

Promoting safe-sun behaviors in outdoor workers

by

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B.A., Augustana College, 2014  
M.S., Kansas State University, 2017

AN ABSTRACT OF A DISSERTATION

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Department of Psychological Sciences  
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## **Abstract**

Sun exposure, with its link to the development of skin cancer and other health issues, can be a serious health hazard. In particular, those who primarily work outdoors and are consistently exposed to the sun's rays are at elevated risk for such health problems. Previous research efforts have focused on appealing to these outdoor workers to practice sun protection behaviors, such as using sunscreen, wearing a hat, or wearing items of clothing that reduce the amount of skin exposed to the sun's rays. In an effort to promote such sun protection behaviors, study 1 used a 3 X 2 between-subjects design to investigate the effects of tailored messaging and the inclusion of content regarding financial consequences of skin cancer on outdoor workers' intention to practice sun protection behaviors. Results from study 1 suggest that tailored messaging was equally as effective as targeted messaging, with both being more effective than generic messaging. This finding indicates that some degree of personalization is necessary when promoting safe sun practices to outdoor workers, but that tailoring to individuals is unnecessary. Additionally, the inclusion of financial content in messaging resulted in participants having greater intentions to practice sun protection behaviors. In study 2, managers and supervisors of outdoor workers were studied in determining the importance of consequences related to employee well-being and financial consequences for employers when it comes to encouraging sun protection behaviors in their employees. Using a four-level between-subjects intervention, it was found that managers and supervisors who received messages that emphasized the financial consequences of employee sun exposure had greater intentions to encourage sun protection behaviors in their employees than those who received a message focused solely on employee well-being. This finding indicates that employers may be most concerned with financial

consequences when it comes to promoting employee health. Together, studies 1 and 2 provide insight into the most effective methods for promoting sun protection for outdoor workers.

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Approved by:

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Dr. Laura Brannon

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# **Chapter 1 - Introduction**

## **Promoting Safe-Sun Behaviors in Outdoor Workers**

In an effort to limit the negative effects of occupational sun exposure, the current dissertation consists two studies aimed at both employees and employers. This dissertation includes a review of the literature on sun exposure and its consequences, particularly as they relate to outdoor workers. Next, a review of past interventions to promote safe sun exposure for both the general population and outdoor workers, in particular, is presented. This culminates in the discussion of two promising communication methods that were tested in study 1: tailoring and financial appeals. Focusing on these two variables, study 1 attempted to find a more effective method for communicating the dangers of sun exposure and effecting changes in behavioral intentions, attitudes, and knowledge. Next, study 2 focuses on effecting change at the employer-level by testing the effects of appeals focused on the well-being of employees versus appeals focused on financial incentives for employers. Given the lack of research in this area, particularly as it relates to sun protection programs, study 2 provides some insight into communicating risk and enacting health promotion and change from the top-down. Together, both study 1 and study 2 should assist with filling gaps in the knowledge base and will hopefully lead to reducing health risks for such an at-risk population in outdoor workers.

### **Dangers of Sun Exposure**

Excessive and unsafe sun exposure represents a particularly concerning hazard to the health of individuals both in the U.S. and abroad. The main concern with sun exposure is the resulting ultraviolet (UV) radiation that is emitted from the sun's rays. According to the American Cancer Society (2017), these UV rays cause skin cells to age and can damage cells' DNA. When the DNA in skin cells is damaged directly, this can trigger mutations that lead to

malignant tumors (i.e. skin cancer) (Skin Cancer Foundation, 2018a). According to the Skin Cancer Foundation (2018b), the majority of skin cancer diagnoses can be traced directly back to sun exposure, with 90% of nonmelanoma skin cancers and 86% of melanomas being attributed to exposure to UV radiation from the sun.

Knowing the process through which skin cancer develops, it becomes necessary to take a closer look at how common the disease is. According to the American Academy of Dermatology (AAD), skin cancer represents the most common type of cancer in the U.S. (AAD, 2018). Current estimates are that one in five Americans will develop skin cancer in their lifetime with approximately 9,500 new diagnoses being made each day (AAD, 2018). Many of these are non-melanoma forms of skin cancer, such as basal cell and squamous cell carcinomas, that affect more than 3 million Americans each year (AAD, 2018). While these non-melanoma forms of skin cancer can potentially be fatal, the American Cancer Society mentions in their annual report that data on basal cell or squamous cell skin cancers are not required to be reported to cancer registries (Siegel, Miller, & Jemal, 2018). As such, it is difficult to place an exact number on how many deaths are occurring from non-melanoma forms of skin cancer. Instead, researchers have focused on melanoma as the most dangerous form of skin cancer.

According to the AAD (2018), there are more than one million Americans living with melanoma. In 2018 alone, it is estimated that there will have been 178,560 new cases of the disease diagnosed, with invasive melanoma being the fifth most common cancer for men (55,150 cases) and the sixth most common cancer for women (36,120 cases) (AAD, 2018). Not only is melanoma widespread, but it can also be incredibly dangerous. The American Cancer Society's annual report suggests that 9,320 deaths will have resulted from melanoma in 2018, with 5,990 men and 3,330 women dying from the disease (Siegel, Miller, & Jemal, 2018). To rephrase that



number, that is more than one person dying every hour as a result of melanoma. Furthermore, Ekwueme et al. (2011) were able to quantify the health burden of melanoma by finding that the disease results in an average of 20.4 years of potential life being lost for people who are diagnosed. As these findings illustrate, melanoma represents a significant concern to the health of the American public.

Aside from the obvious concerns about skin cancer and melanoma resulting from UV radiation, it should also be noted that sun exposure can lead to a multitude of other health problems. Perhaps the most obvious result of sun damage is the all too common sunburn, which actually increase risk for skin cancer development (Dennis et al., 2008). As the Mayo Clinic (2018) points out, sunburns can result in skin issues such as redness, swelling, pain, blistering, and peeling (Mayo Clinic, 2018). If severe enough, sunburns can also lead to headache, fever, nausea, and fatigue. Aside from this readily apparent indicator of excessive sun exposure, the U.S. Environmental Protection Agency (EPA) details that chronic exposure to the sun causes premature aging, which over time leads to skin appearing wrinkled and leathery (EPA, 2017). In fact, up to 90% of visible skin changes that are commonly attributed to normal aging are caused by the sun (EPA, 2017). Outside of premature aging, unsafe sun exposure can lead to eye damage, such as the development of cataracts and macular degeneration (EPA, 2017). The American Cancer Society also reports that exposure to UV rays can lead to a weakening of the immune system (American Cancer Society, 2015). When this happens, the body has a harder time fending off infections and it can even cause vaccines to be less effective (American Cancer Society, 2015). While these aforementioned issues may not be as life-threatening as skin cancer, they do illustrate that excessive and unsafe sun exposure can lead to many other health problems that can have an impact on daily life.

## **Financial Impact of Excessive Sun Exposure**

In addition to the resulting health concerns of excessive sun exposure, we can also look at the financial impact that results from such unsafe practices. For instance, researchers estimate that there were nearly 34,000 emergency room visits in the U.S. in 2013 related to sunburns, with an estimated total cost of \$11.2 million (Guy, Berkowitz, & Watson, 2017). Additionally, Guy, Machlin, Ekwueme, and Yabroff (2015) used data from the 2002-2011 Medical Expenditure Panel Survey to determine that the average annual total cost of skin cancer treatment between 2007-2011 in the U.S. was roughly \$8.1 billion. This number represents a drastic increase over the \$3.6 billion average annual total cost of skin cancer treatment from 2002-2006 (Guy et al., 2017). In fact, the 126.2% increase during this time period compares to an increase of just 25.1% in the average annual total cost of treatment for all other cancers over that same timeframe (Guy et al., 2017). Researchers have even looked at the economic impact of sunburns. Warthan, Sewell, Marlow, Warthan, and Wagner (2003) estimate that sunburn may account for as many as 92,720 lost workdays solely by beachgoers in Galveston, Texas, which could result in an annual economic impact exceeding \$10 million on the surrounding community. Together, these findings serve to illustrate that improper sun-protection and skin cancer have a major impact on the U.S. economy.

Additionally, researchers have considered the financial impact of skin cancer on productivity and business expenses. The CDC (2018-a) reports that every year, Americans lose more than \$100 million in productivity because of restricted activity or absence from work due to skin cancer. Ekwueme et al. (2011) estimate that annual productivity losses in the U.S. attributed to melanoma are roughly \$3.5 billion, though this number incorporates the economic effects of skin cancer deaths. The CDC (2018-a) notes that in some states, employers may even

be required to provide workers' compensation to employees who develop skin cancer as result of sun exposure on the job. In Australia, where sun exposure and skin cancer is of great concern, it is noted that between 2000-2012, workers filed an average of 175 claims of workers compensation for skin cancer each year (Van Voorhis, Blair, and Barnes, 2018). During that timeframe, roughly \$63 million in payments were made to those filing claims (Van Voorhis, Blair, & Barnes, 2018).

Using past research, we can also determine the individual costs that result from treatment of skin cancer. Guy et al. (2015) found that the average annual costs per person for skin cancer treatment between 2007-2011 was \$1,643. However, if a person were specifically treating a melanoma form of skin cancer, that cost rose to \$4,780 (Guy et al., 2015). Additionally, individuals treating skin cancer paid on average 6.7% of their costs out-of-pocket, compared to just 4.9% for those treating other forms of cancer (Guy et al., 2015). Farr et al. (2017) looked at patients with advanced stage melanomas and found that average cost per patient per month ranged from \$1,966 for individuals with stage IIIB (where the cancer has spread locally or through the lymphatic system) to \$4,585 for individuals with stage M1c (where the cancer has spread to vital organs). Alexandrescu (2009) noted that the 5-year cost of treating Stage IV melanoma reaches an estimate of \$159,808.17 per patient. Furthermore, Ekwueme et al. (2011) estimates that individuals who died from melanoma between 2000 and 2006 lost an average of \$413,370 in future lifetime earnings. As such, skin cancer and melanoma can result in serious financial burdens for the individuals and families of those who are diagnosed.

### **Risk Factors for Skin Cancer**

As the Centers for Disease Control and Prevention (CDC) tracks demographic information for those who are diagnosed with melanoma, we can determine for which groups of

people the disease is most prevalent. As the CDC (2018-b) reports, melanoma is more commonly found in males (28.1 cases per 100,000 people) than in females (17.8). Additionally, the CDC (2018-b) finds that melanoma is predominantly a disease that occurs in Caucasians (25.1) as compared to African-Americans (1.0), American Indians (5.9), Asian-Americans (1.3) and Hispanics (4.4). That same report notes that the incidence rate for melanoma increases with age all the way up to the age of 85, meaning that the older a person gets, the more likely they are to be diagnosed with the disease (CDC, 2018-b). This helps indicate the cumulative effect of sun damage and illustrates how excessive sun exposure in one's youth may result in the development of melanoma in later years.

Based on available data, one can also get an idea of the impact that sun exposure and sunburn has on an individual's risk for developing skin cancer. The AAD (2018) reports that increasing intermittent exposure during childhood and throughout adulthood is associated with an increased risk of melanoma, as well as basal cell and squamous cell carcinomas. Researchers have also discovered that experiencing five or more blistering sunburns between the ages of 15 and 20 increases one's melanoma risk by 80% and nonmelanoma skin cancer risk by 68% (Wu, Han, Laden, & Qureshi, 2014). Dennis et al. (2008) found that even just one blistering sunburn during childhood or adolescence nearly doubled a person's risk (1.9 times as likely) for developing melanoma. Notably, adolescents who received at least one blistering sunburn were 1.6 times as likely to develop melanoma and adults who received at least one blistering sunburn were 1.4 times as likely to develop melanoma (Dennis et al., 2008). Dennis et al. (2008) also found that for every five sunburns that an adult receives per decade, their risk for melanoma more than triples. According to Dr. Sarina B. Elmariah, a dermatologist at Massachusetts General Hospital, "One sunburn, typically considered severe with blistering and subsequent

peeling, can increase the risk of melanoma by 1.5 to 4 percent” (as cited in Schumacker, 2018). Using data spanning several decades, Wu et al. (2016) were able to calculate the likelihood of developing melanoma based on the number of sunburns that an individual had received in their lifetime. For instance, individuals with 1 – 5 lifetime sunburns were 2.2 times more likely than average to develop melanoma, while individuals with 6 – 10 sunburns were 2.3 times more likely than average to develop the disease (Wu et al., 2016). For 11 – 15 sunburns, the risk of melanoma was 2.43 times the normal risk and for 16 or more sunburns the risk rose to 2.89 times normal (Wu et al., 2016). While these studies may differ on the exact amount that melanoma risk increases with varying numbers of sunburns, it is clear that as the amount of sunburns and unsafe sun exposure that an individual has increases, the more likely they will be to develop melanoma. As such, it is clearly necessary for research and interventions to focus on populations who are most at risk.

### **Outdoor Workers and Skin Cancer Risk**

In the U.S. and abroad, there are millions of workers in outdoor occupations who are at risk for overexposure to UV radiation and subsequently the development of skin cancer (Saraiya et al., 2004). This includes individuals with occupations such as construction workers, landscapers, farmers, lifeguards, letter carriers, park rangers, and many others which involve high levels of sun exposure. Perhaps unsurprisingly, these types of jobs appear to be quite common. Marrett, Pichora, and Costa (2010) found that 26% of all Canadians work outdoors during the summer. Of that number, 41% spent four or more hours at work each day in the sun, indicating a large portion of workers that are receiving excessive sun exposure (Marrett, Pichora, & Costa, 2010). Peters, Nicol, and Demers (2012) found there to be nearly 900,000 Canadian workers at high exposure levels of UV radiation (greater than 75% of workday outdoors),

primarily consisting of individuals from construction, farming, and landscaping. LeBlanc et al. (2008) identified construction laborers (903,160 in the U.S.), forestry and fishing occupations (119,016), farm workers (1,865,934), and farm operators and managers (891,435) as being the occupations at the highest risk for sun exposure. Moreover, Stock et al. (2009) noted that the majority outdoor jobs in the U.S. are held by fair skinned individuals, who are at an elevated risk for skin cancer. This, coupled with notion that the majority of outdoor worker are men (who already have a higher incidence rate of skin cancer and melanoma than women) further indicates that outdoor workers are highly susceptible to developing skin cancer (Stock et al., 2009). As such, it should come as no surprise that Trakatelli, Barkitzi, Apap, Majewski and De Vries (2016) found outdoor workers to be at a significantly increased risk for developing skin cancer as compared to indoor workers. Echoing this finding, the Occupational Cancer Research Centre (2017) notes that outdoor workers have a 2.5 to 3.5 times greater risk of developing skin cancer than indoor workers.

While the excessive sun exposure that outdoor workers receive is not necessarily dangerous if proper safety precautions are taken, it does not appear that such precautions are commonly used. A survey of U.S. adults who work outdoors at least half of the time found that only 18% of workers reported always wearing sunscreen while on the job (Professional Safety, 2016). Peters, Koehoorn, Demers, Nicol, and Kalia (2016) surveyed construction workers to find that while many wore hats (79%) and sleeved shirts (82%), relatively few would seek shade (8%) or wear sunscreen (29% often/always). Nahar et al. (2013) looked at landscapers' sun protection behaviors and noted that over half reported rarely or never wearing sunscreen, only 14.7% frequently or always wore wide-brimmed hats, and just 13.8% frequently or always wore long-sleeved shirts. In a similar study of state park workers, Nahar et al. (2014) found that less

than 20% of workers frequently or always wore wide-brimmed hats, 67.8% rarely or never wore long-sleeved shirts, and 60.9% rarely or never wore sunscreen. Returning to Marrett, Pichora, and Costa's (2010) study of Canadian outdoor workers, just over half reported always or often covering their heads (58%), wearing protective clothing (56%), or wearing sunglasses (54%), and only 29% reported using sunscreen always or often. Moreover, LeBlanc et al. (2008) discovered that workers with elevated occupational exposure to UV light were less likely than the average U.S. worker to have ever received a skin examination. Together, these findings indicate that many outdoor workers both in the U.S. and elsewhere are doing an inadequate job of protecting themselves from sun exposure and are increasingly susceptible to skin cancer.

As for the reason why outdoor workers are not performing safe-sun protection behaviors, multiple researchers have examined what outdoor workers perceive as barriers to skin protection. Nahar et al. (2013) sampled landscapers to find that for behaviors such using a hat, sunglasses, and sunscreen, the most common barrier was that participants just "forget to wear" these items. For clothing items such as long-sleeved shirts or long pants, participants were more likely to say that these items were simply "too hot to wear" (Nahar et al., 2013). In a related study of state park workers, Nahar et al. (2014) found that participants commonly cited similar barriers, as well as emphasizing the inconvenience of certain behaviors. Notably, many respondents reported that hats and long-sleeved shirts were "inconvenient" to wear (Nahar et a., 2014). Boyas, Nahar, and Brodell (2016) sampled Latino outdoor workers regarding their sun protection habits and perceived barriers, as well. Out of several potential response options, participants rated "Not always convenient to protect myself from the sun" and "Often forget to protect myself from the sun" as being the two largest barriers to sun protection (Boyas, Nahar, & Brodell, 2016). Together, these findings help us see why outdoor workers are not practicing safe-sun behaviors

and, in part, why they are so susceptible to issues such as skin cancer. Knowing this, it is now important to consider what actions can be taken in order to help rectify the situation.

## **Past Interventions to Promote Safe-Sun Practices**

### **Health messages.**

In an effort to find the most effective method for promoting safe-sun practices, researchers have tested a variety of interventions. Of those, one of the earliest and most common methods has been that of the health-based educational intervention. In these types of interventions, researchers provide participants with information through brochures, lectures, slideshows, or any number of other modes that are designed to educate the individual about the health consequences of excessive sun exposure. Notable examples of this type of intervention include work by Cody & Lee (1990) which involved providing educational videos about the link between sun exposure and skin cancer to college students in Australia. The researchers found that students who viewed these educational videos showed increases in their immediate intentions to use sun protection. Montague, Borland, and Sinclair (2001) found that the Sun Smart program in Australia, which focuses on health education about sun exposure through TV, radio, and print, was effective at increasing self-reported sunscreen use, hat use, and shade seeking between 1988 and 1998. Bellamy (2005) conducted a systematic review of health education interventions for promoting sun protection that spanned the use of lectures, videotapes, leaflets, posters, interactive classes and a variety of multi-component interventions. Of the 59 studies that were reviewed, Bellamy (2005) found that 55 reported the intervention having at least some significant effects on participants' knowledge, attitudes, or behavior toward sun protection. Studies have also shown that health educational interventions are effective at promoting safe sun behaviors for younger populations such as college students (Davis et al,



2015), college athletes (Bagatti, Englert & Cline, 2016), and adolescents in school settings (Ali & Moradi, 2018; Erkin & Temel, 2017; Hubbard et al., 2018).

Despite the aforementioned evidence in support of the use of health education interventions, there is reason to suspect that such interventions may not be as impactful as it first appears. For instance, Liu, Barankin, Howard, and Guenther (2001) provided first year medical students with a weeklong curriculum designed to increase their awareness of the health risks of excessive sun exposure. Despite participants showing increased knowledge and intentions to practice safe sun behaviors immediately after the curriculum, findings at a 1-year follow-up indicated that much of that initial knowledge was lost (Liu et al, 2001). Even individuals who have experienced previous diagnoses of skin cancer report relatively poor adherence to safe-sun practices despite warnings from medical professionals (Mujumdar et al, 2009; Robinson, 1990; Zwemer, Mahler, Werchniak, & Recklitis, 2012). Additionally, studies have shown that despite being aware of the health concerns, adults continue to receive large amounts of UV radiation (Beasley & Kittel, 1997; Hoegh et al, 1999; Turrisi, Hillhouse, & Gebert, 1998). As Mahler (2015) concludes in her review of health education-based interventions for safe sun practices, although there is evidence to support health education messaging to increase awareness of the dangers of sun exposure, actual behavioral change may best be instituted through other methods.

### **Appearance messages.**

Outside of health education interventions, researchers have largely focused on the use of appearance-based interventions to promote safe-sun behaviors. As mentioned earlier, UV radiation can result in appearance-related changes such as wrinkling, rough skin, and spider veins (EPA, 2017). With appearance-based interventions, researchers attempt to highlight these issues in order to motivate sun protection behaviors within individuals. In one of the earliest

studies on the matter, Jones and Leary (1994) provided participants with essays that focused on either the health or appearance consequences of sun exposure. Here, the researchers found that appearance essays were more effective than health essays at increasing concerns about the harmful effects of the sun and at increasing the participants' intention to use sunscreen. Thomas et al. (2011) also tested a comparison between appearance and health messages for promoting safe sun practices. Participants were presented with messages that either focused on skin cancer or appearance issues, such as premature aging (Thomas et al., 2011). Interestingly, it was noted that participants who read the appearance-focused message reported a higher perceived threat of skin cancer than the participants who read the message that actually discussed skin cancer (Thomas et al., 2011).

Moving beyond written messages, researchers have further incorporated the use of photo images that provide a visual depiction of the damage that UV radiation can have on one's appearance. Novick (1997) provided high school females with photos of themselves that had either been digitally altered to add 25 years of age or had added both the age and cancerous skin lesions to their photo. Over six weeks of tracking participants' activity, those in the aging plus skin lesion group showed significantly greater usage of sunscreen than participants who only saw the aging effects (Novick, 1997). Both groups, however, used sunscreen more often than participants in a separate control group (Novick, 1997). Researchers have also utilized UV photographs, where a photograph is taken of a person's skin using a UV filter that highlights the uneven epidermal pigmentation caused by sun damage (Mahler, 2015). The use of these photographs, especially when combined with written information about the appearance effects of sun exposure, have been shown to increase both immediate intentions and long-term behavior (at a 1 year follow-up) when it comes to safe-sun practices (Mahler, Kulik, Gerrard, & Gibbons,

2007; Mahler, Kulik, Gibbons, Gerrard, & Harrell, 2003). More recently, Persson et al. (2018) performed a meta-analysis involving 33 individual studies to assess the overall effectiveness of using appearance-related interventions to promote proper sun protection behavior. The authors concluded that appearance-related interventions have positive effects on sun protection both immediately after the intervention and up to 12 months later, with interventions combining UV photography and photoaging information showing a medium effect size on sun protection intentions (Persson et al., 2018).

Despite the support for appearance-focused interventions, there is evidence that it may not always be the most effective method for promoting safe sun practices. Although Thomas et al. (2011) found that participants viewing appearance messages perceived a higher threat of skin cancer, these participants were no more likely than those in the health condition to actually perform sun protection behaviors. Likewise, Mahler et al. (1997) compared appearance and health interventions to find that neither was more effective than the other when it came to reducing sun exposure at a six-week follow-up. Findings such as these may be attributable to the notion that appearance is the primary motivation for intentional UV exposure (Mahler, 2015). When individuals are exposed to the sun for other reasons, such as through occupational sun exposure, appearance messaging may not be all that effective. For instance, Stock et al. (2009) compared the effects of appearance and health interventions on highway workers' sun protection behaviors. Here, results indicated that a 12-minute educational video on the photoaging risks of sun exposure was no more effective than a control message at increasing safe sun practices (Stock et al, 2009). As such, when individuals are receiving unintentional sun exposure, or are not motivated by appearance reasons, it may be most effective to utilize alternative interventions.

#### **Other strategies to encourage safe-sun practices.**

Although health and appearance interventions have been the two most commonly studied, researchers have looked into other methods for promoting safe-sun practices. For instance, Thomas et al. (2011) compared gain (benefits of skin protection) and loss (risks of sun exposure) framing to find that when messaging was framed in terms of loss, participants reported higher intentions to perform skin protection behaviors. Nan (2011) again looked at gain and loss framing, but this time considered participants' incidental affect. It was noted that loss framing was more effective than gain framing at increasing perceived susceptibility to skin cancer and response efficacy, but only when participants were happy (Nan, 2011). Overall though, there may not be a meaningful difference between gain and loss framing when applied to sun protection behaviors. O'Keefe and Wu (2012) performed a meta-analysis on 33 studies that have compared gain and loss framing to find that there was no significant difference between the two for encouraging skin cancer prevention. Somewhat relatedly, Mahler, Kulik, Gerrard, and Gibbons (2010) used upward and downward social comparisons when coupled with appearance-based interventions. Results indicated that adding downward comparisons completely negated the effect of the intervention, while upward comparisons were able to slightly enhance the effect of the appearance intervention (Mahler et al., 2010). Additional interventions have focused on text message reminders (Youl et al, 2015), web-based interventions (Bowen, Burket, Hay, Meischke, & Harris, 2015), and small-group discussions (Roberts & Black, 2009), all of which have been successful to some extent but are lacking in the amount of research able to replicate said findings. Thus, it is important for researchers to continue working in this topic area in order to find the most effective methods for promoting sun protection.

## Chapter 2 - Study 1

### Overview

Given the apparent issues with past research done on promoting safe sun practices, study 1 was conducted with the goal of helping to determine the most effective methods for communicating the risks of sun exposure to outdoor workers. In a review of the literature, two promising intervention methods stood out as warranting further study: message tailoring and the inclusion of financial content in messaging. Focusing on these two approaches, study 1 involved randomly assigning participants to read one of six message types in a 3 (*communication type: generic, targeted, tailored*) X 2 (*financial information: present versus not present*) between-subjects design. Both before and after receiving their message, participants responded to items concerning sun exposure behaviors, knowledge, and attitudes. Given the apparent gaps in research, study 1 attempted to provide further clarification of the most effective methods for promoting sun protection behaviors, particularly for such an at-risk population in outdoor workers.

### Tailoring versus Targeting

As detailed by Kreuter, Strecher, and Glassman (1999) there are many different forms of health communication. These include “*generic communication*”, in which communication is not individualized or based on any kind of assessment. There is “*personalized generic communication*” which applies a small individual identifier (such as one’s name) to a generic message. Even more personalized is “*targeted communication*”, which involves developing messages for a certain segment of the population (e.g. male/female, children/adults, smokers/non-smokers, etc.). As Noar, Benac, & Harris (2007) point out, most health education materials that are developed are best described as targeted communication. Targeted

communication includes any forms of communication which are developed with a specific group of people in mind. Perhaps unsurprisingly, these targeted forms of communication have largely been shown to be more effective than generic communication in producing behavioral health changes.

Support for the use of targeted communication has been demonstrated across a variety of domains. For instance, Rodriguez Esquivel, Webb Hooper, Baker, and McNutt (2015) specifically targeted Hispanic Americans with a smoking cessation intervention that was culturally-specific. This culturally-specific intervention focused on Hispanics and incorporated Hispanic smoking patterns, cultural values, and norms into the materials (Rodriguez Esquivel et al., 2015). At a two-week follow-up, the researchers noted that those receiving culturally-specific intervention reported smoking fewer cigarettes per day and had higher levels of self-reported cessation as compared to those receiving a standard, non-culturally-specific intervention (Rodriguez Esquivel et al., 2015). Martens, Kilmer, Beck, and Zamboanga (2010) tested the use of an intervention to prevent excessive alcohol use that was targeted toward college athletes. Compared to a standard intervention, participants who received information that specifically addressed college athletes were found to consume fewer drinks per week at a one-month follow-up and have a lower blood alcohol concentration at a six-month follow-up (Martens et al., 2010). Further support for the use of targeted communication has been found in areas such as physical activity (Pfeffer, 2013), vaccinations (Dube et al., 2015), diabetes-prevention (Rogers et al., 2014), antibiotic use (Cross, Tolfree, & Kipping, 2016), pediatric clinic use (Sheikh & Macintyre, 2009), and military sexual trauma (Turchik, Rafie, Rosen, & Kimerling, 2014).

Although targeted communication has been shown to be successful in a number of areas, there may be an even more effective method for communicating health risks. As Kreuter,

Strecher, and Glassman (1999) define it, *tailored communication* is “any combination of strategies and information intended to reach one specific person, based on characteristics that are unique to that person, related to the outcome of interest, and derived from an individual assessment” (p. 277). As such, tailored communication is individualized to each person that receives the intervention. This leads to the information that is being presented becoming personally relevant and, in turn, results in individuals being more likely to attend to and remember the information (Kreuter & Wray, 2003). Emphasizing this point, Ryan and Lauer (2002) conducted a meta-analysis of 85 studies using tailored interventions to find that tailoring did generally lead to information being better remembered. Further, Brug, Campbell, and van Assema (1999) reviewed eight different studies on the use of tailored nutrition education as compared to generalized nutrition education. Ultimately, it was concluded that tailored interventions were “more likely to be read, remembered, and experienced as personally relevant compared to standard materials” (Brug, Campbell, & van Assema, 1999, p. 145).

In testing the utility of tailored communication compared to generic communication, tailoring has been found to be highly effective across a variety of health areas. For instance, Lustria et al. (2016) tested the use of tailored web-based interventions in order to promote sexually transmitted disease (STD) testing among college students. Here, content was tailored to participants’ responses to pretest measures of personal information, sexual behavior and perceived risk of STDs. Compared to a generic control intervention, participants receiving tailored content had a higher perceived risk of STDs, greater intentions to get tested, and were more likely to order STD testing kits. Further research on tailoring has shown support for its use in areas such as dieting (Campbell et al., 2009; Gans et al., 2015), smoking cessation (Wangberg, Nilsen, Antypas, & Gram, 2011; Webb Hooper, Rodriguez, & Baker, 2013), alcohol

consumption (York, Brannon, & Miller, 2012), physical activity (Soetens, Vandelanotte, de Vries, & Mummery, 2014), and vaccinations (Gerend, Shepherd, & Lustria, 2013). Going even further, as Abrams et al. (1996) point out, these individual-level interventions have typically been the most effective method for effecting health behavior change.

Some researchers have even directly compared the effectiveness of tailored communication with that of targeted communication. In general, Abrams et al.'s (1996) assertion is supported, tailoring has typically been more effective than targeted communication. For instance, Shah et al. (2014) found tailored communication to be more effective than targeted communication at increasing depressed patients' discussions of suicidal thoughts with their physicians. Similarly, Short, James, Girgis, D'Souza, and Plotnikoff (2015) noted that tailored interventions aimed at promoting physical activity for breast cancer survivors were more effective than targeted interventions. Further studies have demonstrated tailored communication to be preferable to targeted communication in areas such as kidney disease prevention (Roberto, Krieger, & Beam, 2009) and climate change communications (Bostrom, Bohm, & O'Connor, 2013). So while both methods of communication can be effective, it appears that most research directly comparing the two has found tailoring to be more effective.

Despite the evidence in support of tailoring over targeting, it should be noted that there are advantages and disadvantages to tailoring, as well as situations in which its use may not be as appropriate. An argument in favor of tailored communication includes its ability to take individual variation into account, especially as it relates to constructs that influence health behavior changes (Stellefson, Hanik, Chaney, & Chaney, 2008). Further, Hawkins, Kreuter, Resnicow, Fishbein, and Dijkstra (2008) note that tailoring can enhance cognitive preconditions for message processing, thus allowing tailored materials to have a more significant impact.



Disadvantages to tailoring include the potentially high costs and time-intensiveness of creating personalized messages, specifically for printed materials (Campbell & Quintiliani, 2006; Elish, Royak-Schaler, & Higginbotham, 2011; Noar, Benac, & Harris, 2007; Schmid, Rivers, Latimer, & Salovey, 2008). There is also the notion identified by Stellefson et al. (2008) that low public awareness of certain health problems may limit the effectiveness of tailoring. As these authors point out, tailoring could exhaust cognitive resources to focus on novel health topics in a way that targeted or generic communication does not (Stellefson et al., 2008). As such, tailoring may be more appropriate for use in more well-known health areas. Additionally, as Kreuter and Wray (2003) point out, tailored health messages should be advantageous to targeted health messages in situations in which there is significant variability within the intended audience. Thus, if all members of an audience have similar determinants of behaviors and are similar on whichever variable is being tailored, then targeted communication may be a more appropriate method (Kreuter & Wray, 2003). However, given the evidence in support of tailored interventions, it is important to consider the use of such an intervention for addressing sun protection behaviors.

#### **Tailoring for safe-sun interventions.**

When it comes to the domain of skin cancer prevention, tailoring has again been demonstrated to be largely successful. For instance, Glanz, Schoenfeld, and Steffen (2010) mailed a tailored intervention on skin cancer, which included personalized risk feedback, to adults at moderate and high risk for skin cancer. Here, the personalized risk feedback categorized participants as being at low, moderate, or high risk for developing skin cancer. Controlling for risk level, gender, and age, researchers found that receiving tailored materials had a significant effect on sun-protection habits, including the use of hats, sunglasses, and more

recent skin self-examinations (Glanz, Schoenfeld, & Steffen, 2010). In a similar study of adults at increased risk of skin cancer, Glanz et al. (2015) provided participants with mailings tailored to their personal risk level and baseline sun-protection behaviors. Researchers found that individuals receiving the tailored materials reported higher levels of sunscreen and sunglass use, had fewer sunburns at a three-month follow-up, and had more recent and more frequent skin examinations (Glanz et al., 2015). Findings such as these indicate that tailoring and providing personalized risk feedback may be particularly appropriate for individuals with a high risk of developing skin cancer.

### **Tailoring safe-sun interventions for different populations.**

Researchers have also been able to demonstrate that tailoring can be an appropriate intervention for a number of diverse populations. Glanz, Steffen, Schoenfeld, and Tappe (2013) used a tailored intervention for both parents and their children (in grades 1-3) in an effort to promote sun protection. Tailored materials consisted of personalized risk feedback and recommendations that were based on responses to a baseline questionnaire regarding sun protection habits and attitudes (Glanz et al., 2013). It was found that participants in the tailored condition demonstrated significantly greater positive changes in prevention behaviors, including the children's use of sunscreen, shirts, and hats, as well as the parents' use of shade and skin examinations. Manne et al. (2010) studied family members of patients with melanoma who were nonadherent with safe-sun practices by using tailored communication. This tailored intervention consisted of several mailings and a phone call which included information on participants' personal risk factors (e.g. blonde or red hair), age, gender, perceived barriers to sun protection, and family history of melanoma (Manne et al., 2010). After conducting follow-ups at six and 12 months, participants in the tailored condition were almost twice as likely to have received a skin

examination by a healthcare provider and showed greater increases in sun-protection habits over those receiving non-tailored health information. A study from Robinson, Friedewald, and Gordon (2016) has even detailed how personalized risk is an important component for kidney transplant recipients (KTRs), who are at a remarkably high risk for developing squamous cell carcinoma, as roughly 65% of those receiving transplants will develop the disease. After conducting interviews with 30 different KTRs, the researchers concluded that having the benefits of sun protection coupled with information about personal risk for developing squamous cell carcinoma was essential to KTRs believing that they could influence their health outcome (Robinson, Friedewald, & Gordon, 2016). As such, it appears as though tailoring and providing personalized risk feedback may be an appropriate strategy for many populations.

#### **Tailoring safe-sun interventions across different platforms.**

In addition to being appropriate for several audiences, tailoring to promote sun protection has also been shown to be effective across a variety of platforms. De Vries et al., (2012) studied the use of a computer-tailored program in which information was tailored to sun protection habits and attitudes, skin type, risk perception, social support, self-efficacy, intention, and action plans. Results showed that respondents responded positively to the program, regardless of whether they were skin cancer patients, non-skin cancer patients, high educated, or low educated (de Vries et al., 2012). Ultimately, low education participants were more positive about the use of a computer-tailored program and developed more action plans for protecting themselves from sun exposure as a result of the program (de Vries et al., 2012). Darlow and Heckman (2017) tailored sun protection information through the use of text messages sent to young adult women. Here, text messages were tailored to the perceived benefits, barriers, susceptibility, severity, self-efficacy, or cues to action for sun protection (Darlow and Heckman, 2017). At a four-week

follow-up, those who received tailored text messages were significantly more likely to report wearing hats as a form of sun protection than those who did not receive tailored text messages (Darlow & Heckman, 2017). Buller et al. (2015) provided participants with a mobile application which provided advice on sun protection and alerts (to apply/reapply sunscreen and get out of the sun), hourly UV index, and vitamin D production based on forecast UV index, time and location, and user input. The authors found that those using the mobile app reported spending less time in the sun and more shade use. Mair et al. (2012) surveyed participants to find out which modes of communication were most preferred for delivering sun protection messages. Overall, 80% of respondents indicated that they would like to receive some form of sun protection advice with 42% preferring email and 20% preferring text messages (Mair et al., 2012). As tailoring has been evidenced to be effective for a variety of individuals across a variety of platforms, it seems that such an intervention may be successful in promoting safe-sun practices for a population such as outdoor workers.

## **Past Interventions to Promote Safe-sun Practices for Outdoor Workers**

### **Early research promoting safe-sun practices for outdoor workers.**

Early research on possible interventions for promoting safe-sun practices for outdoor workers has provided somewhat mixed results. Borland, Hocking, Godkin, Gibbs, and Hill (1991) examined the effects of a campaign for Telecom workers in Australia to increase their sun protection behaviors. This campaign consisted of information on how to protect one's skin, as well as a video which depicted the consequences of melanoma (Borland et al., 1991). Ultimately, the campaign was found to have led to significant improvement in shirt use and in overall protection (Borland et al., 1991). However, the authors were unable to find any effect of the intervention on hat use or seeking shade (Borland et al, 1991). Girgis, Sanson-Fisher, and

Watson (1994) randomly assigned outdoor workers at an American electric company to either an experimental group receiving an education session and individual skin screenings by a dermatologist or a control group receiving neither interventions. In comparing pretest to posttest reports, a 16% increase in the percentage of outdoor workers who were using high levels of sun protection was found for those in the experimental group, compared to no observable change in for those in the control group (Girgis, Sanson-Fisher, & Watson, 1994). Aside from the behavioral change, the authors also found that the experimental group showed a significantly greater improvement at the posttest in their knowledge of sun protection and skin cancer; however, no changes in attitudes toward skin cancer or personal susceptibility were found (Girgis, Sanson-Fisher, & Watson, 1994). Hanrahan, Hersey, Watson, and Callaghan (1995) provided outdoor workers with educational brochures that detailed the dangers of sun exposure and skin cancer. While these brochures were able to increase knowledge about melanoma, little evidence was provided to support the use of this intervention to promote behavioral change (Hanrahan et al., 1995). Of the few behavioral markers included in the study, participants receiving brochures had no more frequent skin examinations and were no more likely to have received a skin examination by a doctor than those not receiving any educational materials (Hanrahan et al., 1995).

Further evidence of early mixed findings concerning the promotion of sun protection behaviors in outdoor workers can be seen in Geller et al.'s (2001) work with aquatic staff at outdoor pool sites. Employees from both Hawaii and Massachusetts were divided into two groups: an experimental group receiving sun protection education (including training on sun protection behaviors, interactive activities, and the provision of sunscreen and hats) and a control group receiving education on child injury prevention (Geller et al., 2001). Participants in the

experimental group reported fewer sunburns at the end of the summer and more significant improvements in the sun-protection policies at their pools than those in the control group (Geller et al., 2001). However, there were no significant increases in sun protection knowledge, attitudes, or behaviors in the experimental group as compared to the control group (Geller et al., 2001). A similar multi-component study was conducted by Azizi et al. (2000) in which outdoor workers at an Israeli water company were placed into either a comprehensive (safety officer training, education, and provision of protective gear), partial (education, brochures, protective gear), or minimal (education, brochures, sunscreen) intervention group. Significant improvements were found in sun protection behaviors, with those in the comprehensive condition showing an 80% increase in sunscreen use and 71% increase in frequency of skin self-examinations (Azizi et al., 2000). While these findings are promising, the results have come under scrutiny by other researchers. Glanz, Buller, and Saraiya (2007) note that conditions in this study were non-randomized and that a low follow-up rate (68%) which differed by condition (41% in minimal intervention group) was seen. Further, Glanz, Buller, and Saraiya (2007) go on to note that methodological issues such as these have plagued early research on sun exposure interventions aimed at outdoor workers in their review of the topic. Due to the lack of well-designed studies and inconsistent evidence among studies, the authors do not believe that the strategies used early on by researchers can be recommended as effective (Glanz, Buller, & Saraiya, 2007).

### **Different strategies for promoting safe-sun practices for outdoor workers.**

Covering more recent developments in the topic area, Horsham et al. (2014) provided an update to the aforementioned review from Glanz, Buller, and Saraiya (2007). In this review, Horsham et al. (2014) covered papers that had been published since 2007 that had specifically

studied outdoor workers with their sun protection interventions. Of the articles under review, the majority have focused on educational and/or multi-component interventions with a fair amount of success (Horsham et al., 2014). Mayer et al. (2007) studied U.S. Postal Service letter carriers while providing them with six educational sessions, wide-brim hats, sunscreen, and frequent reminders over the course of two years. At a two-year follow-up, those receiving the intervention were twice as likely to regularly use sunscreen as compared to those in a control condition and nearly three times as likely to use hats (Mayer et al., 2007). As mentioned earlier, Stock et al. (2009) compared appearance and health interventions on a sample of American road workers with participants watching an educational video on either photoaging or skin cancer, and either receiving or not receiving a UV photo of their face which highlighted sun damage. While those in the appearance/no UV photo condition were largely unaffected, those receiving a UV photo or watching the health video had significantly increased their sun protection behaviors at three separate follow-ups (Stock et al., 2009).

Andersen et al. (2008) demonstrated that implementing interventions during the winter months can even have an effect. Here, the Go Sun Smart (GSS) campaign, which delivers advice and training at workplaces, was implemented at several different ski resorts in the U.S. and Canada. Though educational materials were only provided through early March, a September follow-up revealed that participants receiving the intervention reported fewer sunburns, engaged in more sun-safety behaviors, and had more discussions of sun-safety at home than those in a control group (Andersen et al., 2008). In a later follow-up study, Andersen et al. (2012) used the GSS program with ski resort employees while differing the dissemination strategy that was used. While half of the worksites were simply given the educational materials, the other half had managers provide interpersonal contact with employees during which the

materials were distributed (a notion which will be touched on in much greater detail in study 2). Ultimately, it was found that those receiving interpersonal contact with their managers were more likely to recall the information that they were given as compared to those who had no interpersonal contact with their managers. Though findings such as this are helpful, they do illustrate a key point regarding generalizability made by Horsham et al. (2014). In essence, much of the existing research on safe-sun practices focuses on specific industries (e.g. postal workers, construction workers, ski resorts, etc.) where worker characteristics and culture may lead to findings being ungeneralizable. Instead, it may be more beneficial to find communication methods that can be applicable to a much larger audience. As such, a call is made by Horsham et al. (2014) to conduct research which includes a diverse range of workers across different industries.

Though research on the matter is relatively scarce, some researchers have considered the notion of tailoring sun protection interventions for outdoor workers. Rye et al. (2014) instituted tailored interventions in multiple Australian workplaces, which included industries such as construction, farming, local government, and public sector. These interventions, which were unique to each worksite, consisted of developing policy, providing changes to the work environment (e.g. providing portable shade or eliminating reflective surfaces), providing personal protective equipment to employees, education and awareness, role modeling, and skin examinations (Rye et al., 2014). After receiving the intervention, workers reported increases in workplace support for sun protection, shade seeking, use of wide-brimmed hats, use of long-sleeved shirts, and use of long pants, as well as a decrease in the proportion of workers reporting sunburns at an 18-month follow-up. Janda et al. (2014) sampled outdoor workers in four separate industries (construction, farming, local government, and public sector) in order to



identify their current practice of sun protection behaviors and the factors associated with effective use. The researchers found several factors associated with increased protective behavior, including having received education on the use of protection and being concerned about being in the sun (Janda et al., 2014). The authors go on to make the recommendation that interventions should be tailored or personalized to account for personal or workplace factors (Janda et al., 2014). This recommendation echoes statements from several other researchers who have called for sun protection interventions to utilize tailored or personalized communication to make sun exposure risks more salient (Carley & Stratman, 2015; Kearney, Xu, Balanay, & Becker, 2014; Zink et al., 2018). Taken together, these findings help illustrate the point that while the use of tailoring is relatively scarce in this domain, it has the potential to be an effective strategy for promoting safe-sun practices in outdoor workers.

### **Health Belief Model**

The goal of most interventions to promote sun protection is to raise concern in respondents to the point that they take action and protect themselves. An aim such as this can directly be tied to the Health Belief Model (HBM), originally developed by Hochbaum, Rosenstock, and Kegels (1952). This model posits that a key determinant of whether or not an individual adopts a healthy behavior is the individual's perceived threat of a disease or negative outcome (Janz & Becker, 1984). This perceived threat can then be divided into two separate constructs: perceived susceptibility and perceived severity. Perceived susceptibility refers to an individual's beliefs about the probability or likelihood of contracting a disease or condition. Perceived severity is an individual's beliefs about the seriousness of a disease or any health consequences. The HBM also includes the related constructs of perceived benefits (what an individual gains by performing a health behavior) and perceived barriers (what is stopping an

individual from performing a health behavior). When perceived benefits outweigh perceived barriers, an individual is likely to make a behavioral change. Though not always included by researchers, some variations of the HBM also include the constructs of self-efficacy and cues to action (Glanz, Rimer, and Su, 2005). Self-efficacy refers to an individual's belief in their ability to perform the particular health behavior, while cues to action refer to stimuli (e.g. brochures, flyers, reminder messages, etc.) used to motivate behavioral change.

According to the HBM, behavioral change is most likely to occur when each of the constructs are sufficiently addressed (Glanz, Rimer, and Su, 2005). In relation to the current project, that means that addressing the susceptibility and severity of sun exposure-related risks, the benefits and barriers to sun protection, and an individual's self-efficacy and cues to action for sun protection should result in behavioral changes. Indeed, many researchers have stressed the importance of the HBM and utilized the model to explain findings related to safe-sun promotion among outdoor workers (Nahar et al., 2013; Nahar et al., 2014; Stock et al., 2009; Street & Thomas, 2015; Woolley et al., 2008). Of particular note, are researchers who have specifically applied or discussed the use of tailored communication as a means for addressing the constructs within the HBM.

#### **Health belief model and tailoring.**

Researchers have noted that tailored communication can be particularly appropriate when attempting to address the health belief model. As the HBM proposes, preventative action is most likely to be taken when an individual perceives themselves to be at risk for some serious health concern and sees more reasons to make a change (i.e. benefits) than impediments to making a change (i.e. barriers) (Kreuter, Strecher, & Glassman, 1999). As Kreuter, Strecher, and Glassman (1999) discuss, by identifying the specific risks, barriers, and benefits that an

individual perceives, tailored communication can address each of those factors directly. Indeed, as pointed out earlier, several researchers have utilized sun exposure-related tailoring within the HBM framework to increase the level of perceived risk and severity (Glanz, Schoenfeld, and Steffen; 2010; Glanz et al., 2013; Glanz et al., 2015) and perceived benefits and barriers (Darlow & Heckman, 2017; Manne et al., 2010). This type of personalized communication is so effective because the information being presented is personally relevant and therefore more likely to be recalled (Brug, Campbell, & van Assema, 1999; Kreuter & Wray, 2003, Ryan & Lauver, 2002). Additionally, the notion that tailoring leads to information being better remembered or recalled is especially pertinent to the issue of studying outdoor workers. As mentioned earlier, one of the primary barriers to sun protection for outdoor workers is simply forgetting to wear sunscreen or various forms of protective clothing (Boyas, Nahar, & Brodell, 2016; Nahar et al., 2013; Nahar et al., 2014). Since tailored communication can be helpful in recalling information, it may be particularly appropriate for communicating the dangers of excessive sun exposure to outdoor workers.

In recent years, researchers have begun to apply what is referred to as tailored communication within the HBM framework to outdoor workers at risk for excessive sun exposure. However, it should be noted that many researchers appear to be conflating the methods of tailoring and targeting. In these instances, researchers claim to be tailoring content to their audience, when, in actuality, they are using targeted content. For instance, Lee et al. (2014) conducted a study in which operating engineers (who spend large amounts of the workday outdoors) took part in an educational session on sun exposure, as well as a group discussion of perceived barriers to sun protection. The educational session was specifically targeted to operating engineers (which the authors refer to as “tailored”) by including information about

those in the profession, as well as utilizing photos of operating engineers on the job (Lee et al., 2014). As the authors describe, “adopting or tailoring this information to address the needs of a specific population was essential to overcome perceived susceptibility, severity and barriers, and increase perceived benefits” (Lee et al, 2014, p. 73). At the posttest, it was found that most participants viewed the intervention as helpful (96%) and intended to use sunscreen in the future (84%) (Lee et al., 2014). In items specific to each component of the HBM (excluding cues to action), it was noted that the intervention led to significant increases in perceived severity, susceptibility, self-efficacy, and benefits (Lee et al., 2014). Notably, the intervention also resulted in an increase in perceived barriers, which is not ideal for creating a behavioral change. The authors reason that perhaps allowing a focused discussion on perceived barriers led to this increase, and as such, recommend that future interventions should avoid placing excessive focus on potential barriers (Lee et al., 2014).

Following up on Lee et al.’s (2014) work, a study conducted by Duffy et al. (2018) used a similar targeted educational intervention (which they refer to as “tailored”), but this time tested the impact of education alone, education with text messages reminders, education with free sunscreen, and education with both text message reminders and free sunscreen. It was found that while those receiving free sunscreen were most likely to have increased their sunscreen use, the educational session alone still led to an increase over baseline sunscreen use and was just as effective as the other conditions at reducing the incidence of sunburns several months later (Duffy et al., 2018). So while including additional resources such as free sunscreen can lead to better outcomes, targeted education that addresses HBM constructs can still be effective on its own. Another recent study from Ali and Rakhshani (2018) used an HBM-inspired educational intervention which included targeting (again, referred to by the authors as “tailoring”) to promote

safe-sun practices in Iranian farmers. The educational intervention included training sessions addressing the dangers of skin cancer, risk factors for skin cancer, benefits and barriers to sun protection, and self-efficacy in applying preventative behaviors (Ali & Rakhshani, 2018). At follow-ups three and six months later, it was seen that those taking part in the educational training showed a significant increase in knowledge, perceived susceptibility, perceived severity, perceived benefits, self-efficacy, cues to action, and skin cancer preventative behaviors as compared to participants in a control group (Ali & Rakhshani, 2018). As this study, and the work of Lee et al. (2014) and Duffy et al. (2018) illustrate, targeting to an audience to address HBM constructs can be a particularly effective strategy in promoting safe-sun practices for outdoor workers. Despite this, it appears that confusion between targeting and tailoring remains an issue in this domain. As such, research is necessary to provide a clear delineation between the two terms and their subsequent effectiveness in promoting safe sun behaviors for outdoor workers.

### **Tailoring Hypotheses**

Given past research concerning the effects of tailored communication, study 1 sought to determine whether such an intervention would be effective at promoting safe-sun practices for a diverse population of outdoor workers. Using the HBM as a theoretical basis, intervention messages included information relating to the constructs of severity, susceptibility, benefits, barriers, and self-efficacy, with the message itself serving as a cue to action. In order to enhance the perceived susceptibility to the dangers of sun exposure (and thus make the messages more effective), tailoring was used to personalize risk feedback. As some researchers have raised concerns about the logistics (e.g. cost and time) of implementing tailored communication strategies, study 1 aimed to compare the effectiveness of individually-tailored health appeals

with appeals targeted specifically toward outdoor workers. As these targeted appeals are applicable to a larger audience and can be more easily dispersed, it is necessary to see if a more generalized type of appeal such as this can still be as effective as an individually-tailored appeal in the domain of sun protection for outdoor workers. Given the past research that has been summarized, the following hypotheses were made for the current study:

*Hypothesis 1:* There will be a main effect of *communication type* on the dependent variable of posttest future sun protection intentions. This will be such that participants in the *tailored* and *targeted* conditions will score higher on the posttest measure of sun protection intentions than participants in the *generic* conditions. Similarly, it is expected that participants in the *tailored* conditions will score higher than participants in the *targeted* conditions on the same measure.

*Hypothesis 2:* There will be a main effect of *communication type* on the dependent variable of posttest perceived susceptibility to skin cancer. This will be such that participants in the *tailored* and *targeted* conditions will score higher on the posttest measure of perceived susceptibility to skin cancer than participants in the *generic* conditions. Similarly, it is expected that participants in the *tailored* conditions will score higher than participants in the *targeted* conditions on the same measure.

*Hypothesis 3:* There will be a main effect of *communication type* on the dependent variable of posttest skin cancer and sun protection knowledge. This will be such that participants in the *tailored* and *targeted* conditions will score higher on the posttest measure of skin cancer and sun protection knowledge than participants in the *generic* conditions. Similarly, it is expected that participants in the *tailored* conditions will score higher than participants in the *targeted* conditions on the same measure.

## **Financial Appeals**

In the area of health persuasion, there has recently been an increase in the use of financial appeals as a method for encouraging change across a variety of health behaviors. Perhaps the most common and most well-supported research on the matter is that which involves the use of financial incentives. In these financial incentive interventions, participants are typically provided with some amount of monetary compensation for making behavioral changes in areas such as smoking, dieting, exercise, or any other number of health behaviors. For instance, Volpp et al. (2009) incentivized smokers with a \$100 for completion of a smoking-cessation program, \$250 for cessation of smoking within six months, and \$400 for participants who made it an additional six months without smoking. The researchers found that as compared to a control group, those that were provided with financial incentives were nearly three times as likely to participate in the smoking cessation program, quit smoking within six months, and have continued abstinence six months later (Volpp et al., 2009). Gardiner and Bryan (2017) recently used daily financial incentives to encourage fruit and vegetable consumption among participants. It was found that offering daily financial incentives of \$1 per serving led to increased consumption of fruits and vegetables, as well as increases in attitudes and self-efficacy (Gardiner & Bryan, 2017). Additional studies on financial incentives have supported their use in domains such as exercise (Finkelstein, Brown, Brown, & Buchner, 2008; Mitchell et al., 2013), weight loss (Volpp et al., 2010), vaccinations (Giles, Robalino, McColl, Sniehotta, & Adams, 2014), and even HIV viral suppression (El-Sadr et al., 2017).

While financial incentives have been shown to be an effective method for creating health behavior changes, they may not always be feasible or realistic. In the context of outdoor workers, employers may be unwilling to provide monetary incentives to their employees for

safe-sun protection practices. However, even if financial incentives are unlikely to be used, financially-based messages can still be utilized as a cost-effective intervention. Sindelar and O'Malley (2014) compared the effectiveness of health and financial messages to motivate smoking cessation. Here, the financial messages were displayed in brochures and discussed the amounts of money that can be saved by quitting (Sindelar & O'Malley, 2014). The researchers found that as compared to health messages, financial messages attracted significantly more attention and were more likely to be picked up across a variety of community settings (e.g. health clinics, grocery stores, check-cashing businesses). Similarly, Bashir, Lockwood, Dolderman, Sarkissian, and Quick (2011) compared health and financial messages to find that a financial message led to greater pro-environmental behavioral intentions as compared to a health message. Van de Vyver et al. (2018) found that using financial messages made drivers nearly twice as likely to help prevent air pollution by turning off their engines while idling as compared to a control condition. Further, researchers have found financial messages to be effective at motivating change related to both energy consumption (Nolan, Kenefick, & Schultz, 2011) and water conservation (Tijs et al., 2017). Although research is relatively scarce on the use of financial messaging, studies such as these provide support for the notion that this method can be an effective tool for promoting safe-sun practices.

### **Financial Hypotheses**

In an effort to further generalize the past successes of financial messaging to a new domain, the current project examined whether such a method could be applied to sun protection promotion. Given past findings, as well as evidence from Frederick, Novemsky, Wang, Dhar, and Nowlis (2009) that making the opportunity costs of a choice more salient can result in behavioral change, it was expected that including financial information would increase the



effectiveness of sun protection messaging. Using the HBM framework, it was also expected that financial information would enhance the perceived benefits of practicing safe-sun protection. As the HBM posits that behavioral change is in part based on perceived benefits outweighing perceived barriers, it was expected that adding financial information would result in improved sun protection practices. As such, the following hypotheses were made:

*Hypothesis 4:* There will be a main effect of *financial information* on the dependent variable of posttest future sun protection intentions. This will be such that participants in the *financial information present* conditions will score higher on the posttest measure sun protection intentions than participants in the *financial information not present* conditions.

*Hypothesis 5:* There will be a main effect of *financial information* on the dependent variable of posttest perceived benefits to sun protection. This will be such that participants in the *financial information present* conditions will score higher on the posttest measure of perceived benefits of sun protection than participants in the *financial information not present* conditions.

## **Method Study 1**

### **Participants**

Study 1 recruited 304 participants from the U.S. through Amazon's Mechanical Turk (MTurk) program. Participants consisted of outdoor workers, which Peters et al. (2016) define as someone who works outdoors for two or more hours on a typical work day. MTurk, an online crowdsourcing platform, was used in order to obtain a more diverse sample than would be possible in a college or single workplace setting. Research has shown that MTurk samples are more diverse than undergraduate samples (Keith, Tay, & Harms, 2017; Landers & Behrend, 2015) and cover a wider range of industries and occupations than most organizational samples (Keith, Tay, & Harms, 2017). Additionally, researchers have found that data collected through

MTurk is similar in quality and reliability to data collected from undergraduate psychology students (Buhrmester, Kwang, & Gosling, 2011). To address potential issues related to inattention or fraudulent responding, recommendations from Cheung, Burns, Sinclair, and Sliter (2017) were incorporated. This included the use of attention check items, creating qualifications for participation in the study, and multiple questions that asked participants to describe their job in detail.

Of the initial 304 participants that completed the survey, 29 participants were removed from the data set for failing to meet the requirements of being considered an “outdoor worker”. These participants either indicated that they worked fewer than two hours outside on an average workday, the definition of an outdoor worker set by Peters et al. (2016), or they indicated that they were employed in positions which were deemed unlikely to involve outdoor work. This includes participants that listed their occupations as accountant, nurse, and librarian. An additional eight participants were removed from the data set for failing to pass each of the attention check items. This resulted in a final data set of 267 participants to be used for analyses.

Of the remaining 267 participants, 169 (63.3%) were male, 97 were female (36.3%), and one participant did not disclose their gender. Participant ages ranged in years from 20 to 72, with an average age of 34.53 ( $SD = 10.89$ ). The majority of the sample was White/Caucasian (66.3%), followed by Black/African-American (13.1%), Asian/Pacific Islander (10.9%), Hispanic (6.4%), Native American (0.2%), and Other (2.6%). When asked to select their highest level of education, the most commonly cited response was a 4-year degree (37.5%), followed by some college (25.1%), graduate or professional degree (13.1%), high school graduate (12.4%), 2-year degree (11.2%), and less than high school (0.7%). Additionally, respondents were asked to select the industry in which they worked. The most commonly cited responses were construction

(21.3%), landscaping (15.7%), and farming (8.2%). The majority of respondents were employed full-time (85.4%) and participants reported working an average of 40.36 ( $SD = 10.98$ ) hours per week and spending an average of 6.86 hours ( $SD = 2.67$ ) outside on a typical workday.

## **Design**

To assess the effect of tailoring and financial information on safe-sun protection intentions, attitudes, and knowledge, a 3 (*communication type: generic, targeted, tailored*) x 2 (*financial information: present versus not present*) between-subjects design was used for Study 1.

### **Intervention.**

Each of the six message types included similar information addressing the HBM constructs of perceived severity, barriers, and self-efficacy, with each message serving as a cue to action. The remaining HBM constructs of perceived susceptibility and benefits were purposefully expected to vary among the levels of the *communication type* and *financial information* independent variables, respectively. Each of the six message types utilized the same text-based format and were each of roughly similar length. The content of each message was largely adapted from an advert by the American Academy of Dermatology (2018) and efforts were made to keep phrasing and word choice consistent between conditions where appropriate. To view the intervention messages in their entirety, please see Appendix A.

Additionally, it should be noted that the decision to focus tailoring efforts on perceived susceptibility was made with multiple considerations. First, perceived susceptibility was expected to have acceptable levels of variation among the population under study, a condition proposed to be necessary for tailoring to be effective (Kreuter and Wray, 2003). Secondly, providing individualized risk feedback allowed for the opportunity to provide a concrete number

on personal susceptibility. Finally, tailoring to a single HBM construct, and one that is oft-cited as the construct most associated with sun protection behavior (Babazadeh, Nadrian, Banayejeddi, & Rezapour, 2017; Hammond et al., 2008; Mermelstein & Riesenber, 1992), allowed for the ability to test an intervention that would be more easily implementable for external practice.

### ***Communication type.***

The independent variable ***communication type*** was a between-subjects variable with participants being randomly assigned to view a *generic*, *targeted*, or *tailored* message regarding the dangers of sun exposure. The ***generic*** message contained information regarding sun exposure and skin cancer that is applicable to the entire U.S. population and was not directed at a single individual or group of people. For instance, information about risk for melanoma was presented as “Research has found that 2.3% of people will be diagnosed with melanoma during their lifetime”. The ***targeted*** message was specifically addressed to outdoor workers and contained information that is specific to this population. For example, information about melanoma risk for outdoor workers was gathered from the Occupational Cancer Research Centre (2017) and was presented as “Research has shown that people with outdoor occupations are roughly 250% more likely to develop melanoma during their lifetime than the average person”. Finally, the ***tailored*** message was specifically addressed to the individual reading the message and provided participants with an estimate of their personalized risk for developing melanoma. This estimate of melanoma risk was based on Wu et al.’s (2016) calculations of the likelihood of developing melanoma based on an individual’s number of lifetime sunburns. For instance, an individual that indicates they have received 11-15 lifetime sunburns was informed that “Based on your personal history of sunburns, your risk of developing melanoma in your lifetime is 243% higher than the average person”.

### ***Financial information.***

Crossed with the *communication type* independent variable was the other independent variable of ***financial information***. This second independent variable was also a between-subjects variable with participants being randomly assigned to view messages in which financial information was either *present* or *not present*. In conditions in which the financial information was ***present***, messages included information related to the expected treatment costs for melanoma (\$4,780 per person per treatment), which were based on Guy et al.'s (2015) findings. For instance, the *generic/financial* condition contained the following sentence, "Further, the expected medical costs for treating a single case of melanoma are \$4,780". In conditions in which financial information was ***not present***, messages simply avoided mentioning the financial consequences of melanoma.

## **Measures**

### **Work information.**

As Cheung et al. (2017) recommend, to prevent fraudulent responding on MTurk, it is advisable to include several initial items in a survey that ask participants about the qualifications which are required. In this instance, several items were used to help ensure that participants were employed as outdoor workers. Participants were asked if they are employed, as well as to provide written responses to questions asking about their job title, the industry that they work in, as well as the job tasks that they perform. Items related to outdoor work included the percentage of work activities occurring outdoors, the average number of hours spent outside during a workday and non-workday, as well as the average number of days per week that they work outside. Additional items in this section included the number of hours worked per week, the

length of time that participants have been employed at their current jobs, and whether or not the participant is a manager or assistant manager at their workplace (see Appendix B).

### **Pretest sun-exposure and protection behaviors.**

To assess baseline behaviors, participants were asked a series of questions regarding their current sun-protection habits and past incidences of sun damage. This included asking the question, “To the best of your knowledge, how many times have you experienced a sunburn (e.g. red, irritated skin) in your lifetime?” which was answered with responses of *0, 1-5, 6-10, 11-15, or 16 or more*. These response intervals were based on the work of Wu et al. (2016) and participants’ responses were used to develop personalized risk feedback for participants in the *tailored* conditions. Participants were also asked to recount the number of times that they had been sunburned this most recent summer (*0, 1, 2, 3, 4 or more times*). To measure protection behaviors, participants were asked how often they use sunscreen, some form of head protection (e.g. hat, cap, visor, bandana, etc.), long-sleeved shirts, long pants, sunglasses, and seek shade while outdoors. This scale was adapted from Heckman, Handorf, Darlow, Yaroch, and Ravitch (2017) and has been found to have an acceptable level of internal consistency ( $\alpha = 0.76$ ). All protection items were measured on a 7-point Likert scale ranging from “Never” to “Always” (see Appendix B).

### **Pretest HBM components.**

Of the six identified HBM components, five were measured in both the pretest and posttest. These measures included perceived susceptibility, severity, benefits, barriers, and self-efficacy. It should be noted that the “cues to action” component of the HBM was not measured in this project. Partially due to its difficulty to measure, some researchers have excluded the cues to action component from previous scale developments (Lee et al., 2014; McDonald et al., 2014).

As such, it did not appear as though an appropriate measurement of this component in relation to sun protection was readily available. Additionally, as all participants in the current study received a singular intervention without the use of reminder messages or materials, it was not expected that participants would differ in their assessment of this component (as all participants are receiving a single cue to action). Thus, a decision was made to exclude this construct from the assessment of HBM components.

***Perceived susceptibility.***

Perceived susceptibility to skin cancer was measured using a scale adapted from McDonald (2014) which had previously been found to have an internal consistency of  $\alpha = 0.88$ . There were four items in this scale and each item was measured on a 7-point Likert scale ranging from “Strongly disagree” to “Strongly agree” (see Appendix B). Example items included “I worry that a severe sunburn in my past may increase my risk for skin cancer” and “I worry about getting skin cancer from my outdoor sun exposure”.

***Perceived severity.***

Perceived severity of skin cancer was measured using a scale adapted from McDonald (2014) which had previously been found to have an internal consistency of  $\alpha = 0.69$ . There were four items in the scale and each item was measured on a 7-point Likert scale ranging from “Strongly disagree” to “Strongly agree” (see Appendix B). Example items included “The more that I am exposed to the sun, the more damage I am doing to my skin” and “Skin cancer would greatly affect my life”.

***Perceived benefits.***

Perceived benefits of sun protection was measured using a scale adapted from McDonald (2014) which had previously been found to have an internal consistency of  $\alpha = 0.88$ . There were

six items in the scale and each item was measured on a 7-point Likert scale ranging from “Strongly disagree” to “Strongly agree” (see Appendix B). Example items included “Using sun protection will decrease my chance of getting skin cancer” and “There are benefits for me to use sun protection any time I go outdoors in the sun”.

***Perceived barriers.***

Perceived barriers to sun protection was measured using a scale adapted from McDonald (2014) which had previously been found to have an internal consistency of  $\alpha = 0.81$ . There were eight items in the scale and each item was measured on a 7-point Likert scale ranging from “Strongly disagree” to “Strongly agree” (see Appendix B). Example items included “Sunscreen is inconvenient to apply before going out in the sun” and “A long-sleeved shirt for skin protection feels uncomfortable to wear”.

***Perceived self-efficacy.***

Perceived self-efficacy for sun protection was measured using a scale adapted from Heckman et al. (2012) which had previously been found to have an internal consistency of  $\alpha = 0.81$ . There were six items in the scale and each item was measured on a 7-point Likert scale ranging from “Strongly disagree” to “Strongly agree” (see Appendix B). Example items included “I feel confident in my ability to use sunscreen when I am outdoors” and “I feel confident in my ability to wear long-sleeved shirts when I am outdoors”.

**Pretest skin cancer and sun protection knowledge.**

Participants were also asked in the pretest to provide responses to several items assessing skin cancer and sun protection knowledge. These items were adapted from Nahar et al. (2013) and were previously found to have an acceptable level of internal consistency ( $\alpha = 0.83$ ). It should be noted in their original state, this 10-item scale was measured in terms of correct or



incorrect responses (i.e. true or false). To allow for more nuanced measurement, the present study assessed these items using a 7-point Likert scale (see Appendix B). Items asked participants to rate their agreement with statements such as “Sun exposure causes most skin cancers” and “The sun’s rays are strongest at mid-day”.

#### **Posttest sun protection behaviors.**

To assess the impact of the intervention messages, participants were asked a series of questions assessing their future intentions toward several sun protection behaviors. This included each of the protection behaviors that were measured in the pretest assessment. These items were phrased in terms of participants’ future intentions regarding each behavior. For instance, the item for sunscreen was phrased as “In future summers, on the days you are working outside in the sunlight, how often do you intend to use sunscreen?”. As Hillhouse, Adler, Drinnon, and Turrisi (1997) have found intentions to be an adequate replacement for behavioral measures of sun exposure and sun protection, it is believed that the use of intentional measures in the current study was an adequate measure of future behavior. In total, there were six items assessing post-intervention sun protection intentions and each was measured using the same 7-point Likert scale as in the pretest (see Appendix C).

#### **Posttest HBM components.**

Items assessing the HBM components of interest (susceptibility, severity, benefits, barriers, and self-efficacy) as they relate to skin cancer and sun protection were also asked in the posttest in order to determine the effectiveness of each message type. Here, the same five scales used to address HBM components in the pretest were used and each scale retained the same exact same wording and response set (see Appendix C).

#### **Posttest skin cancer and sun protection knowledge.**

The posttest included the same set of items used to measure skin cancer and sun protection knowledge in the pretest. Again, this included each of the 10 knowledge items used in the pretest and each item retained the exact same wording and response set (see Appendix C).

### **Demographic questions.**

At the end of the survey, demographic information was assessed. Participants were asked to provide their age, ethnicity, gender, and highest level of education (see Appendix C).

### **Attention checks.**

In addition to the items mentioned above, attention checks were dispersed throughout the survey to determine whether or not participants were carelessly responding to items. These included simple items such as “Please enter today’s date” and “Please solve the following math equation.  $2 + 2 = ?$ ”. Additionally, to ensure that participants had read the intervention message, an attention check was placed below the message that asked participants to provide a brief (one sentence) summary of the message that they had just read (see Appendix C).

## **Procedure**

Participants completed study 1 using an online survey created in Qualtrics which was distributed through MTurk. After reading the informed consent and providing agreement, participants proceeded to answer the aforementioned pretest items assessing work information, sun exposure and protection behaviors, attitudes toward HBM constructs, and finally skin cancer and sun protection knowledge. Once this information was provided, participants were randomly assigned to one of six conditions. These consisted of *generic/financial information not present*, *generic/financial information present*, *targeted financial information not present*, *targeted/financial information present*, *tailored/ financial information not present*, and *tailored/financial information present*. As described above, each message type was similar in

length and format, but differed slightly in terms of content and who the message was directed toward. To ensure that the message was being read and that participants were not just clicking through the intervention, an attention check with a required response was placed below the message. This item asked participants to summarize the message that they just read and needed to be responded to before participants were allowed to advance to the next screen. Once participants reviewed the intervention message, they were then asked to complete the posttest items described above, which related to future intentions regarding sun protection, HBM constructs, skin cancer and sun protection knowledge, and demographic information. Upon completion of the study, participants were debriefed, thanked for their participation, and provided payment through their MTurk account.

## **Results Study 1**

### **Hypotheses Testing**

To analyze the data from study 1 and test hypotheses, a series of 3 x 2 analyses of covariance (ANCOVA) were conducted for each of the primary dependent variables. The decision to utilize this type of analysis was based on the analytical methods of previous studies in a similar topic area (Jackson, & Aiken, 2006; McClendon, Prentice-Dunn, Blake, & McMath, 2002; Reid & Aiken, 2013) and studies using similar designs (Dijkstra, 2014; Sanderson & Yopyk, 2007). In particular, an ANCOVA was used to address the research question of “Which message type is most effective for promoting changes related to behavioral intentions, attitudes, and knowledge?”. Additionally, the use of a covariate analysis allowed for the ability to ensure equality between groups on relevant measures. Finally, any statistically significant main effects were further investigated through pairwise comparisons using a Sidak adjustment. A Sidak

adjustment was utilized due to its relatively liberal correction while maintaining a familywise error rate of .05 (Hayes, 2005).

Before conducting analyses, the assumptions of ANCOVA were tested. In doing so, there was found to be homogeneity of regression slopes, meaning there was no interaction between the any of the covariates and the independent variables. Similarly, Levene's test of homogeneity of variance was found to be non-significant for each analysis, indicating that variance was roughly equal between groups. Linearity was found to be present, with scatter plots indicating that each dependent variable-covariate relationship was approximately linear. The only assumption that may have been questionable was normality. After calculating residuals, the variables of posttest skin cancer and sun protection knowledge ( $p < .01$ ), posttest perceived severity ( $p < .01$ ), posttest perceived benefits ( $p < .01$ ), posttest perceived barriers ( $p < .01$ ), and posttest perceived self-efficacy ( $p < .01$ ) were all found to be significant on the Shapiro-Wilk test of normality. However, further examination through histograms displayed approximately normal curves while Q-Q plots revealed that these variables did not show extreme departures from normality, as points on the plot were fairly clustered around the designated line. Furthermore, previous research has shown that the ANCOVA is fairly robust to violations of normality, especially with sample sizes of roughly 30 participants or more per group (Tabachnick & Fidell, 2013) and when the assumption of homogeneity of regression slopes is met (Levy, 1980). Due to this, ANCOVA analyses were proceeded with for the data.

### **Hypotheses 1 and 4**

In testing hypothesis 1 (main effect of *communication type* on posttest sun protection intentions) and hypothesis 4 (main effect of *financial information* on posttest sun protection intentions), two separate analyses of reliability were first conducted. This included one analysis

with each of the six pretest sun protection items and another analysis with each of the six posttest sun protection items. Cronbach's Alpha scores of  $\alpha = .70$  for the pretest sun protection items and  $\alpha = .85$  for the posttest sun protection items were found, indicating that both scales had adequate levels of internal consistency. Following this, two composite variables were created: one combining each of the six pretest sun protection behavior items and one combining each of the six posttest sun protection intention items. Next, an ANCOVA was run with *communication type* and *financial information* entered as the predictors, the composite variable for posttest sun protection intentions entered as the dependent variable, and the composite variable for pretest sun protection behavior entered as the covariate.

For hypothesis 1, there was a main effect of the *communication type* variable  $F(2, 260) = 8.56, p < .01$ , partial  $\eta^2 = .06$ . It was found through pairwise comparisons using a Sidak adjustment that participants in the *generic* conditions ( $M = 5.18, SE = .10$ ) scored significantly lower than participants in both the *targeted* ( $M = 5.57, SE = .10, p = .01$ ) and *tailored* ( $M = 5.73, SE = .10, p < .01$ ) conditions (see table 1). There was, however, no significant difference in scores between the *targeted* and *tailored* conditions ( $p = .54$ ). Based on these results, there is partial support for hypothesis 1. Although participants in the *targeted* and *tailored* conditions both scored higher on the composite measure of posttest sun protection intentions than participants in the *generic* conditions, we are not able to conclude that the *tailored* message was more effective than the *targeted* message.

For hypothesis 4, there was a main effect of the *financial information* variable  $F(1, 260) = 4.56, p = .03$ , partial  $\eta^2 = .02$ . This main effect was such that participants in the *financial information present* conditions ( $M = 5.61, SE = .08$ ) scored higher on the posttest sun protection intentions measure than participants in the *financial information not present* conditions ( $M =$

5.38,  $SE = .08$ ) (see table 1). With these results, we are able to conclude that hypothesis 4 was supported, as scores on sun protection intentions measure were higher for participants in the *financial information present* conditions than for participants in the *financial information not present* conditions. Additionally, it should be noted that although no clear hypothesis was made regarding an interaction effect between the *communication type* and *financial information* variables, this was still tested for in the analysis. It was found that there was no interaction effect present,  $F(2, 260) = .28, p = .76, \text{partial } \eta^2 = .00$ .

## **Hypothesis 2**

In testing hypothesis 2 (main effect of *communication type* on posttest perceived susceptibility to skin cancer), two separate analyses of reliability were first conducted. This included one analysis with each of the four pretest perceived susceptibility to skin cancer items and another analysis with each of the four posttest perceived susceptibility to skin cancer items. Cronbach's Alpha scores of  $\alpha = .93$  for the pretest perceived susceptibility to skin cancer items and  $\alpha = .95$  for the posttest perceived susceptibility to skin cancer items were found, indicating that both scales had adequate levels of internal consistency. Following this, two composite variables were created: one combining each of the four pretest perceived susceptibility to skin cancer items and one combining each of the four posttest perceived susceptibility to skin cancer items. Next, an ANCOVA was run with *communication type* and *financial information* entered as the predictors, the composite variable for posttest perceived susceptibility to skin cancer entered as the dependent variable, and the composite variable for pretest perceived susceptibility to skin cancer entered as the covariate.

After conducting the analysis, there was found to be a main effect of *communication type*  $F(2, 260) = 8.18, p < .01, \text{partial } \eta^2 = .06$ . It was shown through pairwise comparisons using a

Sidak adjustment that participants in the *generic* conditions ( $M = 4.80, SE = .11$ ) scored lower on the posttest measure of perceived susceptibility to skin cancer than participants in both the *targeted* ( $M = 5.34, SE = .11, p < .01$ ) and *tailored* ( $M = 5.39, SE = .12, p < .01$ ) conditions (see table 2). There was, however, no significant difference between participants in the *targeted* and *tailored* conditions ( $p = .99$ ). Based on these results, there is partial support for hypothesis 2. Although participants in the *targeted* and *tailored* conditions both scored higher on the composite measure of posttest perceived susceptibility to skin cancer than participants in the *generic* conditions, we are not able to conclude that the *tailored* message was more effective than the *targeted* message. Additionally, it should be noted that, as expected, there was no main effect of *financial information* on the dependent variable of posttest perceived susceptibility to skin cancer  $F(1, 260) = .25, p = .62, \text{partial } \eta^2 = .00$ . Additionally, it should be noted that although no clear hypothesis was made regarding an interaction effect between the *communication type* and *financial information* variables, this was still tested for in the analysis. It was found that there was no interaction effect present,  $F(2, 260) = 0.26, p = .77, \text{partial } \eta^2 = .00$ .

### **Hypothesis 3**

For hypothesis 3 (main effect of *communication type* on posttest skin cancer and sun protection knowledge), two separate analyses of reliability were first conducted. This included one analysis with each of the 10 pretest skin cancer and sun protection knowledge items and another analysis with each of the 10 posttest skin cancer and sun protection knowledge items. Cronbach's Alpha scores of  $\alpha = .83$  for the pretest skin cancer and sun protection knowledge items and  $\alpha = .88$  for the posttest skin cancer and sun protection knowledge items were found, indicating that both scales had adequate levels of internal consistency. Following this, two

composite variables were created: one combining each of the 10 pretest skin cancer and sun protection knowledge items and one combining each of the 10 posttest skin cancer and sun protection knowledge items. Next, an ANCOVA was run with *communication type* and *financial information* entered as the predictors, the composite variable for posttest skin cancer and sun protection knowledge entered as the dependent variable, and the composite variable for pretest skin cancer and sun protection knowledge entered as the covariate.

After conducting the analysis, there was found to be a main effect of *communication type*  $F(2, 260) = 7.03, p < .01, \text{partial } \eta^2 = .05$ . It was found through pairwise comparisons using a Sidak adjustment that participants in the *generic* conditions ( $M = 5.36, SE = .08$ ) scored lower on the posttest measure of skin cancer and sun protection knowledge than participants in both the *targeted* ( $M = 5.67, SE = .08, p = .02$ ) and *tailored* ( $M = 5.76, SE = .08, p < .01$ ) conditions (see table 3). There was, however, no significant difference between participants in the *targeted* and *tailored* conditions ( $p = .79$ ). Based on these results, there is partial support for hypothesis 3. Although participants in the *targeted* and *tailored* conditions both scored higher on the composite measure of posttest skin cancer and sun protection knowledge than participants in the *generic* conditions, we are not able to conclude that the *tailored* message was more effective than the *targeted* message. Although this was not hypothesized, it should also be noted that there was a main effect of *financial information* on the dependent variable of posttest skin cancer and sun protection knowledge  $F(1, 260) = 5.03, p = .03, \text{partial } \eta^2 = .02$ . This main effect was such that participants in the *financial information present* conditions ( $M = 5.70, SE = .07$ ) scored higher on the posttest skin cancer and sun protection knowledge measure than participants in the *financial information not present* conditions ( $M = 5.49, SE = .07$ ) (see table 3). Additionally, it should be noted that although no clear hypothesis was made regarding an interaction effect between the



*communication type* and *financial information* variables, this was still tested for in the analysis. It was found that there was no interaction effect present,  $F(2, 260) = 1.16, p = .32$ , partial  $\eta^2 = .01$ .

## **Hypothesis 5**

For hypothesis 5 (main effect of *financial information* on posttest perceived benefits of sun protection), two separate analyses of reliability were first conducted. This included one analysis with each of the six pretest perceived benefits of sun protection items and another analysis with each of the six posttest perceived benefits of sun protection items. Cronbach's Alpha scores of  $\alpha = .92$  for the pretest perceived benefits of sun protection items and  $\alpha = .95$  for the posttest perceived benefits of sun protection items were found, indicating that both scales had adequate levels of internal consistency. Following this, two composite variables were created: one combining each of the six pretest perceived benefits of sun protection items and one combining each of the six posttest perceived benefits of sun protection items. Next, an ANCOVA was run with *communication type* and *financial information* entered as the predictors, the composite variable for posttest perceived benefits of sun protection entered as the dependent variable, and the composite variable for pretest perceived benefits of sun protection entered as the covariate.

After conducting the analysis, a main effect of *financial information* was found  $F(1, 260) = 5.14, p = .02$ , partial  $\eta^2 = .02$ . Participants in the *financial information present* conditions ( $M = 5.87, SE = .08$ ) scored higher on the posttest measure of perceived benefits of sun protection than participants in the *financial information not present* conditions ( $M = 5.64, SE = .07$ ) (see table 4). Based on these results, hypothesis 5 is supported. Although this was not hypothesized, it should also be noted that there was a main effect of *communication type* on the dependent variable of

posttest perceived benefits of sun protection  $F(2, 260) = 6.00, p < .01, \text{partial } \eta^2 = .04$ . It was indicated through pairwise comparisons with a Sidak adjustment that participants in the *generic* conditions ( $M = 5.52, SE = .09$ ) scored significantly lower on the posttest measure of perceived benefits of sun protection than participants in the *tailored* conditions ( $M = 5.96, SE = .09, p < .01$ ) (see table 4). There was, however, no significant difference between the *generic* and *targeted* ( $M = 5.78, SE = .09, p = .12$ ) conditions, nor the *targeted* and *tailored* conditions ( $p = .40$ ). Additionally, it should be noted that although no clear hypothesis was made regarding an interaction effect between the *communication type* and *financial information* variables, this was still tested for in the analysis. It was found that there was no interaction effect present,  $F(2, 260) = 1.24, p = .29, \text{partial } \eta^2 = .01$ .

### **Additional Analyses**

Although no hypotheses were made regarding the remaining measures of HBM constructs (severity, barriers, and self-efficacy), analyses were still conducted on each measure to further explore the potential effects of the independent variables.

#### **Perceived severity.**

Starting with perceived severity of skin cancer, the 4-item pretest measure of perceived severity had a Cronbach's Alpha score of  $\alpha = .80$  and the 4-item posttest measure of perceived severity had a Cronbach's Alpha score of  $\alpha = .87$ , indicating that both measures had adequate levels of internal consistency. After forming composite variables for each measure, an ANCOVA was run with *communication type* and *financial information* entered as the predictors, the composite variable for posttest perceived severity entered as the dependent variable, and the composite variable for pretest perceived severity entered as the covariate. Analysis indicated that there was a main effect of *communication type*  $F(2, 260) = 5.17, p = .01, \text{partial } \eta^2 = .04$ . It

was found through pairwise comparisons using a Sidak adjustment that participants in the *generic* conditions ( $M = 5.52, SE = .09$ ) scored lower on the posttest measure of perceived severity than participants in both the *targeted* ( $M = 5.85, SE = .09, p = .02$ ) and *tailored* ( $M = 5.88, SE = .09, p = .01$ ) conditions (see table 5). Again, there was no significant difference between participants in the *targeted* and *tailored* conditions ( $p = .99$ ). In addition, there was also a main effect of *financial information* on the dependent variable of posttest perceived severity  $F(1, 260) = 11.09, p < .01, \text{partial } \eta^2 = .04$ . This main effect was such that participants in the *financial information present* conditions ( $M = 5.92, SE = .07$ ) scored higher on the posttest perceived severity measure than participants in the *financial information not present* conditions ( $M = 5.58, SE = .07$ ) (see table 5). There was, however, no significant interaction effect between the *communication type* and *financial information* variables  $F(2, 260) = 1.76, p = .18, \text{partial } \eta^2 = .01$ .

### **Perceived barriers.**

For perceived barriers to sun protection, the 8-item pretest measure of perceived barriers had a Cronbach's Alpha score of  $\alpha = .81$  and the 8-item posttest measure of perceived barriers had a Cronbach's Alpha score of  $\alpha = .92$ , indicating that both measures had adequate levels of internal consistency. After forming composite variables for each measure, an ANCOVA was run with *communication type* and *financial information* entered as the predictors, the composite variable for posttest perceived barriers entered as the dependent variable, and the composite variable for pretest perceived barriers entered as the covariate. There was found to be no main effect of *communication type*  $F(2, 260) = .269, p = .76, \text{partial } \eta^2 = .00$  (see table 6). In addition, there was no main effect of *financial information* on the dependent variable  $F(1, 260) = 1.11, p < .29, \text{partial } \eta^2 = .00$ . Finally, there was again no significant interaction effect between the

*communication type* and *financial information* variables  $F(2, 260) = 1.61, p = .20$ , partial  $\eta^2 = .01$ .

### **Perceived self-efficacy.**

For the construct of perceived self-efficacy for sun protection, the 6-item pretest measure of perceived self-efficacy had a Cronbach's Alpha score of  $\alpha = .82$  and that the 6-item posttest measure of perceived self-efficacy had a Cronbach's Alpha score of  $\alpha = .88$ , indicating that both measures had adequate levels of internal consistency. After forming composite variables for each measure, an ANCOVA was run with *communication type* and *financial information* entered as the predictors, the composite variable for posttest perceived self-efficacy entered as the dependent variable, and the composite variable for pretest perceived self-efficacy entered as the covariate. The analysis showed a main effect of *communication type*  $F(2, 260) = 10.42, p < .01$ , partial  $\eta^2 = .07$ . It was found through pairwise comparisons using a Sidak adjustment that participants in the *generic* conditions ( $M = 5.40, SE = .09$ ) scored lower on the posttest measure of perceived self-efficacy than participants in both the *targeted* ( $M = 5.79, SE = .09, p = .01$ ) and *tailored* ( $M = 5.94, SE = .09, p < .01$ ) conditions (see table 7). Again, there was no significant difference between participants in the *targeted* and *tailored* conditions ( $p = .51$ ). In addition, there was also a main effect of *financial information* on the dependent variable of posttest perceived self-efficacy  $F(1, 260) = 6.82, p = .01$ , partial  $\eta^2 = .03$ . This main effect was such that participants in the *financial information present* conditions ( $M = 5.84, SE = .07$ ) scored higher on the posttest perceived self-efficacy measure than participants in the *financial information not present* conditions ( $M = 5.58, SE = .07$ ) (see table 7). There was, however, no significant interaction effect between the *communication type* and *financial information* variables  $F(2, 260) = .68, p = .51$ , partial  $\eta^2 = .01$ .

## Discussion Study 1

Study 1 was conducted with the primary purpose of exploring which message types are most effective for promoting sun protection behaviors among a population of outdoor workers. In doing so, we tested the effects of two different independent variables: *communication type* and *financial information*. With the *communication type* variable, we compared the effects of messages with varying levels of personalization. A *tailored* message used participants' prior history of sunburn to create a message with personalized risk feedback. A *targeted* message focused on the participants status as "outdoor workers". Finally, a *generic* message was used as a comparison group, in which the message that was read could be applied to all U.S. citizens, and was not intended for any specific person or group of people. The other independent variable of interest, *financial information*, concerned the inclusion of information regarding the financial consequences of sun protection and skin cancer. Most notably, participants in the *financial information present* condition viewed messages that emphasized the treatment costs of melanoma, while participants in the *financial information not present* conditions received messages that made no mention of such costs.

### Communication Type

Regarding the *communication type* independent variable, it was consistently found across the dependent variables of interest that both the *tailored* and *targeted* messages were significantly more effective than the *generic* messages. However, in opposition to hypotheses 1-3, there is no evidence to suggest that the *tailored* message was more effective than the *targeted* message. For hypothesis 1, a main effect of *communication type* on posttest sun protection intentions, it was expected that participants in both the *tailored* and *targeted* conditions would report higher intentions to engage in sun protection behaviors than participants in the *generic*

conditions. This portion of hypothesis 1 was confirmed, as both the *tailored* and *targeted* groups scored significantly higher on the posttest measure of sun protection intentions. However, the second portion of hypothesis 1, that the *tailored* groups would score higher on the posttest measure of sun protection intentions than the *targeted* groups, was not supported. The ANCOVA analyses revealed that there was no significant difference between these two groups on the dependent measure. Thus, there is only partial support for hypothesis 1.

Similar to hypothesis 1, hypothesis 2 predicted a main effect of *communication type* on the posttest measure of perceived susceptibility to skin cancer. As with the previous hypothesis it was expected that the *tailored* and *targeted* groups would score higher on the dependent measure than the *generic* groups, and that the *tailored* groups would score higher than the *targeted* groups. Again, it was found that while the *tailored* and *targeted* groups did score significantly higher on the measure of perceived susceptibility than the *generic* groups, there was no meaningful difference between the *tailored* and *targeted* groups. Thus, there is again only partial support for hypothesis 2.

As with the previous two hypotheses, hypothesis 3 predicted a main effect of *communication type* on the posttest measure of skin cancer and sun protection knowledge. Again, it was expected that the *tailored* and *targeted* groups would score higher on the measure than the *generic* groups, and that the *tailored* groups would score higher than the *targeted* groups. Again, the results revealed that the *tailored* and *targeted* groups did score significantly higher than the *generic* groups, however, there was no significant difference between the *tailored* and *targeted* groups. Again, this finding leads to only partial support for hypothesis 3.

Though no hypotheses were made regarding the effects of the *communication type* variable on the additional measures included in study 1, the analyses were conducted and

produced similar results. For the posttest measures of perceived benefits of sun protection, perceived severity of skin cancer, and perceived self-efficacy for sun protection, ANCOVA analyses again revealed main effects for *communication type*. In each instance, the *tailored* and *targeted* groups scored significantly higher than the *generic* groups, but there was no significant difference between the *tailored* and *targeted* groups. Notably, the only dependent measure which did not produce the aforementioned finding was the measure of perceived barriers to sun protection. However, given that the messages used in study 1 purposefully avoided placing excessive focus on potential barriers, in accordance with Lee et al.'s (2014) recommendation, the lack of an effect for this dependent variable is not particularly surprising.

Although it was predicted that a message tailored to individual participants would be more effective than a message targeted towards outdoor workers, in general, the lack of significant findings is, again, not entirely surprising. As mentioned earlier, researchers have found that although tailoring can often be more effective than targeting, this is not always the case. For instance, Kerr, Savik, Monsen and Lusk (2007) found no observable difference tailored and targeted messages used to promote hearing protection in a sample of construction workers. Similarly, Elish, Royak-Schaler, and Higginbotham (2011) found tailored and targeted interventions to be equally effective in promoting medical eye examinations. As Noar, Benac, and Harris (2007) point out, variables that are good candidates for tailoring are those that exhibit considerable variability. While there may potentially be sufficient variability in the number of lifetime sunburns (the variable used to establish tailored risk feedback), that variability is likely lessened due to the use of interval response options for this measure in the present study. Similarly, the use of interval response options resulted in participants in the *tailored* conditions receiving personalized risk feedback ranging from a 220% to 289% increased risk for melanoma.

This is in comparison to the 250% number that was given to all participants in the *targeted* conditions. Given that many participants in the *targeted* conditions saw a risk feedback number that was larger than what participants in the *tailored* conditions saw, and that the difference between risk feedback numbers between the two conditions could be considered relatively small, it may potentially explain the lack of an observable difference between the *tailored* and *targeted* conditions. Despite this, there does still appear to be a pattern of the adjusted means generally being higher in the *tailored* conditions than in the *targeted* conditions across DVs (see figures 1-7). Even though these differences are not significant, such a trend indicates that tailoring may still be more effective than targeting under certain conditions. Perhaps a longer, sustained intervention than what was used in study 1 would lead to the differences between tailored and targeted conditions to become more pronounced or significantly different. Further research would be necessary to determine this, though.

### **Financial Information**

Supporting hypotheses 4 and 5, it was consistently found across the dependent measures that messages which featured the inclusion of financial information were more effective than the messages which did not include a discussion of the financial consequences of skin cancer and melanoma. Starting with hypothesis 4, it was predicted that there would be a main effect of the *financial information* variable with participants in the *financial information present* conditions scoring higher on the posttest measure of sun protection intentions than participants in the *financial information not present* conditions. Indeed, the ANCOVA analysis supported this hypothesis, as those receiving financial information in their message did report greater intentions to practice sun protection behaviors than those who did not receive any such financial information in their message. Similar to hypothesis 4, hypothesis 5 predicted that those in the



*financial information present* conditions would score higher on the posttest measure of perceived benefits of sun protection than those in the *financial information not present* conditions. Again, the analysis supported hypothesis 5, as those receiving financial information in their message did score higher on the posttest measure of perceived benefits than those that did not have financial information included in their message.

Although no hypotheses were made regarding the effect of the *financial information* variable on the remaining dependent measures included in study 1, additional analyses provided similar results to hypotheses 4 and 5. For the dependent measures of posttest skin cancer and sun protection knowledge, perceived severity of skin cancer, and perceived self-efficacy of sun protection, there was found to be a significant difference between the adjusted means of the *financial information present* and *financial information not present* groups. In each instance, the *financial information present* groups scored higher on the posttest measures than did those in the *financial information not present* groups. The only variables for which this main effect did not appear were the posttest measures for perceived barriers to sun protection and perceived susceptibility to skin cancer. This is, again, not entirely surprising. As mentioned earlier, discussion of perceived barriers was purposefully kept to a minimum in the messages and it was not anticipated that financial information would be connected to perceived susceptibility in any way. In total, the above findings appear to offer considerable support for the use of financial information when attempting to communicate the risk of excessive or unsafe sun exposure and to encourage the use of sun protection behaviors.

### **Limitations and Future Directions**

Although a more thorough review of the limitations and future directions that are common between study 1 and study 2 will occur in the general discussion, this section will detail

such aspects that are unique to study 1. Regarding limitations, it was mentioned earlier that it may be possible that the finding of tailored messages to be no more effective than targeted messages could be the result of a lack of variability within the personalized risk feedback given to participants. The use of interval response options for determining personalized risk feedback is due primarily to the lack of available medical research that can be applied to a continuous scale. Although it would be ideal to communicate to participants how much their risk for melanoma is increasing with each single sunburn, there is simply no widely-supported medical research data to base such feedback on. As skin cancer research advances, it may soon be possible to place a more exact number on the increased risk of skin cancer or melanoma that results from each subsequent sunburn. Once such data is available, and can be utilized in health communication, it may be possible that we would find different effects when comparing tailored and targeted messages.

Additionally, it should be noted that the effect sizes in study 1 may be considered to be relatively small. In study 1, the effect sizes for the significant main effects ranged from .02 to .07. In comparison to Cohen's (1988) classification of effect sizes, these would all be considered to be below the threshold for small effect sizes. Among other reasons that will be touched on in the general discussion, the small effect sizes could be the result of the lack of a true control condition. Serving as the "control" condition in study 1 was the *generic* message. Although this message type was not expected to be as effective as the *tailored* or *targeted* messages, it was still expected to be somewhat effective. To illustrate this, a paired samples t-test was conducted to compare pretest sun protection scores and posttest sun protection intention scores for only those in the *generic/non-financial* condition, which was expected to be the least effective message type. There was found to be a significant difference between pretest ( $M = 4.68, SD = 1.16$ ) and

posttest ( $M = 5.10$ ,  $SD = 1.29$ ) scores for the *generic/non-financial* participants  $t(45) = 3.40$ ,  $p < .01$ . This finding indicates that even the supposed “weakest” condition in the study was still reasonably effective at promoting sun protection. As such, perhaps including a true control message consisting solely of innocuous content could lead to more apparent differences between conditions and thus a larger effect size. Future research may wish to utilize a true control message to determine the overall effect of using message types similar to those that were included in study 1, as opposed to their effect in comparison with one another.

## **Implications**

The findings of study 1 carry a number of theoretical and practical implications. Starting with the theoretical or research implications, study 1 provides additional insight into the use of HBM constructs as a basis for tailoring health interventions. While there has been some success thus far in tailoring HBM constructs within the domain of safe-sun exposure, such research is relatively scarce and has often consisted of multiple components (e.g. education, training, providing materials, etc.). The present study, with its singular intervention message, addresses a call from past researchers (Horsham et al., 2014) for more focus to be placed on specific intervention components. Furthermore, the use of an MTurk sample in study 1 helps to address calls for safe-sun research on outdoor workers to include more diverse samples (Horsham et al. 2014). Additionally, the finding of tailored and targeted messages to be of roughly equal effectiveness further indicates that tailoring may not be appropriate for all situations. Future researchers may need to determine under what exact conditions tailoring is the most effective communication method. Similarly, study 1’s evidence for the effectiveness of including financial information in health communication is a somewhat novel finding. Although past research has shown that finances are an important consideration in domains such as smoking

(Sindelar & O'Malley, 2014) and environmentalism (Bashier et al., 2011; Tijs et al., 2017; Van de Vyver et al., 2018), it has primarily been ignored in other health domains. The present findings indicate that including financial information or discussing treatment costs in a message may be an effective method for promoting positive health changes. Further research may wish to determine the effectiveness of financial information in new domains (e.g. dieting, exercise, alcohol consumption, etc.).

As for practical implications, study 1 indicates that tailoring message content may be an unnecessary step when communicating the health risks of unsafe sun exposure. As previous researchers have noted, the disadvantage of tailoring health content is that it can be quite costly and time-intensive (Campbell & Quintiliani, 2006; Elish, Royak-Schaler, & Higginbotham, 2011; Noar, Benac, & Harris, 2007; Schmid et al., 2008). As such, the present study's findings indicate that researchers and practitioners should avoid spending the extra time and resources necessary to tailor safe-sun messages for outdoor workers. While some degree of personalization does appear to be necessary, as both the *tailored* and *targeted* groups scored higher than the *generic* groups, simply using a targeted message may be sufficient. In being able to create messages that will be applicable to larger subsets of the population through targeting, this will save considerable time and resources for those who are tasked with communicating the risks of sun exposure to outdoor workers. In addition, the finding that including financial information in a message leads to greater intention to perform sun protection behaviors should be noted by health communication practitioners. Including such information may help in promoting safe-sun behaviors and lead to greater health outcomes for outdoor workers who are at-risk. Indeed, the findings related to both the *communication type* and *financial information* independent variables in study 1 may ultimately lead to greater instances of outdoor workers

practicing sun protection behaviors and fewer numbers of outdoor workers suffering from skin cancer and melanoma.

## **Chapter 3 - Study 2**

### **Overview**

While study 1 focuses on outdoor employees at the individual level, the purpose of study 2 was to focus on employers or managers who may be able to influence change from the top-down. In essence, Study 2 randomly assigned managers to read one of four message types (control, employee well-being, employer financial, and combined). Both before and after reading the message, managers were asked questions regarding encouraging sun protection behaviors in their employees and their perceived importance of doing so. As research is severely lacking in this area, study 2 represents a necessary initial step. Ultimately, study 2 attempted to discover which methods were most effective for communicating the risks of unsafe sun exposure to employers and could provoke managers to encourage sun protection behaviors in their employees and at their workplace.

### **Role of the Workplace in Sun Protection**

Though nearly all research conducted on safe sun protection for outdoor workers has been conducted with individual employees, researchers have consistently noted the important role that employers and workplace support have. For instance, Woolley, Lowe, Raasch, Glasby, and Buettner (2008) looked at the effect that workplace policies have on sun protection behaviors by comparing outdoor workers who have a mandatory sun protection policy at their worksite with workers who have a strictly voluntary sun protection policy. Results from the study showed that employees at worksites with mandatory sun protection policies had fewer solar keratoses (i.e. warts from sun damage) and had fewer reported instances of skin cancer than employees at worksites with a voluntary sun protection policy (Woolley et al., 2008). Around the same time, Hammond, Reeder, Gray, and Bell (2008) surveyed outdoor workers in New Zealand about the

role that their workplace plays in their own personal sun protection. Participants in this study came from a variety of occupations, including builders, road workers, and horticulture workers (Hammond et al., 2008). Ultimately, the researchers found that perceived workplace support was significantly associated with increased sun protection practices (Hammond et al., 2008). In a related study of outdoor workers from New Zealand, McCool, Reeder, Robinson, Petrie, and Gorman (2009) surveyed workers about their attitudes and behaviors toward sun protection. The authors found that workplace support was again associated with sunscreen use. Furthermore, it was noted that workplace support, along with prioritization of sun protection, concern about sun exposure, and knowledge about sun exposure, accounted for 37% of the variance in sunscreen use (McCool et al., 2009). Together, these studies indicate that workplace support and policies can play a rather significant role in employees' sun protection decisions and health outcomes.

In further study of the role of the employer in sun protection, Janda et al. (2014) surveyed outdoor workers across several industries in Australia regarding their thoughts and behaviors toward sun protection. It was found that 53% of workplaces had some form of sun protection policy and that 50% of workplaces provided some form of education on sun protection (Janda et al., 2014). The authors also noted that those who had received education on sun protection from their employers were significantly more likely to practice sun protection behaviors (Janda et al., 2014). Recently, Schilling et al. (2018) sampled German outdoor workers to determine perceived workplace support for a variety of sun protection behaviors. It was found that just 17.8% of workers agreed that sun protection is enforced at their workplace and that only 27.3% of supervisors protected themselves from the sun (Schilling et al., 2018). Participants who perceived workplace support for sun protection were also found to show greater concern about the dangers of sun exposure, were more likely to use sunscreen, and were more likely to stay in

the shade during work hours (Schilling et al., 2018). Further, outdoor workers who perceived that their supervisors were practicing sun protection behaviors were more likely to practice these behaviors themselves, such as by wearing long-sleeved shirts and sunglasses (Schilling et al., 2018). As these studies have indicated, employers can have a significant impact on their employees' sun protection behaviors in a variety of ways.

### **Employer-targeted Sun Protection Interventions**

Whether it's by providing workplace support (Hammond et al., 2008; McCool et al., 2009; Schilling et al., 2018), education (Janda et al., 2014), behavioral modeling (Schilling et al., 2018), or mandatory policies (Woolley et al., 2008), research has shown that employers can play a significant role in their employees' sun protection habits and health outcomes. To date though, interventions targeting employers directly are almost entirely non-existent. Recently, Buller et al. (2018) tested the effect of a sun protection intervention program aimed at local government organizations in the U.S. Here, the two-year intervention consisted of several meetings with project staff regarding a sun safety program, the provision of a website containing a variety of resources related to the sun safety program, and training on the program itself (Buller et al., 2018). At the end of the two-year period, the researchers found that more organizations receiving the intervention had a sun protection policy in place and that their sun protection policies were much more extensive and stronger than those in a control group (Buller et al., 2018). Although not specifically not targeting outdoor workers, a related study was conducted by Buller et al., (2011) that targeted public school districts to adopt sun protection policies. A similar intervention was used that included meetings, a website, printed materials, and presentations relating to a safe-sun program (Buller et al., 2011). Although the intervention group was again found to have adopted stronger sun safety policies than a control group, there



was no significant difference between the two groups in the percentage of districts adopting a policy (Buller et al., 2011). Given the mixed findings between these two studies and the lack of sun protection research aimed at organizations, it may be most beneficial to look at what research has taken place in other domains.

### **Appealing to Employers**

In an effort to find out what motivates employers to take action in favor of their employees' health, several researchers have gone straight to the source by interviewing decision-makers. For instance, Miller and Haslam (2009) interviewed occupational health and safety professionals in the United Kingdom to explore attitudes and motivations regarding employee health investment. Throughout their interviews, Miller and Haslam (2009) noted that many individuals simply felt it was "the right thing to do" and reported that employee health and well-being was a key driver in decision-making. Notably, interviewees also touched on the financial and business ramifications by noting things such as legal compliance, cost of illness, insurance premiums, and loss of productivity (Miller & Haslam, 2009). Van Dongen et al. (2013) conducted a similar qualitative study using occupational health decision-makers in Canada. While some participants mentioned their moral obligation to help their employees, participants primarily focused on the financial implications of occupational health and safety interventions, especially the employer's costs and benefits (van Dongen et al., 2013). This finding of financial benefits outweighing moral or employee health benefits actually appears to be a reoccurring theme in this line of research.

Pescud et al. (2015) interviewed business owners and managers regarding their thoughts on worker health. It was found that productivity was the most frequently mentioned outcome of importance when thinking about why having healthy workers is important (Pescud et al., 2015).

Numerous participants brought up issues such as sick days, lost production, and the costs of instituting health programs. Again, while there was some mention of employee health and well-being, interviewees chose to largely focus on the business and financial impacts of employee health. Further, Terres, Castejon, and Mondelo (2013) compared intrinsic (e.g. moral and ethical responsibility) and extrinsic (e.g. legal compliance and avoiding litigation) motivation for implementing health and safety programs among managers of construction firms in Spain. The authors found that extrinsic motivation was significantly associated with higher levels of perceived safety risk (Terres, Castejon, & Mondelo, 2013). This indicates that focusing on those extrinsic factors can lead to greater concern among managers, and potentially even behavioral, worksite, or policy changes. The authors go so far as to recommend that future interventions aimed at managers should focus on the financial implications of health outcomes (Terres, Castejon, & Mondelo, 2013).

## **Hypotheses**

As some studies have indicated the important role of employers in promoting safe sun protection but few have actually tested interventions, study 2 represents a necessary initial step in this domain. Since past research has focused on two primary motivations (employee well-being versus business and financial outcomes) behind the implementation of health and safety programs, the present study sought to determine which of these appeals would be most appropriate for safe-sun promotion. To briefly summarize past findings, while employee health and well-being can be an important factor in decision-making, it appears that business and financial outcomes are the primary focus of most decision-makers. Given these findings, the following hypotheses were made in regards to study 2:

*Hypothesis 1:* There will be a main effect of *message type* on the dependent variable of posttest future sun protection encouragement intentions. This will be such that participants in the *employee well-being*, *employer financial*, and *combined* conditions will score higher on the posttest measure of sun protection encouragement intentions than participants in the *control* condition. Similarly, it is expected that participants in the *employer financial* and *combined* conditions will score higher than participants in the *employee well-being* condition on the same measure.

*Hypothesis 2:* There will be a main effect of *message type* on the dependent variable of posttest perceived importance of employee sun protection. This will be such that participants in the *employee well-being*, *employer financial*, and *combined* conditions will score higher on the posttest measure of perceived importance of employee sun protection than participants in the *control* condition. Similarly, it is expected that participants in the *employer financial* and *combined* conditions will score higher than participants in the *employee well-being* condition on the same measure.

## **Method Study 2**

### **Participants**

Study 2 recruited 195 participants from the U.S. through Amazon's Mechanical Turk (MTurk) program. Participants consisted of self-identified managers, assistant managers, or supervisors of outdoor workers. MTurk was again being used in order to obtain a more diverse sample than would otherwise be possible through undergraduate samples or most organizational samples (Keith, Tay, & Harms, 2017; Landers & Behrend, 2015). Study 2 also addressed any potential issues related to inattention or fraudulent responding by utilizing recommendations from Cheung et al. (2017). This included the use of attention check items, multiple questions

that asked participants to describe their job in detail, and the use of qualifications for participation in the study. For instance, MTurk contains a premium qualification that allowed the study to only be viewed by participants that had previously self-reported being employed as a manager. Using a qualification such as this helped to ensure that Study 2's sample consisted only of members from the desired population.

Of the initial 195 participants who completed the survey, 43 participants were removed from the data set for failing to meet requirements of being a manager of outdoor workers. This included participants that indicated that they were unemployed ( $n = 2$ ), not a manager, assistant manager, or supervisor ( $n = 13$ ), or did not manage employees that spent significant amounts of time outdoors ( $n = 28$ ). A further 13 participants failed at least one of the attention check items in the study and were removed from the data set. This resulted in a final data set of 139 participants to be used for analyses.

Of the remaining 139 participants, 94 were male (67.6%) and 45 were female (32.4%). Participant ages ranged in years from 22 to 71, with an average age of 37.31 ( $SD = 10.75$ ). The majority of the sample was White/Caucasian (67.6%), followed by Black/African-American (9.4%), Asian/Pacific Islander (7.9%), Hispanic (7.9%), Native American (5.0%), and Other (2.2%). When asked to select their highest level of education, the most commonly cited response was a 4-year degree (50.4%), followed by some college (17.3%), graduate or professional degree (12.2%), 2-year degree (11.5%), and high school graduate (8.6%). Additionally, respondents were asked to select the industry in which they worked. The most commonly cited responses were construction (30.2%), technology (12.9%), landscaping (7.9%), and farming (7.2%). The majority of respondents were employed full-time (95.7%) and participants reported working an average of 44.11 ( $SD = 9.19$ ) hours per week. When asked about the number of employees that

they manage or supervise, participants reported an average of 27.97 ( $SD = 67.92$ ) and a median of 10. Additionally, when asked about the number of employees that they manage or supervise that spend significant amounts of time working outdoors, participants reported an average of 14.25 ( $SD = 26.88$ ) and a median of 7.

## **Design**

Study 2 tested the effects of a single between-subjects independent variable (*Message type*) with four levels on participants' intended encouragement of sun protection behaviors in their employees and various attitudes toward sun protection.

### **Intervention.**

As with study 1, efforts were made to control for any potentially confounding variables between conditions in study 2. All four intervention messages were of the same text-based format and were kept to similar lengths. Again, much of the content for three of the four messages (excluding the control message) was adapted from an advertisement by the American Academy of Dermatology (2018). Furthermore, efforts were made to keep word choice and phrasing similar between conditions where appropriate. To view the intervention messages in their entirety, please see Appendix D.

### **Message type.**

Participants were randomly assigned to one of the four levels of *message type*: *employee well-being*, *employer financial*, *combined*, and *control*. In the *employee well-being* condition, participants viewed a message that emphasized the potential health and wellness consequences that excessive and unsafe sun exposure can have on the managers' employees. Content here focused on issues related to skin cancer and other health ailments related to sun exposure that could result in physical and emotional suffering for employees. In the *employer financial*

condition, managers viewed a message that emphasized the potential financial consequences that excessive and unsafe sun exposure can have on their workplace or business. This included information from the CDC (2018-a) relating to monetary amounts lost in productivity and potential workers' compensation regulations. The *combined* condition combined information from the previous two conditions and presented participants with information related to both their employees' well-being and the potential financial consequences for their own workplace or business. Finally, the *control* message simply contained information about different industries that feature outdoor work and was adapted from the Learn How to Become website (2018). This last condition was purposefully intended to have innocuous content in order to have a suitable comparison for determining the effectiveness of the other three message types.

## Measures

### **Work information.**

In accordance with recommendations by Cheung et al. (2017), several initial items were included in the survey that asked participants about their qualifications for the study. This included several items relating to the participants' role as managers of outdoor workers. Participants were asked about their employment status, as well as asked to provide written responses to questions asking about their job title, the industry that they work in, and the job tasks that they perform. Further items included the number of hours worked per week, how long the individual has been employed at their current job, whether or not they are a manager or supervisor at the workplace, and the number of employees that they manage. Specific to outdoor work, participants were asked if they manage or supervise outdoor workers, the number of outdoor workers that they manage or supervise, and the types of tasks that outdoor workers perform. Additional items assessed whether the participants work outside themselves, what

percentage of their workday takes place outdoors, the tasks that they perform, the number of hours outside on both a workday and non-workday, the number of days per week that they work outside, and whether or not their workplace has a sun protection policy (see Appendix E).

#### **Pretest sun protection behaviors.**

As with study 1, study 2 included measurements related to six sun protection behaviors. This included the use of sunscreen, some form of head protection (e.g. hat, cap, visor, bandana, etc.), long-sleeved shirts, long pants, sunglasses, and seeking shade while outdoors. However, in study 2 these items were not regarding the participants' personal protection behaviors, but rather the extent to which they encourage such behaviors in their employees. This included items such as "In the past summer, how often did you encourage your employees to use sunscreen while outdoors?" and "In the past summer, how often did you encourage your employees to wear a long-sleeved shirt while outdoors?". All items were assessed using a 7-point Likert scale ranging from "Never" to "Frequently" (see Appendix E).

#### **Pretest sun protection importance.**

This section consisted of a single item designed to measure participants' perceived importance of employee sun protection. The item was phrased as, "How important is it that your employees use some form of sun protection at work?". This item was measured using a 7-point Likert scale ranging from "Not at all" to "Extremely" (see Appendix E).

#### **Pretest additional attitude items.**

Outside of the two primary dependent variables of interest, participants were also asked to provide responses on five separate items concerning their attitudes toward sun protection and exposure. This included items regarding the importance of personal sun protection, concern for the effect of sun exposure on personal health and well-being, concern for the effect of sun

exposure on employee health and well-being, concern for the financial effect of sun exposure, and perceived necessity of a workplace sun protection policy. Each of these single-item measures was assessed using a 7-point Likert scale with varying response options (see Appendix E).

#### **Posttest sun protection intentions.**

Following the intervention messages, participants completed several items assessing their future intentions to encourage sun protection behaviors in their employees. In total, there were six items covering six different protection behaviors, each assessed using a 7-point Likert scale (see Appendix F). As an example, the item regarding sunscreen use was phrased as “In the future, how often do you intend to encourage your employees to use sunscreen while outdoors?”. As with study 1, intentions were expected to be suitable replacement for behavioral measures based on past research (Hillhouse et al., 1997)

#### **Posttest sun protection importance.**

The same item regarding sun protection importance that was used in the pretest was again asked during the posttest. This item was again assessed using the same 7-point Likert scale and retained the exact same wording and response set as was used in the pretest (see Appendix F).

#### **Posttest additional attitude items.**

The same five items that were used in the pretest to measure various attitudes toward sun protection and sun exposure were again asked during the posttest. This included items regarding the importance of personal sun protection, concern for the effect of sun exposure on personal health and well-being, concern for the effect of sun exposure on employee health and well-being, concern for the financial effect of sun exposure, and perceived necessity of a workplace sun



protection policy. Again, all five items retained the exact same wording and were measured using the same 7-point Likert scale as in the pretest.

### **Demographic questions.**

Demographic information was assessed at the end of the survey. Participants were asked to provide their age, ethnicity, gender, and highest level of education (see Appendix F).

### **Attention checks.**

Attention checks were again utilized throughout the survey to ensure that participants were not carelessly responding to items. This included items such as “Please enter today’s date” and “Please solve the following math equation.  $2 + 2 = ?$ ”. Additionally, to ensure that participants had read the intervention message, an attention check was placed below the message that asked participants to provide a brief (one sentence) summary of the message that they had just read (see Appendix F).

## **Procedure**

Participants completed study 2 using an online survey in Qualtrics which was distributed using MTurk. Once participants had read and agreed to the informed consent, they were first provided with the pretest items assessing work information. Following completion of this section, participants then responded to the items assessing their encouragement of sun protection behaviors in their employees, perceived importance of employee sun protection, and the additional attitude measures. After completing each of these pretest measures, participants were randomly assigned to one of the four message types described previously. Again, these consisted of a *control*, *employee well-being*, *employer financial*, and *combined* message. To ensure that each intervention message was being read and that participants were not just clicking through the page, an attention check was placed at the bottom of the page. This attention check item asked

participants to summarize the message that they had just read and needed to be responded to before participants were allowed to advance to the next page. After participants had viewed their message and responded to the attention check item, they were then asked to provide their future intentions toward encouraging sun protection behaviors in their employees. Next, participants filled out the item assessing their perceived importance of employee sun protection, the additional attitude items, and their demographic information. At the conclusion of the study, participants were debriefed, thanked for their participation, and provided with payment through their MTurk account.

## **Results Study 2**

### **Hypotheses Testing**

To test hypotheses for study 2, an analysis plan similar to study 1 was followed. Namely, study 2 utilized multiple ANCOVAs to test for the effects of *message type* on the dependent variables of posttest sun protection encouragement intentions and posttest perceived importance of employee sun protection. The ANCOVA was used to answer the research question, “Which message type is most effective for communicating to employers the importance of encouraging sun protection among their employees?”. As with study 1, the use of an ANCOVA was chosen partially for its ability to ensure equality between groups on relevant measures. Again, any main effects that were found were further investigated through pairwise comparisons using a Sidak adjustment. A Sidak adjustment was utilized due to its relatively liberal correction while maintaining a familywise error rate of .05 (Hayes, 2005).

Before conducting analyses, the assumptions of ANCOVA were tested. In doing so, there was found to be homogeneity of regression slopes, meaning there was no interaction between the any of the covariates and the independent variables. Similarly, Levene’s test of

homogeneity of variance was found to be non-significant for each analysis, indicating that variance was roughly equal between groups. Linearity was found to be present, with scatter plots indicating that each dependent variable-covariate relationship was approximately linear. The only assumption that may have been questionable was normality. After calculating residuals, the variables of posttest perceived importance of employee sun protection ( $p = .01$ ), posttest perceived importance of personal sun protection ( $p < .01$ ), posttest concern for personal health ( $p = .05$ ), posttest concern for employee health ( $p < .01$ ), posttest financial concern ( $p < .01$ ) and posttest perceived necessity of workplace sun protection policy ( $p = .01$ ) were all found to be significant on the Shapiro-Wilk test of normality. However, further examination through histograms showed approximately normal curves while Q-Q plots revealed that these variables did not show extreme departures from normality, as points on the plot were fairly clustered around the designated line. Furthermore, previous research has shown that the ANCOVA is fairly robust to violations of normality, especially with sample sizes of roughly 30 participants or more per group (Tabachnick & Fidell, 2013) and when the assumption of homogeneity of regression slopes is met (Levy, 1980). Due to this, ANCOVA analyses were proceeded with for the data.

## **Hypothesis 1**

For hypothesis 1 (main effect of *message type* on the posttest measure of sun protection encouragement intentions), two separate analyses of reliability were conducted. One analysis was run using the six pretest sun protection encouragement items and the second analysis was run using the six posttest sun protection encouragement items. Cronbach's Alpha scores of  $\alpha = .88$  for the pretest encouragement items and  $\alpha = .93$  for the posttest encouragement items were found, indicating an adequate level of internal consistency for both measures. Next, a composite

variable was created to combine all six of the pretest encouragement items, and another composite variable was created to combine all six of the posttest encouragement items. An ANCOVA was then run with *message type* entered as the predictor, the composite variable for posttest encouragement as the dependent variable and the composite variable for pretest encouragement entered as the covariate.

After conducting the analysis, there was found to be a main effect of *message type*  $F(3, 134) = 15.83, p < .01$ , partial  $\eta^2 = .26$ . It was indicated through pairwise comparisons using a Sidak adjustment that participants in the *control* condition ( $M = 4.71, SE = .16$ ) scored significantly lower on the posttest measure of sun protection encouragement intentions than participants in the *employee well-being* ( $M = 5.39, SE = .16, p = .02$ ), *employer financial* ( $M = 6.02, SE = .16, p < .01$ ), and *combined* ( $M = 6.10, SE = .16, p < .01$ ) conditions (see table 8). Additionally, it was found through the pairwise comparisons that the adjusted mean difference between the *employee well-being* and *employer financial* conditions was significant ( $p = .04$ ), as was the adjusted mean difference between the *employee well-being* and *combined* conditions ( $p = .01$ ). The adjusted mean difference between the *employer financial* and *combined* conditions was not significant ( $p = 1.00$ ). Based on these results, we are able to conclude that hypothesis 1 is supported, with adjusted mean scores on the composite variable for sun protection encouragement intentions for the *control* condition being significantly lower than scores in the *employee well-being*, *employer financial*, and *combined* conditions and the adjusted mean scores on the composite variable for the *employee well-being* condition being significantly lower than scores in the *employer financial* and *combined* conditions.

## Hypothesis 2

In testing hypothesis 2 (main effect of *message type* on the posttest measure of perceived importance of employee sun protection), an ANCOVA was run with *message type* entered as the predictor, the single-item measure for posttest perceived importance of employee sun protection as the dependent variable and the single-item measure for pretest perceived importance of employee sun protection entered as the covariate. After conducting the analysis, a main effect of *message type* was found,  $F(3, 134) = 10.07, p < .01$ , partial  $\eta^2 = .18$ . It was found through pairwise comparisons using a Sidak adjustment that participants in the *control* condition ( $M = 4.98, SE = .17$ ) scored significantly lower on the posttest measure of perceived importance of employee sun protection than participants in the *employee well-being* ( $M = 5.67, SE = .17, p = .02$ ), *employer financial* ( $M = 6.02, SE = .16, p < .01$ ), and *combined* ( $M = 6.14, SE = .16, p < .01$ ) conditions (see table 9). Each of the remaining adjusted mean differences between conditions were not significant, including the adjusted mean difference between the *employee well-being* and *employer financial* conditions ( $p = .56$ ), the *employee well-being* and *combined* conditions ( $p = .22$ ), and the *employer financial* and *combined* conditions ( $p = 1.00$ ). Based on these results, we can conclude that hypothesis 2 is partially supported. Although posttest perceived importance of employee sun protection scores in the *control* condition are significantly lower than scores in each of the three other conditions, the scores in the *employee well-being* condition are not significantly lower than the scores in the *employer financial* and *combined* conditions.

## **Additional Analyses**

In addition to the dependent measures discussed above, there were several other attitude measures that were included in the survey for study 2. Although no hypotheses were made regarding these dependent measures, the results of their analyses are discussed below.

### **Personal sun protection.**

Both before and after receiving their randomly assigned message, participants were asked to respond to the question, “How important is it that you, personally, use some form of sun protection when outdoors?”. The responses for this item were on a 7-point Likert scale with responses ranging from a one being “Not at all important” to a seven being “Extremely important”. To analyze the results for this item, an ANCOVA was run with *message type* entered as the predictor, the single-item measure for posttest perceived importance of personal sun protection as the dependent variable and the single-item measure for pretest perceived importance of personal sun protection entered as the covariate. After conducting the analysis, a main effect of *message type* was found,  $F(3, 134) = 9.51, p < .01$ , partial  $\eta^2 = .18$ . It was found through pairwise comparisons using a Sidak adjustment that participants in the *control* condition ( $M = 5.00, SE = .16$ ) scored significantly lower on the posttest measure of perceived importance of personal sun protection than participants in the *employee well-being* ( $M = 5.69, SE = .16, p = .02$ ), *employer financial* ( $M = 5.96, SE = .16, p < .01$ ), and *combined* ( $M = 6.14, SE = .16, p < .01$ ) conditions (see table 10). Each of the remaining adjusted mean differences between conditions were not significant, including the adjusted mean difference between the *employee well-being* and *employer financial* conditions ( $p = .80$ ), the *employee well-being* and *combined* conditions ( $p = .28$ ), and the *employer financial* and *combined* conditions ( $p = .97$ ).

### **Personal health and well-being.**

Both before and after receiving their randomly assigned message, participants were asked to respond to the question, “To what extent are you concerned about the effects that sun exposure can have on your personal health and well-being?”. The responses for this item were on a 7-point Likert scale with responses ranging from a one being “Not at all concerned” to a seven being “Extremely concerned”. To analyze the results for this item, an ANCOVA was run with *message type* entered as the predictor, the single-item measure for posttest personal health and well-being concern as the dependent variable and the single-item measure for pretest personal health and well-being concern entered as the covariate. After conducting the analysis, a main effect of *message type* was found,  $F(3, 134) = 8.71, p < .01$ , partial  $\eta^2 = .16$ . It was indicated through pairwise comparisons using a Sidak adjustment that participants in the *control* condition ( $M = 4.90, SE = .17$ ) scored significantly lower on the posttest measure of personal health and well-being concern than participants in the *employee well-being* ( $M = 5.71, SE = .17, p = .01$ ), *employer financial* ( $M = 5.94, SE = .17, p < .01$ ), and *combined* ( $M = 5.99, SE = .17, p < .01$ ) conditions (see table 11). Each of the remaining adjusted mean differences between conditions were not significant, including the adjusted mean difference between the *employee well-being* and *employer financial* conditions ( $p = .92$ ), the *employee well-being* and *combined* conditions ( $p = .82$ ), and the *employer financial* and *combined* conditions ( $p = 1.00$ ).

#### **Employee health and well-being.**

Both before and after receiving their randomly assigned message, participants were asked to respond to the question, “To what extent are you concerned about the effects that sun exposure can have on your employees’ health and well-being?”. The responses for this item were on a 7-point Likert scale with responses ranging from a one being “Not at all concerned” to a seven being “Extremely concerned”. To analyze the results for this item, an ANCOVA was run with

*message type* entered as the predictor, the single-item measure for posttest employee health and well-being concern as the dependent variable and the single-item measure for pretest employee health and well-being concern entered as the covariate. After conducting the analysis, a main effect of *message type* was found  $F(3, 134) = 3.95, p = .01$ , partial  $\eta^2 = .08$ . It was indicated through pairwise comparisons using a Sidak adjustment that participants in the *control* condition ( $M = 5.11, SE = .20$ ) scored significantly lower on the posttest measure of employee health and well-being concern than participants in the *combined* condition ( $M = 6.06, SE = .19, p = .01$ ) (see table 12). There were no significant difference between the adjusted means for any of the remaining comparisons.

#### **Financial concern.**

Both before and after receiving their randomly assigned message, participants were asked to respond to the question, “To what extent are you concerned about the financial consequences of excessive sun exposure?”. The responses for this item were on a 7-point Likert scale with responses ranging from a one being “Not at all concerned” to a seven being “Extremely concerned”. To analyze the results for this item, an ANCOVA was run with *message type* entered as the predictor, the single-item measure for posttest financial concern as the dependent variable and the single-item measure for pretest financial concern entered as the covariate. After conducting the analysis, a main effect of *message type* was found,  $F(3, 133) = 11.27, p < .01$ , partial  $\eta^2 = .20$ . It was indicated through pairwise comparisons using a Sidak adjustment that participants in the *control* condition ( $M = 4.73, SE = .20$ ) scored significantly lower on the posttest measure of financial concern than participants in the *employer financial* ( $M = 5.80, SE = .19, p < .01$ ), and *combined* ( $M = 6.02, SE = .19, p < .01$ ) conditions (see table 13). Additionally, participants in the *employee well-being* condition ( $M = 4.87, SE = .20$ ) scored significantly lower



than participants in the *employer financial* ( $p = .01$ ) and *combined* ( $p < .01$ ) conditions. There was, however, no significant difference between the adjusted means for the *control* and *employee well-being* and conditions ( $p = 1.00$ ) or the *employer financial* and *combined* conditions ( $p = .97$ ).

### **Workplace sun protection policy.**

Finally, participants were asked both before and after receiving their randomly assigned message to respond to the question, “To what extent do you feel that a policy regarding sun protection is necessary at your work place?”. The responses for this item were on a 7-point Likert scale with responses ranging from a one being “Not at all necessary” to a seven being “Extremely necessary”. To analyze the results for this item, an ANCOVA was run with *message type* entered as the predictor, the single-item measure for posttest necessity of a sun protection policy as the dependent variable and the single-item measure for pretest necessity of a sun protection policy entered as the covariate. After conducting the analysis, a main effect of *message type* was found,  $F(3, 133) = 4.86, p < .01, \text{partial } \eta^2 = .10$ . It was indicated through pairwise comparisons using a Sidak adjustment that participants in the *control* condition ( $M = 5.00, SE = .23$ ) scored significantly lower on the posttest measure of necessity of a sun protection policy than participants in the *combined* condition ( $M = 6.05, SE = .22, p = .01$ ) (see table 14). Additionally, there was a significant difference between the adjusted means for the *employee well-being* condition ( $M = 5.16, SE = .23$ ) and the *combined* condition ( $p = .03$ ). There were no significant differences between the adjusted means for any of the remaining comparisons.

## **Discussion Study 2**

Study 2 was conducted with the primary purpose of exploring which message types are most effective for encouraging managers and supervisors to promote sun protection behaviors

among their employees. To do so, we tested the effects of four different message types. The first message type, *employee well-being*, focused on the health and wellness consequences of unsafe sun exposure on employees. The second message type, *employer financial*, focused on the financial consequences for employers of unsafe sun exposure. The third message type, *combined*, contained information relating to both the health and wellness consequences of unsafe sun exposure for employees and the financial consequences for employers. The final message type, *control*, contained innocuous content relating to outdoor jobs and served as a comparison group for the other three message types.

### **Message Type**

After running ANCOVA analyses, it was found that hypothesis 1 (main effect of *message type* on posttest encouragement intentions) was fully supported. The *control* condition scored significantly lower on the posttest measure of sun protection encouragement intentions than each of the three other conditions. Similarly, the *employee well-being* condition scored significantly lower on the same measure than both the *employer financial* and *combined* conditions. Such a finding illustrates the importance of using financial information when attempting to persuade managers or supervisors to encourage health behaviors among employees. Hypothesis 2 (main effect of *message type* on posttest perceived importance of employee sun protection), on the other hand, was only partially supported. The *control* condition did score significantly lower on the posttest measure of perceived importance of employee sun protection, as expected, but those in the *employee well-being* condition did not score lower than either those in the *employer financial* or *combined* conditions, as was predicted. Thus, we might conclude that content focused on either employee health or employer finances may be similarly effective when attempting to convince managers and supervisors of the importance of employee sun protection.

Additional analyses regarding the remaining dependent measures provided mixed results. Similar to hypothesis 2, separate ANCOVA analyses of *message type* on the dependent variables of posttest perceived importance of personal sun protection and posttest concern for personal health and well-being indicated that those in the *control* condition scored significantly lower on the respective dependent measures than each of the three remaining conditions. However, as in hypothesis 2, there was no significant difference between the three remaining conditions. A separate ANCOVA analysis and pairwise comparison on the posttest measure of concern for employee health and well-being showed only a significant difference between scores in the *control* and *combined* conditions. As expected, analysis of the posttest measure of concern regarding the financial consequences of sun exposure found that both the *control* and *employee well-being* groups scored significantly lower than those in either the *employer financial* or *combined* conditions. Finally, when looking at the posttest measure of perceived necessity of a workplace sun protection policy, it was found that those in the *combined* condition scored significantly higher than those in the *control* or *employee well-being* conditions.

In general, the adjusted mean scores for each of the dependent variables trended towards the *combined* message being the most effective, followed by the *employer financial* message, then the *employee well-being* message, and finally the *control* message (see figures 8-14). Although the mean differences were not always significant, depending on the dependent variable of interest, this order of effectiveness is similar to what was expected a priori. Based on previous findings (Miller & Haslam, 2009; Pescud et al., 2015; Van Dongen et al., 2013), it was expected that financial consequences would be weighed most heavily by managers and supervisors when considering employee health. Indeed, we found that focusing on the financial consequences of unsafe sun exposure was the most effective method for encouraging these managers and

supervisors to promote sun protection behaviors among their employees. Despite this, the role of employee health and well-being should not be ignored or thought to be unimportant in a manager's decision-making process. Several of the dependent measures that were assessed, such as perceived importance of employee sun protection, showed that appeals relating to employee health and well-being were not significantly less effective than those focusing on financial consequences. Additionally, as scores in the *combined* condition were generally the highest, we may assume that focusing on both the financial and employee health consequences of unsafe sun exposure is the most effective persuasion method. So, while the findings of study 2 may indicate that financial content is the primary driver in a manager's decisions regarding employee sun exposure, there is at least some level of concern for the consequences on employee well-being.

## **Implications**

The results of study 2 have considerable theoretical and practical implications. From a theoretical or research perspective, study 2 represents a very necessary early step in addressing safe sun protection at the employer level. While the overwhelming majority of studies in this topic area have focused directly on outdoor workers, study 2 takes a top-down approach by looking at the role of managers and supervisors. While previous research is certainly lacking, there has seemingly been a consensus among researchers that employers play a considerably important role in their employees' decision to use sun protection (Hammond et al., 2008; Janda et al., 2014; McCool et al., 2009; Schilling et al., 2018; Woolley et al., 2008). In acknowledging the importance of employers in their employees' health behaviors and outcomes, an entirely new approach to research in this domain can be opened up and explored. As a first step, study 2 illustrates that financial concerns may be the most important factor when it comes to health promotion by managers and supervisors. This supports findings from several qualitative studies

that have looked at the key drivers of employers taking preventative action regarding employee health (Miller & Haslam, 2009; Pescud et al., 2015; Van Dongen et al., 2013). Additionally, it should also be noted that the effects found in study 2 may be applicable in domains outside of sun protection. As the research regarding key drivers of employers' investment in employee health outcomes is not specific to the area of sun protection, it remains very possible, if not likely, that utilizing financial content in other health areas would be found to be effective. This could include employee health areas such exercise and weight loss, smoking, or even stress. Although further research is certainly necessary, study 2 represents an important early exploration into the potential of promoting health behaviors in employees through their employers and the best way for accomplishing this task.

Regarding practical implications, study 2 provides a potential blueprint for practitioners in the health communication area. In order to effectively promote sun protection behaviors among outdoor workers, it may be necessary to target these workers from a top-down level, through their employers. In this instance, study 2 indicates that practitioners should attempt to persuade managers and supervisors of outdoor workers by focusing not only on the health consequences of unsafe sun exposure, but on the financial consequences, as well. One such method for doing so may be through creating and providing utility analyses to employers that focus on the financial outcomes that employers can reasonably expect as a result of instituting an employee sun protection program. By providing managers with this type of financial data, we may have an approach that could lead to greater instances of employers encouraging sun protection behaviors in their employees and, ultimately, greater sun protection among the employees. Through this process of promoting sun protection in this at-risk population, we may be able to reduce the number of outdoor workers that suffer from skin cancer and melanoma.

## Chapter 4 - General Discussion

### Purpose of the Current Research

Excessive and unsafe sun exposure can be a particularly harmful and life-altering hazard, especially through the development of skin cancer. As the AAD reports, skin cancer has become the most common form of cancer in the U.S. with approximately 9,500 new diagnoses of the disease being made each day (AAD, 2018). To aid in the prevention of this disease, it is necessary to study populations who are most at risk for developing skin cancer. Outdoor workers, who spend long periods of time exposed to the sun's UV rays, represent such a group. In fact, the Occupational Cancer Research Centre (2017) estimates that outdoor workers have a 2.5 to 3.5 times greater risk of developing skin cancer than the average indoor worker. This elevated risk may be due, in part, to the lack of sun protection behaviors that are practiced by outdoor workers (Nahar et al., 2013; Nahar et al., 2014; Peters et al., 2016; Professional Safety, 2016). In an effort to help reduce skin cancer risk for outdoor workers, the current dissertation involved two studies that focused on messaging that may help promote safe sun protection for such a vulnerable population.

#### **Study 1 summary.**

In study 1, a sample of outdoor workers was recruited through the use of Amazon's MTurk service to complete a survey. After answering various items concerning their job, sun protection behaviors, skin cancer and sun protection knowledge, and attitudes toward various HBM constructs, participants were randomly assigned to view one of six message types in a 3 X 2 between-subjects design. These message types varied according to *communication type* (*generic, targeted, tailored*) and *financial information* (*present versus not present*). After reading their randomly assigned message, participants then completed posttest measures

assessing their future intentions to practice sun protection behaviors, skin cancer and sun protection knowledge, and attitudes toward various HBM constructs. The goal of study 1 was to determine whether message tailoring was indeed a more effective method of communication (as found by Bostrom et al., 2013; Shah et al., 2014; Short et al., 2015) or whether a simpler, targeted approach would be equally effective (as found by Elish et al., 2011; Kerr et al., 2007) in promoting sun protection practices for outdoor workers. An additional goal of study 1 was to study the effects of presenting financial information to individuals in a new domain. While past research had studied messaging that included financial information in other domains (Bashir et al., 2011; Sindelar & O'Malley, 2014; Van de Vyver et al., 2018), study 1 was an attempt to generalize those findings to the area of sun protection.

The results from study 1 indicated that targeting and tailoring were of roughly equal effectiveness in promoting safe sun protection. However, both the targeting and tailoring conditions scored higher than the generic conditions on the measures of sun protection intentions, skin cancer and sun protection knowledge, and the HBM constructs of perceived susceptibility, severity, benefits, and self-efficacy. These findings indicate that some level of personalization is advantageous when communicating the risks of unsafe sun exposure, but that tailoring messages to individual readers may be an unnecessary step. Additionally, it was revealed in study 1 that including financial information in messaging was generally more effective than not including financial information. This effect was present for the dependent variables of sun protection intentions, skin cancer and sun protection knowledge, and the HBM constructs of perceived severity, benefits, and self-efficacy. As such, it appears that discussing the financial consequences and treatment costs of a particular disease may be beneficial in promoting healthy behaviors.

### **Study 2 summary.**

In study 2, a sample of managers and supervisors of outdoor workers was recruited through Amazon's MTurk service to complete a survey. First, participants began by answering various items concerning their job, their encouragement of sun protection behaviors in their employees, and various attitudes regarding sun exposure and protection. Next, participants were randomly assigned to view one of four message types detailing the consequences of unsafe sun exposure: *employee well-being* (focusing on health risks for employees), *employer financial* (focusing on financial consequences for employers), *combined* (focusing on both employee health risks and financial consequences for employers), or *control* (innocuous content about outdoor jobs). After reading one of these four messages, participants then completed posttest measures of intentions to encourage sun protection in their employees and various attitudes regarding sun exposure and protection. The goal of study 2 was to determine which message type would be most effective for convincing managers and supervisors to promote sun protection practices among their employees. While past research in this area has been virtually non-existent, study 2 represents an important, initial foray into the most effective methods for promoting sun protection using a top-down approach through managers and supervisors.

The results of study 2 indicate that financial consequences may be most important for managers and supervisors when considering whether or not to encourage sun protection practices in their employees. It was found that those receiving messages that emphasized financial consequences for employers (either on its own in the *employer financial* condition or in combination with employee wellness information in the *combined* condition) were more likely to intend to encourage sun protection behaviors in their employees. This supports the findings of various researchers that have investigated the factors most important in the promotion of health



behaviors by employers (Miller & Haslam, 2009; Pescud et al., 2015; Van Dongen et al., 2013).

Despite this, it should be noted that those receiving solely information on employee health consequences (in the *employee well-being* condition) were still more likely to encourage their employees to practice sun protection behaviors than those receiving the control message.

Additionally, analyses of other dependent variables, such as perceived importance of employee sun protection, found that the *employee well-being* messages were not significantly less effective than either of the messages including financial content. In another instance, with the dependent variable of concern for employee health, the *combined* condition was the only group to score significantly higher than the *control* group. Together, these findings indicate that while financial consequences may appear to be the most important factor in managers' or supervisors' decision to encourage employee sun protection, the role of the employers' concern for employee health and well-being should not be ignored.

### **Limitations and Future Directions**

While the findings of study 1 and study 2 are promising, it should be noted that there are several general limitations that occur within both studies. First, the samples that were used in studies 1 and 2 were gathered from Amazon's MTurk service. Although numerous studies have supported the use of MTurk samples in conducting research (Buhrmester, Kwang, & Gosling, 2011; Keith, Tay, Harms, 2017; Landers & Behrend, 2015), there remains the possibility of issues such as inattention or fraudulent responding. To correct for this, recommendations from Cheung et al. (2017) were undertaken, including the use of attention check items, multiple questions asking participants to describe their job in detail, and creating qualifications for participation in the study. Despite these steps taken, it is impossible to confirm all participants

were being truthful in their responses. Future research may wish to sample participants in-person from an outdoor worksite to address this potential issue.

Additionally, there may also be a potential issue with the primary dependent variables in both studies focusing on intentions rather than actual behaviors. In study 1, intentions to practice sun protection behaviors were used instead of a measure of actual sun protection behaviors and in study 2, intentions to encourage sun protection behaviors were used rather than a measure of actual encouragement of sun protection behaviors. Even though previous researchers have offered support for intentions translating to actual behavioral change (Hamilton et al., 2017, Hillhouse et al., 1997) and Ajzen's Theory of Planned Behavior (1985) posits that intentions are one of the best predictors of actual behavior, it is possible that the intentions measured in these studies will not entirely translate to actual behavior. As such, the results of both studies 1 and 2 should be interpreted somewhat cautiously in terms of whether actual behavioral change can be expected. To be more certain of behavioral change, it may be necessary for researchers to conduct similar studies with some sort of follow-up measure of actual behavior. In the case of study 2, such measures could be from either the manager directly, or it may be helpful to have employees report on the extent to which their manager has encouraged sun protection behaviors since taking part in the study.

Finally, it should also be noted that the effect sizes in study 1 and study 2 may be considered to be relatively small. In study 1, the effect sizes ranged from .02 to .07 and in study 2, the effect sizes ranged from .08 to .26. According to Cohen's (1988) classification of effect sizes, these would all be considered to be at or below the threshold for small effect sizes. One potential reason for these small effect sizes is that they may be due to the relatively short interventions that were given to participants. In both studies 1 and 2, the interventions consisted

of short written messages for participants to read. In comparison, sun protection studies at the employee-level have often included interventions consisting of lengthier educational sessions (Ali & Rakhshani, 2018; Duffy et al., 2018; Lee et al., 2014) and have even proceeded to use text message reminders and provided free sun protection equipment (Duffy et al., 2018).

Additionally, one of the few other studies to have looked at sun protection on the employer-level consisted of an intervention that lasted roughly two years (Buller et al., 2011). Considering this, it may be unsurprising that the short interventions used in studies 1 and 2 had small effect sizes.

As one final point, it should be noted that any apparent increase in the encouragement of sun protection behaviors among outdoor workers would seemingly be a worthwhile endeavor. As the odds of contracting skin cancer and melanoma increases with the amount of sun damage that an individual does to their skin, any increase in sun protection behaviors could make a considerable difference in terms of health outcomes. As such, the small effect sizes in studies 1 and 2 may still be considerably meaningful and provide a promising indication of the most effective methods for promoting sun protection among outdoor workers and their employers.

### **Importance of the Current Research**

The current dissertation fills a number of gaps in previous literature on sun protection, particularly as it relates to outdoor workers. To begin with study 1, there remains uncertainty regarding the effectiveness of message tailoring in comparison to message targeting. While some researchers have found tailoring to be more effective than targeting (Bostrom et al., 2013; Shah et al., 2014; Short et al., 2015), others have found neither to be of more effectiveness than the other (Ellish et al., 2011; Kerr et al., 2007). Study 1 supports the latter notion and indicates that promoting proper sun protection for outdoor workers may rely on a simpler, quicker, less costly, and less resource-consuming process through targeting rather than tailoring.

Additionally, study 1 provides a clear distinction between what is meant by “targeting” and what is meant by “tailoring”. While previous studies have used these two terms interchangeably (Ali & Rakhshani, 2018; Duffy et al., 2018; Lee et al., 2014), study 1 investigates the effects of these communication methods separately.

Of similar importance in study 1 is the exploration into the use of financial content in a new domain. While previous research has found the inclusion of financial information to be an effective motivator of change in areas such as smoking (Sindelar & O’Malley, 2014) and environmentalism (Bashir et al., 2011; Tijs et al., 2017; Van de Vyver et al., 2018), very little work has been done to assess the effects of such messaging outside of those domains. Study 1 extends the findings of these researchers by testing if financial consequences are an important consideration when it comes to sun protection behaviors. Indeed, study 1’s support for the use of financial information and discussion of treatment costs indicates that other health domains, such as dieting, exercise, alcohol consumption, or any number of others may find this to be a promising strategy for instigating health behavior changes. Additionally, the support for discussing treatment costs in study 1 indicates that perhaps including content regarding a number of other financial consequences may be successful. For instance, as many insurance companies provide reduced premiums for those participating in health programs, we may find that discussing such advantages with individuals does lead to greater health program participation. Although future research would be necessary to determine this, the current project does offer a promising start.

Finally, study 2 fills a very obvious research gap in determining which considerations are most important when it comes to managers’ and supervisors’ decision to support their employees’ health. As noted earlier, previous research into this area is almost entirely non-

existent. While past researchers have shown the important role of employers in sun protection decisions (Hammond et al., 2008; Janda et al., 2014; McCool et al., 2009; Schilling et al., 2018; Woolley et al., 2008), very few studies have actually tested interventions. Using several qualitative studies as a basis for the interventions to be used (Miller & Haslam, 2009; Pescud et al., 2015; Van Dongen et al., 2013), study 2 provides a test of what appear to be the two most important factors for employers when it comes to promoting employee health: employee well-being and financial consequences for the employer. This early exploration into promoting sun protection for outdoor workers from a top-down approach provided promising results that indicate that financial concerns may be the most important factor for managers and supervisors to encourage sun protection behaviors in employees. Given the lack of research into this topic area though, further research is certainly warranted.

## **Implications and Conclusions**

To begin with study 1 there are a number of theoretical and research implications to the current dissertation. Notably, study 1 provides further insight and support for the use of HBM constructs as a basis for designing and tailoring health interventions. Thus far, such research is relatively scarce and has often consisted of multiple components (e.g. education, training, providing materials, etc.). Additionally, finding targeted and tailored messages to be equally effective further indicates that tailoring may not appropriate for every situation. Future research may be necessary to determine under which exact conditions targeting and tailoring are most effective. Finally, the outcomes related to financial information in study 1 support past research and warrant further investigation in other health domains.

Study 2 represents an important, initial step in researching safe sun protection from a top-down approach. While most research on sun protection for outdoors workers has been

conducted at the employee-level, very few studies have involved managers or supervisors of these workers. In taking this new approach to promoting sun protection for outdoor workers, study 2 provides a basis for future researchers to use when determining the best methods for reaching managers and supervisors. This holds true both inside and outside of the sun protection domain, as research in other areas appears to be greatly lacking, as well. Given the findings of study 2, future researchers may wish to study the effects of focusing on financial consequences for employers when attempting to improve health outcomes from a top-down approach.

Regarding practical implications, study 1 indicates that, although some level of personalization is beneficial, message tailoring may be an unnecessary and ill-advised approach for practitioners of safe sun communication. As tailoring is typically more expensive and more time-consuming, message targeting may be a more suitable alternative. Such an approach may save considerable amounts of time and money for individuals or organizations attempting to promote sun protection behaviors. Further, study 1 indicates that practitioners should make an effort to include financial information, including melanoma or skin cancer treatment costs, into their messaging. Together, these two types of content may even lead readers to seeking out sun protection information on their own. In this sense, the effects of the intervention may even go far beyond the information included in the messages and result in individuals doing their own research on the dangers of sun exposure and the importance of sun protection.

As previous research in the area is lacking, study 2 provides an important basis for practitioners to use when crafting messaging for employers of outdoor workers. Given the findings of study 2, it appears that focusing on financial consequences for employers would be the most effective content area to pursue. This can include information related to productivity losses, insurance premiums, worker's compensation rulings, or any other number of ways that

sun exposure can have a financial impact on employers. Despite the finding of financial consequences seeming to be most important for encouraging sun protection, the role of managers' and supervisors' concern for employee well-being should not be dismissed. Indeed, there may be situations where this type of content can be used in combination with financial content to create a more effective message than either type of content is able to be on its own. Furthermore, employers may wish to pursue multi-component interventions in the workplace to really create the most effective sun protection programs. This could include print messaging, education sessions, email reminders, and even providing free sun protection items to employees. With such a large variety of sun protection items that employers could choose from (e.g. hats, masks, shirts, sunglasses, etc.) these items could even be branded by the company to serve in a dual role for both employee health and advertisement purposes. In short, there are a number of different ways that employers may approach sun protection in the workplace and with this project, we have a better idea of how to effectively communicate to employers to encourage them to enact such efforts.

The overall goal of this dissertation project is focused on finding the most effective appeals for promoting proper sun protection practices in outdoor workers. As this is such an at-risk population, it is imperative that researchers focus their efforts on providing a suitable way of communicating the risks of sun exposure and the protection behaviors that can prevent such risks. In combination, studies 1 and 2 provide an indication of the most appropriate methods for promoting sun protection using both an employee-level approach and a top-down approach through managers and supervisors of outdoor workers. These efforts have been made in the hopes of promoting greater practice of sun protection behaviors among outdoor workers.

Ultimately, these sun protection behaviors should lead to greater health outcomes, including lower instances of skin cancer and melanoma for such an at-risk population.



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## **Appendix A - Study 1 Intervention Messages**

### **Generic with No Financial Information**

While time spent outdoors can be enjoyable, it's important to remember the potential dangers that can occur with the sun's harmful ultraviolet (UV) rays. Without proper sun protection, these rays and the resulting sunburns can cause premature skin aging (like wrinkles and age spots) and even most forms of skin cancer, the most common cancer in the United States. It's estimated that one in five Americans will develop skin cancer in their lifetime, and one person dies from melanoma, the deadliest form of skin cancer, every hour.

Research has found that 2.3% of people will be diagnosed with melanoma during their lifetime. Although people may often forget to wear sun-protection, find it inconvenient, or think it's too hot outside, it is necessary to take action to protect one's self. Luckily, the risk for melanoma and most other forms of skin cancer can be reduced and prevented from increasing by following these simple steps:

- Seek shade when appropriate, especially from 10 a.m. to 2 p.m. when the sun's rays are the strongest.
- Wear protective clothing, such as lightweight, long-sleeved shirts and pants, sunglasses with UV protection, or a wide-brimmed hat.
- Generously apply a water-resistant sunscreen with an SPF of 30 or higher to all exposed skin. Reapply every two hours, even on cloudy days, and after excessive sweating.
- Check your skin regularly. If you see any new or suspicious spots or moles on your skin, or anything that is changing, itching or bleeding, see a board-certified dermatologist. When skin cancer is detected early, the cure rate is very high.

### **Targeted with No Financial Information**

Outdoor workers face many potential dangers on the job, including machinery and busy roads; however, one danger that can't be seen is the sun's harmful ultraviolet (UV) rays. Without proper sun protection, these rays and the resulting sunburns can cause premature skin aging (like wrinkles and age spots) and even most forms of skin cancer, the most common cancer in the United States. It's estimated that one in five Americans will develop skin cancer in their lifetime, and one person dies from melanoma, the deadliest form of skin cancer, every hour.

Since outdoor workers spend many hours in the mid-day sun, a major risk factor for melanoma, their risk for developing this disease is much higher than average. Research has shown that people with outdoor occupations are roughly 250% more likely to develop melanoma during their lifetime than the average person. Although outdoor workers may often forget to wear sun-protection, find it inconvenient, or think it's too hot outside, it is necessary that they take action to protect themselves. Luckily, the risk for melanoma and most other forms of skin cancer can be reduced and prevented from increasing by following these simple steps:

- Seek shade when appropriate, especially from 10 a.m. to 2 p.m. when the sun's rays are the strongest.
- Wear protective clothing, such as lightweight, long-sleeved shirts and pants, sunglasses with UV protection, or a wide-brimmed hat.
- Generously apply a water-resistant sunscreen with an SPF of 30 or higher to all exposed skin. Reapply every two hours, even on cloudy days, and after excessive sweating.
- Check your skin regularly. If you see any new or suspicious spots or moles on your skin, or anything that is changing, itching or bleeding, see a board-certified dermatologist. When skin cancer is detected early, the cure rate is very high.

### **Tailored with No Financial Information**

As an outdoor worker, you may face many potential dangers on the job, such as machinery or busy roads. However, one danger that you can't see is the sun's harmful ultraviolet (UV) rays. Without proper sun protection, these rays and the resulting sunburns can cause premature skin aging (like wrinkles and age spots) and even most forms of skin cancer, the most common cancer in the United States. It's estimated that one in five Americans will develop skin cancer in their lifetime, and one person dies from melanoma, the deadliest form of skin cancer, every hour.

Since outdoor workers spend many hours in the mid-day sun, a major risk factor for melanoma, your risk for developing this disease is much higher than average. Based on your personal history of sunburns, your risk of developing melanoma in your lifetime is [220, 230, 243, 289]% higher than the average person. Although you may often forget to wear sun-protection, find it inconvenient, or think it's too hot outside, it is necessary that you take action to protect yourself. Luckily, you can reduce your risk for melanoma and most other forms of skin cancer and prevent it from increasing by following these simple steps:

- Seek shade when appropriate, especially from 10 a.m. to 2 p.m. when the sun's rays are the strongest.
- Wear protective clothing, such as lightweight, long-sleeved shirts and pants, sunglasses with UV protection, or a wide-brimmed hat.
- Generously apply a water-resistant sunscreen with an SPF of 30 or higher to all exposed skin. Reapply every two hours, even on cloudy days, and after excessive sweating.
- Check your skin regularly. If you see any new or suspicious spots or moles on your skin, or anything that is changing, itching or bleeding, see a board-certified dermatologist. When skin cancer is detected early, the cure rate is very high.

### **Generic with Financial Information**

While time spent outdoors can be enjoyable, it's important to remember the potential dangers that can occur with the sun's harmful ultraviolet (UV) rays. Without proper sun protection, these rays and the resulting sunburns can cause premature skin aging (like wrinkles and age spots) and even most forms of skin cancer, the most common cancer in the United States. It's estimated that one in five Americans will develop skin cancer in their lifetime, and one person dies from melanoma, the deadliest form of skin cancer, every hour. In addition, skin

cancer can represent a serious financial concern. Medical bills are the number one cause of bankruptcy in the U.S. and cancer patients are more than twice as likely to declare bankruptcy as the average person.

Research has found that 2.3% of people will be diagnosed with melanoma during their lifetime. Further, the expected medical costs for treating a single case of melanoma are \$4,780. Although people may often forget to wear sun-protection, find it inconvenient, or think it's too hot outside, it is necessary to take action to protect one's self and wallet. Luckily, both health and financial risk related to melanoma and most other forms of skin cancer can be reduced and prevented from increasing by following these simple steps:

- Seek shade when appropriate, especially from 10 a.m. to 2 p.m. when the sun's rays are the strongest.
- Wear protective clothing, such as lightweight, long-sleeved shirts and pants, sunglasses with UV protection, or a wide-brimmed hat.
- Generously apply a water-resistant sunscreen with an SPF of 30 or higher to all exposed skin. Reapply every two hours, even on cloudy days, and after excessive sweating.
- Check your skin regularly. If you see any new or suspicious spots or moles on your skin, or anything that is changing, itching or bleeding, see a board-certified dermatologist. When skin cancer is detected early, the cure rate is very high.

### **Targeted with Financial Information**

Outdoor workers face many potential dangers on the job, including machinery and busy roads; however, one danger that can't be seen is the sun's harmful ultraviolet (UV) rays. Without proper sun protection, these rays and the resulting sunburns can cause premature skin aging (like wrinkles and age spots) and even most forms of skin cancer, the most common cancer in the United States. It's estimated that one in five Americans will develop skin cancer in their lifetime, and one person dies from melanoma, the deadliest form of skin cancer, every hour. In addition, skin cancer can represent a serious financial concern for outdoor workers. Medical bills are the number one cause of bankruptcy in the U.S. and cancer patients are more than twice as likely to declare bankruptcy as the average person.

Since outdoor workers spend many hours in the mid-day sun, a major risk factor for melanoma, their risk for developing this disease is much higher than average. Research has shown that people with outdoor occupations are roughly 250% more likely to develop melanoma during their lifetime than the average person. Further, the expected medical costs for treating a single case of melanoma are \$4,780. Although outdoor workers may often forget to wear sun-protection, find it inconvenient, or think it's too hot outside, it is necessary that they take action to protect themselves and their wallet. Luckily, both health and financial risk related to melanoma and most other forms of skin cancer can be reduced and prevented from increasing by following these simple steps:

- Seek shade when appropriate, especially from 10 a.m. to 2 p.m. when the sun's rays are the strongest.

- Wear protective clothing, such as lightweight, long-sleeved shirts and pants, sunglasses with UV protection, or a wide-brimmed hat.
- Generously apply a water-resistant sunscreen with an SPF of 30 or higher to all exposed skin. Reapply every two hours, even on cloudy days, and after excessive sweating.
- Check your skin regularly. If you see any new or suspicious spots or moles on your skin, or anything that is changing, itching or bleeding, see a board-certified dermatologist. When skin cancer is detected early, the cure rate is very high.

### **Tailored with Financial Information**

As an outdoor worker, you may face many potential dangers on the job, such as machinery or busy roads. However, one danger that you can't see is the sun's harmful ultraviolet (UV) rays. Without proper sun protection, these rays and the resulting sunburns can cause premature skin aging (like wrinkles and age spots) and even most forms of skin cancer, the most common cancer in the United States. It's estimated that one in five Americans will develop skin cancer in their lifetime, and one person dies from melanoma, the deadliest form of skin cancer, every hour. In addition, skin cancer can represent a serious financial concern for you. Medical bills are the number one cause of bankruptcy in the U.S. and cancer patients are more than twice as likely to declare bankruptcy as the average person.

Since outdoor workers spend many hours in the mid-day sun, a major risk factor for melanoma, your risk for developing this disease is much higher than average. Based on your personal history of sunburns, your risk of developing melanoma in your lifetime is [220, 230, 243, 289]% higher than the average person. Further, you are more likely to have to pay the estimated \$4,780 that is typically spent on medical costs for treating a single case of melanoma. Although you may often forget to wear sun-protection, find it inconvenient, or think it's too hot outside, it is necessary that you take action to protect yourself and your wallet. Luckily, you can reduce your health and financial risk related to melanoma and most other forms of skin cancer and prevent them from increasing by following these simple steps:

- Seek shade when appropriate, especially from 10 a.m. to 2 p.m. when the sun's rays are the strongest.
- Wear protective clothing, such as lightweight, long-sleeved shirts and pants, sunglasses with UV protection, or a wide-brimmed hat.
- Generously apply a water-resistant sunscreen with an SPF of 30 or higher to all exposed skin. Reapply every two hours, even on cloudy days, and after excessive sweating.
- Check your skin regularly. If you see any new or suspicious spots or moles on your skin, or anything that is changing, itching or bleeding, see a board-certified dermatologist. When skin cancer is detected early, the cure rate is very high.

## Appendix B - Study 1 Pretest Measures

### Work information

1. Are you employed?
  - a. Yes, full-time.
  - b. Yes, part-time.
  - c. No, I am unemployed.
  
2. What industry are you employed in?  
\_\_\_\_\_
  
3. What is your job title?  
\_\_\_\_\_
  
4. What are your primary responsibilities or tasks at work?  
\_\_\_\_\_
  
5. On average, how many hours per week do you work  
\_\_\_\_\_
  
6. How long have you been employed at your current job?  
\_\_\_\_\_
  
7. Are you a manager or assistant manager at your workplace?
  - a. Yes, I am a manager.
  - b. Yes, I am an assistant manager.
  - c. No, I am neither a manager or assistant manager.
  
8. What percentage of your workday involves you being outdoors?  
\_\_\_\_\_
  
9. On average, how many hours per day do you spend outside on a typical workday? (0-24)  
\_\_\_\_\_
  
10. On average, how many hours per day do you spend outside on a typical non-workday?  
(0-24)  
\_\_\_\_\_
  
11. On average, how many days per week do you work outside? (0-7)  
\_\_\_\_\_

**Sun exposure and protection behaviors**

12. How many times did you get a sunburn (e.g. red, irritated skin) this past summer?

- a. 0
- b. 1
- c. 2
- d. 3
- e. 4 or more

13. To the best of your knowledge, how many times have you experienced a sunburn (e.g. red, irritated skin) in your lifetime?

- a. 0
- b. 1-5
- c. 6-10
- d. 11-15
- e. 16 or more

14. In the past summer, on the days you were working outside in the sunlight, how often did you use sunscreen?

Never Always  
1            2            3            4            5            6            7

15. In the past summer, on the days you were working outside in the sunlight, how often did you wear some form of sun protection on your head (e.g. hat, cap, visor, bandana, etc.)?

Never Always  
1            2            3            4            5            6            7

16. In the past summer, on the days you were working outside in the sunlight, how often did you wear a long-sleeved shirt?

Never Always  
1            2            3            4            5            6            7

17. In the past summer, on the days you were working outside in the sunlight, how often did you wear long pants?

Never Always  
1            2            3            4            5            6            7

18. In the past summer, on the days you were outside in the sunlight, how often did you wear sunglasses?

Never Always  
1            2            3            4            5            6            7

19. In the past summer, on the days you were working outside in the sunlight, how often did you seek shade when appropriate?

Never Always  
1            2            3            4            5            6            7





29. Using sun protection will decrease my chance of getting a sunburn.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
30. There are benefits for me to use sun protection any time I go outdoors in the sun.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
31. Reapplying sunscreen after I sweat will decrease my chance of getting skin cancer.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
32. Wearing protective clothing will decrease my chance of getting skin cancer.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
33. Avoiding mid-day sun exposure to the sun decreases my chances of getting skin cancer.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7

**HBM constructs – Perceived barriers**

34. Sunscreen is inconvenient to apply before going out in the sun.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
35. Sunscreens are too messy to use on a regular basis.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
36. Sunscreens are too expensive to use on a regular basis.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
37. A hat for skin protection feels uncomfortable to wear.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
38. A long-sleeved shirt for skin protection feels uncomfortable to wear.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
39. Long pants for skin protection feel uncomfortable to wear.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7

40. Sunglasses for eye protection feel uncomfortable to wear.  
 Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7

41. Seeking shade to avoid sun exposure is inconvenient.  
 Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7

**HBM constructs – Perceived self-efficacy**

42. I feel confident in my ability to use sunscreen when I am outdoors.  
 Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7

43. I feel confident in my ability to wear a hat when I am outdoors.  
 Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7

44. I feel confident in my ability to wear long-sleeved shirts when I am outdoors.  
 Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7

45. I feel confident in my ability to wear long pants when I am outdoors.  
 Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7

46. I feel confident in my ability to wear sunglasses when I am outdoors.  
 Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7

47. I feel confident in my ability to seek shade when I am outdoors.  
 Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7

**Skin cancer knowledge**

Please rate your agreement with the following statements:

\*\*\* indicates reverse-scored item

48. Sun exposure causes most skin cancers.  
 Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7

49. Experts suggest using sunscreen with a sun protection factor (SPF) of 30 or higher.  
 Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7

50. Sun exposure can cause lasting damage to the skin.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
51. Sunscreen does not need to be reapplied, even after excessive sweating.\*\*\*  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
52. The sun's rays are the strongest at mid-day.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
53. Skin cancer can cause death.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
54. Most skin cancers can be prevented.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
55. Melanoma is the least serious form of skin cancer.\*\*\*  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
56. Skin cancer is the most common form of cancer.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
57. Sunscreen should be applied even on cloudy days.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7

## Appendix C - Study 1 Posttest Measures

### Attention check

1. Please provide a brief (one sentence) summary of the message you just read.
- 

### Sun exposure and protection behaviors

After having read the message that you received, please indicate your future intentions regarding the following behaviors.

2. In future summers, on the days you are working outside in the sunlight, how often do you intend to use sunscreen?

Never  
1                      2                      3                      4                      5                      6                      Always  
7

3. In future summers, on the days you are working outside in the sunlight, how often do you intend to wear some form of sun protection on your head (e.g. hat, cap, visor, bandana, etc.)?

Never  
1                      2                      3                      4                      5                      6                      Always  
7

4. In future summers, on the days you are working outside in the sunlight, how often do you intend to wear a long-sleeved shirt?

Never  
1                      2                      3                      4                      5                      6                      Always  
7

5. In future summers, on the days you are working outside in the sunlight, how often do you intend to wear long pants?

Never  
1                      2                      3                      4                      5                      6                      Always  
7

6. In future summers, on the days you are working outside in the sunlight, how often do you intend to wear sunglasses?

Never  
1                      2                      3                      4                      5                      6                      Always  
7

7. In future summers, on the days you are working outside in the sunlight, how often do you intend to seek shade when appropriate?

Never  
1                      2                      3                      4                      5                      6                      Always  
7

8. In the future, how often do you intend to perform skin self-examinations (e.g. looking for new or oddly-shaped moles, warts, growths, etc.)

Never  
1                      2                      3                      4                      5                      6                      Always  
7

**HBM constructs - Perceived susceptibility**

9. I worry that sun exposure could change my moles to skin cancer.

Strongly Disagree  
1                      2                      3                      4                      5                      6                      Strongly Agree  
7

10. I worry about getting my skin burned when I'm outdoors.

Strongly Disagree  
1                      2                      3                      4                      5                      6                      Strongly Agree  
7

11. I worry that a severe sunburn in my past may increase my risk for skin cancer.

Strongly Disagree  
1                      2                      3                      4                      5                      6                      Strongly Agree  
7

12. I worry about getting skin cancer from my outdoor sun exposure.

Strongly Disagree  
1                      2                      3                      4                      5                      6                      Strongly Agree  
7

**HBM constructs – Perceived severity**

13. The more that I am exposed the sun, the more damage I am doing to my skin.

Strongly Disagree  
1                      2                      3                      4                      5                      6                      Strongly Agree  
7

14. If I get skin cancer, it will be a serious illness.

Strongly Disagree  
1                      2                      3                      4                      5                      6                      Strongly Agree  
7

15. Skin cancer would greatly affect my life.

Strongly Disagree  
1                      2                      3                      4                      5                      6                      Strongly Agree  
7

16. When I think of skin cancer, I think of death.

Strongly Disagree  
1                      2                      3                      4                      5                      6                      Strongly Agree  
7

**HBM constructs – Perceived benefits**

17. Using sun protection will decrease my chance of getting skin cancer.

Strongly Disagree  
1                      2                      3                      4                      5                      6                      Strongly Agree  
7

18. Using sun protection will decrease my chance of getting a sunburn.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
19. There are benefits for me to use sun protection any time I go outdoors in the sun.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
20. Reapplying sunscreen after I sweat will decrease my chance of getting skin cancer.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
21. Wearing protective clothing will decrease my chance of getting skin cancer.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
22. Avoiding mid-day sun exposure to the sun decreases my chances of getting skin cancer.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7

**HBM constructs – Perceived barriers**

23. Sunscreen is inconvenient to apply before going out in the sun.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
24. Sunscreens are too messy to use on a regular basis.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
25. Sunscreens are too expensive to use on a regular basis.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
26. A hat for skin protection feels uncomfortable to wear.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
27. A long-sleeved shirt for skin protection feels uncomfortable to wear.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
28. Long pants for skin protection feel uncomfortable to wear.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7

29. Sunglasses for eye protection feel uncomfortable to wear.  
 Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7

30. Seeking shade to avoid sun exposure is inconvenient.  
 Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7

**HBM constructs – Perceived self-efficacy**

31. I feel confident in my ability to use sunscreen when I am outdoors.  
 Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7

32. I feel confident in my ability to wear a hat when I am outdoors.  
 Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7

33. I feel confident in my ability to wear long-sleeved shirts when I am outdoors.  
 Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7

34. I feel confident in my ability to wear long pants when I am outdoors.  
 Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7

35. I feel confident in my ability to wear sunglasses when I am outdoors.  
 Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7

36. I feel confident in my ability to seek shade when I am outdoors.  
 Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7

**Skin cancer knowledge**

\*\*\* indicates reverse-scored item

Please rate your agreement with the following statements:

37. Sun exposure causes most skin cancers.  
 Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7

38. Experts suggest using sunscreen with a sun protection factor (SPF) of 30 or higher.  
 Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7



39. Sun exposure can cause lasting damage to the skin.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
40. Sunscreen does not need to be reapplied, even after excessive sweating.\*\*\*  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
41. The sun's rays are the strongest at mid-day.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
42. Skin cancer can cause death.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
43. Most skin cancers can be prevented.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
44. Melanoma is the least serious form of skin cancer.\*\*\*  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
45. Skin cancer is the most common form of cancer.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7
46. Sunscreen should be applied even on cloudy days.  
Strongly Disagree 1 2 3 4 5 6 Strongly Agree 7

## Demographics

47. Please select your age in years.

\_\_\_\_\_

48. Please select your ethnicity.
- White/Caucasian
  - African-American/Black
  - Asian/Pacific Islander
  - Native American
  - Hispanic
  - Other (please specify)

49. Gender

- a. Male
- b. Female
- c. Other

50. Please select your highest level of education.

- a. Less than high school
- b. High school
- c. Some college
- d. 2-year degree
- e. 4-year degree
- f. Graduate or professional degree
- g. Other (please specify)

## **Appendix D - Study 2 Intervention Messages**

### **Employee Well-Being**

Outdoor workers face many potential dangers on the job, including machinery and busy roads, that can result in serious health risks for employees. One particular danger to employees is the sun's harmful ultraviolet (UV) radiation. Without proper sun protection, these rays can cause numerous health issues, including skin cancer, an increasingly common and deadly disease. Nearly 5 million people are treated for skin cancer each year in the United States, with over 15,000 deaths. As such, sun exposure and skin cancer represent a serious health risk for outdoor workers.

Aside from skin cancer concerns, employees that receive extensive sun damage may experience painful sunburns, premature aging, and long-term eye damage. Each of these medical and physical issues can potentially lead to significant physical and emotional pain among your employees, as well as significantly impacting and worsening their quality of life. Moreover, these health problems can ultimately lead to premature death for your employees. Fortunately, you can reduce your employees' health and wellness risks by using the following sun-safe strategies:

- Encourage sun safety among your employees and provide sun protection when possible. This includes wearing protective clothing, sunglasses, hats, and sunscreen with an SPF of 30 or higher.
- Schedule breaks in the shade and allow workers to reapply sunscreen throughout their shifts.
- Modify the work site by increasing the amount of shade available, for example, with tents, shelters, and cooling stations.
- Create work schedules that minimize sun exposure. For example, schedule outdoor tasks like mowing for early morning instead of noon, and rotate workers to reduce their UV exposure.
- Provide sun-safety information to employees and teach workers about the risks of UV radiation.

### **Employer Financial**

Outdoor workers face many potential dangers on the job, including machinery and busy roads, that can result in large financial costs for employers. One particularly pricey danger to employers is the sun's harmful ultraviolet (UV) radiation. Without proper sun protection, these rays can cause numerous health issues, including skin cancer, an increasingly common and expensive disease. Nearly 5 million people are treated for skin cancer each year in the United States, at an estimated annual cost of \$8.1 billion. As such, sun exposure and skin cancer represent a serious financial risk for managers and employers of outdoor workers.

Every year, American businesses lose more than \$100 million in productivity because of restricted activity or absence from work due to skin cancer. In some states, employers may be required to provide workers' compensation to employees who get skin cancer because of sun

exposure on the job. Additionally, the Occupational Safety and Health Administration (OSHA) requires that employers provide appropriate personal protective equipment to prevent exposure to serious sun exposure hazards. If discovered, violations of OSHA policies can result in expensive fines and financial penalties. Fortunately, you can reduce your company's financial risk by using the following sun-safe strategies:

- Encourage sun safety among your employees and provide sun protection when possible. This includes wearing protective clothing, sunglasses, hats, and sunscreen with an SPF of 30 or higher.
- Schedule breaks in the shade and allow workers to reapply sunscreen throughout their shifts.
- Modify the work site by increasing the amount of shade available, for example, with tents, shelters, and cooling stations.
- Create work schedules that minimize sun exposure. For example, schedule outdoor tasks like mowing for early morning instead of noon, and rotate workers to reduce their UV exposure.
- Provide sun-safety information to employees and teach workers about the risks of UV radiation.

### **Combined - Employee Well-Being and Employer Financial**

Outdoor workers face many potential dangers on the job, including machinery and busy roads, that can result in serious health risks to employees and large financial costs for employers. One particular danger to employee health and employer finances is the sun's harmful ultraviolet (UV) radiation. Without proper sun protection, these rays can cause numerous health issues, including skin cancer, an increasingly common, deadly, and expensive disease. Nearly 5 million people are treated for skin cancer each year in the United States with over 15,000 deaths. The estimated annual cost of skin cancer treatment is \$8.1 billion. As such, sun exposure and skin cancer represent a serious health and financial risk for both employees and employers.

Aside from skin cancer concerns, employees that receive extensive sun damage may experience painful sunburns, premature aging, and long-term eye damage. Each of these medical and physical issues can potentially lead to significant physical and emotional pain among your employees, as well as significantly impacting and worsening their quality of life. Moreover, these health problems can ultimately lead to premature death for your employees. Additionally, every year, American businesses lose more than \$100 million in productivity because of restricted activity or absence from work due to skin cancer. In some states, employers may be required to provide workers' compensation to employees who get skin cancer because of sun exposure on the job. Further, the Occupational Safety and Health Administration (OSHA) requires that employers provide appropriate personal protective equipment to prevent exposure to serious sun exposure hazards. If discovered, violations of OSHA policies can result in expensive fines and financial penalties. Fortunately, you can reduce your employees' health risks and your company's financial risks by using the following sun-safe strategies:

- Encourage sun safety among your employees and provide sun protection when possible. This includes wearing protective clothing, sunglasses, hats, and sunscreen with an SPF of 30 or higher.
- Schedule breaks in the shade and allow workers to reapply sunscreen throughout their shifts.
- Modify the work site by increasing the amount of shade available, for example, with tents, shelters, and cooling stations.
- Create work schedules that minimize sun exposure. For example, schedule outdoor tasks like mowing for early morning instead of noon, and rotate workers to reduce their UV exposure.
- Provide sun-safety information to employees and teach workers about the risks of UV radiation.

## **Control**

One alluring aspect of the outdoor industry lies in the sheer volume of jobs available. Despite the economic downturn of the late 2000s, the outdoor recreation economy saw 5 percent growth between 2005 and 2011. A significant component of success for the industry is the ease of entrance. Summer and seasonal jobs are abundant for those seeking short-term roles, while individuals looking for permanent, full-time positions also have countless options. Whether you're aspiring to get your hands dirty, walk among the redwoods or live the life aquatic, there are an abundance of job fields that are sure to be of interest.

Whether you dream of being a ski instructor or an archaeologist, surveyor or marine biologist, chances are there is an outdoor career matching your aspirations. With so much variety, those with educational backgrounds ranging from trade schools to doctorate programs can find suitable roles. Use the checklist below to find out if an outdoor job is the right fit for you:

- Do you enjoy being active rather than sitting at a desk?
- Do you value feeling connected to nature?
- Do you appreciate experiencing the changing seasons?
- Can you see yourself in a role that isn't chained to a computer?
- Do you like working with all kinds of people?

## Appendix E - Study 2 Pretest Measures

### Work information

1. Are you employed?
  - a. Yes, full-time.
  - b. Yes, part-time.
  - c. No, I am unemployed.
  
2. What industry are you employed in?  
\_\_\_\_\_
  
3. What is your job title?  
\_\_\_\_\_
  
4. What are your primary responsibilities or tasks at work?  
\_\_\_\_\_
  
5. On average, how many hours per week do you work?  
\_\_\_\_\_
  
6. How long have you been employed at your current job?  
\_\_\_\_\_
  
7. Are you a manager, assistant manager, or supervisor at your workplace?
  - a. Yes, I am a manager.
  - b. Yes, I am an assistant manager.
  - c. Yes, I am a supervisor
  - d. No, I am not a manager, assistant manager, or supervisor.
  
8. How many employees do you manage or supervise?  
\_\_\_\_\_
  
9. Do any of the employees that you manage or supervise work outdoors (i.e. spend significant amounts of time conducting job-related tasks outdoors)?
  - a. Yes
  - b. No
  
10. How many of the employees that you manage or supervise work outdoors (i.e. spend significant amounts of time conducting job-related tasks outdoors)?  
\_\_\_\_\_
  
11. What types of outdoor job-related tasks or duties do your employees perform?  
\_\_\_\_\_

12. Do you spend significant amounts of time at work outdoors yourself?
- Yes
  - No
13. What types of outdoor job-related tasks or duties do you perform?  
\_\_\_\_\_
14. What percentage of your workday involves you being outdoors?  
\_\_\_\_\_
15. On average, how many hours per day do you spend outside on a typical workday?  
\_\_\_\_\_
16. On average, how many hours per day do you spend outside on a typical non-workday?  
(0-24)  
\_\_\_\_\_
17. On average, how many days per week do you work outside?  
\_\_\_\_\_
18. Does your workplace have a policy on sun protection?
- Yes
  - No
  - Unsure

**Sun exposure and protection behaviors**

19. In the past summer, how often did you encourage your employees to use sunscreen while outdoors?
- |       |   |   |   |   |   |            |
|-------|---|---|---|---|---|------------|
| Never |   |   |   |   |   | Frequently |
| 1     | 2 | 3 | 4 | 5 | 6 | 7          |
20. In the past summer, how often did you encourage your employees to wear some form of sun protection on their head while outdoors (e.g. hat, cap, visor, bandana, etc.)?
- |       |   |   |   |   |   |            |
|-------|---|---|---|---|---|------------|
| Never |   |   |   |   |   | Frequently |
| 1     | 2 | 3 | 4 | 5 | 6 | 7          |
21. In the past summer, how often did you encourage your employees to wear a long-sleeved shirt while outdoors?
- |       |   |   |   |   |   |            |
|-------|---|---|---|---|---|------------|
| Never |   |   |   |   |   | Frequently |
| 1     | 2 | 3 | 4 | 5 | 6 | 7          |
22. In the past summer, how often did you encourage your employees to wear long pants while outdoors?
- |       |   |   |   |   |   |            |
|-------|---|---|---|---|---|------------|
| Never |   |   |   |   |   | Frequently |
| 1     | 2 | 3 | 4 | 5 | 6 | 7          |

23. In the past summer, how often did you encourage your employees to wear sunglasses while outdoors?

Never  
1                      2                      3                      4                      5                      6                      Frequently  
7

24. In the past summer, how often did you encourage your employees to seek shade when appropriate while outdoors?

Never  
1                      2                      3                      4                      5                      6                      Frequently  
7

**Sun protection importance**

25. How important is it that your employees use some form of sun protection at work?

Not at all  
1                      2                      3                      4                      5                      6                      Extremely  
7

**Additional attitude items**

26. How important is it that you, personally, use some form of sun protection when outdoors?

Not at all  
1                      2                      3                      4                      5                      6                      Extremely  
7

27. To what extent are you concerned about the effects that sun exposure can have on your personal health and well-being?

Not at all  
1                      2                      3                      4                      5                      6                      Extremely  
7

28. To what extent are you concerned about the effects that sun exposure can have on your employees' health and well-being?

Not at all  
1                      2                      3                      4                      5                      6                      Extremely  
7

29. To what extent are you concerned about the financial consequences of excessive sun exposure?

Not at all  
1                      2                      3                      4                      5                      6                      Extremely  
7

30. To what extent do you feel that a policy regarding sun protection is necessary at your work place?

Not at all  
1                      2                      3                      4                      5                      6                      Extremely  
7



## Appendix F - Study 2 Posttest Measures

### Attention check

1. Please provide a brief (one sentence) summary of the message you just read.
- 

### Sun exposure and protection behaviors

After having read the message that you received, please indicate your future intentions regarding the following behaviors.

2. In the future, how often do you intend to encourage your employees to use sunscreen while outdoors?  
Never 2 3 4 5 6 Frequently  
1 2 3 4 5 6 7
3. In the future, how often do you intend to encourage your employees to wear some form of sun protection on their head while outdoors (e.g. hat, cap, visor, bandana, etc.)?  
Never 2 3 4 5 6 Frequently  
1 2 3 4 5 6 7
4. In the future, how often do you intend to encourage your employees to wear a long-sleeved shirt while outdoors?  
Never 2 3 4 5 6 Frequently  
1 2 3 4 5 6 7
5. In the future, how often do you intend to encourage your employees to wear long pants while outdoors?  
Never 2 3 4 5 6 Frequently  
1 2 3 4 5 6 7
6. In the future, how often do you intend to encourage your employees to wear sunglasses while outdoors?  
Never 2 3 4 5 6 Frequently  
1 2 3 4 5 6 7
7. In the future, how often do you intend to encourage your employees to seek shade when appropriate while outdoors?  
Never 2 3 4 5 6 Frequently  
1 2 3 4 5 6 7

## Sun protection importance

After having the read the message that you received, please respond to the following question.

8. How important is it that your employees use some form of sun protection at work?
- |            |   |   |   |   |   |           |
|------------|---|---|---|---|---|-----------|
| Not at all |   |   |   |   |   | Extremely |
| 1          | 2 | 3 | 4 | 5 | 6 | 7         |

## Additional attitude items

9. How important is it that you, personally, use some form of sun protection when outdoors?
- |            |   |   |   |   |   |           |
|------------|---|---|---|---|---|-----------|
| Not at all |   |   |   |   |   | Extremely |
| 1          | 2 | 3 | 4 | 5 | 6 | 7         |

10. To what extent are you concerned about the effects that sun exposure can have on your personal health and well-being?
- |            |   |   |   |   |   |           |
|------------|---|---|---|---|---|-----------|
| Not at all |   |   |   |   |   | Extremely |
| 1          | 2 | 3 | 4 | 5 | 6 | 7         |

11. To what extent are you concerned about the effects that sun exposure can have on your employees' health and well-being?
- |            |   |   |   |   |   |           |
|------------|---|---|---|---|---|-----------|
| Not at all |   |   |   |   |   | Extremely |
| 1          | 2 | 3 | 4 | 5 | 6 | 7         |

12. To what extent are you concerned about the financial consequences of excessive sun exposure?
- |            |   |   |   |   |   |           |
|------------|---|---|---|---|---|-----------|
| Not at all |   |   |   |   |   | Extremely |
| 1          | 2 | 3 | 4 | 5 | 6 | 7         |

13. To what extent do you feel that a policy regarding sun protection is necessary at your work place?
- |            |   |   |   |   |   |           |
|------------|---|---|---|---|---|-----------|
| Not at all |   |   |   |   |   | Extremely |
| 1          | 2 | 3 | 4 | 5 | 6 | 7         |

## Demographics

14. Please select your age in years.

\_\_\_\_\_

15. Please select your ethnicity.
- White/Caucasian
  - African-American/Black
  - Asian/Pacific Islander
  - Native American
  - Hispanic
  - Other (please specify)

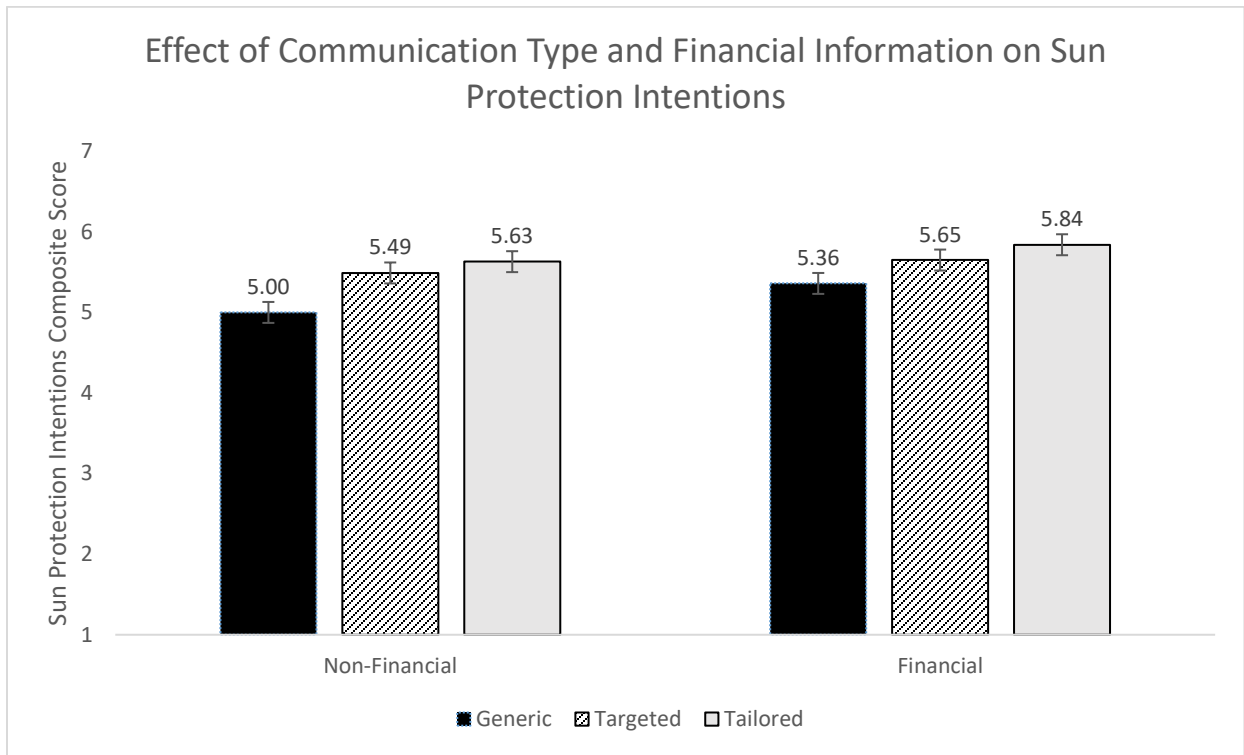
16. Gender

- a. Male
- b. Female
- c. Other

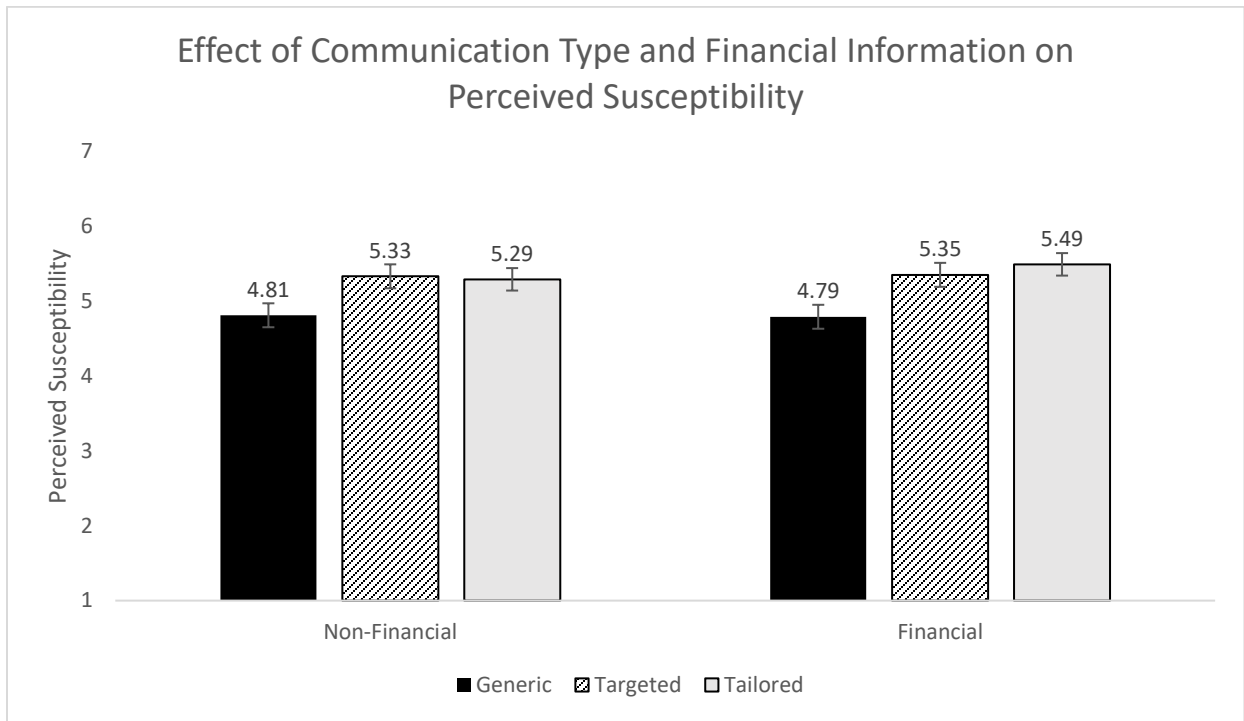
17. Please select your highest level of education.

- a. Less than high school
- b. High school
- c. Some college
- d. 2-year degree
- e. 4-year degree
- f. Graduate or professional degree
- g. Other (please specify)

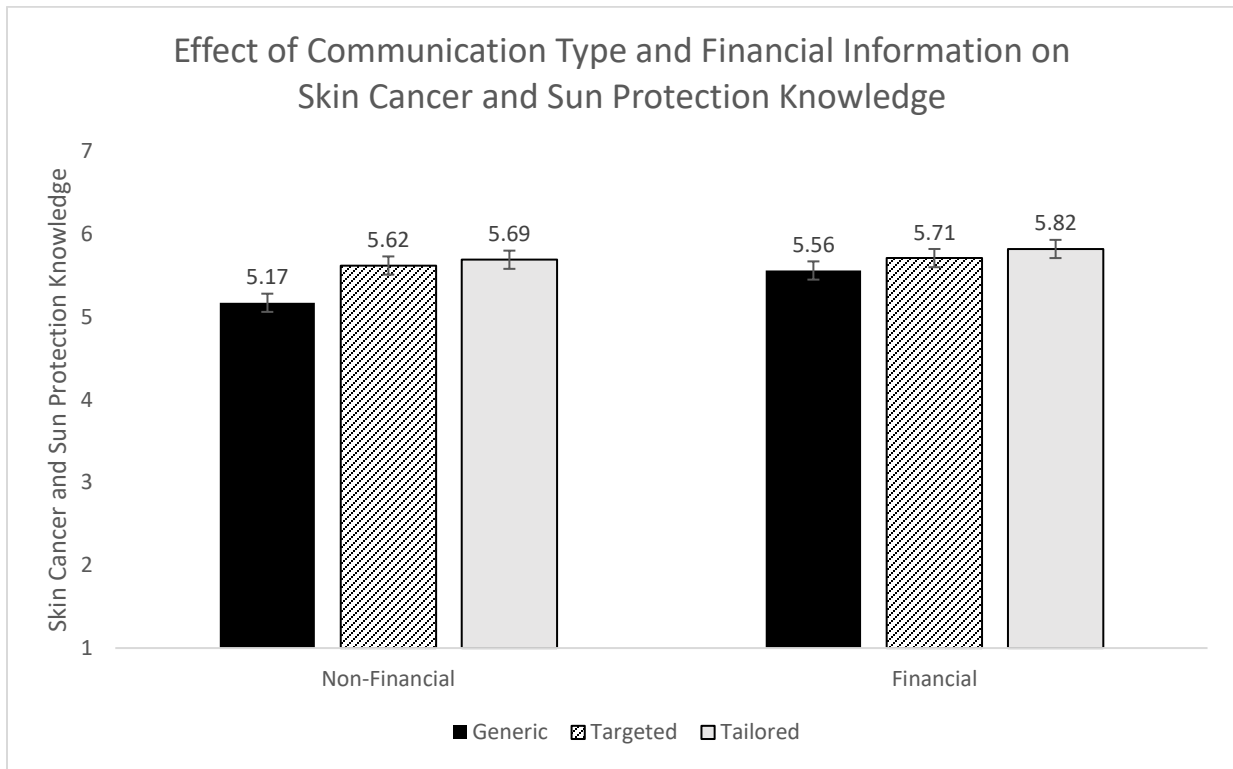
**Figure 1**



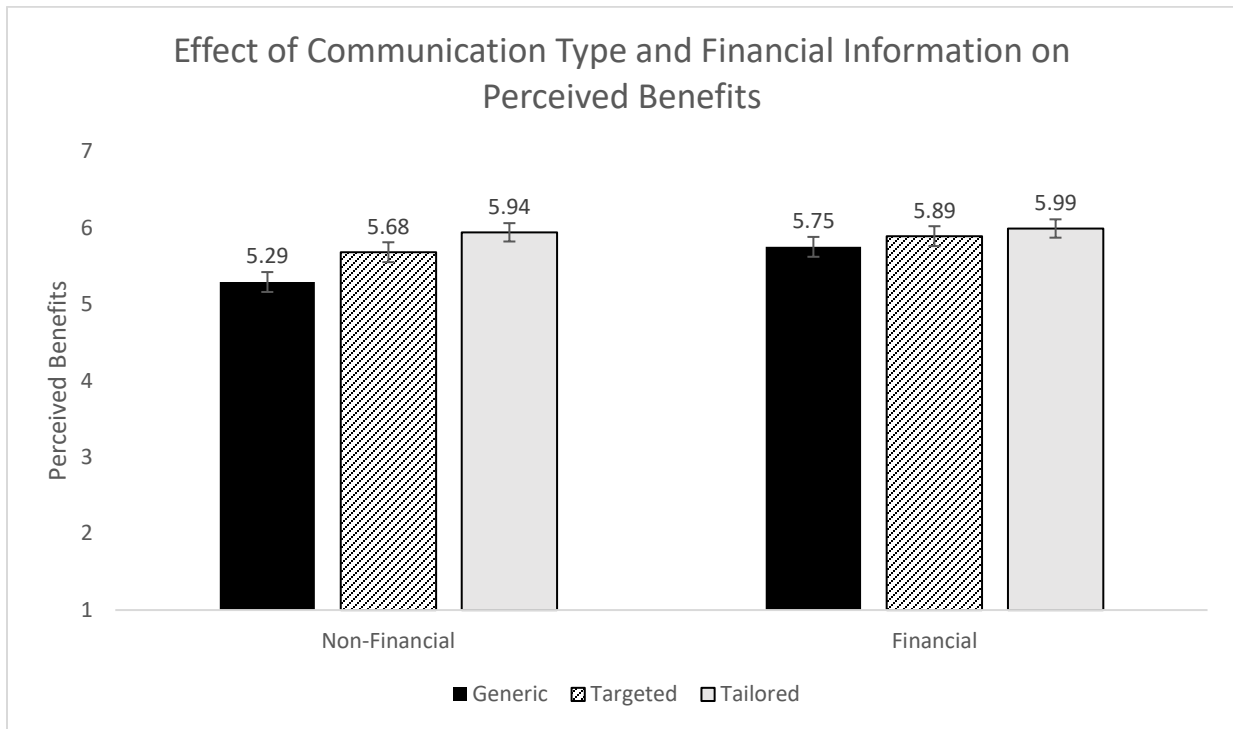
**Figure 2**



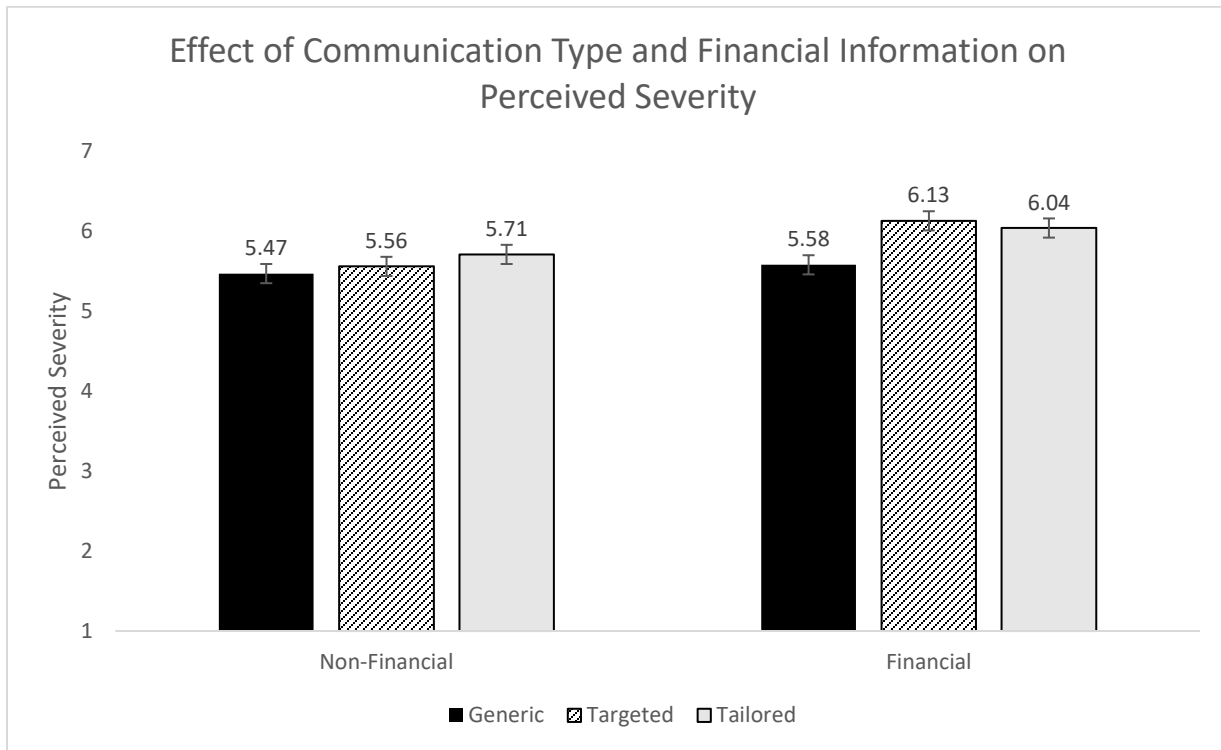
**Figure 3**



**Figure 4**

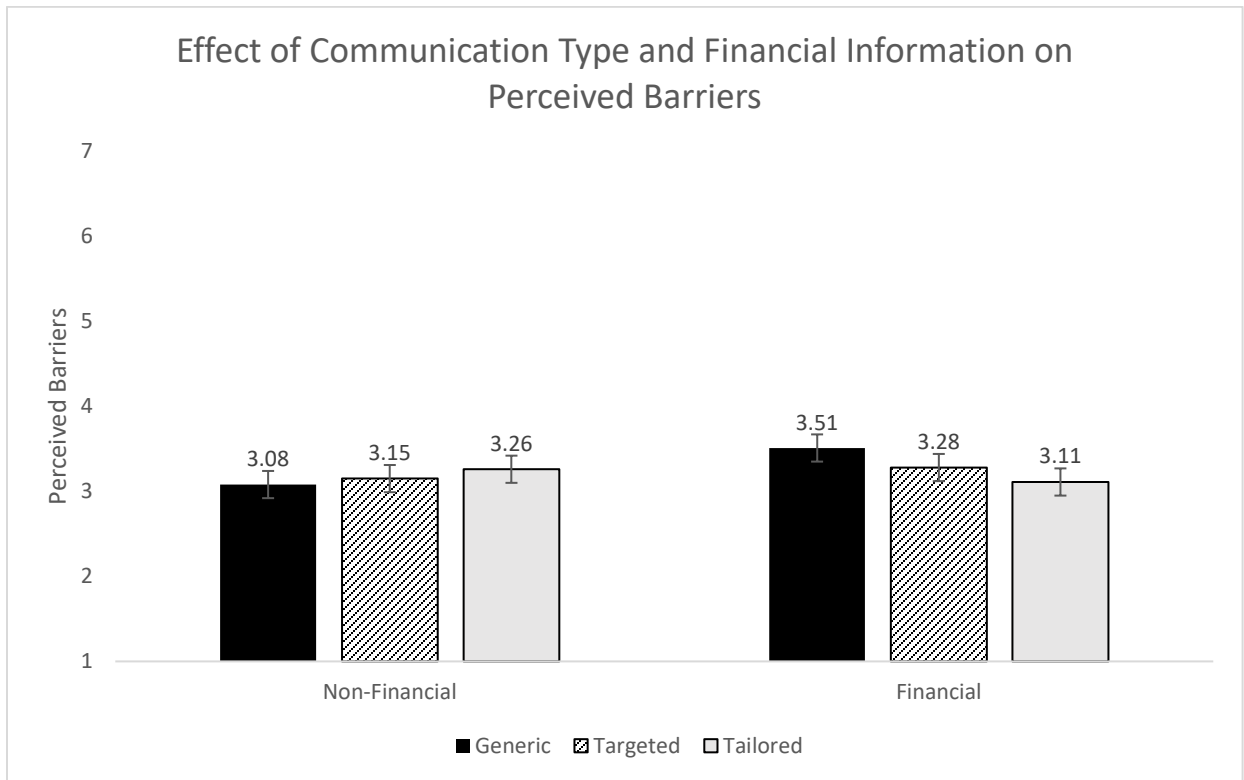


**Figure 5**

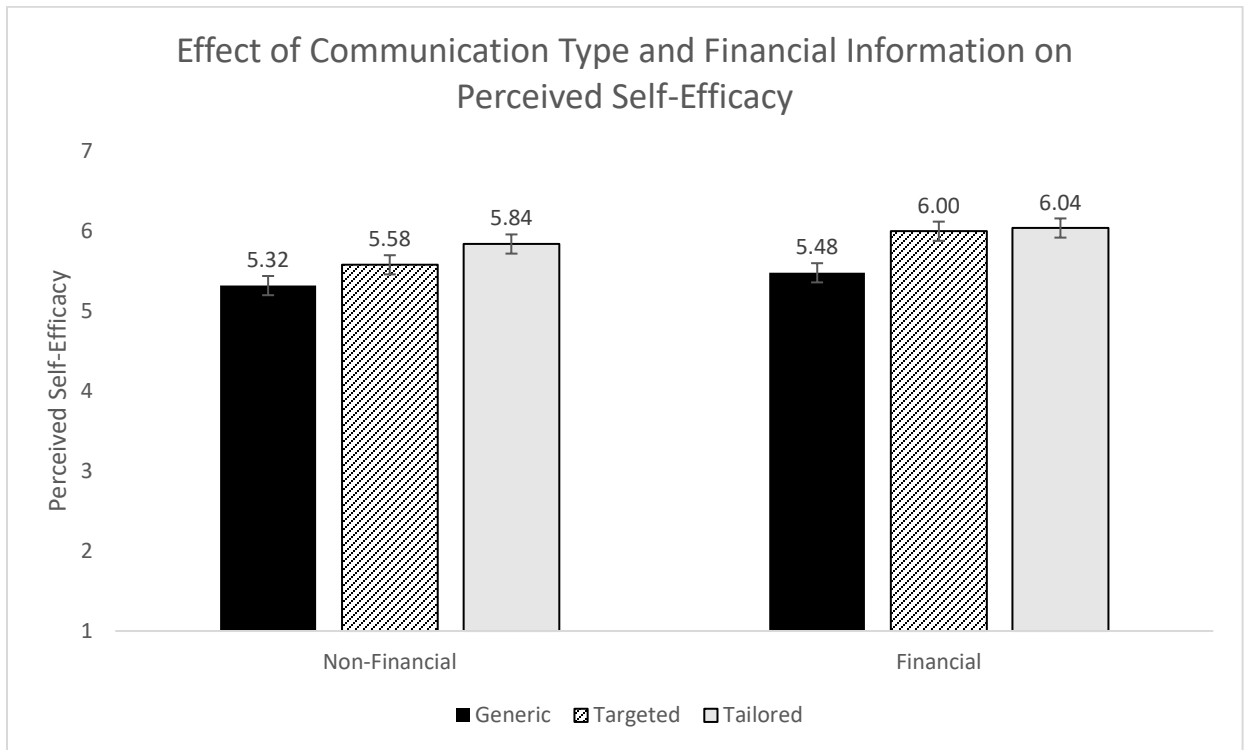




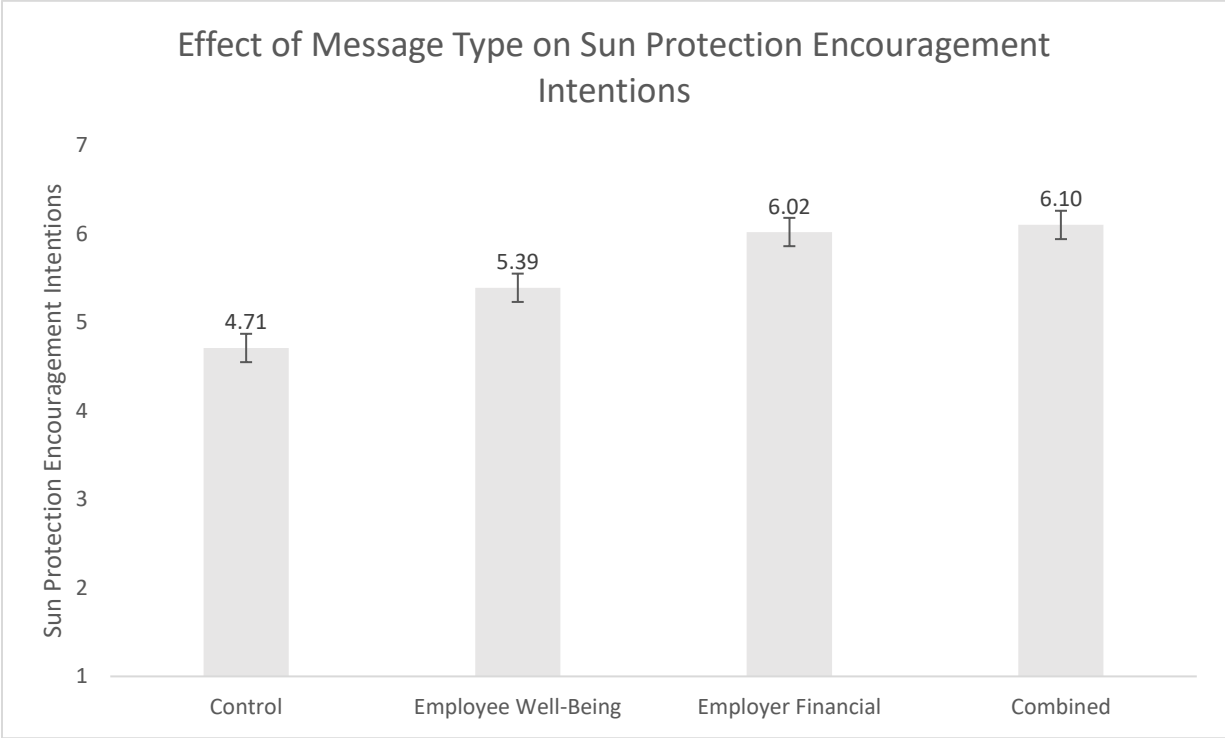
**Figure 6**



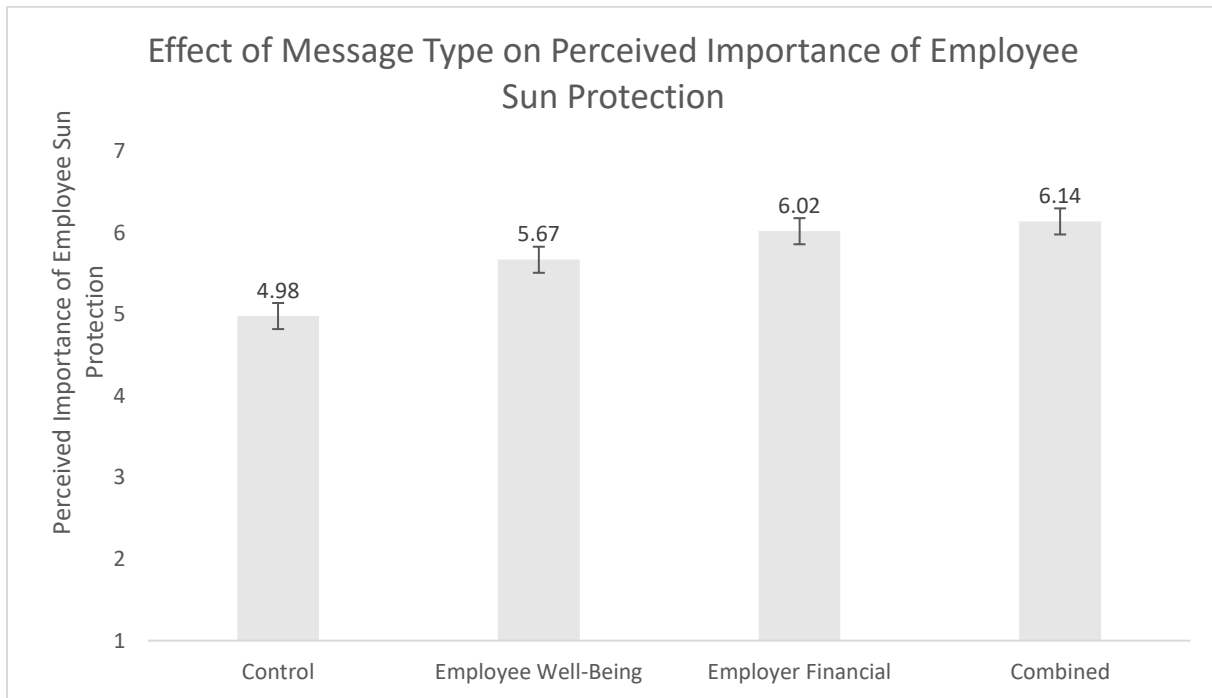
**Figure 7**



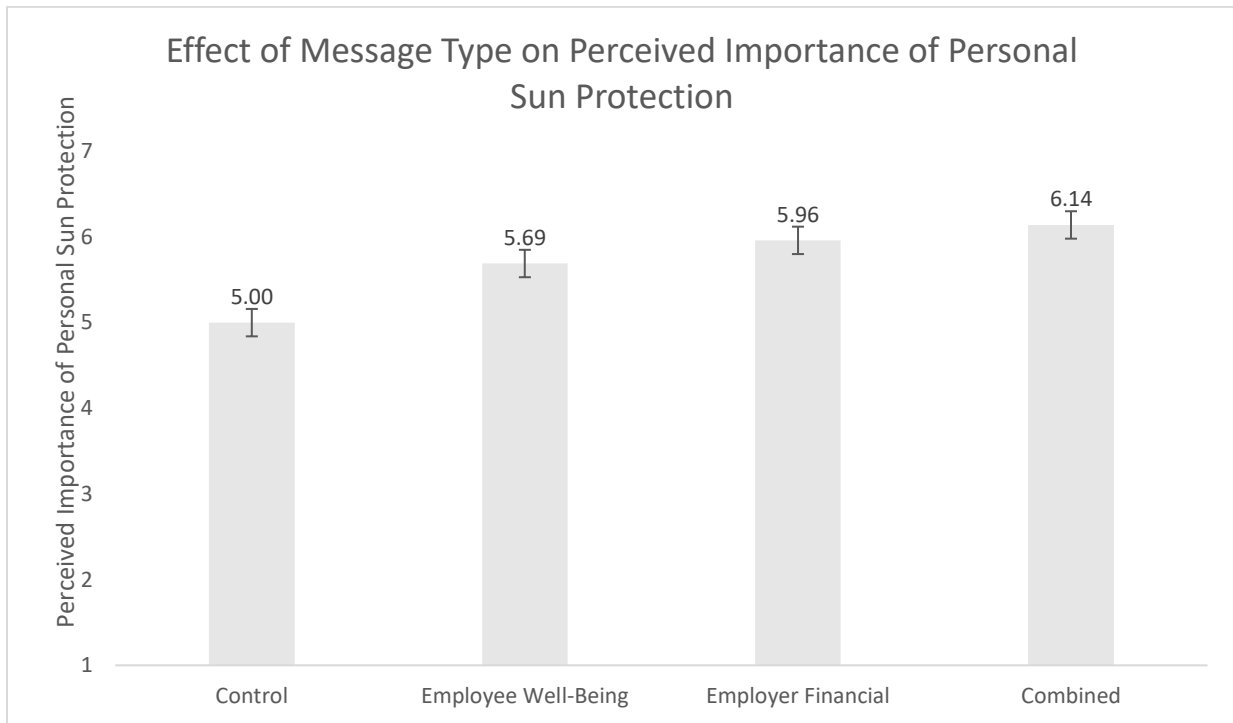
**Figure 8**



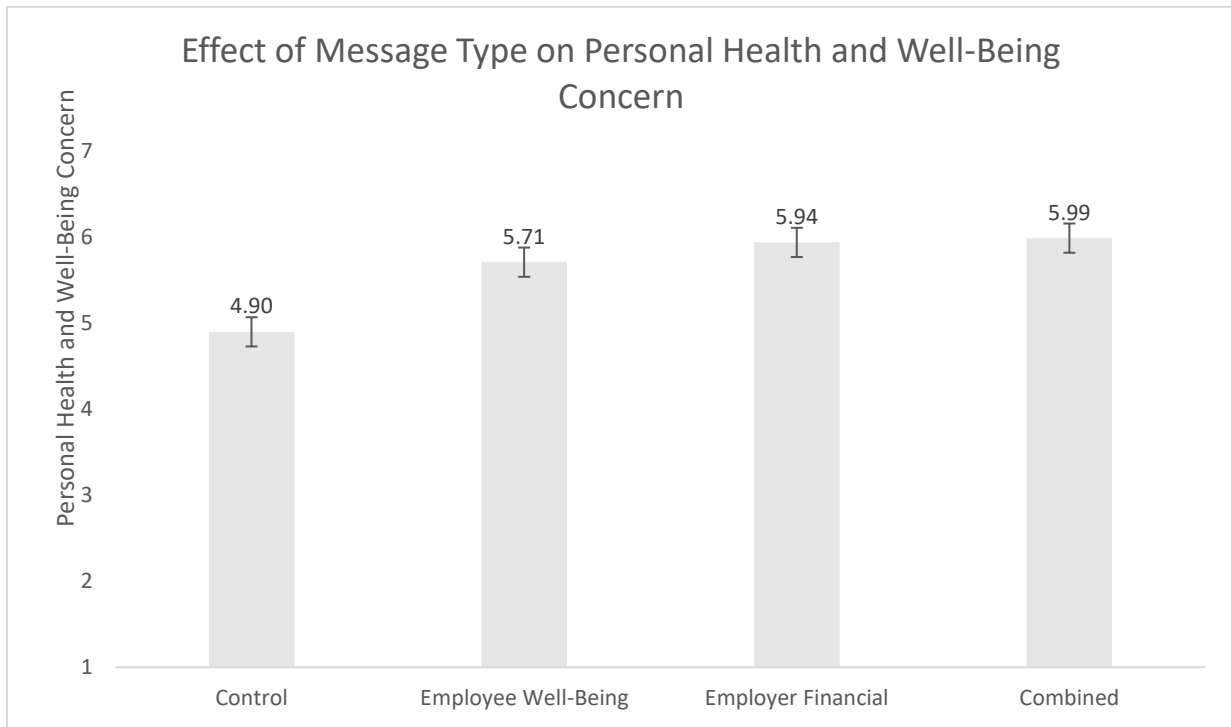
**Figure 9**



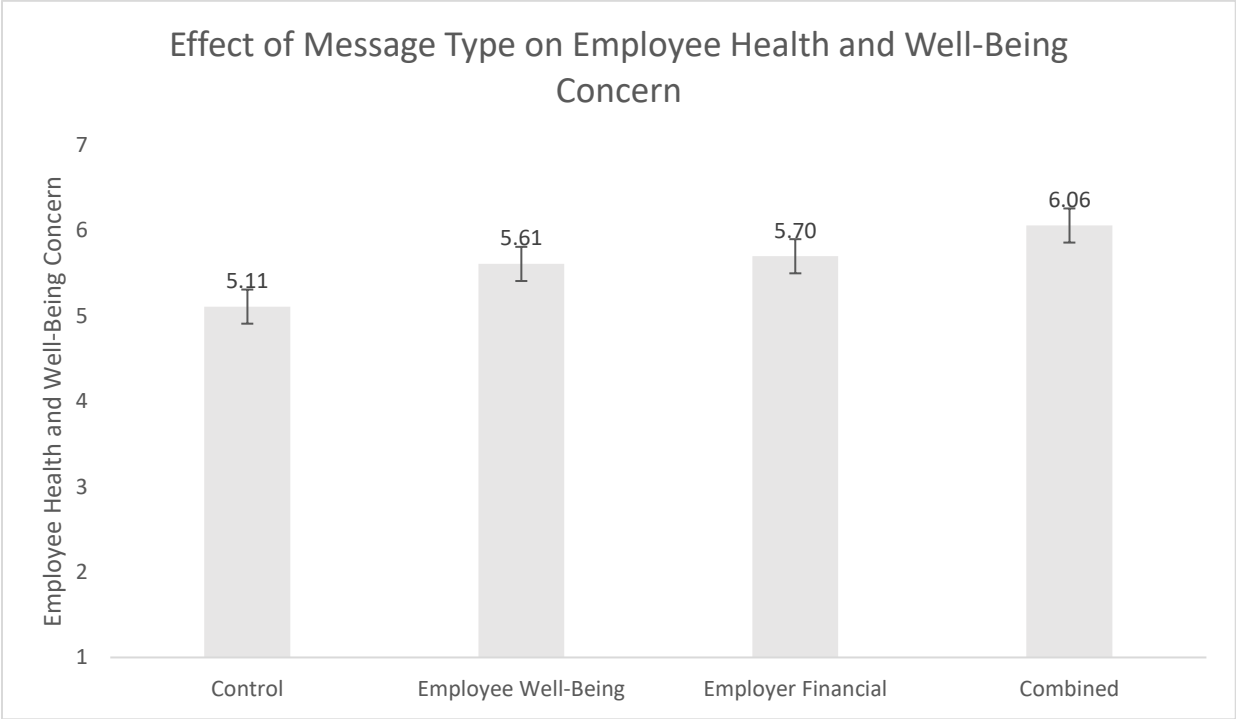
**Figure 10**



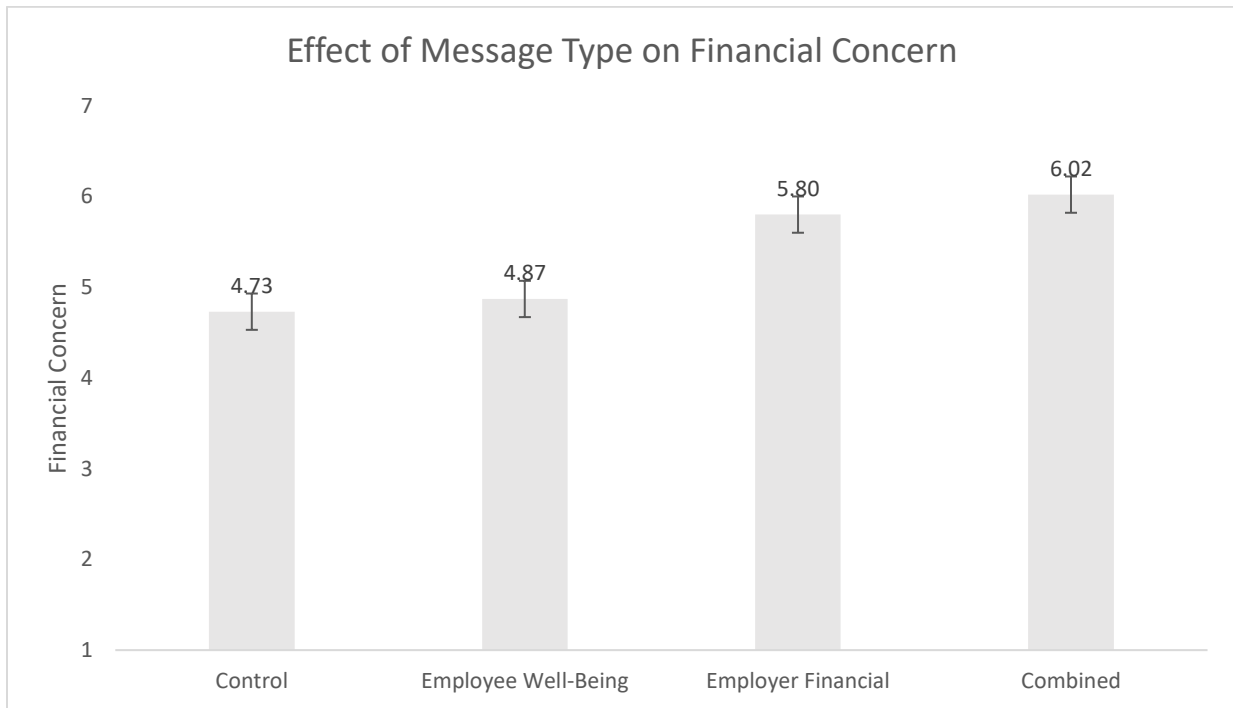
**Figure 11**



**Figure 12**

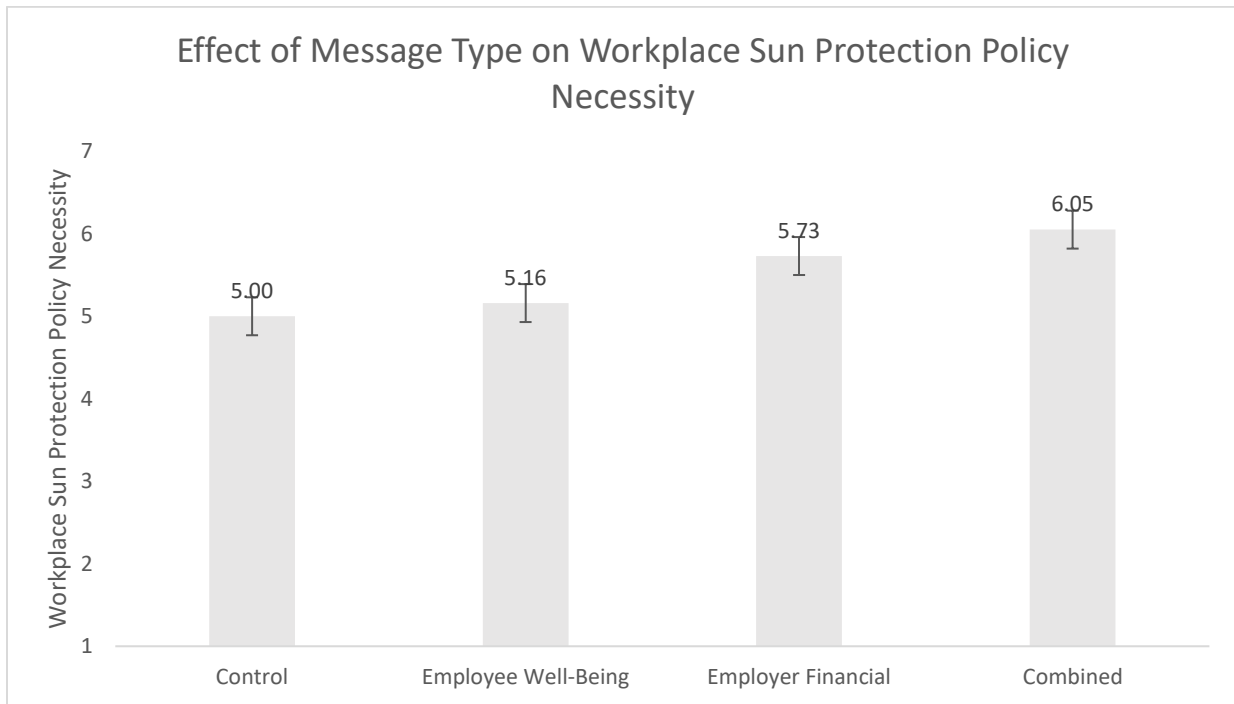


**Figure 13**





**Figure 14**



**Table 1**

*Study 1 Adjusted Means and Standard Errors for the Communication Type and Financial Information Variables in the Analysis of Covariance (ANCOVA) on the Dependent Variable of Posttest Sun Protection Intentions*

Communication Type	Financial Information		Total
	Non-financial	Financial	
Generic	5.00 (.13)	5.36 (.14)	5.18 <sup>a</sup> (.10)
Targeted	5.49 (.13)	5.65 (.13)	5.57 <sup>b</sup> (.10)
Tailored	5.63 (.13)	5.84 (.15)	5.73 <sup>b</sup> (.10)
Total	5.38 <sup>a</sup> (.08)	5.61 <sup>b</sup> (.08)	

*Note.* Standard errors are located in parentheses. Adjusted means with different superscripts in the “Total” row and column indicate a main effect where those adjusted means differed significantly from one another in pairwise comparisons.

**Table 2**

*Study 1 Adjusted Means and Standard Errors for the Communication Type and Financial Information Variables in the Analysis of Covariance (ANCOVA) on the Dependent Variable of Posttest Perceived Susceptibility*

Communication Type	Financial Information		Total
	Non-financial	Financial	
Generic	4.81 (.16)	4.79 (.16)	4.80 <sup>a</sup> (.11)
Targeted	5.33 (.16)	5.35 (.16)	5.34 <sup>b</sup> (.11)
Tailored	5.29 (.15)	5.49 (.17)	5.39 <sup>b</sup> (.12)
Total	5.14 <sup>a</sup> (.09)	5.21 <sup>a</sup> (.09)	

*Note.* Standard errors are located in parentheses. Adjusted means with different superscripts in the “Total” row and column indicate a main effect where those adjusted means differed significantly from one another in pairwise comparisons.

**Table 3**

*Study 1 Adjusted Means and Standard Errors for the Communication Type and Financial Information Variables in the Analysis of Covariance (ANCOVA) on the Dependent Variable of Posttest Skin Cancer and Sun Protection Knowledge*

Communication Type	Financial Information		Total
	Non-financial	Financial	
Generic	5.17 (.11)	5.56 (.11)	5.36 <sup>a</sup> (.08)
Targeted	5.62 (.11)	5.71 (.11)	5.67 <sup>b</sup> (.08)
Tailored	5.69 (.11)	5.82 (.12)	5.76 <sup>b</sup> (.08)
Total	5.49 <sup>a</sup> (.07)	5.70 <sup>b</sup> (.07)	

*Note.* Standard errors are located in parentheses. Adjusted means with different superscripts in the “Total” row and column indicate a main effect where those adjusted means differed significantly from one another in pairwise comparisons.

**Table 4**

*Study 1 Adjusted Means and Standard Errors for the Communication Type and Financial Information Variables in the Analysis of Covariance (ANCOVA) on the Dependent Variable of Posttest Perceived Benefits*

Communication Type	Financial Information		Total
	Non-financial	Financial	
Generic	5.29 (.13)	5.75 (.13)	5.52 <sup>a</sup> (.09)
Targeted	5.68 (.13)	5.89 (.13)	5.78 <sup>ab</sup> (.09)
Tailored	5.94 (.12)	5.99 (.14)	5.96 <sup>b</sup> (.09)
Total	5.64 <sup>a</sup> (.07)	5.87 <sup>b</sup> (.08)	

*Note.* Standard errors are located in parentheses. Adjusted means with different superscripts in the “Total” row and column indicate a main effect where those adjusted means differed significantly from one another in pairwise comparisons.

**Table 5**

*Study 1 Adjusted Means and Standard Errors for the Communication Type and Financial Information Variables in the Analysis of Covariance (ANCOVA) on the Dependent Variable of Posttest Perceived Severity*

Communication Type	Financial Information		Total
	Non-financial	Financial	
Generic	5.47 (.12)	5.58 (.12)	5.52 <sup>a</sup> (.12)
Targeted	5.56 (.12)	6.13 (.12)	5.85 <sup>b</sup> (.12)
Tailored	5.71 (.12)	6.04 (.13)	5.88 <sup>b</sup> (.12)
Total	5.58 <sup>a</sup> (.07)	5.92 <sup>b</sup> (.07)	

*Note.* Standard errors are located in parentheses. Adjusted means with different superscripts in the “Total” row and column indicate a main effect where those adjusted means differed significantly from one another in pairwise comparisons.

**Table 6**

*Study 1 Adjusted Means and Standard Errors for the Communication Type and Financial Information Variables in the Analysis of Covariance (ANCOVA) on the Dependent Variable of Posttest Perceived Barriers*

Communication Type	Financial Information		Total
	Non-financial	Financial	
Generic	3.08 (.16)	3.51 (.16)	3.30 <sup>a</sup> (.11)
Targeted	3.15 (.16)	3.28 (.16)	3.21 <sup>a</sup> (.11)
Tailored	3.26 (.16)	3.11 (.17)	3.18 <sup>a</sup> (.12)
Total	3.16 <sup>a</sup> (.09)	3.30 <sup>a</sup> (.10)	

*Note.* Standard errors are located in parentheses. Adjusted means with different superscripts in the “Total” row and column indicate a main effect where those adjusted means differed significantly from one another in pairwise comparisons.

**Table 7**

*Study 1 Adjusted Means and Standard Errors for the Communication Type and Financial Information Variables in the Analysis of Covariance (ANCOVA) on the Dependent Variable of Posttest Perceived Self-efficacy*

Communication Type	Financial Information		Total
	Non-financial	Financial	
Generic	5.32 (.12)	5.48 (.12)	5.40 <sup>a</sup> (.09)
Targeted	5.58 (.12)	6.00 (.12)	5.79 <sup>b</sup> (.09)
Tailored	5.84 (.12)	6.04 (.13)	5.94 <sup>b</sup> (.09)
Total	5.58 <sup>a</sup> (.07)	5.84 <sup>b</sup> (.07)	

*Note.* Standard errors are located in parentheses. Adjusted means with different superscripts in the “Total” row and column indicate a main effect where those adjusted means differed significantly from one another in pairwise comparisons.



**Table 8**

*Study 2 Adjusted Means and Standard Errors for the Message Type Variable in the Analysis of Covariance (ANCOVA) on the Dependent Variable of Posttest Sun Protection Encouragement Intentions*

Message Type	Mean (SE)
Control	4.71 <sup>a</sup> (.16)
Employee Well-Being	5.39 <sup>b</sup> (.16)
Employer Financial	6.02 <sup>c</sup> (.16)
Combined	6.10 <sup>c</sup> (.16)

*Note.* Standard errors are located in parentheses. Adjusted means with different superscripts indicate a main effect where those adjusted means differed significantly from one another in pairwise comparisons.

**Table 9**

*Study 2 Adjusted Means and Standard Errors for the Message Type Variable in the Analysis of Covariance (ANCOVA) on the Dependent Variable of Posttest Perceived Importance of Employee Sun Protection*

Message Type	Mean (SE)
Control	4.98 <sup>a</sup> (.17)
Employee Well-Being	5.67 <sup>b</sup> (.17)
Employer Financial	6.02 <sup>b</sup> (.16)
Combined	6.14 <sup>b</sup> (.16)

*Note.* Standard errors are located in parentheses. Adjusted means with different superscripts indicate a main effect where those adjusted means differed significantly from one another in pairwise comparisons.

**Table 10**

*Study 2 Adjusted Means and Standard Errors for the Message Type Variable in the Analysis of Covariance (ANCOVA) on the Dependent Variable of Posttest Perceived Importance of Personal Sun Protection*

Message Type	Mean (SE)
Control	5.00 <sup>a</sup> (.16)
Employee Well-Being	5.69 <sup>b</sup> (.16)
Employer Financial	5.96 <sup>b</sup> (.16)
Combined	6.14 <sup>b</sup> (.16)

*Note.* Standard errors are located in parentheses. Adjusted means with different superscripts indicate a main effect where those adjusted means differed significantly from one another in pairwise comparisons.

**Table 11**

*Study 2 Adjusted Means and Standard Errors for the Message Type Variable in the Analysis of Covariance (ANCOVA) on the Dependent Variable of Posttest Personal Health and Well-being Concern*

Message Type	Mean (SE)
Control	4.90 <sup>a</sup> (.17)
Employee Well-Being	5.71 <sup>b</sup> (.17)
Employer Financial	5.94 <sup>b</sup> (.17)
Combined	5.99 <sup>b</sup> (.17)

*Note.* Standard errors are located in parentheses. Adjusted means with different superscripts indicate a main effect where those adjusted means differed significantly from one another in pairwise comparisons.

**Table 12**

*Study 2 Adjusted Means and Standard Errors for the Message Type Variable in the Analysis of Covariance (ANCOVA) on the Dependent Variable of Posttest Employee Health and Well-Being Concern*

Message Type	Mean (SE)
Control	5.11 <sup>a</sup> (.20)
Employee Well-Being	5.61 <sup>ab</sup> (.20)
Employer Financial	5.70 <sup>ab</sup> (.20)
Combined	6.06 <sup>b</sup> (.19)

*Note.* Standard errors are located in parentheses. Adjusted means with different superscripts indicate a main effect where those adjusted means differed significantly from one another in pairwise comparisons.

**Table 13**

*Study 2 Adjusted Means and Standard Errors for the Message Type Variable in the Analysis of Covariance (ANCOVA) on the Dependent Variable of Posttest Financial Concern*

Message Type	Mean (SE)
Control	4.73 <sup>a</sup> (.20)
Employee Well-Being	4.87 <sup>a</sup> (.20)
Employer Financial	5.80 <sup>b</sup> (.19)
Combined	6.02 <sup>b</sup> (.19)

*Note.* Standard errors are located in parentheses. Adjusted means with different superscripts indicate a main effect where those adjusted means differed significantly from one another in pairwise comparisons.

**Table 14**

*Study 2 Adjusted Means and Standard Errors for the Message Type Variable in the Analysis of Covariance (ANCOVA) on the Dependent Variable of Posttest Workplace Sun Protection Policy Necessity*

Message Type	Mean (SE)
Control	5.00 <sup>a</sup> (.23)
Employee Well-Being	5.16 <sup>a</sup> (.23)
Employer Financial	5.73 <sup>ab</sup> (.22)
Combined	6.05 <sup>b</sup> (.22)

*Note.* Standard errors are located in parentheses. Adjusted means with different superscripts indicate a main effect where those adjusted means differed significantly from one another in pairwise comparisons.