

# UV photography, masculinity, and college men's sun protection cognitions

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**Abstract** This study examined the impact of an ultraviolet (UV) photography intervention and masculinity on college men's sun protection cognitions, including: perceived vulnerability to skin damage, attitudes toward sun protection, willingness to engage in sun protection behaviors, and intentions to receive a skin cancer exam. After completing a baseline survey, participants ( $N = 152$ ) viewed a black-and-white photo of their face. Half also viewed a photo showing their UV damage. Participants then completed a second survey assessing sun protection cognitions. Regressions revealed that masculinity predicted lower sun protection cognitions, and men in the UV photograph condition reported higher sun protection cognitions. Masculinity by condition interactions showed that the positive effect of UV photography was stronger among masculine men. Negative associations between masculinity and sun protection cognitions were significant only among men who did not receive the intervention. Findings suggest that UV photography is a promising sun protection intervention among masculine men.

**Keywords** Skin cancer · Intervention · UV photos · Masculinity · Men's health

## Introduction

Each year, more than one million people in the United States are diagnosed with skin cancer (National Cancer Institute [NCI], 2010). Rates of basal and squamous cell skin cancers have been increasing for almost two decades (Rogers et al., 2010). Incidence of melanoma, the type of skin cancer with the lowest survival rate, has also been increasing, particularly among older men (Linos et al., 2009; NCI, 2010). Exposure to ultraviolet (UV) light contributes to skin cancer diagnoses (NCI, 2010; Rigel, 2008), as well as photoaging (changes to one's skin, including pronounced wrinkling and roughness, that are distinct from skin aging without sun exposure; e.g., Tsourelis-Nikita et al., 2006). Several behaviors are recommended to help prevent these negative consequences of UV exposure, including: staying out of the sun, wearing sunscreen, and covering skin with clothing or hats (NCI, 2010). Another recommended action is seeing a medical professional for regular skin cancer exams, so skin cancer can be diagnosed at an earlier stage (Geller et al., 2009; Swetter et al., 2009).

## Sun protection behaviors among male young adults

Sun damage acquired in adolescence and young adulthood is a risk factor for skin cancer in later adulthood, making it important to encourage sun protection behaviors at young ages (Gallagher et al., 1995; Veierød et al., 2003). The majority of sun protection studies among young adults have focused on females, who engage in high levels of intentional sun *risk* behavior such as tanning (Kasparian et al., 2009). However, prevention efforts are also important among young males, given their low rates of sun *protection* behaviors. Only 48.2% of men, compared to

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66.7% of women, report that they usually or always protect themselves from the sun (NCI, 2010). Additionally, although males sometimes report more use of sun-protective clothing than females, they are less likely to stay out of the sun and wear sunscreen regularly (see Kasparian et al., 2009 for a review; also Hoegh et al., 1999; Wheless et al., 2009). Furthermore, males tend to use sunscreen in ways that do not offer the strongest protection, such as after sunburn has already started to appear (Abroms et al., 2003). Gender differences also extend to the early detection of skin cancer, as male young adults are less likely than females to receive professional skin exams (Rodriguez et al., 2007) and to perform skin self-exams (Weinstock et al., 1999).

In addition to these behavioral differences, men have less positive sun protection attitudes and lower perceived vulnerability to skin cancer compared to women (Hillhouse et al., 1996; Mermelstein & Riesenbergs, 1992). These factors combined likely contribute to White men over 50 being the group that is most likely to be diagnosed with skin cancer (Skin Cancer Foundation, 2011). These gender discrepancies in sun risk and protection behavior are most prominent during adolescence and early adulthood, when sun protection behaviors are notably low, and sun risk behaviors (e.g., intentionally spending time in the sun without a shirt) are particularly high, in comparison to older adults (Coups et al., 2008; Hoegh et al., 1999; Kasparian et al., 2009).

#### Promoting sun protection behavior with UV photography interventions

One method of increasing sun protection behavior is through the use of UV photography interventions, which involve showing participants a photograph of UV damage to their skin. These photographs are commonly taken with a Polaroid camera that has a UV filter, which allows for UV damaged areas to become visible or more evident (Fulton, 1997). The damage in the photograph and risks of additional UV exposure are then briefly explained to the participant (e.g., Gibbons et al., 2005; Mahler et al., 2007). This intervention approach may be particularly impactful among young adults, who generally have less readily visible damage.

Several intervention studies using UV photography have demonstrated the positive impact this intervention has on adults' sun protection behaviors. For example, adults who received multicomponent interventions containing UV photography reported more sun protection behaviors than control groups (Pagoto et al., 2003; Weinstock et al., 2002). Interventions focusing more specifically on UV photography and photoaging have also shown positive effects on behavior (Gibbons et al., 2005; Mahler et al., 2003, 2005,

2008, 2010; Stock et al., 2009). In addition, UV photography interventions are associated with higher sun protection cognitions, including: greater perceived risk of photoaging and skin cancer, less favorable attitudes toward sun risk behavior, lower willingness to engage in UV-exposure behaviors, and greater intentions to protect one's skin (e.g., Gibbons et al., 2005; Mahler et al., 2007, 2008, 2010; Stock et al., 2009). All of these cognitions have mediated the effects of UV photography on sun protection behavior (Gibbons et al., 2005; Mahler et al., 2008, 2010; Stock et al., 2009).

#### Promoting sun protection behaviors among men

Prior effective sun protection interventions for adult men have provided them with basic education and skin screenings. For example, Girgis et al. (1994) found that predominantly male electrical workers reported more sun protection behavior one month after receiving a skin screening and information on skin cancer risk and prevention. In another study, male outdoor workers engaged in more sun protection behaviors and skin self-exams after receiving health education, skin screenings, and promotion of sun protection (Azizi et al., 2000). However, only one study has examined the impact of a UV photography intervention specifically among men (Stock et al., 2009). This study found that the intervention was effective in increasing male outdoor road workers' sun protection behaviors one year post-intervention. This effect was partially mediated by: an increase in attitudes toward sun protection behaviors and skin cancer, perceived risk of skin cancer, and images of the typical man who protects one's skin. Although Stock et al.'s (2009) study demonstrates the positive impact of a UV photography intervention among men, and a previous UV photography study among college students included men (along with women) in the sample (Gibbons et al., 2005), this intervention has not yet been examined in an all-male young adult sample. Also, no research has examined how this intervention might interact with individual difference factors that influence men's health; in particular, masculinity.

#### Masculinity and men's health

Men's low levels of skin cancer prevention and early detection behaviors are mirrored in several other health domains. Men are less likely than women to seek health care and engage in health promoting behaviors, and more likely to engage in riskier behaviors in domains such as eating, smoking, and alcohol use (Barkley, 2008; Courtenay, 2000; Courtenay et al., 2002). Low levels of health behaviors among men may be partially explained by social

messages about masculinity, which encourage men to be strong and powerful (Courtenay, 2000). Men can show these social messages about masculinity through behavior, including behavior related to health (Courtenay, 2000). For example, by avoiding health care or sunscreen use, men are able to show masculinity by being consistent with the messages that men should not care about their health and should not engage in behaviors that are considered feminine (Courtenay, 2000). The role of masculinity in sun protection is supported by findings that many men do not view sunscreen as masculine because it is related to cosmetics (Abroms et al., 2003), and that those who *do* view sunscreen as masculine engage in higher levels of sun protection (Stock et al., 2009).

Additional support for the influence of masculinity on men's sun protection and general health behaviors has been found in studies using the Conformity to Masculine Norms Inventory (CMNI; Mahalik et al., 2003). High endorsement of masculinity norms on the CMNI is associated with low levels of sunscreen and sun-protective clothing use, along with other health-related behaviors such as lower health care seeking and lower avoidance of risky situations (Mahalik et al., 2006, 2007). Subscales of the CMNI have also been correlated with health-related outcomes among men. For example, the risk-taking and playboy subscales are positively associated with drug use (Liu & Iwamoto, 2007; Mahalik et al., 2003), the dominance, playboy, and risk taking subscales with drinking behavior (Good et al., 2008; Liu & Iwamoto, 2007), and the self-reliance and playboy subscales with higher risk taking behaviors (Mahalik et al., 2007).

#### Masculinity as a moderator of sun protection message effectiveness

Two studies have found that masculinity moderated the impact of messages designed to promote sun protection behaviors. Conway and Dubé (2002) found that among more masculine participants, sunscreen promotion messages that included humor resulted in more favorable attitudes toward sunscreen and greater sunscreen use intentions than non-humorous messages. However, the presence of humor did not affect sun protection attitudes and intentions among less masculine participants. In another study, Millar and Houska (2007) found that messages describing how skin cancer prevention behaviors can lower fear and worry of skin cancer had a positive impact on protective intentions among more masculine (versus less masculine) men. Therefore, these studies demonstrate that the effectiveness of sun protection interventions among males may be moderated by individual differences in masculinity. We expanded upon these previous studies by controlling for skin type and baseline sun protection

behaviors and cognitions. Additionally, masculinity has not been previously examined as a moderator of UV photography interventions, which are increasingly common in sun protection research. UV photography is also featured in the news (e.g., ABC News, 2005) and media advertisements (e.g., for Coppertone sunscreen), and is encouraged for use in dermatology practices (Fabrizi et al., 2008), making it an important intervention for further study.

#### The prototype/willingness model

In prior research, the positive effect of appearance-focused interventions on sun protection behavior has been mediated by sun protection cognitions including: perceived vulnerability to skin cancer and photoaging (Stock et al., 2009), intentions to protect one's skin (Mahler et al., 2007, 2008), and willingness to engage in sun-risk behavior (Gibbons et al., 2005). Therefore, studying the impact of interventions on these cognitions has implications for actual sun protection behavior. These mediators are all included in the Prototype/Willingness model, a dual-process model that maintains there are two pathways predicting health behavior: a reasoned pathway mediated by behavioral intention and a social reaction pathway mediated by behavioral willingness (Gibbons et al., 2003). A central tenet of the model is that not all health behaviors are planned or intentional. Instead, many behaviors are reactions to risk-conducive social situations, which are captured in behavioral willingness. Unplanned behaviors are better predicted by willingness than intention (Gerrard et al., 2008; Gibbons et al., 2003).

While the Prototype/Willingness model offers a framework for understanding the impact of interventions on cognitions, this model has not been utilized to understand interventions' impact on the sun protection and risk cognitions of an all-male sample of young adults or to explore masculinity as a moderator of intervention effects. Both willingness and intention likely apply to the domain of sun protection among men. Since men often do not plan to apply sunscreen in advance of being outdoors (Abroms et al., 2003), *willingness* to engage in sun protection behavior is a plausible better predictor of men's sun protection behavior. However, receiving a professional skin cancer exam is likely to require planning, in the form of scheduling an appointment or deciding in advance to inquire about an exam. Therefore, *intention* is a plausible better predictor to apply to understanding men's skin examination.

#### The current study

The current study examined the impact of UV photography and masculinity on the sun protection cognitions of young

adult men. Sun protection cognitions assessed in the present study were drawn from those which have been studied as outcomes of UV photography interventions in other samples and which are informed by the Prototype/Will- ingness model: attitudes (Gibbons et al., 2005; Mahler et al., 2010, Stock et al., 2009), perceived vulnerability (Gibbons et al., 2005; Mahler et al., 2010; Stock et al., 2009), willingness (Gibbons et al., 2005; Mahler et al., 2010), and intention (Mahler et al., 2007, 2008, 2010). The present study assessed attitudes toward sun protection behaviors and perceived vulnerability to skin cancer and photoaging, as well as willingness to engage in sun protection behavior and intention to receive a skin cancer exam. Baseline measures of these cognitions, as well as measures of demographics, masculinity, and past sun exposure and sunscreen use behaviors, were obtained in a Time 1 online survey. At Time 2, participants either viewed or did not view their UV photograph, and then completed a computer-based survey assessing Time 2 cognitions.<sup>1</sup>

### Hypotheses

We hypothesized that men who viewed their UV photograph would report higher levels of sun protection cognitions (perceived vulnerability, sun protection attitudes, willingness, and intention) than those who did not. Additionally, we hypothesized that men who reported higher masculinity would report less protective cognitions. It was also predicted that masculinity would moderate the impact of the UV photo intervention. Since masculinity predicts low levels of sun protection behaviors (Mahalik et al., 2006, 2007), it could be the case that more masculine men are in greater need of a sun protection message and consequently would be more positively affected by the UV photo intervention. Therefore, the intervention might be *more* effective for men who are more masculine. However, masculinity may also encourage avoiding both recommended health behaviors and acknowledgement of health needs (Courtenay, 2000). Based on this reasoning, it is also possible that more masculine men would be *less* positively

impacted by the intervention than less masculine men, due to rejection of the intervention's message. Both patterns of moderation were explored in the current study. All analyses controlled for Time 1 cognitions, skin type, and past behavior.

## Method

### Participants

Male undergraduate students were recruited by a posting on an online recruitment system available to psychology students for academic research credit. The posting advertised a two-part study of men's sun-related attitudes and behavior. A total of 179 men completed the Time 1 survey. Of these participants, 160 (89.4%) completed Time 2. One participant who was missing data on several masculinity items was excluded from the analyses, as were seven other participants for whom there were modifications in the experimental protocol (e.g., the UV camera did not work properly). Therefore, 152 participants were included in the current analyses.

Participants ranged in age from 18 to 22 ( $M = 18.87$ ,  $SD = 1.10$ ; 70% White). Of the remaining participants, 18% described their racial background as Asian and 12% indicated they belonged to another racial group.<sup>2</sup> None of the participants reported ever having been diagnosed with skin cancer. Independent samples *t*-tests revealed that there were no differences between those who were included in the analyses and those who completed only the Time 1 survey in terms of past sun exposure, sunscreen use, masculinity, or baseline sun protection cognitions ( $P$ s > .14).

### Procedure

Upon signing up for the study, participants received a link to the survey, which was available through Survey Monkey (<http://www.surveymonkey.com>). The first page of the survey contained information about the study. Participants provided consent after reading this information and before viewing the survey questions. After completing the Time 1 survey, participants returned to the research sign-up system and signed up for a time to participate in Time 2. Participants completed Time 2 an average of 14 days after Time 1. After providing verbal consent, men were randomly assigned to view either both a UV-photograph and a regular black-and-white photograph of their face ( $n = 80$ ), or only a black-and-white photograph ( $n = 72$ ). Photos in both conditions were taken with a Polaroid camera that has

<sup>1</sup> Another purpose of this study was to examine the causal impact of masculinity on sun protection cognitions. Prior to the UV photograph manipulation, participants were randomly assigned to be either primed or not primed with masculine words. We hypothesized that men in the masculine priming condition would report less protective cognitions and that this condition would moderate the effects of viewing one's UV photograph. However, analyses showed no main effects of the priming condition and no interaction with the UV photograph condition on any of the sun protection cognitions. The priming condition also did not pass the manipulation check and therefore was not included in the present analyses. When priming condition was included as a control variable in the final regressions, the results did not change.

<sup>2</sup> Independent samples *t*-tests revealed that White and non-White participants did not differ in levels of self-reported masculinity.

two lenses—one which has a UV filter and the other which takes a normal black-and-white photograph (Fulton, 1997). Those in the UV photo condition had both of these photographs taken simultaneously, while the UV lens was covered for those in the no-UV photo condition. Men in the UV photo condition were told that dark, freckled, or pitted spots on the UV photo showed damage that had occurred due to UV exposure (e.g., Gibbons et al., 2005; Mahler et al., 2003; Stock et al., 2009). They were also told that UV exposure is a risk factor for skin cancer and photoaging (e.g., Gibbons et al., 2005), and that increasing their sun protection behaviors can help prevent additional UV damage. Participants kept the photographs next to them while completing the Time 2 survey, which assessed sun protection cognitions. All participants were debriefed and given written information on sun protection. The university's institutional review board approved all procedures.

## Measures

### *Masculinity (Time 1)*

Masculinity was assessed with four subscales of the Conformity to Masculine Norms Inventory (Mahalik et al., 2003): dominance (4 items; e.g., “In general, I must get my way;”  $\alpha = .78$ ), playboy (12 items; e.g., “If I could, I would frequently change sexual partners;”  $\alpha = .86$ ), self-reliance (6 items; e.g., “Asking for help is a sign of failure;”  $\alpha = .87$ ), and risk-taking (10 items; e.g., “I enjoy taking risks;”  $\alpha = .87$ ). Each subscale has correlated with men's health behaviors in prior research (Good et al., 2008; Liu & Iwamoto, 2007; Mahalik et al., 2003, 2007). All 32 of these items were rated on a scale from 0 (*strongly disagree*) to 3 (*strongly agree*) and, in the present study, were summed to form a total index ( $\alpha = .84$ ).<sup>3</sup>

### *Sun exposure (Time 1)*

Sun exposure was assessed with two questions which asked participants to estimate how many hours they spend in the sun. The first item asked participants to rate how many hours per week they spend outside in the sun during the spring and summer (1 = 0–5 h; 2 = 6–10 h; 3 = 11–15 h; 4 = 16–20 h; 5 = 21–25 h; 6 = 26–30 h; 7 = more than 30 h). The second item asked participants how often they sunbathed or went out in the sun without a shirt, on average, during the warm months (1 = *never* to 7 = *always*). These items are similar to those used in previous studies

that have assessed estimates of summer sun exposure (e.g., Bränström et al., 2004; Cokkinides et al., 2006). Self-report estimates are also a recommended way to assess adults' sun exposure despite the challenges of self-report measures (Glanz et al., 2008). These two items were averaged ( $\alpha = .71$ ).

### *Sunscreen use (Time 1)*

Participants reported, when spending time in the sun, how often they used sunscreen on their face and body (e.g., arms, legs, neck) (1 = *never*; 7 = *always*). These two items were averaged ( $\alpha = .85$ ).

### *Perceived vulnerability (Time 1, Time 2)*

Conditional perceived vulnerability was assessed with two items: “If you were to get tanned on a regular basis from being in the sun, what are your chances that... you would develop skin cancer at some point in the future/your skin would wrinkle prematurely or develop age spots?” (1 = *not at all likely*; 7 = *very likely*) (Time 1  $\alpha = .89$ , Time 2  $\alpha = .94$ ).

### *Sun protection willingness (Time 1, Time 2)*

Participants read two different scenarios, similar to those that have been used in prior research (Gibbons et al., 2005). The first scenario asked them to imagine that their friends are spending most of the first hot, sunny day of summer at the beach, and that no sunscreen is available. Three questions followed this scenario, which assessed willingness to: (1) go to the beach without any sun protection (recoded), (2) go to the beach, but wear long sleeves and pants to protect your skin when not in the water, and (3) decline the invitation to go to the beach.

A second scenario asked participants to imagine that their friends are engaging in outdoor activities (e.g., hiking, soccer, bike riding) on a warm day. Three questions following this scenario assessed: willingness to (1) go out without any sun protection (recoded), (2) go, but first apply sunscreen and bring extra for re-application, and (3) go wearing a long-sleeved shirt and pants. All willingness items were rated on a 7-point scale (1 = *not at all willing*; 7 = *very willing*), and averaged (Time 1  $\alpha = .60$ , Time 2  $\alpha = .64$ ).

### *Skin exam intention (Time 1, Time 2)*

Participants responded to a single item assessing skin exam intention: “I plan to have a doctor check my skin for skin cancer in the next year,” (1 = *definitely not*; 7 = *definitely*).

<sup>3</sup> Twelve participants were missing data for four or fewer items on the masculinity scale. A value was imputed for each of these missing data points based on the individual participants' mean scores on the relevant masculinity subscale. The results did not differ when these participants were excluded from the final analyses.



### Sun protection attitudes (Time 2)

Five items asked participants about their attitudes toward sun exposure and protection behaviors. Participants indicated how strongly they agreed with five statements on a 7-point scale (1 = *strongly disagree*; 7 = *strongly agree*). For example, participants responded to statements that read: “Having a tan improves the way most people look,” and “It is more important for women to wear sunscreen, as compared to men” All items were coded such that higher values corresponded to more protective attitudes ( $\alpha = .72$ ).

### Skin type (Time 2)

A brief measure by Fitzpatrick (1988) assessed skin type. This measure identifies six different skin types based on one’s tendency to burn and/or tan. Responses were coded on a scale from 1 (*always burn, not tan*) to 6 (*not burn at all, I am naturally dark skinned*).

### Manipulation check (Time 2)

A manipulation check similar to those used in prior UV photography studies (Mahler et al., 2007; Stock et al., 2009) asked participants to indicate the extent to which they agreed with the statement, “Compared to others of my age and gender, I currently have significant underlying UV damage to my face” (1 = *strongly disagree*; 7 = *strongly agree*).

## Results

### Preliminary analyses

General linear model analyses of variance revealed that skin type, past behavior, and masculinity did not vary across condition ( $P$ s > .35). An ANCOVA, controlling for past sun exposure, past sunscreen use, and skin type, revealed that the men in the UV photo condition agreed more strongly ( $M = 3.72$ ) than those in the no-UV photo condition ( $M = 2.50$ ) that compared to others of their own age and gender they had significant UV damage to their face ( $F(1, 147) = 39.25$ ,  $P < .001$ ,  $d = 0.88$ ).

### Descriptive statistics and correlations

Correlations, means, and standard deviations for all variables are displayed in Table 1. Men reported engagement in behaviors that increase skin cancer risk: only 5.9% reported either always or almost always wearing sunscreen on their body and face, and 83.6% indicated spending more than 10 hours outside in the sun per week during the spring

and summer. The mean total masculinity score was 41.05 ( $SD = 9.32$ ), and the means on each subscale comprising this measure were similar to those found in prior studies using the CMNI (Liu & Iwamoto, 2007; Mahalik et al., 2003). Correlations indicated that having skin that burns rather than tans was associated with greater sunscreen use and higher sun protection willingness and perceived vulnerability at Time 1 and Time 2 ( $P$ s < .05). At Time 1, participants who engaged in less frequent sunscreen use had lower perceived vulnerability ( $P < .05$ ) and lower sun protection willingness ( $P < .001$ ), and those who spent more time outside reported higher skin exam intentions ( $P < .01$ ).

As expected, there were also significant correlations among the cognitions. Specifically, at both Time 1 and Time 2, perceived vulnerability was positively correlated with willingness ( $P$ s < .05). At Time 2, skin exam intention was positively correlated with perceived vulnerability, sun protection attitudes, and willingness ( $P$ s < .01). Sun protection attitudes were also positively correlated with perceived vulnerability and sun protection willingness ( $P$ s < .05). Self-reported masculinity was positively correlated with Time 1 sun exposure ( $P < .001$ ).

### Regression methods

We used hierarchical multiple regressions to examine the Condition  $\times$  Masculinity interactions on all Time 2 sun protection cognitions, controlling for several variables. Since having skin that is fair and burns easily predicts greater engagement in sun protection behaviors and skin exams (e.g., Coups et al., 2008; Kasparian et al., 2009; Wheless et al., 2009), we controlled for skin type. We also controlled for past sunscreen use and sun exposure, as well as the respective Time 1 cognition (if available) for the dependent variable in the analysis. All control variables were entered in the first step of the regressions, and both Masculinity and Condition (0 = No UV, 1 = UV) were entered in the second step. The final step of each regression entered the Masculinity  $\times$  Condition interaction into the model. All continuous variables were standardized, and all statistics were obtained from the final step. To examine whether including the interaction term explained significant additional variance in cognitions over the UV photograph condition and masculinity main effects, the  $R^2$  change statistics associated with the final (compared to the second) step of the model are reported. We also ran simple slopes analyses with the same control variables to explore the patterns of resulting Masculinity  $\times$  Condition interactions. These analyses examined the effect of condition at low and high levels of masculinity (+1/−1 SD below/above the mean) and the effect of masculinity in each of the two experimental conditions.

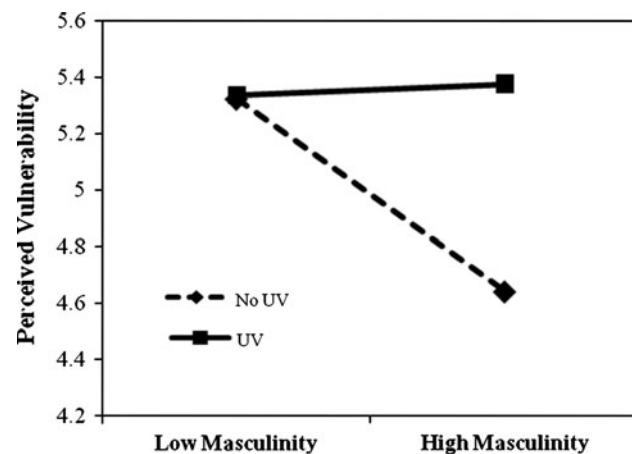
**Table 1** Correlations, means, and standard deviations for control variables, masculinity, and sun protection cognitions at Time 1 and Time 2

Measure	1	2	3	4	5	6	7	8	9	10	11
1. Skin type	–										
2. Sun exposure	.00	–									
3. Sunscreen use	–.38***	.15 <sup>†</sup>	–								
4. Time 1 perceived vulnerability	–.22**	–.15 <sup>†</sup>	.17*	–							
5. Time 1 sun protection willingness	–.38***	–.29***	.28***	.23**	–						
6. Time 1 skin exam intention	–.14 <sup>†</sup>	.21**	.08	.13	.06	–					
7. Masculinity	–.02	.31***	–.12	–.07	–.22**	.13	–				
8. Time 2 perceived vulnerability	–.20*	–.05	.16*	.65***	.18*	.18*	–.12	–			
9. Time 2 sun protection attitudes	–.13	–.32***	.15 <sup>†</sup>	.14 <sup>†</sup>	.32***	.06	–.25**	.17*	–		
10. Time 2 sun protection willingness	–.30***	–.24**	.26***	.18*	.68***	.05	–.19*	.18*	.40***	–	
11. Time 2 skin exam intention	–.12	.11	.19*	.09	.12	.60***	–.14 <sup>†</sup>	.24**	.26***	.22***	–
<i>M</i>	3.32	3.62	3.54	4.88	3.00	1.79	41.05	5.21	3.80	3.04	2.67
<i>SD</i>	1.08	1.44	1.43	1.42	0.97	1.40	9.32	1.44	1.06	0.91	1.84
Range	1–6	1–7	1–7	1–7	1–6	1–7	20–74	1–7	1–7	1–6	1–7

<sup>†</sup>  $P < .10$ ; \*  $P \leq .05$ ; \*\*  $P \leq .01$ ; \*\*\*  $P \leq .001$ 

### Perceived vulnerability

Time 1 perceived vulnerability predicted perceived vulnerability at Time 2 ( $\beta = .64$ ,  $t = 10.07$ ,  $P < .001$ ). In addition, more masculine men reported lower perceived vulnerability ( $\beta = -.24$ ,  $t = -2.50$ ,  $P = .01$ ), and those who saw their UV photo reported higher perceived vulnerability ( $\beta = .13$ ,  $t = 2.12$ ,  $P = .04$ ). As expected, the Condition  $\times$  Masculinity interaction was significant ( $\beta = .19$ ,  $t = 2.05$ ,  $P = .04$ ; see Fig. 1). Simple slopes analyses revealed that masculinity was a marginal predictor of lower perceived vulnerability in the no-UV photo condition ( $\beta = -.15$ ,  $t = -1.76$ ,  $P = .08$ ), but not in the UV-photo condition ( $P = .91$ ). In addition, the UV photo condition was associated with higher perceived vulnerability among more masculine men ( $\beta = .26$ ,  $t = 2.97$ ,  $P < .01$ ), but not among less masculine men ( $P = .96$ ).



**Fig. 1** Time 2 conditional perceived skin cancer/photoaging vulnerability as a function of condition (UV photo vs. no-UV photo) and masculinity level. Masculinity is plotted +1/–1 SD

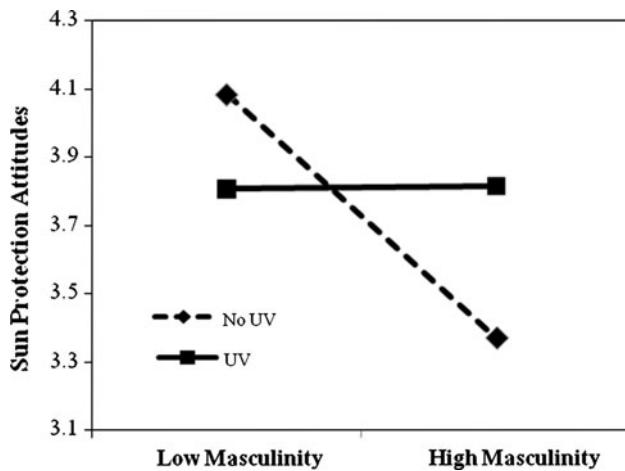
The final model accounted for 45% of the variance in perceived vulnerability,  $\Delta R^2 = .02$ ,  $F(1, 144) = 4.19$ ,  $P = .04$ .

### Sun protection attitudes

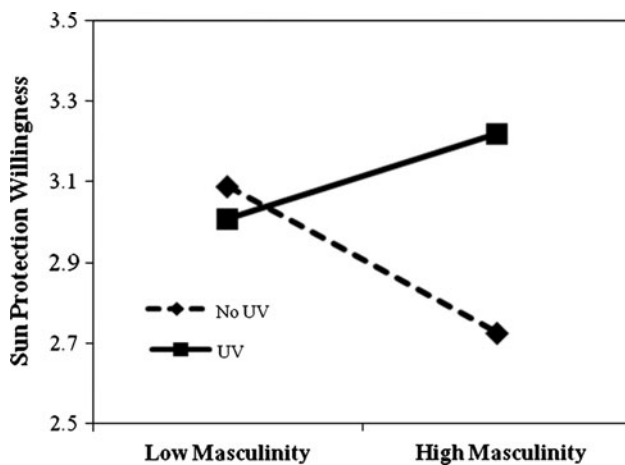
Due to space restrictions, this measure was only included at Time 2. When including all other control variables, lower sun protection attitudes were predicted by higher levels of masculinity ( $\beta = -.35$ ,  $t = -2.95$ ,  $P < .01$ ) and spending more time in the sun ( $\beta = -.28$ ,  $t = -3.47$ ,  $P = .001$ ). Higher sun protection attitudes were reported by men reporting higher levels of sunscreen use ( $\beta = .18$ ,  $t = 2.11$ ,  $P < .04$ ); however, attitudes did not vary by condition ( $\beta = .04$ ,  $t = .54$ ,  $P = .59$ ). The Condition  $\times$  Masculinity interaction was significant ( $\beta = .26$ ,  $t = 2.31$ ,  $P = .02$ ; see Fig. 2). Simple slopes analyses revealed that masculinity was negatively associated with sun protection attitudes in the no-UV photo condition ( $\beta = -.35$ ,  $t = -3.06$ ,  $P < .01$ ), but not in the UV photo condition ( $P = .78$ ). The UV photo condition was associated with higher sun protection attitudes among more masculine men ( $\beta = .22$ ,  $t = 2.03$ ,  $P = .04$ ), but not less masculine men ( $P = .22$ ). The final model explained 16% of the variance in attitudes,  $\Delta R^2 = .03$ ,  $F(1, 144) = 5.32$ ,  $P = .02$ .

### Sun protection willingness

Time 2 willingness was predicted by higher Time 1 willingness ( $\beta = .61$ ,  $t = 8.74$ ,  $P < .001$ ) and lower masculinity ( $\beta = -.20$ ,  $t = -2.17$ ,  $P = .03$ ). Being in the UV photo condition was also marginally associated with higher sun protection willingness ( $\beta = .11$ ,  $t = 1.92$ ,  $P < .06$ ). The significant Condition  $\times$  Masculinity interaction ( $\beta = .24$ ,  $t = 2.66$ ,  $P < .01$ ; see Fig. 3) showed that,



**Fig. 2** Time 2 sun protection attitudes as a function of condition (UV photo vs. no-UV photo) and masculinity level. Masculinity is plotted  $+1/-1$  SD

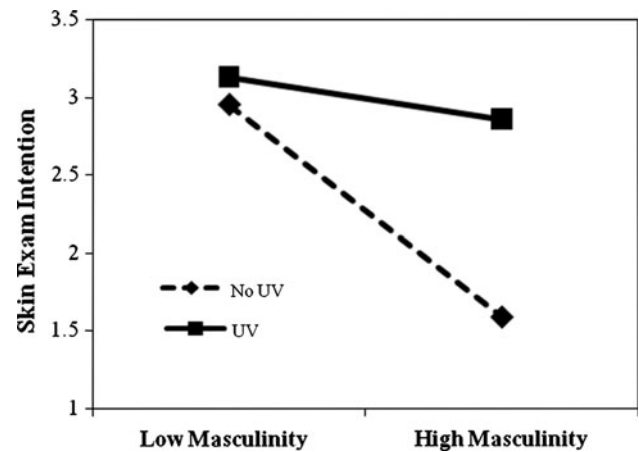


**Fig. 3** Time 2 sun protection willingness as a function of condition (UV photo vs. no-UV photo) and masculinity level. Masculinity is plotted  $+1/-1$  SD

similar to perceived vulnerability and attitudes, masculinity was associated with lower willingness in the no-UV photo condition ( $\beta = -.26$ ,  $t = -2.57$ ,  $P = .01$ ); however, it was associated with higher willingness in the UV photo condition ( $\beta = .17$ ,  $t = 2.01$ ,  $P < .05$ ). Again, the positive condition effect was significant among more masculine men ( $\beta = .27$ ,  $t = 3.27$ ,  $P = .001$ ), but not among less masculine men ( $P = .60$ ). The final model accounted for 48% of the variance in sun protection willingness,  $\Delta R^2 = .02$ ,  $F(1, 144) = 7.10$ ,  $P = .01$ .

#### Skin exam intention

Higher skin exam intentions were predicted by higher Time 1 intention ( $\beta = .60$ ,  $t = 9.71$ ,  $P < .001$ ), being in the UV photo condition ( $\beta = .20$ ,  $t = 3.24$ ,  $P = .001$ ) and having



**Fig. 4** Time 2 skin exam intention as a function of condition (UV photo vs. no-UV photo) and masculinity level. Masculinity is plotted  $+1/-1$  SD

lower levels of masculinity ( $\beta = -.37$ ,  $t = -3.96$ ,  $P < .001$ ). As with the other dependent variables, a significant Condition  $\times$  Masculinity interaction ( $\beta = .22$ ,  $t = 2.45$ ,  $P < .02$ ; see Fig. 4) showed that masculinity was negatively associated with skin exam intention in the no-UV photo condition ( $\beta = -.43$ ,  $t = -4.79$ ,  $P < .001$ ), but not in the UV photo condition ( $P = .58$ ). The UV photo condition was associated with higher skin exam intention among more masculine men ( $\beta = .35$ ,  $t = 4.06$ ,  $P < .001$ ), but not among less masculine men ( $P = .58$ ). The final model accounted for 46% of the variance in skin exam intention,  $\Delta R^2 = .02$ ,  $F(1, 144) = 6.02$ ,  $P = .02$ .

#### Discussion

The results of the present study demonstrate that UV photography can enhance sun protection cognitions among male college students, particularly those higher in masculinity. Overall, the men who viewed their UV photo reported higher levels of perceived vulnerability to skin cancer and photoaging, sun protection willingness, and skin exam intention. The effectiveness of UV photography is consistent with the findings of prior studies (e.g., Gibbons et al., 2005; Mahler et al., 2007, 2008, 2010; Stock et al., 2009).

As hypothesized, men who reported higher masculinity also reported lower levels of sun protection cognitions at Time 2, while controlling for skin type, past behaviors, and baseline cognitions. This pattern is consistent with a general association between masculinity and health related risk-taking, including low levels of sun protection behaviors (e.g., Courtenay, 2000; Mahalik et al., 2006, 2007). However, masculinity also moderated the UV photography intervention's impact on men's cognitions: the negative



association between masculinity and sun protection cognitions was evident only among men in the no-UV photo condition. In the UV photo condition, which had a positive impact among more masculine men, the masculinity differences in sun protection cognitions were either eliminated, or for willingness, reversed.

### Masculinity and men's sun protection behaviors

In the present study, the UV photograph did not have a negative impact on the sun protection cognitions of the less masculine men; further analyses showed that their sun protection cognitions were not lower at Time 2 compared to Time 1. However, among these men, simply participating in the study may have been sufficient to remind them of the importance of sun protection in reducing skin damage. In contrast, cognitions among the masculine men were particularly affected in the UV photo condition, compared to the no-UV photo condition.

We examined whether the positive impact of the UV photography condition among masculine men might be due to different frequency distributions of sun protection cognitions among men of high versus low masculinity. However, since less masculine men did not report uniformly high levels of protective cognitions at Time 1, differences in the condition effects cannot be explained by a lack of variability in their cognitions compared to those of the high masculine men. Instead, it is likely that the explanation for UV photography's stronger impact among more masculine men is based on other factors, one of which may be the relevance of the intervention's message. Since more masculine men engage in lower levels of sun protection behavior than less masculine men (Mahalik et al., 2006, 2007), it is plausible that they benefited more from the encouragement to engage in additional protective behavior. To have as high an impact on the sun protection cognitions of high risk individuals, sun protection interventions might need to contain more concrete, visible evidence of the consequences of UV exposure (as is done in UV photography interventions), rather than simply reminding them of such negative effects.

The current results run contrary to the possibility that more masculine men might have rejected the UV photography intervention's message. These results might also be explained by the fact that the UV photography intervention is not specifically designed to be strongly threatening. Perceptions of threat may be highest when health messages consist of strong language, particularly for those who do not already intend to change their behavior (Buller et al., 1998, 2000). However, strong language is not a central feature of UV photography interventions. The absence of this feature might have allowed for masculine men's acceptance of the message content and a positive impact on

their sun protection cognitions, which might not have occurred if the message had been even more threatening and serious (Conway & Dubé, 2002).

This study coincides with other research which shows the importance of identifying masculine men as a group that could have low levels of sun protection behaviors and cognitions. This suggests that skin cancer prevention campaigns might benefit from targeting high masculine men for sun protection efforts, in addition to other high-risk groups. Given the negative correlation between masculinity and sun protection behaviors and cognitions, the resulting pattern of findings is encouraging, because it shows that interventions that *are* implemented in this group of men can effectively encourage sun protection cognitions. These findings suggest it may be possible for UV photography interventions to also be used with masculine men in other contexts, and might be worth considering for use in stereotypically masculine settings, such as among men's athletic teams and in male-dominated work settings. In addition, it might be a useful approach to utilize in physician's offices, where seeing one's UV damage could help maximize the impact of physicians' sun protection recommendations for men who might otherwise be defensive based on high masculinity and/or high skin cancer risk.

These findings expand upon research in masculinity and health by identifying a situation in which masculinity is not negatively associated with protective cognitions: after viewing one's UV damage. The perspective that masculinity does not always have a negative effect on health-related outcomes has also been raised by other researchers, who have asserted that a tendency to automatically link men and masculinity with negative health outcomes may be a limiting framework (Gough, 2006; Smith et al., 2006). Rather, masculinity can also have a positive impact on health such that for some health-related behaviors, certain aspects of masculinity may actually promote engagement in the behavior (e.g., Levant et al., 2011).

### Limitations and future directions

One limitation of the current study is the limited diversity of the sample. While non-White students were represented in this study, the sizeable percentage of participants reporting an "other" race did not allow for a comprehensive analysis of whether the impact of the intervention and masculinity varied across racial/ethnic background. It is also possible that the impact of the intervention and masculinity could vary for those with lower levels of education, who often report fewer sun protection behaviors and skin cancer exams (Bränström et al., 2004; Saraiya et al., 2004). Additional studies should examine the effect of UV photography and masculinity with more diverse samples of men and explore whether general education level and

domain-specific education about skin cancer moderate UV photography effects among men.

Another area for future research is the investigation of the long term impact of UV photography interventions and masculinity on men's sun protection behaviors. The one other UV photography study among men, which focused on outdoor workers, shows the potential for the intervention to have an enduring impact on sun protection behavior (Stock et al., 2009). However, it is unknown whether masculinity would moderate long-term effects on behavior in the manner it moderated the intervention's impact on sun protection cognitions. Future research could also examine whether the cognitions assessed in the present study mediate the impact of UV photography interventions on masculine men's sun protection behavior.

A third area that warrants further attention is an examination of why the UV photograph was effective among men high in masculinity but did not have a stronger impact (compared to the no-UV photo condition) on the cognitions of the less masculine men. In addition to further assessing the role of message relevance in the intervention's effects on masculine men, it would be useful to explore whether the positive impact of the intervention for masculine men was based more on the inclusion of appearance-based information in the intervention (depictions of underlying skin damage and being told that this damage is associated with premature skin aging), or by being told that UV exposure is associated with skin cancer. Stock et al.'s (2009) study suggests that appearance may be a less salient concern than skin cancer risk among older men. However, appearance concern may be more relevant among younger males. Several studies have found that appearance-based motivations for UV exposure are prevalent and are strong predictors of sun-related behaviors during adolescence and young adulthood (e.g., Haas, 2007; Hillhouse et al., 2000; Leary & Jones, 1993). Furthermore, appearance-based interventions incorporating UV photography have been effective in samples that include males (Gibbons et al., 2005; Mahler et al., 2003). Masculinity may also be associated with stronger concerns about men's body image ideals (Cash & Jacobi, 1992). Further studies should address whether appearance or skin cancer concerns are more influential among masculine men.

## Conclusion

The present study demonstrates that although masculine men who did not view their UV photograph generally reported lower levels of sun protection cognitions than less masculine men, the impact of a UV photography intervention on perceived vulnerability to skin damage, sun protection attitudes, sun protection willingness, and skin

exam intentions was particularly positive among men who reported high levels of masculinity. The impact of the intervention among masculine men suggests UV photography as one means of potentially encouraging them to adopt more sun protection behavior. Future research should focus on identifying the specific components that contribute to this intervention's effectiveness among masculine men and on extending its impact to follow-up behavioral measures and broader samples.

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