliminates participant biases (but does not include participant perceptions), and many of the researcher biases that are associated with participant interaction (e.g. social desirability, halo effect). Further, content analysis focuses on the manifest content of communication, eliminating the ambiguity of latent content by focusing solely on the denotative or shared meaning of the content. This represents a strength of content analysis for the

purpose of analyzing manifest content over other descriptive methods such as surveys or interviews, which are likely to collect less objective latent content, paired with manifest content. Finally, content analysis allows the analyst to understand the cultural narrative and social attitudes surrounding an event, issue, or attitude object at a given point in time. Going back to the first step in the inoculation approach, through understanding the prevalence of misinformation about a given topic also comes an understanding of how the issue at large is framed and its place in a societal context.

Content Analysis

According to Riffe, Lacy, and Fico, “quantitative content analysis is the systematic and replicable examination of symbols of communication,” which are analyzed using numeric values that lend nicely to quantitative statistical analyses, “to describe the communication, draw inferences about its meaning, or infer from the communication to its context, both of production and consumption” (2014, pg. 19). Without content analysis, questions regarding the source of the content or the effects of the content cannot be fully understood. Content analysis allows the researcher to look objectively at how an issue originated, progressed over time, and to better assess the subsequent impact of the content on those exposed.

Literature Review

Existing Content Analyses of Pro-indoor Tanning Content

Seven content analysis studies relevant to arguments in support of indoor tanning were identified in the literature. Six of these studies (Cho et al., 2010; Freeman et al., 2006; Kwon et al., 2002; McWhirter & Hoffman-Goetz, 2015a; Ricklefs et al., 2016; Team & Markovic, 2006) used rigorous content analysis methods, and the one (Greenman & Jones, 2010) used a less

systematic content analysis approach to compare tobacco and indoor tanning advertisements from a variety of sources. Four studies focused on advertisements and promotional materials for tanning salons and related products. These focused on ads in newspapers (Freeman et al., 2006; Kwon et al., 2002), multiple media channels (Greenman & Jones, 2010), and social media posts (Ricklefs et al., 2016), and two focused on articles regarding indoor tanning found in popular female-oriented magazines (Cho et al., 2010; McWhirter & Hoffman-Goetz, 2015b). Finally, one analyzed websites for 22 indoor tanning salons found in Australia (Team & Markovic, 2006).

Studies that analyzed advertisements for indoor tanning reported promotional offers as the most prevalent appeal. Advertisements were generally void of health and safety claims (with the exception of a small number of health claims (2%) (Ricklefs et al., 2016), and safety (10% and 2%, (Kwon et al., 2002; Ricklefs et al., 2016) claims, and very few used appearance or relaxation benefits within promotional materials. Detailed content pertaining to health, safety, and appearance reasons for indoor tanning was found across the four studies which focused on articles (Cho et al., 2010; McWhirter, 2015) or websites (Ricklefs et al., 2016; Team & Markovic, 2006). Specifically, the idea that indoor tanning is safe because it is controlled was found in 3 studies (Kwon et al., 2002; Ricklefs et al., 2016; Team & Markovic, 2006), while a variety of health claims (e.g. vitamin D, disease prevention, immune support) were found across five studies (Cho et al., 2010; Greenman & Jones, 2010; McWhirter & Hoffman-Goetz, 2015a; Ricklefs et al., 2016; Team & Markovic, 2006). Appearance appeals (e.g. look attractive, sexy) were also common. Relaxation and psychological benefits were less common, but still appeared in three studies (Cho et al., 2010; Greenman & Jones, 2010; Team & Markovic, 2006).

The aforementioned content analyses offer insight into some of the claims made in support of indoor tanning, as well as the type of content analyzed and various methods of

sampling. These studies provide a strong foundation from which to understand many of the claims surrounding indoor tanning. The current study expands on previous work by extending the universe of content using a systematic Google search strategy. Considering the frequency with which people turn to the internet to seek out information, pulling content from indoor tanning websites that come up prominently in search results is likely to be representative of arguments that the target audience is commonly exposed to (Le Clair & Cockburn, 2016; Panning et al., 2016; Reinau, Meier, Blumenthal, & Surber, 2015). By extending the reach of the sample, limitations related to geographic, channel, source, and platform constraints may be evaded, providing a well-rounded snapshot of the current pro-indoor tanning environment.

Current Study

In order to effectively address and correct commonly accepted indoor tanning claims, the most prevalent claims must first be identified. To do this, we sought to characterize the current state of the pro-tanning communication environment, using a systematic search of web content related to stated benefits of indoor tanning

Methods

Website Sample

To retrieve pro- indoor tanning content, a series of general search terms reflecting positive aspects of tanning (“~indoor tanning AND ~benefit”; “~indoor tanning AND ~positive”; “~indoor tanning AND ~healthy”; “~indoor tanning AND ~good”; “~indoor tanning AND ~smart”; and “~indoor tanning AND ~safe”) were developed and used in separate searches (see Table 1). The “~” ensured that terms that were variations on term indoor tanning (e.g., tanning bed) would also be included when the searches were conducted.

While understanding the prevalence of claims about indoor tanning was the primary focus of this analysis, claims were not searched for explicitly in order to provide a more holistic analysis of the content that someone may find when searching for information about benefits of indoor tanning using Google search engine. A recent study found that the words “tanning,” “tanning bed,” and “tanning salon” are searched more than 75,000 times per month (Serrano et al., 2016). This high volume of indoor tanning related searches suggests that using Google is likely to be an efficient platform in which to identify the most prevalent pro-tanning arguments.

The use of general, instead of claim-specific, terms allowed for the coding of themes related to appearance and relaxation, which in turn, serve as a metric of comparison for the prevalence of indoor tanning claims. As cited in the literature, appearance and relaxation are two major motivators for indoor tanning (Danoff-Burg & Mosher, 2006; Holman & Watson, 2013; Jerod Stapleton, Turrisi, Hillhouse, Robinson, & Abar, 2010). However, these reasons for tanning are fundamentally different from indoor tanning claims, as appearance and relaxation claims are personal preferences that are less likely to be refuted by science.

Each term was entered into Google Search and was reviewed for the type and frequency of websites that appeared (see *Figure 1*). Websites were examined only if they appeared within the first three pages returned by the search (i.e., roughly 30 websites in each search). This rule was used because research has shown that less than 50% of people look past the third page of results returned in an internet search (Van Deursen & Van Dijk, 2009).

To be included in the sample, sites had to predominantly promote pro-indoor tanning information or topics and be available in English. Sites that were limited to location or contact information, duplicate sites, sites offering minimal pro-IT content, or those that had restricted access or were undeveloped (i.e. layout only, no content) were excluded from the sample.

All website content was downloaded at the same time that the searches were conducted (June 2016). Evernote Web Clipper (<https://evernote.com/webclipper/?var=4>) was used to capture the content present on each page during the time of the search. Since websites and Google searches can be dynamic from day to day, (particularly for current social and regulatory issues such as indoor tanning), depending on who is curating the website contents, downloading the content at the time of the search and using these files for analysis ensured that the coders were coding identical versions of the website.

These criteria yielded 206 unique websites collected using the six search terms. After a review of each site, 128 were excluded because they failed to meet one or more of the previously stated criteria. Therefore, 78 sites comprised the sample for coding and analysis. The unit of analysis was the website page (i.e. the page that appeared directly from the search). Therefore, 78 unique website pages were included.

Coding Categories

A review of the literature, existing campaigns, and relevant legal and policy documents informed the construction of variables. These variables were organized into three overarching categories – 1) descriptive variables (e.g. source of information, site type, valence of information), 2) claims about the health and safety of indoor tanning, and 3) appearance, social, and psychological tanning appeals. The appearance, social, and psychological benefits category (category 3) provides perspective on the prevalence of the claims (category 2), and the descriptive information (category 1) provides information necessary to understand the communication environment in which the other two categories appear. All major themes, codes per major theme, and examples of codes can be found in *Appendix 1*.

Descriptive communication variables (category 1)

Variables related to the source of communication and presentation of information provide context that is useful to understanding the communication environment. To this extent, domain name, site type (e.g. .com, .org), source category (e.g. tanning salon, personal blog), balance of information (e.g. all pro-tanning, mostly pro-tanning), citing and refuting research about the harms of indoor tanning, citing research in support of indoor tanning, and the use of “truth” and “myth” were coded.

Claims about the health and safety benefits of indoor tanning (category 2)

As reported by Balk and colleagues, and supported by a number of other health organizations (Balk et al., 2015; CDC, 2014), there are numerous claims about the health benefits (e.g. vitamin D) and safety (e.g. control over UV exposure in a tanning bed) of indoor tanning. This category includes claims about indoor tanning as a way to prevent and treat various diseases; indoor tanning as a source of vitamin D; achieving a “healthy glow” from using a tanning bed; use of indoor tanning to develop a base tan to protect against future sun exposure; and refuting the association between indoor tanning and various forms of skin cancer.

Claims about the safety of indoor tanning include the idea that indoor tanning is controllable, and therefore safe; indoor tanning is safer than the sun; indoor tanning is safe because it is regulated and approved by the government/ the government controls the exposure schedule and inspects equipment (both of the latter claims are not true); and indoor tanning is only dangerous if one tans to the point of achieving erythema (i.e. “sunburn”). Statements that promote the safety of indoor tanning regarding dermatologists recommendations to indoor tan, as

well as discrediting dermatologists' and the sunscreen or "sunsare" industry claims about the dangers of indoor tanning for personal gain were also captured.

Appearance, social, and psychological appeals (category 3)

There is an abundance of evidence in the literature pertaining to the appearance motivations for indoor tanning. These include: general appeals to appearance (e.g. look attractive, beautiful bronze glow); hiding skin imperfections (this is separate from *treating* skin imperfections); social benefits (e.g. build self-confidence/esteem, become more popular, get compliments); and *looking* thinner (separate from actual weight loss or prevention of weight gain) (Hillhouse et al., 2000; Noar et al., 2015; Prior, Fenwick, & Peterson, 2014). Content analyses have also shown that appearance appeals are often used to promote indoor tanning in pro-indoor tanning communications (Cho et al., 2010; Greenman & Jones, 2010; McWhirter & Hoffman-Goetz, 2015b; Team & Markovic, 2006).

Multiple studies have reported evidence from pro-indoor tanning content and participant self-reports of claims related to the idea that indoor tanning is a way to alleviate symptoms of psychological ailments such as depression, seasonal affective disorder, or mood disorders. Indoor tanning has also been reported as a way to relax or de-stress. Variables coded in this category include indoor tanning as a way to alleviate stress, symptoms of depression, seasonal affective disorder, and anxiety. Promotion of relaxation, or better mood state were also coded (Heckman, Darlow, Cohen-Filipic, & Kloss, 2016; Joel Hillhouse, Stapleton, Florence, & Pagoto, 2015; Kelley et al., 2016).

Procedure

Training and preliminary testing

Before coding the full sample, 2 coders reviewed coding expectations and how to navigate the content (Riff et al., 2014). A detailed codebook, complete with examples and descriptions, was also reviewed. In total, a random sample of 25% ($n=20$) of the websites was coded by both coders to determine reliability. The remaining 58 sites were coded by the main coder (DK). Krippendorff's alpha and percent agreement were used to assess reliability between coders (see Table 2 for interrater reliability for each individual code). Reliability ranged from .85-1 (92%-100% agreement).

Data analysis

Descriptive statistics (frequencies and proportions for nominal and ordinal level variables; frequencies, means, and standard deviations for interval and ratio level variables) were examined to understand the most frequent claims or arguments in support of indoor tanning, as well as the distribution of claims according to logistic information (e.g. place in search results, site type). Where appropriate, chi-square tests or ANOVAs were used to examine differences in content frequency as well as across source categories and website types.

Results

Contextualizing variables

Tanning salon websites comprised over half the sample (56%; $n=46$), followed by professional blogs (18%; $n=14$), industry sites (13%; $n=10$), and personal blogs (10%; $n=8$). None of the search terms returned any news sources. Ninety-two percent of sites were .com

domains, indicating that the majority of the content was curated by commercial sources. As expected given the inclusion criteria and the type of sites that came up in the search, the balance of information was predominantly pro-indoor tanning ($M=1.2$, $SD=0.43$, where 1 = *all pro-tanning content*, and 5 = *all anti-tanning content*). Although sites largely supported and promoted indoor tanning, a significant difference in the balance of information across sources was found. Personal blogs were more likely to feature information about the health and safety claims of indoor tanning ($M=1.8$, $SD=0.71$), relative to tanning salons ($M=1.1$, $SD=0.21$; $F(3,78)=8.96$, $p<.05^2$; see *Table 2*).

In terms of how information was presented, 19% of sites used the word “truth” to talk about the benefits of indoor tanning, and 9% used the word “myth” to denounce arguments against indoor tanning. Only one personal blog site used the word “truth” to talk about the dangers of indoor tanning. None of the sites used the word “myth” to discredit misinformation about the benefits of indoor tanning (see *Table 2*).

Only 12% ($n=9$) of sites cited and refuted research about the dangers of indoor tanning, whereas 31% ($n=24$) of sites cited research in support of indoor tanning, with no major differences across source types (see *Table 2*).

Claims

Overall, every website in the sample mentioned at least one health or safety claims. Conversely, only 49% of sites mentioned at least one appearance, social, or psychological claim of tanning. There were no significant differences in the prevalence of safety or health claims, or

² Differences between source types were tested using the Games-Howell post-hoc statistic due to the unequal group sizes across source types.

appearance, social or psychological benefits across source types (tanning salon, personal blog, professional blog, or industry website). However, clear differences in the prevalence of health and safety claims compared to appearance, social, and psychological benefits were found within every source category (see *Figures 2 and 3*).

Health Claims

Eight-six percent of sites mentioned at least one health claim (see *Table 3*). Across the four site types, 83% of tanning salons, 75% of personal blogs, 100% of professional blogs, and 90% of industry sites mentioned at least one health claim. Overall, an average of 3.1 ($SD=2.34$) health claims were mentioned per site. Professional blogs featured the highest average number of health claims ($M=3.8$, $SD=2.46$), followed by tanning salons ($M=3.0$, $SD=2.98$), industry ($M=2.9$, $SD=2.18$), and personal blogs ($M=2.5$, $SD=2.00$). The most frequently reported claim related to indoor tanning related to the idea that tanning beds are a way to *prevent* various diseases (See *Table 4* for overall frequencies and frequencies by communication source), with 73% of sites mentioning indoor tanning as a way to prevent at least one disease (e.g. cancer, 36%). It is important to note that many of these prevention claims were in relation to receiving vitamin D from indoor tanning, which 63% of sites explicitly stated indoor tanning is a direct source of vitamin D, and an additional 6% of sites mentioning vitamin D, generally, without explicitly stating tanning beds were a source of vitamin D. Thirty-five percent of sites claimed tanning beds treated a physical health condition, with treatment of skin conditions (such as acne or psoriasis) mentioned most often, appearing in 23% of the sample.

Indoor tanning as a way to develop a base tan to protect against future erythema was mentioned in 41% of sites. Twenty-seven percent of sites claimed that things other than indoor tanning (e.g. genetics, skin tone) lead to skin cancer, and 12% claimed no association between

indoor tanning and skin cancer. Fifteen percent of sites referred to indoor tanning as a way to achieve a “healthy glow.”

Safety Claims

Ninety percent of the sites featured at least one safety claim, with an overall average of $M=2.9$ ($SD=1.76$) safety claims featured per site (see *Table 4*). Industry sites featured the highest number of safety claims ($M=3.2$, $SD=0.92$), followed by tanning salons ($M=3.0$, $SD=1.97$), professional blogs ($M=2.6$, $SD=1.70$), and personal blogs ($M=2.4$, $SD=1.41$). The prevalence of all safety claims by source, as well as overall, can be found in *Table 5*. Eighty-one percent of sites featured a claim about controlled tanning, with the claim that a controlled dose of UV from a tanning bed is a safe being most prominent (73%), followed by the idea that tanning is only dangerous if erythema occurs (60%) and tanning beds are safer than the sun (49%).

Fifty-six percent of sites cited government regulation in the context of safety of indoor tanning; specifically, FDA (28%), state or local governments (6%), and government broadly³ (36%). Twenty-six percent of sites referred to dermatologists and the “sunscreen/sunscare” industry as a way to downplay claims about the dangers of indoor tanning and discredit healthcare professionals and prevention specialists. Specifically, 17% discredited the “chemical sunscreen” industry as a dangerous way to protect against sunburn and an industry that lies about the dangers of indoor tanning to protect profits. Twelve percent stated that dermatologists recommend indoor tanning for skin conditions.

³ This category also included broad statements about indoor tanning regulation in other countries. For example, “Indoor tanning procedures are highly regulated by government agencies in both Canada and the United States and the equipment is designed to mimic the effect of sunlight.” (<http://www.tanningsalonlotion.com/the-benefits-of-indoor-tanning-vs-outdoor.html>)

Four percent made other claims about dermatology (e.g. “Some dermatology industry leaders, in efforts to increase awareness about sun care, have clearly overstated the risks associated with UV exposure. For example, dermatology industry leaders have gone on record advocating daily use of sunscreen 365 days a year in all climates”), and 1% claimed dermatologists falsely report the dangers of indoor tanning so that they can charge more to make people use the UV beds in dermatologists’ offices.

Appearance, social, and psychological benefits of indoor tanning

Forty-nine percent of sites mentioned at least one appeal to appearance, social, or psychological benefits of tanning (see *Table 5*). Overall, sites mentioned an average of $M=0.8$ ($SD=1.05$) appeals, with professional blogs featuring the most ($M=1.1$, $SD=1.23$), followed by tanning salons ($M=.8$, $SD=1.11$), personal blogs ($M=0.5$, $SD=0.76$), and industry sites ($M=0.4$, $SD=0.52$). No significant differences were found by source type for any of the variables in this category. The most common claims mentioned were those related to appearance 21%, followed by relaxation or mood enhancement (21%) and alleviating symptoms of depression or seasonal affective disorder (18%).

Discussion

This study confirms the prevalence of indoor tanning claims regarding health and safety that many public health and health communication experts have been trying to correct with various public information campaigns (Foundation, 2016; Organization, 2014; Prevention, 2014, 2016). Safety and health are two very clear themes emerged from this analysis. The first regards beliefs that indoor tanning is safe, controlled, and safer than tanning outdoors, or even using sunscreen. The second is health-related, including indoor tanning as a cancer prevention tool for

cancers other than skin cancer (e.g. colon cancer, breast cancer, ovarian cancer), as well as a source of vitamin D, and prevention from future sunburn (“base tan”).

Although direct comparisons between this analysis and previous content analyses of pro-indoor tanning communication cannot be drawn given the differences in sample selection, findings from this study differ from previous studies which focus primarily on appearance claims; the present study supports the prevalence of claims being refuted in messaging themes currently featured in campaigns (e.g., base tan, controlled tanning, vitamin D) and suggest that these claims are likely among the most prevalent. Further support of the prevalence of these claims is provided by the absence of differences in health and safety claims across the four sources of communication (tanning salons, personal blogs, professional blogs, industry sites). The current study also adds support to the Balk et al.’s report, and expands on those findings using a systematic approach to understand the prevalence of the safety and health claims reported by Balk et al. The only difference found across communication sources was between tanning salons and personal blogs on the balance of information – personal blogs were more likely to present anti-tanning sentiments than were tanning salons. This finding makes sense, as tanning salons are in the business of promoting indoor tanning and may have little incentive to communicate about risks, especially on their websites. Contrary to the motives of tanning salons, personal blogs, even those in support of indoor tanning, offer insight into issues, tips, and tricks for ordinary tanners and likely do not have a profit motive, at least not one directly tied to tanning salons.

The presence of appearance, social, and psychological claims about indoor tanning was unexpectedly low, but also informative in terms of the communication environment around indoor tanning. One explanation for this may be that such claims are made in advertisements that

have minimal space to make claims outside of promotional and appearance appeals, which were not captured in this sample, therefore, these alternative communication platforms may be connected to advertisements via a website or social media link, providing the opportunity for making health and safety claims. It may be of interest to explore how pro-indoor tanning messages are narrowcast across multiple audience segments, and the prevalence and location of various claims. In an analysis of social media promotions of indoor tanning, almost 50% of social media promotions contained a website link (Ricklefs et al., 2016). Understanding how one navigates through various channels of content and at which point certain appeals are presented may have critical implications for skin cancer prevention campaigns because such an understanding would illuminate the best time and channel for intervention messages to appear. For example, if it is found that the websites linked to social media promotions frequently contain claims about health and safety (such as those found in this study), the social media algorithms that govern content exposure could ensure presentation of a message that corrects the claims that consumers may encounter if they engage with indoor tanning promotional posts (Bode & Vraga, 2015).

In terms of how information was presented, 31% of pro-IT sites cited research in support of indoor tanning, and the majority of these cited statements pertained to two of the most prevalent claims: indoor tanning as a source of vitamin D and the safety of indoor tanning due to the level of control one has over a tanning bed. This finding suggests that pro-indoor tanning communications have sought to establish credibility for these common indoor tanning claims with science. In order to correct claims with perceived scientific credibility, prevention efforts may need to follow suit and scientifically refute these claims in a way that is easy to understand and accessible by the target audience. This will be challenging, however, given the prevalence of

these claims and the kernel of truth that underlies these claims – i.e., some tanning beds may stimulate minimal vitamin D production and one can control a tanning bed in at least some very basic ways (discussed in more detail in Aim 2).

Limitations

This study used general search terms to retrieve and analyze pro-indoor tanning arguments. While the search method expanded the content analyzed over that of many existing studies, this study is limited by the fact that the entire communication environment was not considered. We did not examine social media, advertisements, and other ways in which the indoor tanning industry communicates with its audience. Also, the purpose in filtering sites that predominantly featured anti-indoor tanning arguments was to allow for a clear examination of only the pro-environment – to get at the most common claims in support of indoor tanning. Results are also limited as this study focused solely on the text content of each site, and did not code any image or video features, which often are rich in communication value. Future research should take different approaches to examining content that tanners and potential tanners are exposed to, and should also examine the concordance between the arguments made in this content and the beliefs of indoor tanners and potential indoor tanners. Future research should also explore how members of the target audience are exposed to and interpret such content to provide a well-rounded understanding of the communication environment that could better inform prevention efforts.

Conclusion

Using a unique search strategy, this study provided additional context to the cultural narratives regarding the benefits of indoor tanning. Harnessing such an understanding will assist

public health and health communication experts in developing stronger messages to correct the most prominent claims about indoor tanning. While many tanners are aware of the cancer risks associated with tanning bed use (Noar, Myrick, Morales-Pico, & Thomas, 2014), it is possible that these health and safety claims serve as buffers to the fears of cancer risk. By dissecting these claims and developing stronger refutational messages to correct them, prevention efforts may be more effective in creating a disruptive association between indoor tanning and many of the advertised “benefits” of engaging in this behavior.

Table 1. Search Terms

Search Term	Hits
~indoor tanning AND ~benefit	1,810,000
~indoor tanning AND ~positive	307,000
~indoor tanning AND ~healthy	2,400,000
~indoor tanning AND ~good	3,700,000
~indoor tanning AND ~smart	1,060,000
~indoor tanning AND ~safe	2,200,000

Note. Use of “~” is a Google search strategy that allows for results featuring words similar to the word that follows the “~”

Table 2. Contextualizing Variables

	Tanning Salon		Personal Blog		Professional Blog		Industry Source		Total	
	N=46	%	N=8	&	N=14	%	N=10	%	N=78	%
Site Type										
.com	44	96%	8	100%	11	79%	9	90%	72	92%
.net	1	2%	0	0%	1	7%	1	10%	3	4%
.org	0	0%	0	0%	1	7%	0	0%	1	1%
.other	1	2%	0	0%	1	7%	0	0%	2	3%
Valence of Information Mean(SD)										
All pro-tanning (1) – all anti-tanning (5)	1.1 (0.21)		1.8 (0.71)		1.4 (0.50)		1.2 (0.42)		1.2 0 (0.43)	
Use of "truth" and "myth"										
Use of "truth" to support IT	13	28%	0	0%	1	7%	1	10%	15	19%
Use of "myth" to support IT	6	13%	1	13%	0	0%	0	0%	7	9%
Use of "truth" against IT	0	0%	1	1%	0	0%	0	0%	1	1%
Use of "myth" against IT	0	0%	0	0%	0	0%	0	0%	0	0%
Research claims										
Refutes research about harms of IT	5	11%	0	0%	2	14%	2	20%	9	12%
Cites research in support of IT	15	33%	2	25%	4	29%	3	30%	24	31%

Table 3. Health Claims Made on the Websites

	Tanning Salon		Personal Blog		Professional Blog		Industry Source		Total	
	N=46	%	N=8	%	N=14	%	N=10	%	N=78	%
<i>Prevents health conditions</i>										
Cancer	17	37%	3	38%	6	43%	2	20%	28	36%
Heart Disease	5	11%	1	13%	0	0%	0	0%	6	8%
Skin conditions	6	13%	0	0%	3	21%	0	0%	9	12%
Diabetes	3	7%	0	0%	3	21%	0	0%	6	8%
Blood pressure	3	7%	0	0%	1	7%	0	0%	4	5%
Weight gain	1	2%	1	13%	1	7%	1	10%	4	5%
Asthma	1	2%	0	0%	1	7%	0	0%	2	3%
Hypertension	2	4%	0	0%	0	0%	0	0%	2	3%
Blood clots	1	2%	0	0%	0	0%	0	0%	1	1%
Alzheimer's	1	2%	0	0%	0	0%	0	0%	1	1%
Other	14	30%	2	25%	9	64%	4	40%	29	37%
At least one of the above	33	72%	6	75%	10	71%	8	80%	57	73%
<i>Treats health conditions*</i>										
Skin conditions	8	17%	2	25%	3	21%	5	50%	18	23%
Weight loss	1	2%	0	0%	0	0%	0	0%	1	1%
Other	9	20%	1	13%	1	7%	3	30%	14	18%
At least one of the above	18	39%	2	25%	6	43%	1	10%	27	35%
<i>Vitamin D</i>										
Generally	3	7%	0	0%	1	7%	1	10%	5	6%
Specifically related to IT	13	28%	3	38%	3	21%	3	30%	22	28%
Both	16	35%	3	38%	6	43%	2	20%	27	35%
Any mention of Vit D	32	70%	6	75%	10	71%	6	60%	54	69%

	Tanning Salon		Personal Blog		Professional Blog		Industry Source		Total	
	N=46	%	N=8	%	N=14	%	N=10	%	N=78	%
<i>Other Health Claims</i>										
Base tan	23	50%	0	0%	5	36%	4	40%	32	41%
Other things cause cancer	12	26%	1	13%	7	50%	1	10%	21	27%
"Healthy Glow"	6	13%	0	0%	3	21%	3	30%	12	15%
Doesn't cause cancer	5	11%	0	0%	2	14%	2	20%	9	12%
Any Health Claim	38	83%	6	75%	14	100%	9	90%	67	86%
Mean # of Health Claims	3.0 (2.98)		2.5 (2.00)		3.8 (2.46)		2.9 (2.18)		3.1 (2.34)	

Table 4. Safety Claims Made on the Websites

	Tanning Salon		Personal Blog		Professional Blog		Industry Source		Total	
	N=46	%	N=8	%	N=14	%	N=10	%	N=78	%
<i>IT Control</i>										
Controlled dose is safe	34	74%	6	75%	9	64%	8	80%	57	73%
Only dangerous if burn	27	59%	3	38%	9	64%	8	80%	47	60%
Safer than sun	23	50%	3	38%	6	43%	6	60%	38	49%
At least one of the above	36	78%	7	88%	11	79%	4	40%	63	81%
<i>Regulation claims</i>										
FDA	14	30%	1	13%	3	21%	4	40%	22	28%
State/Local	3	7%	0	0%	2	14%	0	0%	5	6%
Other Regulation claim	16	35%	4	50%	5	36%	3	30%	28	36%
At least one of the above	26	57%	5	63%	7	50%	6	60%	44	56%
<i>Anti-Health Professional Claims</i>										
Sunscare/Sunscreen Industry	9	20%	1	13%	1	7%	2	20%	13	17%
Dermatologists recommend IT	6	13%	1	13%	1	7%	1	10%	9	12%
Dermatologists pocketing money	1	2%	0	0%	0	0%	0	0%	1	1%
Other Dermatologist claim	3	7%	0	0%	0	0%	0	0%	3	4%
At least one of the above	14	30%	1	13%	2	14%	3	30%	20	26%
Any Safety Claim	40	87%	8	100%	12	86%	10	100%	70	90%
Mean (SD) Safety Claim	3.0 (1.97)		2.4 (1.41)		2.6 (1.70)		3.2 (0.92)		2.9 (1.76)	

Table 5. Appearance, Social, and Psychological Appeals on the Websites

	Tanning Salon		Personal Blog		Professional Blog		Industry Source		Total	
	N=46	%	N=8	%	N=14	%	N=10	%	N=78	%
Appearance & Social Appeals										
Appeals to appearance	7	15%	2	25%	4	29%	2	20%	15	19%
Hides skin imperfections	1	2%	0	0%	0	0%	1	10%	2	3%
Social benefits	1	2%	1	13%	0	0%	0	0%	2	3%
Other	5	11%	3	38%	3	21%	2	20%	13	17%
Any appearance appeal	14	30%	4	50%	6	43%	4	40%	28	36%
# of appeals per site Mean (SD)	0.2 (0.40)		0.4 (0.74)		0.3 (0.47)		0.3 (0.48)		0.2 (0.46)	
Psychological Appeals										
Treats Mental Health										
Depression	8	17%	1	13%	4	29%	0	0%	13	17%
SAD	6	13%	0	0%	5	36%	0	0%	11	14%
At least one of the above	9	20%	1	13%	4	29%	0	0%	14	18%
Relaxation/Change of state										
Mood	5	11%	0	0%	2	14%	0	0%	7	9%
Relax/Stress Relief	9	20%	0	0%	1	7%	1	10%	11	14%
Any psychological appeal	12	26%	0	0%	3	21%	1	10%	16	21%
# of appeals per site Mean (SD)	0.6 (0.95)		0.1 (0.35)		0.9 (1.03)		0.1 (0.32)		0.5 (0.89)	
Any appearance, social, or psychological appeal	22	48%	3	38%	9	64%	4	40%	38	49%
# of appearance, social, & psychological appeals per site Mean (SD)	0.8 (1.11)		0.5 (0.76)		1.1 (1.23)		0.4 (0.52)		0.8 (1.05)	

Figure 1. Identification of Pro-indoor-tanning Websites

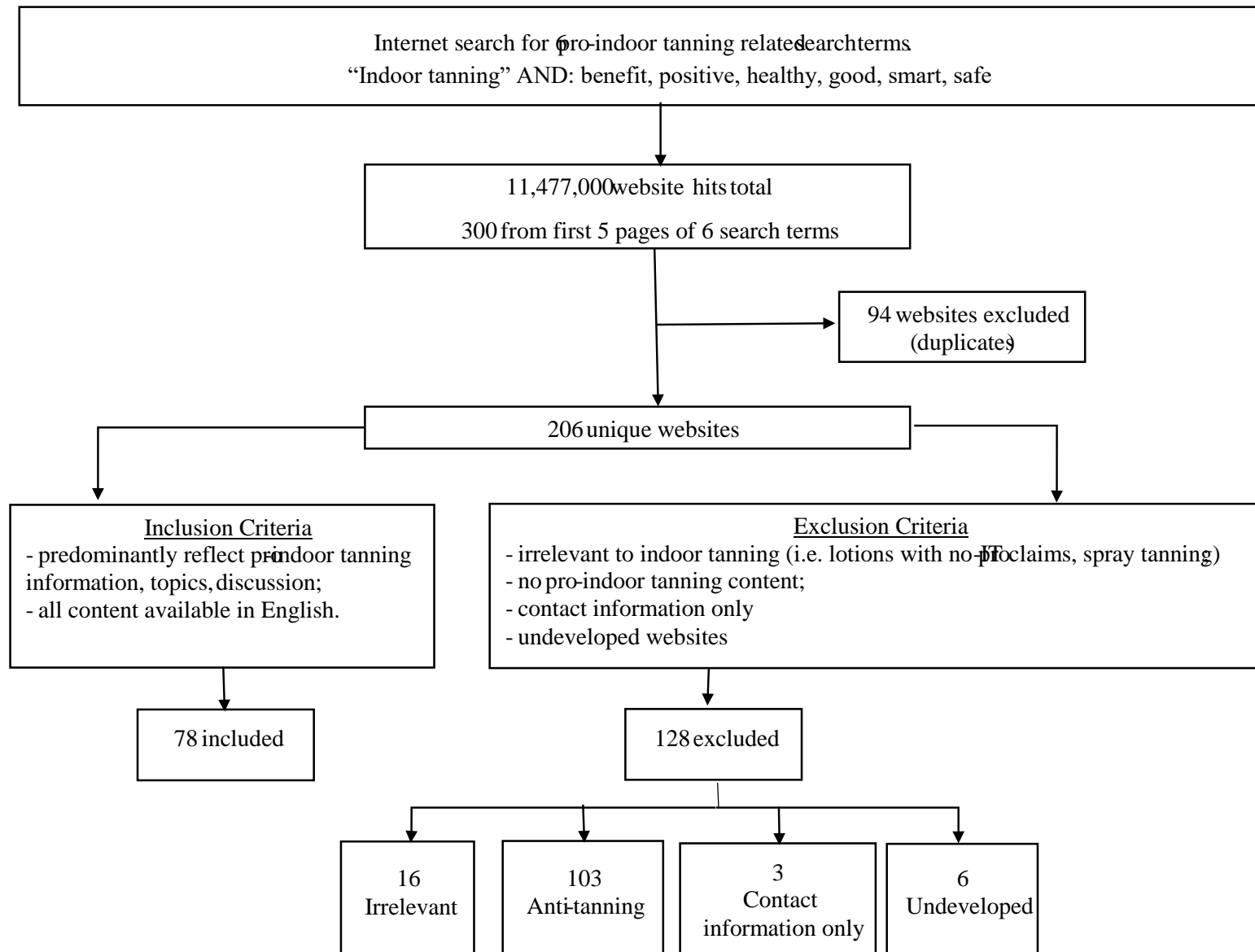


Figure 2. Percent of Code Representations by Website Type (N=78)

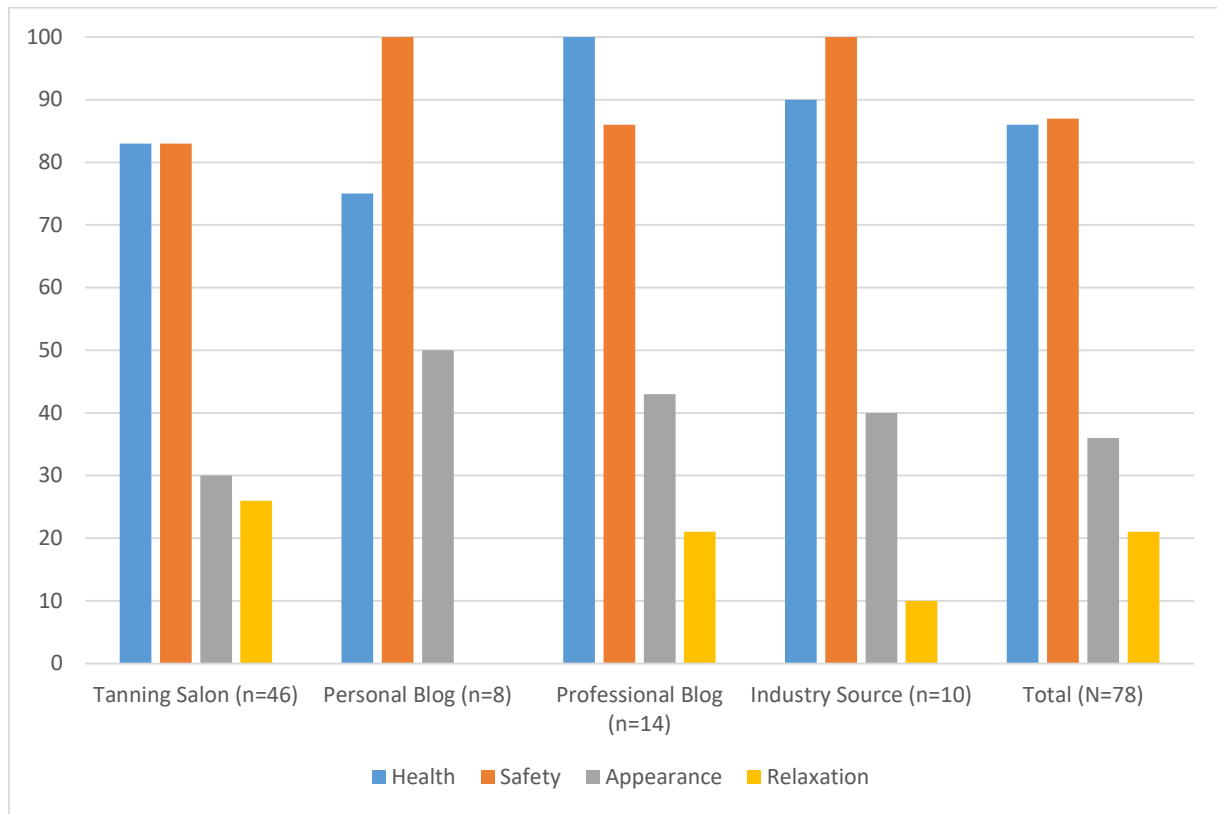
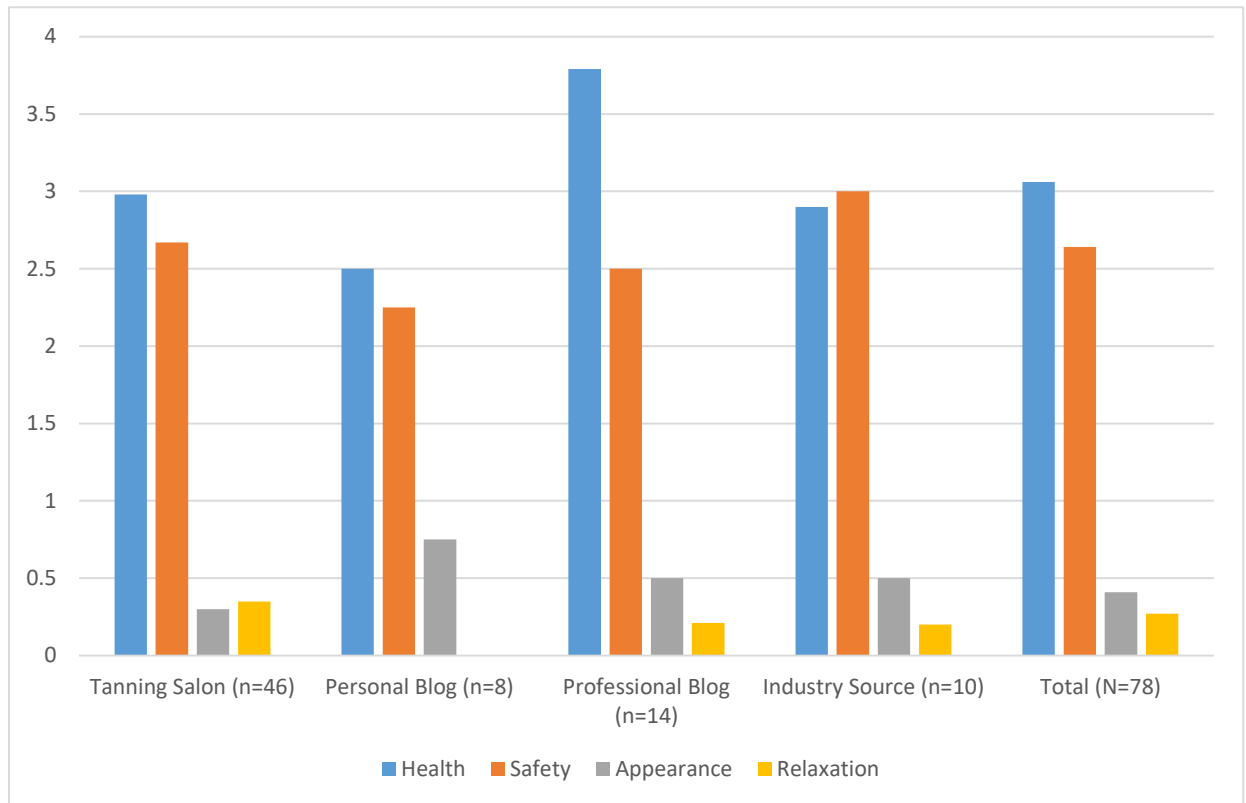


Figure 3. Average Number of Claims Made by Website Type (N=78)



CHAPTER 3

Message Development and Pilot Testing

Introduction

Inherent to the construction of inoculation messages is a firm understanding of the environmental context surrounding an issue (Ivanov, 2017). In addition to understanding the commonly held attitudes, beliefs, and behaviors within segments of the target audience, an understanding of the communication environment in *support* of a dangerous behavior or issue is imperative so that inoculation messages may address the most prominent misconceptions surrounding the behavior. Considering that indoor tanning is a behavior for which an extensive amount of misinformation has been circulated through various communication channels (Balk et al., 2015; Cho et al., 2010; Freeman et al., 2006; Greenman & Jones, 2010; Kwon et al., 2002; McWhirter, 2015; McWhirter & Hoffman-Goetz, 2015a, 2015b; Ricklefs et al., 2016; Team & Markovic, 2006), inoculation messages designed with the intent to correct such misinformation would likely be most effective if messages focused on the most prevalent misleading claims. Also inherent to the inoculation message development process is thorough pretesting and subsequent augmentation of messages based on results of formative research (Ivanov, 2017). Extensive testing of messages before dissemination is imperative for message success, as evidenced by decades of research on health communication campaigns (Atkin, Freimuth, Rice, & Atkin, 2001; Noar, 2006; Pechmann & Andrews, 2010).

Message Development

Message Content

Messages were developed to counter the most prevalent misinformation about indoor tanning identified in the content analysis of pro-indoor tanning websites (Aim 1). The content analysis revealed two broad types of misinformation (health and safety). The two most prevalent claims were selected from each type. For *health* misinformation, claims about indoor tanning as a source of vitamin D and indoor tanning as a way to develop a “base tan” (a tan that provides one with natural sunscreen to protect from future sun damage) were selected for counter-message development. Claims about controlled tanning as safe tanning and government regulation of tanning beds as safety assurance were selected for development of messages to counter *safety* misinformation regarding indoor tanning.

Health Messages

Before messages were constructed, the misinformation about indoor tanning was discussed with two dermatologists in order to understand how to best approach and construct a counter message. Inherent to these indoor tanning myths is the added complication that they may hold a kernel of truth. Claims about indoor tanning as a way to develop a base tan often rely on the fact that simply having a tan may provide you with *some* limited sun protection (*up to* an SPF of 4), but these claims often stretch the truth to state that this minimal protection is enough to prevent future burning from sun exposure. Claims about base tans extending the protection of sunscreen, often presented with a multiplicative formula (e.g., a base tan provides an SPF of 4, so combined with SPF 15 sunscreen, $4 \times 15 = 60$ SPF), are completely unsubstantiated (Levine, Sorace, Spencer, & Siegel, 2005). Also missing from these claims is the fact that a tan is a sign of DNA damage, which can lead to cancer (Woo & Eide, 2010). Thus, encouraging skin damage

to protect from future skin damage is in many ways a nonsensical argument, and the protection offered is miniscule, at best.

Claims about indoor tanning as a way to stimulate vitamin D production also holds a kernel of truth. These claims were often based on the notion that indoor tanning stimulates the same “natural” process the body undergoes when tanning in the sun. For instance, since ten minutes of normal midday sun exposure is recommended for vitamin D production by many dermatologists, these claims state that indoor tanning offers a way to achieve that same level of production *and more* in a shorter period of time. What these claims fail to mention is that tanning beds do not contain as much UVB - the UV responsible for vitamin D production - as the sun. Tanning beds emit primarily UVA rays, which are the rays that tan the skin. In contrast, UVB rays do not stimulate melanin production, and thus do not lead to a tan or change in pigmentation (Foundation, 2016; CDC, 2014, 2016; Reinau et al., 2015; Woo & Eide, 2010).

The idea that indoor tanning is a source of vitamin D is often extrapolated to claims of prevention of various diseases such as breast, colon, and ovarian cancer. While vitamin D has been suggested as a way to prevent various types of cancer, the research is inconclusive. However, none of the research about vitamin D as a cancer prevention method refers to vitamin D received from a tanning bed – most of these studies measured supplement intake, food sources, and natural sun exposure. Finally, vitamin D arguments in support of indoor tanning often state that there is a vitamin D deficiency in America – however, the Institute of Medicine conducted a systematic review of over 1,000 studies that disproves this claim, as there is no such widespread deficiency in America (Del Valle, Yaktine, Taylor, & Ross, 2011). Further, research has shown that those with lighter skin tones (Fitzpatrick type I to II) acquire vitamin D more easily than those with darker skin tones, indicating that those most likely to go indoor tanning

have already acquired as much vitamin D from UV rays as they can. Once the level of vitamin D from UV rays is achieved, any additional UV exposure diminishes vitamin D supply and also increases the risk of other harms associated with too much skin exposure such as DNA damage (Woo & Eide, 2010).

Safety Messages

There is a common misperception that indoor tanning is a controlled way to tan, and that the control one has over their indoor tanning experience makes this a safe form of tanning. While it is true that one can control the amount of *time* they are in the tanning bed, there are many other factors that negate this idea of a “controlled tan.” First, the bulbs in a tanning bed vary in strength and percentage of UVA and UVB depending on the type of bulb, the manufacturer, how old the bulbs are, and how often the bulbs are used (CDC, 2016). The strength and UV output are measured by the manufacturer when bulbs are first manufactured, but not after they have been placed into a tanning bed and after they have been used ("General and plastic surgery devices: reclassification of ultraviolet lamps for tanning, henceforth to be known as sunlamp products and ultraviolet lamps intended for use in sunlamp products," 2014). Also tied into this idea of “controlled tanning” is the erroneous idea that a tanning bed mimics the effect of spending time in the sun. A tanning bed emits an extreme dose of UV radiation relative to the sun, and indoor tanners have been shown to receive up to 12 times the annual dose of UVA radiation than those who do not tan indoors (Skin Cancer Foundation, 2016).

Another prevalent safety claim found in the content analysis of websites promoting indoor tanning was government regulation as an assurance that indoor tanning is safe, and even approved, by the government. However, tanning beds, much like tobacco, are regulated to *minimize* the known risks of using this product. The FDA regulates tanning beds through two

different mechanisms, 1) as a medical device, and 2) as a radiation-emitting product. Under the radiation emitting regulatory authority, the FDA published a Performance Standard in 1985 which required warning language that must appear on all tanning beds, booths, and tabletop sunlamps. This Performance Standard was updated in 2015 to include the recent research on the harms of indoor tanning and to keep up with current science. In 2014, a black box warning was required on all devices about how indoor tanning is not recommended for anyone under the age of 18 years (FDA, 2014).

The most prevalent piece of misinformation regarding government regulation of tanning beds was the claim that the government sets the indoor tanning “exposure schedule,” ensuring the safety of tanning bed use. The government does not actually set the exposure schedule, but instead, has provided *guidelines* to be used by the manufacturers of tanning beds to set an exposure schedule specific to their product ("General and plastic surgery devices: reclassification of ultraviolet lamps for tanning, henceforth to be known as sunlamp products and ultraviolet lamps intended for use in sunlamp products," 2014). Further, the exposure schedule set by the manufacturer is a recommendation and one that research has found less than 11% of salons actually adhere to (Culley et al., 2001). What the FDA does is inspect tanning beds to ensure that the appropriate labels are affixed in designated areas on the device and that the proper bulbs are installed (Miller, 2016).

While research has shown that many tanners are aware of the long term consequences of indoor tanning, such as skin cancer (Yang & Han, 2016), it may be the case that misinformation such as base tan protection, vitamin D, controlled tanning, and government regulation help individuals rationalize their indoor tanning behavior. This is why such misinformation is dangerous, as it allows people to continue to engage in a dangerous behavior by giving them

reasons to overlook and assuage fears of the long-term consequences. Correcting such misinformation may be a way to disrupt such rationalizations to ultimately decrease tanning bed use. Inoculation theory offers a message format that may be best suited for correcting misperceptions about indoor tanning due to misinformation. In order to understand the effect of inoculation messages (i.e., two-sided messages), one-sided messages were developed to reflect the same content presented in inoculation messages, except that one-sided messages do not refute an argument. One-sided messages represent the most common message format used in health communication campaigns (Banas & Rains, 2010; O’Keefe, 1999). A control message was also created for the experiments. The development of message content and structure are described next.

Message Structure

Messages were carefully constructed to ensure that the same content was covered across similar message conditions (i.e., topics addressed in two-sided base tan messages were also present in one-sided base tan messages). The control condition contained a simple statement for each of the four message topics (base tan, vitamin d, controlled tanning, and government regulation). Since the misinformation identified in the content analysis of pro-indoor tanning websites (Aim 1) presented arguments in support of indoor tanning largely grounded in logical, persuasive appeals, rather than emotional appeals or appeals to identity, experimental messages were grounded in logical arguments.

Inoculation messages

Traditional inoculation messages contain an explicit forewarning, which serves to inform the reader that the attitudes they hold towards a given issue may be challenged (McGuire, 1961). However, a forewarning is most often used for messages designed for preventive purposes.

Considering that the sample for this study is college-age women, many of whom may have already gone indoor tanning, or at least been exposed to the behavior through social connections and through various channels of communication, messages for this study were designed with prevention and curative goals in mind. Therefore, use of an explicit forewarning is not necessary here as those who have already gone indoor tanning and may hold positive attitudes towards indoor tanning may find the use of a forewarning about the possibility of encountering others with positive indoor tanning beliefs confusing and ineffectual (Ivanov, 2017). Introducing information at odds with the reader's attitudes or beliefs would confound the effect of the message as the message would then be seen as irrelevant. Instead, each inoculation message starts with a few sentences reflecting the prominent pieces of misinformation per topic. For example, the controlled tanning inoculation message starts with the following:

“People sometimes say that indoor tanning is a safer way to tan compared to outdoor tanning because you have control over the amount of UV radiation you are exposed to and can choose how long you want to tan. Some even believe indoor tanning is a “natural” way to tan because tanning beds create a tan using UVA and UVB rays, just like the sun. But these arguments are seriously flawed.”

These statements represent the first part of the refutational preemption component of inoculation messages. Presenting the arguments in support of indoor tanning behavior as a weakened statement, with no evidence to support the erroneous claim, guides the second piece of the refutational preemption component which is a strong refutation of each of the claims presented in the first half. Since each of the claims to be refuted contains a kernel of truth, refutations of these claims were supported by evidence from credible sources that would likely be recognizable to the target audience (e.g., Centers for Disease Control and Prevention).

The final paragraph of the inoculation messages contains a safer and healthier alternative to indoor tanning. For example, the vitamin D inoculation message contained a statement about how eating foods rich in vitamin D, such as fish, fortified milk, or taking vitamin D supplements

can help keep vitamin D levels where they should be, without the dangers of indoor tanning. Then, the misinformation is again refuted (e.g. “Despite what some people may say, indoor tanning is not a safe or effective way to get Vitamin D”). Finally, as inoculation messages may incite psychological reactance, a restoration statement that served to restore personal agency to the reader is presented at the conclusion of the message (Miller, Lane, Deatruck, Young, & Potts, 2007). An example of such a statement is: “However, it’s your choice whether or not getting that quick tan for an event, vacation, or ‘just because’ is worth damaging your skin, or even your health, for a lifetime.”

One-sided messages

One-sided messages are the most commonly used health prevention and promotion messages and offer a unique opportunity to test the effect of inoculation messages in countering misinformation.

One-sided messages were carefully constructed so as not to include the arguments being refuted, as in the inoculation messages. Instead, basic research on the topic of interest (e.g., vitamin D) in relation to UV exposure via indoor and outdoor tanning were addressed. For example, in the one-sided vitamin D message, the importance of vitamin D was stated, followed by the safest way to get the daily recommended dose, and finally why trying to get vitamin D from UV exposure via tanning beds was not effective or safe. The one-sided vitamin D message then explained the difference between dermatologists’ UV beds (which only provide UVB rays, the rays that stimulate vitamin D production) and tanning beds used for tanning purposes (which primarily provide UVA rays, which are the rays responsible for tanning). Then, safe alternatives relative to the message (e.g., vitamin D, base tan, control) were offered. The government regulation message was a bit different as the purpose of this message was to explain that just

because the government enacts regulations does not make it safe, such as the case of tobacco. The government message established what the role of the government is in relation to indoor tanning (to warn the public of associated harms and try to minimize damage done from indoor tanning by enacting rules for warning labels and providing guidelines for exposure schedules), and conclude that tanning beds are not safe and are classified as known human carcinogens, in the same category as tobacco.

Control Message

A control message was created to briefly state “facts about indoor tanning” that reference the four indoor tanning arguments in this study, but in a format that was not intended to contain the persuasive power of the weight of the evidence and arguments against indoor tanning contained in the 2-sided and 1-sided messages. The control message was adapted from CDC’s “Burning Truth” campaign (CDC, 2014), SkinCancer.org (Skin Cancer Foundation, 2016), and also included a statement about government regulation of tanning beds.

All experimental messages contain a restoration statement, as inoculation messages can generate psychological reactance, which may confound the effect of the message. This was also done to ensure the content of inoculation and one-sided messages were consistent, in order to test differences between message formats (Ivanov, 2017). Thus, inoculation and one-sided messages contained a sentence at the end of the message that acknowledged readers’ personal agency by stating it was their choice whether or not to go indoor tanning. As it was unclear how these restoration statements may best be constructed based on results of the cognitive interviews, four variations were tested in the pilot experiment. Readability of messages was also tested the Flesch–Kincaid readability test in Microsoft Word to ensure messages are composed at the same

reading level, and that this reading level is attainable by the target audience (college-age women) (Kincaid, Braby, & Wulfeck, 1983).

Qualitative Methods

Cognitive Testing

Once messages were developed based on recommendations from dermatologists and the research team, one-on-one cognitive interviewing was conducted to determine how young women understood and responded to messages about the dangers of indoor tanning. Cognitive testing was used as a first step in message testing as it allows for a deeper understanding of how the audience may interpret and respond to messages countering pro-indoor tanning claims, as well as a way to explore how to make messages more salient and persuasive to members of the target audience (Lapka, Jupka, Wray, & Jacobsen, 2008). Two common methods, verbal probing and “think aloud,” were used (Fowler, 1995). Verbal probing allows the participant to describe the main points of the message in their own words and to answer questions about their interpretation and what they liked and did not like about the message. “Think aloud” allows participants to expand on their interpretations by explaining various beliefs, attitudes, experiences, and social norms that may have influenced their interpretation (Fowler, 1995). In this sense, the cognitive interview, while having some structure, is more of a directed conversation about the ideas presented in the message as they relate to the participant.

The goals of this phase of the research were to ensure that:

- a) indoor tanning was clearly addressed in all messages
- b) the content of one and two-sided messages within a topic (e.g. vitamin D) covered similar information, regardless of message format

- c) messages were constructed according to the respective formats (i.e. were two sides of an argument clearly presented in inoculation messages? Did one-sided messages imply the counter-attitudinal viewpoint?)
- d) language used was salient to participants, as these participants were from the target audience
- e) idiosyncrasies of each message did not detract from the overall purpose
- f) arguments presented made sense and were perceived to be persuasive
- g) messages were void of stylistic distractions such as sentence structure or paragraph length.

Participants

Participants were recruited from Panhellenic sororities at a private university in the Southeastern United States. An email explaining the purpose of the study, time required, and available dates for interviews was sent to all sorority members through the Panhellenic Counsel. Participants were asked to respond to the email if they wished to participate in the interview process. Of the 45 sorority members who responded, ten were randomly selected to be invited for an interview. Invited participants were asked to provide their availability during October 12-14, 2016. Of ten invited participants, two had to cancel prior to their interview. Thus, eight sorority members were interviewed on October 12, 2016. All participants were white, juniors (n=4) and seniors (n=4), and either 20 (n=4) or 21(n=4) years of age. Fifty percent indicated they had used a tanning bed at least once in their lifetime, and none of the participants had used a tanning bed within the past year.

Procedure

A semi-structured interview guide was developed with a focus on understanding how messages were interpreted, how inoculation messages compared to one-sided messages, and how messages could be improved based on content and style (*Appendix B1*). One-on-one interviews were held in a closed room at the university to ensure confidentiality of the participants' responses. Prior to beginning the interview, participants read a consent form and were asked if they had any questions about the study. Once participants signed the consent form, the interview commenced. All interviews were conducted by one researcher.

Before reading each message, participants were given a pen and told to circle or underline words or phrases that seemed unclear or awkward. Participants were shown four of the eight experimental messages and the control message. Participants read both inoculation and one-sided messages for one health claim and one safety claim. Interview packets were pre-arranged to ensure each message was viewed an equal number of times and that the order of the message themes and combination of messages varied. For example, one participant viewed one-sided and inoculation base tan messages (health) followed by one-sided and inoculation government regulation messages (safety); whereas another participant viewed one-sided and inoculation controlled tanning (safety) and one-sided and inoculation vitamin D (health) messages. All participants read the one-sided message first, followed by the matched inoculation message, to enable a systematic comparison of the perceived effectiveness of the inoculation message over the one-sided message. For each message, participants were asked about: what they thought the message was trying to tell them; parts of the message they especially agreed or disagreed with; what was effective about the message in discouraging indoor tanning behavior; and how the message could be made more convincing in discouraging indoor tanning behavior.

After participants viewed the four experimental messages, they were asked which message they thought was best and why, as well as which *two* messages would be most effective in discouraging indoor tanning and why. Participants were then shown the control message, asked what they thought about the control message and also how effective they perceived the message to be compared to the four experimental messages they previously read. Finally, participants were asked if they had any final comments about the messages, the interview process, or indoor tanning in general, before basic demographic information was collected. Verbal probing and “think aloud” techniques were employed throughout the interview. Once the interview was complete, participants were given a \$20 Visa gift card for their time. All procedures were approved by the University of North Carolina at Chapel Hill Institutional Review Board.

Results

Overall, participants indicated all messages were written with the intent to dissuade indoor tanning behavior and through the “think aloud” procedure, participants recounted the specific claims addressed in each message (e.g., vitamin D, controlled tanning). Seven participants indicated that inoculation messages were more persuasive against indoor tanning than one-sided messages. One participant preferred the one-sided base tan message over the inoculation base-tan message. Four participants indicated the inoculation vitamin D message was most effective, followed by inoculation indoor tanning control (n=3), and inoculation base tan (n=1). Below are descriptions of the changes made to the messages. The government regulation message underwent the most changes, thus, the description of changes to the government regulation message provides greater detail relative to the other messages.

The controlled tanning, base tan, and vitamin D messages required minimal editing for clarity and stylistic changes. Further, even those participants who reported they had never gone indoor tanning in their lifetime said they were familiar with the controlled tanning, base tan, and vitamin D arguments. Although the inoculation government regulation message outperformed the respective one-sided message, these messages required substantial revisions. A brief explanation of the changes made to messages per participant responses is provided below.

The initial version of the *Controlled Tanning (Safety)* messages lacked the statistical representation present in the other messages, and three of four participants mentioned this when asked what could be done to make these messages more persuasive. Participants also said they did not like the use of “make sure” when discussing the importance of sunscreen and types of sunscreen to use in the one-sided message, as this term was perceived as commanding, and thus, off-putting. The inoculation message lacked the self-efficacy content regarding ways to protect from harmful UV exposure found in the one-sided message.

The UVA/UVB distinction found in the *Vitamin D (Health)* messages needed clarification. The connection between indoor tanning and vitamin D was clarified earlier in the one-sided message. The distinction between tanning beds found in a salon and tanning beds found at a dermatologists office was also clarified.

The *Base Tan (Health)* messages were edited to have fewer mentions of outdoor tanning. These messages also contained an analogy that described a tan as a scab – this analogy was well-received by two participants, but not the other two participants who saw this message. Those who did not like the analogy stated that a scab “eventually goes away and is harmless.” Thus, the connection between the scab, DNA damage from tanning, and serious health effects was made more prominent.

The initial draft of the *Government Regulation (Safety)* messages used tobacco control as a framework likely to be salient to the target audience as a way to counter claims that indoor tanning is safe because the government regulates it. Participants indicated that these messages had too much information about tobacco, and that the connection could be made in a much simpler way. Three participants also stated that the messages were not as persuasive, particularly the one-sided message which was described as “interesting, but too expository.” Further, given the space used to draw parallels between tobacco and tanning bed regulation, mention of consequences related to indoor tanning was sparse, and therefore enhanced in the edited messages. Substantial edits were made to the government regulation messages because the initial framing focused heavily on the transgression of tobacco regulatory policy and how indoor tanning policies are following a similar trajectory, but few policies exist as indoor tanning regulation is decades behind tobacco regulation (Seidenberg, Mahalingam-Dhingra, Weinstock, Sinclair, & Geller, 2015). Therefore, these messages were reframed to focus specifically on current indoor tanning policies and why the presence of such policies and regulations do not equate to device safety. Statistics about the dangers of indoor tanning (e.g. 75% increase in risk for developing melanoma) were also added to be more consistent with the other messages. Three of the four participants who read the government regulation messages also mentioned the idea that if the government regulates something and it is still dangerous, then the government must not be doing their job sufficiently. This perception was carefully addressed in both one-sided and inoculation messages (e.g. “... the mere presence of regulation indicates that these devices have been associated with serious harm including eye damage, burns, and various types of skin cancer. Further, government regulation is not an endorsement for indoor tanning – in fact, the

regulations are in place to minimize harm and warn people about the dangers of using tanning beds”).

In addition to these message specific changes, various minimal edits were made in terms of paragraph structure (participants preferred the shorter paragraphs found in the inoculation messages) and word choice.

Quantitative Methods

To test how messages were operating according to the mechanisms inherent in inoculation theory and health messages, a quantitative pilot survey was implemented. Counterarguing, one of the original mechanisms of Inoculation Theory, is a process of refuting opposing arguments (Compton & Pfau, 2005). Inoculation messages present two sides of an argument and provide a strong refutation against opposing arguments, thereby modeling the process of counterarguing. Typically, counterarguing is measured after exposure to a message in opposition to the inoculation message (i.e. in the context of this study, a message that promotes indoor tanning). However, given that the nature of this study is to refine messages before using them in a full message experiment, counterarguing is being measured after exposure to the inoculation message. Therefore, regardless of whether or not participants have positive or negative beliefs about indoor tanning, it is hypothesized that inoculation messages will elicit *less* counterarguing towards the inoculation message, relative to the one-sided messages (H1a). Since the control message consists of four simple statements under the heading “*Facts about indoor tanning,*” and is void of cited evidence or strong arguments against indoor tanning, it is hypothesized that those exposed to the control message will report less counterarguing, compared to those in the inoculation and one-sided message conditions, as the control message is

void of persuasive arguments, therefore, it is less likely that participants will argue against the simple statements (H1b).

While much of the literature on cognitive processing of messages has found involvement to be a primary factor in the level of cognitive processing (Petty & Cacioppo, 1979b), indoor tanning represents a behavior for which there may not be strong existing attitudes, as tanning beds represent a means to achieve an end goal of tanned skin. This is illustrated by the fact that many who indoor tan are aware of the dangers of tanning, but still tan, citing appearance reasons that trump health harms (Yang & Han, 2016). The topics addressed by the messages in this study are arguments some may use as a way to rationalize their indoor tanning behavior. These arguments have also been widely publicized. Therefore, even for those who do not engage in indoor tanning behavior, the inoculation messages are likely to incite greater cognitive processing relative to one-sided and control messages (H2a), as the inoculation messages acknowledge popular arguments in support of indoor tanning that many in the target audience have likely been exposed to, as indicated by participants during cognitive interviews. Further, since inoculation messages model arguments against indoor tanning, it is hypothesized that inoculation messages will elicit greater cognitive processing frequency against indoor tanning, relative to one-sided and control messages (H2b).

Since each message addresses a particular issue regarding indoor tanning, it is hypothesized that those exposed to inoculation and one-sided messages will be less likely to endorse positive outcome expectations relative to the message topic (e.g. If I went indoor tanning it would be a natural way to get vitamin D), relative to the control condition (H3a). Further, those exposed to inoculation messages will be less likely to report positive outcome expectations and

more likely to report negative outcome expectations relative to one-sided and control messages (H3b).

Considering how inoculation messages model an argument against misinformation in support of indoor tanning, while one-sided messages provide only an argument against indoor tanning, without acknowledging the other side of the issue, it is hypothesized that those exposed to inoculation messages will report more confidence in their attitudes regarding indoor tanning (H4a), as well as their ability to defend and maintain their position if opposing viewpoints are encountered relative to one-sided and control messages (H4b).

Inoculation and one-sided messages both provide substantial evidence against indoor tanning behavior, relative to the control condition. Further, since this is a cross-sectional survey, not all of the mechanisms attributed to inoculation theory's success (e.g., post-inoculation talk - talking with others about the content of the message) are enacted, as assessment occurs immediately after message exposure. Thus, it is hypothesized that those exposed to inoculation and one-sided messages will express less interest in indoor tanning compared to those exposed to the control message (H5).

Finally, perceived message effectiveness items will provide information regarding characteristics of the message that may indicate why a particular message may be effective or ineffective. Overall, it is hypothesized that inoculation messages will be perceived to be more effective relative to one-sided and control messages (H6a), and one-sided messages will be perceived as more effective compared to control messages (H6b). However, no differences are expected on two items regarding 1) understanding of the message and 2) truthfulness, as all messages were constructed to be easily understood and truthful (H7c). See *Table 6* for an index of all hypotheses and results.

Inoculation and one-sided messages ranged in length from 614 words (base tan messages) to 661 words (government regulation messages). Message length was equivalent between like-pairs of inoculation and one-sided messages. The control message was 43 words. The messages in support of indoor tanning to be used in the Aim 3 follow-up survey (also called the “attack” messages in inoculation theory) were also tested to verify that the attacks were strong enough to serve as a true test of inoculation. These messages were pulled directly from the Aim 1 content analysis and ranged in length from 142-157 words. Each attack message focused on one of the topics covered by the experimental messages. All messages were written at a 12th grade reading level according to the Flesch-Kinkaid measure.

Participants

Participants were recruited from a private university in the Southeastern United States. In order to be eligible to take the survey, participants had to be 18 years of age or older, be actively enrolled in a Panhellenic sorority during Fall 2016. Only females were recruited as young adult females are the most frequent users of tanning beds (Guy et al., 2013). A total of 230 sorority members completed the survey between November 28th and December 15th, 2016. Of the 245 participants who took the survey, 177 completed all measures for messages in their condition (i.e. two messages per experimental condition, and five short messages in the control condition) the survey. Sixteen participants did not provide demographic information. Participants ranged in age from 18-22 ($M = 20.2$, $SD = 0.98$), and 34% were sophomores, 32% juniors, and 25% were seniors (no Freshman were in the sororities at the time the study was undertaken). Participants were primarily white (86%), 3% Asian, 1% Native Hawaiian or Pacific Islander, and 2% reported mixed race. Five percent of participants reported Hispanic ethnicity. Seventy-nine percent of participants reported their mother had at least a 4-year college degree, and 82%

reported their father had a 4-year college degree or higher. Eighteen percent (n=31) of participants reported having ever used a tanning bed in their lifetime, and 7% (n=12) reported having used a tanning bed within the past year (see *Table 7*).

Procedure

The Panhellenic Council assisted with recruitment efforts by sending emails to invite sorority members to take the survey. The email explained the purpose of the study, what participation entailed, and a link to the survey. To incentivize participation, sorority houses with at least 25% participation received a \$50 gift card, with graduated incentives at 50% (\$100), and 75% (\$150).

Participants were randomized using the Qualtrics randomization feature to one of five possible conditions: 1) two-sided safety - controlled tanning and government regulation messages (n=47); 2) two-sided health - base tan and vitamin D (n=35); 3) one-sided safety - controlled tanning and government regulation; n=27); 4) one-sided health - base tan and vitamin D; n=37); and 5) control (n=31), which included the control message and the four attack messages in support of indoor tanning, tested for use in the Aim 3 follow-up survey.

All participants first answered indoor tanning demographic items (explained below). Participants in the experimental conditions were exposed to a message, respective to their condition, after which they answered items about perceived message effectiveness, counterarguing, and cognitive processing (described in detail in the next section). Then they read the next message, followed by PME, counterarguing, and cognitive processing measures. After both messages had been read, participants answered questions about self-efficacy and attitude

certainty, positive and negative outcome expectations, interest in indoor tanning, and demographic items.

The order of the control condition differed in that participants were exposed to the control message and then answered all of the aforementioned measures immediately after exposure to the control message, except for the basic demographic items. After responding to the indoor tanning interest items, participants were shown an attack message, followed by a PME measure adapted for the attack messages. This pattern repeated until all four attack messages and corresponding PME measures were complete, at which point participants in the control condition answered demographic items. The average time to survey completion was ten minutes.

Measures

Demographics. Participants were asked a series of demographic questions including race, ethnicity, year in school, age, and mother and father's educational attainment. For detailed demographics see *Table 7*.

Skin type, sun protection, and family history. We asked a series of items related to skin type (Fitzpatrick, 1988), burn tendency, tannability, and general sun protection behaviors (Glanz et al., 2008), making use of standardized items. We also asked questions about personal and family history of skin cancer (Lazovich et al., 2004). See *Table 7* for sample tanning demographics.

Indoor tanning behavior. Participants were asked if they have ever gone indoor tanning (i.e., used a tanning bed). If so, they were asked if they had tanned in the past twelve months,

during which seasons, and how they would describe their tanning behavior (e.g. regularly – all year round, regularly – seasonal, occasionally, etc.).

Dependent Variables

Counterarguing. Counterarguing was measured after each message exposure with four items adapted from a study of inoculation messages in the context of health policy (Niederdeppe, Gollust, & Barry, 2014). Two items were positively worded (“I found myself agreeing with the author’s points,” and “I thought of arguments to support what the author was saying”). These items were reverse coded for analysis purposes. Two items were negatively worded (“I found myself disagreeing with the author’s points,” and “I thought of arguments against what the author was saying”). These items were answered on a 5-point scale (1=*strongly disagree* and 5=*strongly agree*).

Cognitive Processing. Cognitive processing was measured after each message exposure with three free-response items. Participants were asked to write down any thoughts they had against indoor tanning, in support of indoor tanning, and any other thoughts they may have had while reading the message. Each of the three items had five free response fields in which participants could record their response. Fifty-five percent of participants filled in cognitive processing items for the controlled tanning 2-sided message (n=26/47); 34% for the government 2-sided message (n=16/47); 60% for the base tan 2-sided message (n=21/35); 43% for 2-sided vitamin D (n=15/35); 63% for the 1-sided controlled tanning message (n=17/27); 48% for 1-sided government regulation (n=13/27); 65% for 1-sided base tan (n=24/37); 43% for 1-sided vitamin D (n=16/37); and 48% responded to the cognitive processing measures in the control condition (n=15/31). Cognitive processing responses were coded to for relevance and responses

were summed for positive, negative, and other thoughts about indoor tanning for pilot purposes as to see overall cognitive elaboration across conditions. (Petty & Cacioppo, 1979b).

Indoor Tanning Outcome Expectations. Items assessing positive and negative outcome expectations were created to reflect the topics addressed across messages. These items follow the format of the CITE scale (Noar et al., 2014), but were adapted to match the content of the messages tested in this study. Participants received outcome expectations items after reading both messages, as assessing outcome expectations after each message exposure would have been redundant. A prompt informed participants that the items reflected what some people believe are benefits of indoor tanning. The measure began with the stem: “*If I went indoor tanning it would...*” and items were assessed with a 5-point scale where 1 = *definitely would not* and 5 = *definitely would*. Three positive outcome expectation items were constructed per topic (e.g., be safe because I can control how long I tan; be safe because tanning is legal; be a natural way to get vitamin D; give me a base tan that would protect me from sunburn), for a total of twelve positive outcome expectation items. Reliability for positive outcome expectations ranged from $\alpha = 0.94-0.96$.

Ten items assessed negative outcome expectations following a prompt informing participants that the items reflected what some people believe are the drawbacks of indoor tanning. The same question stem and scale as in the positive outcome expectation measure was used for the negative outcome expectations measure. Items reflected arguments against indoor tanning and health consequences of tanning bed use presented across the experimental message conditions. Items reflected negative outcome expectations relevant to safety (e.g. “be unsafe because tanning beds emit a high dose of radiation”) and health (e.g. “not be a healthy way to get a tan”). “Reliability for the negative outcome expectations scale ranged from $\alpha = 0.95 - 0.98$.

Self-Efficacy. Self-efficacy was assessed after participants read both messages using an adapted version of Bandura's (1977) self-efficacy measure (Pfau et al., 2009). Using a 0-100-point scale, where 0=*not at all confident* and 100=*absolutely confident*, participants were asked to indicate how confident they were that their attitude on this topic is firm; they hold the correct attitude on this topic; and that their attitude will not change even if they find out a majority of people disagree with them. Participants also responded to three items about their confidence in defending their position on the issue, maintaining their position in the face of strong counterarguments, and would argue their position with someone who disagrees with them ($\alpha = 0.83 - 0.93$).

Indoor Tanning Intentions. Indoor tanning intentions were assessed after participants read both messages with three items adapted from the tobacco literature (Klein, Zajac, & Monin, 2009). Using a 5-point scale (1 = *not at all likely* to 5 = *extremely likely*) participants indicated how *interested*, how much they *plan*, and how *likely* they are to go indoor tanning in the next year ($\alpha=.86$).

Perceived Message Effectiveness. Ten perceived message effectiveness items assessed message various aspects of perceived message effectiveness. After each message exposure, participants responded on a 5-point scale (1=*strongly disagree* to 5=*strongly agree*) regarding the extent to which that particular message was: easy to understand, truthful, said something important, taught them something new, made them think about the dangers of indoor tanning, made them feel confident in their ability to avoid indoor tanning, is something they would talk about with others, convinced them that many of the things people say about the benefits of indoor tanning are not true, made a strong argument against indoor tanning, and motivated them

to stay away from tanning beds. These items were averaged to form a single scale and had good reliability across conditions, with Cronbach's Alpha ranging from .84 - .93.

Four of the items in the PME measure were adapted for the attack messages. These items were this message: made me think about the *benefits* of indoor tanning, convinces me that many of the things people say about the *dangers* of indoor tanning are not true, made a strong argument *for* indoor tanning, and makes me *want to use* a tanning bed. The item about confidence to avoid indoor tanning was not included, therefore, the PME measure for attack messages contained 9 items. Reliability ranged from 0.79 - 0.86.

Analytic Approach

As this is a pilot with a modest sample size, final message decisions were guided by data in the hypothesized direction, as tests of statistical significance were likely to be confounded by small and unequal cell sample sizes and thus are not reported. SPSS v. 24 was used for all analyses. Exploratory descriptive procedures were used to test for demographic differences between conditions – i.e. ANOVAs, as appropriate – however, no differences across conditions were found. Means, standard deviations, and response ranges were examined to see if data patterns supported hypotheses. Given the uneven, and small number of participants in each condition in this pilot study, tests of significance were not used to explore differences between messages – instead, patterns of means and standard deviations guided message selection.

Results

Counterarguing

Hypothesis 1a was partially supported as overall the pattern of results show that participants exposed to inoculation messages reported less counterarguing overall towards the

anti-tanning message, with the exception of the government regulation message, compared to those exposed to the one-sided messages. Those exposed to the government regulation inoculation message reported more counterarguing relative to those exposed to the one-sided government regulation message. Looking at the four counterarguing items individually, the base tan inoculation message had less agreement with the authors points ($M=1.6$, $SD=0.80$) and fewer thoughts to support what the author was saying ($M=2.0$, $SD=1.00$), compared to the one-sided message ($M=1.9$, $SD=0.80$; $M=2.2$, $SD=0.70$). The base tan inoculation message also produced more disagreement with the anti-tanning message ($M=2.4$, $SD=1.40$) compared to the one-sided message ($M=2.1$, $SD=1.00$). Those exposed to the control message reported less counterarguing of the anti-tanning message, compared to those exposed to the inoculation and one-sided messages, thus providing support for hypothesis 1b (see *Table 8*).

Cognitive Processing

Hypothesis H2a was partially supported in that the controlled tanning ($M=3.3$, $SD=3.02$), base tan ($M=2.7$, $SD=2.32$) and vitamin D ($M=1.5$, $SD=1.82$) inoculation messages had a higher frequency of cognitive processing output, relative to their one-sided counterparts ($M=2.5$, $SD=2.28$; $M=2.6$, $SD=2.69$; $M=1.5$, $SD=2.26$, respectively) and the control message ($M=1.4$, $SD=1.77$). The government regulation inoculation message ($M=0.9$, $SD=1.43$) and one-sided message ($M=1.3$, $SD=1.65$) produced the lowest frequency of cognitive processing relative to all other messages.

Examination of the neutral cognitive processing output revealed that 56% of participants who provided output for the government regulation inoculation message, and 31% of participants who provided output for the government regulation one-sided message did not know that the government was involved with indoor tanning regulation. Further, 31% of those who viewed the

inoculation message, and 23% of those who viewed the one-sided message stated that the government is not “doing a good job” (and similar comments) concerning their regulatory policies. The base tan messages also produced unexpected thoughts regarding the idea of base tans and indoor tanning. Thirty-eight percent of participants who viewed the base tan inoculation message and provided cognitive processing responses, and 46% of those who viewed the one-sided message indicated that they did not consider a base tan as protection from the sun, but rather, a base of color (i.e. base tan for appearance, as opposed to health). Such consistency in thoughts that question the underlying premise of the misinformation addressed in the messages were not found for controlled tanning, vitamin D, and control messages.

Inoculation and one-sided controlled tanning ($M=2.4$, $SD=2.23$; $M=1.6$, $SD=1.50$), base tan ($M=2.0$, $SD=1.72$; $M=1.5$, $SD=1.61$), and vitamin D ($M=1.5$, $SD=1.74$; $M=1.0$, $SD=1.43$) all produced more arguments against indoor tanning relative to the control message. The government regulation inoculation and one-sided ($M=0.53$, $SD=0.91$; $M=0.85$, $SD=1.26$) messages produced fewer arguments against indoor tanning than all messages, including the control message. With the exception of the government regulation message, all inoculation messages produced more arguments against indoor tanning relative to their one-sided counterpart, as well as the control message. Thus, hypothesis H2b was partially supported (see *Table 9*).

Outcome Expectations

Most participants did not report having positive outcome expectations (overall $M=1.59$, $SD=0.73$), and reported high negative outcome expectations (overall $M=4.32$, $SD=0.80$) concerning indoor tanning. A minute pattern of positive outcome expectations was found such that those exposed to the government regulation and controlled tanning, and base tan and vitamin

D inoculation messages reported lower positive outcome expectations relative to their respective conditions, than did participants in other message conditions, with the exception of controlled tanning positive outcome expectations. No such pattern was found for positive outcome expectations regarding controlled tanning. Therefore, hypothesis 3a is partially supported (see *Table 10*).

Regarding negative outcome expectations, inoculation and one-sided messages performed about the same, or produced greater negative outcome expectations, relative to the control condition. Hypothesis 3b was not supported (see *Table 11*).

Self-efficacy

Overall, those in the inoculation safety ($M=87.2$, $SD=14.23$) and health ($M=88.8$, $SD=12.14$) conditions reported greater self-efficacy about their attitude position relative to the one-sided safety ($M=84.1$, $SD=16.31$) health ($M=83.4$, $SD=18.18$), and control ($M=80.0$, $SD=21.12$) conditions. This pattern persisted across individual items, except for the item that asked about participants' confidence that their attitude would not change even if the majority of people disagree in which the control condition reported greater self-efficacy ($M=84.2$, $SD=19.85$) relative to one-sided safety ($M=81.1$, $SD=20.98$) and one-sided health ($M=81.7$, $SD=23.92$). Participants in the inoculation message conditions had higher reports of self-efficacy relative to their similar one-sided message condition, as well as the control condition, across all six self-efficacy items. Hypotheses 4a-b were supported (see *Table 12*).

Intentions

There were no differences in indoor tanning in the next year across conditions. Within the inoculation conditions, safety reported $M=1.1$ ($SD=0.20$), and health reported $M=1.1$ ($SD=0.47$). Within one-sided conditions, safety reported $M=1.1$ ($SD=0.15$), and health reported $M=1.2$

($SD=0.49$). The control condition reported a mean of 1.2 ($SD=0.53$), and the overall intentions score was $M=1.1$ ($SD=0.39$). Thus, hypothesis 5 was not supported.

Perceived Message Effectiveness

Hypothesis 6a was partially supported as the controlled tanning inoculation message ($M=4.3$, $SD=0.46$) performed better than the one-sided message ($M=4.1$, $SD=0.50$), as did the base tan inoculation message ($M=4.3$, $SD=0.54$) compared to the one-sided message ($M=4.0$, $SD=0.60$), and vitamin D inoculation ($M=4.3$, $SD=0.59$) compared to the one-sided message ($M=4.0$, $SD=0.66$). Further, all messages were perceived to be more effective, relative to the control message, which scored the lowest, $M=3.9$, $SD=0.59$. Hypothesis 6b was supported as all one-sided messages were perceived to be more effective relative to the control message.

Inoculation, one-sided, and control messages were easy to understand, with no differences between inoculation and one-sided messages on the same topic. A similar pattern was found for how truthful the message was perceived to be, with a slight difference in that the highest endorsed message was the control message, thus hypothesis 6c was supported. The government regulation inoculation and one-sided messages were rated similar in terms of perceived effectiveness ($M=4.2$, $SD=0.63$; $M=4.2$, $SD=0.60$, respectively). (see *Table 13*).

Discussion

Extensive message testing through the use of cognitive interviews and an online pilot survey proved to be a worthy venture in testing and refining messages to use in a full message experiment of skin cancer prevention messages. Cognitive interviews were critical in refining not only the content of messages, but also semantics and syntax. While messages generally required minimal editing, concerns over whether or not people were aware of indoor tanning safety claims regarding government regulation of indoor tanning beds were first raised in these interviews. The

detailed information received from participants led to substantial edits of the government regulation inoculation and one-sided messages.

The online pilot survey indicated that inoculation messages were generally found to be more effective, compared to one-sided and control messages, in terms of counterarguing, cognitive processing, and self-efficacy for one's attitude position, all important mechanisms in inoculation theory. Measures of perceived message effectiveness, counterarguing, and cognitive processing were especially useful in the pilot survey, as these measures were asked of each message – whereas outcome expectations, self-efficacy, and intentions to indoor tan were asked after participants in the experimental conditions viewed both messages, which did not allow for an examination of individual messages on these outcomes. Specifically, the inclusion of the government regulation messages in the inoculation and one-sided safety conditions, and the base tan messages in the inoculation and one-sided health conditions, suggest caution in interpreting outcome expectation, self-efficacy, and intentions measures across experimental conditions, as issues regarding these messages may have detracted from the effects of the controlled tanning and vitamin D inoculation messages. Fundamental issues with the government regulation and base tan messages led to the final decision to remove these message topics from the final experiment in Aim 3, and instead to test the two most promising messages identified in this work: controlled tanning and vitamin D. This is discussed in more detail below.

The government regulation message, despite substantial edits based on feedback from the cognitive interviews, still did not resonate with participants in the online pilot survey. Even though the content analysis revealed claims about government regulation as an attempt to promote the safety of indoor tanning beds, a number of participants stated that they were unaware that the government had anything to do with tanning regulation. More concerning was

the number of participants who were aware of the government regulations on tanning beds that reported they thought the government was not “doing its job” in protecting people from dangerous devices, or if tanning beds were “really that bad” then why would the government allow the public to use such a dangerous device? While these two issues may represent a key area for messaging to inform the public of the government’s role in regulating dangerous devices such as tanning beds, such messaging does not fit within the scope of this project on anti-tanning messages.

The base tan messages were also problematic, for two reasons. First, the idea of a “base tan” had two different meanings, one as a protection from future sun exposure, and the other as a base tan for appearance reasons. While “base tan for appearance” was included in the Aim 1 codebook, none of the websites included content on this. However, it is clear that a number of participants interpreted “base tan” as an appearance term, instead of a protective health measure, despite the information presented in the base tan messages. This discovery is problematic considering the goal of the current project, as it would be difficult to ascertain the utility of inoculation theory in deconstructing misinformation regarding the base tan claim, when base tan has two different meanings. Further, the base tan messages produced more arguments against the anti-tanning message, and participants reported lower levels of agreement with the message. Perhaps the issue of the two meanings of “base tan” confounded the counterarguing results as participants reported arguments relevant to getting a base tan for appearance purposes, as well as for protection. All considered, these issues render this issue not optimal for counter messaging. Further, the controlled tanning safety messages, and vitamin D health messages most clearly operated within the boundaries of their respective formats. These inoculation messages elicited fewer counterarguments against the experimental message, more arguments against indoor

tanning, and were perceived to be more effective overall, especially in increasing self-efficacy to avoid indoor tanning, convincing the things people say about the benefits of indoor tanning are false, and encouraging talk with others about the dangers of indoor tanning.

While this formative research study provided essential information about these messages and how they should be improved before using them in a full message experiment, it was not without limitations. First, current tanners (those who have tanned in the past year) were not available for cognitive interviews, and feedback from those who had tanned more recently may have indicated issues with messages identified in the pilot, such as base tan as an appearance motivation rather than a health motivation. However, cognitive interview participants indicated that they were familiar with all but the government regulation claims. the sample size of the quantitative pilot was small, and consequently, so was the overall rate of ever tanners, which could be an artifact of the recruitment site. Second, the low response rate to questions regarding the second message in experimental conditions, made it difficult to discern the effectiveness of the second message in each panel. While only four participants indicated that the messages were too long, the lack of response to measures regarding the second message indicates that messages should be shortened to the extent that they still maintain the core arguments and structure of the messages tested in this study. Finally, measures of self-efficacy, outcome expectations, and intentions were provided after participants in the experimental conditions read both messages, making it impossible to discern which message influenced their responses as even those who did not respond to the measures for the second message may have still read the second message. However, content specific measures of positive and negative outcome expectations aided in making the final decision to test two inoculation and two one-sided messages in the final experiment.

Conclusion

The formative research conducted for this Aim provided critical feedback for message improvement, as well as how to structure the experiment in Aim 3. Specifically, with the exclusion of the government regulation and base tax messages, participants will only be exposed to one of the two most promising experimental messages tested in this study. In doing this, the likelihood of encountering the issue of no-response to measures for the second message as found in this study. Messages will also be shortened and word counts will be similar across all experimental conditions, not just similar inoculation and one-sided messages, in the Aim 3 experiment. This will rule out the possibility of message differences due to word length. Arguments will also be refined to more explicitly address the positive and negative outcome expectations relative to each message topic.

Table 6. Index of Message Testing Hypotheses and Results

Hypothesis Number	Hypothesis	Supported?	Location of Relevant Tests
H1a	Those exposed inoculation messages will engage in <i>less counterarguing</i> of the inoculation message than those exposed to similar one-sided and control messages.	Partially	Table 3
H1b	Those exposed to the control message will engage in <i>less counterarguing</i> of the anti-tanning message than those exposed to inoculation or control anti-tanning messages.	Yes	Table 3
H2a	Those exposed to inoculation messages will have a <i>greater frequency of cognitive response</i> output overall than those exposed to similar one-sided or control messages.	Partially	Table 4
H2b	Those exposed to inoculation messages will have <i>greater frequency of cognitive response output against indoor tanning</i> than those exposed to similar one-sided or control messages.	Partially	Table 4
H3a	Those exposed to inoculation and one-sided messages will be <i>less likely to endorse positive outcome expectations relative to their message topic</i> , compared to the control condition.	Partially	Table 5
H3b	Those exposed to inoculation messages report fewer positive outcome expectations, and more negative outcome expectations, overall, relative to those exposed to similar one-sided messages and the control message.	No	Table 5/ Table 6
H4a	Those exposed to inoculation messages will report more confidence in their attitudes regarding indoor tanning relative to those exposed to similar one-sided messages and the control message.	Yes	Table 7
H4b	Those exposed to inoculation messages will report more confidence in their ability to defend and maintain their position if opposing viewpoints are encountered, relative to those exposed to similar one-sided and control messages.	Yes	Table 7
H5	Those exposed to inoculation and one-sided messages will report lower intentions to go indoor tanning compared to those exposed to the control message	No	Table 8
H6a	Inoculation messages will be perceived as more effective compared to similar one-sided messages and the control messages.	Partially	Table 9
H6b	One-sided messages will be perceived as more effective compared to the control message.	Yes	Table 9
H6c	Inoculation, one-sided, and control messages will not differ in perceived understandability and truthfulness.	Yes	Table 9

Table 7. Demographic Characteristics of the Sample (N=177)

Variable	N	%
<i>Age (M, SD)</i>	20.16	0.98
<i>Year in School</i>		
Freshman	1	0.6
Sophomore	60	33.9
Junior	56	31.6
Senior	44	24.9
<i>Race</i>		
White	152	85.9
Other	9	5.1
Black/African American	0	0
<i>Ethnicity</i>		
Hispanic/Latino	9	5.1
<i>Mother's Educational Attainment</i>		
11 th grade or less	2	1.1
HS diploma or GED	9	5.1
2 year technical college or some college	10	5.6
4 year college degree	76	42.9
Some graduate school	3	1.7
Completed graduate school	61	34.5
Not applicable	0	0
<i>Father's Educational Attainment</i>		
11 th grade or less	1	.6
HS diploma or GED	5	2.8
2 year technical college or some college	10	5.6
4 year college degree	50	28.2
Some graduate school	2	1.1
Completed graduate school	92	52.0
Not applicable	1	.6
<i>Skin color (natural)</i>		
Very Fair	33	18.6
Fair	96	54.2
Olive	34	19.2
Light Brown	13	7.3
Dark Brown	1	.6
<i>Tendency to burn (1 hour sun exposure in summer no protection)</i>		
Severe sunburn with blistering	3	1.7
Painful sunburn with peeling	64	36.2
Mildly burnt then tan	84	47.5
Brown without sunburn	25	14.1

Don't know	1	.6
<i>Tannability (repeated sun exposure in summer no protection)</i>		
Always burn, never tan	21	11.9
Usually burn, tan (with difficulty) less than average	45	25.4
Sometimes mild burn, tan about average	62	35.0
Rarely burn, tan (with ease) more than average	45	25.4
Rarely or never burn, my skin is brown	4	2.3
<i>Summer sun protection behavior (sunscreen, hat, etc.)</i>		
Never or hardly ever	8	4.5
Less than half the time	16	9.0
About half the time	39	22.0
Not always but more than half	58	32.8
Always or almost always	56	31.6
<i>Ever had skin cancer?</i>		
Yes	4	2.3
<i>Has anyone in your family ever had skin cancer?</i>		
Yes	99	55.9
<i>Have you ever used a tanning bed in your lifetime?</i>		
Yes	31	17.5
<i>Have you used a tanning bed at least once during the past 12 months?</i>		
Yes	12	6.8
<i>In the past 12 months, which seasons did you indoor tan?</i>		
Winter	7	4.0
Spring	5	2.8
Fall	5	2.8
Summer	5	2.8
<i>What best describes your use of indoor tanning devices?</i>		
Regularly, all year round	1	0.6
Occasionally	6	3.4
Rarely	4	2.3
Regularly, but only during particular seasons	0	0

Note. Where N's do not sum to 177, this is because a small number of participants (n=16) did not provide demographic information.

Table 8. Counterarguing Against the Anti-Tanning Message

		Control Tan		Government Regulation		Base Tan		Vitamin D		Control	Total
		<i>Inoc.⁺</i>	<i>One-sided</i>	<i>Inoc.</i>	<i>One-sided</i>	<i>Inoc.</i>	<i>One-sided</i>	<i>Inoc.</i>	<i>One-sided</i>		
	N =	47	27	47	27	35	37	35	37	31	177
Agreed with author's points*	M (SD)	1.64 (0.71)	1.74 (0.66)	1.98 (0.79)	1.74 (0.66)	1.60 (0.85)	1.89 (0.84)	1.60 (0.74)	1.97 (0.81)	1.52 (0.63)	1.75 (0.76)
Disagreed with author's points		1.66 (0.76)	2.07 (0.96)	2.09 (0.93)	2.07 (1.00)	2.37 (1.40)	2.05 (0.97)	2.23 (1.33)	2.42 (1.16)	1.74 (1.09)	2.07 (1.09)
Thought of arguments to support what author was saying*		2.15 (0.75)	2.30 (0.87)	2.19 (0.71)	2.04 (0.94)	2.00 (0.97)	2.19 (0.70)	2.03 (0.95)	2.22 (0.72)	2.16 (1.00)	2.14 (0.83)
Thought of arguments against what author was saying		2.47 (1.06)	2.56 (1.05)	2.45 (0.90)	2.30 (0.99)	2.83 (1.32)	2.81 (1.13)	2.69 (1.08)	2.61 (1.10)	2.13 (1.06)	2.54 (1.09)
Counterarguing ¹		1.98 (0.82)	2.17 (0.88)	2.18 (0.83)	2.04 (0.90)	2.20 (1.13)	2.31 (0.95)	2.14 (1.02)	2.31 (0.95)	1.89 (0.94)	2.13 (0.94)

Note. ⁺ Inoc. = Inoculation

* Reverse coded so that a higher mean indicates more counterarguing against the experimental message.

¹The average of the 4 counterarguing items measured with the following response scale: 1 = strongly disagree, 2 = somewhat disagree, 3 = neither agree nor disagree, 4 = somewhat agree, 5 = strongly agree.

Table 9. Cognitive Processing

		Controlled Tanning		Government Regulation		Base Tan		Vitamin D		Control	Total
		<i>Inoc.⁺</i>	<i>One-sided</i>	<i>Inoc.</i>	<i>One-sided</i>	<i>Inoc.</i>	<i>One-sided</i>	<i>Inoc.</i>	<i>One-sided</i>		
	N =	47	27	47	27	35	37	35	37	31	177
Arguments against IT ¹	M	2.45	1.59	0.53	0.85	1.97	1.51	1.46	1.00	0.87	1.38
	(SD)	(2.23)	(1.50)	(0.91)	(1.26)	(1.72)	(1.61)	(1.74)	(1.43)	(1.12)	(1.67)
Arguments in support of IT ¹		0.51	0.41	0.15	0.15	0.43	0.59	0.06	0.43	0.35	0.35
		(0.83)	(0.84)	(0.36)	(0.36)	(0.70)	(0.83)	(0.24)	(0.80)	(0.71)	(0.69)
Neutral statements		0.36	0.48	0.23	0.26	0.34	0.46	0.00	0.11	0.19	0.27
		(0.67)	(0.70)	(0.48)	(0.45)	(0.68)	(1.04)	(0.00)	(0.31)	(0.54)	(0.62)
Cognitive processing total ²		3.32	2.48	0.91	1.26	2.74	2.57	1.51	1.54	1.42	2.00
		(3.02)	(2.28)	(1.43)	(1.65)	(2.32)	(2.69)	(1.82)	(2.26)	(1.77)	(2.34)

Note. ⁺ Inoc. = Inoculation

¹IT = Indoor tanning

²Average sum of all cognitive processing output

Table 10. Positive Outcome Expectations

		Safety		Health		Control	Total
		<i>Inoculation</i>	<i>One-sided</i>	<i>Inoculation</i>	<i>One-sided</i>		
N =		47	27	35	37	31	177
Control Avg ¹	M (SD)	1.72 (1.00)	1.60 (0.66)	1.77 (1.08)	1.69 (0.84)	1.77 (0.98)	1.72 (0.93)
Government Regulation Avg ²		1.44 (0.77)	1.41 (0.46)	1.63 (0.87)	1.58 (0.83)	1.60 (0.92)	1.53 (0.78)
Vitamin D Avg ³		1.55 (0.84)	1.54 (0.63)	1.44 (0.72)	1.66 (0.94)	1.42 (0.91)	1.53 (0.82)
Base Tan Avg ⁴		1.60 (0.91)	1.63 (0.68)	1.44 (0.76)	1.61 (0.77)	1.64 (0.98)	1.58 (0.82)

Note. ¹The average of control time, choose bed, and safer than the sun.

²Average of safe because IT is regulated, legal, and government sets exposure schedule.

³Average of good way to get vitamin D, natural, and healthy because IT gives you vitamin D.

⁴Average of base tan for protection, natural sunscreen, and increases sunscreen effect.

Table 11. Negative Outcome Expectations

		Safety		Health		Control	Total
		<i>Inoculation</i>	<i>One-sided</i>	<i>Inoculation</i>	<i>One-sided</i>		
	N =	47	27	35	37	31	177
Dangerous because wouldn't know how well kept up with maintenance	M	4.15	4.38	4.18	4.09	3.92	4.15
	(SD)	(1.18)	(0.64)	(1.13)	(1.06)	(1.29)	(1.09)
Unsafe high dose of radiation		4.41	4.42	4.45	4.24	4.52	4.40
		(0.93)	(0.76)	(1.03)	(1.10)	(1.01)	(0.97)
Don't follow guidelines		3.94	4.31	3.91	3.68	3.92	3.93
		(1.11)	(0.74)	(1.10)	(1.12)	(1.15)	(1.07)
Increase chances for melanoma		4.50	4.62	4.39	4.47	4.36	4.47
		(0.84)	(0.64)	(1.00)	(1.05)	(1.04)	(0.92)
Skin cancer		4.39	4.19	4.00	4.26	4.12	4.21
		(0.86)	(0.80)	(1.03)	(0.90)	(0.93)	(0.91)
Premature skin aging		4.52	4.58	4.27	4.35	4.36	4.42
		(0.84)	(0.64)	(1.07)	(0.88)	(0.95)	(0.89)
More dangerous than the sun		4.43	4.35	4.30	4.24	4.20	4.32
		(0.89)	(0.89)	(1.02)	(0.99)	(1.00)	(0.95)
Damage multiple layers of skin		4.43	4.50	4.36	4.29	4.32	4.38
		(0.81)	(0.71)	(0.99)	(1.06)	(0.90)	(0.90)
Risky way to tan		4.46	4.50	4.42	4.41	4.44	4.45
		(0.81)	(0.71)	(1.00)	(0.86)	(0.92)	(0.85)
Unhealthy way to tan		4.41	4.58	4.39	4.38	4.48	4.44
		(0.83)	(0.64)	(1.00)	(0.85)	(1.01)	(0.87)
Negative Outcome Expectations Avg ¹		4.37	4.44	4.27	4.24	4.26	4.32
		(0.76)	(0.59)	(0.94)	(0.83)	(0.88)	(0.80)

Note. ¹ Negative Outcome Expectations Average was computed by averaging the ten negative outcome expectation items.

Table 12. Self-Efficacy

		Safety		Health		Control	Total
		<i>Inoculation</i>	<i>One-sided</i>	<i>Inoculation</i>	<i>One-sided</i>		
	N =	47	27	35	37	31	177
Attitude firm	M	88.07	86.07	90.24	85.03	85.12	87.10
	(SD)	(17.14)	(18.84)	(17.73)	(20.18)	(15.17)	(17.85)
Correct attitude		90.36	88.59	93.00	88.69	80.88	88.78
		(12.49)	(16.69)	(12.44)	(16.26)	(23.05)	(16.25)
Attitude will not change		87.04	81.11	88.06	81.66	84.15	84.71
		(17.13)	(20.98)	(20.79)	(23.92)	(19.85)	(20.42)
Can defend attitude		86.22	84.11	87.09	85.09	79.92	84.84
		(16.95)	(21.78)	(18.66)	(21.08)	(24.41)	(20.14)
Maintain position		85.78	81.63	87.41	80.29	76.92	82.91
		(17.10)	(19.34)	(13.80)	(23.09)	(26.63)	(20.09)
Successfully argue position		85.89	83.19	86.82	79.63	75.42	82.70
		(18.72)	(17.63)	(14.36)	(24.97)	(25.65)	(20.64)
Overall ¹		87.23	84.12	88.77	83.40	79.86	85.09
		(14.23)	(16.31)	(12.14)	(18.18)	(21.12)	(16.39)

Note. ¹Self-Efficacy Overall was computed by averaging the six self-efficacy items.

Table 13. Perceived Message Effectiveness (PME)

		N =	Control tan		Government Regulation		Base Tan		Vitamin D		Control	Total
			Inoc. ⁺	One-sided	Inoc.	One-sided	Inoc.	One-sided	Inoc.	One-sided		
			47	27	47	27	35	37	35	37	31	177
26	Understand	M	4.50	4.49	4.32	4.26	4.62	4.52	4.34	4.27	4.32	4.39
		(SD)	(0.64)	(0.60)	(0.74)	(0.90)	(0.68)	(0.65)	(0.68)	(0.78)	(1.11)	(0.75)
	Truthful		4.31	4.31	4.26	4.30	4.38	4.17	4.31	4.22	4.58	4.31
			(0.70)	(0.83)	(0.69)	(0.67)	(0.81)	(0.93)	(0.80)	(0.75)	(0.67)	(0.74)
	Said something important		4.21	4.20	4.10	4.19	4.3	4.00	4.26	4.05	3.97	4.11
			(0.75)	(0.83)	(0.88)	(0.68)	(0.80)	(0.83)	(0.70)	(0.78)	(0.98)	(0.81)
	Taught me something new		3.59	3.38	4.28	4.04	3.80	3.55	4.11	3.89	2.97	3.72
			(1.12)	(1.38)	(1.01)	(1.06)	(1.25)	(1.20)	(0.90)	(0.97)	(1.22)	(1.10)
	Made me think about the dangers of IT		4.27	4.21	4.28	4.37	4.30	4.08	4.43	3.92	4.06	4.21
			(0.81)	(0.90)	(0.76)	(0.69)	(0.75)	(0.90)	(0.74)	(1.04)	(0.85)	(0.84)
27	Made me confident in my ability to avoid IT		4.60	4.33	4.28	4.26	4.31	4.17	4.40	3.95	4.29	4.26
			(0.70)	(1.11)	(0.78)	(0.98)	(1.02)	(0.94)	(0.70)	(0.97)	(0.78)	(0.91)
	Talk to others about dangers of IT		3.87	3.69	3.94	3.67	3.92	3.58	4.00	3.54	3.26	3.71
			(0.97)	(1.08)	(0.94)	(0.83)	(1.03)	(1.07)	(0.87)	(1.11)	(1.26)	(1.01)
	Convinces me things people say about IT benefits are false		4.39	4.24	4.12	4.33	4.30	3.93	4.20	3.78	3.90	3.99
			(1.01)	(0.82)	(0.90)	(0.83)	(0.89)	(0.95)	(0.8)	(1.11)	(0.98)	(0.92)
	Made a strong argument against IT		4.45	4.46	4.38	4.44	4.47	4.10	4.37	3.86	4.23	4.31
28			(0.63)	(0.74)	(0.75)	(0.64)	(0.79)	(1.11)	(0.69)	(0.98)	(0.92)	(0.79)
	Motivates me to stay away from IT		4.50	4.49	4.40	4.59	4.51	4.27	4.46	3.97	4.23	4.38
			(0.74)	(0.64)	(0.84)	(0.64)	(0.79)	(0.89)	(0.70)	(0.96)	(0.92)	(0.79)
PME total ¹			4.25	4.19	4.22	4.24	4.27	4.07	4.29	3.95	3.98	4.14
			(0.47)	(0.58)	(0.63)	(0.60)	(0.54)	(0.60)	(0.59)	(0.70)	(0.66)	(0.87)

Note. ⁺ Inoc. = Inoculation

¹PME total represents the average of the ten PME items.

CHAPTER 4

Countering Misinformation: An Experiment of One- and Two-sided Messages for Skin

Cancer Prevention

Introduction

Indoor tanning is a behavior that is the result of preferences for tanned skin as a way to increase attractiveness. Numerous studies have revealed that a large majority of people – including tanners themselves - are aware of the health harms associated with indoor tanning, and yet a recent survey conducted by the American Academy of Dermatology found that 75% of participants said tanned people are more attractive (Yang & Han, 2016). This suggests cognitive dissonance (Festinger, 1962) among tanners regarding knowledge of health harms and the desire to be attractive. The abundance of misinformation regarding indoor tanning likely helps alleviate this dissonance by providing false assurances of the safety and health of indoor tanning. Thus, inoculation theory offers a unique framework in which to deconstruct these myths, removing one of the tools individuals may use to reduce the psychological discomfort that stems from this cognitive dissonance.

This study seeks to understand the utility of inoculation theory in the context of indoor tanning and skin cancer prevention by comparing the effects of inoculation messages to standard health communication messages (i.e. one-sided messages). To achieve this, mechanisms associated with *message evaluation*, the *process* of persuasion, and *outcomes* are assessed immediately after message exposure, and again one-week post-message exposure.

Inoculation Theory in the Context of Indoor Tanning

Inoculation theory is typically applied to issues for which people hold pre-existing attitudes or opinions, such as public policy, tobacco, drinking, and vaccination. Prevalent within the inoculation literature is the idea that in order for inoculation theory to be effective it must be applied to issues with which people are at least moderately involved or hold attitudes and beliefs about (such as those previously mentioned) (JCompton & Pfau, 2005; Pfau, Tusing, Lee, et al., 1997). However, a meta-analysis of the inoculation literature suggests that the contribution of the theory is not limited to such issues (Banas & Rains, 2010). Inoculation theory is often conceptualized as conferring protection from future opposing arguments or attitudes, much like a vaccine is given to prevent future exposure to the flu. The biological analogy of inoculation could also be extended as a prophylactic treatment for coming into contact with misinformation about an issue that may not be personally relevant to the receiver, or may be a less-engaging but dangerous (e.g. tanning beds) component of a highly salient issue (e.g. societal norms of attractiveness and the desire to be attractive).

Considering the prevalence of misinformation about indoor tanning, contact with misinformation about indoor tanning is likely to happen before prevention efforts can take place, making inoculation messages a potential tool for correcting misinformation about indoor tanning. Successful correction of misinformation mitigates the effectiveness of erroneous claims as a tool to assuage the psychological discomfort that arises when engaging in known dangerous behaviors to achieve a goal - In this sense, inoculation is not only used as protection for those who have not tanned indoors, but also for deconstruction and treatment of behavior for those who have. To extend the analogy of biological inoculation, inoculation messages are analogous to treatment for slow moving viruses, such as Tetanus. When tetanus is treated with vaccination,

the initial vaccination contains *passive* antibodies to help the infected person fight the virus, similar to the presentation of a weakened argument in support of an issue or behavior (such as indoor tanning) followed by a strong refutation of that argument. After the initial dose, *active* antibodies are introduced to strengthen the body's natural immune defense in order to continue fighting off the virus. The active dose is analogous to encountering an attack message or message supporting the unhealthy issue or behavior, which is likely to happen naturally outside of the context of a research experiment. In this regard, inoculation messages may offer an advantage over other message types as indoor tanning is a behavior for which many do not hold a strong attitudes or beliefs – it's a means to an end (i.e. socially constructed ideals of attraction).

Involvement has been defined throughout the inoculation literature as “the importance or salience of an attitude object for a receiver” (p. 190; Pfau, Tusing, Lee, et al., 1997). However, for issues such as indoor tanning in which the salient attitude object is the outcome, not the behavior, involvement may best be conceptualized as experience. The impact of indoor tanning misinformation and subsequent correction of misinformation is likely moderated by actual experience. Since the most damaging effects of tanning bed use, such as skin cancer, are distal from the behavior, and acute dangers are uncommon, many who have tanned indoors may be less inclined to accept the correction of indoor tanning misinformation. Those who have not tanned indoors and have not had the experience of going to a tanning bed and leaving with a tan may process the correction of misinformation differently from those with experience.

Using a longitudinal design, this study seeks to apply and extend inoculation theory by applying this message format to counter misinformation regarding a behavior that is fundamentally different from issues and behaviors often studied with inoculation theory, as indoor tanning is not a behavior for which many people have psychological or emotional ties to –

these ties are related to the outcome of indoor tanning, not the behavior itself. The difference of context and reconceptualization of traditional mechanisms may contribute to understanding the underlying processes of persuasion.

Processes of Persuasion and Application in the Current Study

Counterarguing

While the traditional inoculation approach measures counterarguing only after exposure to the attack message (Compton & Pfau, 2005), counterarguing is assessed in this study immediately after exposure to the experimental message, as well as after exposure to the attack message one-week later. Understanding the level of argument against the experimental message may illuminate some of the ways in which inoculation and one-sided messages operate.

Inoculation messages acknowledge two sides of an argument, thus speaking to an individual's agency to think for themselves, whereas one-sided messages are didactic in nature. Thus, it is predicted that inoculation messages will elicit fewer counterarguments against the experimental message at baseline compared to one-sided messages (H1a). Since the control message does not contain persuasive arguments, and simply states basic facts about indoor tanning, it is not expected that the control message will elicit many counterarguments. Thus differences in counterarguing are only predicted between inoculation and one-sided messages. For those who have tanned indoors before, a higher level of counterarguing against the prevention message is expected across conditions, relative to those who have not tanned before (H1b).

As inoculation theory models counterarguments to misinformation about indoor tanning benefits, it is predicted that those in the inoculation condition will engage in more counterarguing against the attack message at follow-up than those exposed to one-sided and

control messages (H1c). Since one-sided messages provide persuasive arguments against indoor tanning, those in the one-sided condition are likely to engage in more counterarguing of the attack message, relative to those in the control condition (which does not provide any persuasive argument against indoor tanning), at follow-up (H1d).

Cognitive Processing

Cognitive processing regards the negative, positive, and neutral thoughts about indoor tanning, and the relationship between the magnitude of such thoughts in response to message exposure. It is expected that those in the inoculation condition will have more negative thoughts about indoor tanning after exposure to the experimental message (H2a) as well as after exposure to the attack message at follow-up (H2b). Compared to those who have never tanned, those who have tanned will report fewer negative thoughts (H2c) about indoor tanning after exposure to the experimental message, regardless of message condition.

Self-Efficacy: Attitude Strength and Defending Attitudes

The role of self-efficacy in the context of indoor tanning is unclear as many do not hold strong attitudes about indoor tanning. However, understanding how attitudes may be affected with messages could be valuable information for future campaigns. Therefore, the following research questions are proposed:

RQ1: Do reports of attitude strength and confidence to defend attitudes change from baseline to follow-up by message condition?

RQ2: Are there differences between those with and without indoor tanning experience for attitude strength and confidence to defend attitudes about indoor tanning?

Message Evaluation

Perceived Message Effectiveness

Since messages were constructed to be equally understandable and truthful, no differences in ratings of these constructs is expected (H3a-b). The inoculation and one-sided messages provide evidence and statistics about the harms of indoor tanning, and the arguments are grounded in logical appeals. Therefore, it is predicted that these messages will be viewed as important (H3c), to contain novel information (H3d), and to be rated as likely to be talked about with others (H3e) relative to the control condition. The design of inoculation messages and the primary theoretical mechanisms suggest that the presentation of both sides of the argument will be more strongly endorsed for: eliciting thinking about the dangers of indoor tanning (H3f); engendering confidence in ability to avoid indoor tanning (H3g); motivating people to talk with others about the dangers of indoor tanning (H3h); convincing that the things people say about the benefits of indoor tanning are false (H3i); making a strong argument against indoor tanning (H3j); and motivating one to avoid indoor tanning (H3k) compared to one-sided and control messages.

Outcome Variables

Outcome Expectations

Inoculation and one-sided messages provide various arguments about the harms of indoor tanning. Therefore, at baseline it is expected that those in the inoculation and one-sided message conditions will be less likely to endorse positive safety and health outcome expectations (H4a) and more likely to endorse negative safety and health outcome expectations (H4b) compared to those in the control condition. The same effect of reduced positive outcome expectations (H4c)

and increased negative outcome expectations (H4d) is expected at follow-up, relative to one-sided and control conditions.

While understanding differences between groups is important to understanding how these messages work, understanding how outcome expectations within groups change over time may be useful for understanding the utility of different message formats in the context of indoor tanning. Therefore:

RQ3: Are there differences in the magnitude of change for positive safety and health outcome expectations within groups?

RQ4: Are there differences in the magnitude of change for negative safety and health outcome expectations within groups?

Intentions

Inoculation messages are predicted to be more effective in reducing indoor tanning intentions relative to one-sided and control messages. This effect is measured at baseline and follow-up. Therefore, those exposed to inoculation messages are expected to report lower intentions to tan indoors at baseline and follow-up relative to one-sided and control messages (H5a-b). Given that few participants will have tanned indoors over the 1-week timeframe, examining the impact of experimental conditions on behavior would likely be misleading.

Also of interest is the possibility of cross-protection for outdoor tanning, as previous research (Parker, Ivanov, & Compton, 2012) has found that inoculating one health behavior directly has implications for related but different health behaviors.

RQ5: Do inoculation messages reduce outdoor tanning intentions from baseline to follow-up?

Interpersonal Communication

There are many mechanisms through which inoculation messages incite conversations with others about the message and issue or topic of the message. Regardless of experience with indoor tanning, the information presented in the message may be novel for those who have never indoor tanned, or it may contradict what experienced tanners believe to be true about indoor tanning, thereby encouraging information seeking or confirmation of what one believes to be true (Compton & Pfau, 2005). Therefore, it is expected that those exposed to inoculation messages will have more conversations about the message compared to those in one-sided and control message conditions (H6a).

Methods

Participants

Participants were recruited from Panhellenic sororities at a large public university in the South Eastern United States. Of the 2,084 participants across 12 sororities who were eligible to take the survey (according to records provided by the Panhellenic council), 706 (34%) participants initiated the survey, while $N=649$ completed it, for a 31% response rate. The 57 participants who were removed from the sample were removed due to false starts ($n=42$) and or completed less than 50% of the survey ($n=15$). The average age of participants was 19.8 years ($SD=1.26$), and participants identified as White (96%), followed by Asian (12%), other (10%), and Black or African American (4%). Thirty- nine (6%) were Hispanic/Latino. Twenty-nine

percent (n=189) indicated that they had ever used a tanning bed in their lifetime, and 52% (n=98) of those who had ever tanned reported tanning within the past year (see Tables 14 and 15).

Procedure

The Panhellenic Council assisted with baseline recruitment efforts by sending emails to invite sorority members to take the survey. The emails explained the purpose of the study and what participation in the study entailed, including a follow-up survey one-week after the baseline survey (see *Appendix C1*). The baseline survey was available for four weeks (1/1/2017-2/8/2017), during which time four reminder emails were sent, each which contained a link to the survey itself.

To incentivize participation, sorority houses with at least a 25% participation rate at baseline received a \$50 gift card, with graduated incentives at 50% (\$100) and 75% (\$150) levels. Also, an additional \$100 gift card was offered for the house with the highest participation rate. Survey completion was recorded into a spreadsheet so that follow-up surveys could be sent to participants exactly one-week after each participant completed the baseline survey. Follow-up emails were sent by the researcher and contained a link generated by Qualtrics according to participants' randomly assigned group at baseline to ensure participants received the correct follow-up survey, which differed only in the attack message delivered as according to each study condition.

At baseline, participants (N=649) were randomized to one of five message conditions: 1) inoculation controlled tanning (n=133), 2) inoculation vitamin D (n=130), 3) one-sided controlled tanning (n=129), 4) one-sided vitamin D (n=130), and 5) control (n=127). All participants provided informed consent before beginning the survey, which began by asking

participants to indicate which sorority they were a member of in order to assign house credit to each sorority. Participants answered questions regarding indoor tanning behavior and tanning demographics (e.g. skin color, burn tendency) before being asked to read a (experimental or control) message. All participants were exposed to one message – 579-595 words in length (see *Figure 4* for study flow). The remainder of the baseline survey asked participants to answer items about the perceived effectiveness of the message they just read, followed by measures of counterarguing, cognitive processing, likelihood of talking with someone about the message, self-efficacy, outcome expectations, intentions, and finally, basic demographic questions (e.g. age, race). The survey took participants about 10 minutes to complete.

At follow-up, N=324 (n=138 inoculation; n=125 one-sided; n=61 control) participants again provided informed consent and were asked about their tanning behavior during the past week, recall of the baseline message, and whether they had talked with anyone about the message, and if so, who they talked to and the content of the conversation. Participants who indicated they had not talked with anyone were asked who/what they would talk to/about if they were to talk with someone about the message. Next, participants were asked to read an attack message that argued in support of indoor tanning behavior, respective to their assigned condition (e.g., participants who read a message about the misconceptions regarding vitamin D and at baseline received a message about vitamin D as a benefit of indoor tanning at follow-up). After reading the message, participants responded to counterarguing and cognitive processing measures in relation to the attack message. Finally, participants answered self-efficacy, outcome expectations, and indoor and outdoor tanning intentions before being debriefed on the message they had just read. The debriefing explained that the attack messages were false, provided evidence of the dangers of indoor tanning, and provided additional online resources from the

CDC that participants could use should they want further information about the dangers of indoor tanning. The survey ended with a free response option in which participants could record any additional thoughts or feedback regarding the study.

Experimental Conditions

This study used the controlled tanning and vitamin D inoculation and one-sided messages based on results from the Aim 2 quantitative pilot survey for a total of four experimental message conditions at baseline. The controlled tanning messages addressed the misconception that indoor tanning is safe because the bulbs and exposure times are carefully controlled. The vitamin D messages addressed the misconception that indoor tanning is a healthy way to get vitamin D. Minor changes were made to the Aim 2 messages based on the quantitative pilot survey results. These changes were made for consistency in length (579-595 words), stylistic presentation, and to ensure basic facts about the dangers of indoor tanning (unrelated to the topic of the experimental condition) were consistent across all messages. For example, all messages referred to the International Agency for Research on Cancer's finding that people who use tanning beds before the age of 35 are 75% more likely to develop melanoma compared to those who have never used tanning beds (2007), while also presenting facts respective to their safety (controlled tanning) and health (vitamin D) topics. All messages were written at a 12th grade reading level, according to the Flesch-Kincaid readability test. (see *Appendix C2* for all messages used in this study).

The attack messages presented at follow-up were the attack messages tested in Aim 2. These messages were found on pro-tanning websites examined in Aim 1. No changes were made to these messages in order to assess the effects of inoculation and one-sided messages in relation to real-world pro-tanning arguments regarding controlled tanning and vitamin D. The controlled

tanning attack message was 157 words and the vitamin D attack message was 142 words. Both were written at a 12th grade reading level.

Control Condition

The control message from Aim 2 was used in this experiment. This message remained unchanged from Aim 2 and contains 43 words written at a 12th grade reading level. This message contained four simple statements under the heading: “*Facts about indoor tanning*,” and was void of detailed, persuasive arguments.

Since there were no significant differences between the controlled tanning and vitamin D attack messages in Aim 2, and given limitations related to randomization algorithms in Qualtrics, those exposed to the control message at baseline received the controlled tanning attack message at follow-up.

Measures

Dependent variables

Dependent variables are described next, grouped by process and outcome variables.

Process Variables

Perceived Message Effectiveness. Perceived message effectiveness was measured using the ten items described in Aim 2 with the addition of an interpersonal communication item (“This message motivates me to talk to others about the dangers of indoor tanning”) to allow for the assessment of an action for those who have never tanned and have no intentions to do so in the future. For this study, individual items were assessed as items assessed a variety of aspects related to perceived message effectiveness (PME). Assessing these items separately offers more

information about how different message formats are perceived and may affect the persuasion process.

Counterarguing. The counterarguing measure previously described in Aim 2 was used. This four item measure had good reliability at baseline across all message conditions ($\alpha = 0.74$) (Miller et al., 2013; Niederdeppe, Heley, & Barry, 2015).

Cognitive Processing. Cognitive processing was assessed to determine the net of arguments against indoor tanning, computed as the sum of arguments in support of indoor tanning subtracted from arguments against indoor tanning (Petty & Cacioppo, 1979a), at both baseline and follow-up. Participants were given five free response fields to report 1) any negative thoughts they had after reading the a) experimental message at baseline b) the attack message at follow-up; 2) any positive thoughts about indoor tanning; and 3) any neutral thoughts about indoor tanning. Responses were reviewed to ensure representativeness of the respective category – any responses that did not match the respective category but did relate to another were recoded to be under the proper category. A net of negative thoughts about indoor tanning was created by subtracting the number of positive thoughts from negative thoughts.

Outcome Variables

Three outcome measures, positive and negative outcome expectations, and self-efficacy, appeared to be composed of separate constructs, therefore, confirmatory factor analysis (CFA) as a special case of structural equation models (SEM) (Bollen, 1989) was employed.

To test the hypothesized models, the variance of the latent variables was set to one. Errors were correlated for items in the same subscale that were similar in terms of issue addressed or question wording. To enable the comparison of the hypothesized models with the

unidimensional models, the correlation between the hypothesized factors is constrained to one, to represent perfect correlation among the factors. This is essentially the same as the single factor model proposed in the original scale (Bollen & Grandjean, 1981). Analyses of model fit will examine the chi-square statistic (should have an insignificant p-value, showing it is not significantly different from the saturated model); the root mean squared error of approximation (RMSEA) (values less than 0.05 suggest a good fit); the comparative fit index (CFI) (values closest to one are the best fit, but 0.90 and above is acceptable); the Tucker-Lewis Index (TLI) (values close to one indicated a good fit, preferable to have values 0.90 and above); and the Bayesian information criterion (BIC) (negative values suggest a good fit). The variances of the indicators and the latent variables will be assessed to determine measurement error and to see how much variance is explained in the individual items

STATA version 13 was used for all analyses. Robust maximum-likelihood estimation was used due to issues of slight data skew and kurtosis common to social and behavioral data. Software limitations in the STATA SEM package will not provide chi-square test statistics with the robust maximum-likelihood procedure, therefore, the chi-square test statistics reported are those obtained from the general maximum-likelihood procedure. While this method may or may not provide the most accurate chi-square test statistic, reporting the robust standard errors will hopefully provide a better understanding of the model.

Outcome Expectations. Outcome expectations were assessed similar to the method used in Aim 2, however, items that did not pertain to the two topic areas being assessed in Aim 3 were removed. Positive outcome expectations included six items, three on controlled tanning as a safe way to tan (e.g. If I went indoor tanning it would be safe because I can control how long I tan), and three on vitamin D as a health benefit from indoor tanning (e.g. If I went indoor tanning it

would be a good way to get vitamin D). CFA revealed that the two-dimensional model ($X^2(8) = 22.51, p < 0.05$; RMSEA=0.05; CFI=0.99; TLI=0.99; BIC=148.78) was more precise than the unidimensional model ($X^2(9) = 830.68, p < 0.001$; RMSEA=0.08; CFI=0.70; TLI=0.51; BIC=772.46). The reliability of positive safety outcome expectations is $\alpha = 0.84$, and positive health outcome expectations is $\alpha = 0.90$.

Negative outcome expectations were assessed with nine items, four on safety concerns about indoor tanning (e.g., unsafe because tanning beds emit a high dose of radiation) and six items regarding negative health effects (e.g., lead to skin cancer). CFA revealed that the two-dimensional model ($X^2(17) = 50.40, p < 0.05$; RMSEA=0.05; CFI=0.98; TLI=0.97; BIC=38.71) was a better fit than the unidimensional model ($X^2(19(27)) = 365.81, p < 0.001$; RMSEA=0.14; CFI=0.94; TLI=0.92; BIC=191.14). Reliability of negative safety outcome expectations is $\alpha = 0.87$, and reliability of negative health outcome expectations is $\alpha = 0.95$.

Self-efficacy. Self-efficacy (Bandura, 1977; Pfau et al., 2009) was measured with the same items as described in Aim 2. However, conceptual analysis of these six items suggested that this single measure may have two factors: attitude certainty i.e., confidence regarding how firm their attitude on the topic is, that they hold the correct attitude, and that their attitude will not change even if they find out others disagree. The second factor measured participants' confidence in their ability to maintain and defend their position on indoor tanning (i.e., confidence defending their position, maintaining their position in the face of strong counterarguments, and confidence in arguing their position with someone who disagrees with them). CFA revealed that the two-dimensional model ($X^2(8) = 89.84, p < 0.05$; RMSEA=0.10; CFI=0.97; TLI=0.95; BIC=18.71) was a better fit than the unidimensional model ($X^2(18)$

=132.28, $p < 0.001$; RMSEA=0.49; CFI=0.95; TLI=0.91; BIC=74.47). Reliability for attitude strength was $\alpha = 0.79$, and defend attitudes was $\alpha = 0.91$.

Indoor and Outdoor Tanning Intentions. Indoor tanning intentions were measured using three items adapted from (Klein et al., 2009). Using a 5-point scale (1 = *not at all likely* to 5 = *extremely likely*) participants indicated how *interested*, how much they *plan*, and how *likely* they are to go indoor tanning in the next year. The scale had good reliability ($\alpha = 0.90$).

Outdoor tanning intentions were measured at baseline and follow-up by adapting an item from the indoor tanning intentions scale. Participants were asked to indicate how *likely* (1 item) they were to “lay outdoors for the purpose of getting a tan within the next year” using a 5-point scale where 1 = *not at all likely* and 5 = *extremely likely* (Gillen & Markey, 2012).

Follow-up – Additional Measures

Indoor Tanning Behavior – “Experience.” Past-week tanning behavior was assessed with two items. The first asked participants whether or not they had tanned indoors during the past week (yes/no). If participants said yes, they were then asked how many times they had tanned during the previous week. This item is hereafter referred to as “experience.”

Interpersonal Communication (actual and hypothetical). At baseline, participants were asked to indicate how likely they were to talk with somebody about the message (1 = *extremely unlikely* 5 = *extremely likely*), as well as who they thought they would talk with about the message (check all that apply, e.g. sorority sister, parents, someone they did not previously know, other).

At follow-up, actual interpersonal communication was assessed by asking, “*In the past week, have you talked with anyone about the indoor tanning message you read last week?*” If a

participant indicated they had talked with someone about the message, they were asked to indicate everyone they had spoken with using six provided response options (e.g. sorority sister, boyfriend/significant other, parents) as well as “other.” If a participant answered “no” to the initial question, they were asked about the future likelihood of interpersonal communication about the indoor tanning message. Those participants were then asked, “*If you were to talk with someone about the message...*” and then provided the same response options as those who had talked with someone.

Two questions were asked in order to understand the context of conversations participants had about the message. The first item asked participants if they had talked with people who go indoor tanning, who do not go indoor tanning, or if they were unsure of the other person’s tanning behavior. Participants were allowed to select all options that applied to them. The next question asked who started the *last* conversation they had over the past week about the message (i.e., “me,” “someone else,” or “don’t remember”). Participants who had indicated they had not talked with anyone about the message were not asked this question.

To understand the content of the conversations, participants were asked to select all relevant topics from a list of 13 response options, regarding the content of the conversations they had over the past week, or for those who had not had any conversations about the messages, conversations they would have if they were to talk to someone about the message. Response options reflected the content of messages (e.g., the safety hazards of indoor tanning), the purpose of the message (e.g., whether the message would make other tanners want to quit indoor tanning), the valence of the conversation (e.g., argued in support of the main points of the message), and other topics such as the research study in general, or other indoor tanning

warnings or messages they had seen. Interpersonal communication measures were adapted from (Hall et al., 2015).

Results

Of the 649 participants who completed the survey, n=133 were randomly assigned to view the inoculation safety message; n=130 saw the inoculation health message; n=129 were assigned to the one-sided safety message; n=130 were assigned to the one-sided health message; and n=127 were assigned to the control message. No significant differences across the five conditions on any of the six demographic variables (e.g. age, year in school, race), or any of the eleven tanning demographic variables (e.g. skin type, burn tendency, past tanning behavior) were found (*Tables 15 and 16*).

The following analyses employ 3 (condition: inoculation, one-sided, control) x 2 (experience: ever tanner vs. never tanner) two-way ANOVAs and MANOVAs (as appropriate) to explore how message conditions vary in terms of the processes of persuasion and outcomes at baseline and follow-up. While main effects and interactions were explored for all variables, the only significant interaction found was for indoor tanning intentions at follow-up. For clarity of results reporting, interaction effects are not discussed for any variables other than follow-up indoor tanning intentions. To understand if within-group change from baseline to follow-up was significantly different, latent difference scores were calculated following the method outlined by Burt and Obradovic (2012) for attitude strength, confidence in defending attitude, outcome expectation subscales, and intentions to indoor tan. Latent difference scores have an advantage over simple difference scores as they take measurement error into account while allowing assessment based on the original scale metric (Burt & Obradovic, 2012).

Preliminary Analyses

To determine if there were differences between the safety and health inoculation messages, and the safety and health one-sided messages, 5 (message condition: inoculation safety, inoculation health, one-sided safety, one-sided health, control) x 2 (experience: ever tanned indoors vs. never tanned indoors) ANOVAs were used to examine main effects and interactions for experimental condition and experience across all dependent variables. While differences were found across conditions, these differences did not exist for like-conditions (i.e. inoculation health and safety did not differ significantly, nor did one-sided health and safety on any of the dependent variables). Further, there were no significant interactions of message condition and experience. Therefore, the decision to collapse the two inoculation conditions and the two one-sided conditions was supported. All remaining analyses focus on three groups: inoculation (n=263), one-sided (n=259), and control (n=127).

The following analyses employ 3 (condition: inoculation, one-sided, control) x 2 (experience: ever tanner vs. never tanner) two-way ANOVAs and MANOVAs (as appropriate) to explore how message conditions vary in terms of the processes of persuasion and outcomes at baseline and follow-up. While main effects and interactions were explored for all variables, the only significant interaction found was for indoor tanning intentions at follow-up. All tests of multivariate significance were guided by Pillai's Trace test statistic due to the unequal group sizes. For clarity of results reporting, interaction effects are not discussed for any variables other than follow-up indoor tanning intentions.

Process Variables

Counterarguing and Cognitive Processing

A two-way ANOVA revealed that counterarguing of the experimental message at baseline differed by condition (H1a: $F(2, 643) = 3.27, p < 0.05, \eta^2 = 0.01$) and experience (H1b: $F(1, 643) = 51.58, p < 0.001, \eta^2 = 0.01$). Tukey's HSD post-hoc tests revealed those in the inoculation condition had fewer counterarguments against the experimental message compared to those in the one-sided conditions ($p < 0.001$), providing support for H1a. Planned contrasts revealed that those who had ever tanned indoors argued more against the experimental message compared to those who had never tanned indoors ($p < 0.001$), supporting H1b.

Hypothesis H1c predicted that those exposed to the inoculation message would report more counterarguing of the attack message at follow-up relative to those exposed to one-sided and control messages. This hypothesis was partially supported ($F(2, 320) = 4.95, p < 0.01$) as those in the inoculation condition reported more counterarguing ($M = 3.49, SD = 1.20$) relative to those in the one-sided condition ($M = 3.06, SD = 1.13$), but there were no differences between inoculation and control ($M = 3.45, SD = 1.06$) or between the one-sided and control conditions (H1d; see *Table 17*).

An ANOVA of the net of negative thoughts about indoor tanning revealed significant main effects of condition ($F(2, 643) = 7.22, p < 0.01, \eta^2 = 0.02$) and experience ($F(1, 643) = 26.09, p < 0.01, \eta^2 = 0.02$). Those in the inoculation condition reported a greater net of negative thoughts against indoor tanning at baseline relative to one-sided and control conditions (both $p < 0.01$), and those who had tanned had fewer negative thoughts about indoor tanning compared to those who had never tanned ($p < 0.001$) confirming H2a and H2c (see *Table 17*).

At follow-up, those in the inoculation condition reported a greater net of negative thoughts ($M = 0.86, SD = 1.03$) compared to the one-sided condition ($M = 0.37, SD = 1.12; F(2, 113) = 3.11, p < 0.05$), but not the control condition ($M = 0.88, SD = 1.05$); while these results provide

partial support for H2b, results should be interpreted with caution due to the low response to this measure, thus lack of power (inoculation $n=37$; one-sided $n=52$; control $n=25$).

Perceived Message Effectiveness

To understand how messages compared on perceived effectiveness items, two-way ANOVAs were employed for each of the 11 perceived effectiveness items.

Hypothesis 3a-b predicted there would be no differences across conditions regarding message understandability ($F(2,643)=2.26, p=0.11$) and truthfulness ($F(2,643)=0.62$). Thus, H3a-b were supported.

Hypothesis 3c predicted that those exposed to inoculation and one-sided messages would be more likely to perceive the messages as important to them ($F(2,642)=7.15, p<0.02, \eta^2=0.02$) and H3d predicted those exposed to experimental messages would perceive the messages taught them something new ($F(2,642)=44.49, p<0.001, \eta^2=0.12$) compared to those exposed to the control message; H3c-d were supported.

Hypotheses 3f, 3j and 3k all predicted that inoculation messages would outperform one-sided and control messages in regards to making people think about the dangers of indoor tanning (H3f: $F(2,642)=21.15, p<0.001, \eta^2=0.06$); making a strong argument against indoor tanning (H3j: $F(2,642)=18.07, p<0.001, \eta^2=0.05$); and motivating indoor tanning avoidance (H3k: $F(2,642)=8.41, p<0.001, \eta^2=0.03$). These hypotheses were partially supported as PME evaluations of one-sided messages did not differ significantly from inoculation or control messages for these hypotheses. Therefore, hypotheses H3f, H3j, and H3k were partially supported as inoculation messages did not outperform one-sided messages as predicted.

Hypothesis 3e predicted that, compared to the control condition, those exposed to inoculation and one-sided messages would be more likely to perceive messages were something they would talk with others about, but this hypothesis was not supported as no differences were found across conditions ($F(2, 642) = 1.94, p = 0.15$).

Hypothesis 3h predicted those exposed to inoculation messages would perceive the message would motivate them to talk with others about the dangers of indoor tanning, compared to one-sided and control messages, but this hypothesis was not supported as no differences were found ($F(2, 642) = 2.76, p = 0.06$).

Finally, it was predicted that those exposed to inoculation messages would perceive that the messages convince them that the things people say about the benefits of indoor tanning are false (H3i), relative to one-sided and control conditions ($F(2, 642) = 6.00, p < 0.01, \eta^2 = 0.02$), as well as feel confident about their ability to avoid (H3g) indoor tanning ($F(2, 642) = 6.73, p < 0.01, \eta^2 = 0.02$); these hypotheses were supported (see *Table 18*).

Attitude Strength and Confidence to Defend Attitude

A MANOVA was used to test the effects of condition and experience on attitude strength and confidence to defend attitude. The main effect of experience (RQ1) was significant ($F(2, 614) = 84.22, p < 0.001$, partial $\eta^2 = 0.22$), and planned contrasts revealed that those who had never tanned indoors reported greater attitude strength ($M = 86.33, SD = 0.86$) and confidence to defend their attitude ($M = 83.37, SD = 0.98$) relative to those who had tanned indoors ($M = 65.09, SD = 1.46$; $M = 62.56, SD = 1.66$; both $p < 0.001$). The main effect of condition was not significant ($F(4, 1230) = 0.67, p = 0.61$). This pattern was maintained at follow-up ($F(2, 302) = 25.90, p < 0.001, \eta^2 = 0.15$) with minimal difference from baseline to follow-up in attitude strength for those who had never

tanned ($M=86.78$, $SD=17.01$) and those who had ($M=71.48$, $SD=20.32$); as well as confidence in defending attitudes for those who had never tanned ($M=82.15$, $SD=18.41$) and those who had ($M=64.15$, $SD=25.63$).

Magnitude of Change

Latent difference scores revealed a significant increase in attitude strength within the inoculation group ($\beta_{\text{Inoculation}} = 0.183$, $p<0.05$) from baseline ($M=81.77$, $SD=18.08$) to follow-up ($M=84.18$, $SD=18.28$). No additional significant within-group changes in attitude strength of confidence to defend attitude were found across conditions.

Outcome Variables

Outcome Expectations

At baseline and follow-up, the bivariate correlation between positive health outcome expectations and indoor tanning intentions was below .3, but the four outcome expectation measures correlated with one another between .3 and .8; therefore, outcome expectations were examined using a MANOVA and indoor tanning intentions were examined using ANOVA.

The MANOVA of positive and negative safety and health outcome expectations revealed that these were differentially endorsed across conditions at baseline (H4a-b) ($F(8, 1264) = 3.56$, $p<0.01$, partial $\eta^2=0.01$). Main effects were found for condition. Examination of subsequent univariate tests revealed that differences were specific to positive health outcome expectations ($F(2, 634) = 3.04$, $p<0.05$, partial $\eta^2=0.01$) and negative health outcome expectations ($F(2, 634) = 3.78$, $p<0.05$, partial $\eta^2=0.01$) such that those in the inoculation and one-sided message conditions reported fewer positive health and more negative health expectations compared to those in the control condition according to Tukey HSD post-hoc analyses (both $p<0.01$). There

were no differences conditions for any positive or negative safety outcome expectations, providing partial support for H4a-b (see *Table 19*).

At baseline, differences were found between those who had tanned and those who had never tanned ($F(4, 631) = 61.98, p < 0.001$, partial $\eta^2 = 0.09$) for positive and negative safety and health outcome expectations (RQ3a). Planned contrasts revealed that those who had tanned reported significantly higher positive safety ($F(1, 634) = 38.22, p < 0.001$, partial $\eta^2 = 0.06$) and health ($F(1, 634) = 23.23, p < 0.001$, partial $\eta^2 = 0.04$) outcome expectations, and significantly lower negative safety ($F(1, 634) = 46.78, p < 0.001$, partial $\eta^2 = 0.07$) and health ($F(1, 634) = 39.33, p < 0.001$, partial $\eta^2 = 0.06$) outcome expectations (all $p < 0.001$; see *Table 19*).

At follow-up, bivariate correlations of outcome expectations and intentions again showed that intentions did not meet the minimum criteria, but the four outcome expectation measures did, therefore, the same procedure used for baseline was used for follow-up.

A MANOVA of outcome expectations indicated significant main effects for condition ($F(8, 610) = 2.05, p < 0.001$, partial $\eta^2 = 0.04$) and experience ($F(4, 304) = 6.32, p < 0.001$, partial $\eta^2 = 0.08$). Univariate tests identified that differences by condition were specific to positive health ($F(2, 307) = 3.51, p < 0.05$, partial $\eta^2 = 0.02$) and negative health ($F(2, 307) = 4.33, p < 0.05$, partial $\eta^2 = 0.03$) outcome expectations. Post-hoc Tukey's HSD tests revealed that those in the inoculation condition reported fewer positive health outcome expectations ($p < 0.05$) and more negative health outcome expectations ($M = 1.54, SD = 0.08$; $M = 4.40, SD = 0.07$, respectively; $p < 0.05$) compared to the control condition ($M = 1.87, SD = 0.11$; $M = 4.11, SD = 0.09$, respectively). There were no differences on safety expectations between the one-sided message condition and inoculation or control conditions, but the pattern of results showed that those in the one-sided condition endorsed more positive safety ($M = 1.81, SD = 0.09$) outcome expectations than those in

the inoculation ($M=1.74$, $SD=0.10$) condition but fewer than those in the control ($M=2.06$, $SD=0.12$) condition. Regarding negative safety outcome expectations, those in the one-sided condition ($M=4.38$, $SD=0.06$) reported similar expectations relative to the inoculation ($M=4.38$, $SD=0.07$) condition, but more than the control ($M=4.22$, $SD=0.10$) condition. Thus, H4c-d are partially supported.

At follow-up, differences in positive and negative outcome expectations between those who had ever and never tanned indoors were found ($F(4, 304) = 6.32$, $p < 0.001$, partial $\eta^2 = 0.08$). Planned contrasts revealed that those with tanning experience reported greater positive safety ($M=2.07$, $SD=0.10$; $F(1, 307) = 11.16$, $p < 0.01$, partial $\eta^2 = 0.04$) and health ($M=1.81$, $SD=0.09$; $F(1, 307) = 4.65$, $p < 0.01$, partial $\eta^2 = 0.03$) outcome expectations compared to those with no tanning experience ($M=1.67$, $SD=0.06$; $M=1.51$, $SD=0.05$, respectively); and fewer negative safety ($M=4.12$, $SD=0.08$; $F(1, 307) = 20.29$, $p < 0.001$, partial $\eta^2 = 0.06$) and health ($M=4.10$, $SD=0.07$; $F(1, 307) = 23.74$, partial $\eta^2 = 0.07$) outcome expectations compared to those with no tanning experience ($M=4.53$, $SD=0.05$; $M=4.52$, $SD=0.05$; all $p < 0.001$).

Magnitude of Change

Latent difference scores revealed that the decrease in positive safety outcome expectations for those in the inoculation condition were significant ($\beta_{\text{Inoculation}} = -0.217$, $p < 0.05$) from baseline ($M = 1.78$, $SD = 0.92$) to follow-up ($M = 1.64$, $SD = 0.82$). No significant differences were found for one-sided and control conditions.

The increase in positive health outcome expectations for those in the control condition was significant ($\beta_{\text{Control}} = 0.320$, $p < 0.01$) from baseline ($M = 1.36$, $SD = 0.69$) to follow-up ($M = 1.74$, $SD = 0.99$), as was the increase for those in the one-sided condition ($\beta_{\text{One-sided}} = 0.180$,

$p<0.05$) from baseline ($M= 1.55$, $SD=0.81$) to follow-up ($M=1.62$, $SD=0.82$). No significant difference in change of positive health outcome expectations was found for those in the inoculation condition.

There were no significant within group changes for negative safety and health outcome expectations.

Indoor Tanning Intentions

ANOVA results of baseline indoor tanning intentions revealed a significant main effect of message condition on indoor tanning intentions ($F(2, 642) = 3.14$, $p<0.05$, partial $\eta^2 = 0.01$), such that those exposed to inoculation messages reported lower intentions to tan indoors (H5a) after message exposure compared to those exposed to the one-sided messages ($p<0.05$) and the control message ($p<0.05$), providing support for and H5a. There were no significant differences between one-sided and control messages. A significant main effect was also found for indoor tanning experience ($F(1, 642) = 315.39$, $p<0.001$, partial $\eta^2=0.34$) in that those who had tanned indoors previously reported greater intentions to tan indoors compared to those who had not previously indoor tanned (see *Table 19*).

At follow-up, main effects were found for condition ($F(2, 312) = 17.92$, $p<0.01$, partial $\eta^2=0.10$) and experience ($F(1, 312) = 104.73$, $p<0.001$, partial $\eta^2=0.25$); However, there was a significant interaction between condition and experience ($F(2, 312) = 6.50$, $p<0.01$, partial $\eta^2=0.04$) for indoor tanning intentions. In order to understand the nature of the interaction, a variable was created to represent each level of the interaction, (i.e. inoculation and ever tanner = 1; inoculation and never tanner = 2; one-sided and ever tanner = 3; one-sided and never tanner = 4; control and ever tanner = 5; control and never tanner = 6), in order to probe the interaction. A

Kruskal Wallis test with Bonferroni correction post-hoc tests was used to explore pairwise comparisons. The test revealed a significant effect of interaction group on intentions to indoor tan ($X^2(5, N=318) = 101.85, p < 0.001$). The post-hoc Bonferroni correction indicated that those in the inoculation condition who had never tanned ($M=1.06, SD=0.22, n=104$) reported significantly lower intentions to indoor tan compared to those in the inoculation condition who had previously tanned ($M=1.49, SD=0.59, n=29$), those in the one-sided condition who had tanned ($M=2.10, SD=0.98, n=43$), and those in the control condition who had tanned ($M=2.43, SD=1.08, n=17$; all $p < 0.001$). Those in the one-sided condition who had never tanned indoors ($M=1.25, SD=0.57, n=81$) reported significantly less intentions to tan indoors compared to those in the one-sided and control conditions who had tanned indoors (both $p < 0.001$). Finally, those in the control condition who had never tanned indoors ($M=1.27, SD=0.51, n=44$) reported less intentions to tan indoors relative to those in the one-sided and control condition who had tanned indoors (both $p < 0.001$).

Magnitude of change

Latent difference score models revealed that for those in the inoculation condition, the decrease in intentions to indoor tan from baseline ($M=1.31, SD=0.69$) to follow-up ($M=1.15, SD=0.38$) was significant ($\beta_{\text{Inoculation}} = -0.250, p < 0.01$). The increase in intentions from baseline ($M=1.46, SD=0.81$) to follow-up ($M=1.54, SD=0.84$) among those in the one-sided message condition was significant ($\beta_{\text{One-sided}} = 0.234, p < 0.01$). No significant differences were found for the control group.

Interpersonal Communication

An ANOVA revealed that at baseline, there were no significant differences across conditions in how likely participants were to talk with somebody about the message they read

(H6: $F(2, 643) = 1.35, p = 0.26$). However, there was a difference by tanning experience ($F(1, 643) = 5.40, p < 0.05$, partial $\eta^2 = 0.01$) such that those who had tanned indoors ($M = 2.86, SD = 0.09$) were significantly less likely to talk with somebody about the message compared to those who had never tanned ($M = 3.09, SD = 0.05$) (see *Table 20*).

Of the $N = 324$ people who completed the follow-up survey, 18% ($n = 57$) reported having talked with someone in the past week about the message (inoculation condition $n = 27/138, 20\%$; one-sided $n = 16/125, 13\%$; control $n = 14/61, 23\%$). There were no differences across groups regarding who participants talked with (e.g. friend, parent; RQ6). Across all conversational topics, only one significant difference was found between groups – those in the control condition reported were more likely to talk about the safety hazards of indoor tanning ($n = 10, 71\%$) compared to those in the inoculation ($n = 13, 48\%$) and one-sided ($n = 5, 31\%$) message conditions ($X^2(2) = 7.93, p < 0.05$; RQ7). Further, there were no differences in who those who have tanned talked with, about, or who started the conversation, compared to those who have never tanned indoors, regardless of condition (RQ8). The majority of participants who reported having a conversation about the experimental message reported talking with sorority sisters ($n = 41, 72\%$) and/or friends (who are not sorority sisters) ($n = 28, 49\%$). Sixty percent of participants indicated having these discussions with people who indoor tan, and 61% talked with those who do not. Participants indicated starting the majority of the conversations ($n = 46, 81\%$). The most prevalent conversation topics were health harms of indoor tanning ($n = 49, 86\%$), safety hazards ($n = 28, 49\%$), and arguments in support of the experimental message ($n = 15, 26\%$) (see *Tables 21-22*).

Those who did not report having a conversation about the experimental message were asked to think about who they would talk with and what they would talk about if they were to have a conversation about the message. The majority of participants reported that they would

talk with at least one person, and the pattern of likely content of discussion mimicked the pattern seen in those who had talked with others about the message in the week between baseline and follow-up (see *Tables 23-24*).

Cross-protection for Outdoor Tanning Behavior

Finally, RQ5 questioned the potential for inoculation messages to impact outdoor tanning behavior. A 3x2 ANOVA indicated no differences across message conditions or tanning experience at baseline (see *Table 19*) or follow-up. Further, means were relatively high across conditions and experience (4.09 – 4.24) indicating intentions to tan outdoors for the purpose of getting a tan at baseline remained constant at follow-up, regardless of indoor tanning experience and intentions.

Discussion

Inoculation messages may be a valuable tool for dissuading engagement with unhealthy behaviors such as indoor tanning for which an abundance of misinformation exists, as evidenced by the results of this study. Although there were some similarities between inoculation and one-sided messages in terms of perceived message effectiveness and certain outcome expectation dimensions, inoculation messages outperformed one-sided and control messages at baseline and one-week follow-up across various message evaluation, process, and outcome measures that illustrate the value of inoculation messages. Further, inoculation messages were effective for those with indoor tanning experience, and those without, relative to one-sided and control message conditions, highlighting the versatility of inoculation theory for complicated behaviors such as indoor tanning. Implications for the use of inoculation theory in terms of perceived message effectiveness, process variables, and outcomes are discussed below.

While this study assessed numerous constructs of perceived message effectiveness, certain constructs were found to be similar between one-sided and inoculation conditions, while others showcase the utility of inoculation theory over and above one-sided messages for the correction of misinformation and problem behaviors. Unpredicted similarities between inoculation and one-sided messages regarded messages encouraging thoughts about the dangers of indoor tanning; making a strong argument against indoor tanning; and motivating indoor tanning avoidance. While these similarities speak to the strength of one-sided manipulations in this study, they also reflect research on the effects of one-sided compared to two-sided messages that suggests when message receivers do not have counterarguments available to them, one-sided messages are likely to be perceived as equally, or more, persuasive than refutational two-sided (inoculation) messages (O’Keefe, 1999). Considering that the majority of the sample were never-tanners, the high level of persuasion ascribed to the one-sided messages makes sense. Further, many of the never-tanners reported no intentions to indoor tan within the next year, thus the finding regarding no differences between messages motivating receivers to avoid indoor tanning also makes sense. Finally, in order to balance the word count of inoculation and one-sided messages, the one-sided messages provided a bit more detail about health effects and consequences of indoor tanning, which may have contributed to similar reports between inoculation and one-sided messages making receivers think about the dangers of indoor tanning.

Inoculation outperformed one-sided messages on a few critical PME constructs. Results indicate that inoculation messages were most effective at challenging misinformation (i.e. convinced that the things people say about the benefits of indoor tanning are false) and increasing self-efficacy to avoid indoor tanning. Considering the purpose of an inoculation message is to correct attitudes, or, in the context of the current study – misinformation, as well as

model an effective defense to counter attitudes or beliefs, it makes sense that inoculation messages would outperform one-sided messages on these outcomes. In tandem, these findings are promising for communication campaigns as the rapid spread of misinformation about safety and health benefits of products known to be harmful to some degree (such as tanning beds and e-cigarettes) presents a difficult challenge for health communication experts, who increasingly wrestle with post-hoc correction of frequent dissemination of harmful misinformation (Southwell & Thorson, 2015). If inoculation messages can successfully challenge and correct misinformation while simultaneously boosting confidence in one's ability to disengage with unhealthy behaviors, the propagation of misinformation through social diffusion may be confounded, thereby bolstering prevention/harm reduction efforts. Specifically, behaviors such as indoor tanning have an immediate social component in the sense that this is a behavior that may be done amongst groups of friends, thus the proliferation of misinformation in support of, or to justify, a shared social activity is likely. But this behavior also speaks to a much larger social component regarding social norms of attractiveness, for which the motivation towards group inclusion is intrinsically high as attractiveness is a culturally constructed indicator of self-worth, thus influencing behavior through self-esteem and self-efficacy (Crocker & Wolfe, 2001). However, if the correction of misinformation through inoculation messages also bolsters self-efficacy to disengage with or avoid a dangerous behavior, it could be that over time the positive effects of misinformation correction may shift the influence of normative and intrinsic motivators, such as culturally constructed ideals of attractiveness. Future research should explore the stability of the correction of misinformation with inoculation messages at multiple time points to determine how underlying processes of persuasion operate over time, and how these

processes contribute meaningful change to overarching motivators of behavior (i.e. outcome expectations, identity).

Inoculation messages may be particularly effective for dangerous behaviors for which strong attitudes and beliefs are not commonly held by encouraging a deeper level of processing of the message through the presentation of both sides of an argument. Since processing of messages about indoor tanning is likely to be peripheral for most, inoculation messages may entice deeper consideration of the message through the presentation of both sides of an argument, thus adding to message logic and credibility. In this study, the majority of participants had never tanned indoors, and even among those who had, positive outcome expectations were relatively low, and negative outcome expectations high (granted, outcome expectations did not include items related to the overarching motivation of tanning bed use – culturally constructed norms of attractiveness). Despite this, inoculation messages produced greater cognitive processing at baseline (i.e. cognitive processing and the net of negative thoughts regarding indoor tanning) and follow-up (i.e. counterarguing against the attack message) relative to the one-sided message condition. While it is likely that attitudes about indoor tanning are formed through peripheral-route processes, these findings suggest that inoculation messages may have encouraged processing akin to the central route (Petty & Cacioppo, 1986). This idea is further supported by the results from this study that showed a significant increase in attitude strength from baseline to follow-up among those in the inoculation condition. Conversely, one-sided messages only present one side of an argument and depending on whether or not a receiver agrees with that argument, the one-sided message may be processed peripherally, never activating the salience of the issue and encouraging a deeper level of processing. Or, one-sided messages that communicate a stance opposite to that of the receiver may produce more arguing

against the one-sided message (as suggested by the results presented for this study), without any consideration of both sides of the indoor tanning argument. Future studies should seek to understand how inoculation messages encourage higher-level processing of low-involving, yet harmful behaviors or issues that are critical mechanisms to high-involving motivations, and the long-term implications of inducing such processing.

Outcome expectations are a well-established indicator of attitudes and behavior (Bandura, 2001). Results from this study suggest that inoculation and one-sided messages influenced higher negative health outcome expectations and fewer positive health outcome expectations compared to control at both baseline and follow-up. The similarities between inoculation and one-sided conditions in regards to positive and negative health effects are likely due to the abundance of health information added to the one-sided messages to make the experimental messages equal in length across conditions. However, at one-week follow-up, those who received inoculation messages reported significantly fewer positive health outcome expectations and more negative health outcome expectations compared to the control condition, while no significant differences were found for the one-sided condition. Further, while those in the one-sided message condition reported a significant increase in positive health outcome expectations at one-week follow-up, inoculation messages significantly decreased positive safety outcome expectations from baseline to follow-up, illustrating the parallel to inoculation through biological vaccination in that effects grew over time in the preferred direction. The significant findings for inoculation messages to decrease positive outcome expectations are meaningful, as previous research in the context of indoor tanning has found that to be effective, prevention efforts should focus on decreasing positive outcome expectations (hence, the correction of misinformation about the benefits of indoor tanning) while also increasing negative outcome

expectations (Noar et al., 2014). The presentation of both sides of the argument in inoculation messages may make these messages less aversive, compared to the presentation of only one side of an argument. Acknowledging both sides of an argument invites consideration of both sides by acknowledging the receiver's agency to think for themselves and judge the validity of the information presented. One-sided messages may be seen as more restrictive in terms of the views communicated and receiver's agency to arrive at a reasonable conclusion on her own.

In essence, inoculation messages offer a strategy through which to address a full spectrum of attitudes and beliefs. Further, outcome expectations play a key role in influencing self-efficacy when a behavior is relatively simple and risk of failing completion of a behavior is low (i.e., laying in a tanning bed). Self-efficacy is most salient when the risk associated with attempting and failing a behavior is high (Maddux, Sherer, & Rogers, 1982). Further, the serious health harms of indoor tanning are rather distal, thus likely far removed from risk assessment as it relates to self-efficacy. This also explains why, despite a significant increase in attitude strength in the inoculation condition, group differences on attitude strength and confidence to defend attitudes were not found across conditions. Interestingly, results at baseline and follow-up showed that across conditions, those who had tanned reported significantly less confidence in their attitudes about indoor tanning, possibly exposing an opportunity for prevention efforts to intervene by influencing and changing attitudes.

Regarding interpersonal communication about the messages, no differences were found across conditions or tanning experience – perhaps indicative of the minimally involving nature of tanning bed use. The lack of interpersonal communication found could also be a consequence of how interpersonal communication was measured. The items in this study asked specifically about talk about the *message*, however, it is possible that the messages sparked relevant

conversations but not specifically about the messages, which is a limitation of this study. However, in a real-world context, in which a message may be viewed by a group of people at once, such messages could spark conversations about the dangers and misinformation surrounding indoor tanning, but in this study, messages were viewed presumably in isolation. considering how complex this behavior is, and other constructs not explored in this study (i.e. identity), the success of inoculation messages despite the absence of interpersonal communication about the message is promising. Future research should explore ways to enhance communication by incorporating constructs, such as identity, likely to encourage interpersonal interaction about the message.

While the indoor tanning messages did not have a cross-protective effect on outdoor tanning intentions, this finding paired with findings regarding indoor tanning intentions and expectations, may indicate that these messages worked for indoor tanning only. Another explanation is that an attack message specific to outdoor tanning was not presented – if it were, perhaps counterarguing of a message supporting unhealthy outdoor tanning behaviors would have led to reduced intentions to tan outdoors (Parker, Ivanov, & Compton, 2012). Further, research on the relationship between indoor tanning and outdoor tanning is inconclusive – much like the complexities inherent to indoor tanning behavior, the interaction of these two tanning behaviors is likely equally as complex.

Finally, inoculation messages were effective over and above other message formats in regards to indoor tanning intentions at baseline and follow-up. Not only were intentions lower among those in the inoculation group at both time points, but within group analyses revealed that intentions in the inoculation condition decreased significantly from baseline to follow-up, while

intentions in the one-sided condition increased significantly. These findings suggest that inoculation messages offer the most promise for indoor tanning prevention efforts.

Limitations

While this study has several implications for health communication and inoculation theory, it is not without limitations. Regarding the sample, data from this study come from a convenience sample, localized to a specific area in the Southeastern United States. Evidence of regional trends in indoor tanning (Lazovich & Forster, 2005) imply that results reported here may not be generalizable to other geographic regions of the US. Further, participants were all enrolled in a University Panhellenic Sorority system, so cultural effects must be considered; however, this group of women represents a population most at risk to the dangers of indoor tanning. The response rate at follow-up also has implications for limitations in interpreting study results. The response rate at follow-up was fairly low, although the only significant difference found between those who participated in follow-up and those who did not was the presence of fewer current (past year) tanners at follow-up. The follow-up response rate also affected analysis capabilities as low cell sizes did not allow for a comprehensive analysis (i.e. structural equation model) of the underlying mechanisms of persuasion from baseline to follow-up. While several findings support the use of inoculation messages over one-sided messages, it is unclear which mechanisms were most effective and how these mechanisms worked in tandem to decrease indoor tanning intentions. Future studies should enlist recruitment and retention methods that will provide a robust sample to allow for such analyses.

Regarding the messages themselves – all messages were written at a 12th grade reading level, which is relatively high in the context of health communication prevention strategies. However, these messages were suitable for the target population, so the implications of this study

must be considered with that target population in mind. Further, experimental messages were long and would need to be condensed for real-world application, and perhaps translated into receiver-friendly formats, such as posters with visuals and video public service announcements. Experimental messages were also considerably longer than the control message, therefore, it is likely that the difference in length contributed to differential effects between control and experimental messages. Future studies should consider ways of constructing inoculation messages in a format compatible with young people's fast-paced media and social media environment. Considering that this is the first study of inoculation theory in the context of indoor tanning, the messages were suitable for the experimental design and study purpose.

Conclusion

This is the first study of inoculation theory in the context of indoor tanning. Results from this study inform the theory by extending the utility to a new content area, as well as extending the biological analogy to low-involving, yet complex behaviors such as indoor tanning. The findings presented here confirm the importance of traditional mechanisms of persuasion that underlie the inoculation process and also suggest consideration of how the function and interaction of these mechanisms may differ by context. Overall, these findings suggest inoculation theory is a promising approach to health communication and prevention efforts in an ever-changing and fast-paced communication environment in which misinformation spreads rapidly.

Table 14. Index of Message Experiment Research Questions and Hypotheses

Construct	H/RQ #	Hypothesis/ Research Question	Time	Supported?
<i>Process Variables</i>				
Counterarguing	H1a	Those exposed to <i>inoculation</i> messages will engage in <i>less counterarguing</i> of the experimental message than those exposed to one-sided messages.	1	Supported
Counterarguing	H1b	Those who report <i>having ever indoor tanned</i> will report <i>more counterarguing</i> of the experimental message compared to those who have never tanned, regardless of condition.	1	Supported
Counterarguing	H1c	Those exposed to <i>inoculation</i> messages will engage in <i>more counterarguing</i> of the pro-tanning message than those exposed to one-sided and control messages.	2	Partially Supported
Counterarguing	H1d	Those exposed to <i>one-sided messages</i> will engage in <i>more counterarguing</i> of the pro-tanning message than those exposed to the control message.	2	Not supported
Cognitive Processing	H2a	Those exposed to inoculation messages will have a <i>greater net of negative thoughts about indoor tanning</i> than those exposed to one-sided or control messages.	1	Supported
Cognitive Processing	H2b	Those exposed to inoculation messages will have a <i>greater net of negative thoughts about indoor tanning</i> than those exposed to one-sided or control messages.	2	Yes
Cognitive Processing	H2c	Those who report <i>having ever indoor tanned</i> will report <i>fewer negative thoughts</i> about indoor tanning compared to those who have never tanned, regardless of message condition.	1	Supported
PME	H3a	There will be no difference in <i>ratings of message understandability</i> across conditions.	1	Supported
PME	H3b	There will be no difference in <i>ratings of message truthfulness</i> across conditions	1	Supported
PME	H3c	Those exposed to <i>inoculation and one-sided messages</i> will be more likely to perceive the messages as saying something <i>important</i> compared to those exposed to the control message.	1	Supported
PME	H3d	Those exposed to <i>inoculation and one-sided messages</i> will be more likely to perceive the messages as <i>teaching them something new</i> compared to those exposed to the control message.	1	Supported

PME	H3e	Those exposed to <i>inoculation and one-sided messages</i> will be more likely to report that they would <i>talk with others</i> compared to those exposed to the control message.	1	Not supported
PME	H3f	Those exposed to <i>inoculation messages</i> will more strongly perceive the messages make them <i>think about the dangers</i> of indoor tanning compared to those in the one-sided and control conditions,	1	Partially Supported
PME	H3g	Those exposed to <i>inoculation</i> messages will perceive the messages elicit confidence in their <i>ability to avoid indoor tanning</i> compared to those in the one-sided and control conditions.	1	Supported
PME	H3h	Those exposed to <i>inoculation</i> messages will be more strongly perceived as <i>motivation to talk with others</i> about the dangers of indoor tanning compared to the one-sided and control conditions.	1	Not supported
PME	H3i	Those exposed to <i>inoculation</i> messages will perceive the messages are more convincing that the <i>things people say about the benefits of indoor tanning are false</i> compared to the one-sided and control conditions,	1	Supported
PME	H3j	Those exposed to <i>inoculation</i> messages will perceive messages as making a <i>strong argument against indoor tanning</i> compared to the one-sided and control conditions,	1	Partially Supported
PME	H3k	Compared to the one-sided and control conditions, those exposed to <i>inoculation</i> messages will be perceive messages as more <i>motivating to avoid indoor tanning</i> compared to the one-sided and control conditions,	1	Partially Supported
Self-Efficacy	RQ1	Do message conditions affect reports of attitude strength and ability to defend attitudes in the context of indoor tanning?	1 & 2	Not supported
Self-Efficacy	RQ2	Are there differences between tanners and non-tanners on attitude strength and ability to defend attitudes?	1 & 2	Supported
Outcome Variables				
Positive Outcome Expectations	H4a	Those exposed to <i>inoculation and one-sided</i> messages will <i>endorse fewer positive safety and health outcome expectations overall</i> compared those exposed to the control message.	1	Partially Supported
Negative Outcome Expectations	H4b	Those exposed to <i>inoculation and one-sided</i> messages will <i>endorse more negative safety and</i>	1	Partially Supported

		<i>health outcome expectations overall</i> that those exposed to the one-sided message.		
Positive Outcome Expectations	H4c	At follow-up, those exposed to <i>inoculation</i> messages will <i>endorse fewer positive safety and health outcome expectations</i> compared those exposed to one-sided and control messages.	2	Partially Supported
Negative Outcome Expectations	H4d	Those exposed to <i>inoculation</i> messages will <i>endorse more negative health and safety outcome expectations overall</i> compared to those exposed to one-sided and control messages.	1 & 2	Partially Supported
Positive Outcome Expectations	RQ3	Are there differences in the magnitude of change in positive safety and health outcome expectations from time 1 to time 2 by group?	1 & 2	Yes
Negative Outcome Expectations	RQ4	Are there differences in the magnitude of change in negative safety and health outcome expectations from time 1 to time 2 by group?	1 & 2	Yes
Indoor Tanning Intentions	H5a	Those exposed to <i>inoculation</i> messages will report <i>lower intentions to go indoor tanning</i> relative to those exposed to one-sided and control messages.	1	Supported
Indoor Tanning Intentions	H5b	Those exposed to <i>inoculation</i> messages will report <i>lower intentions to go indoor tanning</i> relative to those exposed to one-sided and control messages.	2	Partially Supported
Outdoor Tanning Intentions	RQ5	Do inoculation messages reduce outdoor tanning intentions? (cross-protection)	1 & 2	Not supported
Social Interactions	H6a	Those exposed to <i>inoculation</i> messages will be more likely to report <i>having talked with someone about the message</i> within the past week compared to those exposed to one-sided and control messages.	2	Not supported
Social Interactions	RQ6	Are there differences in who participants report talking with about the message across conditions?	2	Not supported
Social Interactions	RQ7	What are the differences in what participants talked about across conditions?	2	No Differences
Social Interactions	RQ8	Are there differences in what those who have indoor tanned and those who have never indoor tanned talked about?	2	Not supported

Table 15. Sample Demographics, N=649

Variable	N	%
<i>How old are you? (M, SD)</i>	19.8	1.26
<i>What is your current year in school?</i>		
Freshman	136	21
Sophomore	224	35
Junior	174	27
Senior	115	18
<i>Are you Hispanic or Latino?</i>		
Yes	39	6
<i>Which one of these groups would you say best represents your race?</i>		
White	622	96
Black	4	1
Asian	12	2
Other	10	2
<i>What is the highest grade of school completed by your mother or female guardian?</i>		
11th grade or less	2	<1
HS diploma or GED	47	7
2 year technical degree or some college	85	13
4 year Bachelor's degree	317	49
Some graduate school	18	3
Completed graduate school	179	28
<i>What is the highest grade of school completed by your father or male guardian?</i>		
11th grade or less	4	1
HS diploma or GED	60	9
2 year technical degree or some college	58	9
4 year Bachelor's degree	232	36
Some graduate school	29	5
Completed graduate school	260	40

Table 16. Tanning and skin cancer-related variables, N=649

Variable	N	%
<i>Skin color (natural)</i>		
Very Fair	77	12
Fair	382	59
Olive	143	22
Light Brown	45	7
Dark Brown	2	0
<i>Tendency to burn (1 hour sun exposure in summer no protection)</i>		
Severe sunburn with blistering	7	1
Painful sunburn with peeling	220	34
Mildly burnt then tan	344	53
Brown without sunburn	78	12
Don't know	0	0
<i>Tannability (repeated sun exposure in summer no protection)</i>		
Always burn, never tan	27	4
Usually burn, tan (with difficulty) less than average	163	25
Sometimes mild burn, tan about average	251	39
Rarely burn, tan (with ease) more than average	189	29
Rarely or never burn, my skin is brown	18	3
Rarely or never burn, my skin is black	1	0
<i>Summer sun protection behavior (sunscreen, hat, etc.)</i>		
Never or hardly ever	29	5
Less than half the time	84	13
About half the time	154	24
Not always but more than half	195	30
Always or almost always	187	29
<i>Ever had skin cancer?</i>		
Yes	20	3
<i>Has anyone in your family ever had skin cancer?</i>		
Yes	345	53
<i>Have you ever used a tanning bed in your lifetime?</i>		
Yes	189	29
<i>Have you used a tanning bed at least once during the past 12 months?</i>		
Yes	98	15
<i>In the past 12 months, which seasons did you indoor tan?</i>		
Winter	58	91

Spring	67	10
Fall	26	4
Summer	17	3

What best describes your use of indoor tanning devices?

(N=98 ever-tanners)

Occasionally	22	22
Rarely	46	47
Regularly, but only during particular seasons	27	28
Regularly, all year round	2	2

Table 17. Baseline Means, Standard Deviations, and Between Group Differences for Counterarguing, Cognitive Processing, Attitude Strength, and Attitude Confidence, $N = 649$

Outcome	Tanning Experience	Inoculation	One-Sided	Control	Overall	<i>p</i> value
		M(SD)	M(SD)	M(SD)	M(SD)	
Counter arguing	Tanners	2.31 (0.72) _a	2.42 (0.68) _a	2.53 (0.71) _a	2.40 (0.70)	<0.05
	Non-tanners	1.91 (0.67) _{ac}	2.14 (0.67) _b	1.87 (0.68) _{ac}	1.99 (0.68)	
	Overall	2.01 (0.70) _a	2.23 (0.69) _b	2.06 (0.75) _{ab}		
					<0.001	
Net negative thoughts about tanning	Tanners	1.09 (1.43) _a	0.79 (1.51) _{ab}	0.45 (0.96) _b	0.83 (1.40)	<0.01
	Non-tanners	1.66 (1.79) _a	1.16 (1.53) _b	0.93 (1.38) _b	1.33 (1.65)	
	Overall	1.52 (1.73) _a	1.03 (1.53) _b	0.80 (1.27) _b		
					<0.01	
Attitude strength	Tanners	64.77 (21.63) _a	65.01 (22.55) _a	60.07 (16.63) _a	64.01 (21.23)	ns
	Non-tanners	85.90 (16.16) _a	86.25 (15.96) _a	85.15 (17.81) _a	85.89 (16.39)	
	Overall	80.93 (19.72) _a	79.12 (20.96) _a	78.37 (20.71) _a		
					<0.001	
Confidence to defend attitude	Tanners	64.08 (24.28) _a	59.60 (27.12) _a	58.85 (20.73) _a	60.96 (25.07)	ns
	Non-tanners	83.23 (16.81) _a	84.19 (17.16) _a	81.49 (19.44) _a	83.25 (17.47)	
	Overall	78.72 (20.47) _a	75.93 (23.99) _a	75.36 (22.15) _a		
					<0.001	

Note. *P-values in the far right column indicate a significant, overall mean difference among the three conditions; p-values within the “Overall” column beneath each outcome indicate a significant mean difference between tanner groups.

^{a, b, c} Subscripts denote significant differences within tanner, non-tanner, and overall across message conditions.

N's: Inoculation (n=263), One-sided (n=259), Control (n=127).

Table 18. Baseline Means, Standard Deviations, and Between Group Differences for Perceived Message Effectiveness, $N = 649$

Outcome <i>This message...</i>	Experience	Inoculation	One-Sided	Control	Overall	<i>p</i> -value
		M (SD)	M (SD)	M (SD)	M (SD)	
Was easy to understand	Tanners	4.26 (0.91) _a	4.31 (0.83) _a	4.41 (0.83) _a	4.31 (0.85)	ns
	Non-tanners	4.34 (0.74) _{ab}	4.3 (0.83) _b	4.57 (0.79) _a	4.37 (0.79)	
	Overall	4.32 (0.78) _a	4.3 (0.83) _a	4.52 (0.81) _a		
Was truthful	Tanners	4.35 (0.72) _a	4.32 (0.74) _a	4.19 (0.94) _b	4.31 (0.77)	ns
	Non-tanners	4.46 (0.68) _a	4.34 (0.74) _a	4.48 (0.84) _b	4.42 (0.74)	
	Overall	4.44 (0.69) _a	4.34 (0.74) _a	4.39 (0.87) _a		
Said something important	Tanners	3.91 (0.8) _a	3.97 (0.8) _a	3.54 (0.87) _b	3.54 (0.87)	<0.01
	Non-tanners	4.1 (0.83)	4.05 (0.86)	3.77 (0.99)	3.77 (0.99)	
	Overall	4.05 (0.82) _a	4.02 (0.84) _a	3.7 (0.96) _b		
Taught me something new	Tanners	3.42 (1.17) _a	3.76 (1.05) _a	2.68 (1.13) _b	3.43 (1.17)	<0.001
	Non-tanners	3.76 (0.96) _a	3.72 (1.1) _a	2.49 (1.16) _b	3.5 (1.17)	
	Overall	3.68 (1.02) _a	3.73 (1.08) _a	2.54 (1.15) _b		
Think about dangers of indoor tanning	Tanners	4.02 (0.91) _a	4.2 (0.7) _a	3.54 (1.07) _b	4.01 (0.88)	<0.001
	Non-tanners	4.29 (0.75) _a	4.3 (0.77) _a	3.72 (0.98) _b	4.18 (0.84)	
	Overall	4.23 (0.8) _a	4.2 (0.75) _a	3.67 (1.01) _b		
Feel confident in ability to avoid indoor tanning	Tanners	3.77 (1.04) _a	3.53 (1.17) _a	3.38 (1.21) _a	3.58 (1.14)	<0.01
	Non-tanners	4.53 (0.73) _a	4.44 (0.8) _a	4.1 (1.05) _b	4.41 (0.84)	
	Overall	4.34 (0.88) _a	4.13 (1.03) _b	3.89 (1.14) _b		
Would talk about with others	Tanners	3.35 (1.08) _a	3.29 (0.99) _a	3.3 (1.13) _a	3.31 (1.04)	ns
	Non-tanners	3.81 (0.98) _a	3.72 (1.04) _a	3.38 (1.08) _b	3.69 (1.03)	
	Overall	3.7 (1.03) _a	3.57 (1.04) _a	3.35 (1.09) _a		
Motivates me to talk with others	Tanners	2.94 (1.07) _a	2.94 (1.11) _a	2.86 (1.13) _a	2.93 (1.1)	ns
	Non-tanners	3.65 (1.03) _a	3.59 (1.05) _a	3.14 (1.2) _b	3.53 (1.09)	
	Overall	3.47 (1.09) _a	3.37 (1.11) _a	3.06 (1.18) _a		
Convinces me things people say about indoor tanning benefits are false	Tanners	3.65 (1.14) _a	3.6 (0.98) _a	3.32 (1.06) _a	3.56 (1.05)	<0.01
	Non-tanners	4.16 (0.79) _a	3.92 (1.03) _b	3.66 (1.14) _b	3.97 (0.98)	
	Overall	4.03 (0.92) _a	3.81 (1.03) _b	3.56 (1.12) _b		
Made a strong argument against indoor tanning	Tanners	4.23 (0.88) _a	4.23 (0.84) _a	3.59 (1.14) _b	4.11 (0.95)	<0.001
	Non-tanners	4.48 (0.66) _a	4.41 (0.8) _a	3.98 (1.08) _b	4.36 (0.83)	
	Overall	4.42 (0.73) _a	4.35 (0.82) _a	3.87 (1.11) _b		

Motivates me to stay away from indoor tanning	Tanners	3.6 (1.07) _a	3.72 (1.04) _a	3.24 (1.14) _a	3.59 (1.08)	<0.001
	Non-tanners	4.52 (0.67) _a	4.44 (0.74) _a	4.12 (1.01) _b	4.41 (0.79)	
	Overall	4.29 (0.88) _a	4.2 (0.92) _a	3.87 (1.12) _b		<0.001

Note. *P-values in the far right column indicate a significant, overall mean difference among the three conditions; p-values within the “Overall” column beneath each outcome indicate a significant mean difference between tanner groups.

^{a, b, c} Subscripts denote significant differences within tanner, non-tanner, and overall across message conditions.

N's: Inoculation (n=263), One-sided (n=259), Control (n=127).

Table 19: Baseline Means, Standard Deviations and Between Group Differences for Indoor Tanning Outcome Expectations and Intentions, $N = 649$

Outcome	Experience	Inoculation	One-Sided	Control	Overall	
		M(SD)	M(SD)	M(SD)	M(SD)	p-value
Outcome Expectations						
Positive Safety	Tanners	2.16 (0.92) _a	2.41 (1.01) _a	2.12(0.93) _a	2.27 (0.97)	ns
	Non-tanners	1.65 (0.88) _a	1.66 (0.84) _a	1.81 (0.96) _a	1.69 (0.88)	
	Overall	1.78 (0.92) _a	1.92 (0.97) _a	1.90 (0.96) _a	0.001	
Positive Health	Tanners	1.83 (0.91) _a	1.80 (0.85) _a	1.50 (0.61) _a	1.75 (0.83)	<0.01
	Non-tanners	1.39 (0.70) _a	1.41 (0.73) _a	1.31 (0.72) _a	1.38 (0.71)	
	Overall	1.50 (0.81) _a	1.55 (0.81) _a	1.36 (0.69) _b	0.001	
Negative Safety	Tanners	4.04 (0.83) _a	4.02 (0.75) _a	3.79 (0.82) _a	3.98 (0.79)	ns
	Non-tanners	4.49 (0.73) _a	4.43 (0.76) _a	4.39 (0.78) _a	4.45 (0.76)	
	Overall	4.38 (0.78) _a	4.29 (0.78) _a	4.17 (0.91) _a	<0.001	
Negative Health	Tanners	4.14 (0.80) _a	4.17 (0.80) _a	3.81 (0.89) _a	4.09 (0.76)	<0.05
	Non-tanners	4.49 (0.67) _a	4.51 (0.72) _a	4.41 (0.84) _a	4.48 (0.73)	
	Overall	4.40 (0.72) _a	4.40 (0.72) _a	4.23 (0.90) _b	<0.001	
Intentions						
Intentions to tan indoors	Tanners	1.96 (1.02) _a	2.15 (1.00) _a	2.30 (1.12) _a	2.11 (1.03)	<0.05
	Non-tanners	1.09 (0.35) _a	1.10 (0.69) _a	1.12 (0.40) _a	1.10 (0.35)	
	Overall	1.31 (0.69) _a	1.46 (0.05) _b	1.46 (0.87) _b	<0.001	
Intentions to tan outdoors	Tanners	4.54 (0.81) _a	4.49 (0.90) _a	4.78 (0.54) _a	4.57 (0.82)	ns
	Non-tanners	3.94 (1.32) _a	4.10 (1.16) _a	4.01 (1.18) _a	4.02 (1.23)	
	Overall	4.09 (1.24) _a	4.24 (1.09) _a	4.24 (1.09) _a	<0.001	

Note. *P-values in the far right column indicate a significant, overall mean difference among the three conditions; p-values within the “Overall” column beneath each outcome indicate a significant mean difference between tanner groups.

^{a, b, c} Subscripts denote significant differences within tanner, non-tanner, and overall across message conditions.

N's: Inoculation (n=263), One-sided (n=259), Control (n=127).

Table 20: Likely Receiver of Interpersonal Communication about Prevention Messages at Baseline, $N = 649$

	Inoculation		1-Sided		Control		Overall		<i>p</i> -value ⁺
	%	N	%	N	%	N	%	N	
Sorority sister	85%	223	78%	202	83%	106	83%	536	ns
Friend (not sorority sister)	85%	224	76%	197	71%	90	79%	511	$p < 0.01$
BF/Significant other	24%	62	24%	61	20%	26	23%	149	ns
Parents	45%	118	45%	116	43%	55	45%	289	ns
Other family member	36%	94	35%	91	30%	38	34%	223	ns
Someone you did not know before	5%	13	5%	13	6%	8	5%	34	ns
Other	1%	3	2%	4	0%	0	1%	7	--
No one	4%	10	7%	19	12%	15	7%	44	ns

Note. ⁺Tests of statistical significance were only employed for items that had at least 5 cases per cell.

Table 21: Post-Inoculation Conversational Partners at One-week Follow-up, $N = 58^*$

	Inoculation		1-Sided		Control		Overall	
	%	N	%	N	%	N	%	N
<i>Who did you talk to?</i>								
Sorority sister	67%	18	69%	11	86%	12	72%	41
Friend (not sorority sister)	52%	14	56%	9	36%	5	49%	28
BF/Significant other	22%	6	13%	2	14%	2	18%	10
Parents	11%	3	0%	0	7%	1	7%	4
Other family member	4%	1	6%	1	0%	0	4%	2
Someone you did not know before	0%	0	6%	1	0%	0	2%	1
Other	4%	1	0%	0	0%	0	2%	1
<i>Were they people who...</i>								
Indoor tan	52%	14	81%	13	50%	7	60%	34
Do not indoor tan	70%	19	63%	10	43%	6	61%	35
Not sure	15%	4	6%	1	29%	4	16%	9
<i>Who started the conversation?</i>								
Me	85%	23	75%	12	79%	11	81%	46
Someone else	11%	3	19%	3	21%	3	16%	9
Don't remember	7%	2	6%	1	0%	0	5%	3

Note. * Of the 324 participants who completed the follow-up survey, 58 participants reported having talked with someone in the past week about the message.

Table 22: Post-Inoculation Talk Conversational Content at One-week Follow-up, $N = 58^*$

	Inoculation		1-Sided		Control		Overall		
	%	N	%	N	%	N	%	N	<i>p</i> -value ⁺
<i>Negative aspects of indoor tanning</i>									
Safety hazards of indoor tanning	48%	13	31%	5	71%	10	49%	28	p<0.05
Health harms of indoor tanning	81%	22	88%	14	93%	13	86%	49	
Whether message would make me want to quit tanning	22%	6	19%	3	14%	2	19%	11	
Whether message would make others want to quit tanning	15%	4	38%	6	29%	4	25%	14	
Whether message would stop other people from starting indoor tanning	15%	4	19%	3	14%	2	16%	9	
Argued in support of the main points of the message	26%	7	31%	5	21%	3	26%	15	
Other indoor tanning warnings/messages	30%	8	19%	3	14%	2	23%	13	
Whether message should be publicized elsewhere	15%	4	6%	1	7%	1	11%	6	
<i>Positive aspects of indoor tanning</i>									
Indoor tanning as a safe way to get a tan	0%	0	0%	0	0%	0	0%	0	
Health benefits of indoor tanning	7%	2	6%	1	0%	0	5%	3	
Argued against the main points of the message	0%	0	6%	1	0%	0	2%	1	
Made fun of the message	4%	1	0%	0	0%	0	2%	1	
<i>Study-specific content</i>									
This research study	15%	4	6%	1	7%	1	11%	6	
Other	19%	5	19%	3	36%	5	23%	13	

Note. * Of the 324 participants who completed the follow-up survey, 58 participants reported having talked with someone in the past week about the message.

⁺Tests of statistical significance were only employed for items that had at least 5 cases per cell.

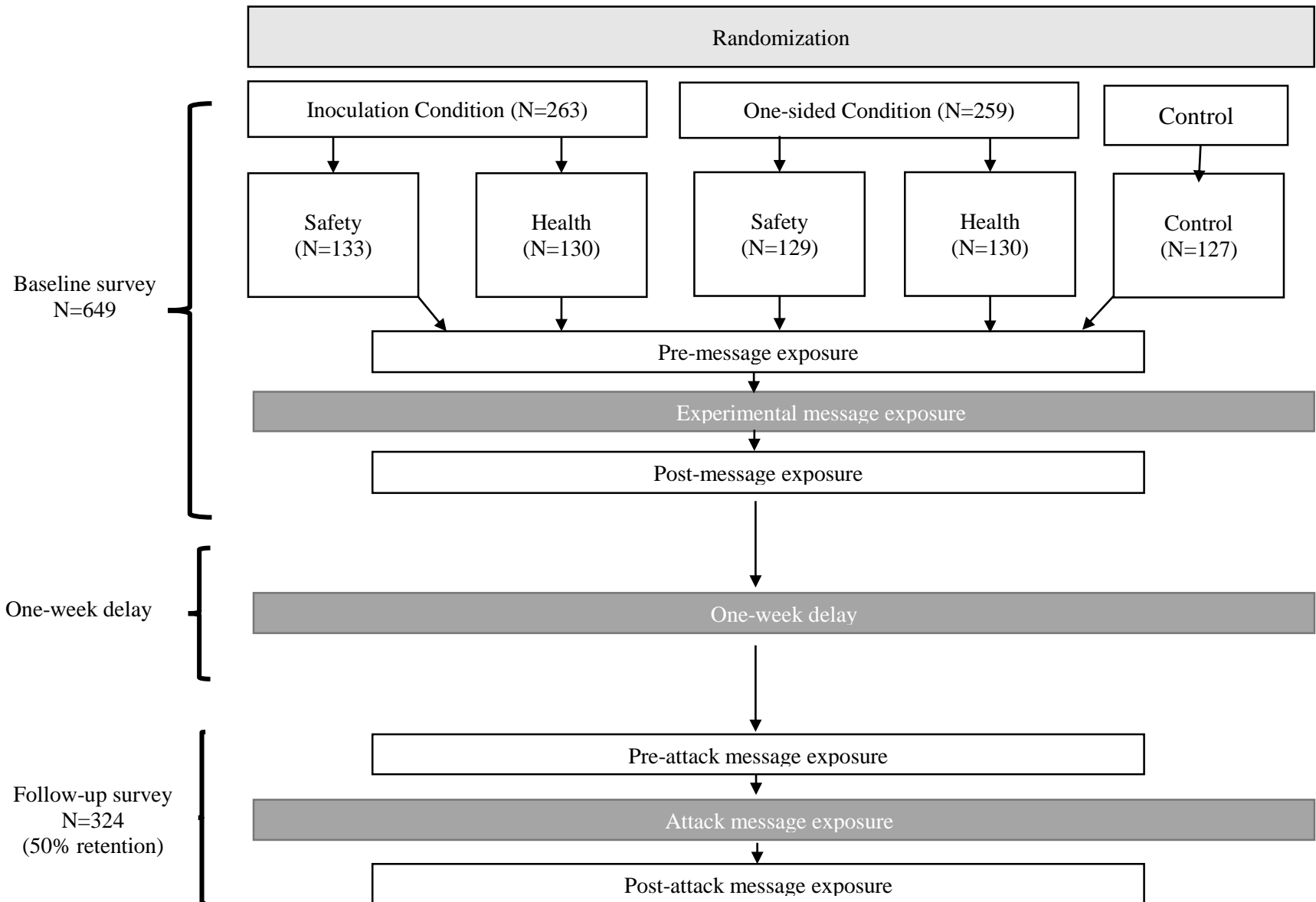
Table 23: Hypothetical Post-Inoculation Talk Conversational Partners at One-week Follow-up, $N = 324$

	Inoculation		1-Sided		Control		Overall	
	%	N	%	N	%	N	%	N
<i>Who would you talk to?</i>								
Sorority sister	83%	92	89%	97	91%	43	87%	232
Friend (not sorority sister)	79%	88	87%	95	85%	40	84%	223
BF/Significant other	27%	30	33%	36	36%	17	31%	83
Parents	37%	41	42%	46	43%	20	40%	107
Other family member	28%	31	35%	38	32%	15	31%	84
Someone you did not know before	3%	3	1%	1	2%	1	2%	5
Other	2%	2	2%	2	2%	1	2%	5

Table 24: Hypothetical Post-Inoculation Conversational Content (N = 324)

	Inoculation		1-Sided		Control		Overall	
	%	N	%	N	%	N	%	N
<i>Negative aspects of indoor tanning</i>								
Safety hazards of indoor tanning	67%	74	66%	72	66%	31	66%	177
Health harms of indoor tanning	92%	102	94%	102	94%	44	93%	248
Whether message would make me want to quit tanning	23%	26	26%	28	32%	15	26%	69
Whether message would make others want to quit tanning	36%	40	40%	44	36%	17	38%	101
Whether message would stop other people from starting indoor tanning	41%	46	32%	35	36%	17	37%	98
Argued in support of the main points of the message	40%	44	32%	35	34%	16	36%	95
Other indoor tanning warnings/messages	28%	31	25%	27	28%	13	27%	71
Whether message should be publicized elsewhere	29%	32	20%	22	17%	8	23%	62
<i>Positive aspects of indoor tanning</i>								
Indoor tanning as a safe way to get a tan	4%	4	2%	2	2%	1	3%	7
Health benefits of indoor tanning	7%	8	6%	7	4%	2	6%	17
Argued against the main points of the message	3%	3	6%	6	9%	4	5%	13
Made fun of the message	2%	2	2%	2	0%	0	1%	4
<i>Study-specific content</i>								
This research study	17%	19	19%	21	17%	8	18%	48
Other	0%	0	4%	4	0%	0	1%	4

Figure 1. Study flow



CHAPTER 5

Discussion and Conclusions

Health communication experts are increasingly faced with the arduous task of not only developing and disseminating effective messages in the midst of a crowded communication environment, but also with having to correct misinformation post-hoc, after risky attitudes and beliefs have had a chance to form. This project examined inoculation theory's potential for persuasive success by comparing inoculation messages to the traditional health communication message format (one-sided message) and a control message, in the context of indoor tanning. The goals of this study were to: 1) Contribute to the indoor tanning prevention literature by exploring the pro-industry arguments in support of indoor tanning (Aim 1, Chapter 2), and developing effective indoor tanning prevention messages (Aims 2-3); 2) Contribute to the literature on Inoculation Theory by expanding its use to a novel context and exploring how various mechanisms of persuasion operate in this context (Aims 2-3); and 3) Contribute to health communication in two ways – the first is a comparison of inoculation (refutational two-sided) and one-sided messages on mechanisms of persuasion within the context of a complex health behavior (Aim 3), while the second is through illustrating how imperative formative research is for message development in the context of complex health behaviors in an environment of misinformation regarding benefits of the behavior (Aims 1-3).

Chapter 1 provides an overview of the problem of indoor tanning and previous prevention and behavioral reduction efforts. A thorough overview of inoculation theory, it's

history, core mechanisms, and remaining questions within the literature is also provided in order to illustrate why inoculation theory is an appropriate and understudied application to the issue of indoor tanning and skin cancer prevention.

Chapter 2 details the first study of this project which was formative data collection in the form of a systematic content analysis of pro-tanning arguments in order to understand the current communication environment regarding the perceived benefits of indoor tanning. This study found two overarching themes (safety and health) with two primary messages each: controlled tanning is safe tanning and government regulation of tanning beds makes the devices safe to use (safety themes); and indoor tanning as a way to provide a protective base tan to prevent future sunburn and as a way to effectively provide vitamin D (health themes).

Chapter 3 describes the second study, which was also formative in nature. This study had two parts – the first consisted of qualitative data collection in the form of in-depth cognitive interviews, and the second consisted of quantitative data collection in the form of a pilot experiment of four experimental messages (one for each of the themes identified in Aim 1), as well as a control message. Also tested in the quantitative pilot were other study materials to be used in the third aim, such as the attack messages, and survey measures. The purpose of this second study was to refine the messages before testing them in the full experiment (Aim 3). Results revealed two messages, one from each theme, as the best choices to test in the full experiment.

The main experiment is presented in Chapter 4. Results of this study showed that inoculation and one-sided messages performed similarly on a small number of constructs, but inoculation messages ultimately outperformed one-sided messages in meaningful ways by eliciting a deeper level of cognitive processing, changing outcome expectations in the preferred

direction, increasing self-efficacy to avoid indoor tanning, and decreasing intentions to tan indoors at baseline, and from baseline to follow-up. Further, Inoculation messages appeared to operate similarly for both non-tanners and tanners.

The first study in this project focused on analyzing pro-indoor tanning arguments using a systematic content analysis to understand what the most prominent pieces of misinformation (“claims”) were in a pro-tanning communication environment. Results from this study yielded two prominent health claims (base tan and vitamin D) and two prominent safety claims (controlled tanning is safe tanning, and government regulation of tanning beds makes them safe to use). This study adds to the understanding of pro-tanning content by using systematic content analysis methodology to explore content easily accessible to 87% of the U.S. population (Anderson & Perrin, 2016), the majority of whom are young white women, who represent the population that is disproportionately affected by the harmful effects of indoor tanning (Wehner et al., 2012). Previous studies used smaller sample pools such as specific women’s magazines (Cho et al., 2010; McWhirter & Hoffman-Goetz, 2015b) or local newspaper ads (Freeman et al., 2006; Kwon et al., 2002). While these studies and others are instrumental to our understanding of pro-indoor tanning content, the current study contributed an understanding of the proportion of health, safety and appearance claims across a variety of communicators (i.e. salons, industry, personal and professional blogs). This study confirms the concerns reported by Balk et al. (2015) and quantifies and contextualizes these concerns, as far as internet communications are concerned.

Current prevention efforts have shown promise in reducing and preventing indoor tanning through various behavioral (Gibbons et al., 2005; J Hillhouse et al., 2008; Turrisi, Hillhouse, Mallett, Stapleton, & Robinson, 2012) and communication (Lazovich et al., 2013;

Mays & Zhao, 2016) interventions. However, many of these interventions were grounded in behavioral theory (with the exception of Mays & Zhao, 2015). As Cappella (2003) explains, theories of health behavior are essential for guiding message design as far as *what* to message on – however, these theories do not provide guidance as to *how* to develop such messages (Cappella, 2003). Further, as O’Keefe (2003) asserts, most of our message elements are defined in terms of the psychological processes they incite (e.g. fear appeals are defined in terms of the amount of fear the participant experiences) (O’Keefe, 2003). While these psychological definitions are important, they provide no guidance as to how to design a message. Only two indoor tanning interventions to date have described formative research methods for message development, focusing on encouraging mother-daughter communication about the health and appearance harms associated with indoor tanning (Lazovich et al., 2013), and message framing (Mays & Zhao, 2016). This study adds to the literature on indoor tanning prevention interventions by incorporating a theory that aids in both guiding message design as well as providing a basis for which psychological reactions are indicative of message success. Further, the inoculation format emphasizes the necessity of formative research and testing of messages before conducting a full experiment or intervention trial. Thus, messages in this study were carefully constructed based on the results of the content analysis of pro-tanning arguments (Aim 1) and then thoroughly tested using qualitative and quantitative methods (Aim 2). This formulaic process has contributed to understanding how indoor tanning messages may be constructed to prevent and deter indoor tanning behavior using a novel message approach that was shown to be effective for the sample of young women tanners and non-tanners.

This study also contributes to the expansive inoculation literature as the first to test the theory in the context of indoor tanning. Further, indoor tanning represents a novel type of

behavior to the inoculation literature as this behavior is not one that is intrinsically meaningful or one that people hold strong attitudes and beliefs about, which are typically prerequisites for issues inoculation messages address. However, as results of this study suggest, the use of inoculation theory may have benefits that exceed previous messaging efforts in that the format of inoculation messages appeared to induce a deeper level of cognitive processing (i.e. processing through the central, instead of peripheral route) compared to the comparison message types. This finding is exciting as pro-indoor tanning messages are, like many messages, likely to be processed peripherally given that the behavior of tanning is not an intrinsic motivator – rather, the outcome (tanned skin, which is culturally equated to attractiveness) is the motivation (for many) for lying in a tanning bed. The reality of indoor tanning prevention and reduction is that until a safer, convenient, and affordable alternative to achieving a tanned look is found, tanning beds will likely be the preferred method of tanning for those looking to get tan quickly. While tanning alternatives such as self-applied tanning lotions or spray tanning are available and many women use these products and services instead of indoor tanning, these options are time consuming, messy, and expensive – they also do not provide the same type of tan, likely because the method of tanning is void of UV penetration and is really a form of skin-dyeing, which produces “unnatural” coloring. Therefore, expecting an indoor tanner to switch over to other sunless tanning products is not a likely solution to tanning bed use. While these simple facts may be intimidating, this dissertation showed inoculation theory as a promising method to illuminate cognitive dissonance that comes from the desire to be tan using a method to tan that many tanners know is harmful (Noar et al., 2014). By discrediting and deconstructing the misinformation about the benefits of indoor tanning, it may be more difficult for tanners to justify their tanning bed use.

Results of this study also speak to the issue of threat and involvement in the context of indoor tanning, a novel application of inoculation. The differences in counterarguing, cognitive processing, and intentions to indoor tan for those in the inoculation condition, regardless of tanning experience, suggest the presence of threat, which is a key mechanism in the inoculation process. Future research should include multiple follow-up assessments over a longer duration of time (compared to the one-week follow-up assessment period for this study) to allow for a thorough understanding of the effects of inoculation messages on indoor tanning behavior, which would be the ultimate indicator of message effectiveness.

This dissertation also contributed to the field of health communication more broadly, by testing one-sided and refutational two-sided messages against one another. Namely, as one-sided messages have been the standard message format for many - if not most - health communication campaigns, this study found some benefits of one-sided messages over the control – including effective persuasion to motivate consideration of the dangers of indoor tanning, perceived argument strength against indoor tanning, and motivation to stay away from tanning beds (mostly for those who have never tanned). However, unlike inoculation messages, one-sided messages failed to incite a deeper level of cognitive processing, increase self-efficacy to avoid indoor tanning, and encourage people that many of the things people say about the benefits of indoor tanning are false - the latter being quintessential for correction of misinformation. Further, inoculation messages proved to be more effective over time: whereas control and one-sided messages saw no change or a reduction in effects on outcomes such as intentions to tan indoors, inoculation effects improved over time on this outcome. While this study does not seek to diminish the importance or potential of one-sided messaging strategies in the health communication context, it does point to the benefits of refutational two-sided messages for

complex health behaviors such as indoor tanning, and suggests that the inoculation approach has much promise and utility, warranting further application of the theory in other health arenas.

Limitations

This study was a first step in understanding how inoculation theory may be beneficial at correcting misinformation surrounding complex, yet harmful, behaviors such as indoor tanning. While results strongly suggest inoculation theory offers promise in this health communication context, this study is not without limitations.

First, the content analysis (Aim 1) revealed many claims related to health and safety that need correction. Misinformation regarding base tans was among the most prevalent claim. However, as revealed in Aim 2, the term “base tan” may have multiple meanings, not just a base tan to protect from future sunburn (as defined in this study). Aim 2 results revealed that this term can also mean a base tan for appearance – so while this claim was included in the coding procedure, it was not identified within the content analysis. Therefore, methods could be improved by understanding how members of the target audience interpret and ascribe meaning to particular claims before coding, as to allow for a better understanding of what the content the target audience is exposed to means to them (i.e., how is ‘base tan’ interpreted?). Future research should also try to understand indoor tanning communication by conducting a forensic analysis – studies of pro-indoor tanning messages across various communication platforms such as social media (Ricklefs et al., 2016), newspapers (Freeman et al., 2006), and magazines (Cho et al., 2010). Considering the rate at which information is consumed and interconnected due to the internet and electronic communication, it may prove beneficial to see how advertising claims focused on topics such as deals and appeals to attractiveness are connected to tanning salon or industry sites that may contain safety and health claims like the claims studied in this project.

Second, the number of tanners in both Aims 2 and 3 was relatively low. Studies show that indoor tanning is decreasing over time, a likely result of the success of policy and communication efforts (Guy et al., 2013; Guy et al., 2017). While the current study found effects for the overall sample, a sample containing a greater number of current tanners may be more insightful for harm reduction purposes- i.e., to better illustrate impact on tanners, including following them over time and examining impact on behavior. Another limitation regarding the sample was that these were convenience samples. While the samples represent those most engaged in indoor tanning (i.e. young, white females), these samples are confined to one geographic area and thus, cannot be generalized broadly. Further, those included in the sample may not be representative of the average education level of those who tan indoors – while the messages used in this study were appropriate for the sample, a 12th grade reading level is not recommended for the general population. This limitation is partly due to the complexities of the pro-indoor tanning claims – as this was the first study to our knowledge to focus on correcting complex misinformation about indoor tanning, refuting such information required a great level of detail. Future studies should test messages written at an 8th grade level in order to speak to a broader and less educated population.

Another limitation is the length of the messages. While the length was suitable for the purposes of this study, health communication messages in a natural environment are likely to be ineffective if the word count is too high. People are often inundated with messages of various sorts, and therefore it is impossible to read every message in its entirety. To optimize the effectiveness of indoor tanning inoculation messages, the messages should be reduced considerably and again tested for efficacy. Future studies should also explore combining health and safety claims into one message as the inoculation health and safety messages were found to

be equally effective. Finally, various delivery formats should be tested – including print, online, and television formats, and potentially other message delivery styles such as narratives.

This study focused on understanding indoor tanning inoculation message effects on foundational mechanisms of persuasion. However, as indoor tanning is intertwined with cultural ideals of attraction, this study is limited in that it did not explore how inoculation messages affect overarching constructs related to attraction, and ultimately, identity. Future message development approaches may benefit by understanding indoor tanning user and nonuser prototypes (Comello & Slater, 2010) and how indoor tanning fits into one's spectrum of identity. Such information may have larger implications for approaching indoor tanning prevention and reduction efforts that consider the motivation for tanning (i.e., attractiveness, self-confidence).

As a consequence of the study design and time interval between assessments, another limitation is the inability to examine impact on behavior. Future studies should adopt longer longitudinal designs that would be conducive to an examination of behavior change. Ideally, such a study would span over periods in which indoor tanning behavior peaks (i.e., winter and spring) to assess the effectiveness of preventative messaging efforts on behavior.

Further, this study is limited in that it cannot offer guidance as to how these messages should be most effectively disseminated. Future research should explore different modes of dissemination to understand the best channels in which to place these messages. Current indoor tanning intervention studies have explored different ways in which to disseminate messages through text (Evans & Mays, 2016), web (Hillhouse et al., 2016), and mail (Lazovich et al., 2013). This literature may offer guidance when considering different modes of dissemination.

Despite these limitations, this study has a number of strengths as well. This is the first application of inoculation theory to the context of indoor tanning, and results indicate that further consideration of the inoculation approach is warranted in this context. This study also directly compares effects of one- and refutational two-sided messages, highlighting areas where the two formats are similar, and also highlighting what makes refutational two-sided messages (i.e., inoculation) more effective. The sample used in this study, although limited, is representative of the population for which these messages are most needed. Finally, extensive formative research enabled the comparison of strong one- and two-sided messages in the context of indoor tanning prevention and reduction, thus demonstrating a systematic approach to message development and testing.

Conclusion

Indoor tanning is a complex health behavior that is, in many ways, a tool to achieve cultural ideals of attractiveness. While approaching prevention and reduction efforts with a focus on the latter is quite a daunting task for any health communication expert, and likely requires much larger systemic change taking place over a long period of time – inoculation messages offer an approach that is promising for achieving more immediate results. This dissertation found that inoculation messages may make issues related to indoor tanning, and the misinformation about indoor tanning, more salient to message receivers. While many acknowledge the harms of indoor tanning, misinformation has likely been instrumental in assuaging the discomfort associated with participating in a behavior known to be harmful to achieve an intrinsically motivated outcome – attractiveness. Inoculation messages are a method for correcting misinformation and making the dangers of indoor tanning more salient and central to the receiver's motivations to indoor tan.

APPENDIX A1: CONTENT ANALYSIS CODING FORM

Description of Codes by Theme

Theme	Codes*	Notes/Examples
Health Claims	<ol style="list-style-type: none"> 1. Mention of vitamin d 1b. Vitamin d directly associated with IT 2. Treats mental health: <ol style="list-style-type: none"> a. depression b. SAD c. anxiety d. stress e. other (fill in) 3. Elevates mood 4. Relaxation/stress relief 5. Treats health ailment (choose from list below) 6. Prevents health ailment (choose from list below) <ol style="list-style-type: none"> a. Cancer (fill in) b. Heart disease c. Asthma d. Hypertension e. Diabetes f. Blood clots g. Alzheimer's h. Blood pressure i. Weight loss j. Skin conditions/Problem skin (fill in - e.g. psoriasis, acne) k. Other (fill in) l. No health ailment mentioned 7. Protective base tan 8. Healthy glow 9. Only dangerous if you burn 10. Safer than the sun 11. Controlled dose is safe 12. Doesn't cause cancer 13. Other things cause cancer 14. Other (fill in) 	<ol style="list-style-type: none"> 5. Treats health ailment – use the same codes presented for prevents health ailment (6; a-l) 8. Healthy glow- site must explicitly use the word “Healthy”
Appearance Claims	<ol style="list-style-type: none"> 1. Appeals to appearance (e.g. look more attractive) 2. Hides skin imperfections/stretch marks/acne 3. Social benefits (e.g. improved social status, compliments from friends, getting attention) 4. “Look” thinner 5. Other (fill in) 	Other examples: increase self-confidence/esteem increased sense of worth

Theme	Codes*	Notes/Examples
Scientific Credibility	<ol style="list-style-type: none"> 1. Refutes research about the harms of IT 2. Research to support indoor tanning 3. Criticizes sunscreen/sunscreen industry (e.g. "chemical sunscreen") 	<p><i>Notes:</i> research may be social (self-reports of tanning beliefs or outcomes collected via survey instrumentation) or medical (bench science) and must be presented in a way that suggests scientific rigor to the average person.</p> <p>Examples of refuted research may include studies from WHO or IARC about the association between tanning beds and skin cancer.</p> <p>Examples of supportive research could be studies that suggest vitamin D is a benefit of indoor tanning, or a survey of people that suggests people who indoor tan are less likely to get skin cancer.</p>
Dermatologists	<ol style="list-style-type: none"> 1. Dermatologist recommends IT 2. Dermatologist criticizes IT so they can get business/charge for indoor tanning services 3. Other 	<p>Other example:</p> <p>"The dermatology and cosmetics industries have long oversimplified UV light's complicated relationship with melanoma, alleging that any exposure to sunlight is damaging and increases one's risk of melanoma skin cancer. In promoting that statement, they have conspicuously ignored confounding information, such as the universally recognized facts that melanoma is more common in indoor workers than in outdoor workers, and that it appears most commonly on parts of the body that do not get regular sunlight."</p>
Site variables	<ol style="list-style-type: none"> 1. Domain Name (fill in) 2. Site type: <ol style="list-style-type: none"> 1 = .com 2 = .net 3 = .org 4 = .gov 	

Theme	Codes*	Notes/Examples
	5 = other (fill in) 3. Source type: 1. tanning salon 2. personal blog 3. professional blog 4. news source 5. industry source 6. other (fill in)	
Balance of information	1 = All pro-tanning 2 = Mostly pro-tanning 3 = Roughly half pro and half anti-tanning 4 = Mostly anti-tanning 5 = All anti-tanning	<i>Note:</i> Sites that are mostly or all anti-tanning should not have been retained in the sample and will be excluded from analyses.
“Truth” & “Myth”	1 = “Truth” – pro tanning 2 = “Truth” – anti-tanning 3 = “Myth” – pro tanning 4 = “Myth” – anti-tanning	Examples: 1: The <u>truth</u> is, indoor tanning does not cause skin cancer. 2: The <u>truth</u> is, indoor tanning causes skin cancer. 3: The idea that indoor tanning causes skin cancer is nothing more than a <u>myth</u> . 4: Indoor tanning as a way to get vitamin D is nothing more than a <u>myth</u> .
<i>Note.</i> *If present, mark “1” in excel database unless otherwise noted (i.e. site type, balance of pro/anti info, truth & myth). If absent, mark “0”		

APPENDIX B1: COGNITIVE INTERVIEW GUIDE

Semi-structured In-depth interview guide

(after consent form is reviewed and signed)

Thank you for agreeing to speak with me today about your perceptions on health, beauty, and indoor tanning. As a reminder, this interview will last approximately 30-45 minutes, and you may stop the interview at any time. Please keep in mind that all of your answers are confidential and your name will in no way be associated with any information you provide, so please answer each question honestly and to the best of your ability. I'm going to show you 4 messages today, and will ask you to read each one, then answer some questions about the message in regards to the content and style.

A. Messages

Here is the first message I would like you to read. As you are reading, please circle or underline any words or phrases that are unclear or seem awkward to you. After you have read through this message, I'll ask you a few questions about it and then we will go over what you circled/underlined— but don't worry about memorizing anything, this isn't a test, the whole purpose is to make these messages better.

One-sided _____(theme/focus)

1. What do you think this message is trying to tell you?
2. Are there things that you especially agreed or disagreed with in the message?
3. What was effective about this message in discouraging indoor tanning behavior?
4. How could this message be more convincing in discouraging indoor tanning?
5. Words/phrases to clarify

Thank you! Here is the second message, please do the same thing you did with the first message.

Two-Sided _____(theme/focus)

1. What do you think this message is trying to tell you?
2. Are there things that you especially agreed or disagreed with in the message?

3. What was effective about this message in discouraging indoor tanning behavior?
4. How could this message be more convincing in discouraging indoor tanning?
5. What do you think about this message (2-sided) compared to the last message? (1-sided)
6. Words/phrases to clarify

Thank you! Here is the third message, please do the same thing you did with the first message.

One-sided _____(theme/focus)

1. What do you think this message is trying to tell you?
2. Are there things that you especially agreed or disagreed with in the message?
3. What was effective about this message in discouraging indoor tanning behavior?
4. How could this message be more convincing in discouraging indoor tanning?
5. Words/phrases to clarify

Thank you! Here is the fourth message.

Two-Sided _____(theme/focus)

1. What do you think this message is trying to tell you?
2. Are there things that you especially agreed or disagreed with in the message?
3. What was effective about this message in discouraging indoor tanning behavior?
4. How could this message be more convincing in discouraging indoor tanning?
5. What do you think about this message (2-sided) compared to the last message? (1-sided)
6. Words/phrases to clarify

B. All messages/Control

Now I have just a couple of questions about all of the messages you read today.

1. Which message did you think was the best message and why?
2. Thinking about the 4 messages you just read, which two do you think would be most effective in discouraging people from indoor tanning? Why?

- 3a. (show control message) What are your thoughts about this message?
- 3b. Do you think this message would be as effective or more effective than the four messages you read previously? Why or why not?
4. Any final comments about any of the messages you read?

C. Basic demographic/tanning info

First I need to ask some basic information about you.

1. What year are you in school?
2. How old are you?
3. What is your race/ethnicity?
- 4a. Have you ever gone indoor tanning before?
(if yes to 4a) 4b. In the past year?
(if yes to 4b) 4c. About how many times have you gone in the past year?

APPENDIX B2: ONLINE PILOT SURVEY

Aim2

Q1 Thank you for your interest in participating in this survey. This survey will take approximately 15-20 minutes to complete and will ask you questions about your opinions regarding health and indoor tanning. You will also be asked to give your opinion on messages about health and indoor tanning. Your answers are completely confidential and your name and chapter will not be associated with any of the answers you provide. Please answer all questions as honestly as you can. You may stop participating at any time or refuse to answer any questions in the survey, without penalty. If you have any questions about the content of this study, please direct them to the Principal Investigator, Dannielle Kelley, at dekelley@live.unc.edu. If you are interested in participating, please answer the questions below and click “next” to begin the survey.

Q3 Are you 18 years of age or older?

- ☐ Yes (1)
- ☐ No (2)

If No Is Selected, Then Skip To End of Survey

Q4 Do you agree to participate in this study?

- ☐ Yes (1)
- ☐ No (2)

If No Is Selected, Then Skip To End of Survey

Q5 Each sorority member can only take this survey one time. In order to register you for the survey, please enter your valid Wake Forest University email address below.

Q6 Before you begin the survey, please select your sorority house from the drop down menu below so that we can give the proper credit for taking the survey.

- ☐ Alpha Delta Pi (1)
- ☐ Chi Omega (2)
- ☐ Delta Delta Delta (3)
- ☐ Delta Zeta (4)
- ☐ Kappa Alpha Theta (5)
- ☐ Kappa Beta Gamma (6)
- ☐ Kappa Delta (7)
- ☐ Kappa Kappa Gamma (8)

Q29 What is the color of your untanned skin?

- ☐ Very fair (1)
- ☐ Fair (2)
- ☐ Olive (3)
- ☐ Light brown (4)
- ☐ Dark brown (5)
- ☐ Very dark (6)

Q25 Think about when you are out in the sun during the day without sun protection. Please rate your tan and burn tendency from the list below:

- ☐ Always burn, never tan (1)
- ☐ Usually burn, tan (with difficulty) less than average (2)
- ☐ Sometimes mild burn, tan about average (3)
- ☐ Rarely burn, tan (with ease) more than average (4)
- ☐ Rarely or never burn, my skin is brown (5)
- ☐ Rarely or never burn, my skin is black (6)

Q31 What would happen to your skin if it were exposed to bright sunlight for the first time in summer for one hour in the middle of the day without sun protection?

- ☐ Get a severe sunburn with blistering (1)
- ☐ Have a painful sunburn for a few days followed by peeling (2)
- ☐ Get mildly burnt followed by some tanning (3)
- ☐ Go brown without any sunburn (4)
- ☐ Don't know (5)

Q21 During the summer, how often do you protect your skin from the sun, for example, by using sunscreen or wearing a hat?

- ☐ Never or hardly ever (1)
- ☐ Less than half the time (2)
- ☐ About half the time (3)
- ☐ Not always but more than half the time (4)
- ☐ Always or almost always (5)

Q23 Have you personally ever had skin cancer?

- ☐ No (1)
- ☐ Yes (2)

Q27 To your knowledge, has anyone in your family ever had skin cancer?

- ☐ No (1)
- ☐ Yes (2)

Q39 Have you ever used a tanning bed in your lifetime?

- ☐ No (1)
- ☐ Yes (2)

If No Is Selected, Then Skip To How often do you tan outdoors for the...

Q41 Have you used a tanning bed at least once during the past 12 months?

- ☐ No (1)
- ☐ Yes (2)

If No Is Selected, Then Skip To How often do you tan outdoors for the...

Q43 Think over the past 12 months. How many times did you use a tanning bed?

Q47 In the past 12 months, during which seasons did you tan indoors?

- ☐ Spring (1)
- ☐ Winter (2)
- ☐ Fall (3)
- ☐ Summer (4)

Q49 In the past 12 months, which of the following best describes your use of indoor tanning devices: I indoor tan...

- ☐ Regularly, all year round (1)
- ☐ Regularly, but only during particular seasons (2)
- ☐ Occasionally (3)
- ☐ Rarely (4)

-----NEXT SCREEN-----

Q45 How often do you tan outdoors for the purpose of getting a tan when the weather is warm?

- ☐ Once per year (1)
- ☐ A few times per year (2)
- ☐ Once per month during warm months (3)
- ☐ Once per week during warm months (4)
- ☐ A few times per week or more during warm months (5)

-----NEXT SCREEN-----
 Q38 Please carefully read the message below and answer the following questions about this message.

[CONDITION 1: INOCULATION SAFETY MESSAGES]

[Safety: Controlled Tanning Inoculation Message]

[Safety: Government Regulation Inoculation Message]

[CONDITION 2: HEALTH INOCULATION MESSAGES]

[Health: Base Tan Inoculation Message]

[Health: Vitamin D Inoculation Message]

[CONDITION 3: SAFETY 1-SIDED MESSAGES]

[Safety: Controlled Tanning 1-sided message]

[Safety: Government Regulation 1-sided Message]

[CONDITION 4: HEALTH 1-SIDED MESSAGES]

[Health: Base Tan 1-sided Message]

[Health: Vitamin D 1-sided Message]

-----NEXT SCREEN-----

Q94 Please rate how much you agree or disagree with the following statements: This message...

	Strongly disagree (1)	Somewhat disagree (2)	Neither disagree nor agree (3)	Somewhat agree (4)	Strongly agree (5)
Was easy to understand (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Was truthful (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Said something important to me (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Taught me something new (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Made me think about the dangers of indoor tanning (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Made me feel confident about my ability to avoid indoor tanning (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is something I would talk about with others (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Convinces me that many of the things people say about the benefits of indoor tanning are not true (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Made a strong argument against indoor tanning (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Motivates me to stay away from tanning beds (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

-----NEXT SCREEN-----

Q95 To what extent did you agree or disagree with the arguments contained in the message?

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
I found myself agreeing with the author's points. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I found myself disagreeing with the author's points. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I thought of arguments to support what the author was saying. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I thought of arguments against what the author was saying. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

-----NEXT SCREEN-----

Q96 In the spaces below, please write down any thoughts you had against indoor tanning while reading this message.

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

Q97 Please write down any thoughts you had in support of indoor tanning while reading this message.

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

Q98 Please write down any other thoughts you had about indoor tanning after reading this message.

1 (1)

2 (2)

3 (3)

4 (4)

5 (5)

-----NEXT SCREEN-----

Q105 Using the scale below, where 0 is "not at all confident" and 100 is "absolutely confident" please indicate how confident you are that...

_____ Your attitude about indoor tanning is firm? (1)

_____ You hold the correct attitude about indoor tanning? (2)

_____ Your attitude about indoor tanning will not change even if you find out that a majority of people disagree with you? (3)

_____ You can defend your position on indoor tanning if necessary? (4)

_____ You can maintain your position even if you encounter strong arguments against it? (5)

_____ You can successfully argue your position with someone else who disagrees with you? (6)

-----NEXT SCREEN-----

Q173 Below are items reflecting what some people believe are benefits of indoor tanning. Please indicate your opinion on these. Even if you have not tanned indoors before, give your best answer.

Q174 If I went indoor tanning it would...

	Definitely would not (1)	Probably would not (2)	Not sure (3)	Probably would (4)	Definitely would (5)
be safe because I can control how long I tan. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
be safe because I can choose the type of tanning bed to use. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
be safer than tanning in the sun. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
be safe because it is regulated by the government. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
be safe because tanning is legal. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
be safe because the government determines how often someone may tan based on their skin type. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
be a good way to get vitamin D. (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
be a natural way to get vitamin D. (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
be healthy because it would give me vitamin D. (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
give me a base tan that would protect me from sunburn. (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
provide me with a base tan that acts as a sunscreen. (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
provide me with a base tan that increases the effectiveness of my sunscreen. (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

-----NEXT SCREEN-----

Q175 Below are items reflecting what some people believe are drawbacks of indoor tanning. Please indicate your opinion on these. Even if you have not tanned indoors before, give your best answer.

Q176 If I went indoor tanning it would...

	Definitely would not (1)	Probably would not (2)	Not sure (3)	Probably would (4)	Definitely would (5)
be dangerous because I wouldn't know how well the salon kept up with tanning bed maintenance. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
be unsafe because tanning beds emit a high dose of radiation. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
be unsafe because most tanning salons do not follow the indoor tanning guidelines set by the government. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
increase my chances of getting melanoma (deadly skin cancer). (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
lead to skin cancer. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
lead to premature skin aging. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
be more dangerous than tanning in the sun. (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
damage multiple layers of my skin. (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
not be a safe way to get a tan. (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
not be a healthy way to get a tan. (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

-----PAGE BREAK-----

Q110 How interested are you in going indoor tanning in the next year?

- ☐ Not interested at all (1)
- ☐ Slightly interested (2)
- ☐ Somewhat interested (3)
- ☐ Very interested (4)
- ☐ Extremely interested (5)

Q111 How much do you plan to go indoor tanning in the next year?

- ☐ A great deal (1)
- ☐ A lot (2)
- ☐ A moderate amount (3)
- ☐ A little (4)
- ☐ None at all (5)

Q112 How likely are you to go indoor tanning in the next year?

- ☐ Extremely likely (1)
- ☐ Very likely (2)
- ☐ Somewhat likely (3)
- ☐ A little likely (4)
- ☐ Not at all likely (5)

-----NEXT SCREEN-----

Q155 How old are you?

Q156 What is your current year in school?

- ☐ Freshman (1)
- ☐ Sophomore (2)
- ☐ Junior (3)
- ☐ Senior (4)
- ☐ Other (5) _____

Q157 Are you Hispanic or Latino?

- ☐ No (1)
- ☐ Yes (2)

Q158 Which one of these groups would you say best represents your race?

- ☐ White (1)
- ☐ Black or African American (2)
- ☐ American Indian or Alaska Native (3)
- ☐ Asian (4)
- ☐ Native Hawaiian or Pacific Islander (5)
- ☐ Other (6) _____

Q159 What is the highest grade of school completed by your mother or female guardian?

- ☐ 11th grade or less (1)
- ☐ HS diploma or GED (2)
- ☐ 2 year technical or some college (3)
- ☐ 4 year Bachelors degree (4)
- ☐ Some graduate school (5)
- ☐ Completed graduate school (6)
- ☐ Not applicable (7)

Q160 What is the highest grade of school completed by your father or male guardian?

- ☐ 11th grade or less (1)
- ☐ HS diploma or GED (2)
- ☐ 2 year technical or some college (3)
- ☐ 4 year Bachelors degree (4)
- ☐ Some graduate school (5)
- ☐ Completed graduate school (6)
- ☐ Not applicable (7)

[END SURVEY FOR CONDITIONS 1-4 → Go to Thank You screen]

[CONTROL CONDITION]

Q71 Please read the message below and answer the following questions about this message.

Facts About Indoor Tanning

- **Indoor tanning is not a safe way to get vitamin D.**
- **A base tan is not a safe tan.**
- **Controlled tanning is not safe tanning.**
- **Tanning beds are regulated, but that doesn't make them safe.**

-----NEXT SCREEN-----

Q72 Please rate how much you agree or disagree with the following statements: This message...

	Strongly disagree (1)	Somewhat disagree (2)	Neither disagree nor agree (3)	Somewhat agree (4)	Strongly agree (5)
Was easy to understand (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Was truthful (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Said something important to me (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Taught me something new (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Made me think about the dangers of indoor tanning (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Made me feel confident about my ability to avoid indoor tanning (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is something I would talk about with others (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Convinces me that many of the things people say about the benefits of indoor tanning are not true (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Made a strong argument against indoor tanning (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Motivates me to stay away from tanning beds (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

-----NEXT SCREEN-----

Q73 To what extent did you agree or disagree with the arguments contained in the message?

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
I found myself agreeing with the author's points. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I found myself disagreeing with the author's points. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I thought of arguments to support what the author was saying. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I thought of arguments against what the author was saying. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

-----NEXT SCREEN-----

Q74 In the spaces below, please write down any thoughts you had against indoor tanning while reading this message.

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

Q75 Please write down any thoughts you had in support of indoor tanning while reading this message.

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

Q76 Please write down any other thoughts you had about indoor tanning after reading this message.

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

-----NEXT SCREEN-----

Q78 Using the scale below, where 0 is "not at all confident" and 100 is "absolutely confident" please indicate how confident you are that...

- _____ Your attitude about indoor tanning is firm? (1)
- _____ You hold the correct attitude about indoor tanning? (2)
- _____ Your attitude about indoor tanning will not change even if you find out that a majority of people disagree with you? (3)
- _____ You can defend your position on indoor tanning if necessary? (4)
- _____ You can maintain your position even if you encounter strong arguments against it? (5)
- _____ You can successfully argue your position with someone else who disagrees with you? (6)

-----NEXT SCREEN-----

Q177 Below are items reflecting what some people believe are benefits of indoor tanning. Please indicate your opinion on these. Even if you have not tanned indoors before, give your best answer.

Q178 If I went indoor tanning it would...

	Definitely would not (1)	Probably would not (2)	Not sure (3)	Probably would (4)	Definitely would (5)
be safe because I can control how long I tan. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
be safe because I can choose the type of tanning bed to use. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
be safer than tanning in the sun. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
be safe because it is regulated by the government. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
be safe because tanning is legal. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
be safe because the government determines how often someone may tan based on their skin type. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
be a good way to get vitamin D. (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
be a natural way to get vitamin D. (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
be healthy because it would give me vitamin D. (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
give me a base tan that would protect me from sunburn. (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
provide me with a base tan that acts as a sunscreen. (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
provide me with a base tan that increases the effectiveness of my sunscreen. (12)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

-----NEXT SCREEN-----

Q179 Below are items reflecting what some people believe are drawbacks of indoor tanning. Please indicate your opinion on these. Even if you have not tanned indoors before, give your best answer.

Q180 If I went indoor tanning it would...

	Definitely would not (1)	Probably would not (2)	Not sure (3)	Probably would (4)	Definitely would (5)
be dangerous because I wouldn't know how well the salon kept up with tanning bed maintenance. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
be unsafe because tanning beds emit a high dose of radiation. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
be unsafe because most tanning salons do not follow the indoor tanning guidelines set by the government. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
increase my chances of getting melanoma (deadly skin cancer). (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
lead to skin cancer. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
lead to premature skin aging. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
be more dangerous than tanning in the sun. (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
damage multiple layers of my skin. (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
not be a safe way to get a tan. (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
not be a healthy way to get a tan. (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

-----NEXT SCREEN-----

Q83 How interested are you in going indoor tanning in the next year?

- ☐ Not interested at all (1)
- ☐ Slightly interested (2)
- ☐ Somewhat interested (3)
- ☐ Very interested (4)
- ☐ Extremely interested (5)

Q84 How much do you plan to go indoor tanning in the next year?

- ☐ A great deal (1)
- ☐ A lot (2)
- ☐ A moderate amount (3)
- ☐ A little (4)
- ☐ None at all (5)

Q85 How likely are you to go indoor tanning in the next year?

- ☐ Extremely likely (1)
- ☐ Very likely (2)
- ☐ Somewhat likely (3)
- ☐ A little likely (4)
- ☐ Not at all likely (5)

-----NEXT SCREEN-----

Q86 Please carefully read the message below and answer the following questions about this message.

Q87 Tanning is a process through which your body can benefit. Exposure to either the sun's or a tanning bed's UV rays helps your body produce vitamin D. Vitamin D itself has been attributed to the prevention of plenty of diseases including colon cancer, depression, high blood pressure, breast cancer, fibromyalgia, prostate cancer, Seasonal Affective Disorder (SAD), PMS, arthritis, psoriasis, diabetes and osteoporosis. While it may be hard to believe that 'fake baking' can help in the prevention of all of these diseases, it's important to remember one thing: your body can produce vitamin D by absorbing UV rays and converting them into this essential vitamin. It's not uncommon to find debilitating, terminal illnesses and depression rampant in areas that stay very cloudy and rainy through most of the year. Maybe all that's needed is a little fake sun from time to time!

Q88 Please rate how much you agree or disagree with the following statements: This message...

	Strongly disagree (1)	Somewhat disagree (2)	Neither disagree nor agree (3)	Somewhat agree (4)	Strongly agree (5)
Was easy to understand (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Was truthful (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Said something important to me (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Taught me something new (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Made me think about the benefits of indoor tanning (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is something I would talk about with others (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Convinces me that many of the things people say about the dangers of indoor tanning are not true (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Made a strong argument for indoor tanning (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Makes me want to use a tanning bed (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

-----NEXT SCREEN-----

Q89 Please carefully read the message below and answer the following questions about this message.

Q90 Getting a good base tan can help you avoid sunburns. Have you ever gone on vacation and on that first day you wanted to spend so much time in the glorious sunshine that made you feel sexy and wonderful that you turned into something that resembled a lobster? Well indoor tanning regularly can help you avoid that! When you apply sunscreen over the top of your base tan, you have an extra level of protection from the sun's rays. If you tan for 20 minutes, you're essentially adding a natural coat of SPF 4 to your body. Combined with the sunscreen, a tan with an SPF 4 actually multiplies the effectiveness of

hat product. So, if you have sunscreen with an SPF of 15 and multiply that by 4, you really have a SPF of 60. Your natural tan offers protection that doesn't rub, sweat or wear off the way sun screen lotion can.

Q91 Please rate how much you agree or disagree with the following statements: This message...

	Strongly disagree (1)	Somewhat disagree (2)	Neither disagree nor agree (3)	Somewhat agree (4)	Strongly agree (5)
Was easy to understand (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Was truthful (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Said something important to me (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Taught me something new (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Made me think about the benefits of indoor tanning (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is something I would talk about with others (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Convinces me that many of the things people say about the dangers of indoor tanning are not true (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Made a strong argument for indoor tanning (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Makes me want to use a tanning bed (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

-----NEXT SCREEN-----

Q92 Please carefully read the message below and answer the following questions about this message.

Q93 Tanning in a professional facility today minimizes risk because the government regulates indoor tanning. In the United States, exposure times for every tanning session are established by a schedule present on every piece of equipment that takes into account the tanner's skin type and the intensity of the equipment to deliver a dosage of sunlight designed to minimize the risk of sunburn. The schedule, as regulated by the U.S. Food and Drug Administration, also takes into account how long an individual has been tanning, increasing exposure times gradually to minimize the possibility of burning. At the highest level of regulations, the FDA is directed by law to maintain inspection and testing procedures and to publicize standards that will reduce unnecessary overexposure to tanning equipment. The obvious question any reader would ask is this: "If tanning units definitely do cause cancer, why would the FDA have laws for compliance and safety for consumers"?

Q94 Please rate how much you agree or disagree with the following statements: This message...

	Strongly disagree (1)	Somewhat disagree (2)	Neither disagree nor agree (3)	Somewhat agree (4)	Strongly agree (5)
Was easy to understand (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Was truthful (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Said something important to me (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Taught me something new (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Made me think about the benefits of indoor tanning (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is something I would talk about with others (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Convinces me that many of the things people say about the dangers of indoor tanning are not true (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Made a strong argument for indoor tanning (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Makes me want to use a tanning bed (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

-----NEXT SCREEN-----

Q95 Please carefully read the message below and answer the following questions about this message.

Q96 When you tan using a tanning bed or booth, your skin tans the same way it does when you lie out in the sun: through ultraviolet (UV) rays. There is a big difference, however, between being in a tanning bed and being out in the sun. When you are outside getting a tan, the atmosphere affects the UV rays. There is no real way to tell how much UV light you are getting. Indoor tanning is one way to regulate the amount of UV light you are exposed to, because it is a controlled environment. By choosing to tan indoors, you actually have more control over the ratio of UVB vs UVA rays and the amount of time you tan. You

increase your exposure time to make sure you won't get harmful sunburns on your skin. This controlled environment helps in getting an even tan on your body in less than a half an hour a day.

Q97 Please rate how much you agree or disagree with the following statements: This message...

	Strongly disagree (1)	Somewhat disagree (2)	Neither disagree nor agree (3)	Somewhat agree (4)	Strongly agree (5)
Was easy to understand (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Was truthful (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Said something important to me (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Taught me something new (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Made me think about the benefits of indoor tanning (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is something I would talk about with others (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Convinces me that many of the things people say about the dangers of indoor tanning are not true (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Made a strong argument for indoor tanning (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Makes me want to use a tanning bed (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

-----NEXT SCREEN-----

Q182 The previous 4 messages you just read are common myths about indoor tanning. Indoor tanning is NOT safe. Vitamin D Although it is important to get enough vitamin D, the safest way to do so is through what you eat. Tanning harms your skin, and the amount of UV exposure you need to get enough vitamin D is hard to measure because it is different for every person and also varies with the weather, latitude, altitude, and more. Base Tan A tan is the body's response to injury from UV rays, showing that damage has been done. A "base tan" only provides a sun protection factor (SPF) of about 3 or less, which does little to protect you from future UV exposure. In fact, people who indoor tan are more likely to report getting sunburned. Government Regulation While the government has done what it can to protect people from the harms of indoor tanning, it cannot ban every harmful product - if this was the case, then we would not have any form of tobacco or alcohol. As far as indoor tanning, the government has done what it can to inform the public of the harms of using tanning beds. The government has also provided guidelines to tanning bed manufacturers about the maximum amount of UV exposure tanning beds should emit at a given time. It is up to the manufacturers and the tanning salons to follow these guidelines - which they often do not. Control You may have heard that indoor tanning is the safer way to tan because you can control your level of exposure to UV rays. The Burning Truth: Sensible indoor tanning is a myth. Indoor tanning exposes you to intense UV rays, increasing your risk of melanoma—the second most common cancer in women between 20 and 29 years old.

-----NEXT SCREEN-----

Q98 How old are you?

Q99 What is your current year in school?

- ☐ Freshman (1)
- ☐ Sophomore (2)
- ☐ Junior (3)
- ☐ Senior (4)
- ☐ Other (5) _____

Q100 Are you Hispanic or Latino?

- ☐ No (1)
- ☐ Yes (2)

Q101 Which one of these groups would you say best represents your race?

- ☐ White (1)
- ☐ Black or African American (2)
- ☐ American Indian or Alaska Native (3)
- ☐ Asian (4)
- ☐ Native Hawaiian or Pacific Islander (5)
- ☐ Other (6) _____

Q102 What is the highest grade of school completed by your mother or female guardian?

- ☐ 11th grade or less (1)
- ☐ HS diploma or GED (2)
- ☐ 2 year technical or some college (3)
- ☐ 4 year Bachelors degree (4)
- ☐ Some graduate school (5)
- ☐ Completed graduate school (6)
- ☐ Not applicable (7)

Q104 What is the highest grade of school completed by your father or male guardian?

- ☐ 11th grade or less (1)
- ☐ HS diploma or GED (2)
- ☐ 2 year technical or some college (3)
- ☐ 4 year Bachelors degree (4)
- ☐ Some graduate school (5)
- ☐ Completed graduate school (6)
- ☐ Not applicable (7)

Q164 Thank you for taking the time to complete this survey! Please click the next button below to submit your answers.

(Thank participant for their time and give gift card)

APPENDIX B3: MESSAGES TESTED IN PILOT SURVEY

Safety: Controlled Tanning Inoculation Message

Word count: 622

Reading level: 12

People sometimes say that indoor tanning is a safer way to tan compared to outdoor tanning because you have control over the amount of UV radiation you are exposed to and can choose how long you want to tan. Some even believe indoor tanning is a “natural” way to tan because tanning beds create a tan using UVA and UVB rays, just like the sun. However, these arguments are seriously flawed.

People who think that indoor tanning is safer than outdoor tanning argue that, because things like weather, time of day, and geographic location affect the amount of UV rays you are exposed to, there is no way to control outdoor tanning. So, these people turn to tanning beds because they think that tanning beds allow them to regulate the amount of UV rays they are exposed to, while tanning their skin in a way that they think is similar to how they tan in the sun. But tanning beds are not at all similar to the sun for many reasons. When you make the decision to use a tanning bed, you are exposing your entire body to an extremely strong dose of UV radiation, as much as six times what you would receive in the sun. The only thing you have control over in a tanning bed is the amount of time you spend in the tanning bed. You have no control over the quality of the equipment. You also have no way of knowing exactly how much UVA/UVB radiation you are absorbing because tanning beds emit different amounts compared to the sun, and the UVA/UVB radiation varies across different types of tanning beds. As the Center for Disease Control and Prevention (CDC) points out, as the bulbs in a tanning bed begin to age, the strength of the UVA/UVB rays will change, so you never really know how much or what type of UV you are getting.

Tanning beds have a higher concentration of UVA rays, also known as “tanning rays,” compared to the sun. This may be appealing for those seeking a quick tan, but UVA rays are the rays responsible for destroying your skin’s elasticity from the inside out, leading to wrinkles at an earlier age, and most worrisome – skin cancer. Research has shown that the damage done by these rays is irreversible and the damage accumulates over time. In fact, you often cannot see the damage because these changes are taking place under the surface of your skin.

So, just like you cannot control the exact amount of UV radiation you get from the sun, you also cannot control the amount of UV radiation you get from a tanning bed or the damage done to your skin from being overexposed to UV radiation. At least in the sun you have the opportunity to control your exposure by wearing protective clothing and reapplying sunscreen. This level of control is not possible in a tanning bed because wearing long sleeves, pants, and a hat would defeat the purpose of lying in a tanning bed. Sunscreen is ineffective for tanning bed use because sunscreen is designed to filter the amount of radiation received from normal sun exposure - but the radiation emitted from tanning beds is six times the amount emitted from the sun.

Contrary to what many people believe, an indoor tan is not a controlled or safe tan. The only control you do have is in making the decision about whether or not to protect yourself from the harmful UV radiation from tanning beds. However, it is your choice whether or not getting that quick tan for an event, vacation, or even “just because” is worth damaging your skin, or even your health, for a lifetime.

Safety: Controlled Tanning 1-sided message

Word count: 621

Reading level: 11.5

A tan is a body's response to injury from UV rays and the act of tanning is dangerous, whether you tan outdoors in the sun or indoors in a tanning bed. Research has shown that both types of tanning lead to burns and put people at risk for various types of skin cancer, including melanoma, which is the deadliest type of skin cancer.

While some people engage in dangerous tanning practices by tanning indoors and/or outdoors as much and as often as they can to get the darkest tan, others try to regulate their tanning behavior by only tanning for a certain amount of time. The truth is, no matter how you achieve a tan or how long you expose your skin to UV rays, a tan is nothing more than a sign of skin damage. Once that skin damage takes place, a number of factors such as skin type, DNA, and family history of skin cancer come into play and help determine what kinds of skin problems may develop. There is no way to know how your body will respond to the damage done to your skin from tanning – everyone is different. There is also no way to know exactly how much UV radiation is emitted from the sun due to environmental factors. Tanning beds can be even more uncertain and dangerous considering the variation in UV radiation across different types of tanning beds and a lack of evidence about how UV radiation changes as the bulbs in a tanning bed begin to age.

Perhaps even scarier, is not knowing how much damage is done to the skin until it is too late because the UV rays penetrate through multiple layers of skin and create long-lasting changes to the layers underneath the surface. This is why the damaging effects of tanning, such as premature aging or skin cancer, will not be evident until years after the damage from tanning has taken place. Because of this, people often think they are safe to continue tanning because they don't see obvious signs of damage.

The best way to protect your skin and overall health is to limit your UV exposure as much as possible. The Center for Disease Control and Prevention (CDC) has recommended a variety of things you can do to control your exposure to UV rays. First, seek shade under an umbrella, tree or other shelter when the sun is strong (usually between 10am and 4pm). Second, wear protective clothing, such as long-sleeved shirts, pants, and long skirts made of tightly woven fabric. If wearing such clothing is not practical, try to cover up as much as you can. Third, wide-brimmed hats and sunglasses will help keep your face, ears, eyes, and nose safe from too much UV exposure. Fourth, sunscreen is a critical part of UV protection, and make sure you choose a sunscreen with an SPF of at least 15. If you are out in the sun for longer than two hours, swimming, or sweating heavily, remember to reapply. Many cosmetics also contain sunscreen, which may be a preferable alternative for face protection. Finally, avoid using tanning beds.

There is no way to protect yourself from the UV rays emitted from tanning beds, which can be six times the strength of the UV rays emitted from the sun – sunscreen will not work in a tanning bed because it was designed for protection from natural sun exposure. A tan is nothing more than a sign of damage to your skin's DNA, and there is no such thing as a safe tan. The safest thing you can do is avoid too much sun exposure and stay away from tanning beds. However, it is your choice whether or not tanning is worth the risks to your health.

Safety: Government Regulation Inoculation Message

Word count: 661

Reading level: 12

Some people say that using tanning beds is a “safe” way to get a tan because tanning beds are regulated by the government. They claim that tanning beds are “safe” because the government has issued guidelines for tanning salons. But this reflects a common misconception that if the government regulates something and creates guidelines for businesses to follow, it means that a product or service is safe. But this is not the case.

The myth that government regulation means tanning beds are safe is dangerously misleading because the mere presence of regulation indicates that these devices have been associated with serious harm including eye damage, burns, and various types of skin cancer. Further, government regulation is not an endorsement for indoor tanning – in fact, the regulations are in place to minimize harm and warn people about the dangers of using tanning beds. The International Agency for Research on Cancer (IARC) concluded that use of a tanning bed before the age of 35 years is associated with a 75% increased chance of getting melanoma, which is the deadliest type of skin cancer. It is evidence such as this that prompted the IARC to reclassify tanning beds from devices that *possibly* cause cancer in humans, to devices that undeniably cause cancer. This reclassification put tanning beds in the same category as products such as tobacco, which is a product that has been known to cause cancer for decades.

The idea that government regulation means that the government approves of the use of tanning beds is a dangerously misleading idea. The thing is - the government cannot possibly ban every harmful thing out there, but what the government *can* do is reduce risk by setting guidelines for industry and educating citizens about the risks associated with products, so that citizens can make informed decisions. Another way to reduce risk and protect public health is to restrict the use of potentially harmful devices or substances to adults only. This method has been effective for tobacco and alcohol products for years, as it acknowledges adults’ freedom to make their own decisions and allows youth enough time to develop sound reasoning skills and to be educated about the dangers associated with such products. An under 18 restriction has recently been proposed for tanning beds, and if approved, may have a positive impact on reducing the number of skin cancer cases from tanning bed use.

Another thing some people believe about government regulation of tanning beds is that the government sets the indoor tanning “exposure schedule” for each tanning bed. This is not true. The government has set *standards* to help *manufactures* create an exposure schedule, which is a schedule that indicates how often someone may use a specific tanning bed and how much UV someone may be exposed to in order to gradually build a tan and avoid serious immediate burns based to their skin type. Manufactures are responsible for the exposure schedule because they are most familiar with how their particular product works. However, once the manufacturer creates the schedule and ships the product to salons, they can only ask that salons follow the instructions they provide. Unfortunately, research has shown that less than 11% of salons actually adhere to these schedules. That means that almost 90% of salons allow people to tan more than the suggested limits set by the companies who make tanning beds.

The truth is, there is no such thing as a safe way to use tanning beds, which is why the government is doing what it can to try and minimize the harms from indoor tanning. By understanding the risks of tanning beds, you can make an informed decision about whether or not to protect yourself from harmful UV rays emitted by tanning beds. At the end of the day, it’s your choice whether or not getting that quick tan for an event, vacation, or even “just because” is worth damaging your skin, or even your health, for a lifetime.

Safety: Government Regulation 1-sided Message

Word Count: 661

Reading level: 12

The government regulates a variety of products to minimize the possibility of harm from using those products. Tanning beds are just one of the many products the government regulates. The International Agency for Research on Cancer (IARC) concluded that use of a tanning bed before the age of 35 years is associated with a 75% increased chance of getting melanoma, which is the deadliest form of skin cancer, compared to those who do not use tanning beds. This evidence encouraged the IARC to reclassify tanning beds from a class 2 (possible human carcinogen) to a class 1 (known human carcinogen) device.

Government regulation of tanning beds requires the manufacturers of tanning beds to develop a tanning exposure schedule, which states how often someone may tan based on their skin type in order to gradually build a tan while avoiding immediate injuries, such as burns. However, it is very important to note that even though the exposure schedule reduces the chances of immediate injury, abiding by an exposure schedule does not decrease a consumer's chance of developing skin cancer from tanning bed use. In an effort to minimize harm, the government provides manufactures with standards that the exposure schedules must meet. The reason the manufacturers create the exposure schedule (rather than the government) is simple: the manufacturers are the people who developed each unique type of bed, and therefore are the people who best understand their product. Once the tanning bed leaves the manufacturer, however, it is up to the salons to enforce the exposure schedules with tanners. Unfortunately, research has shown that less than 11% of salons actually enforce the schedule, which means that almost 90% of salons are allowing people to tan whenever and how often they want, a practice that is very dangerous.

Another thing the government tries to do to minimize harm from indoor tanning is to make sure that consumers are aware of the risks they are taking when using tanning beds. Currently, the required label on all tanning beds reads:

“DANGER--Ultraviolet radiation. Follow instructions. Avoid overexposure. As with natural sunlight, overexposure can cause eye and skin injury and allergic reactions. Repeated exposure may cause premature aging of the skin and skin cancer. WEAR PROTECTIVE EYEWEAR; FAILURE TO MAY RESULT IN SEVERE BURNS OR LONG-TERM INJURY TO THE EYES. Medications or cosmetics may increase your sensitivity to the ultraviolet radiation. Consult physician before using sunlamp if you are using medications or have a history of skin problems or believe yourself especially sensitive to sunlight. If you do not tan in the sun, you are unlikely to tan from the use of this product.”

More recently, in 2015, the government added another required label that specifically addresses youth:

“Attention: This sunlamp product should not be used on persons under the age of 18.”

At the same time the youth label was proposed, the government also proposed a nation-wide ban on tanning bed use for people under the age of 18. This is because of the disproportionate increase in skin cancer found in individuals who begin tanning at such an early age. Banning youth use of dangerous products has been successful in improving public health for a variety of other products such as tobacco and alcohol. This method acknowledges adults' freedom to make their own decisions and allows youth enough time to develop sound reasoning skills and also be educated about the dangers associated with using such products.

It is the responsibility of the government to regulate products in the interest of protecting public health – especially young people. To do this, the government must present undeniable evidence from research to reach its goal of protecting its citizens from the harms caused by carcinogens such as tanning beds by establishing standards and educating citizens' about all of the possible risks. Despite the evidence about the risks of indoor tanning, it is still your choice whether or not using an indoor tanning bed is worth the risks to your health.

Health: Base Tan Inoculation Message

612 words

Reading level: 12

Many people believe that using a tanning bed to get a tan before going on vacation will protect them from burning in the sun, similar to how sunscreen protects people from UV exposure. This idea is called a “base tan”. Some even believe that a base tan protects against premature aging and reduces the risk of skin cancer by increasing the effectiveness of their sunscreen, meaning they can wear a lower SPF sunscreen if they already have developed a base tan. But a “base tan” is nothing more than a dangerous myth.

The truth is, having a tan does not protect you from overexposure to the sun. In fact, research shows that a tan is a biological signal from the skin to indicate DNA damage. Think of it as a scab. When someone trips, falls, and scrapes up their knees and elbows, a scab forms that lets them and others know there is an injury. In the case of tanning, a tan is the scab that lets you and others know you have had damage to your skin cells from UV rays.

While the purpose of a scab, or in this case a tan, is to protect you while your body repairs itself, a tan only gives you an SPF of 4 or less, which is not enough to protect you from burning in the sun. And don’t forget, a tan is actually a sign of damage, so the idea behind the base tan is to damage your skin to avoid damaging your skin – which doesn’t actually make any sense. A scab eventually goes away, sometimes leaving a harmless scar – but in the case of indoor tanning, skin damage from UV rays actually accumulates over time, leading to premature aging, saggy skin, wrinkles, sun spots, and possibly skin cancer. This is because research shows that the UVA rays penetrate through to the deepest layers of your skin, destroying your skin’s elasticity which leads to premature aging and also alters your skin’s DNA. Changes in your DNA are what lead to skin cancer. Unfortunately, since these changes take place well beneath the surface of your skin, you likely will not know the extent of the damage until years later.

There are better ways to protect your skin that do not involve damaging the DNA in your skin with a “base tan” and increasing your risk of premature skin aging and skin cancer. The American Academy of Dermatology recommends wearing broad-spectrum sunscreen with an SPF of at least 15 to protect yourself from burning (and don’t forget to reapply if you are spending long days in the sun!). Wearing hats and other pieces of protective clothing and seeking shade, especially during midday, are also good ways to keep you safe from burning.

If a tan is really what you are after, there are ways to achieve a tanned look that do not require harmful and permanent damage to your skin. Sunless tanning lotions and professional spray tans are ways to get a bronzed look that lasts for many weeks and takes just as much or less time to achieve as multiple sessions in a tanning salon. These methods of protecting your skin and alternative ways to tan will also help keep your skin look healthy and young for years to come.

Base tans are nothing more than a dangerous myth, no matter what people tell you. Using a tanning bed is not a safe or effective way to protect yourself from getting a sunburn. However, it’s your choice whether or not getting that quick tan before vacation, or even “just because” is worth damaging your skin, or even your health, for a lifetime.

Health: Base Tan 1-sided Message

604 words

Reading level: 12

Research suggests that a tan is actually a biological signal from the skin that indicates DNA damage to the skins' cells. Think of it as a scab – when someone trips, falls, and scrapes up their knees and elbows, a scab forms that lets them and others know there is an injury. In the case of tanning, instead of a scab from scraping your knee or elbow, you have a full body scab that lets you and others know you have had damage to your skin cells from UV rays. Research has also shown that your skin never fully repairs from UV damage, and the effects of multiple tans and sunburns accumulate over time. This causes irreversible damage that leads to a number of problems, such as premature skin aging and even skin cancer. No matter how you get a tan, whether it be from the sun or a tanning bed, a tan is actually a bad sign.

While it's impossible to completely avoid UV exposure - you will be exposed to UV rays just by walking outside, traveling from one place to another, or even sitting by a window - there are many things you can do to avoid permanent damage to your skins' DNA caused by overexposure to UV rays from the sun. The American Academy of Dermatology recommends applying a broad-spectrum sunscreen when you spend periods of time outside (and don't forget to reapply if you are spending long days in the sun!). Don't forget to apply sunscreen to the backs of your hands and tops of your feet if you are wearing sandals. Wearing protective clothing is also a great way to protect yourself. When the weather is too warm for long sleeves and pants, you can use a dark umbrella, shawl, wide brimmed hat, and sunglasses in addition to sunscreen, to limit your exposure to UV rays from the sun.

The sun is strongest between 10am and 4pm, so avoiding too much sun exposure, or seeking shade during that time is a great way to protect yourself. Avoiding intentional tanning, whether in the sun or a tanning bed, is critical to protecting yourself from UV damage. If having a tan is important to you, there are safer ways to achieve a tan that do not expose you to UV rays. Sunless tanning lotions and professional spray tans are great ways to get that tanned look without exposure to harmful UV radiation.

Indoor tanning, on the other hand, exposes you to six to twelve times the amount of UV radiation you would receive from the sun and is not a good way to protect yourself from sun exposure. Tanning beds emit primarily UVA rays, which are the rays that penetrate to the deepest layers of your skin, destroying your skin's elasticity which leads to premature aging and also alters your skin's DNA. Changes in your DNA are what lead to skin cancer. Unfortunately, since these changes take place well beneath the surface of your skin, you likely will not know the extent of the damage until years later.

The bottom line is there is no such thing as a safe tan. UV exposure leads to irreversible skin damage that causes premature aging, loss of elasticity, sagging, wrinkles, brown spots, and can cause a variety of skin cancers. The best way to protect yourself from UV rays is to avoid overexposure to the sun and definitely to avoid tanning beds at all costs. However, it's your choice whether or not getting that quick tan before vacation, or even "just because" is worth damaging your skin, or even your health, for a lifetime.

Health: Vitamin D Inoculation Message

Word count: 624

Reading level: 12

Some people believe that tanning beds are a safe and effective way to get Vitamin D. Some even believe that indoor tanning is a “natural” way to get vitamin D because tanning beds emit UVA and UVB rays, and so does the sun. There is even the idea that tanning beds are a good way to get an “extra” dose of vitamin D that will protect you from many diseases. However, none of these things are true.

What is true is that vitamin D is essential for strong bones and a healthy immune system. Research has shown that while your body does produce *some* vitamin D from UV rays, the maximum amount of vitamin D you can get from UV rays is reached after just 5 to 10 minutes of midday sun exposure. The way this works is through exposure to UVB rays, *not* UVA rays. UVB rays stimulate the body’s production of vitamin D. What many seem to misunderstand is that vitamin D is *only* produced from UVB rays, but tanning beds emit primarily UVA rays. It makes sense for a tanning bed to emit primarily UVA rays because these are the rays that create a tan. While a tan may sound desirable, it is important to understand that UVA rays are the rays that penetrate through the deepest layers of skin, creating irreversible skin damage to multiple layers of skin that you cannot see, ultimately leading to premature aging and more serious consequences, such as skin cancer.

It’s also important to note that ten minutes in a tanning bed is not equal to ten minutes of midday sun. Tanning beds give you an extremely high dose of UV exposure. Just ten minutes in a tanning bed exposes you to three to six times the amount of UV rays you would be exposed to after ten minutes in the sun. According to dermatologists, this extremely high dose of UV radiation in such a short period of time is why indoor tanners are more likely to develop melanoma and other types of skin cancer than people who do not tan indoors. In fact, the International Agency for Research on Cancer (IARC) found that people who use tanning beds before the age of 35 years are 75% more likely to develop melanoma, the deadliest type of skin cancer, compared to those who have never used tanning beds.

Not only do we already know indoor tanning is not a good or even an effective way to get vitamin D, but the Institute of Medicine recently reviewed over 1,000 studies and found that most Americans have an adequate level of vitamin D. There is also no research to support the idea that an “extra” dose of vitamin D is helpful – and trying to get an “extra” dose of vitamin D from a tanning bed is a useless effort because there is no evidence to suggest tanning beds stimulate an adequate amount of vitamin D production, and longer exposure to UV rays increases the amount of damage done to your skin.

If you are curious or concerned about your vitamin D levels, talk to your doctor. The safest way to get your daily dose of vitamin D does not include indoor tanning. Eating foods rich in Vitamin D, such as fish, fortified milk or orange juice, and taking Vitamin D supplements will easily keep your vitamin D levels where they should be, without the dangers of indoor tanning.

Despite what some people may say, indoor tanning is not a safe or effective way to get vitamin D. However, it is your choice whether or not getting that quick tan for an event, vacation, or even “just because” is worth damaging your skin, or even your health, for a lifetime.

Health: Vitamin D 1-sided Message

Word count: 624

Reading level: 12

Vitamin D is essential for strong bones and a healthy immune system. The safest and most effective way to get your recommended dose of vitamin D is by eating foods rich in vitamin D and taking supplements. Research has shown that just 5 to 10 minutes in the midday sun can produce some vitamin D because the UVB rays in the sun stimulate your skin to produce vitamin D. However, you should be careful not to get too much UV exposure, and you should always wear sunscreen when out in the sun. Studies have found that people who wear sunscreen get just as much vitamin D benefit from sun exposure as those who do not. Further, while the sun stimulates some vitamin D production, this cannot be separated from the harmful effects associated with UV exposure, which include damage to the DNA in your skin, premature aging, and various types of skin cancer.

Some dermatologists have special UV beds that emit a safe concentrated dose of UVB radiation for people who are unable to get vitamin D from the sun either because of their geographic location or genetic factors. However, it is important to note that these beds are different from the tanning beds you find at tanning salons. The beds in dermatologists' offices will not give you a tan, and only give you enough UVB exposure to produce vitamin D. A tan comes from UVA rays, which also happen to be the rays responsible for premature skin aging, and irreversible damage that can lead to serious problems such as skin cancer. This is because UVA rays penetrate through to the deepest layers of your skin, creating irreversible skin damage to multiple layers of skin that you cannot see, ultimately leading to premature aging and more serious consequences, such as skin cancer.

. The beds you find at tanning salons are called "tanning beds" because they release mostly UVA rays, but these rays do not stimulate vitamin D production. Further, there is no evidence to suggest that the small percentage of UVB rays from a tanning bed (1-3%, depending on the bed) will stimulate vitamin D production. Further, your body can only produce a limited amount of Vitamin D from UVB rays. Once that amount has been satisfied, any additional exposure to UVB rays will start to break down and your body will begin to dispose of the vitamin D it created from UVB rays. If this happens, then not only have you depleted any vitamin D created from UVB exposure, you have also exposed yourself to a greater amount of UV radiation, which increases your risk of premature aging and skin cancer.

The Institute of Medicine recently reviewed over 1,000 studies and concluded that most people in America are receiving an adequate amount of vitamin D from minimal natural sun exposure and other sources. However, the danger of UV exposure, whether from the sun or a tanning bed, does not outweigh what little benefit you may receive from UV rays. A tan is nothing more than a sign of skin damage. If you are concerned about your vitamin D levels, you should talk to your doctor and together, you and your doctor can develop a plan to increase your vitamin D levels, if necessary. The best and safest way to increase your vitamin D level is to add vitamin D rich foods to your diet, or take supplements. Eating foods rich in vitamin D, such as fish, fortified milk or orange juice, and taking vitamin D supplements will easily keep your vitamin D levels where they should be. Spending time in the sun or in a tanning bed will expose you to harmful UV radiation and do a lot more harm than good. Despite the evidence about the risks of indoor tanning, it is still your choice whether or not using an indoor tanning bed is worth the risks to your health.

Control Message**43 words****Reading level: 12****Facts About Indoor Tanning**

- Indoor tanning is not a safe way to get vitamin D.
- A base tan is not a safe tan.
- Controlled tanning is not safe tanning.
- Tanning beds are regulated, but that doesn't make them safe.

APPENDIX C1: BASELINE MESSAGE EXPERIMENT SURVEY

Q1.1 Thank you for your interest in participating in this survey. This survey will take approximately 10-15 minutes to complete and will ask you questions about your opinions regarding health and indoor tanning. You will also be asked to give your opinion on messages about health and indoor tanning. We will also be sending you an opportunity to participate in a follow-up survey one-week later. Your answers are completely confidential and your name and chapter will not be associated with any of the answers you provide. Please answer all questions as honestly as you can. You may stop participating at any time or refuse to answer any questions in the survey, without penalty. If you have any questions about the content of this study, please direct them to the Principal Investigator, Dannielle Kelley, at dekelley@live.unc.edu. If you are interested in participating, please answer the question below and click “next” to begin the survey.

Q1.2 Are you 18 years of age or older?

- ☐ Yes (1)
- ☐ No (2)

If No Is Selected, Then Skip To End of Survey

-----NEXT SCREEN-----

Q1.3 Do you agree to participate in this study?

- ☐ Yes (1)
- ☐ No (2)

If No Is Selected, Then Skip To End of Survey

-----NEXT SCREEN-----

Q1.4 Each sorority member can only take this survey one time. In order to register you for the survey, please enter your valid UNC-Chapel Hill email address below.

Q1.5 My UNC-Chapel Hill email address is:

-----NEXT SCREEN-----

Q1.6 Before you begin the survey, please select your sorority house from the drop down menu below so that we can give the proper credit for taking the survey.

- ☐ Alpha Chi Omega (2)
- ☐ Alpha Delta Pi (1)
- ☐ Alpha Phi (9)
- ☐ Chi Omega (10)
- ☐ Delta Delta Delta (3)
- ☐ Kappa Delta (7)
- ☐ Kappa Kappa Gamma (8)
- ☐ Phi Beta Chi (4)
- ☐ Pi Beta Phi (5)
- ☐ Phi Mu (11)
- ☐ Sigma Sigma Sigma (6)
- ☐ Zeta Tau Alpha (12)

-----NEXT SCREEN-----

Q1.7 What is the color of your untanned skin?

- ☐ Very fair (1)
- ☐ Fair (2)
- ☐ Olive (3)
- ☐ Light brown (4)
- ☐ Dark brown (5)
- ☐ Very dark (6)

Q1.8 Think about when you are out in the sun during the day without sun protection. Please rate your tan and burn tendency from the list below:

- ☐ Always burn, never tan (1)
- ☐ Usually burn, tan (with difficulty) less than average (2)
- ☐ Sometimes mild burn, tan about average (3)
- ☐ Rarely burn, tan (with ease) more than average (4)
- ☐ Rarely or never burn, my skin is brown (5)
- ☐ Rarely or never burn, my skin is black (6)

Q1.9 What would happen to your skin if it were exposed to bright sunlight for the first time in summer for one hour in the middle of the day without sun protection?

- ☐ Get a severe sunburn with blistering (1)
- ☐ Have a painful sunburn for a few days followed by peeling (2)
- ☐ Get mildly burnt followed by some tanning (3)
- ☐ Go brown without any sunburn (4)
- ☐ Don't know (5)

-----NEXT SCREEN-----

Q1.10 During the summer, how often do you protect your skin from the sun, for example, by using sunscreen or wearing a hat?

- ☐ Never or hardly ever (1)
- ☐ Less than half the time (2)
- ☐ About half the time (3)
- ☐ Not always but more than half the time (4)
- ☐ Always or almost always (5)

Q1.11 Have you personally ever had skin cancer?

- ☐ No (1)
- ☐ Yes (2)

Q1.12 To your knowledge, has anyone in your family ever had skin cancer?

- ☐ No (1)
- ☐ Yes (2)

-----NEXT SCREEN-----

Q1.13 The next questions ask about indoor tanning. By indoor tanning, we mean using a tanning bed at a salon or other facility. We are not asking about the use of sunless tanning products such as self-applied lotions or spray-on tans. Even if you have not tanned indoors before, please give your best answer.

-----NEXT SCREEN-----

Q1.14 Have you ever used a tanning bed in your lifetime?

- ☐ No (1)
- ☐ Yes (2)

If No Is Selected, Then Skip To How often do you tan outdoors for the...

-----NEXT SCREEN-----

Q1.15 Have you used a tanning bed at least once during the past 12 months?

- ☐ No (1)
- ☐ Yes (2)

If No Is Selected, Then Skip To How often do you tan outdoors for the...

-----NEXT SCREEN-----

Q1.16 Think over the past 12 months. How many times did you use a tanning bed?

Q1.17 In the past 12 months, during which seasons did you tan indoors? Check all that apply.

- ☐ Spring (1)
- ☐ Winter (2)
- ☐ Fall (3)
- ☐ Summer (4)

Q1.18 In the past 12 months, which of the following best describes your use of indoor tanning devices: I indoor tan...

- ☐ Regularly, all year round (1)
- ☐ Regularly, but only during particular seasons (2)
- ☐ Occasionally (3)
- ☐ Rarely (4)

-----NEXT SCREEN-----

Q1.19 Where did you go tanning at your last tanning session?

- ☐ Locally owned tanning salon (1)
- ☐ Chain-owned tanning salon (e.g. Sun Tan City) (2)
- ☐ Apartment or home (3)
- ☐ Gym or health club (4)
- ☐ Beauty salon (5)
- ☐ Other (please specify): (6) _____

-----NEXT SCREEN-----

Q1.24 How often do you tan outdoors for the purpose of getting a tan when the weather is warm?

- ☐ Never (1)
- ☐ Once per year (2)
- ☐ A few times per year (3)
- ☐ Once per month during warm months (4)
- ☐ Once per week during warm months (5)
- ☐ A few times per week or more during warm months (6)

-----NEXT SCREEN-----

[CONDITION 1: CONTROLLED TANNING INOCULATION MESSAGE]

[CONDITION 2: VITAMIN D INOCULATION MESSAGE]

[CONDITION 3: CONTROLLED TANNING 1-SIDED MESSAGE]

[CONDITION 4: VITAMIN D 1-SIDED MESSAGE]

[CONDITION 5: CONTROL MESSAGE]

-----NEXT SCREEN-----

Q7.1 Please rate how much you agree or disagree with the following statements: This message...

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
Was easy to understand. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Was truthful. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Said something important to me. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Taught me something new. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Made me think about the dangers of indoor tanning. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Made me feel confident about my ability to avoid indoor tanning. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Is something I would talk about with others. (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Motivates me to talk with others about the harms associated with indoor tanning. (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Convinces me that many of the things people say about the benefits of indoor tanning are not true. (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Made a strong argument against indoor tanning. (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Motivates me to stay away from tanning beds. (11)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

-----NEXT SCREEN-----

Q7.2 To what extent did you agree or disagree with the arguments contained in the message?

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
I found myself agreeing with the author's points. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I found myself disagreeing with the author's points. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I thought of arguments to support what the author was saying. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I thought of arguments against what the author was saying. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

-----NEXT SCREEN-----

Q7.3 In the spaces below, please write down any thoughts you had against indoor tanning while reading this message.

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

-----NEXT SCREEN-----

Q7.4 Please write down any thoughts you had in support of indoor tanning while reading this message.

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

-----NEXT SCREEN-----

Q7.5 Please write down any other thoughts you had about indoor tanning after reading this message.

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

-----NEXT SCREEN-----

Q7.6 How likely are you to talk with somebody about the content of this message?

- ☐ Extremely unlikely (1)
- ☐ Somewhat unlikely (2)
- ☐ Neither likely nor unlikely (3)
- ☐ Somewhat likely (4)
- ☐ Extremely likely (5)

Q88 Who do you think you would talk with about this message? Check all that apply.

- ☐ Sorority Sister (1)
- ☐ Friend (who is not a sorority sister) (2)
- ☐ Boyfriend/significant other (3)
- ☐ Parents (4)
- ☐ Other family member (5)
- ☐ Someone you did not previously know (6)
- ☐ Other (7) _____
- ☐ No one (8)

-----NEXT SCREEN-----

Q7.7 Using the scale below, where 0 is "not at all confident" and 100 is "absolutely confident" please indicate how confident you are that...

- _____ Your attitude about indoor tanning is firm? (1)
 _____ You hold the correct attitude about indoor tanning? (2)
 _____ Your attitude about indoor tanning will not change even if you find out that a majority of people disagree with you? (3)
 _____ You can defend your position on indoor tanning if necessary? (4)
 _____ You can maintain your position even if you encounter strong arguments against it? (5)
 _____ You can successfully argue your position with someone else who disagrees with you? (6)

-----NEXT SCREEN-----

Q7.8 Below are items reflecting what some people believe are benefits of indoor tanning. Please indicate your opinion on these. Even if you have not tanned indoors before, give your best answer.

Q7.9 If I went indoor tanning it would...

	Definitely would not (1)	Probably would not (2)	Not sure (3)	Probably would (4)	Definitely would (5)
Be safe because I can control how long I tan. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be safe because I can choose the type of tanning bed to use. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be safer than tanning in the sun. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be a good way to get vitamin D. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be a natural way to get vitamin D. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be healthy because it would give me vitamin D. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

-----NEXT SCREEN-----

Q7.10 Below are items reflecting what some people believe are drawbacks of indoor tanning. Please indicate your opinion on these. Even if you have not tanned indoors before, give your best answer.

Q7.11 If I went indoor tanning it would...

	Definitely would not (1)	Probably would not (2)	Not sure (3)	Probably would (4)	Definitely would (5)
Be dangerous because I wouldn't know how well the salon kept up with tanning bed maintenance. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be unsafe because tanning beds emit a high dose of radiation. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be more dangerous than tanning in the sun. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be a risky way to get a tan. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increase my chances of getting melanoma (deadly skin cancer). (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lead to skin cancer. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lead to premature skin aging. (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Damage multiple layers of my skin. (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be an unhealthy way to get a tan. (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

-----NEXT SCREEN-----

Q7.12 How interested are you in going indoor tanning in the next year?

- ☐ Not at all interested (1)
- ☐ A little interested (2)
- ☐ Moderately interested (3)
- ☐ Very interested (4)
- ☐ Extremely interested (5)

-----NEXT SCREEN-----

Q7.13 How much do you plan to go indoor tanning in the next year?

- ☐ None at all (1)
- ☐ A little (2)
- ☐ A moderate amount (3)
- ☐ A lot (4)
- ☐ A great deal (5)

-----NEXT SCREEN-----

Q7.14 How likely are you to go indoor tanning in the next year?

- ☐ Extremely unlikely (1)
- ☐ Somewhat unlikely (2)
- ☐ Neither likely nor unlikely (3)
- ☐ Somewhat likely (4)
- ☐ Extremely likely (5)

-----NEXT SCREEN-----

Q7.15 How likely are you to tan outdoors for the purpose of getting a tan when the weather is warm?

- ☐ Extremely unlikely (1)
- ☐ Somewhat unlikely (2)
- ☐ Neither likely nor unlikely (3)
- ☐ Somewhat likely (4)
- ☐ Extremely likely (5)

-----NEXT SCREEN-----

Q7.16 How old are you?

Q7.17 What is your current year in school?

- ☐ Freshman (1)
- ☐ Sophomore (2)
- ☐ Junior (3)
- ☐ Senior (4)
- ☐ Other (5) _____

Q7.18 Are you Hispanic or Latino?

- ☐ No (1)
- ☐ Yes (2)

Q7.19 Which one of these groups would you say best represents your race?

- ☐ White (1)
- ☐ Black or African American (2)
- ☐ American Indian or Alaska Native (3)
- ☐ Asian (4)
- ☐ Native Hawaiian or Pacific Islander (5)
- ☐ Other (6) _____

Q7.20 What is the highest grade of school completed by your mother or female guardian?

- ☐ 11th grade or less (1)
- ☐ HS diploma or GED (2)
- ☐ 2 year technical or some college (3)
- ☐ 4 year Bachelors degree (4)
- ☐ Some graduate school (5)
- ☐ Completed graduate school (6)
- ☐ Not applicable (7)

Q7.21 What is the highest grade of school completed by your father or male guardian?

- ☐ 11th grade or less (1)
- ☐ HS diploma or GED (2)
- ☐ 2 year technical or some college (3)
- ☐ 4 year Bachelors degree (4)
- ☐ Some graduate school (5)
- ☐ Completed graduate school (6)
- ☐ Not applicable (7)

APPENDIX C2: FOLLOW-UP MESSAGE EXPERIMENT SURVEY

Q1.1 This survey will take approximately 10 minutes to complete and is a follow-up to the survey you took one week ago. Your answers are completely confidential and your name and chapter will not be associated with any of the answers you provide. Please answer all questions as honestly as you can. You may stop participating at any time or refuse to answer any questions in the survey, without penalty. If you have any questions about the content of this study, please direct them to the Principal Investigator, Dannielle Kelley, at dekelley@live.unc.edu. If you are interested in participating, please answer the question below and click “next” to begin the survey.

Q1.3 Do you agree to participate in this study?

- ☐ Yes (1)
- ☐ No (2)

If No Is Selected, Then Skip To End of Survey

-----NEXT SCREEN-----

Q40 Please enter your UNC email address so we may enter you in the drawing for one of 10 \$50 gift cards if you complete this survey.

-----NEXT SCREEN-----

Q1.13 The next questions ask about indoor tanning. By indoor tanning, we mean using a tanning bed at a salon or other facility. We are not asking about the use of sunless tanning products such as self-applied lotions or spray-on tans. Even if you have not tanned indoors before, please give your best answer.

-----NEXT SCREEN-----

Q1.14 Did you go indoor tanning sometime during the past week?

- ☐ No (1)
- ☐ Yes (2)

#SkipLogicDescription

-----NEXT SCREEN-----

Q1.15 In the past week, how many times did you tan indoors?

Q1.19 Where did you go tanning at your last tanning session?

- ☐ Locally owned tanning salon (1)
- ☐ Chain-owned tanning salon (e.g. Sun Tan City) (2)
- ☐ Apartment or home (3)
- ☐ Gym or health club (4)
- ☐ Beauty salon (5)
- ☐ Other (please specify): (6) _____

-----NEXT SCREEN-----

Q51 Last week you read a message about indoor tanning. In the space provided below, please briefly explain the main arguments presented in that message.

-----NEXT SCREEN-----

Q52 In the past week, have you talked with anyone about the indoor tanning message you read last week?

- ☐ Yes (1)
- ☐ No (2)

-----NEXT SCREEN-----

Display This Question:

If In the past week, have you talked with anyone about the indoor tanning message you read last week?
Yes Is Selected

Q88 Who did you talk with? Check all that apply.

- ☐ Sorority Sister (1)
- ☐ Friend (who is not a sorority sister) (2)
- ☐ Boyfriend/significant other (3)
- ☐ Parents (4)
- ☐ Other family member (5)
- ☐ Someone you did not previously know (6)
- ☐ Other (7) _____

-----NEXT SCREEN-----

Display This Question:

If In the past week, have you talked with anyone about the indoor tanning message you read last week?

Yes Is Selected

Q54 In the last week, did you talk about the message with...(Check all that apply)

- ☐ People who go indoor tanning (1)
- ☐ People who do NOT go indoor tanning (2)
- ☐ Not sure (3)

-----NEXT SCREEN-----

Display This Question:

If In the past week, have you talked with anyone about the indoor tanning message you read last week?

Yes Is Selected

Q55 Think about the last conversation you had about the message. Who started the conversation?

- ☐ Me (1)
- ☐ Someone else (2)
- ☐ Don't remember (3)

-----NEXT SCREEN-----

Display This Question:

If In the past week, have you talked with anyone about the indoor tanning message you read last week?

Yes Is Selected

Q56 Think about the conversations you had about the message in the last week. What came up during these conversations? Check all that apply.

- ☐ The health harms of indoor tanning (1)
- ☐ The health benefits of indoor tanning (13)
- ☐ The safety hazards of indoor tanning (2)
- ☐ Indoor tanning as a safe way to get a tan (14)
- ☐ Whether the message would make me want to quit indoor tanning (3)
- ☐ Whether the message would make other tanners want to quit indoor tanning (4)
- ☐ Whether the message would stop people from starting indoor tanning (5)
- ☐ Whether the message should be publicized elsewhere (6)
- ☐ Other indoor tanning warnings/messages (7)
- ☐ Made fun of the message (8)
- ☐ Argued against the main points of the message (9)
- ☐ Argued in support of the main points of the message (10)
- ☐ This research study (11)
- ☐ Other (12) _____

-----NEXT SCREEN-----

Display This Question:

If In the past week, have you talked with anyone about the indoor tanning message you read last week?

No Is Selected

Q37 If you were to talk with someone about the message, who would you talk with? Check all that apply.

- ☐ Sorority Sister (1)
- ☐ Friend (who is not a sorority sister) (2)
- ☐ Boyfriend/significant other (3)
- ☐ Parents (4)
- ☐ Other family member (5)
- ☐ Someone you did not previously know (6)
- ☐ Other (7) _____

-----NEXT SCREEN-----

Display This Question:

If In the past week, have you talked with anyone about the indoor tanning message you read last week?

No Is Selected

Q38 If you were to talk with someone about the message, what would you talk about? Check all that apply.

- ☐ The health harms of indoor tanning (1)
- ☐ The health benefits of indoor tanning (13)
- ☐ The safety hazards of indoor tanning (2)
- ☐ Indoor tanning as a safe way to get a tan (14)
- ☐ Whether the message would make me want to quit indoor tanning (3)
- ☐ Whether the message would make other tanners want to quit indoor tanning (4)
- ☐ Whether the message would stop people from starting indoor tanning (5)
- ☐ Whether the message should be publicized elsewhere (6)
- ☐ Other indoor tanning warnings/messages (7)
- ☐ Made fun of the message (8)
- ☐ Argued against the main points of the message (9)
- ☐ Argued in support of the main points of the message (10)
- ☐ This research study (11)
- ☐ Other (12) _____

-----NEXT SCREEN-----

[ATTACK MESSAGE FOR CONTROLLED TANNING CONDITIONS]

[ATTACK MESSAGE FOR VITAMIN D CONDITIONS]

[ATTACK MESSAGE FOR CONTROL MESSAGE CONDITION]

-----NEXT SCREEN-----

Q7.2 To what extent did you agree or disagree with the arguments contained in the message?

	Strongly disagree (1)	Somewhat disagree (2)	Neither agree nor disagree (3)	Somewhat agree (4)	Strongly agree (5)
I found myself agreeing with the author's points. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I found myself disagreeing with the author's points. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I thought of arguments to support what the author was saying. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I thought of arguments against what the author was saying. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

-----NEXT SCREEN-----

Q7.3 In the spaces below, please write down any thoughts you had against indoor tanning while reading this message.

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

-----NEXT SCREEN-----

Q7.4 Please write down any thoughts you had in support of indoor tanning while reading this message.

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

-----NEXT SCREEN-----

Q7.5 Please write down any other thoughts you had about indoor tanning after reading this message.

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

-----NEXT SCREEN-----

Q7.7 Using the scale below, where 0 is "not at all confident" and 100 is "absolutely confident" please indicate how confident you are that...

- _____ Your attitude about indoor tanning is firm? (1)
- _____ You hold the correct attitude about indoor tanning? (2)
- _____ Your attitude about indoor tanning will not change even if you find out that a majority of people disagree with you? (3)
- _____ You can defend your position on indoor tanning if necessary? (4)
- _____ You can maintain your position even if you encounter strong arguments against it? (5)
- _____ You can successfully argue your position with someone else who disagrees with you? (6)

-----NEXT SCREEN-----

Q7.8 Below are items reflecting what some people believe are benefits of indoor tanning. Please indicate your opinion on these. Even if you have not tanned indoors before, give your best answer.

Q7.9 If I went indoor tanning it would...

	Definitely would not (1)	Probably would not (2)	Not sure (3)	Probably would (4)	Definitely would (5)
Be safe because I can control how long I tan. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be safe because I can choose the type of tanning bed to use. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be safer than tanning in the sun. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be a good way to get vitamin D. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be a natural way to get vitamin D. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Be healthy because it would give me vitamin D. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX C3: MESSAGES TESTED IN MESSAGE EXPERIMENT

Safety: Controlled Tanning Inoculation Message

Word count: 595

Reading level: 12

People sometimes say that indoor tanning is a safer way to tan compared to outdoor tanning because you have control over the amount of UV radiation you are exposed to and can choose how long you want to tan. Some even believe indoor tanning is a “natural” way to tan because tanning beds create a tan using UVA and UVB rays, just like the sun. However, these arguments are seriously flawed.

People who think that indoor tanning is safer than outdoor tanning argue that, because things like weather, time of day, and geographic location affect the amount of UV rays you are exposed to, there is no way to control outdoor tanning. But tanning beds are not at all similar to the sun for many reasons. When you make the decision to use a tanning bed, you are exposing your entire body to an extremely strong dose of UV radiation, as much as *six* times what you would receive in the sun. That’s an incredibly strong dose in just a short amount of time.

The only thing you have control over in a tanning bed is the amount of time you spend in the tanning bed. You have no control over the quality of the equipment. You also have no way of knowing exactly how much UVA/UVB radiation you are absorbing because tanning beds emit different amounts compared to the sun, and the UVA/UVB radiation varies across different types of tanning beds. As the Center for Disease Control and Prevention (CDC) points out, as the bulbs in a tanning bed begin to age, the strength of the UVA/UVB rays will change, so you never really know how much or what type of UV you are getting.

Tanning beds have a higher concentration of UVA rays, also known as “tanning rays,” compared to the sun. This may be appealing for those seeking a quick tan, but UVA rays are the rays responsible for destroying your skin’s elasticity from the inside out, leading to wrinkles at an earlier age, and most worrisome – skin cancer. Research has shown that the damage done by these rays is irreversible and accumulates over time. In fact, you often cannot see the damage because these changes are taking place under the surface of your skin. The International Agency for Research on Cancer (IARC) found that people who use tanning beds before the age of 35 years are 75% more likely to develop melanoma compared to those who have never used tanning beds.

So, just like you cannot control the exact amount of UV radiation you get from the sun, you also cannot control the amount of UV radiation you get from a tanning bed or the damage done to your skin from being overexposed to UV radiation. At least in the sun you have the opportunity to control your exposure by wearing protective clothing and reapplying sunscreen. Sunscreen is ineffective for tanning bed use because sunscreen is designed to filter the amount of radiation received from *normal sun exposure* - but the radiation emitted from tanning beds is 6 to 12 times the amount emitted from the sun at any given point.

Contrary to what many people believe, an indoor tan is not a controlled or safe tan. The only control you do have is in making the decision about whether or not to protect yourself from harmful UV radiation from tanning beds. However, it is your choice whether or not getting that quick tan for an event, vacation, or even “just because” is worth damaging your skin, and your health, for a lifetime.

Safety: Controlled Tanning 1-sided Message

Word count: 591

Reading level: 11.5

A tan is a body's response to injury from UV rays and the act of tanning is dangerous, whether you tan outdoors in the sun or indoors in a tanning bed. Research has shown that both types of tanning lead to burns and put people at risk for various types of skin cancer, including melanoma, which is the deadliest type of skin cancer. In fact, the International Agency for Research on Cancer (IARC) found that people who use tanning beds before the age of 35 years are 75% more likely to develop melanoma compared to those who have never used tanning beds.

While some people engage in dangerous tanning practices by tanning indoors and/or outdoors as much and as often as they can to get the darkest tan, others try to regulate their tanning behavior by only tanning for a certain amount of time. No matter how you achieve a tan or how long you expose your skin to UV rays, a tan is nothing more than a sign of skin damage. Once that skin damage takes place, a number of factors such as skin type, DNA, and family history of skin cancer come into play, compounding the damage from the burn and leading to all kinds of skin problems, including cancer. There is no way to know how your body will respond to the damage done to your skin from tanning – everyone is different.

Indoor tanning is especially dangerous because there is also no way to know exactly how much UV radiation is emitted from tanning beds, considering the variation in UV radiation across different types of tanning beds and the lack of evidence about how UV radiation changes as the bulbs in a tanning bed begin to age. Perhaps even scarier, is not knowing how much damage is done to the skin until it is too late because the UVA rays penetrate through multiple layers of skin and create long-lasting changes to the layers underneath the surface. This is why the damaging effects of tanning, such as premature aging or skin cancer, will not be evident until *years* after the damage from tanning has taken place.

The best way to protect your skin and overall health is to limit your UV exposure as much as possible. The Center for Disease Control and Prevention (CDC) has recommended a variety of things you can do to control your exposure to UV rays. First, and foremost, avoid tanning beds entirely. There is no way to protect yourself from the UV rays emitted from tanning beds, which can be *six* times the strength of the UV rays emitted from the sun – sunscreen will not work in a tanning bed because it was designed for protection from natural sun exposure.

If out in the sun, seek shade under an umbrella, tree or other shelter when the sun is strong (usually between 10am and 4pm). Sunscreen is a critical part of UV protection, and make sure you choose a sunscreen with an SPF of at least 15. If you are out in the sun for longer than two hours, swimming, or sweating heavily, remember to reapply. Many cosmetics also contain sunscreen, which may be a preferable alternative for face protection.

A tan is nothing more than a sign of damage to your skins' DNA, and there is no such thing as a safe tan. The safest thing you can do is avoid tanning beds and too much sun exposure. However, it is your choice whether or not tanning is worth the risks to your health.

Health: Vitamin D Inoculation Message

Word count: 586

Reading level: 12

Some people believe that tanning beds are a safe and effective way to get Vitamin D. Some even believe that indoor tanning is a “natural” way to get vitamin D because tanning beds emit UVA and UVB rays, and so does the sun. There is even the idea that tanning beds are a good way to get an “extra” dose of vitamin D that will protect you from many diseases. However, none of these things are true.

Research has shown that while your body does produce *some* vitamin D from UV rays, the maximum amount of vitamin D you can get from UV rays is reached after just 5 to 10 minutes of midday sun exposure. The way this works is through exposure to UVB rays, *not* UVA rays. UVB rays stimulate the body’s production of vitamin D. What many seem to misunderstand is that vitamin D is *only* produced from UVB rays, but tanning beds emit primarily *UVA* rays. It makes sense for a tanning bed to emit primarily UVA rays because these are the rays that create a tan. While a tan may sound desirable, it is important to understand that UVA rays penetrate through to the deepest layers of skin, creating irreversible skin damage to multiple layers of skin that you cannot see, ultimately leading to premature aging and more serious consequences, such as skin cancer.

It’s also important to note that ten minutes in a tanning bed is not equal to ten minutes of midday sun. Tanning beds give you an extremely high dose of UV exposure. Just ten minutes in a tanning bed exposes you to *six times* the amount of UV rays you would be exposed to after ten minutes in the sun. According to dermatologists, this extremely high dose of UV radiation in such a short period of time is why indoor tanners are more likely to develop melanoma and other types of skin cancer than people who do not tan indoors. In fact, the International Agency for Research on Cancer (IARC) found that people who use tanning beds before the age of 35 years are 75% more likely to develop melanoma, the deadliest type of skin cancer, compared to those who have never used tanning beds.

Not only do we already know indoor tanning is not a good or effective way to get vitamin D, but the Institute of Medicine recently reviewed over 1,000 studies and found that most Americans already have an adequate level of vitamin D. There is also no research to support the idea that an “extra” dose of vitamin D is helpful – and trying to get an “extra” dose of vitamin D from a tanning bed is a useless effort because there is no evidence to suggest tanning beds stimulate an adequate amount of vitamin D production.

If you are curious or concerned about your vitamin D levels, talk to your doctor. The safest way to get your daily dose of vitamin D does not include indoor tanning. Eating foods rich in Vitamin D, such as fish, fortified milk or orange juice, and taking Vitamin D supplements will easily keep your vitamin D levels where they should be, without the dangers of indoor tanning.

Despite what some people may say, indoor tanning is not a safe or effective way to get vitamin D. However, it is your choice whether or not getting that quick tan for an event, vacation, or even “just because” is worth damaging your skin, or even your health, for a lifetime.

Health: Vitamin D 1-sided Message

Word count: 579

Reading level: 12

Vitamin D is essential for strong bones and a healthy immune system. The safest and most effective way to get your recommended dose of vitamin D is by eating foods rich in vitamin D and taking supplements. Research has shown that just 5 to 10 minutes in the *midday sun* can produce a small amount of vitamin D because the UVB rays in the sun stimulate your skin to produce vitamin D. Studies have found that people who wear sunscreen get just as much vitamin D benefit from sun exposure as those who do not, and sunscreen will help protect you from harmful effects associated with UV exposure, such as premature aging and various types of skin cancer.

Some dermatologists have special UV beds that emit a safe concentrated dose of UVB radiation for people who are unable to get vitamin D from the sun either because of their geographic location or genetic factors. However, it is important to note that these beds are completely different from the tanning beds you find at tanning salons. The beds in dermatologists' offices will *not* give you a tan, and only give you enough UVB exposure to produce vitamin D. A tan comes from UVA rays, which also happen to be the rays responsible for premature skin aging, and irreversible damage that can lead to serious problems such as skin cancer. In fact, the International Agency for Research on Cancer (IARC) found that people who use tanning beds before the age of 35 years are 75% more likely to develop melanoma, the deadliest type of skin cancer, compared to those who have never used tanning beds.

The beds you find at tanning salons are called "tanning beds" because they release mostly UVA rays, but these rays do not stimulate vitamin D production. Further, there is no evidence to suggest that a tanning bed will stimulate vitamin D production. Your body can only produce a limited amount of Vitamin D from UVB rays. Even in natural sunlight, once that amount has been satisfied any additional exposure to UVB rays will start to break down and your body will begin to dispose of the vitamin D it created. If this happens, you have depleted any vitamin D created from UVB exposure, you have also exposed yourself to a greater amount of UV radiation, which increases your risk of premature aging and skin cancer.

The Institute of Medicine recently reviewed over 1,000 studies and concluded that most people in America are receiving an adequate amount of vitamin D from minimal natural sun exposure and other sources. However, the danger of UV exposure, whether from the sun or a tanning bed, does not outweigh what little benefit you may receive from UV rays.

A tan is nothing more than a sign of skin damage. If you are concerned about your vitamin D levels, you should talk to your doctor. The best and safest way to increase your vitamin D level is to add vitamin D rich foods to your diet, or take supplements. Eating foods rich in vitamin D, such as fish, fortified milk or orange juice, and taking vitamin D supplements will easily keep your vitamin D levels where they should be. Spending time in a tanning bed, or too much time in the sun, will expose you to high doses of harmful UV radiation and do much more harm than good. However, it is your choice whether or not tanning is worth the risks.

Control Message**43 words****Reading level: 12****Facts About Indoor Tanning**

- Indoor tanning is not a safe way to get vitamin D.
- A base tan is not a safe tan.
- Controlled tanning is not safe tanning.
- Tanning beds are regulated, but that doesn't make them safe.

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