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Effect of an Intervention on Observed Sun Protection by Vacationers in a Randomized Controlled Trial at North American Resorts

David B. Buller, PhD[a] **[Senior Scientist]**, **Peter A. Andersen, PhD**[b] **[Professor Emeritus]**, **Barbara J. Walkosz, PhD**[a] **[Senior Scientist]**, **Michael D. Scott, PhD**[c] **[Professor Emeritus]**, **Larry Beck, PhD**[d] **[Professor]**, and **Gary R. Cutter, PhD**[e] **[Professor of Biostatistics]**

[a]Klein Buendel, Inc., 1667 Cole Boulevard, Suite 225, Golden, CO 80401, USA

[b]School of Communication, 5500 Campanille, San Diego State University, San Diego, CA 92182-4560, USA

[c]Department of Communication Arts and Sciences, 400 W 1st Street, California State University, Chico, CA 95929, USA

[d]L. Robert Payne School of Hospitality and Tourism Management, San Diego State University, San Diego, CA 92182, USA

[e]School of Public Health, University of Alabama, Birmingham, 1667 University Blvd, Ryals 410b, Birmingham AL 35294, USA

Abstract

During vacations, many individuals receive high-risk sun exposure that is associated with skin cancer. Vacationers in outdoor recreation venues (pretest n=4,347; posttest n=3,986) at warm-weather destination resorts in North America (n=41) were enrolled in a pair-matched, group-randomized pretest-posttest controlled quasi-experimental design in 2012-14. Print, audiovisual, and online messages based on Transportation Theory and Diffusion of Innovation Theory and promoting advanced sun protection (e.g., use of clothing, hats, shade and pre-application/ reapplication of sunscreen and reliable cues to high UV) were delivered through resort channels. Vacationers' sun protection practices observed by trained research staff (i.e., body coverage and shade use analyzed individually and in combined scores) did not differ by experimental condition (p>0.05) or intervention implementation (p>0.05). However, recreation venue moderated intervention impact. The intervention improved sun protection at waterside recreation venues (z-score composite: intervention pre=-22.74, post=-15.77; control pre=-27.24, post=-23.24) but not non-waterside venues (z-score composite: intervention pre=20.43, post=20.53; control pre=22.94, post=18.03, p<0.01). An additional analysis showed that resorts with greater program implementation showed more improvements in sun protection by vacationers at waterside (z=score

Corresponding Author: David Buller, PhD, Klein Buendel, Inc., 1667 Cole Boulevard, Suite 225, Golden, CO 80401, USA, 303.565.4340, 303.565.4320, dbuller@kleinbuendel.com.

composite: high implementation pre=-25.45, post=-14.05; low implementation pre=-24.70, post=-21.40) compared to non-waterside (z-score composite: high implementation pre=14.51, post=19.98; low implementation pre=24.03, post=18.98, p<0.01) recreation venues. The intervention appeared effective with the vacationers in recreation venues with the highest-risk for sun exposure, waterside venues. However, it was not effective throughout all the resort venues, possibly because of the sun-seeking desires of vacationers, information overload at the resorts, and constraints on clothing styles and sun protection by recreation activity.

Keywords

skin cancer; prevention; vacation; outdoor recreation

Introduction

U.S. rates of melanoma, estimated in 2013 to be 20.7 per 100,000 persons (age-adjusted)(U. S. Cancer Statistics Working Group, 2016), are increasing at 3% per year. Nearly 5 million cases of non-melanoma skin cancer (NMSC) occur annually,(American Cancer Society, 2016) creating substantial disfigurement (Bariani et al., 2006; Essers et al., 2007; Girschik et al., 2008; Hannuksela-Svahn et al., 1999) and healthcare costs.(Bickers et al., 2006) Exposure to solar and ultraviolet radiation (UV) is a primary cause.(Armstrong and English, 1996; Koh et al., 1990; Kricker et al., 1995; Rosso et al., 1996; Weinstock et al., 1989).

Intense, intermittent UV exposure, including sunburns, during recreation and vacations in sunny locations is associated with skin cancer,(Claeson et al., 2012; Moehrle, 2008) especially melanoma,(Gandini et al., 2005b; Gefeller et al., 2007; Kricker et al., 2007; Ondrusova et al., 2013; Vranova et al., 2012) and development of nevi, a precursor for melanoma.(Bränström et al., 2006; English et al., 2006; Gandini et al., 2005a; Newton-Bishop et al., 2010; Pettijohn et al., 2009; Silva et al., 2009) Each year, over 100 million Americans take a vacation of over 50 miles.(Hall, 2016) Excessive UV exposure and sunburning still prevail among vacationers.(Bränström et al., 2006; Køster et al., 2011; O'Riordan et al., 2008; Reinau et al., 2014) As much as 75% of this leisure travel involves recreating outdoors with prolonged sun exposure (e.g., golfing and hiking) and/or skin-revealing clothing (e.g., swimming and tennis). Interventions that promote sun protection during vacations could reduce UV exposure but prior efforts have yielded mixed results. (Rodrigues et al., 2013)

This paper reports a randomized trial evaluating a sun safety intervention with vacationers at destination resorts during spring and summer. It was hypothesized that the intervention, *Go Sun Smart* (*GSS*), which was built on a successful program for winter guests at high-altitude ski areas,(Andersen et al., 2012; Walkosz et al., 2014; Walkosz et al., 2008) would improve sun protection by vacationers. Waterside and non-waterside recreation venues were compared as a potential moderator because vacationers' sun protection differed substantially by recreation venue at baseline.(Walkosz et al., 2016) Trial procedures and baseline samples have been reported elsewhere.(Buller et al., 2016)

Methods

Population and Recruitment Methods

Destination resorts (i.e., where vacationers typically stay for several days) with outdoor recreation venues were recruited from the membership of the American Hotel and Lodging Association and Hospitality Sales and Marketing Association International. Eligible resorts a) had at least three outdoor recreation areas or which at least one involved waterside recreation, b) were located in the continental United States or Canada, c) had overnight lodging, and d) agreed to participate. Ski areas from the National Ski Areas Association membership that met these above criteria in their summer operations were also recruited. Resorts were recruited from membership lists (randomly ordered) in two annual waves in 2012-13 and 2013-14 to control for seasonal weather variation and increase feasibility. Recruitment ended when the sample quota of resorts was filled (determined by a priori power analysis).(Buller et al., 2016)

Adult vacationers who were outside at the resorts on the assessment days between noon and 2 PM DST (approximately one hour before and after solar noon) and appeared 18 or older were enrolled unobtrusively until sample quota was met (based on power analysis) or two-day data collection visit ended. Most vacationers were staying at the resort, although some were day visitors using resort amenities. (Buller et al., 2016) All procedures were approved by the San Diego State University and Quorum Institutional Review Boards.

Experimental Design and Procedures

This effectiveness trial was a pair-matched, group-randomized, pretest-posttest controlled quasi-experimental design. Resort pairs were formed within wave after pretesting, based on latitude, elevation, mean annual sunshine hours, primary operational season (summer/winter), number of summer employees, and number of vacationers visiting the hotel/resort for just the day and at waterside recreation areas at pretest, and randomized by the project biostatistician to either the *GSS* intervention or an untreated control group. A cross-sectional panel of vacationers was assessed at pretest (first spring/summer). The intervention was distributed to intervention resorts; senior managers were instructed on implementing it during the warm-weather season in the second spring/summer. A second independent cross-sectional panel was posttested in the second spring/summer, making this a quasi-experimental design. A repeated-measure cohort of vacationers could not be assessed because most vacationers did not repeatedly visit the resort. The independent samples avoided testing, history, and maturation effects.(Campbell and Stanley, 1963) Vacationers were unobtrusively observed by trained research staff during two-day visits. Staff were unaware of condition prior to the visit but could discern whether project messages were present at a resort. Posttest data collection visits were scheduled at approximately the same time of year as the pretest visit (±3 week) to control seasonality effects. Nearly all data collection visits occurred within three months of the summer solstice (i.e., March 20 to September 20). Resorts in semi-tropical or desert regions with high summer temperatures were measured in the spring (March to May); resorts in northern regions or at higher elevations were assessed in the summer (June to September).

Go Sun Smart Intervention

The *GSS* intervention promoted advanced sun protection beyond simple application of sunscreen (i.e., using wide-brimmed hats, protective clothing, and shade, applying sunscreen 30 minutes before sun exposure, reapplying it within 2 hours of initial application, and relying on time of day, season, latitude, altitude, and cloudiness as indicators of UV intensity). Based on the successful program at high-altitude ski areas, messages operationalized principles of Diffusion of Innovations Theory(Andersen et al., 2012; Rogers, 1983; Walkosz et al., 2014; Walkosz et al., 2008), to which were added elements of narrative communication proposed in Transportation Theory (Green and Brock, 2000). People construct anticipatory stories that help guide behavior, e.g., vacations involve pleasure, escapism, and some risk-taking, and messages with narrative elements should be more powerful than conventional persuasive admonitions.(Green, 2006; Reinhart and Feeley, 2007; Slater et al., 2003) Narratives elements were incorporated by using visual images (e.g., photos of a family walking on a beach, woman shopping resort store selecting a hat, and couple sitting in the shade looking out at the ocean; newsreel showing photos of adults and children practicing sun safety) and in an animated video depicting a story of a family checking into a resort, recreating outdoors, using sun protection, and ending by recounting their enjoyable day. Also, to combat the disinhibition often encouraged by some tourism advertising, messages sought to shift normative beliefs about risks, especially severe sunburns and preparations to take precautions.(Bellis et al., 2004; Bellis et al., 2007; Benotsch et al., 2007; Ragsdale et al., 2006; Tutenges and Hesse, 2008)

Intervention messages were delivered on 15 posters/signs and a tip card at the hotels and via print and electronic materials used to reach vacationers before their visit (e.g., pre-arrival messages and packing lists) or at check-in,(Beck et al.) i.e., resort tip line messages, newsletter articles, social media messages (n=75), and a 92-second animated video on sun safety. If requested by the resorts, sun protection training for resort workers, talking points, and docent lectures were provided. All of the materials were also available on the *GSS* website. Prior to the warm-weather season, research staff met with managers to plan for implementation, using a previously-developed protocol based on diffusion of innovations theory.(Buller et al., 2012) Researchers followed up with managers to provide ongoing support for implementation.

Measures

Unobtrusively Observed Sun Protection Practices—The primary outcome was unobtrusively observed sun protection practices of vacationers by trained researcher staff (inter-coder reliability [Gwet AC1]: sex 1.0, age 0.68, clothing articles 0.54 to 1.0; shade use 0.90, and shade percent 0.92). Researcher staff selected vacationers by plotting as straight a line as possible across the outdoor venue and anonymously recording overt sun protection practices of vacationers who were located on either side of the line while remaining inconspicuous. Each vacationer was observed once by a single observer. Observations were performed between 12 pm (noon) to 2 pm (1 hour before and after solar noon during daylight savings time).

The unobtrusive observation protocol was modified from a measure used in Australia (Dobbinson et al., 2014) described previously.(Buller et al., 2016) For each vacationer, research staff recorded sex (male/female), age (18-34/35-60/60 or older), use of head covering (no hat/visor/narrow hat/baseball cap/legionnaire hat/wide-brimmed hat), sunglasses (yes/no), shirts (yes/no), sleeve length (strapless/sleeveless/¼ length/elbow length/¾ length/wrist length); collar (yes/no); neckline (low/high); midriff coverage (covered/cut-out/partially exposed/exposed), leg covering (bikini/short shorts or skirt/mid-thigh/knee length/¾ cover/ankle length), socks (no socks/ankle length/calf length/knee length), and shoes (no shoes/sandals/shoes), and whether they were located in no shade, partial shade (25%/50%/75%), or full shade. Each day, observations were first performed at low-use recreation areas (e.g., courts and marinas) and then at high-use areas (e.g., swimming pools/beaches and outdoor dining areas). The percentage of skin covered by clothing was calculated for each vacationer using a protocol based on emergency medicine burn charts.(Wallace, 1951) Date, time observation started, and outdoor recreation area were also recorded.

Environmental Information on Resorts—Research staff obtained latitude and elevation of the resort from public records. For each observation day, research staf obtained the UV Index for 15-minute intervals from the closest ground-based UV sensor in the U.S. Department of Agriculture's UV-B Monitoring and Research Program and high temperature and average humidity from the closest weather station (reported by weather.org). For each observation, observers estimated cloud fraction by indicating if the sky was clear (0%), had high thin clouds, was partly cloudy, or was overcast (100%) (staff estimated the amount of sky covered by clouds in 10% increments for thin clouds and partly cloudy) (inter-coder reliability [Gwet AC1]: cloud type 0.60, percent cloud cover 0.62).

Intervention Checklist—During the posttest visit, research staff recorded all sun protection messages at the resorts using an implementation checklist(Buller et al., 2012) to calculate the total number of *GSS* intervention items in use. This assessment was validated by having a second project staffer, blind to condition and unknown to resort managers, visit six resorts one week prior to the scheduled data collection visit and complete the checklist. There was very high correlation between the validation record and the recording by research staff (total *GSS* items in use: Spearman Rank r=1.00, p<0.01). Also, in an intercept survey of a separate sample, vacationers reported whether they recalled receiving a sun protection message at the resort.(Buller et al., 2016)

Statistical Analysis Methods

Changes in observed sun protection practices from pretest to posttest were compared between experimental conditions and program implementation levels. Models were fit by using analysis of covariance (ANCOVA) models (PROC GLIMMIX for binary measures and PROC MIXED for continuous measures). Covariates were identified separately for each outcome by stepwise model selection (p < 0.15, two-tailed) from among vacationer demographics, resort characteristics, and environmental cues. Given the cross-sectional samples, the models tested a two-way interaction between experimental conditions and assessment period (pretest v. posttest). Body coverage (overall mean=63%, sd=19%, range=18% to 100%) and percentage of shade use (overall mean=26%, sd=40%, range=0% to 100%) were analyzed separately and advanced sun protection was tested by analyzing two composite measures, one which combined these two sun protection behaviors into an unweighted composite using z-scores (overall mean=1.97, sd=48.64, range=-105.39 to 122.57) and a second that considered individuals sun protected if they were either in full shade or wearing hats and clothing that covered at least 85% of their skin (overall mean=28% sun protected, sd=45%). Outdoor recreation venue was examined as a potential moderator of intervention effects by testing a three-way interaction among venue (waterside v. non-waterside), experimental conditions, and assessment period in the ANCOVA models. All the analyses were performed in SAS; alpha criterion was set at 0.05 (two-tailed).

An additional analysis tested the effect of intervention implementation on sun safety practices, using signal detection analyses employing Receiver Operator Characteristics (ROC) techniques. In an analysis reported elsewhere, the ROC identified the level of intervention implementation (i.e., total *GSS* items in use; mean=8.67, sd=6.18, range=1-26 items at intervention resorts) that increased vacationers' exposure to *GSS* messages (i.e., message recall) as measured in a postttest intercept survey.(Andersen et al., 2016) The “decision tree,” revealed that 9 GSS items in use at a resort was the optimal cut-point for message recall: 27.7% of vacationers at resorts with at least nine GSS items recalled a message on sun protection at the resort, while only 16.8% of vacationers at resorts with less than nine GSS items recalled a sun safety message ($p<0.01$). Resorts were then reclassified as either high implementing resorts (≥9 GSS items) or low implementing resorts (<9 GSS items; control resorts were included in the low implementing group) and sun protection by vacationers at high and low implementing resorts was compared, using the same ANCOVA models as above.

Results

Profile of the of Resorts and Vacationers

As reported elsewhere,(Buller et al., 2016) the resorts were diverse in terms of latitude, elevation, climate (i.e., sunshine hours), season of primary operations, number of waterside recreation venues, visitor mix (number of day users/members), and average UV levels and randomization balanced the resort characteristics across intervention and control conditions (Table 1). Four resorts were lost to follow-up, with those that dropped out being farther south (Table 1). A total of 4,347 vacationers were observed at pretest and 3,986 at posttest (see CONSORT diagram in Figure 1). Both samples were balanced on gender but were predominantly middle aged (35-60 years old; over one-quarter were under 35 and one-fifth over 60). The posttest sample had more middle-aged vacationers than the pretest sample but there were no differences by experimental condition (Table 2).

Effect on Experimental Condition on Sun Protection Practices of Vacationers

There were no statistically significant pre-post differences in vacationers' sun protection practices between intervention and control condition (Table 3).

Effect of Intervention Implementation

Likewise, vacationers' pre-post sun protection practices did not differ statistically significantly between resorts implementing nine or more *GSS* items compared to resorts implementing fewer than nine items (Table 3).

Moderation by Intervention Effectiveness by Recreation Area

Experimental Conditions—Recreation area (waterside v. non-waterside venues) moderated the impact of *GSS* on vacationers' sun protection practices (Table 4). Vacationers in waterside recreation areas at intervention resorts were observed to have nearly twice as large a pre-post increase in advanced sun protection (+6.97 z-score) measured by the unweighted z-score composite (i.e., use of clothing and shade) compared to controls (+4.0 z-score). At non-waterside recreation areas, vacationers in the control group declined in their advanced sun protection from pre to post (-4.90 z-score) but intervention vacationers did not change their advanced sun protection practices (-0.10 z-score). All vacationers at waterside recreation areas, regardless of experimental group (+0.02), improved their use of shade but those in non-waterside recreation areas appeared to reduce their use of shade pre to post less in the intervention (-0.03) than the control (-0.06) group.

Intervention Implementation—Recreation area (waterside v. non-waterside venues) also moderated the impact of *GSS* on vacationers' sun protection practices when comparing high-implementing (nine or more items) and low-implementing resorts (less than nine items) (Table 4). Advanced sun protection, measured both by the z-score composite (+11.4 z-score) and any sun protection score (i.e., full shade or 85% of body covered by clothing) (+11.1%), and amount of shade used (+0.10) all improved from pre to post more in vacationers at waterside recreation areas at resorts implementing more rather than less of the *GSS* intervention (+3.3 score, -0.3%, -0.01, respectively). Use of advanced sun protection, both z-score composite (-5.05 z-score) and any sun protection (– 4.4%), and shade use (-0.01) actually decreased from pre to post among vacationers at non-waterside recreation areas in low-implementing resorts.

Discussion

Studies of sun safety interventions in outdoor recreation and tourism have met with mixed success.(Glanz et al., 2006; Rodrigues et al., 2013; Thanh et al., 2015) While programs to increase protection among outdoor workers in these industries have clearly demonstrated positive effects,(Andersen et al., 2008; Andersen et al., 2012; Buller et al., 2005; Geller et al., 2001) efforts aimed at transitory adult recreators and vacationers have shown more limited results. Several studies showed some positive but mixed effects.(Dupuy et al., 2005; Pagoto et al., 2003; Pagoto et al., 2010; Roberts and Black, 2009; Walkosz et al., 2014; Weinstock et al., 2002) Others showed little or no effects.(Segan et al., 1999; Winett et al., 1997; Zhou et al., 2015) Still, the Community Guide concluded there was sufficient evidence to recommend interventions in outdoor recreation and tourism, based on improvements in sunscreen use and combined sun protection practices.(Centers for Disease Control, 2014) Unfortunately, the present study continued the pattern of small overall effects on protection practices other than sunscreen across all recreation venues at warm-weather destination resorts. However, there was some success in waterside recreation areas (i.e., beaches and pools) discussed below.

Anecdotally, many resort managers noted that the sun protection purpose of the trial was inconsistent with their "product," i.e., selling outdoor recreation and time in the sun. Like indoor tanning salons, some resorts appeared to be selling high-risk UV exposure, which may have attracted sun-seeking vacationers (including those who desired to get a tan) that were unusually resistant to *GSS'* sun protection promotions. We tried to overcome this resistance by using narrative elements that should have reduced counter-arguing.(Green and Brock, 2000) Clearly this strategy did not have a broad impact across all venues. Sun safety may be a responsibility some vacationers want to "escape" during more carefree vacation days, and thus, they appeared to ignore the prevention communication.

Although two large industry associations endorsed our program and individual resorts agreed to participate, some resorts poorly implemented it, possibly undermining effectiveness. The industry associations focused mainly on sales and marketing not resort operations so these managers may have had little commitment or authority to implement *GSS*. However, high intervention implementation throughout the resorts failed to improve sun protection generally. Another possibility is that existing commercial and resort communication interfered with *GSS'* message, by producing information overload and distracting vacationers from sun safety messages. Finally, some recreational activities made it difficult to practice sun protection. Most golf courses had large unshaded areas (e.g., tees and fairways) and all courts were unshaded; many activities occurred at midday when UV was high; and it was uncomfortable to wear protective clothing during vigorous physical activity, such as court games and hiking, or when swimming. Clothing such as lightweight wicking fabrics and tight-fitting swim shirts should be promoted and available, along with providing shade and even possibly adjusting activities times off midday hours.

Despite these obstacles, recreation area moderated intervention effectiveness. *GSS* was effective at waterside recreation venues. While we also examined vacationer, resort, and environmental characteristics as moderators, baseline observations showed that vacationers engaged in more high-risk sun exposure at waterside venues, i.e., wearing less clothing than at golf courses, courts, outdoor dining areas, and other non-waterside venues,(Walkosz et al., 2016), suggesting that intervention effects might differ markedly at waterside recreation area. The results suggested *GSS* paid the greatest dividends at venues where vacationers were most likely to expose large amounts of skin. With substantial skin exposed, waterside vacationers may have felt vulnerable and considered sun protection messages relevant. Golf courses, courts, dining areas, and other non-waterside venues had a typical dress that covered more of the skin than waterside venues that may have made vacationers feel they were already sufficiently protected or that made it more difficult to increase sun protection (e.g., dining areas may already required shirts and footwear). Also, these venues may have more opportunities to use shade than waterside areas, making them feel less vulnerable to sun damage.

Strengths and Limitations

The study had notable strengths. Uniquely, vacationers' sun-safety behavior was unobtrusively observed in real time during actual outdoor recreation, rather than relying on retrospective or anticipated self-reported behavior. Resorts were sampled in diverse geographic areas (i.e., latitude, terrain, and elevation) and almost all resorts were retained for posttesting, increasing generalizability. The group-randomized pretest-posttest controlled designs avoided many threats to internal validity. Data collection was performed at the same time of the year to control for seasonality. Limitations of the trial included low participation rate of resorts, possibly creating selection bias, reluctance of some resorts to fully implement the intervention, and the inability to blind observers to experimental condition at posttest. Additionally, sunscreen application was not measured in the unobtrusive observations, perhaps under-estimating vacationers' sun protection.

Conclusions

In 2014, the U.S. Surgeon General issued a call to action to prevent skin cancer.(Office of the Surgeon General, 2014) More research is needed to test interventions that overcome personal and environmental barriers to sun protection by vacationers (e.g., vacationers' distraction, disinhibition and discomfort, managers' resistance, and unshaded outdoor locations). Interventions that encourage structural changes at resorts, such as providing shade or sunscreen and selling sun protective clothing, might overcome vacationers' resistance or disinhibition more than messages advocating individual-level change, as shown with Australian adolescents in a previous trial.(Dobbinson et al., 2009). Interventions that convince resorts to improve occupational sun safety may overcome managers' resistance to advocating sun protection to vacationers, as occurred in our past interventions with ski areas.(Andersen et al., 2012; Walkosz et al., 2014; Walkosz et al., 2008)

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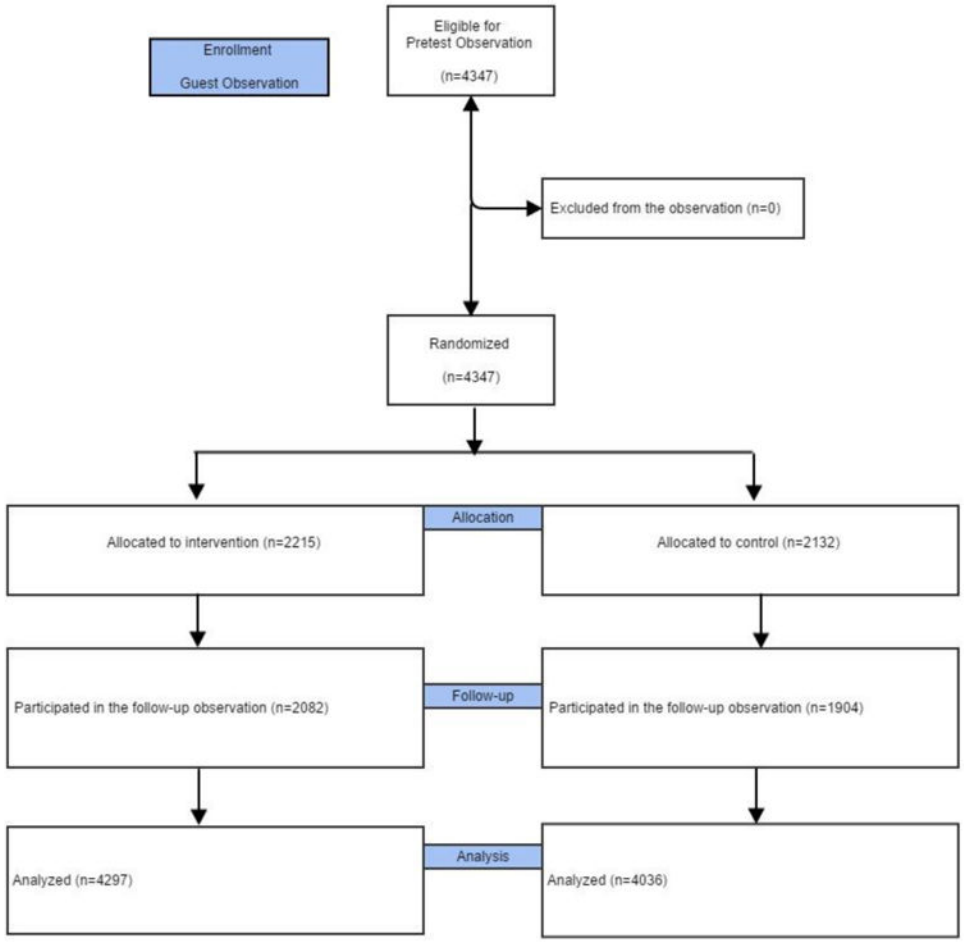

Figure 1. CONSORT Diagram of Vacationers Unobtrusively Observed in Randomized Trial in 2012-14

Table 1

Resort Characteristics in 2012-14 by Experimental Conditions and Follow-Up Status

Resort Characteristics			Experimental Conditions		Follow-Up Status	
		Overall n=41	Control n=21	Intervention n=20	Followed Up n=37	Lost to Follow Up n=4
Latitude						
	Less than 33 degrees	26.8%	33.3%	20.0%	21.6%	75.0%*
	[33, 41) degrees	31.7%	38.1%	25.0%	32.4%	25.0%
	41 and higher degrees	41.5%	28.6%	55.0%	46.0%	0.0%
Elevation						
	Less than 500 feet	31.7%	33.3%	30.0%	27.0%	75.0%
	[500, 1000) feet	14.6%	9.5%	20.0%	16.2%	0.0%
	[1000, 4000) feet	29.3%	28.6%	30.0%	32.5%	0.0%
	4000 and higher feet	24.4%	28.6%	20.0%	24.3%	25.0%
Resort use from total number of day users and members						
	Low	48.8%	61.9%	35.0%	46.0%	75.0%
	High	51.2%	38.1%	65.0%	54.0%	25.0%
Percent of water recreation						
	Less than 40% water	34.2%	28.6%	40.0%	35.1%	25.0%
	[40%, 75%) water	31.7%	28.6%	35.0%	29.8%	50.0%
	75% and more water	34.1%	42.8%	25.0%	35.1%	25.0%
Annual sunshine hours						
	Less than 2400 hours	36.6%	23.8%	50.0%	40.5%	0.0%
	2401-3000 hours	26.8%	33.3%	20.0%	27.1%	25.0%
	More than 3000 hours	36.6%	42.9%	30.0%	32.4%	75.0%
Average UV Index at 1 pm on data collection days (sd) Season		6.68 (1.35)	6.90 (1.34)	6.44 (1.36)	6.58 (1.16)	7.59 (2.63)
	Winter resort	39.0%	28.6%	50.0%	43.2%	0.0%
	Summer resort	61.0%	71.4%	50.0%	56.8%	100.0%
	Size of resort (mean number of employees (sd))	340.56 (229.97)	356.76 (235.65)	323.55 (228.67)	347.38 (237.74)	277.50 (145.00)

* $p<0.05$

Table 2

Demographics of Vacationers in Observations at Pretest and Posttest in 2012-14 by Experimental Conditions

	Overall n=4347	Pretest Control n=2132	Intervention n=2215
Age			
18-34	29.7%	29.5%	29.9%
35-60	47.9%	48.6%	47.2%
60 or older	22.4%	21.9%	22.9%
Gender			
Female	49.6%	50.7%	48.6%
Male	50.4%	49.3%	51.4%
	Overall n=3986	**Posttest Control n=1904**	**Intervention n=2082**
Age			
18-34	28.4% *	28.4%	28.4%
35-60	52.6%	52.2%	53.0%
60 or older	19.0%	19.4%	18.6%
Gender			
Female	50.5%	49.6%	51.3%
Male	49.5%	50.4%	48.7%

* comparison of pretest to posttest, p<0.05

Table 3

Observed Vacationer Sun Protection Behaviors by Experimental Conditions and Program Implementation at Pretest and Posttest in 2012-14

Sun Protection Behaviors	Experimental Condition			
	Control		Intervention	
	Pretest	Posttest	Pretest	Posttest
Body coverage score[1, 2, 4-9]	0.60	0.60	0.60	0.61
Percent of shade use[1-8]	0.26	0.23	0.32	0.31
Advanced sun protection index (mean z-score combining body cover score and percent of shade)[1, 3, 5, 7]	-0.84	-2.61	-1.22	1.51
Sun protection index (in full shade use or body coverage score ≥ 0.85)[2, 6]	25.1%	24.2%	25.3%	25.3%
Program Implementation				
	<9 GSS Items		**≥9 GSS Items**	
Body coverage score[1, 2, 4-9]	0.60	0.60	0.61	0.61
Percent of shade use[1-8]	0.30	0.25	0.25	0.31
Advanced sun protection index (mean z-score combining body cover score and percent of shade)[1, 3, 5, 7]	0.60	-1.39	-6.06	1.85
Sun protection index (in full shade use or body coverage score ≥ 0.85)[2, 6]	25.9%	23.1%	22.9%	30.0%

[*] $p<0.05$

Note: All models included enrollment wave; age of vacationer; recreation area (waterside vs. non-waterside); resort use (low vs. high); number of summer employees at resort; and elevation of resort as covariates. Additional covariates included in the models were:

[1] gender of vacationer;

[2] percent of water recreation at resort;

[3] annual sunshine hours at resort;

[4] proximity of observation to summer solstice;

[5] proximity of observation to noon;

[6] latitude of resort;

[7] cloud cover at observation;

[8] maximum temperature on observation day (°F); and

[9] UV Index.

Table 4

Moderation Effects of Recreation Venues (non-waterside vs. waterside)[a] on Observed Vacationer Sun Protection Behaviors by Experimental Conditions and Intervention Implementation at Pretest and Posttest in 2012-14

Experimental Condition								
Sun Protection Behaviors	**Control**				**Intervention**			
	Non-waterside		**Waterside**		**Non-waterside**		**Waterside**	
	Pretest	**Posttest**	**Pretest**	**Posttest**	**Pretest**	**Posttest**	**Pretest**	**Posttest**
Body coverage score[1, 2, 4-9]	0.70	0.71	0.51	0.50	0.70	0.70	0.49	0.51
Percent of shade use[1-8]	0.35	0.29	0.14	0.16	0.39	0.36	0.25	0.27**
Advanced sun protection index (mean z-score combining body cover score and percent of shade)[1, 3, 5, 7]	22.94	18.03	-27.24	-23.24	20.43	20.53	-22.74	-15.77**
Sun protection index (in full shade use or body coverage score ≥ 0.85)[2, 6]	39.8%	38.0%	13.3%	13.9%	39.1%	36.7%	14.8%	18.4%
Program Implementation								
	<9 GSS Items				**≥9 GSS Items**			
	Non-waterside		**Waterside**		**Non-waterside**		**Waterside**	
	Pretest	**Posttest**	**Pretest**	**Posttest**	**Pretest**	**Posttest**	**Pretest**	**Posttest**
Body coverage score[1, 2, 4-9]	0.70	0.70	0.51	0.51	0.71	0.71	0.49	0.49**
Percent of shade use[1-8]	0.40	0.33	0.18	0.17	0.30	0.34	0.23	0.33**
Advanced sun protection index (mean z-score combining body cover score and percent of 1, 3, 5, 7 shade)	24.03	18.98	-24.70	-21.40	14.51	19.98	-25.45	-14.05**
Sun protection index (in full shade use or body coverage score ≥ 0.85)[2, 6]	41.6%	37.2%	13.0%	12.7%	34.6%	39.6%	18.6%	29.7%**

[a]Non-waterside venues included outdoor dining, court and lawn games, golf courses, marina, activity areas, commons and reception, and other venues. Waterside venues included swimming pools and private beaches.

** p<0.01

Note: All models included enrollment wave; age of vacationer; resort use (low vs. high); number of summer employees at resort; and elevation of resort. Additional covariates included in the models were:

[1]gender of vacationer;

[2]percent of water recreation at resort;

[3]annual sunshine hours at resort;

[4]proximity of observation to summer solstice;

[5]proximity of observation to noon;

[6] latitude of resort;

[7] cloud cover at observation;

[8] maximum temperature on observation day (°F); and

[9] UV Index.