Published in final edited form as:
Am J Prev Med. 2006 January ; 30(1): 13–22.

Effects of the *Sunny Days, Healthy Ways* Curriculum on Students in Grades 6–8

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Abstract

Background—There are few effective sun safety education programs for use in secondary schools. The project aims were to create a sun safety curriculum for grades 6–9 and to test whether exposure to the curriculum would increase children's sun protection behavior.

Design—A pair-matched group-randomized pretest-posttest controlled trial, with middle schools as the unit of randomization, was performed. Teachers implemented the six-unit sun safety curriculum in 2001–03 and analyses were performed in 2003–04.

Setting/participants—2038 children from 30 middle schools in Colorado, New Mexico, and Arizona.

Main outcome measures—Self-reported sun protection behavior using frequency ratings and diary.

Results—Compared to control schools, children receiving the curriculum reported more frequent sun protection (p=0.0035), and a greater proportion wore long-sleeved shirts in during recess (p<0.0001) and applied sunscreen (p<0.0001). Exposure to the curriculum improved knowledge (p<0.0001), decreased perceived barriers to using sunscreen (p=0.0046), and enhanced self-efficacy expectations (p=0.0577) about sun safety, and reduced favorable attitudes toward sun tanning (p=0.0026 to <0.0001). In intent-to-treat analyses, the treatment effect was eliminated only under the most conservative assumptions about dropouts.

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No financial conflict of interest was reported by the authors of this paper.

Conclusions—Educational approaches to sun safety in middle school may be effective for improving children's sun safety. Potential trial limitations include measuring short-term outcomes, focusing on young adolescents, using active parental consent, and testing in the American southwest.

INTRODUCTION

Sun protection of children is a national priority.[1–3] Individuals receive a substantial proportion of lifetime exposure to ultraviolet radiation (UVR) during childhood[4] and severe sunburns before age 20 may increase lifetime risk of developing melanoma.[5] Sun safety is not practiced by many fair-skinned children; many are sunburned; and tanning norms are evident.[6–8]

The school environment is a potentially effective venue for delivering sun safety interventions, but it is uncommon in the United States.[9] The U.S. Centers for Disease Control and Prevention issued guidelines that recommend school programs on sun safety.[1] The Task Force on Community Preventive Services concluded that there was sufficient evidence to recommend sun safety education in primary schools but not in secondary schools.[10]

Multi-unit curricula affect children's sun protection much more than brief programs.[11] The multi-unit ***Sunny Days, Healthy Ways*** skin cancer prevention curriculum (SDHW) demonstrated effectiveness in primary schools.[12–15] This paper reports on an evaluation of a version of SDHW for middle schools - grades 6, 7 and 8 – that contained content and instructional strategies based on social cognitive theory.[16] The main hypothesis was that children who received the SDHW would report greater sun protection at posttest than children who did not. This was the first rigorously-evaluated theory-based intervention for middle schools for preventing skin cancer.

METHODS

A group-randomized pretest-posttest controlled trial was undertaken to evaluate SDHW with children enrolled in grades 6–8.

Sample and Population

The unit of randomization was schools (n=30). Schools were approached through districts and consent to participate was obtained from the principals and district personnel. Teachers of health education and science participated (n=41 teachers; 145 classes). Parental consent was secured for the testing (n=2,038 students; consent rates =55.5%). Schools classified SDHW as experimental instructional materials and presented it to all students. Prior to completing the survey, students read and signed an assent form. All consent and assent forms were approved by the Institutional Review Boards at the participating institutions.

The Sunny Days, Healthy Ways Curriculum

The SDHW curriculum had six 50-minute lessons intended to increase perceived personal risk for skin damage and skin cancer, positive outcome expectations about sun protection to reduce personal risk, and self-efficacy expectations for performing sun protection in a variety of situations. It taught children key prevention skills: selecting and applying sunscreen, selecting sun protective clothing, hats and sunglasses, using shade, and minimizing time in the sun. It contained activities to help children set goals for sun protection, monitor progress toward them, and overcome barriers to sun protection. Each unit was designed to be presented either in its entirety or in 15 or 30 minutes segments over several classes.

Teachers in intervention schools attended two-hour training sessions. Research staff provided information on sun safety and skin cancer, reviewed the curriculum, and described implementation and testing procedures. The SDHW's usability was enhanced by providing a

format with introduction, learning objectives, glossary, and lesson plans for each unit. Teachers role modeled instructional activities during training.

Study Design and Procedures

A stratified pair-matched group-randomized pretest-posttest controlled design was performed, randomizing schools in Colorado, New Mexico and Arizona. Data from Colorado and some of the New Mexico schools were obtained in the 2001–02 school year; data from Arizona and remainder of the New Mexico schools were collected in 2002–03. Schools were stratified by state and paired on size, grade levels participating, proportion of minority students, and proportion of students on free or reduced meals (an indicator of socioeconomic status). A school in each pair was randomly assigned to the intervention group. Students were pretested in their classrooms in a group setting in February and March by trained staff, although teachers were present during testing. Teachers presented the SDHW (following the order of units) during the regularly-scheduled class meetings within a six-week intervention period from mid-March to the end of April. Nine of the 20 teachers presenting SDHW returned an implementation checklist and reported that they taught activities from all six lessons. Also, research staff observed all 13 teachers at intervention schools in Colorado during one class period and confirmed that they completed all activities in the planned unit. Students were posttested at the end of the school year in May, using the same procedures as in pretesting.

Measures

Outcome measures—The surveys contained a variety of self-report measures on sun protection. The primary measures were adapted from a sun protection diary[17] – time outside, mostly in sun/shade, wearing a head covering, wearing clothing that covered shoulders/arms, wearing clothing that covered legs, wearing sunscreen. Children completed these reports for times that they were outdoors while at school yesterday during lunch, physical education class, and recess. A weighted body coverage measure was created for each time outdoors, ranging from 0 to 15.[17] This diary measure was validated in a pilot study.[18] Also, a series of 5-point frequency items assessed how often children applied sunscreen with SPF of 15 or more, wore clothes covering most of the body, wore a hat, limited time in the sun during midday, stayed in the shade, wore sunglasses. A mean rating was calculated across the items.

To further validate these self-reports, a subsample of children from each class (n=191 total) had their skin tone assessed using a colorimeter. Five measures were made on the inside upper arm (unexposed area) and outside lower arm (sun exposed area) and averaged on three scales – a (redness), b (blue-yellow), and L* (light-dark). The difference between these average score was calculated and larger positive differences on a and b scales and smaller negative differences on the L* scale were associated with more exposure to UVR. Three trained staff persons performed the colorimeter assessments (intraclass correlation within reader = 0.74 for a, 0.08 for b, and 0.54 for L*). Two staff persons were selected to conduct the colorimeter reading in school. Comparison of practice ratings between staff showed no statistically significant difference on the b scale but small differences on the L* ($p<0.05$) and a scales ($p<0.05$).

Secondary measures of sun protection included children's frequency of lying out in the sun to get a tan and using self-tanning cream, being sunburned during the past month and in the last summer, the SPF of sunscreen used, and perceived importance of having a tan (1=not important; 4=very important). Sun safety knowledge was tapped with 10 true/false items, attitudes toward sun exposure and sun protection with 17 five-point Likert agree/disagree items, and self-efficacy expectations with four three-point (1=not sure; 3 = sure) items linked to content in the curriculum. A summed knowledge score was created (Kuder-Richardson- 20 reliability=0.71). Two factors were identified in the attitudinal items using principal components factor analysis: barriers to use of sunscreen (sunscreen is not in an easy place to

get to; it's hard to choose the right sunscreen; sunscreens irritate my skin; sunscreens are messy to use; alpha reliability=0.47) barriers to sun protection (if I stay out of the sun, I will miss out on outdoor activities; I have to stop what I'm doing to put sunscreen on; a hat messes up my hair; I don't like the way I look in a hat; it's too hot to wear long sleeves and long pants in the summer; alpha reliability=0.41), and negative normative perceptions of sun safety (if I stay outside, my friends will think I'm weird; my friends will think I'm weird if I wear a hat; if I wear long sleeves and long pants, my friends will think I'm weird; my friends will make fun of me if I wear a hat; alpha reliability=0.54).

Overall kappa values estimating two-week test-retest reliability were 0.39 for knowledge, 0.67 for attitudes, and 0.54 for self-efficacy (all $p < 0.0001$)(18). Although the test-retest reliability and the internal consistency (time 1 = 0.38, time 2 = 0.47) for knowledge were low, concordance rates were high (82%–93%). Internal consistency for attitudes (time 1 = 0.58, time 2 = 0.65) and self efficacy (time 1 = 0.75, time 2 = 0.76) scales were higher in the pilot study. Internal consistency is not always indicative of quality scales[19] and these reliabilities were similar to that reported by another study on measure of sun safety knowledge and attitudes of 10–11 year olds.[20]

Skin cancer risk was measured by hair and skin color, skin sun sensitivity [propensity to sunburn and tan] and state lived for most of life.[21] Demographics assessed included age, gender, Hispanicity, race, and number of siblings and number of parents in household. Number of days absent and typical grades were also asked.

Analysis Plan

The sample size and analyses were designed to adjust for the effect of clustering within schools (22;23) (intraclass correlations = 0.003 [behavior composite], 0.025 [use of shade], 0.000 [importance of a tan], 0.000 [attractiveness of a tan], 0.005 [desire to have a tan], 0.000 [don't like how I look in a hat], 0.000 [long sleeves and long pants are too hot], 0.015 [sunscreen factor], 0.051 [sun safety knowledge], 0.029 [self-efficacy for using sunscreen]). Descriptive statistics were calculated and compared to confirm that the randomization procedures yielded a balanced allocation to the intervention and control groups. Linear mixed models were used to test the main hypothesis on the effect of SDHW taking into account the clustering within school. Associations were tested between each outcome measure, separately, and potential covariates in bivariate mixed models. Multivariate analyses were then performed including significant covariates, i.e., pretest value of the outcome measure, gender, age, and skin sun sensitivity. Treatment group and school pair were fixed-effects. A general linear mixed model (PROC MIXED) was employed for the continuous and Likert scale outcome measures; a generalized mixed model (PROC GENMOD) was use for the binary outcomes. Due to a lack of response in one school, only 14 of the original 15 school pairs were analyzed. An extensive analysis of potential moderators and mediators was performed, but given the complexity, is reported elsewhere(24). The outcomes of the intervention/control comparisons are presented unadjusted and adjusted for covariates. Effect size estimates were calculated using formulae from Hedges (25). Several analyses were performed to test the effect of dropout, including intent-to-treat analyses under various assumptions about the dropout's sun protection.

RESULTS

Profile of Sample

Initially, 2038 students completed the pretest and 1788 (87.8%) completed the posttest. Of these, 1769 were retained for analysis after eliminating one school pair. The final sample contained slightly more girls than boys and was predominately white (although a quarter reported being Hispanic or Latino) (Table 1). The largest age group was 13 years old.

Randomization appeared to allocate children evenly; experimental conditions only differed on age, with slightly more students being age 13 in the control than intervention group.

Pre/Post Change in Sun Protection Behavior

The primary hypothesis was that children receiving the SDHW would report greater sun protection than children not receiving it. This hypothesis was supported with the composite frequency measure. Children in intervention schools reported more frequent sun protection than those in control schools (Table 2). This measure was unrelated to age (r=0.00). Also, more children in intervention schools reported that they wore long-sleeved shirts at recess than children in control schools. Exposure to SDHW was associated with greater use of sunscreen at all times (Table 3). However, the analysis of the body coverage score during lunch, physical education, or recess from the diary did not support the hypothesis (Table 2).

Correlation of Posttest Behavior Measures with Skin Tone Assessments

The posttest self-report measures of sun safe behavior were correlated with the skin tone measure by colorimeter. As expected the greater the reported sun safe behavior, the lower the redness of the skin as measured by the "a" scale (r=0.15, p=0.034). Likewise, the greater the reported use of sunscreen, the lower the redness on the "a" scale (r=0.22, p=0.002) and the lower the darkness on the "L*" scale (r=−0.19, p=0.009). Unexpectedly, children who reported laying out in the sun to get a tan had less dark skin on the "L*" scale (r=0.23, p=0.002). Reports of wearing protective clothing, limiting time in the sun, staying in the shade, and being sunburned were not associated with skin tone (p>0.05).

Pre/Post Change in Sun Safety Knowledge and Attitudes

Presentation of the SDHW also produced positive changes in secondary measures (Table 4). Children in intervention schools demonstrated more knowledge of sun safety, less favorable attitudes toward sun tanning, fewer barriers to sun protection, and more positive self-efficacy expectations for using sunscreen with SPF of 15 or more at posttest than in control schools.

Loss to Follow-up

Comparisons of children who did and did not complete the posttest was performed using chi-square tests. A larger number of students dropped out of the intervention group and in grades 6 and 8. There were also significant group-by-grade and group-by-ethnicity interactions, with 8th grade intervention students and Hispanic control students more likely to drop out. Closer examination revealed that 42% of drop-outs were from two schools - one in the intervention group comprised entirely of 8th graders and one in the control group with a large Hispanic population. These seemingly differential dropout patterns appear to be driven by these two schools.

Intent-to-treat analyses were performed on the primary outcome measures to determine how loss to follow-up might have altered the observed differences in sun protection produced by the SDHW. For the posttest assessment of the continuous behavioral composite measure, students who dropped out were assigned their pretest value, the general linear mixed model was re-estimated, and the intervention/control difference remained significant (C: mean=3.56, s.e.=0.0125; I: mean=3.45, s.e.=0.0182; p value=0.0032), indicating that SDHW's effectiveness was unlikely to be affected by drop out. For the dichotomous measures, intent-to-treat analyses were conducted in two ways. First, the children who dropped out were assigned their pretest value for the post assessment and the intervention/control differences in wearing long sleeves at recess (OR = 2.43, LL = 2.05, UL = 2.89) and wearing sunscreen (OR = 2.41, LL = 1.58, UL = 3.68) remained significant. Second, the children who dropped out were assigned a value that indicated that they did not use shade or wear sunscreen and only

under this very conservative assumption did the intervention/control differences become non-significant (wearing long-sleeves at recess: OR did not converge; sunscreen use: OR = 1.46, LL = 0.73, UL = 2.94).

DISCUSSION

The SDHW was effective with children in grades 6, 7 and 8. It had a positive impact on a broad range of outcomes, including theoretical precursors to behavior change and reported sun protection behavior. The effects of SDHW reported here, coupled with evidence that these effects occurred through a pathway of theoretical mediation based on social cognitive theory - improved knowledge, reduced barriers, and elevated self-efficacy expectations - as reported elsewhere[24] suggests that the behavior change strategies in SDHW influenced children to improve their sun protection, not merely exposure to information on sun safety. Furthermore, these effects were detected within scales validated in our pilot study or by correlations with colorimeter measures in the trial. Validation of sun protection measures has been rare.[26]

The intent-to-treat analyses also appeared to rule out biases due to drop out in all but the most conservative case where it was assumed that all drop outs did not engage in sun protection. This is unlikely as only one of the differences between children lost and not lost to follow-up could plausibly be expected to be related to sun protection. More Hispanic white children were lost to follow-up and this group may be expected to engage in lower sun protection. However, the loss of this group occurred primarily in a single control school where it actually might make it less likely that SDHW produced improvements (i.e., higher sun protection reports by the non-Hispanic white students in a control school would reduce the apparent observed difference with the paired intervention school). It is more plausible that the sun safety behavior of children who were lost was stable over time (i.e., that past behavior was the best predictor of future behavior) and that the intent-to-treat analysis employing pretest values as estimates at posttest provided the most accurate evaluation. Under this assumption, the SDHW improved sun protection, so our confidence that it was an effective intervention for young adolescents is strengthened.

Thus it was concluded that the SDHW was effective with middle school students and can be effectively implemented by teachers with minimal training. This is the first trial to report positive effects of a multi-unit sun safety curriculum for secondary schools. Under criteria used by the Community Preventive Services Task Force[10] – use of group-randomized procedures and validated measures – the results are “strong” evidence that an educational approach is effective in early secondary school grades.

The impact of the middle school SDHW is comparable to that produced by primary school SDHW: SDHW improves knowledge and creates positive attitudes toward sun protection and increases self-reported sun safety by children. Notably, the effectiveness of the primary school SDHW declined in the oldest primary grades.[14,15] Additional behavior change strategies were incorporated from social cognitive theory in the middle school version such as goal setting, coping strategies to overcome barriers, and environmental analysis to bolster its effectiveness with older children. These strategies may in part account for its success in grades 6–8.

This trial does not provide evidence on whether SDHW will remain effective into high school years, but age did not moderate the SDHW’s effect suggesting it may influence older children. Still, the SDHW’s effects were relatively small in grades 6–8 and it influenced some but not all prevention behaviors. It may be unreasonable to expect that school programs alone will produce large improvements in sun protection and should be coupled with other community-wide efforts.

It is also notable that SDHW was effective during early adolescence. This is a time of increasing independence and is marked by a decline in sun protection and emergence of sun tanning norms.[27] These trends should work against SDHW; therefore, to find any evidence of positive outcomes indicates that the SDHW was quite persuasive. However, outcomes were tested only in the short term. UVR in the study region was sufficiently high to sunburn the skin by the end of May, but this introduced a seasonal confound (i.e., more sun protection practiced later in the study period because of the seasonal increase in UVR). The seasonal trend actually should have made it more difficult to detect an effect because the control group was increasing its sun protection, too. Further data is needed from the summer to determine whether SDHW improved protection during the highest UVR season.

Another unanswered question is whether the favorable impact of SDHW will be improved through repeated instruction over more than a single year. Booster sessions improved substance abuse prevention programs and primary school SDHW was more effective when taught again in a second year.[14] Unfortunately, there are substantial challenges to multi-year presentation because many schools do not provide health education each year, health education often is an opt-in program that reaches only some students, and sun protection must compete for instructional time with other health issues that are considered more important to schools or with other topics when integrated into science classes.

The curriculum showed the broadest effects within the composite frequency measure rather than the diary measure. The diary measure of body coverage may have been less sensitive to changes because it focused only on the school day. Time outdoors is more limited in middle school then in primary grades and children may have less control over their attire in physical education classes. The lack of effects on individual items within the composite was surprising. The SDHW instructed children to increase all of their protection behaviors but some of these behaviors are alternatives for one another – e.g., sunscreen is unnecessary if one avoids the midday sun. Given this substitution of protection strategies, a composite measure may be the best way of detecting a general increase in all prevention strategies.

It appears that children in this trial, like many adults, have a preference for using sunscreen as a primary means of protection. Sunscreen is not as effective a protection strategy as other methods that actually block or reduce exposure. People often use it to prolong time outside, apply too little of it, and do not reapply it to receive the maximum protection. It could not be determine precisely how sunscreen was used; however, the SDHW was designed to teach children the value of using methods that physically block or reduce exposure (i.e., wearing protective clothing and hats, limiting time outdoors, staying in the shade) and how to properly apply and reapply sunscreen. Children may not have as much control over time outdoors during school; however, they do decide what they wear and exposure to SDHW was associated with increased use of long-sleeved shirts during recess. A catalyst for this change may be school districts' prohibitions against skin-revealing clothing articles, although these restrictions also may produce psychological reactance in children that create a desire to wear skimpier clothing.

There were several limitations to this trial. Active parental consent may have created a selection bias, yielding a sample with less risky sun exposure that SDHW was more likely influence. The project was conducted only in three states, limiting its generalizability, although they were states with high UVR. A quarter of the population was comprised of minority groups with darker skin tones at lower risk of skin cancer, which mitigated against finding favorable effects. However, this sample was more diverse than in previous SDHW evaluations and suggests that it will be effective in populations with greater ethnic diversity. The follow-up period was very short; data is reported elsewhere that shows persisting effects of SDHW over the summer. The composite behavior measure had low reliability, perhaps due to the substitution of alternative protection behaviors mentioned earlier. The self-reports also could be affected by social

desirability tendencies. Our measures of implementation fidelity were sparse making it impossible to detect effects of implementation on curriculum outcomes. The effect of testing was not controlled in the experimental design. However, using a Solomon four-group design, testing was found to affect the recognition of terms not knowledge or behavior in a previous trial evaluating the primary school SDHW.[15]

The secondary school environment is an effective venue for delivering effective sun protection education to children. A priority is to convince schools to implement evidence-based educational approaches. Also, developing effective materials for non-school environments, either in place of or as an adjunct to, curricular programs is another priority because sun safety. Finally, the case for disseminating sun safety instruction to schools would be strengthened by replicating the results of this trial elsewhere, by documenting that an educational approach in secondary schools can have long-term positive impact, and by demonstrating that this type of program can be effective in high schools.

WHAT THIS STUDY ADDS…

The CDC recommends that schools routinely educate students about sun protection to prevent skin cancer. Effective education for elementary schools has been developed, but not for secondary schools. This article reports on a randomized effectiveness trial on a sun safety curriculum for grades 6–8. Children who were taught the curriculum improved their knowledge and opinions related to sun safety and took more precautions. Sun protection education in secondary schools can be successful.

Acknowledgements

This project was supported by a grant from the National Cancer Institute (CA81864). The authors wish to thank the administrators, teachers and students in the Adams 12 School District, Albuquerque Public Schools, Cherry Creek Schools, Jefferson County School District, and Rio Rancho School District, Sedona – Oak Creek Unified School District, Safford Unified School District, and Mesa Pubic Schools.

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Table 1

Demographic profile of the sample and comparisons between intervention and control groups.

Variable		Sample of posttested students	Intervention	Control	Sample used in analysis
Gender	Male	43.2%	41.8%	43.9%	42.8%
	Female	56.8	58.2	56.1	57.2
Race	White	78.0%	78.6%	77.2%	78.0%
	Black/African American	6.3	6.5	6.3	6.5
	American Indian/Alaska Native	7.7	6.8	8.4	7.5
	Asian	5.1	5.0	5.3	5.1
	Native Hawaiian/Other Pacific Islander	2.9	3.1	2.8	2.9
Ethnicity:	Hispanic	25.4%	24.2%	25.7%	24.8%
	Not Hispanic	74.6	75.8	74.3	75.2
Age*	11 years	2.7%	4.1%	1.2%	2.8%
	12 years	25.5	25.3	26.8	26.1
	13 years	49.2	50.7	48.2	49.1
	14 years	22.1	22.4	20.2	21.5
	15 years	0.5	0.4	0.6	0.5

* There were no significant differences ($p<0.05$) between groups intervention and control groups at baseline or between the sample at baseline and the sample used in the analysis.

Table 2

Estimates for differences between intervention and control groups and mean ratings, standard errors, and sample sizes by condition on continuous measures of self-reported sun protection behavior.

Variable	Control	Intervention	Estimate	*p*value	Effect size
Frequency ratings on sun protection when outside for > 15 minutes in past month:					
I stayed in the shade:	3.20	3.00	0.20	0.0189	0.23
	0.054	0.052	0.071		
	774	902			
I wore a hat	3.81	3.67	0.15	0.0607	0.18
	0.053	0.051	0.070		
	769	915			
I applied sunscreen with SPF ≥ 15	3.59	3.49	0.10	0.1961	0.10
	0.056	0.054	0.075		
	789	938			
I wore clothes covering most of my body	3.27	3.23	0.04	0.4860	0.04
	0.043	0.041	0.059		
	790	940			
I limited my time in sun during midday	3.70	3.56	0.14	0.1223	0.12
	0.042	0.039	0.058		
	764	910			
I wore sunglasses	3.77	3.69	0.08	0.2405	0.08
	0.050	0.048	0.069		
	774	918			
Behavior composite (α =0.43) (mean of above 6 items)	3.56	3.43	0.13	0.0035	0.24
	0.021	0.020	0.029		
	792	944			
Sun protection diary reports:					
Amount of time outside during lunch Yesterday	3.45	3.13	0.32	0.3912	0.18
	0.294	0.293	0.360		
	784	935			
Amount of time outside during PE yesterday	2.72	2.50	0.22	0.6280	0.09
	0.370	0.368	0.453		
	759	883			
Amount of time outside during recess Yesterday	1.88	2.03	−0.15	0.4855	0.10
	0.166	0.165	0.208		
	750	876			
Total body coverage score during lunch	8.75	8.91	−0.15	0.5687	0.08
	0.182	0.185	0.260		
	435	472			
Total body coverage score during physical education class	7.10	9.34	−2.23	0.2430	0.85
	1.256	0.996	1.450		
	27	76			
Total body coverage score during recess	8.90	8.86	0.036	0.9275	0.02
	0.240	0.197	0.311		
	114	137			
Reports on sun exposure in the past month:					
Lay out in the sun to get a tan	1.88	1.75	0.13	0.0974	0.14
	0.049	0.047	0.066		
	784	930			
Use a self-tanning cream	1.32	1.31	0.01	0.9129	0.01
	0.040	0.038	0.054		
	789	931			
Get sunburned	0.48	0.42	0.06	0.4222	0.06
	0.047	0.045	0.065		

Variable	Control	Intervention	Estimate	*p*value	Effect size
	683	779			
Other sun protection reports:					
SPF of sunscreen used in past month	28.76 0.84 356	27.28 0.82 432	1.48 1.11	0.2035	0.15

Table 3

Odds ratios for comparisons between intervention and control groups and percentages and sample sizes by condition on dichotomous measures of self-reported sun protection behavior.

Variable	Intervention pretest	Posttest	Control Pretest	Posttest	Adjusted odds ratio	95% CI
Sun protection diary reports for lunch:						
Proportion using shade	40.3%	41.3%	50.8%	38.8%	1.46	0.90 – 2.36
	474	474	437	437		
Proportion wearing a hat	3.7%	2.3%	1.3%	1.4%	1.70	0.50 – 5.75
	477	477	435	435		
Proportion wearing long sleeves	48.7%	22.9%	51.4%	21.2%	1.19	0.71 – 1.99
	473	473	436	436		
Proportion wearing long pants	83.6%	46.8%	86.2%	51.5%	1.01	0.48 – 2.12
	476	476	436	436		
Proportion wearing sunscreen	3.4%	7.0%	3.6%	4.1%	1.66	0.83 – 3.30
	473	473	436	436		
Sun protection diary reports for physical education class:						
Proportion using shade	38.1%	30.8%	35.0%	12.5%	1.36	0.14 – 13.30
	74	74	27	27		
Proportion wearing long sleeves	25.6%	12.8%	21.3%	8.7%	2.21	0.45 – 10.82
	77	77	27	27		
Sun protection diary reports for recess:						
Proportion using shade	56.3%	55.6%	67.0%	59.1%	1.03	0.46 – 2.30
	134	134	116	116		
Proportion wearing long sleeves	50.5%	29.8%	57.0%	22.8%	2.27	1.59 – 3.25
	137	137	117	117		
Proportion wearing long pants	79.1%	50.2%	85.3%	54.1%	2.28	0.67 – 7.82
	137	137	115	115		
Proportion wearing sunscreen	3.3%	7.4%	4.4%	4.7%	1.78	0.36 – 8.90
	137	137	116	116		
Other sun protection reports:						
Sunburned in past month	15.1%	25.8%	14.5%	28.3%	1.23	0.87 – 1.74
	779	779	683	683		
Use sunscreen	77.1%	80.4%	78.6%	73.4%	2.16	1.54 – 3.01
	563	563	456	456		

Table 4

Estimates for differences between intervention and control groups and mean ratings, standard errors and sample sizes by condition on measures of knowledge, attitudes, social norms, and self-efficacy expectations.

Variable	Control	Intervention	Estimate	*p*value	Effect size
Knowledge:					
Number correct out of 10 items	6.65	8.07	−1.42	<0.0001	0.84
	0.14	0.14	0.18		
	733	879			
Attitudes toward suntanning:					
Importance of a tan	2.02	1.92	0.10	0.0013	0.16
	0.027	0.024	0.037		
	787	938			
Perceived attractiveness of a tan	3.28	3.07	0.21	<0.0001	0.22
	0.035	0.032	0.047		
	772	916			
Desire to have a tan	3.22	2.94	0.28	0.0026	0.27
	0.045	0.042	0.061		
	767	917			
I think I have a chance of getting skin Cancer	2.83	2.79	0.04	0.4321	0.04
	0.033	0.030	0.046		
	779	926			
Barriers to sun protection:					
It is hard to choose the right sunscreen	2.53	2.36	0.17	0.0317	0.17
	0.050	0.047	0.067		
	778	928			
Sunscreens irritate my skin	2.11	1.96	0.15	0.0771	0.15
	0.057	0.055	0.076		
	772	912			
Sunscreens are messy	2.93	2.69	0.24	0.0035	0.23
	0.051	0.048	0.069		
	782	929			
Sunscreens aren’t in a place that’s easy to get to	2.48	2.39	0.07	0.2267	0.09
	0.051	0.048	0.069		
	781	926			
I have to stop what I’m doing to put on sunscreen	3.34	3.28	0.06	0.2937	0.05
	0.040	0.37	0.056		
	781	925			
Barriers to sunscreen use composite (α =0.47)	2.51	2.36	0.15	0.0046	0.24
	0.035	0.034	0.047		
	792	941			
Don’t like how I look in a hat	2.71	2.55	0.16	0.0024	0.15
	0.039	0.036	0.054		
	775	924			
It’s too hot to wear long sleeves & pants in the summer	4.25	4.09	0.16	0.0055	0.14
	0.041	0.037	0.056		
	776	914			
There aren’t enough places that provide Shade	2.96	2.88	0.08	0.3544	0.08
	0.066	0.064	0.087		
	784	929			
If I stay out of the sun I will miss out on activities	3.43	3.38	0.05	0.5167	0.04
	0.052	0.049	0.070		
	786	933			
A hat messes up my hair	3.44	3.35	0.09	0.2508	0.08
	0.054	0.051	0.073		
	781	925			
Barriers to other sun protection composite	3.42	3.34	0.08	0.0662	0.14

Variable	Control	Intervention	Estimate	*p*value	Effect size
	0.028 793	0.026 941	0.038		
Social norms for sun protection:					
If I stay out of the sun, my friends will think I'm weird	2.65 0.051 779	2.54 0.048 919	0.09 0.070	0.1547	0.09
My friends will think I'm weird if I wear a hat	1.86 0.034 764	1.83 0.032 916	0.03 0.047	0.6352	0.03
If I wear long sleeves/pants, my friends will think I'm weird	3.26 0.049 772	3.27 0.045 924	−0.01 0.067	0.9261	0.01
My friends will make fun of me if I wear a hat	1.98 0.046 782	1.94 0.043 927	0.04 0.062	0.4943	0.05
Social norms composite (mean of above 4 items)	2.44 0.030 793	2.40 0.029 941	0.04 0.042	0.4331	0.05
Self-efficacy expectations for sun protection:					
I can use a sunscreen of SPF 15 or more	2.38 0.044 778	2.57 0.043 928	−0.19 0.058	0.0069	0.29
I can stay out of the sun between 10 and 3	1.75 0.037 783	1.81 0.035 930	−0.04 0.050	0.2929	0.08
I can wear long sleeves and pants	1.53 0.044 754	1.56 0.042 919	−0.03 0.057	0.5442	0.05
I can tell my friends if I don't want to Sunbathe	2.43 0.035 780	2.46 0.034 930	−0.03 0.048	0.5841	0.04
Self efficacy composite (mean of above 4 items)	2.02 0.029 785	2.10 0.028 932	−0.08 0.038	0.0577	0.18