



“We Don’t Really Do Anything Unless it’s Really Bad”: Understanding Adolescent Sun Protective Knowledge, Attitudes and Behaviors in the U.S.

**Arissa R. Fitch-Martin¹ · Lauren M. Menger¹ · Amber D. Loomis¹ ·
Lauren E. S. Hartsough¹ · Kim L. Henry¹**

Published online: 14 July 2018

© Springer Science+Business Media, LLC, part of Springer Nature 2018

Abstract

Risk factors for melanoma, the deadliest form of skin cancer, include lifetime sun exposure and a history of sunburns. However, a minority of adolescents report consistent engagement in sun protective behaviors. The few sun protection interventions that have targeted adolescents have had little effect on behavior change, which suggests that a better understanding of the issue, especially from the adolescents’ perspective, is needed. Although efforts to qualitatively examine adolescent sun protection have been carried out in a handful of countries, no studies to date have focused on U.S. adolescents. We conducted focus groups with 44 6th–8th grade students in Colorado to explore their sun protection knowledge, attitudes and behaviors. Results supported previous findings that adolescents do not engage in regular skin protection but have experienced the negative consequences of sun exposure (e.g., severe sun burns, and blistering). In addition, participants demonstrated limited and sometimes inaccurate knowledge about the long-term risks of sun exposure, as well as effective methods of sun protection. Barriers to engaging in sun protective behaviors included a desire to tan, inconvenience, and physical discomfort. Facilitators included peer and family encouragement, previous experience with sunburns and/or skin cancer, and knowledge of potential consequences. These findings provide valuable insights that can inform future intervention and research related to sun protection among U.S. adolescents.

Keywords Sun protection · Adolescents · Melanoma prevention · Qualitative research

✉ Arissa R. Fitch-Martin
arissafm@gmail.com

¹ Department of Psychology Mail Stop 1876, Colorado State University, Fort Collins, CO 80523-1876, USA

Introduction

Rates of melanoma, the deadliest form of skin cancer, are steadily increasing in the U.S. (National Cancer Institute, 2013). As a result, the U.S. Department of Health and Human Services (DHHS) (2014), Office of the Surgeon General highlights skin cancer as a serious public health concern. Major risk factors for melanoma include lifetime sun exposure and a history of sunburns (Gandini et al., 2005; National Cancer Institute, 2011). Recommended sun protection behaviors include limiting time in the sun (especially during the middle of the day when the sun's rays are strongest), wearing protective clothing (e.g., long sleeves and pants, wide brim hats), using broad-spectrum sunscreen lotions, and reapplying every 2 h or after sweating or swimming (National Cancer Institute, 2011). Although there is a clear need for early prevention, few adolescents report consistent engagement in sun protective behaviors (Eaton et al., 2006), and several reports indicate that there is a steady decline in these behaviors from the ages of 12–17 (Boldeman, Jansson, & Ullen, 1997; Livingston, White, Hayman, & Dobbinson, 2003; Lowe et al., 2000). Considering the lack of preventative action among adolescents, it is unsurprising that 56% report at least one sunburn over the last year in the national Youth Risk Behavior Survey conducted by the U.S. Centers for Disease Control and Prevention (Kann, McManus, & Harris, 2016).

The high level of risk and low engagement in protective behaviors, as well as the increased independence from parental influence, strongly indicate that adolescents are a crucial group to target for sun protection interventions (Eadie & MacAskill, 2007). Based on their most recent meta-analysis, the Guide to Community Preventive Services (2012) for skin cancer prevention concludes that multicomponent community-wide interventions are effective in increasing sun protective behavior. However, the majority of the evidence came from studies outside of the U.S. and only one study focused on adolescents. The few sun protection interventions that have been conducted with this population have resulted in minimal behavior change (Arthey & Clarke, 1995; Baum & Cohen, 1998; Elwood & Morris, 1996; Reynolds et al., 2008; Schofield, Lovelace, & McKenzie, 1998). In fact, in the one study that focused exclusively on adolescents reviewed by The Community Guide, the intervention did not increase sun protective behaviors. Instead, all study participants actually decreased sun protective behaviors, but those who participated in the intervention showed less of a decrease than the control group. This disappointing trend suggests that a better understanding of the barriers to and facilitators of sun protective behaviors, especially from the adolescents' perspective, may be necessary to improve intervention outcomes.

Unfortunately, the literature in this area is lacking, particularly within the U.S. One quantitative study using a nationally representative sample suggested that favorable attitudes towards tanning and sun exposure are negatively associated with adolescent engagement in sun protective behaviors (Geller et al., 2002). Of particular concern was that 27% of participants stated that it was worth getting a burn in order to get a tan, and 75% preferred the appearance of tanned skin. A positive attitude towards tanning and sun exposure is echoed in a more recent

quantitative study, which added that most adolescents do not perceive themselves to be at risk for getting skin cancer (Hingle et al., 2014).

Theories of health and risk behavior, like the Health Belief Model (HBM; Janz & Becker, 1984; Rosenstock, 1966), provide some insight into why adolescents may not engage in adequate sun-protective behavior. This theory suggests that there are four psychological mechanisms that influence an individual's adoption of health protective behaviors, including perceived: (1) susceptibility to the health risk, (2) severity of the health risk, (3) benefits of engaging in protective behaviors, and (4) barriers to engaging in protective behaviors. The Theory of Planned Behavior (TPB; Ajzen, 1991) is another widely cited health behavior theory. The TPB suggests that attitudes, subjective social norms, and perceived behavioral control in relation to the health behavior influence behavioral intentions, which in turn influence behavior. Research provides some support for the applicability of these models to adolescent behavior (see Gibbons, Kingsbury, & Gerrard 2012, for a review). The social norms component of TPB is particularly powerful for adolescents, so much so that it can influence other components of HBM and TPB, such as perceived risk (Gibbons et al., 2012). For example, adolescents perceive a behavior to be less risky when they believe it is common among their peers and are thus more inclined to engage in the behavior themselves (Gibbons, Helweg-Larsen, & Gerrard, 1995). The effect of social comparison on behavior can be seen with sun protection. For example, White et al. (2008) found that, among 12–20 year-olds, group norms are predictive of sun protective behavior.

Additional research is needed to broaden and deepen our understanding of what drives adolescents both away from and towards engagement in sun protective behaviors. Without this understanding, our ability to develop efficacious prevention initiatives will be severely limited. Qualitative methods are often employed to gain a richer understanding from a specific population without restricting participants to preselected responses such as in quantitative surveys (Creswell, 2014). Although efforts to qualitatively examine adolescent sun protection have been carried out in countries outside of the U.S. (e.g., Australia: Paul, Tzelepis, Parfitt, & Girgis, 2008; Potente, Coppa, Williams, & Engels, 2011; England: Eadie & MacAskill, 2007), no studies to date have focused on adolescents in the U.S.

We employed focus group methodology to qualitatively examine sun protective attitudes and behaviors with middle school students in Colorado. On average, Colorado has 300 days per year with at least 1 h of sunshine (Colorado Climate Center, 2015). The state melanoma incidence rate is 22.2 per 100,000, greater than the national average of 19.9 (U.S. Cancer Statistics Working Group, 2012). It is thought that the high elevation may contribute to increased exposure to intense sunlight (Colorado Health Institute, 2014). The Colorado Melanoma Foundation and the Colorado Cancer Coalition both have regular fundraisers and programs to raise money for skin cancer research and to promote awareness in the community (Colorado Melanoma Foundation, 2016; Colorado Cancer Coalition, 2016). Focus group methodology has been recommended for use with youth as “many of the behaviors of children are enacted within the context of groups; as such, the group setting represents a familiar and reassuring environment for children” (Heary & Hennessy, 2002, p. 53). We sought to elucidate adolescent sun protection

knowledge, attitudes, and behaviors in the U.S. in order to better inform future intervention efforts.

Methods

We recruited participants from several 6th–8th grade classes at a Northern Colorado middle school. During recruitment, we framed the focus groups as being part of a research study to learn more about adolescents' thoughts and behaviors related to sun protection. We obtained informed consent from all participants and at least one of their parents or guardians, and approval of study materials and procedures from the Poudre School District and the Internal Review Board at Colorado State University.

The two first authors co-facilitated each focus group in a private room at the middle school during normal school hours. The duration of the focus groups was relatively brief (45–60 min) compared to the typical duration of focus groups with adults (90–120 min), as has been suggested when conducting focus groups with children (Vaughn, Schumm, & Sinagub, 1996). Students were excused from class in order to participate, and a semi-structured interview guide was used to ensure consistency in topics discussed across groups while also allowing for additional topics to emerge. In order to engage participants' interest, which has been suggested to promote maximum participation when conducting focus groups with youth (Heary & Hennessy, 2002), we started the discussion by asking participants to share activities they enjoy doing in the sun. The remaining questions asked participants to discuss their sun protective knowledge (e.g., "What are things people might do to protect themselves from the sun?"), attitudes (e.g., "Is there anything you don't like about sunscreen?"), and behaviors (e.g., "What, if anything, do you do to protect yourself from the sun?"), as well as what they perceived as barriers to and facilitators of engaging in these behaviors. All questions were worded at a Flesh Kincaid Grade Level of 2.6 to ensure comprehension. We also asked participants about sun protective attitudes and behaviors of family members, friends, and older peers, as well as their knowledge of and experience with skin cancer, but we intentionally asked these questions at the end of the focus group to prevent question order effects. We took great care to frame all language used in the focus groups in an unbiased and non-judgmental way to encourage participants to feel comfortable being honest when describing how they think, feel, and behave with regards to sun protection. All participants were compensated with a 'goody bag' including stickers, pencils, candy, small toys, a travel-sized sunscreen, and informational brochures pertaining to sun protection and skin cancer prevention.

We audio recorded and transcribed the focus groups. Coding of the transcripts was completed through a two-stage thematic analysis following the guidelines developed by Braun and Clarke (2006). In the first stage, the first two authors independently completed open-coding of each transcript and generated an initial list of themes that surfaced in response to the questions asked during the interviews. The two first authors then met to review their initial lists, discuss discrepant opinions, and come to consensus. Through this inductive process, we developed a

final coding structure to include all identified themes, and created a codebook that included an operationalized definition and example of each theme. In the second stage, two additional members of the research team independently applied the codebook themes to all six transcripts using Atlas.ti V6 (Muhr & Fries, 2004) qualitative data analysis software. Inter-rater agreement for the final coded transcripts was 85.7%.

Results

We conducted six focus groups with a total of 44 students (68% female, 84% White). Two focus groups were with 6th graders ($n = 8$, $n = 7$), 2 with 7th graders ($n = 7$, $n = 5$), and 2 with 8th graders ($n = 8$, $n = 9$). We identified seven major themes: cancer history, education, protective knowledge, skin cancer knowledge, protective behaviors, barriers, and facilitators.

Cancer History

A number of participants had friends or relatives who had a diagnosis of skin cancer. Some of these participants reported that knowing others who had skin cancer served as a motivating factor regarding their own sun protective practices.

Like the only thing I have to worry about is like my grandpa....he was probably like 13 when he started working outside and stuff and he worked until he was about 63 and so he had to go in and go get, like he had a bunch of skin cancer and stuff so I kind of realized that maybe I should start watching out about that. Because it's pretty bad.

Some participants indicated that their parents tried to encourage sun protective behaviors by reminding them of friends' and relatives' experiences of skin cancer.

There's a good family friend of ours who had skin cancer and she had a lot of it cause she never wore sunscreen growing up. And so she [my mom] always brings that up in conversations and threats and stuff.

Overall, a number of participants were able to identify someone that they knew who had skin cancer, and some of these participants indicated an awareness of the importance of protecting themselves from the sun.

Education

Overall, participants reported receiving little education about sun protection and the dangers of skin cancer. Participants mentioned that their family, and particularly their parents, taught them about the importance of protecting themselves from the sun. Participants also reported learning through their firsthand experiences getting burnt and through exposure to media campaigns, such as commercials and advertisements related to sunscreen use and sunburns. "Well like I get the stupid teen magazines or whatever, and it's like 'Reasons why you shouldn't'"—and then

it's always on the news, it's a very big concern on the news apparently cause they're always talking about it." Participants learned some things about skin cancer in elementary school. One recalled being in disbelief about the projected percentage of kids in the classroom who would get skin cancer at some point in their lives:

We did something in 5th grade where we learned about skin cancer and our teacher told us what percent of the kids in our class would be getting it. And I thought that was weird, I'm like 'Uh, I don't think so.'

The facilitator asked "Sounded too high?" The response was "Yeah." However, participants reported that they were not taught anything about sun protection or skin cancer in middle school.

In sum, participants reported learning about sun protection and skin cancer from family members, first hand experiences, exposure to media, and in elementary school, but received no education about these topics in middle school.

Protective Knowledge

We asked participants to describe what they know about specific protective strategies, the benefits of protection, and factors that influence the importance of protection. Knowledge of protective strategies included using sunscreen, limiting sun exposure, self-checking skin for signs of skin cancer, and getting skin checked by a doctor. However, participants had misconceptions about effective sun protective practices and were unsure about how to protect against skin cancer. For instance, a number of participants expressed uncertainty about the significance of SPF: the facilitator asked "So what about the SPF?" The responses were "The more the merrier," "If it's like 30 then 30 min it'll last or like something like that," and "Oh, is that what it means?"

Participants identified a number of benefits of protecting themselves against the sun, including the importance of skincare and reducing the risk of skin cancer. While they claimed that the importance of protection varied based on temporal and contextual circumstances, they often lacked confidence in the accuracy of such claims. For instance: "I heard somewhere that the clouds could get you a worse sunburn than the sun, but I don't know." "Like I hear that- was it 11–3 was the worst times of the day for sun. Something like that, I don't know." Participants considered the importance of protection to vary based on individual characteristics such as skin type, presence of moles, and old age. Participants underestimated the need to engage in protective behaviors, suggesting it isn't necessary with limited exposure or when exposure doesn't lead to sunburn. "Well you said that you only go out for 10 min and then come back again, so you're not like baking." "Yes! As long as I don't get burned I'm good."

In sum, participants reported a general understanding of the benefits of sun protection and common protective strategies. However, some expressed a lack of knowledge regarding the specifics of effective protection and the importance of protection across individuals and situations.

Skin Cancer Knowledge

When asked about their skin cancer knowledge, participants provided basic information related to types, risk factors, warning signs, and treatment. For instance, participants identified melanoma as a type of skin cancer that can result from sun exposure, but only one recognized it as the most severe type of skin cancer. Participants were aware of some of the risk factors of skin cancer, such as having lighter skin, freckles, or a history of sunburns. Some demonstrated an awareness of the warning signs and effects of skin cancer, such as changes in coloration of the skin and appearance of spots or moles, and knowledge of how skin cancer is treated, specifically mentioning chemotherapy and removing the affected parts of the skin. Inaccurate information was also reported, such as suggesting moles with fuzz or dry skin as warning signs. For example, when asked about the warning signs of skin cancer, participants speculated: “Like dark blots maybe?” “Maybe your skin’s icky.” “Maybe like your sunburn won’t go away.” “Or your skin is aching.” “Or you’re really itchy and sensitive.” Participants expressed uncertainty about their skin cancer knowledge. Several stated that they did not know about skin cancer or melanoma, what the warning signs were, the potential for it to spread to other organs, or its severity. For instance, participants asked: “Can’t you cure skin cancer?” “It’s hard, isn’t it? Can’t you burn it all off?” Overall, the extent of skin cancer knowledge demonstrated by the participants was mixed; ranging from none to a basic understanding of types, risk factors, warning signs, and treatment. Participants expressed uncertainty about their knowledge and/or had inaccurate information.

Protective Behaviors

When asked to describe how they protect themselves from the sun, sunscreen was the most commonly mentioned protective behavior. “Well I put like sunscreen on my ears, that’s about it.” Participants mentioned wearing certain kinds of clothing, such as hats or long sleeves. However, upon further probing, admitted they did not wear these items specifically to protect themselves from the sun, but rather for physical comfort or because they were required to (e.g., sport team uniforms). The facilitator asked: “So what if anything do you guys do to protect yourself from getting sunburned?” The response was “I wear hats.” Facilitator: “Yeah? For that reason?” And the response was “No.” Participants mentioned that some of the cosmetics they use (e.g., lotion, foundation, chapstick, hunting concealer) contain sunscreen. Some admitted that because these products mention SPF, they forgo wearing additional sunscreen. Another way that participants said they protect themselves was by limiting their exposure to the sun, either by staying inside or in the shade.

And when I go outside I don’t go out for too long, like I’ll lay out there for a little while and then I’ll like turn over or whatever. But I won’t stay out there for too long cause I know it can be bad for your skin.

Participants also mentioned how different seasons impact their protective behaviors. Some talked about how they were more likely to wear sunscreen when the sun was out or when it was hot. They also stated that they often failed to use protection until after the first burn of the season. Participants reported they were less likely to use sunscreen during the winter, except when they go skiing. In addition to sun protective behaviors, participants talked about checking their skin as a means of protection against skin cancer.

Like I check and see if like I have like the blisters or because I have freckles on my arms a lot and that's- like people with freckles have more of a chance of getting skin cancer. I don't really know why but it's just something about it and so you get sun spots and I check for that quite a bit.

Students reported that they engage in a number of protective behaviors for a variety of reasons. Sunscreen was specifically used to protect the skin from sunburns, but other behaviors were performed for reasons other than sun protection.

Barriers

Participants identified a number of factors that prevent them from engaging in sun protective behaviors including limited access and difficulty remembering—either to bring sunscreen with them, to put it on in the first place, or to reapply. “Once you go outside, you just sometimes just forget about it. You get caught up in the something and you're not thinking about putting on sunscreen.” Participants indicated that the short-term rewards of sun exposure outweighed the risks. Specifically their desire to tan prevented them from using sun protection. Tanning through sun exposure was preferred over spray-tans and tanning beds. Participants expressed the opinion that tan skin looked better than pale skin, a topic that was frequently discussed with friends and relatives. For instance, one participant described how her family engaged in tanning in a competitive fashion:

In my family, it's always a contest...we're always just like 'I'm darker than you!' and if one of us is darker than the other then we'll just go right back outside and we'll be like 'I'm going to be darker than you by the end of the day.'

Participants also mentioned physical discomfort as a barrier to sunscreen use. Comments related to texture, smell, taste and other undesirable physical reactions (e.g., stinging the eyes), were frequently mentioned. For instance, some participants complained: “Sometimes it feels greasy, or like gritty.” “It's sticky.”

My mom buys the like spray kind. Whenever she does it on my face sometimes my mouth is open and it gets in my mouth, your eyes are open and it gets in your eyes. I don't like it. I hate how it burns.

Discomfort also was also a barrier to wearing protective clothing. Participants felt that they would be too hot in long sleeves or long pants during the summer months, and expressed feeling self-conscious when using sunscreen. “And then you're in public and you're putting on sunscreen, it's kind of weird. You're just like

that weird person, rubbing themselves.” Ease of use was suggested as another barrier to using sunscreen. For example, participants indicated they didn’t want to take the time to apply it. “Like most of my friends are like sitting there for like 15 min putting on sunscreen and I’m already enjoying the sun.” Participants also reported that sunscreen isn’t always effective, claiming that they’ve been burned even while wearing sunscreen. For instance, some participants commented: “I hate it when it doesn’t work.”

“Two minutes later it’s gone.” “I don’t like sunscreen cause if you go swimming then it just comes off.” Finally, some participants reported a lack of motivation to wear sunscreen because of limited or no burn history.

Participants thus reported a number of barriers to engage in sun protection, including tendency to forget, physical discomfort, inconvenience, desire to tan, lack of perceived effectiveness, and lack of perceived need.

Facilitators

When asked about what motivates sun protective behaviors, a number of participants suggested that having previous sunburns and remembering the physical consequences (e.g., turning red, being in pain) as motivators. “I just think about sunburns. Like I don’t want to sunburn, I don’t want to be red, I don’t want to hurt when I wake up in the morning.”

Participants expressed motivation to avoid the potential negative consequences of sun exposure, such as skin cancer, sun-damaged skin, and sunburns. “Now that I know the severity of what it can do to you if you don’t wear it... It scares me to think about what I do now could define my future later in life.” Sun intensity (e.g., hottest part of day, summer) was also mentioned as a facilitator of sun protection. “We don’t really do anything unless it’s really bad.” Facilitator: “Really bad meaning...?” Response: “Like really really hot.” Participants suggested comfort and ease of use (e.g., spray on and stick forms) as factors that facilitate sun protective behaviors. This included accessibility, such as keeping sunscreen in multiple and visible places (e.g., near a door, in the car, or in a backpack or purse). Similarly, the importance of integrating protective behaviors into a daily routine was also mentioned. “You just have it sitting out. Like just have it sitting out somewhere in the summer where you don’t miss it. Where you can just see and be like “Oh sunscreen” and then just put it on.” “I just put it on daily.” Participants suggested setting cell phone reminders as a potentially effective strategy to facilitate sunscreen use, but they did not report having used this strategy. “Like maybe when you’re outside a lot put it like on your phone or something. Like a reminder to put some on.” Participants also indicated that media influenced their likelihood of using sunscreen, either through a commercial that reminded them to do so or an educational video about melanoma seen on a social media site. Additionally, participants indicated that influence from others (primarily parents and other relatives, but also peers) was a facilitator for sun protection. “Well I- like my mom will almost drown me in sunscreen ...Like every half hour she’ll make me reapply it.” Facilitator: “So your friends talk to you about wearing sunscreen and stuff?” Response: “Yeah. We always put on sunscreen together.”

In sum, participants described a number of factors that facilitate sun protective behaviors, including recollection of previous sunburns, avoiding negative consequences, such as skin cancer, and the importance of reminders from cell phones, the media, and other people in their lives.

Discussion

Our study is the first to qualitatively examine the sun protective knowledge, attitudes, and behaviors of adolescents in the U.S. Participants indicated that awareness that protecting one's skin is important. However, as in previous quantitative studies examining sun protection among adolescents in the U.S. (e.g., Eaton et al., 2006; Olson, Gaffney, Starr, & Dietrich, 2008), actual engagement in preventive behaviors was reported to be insufficient. Given this lack of engagement in protective behaviors, it was unsurprising that participants had experienced the negative consequences of sun exposure (e.g., sunburns, blistering). Despite these consequences, participants expressed attitudes towards engaging in sun protective behavior that were negative or ambivalent. Participants also knew very little or had inaccurate beliefs about the long-term risks of sun exposure, specifically skin cancer. Overall, our study suggests that adolescents have limited knowledge of and poor attitudes towards sun protection, and do not consistently engage in appropriate sun protective behaviors. The Community Guide for skin cancer prevention recommends interventions for primary and middle school students based on their meta-analysis of mostly education-based interventions (2012). Our study offers additional support for this recommendation and answers their call for more research with this age group. Using a combination of the HBM and TPB as a framework, our study offers several explanations for why adolescents do not engage in sun protective behaviors as well as insights into relevant mechanisms for facilitating behavior change.

Our study brought to light that a negative attitude towards (TBP), and lack of perceived benefits in (HBM), engaging in sun protective behaviors was sometimes due to respondents experiences that these behaviors were ineffective. For example, participants stated that they were less likely to use sunscreen because when they had they still got sunburned. However, upon further discussion, it became apparent that ineffectiveness was likely due to improper use. Participants were confused about the significance of SPF, under what circumstances using sunscreen is necessary, and how often it needs to be reapplied. Given that participants focused primarily on sunscreen with little mention of other forms of protection, interventions should focus on proper use of sunscreen as well as emphasize the importance of utilizing multiple methods of sun protection (e.g., clothing, seeking shade, avoiding high UV).

Another issue that became apparent through the focus groups was that participants were not able to communicate specifics regarding their vulnerability to and the consequences of sun exposure. This lack of knowledge likely contributes to the perception that susceptibility to and severity of the risks of sun exposure is low. According to the HBM, when there is little to no perceived risk (i.e.,

susceptibility and severity are low), protecting against that risk becomes irrelevant. In other words, attitudes toward and benefit of such behavior are of little importance. Participants expressed an interest in knowing more about the risks of sun exposure, such as how UV rays affect the skin as well as the course of skin cancer and details of treatment. Targeting perceived susceptibility and severity through teaching adolescents the specifics of what sun exposure does to the skin, how it can lead to negative consequences, and how such consequences would impact their lives may help them recognize the benefits of, form more favorable attitudes towards, and engage more frequently in, sun protective behaviors.

The way in which interventions provide such education is crucial to their success. Several studies clearly indicate that information alone does not lead to significant behavior change (e.g., Arthey & Clarke, 1995; Lowe, Balanda, Stanton, & Gillespie, 1999; Potente et al., 2011). In order to impact behavior, the HBM and TPB highlight the importance of the individual's subjective experience. In our study, perceived susceptibility for some participants was impacted by their skin type, likely explaining some of the differences in attitudes towards sun protection. For example, one participant stated that she checks her skin regularly for moles because she has freckles, while another stated that he doesn't wear sunscreen often because he rarely burns. These participants used what they knew about their skin type and their personal experience with skin damage to assess their subjective susceptibility, form attitudes, and determine whether to engage in protective behaviors. Although it is true that certain skin types are more vulnerable to sun damage, no person is immune and interventions need to do more to ensure their relevance to all members of the target audience.

Personally relevant information may be particularly important for adolescents who, due to their stage of cognitive development, tend to live more in the present moment and to be less concerned with the distant future (Loewenstein et al., 2001). This presents a challenge as the dominant argument for engaging in sun protection is to prevent damage later in life. For adolescents, this kind of reasoning likely does very little to change their attitudes toward or perceived benefit of engaging in protective behavior. However, participants in our study indicated that if they thought that what they did to protect their skin now mattered, they would be more motivated to do so. Interventions need to emphasize their present level of susceptibility to sun damage and the benefits of acting now. They can be tailored to do so by personalizing information and encouraging engagement with the material through interactive learning experiences. For example, Olson et al. (2008) found that participants who viewed images of what their skin would look like with UV damage were more likely to report intentions to use sunscreen than those who had only participated in an educational class. Such interventions, particularly those that emphasize to adolescents that their skin is vulnerable to damage at any age and that neglecting sun protection now cannot be compensated for later in life, may inspire a more positive attitude towards the sun protection and result in behavior change.

Interventions also need to take into account that decision-making among adolescents is heavily influenced by social factors (Steinberg & Monahan, 2007), and risk behavior is often driven by social gain motivations (Rawn & Vohs, 2010). Sun exposure is no different, and the idealization of tanned skin is perhaps the

biggest barrier to sun protection. Our study confirms previous research that the short-term reward most associated with sun exposure is attaining a tan (e.g., Hingle et al., 2014). Although spray-tans and tanning beds were less popular with study participants, they still expressed a desire for tanned skin and reported neglecting sun protection in favor of getting tan. Considering the adolescent stage of neurological development can help to explain this behavior. For example, executive functioning (e.g., planning, prioritizing, and behavior control) is not fully developed in the adolescent brain, but the reward center is (Casey, Jones, & Hare, 2008; Galvan et al., 2006). Therefore, although adolescents may be capable of accurately assessing risks and rewards, they may place greater emphasis on rewards, particularly those that are short-term (Gibbons, Kingsbury, & Gerrard, 2012). In the adolescent mind, the reward of being tan and fitting in socially likely outweighs the associated risks.

Fitting in, or abiding by social norms, is shaped in large-part by the media, and the impact is especially powerful when it comes to what adolescents perceive to be attractive (Dal Cin et al., 2009; Wills, Sargent, Stoolmiller, Gibbons, & Gerrard, 2008). Study participants pointed out that media tends more to the beauty of untanned skin, but that it continues to present conflicting messages that tanned skin is beautiful and sun protection is important. Media campaigns that offer a more consistent message for adolescents regarding physical attractiveness and health could help to change social norms and behavior regarding sun protection.

The importance of physical attractiveness may be used to enhance sun protection. According to our study, cosmetic damage associated with sun exposure is also relevant to adolescents in the U.S. Previous intervention studies suggest that seeing the visible consequences of UV exposure, such as damaged and wrinkled skin, increases adolescents' intention to engage in sun protection (Olson et al., 2008). These types of messages may be effective because they tap into the importance that adolescents place on physical appearance and have the potential to be used to combat the affinity for tanned skin.

The powerful role that social norms play in acting as a barrier to sun protection extends beyond tanning and physical attractiveness. Study participants indicated that they often felt self-conscious engaging in sun protection around their peers, and that it was unusual to put on sunscreen before or during school. However, participants also stated that they were more likely to engage in sun protection if prompted by their peers to do so. In fact, during the focus groups, participants began to brainstorm how they could encourage one another to protect their skin. This indicates that changing social norms and emphasizing the rewards associated with sun protection is both possible and necessary for adolescents. School-based interventions could engage students to work together to increase sun protective behaviors. For example, adopting a peer educator model or holding discussion groups where students can ask questions of and voice ideas with one another could be beneficial components to adolescent sun safety interventions.

In addition to peers, parents play an important role in facilitating sun protective behaviors, as adolescents are at a unique phase in life in which they are becoming more independent but still require considerable support and guidance. Some participants stated that their parents were the ones who taught them about the risks

of sun exposure and encouraged or, in some cases, insisted that they engage in sun protective behaviors. Parents also model behavior, and participants frequently followed their parents' example when it came to sun protection or lack thereof. In terms of the latter, participants whose parents or other family members tanned tended to have more favorable attitudes toward tanning themselves. Parents should be encouraged to consider how their behavior impacts their children's when it comes to sun exposure risk and to facilitate sun protective behaviors by providing reminders, the means to engage in sun protection and, perhaps most importantly, by setting a good example themselves.

The environment can also provide important behavior prompts, termed "cues to action" in the HBM. With the lack of knowledge that each time they are exposed to the sun susceptibility is increased, participants relied on cues such as heat, sunny weather, and sun burning. Absence of these cues was equated with absence of susceptibility. It was common for participants to state that they only protect their skin in the summer and often only after the first burn of the season. In addition to correcting false assumptions regarding susceptibility, environmental interventions that provide consistent "cues to action," such as sunscreen dispensers in locker-rooms, may provide needed reminders that sun protection is important regardless of the weather.

Other key barriers identified by participants were lack of access to sun protective agents (e.g., sunscreen, clothing) and not remembering to use such agents. Participants mentioned that simply having sunscreen readily available increased the likelihood that they would think about and use it. In TPB terms, access to means is crucial to perceived behavioral control. Providing adolescents with means is especially important as they are still predominantly dependent on adults to do so. Once they have the access, encouraging them to integrate sun protection into a year-round daily routine, would not only reduce their risk of sun damage but would have the added benefit of making it less likely that they would forget.

Our study enriches our understanding of the sun protection knowledge, attitudes, and behaviors of adolescents in the U.S. When interpreting these findings, it is important to keep in mind that the focus groups were conducted in a single middle school in Colorado, a particularly sunny and health-conscious state. In addition, participant responses may have been influenced by the lack of anonymity afforded by focus group methodology. Nonetheless, the qualitative responses elicited in our study provide crucial insights that can inform future interventions to increase sun protective behaviors. These results also offer a foundation from which quantitative methods can be developed, such as improved survey items to assess the components of the HBM and TPB with regards to sun protective behaviors among adolescents. Future research is needed to examine this issue more objectively and in other communities in the U.S.

Acknowledgements This research was made possible through the support of the Dennis Coakley Memorial Foundation.

Compliance With Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Standard 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.

References

- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50, 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T).
- Arthey, S., & Clarke, V. A. (1995). Suntanning and sun protection: A review of the psychological literature. *Social Science and Medicine*, 40(2), 265–274.
- Baum, A., & Cohen, L. (1998). Successful behavioral interventions to prevent cancer: The example of skin cancer. *Annual Review of Public Health*, 19, 319–333. <https://doi.org/10.1146/annurev.publhealth.19.1.319>.
- Boldeman, C., Jansson, B., & Ullen, H. (1997). Sunbed use in Swedish urban adolescents related to behavioural characteristics. *Preventative Medicine*, 26, 114–119. <https://doi.org/10.1006/pmed.1996.9986>.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3, 77–101. <https://doi.org/10.1191/1478088706qp063oa>.
- Casey, B. J., Jones, R. M., & Hare, T. A. (2008). The adolescent brain. *Annals of the New York Academy of Sciences*, 1124(1), 111–126. <https://doi.org/10.1196/annals.1440.010>.
- Colorado Cancer Coalition. (2016). *Skin cancer: Colorado Cancer Action Plan*. Retrieved from <http://www.coloradocancercoalition.org/task-forces/skin-cancer>.
- Colorado Climate Center. (2015). *How much sunshine do we get in Colorado?* Colorado State University. Retrieved from <http://climate.colostate.edu/questions.php>.
- Colorado Health Institute. (2014). *Summer fun bring elevated skin cancer risks for Coloradans*. Retrieved from <http://www.coloradohealthinstitute.org/insights>.
- Colorado Melanoma Foundation. (2016). *Events: Fundraising events in 2016*. Retrieved from <http://www.comelfound.org/Events>.
- Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Thousand Oaks, CA: Sage Publications Inc.
- Eadie, D., & MacAskill, S. (2007). Results from an exploratory study of sun protection practice: Implications for the design of health promotion messages. *Health Education*, 107(3), 250–260.
- Eaton, D. K., Kann, L., Kinchen, S., Ross, J., Hawkins, J., Harris, W. A., et al. (2006). Youth risk behavior surveillance—United States. *MMWR Surveillance Summaries*, 55(5), 1–108.
- Elwood, J. M., & Morris, J. M. (1996). Evaluation of programmes to modify sun exposure. In R. M. Mackie (Ed.), *Primary and secondary prevention of malignant melanoma* (pp. 111–127). Basel: Karger. <https://doi.org/10.4278/2F0890-1171-13.5.282>.
- Galvan, A., Hare, T. A., Parra, C. E., Penn, J. Voss, H., Glover, G., et al. (2006). Earlier development of the accumbens relative to orbitofrontal cortex might underlie risk-taking behavior in adolescents. *Journal of Neuroscience*, 26(25), 6885–6892. <https://doi.org/10.1523/JNEUROSCI.1062-06.2006>.
- Gandini, S., Sera, F., Cattaruzza, M. S., Pasque, P., Picconi, O., Boyle, P., et al. (2005). Meta-analysis of risk factors for cutaneous melanoma: II. Sun exposure. *European Journal of Cancer*, 41, 45–60. <https://doi.org/10.1016/j.ejca.2004.10.016>.
- Geller, A. C., Colditz, G., Oliveria, S., Emmons, K., Jorgensen, C., Aweh, G. N., et al. (2002). Use of sunscreen, sunburning rates, and tanning bed use among more than 10,000 US children and adolescents. *Pediatrics*, 109(6), 1009.
- Gibbons, F. X., Helweg-Larsen, M., & Gerrard, M. (1995). Prevalence estimates and adolescent risk behavior: Cross-cultural differences in social influence. *Journal of Applied Psychology*, 80, 107–121.

- Gibbons, F. X., Kingsbury, J. H., & Gerrard, M. (2012). Social-psychological theories and adolescent health risk behavior. *Social and Personality Psychology Compass*, 10, 170–183. <https://doi.org/10.1111/j.1751-9004.2011.00412.x>.
- Guide to Community Preventive Services. (2012). *Skin cancer: Multicomponent community-wide interventions. The community guide*. Retrieved from <https://www.thecommunityguide.org/findings/skin-cancer-multicomponent-community-wide-interventions>.
- Heary, C. M., & Hennessy, E. (2002). The use of focus group interviews in pediatric health care research. *Journal of Pediatric Psychiatry*, 27(1), 47–57. <https://doi.org/10.1093/jpepsy/27.1.47>.
- Hingle, M. D., Snyder, A. L., McKenzie, N. E., Thomson, C. A., Logan, R. A., Ellison, E. A., et al. (2014). Effects of a short messaging service-based skin cancer prevention campaign in adolescents. *American Journal of Preventive Medicine*, 47(5), 617–623. <https://doi.org/10.1016/j.amepre.2014.06.014>.
- Janz, N. K., & Becker, M. H. (1984). The health belief model: A decade later. *Health Education Quarterly*, 11, 1–47. <https://doi.org/10.1177/109019818401100101>.
- Kann, L., McManus, T., & Harris, W. A. (2016). Youth risk behavior surveillance—United States, 2015. *MMWR Surveillance Summary*, 65(SS-6), 1–174.
- Livingston, P. M., White, V., Hayman, J., & Dobbins, S. (2003). Sun exposure and sun protection behaviours among Australian adolescents: Trends over time. *Preventative Medicine*, 37, 577–584. <https://doi.org/10.1016/j.ypmed.2003.09.004>.
- Lowe, J. B., Balanda, K. P., Stanton, W. R., & Gillespie, A. (1999). Evaluation of a three-year school-based intervention to increase adolescent sun protection. *Health Education & Behavior*, 26(3), 396–408. <https://doi.org/10.1177/109019819902600309>.
- Lowe, J., Borland, R., Stanton, W., Baade, P., White, V., & Balanda, K. P. (2000). Sun-safe behaviour among secondary school students in Australia. *Health Education Research*, 15, 271–281.
- Loewenstein, G. F., Weber, E. U., Hsee, C. K., & Welch, N. (2001). Risk as feelings. *Psychological Bulletin*, 127(2), 267–286. <https://doi.org/10.1037/0033-2909.127.2.267>.
- Muhr, T., & Friese, S. (2004). *User's manual for ATLAS*. Berlin: Scientific Software Development.
- National Cancer Institute. (2011). *What you need to know about melanoma and other skin cancers*. National Institutes of Health, U.S. Department of Health and Human Services. Retrieved from <http://www.cancer.gov/cancertopics/wyntk/skin/page5>.
- National Cancer Institute. (2013). *Cancer skin facts: Melanoma of the skin*. Retrieved from: <https://seer.cancer.gov/statfacts/html/melan.html>.
- Olson, A. L., Gaffney, C. A., Starr, P., & Dietrich, A. J. (2008). The impact of an appearance-based educational intervention on adolescent intention to use sunscreen. *Health Education Research*, 23(5), 763–769. <https://doi.org/10.1093/2Fher/2Fcy005>.
- Paul, C., Tzelepis, F., Parfitt, N., & Girgis, A. (2008). How to improve adolescents' sun protection behavior? Age and gender issues. *American Journal of Health Behavior*, 32(4), 387–398. <https://doi.org/10.5555/ajhb.2008.32.4.387>.
- Potente, S., Coppa, K., Williams, A., & Engels, R. (2011). Legally brown: Using ethnographic methods to understand sun protection attitudes and behaviors among young Australians 'I didn't mean to get burnt—It just happened!'. *Health Education Research*, 26(1), 39–52. <https://doi.org/10.1093/her/cyq066>.
- Rawn, C. D., & Vohs, K. D. (2010). People use self-control to risk personal harm: An intra-interpersonal dilemma. *Personality and Social Psychology Review*, 15(3), 267–289.
- Reynolds, K. D., Buller, D. B., Yaroch, A. L., Maloy, J., Geno, C. R., & Cutter, G. R. (2008). Effects of program exposure and engagement with tailored prevention communication on sun protection by young adolescents. *Journal of Health Communication*, 13, 619–636. <https://doi.org/10.1080/2F10810730802412149>.
- Rosenstock, I. M. (1966). Why people use health services. *Milbank Memorial Fund Quarterly*, 44, 94–124. <https://doi.org/10.1111/2Fj.1468-0009.2005.00425.x>.
- Schofield, W. N., Lovelace, K. S., & McKenzie, J. E. (1998). *Self-reported behaviours of NSW secondary school students: Sun protection, physical activity, injury and eating patterns*. The 1996 Australian School Students' Alcohol and Drugs Survey. Sydney: NSW Cancer Council & NSW Health Department.
- Steinberg, L., & Monahan, K. C. (2007). Age differences in resistance to peer influence. *Developmental Psychology*, 43(6), 1531–1543.

- U.S. Department of Health and Human Services. (2014). *The Surgeon General's call to action to prevent skin cancer*. Washington, DC: U.S. Dept of Health and Human Services, Office of the Surgeon General.
- Vaughn, S., Schumm, J. S., & Sinagub, J. (1996). *Focus group interviews in education and psychology*. London: Sage. <https://doi.org/10.4135/9781452243641>.
- Wills, T. A., Sargent, J. D., Stoolmiller, M., Gibbons, F. X., & Gerrard, M. (2008). Movie smoking exposure and smoking onset: A longitudinal study of mediation processes in a representative sample of U.S. adolescents. *Psychology of Addictive Behaviors*, 22(2), 269–277. <https://doi.org/10.1037/0893-164X.22.2.269>.