

# Communicating to Farmers About Skin Cancer The Behavior Adaptation Model

ROXANNE PARROTT  
JENNIFER MONAHAN  
STUART AINSWORTH

*University of Georgia*

CAROL STEINER

*Georgia Department of Human Resources*

*Although health campaigns promote avoidance of behaviors that put an individual's health at risk, often these behaviors cannot be avoided, and campaign messages designed to encourage behavior adaptation afford greater likelihood of success. With that in mind, a model of health risk behavior adaptation was proposed and tested using four different behaviors in a communication campaign aimed at reducing farmers' risk for skin cancer. Farmers and farm wives answered a series of questions about their skin cancer prevention and detection behaviors and attitudes. Interpersonal expectancies, social resources, and actual procedural knowledge predicted perceived procedural knowledge and public commitment, which, in turn, predicted behavior adaptation.*

Health campaigners often address ways to motivate individuals to avoid behaviors that put their health at risk. These efforts include campaigns designed to get people to avoid drug use (Dukes, Ullman, & Stein, 1995) and to resist smoking (Pfau & Van Bockern, 1994; Pfau, Van Bockern, & Kang, 1992). Although frequently successful, these efforts at times fail, especially in situations in which a behavior that puts an individual's health at risk is one that cannot be avoided. For example, the often heard dictum in relation to skin cancer prevention, "Avoid the sun between the hours of 10 am and 3 pm" (American

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Roxanne Parrott, Ph.D., is an associate professor in the Department of Speech Communication at the University of Georgia. Jennifer Monahan, Ph.D., is an assistant professor in the Department of Speech Communication at the University of Georgia. Stuart Ainsworth, M.A., is a doctoral student in the Department of Speech Communication at the University of Georgia. Carol Steiner, R.N., M.N., is the director of the Cancer Control Section at the Georgia Department of Human Resources. This research was supported by Cooperative Agreement No. U03/CCU410103 from the National Institute for Occupational Safety and Health and a fellowship from the University of Georgia's Institute of Behavioral Research. We are grateful to the editors, Ed Fink, and three anonymous reviewers for their comments on an earlier version of this article.

Academy of Dermatology [AAD], 1990), is likely to engender little support from farmers who cannot avoid the sun between the hours of 10:00 a.m. and 3:00 p.m. and still maintain their livelihood. On such occasions, campaign messages designed to encourage behavior adaptation afford greater likelihood of involving individuals in actions to reduce a particular health risk.

### BEHAVIOR ADAPTATION DEFINED

Behavior adaptation refers to situations in which people engage in a behavior that threatens their health, but with the adoption of specific prevention and detection practices, the probability of harm associated with the risky behavior is reduced. For example, most people drive to work, and a certain number of accidents, injuries, and even deaths result from this action. The use of seat belts, however, has been found to be an effective adaptation behavior likely to reduce the possibility of harm associated with driving to work. Similarly, campaigns aimed at reducing drunk driving incidence can take either an avoidance or an adaptation approach. Rather than emphasizing the avoidance of this activity through messages such as "Don't drink and drive," a behavior adaptation approach would instead encompass an explicit acknowledgment of the risky practice together with a prescription to lessen potential harm. The designated driver campaign illustrates a behavior adaptation strategy through reference to identifying someone who will abstain from drinking to take the responsibility for driving. The emphasis is qualitatively different from behavior avoidance messages, in that individuals are not being told to avoid drinking; rather, they receive advice about how to lessen the likelihood of harm associated with the practice.

Whereas behavior avoidance strives to break or avoid particular habits, behavior adaptation relies on building habitual practices. The application of the behavior adaptation model to developing health communication campaigns is appropriate in situations in which there are efficacious behaviors that may be performed to prevent and/or detect negative outcomes, because early detection, in many situations, affords the greatest likelihood of efficacious treatment. An individual may use sunscreen as a method to prevent skin cancer, for example, but the performance of regular skin self-exams affords an avenue of detecting changes in the skin that could foreshadow skin cancer at a stage when the disease is generally curable. Consideration of both prevention and detection methods of adapting to health risk also suggests that behavior adaptation may best be represented as a continuum of responses to a particular health risk behavior. One person who forms a practice to prevent a negative outcome differs from another person who adopts an action to detect the negative

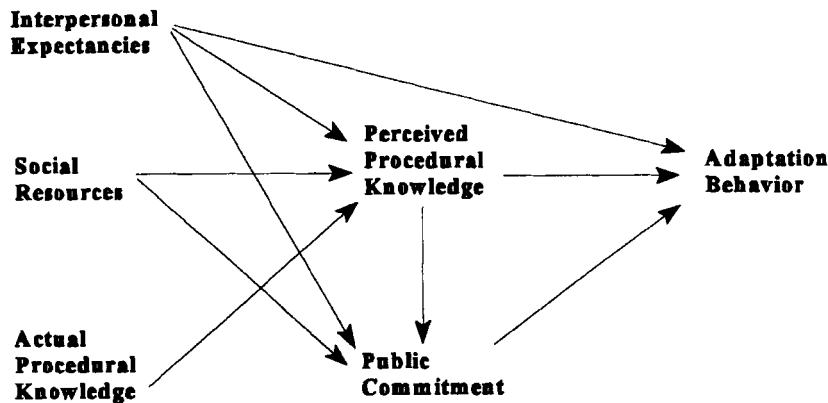


Figure 1: Hypothesized Behavior Adaptation Model

outcome, although each person is adapting to the situation, and these individual responses differ from the person who adopts both prevention and detection behaviors. The person who wears sunscreen, for example, should be considered to be adapting to sun exposure, as should the person who practices regular skin self-exams. Both differ, however, from the individual who wears sunscreen *and* conducts monthly self-exams, with the latter being someone who appears to be adapting more to the risk posed by sun exposure than either of the former individuals. To examine why some people more effectively adapt to situations in which a behavior puts their health at risk, an initial attempt to model adaptation behavior is proposed, as depicted in Figure 1, which illustrates several communication processes involved with individuals' adaptation behavior.

### COMMUNICATING TO FACILITATE ADAPTATION BEHAVIOR

The basic premise of the behavior adaptation model is that efforts to communicate with individuals about behavior adaptation should markedly differ from efforts to communicate with individuals about behavior avoidance or cessation. Communicating about behavior adaptation requires disseminating specific information regarding ways to reduce the negative outcomes associated with a particular behavior while acknowledging that the individual will continue the activity that exposes him or her to risk. Communicating about behavior avoidance and cessation, on the other hand, uses messages dependent on staying out of situations that encourage a particular behavior and/or gaining control over cognitive, affective, and social drives to behave in ways that lead to negative out-

comes. "Just say no" campaign messages in reference to drug use exemplify the latter, whereas "needle exchange" messages illustrate a behavior adaptation approach.

To derive and test a model of behavior adaptation, the present research examines farmers and skin cancer risk. Research has previously established the higher incidence of some types of cancer among agricultural populations as compared to other occupational groups, with essentially every study of nonmelanoma skin cancer (NMSC) death in farmers, for example, finding farmers to have an elevated relative risk (Blair, Maler, Cantor, Burmeister, & Wilklund, 1985; Weinstock et al., 1991). The primary prevention behaviors for reducing skin cancer risk include regular and appropriate use of sunscreen and protective clothing, such as wide-brimmed hats and long-sleeved shirts (AAD, 1990). Primary detection behaviors include monthly skin self-exams and annual clinical skin exams for skin cancer (Berwick, Begg, Fine, Roush, & Barrhill, 1996). Farmers seldom practice either prevention (Lee, Marlenga, & Miech, 1992; Parrott, Steiner, & Goldenhar, 1996) or detection (Marlenga, 1995; Parrott et al., 1996) behaviors relating to sun exposure, affirming the need to motivate farmers to practice sun protection practices. Interpersonal expectancies, social resources, and actual procedural knowledge are hypothesized to influence farmers' perceived procedural knowledge and public commitment, which, in turn, are hypothesized to predict farmers' adaptation behaviors.

### Interpersonal Expectancies

Interpersonal expectancies, defined as one person's beliefs about how another person will behave, often predict the belief holder's behavior. Interpersonal expectancies research consistently finds that what an individual expects another to do may be more predictive of behavior than the person's own beliefs or skills (Chow, 1987; Rosenthal & Rubin, 1978). Numerous studies demonstrate that when experimenters expect particular responses from research subjects, they are more likely to get those results; moreover, teachers who expect better intellectual performance from students are significantly more likely to obtain those actions (Darley & Fazio, 1980; Swann & Ely, 1984). Thus, when significant others expect one to adapt one's behavior to reduce the health threat associated with a particular action, one may be more likely to do so. The relationship between interpersonal expectancies and adaptation behavior has been well documented. For example, research shows that the significant other's beliefs about the importance of following a diabetic regiment was more predictive of the patient's behavioral intention than the patient's own beliefs (Shenkel, Rogers, Perfetto, & Levin, 1985). Mothers' expectations for children to behave as responsible individuals are "associated with

positive health behavior in children (tooth brushing, sleep habits, exercise, nutritional practices, and refraining from smoking)" (Tinsley, 1992, p. 1052). In addition, sunscreen use among adolescents increases when parents expect youths to use it (Banks, Silverman, Schwartz, & Tunnessen, 1992).

Interpersonal expectancies differ from an individual's observations of the normative behavior of others, which is oftentimes used to guide one's own behavior. Interpersonal expectancies relate to an individual's beliefs about what significant others believe the individual will do, although the significant others may not behave that way and/or may not actually hold the belief or ever intend to communicate the expectancy. Even in situations in which individuals misperceive the social norm—cases of "pluralistic ignorance"—individuals have been found to behave according to the misguided perception, with college students consuming more alcohol as a result of their perception of the norm regarding quantity consumed (Prentice & Miller, 1993). Similarly, it is predicted that when an individual misperceives another's interpersonal expectancy, the perception still guides behavior, with interpersonal expectancies being communicated through "praise, criticism, and frequency of interaction" (Marshall & Weinstein, 1986, p. 441).

When one's behavior confirms another's expectation, the expectation is more likely to be internalized if the behavior may be viewed as representing an underlying trait or disposition (Snyder, 1984). The agricultural community highly values family, with family sociologists maintaining that "farm families are closely knit" (Rogers, Burdge, Korsching, & Donnermeyer, 1988, p. 178). Because farmers have been found to view themselves as self-reliant, responsible, and independent (Merchant, Kross, Donham, & Pratt, 1988), family members may expect farmers to have these traits. If farmers' adaptation to sun exposure confirms family members' views of farmers as self-reliant, responsible, and independent, the relationship between family members' interpersonal expectancies and farmers' adaptation behaviors is likely to endure. In sum, when one's action creates a health threat, significant others' expectations regarding an individual's adaptation behavior predict the performance of prevention and detection practices.

### Social Resources

Social resources have been defined as including role models' and others' provision of information or assistance—either vicariously through observation or directly through communication—to promote the assumption of a personal practice for a particular function (Clark & Zimmerman, 1990). It has long been recognized that role models provide a significant mode of teaching values and behaviors, and contribute to rule learning

and perceptions of ability in many settings (Driggers, Nussbaum, & Haddock, 1993). Media afford one avenue to use in having models demonstrate how to perform adaptation behavior. Other people who face the same threat to well-being caused by the performance of an action and with whom a target audience is often likely to interact may also build, maintain, and reinforce the habitual patterns of behavior necessary to adapt to the health risk. As Rofo, Lewin, and Hoffman (1987) observe, "Being with others in similar straits may indeed give one insight into appropriate response" (p. 423).

With regard to skin cancer prevention, one study using lifeguards as peer leaders to model appropriate sun protection for children 1 to 17 years of age found an increase in such behaviors from a baseline of 6.5% to 26.9% following the intervention, particularly in terms of protective clothing use and shade as a sun barrier (Lombard, Neubauer, Canfield, & Winett, 1991). For farmers, an absence of role models and information about sun exposure adaptation behaviors has been observed in previous research. Farmers report that their physicians do not discuss skin cancer prevention and detection with them nor do other farmers or agricultural extension agents practice skin cancer prevention and detection (Marlenga, 1995; Rosenman, Gardiner, Swanson, Mullan, & Zhu, 1995). To the extent that individuals have access to role models and information about how to adapt to a health risk, they are more likely to adopt adaptation behaviors.

### Actual Procedural Knowledge

Procedural knowledge is one's awareness of the specific details about how to perform a behavior. In health settings, campaign messages are more often general than specific and factual rather than procedural (Bandura, 1997). This emphasis on factual knowledge (e.g., skin cancer is the most common form of cancer) over procedural knowledge (e.g., one should apply sunscreen 20 minutes before going into the sun) can be problematic, because the former may heighten awareness of an illness or disease but not tell you what to do about it. Women score better on factual knowledge about breast self-exams (BSEs), for example, than they do on procedural knowledge (Champion & Miller, 1992), suggesting a lack of understanding of the actual steps to perform BSEs. Formative research assessing farmers' understanding of procedures to protect from sun exposure found that nearly three fourths of the participants erroneously selected a wide-brimmed straw hat as being more protective than a tightly woven cap with neck flap (Parrott et al., 1996). This affirms that farmers lack specific knowledge about procedures to use to adapt to sun exposure. The less awareness one has about specific procedures to perform to adapt to a health risk, the less likely one is to enact adaptation behavior.

### Perceived Procedural Knowledge

Perceived procedural knowledge, or what one thinks one knows about the behaviors that may be used to prevent and detect illness and/or disease, may differ from actual procedural knowledge, as demonstrated through one's ability to answer questions about a topic. This may occur in any context, with the two types of knowledge expected to be directly related. However, perceived procedural knowledge is predicted to have a more direct impact on behavior adaptation than actual procedural knowledge—an extension of findings that perceived social support has been found to differ from actual support, with the former having a greater impact on adjustment to cardiac disease than did the latter (Helgeson, 1993). The effects of perceived procedural knowledge on adaptation behavior may be considered as one dimension of the multidimensional construct of self-efficacy,<sup>1</sup> which is defined as those expectancies associated with one's belief that he or she is able to perform the behavior necessary to achieve particular outcomes (Bandura, 1977). Garcia (1995) observes that "previous personal experience, observations of others, information and other symbolic knowledge, and physiological states are all weighted and combined to produce the efficacy expectation" (p. 260). Consideration of perceived procedural knowledge emphasizes people's perceptions of their level of information and other symbolic knowledge regarding ways to adapt to a health risk situation.

Research in a number of contexts demonstrates that individuals' self-referent thought about their capabilities to address a health threat significantly affects their likelihood of initiating efforts to deal with the threat (DiClemente, 1981; Maibach, Flora, & Nass, 1991; Strecher, DeVellis, Becker, & Rosenstock, 1986). Such thought also strongly influences the maintenance of preventive health behaviors constituting the habitual practice so necessary in situations of behavior adaptation (Bandura, 1991; Strecher et al., 1986). Thus, perceived procedural knowledge is deemed to increase the likelihood of behavior adaptation.

### Public Commitment

Public commitment to, or advocacy for, an issue or action contributes to an individual's motivation to act due to anticipated personal and social disapproval and penalties for failure to follow through with verbal support, pledge, and/or promised activities (e.g., Cooper & Fazio, 1984; Frey, 1986). Indeed, hypocrisy has been defined as "advocating a position one supports and being made mindful of one's failure to act in accordance with that advocacy" (Fried & Aronson, 1995, p. 925). This provides a framework for understanding why the use of written and verbal pledges,

promises, and contracts has increased compliance with various health care routines, including diet, exercise, administration of medication to children, and the use of condoms (Franzini & Grimes, 1980; Molteni & Garske, 1983; Stone, Aronson, Crain, Winslow, & Fried, 1994). As previously noted, farmers have strong traditional values, including attachment to the local community and high regard for their verbal pledges and the ability to be taken "at their word" (Bartlett, 1986). Their act of verbally pledging commitment to adapt to sun exposure should increase the likelihood of use of sun exposure adaptation behaviors.

Figure 1 illustrates the proposed model of behavior adaptation. Perceived procedural knowledge is predicted by interpersonal expectancies, social resources, and actual procedural knowledge. Public commitment is predicted by interpersonal expectancies, social resources, and perceived procedural knowledge. Behavior adaptation is predicted by perceived procedural knowledge and public commitment. In addition, based on voluminous literature regarding the influence of interpersonal expectancies on behavior, interpersonal expectancies are also expected to predict adaptation behaviors independent of the influence of either perceived procedural knowledge or public commitment. This study assesses this theoretical approach to behavior adaptation through an initial test of the proposed model with a farming population and their skin cancer prevention and detection behaviors.

## METHOD

### Setting

Farming contributes significantly to economic activity in the state of Georgia, with Georgia farmers receiving \$4.1 billion for their farm products in 1989, a record that was twice that received 15 years earlier (Miller & Givan, 1991). Georgia ranked 15th among all states in total farm production value and 3rd among southeastern states for the year, pointing to the importance of farming in this state, as well as suggesting the amount of time likely to be spent in the sun working toward the goal of crop production. This exposure increases the likelihood of skin cancer, particularly on the lips and ears, which often go unprotected while working outdoors.

### Participants and Procedures

A random sample ( $N = 654$ ) from eight counties in south Georgia of farmers ( $n = 448$ ) and their wives ( $n = 206$ ) comprised the participants. To



satisfy the conditions of the upcoming campaign with regard to implementation and evaluation, three areas were defined in the target region, such that they were noncontiguous geographically and had a similar number of farm operators. The three farming areas were then randomly assigned to one of three conditions (intervention A, intervention B, and control). Farmers' names were randomly selected via simple random selection from a list of farm operators provided by the University of Georgia's Cooperative Extension Service and county agricultural extension field agents. There was an approximately equal distribution of participants from each geographic area to satisfy the conditions of a larger omnibus study (see Parrott et al., 1996). Initial analysis of the data revealed no significant differences between groups' responses due to geographic locale.

Farmers responded to a telephone survey addressing skin cancer prevention and detection.<sup>2</sup> Of the 777 farmers contacted, 461 were interviewed (a 59% response rate); subsequently, 13 surveys were deemed to be incomplete, with an effective response rate of 58%. Because in Georgia farming is a family business (Bartlett, 1986), wives are often as involved in outdoor farming activities as their husbands, putting them at risk for skin cancer as well. Wives of all participating farmers, therefore, were contacted for participation as well, receiving a substantially lengthier version of the phone interview via mail. The length was due to efforts to assess the wives' responses with regard not only to skin cancer but to breast and cervical cancers as well. Despite the length of the survey, 206 of 403 wives returned it, for a 51% response rate.

The average age of farmers, all of whom were White, was 50 years ( $SD = 12.66$ ); most were married (90.2%), and the average age of the farm wives was 48 ( $SD = 11.79$ ). Their farming experience ranged from 1 to 81 years, with an average of 37.5 years ( $SD = 16.14$ ). Just more than one third (36.4%) of the participants operated their own farms, reporting themselves as the only workers. Approximately half (42.6%) indicated that farming comprised 75% or more of their incomes. Most (84.5%) respondents indicated that they had never had skin cancer, but less than half (43.6%) had ever had a physician examine their skin to check for signs of skin cancer.

### Instrumentation

The proposed model required the measurement of six variables. Behavior adaptation, public commitment, perceived procedural knowledge, interpersonal expectancies, and social resources were measured using 5-point scales, with higher numbers indicating greater agreement with Likert-type statements or greater frequency of behavioral performance. A

summative scale was created to assess actual procedural knowledge. Confirmatory factor analysis was selected to analyze the measurement model, as it is viewed as the more appropriate technique when a priori specification of item clustering is possible (Fink & Monge, 1985). The items used to measure the constructs were examined using LISREL 7. Several indicators of fit were used to examine the measurement models, with the following standards being employed: squared multiple correlations greater than .25,  $t$  values greater than 2, and coefficient of determination (COD) greater than .80. The chi-square, goodness of fit index (GFI), adjusted goodness of fit index (AGFI), and root mean square residuals (RMSRs) were also examined for each construct, with items being eliminated until the GFI was greater than .98, the AGFI greater than .93, and the RMSR less than .05. Due to the absence of research addressing the constructs of interest, the scales were pilot tested before use in the present project. Although several items included in the original pilot testing had to be dropped, internally consistent and reliable measures were confirmed for all scales. Each scale was constructed by summing and then dividing by the total number of items.

*Sun exposure adaptation behaviors.* Prevention items were drawn from Marlenga (1995), and additional items were developed to assess detection. With regard to sunscreen behavior, farmers and their wives were asked how often they (a) purchase sunscreen to wear while working in the sun and (b) wear sunscreen while working in the sun. For the behavior relating to sun protective hats, participants were asked how often they (c) purchase a hat that blocks the sun from your neck and ears to wear to work in the sun and (d) wear a hat that blocks the sun from the neck and ears while working in the sun. With regard to wearing a long-sleeved shirt as protection from the sun, participants were asked how often they (e) purchase a long-sleeved shirt to wear while working in the sun and (f) wear a long-sleeved shirt while working in the sun. With regard to skin exam practices, participants were asked how often they (g) perform monthly self-exams of their skin, (h) show someone how to conduct an exam of their skin to help detect skin cancer, (i) ask someone to conduct an exam of the skin to help detect skin cancer, and (j) get a medical professional such as a doctor or nurse to perform an annual clinical exam of their skin. The scores from these 10 measures of sun protective behaviors were summed together to create a composite measure (Cronbach's  $\alpha = .80$ , COD = .90).

*Familial interpersonal expectancies.* Interpersonal expectancies were measured via three statements: (a) My family expects me to conduct an exam of my skin to help detect skin cancer, (b) My family expects me to

wear a hat that blocks the sun from my neck and ears to work in the sun, and (c) My family expects me to get an annual clinical exam of my skin to help detect skin cancer (Cronbach's  $\alpha = .80$ ; COD = .82). These items extend Marshall and Weinstein's (1986) approach to measuring students' perceptions of teacher behavior, including whether he or she has high expectations for the student, provides opportunity, or affords choices. The Marshall and Weinstein instrument, which measured students' expectancies about teachers, was developed and validated in a series of studies, which they review; the internal consistency coefficient was .81, with a 2-week retest reliability correlation of .80 (Marshall & Weinstein, 1986, p. 443).

*Social resources.* Participants were asked the following: (a) How often do members of your family get clinical exams of their skin? (b) How often have you asked someone to help you find a medical professional such as a doctor or nurse to examine your skin for signs of skin cancer? (c) How often have you asked someone to help you select a sunscreen to wear while working in the sun? and (d) How often have you seen members of your family conduct an exam of their own skin? (Cronbach's  $\alpha = .64$ ; COD = .75).<sup>3</sup> This approach to the measurement of social resources was developed as a result of finding that research on role modeling generally focuses on the models' perceptions of their own behavior (e.g., Dalton & Swenson, 1986) rather than on the observer's experience with regard to the role model's behavior. Maibach and Flora (1993) evaluated the effectiveness of symbolic modeling via the use of videotaped presentations of role-modeling and information (social resources), with participants assessing whether the video presented relevant information, provided them with useful skills, had a knowledgeable narrator, and could help reduce risk of exposure to AIDS. Extrapolating from these items, and focusing on the observer's experience of the availability of social resources, the scales for social resources were constructed.

*Actual procedural knowledge.* The measurement of skin cancer knowledge has generally been operationalized at a global level, including such questions as "What is the most serious form of skin cancer?" and "What is the most common form of cancer?" (Marlenga, 1995). Because of the behavior adaptation model's specific focus on procedural information, seven questions were developed: (a) How often should you conduct an exam of your skin to help detect skin cancer? (b) How long before going out in the sun should you apply sunscreen for it to be most effective? (c) Which of the following types of hats provides the best protection from the sun? (d) How often should you get a clinical exam of your skin to help

detect skin cancer? (e) What type of material should you look for when selecting a protective shirt to wear while working in the sun? (f) What tools do you need to conduct an exam of your skin? and (g) What does the SPF number on sunscreen mean? These items were reviewed for content validity by three experts, including the director of a large southeastern university's melanoma center, the director of a southeastern state's public health cancer control section, and a health educator. Correct responses were summed, creating a 0 to 7 measure, with a mean of 2.43 ( $SD = 1.48$ ).

*Perceived procedural knowledge.* Five questions assessed farmers' perceptions of procedural knowledge about sun exposure adaptation behavior, with two relating to detection and three to prevention. Participants were asked "How knowledgeable are you about . . ." (a) skin self-exams, (b) clinical skin exams, (c) sunscreen, (d) sun protective hats, and (e) sun protective shirts (Cronbach's  $\alpha = .81$ ; COD = .82), an adaptation of Champion and Miller's (1992) instrument to assess women's self-efficacy with regard to performing BSEs. Champion (1984) developed instruments to measure the constructs associated with the Health Belief Model, including the scale used by Champion and Miller. The instruments Champion developed had been evaluated for validity and reliability, with content validity being determined by a professional review panel, construct validity tested through factor analysis and multiple regression, and internal consistency reliability using Cronbach's alpha ranging from .64 to .89.

*Public commitment.* To operationalize participants' public commitment to sun exposure adaptation behavior, they responded to five items beginning with the item "How often do you recommend to others that they . . .," with detection being assessed via two items: (a) conduct regular exams of their own skin to help detect skin cancer and (b) get an annual clinical exam of their skin. Prevention behaviors were assessed via three items: (c) wear sunscreen when working in the sun, (d) wear a hat that blocks the sun from the neck and ears when working in the sun, and (e) wear a long-sleeved shirt when working in the sun (Cronbach's  $\alpha = .87$ ; COD = .90). This approach to measuring public commitment stems from prior research. In Stone et al. (1994), for example, participants were asked to develop a speech about AIDS prevention from a list of statements about AIDS and to videotape the speech, with the belief that what they said would be used to recommend AIDS prevention practices to other students, whereas Fried and Aronson (1995) videotaped participants' presentations relating to recommendations to recycle.

**TABLE 1**  
**Means, Standard Deviations, and Intercorrelations**  
**Between Measures for Farmers and Farm Wives (N = 654)**

	M (SD)	1	2	3	4	5	6
1. Interpersonal expectancies	3.154 (.838)	—	.391**	.031	.293**	.413**	.469**
2. Social resources	1.854 (.766)		—	.147**	.385**	.355**	.514**
3. Actual procedural knowledge	2.425 (1.483)			—	.297**	.097*	.218**
4. Perceived procedural knowledge	2.828 (.689)				—	.326**	.493**
5. Public commitment	1.973 (.995)					—	.467**
6. Adaptation behaviors	2.182 (.744)						—

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

## RESULTS

Structural equation modeling (LISREL7) was used to determine the extent to which the behavior adaptation model presented in Figure 1 provided a good fit for the data. First, macrolevel analyses were performed on the overall hypothesized model. Second, microlevel analyses were performed on predicted paths within the model. A covariance matrix was computed through PRELIS (Jöreskog & Sörbom, 1989) and served as the input data for the structural equation model. Table 1 includes the descriptive statistics for the model indicators, together with the correlation coefficients to identify the zero-order relationships among the indicators.

The structural analysis of the hypothesized model with no missing data was based on 654 participants and indicated that the model represented a poor fit for the data. The  $\chi^2$  value was significant ( $\chi^2(3) = 65.09, p < .001$ ), suggesting a significant departure from the data. The GFI and AGFI of .969 and .786, respectively, also suggested a poor fit. The overall COD for the three equations was .406, with the equations for perceived procedural knowledge, public commitment, and behavior adaptation having squared multiple correlations of .233, .240, and .406, respectively. All indicators had significant  $t$  values (ranging from 4.59 to 10.29), with weights ranging from .146 to .361. Attention to the modification indexes, however, indicated that the fit of the model could be significantly improved with the addition of a path from social resources to behavior adaptation. This suggests that the availability of models and sources to seek information from, which was earlier defined as the direct and indirect resources used to support behavior adaptation, affected behavior adaptation not only through the influence of perceived procedural knowledge and public commitment but on its own as well. This relationship is consistent with much research that examines observational learning (Bandura, 1986), although it was proposed that behavior adaptation

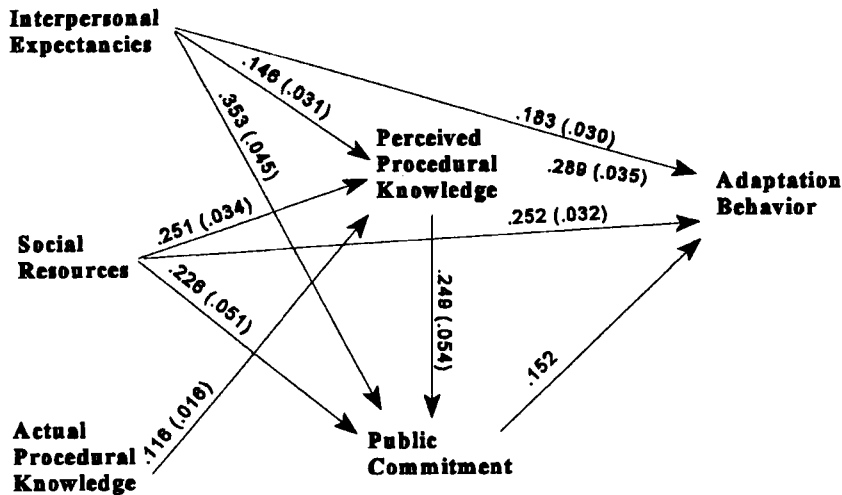


Figure 2: Derived Behavior Adaptation Model, With Path Coefficients (associated standard errors in parentheses)

would be a circumstance in which an individual's perceptual and communication processes would persistently mediate the impact. The finding that social resources have an even more substantial relationship to behavior adaptation clarifies the importance of this construct within the theoretical framework of the behavior adaptation model.

Structural analysis was performed with the path from social resources to behavior adaptation added to the theoretical model, indicating that the model now presented a good fit to the data. The  $\chi^2$  value did not indicate any significant departures from the data ( $\chi^2(2) = 5.68, p = .087$ ),<sup>4</sup> and GFI and AGFI were .996 and .980, respectively. The RMSR was low (.02), with no large residuals. The overall COD for the three equations was .456, showing that the model accounted for nearly half of the variance in participants' adaptation behaviors; the equations for self-efficacy, public commitment, and behavior adaptation had squared multiple correlations of .233, .240, and .456, respectively. Figure 2 contains the maximum likelihood coefficients and associated standard errors for this analysis. All path coefficients were significant ( $p < .05$ ,  $t$  values ranging from 4.59 to 8.29), with weights ranging from .146 to .353.

In sum, the derived behavior adaptation model illustrated in Figure 2 demonstrates that as perceived procedural knowledge increased, farmers' public commitment to perform adaptation behavior was enhanced ( $t = 4.59$ ) and the more adaptation behaviors were performed ( $t = 8.29$ ). The act of making a public commitment to the performance of adaptation behavior increased the probability that one would display prevention and

detection practices ( $t = 6.16$ ). Beyond these predictors of behavior adaptation, the interpersonal expectancies of farming family members were related to farmers' perceptions that they have the knowledge to practice adaptation behaviors ( $t = 4.75$ ), their public commitment to perform prevention and detection behaviors ( $t = 7.84$ ), and performance of these practices ( $t = 6.16$ ). The availability of social resources predicted farmers' perceptions that they have the knowledge to display behavior adaptation ( $t = 7.41$ ), their public commitment to performance of such practices ( $t = 4.46$ ), and behavior adaptation ( $t = 7.76$ ). Farmers' actual procedural knowledge predicted their perceived procedural knowledge ( $t = 7.23$ ).

These analyses used a composite measure of behavior adaptation, as the theoretical argument was made that in the performance of a behavior that leads to a health risk, more than one behavior may be identified as a method to adapt to risk, with any one person's response to the health threat being pictured on a continuum of behavior adaptation. The proposed model was also tested by using each of four sun protective behaviors (sun hat, long-sleeved shirt, sunscreen, skin exams) individually as dependent measures, rather than as one composite measure, to examine the patterns of prevention and detection. The structural analyses suggest that the model presented a very good fit to the data for the skin exam, sun hat, and long-sleeved shirt behaviors. In addition, the path coefficients for the skin exam, sun hat, and long-sleeved shirt behavior models were all significant. However, compared to the results for the composite sun protective behaviors, the model was not as good a fit for the sunscreen behavior data ( $\chi^2(2) = 21.85$ ,  $p > .01$ , GFI and AGFI of .989 and .886, respectively; the RMSR was acceptable at .048, with no large residuals). All links were significant except for the link between interpersonal expectancies and the behavior of wearing the sunscreen. Thus, the expectancies of family members did not predict sunscreen use, with these results suggesting that the behavior adaptation model was significantly better at predicting farmers' skin exam, sun hat, and long-sleeved shirt behaviors than their use of sunscreen. This may be because so few farmers and farm wives used sunscreen; they simply held no expectancies in this regard for other family members.

## DISCUSSION

Individuals often find themselves in the midst of situations that pose a risk to their health and well-being. The mandate to avoid these situations is too often one that cannot practically be employed, and so health communicators should focus on adaptation rather than avoidance messages. This project presents a model of behavior adaptation, emphasizing

the role of interpersonal communication in the process of forming, maintaining, and sustaining healthy habits. The behavior adaptation model provides a framework for understanding why efforts to promote prevention and detection practices are more or less likely to succeed. Application of this approach to the planning, implementation, and evaluation of health campaigns may afford insights about failure of some campaign messages in the past, as well as guide the design of future efforts.

The tenets of the behavior adaptation model were applied to the context of sun exposure and farming, supporting the proposed model with regard to the role of interpersonal expectancies, actual procedural knowledge, perceived procedural knowledge, and public commitment on behavior adaptation, while clarifying the relationship of social resources to individuals' prevention and detection practices. Farmers cannot realistically be expected to avoid the sun between the hours of 10:00 a.m. and 3:00 p.m., a primary message of many skin cancer prevention campaigns. Farmers can adapt to sun exposure in ways that reduce their risk for skin cancer, including the use of four primary prevention and detection behaviors. The findings of this study may be used to guide the design of health campaign messages aimed at reducing farmers' skin cancer risk.

#### The Relationship of Perceived Procedural Knowledge to Behavior Adaptation

The proposed behavior adaptation model posited that individuals' perceptions that they know how to adapt to a health risk increase the likelihood that they will adapt. Perceived procedural knowledge was found to have a direct impact on behavior adaptation, suggesting that emphasizing to individuals that they know how to adapt may enhance performance. A message such as "You know how to protect yourself from overexposure to the sun" could facilitate farmers' performance of skin cancer prevention and detection behaviors. This may occur due to the verbal immediacy of such a statement, with more immediate language triggering thought and action (Parrott, 1995). In addition, perceived procedural knowledge predicted public commitment, which may indicate that belief in one's knowledge functions as a motivator, whereas lack of confidence in one's knowledge contributes to reticence to speak or to act.

#### Public Commitment's Relationship to Behavior Adaptation

The proposed behavior adaptation model emphasized research that has found that a verbal statement in support of an action or issue, in conflict with one's actual behavior, contributes to feelings of hypocrisy (Fried & Aronson, 1995). It was posited that public commitment would



predict behavior adaptation, a relationship that was supported. Health communication campaign messages designed to gain verbal statements in support of practices to prevent and detect skin cancer may be as simple as, "Recommend to your friends and family that they wear long-sleeved shirts to protect their skin while working in the sun." In other behavior adaptation situations, similar construction of messages may evoke this commitment. Moreover, when a farmer recommends skin cancer prevention and detection practices, this may influence not only the farmer's own behavior adaptation but other farmers' behavior adaptation as well. The action of recommending the practice, in other words, has been shown to increase one's behavior adaptation via a sense of personal commitment to behave in the prescribed fashion to avoid feelings of hypocrisy. The act of verbally committing to behavior adaptation may, at the same time, function as a social resource for others so that they are able to observe someone doing the prescribed practice, recommending the practice, and acting as a source of information.

### Interpersonal Expectancies and Behavior Adaptation

Significant others' expectancies with regard to behavior adaptation predicted performance of prevention and detection practices, as well as perceived knowledge about the performance of behavior adaptation and public commitment to such practices. These findings demonstrate the importance of identifying the significant others who will be likely to influence a target audience's adaptation behaviors. When these individuals praise the performance of prevention and detection behaviors, criticize the neglect of such practices, and/or regularly talk about their expectancies (Marshall & Weinstein, 1986), behavior adaptation is more likely to occur. A profile of the significant others' expectancies regarding the risk behavior may provide insights about an appropriate way to enlarge the audience to be addressed through campaign messages.

As a result of the finding that interpersonal expectancies contribute significantly to adaptation behavior, health campaigners may design messages aimed at a target audience's significant others. The messages may focus on informing them about the risk the target audience faces, the options available to reduce harm, and the influence their own actions have on the likelihood that behavior adaptation will occur. "Don't let your loved one be a 'red neck' from working in the sun. Remind them to use sunscreen, wear a sun protective hat, and wear a long-sleeved shirt" illustrates how family members can be prompted to promote behavior adaptation.

The target audience's beliefs about significant others' expectations regarding the behavior adaptation need also to be assessed, with results used to guide the design of campaign messages to reinforce appropriate

expectancies and to reframe inappropriate expectancies. The reframing may become one objective of enlarging a campaign's audience to include members of the target audience's interpersonal expectancy network. In sum, the study's findings support the conclusion that health campaigners may invoke interpersonal expectancies in support of behavior adaptation as one method to facilitate the adoption of prevention and detection practices.

### Social Resources and Behavior Adaptation

It was proposed that social resources would predict individuals' perceived knowledge about behavior adaptation and public commitment to perform the practice. Although these relationships were supported, it was also found that the availability of social resources directly predicted behavior adaptation. The proposed model was modified to add this link, clarifying the impact of social resources on adaptation behavior. Prior theory and research supports both the logic of the importance of social resources in contributing to adaptation behavior (Bandura, 1986) and the logic of its effects being mediated by an audience's perceived procedural knowledge (Champion & Miller, 1992) and public commitment (Fried & Aronson, 1995).

That social resources, such as family role models, are an important predictor of behavior adaptation, perceived knowledge, and public commitment suggests an alternative method of affecting adaptation without reliance on professionals and institutions. Significant others' interpersonal expectancies may bolster the provision of social resources minimally or maximally, as significant others may themselves not be faced with the performance of the behavior that puts an individual at risk. They may hold expectations that an individual will adopt adaptation behaviors but fail to act in the expected fashion themselves and/or be unable to provide information to facilitate such behavior. On the other hand, significant others may communicate supportive expectations and provide social resources to facilitate confirmation of expectations, including action as appropriate role models and/or provision of information relevant to the practice of adaptation behavior. Health campaigners may design messages to strengthen naturally occurring positive connections and to weaken the presence or effects of inappropriate social resources, including bad role models and uninformed sources of information.

### Actual Procedural Knowledge and Behavior Adaptation

An individual's actual procedural knowledge with regard to prevention and detection behaviors was proposed to be related to perceived procedural knowledge, a relationship that was supported. This, too,

becomes an important area for campaigners to focus their message design efforts, identifying the specific procedures associated with an adaptation behavior and providing these guidelines to a group who faces a health risk. The messages relating to sunscreen use for farmers might include information about how soon to apply sunscreen before going into the sun for it to be effective, how much to use, how often to reapply, and so on. Similarly, farmers need to be aware of the best type of hat to wear to protect their ears and neck from the sun. There has clearly been too much neglect of these specific procedural guidelines in the development of many previous campaign messages, leading individuals to have a general factual understanding about many health issues but too little specific procedural understanding (Champion & Miller, 1992). However, exclusive emphasis on this area of message design, to the neglect of significant others' interpersonal expectancies and attaining public commitment to the performance of adaptation behavior, may doom campaigners' efforts. The weakest link in the behavior adaptation model when applied to the case of farmers and sun exposure was the one from actual procedural knowledge to perceived procedural knowledge, highlighting the importance of its inclusion in the conception of health campaign activities but suggesting that its role is contingent. Campaigners' efforts must reflect this contingency.

### Strengths, Limitations, and Future Research

The findings that interpersonal expectancies, social resources, and actual procedural knowledge, together with perceived procedural knowledge and public commitment, predict behavior adaptation affords important insights about the design of health messages in efforts to communicate with individuals unable to avoid behaviors that put their health at risk. The current study did not, however, consider the interactions among the variables, which may provide the means to explain more of the variance in prevention and detection practices among a population. At present, the conclusions of this research are also practically limited by the application of the model to a single population in a single study. However, there is some anecdotal evidence to support the validity of the behavior adaptation model, including the "Weight Watchers" program, which relies on providing people with guidelines about how to eat the foods they love and still lose weight, involving rules relating to frequency and size of portions. Moreover, the program uses social resources in the form of other members, past and present, acting as role models and sources of information for current members (see Matheson, Woolcott, Matthews, & Roth, 1991). The program meetings convey the importance of evaluating others'

expectations regarding one's own weight and eating behavior. Members begin to perceive themselves as having the knowledge to adopt practices that help them to adapt to the health risk associated with previous eating behaviors, while still indulging their love for creamy sauces, rich desserts, or whatever food the individual loves that is unhealthy. In addition, members consistently make public commitments to one another and others about their eating habits.

The current research is also limited by the fact that farmers self-report their behavior adaptation, as well as the available social resources and familial interpersonal expectancies, so farmers' actual behavior, access to social resources, and/or familial expectancies may be quite different. Future studies could examine ways to triangulate data collection. Parrott et al. (1996) did formative research, finding through observation of farmers working in the field that farmers performed even fewer of the practices related to sun exposure than they said they did, and that there was even less availability of products, services, and information about skin cancer than farmers perceived there to be. Thus, future efforts to validate the behavior adaptation model may want to include the use of observational methods to evaluate a group's actual adaptation behavior, together with the availability of social resources to support the behavior and significant others' interpersonal expectancies regarding the group's practices.

The behavior adaptation model should be examined for its ability to predict adaptation behaviors across a variety of contexts and situations. Consider work sites where employees must behave in ways that put their health at risk, yet only some employees heed the adaptation strategies recommended by their employers. The behavior adaptation model suggests additional strategies, including a focus on the expectancies of significant others and/or getting employees to make a public commitment about the behavior. Efforts to communicate about contraceptive use (e.g., Gilchrist & Schinke, 1983) also depend on the promotion of the faithful performance of specific habits to support long-term health aims, constituting an appropriate situation to apply the behavior adaptation model. Communication campaigns designed to address diet and nutrition (e.g., Bernier & Avard, 1986) may also be appropriate avenues for use of the behavior adaptation model, with interpersonal expectancies providing an important consideration in evaluating the audiences and activities to be included in such efforts, together with precise procedural information about diet and nutrition. In each of these settings, the behavior adaptation model advises health campaigners to focus not on change (which seems so hard and unpleasant) nor on stopping a particular practice (which often seems impossible) but rather to acknowledge a practice and advise one that, "When you do that, also do this."

## NOTES

1. Bandura (1997) reviews the voluminous work in the area of self-efficacy, which is beyond the scope of the current project. However, he distinguishes self-efficacy from such constructs as locus of control (see p. 48) and emphasizes its multidimensional and situational nature (pp. 48-49). Chapters 6 (pp. 212-258) and 7 (pp. 259-318) deal with cognitive function and health function, respectively, suggesting that perceived cognitive ability, which strongly affects academic performance, is also likely to affect health. Self-efficacy differs from one's internal-external expectancies or locus of control, with the latter constituting an individual's perceptions about whether what happens to him is the result of his own behavior or dependent on luck, change, fate, and/or powerful others (Rotter, 1966; Strickland, 1978) rather than people's belief that they have the cognitive and behavioral skills together with the motivation to act.

2. To develop the phone survey, two pilot tests were conducted, with 16 of 50 farmers contacted completing one version and taking 30 to 45 minutes. Many complained of the length, with lengthy surveys contributing to fatigue and hang-ups. The length of the phone survey was reduced, largely by eliminating items with little to no variance in response, particularly when respondents all reported knowing something, performing some practice, or not perceiving some barrier previously reported in the literature with regard to skin cancer prevention and detection. A second pilot version of the survey was completed by 5 additional farmers randomly selected from the target region, primarily to demonstrate that the revised phone survey took no longer than 30 minutes to complete; the average length of time was 20 minutes.

3. The reliability of the social resources measure was low, and the COD was lower than .80. In the original measurement instrument, several additional items were included to assess social resources, including observation of other farmers wearing long-sleeved shirts and sun protective hats. However, the addition of these items to the measurement model did not improve model fit. We speculate that these items did not effectively assess social resources because farmers reported so seldom observing other farmers practicing these behaviors.

4. The analysis was rerun using Hoetler's critical  $N$ , obtaining  $\chi^2 = 2.67$ ;  $p = .263$ .

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