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Effects of a Multicomponent Intervention on Motivation and Sun Protection Behaviors Among Midwestern Beachgoers

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Skin cancer is the most prevalent of all cancers in the United States. Although avoiding sun exposure and using sun protection reduces skin cancer risk, rates of such behaviors are moderate at best. The present study examined the impact of a multicomponent intervention that aimed to increase the saliency of skin cancer risk while promoting the use of sun protection. Midwestern beachgoers ($n = 100$) participated in an intervention or questionnaire-only control group. Sun protection, stage of change, and sun exposure were measured at baseline and 2-month follow-up. The intervention group significantly improved in sun protection use and stage of change, but not sun exposure, compared with the control group. Personalizing the risks of unprotected sun exposure combined with providing education about sun protection facilitated healthy changes in behavior and motivation.

Key words: prevention, skin cancer, multicomponent intervention, sun protection, sun exposure

Incidence of skin cancer in the United States is nearly equivalent to that of all other cancers combined (D. L. Miller & Weinstock, 1994). Although sun protection behavior (e.g., sunscreen use) can reduce skin cancer risk (Center for Disease Control, 1995), U.S. adult Caucasians report low to moderate rates (11%–53%) of sun protection behavior and moderate to high rates of sun exposure (Newman, Agro, Woodruff, & Mayer, 1996; Weinstock, Rossi, Redding, Maddock & Cottrill, 2000). The ease with which people can protect themselves from the sun contrasts with reports of marginal rates of sun protection use. Health promotion interventions that address barriers to sun protection use are needed to facilitate sun protection and sun avoidance.

The transtheoretical stages of change model identifies five stages of behavior change ranging from the precontemplation stage, at which the individual has not yet identified the need to change behavior, to the maintenance stage, at which the individual engages in long-lasting behavior change (Prochaska & DiClemente, 1983). Systematic patterns have been identified in sun protection behavior such that the disadvantages of changing be-

havior outweigh the advantages in earlier stages of change and vice versa in later stages of change (Prochaska et al., 1994). For example, people who commonly go without sun protection are less sensitive to harmful effects of the sun (e.g., low burn potential), perceive sun exposure as enhancing physical appearance, and often do not perceive themselves to be at risk for skin cancer (Balanda, Stanton, Lowe, & Purdue, 1999; Wichstrøm, 1994). In contrast, people who experience the negative consequences of unprotected sun exposure, such as frequent sunburn or skin cancer, are the most consistent users of sun protection (Broadstock, Borland, & Hill, 1996; Robinson & Rademaker, 1995).

For many, beliefs about the benefits of sun exposure (e.g., desired suntan) markedly outweigh beliefs about sun-related risks (Jackson & Aiken, 2000; Jones, Harris, & Chrispin, 2000). As a result, health promotion efforts have been designed to bolster rates of sun protection behavior by emphasizing the benefits of protection and reduced sun exposure via health education (Detweiler, Bedell, Salovey, Pronin, & Rothman, 1999; Dixon, Borland, & Hill, 1999), message framing (Rothman, Salovey, Antone, Keough, & Martin, 1993), and media campaigns (Koh, Geller, Miller, Grossbart, & Lew, 1996; Koh, Geller, Miller, & Lew, 1995). Such interventions enhance knowledge but, in most cases, fail to result in behavior change (e.g., Dixon et al., 1999; Lowe et al., 2000).

Alternatively, health promotion interventions involving multiple components have been shown to increase sun protection behavior. For example, a publicity campaign combined with a behavioral intervention produced significantly fewer sunburns and increased sunscreen use among children across a 3-year period (D. R. Miller, Geller, Wood, Lew, & Koh, 1999). Also, a multicomponent behavioral intervention using peer modeling, feedback, prompts, and commitment contracting increased sun protection behaviors at public pools by 22%–38% (Lombard, Neubauer, Canfield, & Winett, 1991). Moreover, interventions that increase the personal relevance or salience of skin cancer risk via public melanoma

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screenings (Brandberg et al., 1996), sun protection education with melanoma patients (Robinson & Rademaker, 1995), or the use of ultraviolet (UV) photography that illuminates skin damage (Weinstock & Rossi, 1998; Weinstock, Rossi, Redding, & Maddock, 1998) have shown much potential to enhance sun protection behavior.

The present study tested the efficacy of a multicomponent intervention designed to provide education and enhance the personal relevance of sun-related risks. The intervention is unique in that it was delivered in a setting where high-risk behavior regularly occurs (i.e., the beach), and the impact of the intervention on both behavior and motivation was assessed. Many studies have examined changes in attitudes and knowledge, but not behavior (e.g., Hillhouse & Turrisi, 2002; Katz & Jernigan, 1991), and only one, to our knowledge, assessed impact on motivation (Rossi, Blais, & Weinstock, 1994). Measures of motivation may be more sensitive to the process of change than even direct measures of behavior (Rossi, Blais, Redding, & Weinstock, 1995). Our specific aim was to test the hypothesis that shifts across motivational stages of change, increases in sun protection behavior, and decreases in sun exposure would be evident in the intervention group as compared with a questionnaire-only control group.

Method

Participants

Midwestern beachgoers ($N = 257$) participated in this study, which was in full compliance with internal review board guidelines. Participants were at least 18 years old and English speaking. Overall, 100 participants (63% female; 53 intervention, 47 control) provided complete data. Table 1 illustrates group comparisons on demographic and dependent variables. Individuals who provided incomplete data were classified as noncompleters and were not included in the analyses. No differences in age, gender, educational status, ethnicity, sun protection behavior, sun exposure, or stage were found between completers and noncompleters. Also, completers and noncompleters were equally as likely to be in the intervention and control groups.

Materials

Sun stage of change. A staging algorithm developed by Rossi et al. (1994) was used to classify participants into one of the five stages of change (i.e., precontemplation, contemplation, preparation, action, and maintenance). The staging algorithm comprises two categories of four questions each. Category 1 assesses the use of and intentions to use general sun protection (i.e., using sunscreen, using protective clothing, limiting sun exposure). Category 2 assesses the use of and intentions to use sunscreen with a sun protection factor (SPF) of 15. The action–maintenance stage of this scale correlates with variables linked to sun protection behavior (e.g., family history of skin cancer; Weinstock et al., 2000).

Sun protection behavior. Consistent with Pratt and Borland (1994), sun protection behavior was assessed using a composite score of items that included (a) frequency of sunscreen use (SPF 15 or higher), (b) frequency of protective clothing use during sun exposure, and (c) the number of body parts protected from sun. Items (a) and (b) were rated on a 4-point Likert-type scale, which ranged from *very seldom* to *always*. Item (c) was assigned a rating that ranged from 0 (*no body parts covered*) to 3 (*all body parts covered*). A composite score was created because adequate sun protection requires the use of sunscreen or protective clothing on all exposed body parts. Composite scores were calculated by adding the highest score from Items (a) and (b) to Item (c). Items were moderately

Table 1
Group Comparisons at Baseline

Variable	Intervention ($n = 53$)			Control ($n = 47$)		
	%	<i>M</i>	<i>SD</i>	%	<i>M</i>	<i>SD</i>
Age		27.96	6.17		24.49**	3.21
Sun protection		5.52	1.84		5.55	1.85
Sun exposure		14.90	16.90		7.53**	7.01
Gender						
Male	45			25*		
Female	55			75		
Education						
Less than high school	0		0			
High school	17		15			
College degree	83		83			
Unknown	0		2			
Skin type						
I	11		9			
II	28		15			
III	36		49			
IV	25		27			
Stage of change						
Precontemplation	34		53			
Contemplation	0		2			
Preparation	39		23			
Action	8		11			
Maintenance	18		11			

Note. Detailed descriptions of the skin type categories are as follows: I = A painful burn the next day after 1 hr of unprotected sun exposure; II = A painful burn the next day and a light tan 1 week later; III = A slightly tender burn the next day and a moderate tan 1 week later; IV = No burn the next day and a moderate tan 1 week later.

* $p < .05$. ** $p < .01$.

related ($r = .20-.61, p < .05$), and alpha was .63. Composite scores ranged from 1 to 7 with higher scores indicating increasing degree of sun protection.

Sun exposure. Sun exposure was evaluated by having participants estimate both the average number of days per week and the average number of hours per week they spent (a) sunbathing and (b) engaging in outdoor activities over the past 2 months (Wichström, 1994). Composite scores were calculated by summing the number of hours per week sunbathing and engaging in outdoor recreational–occupational activities. Items were moderately related ($r = .38, p < .01$), and alpha was .47.

Intervention

The intervention included six components. First, participants were assessed for skin sensitivity to solar radiation and were provided sun protection recommendations consistent with their sensitivity level (Weinstock, 1992). Second, participants were provided with the American Cancer Society's (1999) pamphlet of safe sun recommendations. Third, sun damage was assessed via UV photos taken with the Reflec UV Instant Camera System (Canfield Imaging Systems; Fairfield, NJ). Facial photographs illuminate skin photodamage, a precursor to many skin cancers (Nicol & Fenske, 1993). Participants' photos were compared to three standard photos that reflected varying degrees of skin damage. Fourth, commitment cards were signed by participants and cosigned by a friend. Participants were asked to post the card (and their photo) in a conspicuous place in their home as a reminder and prompt to use sun protection. Fifth, participants were offered a selection of free sunscreens and instructed on proper application of sunscreen. Last, research assistants modeled proper sun

protection by repeatedly applying sunscreens and wearing protective clothing, hats, and sunglasses.

Procedure

Data were collected on the lakefront of a large Midwestern city during peak UV hours in the summer of 2000. Mean temperature across all days of data collection was 83 °F, and cloud cover was minimal. Informed consent was received from interested beachgoers prior to study enrollment. To prevent contamination of the control group, we collected intervention and control group data simultaneously in locations separated by 1 mile (about 1.6 km). Locations for control and intervention group data collection were both public access, sand-covered beach areas populated by predominantly Caucasian beachgoers of all ages.

Baseline. Participants completed three brief questionnaires about sun exposure, sun protection behavior, and stages of change. Intervention group participants then experienced the intervention as described above. All participants were informed that completing follow-up questionnaires would qualify them for a \$100 lottery and up to 150 people could be eligible for the lottery.

Two-month follow-up. Follow-up data about stage of change, sun protection behavior, and sun exposure were collected at 2 months. The follow-up data were collected during the latter months of summer, whereas baseline data were collected midsummer. Follow-up data collection was conducted by telephone, mail, and/or e-mail. E-mail resulted in the highest response rate (56%), followed by mail (52%), and phone (7%). Each participant was contacted three times separated by 1 week.

Results

Two analyses of covariance (ANCOVAs) were used to examine group differences on sun protection and sun exposure with baseline values, age, and gender entered as covariates. We hypothesized that, after baseline group differences were controlled for, the intervention group would report significantly more sun protection behavior and less sun exposure than the control group at follow-up.

The ANCOVA for sun protection was significant, $F(5, 96) = 7.15, p < .01$. When baseline rates of sun protection and sun exposure were held constant, reports of sun protection use in the intervention group ($M = 6.44$) were significantly greater than in the control group ($M = 5.19$) at follow-up. The ANCOVA for sun exposure revealed no significant group differences (see Table 2).

Stage of change data were examined using chi-square analyses with dependent variables identified as (a) the proportion of participants in each group advancing at least one stage across time and (b) the proportion of participants in each group regressing at least one stage across time. Results revealed that 25% of control group and 49% of intervention group participants advanced in stage, $\chi^2(2, N = 100) = 5.742, p < .02$ (two-tailed) and that there was

no difference between the intervention (12%) and control group participants (15%) in stage regression.

Discussion

In the present study we examined the efficacy of a multicomponent intervention that targeted sun protection motivation and behavior in a setting where high-risk behavior is most prevalent, that is, the beach. Results revealed that the intervention significantly impacted sun protection motivation and behavior, but not sun exposure.

Results were consistent with those of other multicomponent interventions that have aimed to increase the saliency of the deleterious effects of unprotected sun exposure (Brandberg et al., 1996; Robinson & Rademaker, 1995; Weinstock et al., 1998). Whether the increased saliency of personal risk drives increased sun protection behavior and motivation or has an additive effect is not clear; however, the extent to which an individual perceives a personal risk for skin cancer appears to be important. The results also support the importance of addressing motivation to change. Although behavior changes were observed, observed changes in motivation were more substantial and provide additional information about the impact of the intervention. Few skin cancer prevention studies have assessed intervention impact on motivational stages, a measure that may be more sensitive to the process of change than behavior change measures alone (Rossi et al., 1995).

After controlling for covariates, we found that sun exposure ratings at follow-up did not appear to be affected by the intervention. Sun exposure among intervention participants did, however, show a decreasing trend from baseline to follow-up. This trend may have resulted from intervention exposure or, possibly, regression to the mean, that is, intervention participants reported significantly greater sun exposure than control participants at baseline.

The lack of significant change in sun exposure behavior is consistent with prior research, which rarely indicates that sun exposure is reduced when sun protection behavior increases (Autier et al., 1999; Wright, Wright, & Wagner, 2001). Plausibly, the motivating factors for sun protection behavior differ from those for sun exposure, or more likely, individuals might perceive the use of sun protection as an adequate measure in the reduction of sun-induced risks. As such, sunbathers who use sunscreen could perceive themselves as safe from the risks of sun exposure and continue prolonged sun exposure patterns. Health promotion efforts are needed to examine interventions that foster the belief that reduced sun exposure is a necessary step in reducing skin cancer risk.

Table 2
Comparison of Group Means on Dependent Variables at Baseline and 2-Month Follow-Up

Variable	n	Intervention				Control				
		Baseline		Follow-up		Baseline		Follow-up		
		M	SD	M	SD	M	SD	M	SD	
Sun protection	53	5.52	1.84	6.44	1.80	47	5.55	1.85	5.19	1.84*
Sun exposure	53	14.90	16.90	8.96	9.00	47	7.53	7.01	6.85	5.09

* $p < .05$.

A few limitations of this study should be given consideration. The rate of failure to follow up was high, possibly because of the transient nature of beachgoers and the relatively small incentive for completing and returning follow-up questionnaires (i.e., the \$100 lottery). Threats to generalizability were reduced because no significant differences in demographic or study variables were observed between completers and noncompleters. Also, the use of nonrandomized groups may have accounted for baseline group differences in recreational sun exposure, age, gender, and possibly other unknown characteristics. To reduce sampling bias, we statistically controlled for observed group differences in the analyses. Another potential limitation concerns the relatively small 2-month follow-up period. Extended follow-up assessments (e.g., 1 year) would have allowed for evaluation of the long-term effects of the intervention. The relatively low internal consistency of the measures of sun protection and exposure is an additional limitation. The skin cancer literature lacks standardized measures of sun protection and exposure; however, attempts were made to adapt measures used in previous studies (Pratt & Borland, 1994; Wichstrøm, 1994) to the purposes of the present study. Finally, the average score of sun protection behavior increased in the intervention group by only 0.81 in a possible score range of 1–7. Although this is a small behavioral change, the stage of change outcome suggests that the intervention was robust enough to push 50% of the intervention participants forward in their sun protection motivation. A progression of even just one stage is meaningful because the individual is closer to making and maintaining changes. Stage progression was associated with some, albeit modest, behavioral changes.

In summary, health promotion efforts should continue to develop interventions that facilitate both motivational and behavioral changes. Our study supports the use of a “one-shot” intervention that provides education while increasing the saliency of risks associated with unprotected sun exposure. Larger and more sustained changes might result from a prolonged version of the intervention that allows for multiple exposures. Research is still needed to differentiate the importance of sun avoidance from sun protection. Interventions that facilitate sun protection may not be effective at facilitating sun avoidance. Future research should explore variables that concomitantly reduce sun exposure and increase sun protection behaviors.

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