SKIN CANCER AND PREVENTIVE BEHAVIORS:
EFFECTS OF POSTED PROMPTING, FEEDBACK,
AND PEER LEADER MODELING

by

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Abstract

The present study applied peer leader modeling and the use of posted feedback and goals to increase the occurrence of protective behaviors for skin cancer at two swimming pools. During the intervention phase, the models, pool lifeguards, wore sunglasses and special t-shirts and hats, used zinc-oxide and sun screen, and sat in the shade. The posted feedback was the percentage of pool patrons from the previous day who engaged in two or more protective behaviors. The protective behaviors measured were wearing shirts, hats or sunglasses, using zinc-oxide, and being in a shaded area. The feedback also consisted of a goal percentage to reach for that day. The results indicated that for Pool 1, substantial increases from the baseline to the intervention phase in behaviors were observed. The most dramatic increases were observed for the remaining in a shaded area measure. Adolescents increased from 20% to 55% during intervention. Adults increased from 15% to 39% during intervention. No changes occurred at Pool 2 until the intervention was introduced. Pool 2 replicated the finding for the adolescents, but not the adults. For the adolescents at pool 2, their measure of being in the shade went from 19% to 42% during intervention, while the adults only changed from 10% to 14% during intervention. This study showed that a skin cancer prevention program can be implemented in natural settings with the utilization of peer
leader models, feedback, and goal setting.
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Introduction

Intentional sun tanning began in Europe as a part of "heliotherapy" in the early 1900's. Sun exposure was believed to improve various medical conditions, such as tuberculosis (Rollier, 1927). Possession of a tan soon became a visible sign associated with good health, while having a pale complexion became a sign of poor health (Keesling & Friedman, 1987).

Other factors have also influenced the general public's opinion of a tan. The industrial revolution allowed many middle class workers the opportunity to work indoors. No longer was being pale a sign of higher class status, and as a result, the stereotype shifted and being tan became a symbol of affluence (Keesling & Friedman, 1987). By the 1940's, having a tan indicated "superior physique, intelligence, and moral character" ("Sun-Tan Addicts," 1949).

Sun exposure is beneficial in a variety of ways. The sun's rays are necessary for the human body to produce vitamin D (Rosenthal et al., 1984). Increases in various hormonal levels have been found as a result of sun exposure (Rosenthal et al., 1984). Also, elevation of positive mood has been linked to the sun and exposure to light (Rosenthal et al., 1984).

In contrast, warnings about the possible negative
effects of sun exposure began as early as the 1940's (Ewing, 1941). The warnings consisted mainly of the adverse effects, skin cancer, of exposure to UVR. These warnings were weakly stated and not well accepted. Stronger warnings began in the 1960's as it became evident that those individuals who sunbathed regularly in the 1930's began developing tumors in the 1960's (Keesling & Friedman, 1987). The strong relationship between sun exposure and skin cancer has become more evident each decade since the 1960's.

There now appear to be many more negative outcomes linked to sun bathing. The National Institutes of Health's (NIH) recent Consensus Development Conference on "The Hazards of Sunlight" stated that "... a tan is evidence of skin damage" (Rossi, 1989, p.87). The Conference also concluded that all forms of tanning, natural or artificial, were potentially damaging to the skin. This damage can range from dryness, sagging, wrinkling, and inelasticity to the more dangerous skin cancers. Sun exposure may also exacerbate preexisting conditions, such as triggering a herpes eruption in those infected with this virus (Hamilton, 1980). Sun exposure may also interact with various drugs in a detrimental way. For example, tetracycline will greatly increase the skin's sensitivity to sun exposure (Seligman, 1985).
Types of Skin Cancer

There are three types of skin cancer associated with sun exposure. The first type, basal cell carcinoma, is the least dangerous. Basal cell carcinoma grows slowly and often do not ever metastasize. Squamous cell carcinoma, the second type, occurs less frequently. By contrast, they are much more dangerous. They can easily spread to internal organs and the lymph glands. These first two types of skin cancer are often referred to as nonmelanoma skin cancer. They both have relatively high cure rates of over 90% (Keesling & Friedman, 1987).

"Black cancer," as melanomas are often labeled, are the most dangerous type of skin cancer. They result from the pigment containing cells, melanocytes, becoming malignant. They then spread from the skin surface to various parts of the body (Edwards, 1987). If detected before they metastasize, the five-year survival rate is also very high, @90%. Melanomas are deceptive in that they often take 30 to 40 years from time of sun exposure to arise or be detected. As a result, many individuals do not see an immediate danger in over-exposure to the sun.

In 1985, there were 400,000 cases of basal cell carcinomas and 100,000 cases of squamous cell carcinomas (Goldsmith, 1987). There were 22,000 cases of melanoma reported in 1985 with 5,500 cases resulting in fatalities
(Seligman, 1985). In 1987, 7,800 deaths were related to melanomas with an estimated 26,000 new cases reported that year (NIH, 1988). For the year 1989, there is an estimate of 27,000 new cases of melanoma. Of these cases, 54% were males (ACS, 1989).

Some forms of skin cancer have more than doubled over the past 5 to 10 years. Because of lifestyle changes and increased sun exposure, Americans have an estimated 1 in 150 chance of developing a skin cancer. This ratio is expected to rise to a level of 1 in 100 by the year 2000 (Wilbur, 1985). These statistics indicate a need for an intervention that will prevent the number of cases from rising.

**Etiology of Skin Cancer**

Before an effective intervention can be developed, the factors associated with the causes or susceptibility for skin cancer need to be addressed. In this way, the correct target population or populations and settings may be chosen.

Skin cancer is more prevalent in males than in females. Also, the cancer is more common in caucasians and is rarely found in other groups (Rossi, 1989). Although blacks are at a lower risk for skin cancer, they are at the same risk for the types of skin damage that excessive sun exposure cause, i.e. dryness, sagging, wrinkling (Rossi, 1989). They may also experience permanent discoloration or blotching of their skin (Rossi, 1989).
Nonmelanoma types of skin cancer have been found to correlate with collective sun exposure or overall time spent in the sun each year. These forms are seen more frequently in men who primarily work in outdoor jobs, i.e., construction workers, farmers. Melanomas are correlated with intermittent, intense exposure, possibly resulting in a bad sun burn or sun blisters (Edwards, 1987). Such sunburns are found frequently in adolescents during spring and summer vacations. One or more blistering sun burns in childhood or adolescence doubles the risk of skin cancer later in life (Rossi, 1985). This places them in a high risk group.

For years researchers have known that ultra violet radiation (UVR) is dangerous to the skin (Rossi, 1989). The harmful effects of UVR depend on the amount and intensity of the UVR and risk factors such as skin type. Lab research has found UVR to cause erythema (sunburns), photoaging of the skin, photocarcinogenesis, eye damage, alteration of the skin’s immune system, and photoallergic reactions (Council on Scientific Affairs, 1989). The danger was generally associated with the medium length wavelengths, UV-B. Recently, the longer wavelength, UV-A, has been found to damage human cells (Raloff, 1985). UV-A is 100 times more common than UV-B. Unfortunately, most sunscreens or sunglasses do not provide protection from these UV-A rays (Rossi, 1989).
Lamps which give off UV-A rays are used and advertised in tanning salons as safe. However, some of the advertised sun lamps radiate five times as much UV-A as reach the earth at the equator. Thus, artificial tanning can be highly dangerous.

**Protective Practices**

Keesling and Friedman (1987) attempted to find the psychosocial factors which related to sunbathing and the use of sunscreen. Sunscreen use was related to gender (i.e., women reporting more use), knowledge about skin cancer, levels of anxiety, and knowing people who have had cancer of any type. Sunbathing was correlated with a positive attitude toward risk taking, little knowledge of skin cancer, and having friends who sunbathe. Keesling and Friedman's research highlights the importance for an intervention to disseminate information about skin cancer and its causes, heighten a sense of personal vulnerability and the possibility of using peer modeling to increase sunscreen use.

The Council on Scientific Affairs and the American Medical Association (1989) released several consensus findings on skin cancer and sun exposure.

1.) Exposure to high intensity UVR has long-term potentially harmful effects.

2.) Sun tanning, in any form, is a health hazard.
3.) UV-A emitting tanning lamps are also a health hazard.

4.) Protective measures need to be taken when being exposed to UVR.

There are many recommended protective measures which can be taken to decrease the probability of developing skin cancer. These measures include: using a waterproof sunscreen with an SPF of 15 or higher; repeated application of sunscreens every 20 minutes or immediately after swimming; wearing protective clothing (long-sleeved shirts, pants, wide-brimmed hats); and reducing exposure during the time period of 10am to 4pm. Researchers have also found that 50% of one’s lifetime exposure to the sun is often obtained by the age of 18 (Rossi, 1989). This finding suggests interventions should aim at changing the skin cancer risk behaviors of children and adolescents (Rossi, 1989).

The Consensus Development Conference (Rossi, 1989) reported there were apparently no published behavioral interventions to decrease sun exposure. The conference also noted an urgent need for development of such preventive intervention programs. An effective intervention would result in a substantial increase in protective behaviors (such as, wearing hats, shirts, and sunglasses, using sunscreen, and staying in shaded areas).
The present used procedures and techniques that have been effective in changing behaviors in community settings, including prompting, feedback and goal setting, and behavioral modeling.

**Prompting and Feedback**

Posted prompting and feedback with goals have been effective in a number of areas including decreasing risky behaviors in drivers and pedestrians. For example, Van Houten and Nau (1981) compared the effectiveness of posted feedback versus police surveillance on the reduction of automotive speeding on two urban highways. The posted feedback consisted of a sign placed near the highway which informed the drivers of the percentage of individuals not speeding during the preceding week and the best record to date for that highway. The posted feedback resulted in an approximate 10% decrease of speeding in the 60 km/hr range and an approximate 5% decreases in the 65 and 70 km/hr ranges.

Van Houten et al. (1985) assessed the effectiveness of posted prompting and feedback on the percentage of motorists yielding to pedestrians. Small signs were placed near intersections which informed pedestrians on the proper way to cross at an intersection. Drivers were given similar information on how to yield to pedestrians. The drivers were also given feedback via fliers on the percentage of
drivers yielding. The results indicated an increase from a baseline of 1% to a post-treatment value of 13% in correct crossing and yielding behaviors. There was also a decrease of 50% in the occurrence of near misses at the intersections.

The effectiveness of posted prompting and feedback have been observed in reduction of home energy use. Winett, Neale, and Grier (1979) reduced residential electrical use by 13 percent with the use of written daily feedback and specific goals. Hayes and Cone (1981) reduced the frequency of the feedback from daily to monthly and found an average 4.7 percent decrease in home energy consumption. Withdrawal of the feedback and prompting lead to a return to baseline values for energy consumption. Adding the component of videotaped modeling to the use of feedback and prompting, Winett et al. (1982) decreased energy consumption in two different studies by 15 percent over baseline values.

Posted prompting and feedback has also been effective in altering behaviors in other areas. Brownell, Albaum, and Stunkard (1978) increased the percentage of people choosing to use the stairs over the escalator from 6.3 to 14.4 percent through the use of signs encouraging the use of the stairs. Geller (1983) used prompting and rewards to increase the use of safety belts in an industrial setting. Geller was able to achieve an increase of 25.1 percent over
the baseline use of safety belts. Removal of the prompting and incentives lead to a return to baseline values. Greene and Neistat (1983) used feedback and prompting to increase the use of shielding by dental professionals during X-ray exposures. Across eight dental offices, the feedback and prompting lead to compliance increases ranging from 25 percent to 45 percent above baseline.

Geller et al. pointed out several important elements for a community intervention using prompting and feedback. They indicated that the impact of an intervention is related to the amount of participant involvement, amount of social support, increasing the saliency of the information presented, decreasing the proximity between the behavioral change request and the opportunity to display the behavior, increasing the amount of extrinsic control over rewards or penalties, and creating a high level of individual self efficacy regarding the behavior change (Geller et al., in press).

Given the findings of these and other studies (Greene et al., 1987), the use of posted prompting and feedback were hypothesized to be effective in decreasing skin-cancer risk behaviors at swimming pools. Furthermore, as suggested by Geller et al., increasing the saliency of the information, decreasing the proximity between the behavior change requested and the opportunity to display the behavior,
increasing extrinsic control of the rewards and penalties, and increasing the amount of self efficacy related to the behavior change are hypothesized to further the effectiveness of a posted prompting and feedback intervention in the swimming pools.

Peer Leaders and Innovative Behaviors

Peer leaders have been found to affect changes in the attitudes, values, and behavior of their peers. Furthermore, when the target behavior is innovative in nature, a peer leader is even more likely to affect changes in the peer group. The innovative behavior is believed to diffuse in a dual-linked fashion (Bandura, 1986). Initially the media or some other external factors influence the leaders in the network. Then the leaders influence the network or the group in a reliable fashion following modeling principles, eventually producing shifts in the behaviors of the entire population (Bandura, 1986). Research in voting preference and persuasion and the diffusion of innovations displayed this dual-linked process (Lazarsfeld, 1955; Rogers, 1983). Furthermore, when the modeled behavior is very conspicuous, even people who are not acquainted closely in the network with the model will learn the innovative behavior from the model (Bandura, 1986).

For peer modeling to be effective, the modeling should
1) relay instructions about the new manner of thinking and behaving by demonstration or description and 2) show the benefits of the innovative behaviors. Sabido's (1981) study of an illiteracy program in Mexico displayed these important components. The program used popular actors and the storyline of a well viewed soap opera to relay information about and benefits of using a self-instructional reading program.

The greater the relative benefits of the modeled innovative behavior, the greater the chance that the public will adopt the behaviors (Ostlund, 1974; Rogers & Shoemaker, 1971). This line of research shows individuals will act on the anticipated costs and benefits of the modeled behaviors. Furthermore, innovations are more readily accepted when the benefits are immediate (Erasmus, 1961). If the benefits are delayed, as with skin cancer prevention programs, there may be a necessity to provide an immediate incentive (e.g., payment or lotteries) to perform the innovative behaviors until the intrinsic value becomes apparent (Bandura, 1986). On a large scale, Welch and Thompson (1980) found that policies with monetary incentives for adopting innovative regulations diffused more rapidly to states than those that did not offer such incentives.

Peer leaders have also been effective in changing behaviors in the health related areas (Downs, Rosenthal, &
Lichstein, 1988; Ross & Carson, 1988). For example, Ross and Carson (1988) found that peer leaders were the most influential sources of information and advice about AIDS prevention. Luepker, Johnson, Murry, & Pechacek (1983) found that using peers to model drug resistance behaviors was more effective in diffusing the innovative behaviors than using adults as models.

In the swimming-pool setting, the most visible and recognizable peer leaders are the lifeguards. The use of lifeguards as peer leader models is hypothesized to be a powerful tool in the attempt to increase protective behaviors among sun bathers. In fact, they may be an essential component for a successful intervention. Furthermore, as the benefits of the modeled behaviors are not immediately apparent, the inclusion of a raffle may add to the diffusion of the innovative behaviors modeled by the lifeguards.

The objectives of the present study were to 1) test the accuracy and reliability of obtaining behavioral data in a swimming pool setting and 2) assess the effectiveness of a multi-component, skin cancer risk-reduction intervention in a swimming pool setting. The study was founded on a social learning theory approach to behavior change, using the theory of diffusion of innovative behaviors as well as posted prompting and feedback. Furthermore, a multiple
baseline design across two pools was chosen. The dependent measures used were behavioral maps of discrete swimming pool behaviors and sunscreen usage.

Method

Setting and Subjects

The sites were two pool with private membership. The pools were located in different towns in southwest Virginia and had nonoverlapping memberships. The pools were compared to assess the comparability of both the participants (number of members, demographics, etc.) as well as the design (i.e., areas of shade) of the pools.

Figure 1 depicts a schema of site 1. Figure 2 depicts a schema of site 2. Both sites had; a baby pool and an adult pool. At both sites, the adults' pool was surrounded by pavement and grass which pool patrons sit or lay on. Both pools had numerous shaded areas. Site 1 had a few large shaded areas, while site 2 had many smaller shaded areas. Both pools had several lifeguard stands surrounding the adult pool, allowing the lifeguards to be seen easily. Site 2 had a small video arcade which site 1 did not have.

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Place Figure 1 and 2 about here.

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Individual participants were not recruited, rather each pool was considered an entity (or "subject") within itself.
No identified individuals were tracked during the study. Instead, the main measures consisted of observing the behaviors of all the pool patrons at a particular time and calculating percentages for those patrons engaging in particular behaviors. As such, this study consisted of an N=2 design.

**Measures**

**Behavioral Mapping.** A map was created for the general area around each of the pool sights. This map was divided into portions in order to allow accurate measurement of the behaviors of interest. (see Appendices A and B for behavioral maps of Pool 1 and Pool 2). The behavioral mapping strategy was based on prior research (Twardosz, Cataldo, & Risley, 1974).

Independent observers walked a specified route through each pool, at specified times, in a manner which covered the entire pool's area. The arrows on Figures 1 and 2 show the specified routes the observers walked. During the walk, the observer marked the position of each person on the scaled drawing of each portion of the pool's area. Next, the observer noted the clothing worn by the person (i.e., shirt, pants, sunglasses). Thus, the walk calculated the total number of persons at the pool during that time and the number of persons wearing various articles of clothing.

The number of patrons found wearing each type of
clothing was divided by the total number of patrons at the pool during that particular time. This resulted in several percentage scores of the number of patrons engaging in the wearing of hats, shirts and sunglasses. For example, if there were 50 people at the pool and 10 were wearing shirts, the protective behavior category "shirts" was 20% for that observation.

However, the measure of protective clothing was also obtained for two age groups. Those 1-17 years old and 18 and older. Placing of people into the age categories was based on observer judgement.

The number of patrons wearing zinc-oxide was also obtained using the same method described above.

**Being in The Shade.** Using the same maps with the same age group divisions, the observers measured the number of patrons in the shade. During the specified walk, the observer also marked whether or not each patron was in the shade. Being in the shade was defined as the patron being in an area where their entire body was out of the direct sunlight. The number of person's found to be in the shade was divided by the total number of people at the pool in order to arrive at the percentage score for this measure. This was calculated separately for the two age groups.

**Sun Tan Lotion Use**

**Individual Samples.** A dispenser of lotion, similar to
a mustard push-dispenser, was located at the front desk of each pool. The number of ounces of lotion in the dispenser was measured before each day began by weighing the dispenser. At the end of each day, the number of ounces remaining was weighed to determine the amount of lotion used that day. This number was then divided by the mean number of patrons attending the pool that day in order to achieve a ratio of ounces used to number of patrons attending the pool that day. The number of patrons for a particular day was calculated from the data gathered from sign-in sheets at each pool for each day.

Personal Bottles of Lotion. During the behavioral mapping the number of bottles of sun screen visible in each pool area was counted. This number was changed to a percentage by dividing by the number of bottles by the number of persons at the pool each observation.

Frequency of the Measures. At both pool sites, all measures were taken during baseline and intervention at approximately 2pm and 2:30pm, seven days per week. The sun tan lotion measure was calculated once at the end of each day. The measures of protective clothing and zinc-oxide use, number of personal bottles of sunscreen, and being in the shade were obtained at 2pm and 2:30pm. The two values per day for the three measures were averaged using their weighted average (weighted by the number of people at the
pool during that measure). For example, if use of zinc-oxide was 20 out of 50 for the 2pm measure and 10 out of 25 for the 2:30pm measure, the average measure would be calculated by dividing 20+10 by 50+25 to arrive at a measure of "zinc-oxide" of 40% for that day.

Reliability

Three trained observers obtained measures throughout the phases of the study. Before the study began, reliability was assessed by having the three researchers obtain concurrent measures ten times at each pool. The measures were obtained by having the three observers simultaneously take measures on a particular area of the pool. The observers were given 45 s to make the observation for an area, while being unaware of the other observers ratings. Then, they moved on to observe the next area. Once all the areas of the pool were measured, the procedure was repeated five min later with new coding maps. This was repeated ten times.

The reliability procedure allowed for the comparison of the raters total number of observations for each category. Thus, the reliability procedure resulted in the comparison of the presence or absence of observed behaviors. However, the procedure did not allow for specific comparison of which coding each individual within the pool received.

Inter-rater reliability on all measures taken at the
beginning of the study ranged from 87.1% to 100%. Interrater reliability was calculated by comparing the highest to lowest value obtained by the different observers. For example, on 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. The reliability was calculated by comparing 318 to 325 to arrive at an inter-rater reliability of 97.8% for "shirts." For "sunglasses", inter-rater reliability was 401/460, or 87.1%. For "being in the shade", inter-rater reliability was 211/211, or 100%. For "hats", inter-rater reliability was 122/131, or 93.1%. For "zinc-oxide", inter-rater reliability was 5/5, or 100%. For the age "1-17 years old" categorization, inter-rater reliability was 671/729, or 92%. For the age "18 years old and up" categorization, inter-rater reliability was 471/543, or 87%.

Additional Measures. For each day, the temperature and weather conditions at each pool were recorded. Temperature values were obtained from identical thermometers placed in a sunny area of each pool (see pool schema). For Pool 1, the thermometer was placed on a pole near the lifeguard stand. For Pool 2, the thermometer was placed on the outer wall of the pump room. Observers recorded the temperature twice each day, once during each behavioral mapping. These two values were averaged to calculate a mean temperature for each pool for each day.
Figure 3 depicts the temperatures for both pools across the phases of the study. The figure shows that there were no significant differences in temperature between the phases at each pool or between each pool during a phase. Furthermore, no direct relation was found between temperature and pool patron behavior. This may be because the temperature remained fairly warm throughout the study at both sites, ranging from 78 to 108 degrees.

Place Figure 3 about here.

Weather conditions were recorded by the observers. The observers circled the type of cloud coverage on their coding sheets. These types of cloud coverage were coded as numeric values for data analysis; clear, no clouds = 1; a few clouds = 2; partly cloudy = 3; mostly cloudy = 4; overcast = 5; hazy and overcast = 6; rain or rain clouds = 7.

Figure 4 depicts the weather conditions for each pool across the phases of the study. For Pool 1, there were less "few clouds" days and more "partly cloudy" days when comparing the intervention phase to the baseline phase. Pool 2 also had similar weather conditions during this time. Because Pool 2 showed no changes in protective behaviors during this time period, the decrease in "few clouds" days
apparently did not affect any observed changes in behavior at Pool 1.

Place Figure 4 about here.

Conversely, within a phase, when weather conditions increased to "hazy and overcast" or "rain or rain clouds", increases in the use of shirts was observed in both age groups at both pools.

**Interventions**

Each pool received six components which combined defined the "SafeSun" intervention. The components were:

*Information Poster.* Two identical posters, 24" high by 19" wide, were placed in visible areas at each pool. For Pool 1, these were under the large shaded deck and on the wall of the refreshment room facing the pool (see schema of Pool 1). For Pool 2, these places were in the entrance hallway opposite the lifeguard room and on a wooden door facing from the entrance towards the pool (see schema of pool 2). The poster contained information on how to protect against "sun damage". Using sun screen, using covering clothing, and sitting in the shade were the recommended protective behaviors. The poster also informed the pool patrons that they could obtain free sun-screen at the front
desk. Also, the posters contained the "SafeSun" name and logo (see Appendix C for the logo).

In order to assess the saliency of the material contained in this poster the poster was shown to a small sample of people; ten adults of ages ranging from 20 to 31 and ten children of ages ranging from 11 to 17. These people were comparable to the pool’s visitors, but did not consist of the same individuals. Each person viewed the poster and then completed a short 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 one being low and seven being high. The poster relayed an average of 83% of the information, created a high sense of importance (X=6.2), and a moderate sense of vulnerability (X=5.1).

*Information flier. Two information fliers were constructed, one for each age group. The fliers contained information about the dangers and causes of skin cancer and what they could do to protect themselves or their children from developing skin cancer. These fliers were placed at the front desk of the pool and were available to anyone who walked into the pool.

*Risk protection feedback. Posted feedback, based on the percentage of pool patrons performing protective
behaviors for the prior day was the fourth component. The posted feedback was placed on two identical posters, 19" high and 24" wide, next to the informational posters already described. The percentage of protective behavior posted on the feedback signs were posted for both age ranges. The feedback was the percentage of individuals within each age group who engaged in two or more protective behaviors (e.g., wearing sunglasses and a shirt). The posted feedback included a goal percentage for the pool to reach. This goal was based on achieving a substantial increase from the baseline measure of protective behaviors (i.e., the baseline for adults was 28%, so the initial goal was 40%; the baseline for children was 8%, so the initial goal was 20%). After a group reached their goal, a 10% higher new goal was posted.

*Peer leader modeling.* The lifeguards were asked to act as the peer leaders and models for this study. These peer leaders were trained by the experimenter in the target protective behaviors, how to instigate conversations supporting these behaviors, and how to help others engage in these behaviors. The leaders were observed daily by the observers during their sweeps of the pools to assess if they were engaging in the target protective behaviors. If they were not, the researcher reinforced the lifeguards in how to engage in these behaviors. In order to aid the
lifeguards in performing the target behaviors, they were given a supply of sun screen and zinc oxide. Furthermore, t-shirts with a "SafeSun" logo were given to the lifeguards to be worn while at the pool.

*Raffle. Fliers were given out during the intervention stating how children could win free "SafeSun" hats and t-shirts if they reached their goal percentage of 40% (protective target behaviors) for three consecutive days. The children entered the raffle by having their parents read the flier. The parent and child signed and turned in a commitment card which stated that they would attempt to practice "SafeSun."

Design of the Study

The design of the study was a multiple baseline design across pools. Both pools started in a baseline phase. Pool 1 first received the overall intervention while pool 2 remained in baseline. Pool 2 then received the intervention while Pool 1 also retained the intervention.

Phases of the Study

Baseline. Baseline consisted of 16 days; June 16th to July 1st. During baseline, free sun tan lotion was available at both pools. No interventions were in place at either pool during the baseline phase.

Intervention 1. The intervention 1 phase consisted of 21 days; July 2nd to July 22nd. Sun tan lotion was
available at both pools during the intervention phase. The first pool received the intervention in three phases. Phase 1 consisted of peer leader modeling and posted feedback, prompting, and information (Day 17 to Day 23). Phase 2 added the information fliers to the intervention (Day 24 to 30). Phase 3 added the raffle component (Day 31 to 37). There was no intervention at the second comparison pool.

**Intervention 2.** The Intervention 2 phase consisted of 21 days; July 23rd to August 12th. Sun tan lotion was available at both pools during the intervention phase. Both the first and second pools received the intervention with all six components delivered simultaneously to the second pool.

**Results**

The results are presented for each measure as a mean percentage for each pool for each phase of the study. In addition, each measure is reported graphically across phases of the study with treatment condition noted.

**Shade**

Children. Figure 5 depicts the use of shade for children across the two pools. The children from pool 1 increased from a baseline mean of 10.0% to intervention mean of 45.3%, a 35.3 percentage point increase. The figure shows that the trend in Pool 1 was an initial increase over
the first eight days of the intervention with subsequent daily fluctuations without any return to baseline. No changes occurred in Pool 2 until the intervention was introduced. The children from pool 2 increased from a baseline of mean 15.6% to an intervention mean of 41.2%, a 25.6 percentage point increase. The figure shows that pool 2 also increased after the intervention with daily fluctuations. A few days did return to baseline values, but not consistently.

Place Figure 5 about here.

Adults. Figure 6 depicts the use of shade for adults across the two pools. The adults from Pool 1 increased from a baseline mean of 10.7% to an intervention mean of 30.8%, a 20.1 percentage point increase. The figure shows that the adults increased to an initial high of 60% after the first ten days. Then over then next few weeks, they went slowly down to the 30% range with one extreme day reaching 88%. No changes occurred in Pool 2 until the intervention was introduced. The adults from Pool 2 increased from a baseline mean of 6.1% to an intervention mean of 9.9%, a 3.7 percentage point increase. The trend for Pool 2 was a slight increase over baseline with great variability.
Shirts

Children. Figure 7 shows the percentage of children across the two pools who wore shirts. For Pool 1, the children increased from a baseline mean of 21.0% to an intervention mean of 31.6%, a 10.6 percentage point increase. The trend was a delayed increase over baseline with continued great variability. As noted earlier, the great variability may have been generated by the daily fluctuation in weather conditions. No changes occurred in Pool 2 until the intervention was introduced. For Pool 2 the children increased from a baseline mean of 22.6% to an intervention mean of 36.3%, a 13.7 percentage point increase. The trend in Pool 2 was an initial increase followed by great variability in subsequent days.

Adults. Figure 8 shows the percentage of adults across the two pools who wore shirts. The adults in Pool 1 increased from a baseline mean of 19.6% to an intervention
mean of 22.3%, a 2.7% increase. No changes occurred in Pool 2 until the intervention was introduced. The adults in Pool 2 increased from a baseline mean of 15.1% to an intervention mean of 16.9%, a 1.8 percentage point increase.

Place Figure 8 about here.

Hats

Children. Figure 9 depicts the percentage of children across the two pools who wore hats. The children in Pool 1 increased from a baseline mean of 3.0% to an intervention mean of 4.8%, a 1.8 percentage point increase. There were no observable trends. No changes occurred in Pool 2 until the intervention was introduced. The children in Pool 2 increased from a baseline mean of 3.7% to an intervention mean of 7.1%, a 3.4 percentage point increase. There were no observable trends.

Place Figure 9 about here.

Adults. Figure 10 shows the percentage of adults across the two pools who wore hats. The adults in Pool 1 increased from a baseline mean of 13.6% to an intervention
mean of 23.1%, a 9.5 percentage point increase. The trend was an initial increase to 40% followed by a sharp decline to 0%. Subsequent days fluctuated between 5 and 55% with no observable trend. No changes occurred in Pool 2 until the intervention was introduced. The adults from Pool 2 increased from a baseline mean of 13.1% to an intervention mean of 14.4%, a 1.3 percentage point increase. There were no observable trends.

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Place Figure 10 about here.

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Sun Glasses

Children. Figure 11 depicts the percentage of children across the two pools who wore sun-glasses. The children in Pool 1 increased from a baseline mean of 2.0% to an intervention mean of 5.4%, a 3.4 percentage point increase. The only observable trend was an unexplainable increase in use approximately twenty days after the intervention began. No changes occurred in Pool 2 until the intervention was introduced. The children in Pool 2 decreased from a baseline mean of 4.3% to an intervention mean of 1.9%, a 2.4 percentage point decrease. There were no observable trends.
Adults. Figure 12 depicts the percentage of adults across the two pools who wore sun-glasses. The adults from Pool 1 increased from a baseline mean of 48.1% to an intervention mean of 59.4%, a 11.3 percentage point increase. The trend was an initial increase to 80% followed by daily fluctuations with a low of 0% and a high of 90%. No changes occurred in pool 2 until the intervention was introduced. The adults from Pool 2 increased from a baseline mean of 47.6% to an intervention mean of 56.1%, a 8.5 percentage point increase. The trend was an immediate increase to 85% on the first day followed by great variability in subsequent days.

Zinc-oxide

Children. Figure 13 shows the percentage of children across the two pools who used zinc-oxide. The children from Pool 1 increased from a baseline mean of 1.1% to an intervention mean of 3.3%, an increase of 2.2 percentage
points. Although there was an increase over baseline, there were no observable trends. No changes occurred in Pool 2 until the intervention was introduced. The children from Pool 2 increased from a baseline mean of .4% to an intervention mean of 3.2%, a 2.8 percentage point increase. There was an immediate increase during the first four days of the intervention followed by a return to baseline.

Place Figure 13 about here.

Adults. Figure 14 depicts the percentage of adults across the two pools who used zinc-oxide. The adults from Pool 1 decreased from a baseline mean of 1.1% to an intervention mean of 1.0%. There were no observable trends. No changes occurred in Pool 2 until the intervention was introduced. The adults from pool 2 decreased from a baseline mean of 1.6% to an intervention mean of 0.0%. There were no observable trends.

Place Figure 14 about here.

Any One or More Protective Behavior

Children. Figure 15 shows the percentage of children
across the two pools who engaged in any one or more protective behaviors. The children in Pool 1 increased from a baseline mean of 31.7% to an intervention mean of 61.1%, a 29.4 percentage point increase. The trend was a slow increase to 85% followed by daily fluctuations around the phase mean. The trend remained higher than baseline through the rest of the study. No changes occurred in Pool 2 until the intervention was introduced. The children from Pool 2 increased from baseline mean of 38.3% to an intervention 58.7%, a 20.4 percentage point increase. The trend was a slow increase to 80%, remaining higher than baseline, but with daily variability.

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Place Figure 15 about here.

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Adults. Figure 16 depicts the percentage of adults across the two pools who engaged in any one or more protective behavior. The adults from Pool 1 increased from a baseline mean of 62.6% to an intervention mean of 81.1%, a 18.5 percentage point increase. The trend was an initial increase to 90% followed by consistently high values with some variability. Only on a few days did the values return to the baseline mean. No changes occurred in Pool 2 until the intervention was introduced. The adults from Pool 2
increased from a baseline mean of 59.8% to an intervention mean of 65.2%, a 5.4 percentage point increase. There were no discernible trends.

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Place Figure 16 about here.

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Any Two or More Protective Behaviors

Children. Figure 17 depicts the percentage of children across the two pools who engaged in any two or more protective behaviors across the two pools. The children from Pool 1 increased from a baseline mean of 6.3% to an intervention mean of 24.7%, a 18.4 percentage point increase. The trend was a slow initial increase to 56% followed by values which remained higher than baseline on most days. Again, there was daily variability. No changes occurred in Pool 2 until the intervention was introduced. The children from Pool 2 increased from a baseline mean of 6.6% to an intervention mean of 29.1%, a 22.5 percentage point increase. The trend was an initial increase to 42% followed by a sharp decline for a few days. The trend then increased back to 44% and remained high for a week, which was then followed by a decline during the final week of the study.
Adults. Figure 18 depicts the percentage of adults across the two pools who engaged in any two or more protective behaviors across the two pools. The adults from Pool 1 increased from a baseline mean of 23.3% to an intervention mean of 46.0%, a 22.7 percentage point increase. The trend was an initial increase to 54%. This increase was followed by subsequent increases to 60% and 70% over the next two weeks. The values remained high until the final week of the study when the values began to decline to near the baseline mean. No changes occurred in Pool 2 until the intervention was introduced. The adults from Pool 2 increased from a baseline mean of 20.7% to an intervention mean of 29.7%, a 9.0 percentage point increase. Although there was a change over the baseline mean, there was so much variability in the values that there were no observable trends in the intervention phase.
Bottles of Lotion

Figure 19 depicts the percentage of pool patrons across the two pools who brought their own bottles of lotion. The patrons in Pool 1 increased from a baseline mean of 14.6% to an intervention mean of 19.1%, a 4.5 percentage point increase. The trend was an initial increase to 48% after the first week, followed by a return to baseline values. No changes occurred in Pool 2 until the intervention was introduced. The patrons in Pool 2 increased from a baseline mean of 11.4% to an intervention mean of 17.3%, a 5.9 percentage point increase. The trend was an initial increase to 30%. The values fluctuated daily with no other reportable trends.

Place figure 19 about here.

Ounces of Free Lotion Used

Figure 20 shows the percentage of individuals across each pool who used the free sun tan lotion. The measure was in ounces per patron attending the pool that day. For Pool 1, the measure remained the same from baseline to intervention with a mean of .011 oz per patron. There were no reportable trends. No changes occurred in Pool 2 until the intervention was introduced. For pool 2, the measure
increased from a baseline mean of .01 oz per patron to an intervention mean of .012 oz per patron, a .002 oz per patron increase. There was an initial consistent use of lotion at approximately .018 for the first week. The following weeks showed great variability in values ranging from 0 to .03 oz per patron.

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Place Figure 20 about here.
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Manipulation Check

Lifeguard Behavior. Figure 21 depicts the percentage of possible protective behaviors displayed by the lifeguards across the two pools. The lifeguards in Pool 1 increased from a baseline mean of 25.0% to an intervention mean of 64.5%, a 39.5 percentage point increase. They never reach 100% but remain fairly consistent between 50% to 80% during the intervention. No changes occurred in Pool 2 until the intervention was introduced. The lifeguards in Pool 2 increased from a baseline mean of 8.3% to an intervention mean of 62.4%, a 54.1 percentage point increase. They reached 100% for the first four days, then they steadily declined to approximately 40% the last week of the intervention. During the first four days of the intervention, the lifeguards at Pool 2 were informed that if
they did not perform the behaviors, they would lose their job. After the fourth day, they were told that this was no longer the case. This point is noted on figure 21.

Place figure 21 about here.

Discussion

The results of this study showed a modest increase in child and adult skin-cancer, preventive behaviors at two pools with the introduction of a multi-component intervention. The largest changes (see Figures 5, 6, 7, and 8) were for "being in the shade" and "wearing shirts." Very minimal or no change was found for children or adults for other protective behaviors. In addition, the changes in adults behaviors at the second pool were appreciably less than at the first pool.

The role of the lifeguard as a model was important in influencing protective behaviors. Manipulation checks showed the lifeguards increased their modeling of protective behaviors at both pools after the respective intervention started. This increase was associated with the increases in protective behaviors displayed, especially by the children. For example, on days when the lifeguards wore colored zinc-oxide, the children not only wore it more often, but they
often "pestered" the lifeguards to obtain some zinc-oxide. Furthermore, when the lifeguards failed to model a behavior one day, the effect would be observed particularly in the children's behaviors for that day. For example, on one day at Pool 2, a noted decrease in the number of shirts worn by children had been preceded by the removal of shirts by the lifeguards 15 minutes earlier.

The behavior of the lifeguards at the pools is remarkable for one other reason. The lifeguards themselves made large changes in their risk behaviors. At both pool, they increased their use of shade, shirts, sunglasses, hats, and lotion. As the lifeguards at the pool and exposed to sun light for many hours each day, they are at a very high risk for developing skin cancer. For this reason, the obtained changes in lifeguard behaviors were very encouraging.

The results indicated that the intervention appeared to affect the children more than the adults. As stated earlier, sun exposure in the adolescent and teenage years is considered the most damaging to the skin. Thus, the increase in the children's skin cancer risk reduction behaviors is an encouraging finding.

The introduction in the first pool of the different components of the intervention did not appear to increase protective behaviors, i.e., no apparent additive effects.
However, it is possible the sequential introduction of the procedures maintained the effects of the intervention by sustaining interest of the children and adults. For example, Pool 1 data (e.g., being in the shade, wearing shirts) did not appreciably decrease across the intervention. Unfortunately, though, in neither pool did children maintain the three consecutive day, 40% protective behavior criterion for the raffle drawing. Thus, at this point, it appears that an overall multi-component program will result in some increases in protective behaviors, but the importance of each component remains unclear.

The variability in observed behaviors may be attributable to differences in patrons present each day and weather conditions. However, despite the variability shown in the observational measures, it was apparent that very high rates of protective behaviors were not reached. This may be because group feedback and collective goals are only meaningful in settings where groups have a distinct identity and cohesion. This was not the case at either pool, as there were several small distinct social groups within each pool.

On the other hand, this study does suggest those skin cancer protective behaviors targets which are more likely to be effective in most pools. Interestingly, the approach and behavioral targets involve both behavioral and environmental
change, i.e., behavior change and public health approaches (Winett, King, & Altman, 1989). Persuading persons to stay in the shade is an important behavioral target since the behavior assures relative protection without altering other behaviors (e.g., use of clothing or sunscreen). Additional behavior changes may require individuals to perceive themselves at greater risk (see Catania, Kegles, & Coates, 1990). For this behavior to be more easily enacted and naturally reinforced, pools need to construct more shade areas which are conducive to social interactions. These shade areas were more available in the first pool than at the second pool (see schemes of pools). This may explain why adults at the first pool increased this protective behavior while the behavior only slightly increased for adults at the second pool (see schema of the pools).

Additionally, the present findings are tempered somewhat by two shortcomings. Firstly, some pool patrons became aware of being regularly observed. Although they did not know exactly what was being observed, this may have led to an increase in some protective behaviors by patrons prior to the routine arrival of observers. However, this observer effect could be built into future skin cancer protective programs conducted by lifeguards. Secondly, no reliability measures were taken throughout the study. Fortunately, pre-study training of the observers resulted in initial high
reliabilities. Furthermore, the measures were of discrete behaviors requiring minimal judgment.

Comments from pool patrons and lifeguards may explain why there were no changes in the use of the free lotion and the use of personal bottles of lotion. Patrons and lifeguards stated that the free SPF 15 lotion was more protection than the people wanted. The patrons told researchers that offering a variety of SPF free lotions might increase their desire to use them. Furthermore, parents at the pool stated that they were reluctant to buy their children their own lotion because of loss and pilferage. Many parents stated that they hid their personal bottles of lotion 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.

In general, the findings from this preliminary study are encouraging. A multi-component low cost intervention has shown increases in skin-cancer, protective behaviors within the natural environment. The changes occurred even though the target behaviors were counter to the norm of sun bathing at the pools. The individuals attending the pools had paid a private membership fee in order to have the opportunity to sunbathe. The intervention was successful in changing their goal behavior of obtaining a suntan to a goal
of protecting their skin by reducing their sun exposure.

The next step in this line of research will be to assess which components of this multi-component intervention are effective within different populations and swimming pool environments. Another step in this line of research will be to create more age categories for the behavioral observations. This will afford future researchers more accuracy in stating who was affected by the intervention.

The intervention was simple to implement and easily portable to other pools. The behavioral maps have proven reliable, easy to learn, and easy to use. Further use of these maps in the pool setting as well as other settings will allow simple, accurate measurement of cancer risk reduction behavior changes.
References


Communication Research.


Figure 1. Schema of Pool 1.
Figure 2. Schema of Pool 2.
Figure 3. Daily temperature across pools.
Figure 4. Daily cloud coverage across pools.
Figure 5. Use of shade for children across pools.
Figure 6. Use of shade for adults across pools.
Figure 7. Use of shirts for children across pools.
Figure 8. Use of shirts for adults across pools.
Figure 9. Use of hats for children across pools.
Figure 10. Use of hats for adults across pools.
Figure 11. Use of sunglasses for children across pools.
Figure 12. Use of sunglasses for adults across pools.
Figure 13. Use of zinc-oxide for children across pools.
Figure 14. Use of zinc-oxide for adults across pools.
Figure 15. Any one protective behavior for children across pools.
Figure 16. Any one protective behavior for adults across pools.
Figure 17. Any two protective behaviors for children across pools.
Figure 18. Any two protective behaviors for adults across pools.
Figure 19. The number of visible bottles observed daily across pools.
Figure 20. Amount of free lotion used daily by pool patrons across pools.
Figure 21. Percentage of possible protective behaviors modeled by the lifeguards across pools.
Appendix A
Pool ___________ Date ________ Swim: All Adult
Time ___________ Temp ________ Initials ____
Clouds: Clear Some Partly Mostly
       Hazy Overcast Rain
Bottles ________

Legend
Child = Blue Ink
Adult = Black Ink
no protection = "X"
Shirt = "S"
Hat = "H"
Sunglasses = "G"
Zinc Oxide = "Z"
Shade = circle individual
Appendix B
Pool _______  Date _______  Swim: All Adult
Time _______  Temp _______  Initials _______
Clouds: Clear  Some  Partly  Mostly
       Hazy  Overcast  Rain
Bottles _______

Legend
Child = Blue Ink
Adult = Black Ink
no protection = "X"
Shirt = "S"
Hat = "H"
Sunglasses = "G"
Zinc Oxide = "Z"
Shade = circle individual
Appendix C
SAFE
SUN
Appendix D
Kids

Being in the sun can be very dangerous. You can get a painful sunburn. Also, you may get blisters that hurt for a long time. There are may other bad things that could happen while you are in the sun. There are ways to be safe. Follow these "Safe Sun" rules:

Use a Sunscreen when in the Sun
Use the Sunscreen After Swimming
Use Zinc Oxide on Your Face

Wear a T-Shirt, Hat, or Sunglasses

Sit in the Shade

Most Importantly: If you are Getting a Sunburn, Get Out Of the Sun!!!

Posters are placed around the pool. They show you what to do to be safe in the sun. Also, they show how you are doing at being safe in the sun. The numbers on the posters are changed each day.

Keep this as a guide for "Safe Sun" this summer.
Adults

Spending too much time in the sun and not protecting yourself from the harmful rays of the sun can cause skin damage. The National Cancer Institute has stated that exposure to the harmful sun's rays can cause wrinkles, premature aging, inelasticity, and a variety of skin cancers. 600,000 cases of skin cancer are expected to be diagnosed in 1990 alone.

Children are at an especially high risk for damage from the sun. For every severe blistering sunburn a child's chance of having skin cancer in the future is Doubled! The National Cancer Institute and the American Medical Association both concluded that a "Tan", in any degree, is a sign of skin damage. Everytime you see a tanned adult or child, you see a person with a skin injury. Furthermore, high exposure to the sun in adolescence is greatly associated with skin cancers in later years. These cancers can begin to be visible as early as age 20. You can protect the future of your children's skin in the same ways that you can protect your own. Follow these "Safe Sun" steps:

Use a Sunscreen of SPF 15 or higher.
Apply The Sunscreen Frequently
   Especially After Swimming.
Use Zinc-Oxide for Your Nose, Lips, and Face.
Wear a T-Shirt, Hat, or Sunglasses
   While In the Sun.
Sit In Shaded Areas Whenever Possible.

Most Importantly: Watch for Signs of A Sunburn.
   If you or your child is burning,
   GET OUT OF THE SUN!!

Posters will be displayed at pool side with information about the protective behaviors used by the members of this pool. This information will be updated daily to keep you informed.

Keep this flier as a guide for "Safe Sun" this summer.
Practice "Safe Sun" and you can win a free T-Shirt.

You have been doing well at practicing "Safe Sun."
Try to do as many of the "Safe Sun" things as you can.
They are:

Use Sunscreen

Use Zinc-Oxide

Wear a Hat, Shirt, and Sunglasses

Sit In A Shaded Place

Don’t forget, there is free sunscreen by the front desk.

Watch the posters to see how the pool is doing.

When the kids reach 40 for three days in a row, there will be a drawing for free "Safe Sun" T-shirts.

When the Kids reach 50 for three days in a row, there will be a drawing for more free T-Shirts.

When the kids reach 60 for three days in a row, there will be a drawing for more free T-Shirts.

To enter the drawing, take this paper to your mother or father. After they read it, bring the bottom back to the front desk. Then you will be entered.

I will encourage my child to practice the "Safe Sun" behaviors. Also, I am allowing my child to enter the drawings for free T-shirts.

Name of Child: __________________

Signature (Parent): ______________
Curriculum Vita

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