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Improving the Efficacy of Appearance-Based Sun Exposure Interventions with the Terror Management Health Model

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Abstract

The terror management health model (TMHM) suggests that when thoughts of death are accessible people become increasingly motivated to bolster their self-esteem relative to their health, because doing so offers psychological protection against mortality concerns. Two studies examined sun protection intentions as a function of mortality reminders and an appearance-based intervention. In Study 1, participants given a sun protection message that primed mortality and shown a UV-filtered photo of their face reported greater intentions to use sun protection on their face, and took more sunscreen samples than participants shown a regular photo of their face. In Study 2, reminders of mortality increased participants' intentions to use facial sun protection when the UV photo was specifically framed as revealing appearance consequences of tanning, compared to when the photo was framed as revealing health consequences, or when no photo was shown. These findings extend the terror management health model, and provide preliminary evidence that appearance-based tanning interventions have a greater influence on sun protection intentions under conditions that prime thoughts of death. We discuss implications of the findings, and highlight the need for additional research examining the applicability to long-term tanning behavior.

Keywords

tanning; UV imaging; mortality salience; self-esteem

Most people with access to television, magazines, or other forms of media know that the effects of sun exposure can be deadly. Anti-tanning ads often target this dire outcome to

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motivate individuals to use sun protection. Despite knowledge of the potentially fatal consequences, the rate of people intentionally tanning their skin is on the rise (Buller et al., 2011; Coups, Manne & Heckman, 2008), as are incidents of skin cancer (Simard, Ward, Seigel & Jamal, 2012; Purdue, Freeman, Anderson & Tucker, 2008). Research in social psychology has suggested that one reason people may tan despite the health risks stems from motivations to meet cultural ideals of attractiveness (which, in many instances, involves tanned skin; Ingledew, Ferguson & Markland, 2010; Leary & Jones, 1994) because doing so confers self-esteem (Crocker & Wolfe, 2001). What then are conditions that engage this motivation and increase its influence on health decision-making? The terror management health model (TMHM; Goldenberg & Arndt, 2008) highlights one potentially important factor, positing that when thoughts of death are accessible, health decisions and behaviors are particularly likely to be aimed at maintaining self-esteem, even at the expense of one's health. Thus, when appearance standards include tanned skin, cognitions about mortality might ironically increase tanning behavior. Using this framework, research has shown that reminders of mortality increase tanning intentions and decrease intentions to use sun protection, especially when tanned skin is associated with an attractive appearance (e.g., Routledge, Arndt, & Goldenberg, 2004)

This perspective helps to explain conditions under which many health risk-based sun exposure intervention programs may be ineffective (see Weinstock & Rossi, 1998)—when interventions prime thoughts of mortality and do not take into consideration motivations concerning self-esteem— and highlights the potential for appearance-based interventions to provide a successful alternative. A number of studies have explored such methods with promising results. Jones and Leary (1994), for example, found that messages highlighting the negative effects of sun exposure on appearance were more effective than messages highlighting the negative consequences for health. Ultraviolet (UV) photo imaging interventions—which depict existing sun damage to the face as dark spots and blotches—have also shown promise in promoting sun protection intention and behavior (e.g., Gibbons, Gerrard, Lane, Mahler, & Kulik, 2005; Mahler, Kulik, Gibbons, Gerrard, & Harrell, 2003). Integrating TMHM with this line of intervention research suggests that appearance-based interventions should be especially effective at increasing sun protection intentions when used in the context of heightened mortality concerns.

Terror Management Health Model (TMHM)

Terror management theory (Greenberg, Pyszczynski & Solomon, 1986) suggests that a great deal of human behavior is aimed at reducing the psychological threat associated with the awareness of one's own mortality. To do this, people maintain faith in a cultural worldview and strive to preserve self-esteem by living up to the standards of their worldview. Though such approaches do not solve the problem of death by any direct means, they move the problem of death to a symbolic realm: People can obtain a sense of symbolic immortality by living up to the standards of an enduring, meaning-conferring worldview. Specifically, when thoughts of death are activated, but no longer in conscious awareness, self-esteem contingencies offer ways to manage mortality concerns and thus become especially influential in one's behavior and decisions (Pyszczynski, Greenberg, Solomon, Arndt & Schimel, 2004).

The terror management health model (TMHM; Goldenberg & Arndt, 2008) focuses on peoples' concerns about mortality as a critical catalyst influencing the motivations underlying the health decisions that people make. In this way the TMHM helps to integrate and advance insights provided by other existing models of health decision making. For example, a considerable body of research illustrates how defensive biases in health decisions are influenced by rationally oriented processes that take into account such factors as perceptions of efficacy, vulnerability, and severity (e.g., Cameron & Leventhal, 1997; Witte, 1998; Witte & Allen, 2000). In addition, another class of models focuses on esteem relevant factors and show how motivations for self-value influence health decisions (as noted above; e.g., Leary & Jones, 1994) and can reduce biased processing of risk information (e.g., Sherman, Nelson, & Steele, 2000).

In line with these perspectives, TMHM suggests that people are motivated to attend to health risks (or deny them) when thoughts about death are conscious (e.g., Arndt, Schimel, & Goldenberg, 2003; Greenberg, Arndt, Simon, Pyszczynski, & Solomon, 2000). However, people are quick to remove thoughts of death from focal awareness; further, many health situations may activate thoughts of death without such thoughts ever entering consciousness (e.g., Arndt, Cook, Goldenberg, & Cox, 2007). It is when thoughts of death are accessible, but not conscious (or no longer conscious), that TMHM posits that health decisions are particularly likely to be oriented toward maintaining self-esteem, rather than maintaining health.

In Western culture, the emphasis on physical attractiveness makes appearance an important contingency for self-esteem (Crocker & Wolfe, 2001) especially among women (Pliner, Chaiken, & Flett, 1990). Thus, when mortality concerns are accessible (but not conscious), health decisions are often aimed at maintaining self-esteem in the domain of appearance. For example, people may exercise to maintain an attractive physique (Kilpatrick, Hebert, & Bartholomew, 2005); consistent with this, making thoughts of death salient (with an explicit death prime followed by a delay that allows thoughts of death to fade from focal awareness) increases intentions to exercise (Arndt et al., 2003). Similarly, many women diet in order to obtain a desired, thin appearance. As Goldenberg, Arndt, Hart and Brown (2005) demonstrated, mortality salience decreased women's consumption of a healthy but high calorie snack, especially for women who were relatively unsuccessful in maintaining the cultural ideal of an attractive body type (i.e., higher body mass index).

Routledge et al. (2004) applied this line of reasoning to tanning behaviors which, like exercise and dieting, are often engaged in to obtain an attractive appearance, particularly among women (Hillhouse, Turrisi, Holwiski, & McVeigh, 1999). They found that whereas participants reduced their intentions to tan when they were consciously thinking about death, non-conscious thoughts of death led participants (who had previously indicated that appearance was relevant to their self-esteem) to express increased intentions to tan. Of course, media and other environmental stimuli can also increase the appeal of particular self-esteem or appearance standards. In this vein, priming female participants with mortality and an advertisement for a beach store featuring a tanned, attractive woman led them to show more interest in the store's line of tanning products (e.g., tanning lotion). Notably, this perspective also suggests that tanning related effects of mortality reminders can be reversed

if relevant appearance standards are targeted. Cox et al. (2009) thus extended this research by exposing participants to mortality reminders and a magazine article highlighting the attractiveness of tanned skin, the attractiveness of pale skin, or natural-looking skin (that did not mention skin color). When mortality was salient, priming the association between tanned skin and attractiveness increased tanning intentions, whereas priming pale skin as attractive decreased tanning intentions. Further, beachgoers primed with mortality and a "pale is pretty" magazine article reported a preference for higher SPF products than those not primed with mortality. Research thus demonstrates how cognitions about death interact with dispositional or situational standards for an attractive appearance to influence tanning related decision-making.

Current Research: Integrating TMHM with Appearance-Based UV Photo Imaging Interventions

The aim of the present research was to build on these insights derived from TMHM to identify an additional mechanism that might complement appearance-based tanning interventions. Research aimed at decreasing intentional tanning (and increasing sun protection use) has effectively employed UV photo imaging to target the appearance consequences of sun exposure. Such manipulations use facial photographs taken with a UV filter lens that shows dark spots and uneven pigmentation as a result of sun exposure. For example, Gibbons and colleagues (2005) found that participants shown a UV photo reported decreased tanning booth use three to four weeks after the intervention, compared to those not shown the UV photo. Similarly, Mahler and colleagues (2003; 2006) demonstrated that the UV photo manipulation, in addition to information about photo aging, was associated with greater intentions to use sunscreen in the future, and in a follow-up, greater sunscreen use for incidental exposure and lower reported sunbathing (among both college students and beachgoers). Good and Abraham (2011) found that a photo-aging intervention was associated with greater acceptance of an efficacy-based sun protection message amongst participants who were self-affirmed. Further, Mahler, Kulik, Gerrard and Gibbons (2007) measured actual sun exposure using spectrometer ratings and found that college students provided with a UV photo of their face showed less skin tanning in the months following the intervention, compared to those not given the photo.

Given the evidence that people often tan their skin because of the implications for their appearance, and that using UV photographs to highlight the consequences of sun exposure to their appearance has been shown to reduce actual tanning behavior, it follows from TMHM that an appearance-based intervention should be especially effective when it is coupled with reminders of mortality. Two experiments were conducted to examine the merits of this hypothesis.

Study 1

The first study was designed as a preliminary test of the efficacy of appearance-based intervention methods when people are reminded of their mortality in the context of a sun protection communication. Both self-report (sun protection intentions) and a behavioral measure (number of free samples of sunblock taken) were assessed. The guiding hypothesis

was that participants given the appearance (UV photo) intervention would report greater intentions to protect their face from sun exposure, as well as take more sunscreen samples, relative to participants in the control condition, and that this would be enhanced by an anti-tanning message that primed mortality. Because the UV photo manipulation only shows the face, and thus specifically targets appearance consequences for one's facial appearance, we considered that the effects might be specifically focused on intentions to protect one's face, and not necessarily one's body, from the sun.

Method

Participants—Following the reporting guidelines of the CONSORT statement (Schulz et al., 2010; see also Moher et al., 2010), Study 1 was a two-factor, parallel group randomized experimental design conducted in the Department of Psychology at the University of South Florida. All females aged 18 or over enrolled in a research pool were eligible to participate. We restricted the sample to female participants because women are more likely than men to report investing self-esteem in their appearance (Pliner et al., 1990), and also more likely to intentionally tan their skin regularly (Demko, Borawski, Debanne, Cooper & Stange, 2003; Hillhouse et al., 1999). Participants had the choice to participate in the study based on a short description of the study provided through SONA participant management software (www.sona-systems.com).

Ninety-three female participants completed the study in exchange for course credit. However, because the UV photo manipulation relies on skin color contrast to show sun damage, participants with very dark skin tones are unable to see existing sun damage in their photos. Therefore, participants indicating their race as Black were excluded from the final sample. Participants who were more than three standard deviations from the mean age of the sample were also excluded. In addition, participation was restricted to native English speakers. The resulting final sample consisted of 59 female undergraduate students (M_{age} = 19.36, *SD* = 1.20) who completed the study.

Procedure—Participants from the research pool who volunteered completed the study one at a time in a psychology lab with individual cubicles. We randomly assigned participants to conditions by sequentially numbering each packet of materials that corresponded to the conditions of the study. They were told the study would involve completing personality and attitude questionnaires, and having their picture taken. Participants completed the study in three stages over a 45-minute time period (see Figure 1). In the first stage, after obtaining written consent, the experimenter took a photo of the participant and instructed them to sit in a cubicle and complete the first packet of materials while the photo developed. The first packet of materials included several personality questionnaires to substantiate the cover story, the measure of facial appearance satisfaction and the mortality salience (or control) manipulation. The participant was instructed to notify the experimenter when they completed the first packet. In the second stage of the study, the experimenter gave participants a second packet of materials that included the UV (or non-UV control) photo manipulation and the measure of sun protection intentions. Because the experimenters had to prepare the photos, they were not blind to this condition (they were blind to all other conditions); however, participants were not aware of which condition they were in. In the

final stage of the study, participants were instructed to move to another cubicle to complete some remaining demographic questionnaires, where they were also provided with the opportunity to take free sample of sunscreen and candy. Materials are described below in the order of presentation. All questionnaires were completed using paper-and-pencil format.

Materials

Facial Appearance Satisfaction: Because participants were to be presented with a closeup photograph of their face, we included a question measuring satisfaction with one's facial appearance. This allowed us to examine reactions to the UV photo intervention independent of facial appearance satisfaction. This item was part of the Body Area Satisfaction Scale (Cash, 1990) which lists facial appearance amongst eight other body-related items and asks participants to indicate "how dissatisfied or satisfied you are with each of the following areas or aspects of your body," ranging from 1, *very dissatisfied*, to 5, *very satisfied*.

Mortality Prime and Delay: Mortality salience was manipulated using an anti-tanning health message. Participants were told the health message was from a health magazine and they would be asked about their reactions to the message. In the health message designed to activate thoughts of mortality, participants were shown an image of a woman sunbathing on the beach surrounded by individuals that looked as if they were attending her funeral. Below the image a caption read, "While you like your tan today, skin cancer is a direct result of over exposure to the sun. Left alone, skin cancer can spread throughout your body and eventually kill you." In the control condition, participants saw a health message without an image that read, "Use sunscreen to protect yourself from excessive sun exposure." The control condition was selected because it also encourages sun protection (like the mortality salience condition), but does not include any reference to mortality. Previous research has confirmed that the image of the sunbathing woman elicits greater thoughts of death than the control condition (and also greater death thoughts than a condition that highlights the appearance consequences of tanning, Cooper, Goldenberg & Arndt, 2012).[1] Substantiating the cover story, the health message was followed by three items assessing participants' reactions ("How much did you like this particular message?," "How interested would you be in buying a magazine that contains messages like this in it?," and "Did you find the message to be informative?") rated from 1, *not at all*, to 7, *very much*. Following the health message and assessment items, participants completed the PANAS-X (Watson & Clarke, 1994) to serve as a delay since previous research has shown that esteem-oriented effects of mortality salience tend to occur when individuals are no longer consciously attending to such thoughts (e.g., Greenberg et al., 2000). Including the PANAS-X also enabled us to assess affect.

Appearance Intervention: We utilized an appearance-based intervention used in previous research (Mahler et al., 2003; Gibbons et al., 2005). Photos were taken using a Polaroid UV detect twin image camera manufactured by Faraghan/Medical Camera Systems (uvcamera.com). Participants in the control condition were provided with only a normal black-and-white image of their face. Participants in the intervention condition were

[1]We did not include a manipulation check measuring activation of thoughts of death because previous research has indicated that measuring death thought accessibility could bring thoughts of mortality back into focal awareness (Hayes, Schimel, Arndt & Faucher, 2010), which would disrupt the hypothesized process of interest.

presented with a UV-filtered photo of their face next to the normal black-and-white photo. In addition, the UV photo was accompanied by a brief explanation indicating that dark spots, blotchiness, and uneven skin tone revealed in the UV-filtered photo signal areas of existing sun damage. Participants in both conditions were asked to examine the photo(s) for a few moments. Next, participants again rated their mood, using the 20-item PANAS (Watson, Clarke & Tellegen, 1988), to assess whether this manipulation influenced positive or negative affect.

Sun Protection Intentions: Intentions to use sun protection were assessed by six items adapted from Mahler et al. (2006). Items were rated on a scale ranging from 1, *strongly disagree*, to 7, *strongly agree*. Facial sun protection intentions were assessed using a composite of three items ($\alpha = .85$) that read, "I plan to always use a sunscreen with an SPF of at least 15 on my face," "I plan to always use sunscreen on my face when I do any outdoor activity," and "I plan to use sunscreen on my face on a daily basis." Body sun protection intentions were assessed using a composite of three items ($\alpha = .77$) that read, "I plan to always use a sunscreen with an SPF of at least 15 on my body," "I plan to use sunscreen on all exposed areas of my body when I do any outdoor activity," and "I plan to use sunscreen on all exposed areas of my body on a daily basis."

Sun Protection Intentions Behavior: To assess behavioral intentions to use sun protection, participants were given the opportunity to take as many free samples of sunscreen (1 oz. packets of SPF 30) at the end of the study as they would like. In addition, to conceal specific interest in this choice, and to control for a general tendency to take *free stuff*, participants were also offered free candy (Starbursts and Hershey's chocolates). Baskets containing sunscreen and candy (50 in each) were left on the table in the cubicle where the participant completed the demographic questions in private. The experimenter counted and recorded the number of sunscreen packets (and candy) taken after the participant left the room.

Results

A 2 (Prime: Mortality vs. Control) X 2 (Photo: UV vs. No UV) ANCOVA was conducted on participants' self-reported facial sun protection intentions scores, controlling for facial appearance satisfaction. Results revealed a main effect of the UV photo manipulation, F (1, 54) = 21.05, $p < .01$, which was qualified by a significant Prime X Photo interaction, F (1, 54) = 4.27, $p < .05$, $\eta^2 = .35$. As can be seen in Figure 2, when participants were primed with mortality, the UV photo intervention significantly increased intentions to use sun protection on the face compared to participants shown the regular, non-UV image, F (1, 54) = 21.69, $p < .01$. Although the trend was in the same direction, the effect of the UV photo was not significant for participants not primed with mortality ($p = .09$). Looked at differently, in the absence of the UV photo, participants primed with mortality expressed decreased intentions to protect their face compared to participants not primed with mortality, F (1, 54) = 4.16, $p < .05$; in contrast, this effect was reversed but non-significant in response to the UV photo ($p > .36$).

We conducted the same 2 (Prime: Mortality vs. Control) X 2 (Photo: UV vs. No UV) ANCOVA on participants' body sun protection intention scores. There was a main effect of

the photo intervention, F (1, 54) = 38.05, $p < .001$, with participants given the UV photo reporting higher body sun protection intentions, but there was no interaction with mortality salience ($p = .66$).

To analyze the behavioral measure of sun protection intentions, we conducted a 2 (Prime: Mortality vs. Control) X 2 (Photo: UV vs. No UV) ANCOVA on the number of sunblock samples participants took, controlling for facial appearance satisfaction and how much candy they took. Results revealed a main effect of the UV photo intervention, F (1, 53) = 30.76, $p < .05$, with participants shown the UV photo taking more sunblock samples. Additionally, a marginal Prime X Photo interaction emerged, F (1, 53) = 3.47, $p = .07$, $\eta^2 = .28$. As can be seen in Figure 3, participants primed with mortality and given the UV photo intervention took more sunblock compared to participants shown the regular image, $F(1, 53) = 8.52$, $p < .01$, consistent with the results of the measure of facial sun protection intentions. The effect of the UV photo intervention was non-significant for participants not primed with mortality ($p = .78$).

Further examination revealed that 41% of participants did not take any sunblock samples, resulting in a skewed distribution of scores. Therefore, we also dichotomized the variable and examined whether or not participants took free samples of sunblock as a function of the manipulations using a Chi-square analysis. Among participants primed with mortality, 80% of those given the UV photo intervention took sunblock samples compared to only 43% of those given the regular photo, χ^2 (1, 59) = 4.24, $p < .05$. For participants not primed with mortality, the UV photo intervention did not significantly influence whether or not they took sunblock samples ($p = .37$).

To determine if participant mood was altered as a function of the manipulations, we assessed affect scores after both the mortality and photo manipulation. Consistent with prior research, mortality salience had no influence on either negative or positive affect (ps > .48), nor was there an overall effect when each of the individual PANAS-X subscales was entered into a multivariate analysis of variance (MANOVA; $p = .42$). Exposure to the UV photo, however, significantly increased negative affect ($p < .01$) and decreased positive affect ($p < .05$) on the PANAS. This effect was not qualified by the mortality salience manipulation (ps < .44), and critically, controlling for positive and negative affect did not alter any of the critical analyses.

Discussion

The results of Study 1 support the hypothesis that an appearance-based intervention is more effective at increasing facial sun protection intentions when juxtaposed with heightened mortality concerns. The UV photo was especially effective at increasing intentions to use sunblock on one's face relative to the regular photo when participants were also presented with a sun protection communication that reminded them of their mortality. Study 1 also examined a behavioral measure of sun protection intentions and found that participants took more samples of sunblock when primed with mortality and given the UV, compared to regular, photo of their face. That participants not only reported greater intentions to protect their face, but also took the means to do so, helps to validate the self-report measure of sun protection intentions (indeed, these two measures are positively correlated, $r = .32$, $p < .05$).

Notably, although the UV photo was especially effective under conditions that reminded participants of their mortality, the mortality salience UV photo condition did not significantly differ from the non-mortality salience UV photo condition. One explanation for this could be that although the UV photo intervention is thought to affect tanning related outcomes because of the appearance concerns it elicits (Mahler et al., 2006), viewing dark spots and sun damage might also trigger health concerns. From the perspective of TMHM, the simultaneous activation of health and appearance concerns may actually dampen the motivating impact of non-conscious thoughts of mortality. This suggests that the potential for mortality salience to enhance the effectiveness of the UV manipulation would be improved by a message highlighting the appearance implications of the photo. Study 2 was guided by the goal of assessing this possibility.

Study 2

The aim of Study 2 was to isolate the appearance aspect of the UV intervention from the health aspect, and examine the impact of mortality salience on sun protection intentions. To that end, the appearance intervention was coupled with a descriptive frame of reference for the UV photo. The photo was framed as showing that sun damage has negative implications for one's appearance, or conversely, one's health. Additionally, participants in a control condition did not receive a photo. This design afforded the opportunity to assess the hypothesis that when the appearance implications of the photo are clear, reminders of mortality would increase facial sun protection intentions relative to those given the same photo and framing but not reminded of their mortality. In contrast, mortality salience was not expected to affect intentions for women who received the health-framed photo. In addition to isolating the appearance aspects of the UV intervention, in Study 2 we isolated the effects of mortality salience, using a traditional mortality prime unrelated to the tanning intervention. Given the result of Study 1, the hypothesized results were again expected to be specific to sun protection intentions for the face.

Method

Participants—Study 2 was a two-factor, parallel group randomized experimental design conducted in the Department of Psychology at the University of South Florida. Again, only females aged 18 or over and enrolled in the research pool were eligible to participate and were provided a short description of the study through SONA participant management software.

The initial sample consisted of 137 females. As in Study 1, we excluded Black participants, those who were more than three standard deviations above the mean age, and non-native English speakers. The final sample consisted of 84 female undergraduate students (M_{age} = 19.88, *SD* = 2.39) who completed the study in exchange for course credit.

Procedure—As in Study 1, participants completed paper-and-pencil materials individually in the lab. As in Study 1, we used simple random assignment methods by sequentially numbering each packet of materials that corresponded to the conditions of the study. Participants were told the study would involve completing several questionnaires, and having their picture taken. For participants in the no photo condition, the camera was out of

sight and they were told the study involved completing questionnaires. Participants completed the study in two stages over a 45-minute period (see Figure 4). In the first stage, after obtaining consent, the experimenter took a photo of the participants and then instructed them to sit in the cubicle to complete the first packet of materials. Participants in the no photo condition went immediately to the cubicle to complete the first packet of materials. The first packet of materials included the measure of facial appearance satisfaction used in Study 1 and the mortality salience (or control) manipulation. Both the experimenter and participant were blind to the mortality salience condition. Participants were instructed to notify the experimenter when they were finished with the first packet of materials. In the second stage of the study, the experimenter provided participants with the second packet of materials, which contained their photo (appearance-framed UV photo, health-framed UV photo, or no photo), along with the measure of sun protection intentions and demographic questions. As in Study 1, experimenters were not blind to this condition and participants were not aware of which condition they were in.

Materials

Facial Appearance Satisfaction: Participants' satisfaction with their facial appearance was assessed as in Study 1.

Mortality Prime: The mortality salience manipulation (see e.g., Rosenblatt, Greenberg, Solomon, Pyszczynski, & Lyon, 1989) consisted of two open-ended essay questions regarding the feelings and emotions associated with one's own death. In the control condition, participants responded to two similar, open-ended questions regarding the feelings associated with experiencing intense pain. The essay prompts stated: "Please describe the emotions that the thought of your own death (experiencing intense pain) arouses in you," and "Jot down, as specifically as you can, what you think will happen to you as you physically die (experience intense pain) and once you are physically dead (have experienced intense pain)." This was followed by a word search puzzle and a 20-item mood assessment (PANAS; Watson & Clarke, 1988) to serve as a delay and allow thoughts of death to fade from consciousness. It also allowed us to assess the effect of mortality salience on mood.

Appearance Intervention: The appearance-based intervention consisted of the same UV-filtered photo used in Study 1. Participants in the appearance frame condition received the photo along with information indicating that the dark spots and uneven skin tone were areas of "existing skin damage that can negatively affect the appearance of your face." Participants in the health-frame condition received the photo, along with information indicating that the photo showed "existing skin damage that can negatively affect your health." Participants in the no photo condition did not receive a photo or any information about UV-filtered photos.

Self-Report Sun Protection Intentions: We used the same items as in Study 1 to assess intentions to use sun protection, including three items used to evaluate facial sun protection intentions ($\alpha = .80$), and three items used to evaluate body sun protection intentions($\alpha = .79$).

Finally, participants completed several demographic items at the end of the study.

Results

Intentions to use facial sun protection were subjected to a 2 (Prime: Mortality vs. Control) X 3 (Photo Frame: Appearance vs. Health vs. No Photo) ANCOVA, controlling for facial appearance satisfaction. Results revealed no main effects (*p*s > .84), but the predicted Prime X Photo Frame interaction emerged, F (2, 77) = 10.05, $p < .05$, $\eta^2 = .11$. Simple effects analysis showed that, when reminded of mortality, participants given the appearance frame photo reported increased sun protection intentions relative to those provided with no photo ($p = .03$; the difference between appearance and health was not significant, $p = .13$, and the difference between the health frame photo and no photo condition was also not significant, $p = .49$). Importantly, analyses also showed that for participants given the appearance frame photo, reminders of mortality increased intentions to use sun protection relative to those not reminded of mortality, F (1, 77) = 4.19, $p < .05$ (see Figure 5). For participants given the health-framed photo, or not given a photo, the pattern was in the opposite direction, with reminders of mortality showing trends toward decreasing intentions (*p*s > .14).

The same 2 (Prime: Mortality vs. Control) X 3 (Photo Frame: Appearance vs. Health vs. No Photo) ANCOVA on participants' body sun protection intention scores revealed no main effects or interactions (*p*s > .11), but the marginal trend of the interaction between mortality and the photo manipulation ($p = .12$) was in the same direction as the results for facial sun protection intentions.

We also examined participant mood after the mortality salience prime and found no effect of the manipulation on either positive or negative affect (*p*s > .9). Further, controlling for affect did not influence the critical Prime X Photo Frame interaction.

Discussion

These results replicate Study 1 by demonstrating that the UV photo intervention increased sun protection intentions in the context of a mortality prime, but extend the findings to show that it is consequences for one's appearance, and not one's health, driving the effect. By isolating the appearance aspect of the UV photo, Study 2 provides evidence for the key role of appearance concerns through which raising the prospect of death helps to augment the impact of the UV photo intervention on sun protection intentions. In addition, using a well-validated mortality salience manipulation allows us to more confidently pinpoint the role of death-related cognition in these effects.

General Discussion

Two studies supported the hypotheses that UV photo tanning interventions are relatively more effective when paired with cognitions about mortality, and that this increased effectiveness is due to mortality cognitions engaging motivations that capitalize on the potential for such interventions to highlight concerns about appearance. Study 1 showed that the effectiveness of UV photography, traditionally construed as an appearance-based intervention (Mahler et al., 2003; Gibbons et al., 2005), is enhanced when coupled with mortality reminders. This was the case for both the self-report and behavioral measures.

Although reminders of mortality increased the efficacy of the UV photo compared to the regular photo in Study 1, this study did not find that priming mortality in conjunction with the UV intervention significantly increased sun protection intentions relative to those not reminded of their mortality. We speculated that the effects of mortality salience might have been stifled on account of the UV photo intervention raising not only appearance concerns, but health concerns as well. Study 2 experimentally disentangled appearance-related concerns from health-related concerns. When the photo was framed as showing damage that could negatively impact appearance, reminders of mortality increased sun protection intentions. In contrast, when the photo was framed as showing sun damage that could negatively impact health, reminders of mortality had no effect on intentions to use sun protection. Importantly, in both studies, these effects were independent of individual differences in facial appearance satisfaction, suggesting that it was the implications of the sun damage for appearance (or health) and not a more general concern about the appearance of the face that was driving the effect of the UV photo manipulation.

Implications of TMHM for Appearance-Based Interventions

The current studies have important implications for understanding the role of cognitions about death in appearance-based tanning interventions. Previous research has demonstrated that framing pale skin as attractive decreases tanning intentions among both lab participants and beachgoers when participants were primed with death-related thoughts (Cox et al., 2009). The current studies extend this work, using TMHM to flip the prediction. That is, in the same way that non-conscious mortality reminders decrease tanning intentions when “not tanning” is framed as attractive, highlighting the negative appearance consequences of tanning was here shown to decrease intentions to tan. Future research should more clearly ascertain whether it is concerns with avoiding negative consequences or meeting positive standards of appearance that provides a more effective route to changing sunbathing behavior in conjunction with reminders of mortality.

The current studies also have implications for appearance-based interventions that have traditionally targeted damage to facial appearance (i.e., wrinkles, dark spots; Mahler et al., 2003, 2006). In both Studies 1 and 2, when mortality was primed, the effectiveness of the appearance-based UV photo intervention was limited to facial sun protections. This may reflect that the face is the first and most visible part of the body that would be judged on appearance, and thus whether it has been damaged by excessive, unprotected sun exposure may be especially important when appearance concerns are motivating decision making. Thus, one consideration that the present work highlights is that, to the extent that one’s motivation concerns appearance and not health, an individual’s behaviors may fall short of a presumably more holistic approach to protecting one’s health, leaving the door open to significant health risk.

Implications of TMHM for Additional Routes to Changing Sun Protection Behavior

Although this work focuses on appearance as a means to impact sun protection behavior, we do not mean to imply that appearance is the only route to affecting sun protection behavior. Social norms, for example, can play an important role in the motivation to engage in health behavior (Reid, Cialdini, & Aiken, 2010), and research shows specifically that injunctive

norms are effective in increasing sun protection behaviors (Reid & Aiken, 2013). Similarly, previous TMHM research utilizing a “pale is pretty” communication (in which participants read an article suggesting that pale skin is fashionable) implicates normative pressure in addition to concerns about appearance. From the perspective of terror management theory, social norms have more influence when thoughts of death are accessible, and thus, building on the work of Reid and Aiken (2013), it may be possible to increase sun protection with messages highlighting social approval for sun protection behaviors in the context of also priming thoughts about death. Such an approach would perhaps also lead to more encompassing sun protection behavior, in contrast to the focus on the face observed in the current studies.

Although this research speaks to the relevance of esteem-related processes, we do not intend to suggest that other social and psychological factors are irrelevant to decisions concerning tanning and sun protection. Several different health models have identified important factors for affecting a variety of health behaviors including perceptions of risk (De Vries, Mesters, van-de-Steeg, & Honing, 2005), perceived behavioral control (Godin & Kok, 1996) and perceived self-efficacy expectations (De Vries, Dijkstra & Kuhlman, 1988; Berndt et al., 2013). Research specifically examining sun protection has identified multiple predictors of behavior including perceived need for, efficacy of, and consequences of sunscreen use (Turrisi, Hillhouse, Gerbert & Grimes, 1999), as well as knowledge of social norms regarding sun protection (Mahler, Kulik, Butler, Gerrard, & Gibbons, 2008). Thus, health behaviors are likely influenced by a series of complex processes, and this research identifies the specific conditions under which self-esteem maintenance may be a stronger motivation for behavior change than health maintenance.

Implications for the Application of TMHM

This research helps to further extend TMHM from a tool to explain health motivations to an effective guide for designing interventions that can channel those motivations to productively impact health-relevant decisions. While much TMHM research has used conventional manipulations of mortality salience involving explicit questions about one’s own death (e.g., Study 2), Study 1 follows in the footsteps of some recent studies demonstrating that mortality can be primed in the context of a health communication (e.g., Hansen, Winzeler, & Topolinski, 2010). Cooper et al. (2012) found that this same prime depicting a funeral scene of a woman tanning on a beach effectively increased conscious thoughts of death, and further, led to increased sun protection intentions when sun protection was framed as an effective health behavior. Cooper et al. (2012) were testing the utility of the mortality salience prime to induce conscious thoughts of death, however; whereas Study 1, by incorporating a delay, extended the utility of the funeral scene to presumably increase accessible death-related thought outside of focal attention and thereby initiate esteem-relevant motivation. Moving forward, it would be useful to develop communications that elicit non-conscious thoughts of death without a delay to use in the context of print advertisements; the delay format could work effectively in the context of a television advertisement. Future research should continue to expand the repertoire of methods for eliciting conscious and non-conscious thoughts of death in the context of health promotion efforts so as to increase understanding of how such cognitions influence health behavior.

Additionally, Study 1 adds to a growing body of evidence that TMHM can be used to help understand how cognitions about mortality influence actual health behaviors. Goldenberg, Hart, Arndt, and Routledge (2008), for example, found that mortality salience decreased future intentions to conduct a breast self-exam and time spent conducting a self-exam on a breast model among women reminded of their physical nature. Likewise, Cox and colleagues (2009) found that mortality salience increased sun protection intentions when attractiveness was associated with pale skin and increased the SPF strength chosen for a sun product. The current study provided additional evidence for the behavioral effects of mortality reminders by showing that participants selected more free samples of an SPF 30 sunscreen when they viewed a UV photo highlighting the appearance damage caused by excessive sun exposure. The finding that the behavioral effects mirrored participants' intentions is suggestive that TMHM can be a useful model for promoting behavioral health.

Limitations

While these studies provide insight into how mortality salience and appearance interventions can be utilized to promote sun protection behaviors, they are not without limits. First, this research relies on a relatively small, homogeneous sample of young, female, and primarily Caucasian college students. Although appearance norms exist for all genders, ages, and races, it is unclear whether the effects of these manipulations would generalize to other populations. Further, this research was conducted in Florida, where there is nearly year-round sunshine and daily sun exposure is almost unavoidable. The appearance-based intervention may be less compelling in a region where constant sun exposure is not such a prominent concern. In addition, Study 1 included an assessment of behavior by measuring the amount of sun block each participant took. There is a difference, however, between taking sunscreen and actually using it. Thus, a limitation of this research is that tanning behavior was not measured directly, and moreover, long-term behavioral effects were not assessed. Future research should extend this work further by examining tanning behavior both during the study and for a period of time subsequent to it using objective behavioral measures (i.e., skin tone measurement). Finally, the experiments we conducted were confined to a laboratory. Some new approaches involving computer tailored sun protection interventions delivered over the internet (De Vries et al., 2012) suggest that it may be possible to disseminate the impact of TMHM more widely in the future.

Conclusion

The current research highlights implications of death-related cognitions for behaviors that are relevant to both health and self (-esteem). Previous research using TMHM (Goldenberg & Arndt, 2008) has demonstrated that interventions reminding people of the deadly consequences of a particular behavior may actually, counter-intuitively, lead to increased engagement in that behavior, if a person's self-esteem is contingent on it. In the case of intentional tanning, research has shown that intentions to tan increase when thoughts of death are activated, but no longer in focal awareness (Routledge et al., 2004). But TMHM also specifies a path to facilitate positive health outcomes by virtue of the relevance of the behavior for self-esteem. To the extent that people are motivated to maintain their self-esteem when thoughts of death are activated, this research suggests that it may be possible to

improve the efficacy of an appearance-based sun exposure intervention by pairing it with an intervention aimed at activating thoughts about death.

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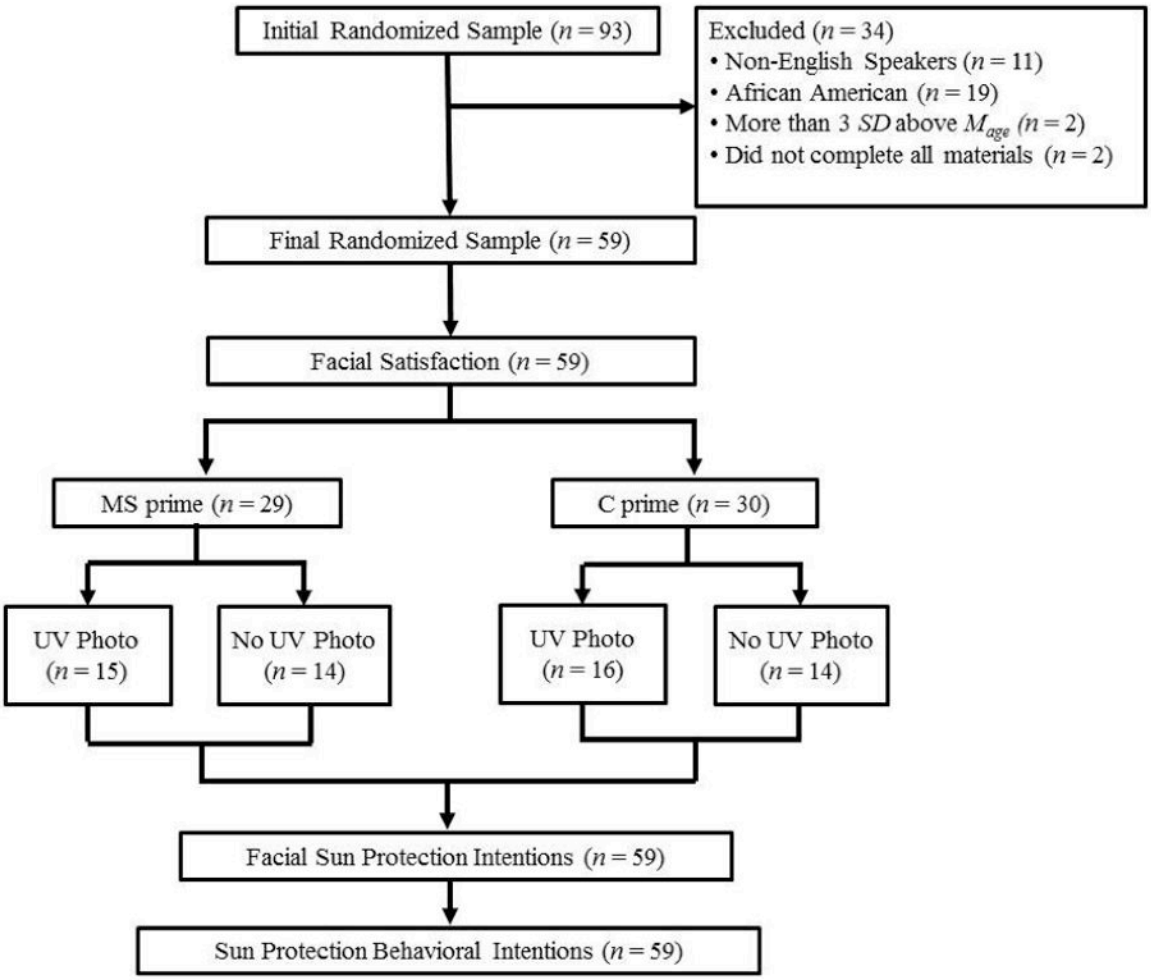

Figure 1.

Participant numbers and flow through procedures of Study 1. Note: MS Prime = mortality salience with death-related image; C Prime = Control with no image.

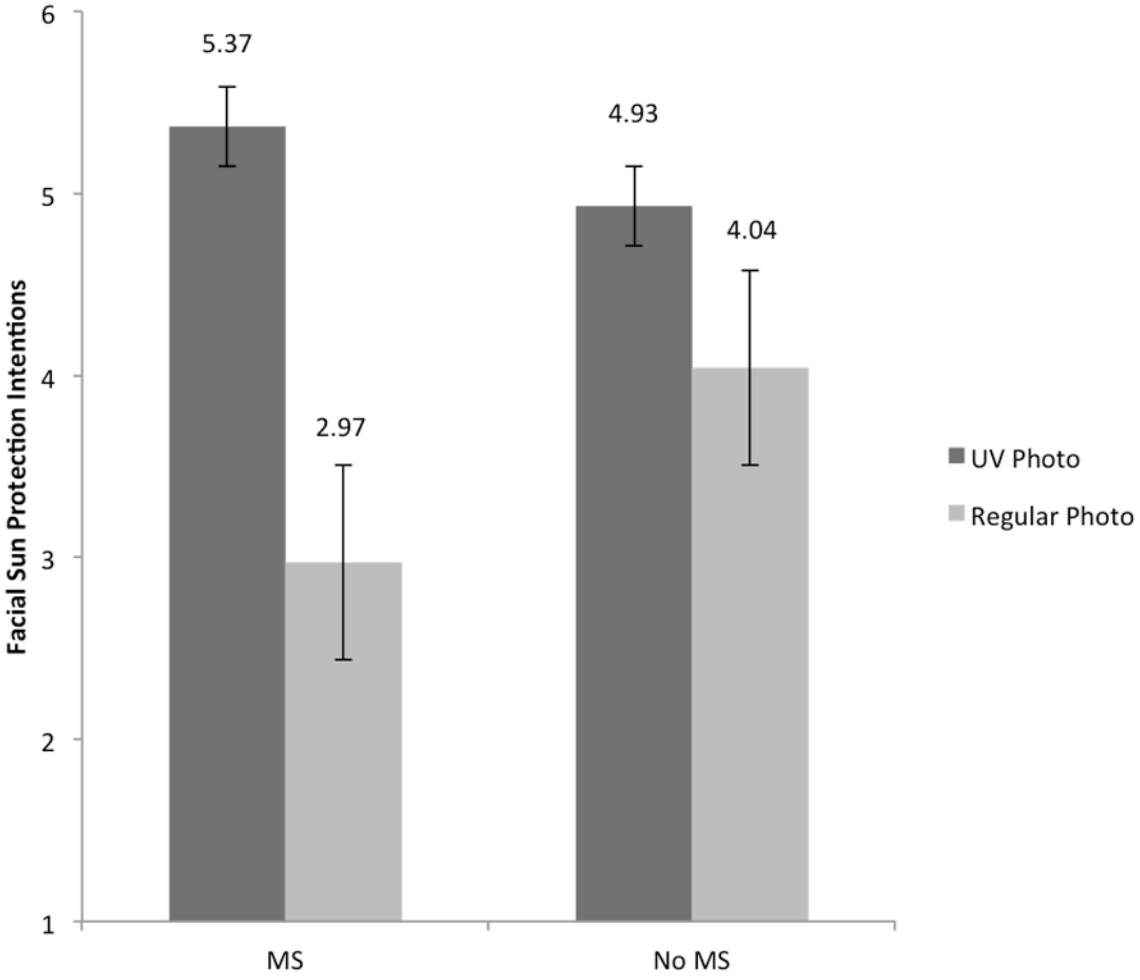

Figure 2.
Intentions to use facial sun protection by mortality salience and UV photo intervention, controlling for facial appearance satisfaction.

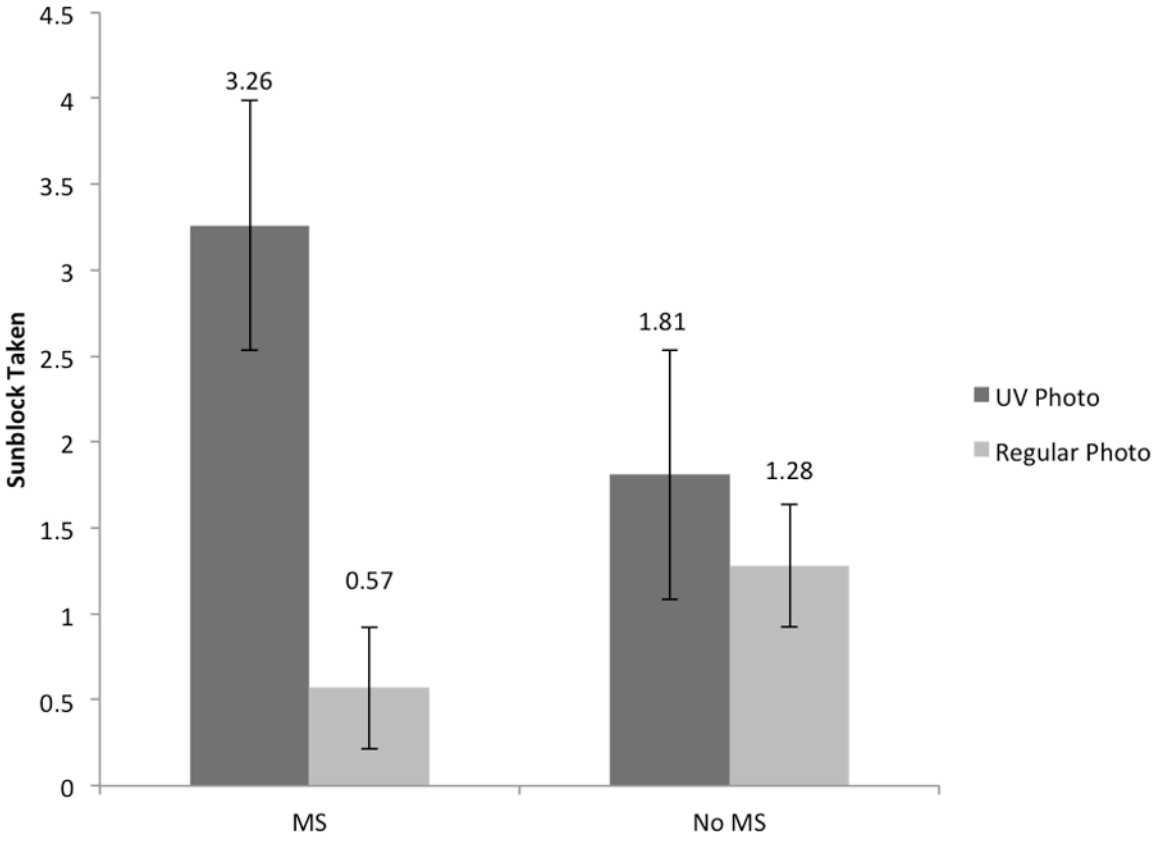

Figure 3.

Number of sunblock packets taken by mortality salience and UV photo intervention, controlling for facial appearance satisfaction and number of candies taken.

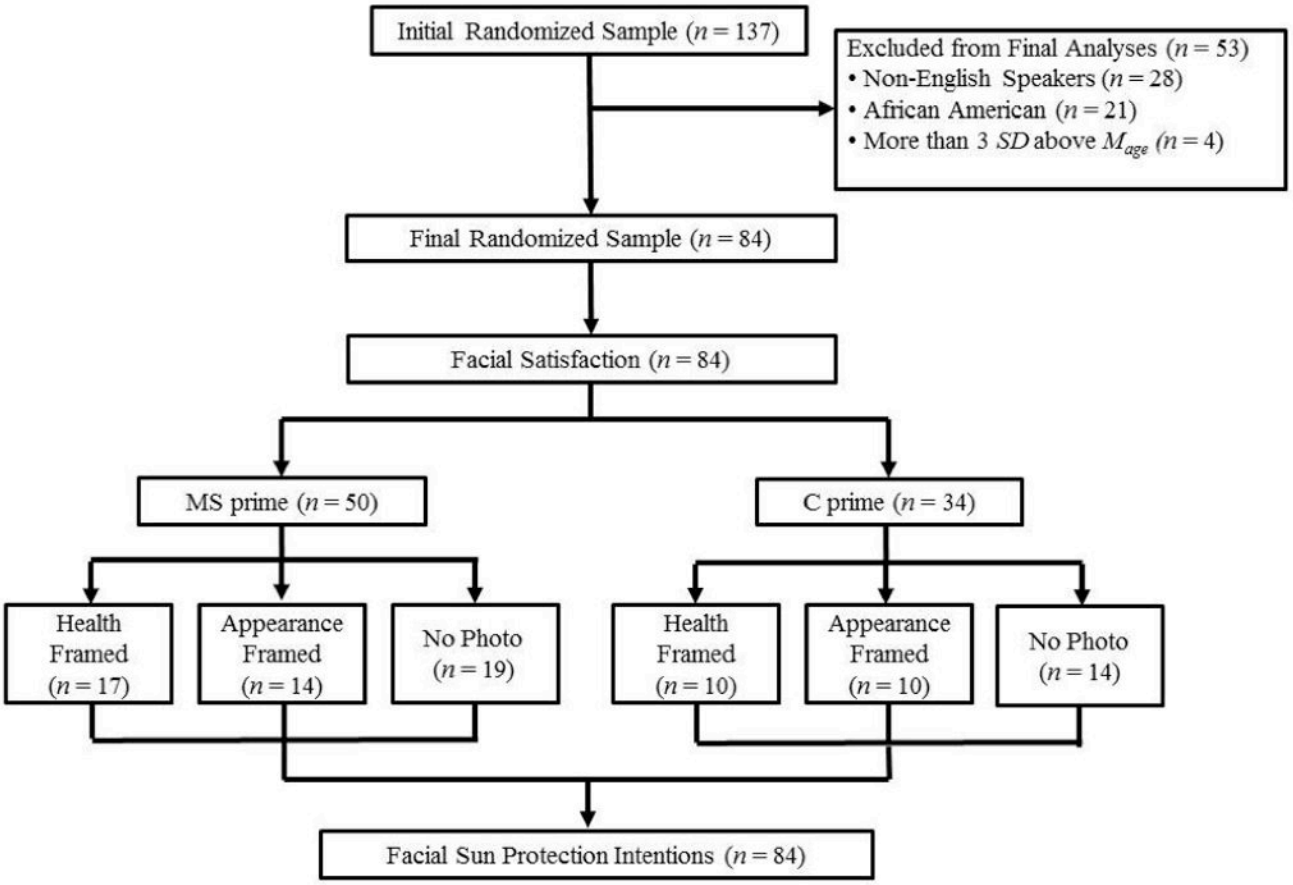

Figure 4.

Participant numbers and flow through procedures of Study 2. Note: MS Prime = mortality salience questions; C Prime = Control with intense pain salience questions. Health Framed = UV Photo accompanied by message highlighting health consequences of sun damage; Appearance Framed = UV Photo accompanied by message highlighting appearance consequences of sun damage.

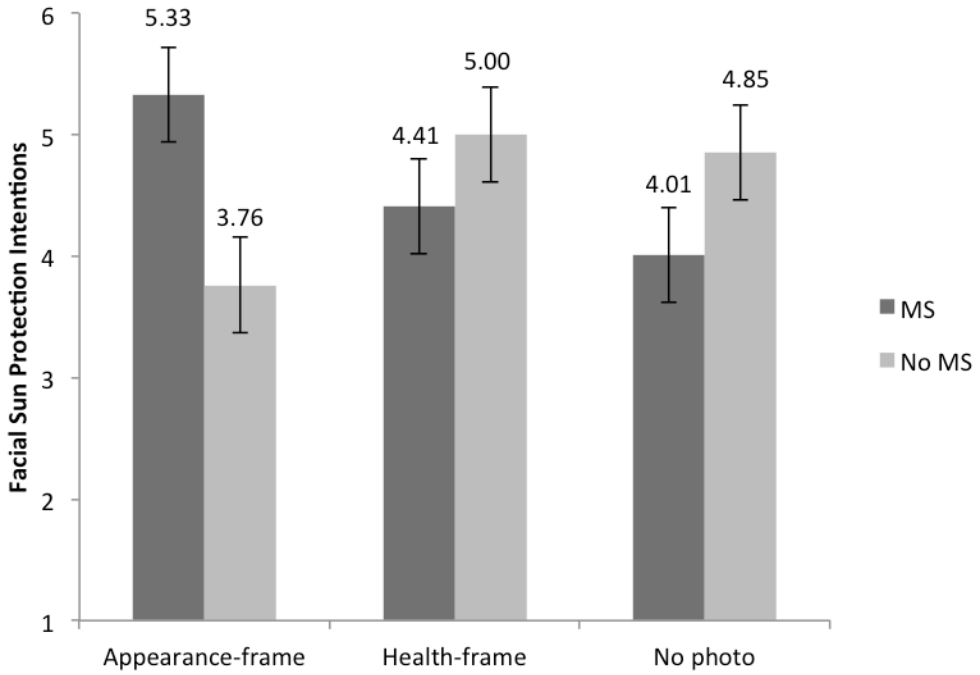

Figure 5.

Facial sun protection intentions by mortality salience and photo frame, controlling for facial appearance satisfaction.