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BEHAVIORAL COMMUNITY INTERVENTION TO REDUCE THE RISK OF SKIN CANCER

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Peer leader modeling, posted feedback, posted goals, and a commitment raffle were used at two swimming pools to increase behaviors associated with skin cancer prevention. During the intervention condition, pool lifeguards modeled the protective behaviors by wearing sunglasses, t-shirts, and hats, using zinc oxide and sunscreen, and staying in the shade. Children and adolescents (1 to 16 years old) increased their use of two or more protective behaviors from a baseline mean of 6.5% to 26.9% during the intervention. Adults (older than 16 years) increased their protective behaviors from a baseline mean of 22% to 37.95% during the intervention. The lifeguards increased their use of all the protective behaviors from a baseline mean of 16.7% to 63.5% during intervention. Ways to improve and expand this intervention are discussed.

DESCRIPTORS: community psychology, prevention, behavioral recording, skin cancer

From 1987 to 1990 the number of new cases (incidence) of skin cancers rose from 26,000 to 27,600, with melanoma-related deaths increasing from 7,800 to 8,800 per year (American Cancer Society, 1989, 1990). In 1930, Americans had a 1 in 1,500 chance of developing skin cancer. With life-style changes, increased sun exposure, and a loss of the protective ozone layer, the chance of developing skin cancer has increased to 1 in 150 today and is expected to reach 1 in 100 by the year 2000 (Wilbur, 1985). Thus, skin cancer is a problem of increasing importance. Furthermore, as melanomas metastasize they can quickly spread from the skin surface and create cancerous growths in other parts of the body (Edwards, 1987). Obviously, promoting protective behaviors to prevent skin cancer is a significant public health objective (United States Department of Health and Human Services, 1991).

The Council on Scientific Affairs and the American Medical Association (1989) have indicated that sun tanning, in any form, is a health hazard; protective behaviors are needed during exposure to ultraviolet radiation (UVR). These behaviors include using a waterproof sunscreen with a skin protection factor (SPF) of 15 or higher, repeating applications of an appropriate sunscreen every 20 min or immediately after swimming, wearing protective clothing (long-sleeved shirts, pants, wide-brimmed hats), and reducing sun exposure between 10:00 a.m. and 4:00 p.m.

The present study applied prompting, feedback, goal setting, commitment, and behavioral modeling in the SafeSun intervention package. Posted prompting and feedback with goals have been used effectively to decrease risky behaviors among drivers and pedestrians (Van Houten & Nau, 1981), to decrease energy consumption (Winett, Neale, & Grier, 1979), and to increase safety belt use (Geller & Hahn, 1984). Commitment pledge cards have also been effective in increasing desirable behaviors, including the collection of recyclables and the use of vehicle safety belts (Geller & Lehman, 1991). Thus, we hypothesized that an intervention package combining commitment, posted prompting, and

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Send correspondence, including requests for reprints, copies of maps and instructions for observations, and figures displaying the daily temperature and cloud changes for each pool, to David Lombard, Department of Psychology, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061-0436.

feedback strategies would be effective in decreasing skin cancer risk behaviors at community swimming pools.

Peer leaders have also been found to effect beneficial changes in behaviors of their peers. When the target behavior is innovative, a peer leader who models the innovative behavior is even more likely to influence desired behavior change in the peer group (Kelly et al., 1991). Also, when the modeled behavior is very conspicuous, even people who are not closely acquainted with the model can learn the innovative behavior from the model (Bandura, 1986). Recently, peer leaders have been used to reduce high-risk behaviors associated with smoking, drug use, and HIV transfer (Kelly et al., 1991; Luepker, Johnson, Murray, & Pechacek, 1983; Ross & Carson, 1988).

Interviews with swimming pool patrons, staff, and management indicated that the lifeguards were the most visible and recognizable peer leaders in the swimming pool milieu. As older teens or young adults with high status within the swimming pool setting, lifeguards could be a powerful influence on protective behaviors among sunbathers, particularly children and adolescents. In other words, the lifeguards were ideal intervention agents for the field setting, and in the process of modeling the protective behaviors they were perhaps developing a personal commitment to protect themselves from the sun (cf. Geller et al., 1990).

METHOD

Setting and Subjects

The research was conducted at two private swimming pools with nonoverlapping memberships, located in two southwest Virginia towns. The pools had similar memberships (Pool A = 325, Pool B = 293), demographic characteristics (primarily middle to upper middle class), and shaded areas (Pool A, approximately 560 square feet; Pool B, approximately 477 square feet).

Individual participants were not recruited or monitored; instead, each pool was considered an entity. The behaviors of all pool patrons were observed and percentages calculated for those patrons engaging in particular behaviors. Lifeguards were also monitored throughout the study. After a baseline phase, all lifeguards at both pools were recruited to perform as peer leader models.

Dependent Measures

Behavioral mapping. A map was developed for the general area around each pool, which was then divided into portions to allow accurate measurement of the behaviors of interest. The behavioral mapping strategy was based on research of Twardosz, Cataldo, and Risley (1974).

At specified times, independent observers walked a specified route covering the entire pool area. During systematic walks, the observers marked each person's position and the dependent measures of interest. The dependent measures were defined as (a) *shirt:* wearing of any type of shirt covering large areas of the upper body; (b) *shade:* being in any area where one's entire body was shaded from the sun; (c) *hat:* wearing of any type of hat covering parts of one's head and shading one's face; (d) *sunglasses:* wearing a pair of tinted sunglasses covering one's eyes; (e) *zinc oxide:* wearing zinc oxide of any color on one's face; and (f) *sunscreen bottles:* the visible display of any type of lotion offering an SPF greater than 2. From these data, the researchers calculated the percentages of patrons located in the shade, having bottles of sunscreen, and wearing hats, shirts, sunglasses, and zinc oxide. For example, when there were 50 people at the pool and 10 were wearing shirts, the protective behavior category of *shirts* was 20% for that observation. Each measure was obtained separately for two age groups (1 to 17 years old and 18 years and older). Throughout the study, the lifeguards were also evaluated on the same behaviors as the pool patrons.

Use of free sunscreen. A 32-oz dispenser of SPF 15 sunscreen was located at the front desk of each pool. The dispenser was weighed after 10:00 p.m. each day to determine the amount of sunscreen used that day. This amount was then divided by the number of patrons attending the pool that day (obtained from sign-in sheets) to compute a ratio

of ounces used per number of patrons attending the pool.

Frequency of the measures. At both pools, all measures were taken at approximately 2:00 p.m. and 2:30 p.m., 7 days per week during both baseline and intervention. The sunscreen measure was calculated once at the end of each day. A daily weighted average was calculated for each of the six measures (i.e., weighted by the number of people at the pool during that audit).

Interobserver Reliability

Three trained observers collected data throughout all phases of the study. Before the study began, reliability was assessed by having the three researchers obtain concurrent measures for 10 occasions at each pool. The measures were obtained by having the three observers simultaneously, but independently, take measures on a particular area of the pool. The observers were given 45 s to make the observation for each area. Once all areas of the pool were measured, the procedure was repeated 5 min later with new coding maps. This procedure occurred 10 times during the same day.

The reliability procedure permitted a comparison of the raters' total number of observations for each category. Thus, the procedure resulted in the comparison of the presence or absence of observed behaviors. However, the procedure did not allow for comparisons of how specific pool patrons within an area were coded by the observers.

Interrater reliability was calculated by comparing the highest to lowest value obtained by the different observers. For example, for the shirts measure, Observer 1 had a value of 325, Observer 2 had a value of 322, and Observer 3 had a value of 318. Reliability was calculated by dividing 318 by 325 and multiplying the result by 100 to arrive at an interrater reliability of 97.8% for shirts. The interrater reliability for sunglasses was 401/460, or 87.1%; for being in the shade it was 211/211, or 100%; for hats it was 122/131, or 93.1%; for zinc oxide it was 5/5, or 100%. For the 1 to 17 year age group, interrater reliability was 671/729, or 92%; whereas for the 18 years and older group, interrater reliability was 471/543, or 87%. Interrater reliability on all observations taken before the study began ranged from 87% to 100%.

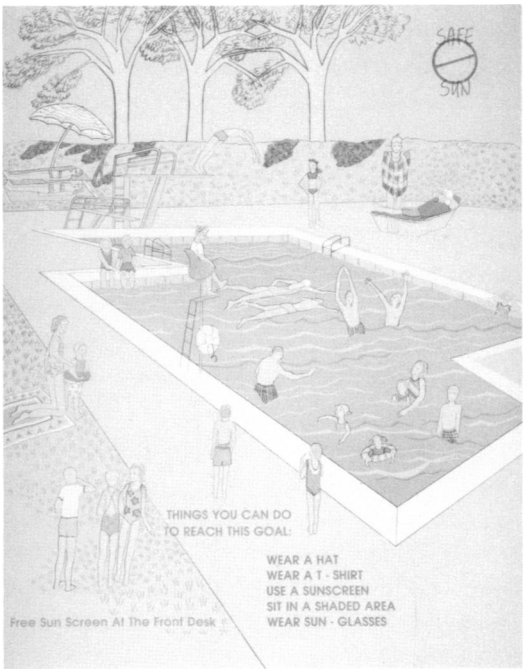


Figure 1. A photograph of one of the informational posters.

Interventions

Each pool received five components that together defined the SafeSun intervention. They included:

Information poster. Two identical posters (19 in. by 24 in.) were placed at each pool (a total of four informational posters) on walls facing the swimming pool. As illustrated in Figure 1, the posters contained information on how to protect oneself against sun damage by using sunscreen, using protective clothing, and sitting in the shade. They also indicated that free sunscreen was available at the front desk.

Information fliers. Separate information fliers were created for adults and children. Both fliers contained information about the causes and dangers of skin cancer and strategies to protect themselves (or their children) from developing skin cancer. These fliers were placed at the front desk and were available to anyone.

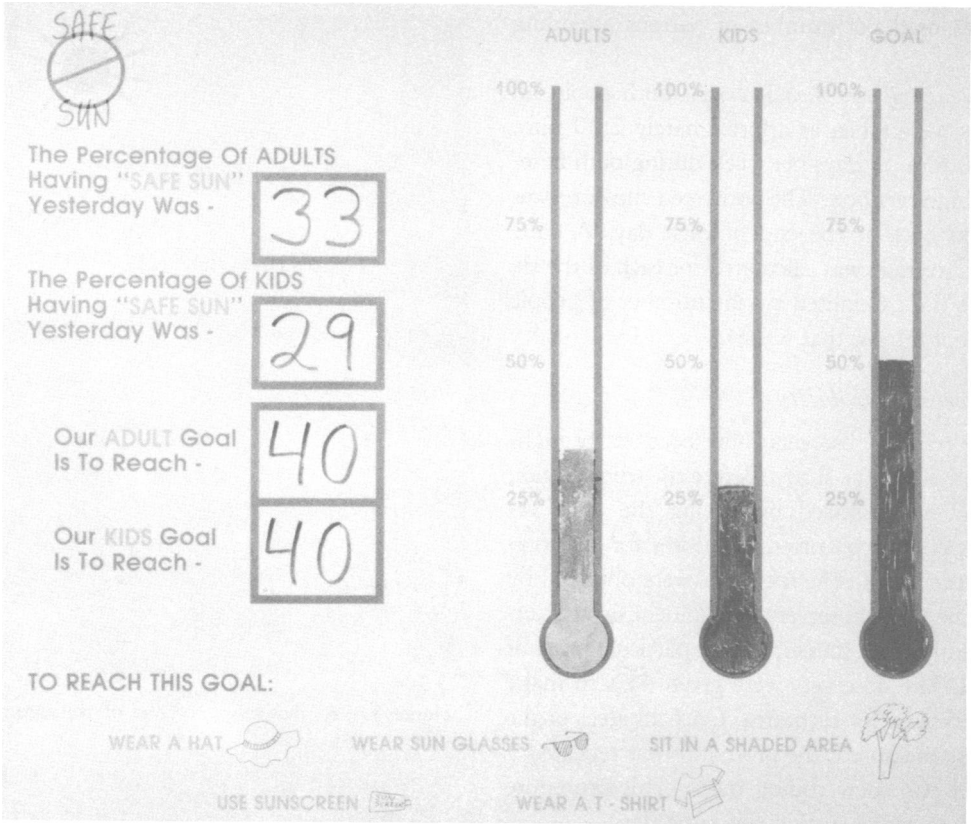


Figure 2. A photograph of one of the daily feedback posters.

Risk protection feedback and goals. Feedback on the percentage of pool patrons performing two or more protective behaviors (e.g., wearing sunglasses and a shirt) for the previous day was posted on two identical posters (19 in. by 24 in.) next to the informational posters already described. The percentage of protective behaviors posted on the feedback signs was presented separately for children and adults. The posted feedback included a goal percentage for the pool to reach, based on achieving a substantial increase from the baseline measure of protective behaviors. After a group reached their goal, a new goal (10% higher) was posted. Initial goals of 40% for adults and 20% for children were established at both pools. Figure 2 depicts one of the daily feedback displays.

Peer leader modeling. A 3-hr lifeguard training session was conducted at each pool, just before the intervention. During this session, the lifeguards were informed of and practiced the target behaviors (i.e., wearing t-shirts, sunglasses, hats, and zinc oxide, and using sunscreen and an umbrella for shade on the lifeguard stand). To facilitate the practice of the target behaviors, the lifeguards were given a supply of sunscreen, zinc oxide, and t-shirts with a "SafeSun" logo to use throughout the intervention. They were taught how to instigate conversations supporting these behaviors and to help others engage in these behaviors. Training stressed the need to show how they, the lifeguards, had changed their own behavior and how easy it was to be protected from the sun.

During the intervention phases, the percentage of protective behaviors performed by the lifeguards was depicted on a poster (12 in. by 14 in.) at the front desk of each pool. Research observers were instructed to prompt the lifeguards to engage in the specified behaviors. During the first 4 days of the intervention, the lifeguards at Pool B were informed by the manager of the pool that if they did

not perform the target behaviors, they would lose their jobs. After the 4th day, the pool manager rescinded this demand. No such contingency was ever in place at Pool A.

Commitment raffle. During the intervention, fliers were given out stating that if the children filled out a commitment card pledging that they would practice the SafeSun procedures, they would be eligible to win free "SafeSun" hats and t-shirts when the children reached their goal of 40% protective target behaviors for 3 consecutive days. The fliers were handed out to pool patrons on three separate afternoons and were posted at the front desk for patrons to take. A poster (12 in. by 14 in.) was placed on a wall by the front desk to remind the patrons of the raffle. A raffle box was left at the front desk of each pool for the children's pledge cards. There were 57 entries at Pool A and 42 entries at Pool B. Actual drawings were never performed, because neither pool reached the criterion of 40% for 3 consecutive days.

Experimental Phases

Baseline. The baseline at Pool A lasted 15 observation days, and baseline at Pool B lasted 32 observation days. During baseline, free sunscreen was available at both pools. No interventions were in place at either pool during baseline.

Intervention. The intervention phase at Pool A lasted 41 observation days. Sunscreen was available at both pools during the intervention phase. At Pool A the intervention occurred in three phases. During the first phase (beginning on Day 16), lifeguards modeled the desired behaviors and posters reported goals and feedback. On Day 24, information fliers were placed at the front desk. Finally, on Day 31, the commitment raffle component was announced. At Pool B, the intervention lasted 21 observation days, and all five intervention components were delivered simultaneously.

RESULTS

Lifeguards

Figure 3 depicts the percentage of possible protective behaviors displayed by the lifeguards at each pool. Because the lifeguards were requested to engage in five protective behaviors (wear hat, shirt, sunglasses, and zinc oxide, and sit in the shade) during the intervention phase, the lifeguards were evaluated daily by assessing what percentage of the five behaviors each was performing. Thus, if 4 lifeguards were present and each was engaging in four target behaviors, their combined percentage was 80%. The lifeguards at Pool A increased from a baseline mean of 25.0% (15 observations) to an intervention mean of 64.5% (41 observations). Though never reaching 100%, the lifeguards' percentages of protective behaviors remained between 50% to 80% throughout the intervention phase. No notable change in lifeguard protective behavior occurred at Pool B until the intervention was introduced. The lifeguards at Pool B increased their target behavior percentages from a baseline mean of 8.3% (32 observations) to an intervention mean of 62.4% (21 observations). These lifeguards engaged in 100% of the specified behaviors for the first 4 days of the intervention phase, but these behaviors steadily declined to approximately 40% during the last week of the intervention.

Pool Patrons

Table 1 reports the results for each dependent measure as a mean percentage for each age group at each pool during both baseline and intervention conditions. For the target behaviors, the largest increases occurred in the use of shade for all ages and use of t-shirts for children. Children's use of shade increased 35.3 percentage points at Pool A and 25.6 at Pool B. Adults' use of shade increased 20.1 percentage points at Pool A and 3.7 percentage points at Pool B. Children's use of t-shirts increased 10.6 percentage points at Pool A and 13.7 percentage points at Pool B.

The aggregate measures (i.e., both any one or more and any two or more measures of protective behaviors displayed) increased for both age groups. For the any one or more measure, the children showed increases of 29.4 and 20.4 percentage points at Pools A and B, respectively; the adults showed increases of 18.5 and 5.4 percentage points at Pools A and B, respectively. For the any two or more measure, the children showed increases of 18.4 and

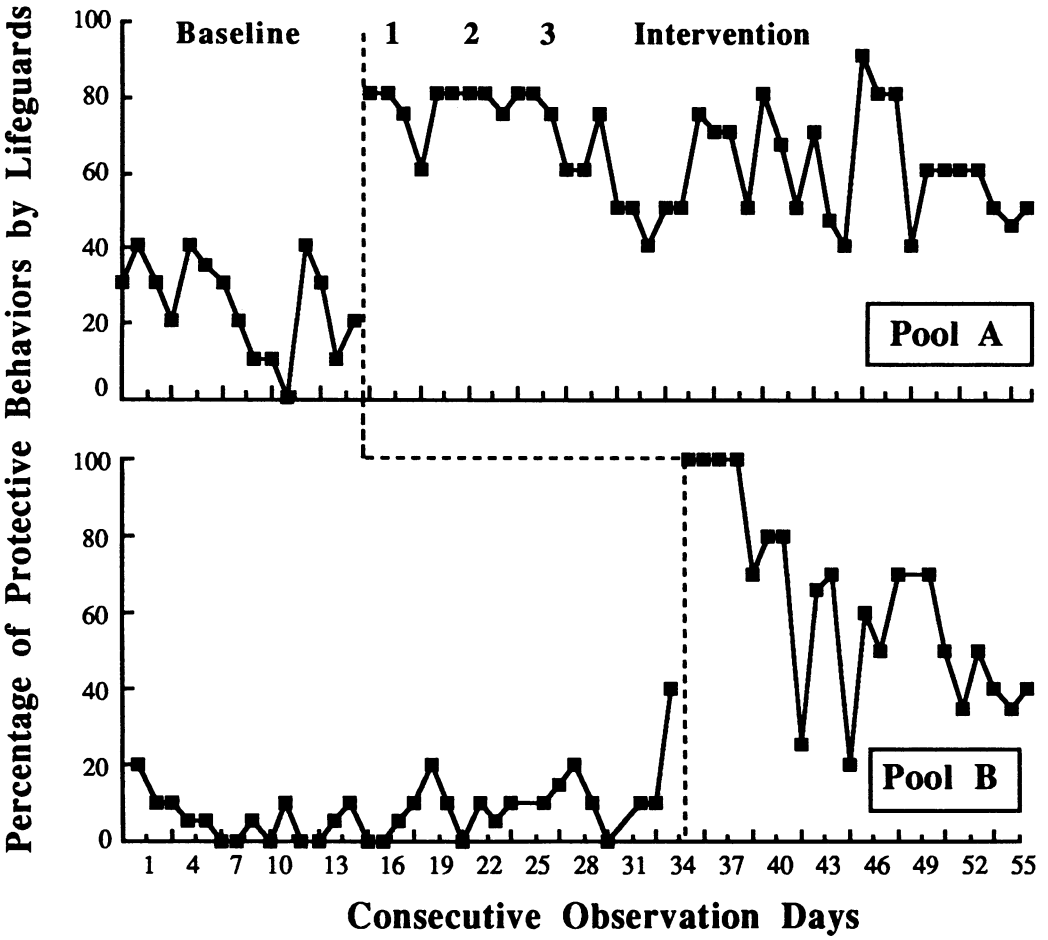


Figure 3. Percentage of lifeguards at each pool engaging in all of the target protective behaviors on consecutive observation days. The numbers 1, 2, and 3 refer to the sequential introduction of the intervention at Pool A; 1 = peer leader modeling, posted information, prompting, feedback, and goals; 2 = peer leader modeling, posted information, prompting, feedback, goals, and informational fliers; 3 = peer leader modeling, posted information, prompting, feedback, goals, informational fliers, and raffle.

22.5 percentage points at Pools A and B, respectively; the adults showed increases of 22.7 and 9.0 percentage points at Pools A and B, respectively.

Figure 4 depicts the percentage of children and adults at the two pools who engaged in two or more protective behaviors. At Pool A, children increased their protective behaviors from a baseline mean of 6.3% to an intervention mean of 24.7%, whereas adults increased from a baseline mean of 23.3% to an intervention mean of 46.0%. There did not appear to be incremental effects attributable to adding the intervention components.

At Pool B, no notable changes in protective behaviors occurred until the intervention was introduced. The children at Pool B increased their two or more protective behaviors from a baseline mean of 6.6% to an intervention mean of 29.1%, whereas adults at Pool B increased from a baseline mean of 20.7% to an intervention mean of 29.7%. It is noteworthy that there was a decrease in protective behaviors exhibited by children and adults at both pools at the end of the intervention.

Sunscreen

There were no notable changes in use of free sunscreen at either pool. At Pool A, the measure

Table 1
Baseline and Intervention Means and Change Scores by Pool

Measures	Pool A		Pool B	
	Baseline (n = 15)	Intervention (n = 41)	Baseline (n = 32)	Intervention (n = 21)
Children				
Shade	10.0	45.3	15.6	41.2
Shirts	21.0	31.6	22.6	36.3
Hats	3.0	4.8	3.7	7.1
Sunglasses	2.0	5.4	4.3	1.8
Zinc oxide	1.1	3.3	0.4	3.2
Any one behavior	37.1	61.6	38.3	58.7
Any two behaviors	6.3	24.7	6.6	29.1
Adults				
Shade	10.7	30.8	6.1	9.9
Shirts	19.6	22.3	15.1	16.9
Hats	13.6	23.1	13.1	14.4
Sunglasses	48.1	49.4	47.6	56.1
Zinc oxide	1.1	1.0	1.6	0.0
Any one behavior	62.6	81.1	59.8	65.2
Any two behaviors	23.3	46.0	20.7	29.7
Sunscreen				
Bottles	14.6	19.1	11.4	17.3
Free (oz/patron)	0.011	0.011	0.010	0.012

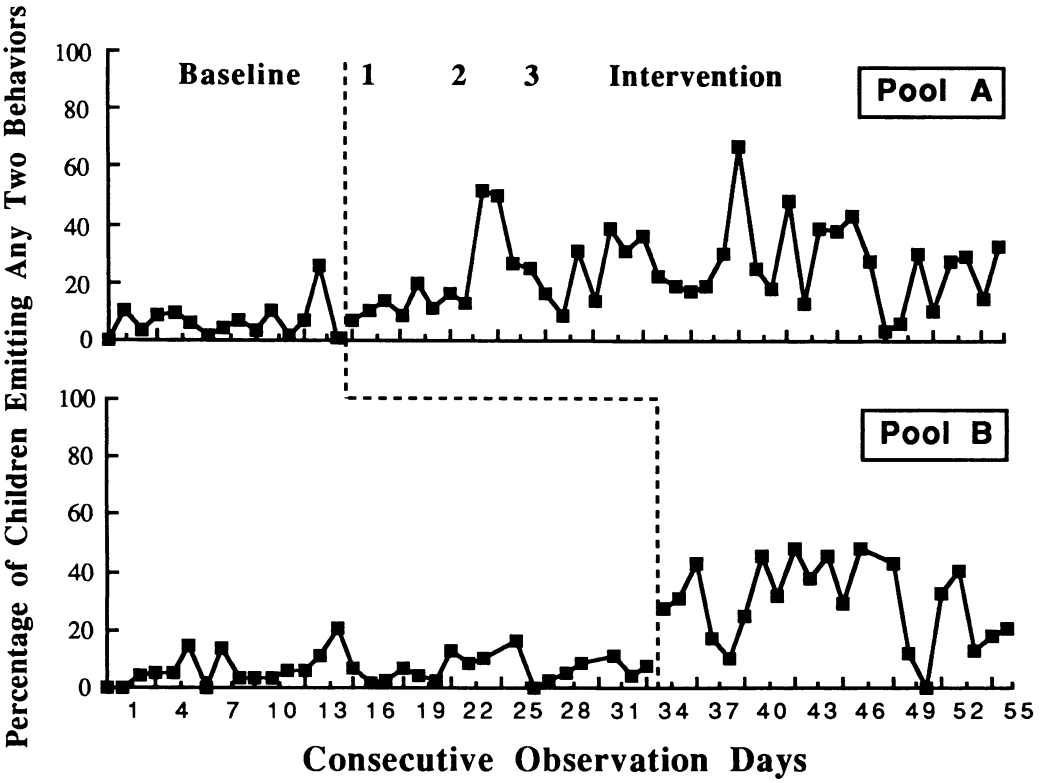
remained constant throughout baseline and intervention, with a mean of 0.011 oz per patron. At Pool B, the measure increased only slightly from a baseline mean of 0.01 oz to an intervention mean of 0.012 oz per patron. The observation of visible bottles of sunscreen revealed only a minimal increase. The patrons at Pool A increased from a baseline of 14.6% to an intervention mean of 19.1%, whereas the patrons at Pool B increased from a baseline mean of 11.4% to an intervention mean of 17.3%.

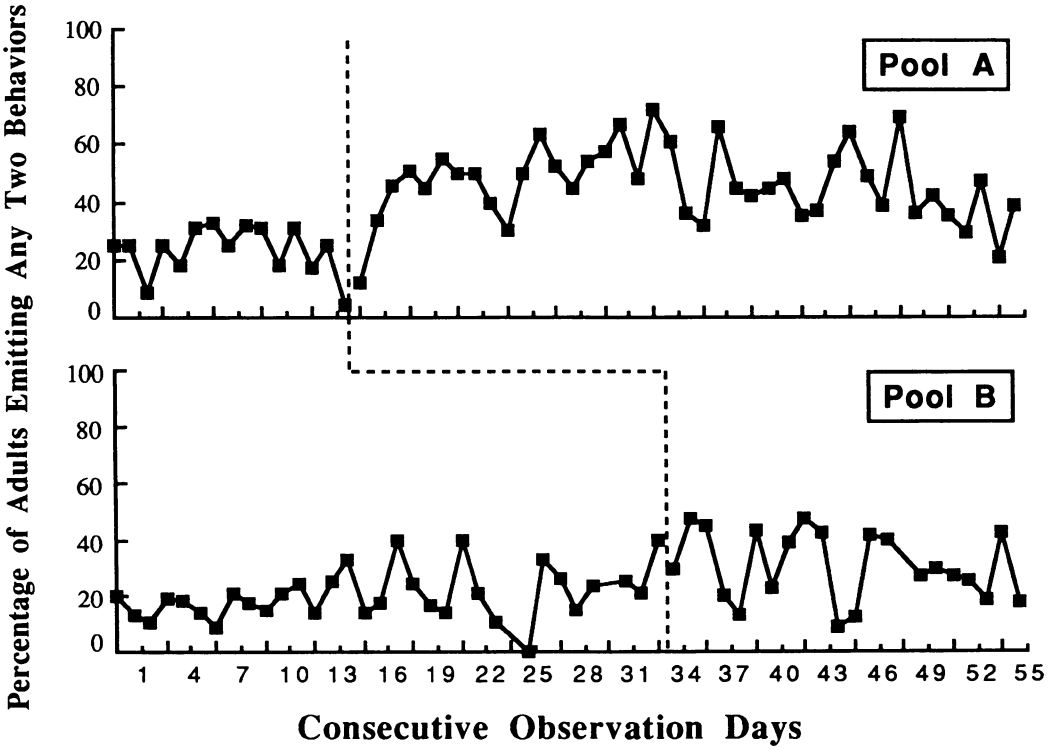
Social Validation

In a pilot test, the poster was shown to 10 adults (ages 20 to 31) and 10 children (ages 11 to 17). These subjects were comparable to the pool patrons but were not the same individuals. Each person viewed the poster and then completed a short 11-item free-response questionnaire on the poster's content, on how important the content was to them, and whether the poster created a sense of importance and vulnerability. Importance and vulnerability were measured on a 7-point Likert scale, with 1 being low and 7 being high. The poster relayed an average of 83% of the target information (protective behaviors), created a high sense of importance (M = 6.2), and a moderate sense of vulnerability (M = 5.1).

DISCUSSION

Our multicomponent intervention package produced a modest increase in child and adult preventive behaviors at two swimming pools. The largest changes were for being in the shade and wearing shirts. Very minimal or no changes were found among children or adults for other protective behaviors. In addition, the changes in adults' behaviors at the second pool were appreciably smaller than at the first pool. However, Pool A had the intervention introduced in phases, but Pool B did not. Thus, the study did not use a true multiple baseline design. The sequential introduction of the intervention at Pool A may have maintained interest


Percentage of Children Emitting Any Two Behaviors
Baseline
1
2
3
Intervention
Pool A
Pool B
100
80
60
40
20
0
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55
Consecutive Observation Days


Percentage of Adults Emitting Any Two Behaviors
Pool A
Pool B
100
80
60
40
20
0
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55
Consecutive Observation Days

among the adults, thus resulting in their higher rates of protection at Pool A than at Pool B. However, as noted previously, some decrease was observed at the end of the intervention at both pools.

Staying in the shade was the protective behavior most influenced by this intervention. This is important because staying in the shade is a far more protective behavior than is the partial protection provided by wearing a hat, shirt, or even using SPF 15 lotion (United States Department of Health and Human Services, 1991). However, to claim true disease prevention benefits, future systematic replications of the present study's intervention would need to demonstrate higher and more consistent individual rates of staying in the shade over time. Obviously, more conclusive demonstrations of disease prevention will require showing that patrons involved in interventions at pools also increased their protective behaviors at other settings.

For each day, the temperature and weather conditions at the pools were recorded to assess any possible confounding effects. Daily temperature was obtained from thermometers at poolside. The temperature and weather conditions for both pools were not observed to vary systematically between conditions. Thus, the possible effects of climate on the present intervention were minimal.

The present findings are tempered somewhat by three shortcomings. First, reliability measures were not taken during the study. This is of major concern because it brings into question the accuracy of the measures obtained throughout the study and the possibility of observer bias and observer drift. Future studies should use continuous reliability assessments, regardless of high levels of reliability achieved prior to the start of the study.

Second, because measures were taken daily for over 3 months, some pool patrons were aware of the regular observations. Although they did not know the study's purpose, this awareness may have led to an increase in some protective behaviors by patrons. However, this potential reactivity effect could be minimized in future programs by having lifeguards serve as both models and data recorders. Finally, we may have lost useful information by defining the broad category of 1 to 17 years of age as "children." In future studies, more specific categories for children (such as 1 to 5, 6 to 12, and 13 to 17 years of age) would permit a more precise assessment of how different age groups are affected by the intervention.

The lifeguards' increased use of shade, shirts, sunglasses, hats, and sunscreen is particularly encouraging. Lifeguards are exposed to sunlight for many hours each day and, therefore, are at a relatively high risk for developing skin cancer. Thus, the observed changes in lifeguard behaviors were particularly encouraging from a disease prevention perspective. Likewise, the results indicated that the intervention appeared to affect children more than adults. As stated earlier, sun exposure in the adolescent and teenage is considered the most damaging to the skin (United States Department of Health and Human Services, 1991). Thus, the increase in children's risk-reduction behaviors is an encouraging finding.

An alternative approach to promote the use of shade at pools would be to construct more shady areas conductive to social interactions. Such areas should be large, open, and equipped with chairs and tables to facilitate interactions among pool patrons. This is an example of a more environmentally passive strategy advocated by public health professionals.

Comments from pool patrons and lifeguards may explain why there were no changes in the use of the free sunscreen and personal bottles of sunscreen. Patrons and lifeguards stated that the free SPF 15

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Figure 4. Percentage of children and adults at each pool emitting any two or more protective behaviors on consecutive observation days. The numbers 1, 2, and 3 refer to the sequential introduction of the intervention at Pool A; 1 = peer leader modeling, posted information, prompting, feedback, and goals; 2 = peer leader modeling, posted information, prompting, feedback, goals, and informational fliers; 3 = peer leader modeling, posted information, prompting, feedback, goals, informational fliers, and raffle.

sunscreen was more protection than they needed (an incorrect conclusion, suggesting that the information component of the intervention needed to be revised and strengthened). Furthermore, many patrons stated that they kept their personal bottles of sunscreen in bags or under towels. As such, the measure of observable bottles may or may not have tapped actual changes in the number of bottles brought to the pools.

Reevaluation of the coding system for protective behaviors should also be considered for future replications. For example, being in the shade offers more protection than wearing a hat. In the present coding system, both behaviors were given equal weight, as if they offered the same level of protection. Future studies could measure "complete protection" (i.e., shade or fully clothed) versus "partial protection" (i.e., wearing a hat, a shirt, or zinc oxide) to represent more accurately the level of protection displayed.

Although preliminary and exploratory, the findings from this field study were encouraging. A multicomponent, low-cost intervention increased protective behaviors at two swimming pools. The changes occurred even though the target behaviors were counter to the norm of sunbathing at the pools. Perhaps the most promising finding was the apparent effectiveness of the lifeguards as intervention agents. The lifeguards evidently influenced pool patrons, and the lifeguards themselves showed increases in protective behavior. Thus, peer leaders may be efficient multipliers of change efforts in a number of risk-reduction programs (Geller et al., 1990; Kelly et al., 1991).

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