

Original Paper

# A Sun Safety Pilot Program Using a Tanning Myths–Focused Video Contest for Utah Adolescents: Cross-sectional Analysis

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## Abstract

**Background:** Adolescents are susceptible to excessive ultraviolet exposure due to intentional tanning, outdoor lifestyles, and poor sunscreen adherence. As skin cancer incidence continues to rise in the United States, effective and focused interventions are needed to encourage photoprotective behaviors.

**Objective:** This study seeks to determine poor photoprotective behavior risk factors in adolescents residing in Utah and whether video contest participants have increased sun-protective knowledge and intentions.

**Methods:** In this cross-sectional study, we surveyed Utah high school students (n=20) who participated in a tanning myths-themed public service announcement video contest. A control cohort of students who did not participate in the video contest were also surveyed (n=89). Demographics, sun exposure history, intentions to tan, and intentions to use sunscreen were documented. Knowledge of tanning myths was assessed with a 7-question sun safety quiz.

**Results:** The survey response rate was 93.2% (109/117). Two-thirds reported at least one sunburn, and 47.7% (52/109) reported intentional tanning within the past 2 years. Higher tanning intentions were associated with a personal ( $P<.001$ ), family ( $P=.001$ ), and peer ( $P<.001$ ) history of tanning. Video contest participants had higher sun safety quiz scores ( $P<.001$ ) and higher sunscreen use intentions ( $P=.01$ ), but did not have decreased tanning intentions ( $P=.47$ ) compared to non–video contest participants. Hispanic and Black students were less likely to participate in the video contest ( $P<.001$  and  $P=.04$ , respectively). In a comparison of White students to students of color, there were no differences in sun exposure history, but students of color had lower sun safety knowledge ( $P=.01$ ) and lower sunscreen use intention ( $P=.02$ ).

**Conclusions:** Sun safety educational disparities exist, and targeted efforts are needed to encourage photoprotective behaviors in high-risk populations. Our findings suggest that video contest participation may encourage sunscreen use and sun protection awareness.

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**KEYWORDS**

prevention; sun protection; questionnaire; photoprotection; experiential learning; teenager; safety; pilot; video; cross-sectional; adolescent; young adult; behavior; risk; knowledge; intention

## Introduction

### Background

The incidence of skin cancer has been increasing for the past several decades in the United States [1-3]. The state of Utah has one of the nation's highest skin cancer incidence rates and the highest rate of incidence and death of melanoma, the deadliest type of skin cancer [4]. It has been well established that ultraviolet exposure is a modifiable risk factor for melanoma and nonmelanoma skin cancers [5]. Because adolescents are generally exposed to high amounts of UV radiation from intentional tanning, they are an important target population for skin cancer prevention programming [6].

The most efficacious sun protection programs have been shown to involve children and include active individual participation [7]. Building on this concept, while specifically addressing an adolescent population, we designed and sponsored an annual statewide contest running from 2015 to 2018, in which Utah teenagers voluntarily created 1-minute public service announcement videos debunking tanning myths. Between 3 and 10 finalists and their families attended a celebratory event at the University of Utah Department of Dermatology each year where their public service announcement videos were viewed, students' achievements were recognized, and the importance of sun-protective behaviors, particularly in Utah, was stressed.

In this study, a cohort of adolescents from high schools who participated in the video contest and a cohort of adolescents from the same high schools who did not participate were electronically surveyed about tanning intentions on sun-protective behaviors and understanding of tanning myths. We sought to identify the demographics and risk factors associated with increased tanning intentions and decreased sunscreen use intentions. We hypothesized that video contest participants would have increased sun-protective intentions and knowledge compared to those who did not participate in the video contest.

## Methods

### Recruitment

This study was approved by the institutional review board at the University of Utah (institutional review board no. 00085420). In June 2018, all students (n=22) who participated in the video contest between 2015 and 2018 were emailed an anonymous closed survey eliciting demographic information, sun exposure history prior to video contest participation, and the intention to tan or use sunscreen in the future. A 7-question true-or-false knowledge quiz consisting of 5 tanning myths (false) and 2 skin cancer facts (true) was also included. The score was calculated from the quiz to evaluate the tanning myths knowledge of participants by assigning 1 point for each correct answer. A convenience sample of 95 non-video contest

participants attending the same high schools were invited to complete the same electronic survey. These participants were recruited at tabling events during 3 lunch time hours and were asked to complete anonymous surveys on tablets or laptop computers provided by the research team. Participants in both groups were given a US \$5 gift card or a candy bar for completing the survey.

### Statistical Analysis

Tanning intentions were calculated based on participant responses for questions asking likelihood to tan in the future. High tanning intentions corresponded to responses "very likely" or "extremely likely". Medium tanning intentions corresponded to "moderately likely" or "slightly likely" responses, and low tanning intentions corresponded to a "not likely" response. For sunscreen use intentions, answers for likelihood to use sunscreen in the future included "always" or "most of the time" for high intentions, "sometimes" and "rarely" for medium intentions, and "never" for low intentions.

For participant characteristics, we report descriptive statistics as medians (IQR) or frequencies (percentages). To assess the efficacy of the video contest and evaluate the factors associated with knowledge of tanning myths and tanning intentions, we used chi-square tests for categorical variables and Wilcoxon rank sum tests for continuous variables. If numbers were sparse, Fisher exact tests were performed for categorical variables, and the exact version of the Wilcoxon rank sum tests were performed for continuous variables. To compare race demographics, each was compared to the total of each category (ie, White vs. people of color, Hispanic vs. non-Hispanic etc). Results were considered statistically significant if the 2-sided *P* values were less than .05. All tests were performed using R studio version 1.0.143.

## Results

In total, 109 participants completed the survey (20 video contest participants and 89 non-video contest participants), with a survey response rate of 93.2% (109/117). Approximately half of the survey respondents were male. Self-identified race included White (51/109, 46.8%), Hispanic (36/109, 33.0%), Asian or Pacific islander (18/109, 16.5%), Black or African American (16/109, 14.7%), Native American (2/109, 1.8%), and other (8/109, 7.3%). Furthermore, 39.4% (43/109) of respondents reported having 1 sunburn in the past 2 years, and 26.6% (29/109) reported having at least two or more sunburns in the past 2 years. Almost half (52/109) had a history of intentional tanning, 22.9% (25/109) had family members that tan, 45.9% (50/109) had friends who tan, and 26.6% (29/109) had a family history of skin cancer. In the comparison of video contest and non-video contest participants, White students were more likely to participate in the video contest ( $P<.001$ ), whereas Hispanic and Black students were less likely to participate in the video contest ( $P<.001$  and  $P=.04$ , respectively; [Table 1](#)).

**Table 1.** Participant demographics and tanning history comparing video contest (n=20) and non-video contest (n=89) participants.

Characteristic	Video contest participant		P value	
	All participants (N=109)	Yes (n=20)		No (n=89)
<b>Gender, n (%)</b>			.85	
Male	62 (56.9)	11 (55)	51 (57)	
Female	47 (43.1)	9 (45)	38 (43)	
<b>Race<sup>a</sup>, n (%)</b>				
White	51 (46.8)	17 (85)	34 (38)	<i>&lt;.001<sup>b</sup></i>
Hispanic	36 (33.0)	0 (0)	36 (40)	<i>&lt;.001<sup>b</sup></i>
Black/African American	16 (14.7)	0 (0)	16 (18)	<i>.04<sup>bc</sup></i>
Native American/American Indian	2 (1.8)	0 (0)	2 (2)	<i>&gt;.99<sup>c</sup></i>
Asian/Pacific Islander	18 (16.5)	4 (20)	14 (16)	<i>.74<sup>c</sup></i>
Other	8 (7.3)	0 (0)	8 (9)	<i>.35<sup>c</sup></i>
<b>Sunburn in the past 2 years, n (%)</b>			.81	
More than once	29 (26.6)	5 (25)	24 (27)	
Once	43 (39.5)	7 (35)	36 (40)	
None	37 (33.9)	8 (40)	29 (33)	
<b>Personal history of tanning, n (%)</b>			.79	
Yes	52 (47.7)	9 (45)	43 (48)	
No	57 (52.3)	11 (55)	46 (52)	
<b>Family members that tan, n (%)</b>			.39 <sup>a</sup>	
Yes	25 (22.9)	6 (30)	19 (21)	
No	84 (77.1)	14 (70)	70 (79)	
<b>Friends that tan, n (%)</b>			.68	
Yes	50 (45.9)	10 (50)	40 (45)	
No	59 (54.1)	10 (50)	49 (55)	
<b>Family history of skin cancer, n (%)</b>			.13	
Yes	29 (26.6)	8 (40)	21 (27)	
No	80 (73.4)	12 (60)	68 (76)	
<b>Sun safety education in class, n (%)</b>			.46	
Yes	54 (49.5)	8 (40)	46 (52)	
No	55 (50.5)	12 (60)	43 (48)	

<sup>a</sup>For race, participants were allowed to pick more than one response.

<sup>b</sup>Italics indicate value is statistically significant.

<sup>c</sup>Fisher exact test was used.

Although knowledge of skin cancer facts did not differ between video contest and non-video contest participants ( $P=.14$  and  $P=.11$ , respectively), video contest participants were more likely to correctly identify 2 tanning myths: “A base tan protects you against getting a sunburn” ( $P=.02$ ) and “There is no need for sun protection on cloudy or cold days” ( $P=.04$ ; Table 2). Overall, video contest participants had a higher total knowledge quiz

score compared to non-video contest participants ( $P<.001$ ; Table 3). Furthermore, quiz scores were not significantly different when students who had prior sun safety classroom education, a history of tanning, or gender or family history of skin cancer were compared to those who did not, but higher quiz scores were associated with high sunscreen intentions ( $P=.01$ ; Tables 3 and 4).

**Table 2.** Number of participants answering knowledge quiz questions correctly comparing video contest (n=20) and non-video contest (n=89) participants. Skin cancer facts were used as control questions.

Quiz items by correct answers	Video contest participant		P value
	Yes (n=20)	No (n=89)	
<b>Tanning myth (false), n (%)</b>			
A “base tan” protects you against getting a sunburn	19 (95)	62 (70)	.02 <sup>a</sup>
Tanning beds are a safe way to tan	20 (100)	75 (84)	.07
There is no need for sun protection on cloudy or cold days	20 (100)	72 (81)	.04 <sup>a</sup>
A fake (spray-on or lotion) tan will protect me from the sun	20 (100)	76 (85)	.12
Only old people get skin cancer	20 (100)	80 (90)	.21
<b>Skin cancer fact (true), n (%)</b>			
Utah has one of the highest rates of skin cancer in the country	13 (65)	41 (46)	.14
Skin cancer is the most common type of cancer	17 (85)	57 (64)	.11

<sup>a</sup>Italics indicate value is statistically significant.

**Table 3.** Analysis of median tanning myths and skin cancer facts quiz scores (maximum score 7).

Variable	Score, median (IQR)	P value
<b>Video contest participation</b>		<i>&lt;0.001</i> <sup>ab</sup>
Yes (n=20)	7 (6-7)	
No (n=89)	5 (4-6)	
<b>Sun safety class education</b>		0.82
Yes (n=54)	6 (5-6)	
No (n=55)	6 (5-6.5)	
<b>History of tanning</b>		0.29
Yes (n=52)	6 (5-6)	
No (n=57)	5 (4-6)	
<b>Gender</b>		0.16 <sup>a</sup>
Male (n=62)	6 (4.2-6)	
Female (n=47)	6 (5-7)	
<b>Race</b>		<i>&lt;0.001</i> <sup>ab</sup>
White only (n=40)	6 (6-7)	
People of color (n=69)	5 (4-6)	
<b>Family history of skin cancer</b>		0.34 <sup>a</sup>
Yes (n=29)	6 (5-7)	
No (n=80)	6 (5-6)	

<sup>a</sup>Exact version of Wilcoxon rank sum test used.

<sup>b</sup>Italics indicate value is statistically significant.

**Table 4.** Variables associated with future intentions of sunscreen use and tanning.

Variable	Sunscreen use intention			<i>P</i> value	Tanning intention			<i>P</i> value
	High	Medium	Low		High	Medium	Low	
<b>Video contest participation, n (%)</b>				<i>0.01</i> <sup>ab</sup>				.47 <sup>a</sup>
Yes (n=20)	15 (75)	5 (25)	0 (0)		2 (10)	7 (35)	11 (55)	
No (n=89)	36 (40)	39 (44)	14 (16)		20 (22)	25 (28)	44 (49)	
<b>Knowledge score, n (%)</b>				<i>0.01</i> <sup>ab</sup>				.46
≥5 (n=85)	46 (54)	31 (36)	8 (9)		15 (18)	26 (31)	44 (52)	
<5 (n=24)	5 (21)	13 (54)	6 (25)		7 (29)	6 (25)	11 (46)	
<b>Sun safety class education, n (%)</b>				0.21				.69
Yes (n=54)	23 (43)	26 (48)	5 (9)		12 (22)	17 (31)	25 (46)	
No (n=55)	28 (51)	18 (33)	9 (16)		10 (18)	15 (27)	30 (55)	
<b>History of tanning, n (%)</b>				0.09				<0.001 <sup>ab</sup>
Yes (n=52)	25 (48)	24 (46)	3 (6)		18 (35)	18 (35)	16 (31)	
No (n=57)	26 (46)	20 (35)	11 (19)		4 (7)	14 (25)	39 (68)	
<b>Peer tanning, n (%)</b>				0.15				<0.001 <sup>ab</sup>
Yes (n=50)	28 (56)	18 (36)	4 (8)		20 (40)	14 (28)	16 (32)	
No (n=59)	23 (39)	26 (44)	10 (17)		2 (3)	18 (31)	39 (66)	
<b>Family member tanning, n (%)</b>				0.78 <sup>a</sup>				.001 <sup>b</sup>
Yes (n=25)	12 (48)	11 (44)	2 (8)		10 (40)	10 (40)	5 (20)	
No (n=84)	39 (46)	33 (39)	12 (14)		12 (14)	22 (26)	50 (60)	
<b>Gender, n (%)</b>				0.7				.96
Male (n=62)	27 (44)	26 (42)	9 (15)		12 (19)	18 (29)	32 (52)	
Female (n=47)	24 (51)	18 (38)	5 (11)		10 (21)	14 (30)	23 (49)	
<b>Race, n (%)</b>				0.002 <sup>b</sup>				.98
White (n=39)	25 (64)	14 (36)	0 (0)		8 (21)	11 (28)	20 (51)	
People of color (n=70)	26 (37)	30 (43)	14 (20)		14 (20)	21 (30)	35 (30)	
<b>Family history of skin cancer, n (%)</b>				0.32 <sup>a</sup>				.42
Yes (n=29)	17 (59)	10 (34)	2 (7)		8 (28)	9 (31)	12 (41)	
No (n=80)	34 (42)	34 (42)	12 (15)		14 (18)	23 (29)	43 (54)	

<sup>a</sup>Fisher exact test was used.

<sup>b</sup>Italics indicate value is statistically significant.

Analysis of all survey respondents revealed that tanning intentions were significantly higher for those with a history of tanning ( $P<.001$ ), those who have friends that tan ( $P<.001$ ), and those with family members who tan ( $P=.001$ ). Future intentions to use sunscreen were higher in video contest participants ( $P=.01$ ) and White students ( $P=.002$ ; Table 4). In addition, White students had higher average knowledge quiz scores compared to students who did not self-identify as only White ( $P<.001$ ; Table 3).

A subsequent analysis of non-video contest participants comparing White students and students of color found no statistical differences in tanning intentions, having family members who tan, having friends who tan, a family history of skin cancer, or a personal history of sunburn. However, students of color had lower tanning myth knowledge scores ( $P=.01$ ) and reported lower intention to use sunscreen in the future ( $P=.02$ ; Table 5).

**Table 5.** Evaluation of tanning knowledge, history, and intentions of non-video contest participants comparing White students (n=23) to students of color (n=66).

Variable	Total (N=89)	White (n=23)	People of color (n=66)	<i>P</i> value
<b>Sun safety knowledge, median (IQR)</b>				
	5 (4-6)	6 (5.5-6)	5 (4-6)	<i>.01<sup>ab</sup></i>
<b>Personal tanning history, n (%)</b>				
Yes	43 (48)	14 (61)	29 (44)	.16
No	46 (52)	9 (39)	37 (56)	
<b>Family tanning history, n (%)</b>				
Yes	19 (21)	5 (22)	14 (21)	<i>&gt;.99<sup>a</sup></i>
No	70 (79)	18 (78)	52 (79)	
<b>Peer tanning history, n (%)</b>				
Yes	40 (45)	14 (61)	26 (39)	.08
No	49 (55)	9 (39)	40 (61)	
<b>Family history of skin cancer, n (%)</b>				
Yes	21 (24)	8 (35)	13 (20)	.14
No	68 (76)	15 (65)	53 (80)	
<b>Sunburn in the past 2 years, n (%)</b>				
More than once	24 (27)	9 (39)	15 (23)	.28
Once	36 (40)	7 (30)	29 (44)	
None	29 (33)	7 (30)	22 (33)	
<b>Sunscreen use intention, n (%)</b>				
High	36 (40)	13 (57)	23 (35)	<i>.02<sup>bc</sup></i>
Medium	39 (44)	10 (43)	29 (44)	
Low	14 (16)	0 (0)	14 (21)	
<b>Tanning intention, n (%)</b>				
High	20 (22)	6 (26)	14 (21)	<i>.89<sup>c</sup></i>
Medium	25 (28)	6 (26)	19 (29)	
Low	44 (49)	11 (48)	33 (50)	

<sup>a</sup>Exact version of Wilcoxon rank sum test was used.

<sup>b</sup>Italics indicate value is statistically significant.

<sup>c</sup>Fisher exact test was used.

## Discussion

In summary, our study confirms a high percentage of intentional tanning and poor sun-protective behaviors in our adolescent population. In a comparison of those who did and did not participate in a tanning myths-focused video contest, video contest participants had higher sun safety knowledge and higher intentions to use sunscreen, but did not show significant differences in tanning intentions compared to non-video contest participants. In addition, although the video contest was open to all Utah high school students, we had no Black or Hispanic students participate. A subsequent analysis found that students of color had lower sun safety knowledge scores and lower sunscreen use intentions despite having similar sun exposure and tanning histories compared to White students.

We and others have previously shown that sun-protective behaviors decrease as children age [8-10]. Our current study confirms the critical need for continued sun-protective interventions in Utah's adolescent population: two-thirds had at least one sunburn within the past 2 years and nearly half reported intentional outdoor tanning within the past 2 years. Adolescents who report having family members who purposefully tan have displayed similar behavior [11,12]. Congruently, those who have parental encouragement to practice sun-protective behaviors are significantly more likely to practice them [9,13]. Our study confirms this pattern and another that identifies peer tanning as an important psychosocial factor influencing adolescent tanning behavior [6,14,15]. Interventions focused on parental and peer influence may be beneficial for this population.

Traditional classroom lectures have been shown to be ineffective in promoting photoprotective behavior changes [16-18]. In our cohort, there was no difference in sun safety knowledge or sunscreen and tanning intentions between those that had sun safety education in school versus those that did not. However, our video contest participants were more likely to identify tanning myths resulting in unintentional sun exposure, indicating, "A base tan protects you against getting a sunburn" and "There is no need for sun protection on cloudy or cold days". Video contest participants also reported increased sunscreen use intentions, although they did not have decreased tanning intentions compared to non-video contest participants. Because preintervention knowledge scores were not assessed, we could not determine whether video contest participants had higher baseline knowledge of tanning myths compared to non-video contest participants. Nevertheless, our findings suggest that although skin cancer prevention may be of importance for video contest participants, as implicated by increased sunscreen use intention, the desire to have tanned skin persists. This is in concordance with recent studies that used individualized appearance-based approaches, such as ultraviolet photography and age-enhancing software to promote photoprotective behaviors [10,19-22]. Thus, future studies evaluating experiential learning methods, such as the video contest described herein, in conjunction with an appearance-based model, may show promise with this population.

Of note, adolescent members of underrepresented racial minority groups did not participate in our video contest. Although skin cancer is indeed far less common in people of color, its incidence is rising, and those diagnosed face a poorer prognosis than do White individuals [23]. Poor prognosis is thought to be caused by delay in treatment, which can result from skin cancer misconceptions and socioeconomic factors influencing access

of care in people of color, as well as lack of skin cancer education directed towards this population and their providers [24-27]. These factors may also contribute to the lack of participation in our video contest. In particular, students were asked to use their own recording devices, which may discourage those from resource-limited households. Indeed, adolescents who are people of color in our study had both lower tanning myth knowledge scores and decreased sunscreen use intention. However, our findings did not show differences in tanning history, sunburn history, or family history of skin cancer between White students and students of color. These findings underlie the need for targeted skin cancer prevention education that is community- or family-centered for adolescents who are people of color [28-30].

Our study has several limitations including the small sample size surveyed, which reduces the power of our conclusions and renders them ungeneralizable to the adolescent population as a whole. Furthermore, we cannot comment on the efficacy of the video contest in improving knowledge because preintervention tanning knowledge was not assessed in the video contest participants. The video contest may inherently possess a selection bias for those who have a greater understanding of sun safety or access to video recording devices. Thus, the contest may be unappealing to those who are less informed about sun safety or who are less familiar with video production. Follow-up studies are needed to assess retention of sun-protective knowledge and behaviors long term.

In conclusion, adolescents are at high risk for poor sun-protective behaviors. Participating in a public service announcement video contest may promote sunscreen use, but does not reduce tanning intentions. Our findings highlight the need for targeted photoprotective interventions, specifically for those who report high-risk tanning intentions and also those who are people of color.

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## Conflicts of Interest

None declared.

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