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# Effect of appearance-based education compared with health-based education on sunscreen use and knowledge: A randomized controlled trial

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**Background:** Appearance-based education shows promise in promoting sunscreen use although resource-intensive methods used in prior studies preclude wide dissemination. Appearance-based video education can be made easily accessible.

**Objective:** We sought to compare the effectiveness of appearance-based video education with that of health-based video education in improving sunscreen use and knowledge.

**Design:** In a randomized controlled trial, participants viewed either an appearance-based video on ultraviolet-induced premature aging or a health-based video emphasizing ultraviolet exposure and skin cancer risk.

**Results:** Fifty high-school students participated in the study, conducted from February through March 2012. The health-based group had a nonstatistically significant increase in sunscreen use ( $0.9 \pm 1.9$  d/wk,  $P = .096$ ), whereas the appearance-based group demonstrated a statistically significant increase in sunscreen use ( $2.8 \pm 2.2$ ,  $P < .001$ ). Between-group comparisons revealed that the appearance-based group applied sunscreen at significantly greater frequencies compared with the health-based group ( $2.2 \pm 1.4$  vs  $0.2 \pm 0.6$ ,  $P < .001$ ). Knowledge scores significantly improved in both study groups. The difference in knowledge scores between the study groups was not significant.

**Limitations:** The study population may not reflect the general population.

**Conclusion:** Appearance-based video education appears to be effective in promoting sunscreen use and knowledge in adolescents. (J Am Acad Dermatol 2014;70:665-9.)

**Key words:** adolescents; appearance-based education; behavioral change; skin cancer prevention; sunscreen use; video education.

Many skin cancer prevention efforts to date are “health-based” in that they emphasize the relationship between enhanced ultraviolet (UV) exposure and skin cancer risk. Health-based interventions performed within schools have improved skin cancer knowledge and behavioral intent.<sup>1-4</sup> However, reported outcomes often fail to demonstrate significant improvement in actual

sun-protection behavior.<sup>5-7</sup> Past research shows that adolescents have difficulty practicing preventive health behavior because they believe themselves less likely to experience disease.<sup>8,9</sup> Therefore, health-based messages that emphasize long-term skin cancer risk may be less effective in changing behavior among young individuals who perceive less risk of skin cancer development.

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Skin cancer prevention interventions may benefit from using an “appearance-based” model. Appearance-based interventions emphasize how UV exposure contributes to the premature aging of skin (eg, wrinkle development, uneven pigmentation, sagging skin).<sup>10-15</sup> One study found that college students who viewed UV-filtered photographs of their faces reported significantly higher levels of intent and actual use of sunscreen.<sup>13</sup> Another found that middle-school students who viewed their skin under UV-filtered light expressed significantly greater intent to apply sunscreen.<sup>15</sup> Thus, messages that emphasize the short-term negative effects of UV light on physical appearance may be more effective in changing behavior.

The purpose of our study was to compare the effectiveness of appearance-based video education with that of health-based video education on improving sunscreen use and knowledge. We hypothesized that a group of adolescents who viewed the appearance-based video would display greater sun-protection behavior and sunscreen knowledge.

## METHODS

This randomized controlled study was approved by the Institutional Review Board of University of California, Davis (protocol number 251825-2). The study population consisted of 50 11th-grade students from an inner-city high school located in Northern California. We conducted the study between February and March 2012. Participation in the study was integrated into the students' health education class although study participation was not mandatory. Participants were eligible for the study if they were English-speaking, at least 13 years of age, and able to hear and view the educational videos. Participants were required to obtain parent/guardian informed consent and provide assent to participate.

Fifty participants were randomized in a 1:1 simple, nonstratified randomization scheme (Fig 1) with allocation concealment preserved through the use of sequentially numbered, opaque, sealed envelopes. Twenty-five participants were randomized to the appearance-based video group and 25 were randomized to watch the health-based video. Participants viewed the video to which they were assigned as a group.

## Health-based and appearance-based video description

The videos were approximately 5 minutes in duration and guided by the Health Belief Model.<sup>16</sup> This model predicts that individuals are more likely to adopt a new behavior if they perceive: (1) a negative health outcome of not performing a behavior to be severe, (2) themselves to be susceptible to the negative outcome, (3) the benefits to a behavior to be high, and (4) the barriers to adopting a behavior to be low.<sup>16</sup>

The health-based video discussed the growing incidence of melanoma among young people and the link between skin cancer and UV radiation. It also explained how sun protection could lower skin cancer risk. The appearance-based video discussed the contribution of UV light to premature cutaneous aging and how sun-

screen use could help delay signs of skin aging.

A mixed-race actress, who was featured in both videos, was chosen to mirror our young and ethnically diverse target population. Computer-generated images, animations, popular culture references, and humor made the educational videos more relatable. The health-based video (<http://youtu.be/wJ5nJLa6gtY>) and appearance-based video (<http://youtu.be/jQDPKMItMCM>) can be viewed online.

## Measures and scales

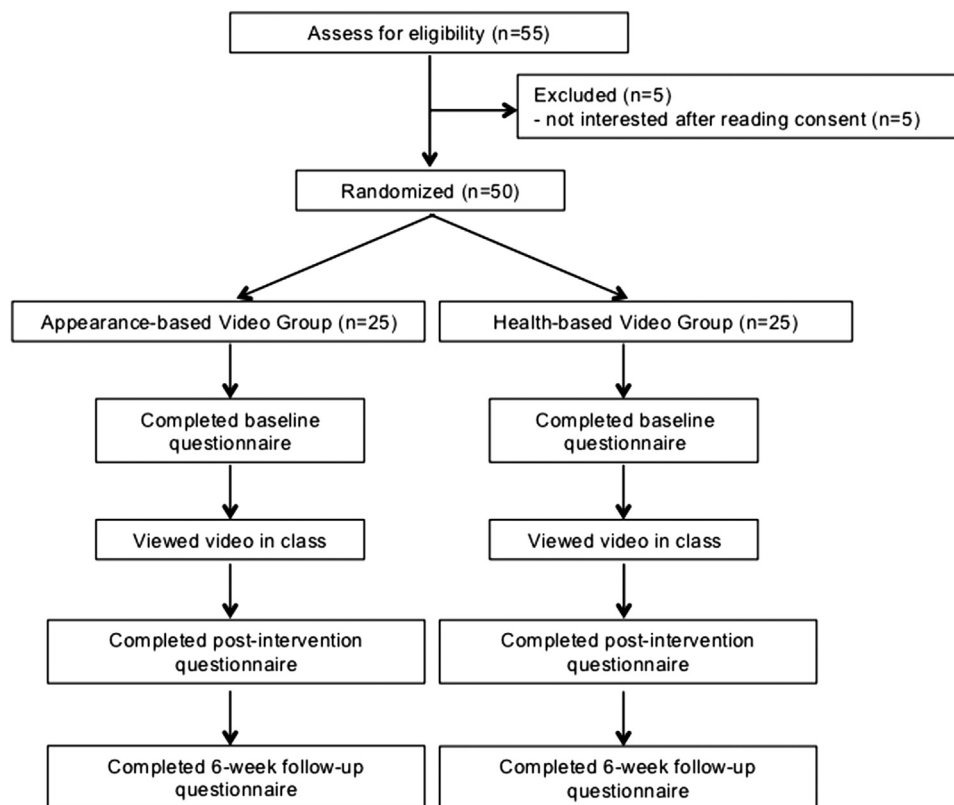
Sunscreen application behavior was assessed at baseline and at 6 weeks postintervention using standard questions from the National Health and Nutrition Examination Survey on sun-protective behaviors. Sunscreen application behavior was defined as the average number of days per week that participants applied sunscreen during the preceding 30 days. Knowledge regarding proper sunscreen use and the effects of UV light was assessed at baseline, immediately after watching the video, and 6 weeks postintervention with a questionnaire consisting of the same questions.

## Statistical analysis

Statistical analyses were based on an intention-to-treat approach using software (SPSS 20.0, IBM Corp, Armonk, NY). Two-tailed tests were performed for all statistical analyses. Unpaired Student *t* test was

### CAPSULE SUMMARY

- Skin cancer prevention interventions include appearance-based or health-based messages to educate schoolchildren.
- Appearance-based video education was found to be superior to health-based video education in promoting sunscreen use.
- Appearance-based educational techniques delivered by video can effectively disseminate knowledge and promote sun-protective behaviors in adolescents.



**Fig 1.** Study schema and flow diagram for a randomized controlled trial comparing appearance-based video education with health-based video education.

used to analyze continuous variables for between-group comparisons, and paired Student *t* test was used for within-group comparisons. We performed  $\chi^2$  tests for categorical variables. For all statistical analyses, *P* less than .05 was considered statistically significant.

## RESULTS

Fifty participants enrolled and completed the study. Demographic information and responses to questionnaire items on sun-protective behaviors are presented in [Tables I and II](#), respectively.

### Improvement in sunscreen application behavior

The appearance-based group ( $0.6 \pm 1.1$  d/wk) and health-based group ( $0.7 \pm 1.9$ ) had similar baseline frequencies of sunscreen application per week ( $P = .792$ ). Within-group analysis showed that the appearance-based group reported significantly higher mean sunscreen use at the 6-week follow-up period ( $2.8 \pm 2.2$  d/wk) compared with baseline ( $P < .001$ ). In contrast, the health-based video intervention group reported a mean sunscreen application frequency of  $0.9 \pm 1.9$  days per week that was not significantly different from baseline ( $P = .096$ ).

Between-group comparisons revealed that the mean increase in sunscreen application was significantly higher in the appearance-based group ( $2.2 \pm 1.4$  d/wk) than the health-based group ( $0.2 \pm 0.6$ ;  $P < .001$ ).

### Improvement in sunscreen knowledge

The appearance-based group ( $6.6 \pm 1.3$ ) and health-based group ( $5.8 \pm 1.7$ ) had similar knowledge scores at baseline ( $P = .061$ ). Within-group analysis showed that the knowledge score of the appearance-based group was significantly higher immediately after watching the video ( $7.9 \pm 0.9$ ) compared with baseline ( $6.6 \pm 1.3$ ;  $P = .001$ ). After 6 weeks, knowledge score remained significantly higher than baseline at  $7.5 \pm 1.0$  ( $P = .013$ ). Similarly, the health-based group exhibited a significant improvement in sunscreen knowledge immediately after watching the video ( $7.4 \pm 1.0$ ) compared with baseline ( $5.8 \pm 1.7$ ;  $P < .001$ ). The knowledge score at 6 weeks postintervention was  $7.0 \pm 2.0$ , which was significantly higher than baseline ( $P = .008$ ).

Between-group comparison showed that the mean improvement in knowledge immediately after watching the video was not significantly different

**Table I.** Baseline demographic factors between participants randomized to the appearance-based video and health-based video

	Appearance-based (n = 25)	Health-based (n = 25)	P value
Sex			
Female	76% (19)	84% (21)	.725*
Male	24% (6)	16% (4)	
Age, y			
Mean $\pm$ SD	17.1 $\pm$ 0.88	17.2 $\pm$ 0.44	.545 <sup>†</sup>
Ethnicity			
White	12% (3)	4% (1)	.609*
Non-white	88% (22)	96% (24)	
Lunch program eligibility			
No	36% (9)	36% (9)	1*
Yes	64% (16)	64% (16)	
Skin type			
Burns easily, difficult to tan	24% (6)	20% (5)	.675 <sup>‡</sup>
Tans after initial burn	16% (4)	24% (6)	
Tans easily, difficult to burn	60% (15)	56% (14)	
No. of sunburns in last year			
Mean $\pm$ SD	1.08 $\pm$ 1.11	1.00 $\pm$ 1.12	.801 <sup>†</sup>

Percentages are followed by number of cases (in parentheses).

\*Fisher exact, <sup>†</sup>Student *t*, and <sup>‡</sup> $\chi^2$  tests were used to determine significance.

between the appearance-based group (1.6  $\pm$  1.6) and health-based group (1.3  $\pm$  1.6; *P* = .533). Likewise, the difference in improvement after 6 weeks was not significant between the appearance-based group (1.2  $\pm$  2.0) and health-based group (0.9  $\pm$  1.7; *P* = .651).

## DISCUSSION

Sun-protection behaviors have been shown to reduce the risk of nonmelanoma skin cancers with some evidence suggesting a reduction in melanoma risk as well.<sup>17-20</sup> Significant risk for skin cancer from solar radiation begins during childhood and early sun-safe practices may reduce the incidence of UV-induced skin cancers that occur later in life. Thus, it is beneficial to tailor education to younger individuals for more effective skin cancer prevention and control.

Appearance-based studies have shown greater promise in promoting sun-protective behavior compared with traditional health-based education. However, many appearance-based studies have used UV photography or similar technology that may be too resource intensive to be disseminated population-wide.

Video can be an effective medium for delivering educational content, promoting behavior change, and improving clinical outcomes.<sup>21-27</sup> Coupling the increased consumption and acceptability of digital media by youth<sup>28</sup> with the promising results of appearance-based interventions suggested a way of promoting sun protection among adolescents.

Our study found that an appearance-based video significantly improved sunscreen application frequency at a 6-week follow-up time point compared with baseline. This was not observed in the health-based video group. Both videos were effective in increasing sunscreen knowledge and resulted in greater knowledge gain at 6 weeks compared with baseline. By emphasizing the short-term effect of ambient solar radiation on appearance, the appearance-based video may have increased the salience of UV damage and the importance of proper sun protection.

One limitation of this study was that it focused on adolescents and may not be generalizable to patients of other age groups. Nevertheless, it provides evidence that appearance-based messaging may be superior to traditional health-based messages in promoting sun-protection behaviors. Our study also demonstrates that appearance-based education can be effectively delivered by video. In contrast to appearance-based interventions using resource-intensive methods, such as UV photography, video education can be easily and widely disseminated to influence behavior.

## REFERENCES

- Geller AC, Cantor M, Miller DR, Kenausis K, Rosseel K, Rutsch L, et al. The Environmental Protection Agency's national SunWise school program: sun protection education in US schools (1999-2000). *J Am Acad Dermatol* 2002;46:683-9.
- Geller AC, Shamban J, O'Riordan DL, Slygh C, Kinney JP, Rosenberg S. Raising sun protection and early detection awareness among Florida high schoolers. *Pediatr Dermatol* 2005;22:112-8.
- Lowe JB, Balanda KP, Stanton WR, Gillespie A. Evaluation of a three-year school-based intervention to increase adolescent sun protection. *Health Educ Behav* 1999;26:396-408.
- Hewitt M, Denman S, Hayes L, Pearson J, Wallbanks C. Evaluation of "Sun-safe": a health education resource for primary schools. *Health Educ Res* 2001;16:623-33.
- Buller DB, Buller MK, Beach B, Ertl G. Sunny days, healthy ways: evaluation of a skin cancer prevention curriculum for elementary school-aged children. *J Am Acad Dermatol* 1996;35:911-22.
- Buller MK, Loescher LJ, Buller DB. "Sunshine and skin health": a curriculum for skin cancer prevention education. *J Cancer Educ* 1994;9:155-62.
- Mermelstein RJ, Riesenber LA. Changing knowledge and attitudes about skin cancer risk factors in adolescents. *Health Psychol* 1992;11:371-6.
- Roberts ME, Gibbons FX, Gerrard M, Alert MD. Optimism and adolescent perception of skin cancer risk. *Health Psychol* 2011;30:810-3.

**Table II.** Sun-protective behaviors at baseline and at 6-week follow-up between participants randomized to appearance-based and health-based video education

	Appearance-based (n = 25)			Health-based (n = 25)			<i>P</i> <sup>†</sup> (between-group)
	Baseline	6-wk Follow-up	<i>P</i> <sup>*</sup> (within-group)	Baseline	6-wk Follow-up	<i>P</i> <sup>*</sup> (within-group)	
How often do you stay in the shade when out in the sun for >1 h?							
Never/rarely	20% (5)	20% (5)	1.000	8% (2)	12% (3)	1.000	.417; .702
At least sometimes	80% (20)	80% (20)		92% (23)	88% (22)		
How often do you wear a hat that shades your face, ears, and neck when out in sun for >1 h?							
Never/rarely	92% (23)	80% (20)	.453	84% (21)	76% (19)	.727	.667; 1.000
At least sometimes	8% (2)	20% (5)		16% (4)	24% (6)		
How often do you wear a long-sleeved shirt when out in the sun for >1 h?							
Never/rarely	76% (19)	64% (16)	.375	88% (22)	88% (22)	1.000	.463; .095
At least sometimes	24% (6)	36% (9)		12% (3)	12% (3)		
Sunscreen adherence (mean d/wk ± SD)	0.6 ± 1.1	2.8 ± 2.2	<.001	0.7 ± 1.9	0.9 ± 1.9	.096	.792; .003

Percentages are followed by number of cases (in parentheses).

\**P* value when comparing baseline values with 6-wk follow-up results (within-group results).

<sup>†</sup>*P* value when comparing results between video groups. Baseline significance is followed by 6-wk follow-up significance (after semicolon).

- Moore SM, Rosenthal DA. Australian adolescents' perceptions of health-related risks. *J Adolesc Res* 1992;7:177-91.
- Mahler HI, Fitzpatrick B, Parker P, Lapin A. The relative effects of a health-based versus an appearance-based intervention designed to increase sunscreen use. *Am J Health Promot* 1997;11:426-9.
- Mahler HI, Kulik JA, Gerrard M, Gibbons FX. Long-term effects of appearance-based interventions on sun protection behaviors. *Health Psychol* 2007;26:350-60.
- Mahler HI, Kulik JA, Gibbons FX, Gerrard M, Harrell J. Effects of appearance-based interventions on sun protection intentions and self-reported behaviors. *Health Psychol* 2003;22:199-209.
- Mahler HI, Kulik JA, Harrell J, Correa A, Gibbons FX, Gerrard M. Effects of UV photographs, photoaging information, and use of sunless tanning lotion on sun protection behaviors. *Arch Dermatol* 2005;141:373-80.
- Stock ML, Gerrard M, Gibbons FX, Dykstra JL, Weng CY, Mahler HI, et al. Sun protection intervention for highway workers: long-term efficacy of UV photography and skin cancer information on men's protective cognitions and behavior. *Ann Behav Med* 2009;38:225-36.
- Olson AL, Gaffney CA, Starr P, Dietrich AJ. The impact of an appearance-based educational intervention on adolescent intention to use sunscreen. *Health Educ Res* 2008;23:763-9.
- Rosenstock IM. Why people use health services. *Milbank Mem Fund Q* 1966;44(Suppl):94-127.
- Drolet BA, Connor MJ. Sunscreens and the prevention of ultraviolet radiation-induced skin cancer. *J Dermatol Surg Oncol* 1992;18:571-6.
- Gimotty PA, Glanz K. Sunscreen and melanoma: what is the evidence? *J Clin Oncol* 2011;29:249-50.
- Green AC, Williams GM, Logan V, Strutton GM. Reduced melanoma after regular sunscreen use: randomized trial follow-up. *J Clin Oncol* 2011;29:257-63.
- Lazovich D, Vogel RI, Berwick M, Weinstock MA, Warshaw EM, Anderson KE. Melanoma risk in relation to use of sunscreen or other sun protection methods. *Cancer Epidemiol Biomarkers Prev* 2011;20:2583-93.
- Gagliano ME. A literature review on the efficacy of video in patient education. *J Med Educ* 1988;63:785-92.
- Tuong W, Larsen ER, Armstrong AW. Videos to influence: a systematic review of effectiveness of video-based education in modifying health behaviors. *J Behav Med* doi:10.1007/s10865-012-9480-7. Published online November 28, 2012.
- Armstrong AW, Parsi K, Schupp CW, Mease PJ, Duffin KC. Standardizing training for psoriasis measures: effectiveness of an online training video on Psoriasis Area and Severity Index assessment by physician and patient raters. *JAMA Dermatol* 2013;149:577-82.
- Armstrong AW, Kim RH, Idriss NZ, Larsen LN, Lio PA. Online video improves clinical outcomes in adults with atopic dermatitis: a randomized controlled trial. *J Am Acad Dermatol* 2011;64:502-7.
- Idriss NZ, Alikhan A, Baba K, Armstrong AW. Online, video-based patient education improves melanoma awareness: a randomized controlled trial. *Telemed J E Health* 2009;15:992-7.
- Armstrong AW, Alikhan A, Cheng LS, Schupp C, Kurlinkus C, Eisen DB. Portable video media for presenting informed consent and wound care instructions for skin biopsies: a randomized controlled trial. *Br J Dermatol* 2010;163:1014-9.
- Armstrong AW, Idriss NZ, Kim RH. Effects of video-based, online education on behavioral and knowledge outcomes in sunscreen use: a randomized controlled trial. *Patient Educ Couns* 2011;83:273-7.
- Roberts DF, Foehr UG. Trends in media use. *Future Child* 2008;18:11-37.