Protection Motivation Theory and Stages of Change in Sun Protective Behavior

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Abstract

This study examined the usefulness of the stage of change model and protection motivation theory (PMT) in creating brief persuasive appeals to promote healthy sun-behavior. College women ($N = 254$) read one of four essays that manipulated the level of threat and coping appraisal. The transition from the precontemplation to contemplation stage was promoted by threat appraisal information, but transition from contemplation to the preparation stage occurred only when individuals were provided with both high threat and high coping information. Thus, brief communications based on PMT may create attitudes leading to behavior change when later, more intensive, interventions are introduced.

Keywords

- *health promotion*
- *protection motivation theory*
- *skin cancer*
- *stages of change*
- *sun-protective behavior*

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DESPITE gaining epidemic status over the last decade, there is a troubling lack of public response to the threat of skin cancer. Studies consistently find the vast majority of sunbathers do not seriously consider sun-protective behaviors (Weinstock, Rossi, Redding, Maddock, & Cottrill, 2000). In interviews with beachgoers, Hedeker, Mermelstein and Weeks (1999) found that many express little worry regarding sunburn effects, low confidence in their ability to protect themselves from the sun and positive attitudes about a tanned appearance. These striking perceptions illustrate what may be the most pressing target in skin cancer prevention efforts.

Until recently, education has been the primary method used to confront negative sun behaviors. Although such an approach increases knowledge, it usually produces little change in behavior (see Jackson & Aiken, 2006; McMath & Prentice-Dunn, 2005). More promising results have been shown by interventions that seek to not only educate, but also motivate people to act (e.g. Jackson & Aiken, 2006; McClendon & Prentice-Dunn, 2001; McClendon, Prentice-Dunn, Blake, & McMath, 2002; McMath & Prentice-Dunn, 2005; Prentice-Dunn, Jones, & Floyd, 1997).

Protection motivation theory

One of the most often used frameworks for designing preventive health messages is protection motivation theory (PMT) (Fry & Prentice-Dunn, 2006; Prentice-Dunn & Rogers, 1986; Rogers & Prentice-Dunn, 1997). PMT maintains that individuals confronted with health information engage in two cognitive processes: threat appraisal and coping appraisal. Affecting the threat appraisal is the perceived *severity* of the threat (i.e. how damaging and/or life-threatening is skin cancer) and the individual's perceived *vulnerability* to it. These components increase the likelihood of an adaptive response such as reducing sunbathing or using sunscreen, while any *rewards* associated with continuing unprotected sun exposure (e.g. a tanned appearance) reduce this likelihood.

Coping appraisal involves the individual's assessment of the *response efficacy* of the recommended behavior (i.e. perceived effectiveness of sunscreen in preventing premature aging) as well as one's perceived *self-efficacy* in carrying out the recommended actions (i.e. confidence that one can use sunscreen consistently). Higher levels of the efficacy variables lead to greater likelihood that the adaptive behavior will be enacted. Reducing this likelihood are perceptions of high *response costs* associated with the recommended actions, such as the messiness and inconvenience of sunscreens or the loss of benefits associated with a tan.

Floyd, Prentice-Dunn and Rogers' (2000) meta-analysis of 65 studies representing 20 health domains and approximately 30,000 participants found a moderate average effect size ($d+ = .52$) for all PMT variables. Severity, self-efficacy and response efficacy were all positively associated with healthier intentions and behavior, whereas rewards and response costs were negatively associated. Milne, Sheeran and Orbell (2000) corroborated this pattern of results in an independent meta-analysis. Both studies found a substantial correlation between behavioral intentions and actual behavior. Fry and Prentice-Dunn (2005, 2006) subsequently found that a high level of threat leads to adoption of health recommendations most often when coping information is provided as well.

Stages of change model

Although many health campaigns in the mass media are based on established models such as PMT, their one-size-fits-all approach means that they are not effective with everyone. Personal 'readiness' to change one's unhealthy behavior (Prochaska & DiClemente, 1982, 1985; Slater, 1999; Wilde, 1993) is one example of an audience characteristic that may influence receptivity to a message. For example, some individuals may not have considered change at all, whereas other individuals may already be on the threshold of change or even have successfully altered their behavior for a period of time.

Models that consider personal readiness have been shown to be effective in various types of clinical interventions such as smoking cessation and eating disorders (DiClemente, Carbonari, & Velasquez, 1992). Recently such models have attracted the interest of designers of brief health communications for larger audiences who want to ensure that 'well-intended messages do not produce undesirable behaviors' (Slater, 1999, p. 336).

In the stages of change model (SCM) (Prochaska, DiClemente, & Norcross, 1992), the appropriate components of an intervention are dependent on the target individual's readiness to change. Five stages have been recognized within the SCM. *Precontemplation* is the stage in which individuals have no intention to change behavior in the near

future. In the *contemplation* stage, individuals have definite plans to take action within a certain period of time (i.e. six to 12 months). In the *preparation* stage, individuals have decided to take action very soon (usually within 30 days) and have likely made a small gesture related to the change process, such as quitting smoking for a day. Those in the *action* stage have successfully changed their behavior, and those in the *maintenance* stage have successfully adopted healthier behavior for a distinct period of time (i.e. six to 12 months). The goal for interventions using SCM is typically the transition to the next, more advanced, stage.

Individuals in early stages consider potentially negative outcomes of their behavior on themselves. As a result, they evaluate current rewards as they relate to the negative consequences (Velicer, Prochaska, Fava, Norman, & Redding, 1998). They also experience greater emotional reactions from warnings related to their behavior. There is no actual behavior change occurring, and little or no consideration of precautionary measures (i.e. exactly *how* to change) at this time. This process of assessing vulnerability and rewards is closely analogous to the threat appraisal in PMT.

SCM's concept of 'counterconditioning' (i.e. substituting healthy behaviors for less healthy ones) is consistent with PMT's coping appraisal, which involves an assessment of options for healthier behavior (i.e. PMT's response efficacy and response costs) as well as a more personal assessment of one's ability to follow through with those options (i.e. self-efficacy). According to SCM, these behavioral, action-oriented processes are generally used during later stages when change is being initiated or maintained—not before change is being seriously contemplated (Prochaska et al., 1992).

Message designers seeking stage transition for precontemplators would logically focus on increasing awareness of health risk, severity and loss to a level more characteristic of those contemplating change (Velicer, DiClemente, Prochaska, & Bradenburg, 1985). Attention to ways to cope with threat (i.e. high response efficacy and low response costs), however, is implied in the transition from the contemplation to the preparation stage.

Only a few studies have experimentally investigated stages of change theory in brief communications. Targeting home radon testing, Weinstein, Lyon, Sandman and Cuite (1998) found that high vulnerability information combined with making the testing seem less complicated was the most effective condition for precontemplators. Similar results were found among precontemplators in a smoking intervention (Dijkstra, de Vries, Roijackers, & van Breukelen, 1998).

Only one published study has simultaneously investigated stages of change and protection motivation theory (Block & Keller, 1998). In an experiment on safe-sex intentions among precontemplators, perceived vulnerability was the best predictor of intentions to use condoms. However, the researchers did not manipulate self-efficacy information or response efficacy and thus did not address the potential impact of providing efficacy information to those least ready to change.

As noted earlier, Weinstock et al. (2000) found that most sunbathers are in the pre-action stages regarding sun-protective behaviors. In addition, Hedeker et al. (1999) found that precontemplators, relative to contemplators, showed less concern about sunburn effects, lower perceptions of vulnerability to sunburn and more positive attitudes about the sun. Thus, our goal was to target such perceptions with a brief intervention based on PMT in order to assess its impact on individuals in two pre-action stages of change.

Design and hypotheses

A stage of change (precontemplation vs contemplation) X threat appraisal information (high vs low) X coping appraisal information (high vs low) factorial design was used. Precontemplators and contemplators were randomly assigned to read one of four experimental essays. Reactions were measured through self-reports of behavioral intentions (i.e. using sunscreen, avoiding intentional sun exposure, wearing protective clothing), movement to a higher stage of change (i.e. precontemplation to contemplation) and requests for additional information (e.g. skin cancer brochures).

Initial perceptions

Precontemplators were expected to differ from contemplators in their initial perceptions regarding sun protection. They were expected to report lower vulnerability perceptions regarding skin cancer and other sun-related problems, and perceive these outcomes as less severe. Precontemplators were also expected to report lower initial self-efficacy and lower response efficacy.

Behavioral intentions and requests

Following exposure to the experimental manipulations of threat appraisal information and coping appraisal information, a main effect was expected

for stage of change on behavioral intentions and on requests, with contemplators showing higher levels than precontemplators. A threat appraisal X stage interaction was also anticipated, with contemplators having higher intentions, more requests and more stage change than precontemplators.

Method

Participants

Undergraduate Caucasian females participated to fulfill a research requirement in their introductory psychology course. Participants were required to have intentionally sought a tan within the last year and be either in the precontemplation or contemplation stage regarding sun-protective behavior. Participants with preexisting medical conditions for which sun exposure is advised (i.e. psoriasis) were excluded, as were those who had prior skin cancer. After all screening criteria were considered, 254 participants qualified.

Experimental manipulations

The essays used (available from the authors) were based on prior successful interventions (McClendon & Prentice-Dunn, 2001; McClendon et al., 2002; McMath & Prentice-Dunn, 2005). The high threat essay contained graphic photos of cancer lesions, leathery skin and age spots. It emphasized the detrimental effects of the sun on appearance, increasing rates of skin cancer in younger people and the changing norms of beauty to a lighter skin tone. The low threat essay minimized the above concerns, contained innocuous images and offered positive information about the sun such as the enhancement of the immune system and reduction of depression. The high coping essay focused on the effectiveness of eliminating sunbathing and using sunscreen in avoiding skin cancer and damaged skin and the ease of following such practices. The low coping essay focused on the equivocal data regarding the effectiveness of sunscreen, its inconvenience and the practical difficulties involved in severely curtailing intentional and unintentional sun exposure.

Measures

Stages of change Participants' stage of change was measured before and after the intervention, and at a 10-day follow-up. The instrument was based on the sun-protection staging algorithm used by Weinstock et al. (2000) who successfully differentiated individuals in a large beach sample (N = 2134). The algorithm consisted of a brief description of the three primary means of sun protection (sunscreen, limiting sun exposure and protective clothing). Five items were then used to place individuals in one of the five stages of change. The five items were based on whether at least one of the three means of protection was planned vs already enacted and for how long (e.g. no plans to start, less than 30 days, less than 12 months, more than 12 months). Measurement of stage progression followed the procedure used by Dijkstra et al. (1998), who coded stage transition as a dichotomy. Stasis (and backward movement) was coded '0', and forward movement was coded '1'.

PMT variables

To assess the impact of the essays and stage of change on the PMT variables (e.g. vulnerability, response efficacy) a self-report questionnaire was given that was similar to that used in recent research (McClendon & Prentice-Dunn, 2001; McClendon et al., 2002; McMath & Prentice-Dunn, 2005). Each variable was assessed with at least five items in 10-point Likert format. For example, items such as 'I increase my chances of getting skin cancer if I deliberately seek a tan' measured vulnerability and 'Using sunscreen will definitely help prevent me from developing skin cancer' assessed response efficacy. These items were then summed for each PMT variable. McMath and Prentice-Dunn (2005) found the item for each variable to be internally consistent, with alphas ranging from .66 to .83.

Behavioral intentions

Behavioral intentions were measured immediately after the essay and at a 10-day follow-up with seven items (10-point Likert format) about avoiding intentional sunbathing, wearing protective clothing and hats and using sunscreen of at least SPF 15 when exposure to the sun is necessary. The sum of these items was found by McMath and Prentice-Dunn (2005) to be internally consistent (alpha = .77).

Requests

The follow-up questionnaire allowed for requests for: (a) free samples of broad-spectrum sunscreen; (b) catalogs of sun-resistant clothing; and (c) illustrated brochures showing skin cancer manifestations and how to do a skin-cancer self-check. The request of an item was coded '1', whereas a non-request was coded a '0'. Participants were made aware that they would be required to pick up their items personally.

Table 1. Pre-intervention Means for PMT Variable Sums

Mediating Variable	*Precontemplators (N=138)*	*Contemplators (M=115)*	*p-value*
Severity	52.59 (6.97)	54.98 (7.32)	.009
Vulnerability	32.19 (5.00)	33.48 (4.17)	.03
Rewards	46.24 (7.22)	44.82 (7.02)	.12
Self-efficacy	40.62 (9.79)	44.10 (8.76)	.003
Response efficacy	40.14 (8.48)	40.67 (5.75)	.56
Response costs	29.68 (8.21)	27.03 (7.81)	.009
*Total threat appraisal	38.56 (13.28)	43.64 (12.51)	.002
*Total coping appraisal	50.99 (19.60)	57.74 (16.36)	.003
*Total protection motivation	89.37 (28.18)	101.38 (24.98)	.0004

Note. Standard deviations are shown in parentheses. *"Threat Appraisal" = sum of severity and vulnerability less rewards; "Coping Appraisal" = sum of self-efficacy and response efficacy less response costs; "Protection Motivation" = sum of threat and coping appraisals.

Procedure

All study procedures were approved by the university's Institutional Review Board. After informed consent, participants completed screening measures and then the pre-intervention measure of the PMT variables and the stage of change questionnaire. Since screening criteria were not considered until after the study was completed (but before data analysis), all participants were randomly assigned to read one of the four possible essays of about nine pages, half of which was comprised of photos. Upon finishing the essays, they completed the questionnaire that contained PMT items along with the items measuring behavioral intentions. They also completed the post-intervention stage of change measure and a hypothesis-guessing questionnaire. Participants were informed of the brief e-mail follow-up questionnaire that was to be sent approximately 10 days from the date of their participation. They were told of the importance of their e-mail responses to the questionnaires and of the offer for free sunscreen, UV clothing catalogs and skin cancer brochures. The entire session lasted approximately 45 minutes.

Results

Psychometric properties

Coefficient alphas for the six PMT variable measures ranged from .72 to .89. For behavioral intentions, the alpha was .87. These values are consistent with those found in previous PMT studies.

Manipulation checks

A 2 (threat appraisal information: high vs low) X 2 (coping appraisal information: high vs low) ANOVA was performed for each of the two primary appraisal processes: threat (severity sum plus vulnerability sum, minus rewards sum) and coping appraisal (response efficacy sum plus self-efficacy sum, minus response costs sum). Participants who read the high threat essay had higher threat appraisal perceptions than did those reading the less threatening essay (F (1, 247) = 330.74, $p < .0001$, eta squared = .58). Those who read the high coping essay reported higher coping appraisal perceptions than did those in the low coping condition (F (1, 247) = 13.25, $p < .001$, eta squared = .05). Although participants reading the high threat essay also reported higher coping appraisal ($p < .0001$), the magnitude of the effect was much smaller than that of the threat essay (eta squared = .10 vs .58). These results indicate that the independent variables were properly manipulated.

Primary analyses

Precontemplator–contemplator differences

Precontemplators and contemplators differed on four of six PMT variables (see Table 1). Precontemplators perceived the threat of skin cancer as less severe and believed themselves to be less vulnerable. They also perceived lower self-efficacy related to reducing their skin cancer risks and saw the recommendations as more costly. There were no differences between the stages in perceptions of sun-related rewards or the effectiveness of the recommended precautions.

Behavioral intentions

A 2 (stage of change) X 2 (threat appraisal information) X 2 (coping appraisal information) ANOVA was performed for behavioral intentions. Main effects were found for all three independent

Table 2. Percentage of Precontemplators and Contemplators Reporting Stage Progress Post-intervention and at Follow-up

	Stage Progression			
	Precontemplators		*Contemplators*	
Condition	*Progressed (FU)*	*N (FU)*	*Progressed (FU)*	*N (FU)*
Low Threat				
Low Coping	17.2 % (25.0%)	29 (28)	24.0 % (30.4%)	25 (23)
High Coping	34.0 % (31.3%)	35 (32)	24.8 % (30.8%)	29 (26)
High Threat				
Low Coping	53.8 % (56.8%)	39 (37)	29.2 % (30.8%)	24 (22)
High Coping	68.6 % (69.0%)	35 (29)	*75.0 % (62.9%)	36 (35)

Note. "Progressed" = % reporting forward stage progress post-intervention. "FU" = at follow-up. Significant effect for precontemplators post-intervention: high versus low threat (p = .0001). Significant effect for contemplators post-intervention: interaction of threat and coping (p = .0001). * denotes borderline-significant difference post-intervention vs. follow-up ($p < .10$).

variables. Precontemplators, relative to contemplators, reported fewer intentions to adopt precautionary measures ($F = 25.39$; $p < .0001$). The high threat appraisal information produced higher intentions than did the low threat essay ($F = 92.32$, $p < .0001$), as did the high coping appraisal essay compared to the low coping essay, $F = 5.84$; $p < .02$. Threat appraisal, coping appraisal and stage of change essay had effect sizes (eta squared) of .28, .02 and .10, respectively.

Stage progression A 2 X 2 X 2 logistic regression on stage progression revealed main effects for threat appraisal information, B = 2.24, Wald χ^2 (1, N = 252) = 14.96, p = .0001, and coping appraisal information, B = 1.99, Wald χ^2 (1, N = 252) = 11.27, p = .001. The effect of coping appraisal information was qualified by a three-way interaction, B = 2.27, Wald χ^2 (1, N = 252) = 3.79, p = .05. Table 2 shows the percentage of precontemplators and contemplators in each experimental condition reporting stage transition post-intervention and at 10-day follow-up. Selected chi-square analyses showed stage progression was more likely for contemplators exposed to high coping information, but only under conditions of high threat, χ^2 (1, N = 65) = 16.66, p = < .0001. Conversely, precontemplators had more stage progression after reading the high threat appraisal information only, χ^2 (1, N = 138) = 16.27, $p < .0001$, and were not significantly influenced by coping appraisal information.

Requests

A 2 X 2 X 2 logistic regression was performed on requests for each skin cancer-related item (i.e. sunscreen, catalogs of UV protective clothing, illustrated skin cancer brochures). Contemplators, relative to precontemplators, requested more brochures (26% vs 14%; B = 1.31, Wald χ^2 (1, N = 231) = 4.14, p = .04) and more clothing catalogs (26% vs 4%; B = .77, Wald χ^2 (1, N = 232) = 5.12, p = .02). Contemplators and precontemplators were equally likely to request sunscreen (56% vs 47%).

Discussion

Our results suggest that the stage of change model is compatible with the primary elements of PMT and that the combination of models may be useful in targeting specific audiences. Although PMT-based brief messages can persuade many individuals to alter sun-protective intentions, their greatest impact may be in creating a readiness to change. Indeed, we found that shaping one's perceptions of threat and coping resources is sufficient to move many individuals to the next stage of change.

Behavioral intentions and stage progression

Both precontemplators and contemplators reported greater intentions to take sun protective measures after reading either the high threat appraisal information or the high coping appraisal information. Prior researchers (Fry & Prentice-Dunn, 2006; Prentice-Dunn, Floyd, & Flournoy, 2001) have found that coping appraisal information is necessary to channel threatened individuals away from maladaptive reactions such as fatalistic thinking and

avoidance and toward such adaptive reactions as increased intentions and behavior change. However, the finding that precontemplators given only high threat appraisal information planned to take precautions within one year suggests that threat alone may be enough to alter the attitudes and intentions of some individuals.

Forward movement for contemplators involves a shorter time frame and the finding that they benefit from both high threat appraisal information and high coping appraisal information reflects this more pressing transition. Meeting these individuals' concerns means highlighting the efficacy of specific precautions (i.e. sunscreens, sun-avoidance, protective clothing), reducing perceptions of response costs and heightening self-efficacy to increase confidence about performing and maintaining the behaviors. Furthermore, research suggests that attitudes are likely to be strengthened when they are accessed in the context in which they are needed, such as in the presence of threat (Fazio, 1989). This supports the finding of the contemplators' needs for high threat-appraisal information to make the coping options salient.

Requests

Although prior meta-analyses (Floyd et al., 2000; Milne et al., 2000) revealed a positive correlation between intentions and behavior, health promotion efforts are often challenged by difficulties in demonstrating actual behavior change. While participants in our study knew they would have to pick up the items they requested, their requests were only ancillary to true sun-protective behaviors such as applying sunscreen. Nonetheless, our finding that contemplators requested more skin cancer brochures corroborates SCM's premise that contemplators are indeed ready for a greater engagement than are precontemplators. It also suggests that the denial of threat that is a hallmark of the precontemplator is less prominent in the contemplation stage. Voluntarily requesting graphic, skin cancer material may also indicate movement to the preparation stage.

Rarely considered by young people as an option for sun-protection (Weinstock et al., 2000), requesting the catalog for sun-protective clothing was more likely in the contemplation stage. However, high perceptions of sun-related rewards resulted in these requests being less likely than were the other options, suggesting that reducing the perceived rewards of sunbathing may be a precursor to successfully marketing such clothing to young women (see Cafri, Thompson, Roehrig, Jacobsen, & Stark, 2006; Jackson & Aiken, 2006).

Limitations and implications

Our sample of young women was likely to be somewhat similar in their educational level, intelligence, access to quality health care and other personal and demographic factors such as knowledge about sun-related health issues and appearance concern. Our participants were required to read the essays carefully when, in daily life, some individuals might turn the page of the magazine to avoid a skin cancer ad. This is a substantive concern as studies have shown people who vary on individual difference variables such as need for cognition may process skin cancer messages differently (e.g. McMath & Prentice-Dunn, 2005). It is also possible that precontemplators, relative to contemplators, would have differed on their likelihood of processing the messages were they left to their own volition. Thus, the applicability of our results to other samples and settings is unknown.

In addition, the longevity of our results is an open question. Although our goal was to use a message format that people often encounter in the mass media, the impact of such messages has rarely been tracked over time. Slightly more extensive interventions have been found to still affect skin protection behaviors after one month (McClendon & Prentice-Dunn, 2001; McClendon et al., 2002) and breast self-examination practices after three months (Fry & Prentice-Dunn, 2006), but additional exposure to the message may be necessary to maintain its impact over a longer term.

In summary, our results suggest that the brief message format so often encountered in daily life is unlikely to trigger immediate action in most people. However, protection motivation theory in combination with the stages of change model may have a useful role in promoting healthier sun behavior. We found that shaping one's perceptions of threat and coping resources is sufficient to move many individuals to the next stage of change. Thus, brief communications based on PMT may establish the context for the behavior change that can occur when more intensive interventions are introduced in smaller settings such as school or community groups. Designers of brief appeals to promote healthier sun behavior should address both the threat and coping appraisals of PMT to effectively reach the most people.

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