

Cognitive and Physiological Processes in Fear Appeals and Attitude Change: A Revised Theory of Protection Motivation

Ronald W. Rogers
University of Alabama

INTRODUCTION

If you have forgotten what a fear appeal is, a passage from Jonathan Edwards's "Sinners in the Hands of an Angry God" may refresh your memory.

O Sinner! Consider the fearful danger you are in. It is a great furnace of wrath, a wide and bottomless pit, full of the fire of wrath. . . . The use of this awful sermon may be for awakening unconverted persons in the congregation. This that you have heard is the case of every one of you. . . . And now you have an extraordinary opportunity, a day wherein Christ has thrown the door of mercy wide open . . . a day wherein many are flocking to him, and pressing into the kingdom of God.

This passage contains all of the crucial ingredients of a fear appeal. The preacher is telling you that (1) the threatened event is severe, (2) that, oh yes, it *can* happen to you, (3) but that there is an effective way to avoid the danger, (4) if you will only abandon your wicked, wicked ways, and accept his recommendation.

Fear appeals are ubiquitous. Preachers still use them. So do politicians, parents, advertisers, and public health organizations. Communications that attempt to change our attitudes by appealing to that unpleasant emotion of fear have been the object of a great deal of research. We review some of that research in this chapter.

Overview of the Chapter

This chapter has three purposes. First, it provides an opportunity to evaluate critically the empirical data on fear and persuasion in order to determine what conclusions may be drawn. The second purpose is to identify some of the critical issues requiring additional study. Finally, we integrate the data and concepts into a coherent theoretical framework: an expanded and revised theory of protection motivation.

The review of the literature on fear appeals and attitude change is divided into five major sections. First, we examine the relationship between fear and attitude change. Second, the three major theories of fear and persuasion that have evolved to guide research and explain results are reviewed. The third section examines those studies of attitude change directly manipulating physiological arousal, focusing on the implications for theories of emotion as well as attitude change. The fourth section reviews the data bearing on the role of physiological processes in mediating or producing attitude change. The third and fourth sections focus primarily on my program of research. The chapter concludes with a revised theory of protection motivation that incorporates the empirical and conceptual advances reviewed in the chapter.

The Relation of Fear to Attitude Change

The interrelationship among environmental stimuli, physiological arousal, emotion, and attitudes has been a topic of enduring interest. Although social psychological approaches to the study of emotion have employed a wide range of perspectives (cf. Harris & Katkin, 1975), our approach has focused on cognitive evaluations of autonomic nervous system activity. The research reported in the third and fourth sections attempts to integrate the social and psychophysiological approaches, applying them to the investigation of fear and persuasion. A fuller understanding of fear appeals and attitude change may require knowledge of physiological, as well as phenomenological, processes.

In the research paradigm designed to investigate the effects of fear appeals on attitude change, an individual typically is exposed to persuasive communications that depict the noxious consequences accruing to a specified course of action. The message usually portends bodily harm to the individual. Recommendations are presented that can avert the danger if the individual adopts the appropriate attitudes and acts on them. Fear-arousing stimuli seek to eliminate response patterns that produce aversive consequences (e.g., cigarette smoking) or establish response patterns that might prevent the occurrence of noxious events (e.g., taking prescribed inoculations).

Historically, fear has been conceptualized as a motivational state protecting one against danger (e.g., Cannon, 1915; Freud, 1936). A "motivational theory of emotion," especially the emotion of fear, is perhaps the most typical conceptualization of the emotions (cf. Izard, 1977; Leeper, 1965; Spence, 1956). A close relationship between emotion and muscular activity has been postulated in a long and rich tradition (e.g., Cannon, 1915; Darwin, 1872/1965; Sherrington, 1906). According to this tradition, the emotional disturbance of the viscera facilitates the muscular activity that protects the organism from the dangerous environmental stimulus: hence the etiology of the word "emotion" itself from the Latin *emovere*, *e* meaning out, and *movere* to move.

The emotion of fear has been of interest because of its role in mediating attitude and behavior change. According to the fear-as-acquired-drive model, fear is acquired through the classical conditioning of a noxious unconditioned stimulus to autonomic and skeletal responses. Fear is the conditioned form of the pain reaction. These conditioned interoceptive responses act as an acquired drive to evoke instrumental avoidance behavior. The instrumental avoidance response is reinforced by drive reduction. Fear is referred to as an acquired drive because it is learned as a response to previously neutral cues. Fear is called a drive because it can produce the learning of new responses. In the initial theoretical formulation of the effects of fear on attitude change, Hovland, Janis, and Kelley (1953) adopted the fear-as-acquired-drive model.

THEORIES OF FEAR AND PERSUASION

The effects of fear on persuasion have been interpreted from three theoretical perspectives. Each theory has been presented in detail by the original author and thus will be reviewed only briefly here. The interested reader should refer to Beck and Frankel's (1981) excellent critical evaluation of all three theories.

Janis's Extension of the Drive Model

One of the first systematic theories of fear and persuasion was provided by Janis (1967), who adopted and extended the fear-as-acquired-drive model. According to this model, if a persuasive communication arouses fear, people are motivated to reduce this unpleasant drive state. Attitudes are changed when they reduce this state of arousal. The amount of attitude change depends on the amount of drive reduction contiguous with rehearsal of the communicator's recommendations. Janis also proposed that fear arousal has both facilitating and interfering effects. Because of these two contrasting effects, persuasion is an inverted-U-shaped function of

the level of fear aroused. Thus, at a low level of arousal, any interfering effects will be outweighed by the facilitating effects of heightened vigilance and the need to seek reassurance. As fear arousal increases, the interfering effects will come to match the facilitating effects. This point is the optimal level of arousal. Beyond this point, facilitating effects are outweighed by interfering effects. Unfortunately, perhaps, the vast majority of tests of this interesting relationship have rejected it. A review of some of the formal inadequacies of this position may be found in Beck and Frankel (1981), Leventhal (1970), and Rogers (1975).

The empirical data have overwhelmingly rejected the drive model of fear appeals and attitude change. The model had to be abandoned for a variety of reasons. First, many variables that should interact with fear arousal (e.g., efficacy of recommendations, specificity of recommendations) did not interact in the manner predicted by drive theory (see the reviews by Beck & Frankel, 1981; Leventhal, 1970). Second, studies manipulating false physiological feedback of fear arousal revealed that arousal per se, not arousal reduction as required by drive theory, produced attitude change (Giesen & Hendrick, 1974; Hendrick, Giesen, & Borden, 1975). These data were interpreted in terms of a cognitive analysis: People use physiological feedback as a cognitive source of information from which to infer their attitudes. Finally, Leventhal's and Rogers's experiments never found a direct relationship between emotional responses (drive) and attitude change. Although the drive model must be rejected, we should remember that this theory not only initiated research in this area, but started the research in a theoretically elegant fashion by applying sophisticated learning theory principles to the study of fear appeals and attitude change.

Leventhal's Parallel Response Model

Leventhal's extensive research program led him to reject the fear-as-acquired-drive model. In its place, Leventhal (1970) proposed a parallel response model that distinguishes between emotional reactions to a threat and attempts to cope with the threat. According to Leventhal, a fear appeal may initiate a danger control process, which attempts to avoid the threatened danger, and/or a fear control process, which functions to reduce fear. These two processes are parallel or independent. Attempts to control fear are not necessary to produce adaptive behavior. Adaptive behavior results primarily from the danger control process. Thus, fear appeals may arouse the emotion of fear, but protective action results from the attempt to control the danger, not to control the fear. Research guided by the parallel response model has focused on how people respond to health threats and noxious medical examinations rather than fear and persuasion. Nevertheless, this research has demonstrated convincingly that emotional responses (i.e., fear control) are independent of and do not directly facilitate

the danger control process of coping (Leventhal, Meyer, & Gutmann, 1980). The parallel response model performed the invaluable service of differentiating emotional from cognitive responses to fear-arousing communications.

Rogers's Original Protection Motivation Theory

I attempted to take the next logical steps of (1) specifying the components of a fear appeal initiating the coping process (i.e., the danger control process), and (2) analyzing this coping process in more detail. In one of the earliest theoretical analyses of fear arousal and persuasion (Hovland *et al.*, 1953), fear appeals were characterized as communications describing the unfavorable consequences that might result from failure to adopt the communicator's recommendations. This definition was sufficiently sweeping to allow fear-arousing communications to be operationalized in a variety of ways. And they were. For example, different levels of fear have been aroused by varying (1) the amount of information in the communications (e.g., the number of references to physical danger; Powell, 1965), (2) the type of information (e.g., use of personalized "It can happen to you" statements; Janis & Feshbach, 1953), (3) presence or absence of films (e.g., Leventhal & Watts, 1966), and (4) what information is emphasized (e.g., the degree of emphasis on negative consequences; Janis & Feshbach, 1953). Furthermore, high versus low fear has been manipulated in some studies by presenting information on the amount of bodily injury *and* the likelihood of exposure in both high- and low-fear conditions (e.g., Chu, 1966) by omitting the latter information only in the low-fear condition (e.g., Janis & Feshbach, 1952) and by omitting the latter information entirely (e.g., Rogers & Thistlethwaite, 1970). Because fear-arousing communications are multifaceted stimuli, their persuasive impact may be due to any one or more of the components. Thus, the effective content stimuli that produce attitude change may not have been firmly established.

If studies have varied types of communication content, it would be difficult to compare experiments and determine the communication variables producing the theoretically relevant changes in attitudes. I believed that conceptualizations of fear appeals had been too global and that they had to be refined if more precise and unequivocal relations were to be generated. An important conceptual and empirical task was to identify the effective content variables and their associated mediational processes.

I proposed that an expectancy-value model, which includes all the factors of concern to investigators on fear communication and to workers with the health belief model (e.g., Becker, Haefner, Kasl, Kirscht, Maiman, & Rosenstock, 1977), be applied to the fear communication problem in a more systematic manner (Rogers, 1975). The three most crucial variables in a fear appeal are (1) the magnitude of noxiousness of a depicted event

(the value component), (2) the conditional probability that the event will occur provided that no adaptive activity is performed (an expectancy), and (3) the effectiveness of a coping response that might avert the noxious event (another expectancy). These three constructs are similar to those in the general category of expectancy-value theories. According to this class of theory, the tendency to perform a particular act is a function of the expectancy that the act will be followed by certain consequences and the value of those consequences. Hopefully, progress in understanding the fear communication problem will be facilitated by a theoretically based classification schema that is linked to more general psychological theories.

It was assumed that each of the three components of a fear appeal initiates a corresponding cognitive mediating process. Each of these processes appraises communication information about (1) noxiousness, (2) probability, or (3) efficacy by placing each stimulus on dimensions of (1) appraised severity of the depicted event, (2) expectancy of exposure to the event, or (3) belief in the efficacy of the recommended coping response, respectively. It has been demonstrated that these cognitive processes are independent (Rogers & Mewborn, 1976). Each of these appraisal processes will be roughly proportional to the strength of the associated message variable. The representation will not be exact, since individuals have different styles of appraising threatening events (cf. Lazarus & Launier, 1978).

It is also assumed that these three cognitive processes mediate the effects of the components of fear appeals on attitudes by arousing what has been termed "protection motivation." The intent to adopt the communicator's recommendation is a function of the amount of protection motivation aroused. Protection motivation is an intervening variable that has the typical characteristics of a motive: It arouses, sustains, and directs activity. The basic postulate is that protection motivation arises from the cognitive appraisal of a depicted event as noxious and likely to occur, together with the belief that a recommended coping response can effectively prevent the threatened event from occurring.

The model asserts that attitude change is not mediated by or a result of an emotional state of fear, but rather is a function of the amount of protective motivation aroused by the cognitive appraisal processes. The emphasis is thus on cognitive processes and protection motivation, rather than on fear as an emotion.

The basic assumption of the original statement of protection motivation theory, that the three crucial components of a fear appeal are noxiousness, probability, and response efficacy, has been confirmed in numerous studies. It was originally assumed that these three components would combine multiplicatively. That is, when persuasion is plotted against any one of the components, the other two components should form a fan of

diverging curves. The original multiplicative combinatorial rule has been rejected. We shall now briefly review the evidence bearing on these three components of a fear appeal.

The noxiousness component has been operationalized, for example, by essays arguing that excessive drinking produces either severe injury or minor irritation to the internal organs (Stainback & Rogers, *in press*). The magnitude of noxiousness of the depicted threat exerts a main effect on intentions (1) to stop smoking (Rogers & Deckner, 1975; Rogers & Thistlethwaite, 1970), (2) to conserve energy (Hass, Bagley, & Rogers, 1975), (3) to abstain from drinking alcohol (Stainback & Rogers, *in press*), and (4) to help an endangered animal species (Shelton & Rogers, 1981). With respect to overt behavior, noxiousness increases the percentage of smokers who are able to stop smoking (Rogers, Deckner, & Mewborn, 1978) and reduces driver education students' error rates on their driving simulators (Griffeth & Rogers, 1976).

Response efficacy has a main effect on intentions to protect oneself (Rogers & Mewborn, 1976; Rogers & Thistlethwaite, 1970), on intentions to protect others (Shelton & Rogers, 1981), and on overt behavior (Chu, 1966). Response efficacy has been operationalized, for example, by essays arguing that there is no effective method to treat venereal disease or that simple medical treatment cures it (Rogers & Mewborn, 1976). Also, response efficacy is effective if combined with another original component of protection motivation theory: The probability of the threat's occurrence. This combination is referred to as "reassurance." Reassurance that the recommended coping response can reduce one's chances of exposure to a threat enhances intentions to adopt that response (Mewborn & Rogers, 1979).

When the probability of the threat's occurrence is manipulated independently of response efficacy, there is some evidence of a simple main effect on intentions (Janis & Mann, 1965; Leventhal & Watts, 1966; Stainback & Rogers, *in press*). The probability of occurrence component has been operationalized, for example, by persuasive essays arguing that a smoker has a very high chance of contracting lung cancer or that, although smoking can cause cancer, the chances of any particular smoker developing cancer are actually quite small (Rogers & Mewborn, 1976). Rogers and Mewborn (1976) and Kleinot and Rogers (1982) found an interaction between probability of occurrence and response efficacy. Figure 6-1 shows that if the recommended coping response is a highly effective preventive practice, increasing the probability of exposure to the danger increases intentions to adopt that practice; if the response is ineffective, increasing probability decreases intentions to adopt the response (*i.e.*, smokers intend to increase their cigarette consumption, Rogers & Mewborn, 1976; and social drinkers intend to increase their alcohol consumption, Kleinot &

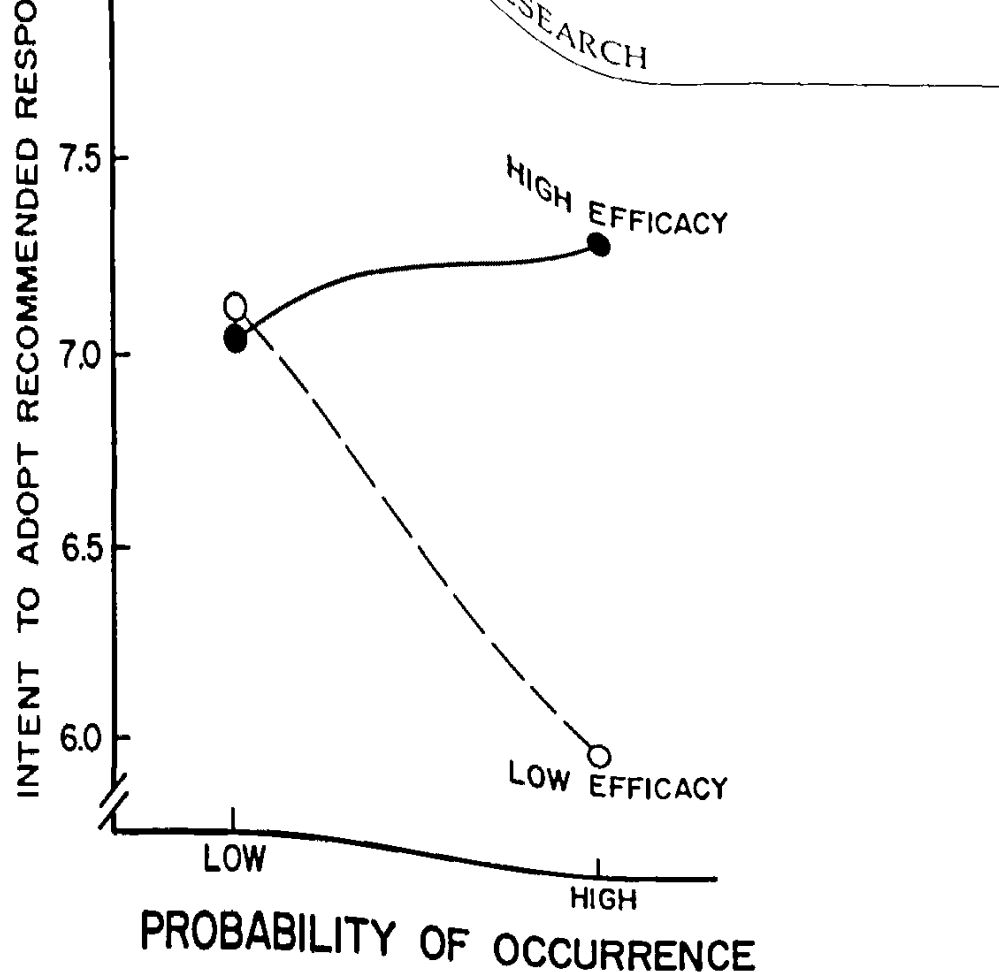


FIGURE 6-1. Intentions as a function of the probability of the threat's occurrence (vulnerability) and response efficacy. From "Fear appeals and attitude change: Effects of a threat's noxiousness, probability of occurrence, and the efficacy of coping responses" by R. W. Rogers & C. R. Mewborn, *Journal of Personality and Social Psychology*, 1976, 34, 54-61. Copyright 1976 by the American Psychological Association. Reprinted by permission.

Rogers, 1982). It is small wonder that psychologists (e.g., Corah, Koch, & Eisenberg, 1977) frequently conclude that fear tactics should be abandoned because they can backfire!

In sum, most of the empirical evidence supports the original theory of protection motivation. There are (at least) three components of a fear appeal that, independently and in combination, affect attitude change. Furthermore, the effects of these communication variables are *mediated* by the cognitive appraisal processes originally proposed. In the section dealing with a revised theory of protection motivation, we shall retain these features of protection motivation theory and build a slightly more elaborate model around them. But first we need to review the research investigating the role of physiological arousal in mediating the effects of fear appeals on attitude change.

MANIPULATIONS OF PHYSIOLOGICAL AROUSAL

According to Schachter and Singer's (1962) well-known theory of emotion, emotion is determined by physiological arousal and situational cues. There

is also evidence that the affective component of an attitude is influenced similarly (cf. Rogers & Deckner, 1975). Rogers and Deckner (1975) investigated the possibility of extending Schachter's theory to determine if physiological arousal and situational cues interact to affect, not only the emotional state of fear, but attitude and behaviors hypothesized to be mediated by the emotion of fear. In a series of experiments, physiological arousal was manipulated directly by injections of epinephrine. Epinephrine was the drug of choice because it is classified as an autonomic arousal agent that closely approximates the discharge of the sympathetic nervous system (Levy & Ahlquist, 1971). Epinephrine enhances vascular, muscular, and metabolic activity in response to stress. A total of 279 cigarette smokers were administered either epinephrine or a placebo and then exposed to situation cues suggestive of disparate emotional states (Experiment 1) or different intensities of the same emotion—fear (Experiment 2). In Experiment 1, disparate emotional states were aroused by exposing subjects to either a low-fear-arousing film or emotionally neutral material. In Experiment 2, the low-fear film, which was the same film used in Experiment 1, portrayed a smoker's discovery that he has lung cancer. The high-fear film consisted of the same scenes plus a 5-minute operation removing the smoker's cancerous lung.

Self-reports of fear, shown in Table 6-1, did not simply fail to replicate Schachter and Singer's classic study; they suggested two modifications of the theory. First, the data from the no-film condition of the first experiment indicated that when there are no compelling situational cues to which to attribute a state of unexplained physiological arousal, epinephrine-induced arousal is interpreted as a state of fear. Marshall and Zimbardo (1979) and Maslach (1979) attempted to replicate Schachter and Singer's

TABLE 6-1. Mean Scores on Self-Report of Fear

	EPINEPHRINE	PLACEBO
Experiment I		
No film*	5.3 _a	2.8 _b
Low-fear film†	6.0 _a	5.1 _a
Experiment II		
High-fear film†	6.2 _a	6.0 _a
Low-fear film†	4.9 _b	4.4 _b

Note. Range = 1 to 9. Means that do not share a common subscript differ significantly; $p < .05$. From Rogers and Deckner (1975).

*Epinephrine-induced arousal may be interpreted as fear.

†Cognitive cues may be more important than physiological activity in labeling emotional states.

study, but they too found a negative bias in the interpretation of unexplained arousal.

The second modification of the original theory is derived from the equivalence of the emotional response in the epinephrine and placebo groups in the low- and high-fear film condition. When situational cues clearly suggest an emotion, the emotional response may be attributed to the situational cues and not to the manipulated arousal. Marshall and Zimbardo reached a similar conclusion. A great deal of evidence has been amassed by Lazarus and his colleagues (see reviews by Lazarus, Averill, & Opton, 1970; Lazarus & Launier, 1978) demonstrating that the manipulation of cognitive cues can enhance or inhibit emotional states. Therefore, the available data strongly suggest that the cognitive appraisal of environmental events is more important than peripheral, physiological activity in labeling emotional states.

The major research question posed by Rogers and Deckner was: Would the manipulation of physiological arousal affect attitudes and behavior change? The answer was no. Since fear was not affected by the experimental manipulations as Schachter's theory predicted, the extension of the theory to attitude change mediated by the emotional state was also rejected. Neither the analyses of variance nor the correlational analyses revealed any relationship between physiological arousal and persuasion. However, the high-fear appeal significantly increased intentions to stop smoking, and a 3-month follow-up revealed that, compared to the low-fear condition, a significantly higher percentage of smokers in the high-fear condition had been able to stop smoking completely. Also, the response-efficacy communication reduced cigarette consumption. In sum, the messages containing information changed cognitive appraisals, which in turn changed attitudes and behavior; the physiological arousal did not.

THE MEDIATIONAL ROLE OF PHYSIOLOGICAL AROUSAL

Empirical Studies of Physiological Arousal and Fear Appeals

We shall now review attitude-change studies that, although not manipulating physiological arousal directly, manipulated fear and employed continuous monitoring of multiple autonomic functions.

Many conceptualizations of emotion maintain that emotion has several component subsystems, including cognitive and physiological components (e.g., Lazarus *et al.*, 1970; Schachter & Singer, 1962). If emotions are defined as syndromes, no single response system may be adequate to infer an emotion. Therefore, it behooves us to measure physiological arousal in studies of fear and persuasion. Studies of other negative affective states, especially stress and anxiety, typically measure self-reports and autonomic

activity. For example, Shapiro and Crider (1968) reported that "activation of the autonomic nervous system is used by psychologists as a measure of choice in the study of stress" (p. 34).

In addition to considering emotion in general as having component subsystems, many definitions of the emotion of fear consider it to have cognitive and physiological subsystems (e.g., Lang, 1971; Lazarus *et al.*, 1970). Yet despite the fact that a physiological component is an integral part of many definitions of emotion and the emotion of fear in particular, few studies of fear and persuasion have simultaneously measured self-report and autonomic measures of fear.

In a rare exception, Corah *et al.* (1977) investigated high- versus low-fear-arousing communications on the topic of dental hygiene. The manipulation of fear had no effects on galvanic skin responses, heart rate, or self-reports of fear. The manipulations simply were not successful. Hendrick *et al.* (1975) investigated false physiological feedback of fear arousal. They found that the false feedback of arousal changed attitudes, but did not affect measures of heart rate or galvanic skin responses. Beck (1979) found that false physiological feedback of negative arousal was related to changes in attitudes and beliefs and that false physiological feedback of positive arousal was related to changes in intentions. However, the manipulations of arousal had no effect on heart rate. Thus, studies of false feedback of emotional arousal indicate that persuasion is independent of physiological activity.

Mewborn and Rogers (1979) showed research participants either a high- or low-fear film on the topic of venereal disease. The low-fear film blandly depicted laboratory procedures for serum detection of syphilis. The high-fear film demonstrated surgical procedures for removing tissue damaged by venereal disease. These two films were of equal length and had been used successfully by Rogers and Mewborn (1976). Half of the subjects were given high reassurance about the effectiveness of the recommended coping response, while half were given low reassurance. In addition to postexperiment measures of emotion and intentions, heart rate and skin conductance were monitored continuously. The results shown in Table 6-2 indicate that an identical pattern of findings emerged on the

TABLE 6-2. Mean Scores on Measures of Fear

	SELF-REPORT	HEART RATE (BEATS PER MINUTE)	SKIN CONDUCTANCE (μ mhos)
High-fear condition	5.8	86.6	9.9
Low-fear condition	3.7	83.6	8.7

Note. From Mewborn and Rogers (1979).

cardiovascular, electrodermal, and self-report measures: The high-fear film produced significantly stronger arousal than the low-fear film.

The fear-arousing film was chosen for study because it is typical of the films used in studies of fear and persuasion (e.g., Leventhal & Watts, 1966; Rogers & Mewborn, 1976). Since the fear manipulation had a main effect on self-reports and autonomic indices of arousal, we can be confident that prior studies employing similar manipulations have also aroused "fear."

The construct validity and generality of paper-and-pencil measures of fear has been enhanced. The significant relationship between these different response measures should be comforting to users of either one. Furthermore, these data tend to weaken two criticisms of self-report measures: (1) People do not possess the appropriate language to report bodily states, and (2) people may be unwilling to report truthfully. The similar pattern of data yielded by the dependent measures of fear indicate that self-report data may be sufficient to check on the adequacy of manipulations. Furthermore, time of measurement interacted with the fear and the reassurance variables on the self-report measure (these interactions were not significant on the heart rate and the skin conductance measures), which suggested that the verbal measure may be more sensitive than the physiological measures.

The intragroup correlation between heart rate and skin conductance was a substantial .70. Thus, although each of these measures may be sensitive to different kinds of events (e.g., skin conductance to novelty, heart rate to action-instigating properties of stimuli), when there is an attempt to arouse fear, there is a great deal of convergence and commonality. However, the self-report measure correlated only .36 with heart rate and .39 with skin conductance. These low correlations are not surprising because each response system serves multiple functions, militating against high correlations (e.g., autonomic activity is responsive to reflexive and homeostatic processes). In addition, whereas the autonomic measures were continuous, the verbal measure required a retrospective report over the preceding 6 to 7 minutes. Students had to select a single value to represent the fluctuating levels of their affective reactions. The multiple correlation among self-report, heart rate, and skin conductance was .44 during the film, but diminished to a negligible .15 during the communication, suggesting that verbal and autonomic measures converge only momentarily after a rather dramatic event. This suggests that the measures will correspond only when their controlling conditions covary. These data support the position of Lang (1971), Lazarus *et al.* (1970), and Leventhal (1970) that these response systems are only loosely integrated—that they are interactive but largely independent except after a dramatic event.

With respect to the role of fear arousal in mediating attitude change, these results disclosed that fear was successfully aroused but did not mediate attitude change. Evidence reviewed in the preceding section led us

to conclude that cognitive appraisal of environmental events is more important than peripheral, physiological activity in *labeling* emotional states (i.e., the films used in the Rogers and Deckner studies affected the labeling of emotion, but the manipulation of physiological arousal did not affect labeling). Taken together, these experiments indicate that the autonomic components of fear are of secondary importance in both the labeling of the emotional state and changing the attitudes hypothesized to be mediated by the emotion of fear. These data are consistent with our path analytic findings that fear arousal does not facilitate attitude change unless this arousal directly affects the cognitive appraisal of the severity of that threat (Rogers & Mewborn, 1976; Shelton & Rogers, 1981).

A Conceptual Review of Physiological Arousal and Cognitive Processes

We have reviewed several studies in which manipulations of fear have changed attitudes or behavioral intentions, but there was no evidence for a mediational role of physiological processes. Let us review the reasons for these negative findings. First, direct manipulations of physiological arousal by injections of the sympathomimetic agent epinephrine did not facilitate attitude change (Rogers & Deckner, 1975). Second, studies monitoring physiological arousal indicated that the arousal was not associated with attitude change (Beck, 1979; Giesen & Hendrick, 1974; Hendrick *et al.*, 1975; Mewborn & Rogers, 1979). Third, fear arousal has been found to have no direct effect on attitude change, but only an indirect effect via the cognitive appraisal of the severity of the threat. Fourth, rejection of the drive model casts doubt on the mediational role of physiological processes, although rejecting the former does not require rejecting the latter. Finally, Cacioppo's (1979) research on his biosocial model of attitude change (other than fear appeals) has demonstrated that a manipulation of heart rate facilitated cognitive elaboration, but had no direct effect on attitude change. Cacioppo concluded "recent evidence casts doubt on a *direct* link between affective and heart rate responses" (p. 496). In sum, the available evidence reveals no direct relationship between physiological arousal and attitude change with (1) perceived but nonveridical changes in autonomic nervous system (ANS) functioning (Beck, 1979; Hendrick *et al.*, 1975), (2) actual but unperceived changes in ANS functioning (Cacioppo, 1979), and (3) actual and perceived changes in ANS functioning (Mewborn & Rogers, 1979; Rogers & Deckner, 1975).

Despite these data, it may be premature to deny physiological processes a mediational role in changing attitudes. Social psychologists need more sophisticated conceptualizations of the physiological processes underlying social phenomena (e.g., the role of negative feedback between the reticular activating system and the baroreceptors of the aortic arch and carotid

sinus). We also need more sophisticated measures (e.g., the transit time of the blood pulse wave to index catecholamine excretion). In a nutshell, we need more collaboration with psychophysiological researchers, which should be mutually beneficial.

How can the data denying physiological processes a mediational role in attitude change be reconciled with the knowledge that in response to a threat, our autonomic nervous system reacts with vascular, muscular, and metabolic activity that serve an adaptive function? These bodily changes mobilize us for flight or fight. The answer may be that these bodily responses play a crucial role *if an immediate bodily response is required to cope with the threat*. No such immediate action is required in studies of attitude change. Therefore, threats requiring immediate action are facilitated by physiological activity. On the other hand, the vast majority of psychological and education interventions designed to change attitudes and behavior are directed toward a very different class of responses. These responses typically do not have to be made immediately and usually must be made repeatedly over a long period of time (e.g., drive safely, take medication). These protective responses must be made after an emotional state and accompanying physiological arousal have vanished. The theory of protection motivation assumes that protection from danger frequently requires long-sustained processes, cognitive representations, rather than reflexive responsivity to physiological events.

There are numerous other advantages to the emphasis on cognitive constructs. With respect to investigations of animal instrumental avoidance learning (an area where peripheral explanations might be expected to be preferred to cognitive ones), Rescorla and Solomon (1967) concluded from their review of the literature that "we have not yet identified any peripheral CRs [conditioned responses] which are necessary to mediate avoidance behavior" (p. 169). They further suggest that physiological activity is merely an index of a central state that mediates the avoidance learning. Mineka (1979) concluded: "There is often a marked dissociation between fear and avoidance responding that had led a number of theorists to question whether fear plays any role at all in mediating avoidance responding" (p. 985). Our conclusion is also consistent with the position of Obrist and his colleagues (e.g., Obrist, Gaebelein, Shanks, Langer, & Botticelli, 1976) that changes in heart rate and somatic activity are both mediated by a common central nervous system integrating mechanism. Although bodily responses do not control emotion, however, they can be used as indices of emotional states (cf. Grings & Dawson, 1978). Thus, the deemphasis on the mediational role of physiological processes is consistent with empirical data and emerging conceptualizations. Both emotional responses and coping responses are products of cognitive appraisal. The cognitive appraisal processes are the crucial mediating processes. We shall

now attempt to extend the theory of protection motivation reviewed earlier, focusing on these cognitive mediational processes.

A REVISED THEORY OF PROTECTION MOTIVATION

One of the major purposes of this chapter is to revise and extend protection motivation theory. The revised theory includes (1) a broader statement about the sources of information initiating the coping process, (2) additional cognitive mediating processes, and (3) a fuller exposition of the modes of coping. The components of the original model remain intact in the revision. The components of a fear appeal are part of the "verbal persuasion" source of information. The associated cognitive mediational processes are now part of a more comprehensive model. A schema of protection motivation theory is shown in Figure 6-2.

Sources

The sources of information initiating the cognitive mediating processes can be environmental or intrapersonal. The environmental sources include verbal persuasion (especially fear appeals) and observational learning (seeing what happens to others). The intrapersonal sources include personality variables and prior experiences with similar threats (including feedback from coping activity). Any source of information can lead to any of the mediating processes. The focus of protection motivation theory is on the cognitive mediational processes, regardless of the source.

Cognitive Mediating Processes

The sources of information initiate two appraisal processes: threat appraisal and coping appraisal (which are similar to Lazarus's primary and secondary appraisals, respectively).¹ The components of these appraisal processes may be viewed as the 4 cells of a 2 × 2 table. These cognitive processes appraise (1) either the maladaptive or adaptive response(s), and (2) the variables increasing or decreasing the probability of the occurrence of the response.

We shall consider threat appraisal first. The maladaptive response can be a behavior currently engaged in (e.g., drinking excessively) or one that

1. A principal distinction between Lazarus's position and the protection motivation position is that the latter organizes the cognitive mediating processes around (1) the maladaptive versus the adaptive response, and (2) the factors increasing versus decreasing response probability (see Figure 6-2). Thus, protection motivation theory is more specific about the component cognitions of threat appraisal (e.g., beliefs in severity and vulnerability) and of coping appraisal (e.g., beliefs in self-efficacy).

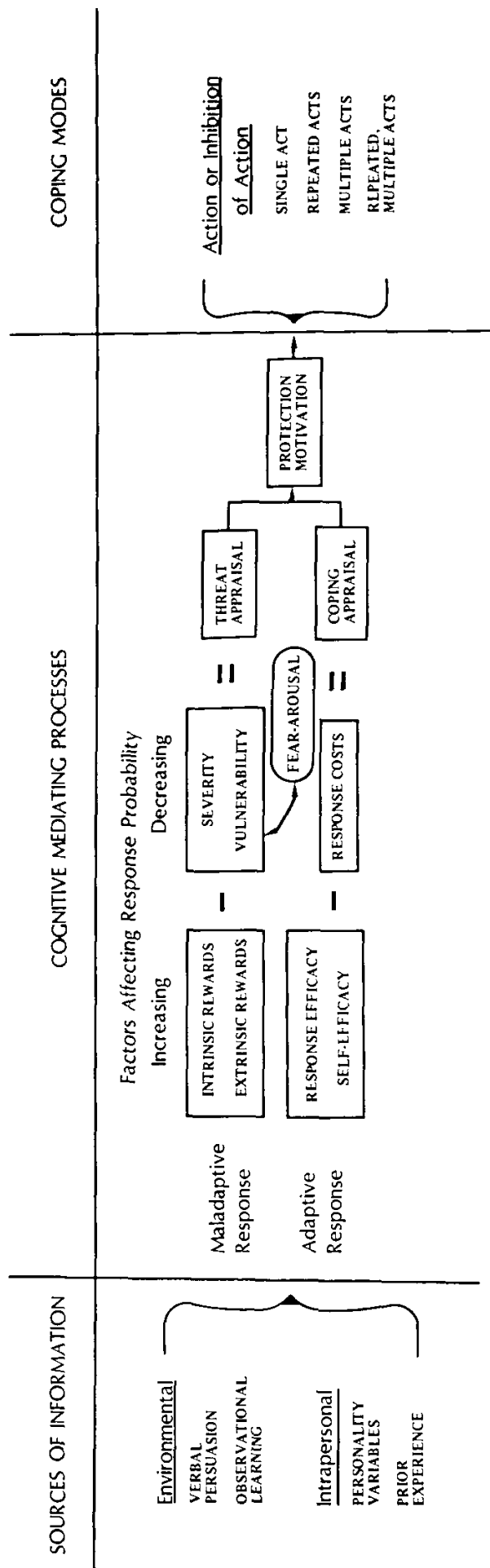


FIGURE 6-2. Schema of protection motivation theory.

could be adopted (e.g., starting to smoke). The factors increasing the probability of the maladaptive response (i.e., positive reinforcers) include both intrinsic rewards (e.g., bodily pleasure, satisfaction) and extrinsic rewards (e.g., social approval). The factors decreasing the probability of the occurrence of the maladaptive response (i.e., punishers) are the severity of the threat and the expectancy of being exposed to the threat (i.e., one's vulnerability). Although severity usually refers to bodily harm, it can also involve intrapersonal threats (e.g., self-esteem) and interpersonal threats (e.g., family and work relationships). It is assumed that the appraisal of these factors increasing and decreasing the probability of the maladaptive response will summate algebraically to produce the final appraisal of threat.

We have seen that fear arousal was originally thought to be the crucial mediator of the effects of fear appeals on attitude and behavior change (cf. Hovland *et al.*, 1953). The preceding sections of this chapter have shown that physiological activity is cognitively appraised and these central nervous system events mediate protective activity. Our emphasis on "protection motivation" rather than "fear" is designed to emphasize the importance of cognitive processes rather than visceral ones. According to protection motivation theory (Rogers & Mewborn, 1976), the emotional state of fear influences attitude and behavior change, not directly, but only indirectly through the appraisal of the severity of the danger. Note in Figure 6-2 that arousal has no direct link to protection motivation or coping.

The coping appraisal process evaluates one's ability to cope with and avert the threatened danger. As seen in Figure 6-2, the beliefs that increase the probability of the adaptive response are the beliefs that the recommended coping response is effective (e.g., "stopping smoking is an effective way to avoid the dangers associated with smoking") and that one can successfully perform the coping response (e.g., "I can stop smoking"). Coping appraisal is a summation of these appraisals of response efficacy, self-efficacy, and any "costs" of adopting the recommended preventive response: inconvenience, expense, unpleasantness, difficulty, complexity, side effects, disruption of daily life, and overcoming habit strength.

Self-efficacy is the major new component of the theory. According to Bandura (1977), a self-efficacy expectancy is the belief that one is or is not capable of performing a behavior. Self-efficacy is so important that Bandura proposed that *all* processes of psychological change are mediated by changes in an individual's sense of self-efficacy or mastery. According to Bandura, the cognitive appraisal of self-efficacy determines if coping behavior will be initiated, which behavior(s) will be chosen, how much effort will be expended, and how long it will persist.

Virtually every expectancy-value theory has omitted the self-efficacy concept. Research on fear and attitude change, however, has referred to it. Leventhal (1970) noted that not only must a coping response be effective, but one must possess the ability to make that coping response. Leventhal

operationalized this concept in terms of "specific action instructions," which consistently has been found to facilitate coping. Recently, he included self-efficacy as a component of his self-regulatory model of dealing with health threats (Leventhal *et al.*, 1980). He also noted that early research in the fear and persuasion area investigating the personality variable of self-esteem was concerned with a similar issue; however, research with a new scale to measure dispositional self-efficacy has found it is relatively independent of self-esteem (Sherer, Maddux, Mercadante, Prentice-Dunn, Jacobs, & Rogers, 1982). The most thorough analysis of the role of self-efficacy for fear appeals has been offered by Beck and his colleagues (Beck & Frankel, 1981; Beck & Lund, 1981). Beck argued that self-efficacy (he prefers to label it personal efficacy) is not only an important construct but that it is critical to each of the three existing theories of how people cope with threats to their health. The only experiment I am aware of that manipulated self-efficacy in the context of an attitude-change study found that self-efficacy tended to increase intentions to adopt the communicator's recommendation (Maddux, Sherer, & Rogers, 1982). Our ability to understand and predict the effects of fear appeals on persuasion is greatly advanced by including the concept of self-efficacy.

Figure 6-2 shows that the amount of protection motivation elicited is a function of the threat appraisal and coping appraisal processes. Protection motivation, like any intervening variable, can be measured several ways, but it is assumed that protection motivation is best measured by behavioral intentions. The major assumptions of protection motivation theory are that the motivation to protect oneself from danger is a positive linear function of four beliefs: (1) the threat is severe, (2) one is personally vulnerable to the threat, (3) one has the ability to perform the coping response, and (4) the coping response is effective in averting the threat. Furthermore, the motivation is a negative linear function of (1) the reinforcements associated with the maladaptive response, and (2) the response costs.

The additive model holds *within* each appraisal process. When combining components *between* the two processes, second-order interaction effects occur (see Figure 6-1). It is assumed that if response efficacy (or self-efficacy) is high, severity and/or vulnerability will have a simple main effect on intentions; if response efficacy (or self-efficacy) is low, increments in severity and/or vulnerability will either have no effect or a boomerang effect, actually reducing intentions to comply with the recommendations. Thus, the model predicts outcomes that violate a completely rational decision-making process. There are at least two conditions in which individuals feel incapable of protecting themselves: (1) if the only available coping response is ineffective (i.e., low response efficacy), and (2) if they cannot perform the necessary coping response (i.e., low self-efficacy). We have obtained no evidence indicating that the boomerang effect shown in

Figure 6-1 is a product of defensive avoidance, denial, or reactance (Kleinot & Rogers, 1982; Rogers & Mewborn, 1976). It is assumed that the inability to protect oneself induces feelings of helplessness and loss of control. These feelings may motivate attempts to restore *perceived* control of one's fate, which can be accomplished by consciously and vigorously choosing to perform the behavior that will lead to the inescapable danger.

These assumptions yield six sufficient conditions that are prerequisite to eliciting protection motivation and coping behavior: An individual must believe that (1) the threat is severe, (2) he or she is vulnerable, (3) he or she can perform the coping response, (4) the coping response is effective, (5) the rewards associated with the maladaptive response are outweighed by the factors decreasing the probability of making the maladaptive response, and (6) the costs of the adaptive response are outweighed by the factors increasing the probability of making the adaptive response.

This model does not assume that the decision maker is rational. Each of the appraisal processes will be biased by heuristic judgments (Tversky & Kahneman, 1981) and the vividness of the sources of information (Nisbett & Ross, 1980). For example, in a recent study of vividness, we discovered that manipulations of the concreteness of information in a fear appeal affected the threat appraisal process (Sherer & Rogers, submitted for publication). That is, although information about the magnitude of bodily damage was held constant, the more detailed and specific the information, the more severe the threat was believed to be. Another aspect of vividness is how emotionally interesting information is. If the people depicted in the fear appeal messages were upset by the health threat (problem drinking in the Sherer and Rogers experiment) and were similar to the subjects, the subjects' intentions to protect themselves (i.e., moderate alcohol use) were stronger than if the people depicted in the messages were not upset and were dissimilar to the subjects. Thus, at least two components of vividness affect the threat appraisal process and intentions to protect oneself. In addition to these cognitive biases, there are dynamic tendencies of defensively avoid threats (cf. Janis & Mann, 1977). Detailed consideration of these cognitive and motivational sources of bias is beyond the scope of this chapter. These biasing processes will prevent a one-to-one mapping of the objective information, but the final appraisals will reflect them. Thus, protection motivation should correspond closely with final threat and coping appraisals.

Coping Modes

Protection motivation eventuates in a single act, repeated acts (e.g., return to clinic for follow-up visits), multiple acts, or repeated multiple acts. Furthermore, the acts can either involve direct action or the inhibition of action. That is, coping with a threat may require that one actively do

something (e.g., stop smoking, take medication) or *not* start something (e.g., do not start smoking). Attempts to persuade people to take direct action is usually the goal of remedial programs (i.e., illness and sick role behaviors); attempts to persuade people to refrain from an act is the goal of prevention programs.

Having hypothesized that protection motivation is best measured by behavioral intentions, a comment on the relation between intentions and behavior is in order. This relationship has been the subject of extensive and intensive research, guided by Fishbein's model. This research (e.g., Fishbein & Ajzen, 1975) has demonstrated that intentions accurately predict behavior if (1) the behavior, object, situation, and time are measured at the same level of specificity, and (2) the measure of intention reflects intention at the time the behavior is measured.

Three final observations are important. First, what about the factors, which are not included in protection motivation theory, known to affect coping with threats? These factors are assumed to be "external" or "distal" determinants of protection motivation. That is, those conditions not explicitly included in the model influence protection motivation and coping behavior *indirectly* by affecting threat appraisal and/or coping appraisal. Second, we should note that the theory has moved beyond fear appeals and persuasion. The theory is now sufficiently broad to apply to any situation involving threat (e.g., health behavior, coping with stress, compliance). Finally, protection motivation theory is one of a class of theories that differ from each other only in detail. It is similar to the health belief model (Becker *et al.*, 1977) and the models of Lazarus (Lazarus & Launier, 1978) and Leventhal (Leventhal *et al.*, 1980). These theories deal with essentially the same beliefs, but organize them differently and assume slightly different mediational processes.² It would be comforting to believe

2. There are several differences between the health belief model (HBM) and the protection motivation model. (Some distinctions between our position and Lazarus's and Leventhal's positions have been noted previously.) First, the components of the HBM are organized like predictors in a multiple regression equation; the components of protection motivation theory are organized and differentiated according to (1) the maladaptive versus the adaptive response, and (2) the factors increasing versus decreasing response probability (see Figure 6-2). A related distinction is that the models assume different mediating processes. Threat appraisal and coping appraisal (especially the component of self-efficacy) are unique to protection motivation. Third, the HBM has difficulty accounting for the frequently observed lack of effects of severity or vulnerability, but our model can account for them. Fourth, the HBM does not deal explicitly with emotional arousal, which has been shown to have an indirect effect in our model. Fifth, the concepts of the HBM have not been connected to antecedent conditions (especially components of persuasive communication) as precisely as those of the protection motivation model. Finally, the HBM assumes that the presence of the appropriate components will lead to changes in health behavior, whereas our model assumes that the appropriate components will lead to changes in motivation to protect oneself, which is best indexed by behavioral intentions. We assume that intentions are related to behavior according to Fishbein's well-known theory of reasoned action.

that these similarities mean that our theories are as advanced as unified theories of particle interaction, which also differ from each other only in detail. (It would also be delusional.) Nevertheless, I interpret this convergence in theory construction to be a strength.

CONCLUSION

Fear added wings to his feet.—Vergil (*The Aeneid*)

Social psychologists realized long ago that fear might do for attitudes what it did for feet. The original theoretical formulation borrowed heavily from the reinforcement theories of the time. Several different theories have evolved, each attempting to rectify the inadequacies of the previous positions. In this sense, theory construction has advanced in a systematic, cumulative fashion. One of the major goals of this chapter was to describe a revision of one of those theories.

We discovered several different types of experiments designed to investigate the role of physiological processes in attitude change. Some studies actually manipulated physiological arousal, others led people to believe they were aroused, and others measured physiological activity. All roads led to the same conclusion: There is very little, if any, evidence supporting the proposition that physiological processes mediate fear-based attitude change. We learned that fear arousal (which includes a physiological component) can affect attitude change only by first altering the cognitive appraisal of the severity of the threatening event. This relationship was incorporated into the revised theory of protection motivation. Furthermore, as the evidence unfolded, it became increasingly apparent that cognitive processes were much more important than physiological ones in changing attitudes and behavior. Protection motivation theory incorporated these new findings into an organized and sequential framework. Basically, any source of information about a threat, especially a fear appeal, initiates a threat appraisal process and a coping appraisal process. The former evaluates the consequences of acting maladaptively, and the latter evaluates the consequences of coping adaptively. Furthermore, the components of the two cognitive appraisal processes were organized according to whether they increased or decreased the probability of the adaptive and maladaptive responses.

According to protection motivation theory, the sinners in Jonathan Edwards's congregation would weigh the rewards associated with their wicked ways against their beliefs that they might be consigned to an everlasting Hell. The congregation also would quickly assess the effectiveness of the preacher's recommendation and their ability to follow his instructions despite the "costs" involved. The outcome of these two appraisal processes would determine the flock's motivation to take pro-

protective action. Fear may add wings to the sinners' feet so they can run faster, but protection motivation adds the wings that will enable them to soar over the bottomless pit.

R E F E R E N C E S

- Bandura, A. Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 1977, 84, 191-215.
- Beck, K. H. The effects of positive and negative arousal upon attitudes, belief acceptance, behavioral intention, and behavior. *Journal of Social Psychology*, 1979, 107, 239-251.
- Beck, K. H., & Frankel, A. A conceptualization of threat communications and preventive health behavior. *Social Psychology Quarterly*, 1981, 44, 204-217.
- Beck, K. H., & Lund, A. K. The effects of health threat seriousness and personal efficacy upon intentions and behavior. *Journal of Applied Social Psychology*, 1981, 11, 401-415.
- Becker, M. H., Haefner, D. P., Kasl, S. V., Kirscht, J. P., Maiman, L. A., & Rosenstock, I. M. Selected psychosocial models and correlates of individual health-related behaviors. *Medical Care*, 1977, 15, 27-46.
- Cacioppo, J. T. Effects of exogenous changes in heart rate on facilitation of thought and resistance of persuasion. *Journal of Personality and Social Psychology*, 1979, 37, 489-498.
- Cannon, W. B. *Bodily changes in pain, hunger, fear, and rage*. New York: Appleton, 1915.
- Chu, C. C. Fear arousal, efficacy, and imminency. *Journal of Personality and Social Psychology*, 1966, 4, 517-524.
- Corah, N. L., Koch, B. E., & Eisenberg, L. S. *Use of fear appeals to change oral hygiene behavior*. Paper presented at the meeting of the International Association for Dental Research, Copenhagen, 1977.
- Darwin, C. *The expression of the emotions in man and animals*. Chicago: University of Chicago Press, 1965. (Originally published, 1872.)
- Fishbein, M., & Ajzen, I. *Belief, attitude, intention, and behavior*. Reading, Mass.: Addison-Wesley, 1975.
- Freud, S. *The problem of anxiety*. New York: W. W. Norton, 1936.
- Giesen, M., & Hendrick, C. Effects of false positive and negative arousal feedback on persuasion. *Journal of Personality and Social Psychology*, 1974, 30, 449-457.
- Griffeth, R., & Rogers, R. Effects of fear-arousing components of driver education on students' attitudes and simulator performance. *Journal of Educational Psychology*, 1976, 69, 501-506.
- Grings, W. W., & Dawson, M. E. *Emotions and bodily responses: A psychophysiological approach*. New York: Academic, 1978.
- Harris, V. A., & Katkin, E. S. Primary and secondary emotional behavior: An analysis of the role of autonomic feedback on affect, arousal, and attribution. *Psychological Bulletin*, 1975, 82, 904-916.
- Hass, J., Bagley, G., & Rogers, R. Coping with the energy crisis: Effects of fear appeals upon attitudes toward energy consumption. *Journal of Applied Psychology*, 1975, 60, 754-756.
- Hendrick, C., Giesen, M., & Borden, R. False physiological feedback and persuasion: Effect of fear arousal vs. fear reduction on attitude change. *Journal of Personality*, 1975, 43, 196-214.
- Hovland, C., Janis, I., & Kelley, H. *Communication and persuasion*. New Haven, Conn.: Yale University Press, 1953.
- Izard, C. *Human emotions*. New York: Plenum, 1977.
- Janis, I. L. Effects of fear arousal on attitude change: Recent developments in theory and experimental research. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 3). New York: Academic, 1967.

- Janis, I. L., & Feshbach, S. Effects of fear-arousing communications. *Journal of Abnormal and Social Psychology*, 1953, 48, 78-92.
- Janis, I. L., & Mann, L. Effectiveness of emotional role-playing in modifying smoking habits and attitudes. *Journal of Experimental Research in Personality*, 1965, 1, 84-90.
- Janis, I. L., & Mann, L. *Decision making*. New York: Free Press, 1977.
- Kleinot, M. C., & Rogers, R. W. Identifying effective components of alcohol misuse prevention programs. *Journal of Studies on Alcohol*, 1982, 43, 802-811.
- Lang, P. J. The application of psychophysiological methods to the study of psychotherapy and behavior modification. In A. E. Bergin & S. L. Garfield (Eds.), *Handbook of psychotherapy and behavior change: An empirical analysis*. New York: Wiley, 1971.
- Lazarus, R. S., Averill, J. R., & Opton, E. M. Toward a cognitive theory of emotion. In M. Arnold (Ed.), *Feelings and emotion*. New York: Academic, 1970.
- Lazarus, R. S., & Launier, R. Stress-related transactions between person and environment. In L. Pervin & M. Lewis (Eds.), *Perspectives in interactional psychology*. New York: Plenum, 1978.
- Leeper, R. Some needed developments in the motivational theory of emotions. In D. Levine (Ed.), *Nebraska Symposium on Motivation*. Lincoln: University of Nebraska Press, 1965.
- Leventhal, H. Findings and theory in the study of fear communications. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 5). New York: Academic, 1970.
- Leventhal, H., Meyer, D., & Gutmann, M. The role of theory in the study of compliance to high blood pressure regimens. In R. Haynes & M. Mattson (Eds.), *Patient compliance to prescribed antihypertensive medication regimens: A report to the National Heart, Lung, and Blood Institute* (NIH Publ. No. 81-2102). Bethesda, Md.: U.S. Department of Health and Human Services, 1980.
- Leventhal, H., & Watts, J. Sources of resistance to fear-arousing communications on smoking and lung cancer. *Journal of Personality*, 1966, 34, 155-175.
- Levy, B., & Ahlquist, R. Adrenergic drugs. In J. R. Dipalma (Ed.), *Drill's pharmacology in medicine* (4th ed.). New York: McGraw-Hill, 1971.
- Maddux, J. E., Sherer, M., & Rogers, R. W. Self-efficacy expectancy and outcome expectancy: Their relationship and their effects on behavioral intentions. *Cognitive Therapy and Research*, 1982, 6, 207-211.
- Marshall, G. D., & Zimbardo, P. G. Affective consequences of inadequately explained physiological arousal. *Journal of Personality and Social Psychology*, 1979, 37, 970-988.
- Maslach, C. Negative emotional biasing of unexplained arousal. *Journal of Personality and Social Psychology*, 1979, 37, 953-969.
- Mewborn, C. R., & Rogers, R. W. Effects of threatening and reassuring components of fear appeals on physiological and verbal measures of emotion and attitudes. *Journal of Experimental Social Psychology*, 1979, 15, 242-253.
- Mineka, S. The role of fear in theories of avoidance learning, flooding, and extinction. *Psychological Bulletin*, 1979, 86, 985-1010.
- Nisbett, R., & Ross, L. *Human inference: Strategies and shortcomings of social judgment*. Englewood Cliffs, N.J.: Prentice-Hall, 1980.
- Obrist, P. A., Gaebelein, C. J., Shanks, E. M., Langer, A. W., & Botticelli, L. J. Cardiovascular behavioral interactions. In D. Mostofsky (Ed.), *Behavior control and modification of physiological activity*. Englewood Cliffs, N.J.: Prentice-Hall, 1976.
- Powell, F. The effect of anxiety-arousing messages when related to personal, familial, and impersonal referents. *Speech Monographs*, 1965, 32, 102-106.
- Rescorla, R., & Solomon, R. L. Two-process learning theory: Relationships between Pavlovian conditioning and instrumental learning. *Psychological Review*, 1967, 14, 151-182.
- Rogers, R. W. A protection motivation theory of fear appeals and attitude change. *Journal of Psychology*, 1975, 91, 93-114.
- Rogers, R. W., & Deckner, C. W. Effects of fear appeals and physiological arousal upon emotion, attitudes, and cigarette smoking. *Journal of Personality and Social Psychology*, 1975, 32, 222-230.

- Rogers, R. W., Deckner, C. W., & Mewborn, C. R. An expectancy-value theory approach to the long-term modification of smoking behavior. *Journal of Clinical Psychology*, 1978, 34, 562-566.
- Rogers, R. W., & Mewborn, C. R. Fear appeals and attitude change: Effects of a threat's noxiousness, probability of occurrence, and the efficacy of coping responses. *Journal of Personality and Social Psychology*, 1976, 34, 54-61.
- Rogers, R. W., & Thistlethwaite, D. L. Effects of fear arousal and reassurance upon attitude change. *Journal of Personality and Social Psychology*, 1970, 15, 227-233.
- Schachter, S., & Singer, J. E. Cognitive, social, and physiological determinants of emotional state. *Psychological Review*, 1962, 69, 379-399.
- Shapiro, D., & Crider, A. Psychophysiological approaches in social psychology. In G. Lindzey & E. Aronson (Eds.), *The handbook of social psychology* (Vol. 3). Reading, Mass.: Addison-Wesley, 1968.
- Shelton, M. L., & Rogers, R. W. Fear-arousing and empathy-arousing appeals to help: The pathos of persuasion. *Journal of Applied Social Psychology*, 1981, 11, 366-378.
- Sherer, M., Maddux, J. E., Mercadante, B., Prentice-Dunn, S., Jacobs, B., & Rogers, R. The self-efficacy scale: Construction and validation. *Psychological Reports*, 1982, 51, 663-671.
- Sherer, M., & Rogers, R. W. Impact of vividness of information on persuasiveness of fear appeals. Manuscript submitted for publication.
- Sherrington, C. S. *The integrative action of the nervous system*. London: Constable, 1906.
- Spence, K. W. *Behavior therapy and conditioning*. New Haven, Conn.: Yale University Press, 1956.
- Stainback, R. D., & Rogers, R. W. Identifying effective components of alcohol abuse prevention programs: Effects of fear appeals, message style, and source expertise. *International Journal of the Addictions*, in press.
- Tversky, A., & Kahneman, D. The framing of decisions and the psychology of choice. *Science*, 1981, 211, 453-458.