Enhancing UV Photography among Men with Choice-Promoting Information

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Abstract of Dissertation

Enhancing UV Photography with Choice-Promoting Information

The present study examined the influence of UV photography (seeing an image of one's skin damage) and receiving choice-promoting sun protection information on college men's sun protection cognitions. In particular, the aim of this dissertation was to study whether promoting personal choice (by providing information on sun protection behaviors that emphasizes choices and options) enhanced the impact of UV photography on men's sun protection cognitions. The cognitions assessed in this study were informed by the Prototype Willingness Model: *conditional perceived vulnerability* to skin cancer and photoaging, *attitudes* toward sun protection, *prototypes* of the typical young adult male who does and does not protect his skin from the sun, *willingness* to engage in sun protection and risk behaviors, and *intentions* to engage in sun protection behaviors, sun-risk behaviors, and skin examinations. An additional goal of the study was to examine whether the promotion of choice in the context of UV photography would be particularly influential among men who report high levels of conformity to masculine norms. Therefore, masculinity was explored as a moderator of experimental effects on cognitions.

Male young adults completed an initial online survey assessing background information, baseline cognitions, and masculinity, before participating in the experimental portion of the study. During the experiment, participants were randomly

assigned to one of six conditions that varied on two variables: (1) whether or not they received their UV photograph (yes versus no), and (2) the type of sun protection information that they received (no information, information that framed sun protection behaviors as recommendations to follow, or information that framed these behaviors as individual choices to make). Following the experimental manipulations, participants completed a second computer-based survey assessing sun protection cognitions.

Results showed several significant main effects of UV photography, thus partially supporting results of prior studies that have found this intervention approach to be effective. Perceptions of choice correlated with several cognitions. However, the information condition manipulation checks, main effects, and interactions with UV photography provided only limited evidence for the hypothesis that receiving choice-promoting information would enhance the impact of UV photography, and no evidence that choice information is an effective standalone intervention. A significant three-way interaction between masculinity, UV photography, and the information conditions revealed a pattern similar to one found in a prior study – that the conditional perceived vulnerability of high masculine men was more affected by the interventions than was the conditional perceived vulnerability of less masculine men. There was a similar UV photography effect among high masculine men on protective prototypes, although additional moderation analyses showed inconsistent patterns. Overall, the results involving the information condition and masculinity were inconsistent; however, they suggest future directions for research on sun protection and risk cognitions, as well as strategies for informing young men about sun protection.

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Chapter 1: Introduction

The present study was designed to examine the impact of two potential ways of increasing sun protection cognitions among male young adults: (1) showing them a photograph of their facial skin damage due to UV exposure (versus a regular black and white photograph) and (2) providing them with information about sun protection behaviors that promotes individual choice (versus both no information and information that describes these behaviors as recommendations to follow). Several sun protection cognitions examined in the present study predict behaviors that are consistent with recommendations for reducing skin cancer risk (American Cancer Society [ACS], 2013a; Centers for Disease Control and Prevention [CDC], 2013; Skin Cancer Foundation, 2013a). Therefore, the ultimate goal of this study was to identify effective means of potentially lowering skin cancer risk among male young adults.

Skin cancer is the most frequently diagnosed cancer in the United States, and rates of melanoma (the skin cancer with the highest mortality rate), are increasing (ACS, 2013a; CDC, 2013; Linos, Swetter, Cockburn, Colditz, & Clarke, 2009; National Cancer Institute [NCI], 2013). An important but understudied area of research is how to prevent skin cancer among men. Men have higher rates of basal and squamous cell skin cancers than do women, as well as higher melanoma rates than women after age 40 (ACS, 2013b; Skin Cancer Foundation, 2013b).

Ultraviolet (UV) exposure is a primary risk factor for all three of the primary forms of skin cancer (basal cell carcinoma, squamous cell carcinoma, and melanoma; Narayanan, Saladi, & Fox, 2010). One way to help prevent skin cancer, as well as skin

damage and premature aging of the skin, is by increasing behaviors that protect the skin against UV exposure, including: limiting sun exposure and tanning, wearing sun protective clothing, and using sunscreen (ACS, 2013a; CDC, 2013; Skin Cancer Foundation, 2013a). In general, men engage in fewer sun protection behaviors than do women, and these comparatively low levels of sun protection behaviors may play a role in men's overall higher rates of melanoma diagnosis (Reuter et al., 2010). Promoting sun protection among men is especially important during young adulthood, when gender differences in sun protection behaviors are more prominent (e.g., Kasparian, McLoone, & Meiser, 2009). Therefore, it is important to examine effective ways of promoting sun protection behaviors among male young adults.

One intervention that is effective in increasing sun protection behaviors and cognitions among men is UV photography (Stock et al., 2009; Walsh & Stock, 2012). The aim of the present study was to examine a way of enhancing this intervention among men, and particularly men who have high levels of masculinity (Walsh & Stock, 2012). Promoting personal choice is one way of potentially encouraging men's health behavior because it conveys health in a way that does not challenge masculine norms of independence (Noone & Stephens, 2008; Sloan, Gough, & Conner, 2010). Therefore, the present study examined the impact of enhancing feelings of individual choice on the effects of a UV photography intervention on men's sun protection cognitions.

Chapter 2: Background

Sun Protection Recommendations and Behaviors

Although there are several risk factors for skin cancer over which one has limited control (e.g., having a family skin cancer history or skin that often burns; ACS, 2013b), skin cancer risk is also malleable due to the association between the three most common forms of skin cancer (melanoma, basal cell carcinoma, and squamous cell carcinoma) and exposure to/sunburns from UV light (ACS, 2013a,b; Lazovich et al., 2010; Neale, Davis, Pandeya, Whiteman, & Green, 2007; Rigel, 2008; Narayanan et al., 2010; Veierød et al., 2003; Zanetti et al., 2006). To help prevent skin cancer, as well as photoaging (pronounced aging of the skin; Helfrich, Sachs, & Voorhees, 2008; Oikarinen, 1990), medical health professionals recommend several sun protection behaviors.

Sun protection recommendations. It is recommended that people protect their skin from UV exposure by: 1) limiting time spent in the sun, 2) limiting time spent sunbathing outdoors and using tanning beds, 3) wearing sun protective clothing, and 4) wearing sunscreen that has a sun protective factor (SPF) of at least 15 and protects against both UVA and UVB rays (ACS, 2013a; CDC, 2013; Skin Cancer Foundation, 2013a). In addition, there are recommendations to check one's skin regularly for signs of skin cancer and receive skin exams from a medical professional in order to detect skin cancer at its earliest, and most treatable, stages (ACS, 2013a; Skin Cancer Foundation, 2013a). These sun protection behaviors protect skin from UV damage and sunburns (Hall et al., 2003; Nole & Johnson, 2004), and sunscreen use has been linked to lower rates of some forms of non-melanoma skin cancer (Green & Williams, 2007; van der Pols,

Williams, Pandeya, Logan, & Green, 2006). There is also evidence for the effectiveness of skin examinations to reduce rates of melanoma diagnosis and later-stage skin cancer overall (Aitken, Elwood, Baade, Youl, & English, 2009; Berwick, Begg, Fine, Roush, & Barnhill, 1996; Swetter et al., 2009).

Sun protection behaviors among men. Men are less likely than women to intentionally tan outdoors or in tanning beds and are often more likely to wear sun-protective clothing such as a hat and long pants; however, they still report lower levels of sun protection in general, including: greater sun exposure, less shade seeking, and lower sunscreen use (Bränström, Ullén, & Brandberg, 2004; Buller et al., 2011; Heckman & Coups, 2011; Kasparian et al., 2009; Reuter et al., 2010; Wheless et al., 2009). There are additional gender differences in the ways that young adults use sunscreen: males tend to use it primarily when they have been outdoors for several hours, rather than applying it prior to going outside (Abroms, Jorgensen, Southwell, Geller, & Emmons, 2003). Men also tend to apply sunscreen less adequately than women (Wright, Wright, & Wagner, 2001). These comparatively low levels of sun protection behaviors among men have been posited to play a role in their melanoma diagnoses (Reuter et al., 2010). In addition to these protection behaviors, men are less likely than women to conduct or receive skin examinations (Kasparian et al., 2009). Gender differences in sun protection behaviors are pronounced during young adulthood and adolescence, when sun risk behaviors and sunburns are more common (Buller et al., 2011; Kasparian et al., 2009). These trends demonstrate the importance of encouraging sun protection behaviors among men during young adulthood.

Sun protection cognitions among men. Differences between men and women in sun protection and skin cancer detection behaviors are also seen in related cognitions. For example, while many young adults of both genders believe that sunscreen is not convenient or practical, males express less favorable beliefs about sunscreen overall and report that sunscreen use conflicts with masculinity (Abroms et al., 2003; Kasparian et al., 2009). In addition, compared to females, males report being less concerned about the impact of sun exposure on one's appearance later in life (Abroms et al., 2003). Males also report lower willingness and intentions to receive a skin cancer screening, and lower sun protection intentions (Bränström et al., 2004; Davis, Buchanan, Katz, & Green, 2011; Heckman & Coups, 2011; Janda et al., 2004).

Cognitions such as those mentioned above have been shown to predict sun protection behaviors. For example, perceived risk of skin cancer and photoaging, attitudes toward sun protection, sun exposure, and tanning, and willingness and intentions to engage in these behaviors predict actual engagement in sunscreen use and tanning (Bränström et al., 2004; Cottrell, McClamroch, & Bernard, 2005; Coups, Manne, & Heckman, 2008; Hillhouse, Turrisi, & Kastner, 2000; Stock et al., 2009). In addition, perceived skin cancer risk and favorable attitudes toward skin screenings have been associated with greater intentions to engage in a skin examination or to have one's skin screened by a medical professional (Janda et al., 2004; Kasparian et al., 2009). Therefore, one way to increase sun protection and early detection behavior is to raise levels of these cognitions (Bränström et al., 2004). This approach is taken in several existing sun protection interventions, including UV photography interventions.

Existing Sun Protection Interventions: UV Photography

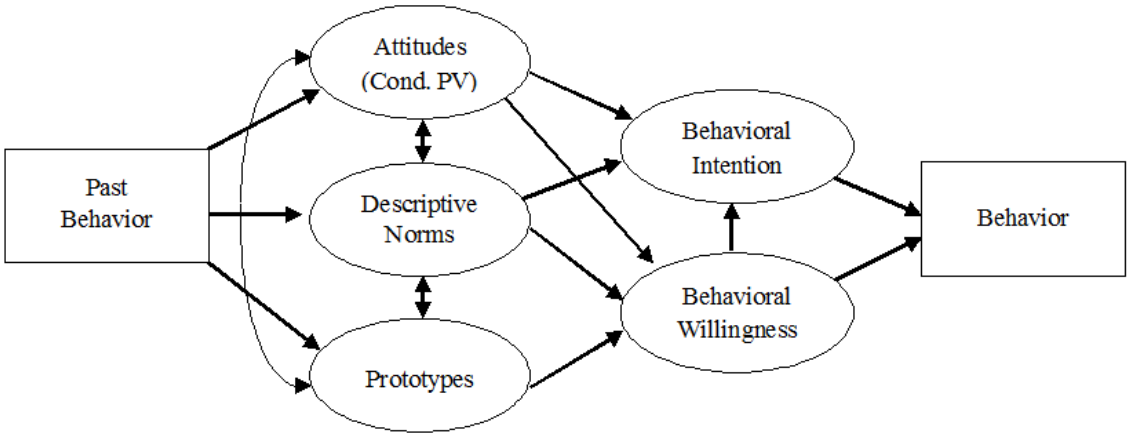
UV photography interventions involve showing individuals a photograph of their facial skin damage due to UV exposure that is not easily seen in regular light and allowing them to compare this photograph to a standard black-and-white photo of their face (Fulton, 1997). When participants view their UV photograph, they are also often presented with education on the health (skin cancer) and/or appearance (photoaging) consequences of UV exposure (e.g., Gibbons, Gerrard, Lane, Mahler, & Kulik, 2005; Mahler, Kulik, Gerrard, & Gibbons, 2007; Stock et al., 2009). Therefore, in addition to making skin damage salient, UV photography interventions offer an opportunity to highlight both the health and appearance consequences of UV exposure, as is done on public websites containing information on UV exposure risks (e.g., Skin Cancer Foundation, 2013c).

UV photography effects on sun protection cognitions and behaviors. In prior studies, UV photography has had positive effects on both sun protection cognitions and behaviors. The positive cognition effects are often evident on constructs contained within the Prototype Willingness (PW) model of health behavior (See Figure 1). The PW model is a dual-process model based on the premise that not all health-risk behaviors are fully intentional, but rather that some are based in a less planned willingness to engage in the behavior (e.g., an openness to engage in the behavior in certain social scenarios; Gerrard, Gibbons, Houlihan, Stock, & Pomery, 2008; Gibbons, Gerrard, & Lane, 2003). In the *reasoned pathway* of the model, behavioral intention is the proximal predictor of behavior, whereas behavioral willingness is behavior's proximal predictor in the model's *social reaction pathway*. Intentions and willingness are, in turn, both predicted by

conditional perceived vulnerability of a negative health outcome and descriptive norms for the relevant behavior in one's peer group. Willingness, however, is uniquely predicted by a third construct: prototypes. Prototypes are social images (favorable or unfavorable) of the typical person of one's age and gender who engages in the behavior of interest (Gerrard et al., 2008; Gibbons et al., 2003). Studies demonstrate that prototypes and willingness explain additional variance in health and health-risk behaviors and intentions beyond that explained by constructs contained in the Theory of Planned Behavior (Rivis, Sheeran, & Armitage, 2006; Zimmerman & Sieverding, 2010).

Figure 1

The Prototype Willingness Model



Seeing one's UV photograph has a positive impact on several of the cognitions included in the PW model: perceived vulnerability, prototypes, willingness, and intentions. For example, among young adults, interventions combining UV photography with health and/or appearance information have led to: higher perceived vulnerability of skin cancer and photoaging, as well as higher sun protection/lower sun risk intentions and

willingness (e.g., lower willingness and intentions to go outside without sun protection or tan, and greater intentions to wear sunscreen and avoid sun exposure; Gibbons et al., 2005; Mahler et al., 2007; Mahler, Kulik, Butler, Gerrard, & Gibbons, 2008; Mahler, Kulik, Gerrard, & Gibbons, 2010). UV photography interventions have also encouraged less favorable prototypes of the typical person who engages in tanning behavior (Gibbons et al., 2005; Mahler et al., 2010).

In addition to these PW model constructs, UV photography studies have examined attitudes regarding the positive and negative appearance and health consequences of tanning, the inconvenience of sun protection, and whether sun protection is more important for women, versus men (Gibbons et al., 2005; Mahler et al., 2010; Stock et al., 2009; Walsh & Stock, 2012). Interventions containing UV photography have led to more favorable sun protection attitudes and less favorable attitudes toward tanning, compared to no-intervention control groups (Gibbons et al., 2005; Mahler et al., 2010; Stock et al., 2009; Walsh & Stock, 2012). Sun-related attitudes are significantly associated with cognitions contained within the PW model (i.e., intentions and willingness; Heckman & Coups, 2011; Hillhouse, Adler, Drinnon, & Turrisi, 1997; Janda et al., 2004; Walsh & Stock, 2012; White et al., 2008), and are a component of cognition indices that have mediated the effect of UV photography on sun protection and tanning behavior (Gibbons et al., 2005; Stock et al., 2009).

In addition to its effects on cognitions, UV photography interventions reduce tanning behavior (and produce greater sun protection behavior) three to five weeks after the intervention (Gibbons et al., 2005; Mahler et al., 2008; 2010), less tanned skin at the end of a summer (Mahler et al., 2007), and higher sun protection behavior and less tanned

skin one year later (Stock et al., 2009), compared to control groups. As previously noted, in several UV photography studies, intervention effects on behavior have been mediated by cognition indices comprised of one or more of the following: perceived vulnerability, attitudes, prototypes, willingness, and/or intentions (Gibbons et al., 2005; Mahler et al., 2008, 2010; Stock et al., 2009), which are the primary cognitions in the PW model.

The constructs that are contained in both pathways of the PW model are potentially important intervention targets for encouraging sun protection among male young adults. Because young adult men are less likely to plan their sun protection in advance (Abroms et al., 2003), the social reaction pathway of the model (e.g., prototypes and willingness) likely contributes to their sun protection behaviors. In addition, sun exposure behaviors (e.g., spending time in the sun) are considered risky and may be well predicted by constructs in the social reaction pathway of the model, which offers additional prediction of health risk behaviors over rational models of behavior (e.g., Gerrard et al., 2008). Furthermore, research has consistently demonstrated that reasoned constructs (e.g., intentions) are associated with engagement in sun exposure and risk behaviors (e.g., Kasparian et al., 2009; Mahler et al., 2007). Therefore, it is important to encourage constructs in both pathways of the model in order to change these behaviors. UV photography has proven to be a useful means of encouraging more protective levels of cognitions contained in both pathways.

Skin examination behaviors are predicted by behavioral intentions (e.g., Janda et al., 2004). This finding, combined with the advanced planning involved in skin exams (versus sun protection and risk behaviors), demonstrates that intentional cognitions are likely the most important to consider when promoting skin examination behaviors among

men. For example, Sieverding, Matterne, and Ciccarello (2010) found that intention predicted cancer screening within the next 12 months in a sample of German men. A recent study found that UV photography resulted in higher skin examination intentions among male college students (Walsh & Stock, 2012); however, skin examination cognitions have not been regularly studied as outcomes of UV photography interventions. Skin examination cognitions are important to encourage given that their corresponding behavior (skin examination) may increase the likelihood of early skin cancer detection (ACS, 2013a; Skin Cancer Foundation, 2013a).

UV photography effects among men. Several UV photography studies have been conducted among predominantly female samples (Mahler et al., 2007, 2008, 2010). However, UV photography is an effective approach among a co-ed college-aged sample (Gibbons et al., 2005) and a sample of male outdoor workers (Stock et al., 2009). In the latter study, men who viewed their UV photo and/or received information on the health consequences of UV exposure (skin cancer) reported higher sun protection cognitions (attitudes, perceived vulnerability, and prototypes) one year later. These effects partially mediated a positive effect of the intervention on concurrent increases in sun protection behavior (Stock et al., 2009).

The one published study to date that examined UV photography effects among an all-male young adult sample found that seeing one's UV photo had a positive impact on men's sun protection cognitions (Walsh & Stock, 2012). Immediately after receiving their UV photograph, male college students reported higher levels of: positive attitudes toward sun protection, conditional perceived vulnerability to skin cancer and photoaging, willingness to engage in sun protection, and intentions to receive a skin exam. In

addition, the positive intervention effects were seen only among those who typically engage in lower levels of sun protection behavior: men who report higher levels of masculinity (Mahalik, Lagan, & Morison, 2006; Mahalik, Levi-Minzi, & Walker, 2007b; Walsh & Stock, 2012). These results suggest that UV photography may be an effective intervention approach for male young adults, and especially individuals who conform to traditional norms of masculinity. A next step for research on the impact of UV photography among young adult men is to examine ways of potentially enhancing the intervention effects on men's sun protection cognitions.

Enhancing UV Photography among Men: Perceived Choice

Researchers have begun to study ways to increase the impact of UV photography on both cognitions and behavior. In one study, Mahler and colleagues examined how providing participants with sunless tanning lotion (and noting that using sunless tanning lotion is the only healthy way to get a tan) moderated the impact of their appearance-based intervention combining UV photography with information on photoaging. Results showed that those who received both the intervention and the sunless tanner tended to report greater sun protection behavior one month later (versus those who received the standard intervention; Mahler et al., 2005). Similar enhancement effects were found in a study supplementing UV photography and photoaging information with information on injunctive and descriptive norms. Those who received the UV photography intervention plus either form of normative information reported higher sun protection intentions and behavior one month later compared to those in the standard UV photography condition (Mahler et al., 2008). Finally, researchers have studied whether social comparison information moderates UV photography effects. While seeing a UV photo of someone

with *more* damage (receiving downward social comparison information) eliminated the positive effects of UV photography on behavior five weeks later, seeing a UV photo of someone with *less* damage (receiving upward social comparison information) did not significantly enhance the impact of UV photography (Mahler et al., 2010).

Although researchers have begun to study conditions under which UV photography has the strongest impact, none of the enhancements examined to date were based on health promotion approaches that may be especially salient for men. The goal of the present study was to examine a proposed enhancement of UV photography that is: informed by several areas of social psychology, relevant to the area of sun protection, and may be particularly relevant for the current sample given existing literature on men, masculinity, and health – the promotion of personal choice. Continuing to examine ways of encouraging sun protection specifically for men is consistent with the suggestion that it is important to design sun protection interventions specific to each gender (Abroms et al., 2003; Cottrell et al., 2005). In addition, given that UV photography has been shown to be effective among masculine men (Walsh & Stock, 2012), studying whether this positive impact can be further enhanced by strategies drawn from men's health literature is a logical next step. The present study examined whether promoting individual choice over sun protection and early detection strengthened the impact of UV photography on the sun protection cognitions of young adult men.

Perceived choice, health, and sun protection. Prior literature on reactance, self-determination theory, and masculinity has highlighted choice as an important factor motivating engagement in health behaviors.

Psychological reactance. Research in the area of psychological reactance demonstrates that eliminating or threatening one's sense of personal choice often has detrimental effects for health interventions' impact. Reactance is a psychological reaction to perceived threats to freedom (Brehm & Brehm, 1981). This state often results from encountering a persuasive message that attempts to change an individual's behavior, and it can produce several unintended negative outcomes including: the individual intending to engage in *more* of a behavior that the message is trying to change, and increasing the extent to which he or she prefers that behavior to others (Brehm, Stires, Sensenig, & Shaban, 1966; Dillard & Shen, 2005; Miller, Lane, Deatrick, Young, & Potts, 2007). These outcomes are most common in the face of messages that are controlling and forceful (Bensley & Wu, 1991; Dillard & Shen, 2005; Miller et al., 2007; Quick & Considine, 2008; Quick & Stephenson, 2008), or health recommendations that are particularly complicated or demanding (Fogarty, 1997).

Reactance theory identifies the potentially health-compromising effects of messages that directly threaten the freedom to choose and highlights the importance of allowing for individual choice in health communications. Reactance literature also suggests several ways to reduce feelings of reactance. These recommendations involve increasing or acknowledging an individual's role in decision-making by: explicitly *acknowledging individual choice*, giving people the *ability to choose* among several recommended options that are similarly effective, and *avoiding an instructive tone* when health recommendations are made (Fogarty, 1997; Miller et al., 2007).

Self-determination theory. Self-determination theory (SDT; Deci & Ryan, 1985) also promotes individual choice as having a positive impact on encouraging healthy

behaviors. A central tenet of this theory is that individuals can engage in behaviors as a result of various motivations. Specifically, motivations for behavior may be "self-determined / autonomous / intrinsic" or "controlled / extrinsic," with the former being related, in part, to individual preferences and the latter being related to external pressures, including persuasion from others (Deci & Ryan, 2000; Ryan, Patrick, Deci, & Williams, 2008). Feelings of autonomy are integrally related to more internally driven motives for behavior (Deci & Ryan, 2000; Ryan et al., 2008). Research has shown that autonomy and autonomous motivation can have a positive influence on levels of behavior (e.g., adherence to health regimens and smoking cessation), as well as cognitive predictors of behavior, including attitudes, perceived behavioral control, and behavioral intentions (Deci & Ryan, 2000; Hagger & Chatzisarantis, 2009; Ng et al., 2012; Pavey & Sparks, 2010).

Perceptions of autonomy can have beneficial effects on health-related outcomes. For example, individuals who feel more autonomous report greater intentions to engage in health behaviors (Pavey & Sparks, 2010). Fostering a personal sense of autonomy may be an important component of health interventions, in that it makes individuals view health behaviors as more personally significant and also fosters a more positive reaction to health risks (Pavey & Sparks, 2010; Ryan et al., 2008). Some experimental work has examined the effectiveness of this approach. For instance, Williams and colleagues (2006) tested a smoking cessation intervention informed by SDT. This intervention focused on autonomy, in part by communicating that the choice to stop smoking was ultimately up to the individual. Compared to a standard intervention, this approach resulted in higher perceptions of autonomy and higher rates of smoking cessation. In

addition, Williams, Cox, Kouides, & Deci (1999) presented information on smoking to youth in a way that framed whether or not one smokes as a personal choice, rather than focusing on medical demands to avoid smoking. They found that those in the choice condition felt their autonomy was supported, which predicted increases in autonomous motivation. Although the interventions did not reduce smoking behavior over the long-term, smoking behavior was predicted by increased autonomous motivation. In addition to this experimental work, a recent meta-analysis of SDT studies found support for a positive relationship between autonomy, autonomous motivation, and health behaviors (Ng et al., 2012). Similar to the approach undertaken by Williams et al. (1999), but over a shorter time frame, the present study examined whether providing men with choice-promoting information can have a positive impact on their sun protection cognitions in the context of a UV photography intervention.

Relevance of perceived choice for sun protection. In addition to existing research that encourages the role of individual choice in health interventions, there are several reasons why perceptions of choice are relevant to sun protection. First, there are multiple recommended sun protection behaviors, which provide the opportunity to exercise choice among these behaviors and have behavioral preferences. There are also further opportunities for choices *within* each of the recommended behaviors. For instance, individuals can choose from several different formats of sunscreen (e.g., lotion, stick, or spray). Initial evidence suggests that people do have preferences over their sunscreen type (Solky et al., 2007). It is possible that these preferences extend to preferences in the other sun protection behaviors. Second, acknowledgements that there are behavioral options in sun protection that can align with one's lifestyle are included in some of the

main sun protection and skin cancer education websites (e.g., Skin Cancer Foundation, 2013c). Therefore, studying the impact of choice-promoting information in a lab setting can provide insight regarding the effects of this type of information outside of the lab. Third, reminding participants of the multiple behavioral options in sun protection is consistent with recent recommendations that health promotion efforts focus on encouraging a variety of sun protection behaviors. It is uncommon for adults to engage in several of the recommended behaviors (Coups et al., 2008; Kasparian et al., 2009; Linos et al., 2011), even though engaging in multiple behaviors maximizes protection (Jungman & Maibach, 2010; Linos et al., 2011; Rigel, 2008; Wright et al., 2001). Therefore, education on multiple sun protection methods is needed.

Despite the relevance of choice for sun protection, the impact of choice-promoting information as a sun protection intervention approach has not been widely studied. The Centers for Disease Control and Prevention implemented a five-year "Choose Your Cover" campaign, which included the presentation of the various behaviors that an individual can choose from to protect his or her skin (Jorgensen, Wayman, Green, & Gelb, 2000); however, no published article has presented the outcomes of this intervention aside from focus group findings that informed the content of the campaign (Abroms et al., 2003).

Promoting the role of the individual (in making decisions about their behaviors) has promise in the area of sun protection. However, studies have not experimentally isolated the impact of choice-promoting language on sun protection cognitions. Also, no study has examined whether promoting choice via information provided about sun protection enhances the impact of an effective sun protection intervention: UV

photography. Research is needed on the role of choice in health interventions among men, as well as whether encouraging choice can enhance the effectiveness of existing sun protection interventions (e.g., UV photography). Research in psychological reactance and SDT, as well as the potential role of choice in sun protection, supports the basis of the present study's examination of the role of choice in the context of an effective sun protection intervention. In addition, literature on men's health and masculinity suggests that providing choice-promoting information may be particularly effective for men, and perhaps especially for men with high levels of masculinity.

Choice, Health, and Men

A goal of the present study was to enhance the impact of a UV photography intervention on the sun protection and early detection cognitions of college men, thus expanding on the findings of a prior UV photography study conducted among an all-male young adult sample (Walsh & Stock, 2012). Findings from literature on men, masculinity, and health suggest that the encouragement of choice may be particularly salient for men and perhaps particularly relevant for men who conform to social norms about masculinity.

Men and reactance. Although reactance effects are posited to exist regardless of gender, the tendency to experience reactance may be higher among men, compared to women (Woller, Buboltz, & Loveland, 2007). Reactance has been conceptualized as one barrier toward men's help seeking, because men's desires to maintain their own personal autonomy may make them vulnerable to perceiving directions to engage in a particular behavior as threatening. They may therefore enact behaviors opposite of those that are recommended in an effort to maintain their autonomy (Addis & Mahalik, 2003;

Mansfield, Addis, & Mahalik, 2003). Given that reactance tends to be higher among men and may explain some of the negative associations between masculinity and positive health outcomes, efforts to promote choice (rather than threaten it) may be particularly impactful for men.

Men's health, masculinity and choice. Men's lower engagement than women in skin cancer prevention behaviors extends to other behaviors, including: seeking and attending medical appointments, self-screening for health problems, and eating healthy foods, as well as having higher levels of drug and alcohol use and non-compliance with medical recommendations in several areas (Barkley, 2008; Berrigan, Dodd, Troiano, Krebs-Smith, & Ballard-Barbash, 2003; Courtenay, 2000a, Courtenay, McCreary, & Merighi, 2002). Masculinity is one factor that has been studied to help understand these gender differences. Research using the Conformity to Masculine Norms Inventory (CMNI; Mahalik et al., 2003) has found that men who report higher levels of conformity to masculine norms report lower levels of nutritious eating, health care seeking, and avoidance of risky situations, and more risky behaviors like alcohol/tobacco use (Mahalik et al., 2006; Mahalik, Burns, & Syzdek, 2007a; Mahalik et al., 2007b). Of particular interest for the current study are negative associations between conformity to masculine norms and the use of sunscreen and sun-protective clothing, as well as positive associations between masculinity and sun exposure (Mahalik et al., 2006; Mahalik et al., 2007b; Walsh & Stock, 2012).

These associations demonstrate that masculinity often negatively influences health behaviors, including sun protection behaviors. The social constructionist perspective of gender further posits that health behaviors and health-seeking are domains

in which men can behave in ways that affirm their masculinity (Addis & Mahalik, 2003; Courtenay, 2000b). In particular, because social messages convey to men that health is more consistent with femininity than masculinity, rejecting health is one way of affirming masculinity (and thus rejecting femininity; Courtenay, 2000b). This hesitancy to embrace health has been supported by interviews and focus groups with men, which have found that when discussing health, men often mention: that they are not worried about their own health, that they are not willing to see a doctor regularly, and/or that vulnerability and discussions of health concerns are feminine and unwanted (Charles & Walters, 2008; Davies et al., 2000; Jeffries & Grogan, 2012; Noone & Stephens, 2008; Sloan et al., 2010). However, and of particular relevance to the present study, men appear more interested in engaging in health and health care *if* they can justify it in a way that does not conflict with masculine norms of independence and invulnerability (Noone & Stephens, 2008; O'Brien, Hunt, & Hart, 2005; Sloan et al., 2010). For instance, men may describe themselves as "legitimate users" (Noone & Stephens, 2008, p. 719) of health seeking, rather than excessive users, whereby they seek medical attention only when essential. They may also rationalize engagement in healthy behaviors by conceptualizing them as choices they can make to be in control (Sloan et al., 2010).

Masculinity as a positive influence on health. Researchers have called for additional study into the complex influence of masculinity on men's health and well-being, and how masculinity interacts with context and other social factors (Addis, Mansfield, & Syzdek, 2010; Evans, Frank, Oliffe, & Gregory, 2011). One way to do so is by examining the contexts under which attending to one's health may not conflict with masculine norms. The perspective that masculinity may not always be negatively

correlated with positive health outcomes, and that some aspects of masculinity may actually *promote* some healthy outcomes, has recently become more prominent (Charles & Walters, 2008; de Visser & Smith, 2007; Hammer & Good, 2010; Levant, Wimer, & Williams, 2011). de Visser and Smith (2007) note the inadequacies involved in assuming a negative influence of masculinity on health, given that there are ways to be masculine that do *not* require engagement in behaviors that place one's health at risk. While some men may affirm their masculinity through engagement in health-risk behaviors, others may affirm their masculinity via behaviors that are unrelated to health risks, such as participating in athletics or asserting their independence (de Visser and Smith, 2007).

Some aspects of masculinity that may be beneficial for men's health are those related to independence or autonomy. Research has found that men prefer to take care of their own health rather than seeking attention from medical professionals (Davies et al., 2000; Jeffries & Grogan, 2012; Sloan et al., 2010). Sloan et al. (2010) also found that when healthy men discuss health, they promote topics such as having the ability to independently manage their health without the help of doctors and having choice (the ability to choose health behaviors).

Health promotion efforts among men can also benefit from drawing on themes of masculinity (Gough, 2006). One way to do so may be to present men with messages that promote personal choice and autonomy over one's health behaviors, because these types of messages are consistent with messages about what it means to be a man (Davies et al., 2000; Sloan et al., 2010). In fact, specific recommendations have been made to present health and health-seeking behaviors to men as ways of enhancing independence, autonomy, and choice (Davies et al., 2000; Gough & Conner, 2006; Jeffries & Grogan,

2012; Sloan et al., 2010). Giving men messages that emphasize their ability to make choices about one's health are likely more effective than messages that instruct them about the specific health actions they must take (Gough & Conner, 2006; Sloan et al., 2010). The enhancement to the UV photography intervention that was examined in the present study is informed by suggestions to enhance feelings of choice over men's health behavior.

Chapter 3: Present Study

The present study examined the impact of choice-promoting information in the context of UV photography on college men's sun protection cognitions. The impact of this information, as well as UV photography, was examined on: *conditional perceived vulnerability* to skin cancer and photoaging, *attitudes* toward sun protection, *prototypes* of the typical male college student who protects or does not protect his skin from the sun, *willingness* to engage in sun protection and risk behaviors, and *intentions* to engage in sun protection and risk behaviors. The goal of this research was to provide information regarding whether standard UV photography interventions, which have encouraged sun protection cognitions and behavior among men in previous work (Stock et al., 2009; Walsh & Stock, 2012), can be enhanced by promoting choices over one's sun protection behaviors. In addition, an aim of this study was to determine whether the encouragement of choice is an effective sun protection intervention on its own. This latter contribution was based on research from reactance and SDT, which suggests that the promotion of individual choice in health messaging is a beneficial approach for health interventions. To test whether the hypothesized effects of choice promoting information (both in conjunction with UV photography, and alone) were due to the receipt of additional information or actually to the choice-promoting language, the choice promoting condition was compared to both a no-information condition and a condition which framed the behavioral guidelines as behavioral recommendations that need to be followed.

Information and UV photography in Existing Studies versus the Present Study.

Informational content, provided by an experimenter and/or a video, is a standard component of many UV photography study protocols. First, most UV photography studies (including the present study) provide brief information explaining and contextualizing the UV photograph. For instance, participants are told that dark areas in the photographs are indicators of damage from UV exposure that has previously occurred (e.g., Gibbons et al., 2005; Walsh & Stock, 2012). In several prior studies, participants have also received additional information along with their photograph which provides greater detail on the consequences of UV exposure (skin cancer and/or photoaging). For example, participants in one study received a brief verbal presentation which explained the link between UV exposure and both skin cancer and photoaging, and conveyed the importance of sun protection during young adulthood (Gibbons et al., 2005). In other studies, participants have received information that focuses specifically on either cancer or appearance. Mahler and colleagues, for example, have consistently paired UV photography with photoaging information to comprise an appearance-focused intervention (e.g., Mahler et al., 2007, 2010). In addition, in one study, researchers tested whether photoaging or cancer-based information was a more effective strategy for promoting sun protection among male outdoor workers (Stock et al., 2009).

Despite the fact that information was included in prior research on UV photography, the informational content in these prior studies differs from the type information being examined in the present study. First, the informational content in prior studies has focused more than that in the present study on the risk of UV exposure for cancer and/or premature aging of the skin. Second, the information has often been

provided in the format of a video containing imagery (specifically, of photoaging) rather than only written text (Mahler et al., 2007, 2010; Stock et al., 2009). Finally, the language used in the existing informational videos on photoaging did not contain repetitive language conforming to either the choice or recommendation conditions in the present study. For example, these videos used the phrase "it is important to" to convey the importance of the recommended behaviors (similar to the present study's recommendation information condition), while in at least one instance, a behavioral option (being completely covered when outside) was acknowledged as being impractical (similar to the present study's choice information condition). No studies to date have examined the most effective means of conveying information that accompanies UV photography (e.g., the linguistic strategies that should be used). The present study added to literature of informational supplements to UV photography interventions by further examining the ways in which information can be maximally effective.

Secondary research objectives in the present study included examining whether the effects of the interventions on sun protection cognitions extended to skin examination cognitions, and also examining whether masculinity moderated intervention effects. Analyzing masculinity as a moderator of the effectiveness of both UV photography and the choice-promoting information on men's sun protection cognitions served as an examination into whether including choice-promoting information in health interventions can be particularly influential among more masculine men. To date, no published study has examined this question, even though emphasizing personal choice is recommended for men's health (Gough & Conner, 2006; Sloan et al., 2010).

Design. The present study involved a 2 (UV Photograph: Yes vs. No) X 3 (Sun Protection Information: Choice-Promoting Information vs. Recommendation Information vs. No Information) experimental design, with one continuous moderator: masculinity. The study was completed in two parts. At Time 1 (T1), a survey was administered via the Internet to assess demographics, skin cancer risk factors (e.g., history of skin cancer), baseline sun protection cognitions and behaviors, and masculinity. Several of these background variables served as covariates in the analyses. Approximately two weeks later, at Time 2 (T2), participants attended a lab appointment during which they were randomly assigned to one of the six conditions that varied in whether or not they viewed their UV photograph and the type of sun protection information that they received (no information, sun protection information that did not encourage choice, or sun protection information that promoted choice). Following these experimental manipulations, participants completed a second computer-based survey on sun protection cognitions.

Primary hypotheses.

Hypothesized main effects of the UV photography condition. Main effects of both the UV photography and information conditions were hypothesized. Consistent with prior UV photography research, it was hypothesized that men who viewed their UV photograph (compared to those who did not) would report higher sun protection cognitions and lower sun risk cognitions. In particular, it was expected that men who viewed their UV photograph would report: higher conditional perceived vulnerability to skin cancer and photoaging, more favorable prototypes of the typical man who protects his skin, higher willingness and intentions to engage in sun protective behavior, and more favorable attitudes toward sun protection behaviors. Also aligned with the general

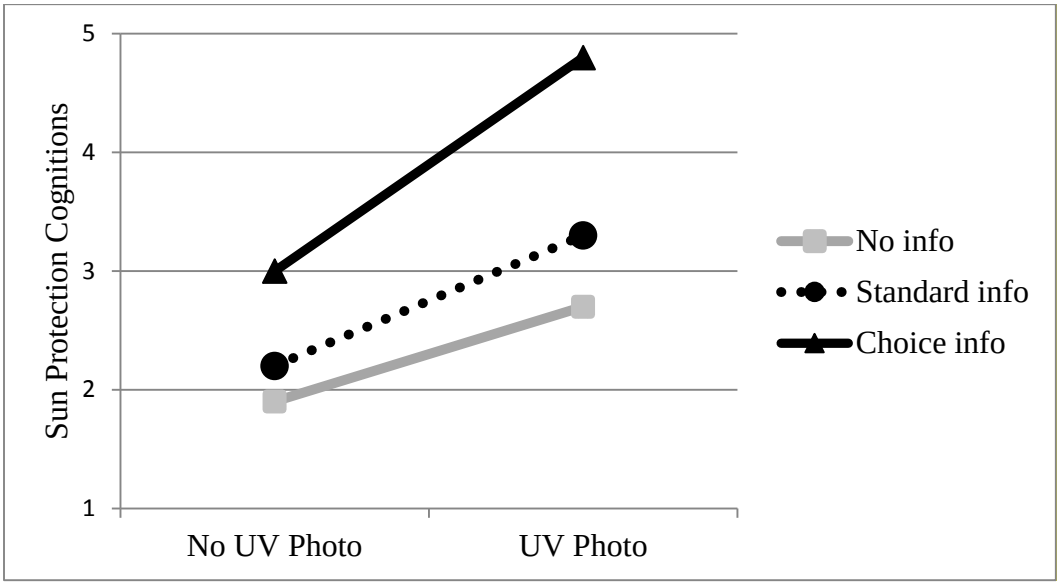
prediction that UV photography would be associated with more protective cognitions, it was hypothesized that men who viewed their UV photo would report lower willingness and intentions to engage in risky behaviors (e.g., spending time tanning or outside in the sun) and less favorable risk prototypes (prototypes of the typical man who does *not* protect his skin; Gibbons et al., 2005; Mahler et al., 2010; Stock et al., 2009; Walsh & Stock, 2012).

Hypothesized information condition effects. The men who received sun protection information were also hypothesized to report higher levels of sun protection cognitions and lower levels of sun risk cognitions, compared to those who received no sun protection information aside from a brief interpretation of the UV photograph. It was further hypothesized that attitudes, prototypes, willingness, and intentions would be highest among men who read the choice-promoting information, versus the recommendation information and no-information groups. The choice-promoting information was hypothesized to encourage higher sun protection cognitions among men because it frames engagement in sun protection behaviors in a way that does not conflict with messages about men and health (Sloan et al., 2010).

Hypothesized UV photo condition by information condition interactions. A two-way interaction was hypothesized between the UV photo condition and the information condition, such that the positive impact of the UV photograph on sun protection cognitions would be strongest among those who also received choice-promoting information about sun protection. Specifically, those who received this enhanced UV photo intervention were expected to report the highest sun protection cognitions (See Figure 2).

Figure 2

Hypothesized UV Photo Condition by Message Condition Interaction



Secondary hypotheses.

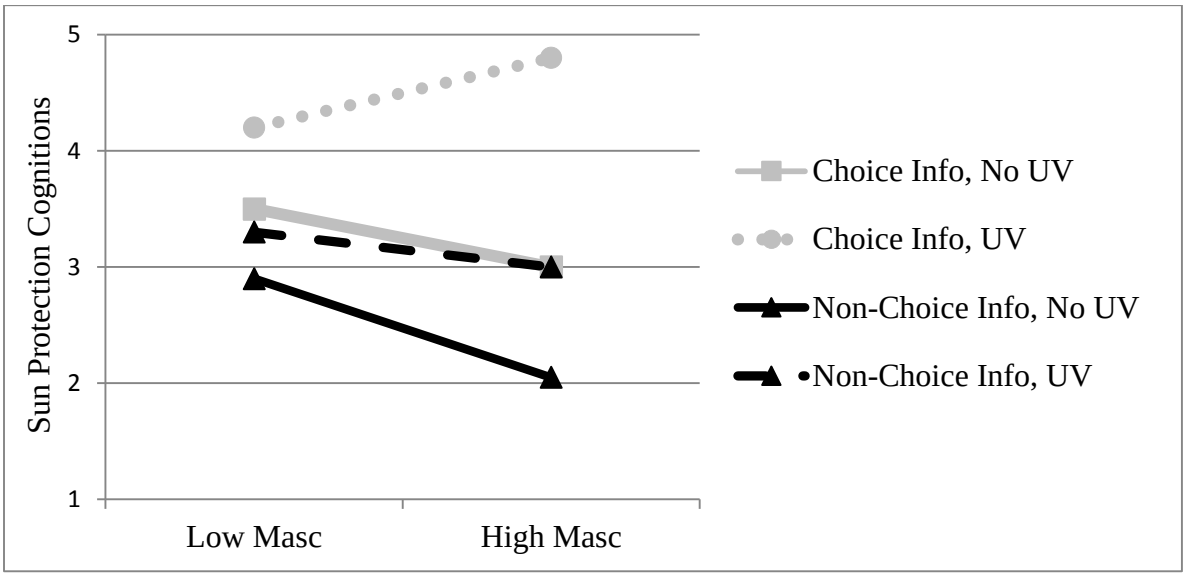
Skin examination cognitions. The present study involved an exploratory hypothesis based on differences between cognitions related to conducting and receiving skin examinations, versus cognitions related to engaging in sun protection. While feeling personally independent and able to exercise choice over one's health has a tenable link with having higher levels of health behavior cognitions, these effects may not hold for cognitions related to getting a professional skin screening. This is because encouraging men to make independent choices may be more consistent with individual engagement in health behaviors versus seeking help from a medical professional (Sloan et al., 2010).

Hypothesized role of masculinity. It was hypothesized that masculinity would moderate the impact of the interventions. In particular, it was hypothesized that there would be a three-way interaction between the UV Photo Condition, the Information Condition, and Masculinity. It was expected that the enhancement of the UV photography

intervention by the choice-promoting information would be stronger for men who are higher in masculinity and that the high masculine men in the UV photo/choice-promoting information condition would report the highest levels of sun protection cognitions. These hypotheses were based on recent research as well as literature that implies a link between masculinity and the importance of individual autonomy (Davies et al., 2000; Sloan et al., 2010; Walsh & Stock, 2012). Furthermore, it was expected that the impact of each of the individual experimental manipulations would be stronger among more masculine men, resulting in significant two-way interactions between the Information Condition and Masculinity, and also between the UV Photography Condition and Masculinity.

Figure 3

Hypothesized Moderation by Masculinity



Pilot Study

A pilot study was conducted to test whether two different manipulations of choice-promoting information were effective in increasing perceptions of choice in sun

protection, compared to recommendation-focused information. Male college students and young adults (N = 115; M age = 20.32) completed the study via Survey Monkey and were randomly assigned to view either recommendation-focused or choice-promoting sun protection information before answering questions about their perceptions of choice, sun protection cognitions, knowledge, past sun protection behavior, and demographics.

Information manipulation. Each information condition began with a brief introductory paragraph and was followed by five blocks of information specific to each of five recommended behaviors: 1) limiting UV exposure, 2) not tanning or sunbathing, 3) wearing sun-protective clothing, 4) wearing sunscreen on the face and body, and 5) examining one's skin regularly. These recommendations are consistent with those of at least one or more of the main organizations promoting skin cancer prevention behaviors (ACS, 2013a; CDC, 2013; Skin Cancer Foundation, 2013a).

In the *Recommendation Information Condition*, the introductory paragraph conveyed that the sun protection behaviors presented in this study are behaviors that should be followed closely. The content of each behavioral recommendation then provided guidelines for enacting each of the recommended behaviors, using phrases similar to "you should…" and "it is important that…" to communicate that these are guidelines that should be followed for maximum sun protection (Miller et al., 2007). In contrast, those in the *Choice Information Condition* read an introductory paragraph that described sun protection as a matter of personal *choice* and noted that there are several options to choose from in protecting one's skin. The content of each behavioral recommendation included the same general content as was included in the recommendation condition, but used phrases similar to "you can…" and "if you decide

to…" to communicate that these are behavioral options that a person can choose to enact as a means of protecting his skin (Miller et al., 2007), rather than behaviors that must be done (Quick & Considine, 2008). In addition, the choice-promoting information presented more specific information about the behavioral options *within* each of the different behaviors (e.g., "You also have several options for sunscreen type, including lotions, sprays, sticks, wipes, and lip balms"). The information in this condition concluded with a brief section titled "Deciding to Protect Your Skin," consisting of two sentences that reminded participants that they can exercise choice in protecting their skin.

These choice promoting and recommendation information conditions were tested in two different formats. In the first format (*active response format*), participants saw the informational content on a series of screens in Survey Monkey. After each section, the participant provided an active response by checking a box next to a statement that further emphasized the manipulation (e.g., "I can decide how to use sunscreen on my face and body" versus "I should use sunscreen on my face and body"). In the second format (*electronic brochure format*), participants did not provide an active response, but instead read the information by flipping through an electronic brochure.

Condition effects on perceptions of choice. Analyses of covariance (controlling for past sun exposure and sun protection behaviors) were run with both the full sample and when only selecting for White participants (n = 68), who are at greatest risk for skin cancer (Skin Cancer Foundation, 2013b) and have been the primary ethnic group included in some prior studies (e.g., Mahler et al., 2010; Stock et al., 2009). The pilot study results indicated that the manipulation was strongest for White males, such that the choice-promoting information condition was more strongly associated with enhanced

perceptions of choice for Whites, compared to the full sample. This finding, as well as the demonstrated usefulness of UV photography in highlighting skin damage among individuals with lighter skin types (Fulton, 1997) led to the decision to include only White participants in the present study.

As part of the pilot survey, two indices were used to assess the effectiveness of the manipulation on perceptions of choice. First, a perceived choice index was created by averaging two items informed by similar questions on choice and control in prior research (e.g., Harmon-Jones, Harmon-Jones, Serra, & Gable, 2011; Myers & Horswill, 2006): "How much choice do you feel you have over whether or not to protect your skin?" (1 = *no choice at all*; 7 = *very much of a choice*), and "How many choices do you feel you have over how to protect your skin?" (1 = *no choices at all*; 7 = *very many choices*). When selecting only for White participants, results showed that participants who received the choice-promoting information (n = 38) reported higher perceptions of choice on this index (M = 6.08) than those who received the recommendation-focused information (n = 30; M = 5.58), F (1, 62) = 3.86, p = .05.

A second scale was created with three items adapted from the Health Care Climate Questionnaire, a scale used in prior research to assess the extent to which medical professionals have supported one's autonomy (e.g., Williams, Gagné, Ryan, & Deci, 2002; Williams et al., 1999, 2006). Three items from this scale were judged to be the most relevant for the current study and were adapted to refer to the information that was read in the study: "The information I received… (1) provided me with choices and options about sun protection (including not changing my current behaviors)… (2) conveyed confidence in my ability to make choices and changes regarding sun

protection… (3) acknowledged how I would like to do things regarding sun protection" (1 = *strongly disagree*; 7 = *strongly agree*). These three items were averaged (α = .83). Similar to the findings on the perceptions of choice scale, analyses showed that participants in the choice-promoting information condition perceived greater autonomy support (M = 5.16) than those who received recommendation-focused information (M = 4.26), F (1, 62) = 8.56, p = .005. Further analyses indicated that the active response format was the most effective manipulation of choice. Specifically, the condition effects on perceptions of choice and autonomy support were significant in the active format (ps < .04), but neither was significant in the electronic brochure format (ps > .49).

Condition effects on cognitions. Additional ANCOVAS were run to determine whether there were any effects of the information in the active response format conditions on sun protection cognitions and knowledge. Results showed a marginal effect of condition on an index of three items of willingness to engage in sun protection when spending "the first hot, sunny day of the spring semester … outside with some outdoor activities (e.g., hiking, playing soccer, bike riding)": willingness to… "go with your friends for the day, but… (1) seek the shade when possible… (2) wear sun protective clothing (e.g., sunglasses, a wide-brimmed hat, a long-sleeved shirt, and/or long pants)… (3) but apply sunscreen" (1 = *not at all willing*; 7 = *very willing*; α = .51). Men in the choice-promoting information condition tended to report higher willingness to protect their skin (M = 4.50), compared to those in the recommendation information condition (M = 4.01), F (1, 31) = 3.37, p = .08. This finding suggested that there may be a beneficial effect of this manipulation on an openness to engage in sun protection

behavior, although there were no significant condition effects on sun protection prototypes, attitudes, or intentions.

Finally, sun protection knowledge was assessed at the end of the survey with three multiple-choice items (e.g., "What is the minimum recommended SPF level?") and two open-ended items (e.g., "Between what hours of the day are the sun's rays the strongest?") that tested knowledge of information presented in both conditions. Results showed that the total number of knowledge items correct did not vary as a function of condition, F (1, 29) = 0.46, p = .50 (Ms = 3.19 vs. 3.88), indicating that the choice-promoting and recommendation-focused conditions, respectively, did not have a differential effect on the sun protection knowledge of White male young adults. The pilot study demonstrated the potential for perceptions of choice and sun protection cognitions to be affected by a brief experimental manipulation. In the present study, this manipulation of choice was presented to participants in conjunction with a UV photography manipulation and in the context of two surveys which assessed background variables, cognitions, and manipulation checks related to perceptions of choice and UV damage.

Participants

White male college students and young adults between the ages of 18 and 25 were recruited for this study. A total of 152 participants who met the eligibility criteria or were within a few years of the upper limit for the age criterion completed the T1 online survey. Of these participants, 124 (81.58%) completed the study by participating at T2. One participant was mistakenly run through a computer condition other than the one to which he was assigned, and one participant was excluded from analyses due to a prior skin

cancer diagnosis, resulting in a final sample size of 122. Most of the participants were recruited from the George Washington University psychology student subject pool and participated for research credit (n = 93). The remaining participants received $20 in cash and were recruited from advertisements that were distributed around the campus (n = 15) or posted electronically on the Washington, DC Craigslist page (n = 14).

Based on the hypothesized three-way interaction between masculinity, the UV photography condition, and the information condition, an initial recruitment goal was 264 participants. An a-priori power analysis was run for an ANCOVA with 12 groups (in a 2 X 3 X 2 design [including masculinity]), 6 covariates, and a numerator df of 2, and revealed that 158 participants were needed to detect a medium size effect (f = .25) and have power = .80. As data collection efforts proceeded, slow sign-ups presented recruitment difficulties. These recruitment challenges shifted the primary focus of the study to testing the hypothesized experimental effects with a smaller sample size, while masculinity analyses became secondary. While it is recognized that following an a-priori defined sample size is strongly recommended for testing one's hypotheses (Simmons et al., 2011), these analytical adjustments were made when it was determined that the a-priori sample size would not be achieved.

After recruiting a final sample of 122, post-hoc power analyses were run to determine the achieved power for testing the main analyses – in particular, for testing the hypothesized condition main effects and the UV condition by information condition interaction. With a sample size of 122, and five covariates[1], the achieved power for detecting a significant UV condition main effect (based on 2 groups) was 0.78. The

achieved power for detecting significant main effects of the information condition (based on 3 groups) and the 2-way interaction was 0.68.

Time 1 (T1): Online Survey

Participants either used the online sign-up system available to psychology students or sent the researcher an e-mail to enroll in the study. They received the link to the T1 online survey via SurveyMonkey (www.surveymonkey.com). Consent was provided on the first screen of the survey. After providing consent, participants responded to questions assessing baseline sun protection cognitions and behaviors, skin cancer risk factors, and masculinity. At the completion of the survey, participants were instructed to sign up for the second part of the study at a time approximately two weeks later either via the online sign-up system or by e-mailing the researcher.

Time 2 (T2): Lab Appointment

At T2, each participant was assigned to one of six conditions that varied in levels of the two experimental manipulations: whether or not he viewed his UV photograph (Yes vs. No), and the type of sun protection information that he received (No information vs. Recommendation information vs. Choice-promoting information). Random assignment resulted in 61 participants in the no-UV photo conditions (19 received no information, 20 recommendation-focused information, and 22 choice-promoting information), and 61 participants in the UV photo conditions (20 received no information, 20 recommendation-focused information, and 21 choice-promoting information).

At the beginning of the appointment, each participant reviewed the consent form and provided verbal consent. Participants then read basic information about the study on a computer screen via the computer program MediaLab. Following this brief task, a

research assistant administered the experimental manipulations before the participant completed a second computer-based survey assessing manipulation checks and sun protection cognitions.

Photo manipulation. Prior to having their UV photographs taken, all participants answered two questions (about their skin type and eye color) so the camera could be adjusted to the correct setting. Participants in the *UV Photo Condition* then had two photos taken of their face using a Polaroid camera that has two lenses – one which takes a regular black and white photograph and another lens with a UV filter that takes the UV photograph (Fulton, 1997). Both photos were taken simultaneously and appeared side-by-side. The experimenter showed each participant his photographs and provided a brief interpretation, pointing out sun damage that was evident in the UV photo due to "dark, freckled, or pitted" areas, compared to the black and white photo. Participants in the UV photo conditions were also told that exposure to UV light is a risk factor for skin cancer and premature wrinkling of the skin and that engaging in additional sun protection behaviors can help to prevent future skin damage (e.g., Gibbons et al., 2005; Mahler et al., 2007; Stock et al. 2009; Walsh & Stock, 2012). Participants in the *No-UV Photo Condition* did not see a UV photograph. Instead, they had only the black-and-white photograph taken with the camera. In this condition, the experimenter showed each participant his photograph and noted that he would learn more about the purpose of the photo at the end of the study.

Information manipulation. Depending on their condition assignment, participants either proceeded directly to the T2 survey (if they were in the *No Information Condition*) or first received information on recommended sun protection behaviors that

promoted or did not promote choices and options. The content of both information conditions was presented both via the experimental script and on the computer.

First, the experimenter provided brief information about the survey that was consistent with the participant's condition assignment. Participants in the *Recommendation Information Condition* were told that they would be reading about recommended sun protection behaviors. In contrast, those in the *Choice-Promoting Information Condition* were told that they would be reading about different sun protection behaviors that they can choose from. They were also told that people can decide whether or not they want to engage in sun protection behaviors, and that many individuals choose the behaviors that work best for them. (In an effort to maximize participants' attention to the sun protection information, all participants were also encouraged to take as much time as they need reading it and were told that their knowledge of the information's content would be assessed at the end of the survey.)

Following this interaction with the experimenter, participants received the information manipulation consistent with the active response format examined in the pilot study. Unlike the pilot study, participants received this information via Media Lab software instead of Survey Monkey. The full content of the written part of the information condition manipulation is included in Appendix A.

Measures – Background Variables

Demographic information, skin cancer risk factors, masculinity, and sun protection cognitions/behaviors were assessed at T1. At T2, the survey contained measures of skin type, manipulation checks, and post-manipulation cognitions. Survey items are shown in detail in Appendix B. There were no missing data at T2. At T1, a

participant with missing data on any item that was part of an averaged scale was included in the computation of that scale. Their scale values were computed from the mean of their non-missing data.

Demographics (T1). Sex and age were assessed to verify that only young adult males participated in the study. Racial/ethnic background was assessed as a check that all participants in the study identified as White or European American.

Baseline cognitions and behaviors (T1). The respective T1 cognition was included as a covariate in primary T2 analyses (Walsh & Stock, 2012). The specific cognitions assessed at T2 included: sun protection and risk willingness, sun protection and risk prototypes, sun protection attitudes, conditional perceived vulnerability to skin cancer and photoaging, and sun risk, sun protection, and skin examination intentions. The specific items included as baseline measures matched those included at T2 dependent variables, and are described in detail below.

Past sun protection behaviors. Prior sun protection behaviors were assessed and included as covariates in the analyses (Stock et al., 2009; Walsh & Stock, 2012). As an indicator of *sun exposure*, participants were asked to report "how many hours per week [they] spend in the sun during the spring and summer doing any kind of outdoor activity" (1 = *0-5 hours*; 7 = *More than 30 hours*), as well as "how often [they] try to get tan from UV rays (e.g., by sunbathing outside or using a tanning bed)" (1 =*Never*; 7 = *Every day*). For *protective behaviors*, participants responded to four questions that asked, "When spending time in the sun, how often have you … used sunscreen on your face… used sunscreen on your body… worn sun protective clothing (e.g., sunglasses, a wide-brimmed hat, a long-sleeved shirt, and/or long pants)… tried to seek the shade?" (1 =

Never; 7 = *Always*). A factor analysis showed that sun exposure (recoded), tanning (recoded), and shade-seeking loaded on a single factor ("*avoiding sun exposure*") and these three items were thus averaged ($\alpha = .58$). Sunscreen use items and clothing use loaded on a second factor, but the factor loading for clothing use was low and that item was therefore excluded from the scale. The two sunscreen use items were averaged to form a second combined indicator of *sun protection* ($r = .83$, $p < .001$).

Past skin examination behaviors. Past skin self-examinations and experience with professional skin examinations were assessed and included as covariates in analyses of skin examination cognitions. Participants were asked, "Have you ever had a full-body skin exam from a doctor?" (1 = *yes*; 2 = *no*). Self-examination behavior was assessed with a single item: "How often have you performed a skin self-examination (checked your skin for signs of skin cancer)?" (1 = *never*; 6 = *more than once a month*).

Skin type (T2). Prior to having a photograph taken, participants were asked two questions that were used to set the camera to the correct setting – one that asked about their eye color, and another that asked how their skin responds to unprotected UV exposure (e.g., burning versus tanning; Fitzpatrick, 1988). Having a skin type that is sensitive to UV exposure is related to higher levels of skin cancer and sunburns (Hall et al., 2003; Neale et al., 2007), as well as a greater likelihood of engaging in sun protection behaviors, and a greater intention to receive skin exams (Buller et al., 2011; Cottrell et al., 2005; Heckman & Coups, 2011; Janda et al., 2004). Therefore, skin type was included as a covariate in the analyses.

Masculinity (T1). The Conformity to Masculine Norms Inventory (CMNI; Mahalik et al., 2003) was used to assess masculinity. This 94-item scale assesses eleven

subscales (winning, emotional control, risk-taking, violence, dominance, playboy, self-reliance, primacy of work, power over women, disdain for homosexuals, and pursuit of status) on 4-point scales from 0 (*strongly disagree*) to 3 (*strongly agree*). Consistent with prior research, the 94-item total scale and the 11 individual subscales were created by summing scores to individual items. Participants with missing data on five or fewer CMNI items had values imputed based on the means of their other data on the relevant subscale. Those with a greater amount of missing data (n = 8) were excluded from masculinity analyses. For consistency with prior research (e.g., Mahalik et al., 2006, 2007a) the total masculinity score was the primary scale used to define masculinity in the present analyses. Reliability for this total masculinity scale was high ($\alpha = .94$). Reliability was also high for each of the eleven subscales, which were examined in follow-up analyses to further explain the study findings (αs ranged from .75 [for dominance] to .94 [for emotional control]).

Measures – Dependent Variables

Manipulation checks (T2). Manipulation checks were included in the T2 survey to gauge the effectiveness of the two experimental manipulations.

Manipulation Check – Photo Condition. Participants were asked, "How much long-term skin damage do you think you have from the sun?" (1 = *none*; 7 = *a lot*; Mahler et al., 2010; Stock et al., 2009; Walsh & Stock, 2012).

Manipulation Checks – Information Condition. Participants responded to questions regarding their perceptions of choice after the message manipulation.

General perceptions of choice. The same two questions that assessed perceived choice in the pilot study were included in the present study (e.g., "How much choice do

you feel you have over whether or not to protect your skin?;" 1 = *no choice at all*; 7 = *very much of a choice*). These items were averaged into a single index (r = .41, $p < .001$).

Autonomy support. Participants answered the same three questions that were included in the pilot study (e.g., "The information I received during this study provided me with choices and options about sun protection [including not changing my current behaviors];" 1 = *strongly disagree*; 7 = *strongly agree*). These three items were averaged ($\alpha = .78$).

Importance of choice. A single item was included at both T1 and T2 as a measure of the importance of choice: "How important is it to you to have choices about how to protect your skin?" (1 = *not at all important*; 7 = *very important*).

Knowledge. Knowledge items also served as manipulation checks of the information versus no-information conditions. The knowledge questions referenced the general recommended behaviors (as has been the case in prior studies; e.g., Mahler et al., 2007; Stock et al., 2009). Participants were asked to report: the hours of the day when the sun is the strongest (*open-ended*), the minimum recommended level of SPF (*SPF10, SPF15, SPF25, or SPF45*), which of a series of options is not a recommended form of sun-protective clothing (*dark fabrics, a baseball hat, dense fabrics, or a wide-brimmed hat*), how long before going outside sunscreen should be applied (*15 minutes, 45 minutes, 5 minutes, or 30 minutes*) and which common object helps one identify spots on the skin that may be large enough to elicit concern (*open-ended*). Responses to the two open-ended questions were coded as correct or incorrect, and the number of correct responses was summed. Each participant had a total score of correct responses out of a maximum of five.

Sun Protection Cognitions (T1, T2). Scales of sun protection and risk willingness, sun protection and risk prototypes, sun protection attitudes, perceived vulnerability, and sun protection and risk intentions, were included in both surveys.

Behavioral willingness. Sun protection and risk willingness related to each of the behaviors mentioned in the pamphlet were assessed in the context of two different willingness scenarios. In one scenario, participants were told, "Suppose it is the first hot, sunny day of the spring semester. Your friends are planning to enjoy the day outside with some outdoor activities (e.g., hiking, playing soccer, bike riding). They have asked you to join them. You want to spend time catching up with these friends." They were then asked to answer the question, "How willing would you be to each of the following?" Go with your friends… (1) "and try to get tan" (recoded), (2) "but without any sun protection," (recoded), (3), "but seek the shade when possible," (4) "but wear sun protective clothing (e.g., sunglasses, a wide-brimmed hat, a long-sleeved shirt, and/or long pants," and (5) "but apply sunscreen," from 1 (*not at all willing*) to 7 (*very willing*). A second set of items assessed willingness to do the same behaviors, but during a day at the beach. These scenarios are based on those utilized in prior UV photography studies (Gibbons et al., 2005; Mahler et al., 2010; Walsh & Stock, 2012). A factor analysis showed that the four sun exposure and tanning items (try and get a tan/not use sun protection) loaded together. These items were combined to form a measure of *sun risk willingness* (T1 $\alpha = .70$; T2 $\alpha = .84$). The other six willingness items (comprised of shade-seeking, sunscreen, and clothing use items) were combined to form a measure of *sun protection willingness* (T1 $\alpha = .62$; T2 $\alpha = .67$).

Prototypes. A *protective prototype* was assessed by asking participants to rate "the typical male of my age who protects his skin from the sun" on six different characteristics informed by prior research: smart, self-confident, attractive, mature, masculine, and feminine (1 = *not at all*; 7 = *very much*; T1 α = .76; T2 α = .83) (e.g., Mahler et al., 2010; Stock et al., 2009). Participants were also asked to rate a *risk prototype* ("the typical male of my age who does NOT protect his skin from the sun [e.g., spends time in the sun trying to get tan or without sun protection]") on the same characteristics (T1 α = .68; T2 α = .64). Perceptions of one's own similarity to these prototypes were also assessed (1 = *not at all similar*; 7 = *very similar*; Gerrard et al., 2006; Litt & Stock, 2011). Perceived similarity was multiplied by the respective favorability scale resulting in two total prototype indices – one protective and one risky.

Attitudes. Eight items asked participants to rate each of the protective behaviors mentioned in the informational pamphlet (limiting UV exposure, not tanning/sunbathing, using sun-protective clothing, and using sunscreen) regarding whether they are (un)pleasant and (in)convenient, on scales ranging from 1 to 7 (1 = *very unpleasant/inconvenient*; 7 = *very pleasant/convenient*). Attitudes regarding pleasantness and convenience were positively correlated; therefore, a total index of favorable attitudes toward sun protection was created by averaging all items (T1 α = .78; T2 α = .82).

Participants were also asked to indicate their agreement with four statements that the recommended sun protection behaviors are "not manly" (e.g., "It is not manly to wear sunscreen"), and also whether sun protection is more important for women than it is for men, on scales from 1 (*strongly disagree*) to 7 (*strongly agree*) (e.g, Walsh & Stock,

2012). These items loaded on a single factor and were averaged into an index of attitudes that sun protection is not masculine (T1 α = .83; T2 α = .82).

Conditional perceived vulnerability. The present study assessed *conditional perceived vulnerability* to skin cancer and photoaging with two questions: "*If you were to get tanned on a regular basis from being in the sun*, how likely is it that you would … get skin cancer… experience photoaging (e.g., premature aging of the skin)… at some point in the future?" (1 = *not at all likely*; 7 = *very likely*; Gibbons et al., 2005; Walsh & Stock, 2012; T1 r = .68; T2 r = .74, *p*s < .001).

Behavioral intentions. Participants were asked to indicate their agreement with several statements regarding their behavioral intentions to protect their skin: "I plan to…. limit UV exposure whenever possible (e.g., by staying inside or seeking the shade)… wear sun-protective clothing (e.g., a wide-brimmed hat, a long-sleeved shirt, and/or long pants) … wear sunscreen… whenever I am in the sun." (1 = *strongly disagree*; 7 = *strongly agree*). In addition, participants rated their agreement with statements about sun-related risk-taking: "I plan to get tan from the sun or tanning booths" and "I plan to go outside on sunny days without trying to protect my skin." A factor analysis confirmed two factors of risk and protective behavior. The tanning and sun exposure intention items were thus averaged to form a risk intention scale (T1 r = .11, *p* = .23; T2 r = .47, *p* < .001) and the remaining items were averaged to form a sun protection intention scale (T1 α = .63; T2 α = .66).

Skin examination intentions (T1, T2). Intentions for each of the examination behaviors were also assessed with two items: "I plan to check my skins for signs of skin cancer within the next month" and "I plan to have a medical professional check my skin

for signs of skin cancer within the next year" (1 = *strongly disagree*; 7 = *strongly agree*). These items were averaged into a total index of skin examination intentions (T1 r = .46; T2 r = .58, *p*s < .001).

Sun protection and skin examination informational preferences (T2). The final two questions of the survey asked participants, "Would you be interested in receiving more information about… sun protection behaviors… skin examinations?" (1 = *definitely not*; 7 = *definitely*).

Chapter 4: Results

Statistical Analyses

Preliminary analyses. Frequency checks and descriptive statistics were run on all survey items. Factor analyses, reliability analyses, and correlations were conducted to create indices of the major constructs and examine the relationships among them. Given the multiple comparisons being made in the correlation matrices, a conservative criterion ($\alpha = .01$) was used to determine statistical significance of all correlations.

Experimental effects on manipulation checks and sun protection cognitions. A series of 2 (UV Photo: Yes vs. No) X 3 (Information Condition: No Info vs. Recommendation Info vs. Choice Info) ANCOVAs was run to test the hypothesized main effects and interactions of the UV photo and information conditions. These analyses were conducted on each manipulation check index and all T2 sun protection cognitions. ANCOVAs controlled for two indices of sun protection behavior (avoiding unprotected sun exposure and wearing sunscreen), skin type, the matching T1 cognition (when available), and whether or not the participant had taken a prior UV photograph. 2 X 3 ANOVAs also checked for randomization issues. Significant pairwise comparisons were also reported in the case of significant two-way interactions. Given that the purpose of the study was to examine whether the UV photography effect was enhanced in the presence of information, any significant pairwise comparisons of the UV conditions within each information condition are reported regardless of the interactions' significance, for the UV photography manipulation check and sun protection cognitions. In contrast, for analyses of the information condition manipulation checks, significant

pairwise comparisons of information conditions within each UV condition are reported. The criterion for statistical significance was set at $\alpha = .05$ for tests of main effects and the two-way interactions. However, *p*-values for tests of pairwise comparisons were compared to a more stringent criterion ($\alpha = .01$). This was done in an effort to control for the probability of Type I error in the context of a small sample size and multiple statistical tests (e.g., Maxwell, 2004; Smith, Levine, Lachlan, & Fediuk, 2002).

Participants

Participants ranged from 18 to 33 years of age ($M = 20.25$, $SD = 2.29$).[2] One-hundred and eighteen participants selected White/European American or Caucasian as one of their racial/ethnic backgrounds or their sole background. Of the remaining four participants, three indicated their backgrounds as: Middle Eastern, Turkish, and Indian/Italian. One participant did not provide a response. Six participants reported having a prior UV photograph taken (three were in a no-UV photo condition and three were in a UV photo condition).[3, 4]

Descriptive Statistics and Correlations

Table 1 presents correlations, means, and standard deviations for skin type, sun protection behaviors, having a prior UV photograph, perceptions of choice, and T2 cognitions. Both indicators of sun protection behavior (avoiding sun exposure and wearing sunscreen) were positively associated with: protective willingness, protective intentions, and favorable protective prototypes (*p*s < .01); in contrast, both measures of sun protection were negatively associated with risk willingness (*p*s < .01). Greater avoidance of sun exposure also correlated with higher conditional perceived vulnerability, lower risk intentions, and more favorable attitudes toward sun protection

(*p*s < .01), while greater sunscreen use correlated with less favorable risk prototypes (*p* < .001). Having a less sun-reactive skin type was associated with: higher sun risk willingness, a more favorable risk prototype, and lower conditional perceived vulnerability (*p*s ≤ .01).

There were also several correlations among sun protection cognitions. Participants who reported higher sun protection (risk) willingness also reported higher sun protection (risk) intentions and more favorable protective (risk) prototypes (*p*s ≤ .001). Higher conditional perceived vulnerability correlated with higher levels of protective intentions, willingness, and prototypes, as well as lower levels of risk indicators of these cognitions (*p*s < .01). Attitudes that sun protection is not manly were negatively correlated with protective willingness, intentions, and prototypes, but positively correlated with risky levels of these cognitions (*p*s ≤ .01). With the exception of the correlation with risk prototypes, the opposite was true for favorable attitudes toward sun protection (*p*s < .001). Finally, higher skin examination intentions correlated with higher conditional perceived vulnerability, greater sun protection willingness and intentions, lower sun risk willingness and intentions, more favorable sun protection prototypes, and more favorable attitudes toward sun protection (*p*s < .01).

Table 1

Correlations, means, and standard deviations for control variables and T2 cognitions

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*
1. Avoid Exp	--	-.13	-.18	.02	.36**	-.49**	.34**	-.46**	.24*	-.11	.26*	-.11	.34**	.08
2.Sunscreen Use		--	-.23*	-.02	.24*	-.28*	.31**	-.12	.32**	-.43**	.12	-.20	.19	.06
3. Skin Type			--	.06	-.15	.23*	-.20	.19	-.12	.33**	-.27*	.01	.08	-.00
4. Prior Photo				--	-.02	.09	-.07	.13	.06	.16	-.08	-.14	.00	.02
5. Protect Willingness					--	-.37**	.60**	-.37**	.42**	-.11	.29**	-.23*	.47**	.23*
6. Risk Willingness						--	-.60**	.67**	-.39**	.47**	-.33**	.32**	-.38**	-.34**
7. Protect Intention							--	-.55**	.52**	-.37**	.30**	-.30**	.66**	.37**
8. Risk Intention								--	-.39**	.30**	-.25*	.24*	-.42**	-.32**
9. Protect Prototype									--	-.26*	.28*	-.33**	.38**	.25*
10. Risk Prototype										--	-.26*	.28*	-.13	-.05
11. Conditional PV											--	.06	.10	.25*
12. Att – Not Manly												--	-.30**	.05
13. Att – Favorable													--	.31**
14. Exam Intention														--
M	4.53	3.93	3.03	--	4.71	3.84	3.98	3.18	23.98	12.95	5.86	2.44	3.59	3.57
SD	1.08	1.68	1.13	--	0.95	1.49	1.24	1.45	9.30	6.97	1.10	1.16	1.00	1.77
Range	1-7	1-7	1-6	--	2-7	1-7	1-7	1-7	6.3-47.8	2-35	2-7	1-5.6	1.5-7	1-7

Note. "Avoid Exp" = Behavior of avoiding sun exposure; "Prior Photo" = Having a prior UV photograph (0 = *no*; 1 = *yes*); "PV" = perceived vulnerability; "Att" = Attitude.
* $p \leq .01$, ** $p \leq .001$

Primary Analyses: Experimental Condition Effects

GLM ANCOVAs were run to verify that there were no randomization errors, check the effectiveness of the experimental manipulations, and examine the impact of the manipulations on sun protection cognitions.

Randomization error checks. ANOVAs were run on past sun exposure and protection behaviors, masculinity, and skin type (without controls). There were no significant condition effects (*p*s ≥ .12), indicating no randomization problems.

Manipulation checks.

UV photograph manipulation check. Table 2 shows the estimated marginal means and standard errors of the UV photography manipulation check across condition. ANCOVAs (controlling for sun exposure, sunscreen use, skin type, and having had a prior UV photo) demonstrated that participants who saw their UV photo reported more sun damage compared to those who did not see their UV photo, F (1, 112) = 14.10, p < .001, *M*s 4.37 vs. 3.42. Perceived damage did not vary by information condition (p = .84), but a significant two-way interaction, F (2, 112) = 3.26, p = .04, showed that the UV photo manipulation check was significant only in the no-information condition (p < .001).

Table 2

Estimated Marginal Means and (Standard Errors) for the UV Photo Manipulation Check (Perceived Damage) by Condition

	UV Photography Condition	
Information Condition *(Overall means and SEs)*	**No UV Photo** $M = 3.42\ (0.18)_{a}$	**UV Photo** $M = 4.37\ (0.18)_{b}$
No Info $M = 3.80\ (0.22)_{a}$	2.88_{a} (0.32)	4.71_{b} (0.31)
Recommendation Info $M = 3.98\ (0.22)_{a}$	3.65_{a} (0.31)	4.30_{a} (0.31)
Choice Info $M = 3.91\ (0.21)_{a}$	3.73_{a} (0.30)	4.09_{a} (0.30)

Note. For main effects, means that do not share a similar subscript are significantly different, $p \leq .05$. For pairwise comparisons, different subscripts between the no-UV photo and UV photo conditions within each individual information condition indicate a significant difference, $p \leq .01$.

Information condition manipulation checks. A significant information condition effect, $F\ (2, 112) = 7.00$, $p = .001$, showed that participants in the choice-information condition reported higher *perceived autonomy support* ($M = 5.57$) than participants in the no-information condition ($M = 4.62$), $p < .001$. The mean autonomy support in the recommendation information condition was in between the other two information conditions ($M = 4.95$). The UV condition main effect and interaction term were not significant ($ps \geq .07$), although pairwise comparisons showed that the difference between the choice information condition and no-information conditions in autonomy support was

significant only among participants who viewed their UV photo ($p < .001$; see Table 3 for estimated marginal means).

Perceived choice over sun protection behaviors did not significantly differ by either of the two manipulations (ps > .14). The two-way interaction was significant, F (2, 112) = 3.31, p = .04, although there were no choice information condition effects among either participants who saw their UV photo or those who did not (ps >.01; see Table 4).

There was not a significant effect of the information condition on the *perceived importance of choice*, after excluding three participants for whom the response scale to this question was coded incorrectly (p = .09). The UV condition effect was also not significant (p = .56). There was a significant two-way interaction, F (2, 109) = 4.35, p = .02, showing that only among participants who did not see their UV photograph, there was a trend for those in the recommendation and choice information conditions to report a higher importance of choice than those in the no-information condition (ps = .01; see Table 5).

Knowledge of sun protection varied by information condition, F (2, 112) = 75.12, $p < .001$, such that those in the choice information and recommendation information conditions provided more correct responses (Ms 3.76 and 3.60, respectively) than those who received no information (M = 0.89), ps < .001. The UV photography condition and the two-way interaction were not significant (ps ≥ .18; see Table 6).[5]

Table 3

Estimated Marginal Means and (Standard Errors) for Autonomy Support by Condition

	Information Condition		
UV Photography Condition *(Overall means and SEs)*	**No Info** 4.62 (0.19) $_{a}$	**Rec Info** 4.95 (0.19) $_{ab}$	**Choice Info** 5.57 (0.18) $_{b}$
No UV Photo 5.24 (0.15) $_{a}$	5.05 $_{a}$ (0.27)	5.11 $_{a}$ (0.26)	5.57 $_{a}$ (0.25)
UV Photo 4.85 (0.15) $_{a}$	4.20 $_{a}$ (0.26)	4.78 $_{ab}$ (0.26)	5.57 $_{b}$ (0.26)

Note. For main effects, means that do not share a similar subscript are significantly different, $p \leq .05$. For pairwise comparisons, different subscripts among the information conditions within each individual UV condition indicate a significant difference, $p \leq .01$.

Table 4

Estimated Marginal Means and (Standard Errors) for Perceived Choice by Condition

	Information Condition		
UV Photography Condition *(Overall means and SEs)*	**No Info** 5.55 (0.16) $_{a}$	**Rec Info** 5.81 (0.16) $_{a}$	**Choice Info** 5.99 (0.15) $_{a}$
No UV Photo 5.89 (0.13) $_{a}$	5.63 $_{a}$ (0.23)	6.22 $_{a}$ (0.22)	5.83 $_{a}$ (0.22)
UV Photo 5.68 (0.13) $_{a}$	5.48 $_{a}$ (0.23)	5.40 $_{a}$ (0.22)	6.15 $_{a}$ (0.22)

Note. For main effects, means that do not share a similar subscript are significantly different, $p \leq .05$. For pairwise comparisons, different subscripts among the information conditions within each individual UV condition indicate a significant difference, $p \leq .01$.

Table 5

Estimated Marginal Means and (Standard Errors) for Importance of Choice by Condition

	Information Condition		
UV Photography Condition *(Overall means and SEs)*	**No Info** 4.60 (0.23) $_{a}$	**Rec Info** 4.85 (0.23) $_{a}$	**Choice Info** 5.30 (0.22) $_{a}$
No UV Photo 4.84 (0.19) $_{a}$	4.03 $_{a}$ (0.33)	5.26 $_{b}$ (0.33)	5.22 $_{b}$ (0.31)
UV Photo 4.99 (0.19) $_{a}$	5.17 $_{a}$ (0.33)	4.44 $_{a}$ (0.32)	5.38 $_{a}$ (0.32)

Note. For main effects, means that do not share a similar subscript are significantly different, $p \leq .05$. For pairwise comparisons, different subscripts among the information conditions within each individual UV condition indicate a significant difference, $p \leq .01$.

Table 6

Estimated Marginal Means and (Standard Errors) for Knowledge by Condition

	Information Condition		
UV Photography Condition *(Overall means and SEs)*	**No Info** 0.89 (0.19) $_{a}$	**Rec Info** 3.60 (0.19) $_{b}$	**Choice Info** 3.76 (0.18) $_{b}$
No UV Photo 2.75 (0.15) $_{a}$	0.95 $_{a}$ (0.27)	3.80 $_{b}$ (0.26)	3.50 $_{b}$ (0.25)
UV Photo 2.75 (0.15) $_{a}$	0.82 $_{a}$ (0.26)	3.40 $_{b}$ (0.26)	4.03 $_{b}$ (0.26)

Note. For main effects, means that do not share a similar subscript are significantly different, $p \leq .05$. For pairwise comparisons, different subscripts among the information conditions within each individual UV condition indicate a significant difference, $p \leq .01$.

Correlations between perceptions of choice with T2 cognitions. Correlations were run between the choice manipulation checks and sun protection cognitions to further examine the importance of choice. These correlations are shown in Table 7. Perceiving greater autonomy support correlated with more protective willingness and intentions, as well as more favorable sun protection attitudes and prototypes (rs ≥ .25, *p*s < .01). Perceived choice correlated with more favorable sun protection attitudes (r = .25, *p* = .01).

Similar to the other manipulation checks, the perceived *importance* of choice was positively associated with several sun protection cognitions (willingness, intentions, prototypes, and conditional perceived vulnerability, *p*s < .01). Those who reported that that choice is important also reported higher skin examination intentions (r = .27, *p* < .01) and lower sun-risk cognitions (willingness, intentions, and prototypes, rs ≤ -.24, *p*s < .01).[6]

Table 7

Correlations between Information Condition Manipulation Checks and T2 Cognitions

	Perceived Choice	Autonomy Support	Importance of Choice
Protect Willingness	.17	.26*	.27*
Risk Willingness	-.01	-.13	-.24*
Protect Intention	.10	.27*	.42**
Risk Intention	-.10	-.11	-.24*
Protect Prototype	.09	.28*	.27*
Risk Prototype	.09	-.09	-.37**
Conditional PV	-.03	.17	.24*
Att - Not Manly	-.07	-.02	-.09
Att - Favorable	.25*	.30**	.18
Exam Intention	.03	.01	.27*

Note. "PV" = Perceived vulnerability; "Att" = Attitude.
* $p \leq .01$, ** $p \leq .001$

Sun protection cognitions. ANCOVAs were run to examine the hypothesized impact of the experimental manipulations on sun protection willingness, prototypes, attitudes, and intentions. Covariates in in the models were: sun exposure, sunscreen use, skin type, having had a prior UV photo taken, and the matching T1 cognition.

Behavioral willingness. Estimated marginal means and standard errors of willingness across conditions are presented in Tables 8 and 9. An ANCOVA showed main effects of both the UV photography condition, F (1, 111) = 12.02, p = .001, and the information condition, F (2, 111) = 5.74, p = .004, on *risk willingness*. Those in the UV

photograph condition reported lower risk willingness (M = 3.57) compared to those in the no-UV photograph condition (M = 4.11), and those in the recommendation information condition reported lower risk willingness (M = 3.47) compared to both those in the no-information condition (M = 3.98) and choice-information condition (M = 4.06) (ps < .01). The interaction was not significant (p = .67), although pairwise comparisons showed that the UV photography effect existed only in the choice-information condition (p = .01). Neither of the main effects nor the interaction was significant for *protective willingness* (ps ≥ .11).

Table 8

Estimated Marginal Means and (Standard Errors) for Risk Willingness by Condition

	UV Photography Condition	
Information Condition *(Overall means and SEs)*	**No UV Photo** M = 4.11 (0.11) $_a$	**UV Photo** M = 3.57 (0.11) $_b$
No Info M = 3.98 (0.14) $_a$	4.16 $_a$ (0.19)	3.81 $_a$ (0.19)
Recommendation Info M = 3.47 (0.13) $_b$	3.77 $_a$ (0.19)	3.17 $_a$ (0.19)
Choice Info M = 4.06 (0.13) $_a$	4.39 $_a$ (0.18)	3.73 $_b$ (0.18)

Note. For main effects, means that do not share a similar subscript are significantly different, $p \leq .05$. For pairwise comparisons, different subscripts between the no-UV photo and UV photo conditions within each individual information condition indicate a significant difference, $p \leq .01$.

Table 9

Estimated Marginal Means and (Standard Errors) for Protective Willingness by Condition

	UV Photography Condition	
Information Condition *(Main effect means and SEs)*	**No UV Photo** $M = 4.58\ (0.10)_{a}$	**UV Photo** $M = 4.82\ (0.10)_{a}$
No Info $M = 4.56\ (0.13)_{a}$	4.39_{a} (0.18)	4.73_{a} (0.18)
Recommendation Info $M = 4.69\ (0.13)_{a}$	4.69_{a} (0.18)	4.69_{a} (0.18)
Choice Info $M = 4.85\ (0.13)_{a}$	4.67_{a} (0.17)	5.04_{a} (0.17)

Note. For main effects, means that do not share a similar subscript are significantly different, $p \leq .05$. For pairwise comparisons, different subscripts between the no-UV photo and UV photo conditions within each individual information condition indicate a significant difference, $p \leq .01$.

Prototypes. There were no condition main effects on the *risk prototype* (prototype of the typical man who does not protect himself from the sun) (*p*s > .75). There was a significant two-way interaction, $F\ (2, 111) = 3.30$, $p = .04$; however, no pairwise comparisons were significant (*p*s ≥ .06; see Table 10).

Participants in the UV photo condition reported a more favorable *protective prototype* (prototype of the typical man who protects his skin from the sun) than those in the no-UV photo condition, $F\ (1, 111) = 5.34$, $p = .02$, *M*s 25.50 vs. 22.47. The information condition main effect and the interaction were non-significant (*p*s ≥ .19), although pairwise comparisons showed that the positive UV photography effect was significant only within the choice information condition ($p = .01$; see Table 11).

Table 10

Estimated Marginal Means and (Standard Errors) for Risk Prototype by Condition

	UV Photography Condition	
Information Condition *(Overall means and SEs)*	**No UV Photo** $M = 13.13\ (0.71)_{a}$	**UV Photo** $M = 12.81\ (0.71)_{a}$
No Info $M = 12.93\ (0.90)_{a}$	14.48_{a} (1.29)	11.39_{a} (1.34)
Recommendation Info $M = 13.19\ (0.89)_{a}$	11.56_{a} (1.26)	14.82_{a} (1.24)
Choice Info $M = 12.78\ (0.84)_{a}$	13.34_{a} (1.20)	12.22_{a} (1.21)

Note. For main effects, means that do not share a similar subscript are significantly different, $p \leq .05$. For pairwise comparisons, different subscripts between the no-UV photo and UV photo conditions within each individual information condition indicate a significant difference, $p \leq .01$.

Table 11

Estimated Marginal Means and (Standard Errors) for Protective Prototype by Condition

	UV Photography Condition	
Information Condition *(Overall means and SEs)*	**No UV Photo** $M = 22.47\ (0.92)_{a}$	**UV Photo** $M = 25.03\ (0.92)_{b}$
No Info $M = 22.77\ (1.15)_{a}$	21.64_{a} (1.64)	23.89_{a} (1.62)
Recommendation Info $M = 22.33\ (1.14)_{a}$	25.03_{a} (1.60)	25.63_{a} (1.61)
Choice Info $M = 23.86\ (1.10)_{a}$	20.74_{a} (1.55)	26.99_{b} (1.58)

Note. For main effects, means that do not share a similar subscript are significantly different, $p \leq .05$. For pairwise comparisons, different subscripts between the no-UV photo and UV photo conditions within each individual information condition indicate a significant difference, $p \leq .01$.

Attitudes. An ANCOVA revealed that for attitudes regarding the manliness of sun protection, both condition main effects, as well as the interaction term, were non-significant (*p*s ≥ .07). The ANCOVA for favorable attitudes toward sun protection also showed no significant effects (*p*s > .51; see Tables 12 and 13).

Table 12

Estimated Marginal Means and (Standard Errors) for Attitudes that Sun Protection is Not Manly, by Condition

	UV Photography Condition	
Information Condition *(Overall means and SEs)*	**No UV Photo** $M = 2.37\ (0.12)_{a}$	**UV Photo** $M = 2.49\ (0.12)_{a}$
No Info $M = 2.16\ (0.14)_{a}$	2.03_{a} (0.21)	2.28_{a} (0.20)
Recommendation Info $M = 2.54\ (0.14)_{a}$	2.46_{a} (0.20)	2.62_{a} (0.20)
Choice Info $M = 2.59\ (0.14)_{a}$	2.61_{a} (0.20)	2.57_{a} (0.20)

Note. For main effects, means that do not share a similar subscript are significantly different, $p \leq .05$. For pairwise comparisons, different subscripts between the no-UV photo and UV photo conditions within each individual information condition indicate a significant difference, $p \leq .01$.

Table 13

Estimated Marginal Means and (Standard Errors) for Favorable Attitudes toward Sun Protection, by Condition

	UV Photography Condition	
Information Condition *(Overall means and SEs)*	**No UV Photo** $M = 3.62\ (0.10)_{a}$	**UV Photo** $M = 3.56\ (0.10)_{a}$
No Info $M = 3.48\ (0.12)_{a}$	3.44_{a} (0.18)	3.52_{a} (0.17)
Recommendation Info $M = 3.66\ (0.12)_{a}$	3.68_{a} (0.17)	3.64_{a} (0.17)
Choice Info $M = 3.63\ (0.12)_{a}$	3.75_{a} (0.16)	3.51_{a} (0.16)

Note. For main effects, means that do not share a similar subscript are significantly different, $p \leq .05$. For pairwise comparisons, different subscripts between the no-UV photo and UV photo conditions within each individual information condition indicate a significant difference, $p \leq .01$.

Conditional perceived vulnerability. As shown in Table 14, neither of the condition main effects, nor their interaction, were significant for conditional perceived vulnerability (*p*s > .10).

Table 14

Estimated Marginal Means and (Standard Errors) for Conditional Perceived Vulnerability by Condition

	UV Photography Condition	
Information Condition *(Overall means and SEs)*	**No UV Photo** $M = 5.73\ (0.11)_{a}$	**UV Photo** $M = 5.98\ (0.11)_{a}$
No Info $M = 5.69\ (0.14)_{a}$	5.35_{a} (0.20)	6.03_{a} (0.20)
Recommendation Info $M = 5.92\ (0.14)_{a}$	5.86_{a} (0.19)	5.98_{a} (0.20)
Choice Info $M = 5.95\ (0.13)_{a}$	5.97_{a} (0.19)	5.93_{a} (0.19)

Note. For main effects, means that do not share a similar subscript are significantly different, $p \leq .05$. For pairwise comparisons, different subscripts between the no-UV photo and UV photo conditions within each individual information condition indicate a significant difference, $p \leq .01$.

Behavioral intentions. Estimated marginal means for intentions by condition are shown in Tables 15 and 16. There was a main effect of the UV photography condition, $F(1, 111) = 8.65$, $p = .004$, such that those who saw their UV photo reported lower risk intentions ($M = 2.87$) compared to those in the no-UV photo condition ($M = 3.48$). The information main effect and the interaction were not significant ($ps > .10$). However, pairwise comparisons indicated that the positive UV effect was significant only in the choice information condition ($p < .01$). For protective intentions, neither of the main effects nor the interaction were significant ($ps \geq .19$).

Table 15

Estimated Marginal Means and (Standard Errors) for Risk Intention by Condition

	UV Photography Condition	
Information Condition *(Overall means and SEs)*	**No UV Photo** $M = 3.48\ (0.15)_{a}$	**UV Photo** $M = 2.87\ (0.15)_{b}$
No Info $M = 3.33\ (0.18)_{a}$	3.73_{a} (0.26)	2.94_{a} (0.26)
Recommendation Info $M = 2.99\ (0.18)_{a}$	2.99_{a} (0.25)	2.99_{a} (0.26)
Choice Info $M = 3.20\ (0.17)_{a}$	3.73_{a} (0.25)	2.68_{b} (0.25)

Note. For main effects, means that do not share a similar subscript are significantly different, $p \leq .05$. For pairwise comparisons, different subscripts between the no-UV photo and UV photo conditions within each individual information condition indicate a significant difference, $p \leq .01$.

Table 16

Estimated Marginal Means and (Standard Errors) for Protective Intention by Condition

	UV Photography Condition	
Information Condition *(Overall means and SEs)*	**No UV Photo** $M = 3.87\ (0.12)_{a}$	**UV Photo** $M = 4.09\ (0.12)_{a}$
No Info $M = 3.81\ (0.14)_{a}$	3.60_{a} (0.21)	4.01_{a} (0.20)
Recommendation Info $M = 4.12\ (0.14)_{a}$	4.10_{a} (0.20)	4.14_{a} (0.20)
Choice Info $M = 4.02\ (0.14)_{a}$	3.92_{a} (0.20)	4.12_{a} (0.20)

Note. For main effects, means that do not share a similar subscript are significantly different, $p \leq .05$. For pairwise comparisons, different subscripts between the no-UV photo and UV photo conditions within each individual information condition indicate a significant difference, $p \leq .01$

Secondary analyses: Skin examination intentions, the role of masculinity, and informational preferences.

Skin examination intentions. ANCOVAs were also used to examine whether experimental effects extended to skin examination intentions. As with previous analyses, covariates included: skin type, the matching T1 cognition (T1 skin exam intention), and having a prior UV photograph. Prior self- and professional- skin examinations replaced sun protection indicators as behavioral covariates. All main effects and interactions were non-significant (*p*s ≥ .18; see estimated marginal means in Table 17).

Table 17

Estimated Marginal Means and (Standard Errors) for Skin Examination Intention by Condition

	UV Photography Condition	
Information Condition *(Overall means and SEs)*	**No UV Photo** $M = 3.40\ (0.18)_{a}$	**UV Photo** $M = 3.75\ (0.18)_{a}$
No Info $M = 3.49\ (0.23)_{a}$	3.14_{a} (0.32)	3.85_{a} (0.33)
Recommendation Info $M = 3.70\ (0.22)_{a}$	3.77_{a} (0.32)	3.63_{a} (0.31)
Choice Info $M = 3.53\ (0.21)_{a}$	3.30_{a} (0.30)	3.76_{a} (0.30)

Note. For main effects, means that do not share a similar subscript are significantly different, $p \leq .05$. For pairwise comparisons, different subscripts between the no-UV photo and UV photo conditions within each individual information condition indicate a significant difference, $p \leq .01$.

Masculinity as a moderator. Masculinity was explored as a potential moderator using multiple regressions. Two orthogonal contrasts were computed to examine the pattern of the information condition interaction with masculinity. Since the main moderation hypothesis was that men high in masculinity would be most strongly impacted by the choice information condition (as well as the UV photography condition), the primary information condition contrast (**Contrast 1**) compared the choice-promoting information condition (coded –2) with both the standard information condition (coded 1) and the no-information condition (coded 1). The second contrast (**Contrast 2**) compared the recommendation information condition (coded 1) with the no-information condition (coded –1; West, Aiken, & Krull, 1996). The UV photography condition was entered as a dichotomous variable (-1 = *no-UV photo condition*; 1 = *UV photo condition*), and masculinity and all continuous covariates were standardized. The model included: (1) all covariates inserted in the ANCOVAs, (2) the main effects of the UV photography condition, the two information condition contrasts, and masculinity, (3) all possible two-way interactions among masculinity and the experimental conditions (UV photography condition and the two information condition contrasts), and (4) the three-way interactions between masculinity, the UV photography condition, and each contrast. Since masculinity was hypothesized to moderate the effects of both the UV photography condition and the choice information condition effects, interactions in the full model between masculinity and either Contrast 1 or UV photography, as well as the three way interaction among them, were evaluated against an alpha level of .05. Interactions with Contrast 2, as well as analyses breaking down the interactions into lower level interactions and simple effects, were examined against a more stringent alpha of .01.

Significant three-way interactions. The moderation hypotheses for this study stated that the highest sun protection cognitions would be seen among high masculine men who viewed both their UV photograph and choice promoting information. In other words, the two proposed intervention components (UV photography and choice promoting information) were expected to have their strongest effects among high masculine men. Based on this hypothesis, the primary interactions of interest were the three-way interactions between masculinity, the UV photography condition, and the two information condition contrasts (Contrast 1, comparing the choice information condition with the non-choice information conditions, and Contrast 2, comparing the two non-choice information conditions against each other). Three significant three-way interactions resulted from the analyses, on: (1) conditional perceived vulnerability, (2) the protective prototype, and (3) risk willingness.

For *conditional perceived vulnerability*, there was a significant interaction between masculinity and Contrast 1 ($\beta = -.16$, $t = -2.10$, $p = .04$). Although the three-way interaction with Contrast 2 was not significant ($p = .24$), there was a significant three-way interaction between masculinity, UV photography, and Contrast 1 (choice information condition versus non-choice information conditions); $\beta = .16$, $t = 2.05$, $p = .04$.

Two understand the patterns of these interactions, the regression model was re-run twice, with masculinity set first at a conditionally low value and then at a conditionally high value (+/- 1 *SD*). These conditional values of masculinity, in turn, were used to compute the interaction terms, such that all terms involving masculinity in the model were set at either a low or a high value. With regard to the pattern of the two-way interaction, these analyses revealed that the Contrast 1 main effect was not significant

among less masculine men (p = .43). The UV photography effect was also not significant (p = .48). However, among high masculine men, those who were in the non-choice information conditions reported lower conditional perceived vulnerability compared to those in the choice information condition (β = -.48, t = -3.44, p = .001). In addition, high masculine men in the UV photo condition tended to reported higher conditional perceived vulnerability than those who did not see their UV photograph (β = .22, t = 2.05, p = .04), although this effect did not reach significance at the more conservative alpha level.

The nature of the significant three-way interaction was examined by both graphing the interaction and examining whether there were significant two-way interactions between UV photography and Contrast 1 at high versus low levels of masculinity. The graph was created by plotting points in the regression equation for each of the conditions represented in the interaction (choice information/no-UV, non-choice information/no-UV, choice information/UV, and non-choice/UV) at high versus low (+/- 1 *SD*) levels of masculinity. The resulting figure (see Figure 4) showed that, among high masculine men, those in the non-choice/no-UV conditions reported lower conditional perceived vulnerability, compared to high masculine men who received either form of an intervention. Also, the only conditions in which masculinity was negatively associated with conditional perceived vulnerability were the non-choice/no-UV conditions.

Similar to the findings seen for the main effects at low versus high masculinity, re-running the regressions showed that among less masculine men, the two-way interaction between Contrast 1 and UV photography was not significant (p = .44). Among high masculine men, there was a marginal trend toward a significant interaction between UV photography and Contrast 1, but it did not reach significance at the stringent

alpha level (β = .33, t = 2.26, p = .03). In separate regressions, selecting for both high masculinity and levels of Contrast 1 revealed that the UV photography effects were not significant for either high or low masculine men (ps > .05).

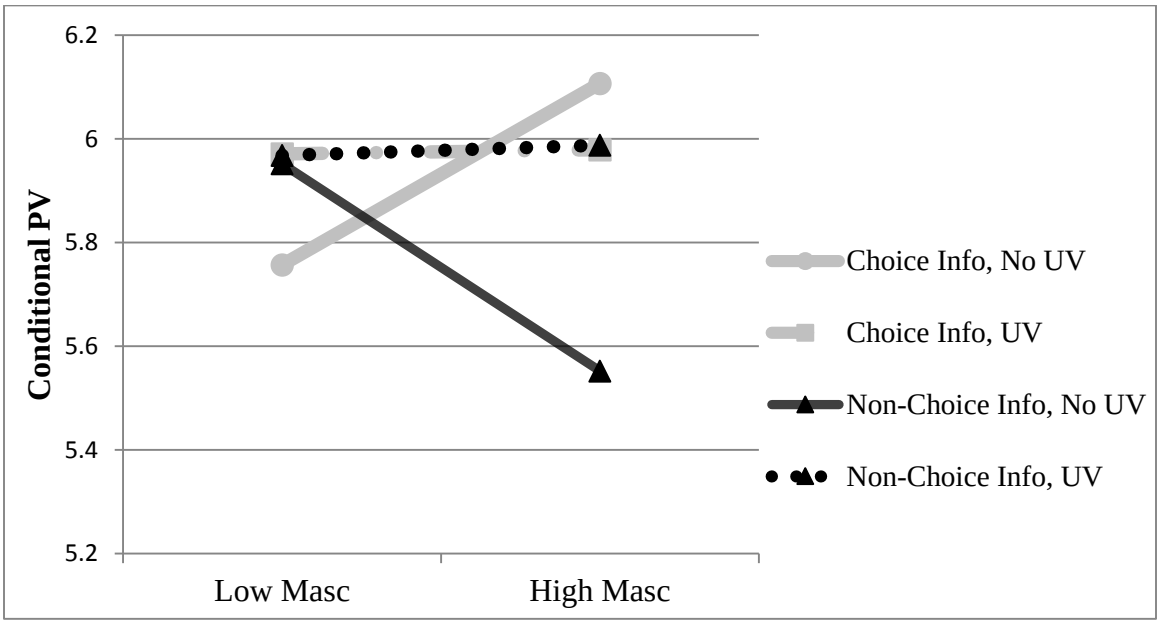


Figure 4. Conditional perceived vulnerability (PV) by masculinity, UV photography, and Contrast 1 (choice information condition versus non-choice information conditions)

The second significant three-way interaction was seen on *protective prototypes*. Similar to the findings for conditional perceived vulnerability, there was a significant three-way interaction between masculinity, UV photography, and Contrast 1 (choice information condition versus non-choice information conditions); β = .18, t = 2.26, p = .03, but the three-way interaction with Contrast 2 was not significant (p = .78). The graph of the significant three-way interaction with Contrast 1 showed that among high masculine men, those in the non-choice/UV condition reported the most favorable protective prototype (see Figure 5).

The same approach used to examine the three-way interaction on conditional perceived vulnerability was applied again to examine whether the UV photography by Contrast 1 interaction, as well as each of those two main effects, was significant on protective prototypes, with masculinity set low, versus high. At high masculinity, the two-way interaction was not significant (p = .42). Although there was a trend toward UV photography being associated with more favorable protective prototypes among high masculine men, it was not significant (β = .23, t = 2.06, p = .04). Among less masculine men, neither of the main effects were significant (ps > .47), although there was a marginal UV photography by Contrast 1 interaction (β = -.27, t = -2.49, p = .02). Selecting for both low masculinity and levels Contrast 1 revealed that the UV photography effect did not reach significance among less masculine men in either the choice or non-choice conditions (ps ≥ .05).

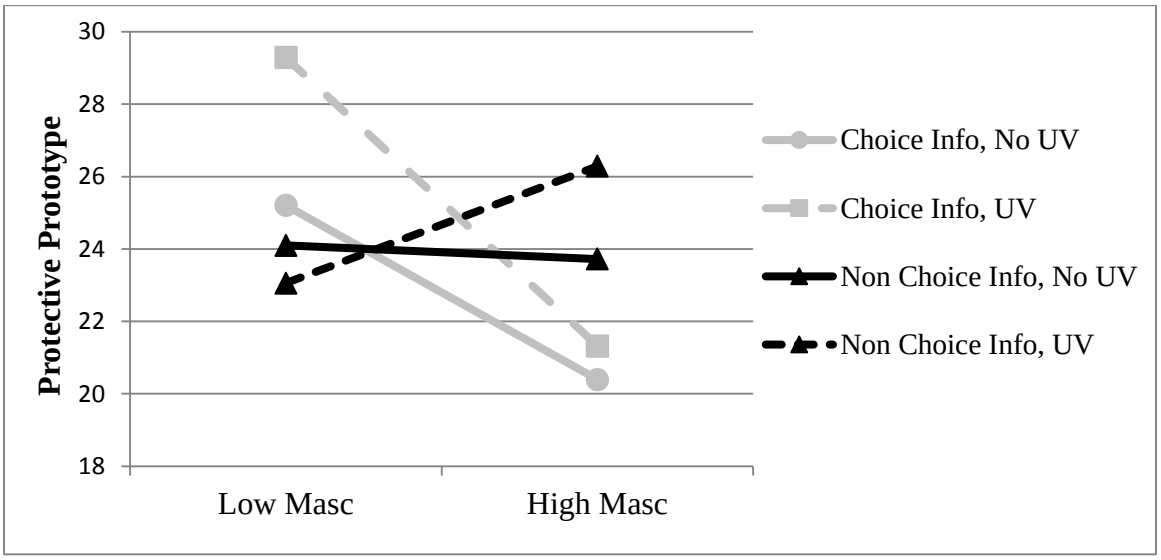


Figure 5. Protective prototype favorability by masculinity, UV photography, and Contrast 1 (choice information condition versus non-choice information conditions).

The third and final significant three-way interaction was seen for *risk willingness.* Unlike the findings for conditional perceived vulnerability and protective prototypes, it was the three-way interaction between masculinity, UV photography, and *Contrast 2* (recommendation information condition versus no information condition) that was significant ($\beta = -.14$, $t = -2.63$, $p = .01$), while the three-way interaction with Contrast 1 was not significant ($p = .60$). To examine the nature of these interactions, similar methods were used to re-run the regression at high versus low levels of masculinity. Doing so revealed that among less masculine men, there was a significant effect of UV photography, such that seeing one's UV photograph was associated with lower risk willingness ($\beta = -.30$, $t = -4.18$, $p < .001$). The conditional main effect of UV photography was not significant among more masculine men ($p = .25$).

The three-way interaction was studied further by graphing the interaction and also examining whether there were significant two-way interactions between Contrast 2 and UV photography at high and low levels of masculinity. To create the graphical portrayal of the interaction, points in the regression equation were plotted in each of the conditions represented by Contrast 2 (recommendation information/no-UV, recommendation information/UV, no-information/no-UV, and no-information/UV) at both low and high values (+/- 1 *SD*) of masculinity. The resulting figure (see Figure 6) showed a pattern indicating that among high masculine men, those who received recommendation information and their UV photograph reported the lowest risk willingness. In addition, the pattern revealed a strong positive association between masculinity and risk willingness for men who were in the no-information / UV photograph condition.

The regressions run at high and low levels of masculinity further explicated the nature of this three-way interaction. The two-way interaction between Contrast 2 and UV photography was not significant among high or low masculine men (*p*s ≥ .02). Selecting for both conditionally high masculinity and levels of Contrast 2 (recommendation information condition versus no information condition) revealed that UV photography simple effects among high masculine men were not significant in either the recommendation condition or the no-information condition (*p*s ≥ .04).

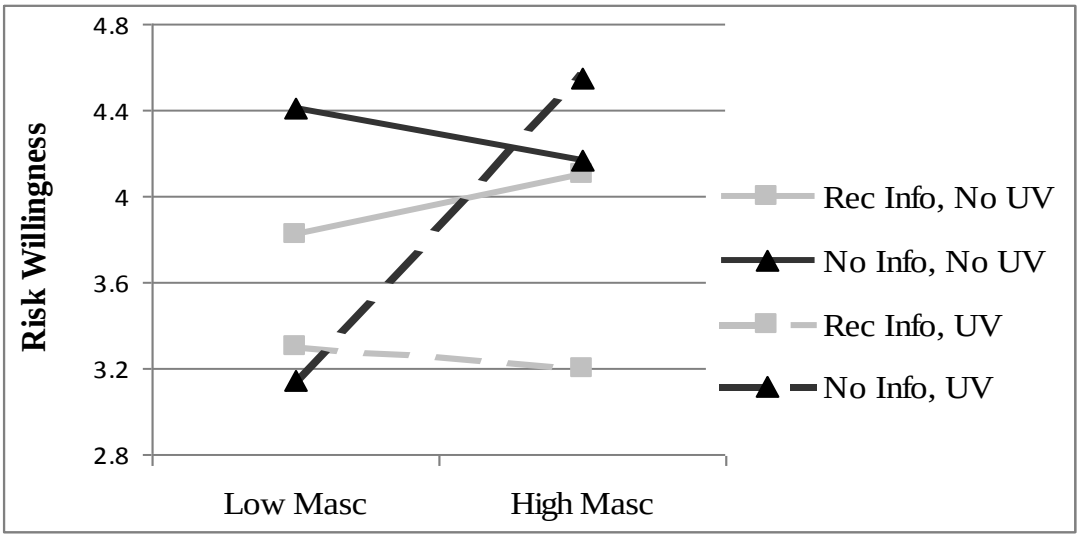


Figure 6. Risk willingness by masculinity, UV photography, and Contrast 2 (recommendation information condition versus no information condition).

Masculinity as a moderator in additional two-way interactions. Within the larger regression models testing the three-way interaction hypotheses, there were four additional two-way interactions between masculinity and one of the experimental conditions.

Risk intentions. There was a significant two-way interaction between masculinity and Contrast 1 (choice-information versus non-choice information) on risk intentions (β =

-.16, t = -2.05, p = .04). To examine the pattern of this interaction, the regression model was run again at low versus high masculinity. Although there was a trend for high masculine men in the choice information condition to report higher risk intentions than those in the non-choice information conditions, this effect was not significant (β = -.34, t = -2.42, p = .02). The Contrast 1 effect among less masculine men was also not significant (p = .20).

Attitudes that sun protection is manly. For these attitudes, there was a significant two-way interaction between masculinity and the UV photography condition (β = -.15, t = -2.06, p = .04). Among less masculine men, there was a non-significant trend for viewing one's UV photograph to be associated with higher attitudes that sun protection is not manly (β = .21, t = 2.00, p = .05). However, the UV photography effect was not significant among high masculine men (p = .35).

Protective intentions. There was a significant interaction between masculinity and Contrast 2 (recommendation information versus no information) on protective intentions (β = .16, t = 2.23, p = .03). However, for each of these two cognitions, simple effects of the contrasts at each level of masculinity were non-significant (ps > .13).

Masculinity as a correlate of sun protection and choice. The present tests of masculinity as a moderator revealed that masculinity did not uniformly moderate the effects of the two experimental manipulations on men's cognitions. Further exploratory analyses were therefore conducted to ascertain whether the structure of masculinity in the present study, or the correlations between masculinity and indicators of sun protection and choice, could provide an explanation for the weak support of the moderation hypothesis. First, the structure of masculinity was examined through correlations among

each of the subscales, as well as between each subscale and the total CMNI score. With the exception of self-reliance, each of the subscales was significantly and positively correlated with the total masculinity score (*p*s ≤ .001; see Table 18). In addition, masculinity scales were examined as correlates of sun protection behaviors and cognitions, in an effort to further understand the role of masculinity in men's sun protection and potentially explain the patterns of effects seen in the present study.

Masculinity and sun protection. The rationale for the present study was partially based on a negative association between masculinity and sun protection, which contributes to low levels of sun protection among men. Correlations between masculinity and indicators of sun protection in the present study are presented in Table 19. Masculinity was negatively related to avoiding sun exposure ($p < .001$).

Masculinity was *positively* correlated with risk willingness and intentions, as well as with attitudes that sun protection is not manly (*p*s < .01). However, masculinity was *negatively* correlated with protective intentions, conditional perceived vulnerability, and favorable attitudes toward sun protection (*p*s ≤ .01).

Masculinity and choice. Hypotheses related to the impact of the choice-promoting information for men were largely based on choice and independence being consistent with themes of masculinity. Thus, correlations were run to examine the association between masculinity and the importance of choice at T1 and T2. At T1, the total masculinity scale was *negatively* correlated with the importance of choice in sun protection ($r = -.25$, $p = .01$). Partial correlations, controlling for the UV photograph condition and the information condition, showed that masculinity was similarly negatively correlated with the importance of choice at T2 ($r = -.23$, $p = .01$).

In addition, correlations were run to examine the associations between masculinity and perceptions of autonomy support, separately by condition. Masculinity was not significantly associated with either manipulation check in any of the three information conditions ($ps \geq .05$).

Informational preferences. ANCOVAs using the same covariates that were included in analyses of the experimental effects on sun protection cognitions were used to test whether interest in receiving additional information varied by condition. These analyses were conducted in order to analyze condition effects on a proxy behavioral measure of information seeking. Results showed that there were no differences in interest to receive additional information about sun protection or skin exams by either of the conditions or the interaction between them ($ps \geq .17$).

Table 18

Correlations, Means, Standard Deviations, and Ranges for Masculinity Total Score and Subscales

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
1. Total CMNI	--	.70**	.54**	.47**	.59**	.65**	.56**	.52**	.16	.38**	.62**	.46**
2. Winning		--	.23	.35**	.31**	.28*	.58**	.24*	-.03	.29*	.44**	.40**
3. Emotional Control			--	-.06	.34**	.16	.03	.29**	.29*	.14	.20	.04
4. Risk-Taking				--	.43**	.27*	.25*	.09	-.14	.10	.18	.34**
5. Violence					--	.32**	.14	.14	-.01	.11	.30**	.21
6. Power over Women						--	.44**	.34**	.01	.20	.49**	.22
7. Dominance							--	.20	.05	.22	.33**	.48**
8. Playboy								--	.08	-.00	.15	.16
9. Self-Reliance									--	.17	-.14	-.05
10. Primacy of Work										--	.07	.13
11. Disdain for Homosexuality											--	.16
12. Pursuit of Status												--
M	132.19	16.23	16.35	16.88	12.48	7.15	6.15	14.22	7.12	11.05	12.74	11.93
SD	27.27	5.24	6.83	5.05	4.34	4.41	2.21	6.16	3.09	4.04	6.81	2.91
Range	46-198	1-30	2-33	3-30	0-23	0-20	1-12	0-29	0-15	1-19	0-30	3-18

* $p \leq .01$, ** $p \leq .001$

Table 19

Correlations between Masculinity Scales and T1 Sun Protection Behaviors and Cognitions

	Total CMNI	Winning	Emotional Control	Risk Taking	Violence	Power over Women	Dominance	Playboy	Self Reliance	Primacy Work	Disdain Homosex.	Pursuit of Status
Avoid UV Exp	-.45**	-.36**	-.06	-.44**	-.25*	-.36**	-.16	-.28*	.13	-.15	-.33**	-.15
Sunscreen Use	.01	.02	-.07	-.09	.05	.04	-.08	.08	-.02	.06	.02	.02
Clothing Use	-.18	-.03	-.10	-.25*	-.07	.10	-.05	-.16	-.14	.07	-.12	-.13
Protect Willingness	-.12	-.15	.05	-.18	.01	-.09	-.14	.06	.04	-.11	-.16	-.05
Risk Willingness	.28*	.16	.09	.28*	.12	.23*	.12	.16	.08	-.06	.22	.15
Protect Intention	-.25*	-.06	-.13	-.34**	-.08	-.19	-.12	-.17	-.09	.13	-.19	-.12
Risk Intention	.26*	.14	.11	.19	.06	.25*	.18	.17	-.07	-.08	.34**	-.01
Protect Prototype	-.06	-.08	-.07	-.11	-.03	-.02	-.01	-.03	.03	.10	-.07	.04
Risk Prototype	.15	.14	.07	.24*	.13	.07	.02	-.04	-.03	-.03	.16	.07
Conditional PV	-.31**	-.13	-.11	-.07	-.12	-.33**	-.25*	-.19	-.04	-.19	-.24*	-.10
Att - Not Manly	.29*	.24*	.12	.19	.20	.23*	.12	.03	.04	.12	.21	.17
Att - Favorable	-.23	-.18	-.03	-.38**	-.10	-.14	-.19	-.07	-.09	.09	-.13	-.14
Exam Intention	-.04	-.07	-.22	.02	-.00	.15	-.05	.03	-.06	.01	.10	-.20

Note. "Avoid Exp" = Behavior of avoiding sun exposure; "Prior Photo" = Prior UV photograph (0 = *no*; 1 = *yes*); "PV" = Perceived vulnerability; "Att" = Attitude

* $p \leq .01$, ** $p \leq .001$

Chapter 5: Discussion

The present study examined whether the impact of UV photography on male young adults' sun protection cognitions could be enhanced by information that promotes personal choice. The present study was the first to examine this potential enhancement of a UV photography intervention, drawing from recommended intervention approaches in social psychology and research on men's health. It was hypothesized that viewing one's UV photograph and receiving choice-promoting information would increase college men's sun protection cognitions, and that men who received both choice information and their UV photograph would report the highest sun protection cognitions. In addition, it was hypothesized that the impact of both UV photography and choice promotion would be strongest among men who report high levels of masculinity, such that high masculine men who received both intervention components would report the most protective cognitions. Several of the results related to UV photography main effects were consistent with prior findings that this basic intervention can positively affect sun protection cognitions. However, the impact of the information conditions on sun protection cognitions, as well as the moderating role of masculinity, were largely inconsistent with the hypotheses.

Findings in Support of Hypotheses

UV photography and sun protection cognitions. A summary of findings related to each of the study hypotheses is presented in Table 20. Consistent with prior research conducted with both college students and men, there were several UV photography main effects on cognitions (e.g., Gibbons et al., 2005; Stock et al., 2009; Walsh & Stock,

2012). Overall, men who viewed their UV photograph reported less risky willingness and intentions, and more favorable protective prototypes. Thus, there was some support for the hypothesis that a UV photography intervention would have a positive impact on men's sun-related cognitions. Despite these findings, the hypothesized beneficial UV photography effects were not supported on several cognitions, including: protective willingness and intentions, risk prototypes, conditional perceived vulnerability and sun protection attitudes, suggesting that beneficial UV photography effects may not be universal across young men's sun protection cognitions.

Manipulation of perceptions of choice. The results partially support the manipulation of choice using methods similar to those in reactance studies, which have used written messages to manipulate the extent to which individuals feel decisional freedom (e.g., Miller et al., 2007; Quick & Considine, 2008). The strongest support for the current manipulation was seen in the main effect of the information manipulation on perceived autonomy support, such that participants in the choice-promoting information condition reported greater autonomy support than participants in either of the other two conditions. In addition, for some participants (those who viewed their UV photograph), being in the choice or recommendation information conditions was associated with greater reports of the importance of choice over sun protection, compared to the no-information condition. Although participants in the choice/UV condition reported the highest perceptions of the importance of choice, the finding that the recommendation condition also produced greater reports of the importance of choice, as well as non-significant condition effects on general perceptions of choice, suggest that the current study's information manipulation had limited impact on perceptions of choice. Thus,

while one goal of the present study (to change men's perceived choice over sun protection) was partially met in that it affected perceived autonomy support, inconsistent results across manipulation checks suggest that the manipulation should be strengthened in future studies.

Perceptions of choice assessed via the present manipulation checks also were associated with sun protection cognitions. In particular, perceiving greater autonomy support was correlated with higher protective willingness, intentions, and prototypes, and favorable sun protection attitudes. General perceptions of choice were also correlated with more favorable attitudes toward sun protection. The importance of choice was similarly correlated with more protective cognitions but was also negatively correlated with risk willingness, intentions, and prototypes. These associations provide support for the role of personal choice in promoting cognitions related to healthy behavior and are consistent with findings from reactance and self-determination theory literature, which suggest that the freedom to make choices is an important contributor to engagement in health behaviors.

Findings Inconsistent with Hypotheses

Choice information and sun protection cognitions. The effects of the experimentally manipulated information conditions on sun protection cognitions were generally inconsistent with the hypotheses. Men in the *recommendation* information condition reported the lowest risk willingness (compared to both of the other information conditions), and all other main effects of the information condition were non-significant. Overall, the present data did not support the hypothesis that receiving choice promoting information would result in uniformly positive cognitions.

UV photography by information condition interactions. The only cognition on which there was a significant two-way interaction between UV photography and information was the risk prototype; however, simple effects analyses showed that none of the pairwise comparisons were statistically significant. However, there were a few cognitions for which the impact of the UV photography manipulation varied across information condition (even though the higher order interaction was not significant). For protective prototypes, risk willingness, and risk intentions, the positive UV photography effect was significant only in the presence of choice-promoting information. These findings are aligned with the hypothesis that receiving choice promoting information would enhance UV photography effects. The patterns of means are particularly consistent with this "enhancement" hypothesis for risk intentions and protective prototypes, such that men in the UV photography/choice information condition reported the lowest risk intentions and most favorable prototypes. However, for risk willingness, men in the UV photography/*recommendation* information condition who reported the lowest risk willingness.

The findings for risk intentions and protective prototypes are aligned with the hypotheses that informed the present study and suggest that the current manipulation had some positive impact on the utility of the UV photography intervention among male young adults. However, the lack of consistent effects of the information manipulation across cognitions, combined with inconsistent effects on manipulation checks, prevents a confident conclusion from being drawn regarding choice promoting information as an effective supplement to UV photography.

Table 20

Summary of Hypotheses and Corresponding Findings

Methodological Hypothesis: Manipulation checks will be successful

Level of Support	Notes
Moderate support	Hypothesis supported for: • Perceived skin damage • Knowledge • Autonomy support Hypothesis partially supported for: • Importance of choice

Hypothesis 1: Main effect of UV Photography Manipulation
(Participants who view their UV photo will report higher protective and lower risk cognitions)

Level of Support	Notes
Partial support	Hypothesis supported for: • Risk willingness • Risk intentions • Protective prototypes

Hypothesis 2: Main effect of Information Manipulation
(Participants who view choice information will report higher protective and lower risk cognitions)

Level of Support	Notes
Not supported	Hypothesis not supported for any cognitions

Hypothesis 3: UV Photography X Information Condition Interaction
(Participants who view both their UV photograph and choice information will report the highest protective and lowest risk cognitions)

Level of Support	Notes
Low support	Hypothesis supported for: • Risk intentions • Protective prototypes

Hypothesis 4: Masculinity X UV Photography X Information Condition Interactions
(The impact of UV photography and choice information will be strongest among high masculine men)

Level of Support	Notes
Low support	Hypothesis partially supported for: • Conditional perceived vulnerability

Masculinity as a Moderator

Masculinity was not a consistent moderator of the intervention effects in this study. However, a significant interaction between masculinity, the UV photography

condition, and receiving choice versus non-choice information on conditional perceived vulnerability mirrored the findings from another recent study on UV photography and masculinity among male college students. Specifically, in the absence of any sun protection intervention, masculinity was associated with lower conditional perceived vulnerability. However, it appears that among high masculine men, receiving choice-promoting information raised their conditional perceived vulnerability to a level similar to that of less masculine men (Walsh & Stock, 2012). The pattern of the interaction, as well as a trending effect of a positive UV photography effect on conditional perceived vulnerability among the high masculine men, suggests that these two intervention approaches may have been most influential on conditional perceived vulnerability for men who conform to more masculine norms. It is possible that the choice-promoting information encouraged high masculine men to think more about their skin damage risk that they learned from viewing their UV photograph. In addition, men who received an intervention may have increased the extent to which they acknowledge the risk inherent in unprotected sun exposure.

However, the other significant three-way interaction involving both masculinity and the contrast comparing the choice and non-choice conditions (on protective prototypes) displayed a different pattern. This interaction showed that it was actually the *less* masculine men in the choice-information/UV photography condition who reported the most protective prototypes. This pattern suggests that less masculine men in this condition may think that if one is at high risk of skin damage (made salient by the UV photograph), it is favorable to engage in sun protection. It is possible that the attention given to the choice promoting language (as compared to the UV photograph) could have

differed among high masculine versus less masculine men. In particular, since both the choice information and the UV photograph were in front of participants at the same time, it could have been the case that more masculine men gave comparatively more attention to their UV photographs, thereby reducing the relative impact of the choice promoting language among this subgroup of participants. The lack of consistent findings related to masculinity precludes strong conclusions that masculinity is a consistent moderator of the impact of the UV photography and choice promoting information on men's sun protection cognitions.

Implications for Sun Protection Interventions

UV photography. Additional research is needed to identify whether there are long-term effects of UV photography on college men's sun protection and risk behaviors, as well as the mediational pathways that explain intervention effects on these behaviors. The present study suggests that a UV photography intervention among male young adults has positive effects on some cognitions that have contributed to mediating intervention effects on behavior in other samples (Gibbons et al., 2005; Mahler et al., 2010; Stock et al., 2009). These cognitions (risk willingness, risk intentions, and protective prototypes) are plausible mediators to consider in future UV photography studies examining young men's sun-related behavior.

The present results also suggest the importance of examining risk versus protective cognitions in the context of sun protection interventions. It is possible that cognitions related to tanning and spending time in the sun are most amenable to change. Research has shown that engagement in sun protection behaviors often involves a trade-off. For example, sunscreen and sun exposure are often negatively correlated, such that if

an individual applies sunscreen, he or she may prolong the time spent out in the sun or acquire greater sunburn (Autier, Boniol, & Doré, 2007; Davis, Cokkinides, Weinstock, O'Connell, & Wingo, 2002; Jungman & Maibach, 2010; Thieden, Philipsen, Sandby-Møller, & Wulf, 2005). In the present study, UV photography effects were strongest on *risky* willingness and intentions (i.e., willingness and intentions to acquire unprotected sun exposure). It may be the case that the UV photography effects on risk cognitions existed at the expense of effects on protective cognitions. Given that in the present study, sun protection and risk behaviors loaded on separate factors (representing the idea of a "trade off" seen in prior literature), and UV photography effects were not seen on protective willingness or intentions, this is an area deserving of future study.

While it is the case that sun protection willingness items have been assessed in prior UV photography research, these items are generally combined with risky items into a total index (Gibbons et al., 2005; Mahler et al., 2010; Walsh & Stock, 2012). The present study suggests that, among male young adults, UV photography effects on willingness and intentions may be driven by the items referencing risky behaviors. It is possible that, for college-aged men, sun exposure is the easiest behavior to change. Compared to populations who work outside (Stock et al., 2009) and are thus limited in their ability to reduce UV exposure, college-aged men likely are more able to reduce their levels of exposure. They may therefore show greater tendencies toward reducing sun exposure rather than engaging in other behaviors such as applying a cosmetic-like sunscreen product (Abroms et al., 2003). Research should continue to examine the default choices that men make regarding their sun protection and should aim to identify which in the set of recommended sun protection behaviors individual populations tend to

comply with the most (e.g., regular shade seeking or reapplication of a broad-spectrum sunscreen). Perhaps the behavior that is most likely to be properly enacted in a specific population is the one that should be most strongly promoted.

Choice promotion. The lack of a consistent positive effect of choice promotion contradicts research in SDT and reactance. However, there are several potential reasons for the lack of choice information effects. First, it is possible that choice simply does not have as strong of an effect on sun protection behaviors as it does on behaviors for which SDT interventions have received consistent support, including smoking and physical activity (e.g., Patrick & Williams, 2012). Several sun protection behaviors (e.g., applying sunscreen) are relatively simple to enact, and may therefore be less likely than behaviors like smoking and diet to be affected by interventions that increase autonomy.

Although it is possible that interventions based on choice are simply not as important for sun protection as they are in other health behavior domains, the correlations between self-reported perceptions of choice and sun protection cognitions do suggest that the role of choice in sun protection deserves further consideration. Additional possible explanations for the present findings are linked to methodology. Specifically, the present study involved a one-time manipulation of perceived choice. Although consistent with written messages in length and style used in reactance studies (e.g., Miller et al., 2007; Quick & Considine, 2008), successful autonomy-supportive interventions informed by SDT have been administered repeatedly over time, and via one-on-one interactions (e.g., Moustaka, Vlachopoulos, Kabitsis, & Theodorakis, 2012; Patrick & Williams, 2012; Williams et al., 2006). This latter approach is more engaging than the brief interaction

participants had with the experimenter in the current study and may explain the lack of findings related to experimentally manipulated choice.

Implications for Masculinity and Sun Protection

Consistent with a prior study, masculinity was positively associated with sun exposure and risky cognitions, and was negatively associated with protective cognitions (Walsh & Stock, 2012). However, the lack of consistent findings related to masculinity in the three-way interactions suggests that masculinity may not consistently function as a moderator of sun protection intervention effects. Given that the present study assessed masculinity using a fuller scale than was used in our prior study (Walsh & Stock, 2012), it is possible that examinations related to masculinity are sensitive to the way masculinity is measured. In future work, it will be important to further examine in which contexts and for which behaviors an overall masculinity construct is strongly influential on health behaviors.

The correlations among masculinity subscales, sun protection cognitions, and perceptions of choice in the present study offer potential explanations for why masculinity did not consistently moderate effects of the information condition. In particular, there were no significant correlations between self-reliance (a masculinity subscale conceptually linked to personal choice) and sun protection cognitions or behaviors. These findings suggest that a sun protection intervention targeted toward men high in masculinity may benefit from appealing to other dimensions of masculinity. Self-reliance may not account for the negative associations between masculinity and sun protection and exposure behaviors found in the present study and in prior studies (Mahalik et al., 2006, 2007b; Walsh & Stock, 2012). In addition, correlations between

masculinity and perceptions of choice over sun protection were not consistent with the rationale that appealing to one's sense of choice would be more influential among men high in masculinity. Negative associations between masculinity and the importance of choice overall, as well as non-significant associations between masculinity and perceptions of autonomy support across conditions, suggest that men who conform to norms of masculinity may not explicitly acknowledge that their independence is important in the area of sun protection or that the information supports or detracts from their personal choice.

Limitations and Future Research

A few notable limitations to the present study should be expanded upon in future studies. Doing so will allow for more confident conclusions to be drawn about the roles of UV photography, choice, and masculinity in the promotion of young men's sun protection cognitions.

Sample. A primary limitation of the present study is the small sample size. Recruitment challenges resulted in a significantly smaller sample size than planned, thus presenting an obstacle for statistical analyses. The tests of the information condition and interaction hypotheses in this study were underpowered, compared to an ideal power of .80 (Cohen, 1988). Thus, the present study was unable to detect small effects. Although appearance-based interventions combining UV photography with photoaging information have produced greater than medium sized effects on sun protection intentions and perceived risk (Williams, Grogan, Clark-Carter, & Buckley, 2013), the present study was likely underpowered to adequately test the effects of the information manipulation. In addition, the small sample size particularly limited conclusions that can be drawn from

the three-way interactions, for which there were essentially twelve groups (the six conditions at each of low versus high levels of masculinity). In addition, the present sample consisted primarily of college-educated men. Given that sun protection is positively associated with educational level (Branstrom et al., 2004; Saraiya et al., 2004), it is likely that the men in the present sample had a higher awareness about their options in sun protection than the general population. They therefore could have been less influenced by receiving information about their choices than a sample that is less educated about sun protection.

Stimuli. As previously noted, the stimuli in this study were administered in a single lab session. While the UV photography protocol matched that used in prior studies, the information protocol was a new addition to the literature. The information in the present study was as not interactive as many choice-promoting interventions that occur in the context of repeated one-on-one interactions with a professional (e.g., Moustaka et al., 2012; Patrick & Williams, 2012; Williams et al., 2006). This discrepancy in methodologies limits the conclusions that can be drawn about the extent to which the present results contradict prior literature.

In addition, although the choice promoting information condition had positive effects on perceptions of choice, the language of the choice-promoting information could have produced other unintended effects, thereby compromising the ability of the choice promotion to positively affect cognitions. In particular, participants in the choice information condition were told that they could choose whether *or not* to engage in sun protection. Although the concept of autonomy support is based on acknowledging the range of one's decisions, including the decision to *not* change behavior (e.g., Williams,

Niemiec, Patrick, Ryan, & Deci, 2009; Williams et al., 1999, 2006), this approach may have backfired in the current context by inadvertently communicating that sun protection is not a crucial health issue. This likely reduced the positive effects of this condition compared to the recommendation information condition. Perhaps even when the option to not engage in health protective behavior is communicated, the options to select healthy behaviors become more appealing if they are repeatedly conveyed to the individual via one-on-one communication.

Furthermore, it is possible that the additional information about all of the decisions that can be made *within* each of the recommended behaviors overwhelmed participants. Additional studies would benefit from a further analysis of the language and informational content that best enhances UV photography interventions among men, as well in other samples. Although literature has identified information on the photoaging consequences of UV exposure as effective among predominantly female populations (Mahler et al., 2003, 2007) and information on the health consequences of UV exposure as effective for important for men (Stock et al., 2009), the way the information is communicated and the language that is used deserves further attention.

Measurement. A third important limitation of the present study involves issues of measurement. One potential measurement issue lies in the assessment of attitudes. The lack of UV photography effects on sun protection attitudes may be due to a limited assessment of the characteristics of sun protection that are most important to young men, including whether it is effective in preventing sunburn or the characteristics of sunscreen as a cosmetic product (Abroms et al., 2003). Future research would also benefit from an additional assessment of the forms of masculinity that are related to sun protection.

Masculinity is a complicated construct; several recent articles have discussed the complexities and the need to reconsider masculinity as multidimensional and contextual (Addis et al., 2010; Evans et al., 2011). The present study relied on a total masculinity score, for consistency with prior research (e.g., Mahalik et al., 2006, 2007a). However, correlations between the individual subscales and cognitions suggest that studies on masculinity and sun protection may continue to find different associations depending on how masculinity is measured. The associations between subscales of masculinity and sun protection cognitions and behaviors vary substantially. Future studies of the role of masculinity in sun protection should more fully examine the influence of each of these dimensions.

Finally, it is important to acknowledge that variables other than the cognitions in the present study may be the most important to consider as outcomes of autonomy supportive language. Although testing the motivational process of self-determination theory was beyond the scope of the present study, constructs identified by that theory as influencing behavior (for example, autonomous motivation) would be important to assess as outcomes following the present manipulation (Ryan & Deci, 2000; Williams et al., 2002; 2006). It is possible that the present manipulation, if presented repeatedly, could have beneficial behavioral effects that are mediated through mechanisms other than PW model cognitions. However, the present study does not assess behavior and only assesses a limited array of cognitions as primary outcomes, leaving that question unanswered.

Conclusion

The present study examined the impact of UV photography, choice-promoting information, and masculinity, as well as their interactions, on the sun protection

cognitions of male young adults. Results provided support for the efficacy of UV photography as a means of promoting some healthy sun-related cognitions. Although UV photography effects were sometimes strongest in the presence of choice-promoting information, the lack of statistically significant interactions and manipulation checks limits the conclusions that can be drawn about the role of choice promotion in men's sun protection cognitions. In addition, the present results do not support masculinity as a moderator of the impact of UV photography and choice promoting sun protection information on men's sun protection and risk cognitions. Additional studies in this area would benefit from more expansive data collection, examination of follow-up behavioral effects and additional cognitive outcomes, and more detailed analysis of the role of masculinity on the impact of sun protection interventions.

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Footnotes

[1] Prior sunburn was proposed as an additional covariate. However, sunburn was highly correlated with skin type and the two measures were judged to be redundant. Thus, prior sunburns were dropped from the present analyses.

[2] Two participants were missing data on age.

[3] ANCOVAs on sun protection cognitions were also run excluding the six participants who had a prior UV photograph. For risk prototypes, the two-way interaction was no longer significant (p = .13). The simple effect of UV photography in the choice information condition on risk willingness was reduced to non-significance, although the main effects remained significant.

[4] ANCOVAs were also run on the manipulation checks excluding the six participants who had a prior UV photograph. The two-way interaction between UV photography and information on perceived choice became significant; however, the effects of all other main effects and interactions did not change.

[5] To test whether the psychological effects of the information manipulation expanded beyond perceived choice (decisional control), ANCOVAs were also run on two related constructs: (1) general perceptions of control (a two-item index; e.g., "How much control do you have over protecting your skin?"), and (2) efficacy for engaging sun protection (a three-item index; e.g., "If I wanted to, I could easily protect my skin"). Results confirmed that there was no main effect of the information condition (or the interactions) on either variable (ps > .17). In addition, perceived control did not vary by UV photograph condition (p = .36). However, participants in the UV photograph

condition reported a lower efficacy for sun protection than those who did not see their photograph, F (1, 112) = 4.84, p = .03, Ms = 5.27 vs. 5.70.

[6] Further correlational analyses were run to examine the associations between the manipulation checks and T2 cognitions within experimental conditions. The most frequent correlations between perceived autonomy support and T2 cognitions occurred within the choice information condition. Specifically, in that condition, autonomy support correlated with higher protective intentions and prototypes. In addition, perceptions of the importance of choice were most often related to T2 cognitions in the no-information condition, in which these perceptions were associated with higher levels of protective cognitions and lower levels of risk cognitions with the exception of risk intentions, risk prototypes, and attitudes. Further correlational analyses revealed that the significant correlations between perceived autonomy and cognitions in the choice-information condition, and between perceptions of choice and cognitions in the no-information condition, were most consistent among those who viewed, versus those who did not view, their UV photograph.

[7] Additional regressions were run examining masculinity as a moderator of the choice information condition versus the recommendation information condition and the no-information condition, individually. There was a significant 3-way interaction on conditional perceived vulnerability when the choice information condition was compared to only the no-information condition. The 3-way was significant on protective prototype when the choice information condition was compared to the recommendation information condition. The resulting patterns in these two three-way interactions were similar to those seen when the recommendation and no-information conditions are combined, showing

that high masculine men in the no-information/no UV photography condition reported the lowest conditional perceived vulnerability, and that high masculine men in the recommendation-information/no UV photography condition reported the most favorable protective prototypes.

Appendix A

Information Condition Manipulation

Section	Recommendation Information	Choice-Promoting Information
Introduction: Introduction to Behaviors	<u>Behaviors to follow for sun protection</u> Medical professionals recommend protecting your skin from UV exposure. It is recommended that you follow each of the behaviors listed on the following screens to help reduce skin damage. This information gives instructions on the specific ways that you should protect your skin.	<u>Behavioral options in sun protection</u> Medical professionals recommend protecting your skin from UV exposure. However, it is a matter of personal choice whether you engage in any of the behaviors listed on the following screens to help reduce skin damage. You have several behavioral options in sun protection. This information gives an overview of the different ways you can protect your skin.
Behavior 1: Limit UV Exposure	<u>You should limit UV exposure</u> You should limit your UV exposure by: -Staying indoors AND -Seeking the shade when outside Limiting UV exposure is especially important when the sun's UV rays are strongest - between 10:00 AM and 4:00 PM.	<u>Choosing to limit UV exposure</u> If you decide to limit your UV exposure, you can: -Stay indoors (if feasible) AND/OR -Seek the shade when outside Limiting UV exposure is especially important when the sun's UV rays are strongest - between 10:00 AM and 4:00 PM. *The ways you can limit UV exposure may be limited by the requirements of an outdoor job or activity. You can decide to try limiting your UV exposure by seeking out shady spaces that are practical for these activities*
	Click on the box below when you are done reading about how you should limit your UV exposure. □ I should limit my UV exposure.	Click on the box below when you are done reading about ways you can limit your UV exposure if you decide to do so. □ I can decide how to limit my UV exposure.
Behavior 2: Do Not Tan or Sunbathe	<u>You should not tan or sunbathe</u> It is crucial that you: · Avoid getting tan outside (sunbathing) AND · Avoid tanning beds	<u>Choosing to not tan or sunbathe</u> If you choose to do so, you can: · Avoid getting tan outside (sunbathing) AND/OR · Avoid tanning beds

	If you tan or sunbathe, you should stop now. If you do not tan or sunbathe, you should not start.	*If you tan or sunbathe, you may choose to stop these behaviors altogether, or reduce your levels of either behavior.* *If you do not tan or sunbathe, you could protect your skin by choosing not to start tanning. You can also choose to use sunless tanning lotion or get a spray tan.*
	Click on the box below when you are done reading about how you should not tan or sunbathe. □ I should not tan or sunbathe.	Click on the box below when you are done reading about ways you can avoid tanning or sunbathing if you decide to do so. □ I can decide how to limit tanning or sunbathing.
Behavior 3: Wear Protective Clothing	<u>You should wear protective clothing</u> It is recommended that you wear protective clothing and accessories. These items include: · A wide-brimmed hat that shades the face, ears, and neck · Long-sleeved shirts and pants · Clothing made of dark, dense fabrics	<u>Choosing to wear protective clothing</u> You can pick from several types of protective clothing and accessories. Your options include: · A wide-brimmed hat that shades the face, ears, and neck · Long-sleeved shirts and pants · Clothing made of dark, dense fabrics *You can choose clothes that fit with your lifestyle and the ways that you get the most sun exposure. For example, you can pick sun protective swimwear, athletic wear, or everyday clothing. You know which options work best for you.*
	Click on the box below when you are done reading about how you should use protective clothing. □ I should use protective clothing.	Click on the box below when you are done reading about ways you can use protective clothing if you decide to do so. □ I can decide how to use protective clothing.
Behavior 4: Use Sunscreen on Face and Body	<u>You should use sunscreen on your face and body</u> Everyday, you should wear sunscreens that: · Have a sun protective factor (SPF) of at least 15 · Protect against both UVA and UVB rays To maximize effectiveness, it is critical that you:	<u>Choosing to use sunscreen on your face and/or body</u> You can pick sunscreens that: · Have a sun protective factor (SPF) of at least 15 · Protect against both UVA and UVB rays To maximize effectiveness, you may decide to:

	· Apply enough sunscreen (approximately one shot glass full) 30 minutes before going outside · Reapply after two hours, but sooner if swimming or sweating	· Apply enough sunscreen (approximately one shot glass full) 30 minutes before going outside · Reapply after two hours, but sooner if swimming or sweating *You also have several options for sunscreen type, including lotions, sprays, sticks, wipes, and lip balms. Sunscreens also come in varying degrees of water resistance. Any of these, if used properly, can protect your skin. You can pick which one(s) work(s) best for you.*
	Click on the box below when you are done reading about how you should use sunscreen on your face and body. □ I should use sunscreen on my face and body.	Click on the box below when you are done reading about ways you can use sunscreen on your face and body if you decide to do so. □ I can decide how to use sunscreen on my face and body.
Behavior 5: Check Skin Regularly	<u>You should check your skin regularly</u> It is also crucial to check your skin for signs of skin cancer by: -Completing self-exams once a month AND -Getting a professional skin exam each year Look for spots that: · Grow larger or do not heal over time · Appear after age 21 · Are larger than a pencil eraser · Change in color, border, or texture	<u>Choosing to check your skin regularly</u> You can also decide to check your skin for signs of skin cancer by: -Completing self-exams once a month AND/OR -Getting a professional skin exam each year Look for spots that: · Grow larger or do not heal over time · Appear after age 21 · Are larger than a pencil eraser · Change in color, border, or texture
	Click on the box when you are done reading about how you should check your skin regularly. □ I should check my skin regularly and get yearly skin exams.	Click on the box below when you are done reading about ways you can have your skin checked out if you decide to do so. □ I can decide how to have my skin checked for signs of skin cancer.
Closing		<u>Deciding to protect your skin</u> You can choose whether or not to engage in these behaviors to reduce your risk of skin damage. It is up to you to pick the sun protection options that make the most sense for your lifestyle.

Appendix B

Measures

Control Variables – Past Sun Protection and Skin Examination Behavior (T1)

1. Approximately how many hours per week do you spend in the sun during the spring and summer doing any kind of outdoor activity?
   1 (*0-5 hours*)
   2 (*6-10 hours*)
   3 (*11-15 hours*)
   4 (*16-20 hours*)
   5 (*21-25 hours*)
   6 (*26-30 hours*)
   7 (*More than 30 hours*)

2. How often have you tried to get tan from UV rays (e.g., by sunbathing outside or using a tanning bed) during the past 12 months?
   1 (*Never*)
   2 (*Less than once a month*)
   3 (*Once or twice a month*)
   4 (*Three to four times a month*)
   5 (*At least once a week*)
   6 (*More than once a week*)
   7 (*Every day*)

3. When spending time in the sun during the past 12 months, how often have you used sunscreen on your face?
   1 (*Never*)
   2 (*Occasionally*)
   3 (*Some of the time*)
   4 (*About half of the time*)
   5 (*Most of the time*)
   6 (*Almost always*)
   7 (*Always*)

4. When spending time in the sun during the past 12 months, how often have you used sunscreen on your body?
   1 (*Never*)
   2 (*Occasionally*)
   3 (*Some of the time*)
   4 (*About half of the time*)
   5 (*Most of the time*)
   6 (*Almost always*)
   7 (*Always*)

5. When spending time in the sun during the past 12 months, how often have you worn sun protective clothing (e.g., a wide-brimmed hat, a long-sleeved shirt, and/or long pants)?
   1 (*Never*)
   2 (*Occasionally*)
   3 (*Some of the time*)
   4 (*About half of the time*)
   5 (*Most of the time*)
   6 (*Almost always*)
   7 (*Always*)

6. When spending time in the sun during the past 12 months, how often have you tried to seek the shade?
   1 (*Never*)
   2 (*Occasionally*)
   3 (*Some of the time*)
   4 (*About half of the time*)
   5 (*Most of the time*)
   6 (*Almost always*)
   7 (*Always*)

7. Have you ever had a full-body skin exam from a doctor?
   1 (*Yes*)
   2 (*No*)

8. How often have you performed a skin self-examination (checked your skin for signs of skin cancer)?
   1 (*Never*)
   2 (*Less than once a year*)
   3 (*A few times a year*)
   5 (*About once every other month*)
   6 (*About once a month*)
   7 (*More than once a month*)

<u>Skin Cancer History (T1)</u>

1. Have you ever had any of the following skin problems? (Select all that apply.)
   1 (*Had pre-cancerous spots*)
   2 (*Been diagnosed with skin cancer*)
   3 (*Been diagnosed with another skin disease*)
   [If you have been diagnosed with some other skin disease, what was it?]

Demographics (T1)

1. What is your gender?
   1 (*male*)
   2 (*female*)

2. What is your age, in years?

3. What is your racial/ethnic background? (Select all that apply.)
   1 (*European American/White*)
   2 (*African American/Black*)
   3 (*Asian American/Asian*)
   4 (*Native Hawaiian/Pacific Islander*)
   5 (*American Indian/Alaska Native*)
   6 (*Hispanic/Latino[a]*)
   7 (*Other*) [If "Other," please specify: _____]

Control Variables – Skin Type (T2)

1. What is your eye color?
   1 (*Blue*)
   2 (*Green*)
   3 (*Hazel*)
   4 (*Brown*)
   5 (*Dark Brown*)
   6 (*Black*)

2. Suppose you are not wearing sunscreen and it is the first day of the spring that is warm enough to be outdoors in a swimsuit. What would happen to your skin if you were to go out for an hour in the midday sun wearing a swimsuit? (Check only the one that best describes how previously unexposed skin would respond.)
   1 (*Always burn, not tan*)
   2 (*Usually burn, tan minimally*)
   3 (*Sometimes burn, usually tan*)
   4 (*Rarely burn, tan well*)
   5 (*Not burn at all, dark tan*)
   6 (*Not burn at all, I am naturally dark skinned*)

Moderator – Masculinity (T1)

The Conformity to Masculine Norms Inventory (Mahalik et al., 2003) was used.

Manipulation Checks - Perceptions of Choice and Perceived Autonomy Support (T2)

1. How much choice do you feel you have over whether or not to protect your skin?
   1 (*no choice at all*) – 7 (*very much of a choice*)

2. How many choices do you feel you have over how to protect your skin?
   1 (*no choices at all*) – 7 (*very many choices*)

3. I feel that the information I received during this study provided me with choices and options about sun protection (including not changing my current behaviors).
   1 (*strongly disagree*) – 7 (*strongly agree*)

4. The information I received during this study conveyed confidence in my ability to make choices and changes regarding sun protection.
   1 (*strongly disagree*) – 7 (*strongly agree*)

5. The information I received during this study acknowledged how I would like to do things regarding sun protection.
   1 (*strongly disagree*) – 7 (*strongly agree*)

Cognitions - Sun Protection and Risk Willingness (T1, T2)

Suppose it is the first hot, sunny day of the spring semester. Your friends are planning to enjoy the day outside with some outdoor activities (e.g., hiking, playing soccer, bike riding). They have asked you to join them. You want to spend time catching up with these friends. In this situation, how willing would you be to do each of the following?

1. Go with your friends, and try to get tan.
   1 (*not at all willing*) – 7 (*very willing*)

2. Go with your friends, but without any sun protection.
   1 (*not at all willing*) – 7 (*very willing*)

3. Go with your friends, but seek the shade when possible.
   1 (*not at all willing*) – 7 (*very willing*)

4. Go with your friends, but wear sun protective clothing (e.g., a wide-brimmed hat, a long-sleeved shirt, and/or long pants).
   1 (*not at all willing*) – 7 (*very willing*)

5. Go with your friends, but apply sunscreen.
   1 (*not at all willing*) – 7 (*very willing*)

Suppose some of your friends decided to spend most of their day at the beach. It is the first really hot and sunny day of summer, and you really enjoy going to the beach. However, neither you nor your friends have any sunscreen, and there isn't enough time to buy some and still meet your friends at the beach. In this situation, how willing would you be to do each of the following?

1. Go to the beach, and try to get tan.
   1 (*not at all willing*) – 7 (*very willing*)

2. Go to the beach, but without any sun protection.
   1 (*not at all willing*) – 7 (*very willing*)

3. Go to the beach, but seek the shade when possible.
   1 (*not at all willing*) – 7 (*very willing*)

4. Go to the beach, but wear sun-protective clothing (e.g., a wide-brimmed hat, a long-sleeved shirt, and/or long pants).
   1 (*not at all willing*) – 7 (*very willing*)

5. Go to the beach, but apply sunscreen.
   1 (*not at all willing*) – 7 (*very willing*)

Cognitions - Sun Protection and Risk Prototypes (T1, T2)

1. The typical male of my age who protects his skin from the sun is… Smart
   1 (*not at all*) – 7 (*very much*)

2. The typical male of my age who protects his skin from the sun is… Self-Confident
   1 (*not at all*) – 7 (*very much*)

3. The typical male of my age who protects his skin from the sun is… Attractive
   1 (*not at all*) – 7 (*very much*)

4. The typical male of my age who protects his skin from the sun is… Mature
   1 (*not at all*) – 7 (*very much*)

5. The typical male of my age who protects his skin from the sun is… Masculine
   1 (*not at all*) – 7 (*very much*)

6. The typical male of my age who protects his skin from the sun is… Feminine
   1 (*not at all*) – 7 (*very much*)

7. How similar are you to the typical male of your age who protects his skin from the sun?
   1 (*not at all similar*) – 7 (*very similar*)

8. The typical male of my age who does NOT protect his skin from the sun is… Smart
   1 (*not at all*) – 7 (*very much*)

9. The typical male of my age who does NOT protect his skin from the sun is… Self-Confident
   1 (*not at all*) – 7 (*very much*)

10. The typical male of my age who does NOT protect his skin from the sun is… Attractive
    1 (*not at all*) – 7 (*very much*)

11. The typical male of my age who does NOT protect his skin from the sun is… Mature
    1 (*not at all*) – 7 (*very much*)

12. The typical male of my age who does NOT protect his skin from the sun is… Masculine
    1 (*not at all*) – 7 (*very much*)

13. The typical male of my age who does NOT protect his skin from the sun is… Feminine
    1 (*not at all*) – 7 (*very much*)

14. How similar are you to the typical male of your age who does NOT protect his skin from the sun?
    1 (*not at all similar*) – 7 (*very similar*)

Cognitions - Sun Protection Attitudes (T1, T2)

1. Wearing sunscreen when in the sun is:
   1 (*very inconvenient*) – 7 (*very convenient*)

2. Wearing sunscreen when in the sun is:
   1 (*very unpleasant*) – 7 (*very pleasant*)

3. Wearing sun-protective clothing in the sun is:
   1 (*very inconvenient*) – 7 (*very convenient*)

4. Wearing sun-protective clothing in the sun is:
   1 (*very unpleasant*) – 7 (*very pleasant*)

5. Limiting sun exposure is:
   1 (*very inconvenient*) – 7 (*very convenient*)

6. Limiting sun exposure is:
   1 (*very unpleasant*) – 7 (*very pleasant*)

7. Avoiding trying to get tan is:
   1 (*very inconvenient*) – 7 (*very convenient*)

8. Avoiding trying to get tan is:
   1 (*very unpleasant*) – 7 (*very pleasant*)

9. It is not manly to wear sunscreen.
   1 (*strongly disagree*) – 7 (*strongly agree*)

10. It is not manly to wear sun-protective clothing.
    1 (*strongly disagree*) – 7 (*strongly agree*)

11. It is not manly to limit UV exposure.
    1 (*strongly disagree*) – 7 (*strongly agree*)

12. It is not manly to avoid trying to tan.
    1 (*strongly disagree*) – 7 (*strongly agree*)

13. It is more important for women to protect their skin, as compared to men.
    1 (*strongly disagree*) – 7 (*strongly agree*)

<u>Importance of Choice (T1, T2)</u>

1. How important is it to you to have choices about how to protect your skin?
   1 (*not at all important*) – 7 (*very important*)

<u>Cognitions – Conditional Perceived Vulnerability (T1, T2)</u>

1. *If you were to get tanned on a regular basis from being in the sun*, how likely is it that you would get skin cancer at some point in the future?
   1 (*not at all likely*) – 7 (*very likely*)

2. *If you were to get tanned on a regular basis from being in the sun*, how likely is it that you would experience photoaging (e.g., premature aging of the skin) at some point in the future?
   1 (*not at all likely*) – 7 (*very likely*)

<u>Cognitions - Sun Protection and Risk Intentions (T1, T2)</u>

1. I plan to limit UV exposure whenever possible (e.g., by staying inside or seeking the shade) when I am in the sun.
   1 (*strongly disagree*) – 7 (*strongly agree*)

2. I plan to get tan from the sun or tanning booths.
   1 (*strongly disagree*) – 7 (*strongly agree*)

3. I plan to wear sun protective clothing (e.g., a wide-brimmed hat, a long-sleeved shirt, and/or long pants) whenever I am in the sun.
   1 (*strongly disagree*) – 7 (*strongly agree*)

4. I plan to wear sunscreen whenever I am in the sun.
   1 (*strongly disagree*) – 7 (*strongly agree*)

5. I plan to go outside on sunny days without protecting my skin.
   1 (*strongly disagree*) – 7 (*strongly agree*)

Cognitions - Skin Examination Intentions (T1, T2)

1. I plan to check my skin for signs of skin cancer within the next month.
   1 (*strongly disagree*) – 7 (*strongly agree*)

2. I plan to have a medical professional check my skin for signs of skin cancer within the next year.
   1 (*strongly disagree*) – 7 (*strongly agree*)

Manipulation Check – Skin Damage (T2)

1. How much long-term skin damage do you think you have from the sun?
   1 (*none*) – 7 (*a lot*)

Manipulation Check – Knowledge (T2)

1. Between what hours of the day are the sun's rays the strongest (e.g., between ____ and ___)?

2. What is the minimum recommended sun protection factor (SPF) level?
   1 (*SPF 10*)
   2 (*SPF 15*)
   3 (*SPF 25*)
   4 (*SPF 45*)

3. Which of the following is not a recommended form of sun protective clothing?
   1 (*dark fabrics*)
   2 (*a baseball hat*)
   3 (*dense fabrics*)
   4 (*a wide-brimmed hat*)

4. How long before going outside should sunscreen be applied?
   1 (*15 minutes*)
   2 (*45 minutes*)
   3 (*5 minutes*)
   4 (*30 minutes*)

5. When doing a skin self-exam, you should look for spots on your skin that are larger than what object?

Informational Preferences (T2)

1. Would you be interested in receiving more information about sun protection behaviors?
   1 (*definitely not*) – 7 (*definitely*)

2. Would you be interested in receiving more information about skin examinations?
   1 (*definitely not*) – 7 (*definitely*)