Sun-Protective Behavior among Individuals with a Family History of Melanoma

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Abstract

Routine sun protection is recommended to prevent skin cancer. Skin cancer prevention may be particularly important for individuals at greater risk, such as those with a family history of melanoma. Our aims were to examine the prevalence of sun-protective behavior (SPB) in unaffected first-degree relatives (FDR) of individuals diagnosed with melanoma and to examine the relationship between protection motivation theory (PMT) variables (i.e., perceived risk, perceived severity, self-efficacy, response efficacy) and SPB. FDRs (n = 100), who were nominated by melanoma patients, completed a standardized, self-report questionnaire measuring demographic characteristics, melanoma risk factors, PMT variables, and SPB. The results indicated that less than one-third of FDRs used sunscreen routinely when in the sun and fewer stayed in the shade or used protective clothing on a frequent basis. FDRs with a college education and with more melanoma risk factors reported higher levels of SPB. Of the four PMT variables, greater perceived risk and greater self-efficacy were significantly correlated with higher levels of SPB. Furthermore, results of multiple regression analyses suggest that perceived risk mediated the relationship between education and SPB and between melanoma risk factors and SPB. These findings suggest that interventions to increase the frequency of SPB in at-risk individuals should highlight risk information as well as methods to improve individuals' confidence in their abilities to engage in SPB. (Cancer Epidemiol Biomarkers Prev 2006;15(1):142–5)

Introduction

Family history of melanoma is a known independent risk factor for the disease (1). Compared with individuals with no family history, those with an affected first-degree relative (FDR) have an ~1.7 times greater chance of developing melanoma (2). Among individuals who have an affected FDR, melanoma risk increases ~20-fold when at least two other risk factors are present (3). Although studies suggest that risk is greater from intense sun exposure in childhood (1, 4), sun exposure during adulthood could still affect melanoma development (5, 6). Thus, engaging in sun-protective behavior (SPB) may be important for FDRs.

To date, there has been limited research on SPB among FDRs of patients with melanoma. Bergenmar and Brandberg (7) assessed young adults with dysplastic nevi and at least two FDRs with melanoma. Although FDRs received skin examinations and counseling, results indicated that 59% used sunscreen with a high sun protection factor, 28% used protective clothing, and 22% stayed in the shade. In a study of adult siblings of melanoma patients, Geller and colleagues (8) found that 54% reported routine sunscreen use; participants who were female and had skin with a tendency to burn, a dermatologist, and greater knowledge of suspicious moles were more likely to use sunscreen routinely. Recently, Manne and colleagues (9) assessed SPB correlates in FDRs of melanoma patients. They found that, on average, FDRs ''often'' wore sunglasses and ''sometimes'' used sunscreen and protective clothing; greater SPB frequency was associated with having a physician who recommended SPB, fewer barriers to using sunscreen, and greater self-efficacy for sunscreen use, perceived benefits of SPB, and peer influence on both tanning and SPB.

Our study aims to obtain additional information regarding type and frequency of SPB among FDRs, examine background variables that could account for differences in SPB, and identify variables that could provide insight into possible mechanisms for changing SPB based on protection motivation theory (PMT; refs. 10-12), an approach with established utility in predicting health-related prevention behaviors (13). Based on this theory, we hypothesized that greater SPB would be associated with greater perceived risk and severity of melanoma, and greater self-efficacy and response efficacy for SPB.

Materials and Methods

Participants. Potential participants had to (*a*) be between 23 and 80 years old, (*b*) have no history of cancer, including basal cell carcinoma, (*c*) have a parent, sibling, or child diagnosed with melanoma within the past 5 years, and (*d*) be able to read and write English. The study was conducted concurrently with a study examining skin cancer screening; thus, age limits correspond with American Cancer Society recommendations that screening begin once every 3 years at age 20 (14).

Procedure. Melanoma patients (n = 319) were approached during a clinic visit or contacted by telephone and asked to provide contact information for their FDRs and allow medical record review. Of 150 patients (47%) who consented, 136 (43%) provided contact information, and 126 (39%) agreed to chart reviews. One FDR per patient was randomly selected to insure participants were unrelated to each other. Of 326 FDRs nominated, 189 were sent an introductory letter describing the study and were contacted via telephone and/or e-mail. Fifty-one could not be reached, and 14 were ineligible. Of the 124 eligible FDRs contacted, 100 (80%) returned complete questionnaires. Eligible FDRs who agreed to participate were mailed Institutional Review Board–approved study materials and contacted up to three times to be reminded to return

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forms. Participants returning questionnaires received $20 and information regarding skin cancer prevention and detection (15).

Measures

Background characteristics. Gender, birthdate, marital status, race, education, employment, income, zip code, melanoma risk factors, and melanoma family history were obtained via a standardized self-report measure. Zip code information was converted to a latitude estimate (16). Melanoma risk factors assessed were blonde or red hair, freckles, actinic keratosis, and history of three or more blistering sunburns before age 20 (1, 3, 17, 18). Risk status was calculated by summing the number of risk factors in addition to family history (possible range = 0-4). Family history items included number of affected FDRs and relationship type (e.g., sibling). Age, gender, race, diagnosis date, Clark level, and Breslow depth were obtained for each patient with a participating FDR.

Sun protection. Sun protection in the past 12 months was measured using seven-point scales (0 = never to 6 = always) that asked participants to rate how often they: used sunscreen with sun protection factor ≥15 on their face when in the sun, used sunscreen with sun protection factor ≥15 on their body when in the sun, wore protective clothing when in the sun, and stayed in the shade when outdoors. Similar to procedures used previously (17), these four items were summed to yield a total SPB score (Cronbach's $\alpha = 0.69$).

Table 1. Background characteristics and levels of PMT variables of the FDRs

	n (%)
Race	
White	98 (98%)
Biracial	2 (2%)
Marital status	
Married	78 (78%)
Not married	22 (22%)
Gender	
Male	43 (43%)
Female	57 (57%)
Education	
<College	47 (47%)
>College	53 (53%)
Employment status	
Employed	76 (76%)
Not employed	24 (24%)
Household income*	
<$40,000	23 (24%)
>$40,000	74 (76%)
No. of affected relatives	
One	97 (97%)
Two	3 (3%)
Relationship to melanoma patients	
Child	62 (62%)
Sibling	23 (23%)
Parent	15 (15%)
Risk factors in addition to family history	
None	32 (32%)
One	28 (28%)
Two	30 (30%)
Three	10 (10%)
	Mean (SD)
Age (range 23-72)	46 (12.8)
Latitude† (range 26.16° to 47.53°)	33.81° (6.45°)
Perceived risk	67.02 (25.52)
Perceived severity	17.64 (4.48)
Self-efficacy	18.9 (3.36)
Response efficacy	20.61 (3.23)

*Data not provided by three participants.
†Latitude is measured in degrees north of the equator.

PMT variables. PMT items were derived from previous research on perceived risk for breast cancer (19) and attitudes toward SPB (17). Participants were asked to rate the chance they would: develop melanoma during their lifetime (0 = 0% to 10 = 100%), develop melanoma during their lifetime if they never took actions to protect themselves from the sun (0 = 0% to 10 = 100%), and develop melanoma relative to other persons of similar age (1 = much lower to 5 = much higher). Items were converted to a standard metric and summed to create a total perceived risk score (Cronbach's $\alpha = 0.80$). A total perceived severity score (Cronbach's $\alpha = 0.60$) was derived by summing ratings (1 = strongly disagree to 6 = strongly agree) to five items (e.g., I don't consider melanoma life-threatening). A total self-efficacy for SPB score (Cronbach's $\alpha = 0.78$) was derived by summing ratings (1 = very difficult to 6 = very easy) to four items (e.g., How easy or difficult would it be for you to stay in the shade when outdoors). A total response efficacy for SPB score (Cronbach's $\alpha = 0.85$) was derived by summing ratings (1 = strongly disagree to 6 = strongly agree) to four items (e.g., wearing sunscreen with sun protection factor ≥15 regularly when in the sun would reduce my chances of developing melanoma).

Data Analysis. We did univariate correlational analyses or ANOVAs, as appropriate, to identify significant relationships between background and PMT predictor variables and SPB. Based on these findings, multiple regression analyses were conducted following procedures outlined by Baron and Kenny (20) to test whether PMT variables mediated relationships between background variables and SPB.

Results

Participant Characteristics. Average patient age was 57 years (SD, 14.8; range, 23-87). All were Caucasian, and most were female (53%). Mean time since diagnosis was 1.5 years (SD, 1.1), and average Breslow depth of invasion was 1.49 mm (SD, 1.29). Most patients had Clark level IV melanoma (52%). Information about the background characteristics of the FDRs appears in Table 1, along with the means and SDs for PMT variables. Information about their frequency of engaging in SPB appears in Table 2.

Relationship of Background Variables to PMT Variables. Greater perceived risk was associated with younger age ($P = 0.005$), being employed ($P = 0.03$), higher education ($P = 0.005$), income ($P = 0.02$), risk status ($P < 0.0001$), and patient disease stage ($P = 0.05$; see Table 3). Greater perceived severity was associated with higher risk status ($P = 0.04$). Greater self-efficacy was associated with lower patient Clark level ($P = 0.04$) and lower patient Breslow depth ($P = 0.02$). No background variables were significantly ($P < 0.05$) associated with response efficacy. ANOVA done to examine differences in PMT variables based on relationship type indicated that there was a significant association between perceived risk and relationship type ($F = 11.22$; $P < 0.0001$). Follow-up analyses indicated that parents of melanoma patients had lower perceived risk than siblings ($P \leq 0.05$) and children ($P \leq 0.05$) of melanoma patients.

Relationship of Background and PMT Variables to SPB. SPB was significantly positively associated with the background variables of education ($P = 0.006$) and risk status ($P = 0.01$), and the PMT variables of perceived risk ($P = 0.02$) and self-efficacy ($P = 0.0006$; see Table 3). Additional analysis indicated that relationship type was unrelated to SPB ($F = 1.49$; $P = 0.23$).

Mediational Analyses. Variables meeting criteria for inclusion in mediational analyses were the background variables of education and risk status, and the PMT variable of perceived

Table 2. Sun-protective behaviors of the FDRs

	n (%)	Mean (SD)
SPB total score		9.94 (5.58)
Used sunscreen on face		
Never	21 (21%)	
Rarely	14 (14%)	
Less than half the time	12 (12%)	
About half the time	13 (13%)	
More than half the time	8 (8%)	
Almost all the time	20 (20%)	
Always	12 (12%)	
Used sunscreen on body		
Never	22 (22%)	
Rarely	16 (16%)	
Less than half the time	17 (17%)	
About half the time	8 (8%)	
More than half the time	9 (9%)	
Almost all the time	18 (18%)	
Always	10 (10%)	
Wore protective clothing		
Never	36 (36%)	
Rarely	25 (25%)	
Less than half the time	11 (11%)	
About half the time	11 (11%)	
More than half the time	6 (6%)	
Almost all the time	9 (9%)	
Always	2 (2%)	
Stayed in shade		
Never	7 (7%)	
Rarely	19 (19%)	
Less than half the time	11 (11%)	
About half the time	29 (29%)	
More than half the time	12 (12%)	
Almost all the time	16 (16%)	
Always	6 (6%)	

risk. First, we examined whether perceived risk mediated the relationship between education and SPB. Education accounted for 5% of variance in SPB ($\beta = 0.21$; $P = 0.03$) and 8% of variance in perceived risk ($\beta = 0.28$; $P = 0.005$). Perceived risk accounted for 6% of variance in SPB ($\beta = 0.24$; $P = 0.02$). After controlling for perceived risk, education accounted for a nonsignificant amount (2%) of variance in SPB ($\beta = 0.16$; $P = 0.12$). This suggests that perceived risk mediates the relationship between education and SPB.

Next we examined whether perceived risk mediated the relationship between risk status and SPB. Risk status accounted for 6% of variance in SPB ($\beta = 0.25$; $P = 0.01$) and 21% of variance in perceived risk ($\beta = 0.46$; $P < 0.0001$). As previously mentioned, perceived risk accounted for 6% of variance in SPB ($\beta = 0.24$; $P = 0.02$). After controlling for perceived risk, risk status accounted for a nonsignificant amount (2%) of variance in SPB ($\beta = 0.18$; $P = 0.11$). This suggests that perceived risk also mediates the relationship between risk status and SPB.

Discussion

Results indicated that less than one-third of FDRs used sunscreen routinely when in the sun. This prevalence rate is similar to that found by Manne and colleagues (9) but was lower than rates found by others for this population (7, 8). Differences in measurement of sunscreen use (8) and sample demographics may account for differing rates (7). Among our participants, practice of other SPB was lower than rates of sunscreen use. Few FDRs stayed in the shade or used protective clothing on a frequent basis. These results are similar to earlier studies of FDRs of melanoma patients (7, 9). Thus, there is growing evidence to suggest that FDRs do not routinely engage in SPB.

We found that college-educated FDRs reported higher SPB levels than those without a college education. This finding differs from previous research (8, 9), which found no relationship between education and SPB. Given these conflicting results, more research is needed before definitive conclusions may be drawn regarding this relationship. We also found that FDRs with more risk factors reported higher SPB levels. Although these findings differ from results reported by Manne and colleagues (9), they are consistent with prior research on an average risk sample, which found that greater melanoma risk was associated with greater SPB use among women (17).

As predicted, FDRs with greater perceived risk of melanoma were more likely to practice SPB. This finding differs from null findings for perceived risk reported in previous research on FDRs (8, 9). In contrast to earlier studies of mostly siblings (8, 9), we assessed primarily children of melanoma patients. In addition, our perceived risk measure included an item asking participants to rate risk of developing melanoma if they did not practice SPB, a method that has been recommended as a way to remove the effect of current health protective behavior (21, 22).

Consistent with previous research on high risk (9) and average risk samples (17), we found that individuals with greater self-efficacy for SPB were more likely to practice SPB. In their study of FDRs, Manne and colleagues (9) examined the relationship between self-efficacy for sunscreen use and SPB. Our finding is an important extension of this research because

Table 3. Correlational relationships among study variables

	Perceived risk	Perceived severity	Self-efficacy	Response efficacy	SPB
Clark level	0.09	0.04	−0.23*	−0.15	−0.11
Breslow depth	0.13	0.07	−0.25*	−0.15	−0.06
Stage	0.22*	0.05	−0.01	−0.17	0.06
Time since diagnosis	−0.00	0.19	0.05	−0.04	0.16
Age	−0.28†	−0.08	0.11	0.11	−0.02
Gender (0 = male, 1 = female)	−0.09	0.13	0.14	−0.06	0.05
Marital status (0 = not married; 1 = married)	−0.09	−0.02	−0.06	0.12	0.05
Education (0 = <college; 1 = ≥college)	0.37†	0.18	−0.08	0.05	0.27†
Employment status (0 = not employed; 1 = employed)	0.22*	0.04	0.07	0.03	0.04
Household income (0 = <$40,000; 1 = ≥$40,000)	0.23*	0.10	−0.12	0.12	0.11
Florida residency (0 = no; 1 = yes)	0.00	−0.06	−0.02	0.08	−0.15
No. of melanoma risk factors	0.46‡	0.20*	−0.06	−0.08	0.25†
Latitude (degrees north of the equator)	−0.02	0.02	−0.03	0.19	0.01
SPB	0.24*	0.11	0.34§	0.08	—

*$P \leq 0.05$.
†$P \leq 0.01$.
‡$P \leq 0.0001$.
§$P \leq 0.001$.

we assessed self-efficacy for all SPBs, not just sunscreen use. There was no support for the hypothesized relationship between perceived severity and SPB. Manne and colleagues (9) also found that perceived severity was unrelated to SPB. There was also no support for the hypothesized relationship between response efficacy and SPB. To our knowledge, this is the first study to examine response efficacy in FDRs of melanoma patients. Consistent with this pattern of results, a metaanalysis examining the relationship of PMT variables to cancer prevention intentions and behaviors found perceived severity and response efficacy to have weaker relationships relative to perceived risk and self-efficacy (23).

Results of regression analyses indicated that perceived risk mediated the relationship between education and SPB and between melanoma risk factors and SPB. These findings suggest that FDRs with more education and more melanoma risk factors engage in SPB because they perceive themselves at greater risk of developing melanoma.

Several limitations of the current study should be noted. First, low α coefficients for the perceived severity scale (0.60) and SPB total score (0.69) suggest that results should be interpreted with caution. In addition, generalizability may be limited due to the low patient participation rate (43%) and the limited diversity of participants' demographic characteristics. Furthermore, the accuracy of information regarding risk factors and SPB is unknown because data were obtained via self-report. We did not assess the FDR's knowledge of sun protection, which also could explain the low SPB prevalence rates. Finally, we relied on correlational analyses and cannot conclude that perceived risk and self-efficacy have a causal relationship with SPB.

The relationships of SPB to PMT variables, including perceived risk and self-efficacy, highlight the importance of designing interventions to provide accurate risk information as well as to improve individuals' confidence in their abilities to engage in SPB. A randomized controlled longitudinal study, in which psychoeducational materials are provided to individuals at risk for melanoma, could provide evidence demonstrating a causal relationship between PMT variables and practice of SPB.

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