USING AN INDIRECT MESSAGE TO PROMOTE HEALTH BEHAVIORS

A thesis submitted
To Kent State University in partial
Fulfillment of the requirements for the
Degree of Master of Arts

by

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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>TABLE OF CONTENTS</td>
<td>iii</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>v</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>vi</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>vii</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>Health Messages and Defensiveness</td>
<td>2</td>
</tr>
<tr>
<td>Self-Affirmation</td>
<td>3</td>
</tr>
<tr>
<td>Invisible support</td>
<td>4</td>
</tr>
<tr>
<td>The present studies</td>
<td>6</td>
</tr>
<tr>
<td>STUDY 1</td>
<td>8</td>
</tr>
<tr>
<td>METHOD</td>
<td>9</td>
</tr>
<tr>
<td>Participants and Design</td>
<td>9</td>
</tr>
<tr>
<td>Procedure</td>
<td>9</td>
</tr>
<tr>
<td>Measures and Outcomes</td>
<td>10</td>
</tr>
<tr>
<td>RESULTS</td>
<td>13</td>
</tr>
<tr>
<td>STUDY 1 DISCUSSION</td>
<td>18</td>
</tr>
<tr>
<td>STUDY 2</td>
<td>20</td>
</tr>
<tr>
<td>METHOD</td>
<td>20</td>
</tr>
<tr>
<td>Participants and Design</td>
<td>20</td>
</tr>
<tr>
<td>Procedure</td>
<td>21</td>
</tr>
<tr>
<td>Measures and Outcomes</td>
<td>21</td>
</tr>
<tr>
<td>RESULTS</td>
<td>24</td>
</tr>
</tbody>
</table>
LIST OF FIGURES

Figure 1. Interactive Effects of Message Type and Perceived Risk on Sunscreen Use……16
LIST OF TABLES

Table 1. Illustrating Means and Standard Deviations of Outcomes, Study 1……………17

Table 2. Pearson correlations examining the relationship between outcome variables,

Study 1..................................................................................................................................18

Table 3. Illustrating Means and Standard Deviations of Outcomes, Study 2………………27

Table 4. Pearson correlations examining the relationship between outcome variables,

Study 2..................................................................................................................................28
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INTRODUCTION

How can we motivate people to be healthier? Can we scare them into engaging in healthy behaviors by giving them health risk information? Researchers have used fear appeals in health messages in an attempt to do so (for a systematic review, see Witte & Allen, 2000). Unfortunately, threatening information in these fear appeals can sometimes result in defensiveness in the message recipient and ultimate rejection of the health message rather than positive changes in behavior (van ‘t Riet & Ruiter, 2013). It is thought that this defensiveness arises because the fear-provoking health information threatens the recipient’s sense of self-worth and moral adequacy (Sherman & Cohen, 2006). Researchers have used manipulations derived from Self-Affirmation Theory (SA) as a way to counter the defensiveness that may arise when a person is presented with threatening information and lead to acceptance of health information (Harris & Napper, 2005; Sherman & Cohen, 2002; Sherman, Nelson, & Steele, 2000).

In a seemingly different area, the literature on social support has shown that, while perceived support may be beneficial, actual support receipt can sometimes have negative consequences such as feelings of indebtedness, lowered self-efficacy, and negative moods (Bolger, Zuckerman, & Kessler 2000; Howland & Simpson, 2010). Researchers have hypothesized that this may be because the support provided may be threatening to the support recipient’s sense of competence and self-worth (Amarel, 2001; Gleason, Lida, Shrout, & Bolger, 2008). Invisible support (IS) is a type of social support that is given in an indirect manner. For example, rather than directly giving advice to a person who is in distress, a support provider can disguise the advice as a story. This type of social support is thought to reduce the threat to a support recipient’s sense of competency and self-worth and allow for acceptance of the advice, permitting the recipient to gain the benefits without the negative consequences of received
support. This study attempts to extend what is known about IS, which is thought to have similar underlying mechanisms as SA, to health messages. The purpose of this study was to create an "invisible" or indirect health message in order to promote the acceptance of potentially threatening health messages. For the purposes of this study, the invisible health message will be referred to as the indirect health message.

**Health Messages and Defensiveness**

Health messages that use fear as a motivator have been shown to be effective in promoting health behaviors, but only under certain conditions (Witte, 1992; Witte & Allen, 2000). Witte (1992) argued that these fear appeals can be beneficial in promoting behavior change only if used correctly and in certain circumstances. According to Witte, three constructs—fear, threat, and efficacy—are essential components of fear appeals in health messages. That is, in order to be effective, a message must include a fear-inducing component for a person to potentially perceive threat and the person must have efficacy, or the belief that she can overcome the threat. On the other hand, if the person’s perceived threat is minimal, she will not process the information in the health message at all, and therefore, will not accept the information in the message. Witte also claims that acceptance of fear appeal messages will increase when perceived threat is high and the participant also has high perceived efficacy, but if perceived threat is high and perceived efficacy is low, people will reject the message. Thus, in situations where this is the case, fear appeals can result in the negative consequence of message rejection.

One example of how a fear-inducing health message can lead to negative consequences (i.e., rejection of the message) comes from Liberman and Chaiken (1992). In this study, participants were categorized into two groups: 1) high relevance, or those who were coffee
drinkers, and 2) low relevance, or those who were not coffee drinkers. They were given an article that was either “high-threat” or “low-threat” about a link between caffeine and fibrocystic disease. In this study, those with high relevance were less likely to accept either the low or high threat message than those with low relevance. The authors concluded that participants for whom the message was highly relevant processed the health information in a biased manner which led them to reject the message.

Similarly, Berkowitz and Cottingham (1960) conducted two experiments that found that a high-fear message led participants who were classified as low-relevance to accept the message, whereas the participants who were classified as high-relevance were more likely to reject the message. They concluded that the high-relevance participants who received a high-fear message became defensive, and therefore, rejected the message. In addition, many other researchers have concluded that, when presented with relevant health information, participants often defensively process the information and reject the message (Brown and Locker, 2009; Jemmott, Ditto, & Croyle, 1986; Kunda, 1987; Sherman, Nelson, & Steele, 2000).

Self-Affirmation

One way to achieve acceptance of highly threatening health messages is derived from self-affirmation theory (SA). This theory suggests that people are compelled to protect their sense of integrity, adequacy, and self-worth (Sherman & Cohen, 2006; Sherman, Nelson, & Steele, 2000). People have a tendency to view themselves in a positive way, consequently, when presented with negative information that is self-relevant, they can become defensive and reject the information (Sherman & Cohen, 2006). Therefore, people who are in most need of the health message may be the least likely to be influenced by it (Sherman, Nelson, & Steele, 2000; van ‘t Riet & Ruiter 2013).
This has led researchers to use self-affirmation as a way to overcome the defensiveness in participants and lead them to accept health messages (Harris & Napper, 2005; Sherman & Cohen, 2002; Sherman, Nelson, & Steele, 2000). When people are allowed to self-affirm, or engage in activities that remind them of their values and their identity, their defensiveness can be reduced in such a way that they are able to accept otherwise threatening information (Sherman & Cohen, 2006). In a typical SA manipulation, participants are asked to list values that are important to them in order from most important to least important. They are then asked to write an essay about their most important value (e.g., Cohen, Aronson, & Steele, 2000; Harris & Napper, 2005; Sherman, Nelson, & Steele 2000; Zhao & Nan 2010). While SA-based interventions can be helpful in reducing defensiveness so that people can accept health messages, these interventions are typically lengthy and done in-lab. This poses a problem for interventionists who are interested in quickly delivering health messages to large groups of people.

**Invisible Support**

Another potential way to overcome defensiveness is through the use of invisible support (IS), a type of support that is given in an indirect manner (Howland & Simpson, 2010). The literature on social support indicates that the use of IS can buffer some of the negative consequences that can sometimes arise from support receipt (e.g., decreased sense of self-worth, competence, self-efficacy, and feelings of indebtedness) and lead to acceptance of the support in the form of advice provided (Bolger, Zuckerman, & Kessler 2000; Howland & Simpson, 2010). While perceived availability of support is associated with positive outcomes, actual receipt of support is often associated with negative outcomes (Bolger, Zuckerman, & Kessler 2000). For example, Bolger et al. (2000) examined daily diary support receipt/provision dyadic data from
couples, one member of which was planning on taking the New York Bar exam. They found that participants who were aware of provided support reported higher levels of depression and anxiety compared to participants whose partner reported giving support when the participant did not report receiving it. Thus, this “invisible” form of support is thought to counter the negative effects of perceived support receipt while maintaining the benefits of support receipt. In another example of IS, Howland and Simpson (2010) observed interactions between romantic couples who were asked to discuss something that they wanted to change about themselves. Participants were then questioned on support received or provided. In line with previous definitions of invisible support (Bolger & Amarel, 2007), in this study, social support was related to positive outcomes when the recipient was unaware of the support received and when the provider was skilled at giving support in an undetectable manner.

In addition, social support is considered “invisible” when it is indirect, when the locus of attention is moved away from the recipient of support and her or his problem, and when there are no clear support recipient/provider roles (Howland & Simpson, 2010). One way in which to provide invisible support is by giving advice in an indirect manner (Bolger et al., 2000). For example, in one study (Bolger & Amarel, 2007), participants were told that they were required to give a speech, a task that was designed to be stressful. Confederates either gave visible support to the participants by directly giving them advice on how to give a good speech, or invisible support by indirectly relaying the information through asking the experimenter a question. For example, visible support was given when the confederate addressed the participant with the statement, “…You know, to give a good talk it’s probably most important to summarize what you’re going to say at the beginning, and also make a strong conclusion at the end.” On the other hand, invisible support was given when the confederate addressed the experimenter with the
question, “…I’ve got a question about what we’re supposed to be doing. I thought that for this kind of thing it is probably most important to summarize what you’re going to say at the beginning, and also to make a strong conclusion at the end?” In this study, the participants who were given the direct advice had greater increases of feelings of distress than the participants who were given the indirect advice. Thus, while traditional support can sometimes lead to negative emotions in support recipients, invisible support allows them to maintain their sense of self-worth and competence.

**The Present Studies**

The studies previously reviewed suggest that both fear appeals in health messages and support provision in relationships are meant to benefit the recipient of the information or support, but can sometimes end up backfiring, presumably because of defensiveness that results when information or support in the form of advice threatens the recipient's sense of self-worth and competence. SA and IS theories suggest ways to reduce defensiveness by allowing people to maintain a positive self-concept and therefore making them less motivated to reject potentially threatening information or advice. In the same manner that SA does, incorporating IS in health messages may help reduce defensiveness in recipients of a health message and help them become more accepting of the message. Unlike SA interventions, a health message that incorporates principles from IS can be widely disseminated without the use of resources such as interventionists and facilities.

The aim of the current set of studies is to determine whether an “invisible” or indirect message is more effective when conveying potentially threatening information than a standard, direct message at increasing message acceptance by reducing defensiveness. For the purposes of this study, the invisible message will be referred to as the indirect message. Study 1 was conducted in order to determine whether the indirect message would be more effective in
promoting sunscreen use than a direct message. Study 2 was conducted in order to determine whether an indirect message would be more effective in promoting flossing behavior than a direct message. Across the two studies, the direct messages depicted a character giving health advice directly to the reader. The indirect messages depicted a character telling a friend on the phone of plans to engage in the health behavior. This latter message is indirect in that the character is not giving the information to the reader; instead, the character is giving the information to a friend. In addition, the character is not directly telling the friend to engage in the health behavior; instead, the character is telling a story of her plans to engage in the health behavior. Thus, consistent with Howland and Simpson’s (2010) characterization of invisible support, the indirect messages had the locus of attention moved away from the message recipient and there were no clear message recipient/provider roles.

The main aim of the studies was to determine whether an indirect message reduces defensiveness and increases acceptance of information. Therefore, these constructs were measured as outcome variables. In addition, the main purpose of decreasing defensiveness and increasing message acceptance is to promote behavior change. Therefore, intentions to change behavior and actual behavior change were measured. Finally, because those who perceive a health risk as highly relevant and threatening are more likely to reject health information (Sherman & Cohen, 2006), perceived risk was measured to determine its effects on the promoted health behavior.

The following were hypothesized:

Hypothesis 1: The indirect message will lead to higher acceptance of information than the traditional, direct message.
Hypothesis 2: The indirect message will lead to lower levels of defensiveness than the traditional, direct message.

Hypothesis 3: The indirect message will lead to greater intentions to buy, carry, and use the product necessary to engage in the health behavior than the traditional, direct message.

Hypothesis 4: The indirect message will lead to increases in the target health behavior.

Hypothesis 5: Perceived risk will moderate the effect of message type (direct or indirect) on the health behavior.

**STUDY 1**

Skin cancer is the most common form of cancer in the United States (U.S. Cancer Statistics Working Group, 2012). In fact, in 2012, 67,753 people were diagnosed with skin cancer and 9,251 people died of the disease (U.S. Cancer Statistics Working Group, 2012). In addition, contrary to popular opinion, this disease is very common in young adults (Bleyer, O’leary, Barr, & Ries, 2006). Fortunately, because most skin cancers are associated with ultraviolet (UV) exposure (Miller et al., 1996), they are preventable by limiting UV exposure either by avoiding UV rays or through the use of sunscreen. Sunscreen helps protect skin against UV light radiation (Skin Cancer Foundation, 2014) and regular use may help prevent skin cancer (Green, Williams, Logan, & Strutton, 2011). The Skin Cancer Foundation recommends that people use sunscreen of at least a sun protection factor (SPF) of 15 because it filters out 93% of UV rays. Even so, as the SPF increases, the number of UV rays that are blocked only increases marginally (e.g., SPF 50 filters out 98% of UV rays). Therefore, for this study, messages that promote the use of a sunscreen with an SPF 15 were created. The target population of interest was a young adult population as skin cancer is fairly common in this age group (Bleyer, O’Leary, Barr & Ries, 2006). In addition, more cases of sunburn in a person’s lifetime are
associated with an increased risk of skin cancer (melanoma; Dennis et al., 2008). Therefore, encouraging sunscreen use of SPF 15 in young adults can prevent the accumulation of sunburn cases in a person’s lifetime, thus reducing their risk of skin cancer.

**METHOD**

**Participants and Design**

Three hundred and seventy-three participants were recruited during the summer months via Amazon Mechanical Turk (MTurk). This method of recruitment was used because it allowed for recruitment of a diverse sample while maintaining the quality of data of traditional sampling methods (Buhrmester, Kwang, & Gosling, 2011). Of these 373 participants, 209 completed the follow up survey and were, therefore, included in the data analysis. Participants were compensated $0.75 for completing the first part of the study, and an additional $0.75 for the completing the second part of the study.

Ages ranged from 18 to 30 years old with a mean of 25.86. Males (50.2%) and females (49.8%) were equally represented in this sample. Participants were not excluded based on gender, ethnicity, or any other sociocultural variables. Of the participants included in the study, 78% identified as Caucasian, 11% identified as Asian, 7.7% identified as African American, 4.8% identified as Hispanic/Latino, 1.4% identified as Native American, and 1.9% identified as mixed or other.

**Procedure**

This study was comprised of two time points. The first part included baseline measures and the health message intervention. Participants completed the study online with the second part completed approximately one week after the first part.
Measures and Outcomes

Defensiveness. Defensiveness was measured using a 17-item scale with statements like “I avoid talking to other people about skin cancer risk.” Responses range from 1 (strongly disagree) to 7 (strongly agree). This scale was adapted from McQueen, Vernon, and Swank (2013) and had high internal reliability (Cronbach's $\alpha = .93$). Participants were given this measure before and after they received the health message.

Acceptance of Information. In addition, after participants were exposed to the health message (described below), they were asked the following two questions (adapted from Sherman, Nelson, & Steele, 2000) to assess the extent to which they had accepted the information: 1) “To what extent do you think that using sunscreen during sun exposure is an effective way of reducing your risk of getting skin cancer?” Responses ranged from 1 (very ineffective) to 7 (very effective). 2) “How important do you think it is to use sunscreen during sun exposure in order to reduce your risk of getting skin cancer?” Responses ranged from 1 (not at all important) to 7 (extremely important). Although these items appeared to be related, the measures were not highly correlated, $r = .58$, therefore, they were treated as separate measures.

Perceived Social Norms. Participants’ perceived social norms were measured after the participants received the health message using the item “Most people like me always use sunscreen.” Responses ranged from (very unlikely) to 7 (very unlikely; Fishbein & Ajzen, 2010). This measure was used to ensure that effects were not due to the characters’ (who were of a similar age and gender) endorsement of sunscreen use.

Intentions. Three items were used to assess intentions regarding sunscreen use, including intent to buy sunscreen, intent to use sunscreen and intent to carry sunscreen. These items were adapted from a previously utilized scale (Fishbein & Ajzen, 2010; Bryan, Aiken, & West, 1997).
Response options ranged from 1 (very unlikely) to 7 (very likely). Intentions were assessed before and after the participant received the health message. Although an aggregate “intentions” score was not used in analyses, as “intent to use” was considered the primary outcome for intentions, their reliability was examined. The three variables had high reliability (Cronbach's $\alpha = .84$).

**Perceived Risk for Skin Cancer.** After participants viewed the health message, a single-item measure of perceived risk assessed the participant’s perceived lifetime likelihood of getting skin cancer compared to peers (adopted from Weinstein, 1982). Response options ranged from 1 (not at all likely) to 7 (very likely).

**Sunscreen Use.** Before receiving the health message, participants were asked to estimate the average number of days per week in the last week that they engage in sunbathing and outdoor activities, and how often they used sunscreen or protective clothing during those activities. They were once again asked about sunscreen use during these activities a week later.

**Health Message.** For the experimental manipulation, participants viewed a single health message. Participants were randomly assigned to view either a direct or an indirect message. The message was matched to the gender of the participant (i.e., females viewed the female messages). All health messages appeared on the computer screen with list of facts and “how to spot a melanoma” pictures. The direct message was a standard gain-framed message, which described the benefits of adhering to sunscreen use. This type of message was used because gain-framed messages are more effective than loss-framed messages at encouraging preventative health behaviors such as sunscreen and flossing use (Gallagher & Updegraff, 2012).
Female Direct

This message depicted a female directly giving information and advice to the participant. The female in the image looked directly at the reader, and the message was stated as though she was speaking to the reader (i.e., “Did you know that 1 person dies of skin cancer every hour? By using sunscreen of SPF 15 or higher every day you can reduce your risk of developing skin cancer by 50% Start wearing sunscreen today!”)

Female Indirect

This message depicted the same female character as in the previous condition indirectly giving information and advice to the participant. This message is indirect in two ways: 1) The female in the image is on the phone, and the message is stated as though she is speaking to the person on the phone, which presumably gives the participant the experience of listening in on a conversation, and 2) Because the character is not directly giving advice to the person on the phone (i.e., “Hey, I heard in class today that 1 person dies of skin cancer every hour! But I also heard that wearing sunscreen of SPF 15 or higher every day reduces the risk of developing skin cancer by 50%. I’m totally going to start wearing sunscreen ASAP.”).

Male Direct

This message was similar to the “Female Direct” message, only a male character gave the information.

Male Indirect

This message was similar to the “Female Indirect” message, only a male character gave the information.
In addition, each message contained pictures of melanomas and the following list of facts:

- Skin cancer is the most common form of cancer in the United States.
- Skin cancer is common in young adults.
- Skin cancer is associated with UV exposure.

**Manipulation Check.** After participants viewed the health message, two questions were asked to assess the participants’ perception of whether the message was direct or indirect. Questions were “To what extent was the message you saw geared towards you?” and “To what extent was the person in the message addressing you?” Responses ranged from 1(very) to 4 (not at all).

**RESULTS**

Means and standard deviations of outcome variables are presented in Table 1 and correlations between the outcome variables are presented in Table 2.

In order to determine whether the participants perceived the message as direct or indirect, two questions were given that assessed (a) whether they felt that the message was geared towards them and (b) to what extent they felt that the person in the message was addressing them. Unexpectedly, an ANOVA indicated that there were no significant differences, $F (1,207) = 0.29$, $p = .59$, between those that received the indirect message ($M = 1.91$, $SD = 0.69$) and those that received the direct message ($M = 1.96$, $SD = 0.77$) in whether the participants felt that the message was geared towards them. In addition, an ANOVA was used to determine the extent to which the participants felt that the person in the message was addressing them. Contrary to predictions, results indicated no significant differences, $F (1,207) = 0.15$, $p = .70$, between those that received the indirect message ($M = 1.91$, $SD = 0.69$) and those that received the direct message ($M = 1.96$, $SD = 0.77$).
Hypothesis 1 proposed that the indirect message would lead to higher acceptance of information than the traditional, direct message and was tested using a hierarchical linear regression analysis. To determine whether there was an effect of the message type (indirect vs. direct) on acceptance of information, the following two items were used: 1) To what extent do you think that using sunscreen during sun exposure is an effective way of reducing your risk of getting skin cancer? 2) How important do you think it is to use sunscreen during sun exposure in order to reduce your risk of getting skin cancer?

Results of the first analysis indicated a significant effect for message type, $t = 2.02, p = .045$ on acceptance of information, with those that received the indirect message ($M = 5.97, SD = 0.87$) more likely to accept the message than those that received the direct message ($M = 5.65, SD = 1.41$). The effect for message type remained significant after even controlling for social norms, $t = 2.00, p = .047$. This analysis was important to conduct because the characters depicted in the messages were of the same gender and relative age as the participants and they endorsed the use of sunscreen. Therefore, it was important to rule out the effect of social norms as a possible influence on acceptance of information.

These same analyses were repeated with the second item assessing acceptance of information as the outcome. These analyses revealed no significant effect for message type on acceptance of information, $t = 1.00, p = .320$, (indirect, $M = 6.03, SD = 0.95$; direct, $M = 5.89, SD = 1.02$).

Hypothesis 2 proposed that the indirect message would lead to lower levels of defensiveness than the traditional, direct message. A multiple regression analysis was conducted to examine whether message type predicted post-message defensiveness while controlling for
pre-message defensiveness. Results revealed no main effect of message type, $\beta = -0.09$, $t = -0.97$, $p = .33$ (indirect, $M = 2.60$, $SD = 1.01$; direct, $M = 2.71$, $SD = 0.93$).

Hypothesis 3 proposed that the indirect message would lead to greater intentions to buy, carry, and use sunscreen than the traditional, direct message. In order to examine the effect of message type on intentions to buy, carry and use sunscreen a hierarchical linear regression was used. Controlling for pre-message intentions, there was not a significant effect of message type on intentions to buy, $\beta = -0.07$, $t = -0.462$, $p = .645$, indirect ($M = 1.64$, $SD = 0.48$) direct ($M = 1.76$, $SD = 0.43$); carry, $\beta = 0.06$, $t = 0.386$, $p = .700$, indirect ($M = 4.02$, $SD = 2.16$) direct ($M = 4.13$, $SD = 1.91$); or use, $\beta = -0.09$, $t = -0.511$, $p = .610$ indirect ($M = 4.38$, $SD = 2.05$) direct ($M = 4.30$, $SD = 2.00$) sunscreen. Results of these analyses do not support Hypothesis 3, indicating that those who received the indirect message were not more likely to have increased intentions to buy, carry, or use sunscreen.

Hypothesis 4 proposed that the indirect message would lead to increases in sunscreen use during tanning or sunbathing. Consistent with the hypothesis, results indicated that, while controlling for sunscreen use at baseline, those who received the indirect ($M = 3.67$, $SD = 2.07$) message were more likely to use sunscreen during sunbathing than those who received the direct message ($M = 3.32$, $SD = 2.00$; $t = 2.09$, $p = .038$).

Hypothesis 5 proposed that perceived risk would moderate the effect of message type on sunscreen use. To test this hypothesis, the procedures of Aiken and West (1994) were followed to test for interactions in multiple regression analysis. First, the perceived risk variable was centered. Then an interaction term of perceived risk and message type was created. A hierarchical linear regression was then used to examine this interaction. When controlling for prior sunscreen use during tanning or sunbathing, there was no significant effect for perceived
risk ($\beta = -0.09, t = -0.68, p = .49$), but there was significant main effect for message type ($\beta = 0.41, t = 2.13, p = .03$). Moreover, there was a significant interaction of perceived risk and message type, $\beta = .48, t = 2.30, p = .022$. Graphing of this interaction (Figure 1) indicates that those who scored high on perceived risk and received the indirect message ($M = 4.06, SE = .20, 95\% CI [3.67, 4.45]$) reported using sunscreen during sun bathing more often than those who received the direct message ($M = 3.20, SE = .19, 95\% CI [2.82, 3.57]$). Yet, those who scored low on perceived risk and received the indirect message ($M = 3.35, SE = .19, 95\% CI [2.96, 3.73]$) were not more likely to report sunscreen use during sunbathing than those who received the direct message ($M = 3.38, SE = .19, 95\% CI [3.00, 3.76]$).

**Figure 1.** Interactive Effects of Message Type and Perceived Risk on Sunscreen Use.
Table 1. Illustrating Means and Standard Deviations of Outcomes, Study 1

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<thead>
<tr>
<th></th>
<th>Indirect Message</th>
<th></th>
<th>Direct Message</th>
<th></th>
</tr>
</thead>
<tbody>
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<td></td>
<td>Mean (SD)</td>
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<td>Defensiveness</td>
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<td>2.71 (0.93)</td>
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<td>Acceptance of</td>
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<td>Acceptance of</td>
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<td>5.89 (1.02)</td>
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<td>Intentions to buy</td>
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<td>4.30 (2.00)</td>
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<td>3.32 (2.00)</td>
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Note. SD = standard deviations
### Table 2.
*Pearson correlations examining the relationship between outcome variables, Study 1*

<table>
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<th>AOI 2</th>
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<th>Intentions to Carry</th>
<th>Intentions to Use</th>
<th>Sunscreen Use</th>
<th>Perceived Risk</th>
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</table>

*Note: *p = < .05, **p = < .01; AOI 1 = Acceptance of Information 1; AOI 2 = Acceptance of Information 2*

### STUDY 1 DISCUSSION

Sunscreen use is an effective way of limiting the UV rays that can cause skin cancer (Green, Williams, Logan, & Strutton, 2011). Therefore, encouraging sunscreen use is important in reducing skin cancer rates. In this study, an indirect and a direct message that promote sunscreen use were created and compared. The results partially supported the hypothesis that the indirect message would lead to higher acceptance of information than the traditional, direct message. Exposure to the indirect message predicted higher levels of acceptance of information for the first item, even when controlling for the effect of social norm influence, but not for the second item. Counterintuitive as this may be, the fact that these two items were not strongly
related suggests that they may not address the same construct. The first item assesses whether the participants believe sunscreen use during sun exposure is an effective way of reducing risk of skin cancer; while the second item assesses how important the use of sunscreen during sun exposure to reduce risk of skin cancer is to them. Arguably, one can find that while using sunscreen during sun exposure is an effective way of reducing skin cancer risk, sunscreen use during sun exposure itself may not be important in reducing risk of skin cancer as there are other ways to reduce sun exposure, such as wearing protective clothing.

The results of this study supported the hypothesis that the indirect message would lead to greater sunscreen use during tanning or sunbathing than the direct message. In addition, the results supported the hypothesis that those who received the indirect message and had high levels of perceived risk were more likely to use sunscreen while sunbathing a week after they were exposed to the health message. These findings support the proposition that the indirect message may benefit those who find the health information threatening and highly relevant (i.e., those that would typically reject the health information).

'Contrary to the hypothesis, the results of this study indicated that participants were not less defensive when exposed to the indirect message than when exposed to the direct message. It is important to note that this measure of defensiveness has only been previously used once in a study with a focus on colorectal cancer (McQueen, Vernon, & Swank, 2013). It is possible that the scale failed to measure defensiveness in relation to skin cancer. Even so, it is also possible that the indirect message failed to reduce defensiveness as hypothesized.

It was also hypothesized that participants who viewed the indirect message would increase intentions to buy, carry, and use sunscreen. The results of the study did not support this hypothesis. It is possible that participants did not increase intentions to buy sunscreen because
they were already in possession of it. In addition, they may have not felt that carrying sunscreen with them was necessary. The participants who viewed the indirect message were not more likely to report intentions to use sunscreen, despite reporting greater sunscreen use during sunbathing at follow-up. One possible explanation for this is that participants were questioned about their intentions shortly after they viewed the health message. It is possible that their intentions may increase after they have had time to consider the message. Another possibility is that the message did not deliver the information in an indirect way as intended. In fact, the results of the manipulation check appear to indicate that participants did not perceive the indirect message as "invisible." This may have been because, even though the message was indirect, it was nonetheless perceived as a health message relaying information to them.

STUDY 2

It is important to examine whether the findings of Study 1 extend to a different domain to provide further evidence of the effect of indirect versus direct health messages. In Study 2, the focus was on the health behavior of flossing because it is similar to sunscreen use in that they are both preventative health behaviors that are relatively easy to adopt. In addition, flossing is an important behavior in reducing the likelihood of gum disease (Page, 2008).

METHOD

Participants and Design

Students from Kent State University's SONA subject pool were recruited for Study 2. These participants were granted research participation credit for each survey they completed. Of the 514 participants, 340 participated in both part 1 and part 2 of the study. Due to technical errors that allowed participants access to the second survey immediately after taking the first, only 246 participants completed the second part of the study approximately one week after
completing the first part. Therefore, to maintain consistency with Study 1, only those 246 participants' data were analyzed. Both parts of the study were completed online.

Participants were not excluded based on gender, ethnicity, or any other sociocultural variables. Of the participants included in the study, 85.8% identified as Caucasian, 3.3% identified as Asian, 10.6% identified as African American, 2.8% identified as Hispanic/Latino, 2.4% identified as Native American, and 3.7% identified as mixed or other. Ages ranged from 18 to 27 with a mean of 19.86. In this sample, females (74.8%) outnumbered males (25.2%).

Procedure

As in Study 1, this study was also comprised of two time points. The first part included baseline measures and the health message intervention. Participants took the follow up survey one week later.

Measures and Outcomes

Defensiveness. Defensiveness was measured after participants viewed the health message using a 17-item scale with statements like “I avoid talking to other people about gum disease/tooth loss.” Responses range from 1 (strongly disagree) to 7 (strongly agree). This scale was adapted from McQueen, Vernon, and Swank (2013) and had high internal reliability (Cronbach's $\alpha = .89$).

Acceptance of Information. After participants were exposed to the health message (described below), they were asked the following two questions (adapted from Sherman, Nelson, & Steele, 2000) to assess the extent to which they had accepted the information: 1) “To what extent do you think that flossing daily is an effective way of reducing your risk of getting gum disease/tooth loss?” Responses ranged from 1 (very ineffective) to 7 (very effective). 2) “How important do you think it is to floss daily in order to reduce your risk of getting gum
disease/tooth loss?” Responses ranged from 1 (not at all important) to 7 (extremely important). Although these items appeared to be related and were correlated, \( r = .67 \), they were treated as separate measures as in Study 1.

**Intentions.** Finally, three items were used to assess intentions regarding flossing behavior, including intent to buy floss, intent to carry floss, and intent to use floss. These items were adapted from a previously utilized scale (Bryan, Aiken, & West, 1997; Fishbein & Ajzen, 2010). Response options range from 1 (very unlikely) to 7 (very likely). In this study, intentions were only measured after participants received the health message. Although an aggregate intentions score was not used, as the main intention outcome was intent to use floss, their reliability was examined. The three variables had high reliability (Cronbach’s \( \alpha = .77 \)).

**Perceived Risk.** After participants viewed the health message, a measure of perceived risk assessed the participant’s perceived lifetime likelihood of experiencing gum disease or tooth loss compared to peers (adopted from Weinstein, 1982). Response options ranged from 1 (not at all likely) to 7 (very likely).

**Flossing.** Finally, Participants were asked to estimate the average number of days per week in the last week that they flossed both before viewing the health message and at the one-week follow-up.

**Health Message.** For the experimental manipulation, participants viewed a single health message. Participants were randomly assigned to view either a direct or an indirect message. The message was matched to the gender of the participant (i.e., females viewed the female messages). All health messages appeared on the computer screen with list of facts and pictures of gum disease. The direct message used in this study was a standard gain-framed message. This type of message was used because gain-framed messages are more effective at encouraging preventative
health behaviors such as sunscreen and flossing use than loss-framed messages (Gallagher & Updegraff, 2012).

Female Direct

This message depicted a female character directly giving information and advice to the participant. The character in the image looked directly at the reader, and the message was stated as though she was speaking to the reader (i.e., “Did you know that severe gum disease causes tooth loss and even heart disease? By flossing every day, you’ll reduce your risk of gum disease, tooth loss, and heart disease by at least 50%. You should start flossing today!”)

Female Indirect

This message depicted the same female character as in the previous condition indirectly giving information and advice to the participant. This message is indirect in two ways: 1) The female in the image is on the phone, and the message is stated as though she is speaking to the person on the phone, which should give the participant the experience of listening in on a conversation, and 2) Because the character is not directly giving advice to the person on the phone (i.e., “Hey, I heard in class today that severe gum disease causes tooth loss and even heart disease! But I also heard that if you floss every day, you'll reduce your risk of gum disease, tooth loss, and heart disease by at least 50%. I'm going to start flossing ASAP.”

Male Direct

This message was similar to the “Female Direct” message, only a male character gave the information.
Male Indirect

This message was similar to the “Female Indirect” message, only a male character gave the information.

Each message contained pictures of gum disease and the following list of facts:

- Gum disease is the most common reason for tooth loss in the United States.
- Gum disease is common in young adults.
- Gum disease is associated with poor flossing habits.

**Manipulation Check.** After participants viewed the health message, two questions were asked to assess the participants’ perception of whether the message was direct or indirect. Questions were “To what extent was the message you saw geared towards you?” and “To what extent was the person in the message addressing you?” Responses ranged from 1(very) to 4 (not at all).

**RESULTS**

Means and standard deviations of outcome variables are presented in Table 3 and correlations between the outcome variables are presented in Table 4.

In order to determine whether the participants perceived the message as direct or indirect, two questions were given that assessed (a) whether they felt that the message was geared towards them and (b) to what extent they felt that the person in the message was addressing them. An ANOVA indicated that there were no significant differences, $F(1,244) = 1.11, p = .294$, between those that received the indirect message ($M = 2.38, SD = 0.84$) and those that received the direct message ($M = 2.27, SD = 0.69$) in whether the participants felt that the message was geared towards them. In addition, an ANOVA was used to determine the extent to which the participants felt that the person in the message was addressing them. Results indicated no
significant differences, $F(1,244) = .79, p = .376$, between those that received the indirect message ($M = 2.36$, $SD = 0.83$) and those that received the direct message ($M = 2.27$, $SD = 0.69$).

Hypothesis 1 proposed that the indirect message would lead to higher acceptance of information than the traditional, direct message. A t-test analysis was used to determine whether there was an effect of the message type (indirect vs. direct) on acceptance of information using the following two items: 1) To what extent do you think that flossing is an effective way of reducing your risk of getting gum disease/tooth loss? 2) How important do you think it is to use floss in order to reduce your risk of getting gum disease/tooth loss?

Results of the first analysis indicated no significant effect for message type, $t(242) = -0.56, p = 0.57$ on acceptance of information. That is, those that received the indirect message ($M = 5.90$, $SD = 1.27$) were not more likely to endorse the statement than those who received the direct message ($M = 5.78$, $SD = 1.16$). These same analyses were repeated with the second item assessing acceptance of information as the outcome. These analyses also revealed no significant effect for message type on acceptance of information, $t = -0.52, p = .70$. Those that received the indirect message ($M = 5.71$, $SD = 1.19$) were not more likely to endorse the statement than those who received the direct message ($M = 5.64$, $SD = 1.01$). These results did not support the hypothesis that the indirect message would lead to higher levels of acceptance of information than the direct message.

Hypothesis 2 proposed that the indirect message would lead to lower levels of defensiveness than the traditional, direct message. Results of t-test indicated a trend of a main effect for message type, $t(242) = 1.60, p = 0.11$ (indirect, $M = 3.23$, $SD = 1.02$; direct, $M = 3.41$, $SD = 0.83$) on defensiveness at follow-up. While these results were not statistically significant,
they suggest that the indirect message did reduce defensiveness somewhat in participants compared to the direct message.

Hypothesis 3 proposed that the indirect message would lead to greater intentions to buy, carry, and use sunscreen than the traditional, direct message. A t-test was conducted to examine the effect of message type on intentions to buy, carry and use floss. There was not a significant effect for message type on intentions to buy, \( t = 0.84, p = 0.40 \) (indirect, \( M = 2.87, SD = 1.95 \); direct \( M = 2.67, SD = 1.95 \); carry, \( t = -1.32, p = 0.19 \) (indirect, \( M = 3.00, SD = 1.97 \); direct \( M = 2.68, SD = 1.88 \); and use, \( t = -0.67, p = 0.50 \) (indirect \( M = 4.20, SD = 2.04 \); direct \( M = 4.03, SD = 1.98 \)) floss. Results of these analyses do not support hypothesis 3, indicating that those who received the indirect message were not more likely to have increased intentions to buy, carry, and use sunscreen.

Hypothesis 4 proposed that the indirect message would lead to more increases in flossing behavior compared to the direct message. Using a linear regression, controlling for baseline floss use, results indicated that there was no significant difference between those who received the indirect message (\( M = 2.92, SD = 3.47 \)) and those who received the direct message (\( M = 2.38, SD = 2.68 \)) on floss use (\( t = 1.19, p = .24 \)).

Hypothesis 5 proposed that perceived risk would moderate the effect of message type on flossing behavior. To test this hypothesis, first the perceived risk variable was centered. Then an interaction term of perceived risk and message type was created. A hierarchical linear regression was then used to examine this interaction. When controlling for prior flossing behavior, there was no significant effect of perceived risk (\( \beta = .27, t = -0.88, p = .38 \)) or of message type (\( \beta = .41, t = 1.13, p = .26 \)). In addition there was no significant interaction of perceived risk and message type, \( \beta = -0.26, t = -0.56, p = .58 \).
Table 3. Illustrating Means and Standard Deviations of Outcomes, Study 2

<table>
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<tr>
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<th>Indirect Message</th>
<th>Direct Message</th>
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<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
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<tr>
<td>Defensiveness</td>
<td>3.23 (1.02)</td>
<td>3.41 (0.83)</td>
</tr>
<tr>
<td>Acceptance of Information 1</td>
<td>5.90 (1.27)</td>
<td>5.78 (1.16)</td>
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<tr>
<td>Acceptance of Information 2</td>
<td>5.71 (1.19)</td>
<td>5.64 (1.01)</td>
</tr>
<tr>
<td>Intentions to buy</td>
<td>2.87 (1.95)</td>
<td>2.67 (1.95)</td>
</tr>
<tr>
<td>Intentions to carry</td>
<td>3.00 (1.97)</td>
<td>.68 (1.88)</td>
</tr>
<tr>
<td>Intentions to use</td>
<td>4.20 (2.04)</td>
<td>4.03 (1.98)</td>
</tr>
<tr>
<td>Floss use</td>
<td>2.92 SD (3.47)</td>
<td>2.38 (2.68)</td>
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*Note. SD = standard deviations*
Table 4. Pearson correlations examining the relationship between outcome variables, Study 2

<table>
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<th>Floss Use</th>
<th>Perceived Risk</th>
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<td>.67**</td>
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<tr>
<td>Intentions to Carry</td>
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<td>.19**</td>
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<td>Intentions to Use</td>
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<td>Floss Use</td>
<td>-.31**</td>
<td>.27**</td>
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<td>.27**</td>
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<td>.57**</td>
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<td>Perceived Risk</td>
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<td>.16*</td>
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<td>.01</td>
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Note: *p = < .05, ** p = < .01; AOI 1= Acceptance of Information 1; AOI 2 = Acceptance of Information 2

STUDY 2 DISCUSSION

The purpose of this study was to extend the findings from the previous study that sought to test a novel way of conveying health information in an indirect manner against a traditional health message. It was hypothesized that the indirect message would lead to lower levels of defensiveness, increased message acceptance, increased intentions to engage in flossing behavior, and increases in flossing behavior, especially for those who had high levels of perceived risk and received the indirect message.

When testing whether the indirect message led to lower defensiveness in participants than the direct message, the results were not statistically significant. Even so, they suggest that the indirect message did reduce defensiveness somewhat in participants compared to the direct
As previously mentioned in the results section of Study 1, this measure of defensiveness has only been previously used once in a study with a focus on colorectal cancer (McQueen, Vernon, & Swank, 2013). Therefore, it is possible that the scale failed to measure defensiveness in relation to gum disease and tooth loss.

As in Study 1 and contrary to the hypotheses, participants who received the indirect message were not more likely to intend to buy, carry, or use floss. One possibility for this is that the time interval between viewing the health message and indicating their intentions was not long enough for participants to have fully absorbed the information and change their intentions.

Contrary to the results in Study 1, the participants in this study were not more likely to accept the health information when they received the indirect message compared to the direct message. One possible explanation for this is that the participants were recruited from a university participant pool. It is possible that college-aged people may not feel threatened by the prospect of losing their teeth and getting gum disease was not threatening enough.

Also contrary to the results in Study 1, participants who received the indirect message were not more likely to engage in the promoted behavior (floss use) a week after being exposed to the health message. In addition, those who had high levels of perceived risk and received the indirect message were not more likely to engage in the behavior.

**GENERAL DISCUSSION**

In two studies, "invisible" or indirect health messages were compared to traditional, direct health messages. It was hypothesized that the indirect message would lead to decreases in defensiveness, increases in acceptance of information, and increases in intentions to buy, carry, and use the product needed to engage in the health behavior that the health message was
promoting. In addition, it was hypothesized that perceived risk would influence the relationship between the type of message that participants received and their later sunscreen or flossing use.

In Study 1, participants who viewed the indirect message appeared to be more likely to accept the information when testing the first measure that was included of acceptance of information. However, there was not a statistically significant difference between participants who viewed the indirect and direct message on the second item of acceptance of information. This is likely because the items were dissimilar and not actually addressing the same construct.

In addition, in Study 1, participants' perceived risk levels influenced the relationship between the message type that they received and later sunscreen use. In this case, participants were more likely to use sunscreen while sunbathing if their levels of perceived risk were high and they received the indirect message. This finding falls in line with the hypothesis that was based on fear appeal theory (Witte, 1994) and SA theory (Sherman & Cohen, 2002; Sherman, Nelson, & Steele, 2000). People with high levels of perceived risk presumably have high levels of relevance. Theoretically, this would mean that given the direct message, those with high perceived risk will be more likely to reject the message, and consequently, less likely to engage in the promoted health behavior. Conversely, those that were given the indirect message presumably have a reduced sense of threat, and rather than becoming defensive and rejecting the message, they should be more likely engage in the promoted health behavior.

The hypothesis that participants who received the indirect message would have lower levels of defensiveness was not supported. One possibility for this is that, if the effects were present, they were weak. Another possible explanation is that the defensiveness measure used in this study is new and had not yet been validated outside of a colorectal cancer screening study (McQueen, Vernon, & Swank, 2013). A different measure of defensiveness may have better
addressed the construct and yielded results consistent with the hypothesis. For example, as previously stated, participants in Study 1 were less defensive when they received the indirect message when defensiveness, or the lack of, was measured using acceptance of information.

Study 2 failed to extend the results of Study 1 into another domain. This may be because the consequences of not flossing (gum disease and tooth loss) are not as severe or salient as the consequences of not wearing sunscreen (skin cancer and possible death). Moreover, the threat of gum disease and tooth loss would have been even less salient to the sample—a group of young adults who are generally at low risk. As Witte (1992) noted, if the health message is only minimally threatening, a person is not likely to attend to and process the health information. Future studies examining this effect should promote a health behavior that can protect people from a more threatening health issue, such as skin cancer.

Both studies were limited in that they were conducted online. It is possible that the participants did not attend to the health message as they would have if the experiment was conducted in-lab. Online studies do not allow for controlled environments that are free from distraction. In addition, it is possible that a brief poster-style health message may not have provided the participants with a strong enough interaction with the health information. It is important to note that, in the IS literature, this type of support tends to happen over a longer period of time than the time it takes to read a simple health message. Perhaps a more intensive intervention is necessary to amplify the effects of receiving the indirect message. For example, a video with characters who are telling their friend on the phone about the prevention behavior can be compared to a video with the characters directly telling the participant to engage in the behavior. This intervention may make the differences between the indirect and direct messages more apparent, and possibly yield message greater difference between the indirect and direct
messages. Creating a video with an indirect message could provide a way to dispense health information that is lengthy enough to capture the participants’ attention, yet still shorter and less resource-consuming than self-affirmation manipulations.

Finally, while many of the results of this study did not support the hypotheses, it is important to continue to attempt to find a defensiveness-reducing mechanism within health messages so that they can be more widely distributed in a cost-effective manner. Future research can attempt to do this by designing creative approaches to providing health information in a way that reduces defensiveness, increases acceptance of information, and maintains the recipient’s sense of self-worth and integrity.
REFERENCES


Skin Cancer Foundation (2014). *Sunscreens Explained*. Retrieved from:
http://www.skincancer.org/prevention/sun-protection/sunscreen/sunscreens-explained


Appendix1

Study 1 Messages
Indirect Message, Female

“Hey, I heard in class today that 1 person dies of skin cancer every hour!

But I also heard that wearing sunscreen of SPF 15 or higher every day reduces the risk of developing skin cancer by 50%.

I’m totally going to start wearing sunscreen ASAP.”

Facts:

- Skin cancer is the most common form of cancer in the United States
- Skin cancer is common in young adults
- Skin cancer is associated with UV exposure
Indirect Message, Male

“Hey, I heard in class today that 1 person dies of skin cancer every hour!

But I also heard that wearing sunscreen of SPF 15 or higher every day reduces the risk of developing skin cancer by 50%.

I’m totally going to start wearing sunscreen ASAP.”

Facts:

• Skin cancer is the most common form of cancer in the United States
• Skin cancer is common in young adults
• Skin cancer is associated with UV exposure
Did you know that 1 person dies of skin cancer every hour?

By using sunscreen of SPF 15 or higher every day you can reduce your risk of developing skin cancer by 50%.

Start wearing sunscreen today!

Facts:
- Skin cancer is the most common form of cancer in the United States
- Skin cancer is common in young adults
- Skin cancer is associated with UV exposure
Did you know that 1 person dies of skin cancer every hour?

By using sunscreen of SPF 15 or higher every day you can reduce your risk of developing skin cancer by 50%.

Start wearing sunscreen today!

Facts:
- Skin cancer is the most common form of cancer in the United States
- Skin cancer is common in young adults
- Skin cancer is associated with UV exposure
Study 2 Messages

Indirect Message, Female

“Hey I heard in class today that severe gum disease causes tooth loss and even heart disease!

But I also heard that if you floss every day, you'll reduce your risk of gum disease, tooth loss, and heart disease by at least 50%.

I'm totally going to start flossing ASAP.”

Facts:
- Gum disease is the most common reason for tooth loss in United States
- Gum disease is common in young adults
- Gum disease is associated with poor flossing habits
Indirect Message, Male

“Hey I heard in class today that severe gum disease causes tooth loss and even heart disease!

But I also heard that if you floss every day, you'll reduce your risk of gum disease, tooth loss, and heart disease by at least 50%.

I'm totally going to start flossing ASAP!”

Facts:

- Gum disease is the most common reason for tooth loss in United States
- Gum disease is common in young adults
- Gum disease is associated with poor flossing habits
Direct Message, Female

Did you know that severe gum disease causes tooth loss and even heart disease?

By flossing every day, you’ll reduce your risk of gum disease, tooth loss, and heart disease by at least 50%.

You should start flossing today!

Facts:

- Gum disease is the most common reason for tooth loss in United States
- Gum disease is common in young adults
- Gum disease is associated with poor flossing habits
Did you know that severe gum disease causes tooth loss and even heart disease?

By flossing every day, you'll reduce your risk of gum disease, tooth loss, and heart disease by at least 50%.

You should start flossing today!

Facts:

- Gum disease is the most common reason for tooth loss in the United States.
- Gum disease is common in young adults.
- Gum disease is associated with poor flossing habits.
Appendix 2

Study 1 Measures:

Acceptance of Information

To what extent do you think that using sunscreen is an effective way of reducing your risk of getting skin cancer?

- Very Ineffective
- Ineffective
- Somewhat Ineffective
- Neither Effective nor Ineffective
- Somewhat Effective
- Effective
- Very Effective

How important do you think it is to use sunscreen in order to reduce your risk of getting cancer?

- Not at all Important
- Very Unimportant
- Somewhat Unimportant
- Neither Important nor Unimportant
- Somewhat Important
- Very Important
- Extremely Important

Defensiveness

<table>
<thead>
<tr>
<th>I avoid talking to people about skin cancer risk</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Somewhat Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I do not want any more information about skin cancer risk</td>
<td>○</td>
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<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
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<td>I tend to avoid thoughts of skin cancer.</td>
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<tr>
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<tr>
<td>Don't believe the hype; it's just not true that skin cancer is the most common cancer in the United States.</td>
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<td>There is not enough evidence yet to support the need to use sunscreen.</td>
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<td>Few people get skin cancer</td>
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<td>The claims that sunscreen use can prevent skin cancer are exaggerated</td>
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**Intentions**

How likely is it that you will…

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<td>always use sunscreen when you are exposed to the sun over the next week?</td>
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**Perceived Risk**

Compared to other people my age, my chances of experiencing gum disease/tooth loss in the future are:

- Much below average
- Below average
- Average for people my age
- Above average
- Much above average
Sunscreen Use

In the past week, how often have you used sunscreen SPF 15 or above on exposed skin while sunbathing or tanning?

- Do not use sunscreen SPF 15 or higher
- Rarely
- Occasionally
- Usually
- Always; I wear sunscreen SPF 15 or higher every day

Study 2 Measures:

Acceptance of Information

1) To what extent do you think that flossing is an effective way of reducing your risk of getting gum disease/tooth loss?

- Very Ineffective
- Ineffective
- Somewhat Ineffective
- Neither Effective nor Ineffective
- Somewhat Effective
- Effective
- Very Effective

2) How important do you think it is to use floss in order to reduce your risk of getting gum disease/tooth loss?

- Not at all Important
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Don't believe the hype; it's just not true that gum disease is associated with tooth loss and cardiovascular disease

Using floss daily cannot be all that important because few people I know use it

Using floss daily cannot be all that important because my doctor never told me I had to use it

If you are reading this statement, please click on the "Strongly Disagree" answer selection.

The medical evidence that people should use floss daily is not convincing

There is not enough evidence yet to support the need to use floss daily
| Few people get gum disease/tooth loss | | | | | | | |
| The claims that flossing daily can prevent gum disease/tooth loss are exaggerated | | | | | | | |
| The recommendation that people should use floss daily is overstated | | | | | | | |
| I can't do EVERYTHING that you're supposed to do for your health; it'd be a full-time job | | | | | | | |
| Science always corrects itself; what is good today is bad tomorrow | | | | | | | |
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- Much below average
- Below average
- Average for people my age
- Above average
- Much above average

**Floss use**

In the past week, how frequently did you floss?

- Every day
- Sometimes
- Rarely
- Never