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To Protect or Not to Protect: Examining Reasons for Sun Protection among Young Women at Risk for Skin Cancer

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Abstract

We aimed to further the understanding of the low rates of sun protection in young women at risk for skin cancer. Six-hundred-sixty-one daily diary entries were received via text message over 14 days from 56 young women at moderate to high risk of developing skin cancer. Women reported whether or not they used sun protection and also listed what their reasons were for using protection or not using sun protection each day. Multi-level modeling was used to examine the influence of study variables when predicting daily sun protection or lack of protection. The number of days in which sun protection was reported was positively associated with “habit” and “prevention” as reasons for protection and negatively associated with “not-needed” and “unprepared” as reasons for non-protection. Self-reported sun protection increased over the 14-day study period. Results of this study suggest the potential value of interventions aimed at motives for sun-protection behaviors.

Keywords

skin cancer; sun protection; young women; psychosocial; daily diary; multi-level modeling

Introduction

Melanoma is one of the most commonly diagnosed cancers in young adult women (Wu et al., 2005). Risk factors for developing skin cancer are greatly influenced by behavior, such as failing to adequately protect oneself from ultraviolet (UV) exposure (Gandini et al., 2005). Young adults have especially high rates of UV exposure (Coups et al., 2008).

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Compliance with ethical standards:

Human and animal rights and Informed consent. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

However, 50 to 85 percent of them fail to properly protect themselves from the sun (e.g., wear adequate sunscreen; Cokkinides et al., 2009; Jones et al., 2012). For these reasons, it is important to investigate psychosocial correlates of sun protection behavior in this population in order to help design effective interventions.

Studies show that greater engagement in sun protection is associated with positive attitudes about appearance and self-image, sunscreen self-efficacy, and intentions to avoid sun and cover up (Cafri et al., 2006; Coogan et al., 2001; Heckman et al., 2017), which suggests that sun protection may be linked with an overall orientation toward skin health awareness and behavior. These findings are also consistent with the Health Belief Model (HBM; Rosenstock, 1974), which has been helpful in identifying psychosocial constructs associated with sun protective behaviors. HBM constructs, such as perceived benefits of engaging in a behavior, have been highly predictive of health behaviors (Carpenter, 2010) including skin cancer risk and preventive behaviors in several studies (Davati et al., 2013; Lee, et al., 2014; McWhirter & Hoffman-Goetz, 2016; Skiveren et al., 2010). For example, research has shown that people are more likely to protect themselves from the sun if they perceive skin protection to be beneficial to one's skin health (Heckman et al., 2017). HBM constructs have also been used in developing some interventions that have successfully impacted behaviors associated with skin cancer risk (e.g., Darlow & Heckman, 2017; Geller et al., 2006; Glanz et al., 2010).

Despite the considerable literature on sun protection, less is known about the specific reasons why at-risk young adults, particularly Americans, protect or don't protect themselves from the sun. Exploration of these reasons could help inform intervention development. Studies from other parts of the world have found the following: English primary (41.7%) and secondary (29.5%) students who reported not protecting their skin because they wanted a tan were also more likely to report sunburn (Horsley et al., 2002); Queensland, Australia residents reported that they protected themselves out of a desire for good health and did not protect themselves when they perceived themselves not to be outdoors long enough to get burned (Stanton et al., 2005). Another study employed qualitative research methods to explore why adolescents protect themselves from the sun (Paul et al., 2008) in more depth. In this study, reasons for using sun protection included appearance (e.g. avoiding facial burns, moles, or wrinkles), personal comfort (e.g. avoiding sunburn pain), fear of skin cancer, parents' expectations, peer actions (e.g. sharing sunscreen or encouragement of sunscreen use by peers), and habit. Reasons for not using sun protection included desire to tan, inconvenience, and low perceived risk for skin cancer. However, this study examined adolescents (ages 12–17) in Australia who were at average risk for skin cancer; whereas, in the current study, the focus was on young adult women in the U.S. (ages 18–29) who were at moderate to high risk for developing skin cancer. It is possible that Americans who are at moderate to high risk for skin cancer may have different attitudes and beliefs regarding sun protection compared to the average-risk populations evaluated in the prior studies from elsewhere. Moreover, prior studies captured retrospective rather than daily diary data. As well, interventions aimed at promoting healthy motives for sun-protection behaviors among a moderate to high risk population may differ compared those who are average risk.

Objectives

Given the persistently low level of sun protection in young adults, it is necessary to explore in depth the potential reasons for their behavior. Our first objective was to employ a daily diary method comprised of quantitative and open-ended questions to explore day-to-day sun protection behavior and reasons for protection or non-protection in young adult women at risk of developing skin cancer. Diaries are self-report instruments which offer the opportunity to investigate psychological and physical processes within everyday situations. This method, using electronic data entry and submission, recognizes the importance of the timing and context in which behavioral processes unfold (Bolger et al., 2003). Consistent with prior research, we expected that many participants would not protect their skin consistently and that their reasons would be similar, yet not identical, to those found by Paul and colleagues (2008), due to the differences in populations. Our second objective was to use multi-level modeling to examine the influence of study variables (i.e., self-identified reasons for daily protection and non-protection, skin cancer risk, and constructs from the Health Belief Model) when predicting sun protection. We posited that the specific self-identified reasons for protecting or not protecting oneself would be particularly influential on sun protection behaviors, as these variables reflected participants' own motivations for sun protection behaviors across the two-week daily diary period. Thus, self-identified reasons assessed daily are more relevant to the immediate context of daily sun protection, as opposed to other more generic psychological variables only assessed at baseline. Specifically, it was predicted that self-identified reasons for daily protection and non-protection would be stronger predictors of these behaviors compared to more generic constructs from the Health Belief Model which were assessed only at baseline.

Method

Overview

The current study involved planned analyses utilizing daily diary data from a larger pilot study that examined the effects of daily behavior tracking and individually tailored text messages on sun-safe behaviors in young women (Darlow & Heckman, 2017). The full intervention study methods and results are reported elsewhere (Darlow & Heckman, 2017). We asked participants each day for 14 days whether or not they used sun protection. As well, participants were asked to report their reasons for using or not using protection each day. Multi-level modeling was used to analyze the data. This statistical analysis is commonly used with diary studies and allows researchers to estimate within-person change over time, as well as between individual differences.

Participants

Women (N = 56), ages 18–29, from a metropolitan region in the US northeast were recruited using online methods (i.e. Craigslist) and flyers and email announcements distributed at local colleges, train stations, and community bulletin boards. Female respondents were eligible to participate in the study if they met criteria for moderate to high risk of skin cancer based on the Brief Risk Assessment Tool (see below) (Glanz et al., 2003) and owned a mobile phone. Those with a personal history of skin cancer were not eligible to participate. Participants' ages ranged from 18 to 29 (M = 24.4) years. The racial self-identification of

participants was as follows: 89.3% White, 8.9% Asian American or Pacific Islander, and 1.8% Other or Mixed. One participant (1.8%) identified as Hispanic or Latino. All women had received a high school degree, a majority (76.8%) held college or advanced degrees, and 16.1% held an associate's degree or received some college. Approximately 32% of the participants reported a family history of skin cancer.

Procedure

After completing an online screener form and meeting the study's eligibility criteria (women ages 18–29; mobile phone owner; no personal history of skin cancer; at least moderate risk of developing skin cancer), eligible individuals were invited to participate via email. Participants completed an online consent form, followed by baseline assessments that were also completed online. The majority of study enrollments occurred in June or July. Participants in the parent study were randomized via block randomization into one of four study conditions (tailored text messaging only, daily diary only, both tailored text messaging and daily diary, or assessment only). The analyses described in this paper include only the participants from the daily diary conditions. Fifty-six participants received the daily diary intervention, which involved completing daily entries via text message tracking their UV exposure and protection behavior for 14 days. This time period is the standard assessment for studies utilizing daily diary methods (Gautreau et al., 2015). Diary prompts were sent in the evening, prompting participants to indicate whether or not they used sun protection that day. Daily entries also prompted participants to report why they protected or did not protect themselves that day. Half of the participants ($n = 28$) were randomly assigned into an additional intervention that involved receiving tailored text messages in the morning. Participants received these tailored text messages based on their responses to survey items pertaining to the Health Belief Model, aimed at developing more supportive attitudes towards sun protection. The lowest mean score for each of six HBM constructs (i.e., benefits, barriers, susceptibility, severity, self-efficacy, cues to action) determined which sets of messages participants received. For example, participants who scored low on benefits of sun protection, received a message such as “Protect your skin today, and look younger when you're older!” Participants who completed all assessments received a total of \$50 in gift cards and were entered into a raffle for an additional \$100 gift card.

Measures

Skin Cancer Risk—The Brief Skin Cancer Risk Assessment Tool was assessed at baseline and was used to determine study eligibility. This internally consistent measure (Glanz et al., 2003) was designed to identify those at moderate or high risk of developing skin cancer. The seven risk factor items include number of moles, presence of freckles, childhood location, sunburn, skin color, hair color, and sun sensitivity. Participants receive a score based on their responses indicating if they are low, moderate, or high risk of skin cancer. Women who met at least moderate risk criteria (17 out of 68) for skin cancer were invited to participate in the study.

Daily Diary Measures—The outcome measure of protection behavior consisted of one item asked every day for 14 days: “Did you protect your skin from the sun today? (e.g., wore sunscreen, wore a hat, wore sunglasses, wore protective clothing, and stayed in the shade).”

Responses were dichotomous, 0 = no, 1 = yes. *Reasons for protection* were assessed each day by asking participants “Why did you protect your skin from the sun today?” *Reasons for non-protection* were also examined each day by asking, “Why didn’t you protect your skin today?” Reason responses were open-ended, up to 8 reasons could be listed, and participants could skip to the end of the entry depending on whether or not they protected themselves that day.

HBM variables—HBM constructs were assessed at baseline. *Perceived skin damage* was assessed using three items (e.g., I already have some long-term damage from the sun or tanning) (Heckman et al., 2017) with Likert-style responses that ranged from 1–5 (strongly disagree to strongly agree ($\alpha = 0.72$)). *Perceived severity of and worry about skin cancer* was assessed using six items adapted from several measures (Aiken et al., 1994; Buller et al., 2006; Cameron & Diefenbach, 2001). Items (e.g., “I am worried about getting skin cancer”, “People cannot die from skin cancer”) included Likert-style responses that ranged from 1 (strongly disagree) to 5 (strongly agree) ($\alpha = 0.61$). *Perceived benefits of using sun protection* were assessed using a questionnaire developed by Ingledew and colleagues (2010). The nine items pertained to appearance (e.g., “To prevent my skin from ageing too quickly”) and health/well-being (e.g., “To avoid getting skin cancer”) benefits of protecting one’s skin from the sun. Likert-style response options ranged from 1 (strongly disagree) to 5 (strongly agree). This measure was internally consistent in this sample ($\alpha = 0.88$). *Perceived barriers of using sun protection* (e.g., weather is cool or cloudy; sunscreen isn’t around) (Robinson et al., 2008) consisted of eight Likert-style items with response options ranging from 1 (strongly disagree) to 5 (strongly agree). This measure was internally consistent in this sample ($\alpha = 0.76$). HBM variable scores were calculated as averages for each participant.

Data Coding

Measures developed for assessment of perceived benefits and barriers of sun protection were used to develop the coding scheme for the reasons for protection and non-protection provided by the participants as part of their daily diaries (e.g., Buller et al., 2006; Ingledew et al., 2010; Robinson et al., 2008). Reasons listed for protection were coded into six categories that captured the content and were consistent with the existing literature. One category of reasons for protection corresponded to habit (e.g., “I always try to protect my skin”), another category pertained to general health reasons (e.g., “Concerned about health”), and the other four categories corresponded to prevention: to prevent burning (e.g., “I burn easily”), prevent skin cancer (“I don’t want skin cancer”), prevent photo-aging (e.g., “To avoid wrinkles”), and prevent general skin damage (e.g., “To take care of skin”). Reasons for non-protection were coded into two categories: not-needed (e.g., “I was inside all day” or “Was cloudy out”) and unprepared (e.g., “I ran out of sunscreen” or “No time”). Each of the open-ended responses regarding protection and non-protection was coded by two trained research assistants, and disagreements were resolved by the study investigator. Interrater reliability was assessed by calculating Cohen’s Kappa, 0.96 ($p < .001$), which indicates substantial reliability (Landis & Koch, 1977).

Reasons data were transformed into score for each individual: the number of times a participant endorsed each reason category was divided by the total number of reasons they listed over the span of 14 days. Therefore, a total of eight proportion scores were calculated for each participant, with each score pertaining to the eight different reason categories (i.e., six reasons for protection and two reasons for non-protection). For example, if a participant listed “prevent sunburn” as a reason for protection on seven out of the 14 days, and listed habit as a reason for protection on the other seven days, then she scored 50% for the “prevent sunburn” category, 50% for the “habit” category, and 0% for the other four reason categories.

Data Analysis

Data were assessed for normality. Each variable was examined for missing values. For variables with 10% or less missing data, missing values were replaced using mean imputation. When one item from a multi-item scale was missing, the participant’s mean score on that scale was substituted for the missing value. In order to treat missing daily diary data, maximum likelihood estimation was used, an approach that includes the missing data points in the analysis (Enders, 2011).

Daily protection was operationalized as both a within-person variable and a between-persons variable. Within-person *daily protection* consisted of 14 yes or no responses for each daily participant response. Between-persons *overall protection* involved calculating the total number of days sun protection was used for each participant, with values ranging from 0 (no daily protection) to 14 (everyday protection). Sun protection behavior and other HBM constructs did not differ significantly between the diary plus tailored messages vs. diary only intervention groups (data not shown); thus, data from the two groups were combined. Descriptive statistics and correlations were examined among study variables.

Multi-level modeling, which allows for analysis of both within-person and between-persons factors, was used to examine the relationship between baseline predictors, reasons for protection/non-protection, and within-person daily protection. The within-person model allowed us to investigate whether the number of days in which sun protection was reported was associated with daily diary variables. The within-person model also allowed for assessment of individual change in protection behavior over a two-week time period. The between-persons model allowed us to examine individual differences (i.e. perceived skin damage, perceived severity, perceived benefits, perceived barriers, skin cancer risk, and reasons for protection/non-protection) in protection correlates across individuals.

Results

Descriptive Statistics

All 56 participants completed the baseline assessment. Of the 784 possible daily entries (56 participants $\times$ 14 days), 661 daily entries of protection behavior were completed, a completion rate of 84.4%. Of the 661 daily protection entries, women reported using protection in 319 entries (48.3%). On average, participants used sun protection about half of the time (6.69 out of 14 days). Out of the 56 participants, 12.5% used protection for all 14

days, 8.9% did not use any protection during the 14 days, and the majority (78.6%) used protection on some of the days.

Table 1 shows the number of participants that listed reasons for protection or non-protection at least once out of the 14 days. Descriptive statistics and correlations among study variables are reported in Table 2. Only two out of the six reasons for protection, prevent burning ($r = .31$) and prevent skin cancer ($r = .29$), were positively associated with overall protection. One out of two reasons for non-protection, not-needed ($r = -.46$), was negatively associated with overall protection. Out of the four HBM variables, only perceived benefits was significantly positively associated with overall protection ($r = .33$). Skin cancer risk was not associated with overall protection.

Multi-level Modeling Analysis

The results of the multi-level modeling analysis predicting within-person daily protection are presented in Table 3. With the exception of general health reasons, seven out of eight reasons for protection and non-protection significantly predicted daily protection (all p 's < .01). Baseline skin cancer risk significantly predicted daily protection $t(580) = 4.36$, $p < .01$. None of the HBM variables predicted daily protection (all p 's > .05). Daily protection changed over time $t(414) = 3.08$, $p < .01$, with protection increasing over the 14 day period, from approximately 35% protecting themselves to 60%.

Discussion

Given the persistently low level of sun protection in young adults, it is important to understand why young people may or may not protect themselves from the sun. In the current study, we explored reasons for protection and non-protection in young women. Univariate associations indicated that women with higher overall sun protection were more likely to perceive greater benefits of using sun protection, and were also more likely to report prevent burning and prevent skin cancer as reasons for protection. Findings also suggest that those with less overall sun protection were more likely to report that protection was not-needed as a reason for not using protection. According to the multi-level modeling analysis, the number of days in which sun protection was reported was positively associated with habit and prevention (i.e. prevent burning, aging, general skin damage, and skin cancer) as reasons for protection. Results also showed that the number of days in which sun protection was reported was negatively associated with not-needed and unprepared as reasons for non-protection. We also found that the act of reporting sun protection behaviors via daily diary may have helped to increase sun protection use over time. Although it was expected that the HBM would be predictive of sun protection behavior, the results did not confirm this.

Reasons for protection in the current study were similar to prior research in this area (Paul et al., 2008), demonstrating that habit and prevention of skin damage are frequently cited reasons for using sun protection in those who tend to protect their skin. It is notable that approximately half of the sample reported habit as a reason for protection at least once in their daily diary, which was more frequently endorsed than any other protection reason. There has been little prior research examining habitual sun protection. Habits are a pertinent

aspect of routinized behaviors, as once a habit is formed, it can become engrained into one's routine (Langer & Moldoveanu, 2000). When such behaviors are fully automatized, and the cues that stimulate them are constant, then these habits can be effortless and occur without much thought. Several health-related behaviors have been shown to have a habitual component, including hand hygiene (Aunger et al., 2010) and brushing teeth (Aunger, 2007). A primary skin cancer prevention goal is to make skin protection habitual. It is also notable that some habits are formed not necessarily by their daily use, but by the contexts that stimulate their use. For instance, if one is going to be sitting indoors all day, then sunscreen protection is clearly not necessary on such days. However, one can develop a habit of using sun protection on days that they will be going outdoors. Another frequently reported reason for protection was to prevent burning. The higher endorsement of this reason may be explained by the fact that burning has a more immediate effect on people's skin compared to the other prevention outcomes, such as the development of skin cancer, which tends to develop over longer periods of time. Though potentially unaware of this fact, the current sample was also at moderate to high risk of developing skin cancer, due in part to having more UV-sensitive skin.

Also similar to prior research, we found that being unprepared to protect one's skin (e.g. forgetfulness) was a common barrier to using sun protection (Robinson et al., 2008). However there were some differences between our study results and previous research. According to Paul et al., (2008), a desire to tan was found to be an important reason not to use sun protection, whereas in the current study, such reasons were never reported. However, our study sample was comprised of young women, whereas those in the prior study were adolescents. Therefore, it is possible that the participants in the current study did not report tanning as a reason for non-protection, as they may be more knowledgeable or aware of the long-terms costs associated with this behavior.

"Not-needed" was often reported as a reason for non-protection, and 78% of the participants reported it at least once in their daily diary. It is possible that some participants believed that sun protection was not needed because they didn't know they were at risk for developing skin cancer. Several participants reported that sun protection was not-needed because they did not experience UV exposure on those days or because the weather was cool or cloudy.

Multi-level model findings supported our hypothesis that, with the exception of general health reasons (e.g., concerned about health), reasons for protection and non-protection are associated with daily protection. However, skin cancer risk was also associated with higher daily protection, which is consistent with prior research (Heckman et al., 2017). Contrary to prior research (Carpenter, 2010), HBM constructs (e.g. perceived benefits and barriers of using sun protection) did not significantly influence daily protection. It is possible that specific reasons for protection and non-protection, which were assessed daily across the two week time period, were more relevant to the immediate context of daily protection than global variables only assessed at baseline. That is, sun protection and the reasons behind this behavior may be specific and situational and fluctuate from day to day, whereas attitudinal factors like perceived benefits of protection may be less likely to fluctuate over time.

This study had strengths, such as the use of the daily diary method. Daily diaries offer the opportunity to investigate psychological and physical processes within everyday situations and recognize the importance of the timing and contexts in which behavioral processes unfold (Bolger et al., 2003). The current study also utilized mobile technology, which has scarcely been used for skin cancer prevention. The use of multi-level modeling, the statistical analysis commonly used with diary studies, was also a study strength as it allows researchers to estimate within-person change over time, as well as between-individual differences.

There were some study limitations. Although a relatively large number of data points were collected, the sample was relatively small and included only women at moderate to high risk of skin cancer, which potentially limits generalizability. Future research should be conducted similarly with other populations. Another limitation is that our measures were all self-report, the worry and severity scale had lower internal reliability ($\alpha = 0.61$), and skin protection was assessed with a single yes-no item rather than capturing types or levels of skin protection. However, several studies have demonstrated the reliability and validity of self-report questionnaires of UV protection compared to observation and objective measures (Daniel et al., 2009; Glanz et al., 2010). It is important to note that the measures assessing reasons for protection and non-protection could be improved by requiring a response rather than making the items optional. This modification could potentially result in participants reporting their motives more frequently, rather than reporting them intermittently throughout the study. However, it was also important to keep such measures as brief as possible, due to the already labor-intensive nature of daily diary studies.

Conclusions

In the current study, we found that habit and prevention (i.e. prevent burning, aging, general skin damage, and skin cancer) reasons were associated with more daily protection, and that not-needed and forgetfulness reasons were associated with non-protection. Study findings also suggest that reporting sun protection behaviors on a daily basis may increase one's use of sun protection, though this should be investigated in future studies. Results of this study underscore the potential value of interventions aimed at promoting healthy motives for sun-protection behaviors. Interventions that are tailored based on attitudinal variables, such as reasons for engaging in a health behavior, have been shown to be successful (Heckman et al., 2017). For example, interventions could promote understanding of the importance of skin damage prevention habits, emphasizing that such behaviors can become easy, effortless, and automatic once they are engrained in one's routine. Such interventions would be particularly helpful for those who do not already adhere to sun protection behaviors. Interventions that convey why sun protection is needed based on personal skin cancer risk and/or the intensity of the local UV index even on cold cloudy days or that help people become more prepared for sun protection (e.g., by having it available at all times) are worth exploring. Future studies should also investigate how specific interventions may minimize forgetfulness (e.g., forgetting to put on sunscreen) as reasons for not using sun protection. For example, sun protection reminders could be used, such as a mobile app that sends alerts on warm sunny days reminding those at risk to apply or re-apply sunscreen (Buller et al., 2015; Darlow & Heckman, 2017). Future investigations of implementation intentions may also prove useful

for improving sun protection adherence. Implementation intentions are the formulated plans for an individual to act on a certain behavioral intention, which can increase the likelihood of the intended behavior (Robinson et al., 2008). For example, one implementation intention strategy could involve providing young adults with step-by-step sun safety instructions to use on the days they plan to be outside for extended periods of time. Such implementation intentions can be used to increase motivation and engagement in sun safety behaviors.

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Table 1

Frequency of reasons for protection or non-protection (N = 56)

Reasons for protection	Frequency ^a (%)
Habit	28 (50.0)
Prevent burning	20 (35.7)
Prevent general skin damage	9 (16.1)
Prevent aging	8 (14.3)
Prevent skin cancer	5 (8.9)
General health reasons	3 (5.3)
Reasons for non-protection	
Not-needed	44 (78.5)
Unprepared	28 (50.0)

^aReason endorsed at least once out of the 14 day study period

Table 2

Correlations among study variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 Prevent burning	1	-0.03	-0.15	-0.14	-0.11	-0.43*	-0.25	0.00	0.08	-0.13	0.00	0.22	0.23	0.31*
2 Prevent aging		1	0.20	0.05	-0.02	-0.19	0.08	0.00	0.26	0.23	0.30*	-0.01	0.06	0.18
3 Prevent general skin damage			1	0.03	-0.07	-0.07	-0.20	0.34*	-0.05	-0.15	-0.02	-0.10	-0.14	0.23
4 Prevent skin cancer				1	0.02	-0.20	-0.12	0.01	0.10	0.33*	0.18	-0.10	0.10	0.29*
5 General health reasons					1	0.06	0.13	-0.06	-0.22	0.14	0.18	-0.12	-0.01	-0.07
6 Habit						1	0.07	-0.06	-0.09	-0.05	0.06	-0.05	-0.21	-0.12
7 Not needed							1	-0.49*	-0.06	-0.03	-0.08	0.18	-0.05	-0.46*
8 Unprepared								1	0.12	-0.02	-0.18	-0.08	0.07	0.02
9 Perceived skin damage (range: 1–5)									1	0.35*	0.13	-0.18	0.38*	0.10
10 Perceived severity of skin cancer (range: 1–5)										1	0.53	-0.37*	0.13	0.10
11 Perceived benefits of sun protection (range: 1–5)											1	-0.35*	0.05	0.33*
12 Perceived barriers of sun protection (range: 1–5)												1	0.02	-0.18
13 Skin cancer risk (range: 17–68)													1	0.24
14 Overall protection														1
Mean	-	-	-	-	-	-	-	-	2.5	4.1	3.9	2.9	29.5	6.7
SD	-	-	-	-	-	-	-	-	0.78	0.46	0.63	0.41	7.51	4.36

* $p < .05$;

Note Variables 1 through 6 = reasons for protection; Variables 7 through 8 = reasons for non-protection. Reasons were calculated as a proportion score for each individual: the number of times a participant endorsed each reason category was divided by the total number of reasons they listed over the span of 14 days. Overall protection was operationalized by calculating the total number of days out of 14 days that sun protection was used for each participant.

Table 3

Summary of multilevel model analyses predicting daily sun protection (N = 56)

Predictor	Estimate	SE	t (580)	Sig.
<u>Daily Diary Measures: Reasons</u>				
Intercept	0.18	0.31	0.58	0.56
Prevent burning	0.22	0.06	3.53	<0.01
Prevent aging	0.54	0.19	2.87	<0.01
Prevent general skin damage	0.68	0.14	4.80	<0.01
Prevent skin cancer	0.40	0.11	3.50	<0.01
General health reasons	−0.04	0.24	−0.16	0.87
Habit	0.16	0.05	2.96	<0.01
Not-needed	−0.45	0.06	−7.43	<0.01
Unprepared	−0.28	0.07	−3.81	<0.01
<u>Baseline Measures</u>				
Skin cancer risk	0.01	0.00	4.36	<0.01
Perceived skin damage	−0.04	0.03	−1.24	0.22
Perceived severity of skin cancer	−0.02	0.06	−0.31	0.75
Perceived benefits of protection	0.07	0.04	1.68	0.09
Perceived barriers to protection	−0.03	0.05	−0.51	0.61