CHAPTER 40

Emotions and Health Behavior

A Self-Regulation Perspective

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The study of emotions and health has had a long history. To begin with, research was concerned with the influence of physiological reactions (later termed "stress") to outside aversive events (Selye, 1951). Subsequent research examined the influence of experienced negative emotions on the body's ability to fight infections (Cohen & Wills, 1985). More recently, Leventhal and Patrick-Miller (2000) have argued that emotions can be causes of health states as well as outcomes, and can even be indicators of health. Such relationships usually assume a direct pathway between health and emotions. However, it is also plausible to envision indirect influences between emotions and health—for example, those in which emotions influence health behaviors (e.g., screening for cancer), which in turn might influence health states.

Traditional health behavior theories, such as the health belief model or the theory of planned behavior (Ajzen, 1985), have not been concerned with the influence of emotional states on health behavior. Such theories stand in contrast to a self-regulation perspective, as elaborated in the parallel-processing model (Leventhal, 1970) or the cognitive-social health information processing (C-SHIP) framework (Miller, Shoda, & Hurley, 1996). In both of these latter approaches, emotional states are given equal weight to the cognitive processing of a health threat. Still, the specific roles of emotions in health cognitions and health behavior have not as yet been well described, compared to the body of literature that has concerned itself with the description and influence of health-related beliefs and illness representations (Lau & Hartman, 1983; Meyer, Leventhal, & Gutmann, 1985; Miller, Diefenbach, Krantz, Baum, & Academy of Behavioral Medicine Research, 1998).

This chapter explores the possible roles emotions may play in health cognitions and subsequent health behaviors. In our effort to address this topic, we rely on a self-regulation perspective and will also draw from other perspectives, including those from health, social, and cognitive psychology, as well as from the judgment and decision literature. The chapter is structured as follows. First, a historical perspective
relating results from the early fear studies (e.g., Janis & Feshbach, 1953) to the emergence of the cognitive-affective parallel-processing framework (Leventhal, 1970) is presented. Next, studies on negative emotions and breast cancer screening are described, to illustrate the complex relationship between emotions and health behavior. This description is followed by a brief discussion of cognitive models of decision making, focusing primarily on a description of heuristics, and their relationship to cognitive and affective threat representations in a self-regulation framework (Leventhal & Diefenbach, 1991; Miller et al., 1996, 1998). Following this, we return to the example of breast cancer screening, applying theory to resolve divergent findings in that literature. We conclude with a discussion of new areas of research emanating from our review; we focus in particular on four functions of emotions derived from the decision-making literature and applied to the self-regulation framework.

EARLY STUDIES ON EMOTIONS AND BEHAVIOR

It is worthwhile to briefly review the original studies on fear communications. Fear appeals (or communications) originated from the fear-drive reduction model advanced by Dollard and Miller (1950). The central hypothesis underlying this model was that fear acts as a motivating force prompting individuals to perform recommended behaviors, which in turn reduce the unpleasant fear state. This model generally assumed that as the level of fear increases, so too does the likelihood of changes in behavior and attitude. Interventions based on this model consisted of fear-arousing messages that paired images of the undesired outcome with a recommendation for new behaviors. For example, pictures of decaying teeth were presented with the message to brush one’s teeth regularly.

One of the first experimental studies to test this model was conducted by Janis and Feshbach (1953). Junior high school students received recommendations for oral hygiene (i.e., brushing one’s teeth three times a day) coupled with three different fear appeals. The high-fear condition consisted of vivid pictures of decaying teeth and gums; the mild-fear condition consisted of less vivid pictures; and the no-fear condition had no pictures of decaying teeth. It was hypothesized that a positive linear relationship between intensity of fear and a person’s willingness for behavior change would be found, such that higher levels of fear would be associated with a greater likelihood of behavior change. Contrary to the researchers’ expectations, students in the no-fear condition were more likely to change their dental hygiene than students in either the mild-fear or high-fear conditions. Janis and Feshbach attributed these findings to defensive avoidance aroused among students exposed to the fear messages (see also Janis, 1967).

A majority of subsequent studies, however, did not confirm these initial results or this interpretation. In studies that employed Janis and Feshbach’s basic experimental design, higher levels of fear were consistently associated with stronger behavioral intentions or actual behavior changes. One such study (Dabbs & Leventhal, 1966) exposed students to three levels of fear-arousing information about the consequences of failing to obtain a tetanus shot. Both intentions and actual inoculation behavior correlated linearly with increased fear arousal; that is, students with higher fear were much more likely to obtain a tetanus shot. This basic pattern of results has been confirmed in studies using a number of paradigms, such as safe driving (Leventhal & Tremblay, 1968; Rogers & Deckner, 1975), dental hygiene (Leventhal & Singer, 1966), and smoking cessation (Leventhal & Watts, 1966; Rogers & Thistlethwaite, 1970).

Another implication of these studies was the realization that the effects of fear appeals are transient and short-lived (Leventhal & Niles, 1965), and that intentions can best be translated into behavior if an individual receives an action plan. An “action plan” is a concrete set of instructions containing information about how, when, and where to execute a desired action in the context of the individual’s life (e.g., getting a tetanus shot—Leventhal, Singer, & Jones, 1965; quitting smoking—Leventhal, Watts, & Pagano, 1967). Most importantly, it was found that if an action plan was provided, the attitude change and desired behaviors were sustained over weeks or months (in the case of smoking cessation) beyond the immediate effects of the fear appeal. The results suggested that neither fear (high or low) nor an action plan alone was sufficient to result in behavioral change; rather, the combination of fear and an action plan resulted in changes to individuals’ cognitive and emotional representations of a
threat, and these led in turn to changes in behavior (Leventhal, 1970).

THE FIRST PARALLEL-PROCESSING FORMULATION OF COGNITION AND EMOTION

The realization that individuals’ threat representations are central to motivating behavior had two major implications. First, it led to research describing the content and nature of threat representations; second, it led to the development of a new theoretical framework, the parallel-processing model (Leventhal, 1970). In contrast to the fear-drive reduction model, which assumed serial processing of cognition and emotion (i.e., emotion follows cognition), this framework postulates the parallel processing of threat messages on both cognitive and emotional levels. Stimuli and potential responses are evaluated and represented simultaneously with both cognitions and emotions. The representations are situated within a processing network that is modified as new information enters.

The notion of “separate but equal” processing arms for cognition and emotion in a parallel framework raises the question of how the two arms interact to determine coping and appraisal behaviors. Much past research in this vein has assumed the existence of a processing system heavily influenced by a cognitive approach to information processing and decision making (e.g., Simon, 1967; Kahneman & Tversky, 1982). Zajonc (1984) was a strong proponent of the importance of emotion. He noted that although cognitions are traditionally viewed as the primary driver of decisions, emotions need not always be postcognitive phenomena. According to Zajonc, emotions can be quite independent of cognitive operations and can precede them in time. Indeed, some investigators have proposed that people use an emotion heuristic for decision making; this means that individuals’ representations of objects or people are “tagged” with emotion (Finnucane, Alhakami, Slovic, & Johnson, 2000), and that individuals access this “affective pool” in the process of making judgments. This is not unlike Damasio’s (1994) hypothesis that thought is drawn largely from images consisting of symbolic representations. Individuals over time learn to “mark” these images as positive or negative, based on personal experiences.

Hence, if a negative image is linked to an image of a future outcome, it may serve as a barrier to a given action; if a positive image is associated with the outcome image, it may serve as an incentive. This is important, as we shall see when discussing further developments of the parallel-processing framework, such as the common-sense model of illness behavior and the C-SHIP model (Miller et al., 1996).

THE EXAMPLE OF FEAR AND BREAST CANCER SCREENING

Having reviewed the early literature on fear processing and the emergence of a psychological model to account for divergent experimental findings, we turn to a more recent example that illustrates the complex relationship between emotion and health behavior. We have chosen the example of how negative emotional states such as worry or fear affect breast cancer screening, because it is one of the best-developed areas within the otherwise sparse body of empirical studies on the relationship between emotions and cancer screening.

The U.S. Department of Health and Human Services (2000) report Healthy People 2010 makes screening a cornerstone of cancer prevention and control efforts. It recognizes that one of the most important weapons in the battle against cancer is early detection through screening. Existing guidelines, endorsed by all major health institutes, recommend screening for breast, cervical, and colon cancer. Because patients’ uptake of these recommendations has been variable, research on patients’ decisions about screening is of paramount importance, and this is an area where emotions play a key role.

We conducted broad searches of comprehensive computerized databases (MEDLINE, PsycLIT, and CancerNet). This process identified 21 relevant, quantitative, empirical studies of breast cancer screening, published in English in peer-reviewed journals between 1990 and 2006. All studies included quantitative measures of worry or fear and actual screening behavior (not intentions to be screened).

“Cancer worry” or “cancer fear” is defined as a negative emotional state with specific reference to cancer. It is often assessed with a four-item scale developed by Lerman and colleagues (Lerman, Trock, Rimer, Boyce, et al., 1991; Lerman, Trock, Rimer, Jepson, et al., 1991).
This scale not only measures the degree of worry in response to cancer, but determines the impact such worry has on daily functioning. An alternative approach is to use a single item such as “When thinking about cancer, I am worried,” which is scored on a 4- or 5-point Likert scale.

Results across the pool of 21 primary studies were mixed and are summarized in Table 40.1. Thirteen studies reported a positive association between anxiety and screening; that is, greater anxiety was associated with more screening behavior. Four studies reported a negative or inverse association; that is, greater anxiety was associated with less screening behavior. The remaining four studies reported no relationship between anxiety and screening behavior. Generally, stronger relationships with screening behavior were demonstrated for cancer-specific anxiety than for trait anxiety (see Dielman, Miller, & Daly, 1999). In addition, several studies suggested that the relationship between anxiety and screening may be curvilinear, taking the shape of an inverted-U curve—a relationship where moderate anxiety is associated with greater screening, but very high and very low levels of anxiety are associated with less screening (Bowen, Alfano, McGregor, & Andersen, 2004; Lerman et al., 1993; Schwartz, Taylor, & Willard, 2003). Substantiating such a pattern would require further research.

The diversity of results in part reflects methodological heterogeneity among the studies. Primary studies differed in sampling (e.g., women with or without a family history of breast cancer, women of different demographic backgrounds), construct operationalization (e.g., general vs. cancer-specific anxiety), and outcome (i.e., breast self-examination, clinical breast examination, or mammography attendance). Some of the studies used a cross-sectional/retrospective design, measuring both emotion and history of screening behavior at a single time point. Others employed a longitudinal/prospective design, measuring emotion at baseline and subsequent screening behavior at a later time point. Due to the quasi-experimental nature of all the investigations, establishing causality is difficult. However, the longitudinal studies at least establish that emotion preceded screening behavior, making a stronger argument for the hypothesized causal relationship between emotion and screening.

Based on the number and quality of studies reviewed, we can cautiously support the notion that cancer worry motivates breast cancer screening behavior. Even so, the question of how to account for the different effects of cancer worry on screening behavior remains. To explore why this may be so, we turn our attention to the role of cognitive heuristics and biases.

COGNITIVE HEURISTICS AND BIASES IN DECISION MAKING

Our knowledge of decision making and judgment under uncertainty has been heavily influenced by the study of cognitive heuristics and biases (Kahneman & Tversky, 1982). The original work by Tversky and Kahneman (1981) described 12 cognitive biases related to subjective judgment of probability, such as salience and availability. The potential influence of the most common biases listed by Kahneman and Tversky (1982) on cancer screening, prevention, or treatment decision making has not been systematically evaluated for their relevance; nor, obviously, have strategies been tested to ameliorate these biases. For example, according to the availability heuristic, knowledge that no one in one’s own family has had any type of cancer associated with the human papillomavirus (HPV) could lead to a predisposition to judge HPV-related cancer as less likely for oneself (regardless of one’s own exposure history), thereby decreasing screening behavior. According to the salience heuristic, knowledge of a friend or relative who endured a difficult treatment regimen for breast cancer could lead to a predisposition to judge a diagnosis of breast cancer as more likely for oneself, due simply to the greater cognitive salience of that particular information (which presumably results from its emotional impact). In both examples, screening decisions are based on cognitive biases rather than objective reality. Yet the operation of these cognitive biases in making decisions about cancer screening has not yet been systematically investigated; nor have interventions to correct them been developed or tested. The need to clarify the role of cognitive biases in screening and treatment decision making is heightened, because health care providers often provide relatively complex incidence and prevalence statistics to patients who may not be equipped to interpret them.
TABLE 40.1. Summary of Investigations of the Relationship between Anxiety and Breast Cancer Screening

<table>
<thead>
<tr>
<th>Author</th>
<th>Design</th>
<th>Screening modality</th>
<th>Population</th>
<th>Affect measure</th>
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<tbody>
<tr>
<td>Studies reporting a positive relationship</td>
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<tr>
<td>Diefenbach et al.</td>
<td>Prospective</td>
<td>Mammogram</td>
<td>FDRs of women with cancer (N = 213)</td>
<td>Breast cancer worry, 1 item</td>
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<td>(1999)</td>
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<tr>
<td>McCaul et al.</td>
<td>Prospective</td>
<td>BSE</td>
<td>Women with (n = 65) and without (n = 70) family history of breast cancer</td>
<td>Breast cancer worry, 4 items</td>
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<tr>
<td>(1998)</td>
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<tr>
<td>McCaul et al.</td>
<td>Prospective</td>
<td>BSE, mammogram, CBE</td>
<td>Women from the community (N = 353)</td>
<td>Breast cancer concerns, 3 items</td>
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<tr>
<td>(1996)</td>
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<tr>
<td>Tinley et al.</td>
<td>Prospective</td>
<td>BSE, CBE, mammogram</td>
<td>Women from BRCA1/2 families (N = 112)</td>
<td>IES Intrusion Scale</td>
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<td>(2004)</td>
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<tr>
<td>Young &amp; Severson</td>
<td>Prospective</td>
<td>Mammogram</td>
<td>African American women eligible for federally funded cancer screening program (N = 405)</td>
<td>Cancer fear, 11 items</td>
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<td>(2005)</td>
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<tr>
<td>Andersen et al.</td>
<td>Retrospective</td>
<td>Mammogram</td>
<td>Population sample (N = 6,512), including some women with family history (n = 948)</td>
<td>Cancer worry, 5 items</td>
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<td>(2003)</td>
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<tr>
<td>Bowen et al.</td>
<td>Retrospective</td>
<td>BSE, mammogram</td>
<td>Population-based (N = 1,366) sample of women</td>
<td>Breast cancer worry, 4 items; general anxiety and depression (Brief Symptom Inventory)</td>
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<tr>
<td>(2004)</td>
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<tr>
<td>Burnett et al.</td>
<td>Retrospective</td>
<td>BSE, CBE, mammogram</td>
<td>Women with family history (N = 139)</td>
<td>Breast cancer worry, 3 items</td>
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<tr>
<td>(1999)</td>
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<tr>
<td>Consedine et al.</td>
<td>Retrospective</td>
<td>BSE, CBE, mammogram</td>
<td>Cluster sampling of older women from six ethnic groups (N = 1,364)</td>
<td>Cancer worry (Cancer Attitude Inventory, 4 items)</td>
</tr>
<tr>
<td>(2004)</td>
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<tr>
<td>Epstein et al.</td>
<td>Retrospective</td>
<td>BSE</td>
<td>FDRs of women with cancer (N = 1,053); focused on 85 excessive BSE performers</td>
<td>Cancer worry, 3 items</td>
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<tr>
<td>(1997)</td>
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<tr>
<td>Gram &amp; Slenker</td>
<td>Retrospective</td>
<td>Mammogram</td>
<td>Women invited to a free mammography screening (N = 1,349) in two cities</td>
<td>Breast cancer anxiety, recalled 1 year later</td>
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<tr>
<td>(1992)</td>
<td></td>
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<tr>
<td>Lauver et al.</td>
<td>Retrospective</td>
<td>BSE, CBE, mammogram</td>
<td>Patients at an urban hospital who had not had a mammogram in the last 13 months (N = 119)</td>
<td>Profile of Mood States</td>
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<tr>
<td>(1999)</td>
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<tr>
<td>Stefanek &amp; Wilcox</td>
<td>Retrospective</td>
<td>BSE, mammogram</td>
<td>FDRs of breast cancer patients (N = 125)</td>
<td>Breast cancer worry, no specific information given</td>
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<tr>
<td>(1991)</td>
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(continued)
TABLE 40.1. (continued)

<table>
<thead>
<tr>
<th>Author</th>
<th>Design</th>
<th>Screening modality</th>
<th>Population</th>
<th>Affect measure</th>
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<tbody>
<tr>
<td><strong>Studies reporting a negative relationship</strong></td>
<td></td>
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<tr>
<td>Schwartz et al. (1993)</td>
<td>Prospective</td>
<td>Mammogram</td>
<td>FDRs of women with breast cancer (N = 159); general distress mental health inventory</td>
<td>Breast cancer worry, 2 items; general distress mental health inventory</td>
</tr>
<tr>
<td>Lerman et al. (1993)</td>
<td>Retrospective</td>
<td>Mammogram</td>
<td>Women with family history (N = 140)</td>
<td>Breast cancer worry, 1 item; IES Intrusion Scale</td>
</tr>
<tr>
<td>Kash et al. (1992)</td>
<td>Retrospective</td>
<td>BSE, CBE, mammogram</td>
<td>Women enrolled in a breast protection program (N = 217)</td>
<td>Taylor Manifest Anxiety Scale; cancer-related anxiety and helplessness scale</td>
</tr>
<tr>
<td>Lerman et al. (1994)</td>
<td>Retrospective</td>
<td>BSE, mammogram</td>
<td>Women &lt; 50 years old with family history of breast cancer (N = 783) from three study sites</td>
<td>Breast cancer worry, 2 items; psychological distress; IES Intrusion Scale</td>
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<tr>
<td><strong>Studies reporting a null relationship</strong></td>
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<tr>
<td>Aro et al. (1999)</td>
<td>Prospective</td>
<td>Mammogram</td>
<td>Attendees and nonattendees of a mammography screening program (n's = 946 and 641, respectively)</td>
<td>General anxiety and depression</td>
</tr>
<tr>
<td>Sutton et al. (1995)</td>
<td>Prospective</td>
<td>Mammogram</td>
<td>Community sample of women 50-64 years old (N = 1,500)</td>
<td>State–Trait Anxiety Inventory; General Health Questionnaire; 7-item anxiety measure</td>
</tr>
<tr>
<td>Lindberg &amp; Wellsch (2001)</td>
<td>Retrospective</td>
<td>BSE, mammogram</td>
<td>Attendees and nonattendees of a mammography screening program (n's = 191 and 174, respectively)</td>
<td>Breast cancer worry</td>
</tr>
<tr>
<td>Drossaert et al. (1996)</td>
<td>Retrospective</td>
<td>Mammogram</td>
<td>Women with and without family history of breast cancer (n's = 389 and 295, respectively)</td>
<td>Breast cancer anxiety; investigator-developed anxiety scale</td>
</tr>
</tbody>
</table>

Note: FDRs, first-degree relatives; BSE, breast self-examination; CBE, clinical breast examination; BRCA1/2, breast cancer susceptibility genes 1 and 2; IES, Impact of Events Scale.

*This study provides inconclusive results, as they vary by study site.*
Although "virtually all current theories of choice under risk or uncertainty are cognitive and consequentialist" (Loewenstein, Weber, Hsee, & Welch, 2001, p. 267), relatively few of these theories attempt to link the roles of cognition and emotion. Schwarz (1990), for example, has pointed out that the anticipation of emotion as a consequence of a decision is capable of influencing the decision, as well as the formation of attitudes. Mellers and McGraw (2001) have found that anticipated pleasure is closely connected to choice. They have proposed, as part of their theory of subjective expected pleasure, that individuals predict the pleasurable emotion that could result from each potential outcome of a particular behavioral option, weight these by the perceived chances of their occurrence, and combine them to form an average anticipated pleasure index for each behavioral option. This is done for all behavioral options under consideration, and then the option with the greatest average anticipated pleasure index is selected. A corollary of this theory is that individuals will avoid selecting any option that could make them feel worse. The theory has not yet been applied to medical decision situations, and thus it is unknown how accurate individuals are in predicting emotional consequences of future events (Loewenstein & Schkade, 1999; Ditto & Hawkins, 2005; Ubel, Loewenstein, Schwarz, & Smith, 2005).

A COMMON-SENSE MODEL OF COGNITIVE-AFFECTIVE PROCESSING

As the discussion to this point has suggested, biased cognitive processing exists within a larger cognitive-affective framework. This idea is supported by research that attempted to characterize the cognitive attributes of a threat stimulus and led to the formulation of the common-sense model of illness representations (Meyer et al., 1985). At the beginning of the threat identification and processing sequence is the individual's attempt to identify the threat, and thus to assign it a "label" (e.g., "I can feel something in my breast; is it cancer?"). The use of a label often determines subsequent attributes, such as "timeline or duration," "consequences," "cause," and "controllability" (Lau & Hartman, 1983). Each attribute answers a different question in the attempt to define the unknown stimulus. Timeline or duration addresses the perceived temporal progression of the stimulus. It answers the question of whether the threat represents an acute condition (e.g., a benign tumor), a chronic condition (e.g., cancer), or a condition that might disappear and reappear (e.g., an allergy). The consequence attribute defines the stimulus in terms of its potential impact on the individual's overall health—whether it is minor, major, or life-threatening. The cause attribute categorizes the stimulus in terms of potential factors that might have led to the stimulus. Controllability answers the question of whether anything can be done about it. Attributes of illness representations are highly individualized and are not necessarily consistent with medical knowledge. Although there is a lack of research on the influence of cognitive biases and heuristics on the representational level, it is most likely that cognitive biases work at this initial encoding level.

The next step in the processing of the stimulus involves the selection of a coping response. Coping responses can be triggered as a result of a cognitive evaluation of the threat, as a way to deal with the emotional impact of the threat, or as the result of an interaction of the two. For example, coping with a cold will probably prompt a person to take some over-the-counter cold medication—an act that involves only minimal emotional processing. In contrast, the occurrence of a persistent stuffy nose with symptoms of aching may lead the person to consider a more severe diagnosis, triggering feelings of worry and anxiety. In that case, the coping response may be triggered as much to allay worry about an unknown condition as it is to relieve the discomfort.

After selecting and executing a coping action, the individual next appraises the chosen coping response for its effectiveness. To continue the prior example, if the cold symptoms subside after the person ingests the medication, the coping procedure has been successful. If however, the cold symptoms persist, the individual will have to change his or her initial diagnosis to consider more severe illnesses, such as a type of flu. This leads to a revision of the relevant illness representation attributes (i.e., label, time line, consequences, cause, and controllability), triggering new negative feelings and prompting the selection of other coping procedures.
An often overlooked feature of the commonsense model is that coping requires not just the representation of the threat, but also the representation of coping procedures—the action plan. Thus this approach integrates the earlier finding from the fear communication literature that an action plan is an important addition to the cognitive and emotional threat representations. This approach leads to a coherent, action-oriented model, in which the threat is placed in an action framework. Of course, the individual must appraise the available responses as effective—and, more importantly, actions must seem necessary and feasible as a way to limit the threat. If the responses are not adequate, an individual faces a health threat without an action plan, with a likely increase in negative emotional states.

Cognitive-Social Health Information Processing

The cognitive-affective approach has been expanded and applied to coping with cancer threat and disease (Miller et al., 1996, 1998). The C-SHIP framework frees itself from a parallel-processing mechanism by postulating the existence of five main cognitive-affective mediating units that process cancer-relevant information. These units are interconnected and include many of the primary theoretical constructs from existing health behavior theories developed in the cognitive, social, and health sciences. Specifically, the units consist of (1) the individual’s encoding/self-construals of the cancer threat (Champion, 1985, 1987, 1988; Lazarus & Folkman, 1984; Leventhal, 1970, 1983, 1990); (2) the individual’s cancer-related self-efficacy beliefs (Bandura, 1977) and outcome expectations (Bandura, 1986; Scheier & Carver, 1985); (3) the individual’s cancer-related values and goals (Lau & Hartman, 1983); (4) the individual’s emotional responses to cancer threats (Horowitz, 1991; Leventhal, 1970); and (5) the individual’s repertoire of self-regulators/coping skills and strategies (Carver, Scheier, & Weintraub, 1989). Figure 40.1 displays the interconnected network of emotion and cognition at work in the example of making a decision about breast cancer screening. Specifically, a woman may react to information about breast cancer risk, the effectiveness of mammograms, and screening recommendations with increased risk perception (Path 1), a belief that mammograms will be able to detect cancer in an early stage (Path 2), or the intention to adhere to a regular screening regimen (Path 3). Beliefs of increased vulnerability to breast cancer may be followed by a related belief that a lump may be found soon (Path 4), which will be cured by treatment (Path 8). However, to take advantage of early treatment, screening is necessary (Paths 4 and 7). A belief that “a lump will be detected sooner or later” does not necessarily lead to action, as can be seen in Path 11, which points to a predominantly negative affective reaction. It is possible, however, that some women use action in the form of screening as a way to control their negative emotions. This possibility is accounted for in Paths 12 and 13.

Thus, depending on the initial encoding of an external or internal stimulus, different mediating units are activated that trigger individual beliefs, values, goals; outcome expectations; and emotional response to the stimulus. Ultimately, this processing will lead to the execution or inhibition of behaviors related to coping and adjustment to cancer risk and disease.

The conceptualization of information processing within C-SHIP as a model of mediating units can be compared to the excitation of nodes within the actual physiological nervous system. The mediating units, or nodes, are excited or inhibited based on the information that is processed through the connected nodes, eventually resulting in a behavioral action. Implicit in the C-SHIP framework is the development of information-processing signatures. These signatures are the result of repeated processing of similar information, resulting in similar responses. Thus the behavioral signatures reflect a system’s tendency to react with similar behavioral patterns, given that similar nodes are activated. In other words, these signatures can be thought of as a sequence of “if–then” statements resulting in more or less consistent behavioral responses. The identification of such sequences or signatures will facilitate the accurate prediction of individual responses to threat messages and different health behaviors by incorporating an individual’s habitual response style.
COGNITIVE AND EMOTIONAL HEURISTICS WITHIN A SELF-REGULATION FRAMEWORK

The self-regulation approach sees the patient as an active protagonist who is constantly evaluating his or her internal and external environment to control health behavior. These evaluation behaviors can be executed on both an automatic and a deliberate level. Research has identified a number of such mental rules or shortcuts in somatic processing and has connected them to the basic illness representation attributes. For example, the “symmetry” rule is used to link the somatic experience to the identity attribute or label. A patient experiencing symptoms searches for a meaning-giving identity to the symptomatic process. However, in the case of an illness label, a patient is also inclined to search for symptoms in support of his or her own illness experience: symptoms are there for a reason and have a name, and illnesses are characterized by a set of symptoms (Meyer et al., 1985). Other heuristics that help patients to process somatic and experiential information include the “stress—illness” heuristic and the “age—illness” heuristic. The stress—illness heuristic categorizes general somatic events (e.g., fatigue, muscle aches, headaches) as either stress responses or, in the absence of...
stressful events, as symptoms of an illness (Cameron, Leventhal, & Leventhal, 1995). The age–illness heuristic similarly attributes somatic events that fit with a perceived aging model to aging and not to illness (Prochaska, Keller, Leventhal, & Leventhal, 1987; Stoller, 1984). Illness attributions are made if the somatic event significantly departs from the aging attribution—for example, if there is a sharp pain that is distinguishable from regular arthritic pain. Other heuristics are concerned with the “duration” of a somatic event (a more enduring event is more serious and threatening) and its “prevalence.” Finally, the “affect” heuristic connects negative emotions, such as anxious and depressed moods, to increased disease vulnerability (Salovey & Birnbaum, 1989).

Thus the self-regulation framework not only allows for the processing of the threat stimulus on the cognitive and emotional level, but also permits the formulation of some rules that govern the emotional and cognitive processing of health-threatening events. In addition, as in any complex regulatory system that strives for equilibrium, it provides for a feedback loop with the potential to revise the underlying cognitive and emotional representations, heuristics, and subsequent selection of coping procedures (see Figure 40.2). Such a feedback mechanism increases the complexity of the model—a cost that is offset by improved explanatory power for the processes hypothesized to underlie health behaviors. Thus we argue that comprehensive models of health behavior need to include constructs of emotions as well as cognitive representations. Models such as the theory of planned behavior (Ajzen, 1985) and the health belief model, which lack such components, consequently have limited explanatory utility, even though they address cognitive factors as well as external societal factors. Similarly, single-variable models, such as the focus on self-efficacy (Bandura, 1977), have limited utility in predicting health behavior.

FUNCTIONS OF AFFECT1 AND THEIR ROLE IN DECISION MAKING

Although the role of emotion in decision making has received renewed attention over the past several years, a formal description of the specific roles of emotionally based heuristics is lacking. A recent paper by Peters, Lipkus, and Diefenbach (2006) has begun to address this point by focusing on the functions of affect, a concept closely related to emotion. Peters et al. argue that affect has four separable roles important to health decision-making processes. First, affect can act as “information.” This function is best exemplified by the affect heuristic (Slovic, Peters, Finucane, & MacGregor, 2005). That is, affect may serve as a cue for

![Figure 40.2: Self-regulation or parallel processing model.](image-url)
many important judgments, including probability judgments (Slovic, Finucane, Peters, & MacGregor, 2002). Zajonc (1980) proposed that emotional reactions to stimuli are often the earliest reactions. Under the affect heuristic model, affect can be experienced first upon consideration of a familiar technology, or it can be the result of further information processing (LeDoux, 1996; Peters, Västfjäll, Gärling, & Slovic, 2006). In either event, affect then acts as information, guiding decisions and judgments such as risk and benefit perceptions. The affect heuristic is substantially similar to models of "risk as feelings" and "mood as information" (Loewenstein et al., 2001; Schwarz & Clore, 2003), and it has much in common with dual process theories discussed earlier (see, e.g., Cameron & Leventhal, 2003; Leventhal, 1970; Leventhal, Diefenbach, & Leventhal, 1992; Epstein, 1994).

Whereas some theories focus exclusively on the use of mood states in judgments (e.g., Forgas, 1995; Schwarz & Clore, 2003), use of the affect heuristic is characterized by reliance on feelings attributed to an option or stimulus and experienced while considering it in judgments and decisions. Alhakami and Slovic (1994) proposed that the strength of positive or negative affect associated with an activity (and experienced while considering that activity) guides perceptions of its risks and benefits. Thus judgments about a technology such as a new medical treatment may be based not only on what people think about the treatment, but also on how they feel about it. If feelings related to a technology are more positive, decision makers tend to judge its risks as low and its benefits as high; if their feelings are more negative, they tend to judge the opposite—risks as high and benefits as low. For example, virtual colonoscopy is currently under much scrutiny for the detection of colon cancer. Individuals with positive affect toward this technology (e.g., because they have learned that it is not invasive or that it is less embarrassing than actual colonoscopy) may interpret new information about risks and benefits in ways that are consistent with their affect (i.e., they may perceive it as having low risk and high benefit).

Considerably less work has been done on the other three proposed functions of affect. Affect also can act as a “spotlight,” focusing people’s attention on different information (e.g., numerical cues, risks vs. benefits), depending on the extent of their affect. First, the extent or type of affective feelings (e.g., weak vs. strong affect, or anger vs. fear) focuses the decision maker on new information. Second, the new information (rather than the initial feelings themselves) is used to guide the judgment or decision. Affect can also serve as a “motivator” for action or the processing of information. For example, it may provide an action tendency toward getting a mammogram. Alternatively, it could change the extent of deliberative effort the decision maker puts forth. Finally, affect may serve as a “common currency” in judgments and decisions allowing people to compare more effectively the values of very different decision options or information—in effect, to compare apples to oranges (Cabanac, 1992). Montague and Berns (2002) link this notion to “neural responses in the orbitofrontal—striatal circuit which may support the conversion of disparate types of future rewards into a kind of internal currency, that is, a common scale used to compare the valuation of future behavioral acts or stimuli” (p. 265). By translating more complex thoughts into simpler emotional evaluations, decision makers can compare and integrate good and bad feelings, rather than attempt to make sense out of a multitude of conflicting logical reasons. This function is thus an extension of the affect-as-information function into more complex decisions that require integration of information. It predicts that emotional information can often be more easily and effectively integrated into complex judgments than cognitive information can be.

INTEGRATING THE FUNCTIONS OF AFFECT INTO A SELF-REGULATION FRAMEWORK

We argue that the functions of affect should not be examined as constructs by themselves, but should be integrated into the larger body of work that supports the self-regulation framework. There is considerable overlap between the roles assigned to emotion in the parallel-processing model and C-SHIF on the one hand, and the functions of affect on the other. Thus, from a theoretical point of view, a combination of the two approaches seems readily achievable. Theoretical models need experimental confirmation, and a greater effort must be made to examine the role and functions of emotion in both laboratory and field studies. Examining the functions of emotion in medical
decision making would be a particularly fruitful approach. Medical decision making under uncertainty, such as the decision of whether to undergo mammography or genetic testing for susceptibility to breast cancer, is fraught with emotions. Yet few investigations have examined the role of emotions in such situations.

THE RELATIONSHIP BETWEEN FEAR AND BREAST CANCER SCREENING REVISITED

In our review of the literature on the role of emotions in breast cancer screening behavior, we have found provisional support for a positive relationship between negative emotions and such behavior. Some of the diverging results might be explained by differences in populations and measures of emotion, but none of these factors appears to consistently influence the direction of the effect. Some researchers (Bowen et al., 2004; Lerman et al., 1993; Schwartz et al., 2003) suggest that the effect of worry may best be characterized by an inverted-U curve: Very low and very high levels of worry may be associated with lower levels of screening behavior—the former because low levels of emotion lack motivational force, and the latter because levels that are too high act as a barrier. Although intuitively attractive, this interpretation of the data is less plausible in the context of the literature on fear studies and its resulting theoretical developments.

The driving force behind a screening decision is likely to be a combination of factors. As suggested by the self-regulation approach, these factors consist of individual threat, vulnerability, and coping representations; emotional reactions; and societal and cultural determinants. In addition, research on heuristics and biases point to processing pitfalls that could potentially influence the information-processing sequence. Research on heuristics and biases within the health or cancer context is sparse; most of it has been conducted in the laboratory with non-health-related or non-cancer-related scenarios, and thus the influence of these variables in health-related decision situations is as yet unknown.

Many of the same points made about research focusing on cognitive variables and decision making can also be made with regard to research on emotion variables and decision making. Much of it lacks a health focus and is therefore not readily transferable to decision making in the health or cancer context. Furthermore, researchers focusing on emotion variables often do so to the exclusion of cognitive variables, making it impossible to compare the individual contributions of each group of variables to the decision process.

As we have demonstrated, negative emotions can motivate, or in some cases can interfere with, cancer screening behavior. However, we do not currently understand the potential role that positive emotions—or the absence of negative emotions—may play. For example, are there some circumstances when a feeling of tranquility coupled with an objective assessment of costs and benefits may increase screening behavior? Or to what extent may screening behavior be prompted by the anticipation of relief from a current unpleasant anxiety state upon receiving good news? Anticipating one's affect in a particular situation is akin to role playing or the pre-living of a screening result. The role-playing/pre-living technique has recently been applied to facilitate decision making for genetic testing. At-risk individuals are asked to pre-live the emotional and cognitive consequences of both positive and negative genetic testing results (Dietenbach & Hamrick, 2003; Miller et al., 2001). However, it is necessary to examine the information-processing flow within that context more carefully, particularly the use and influence of heuristics and biases during the pre-living sequences. It is also critical to continue examining the degree to which individuals using the role-playing/pre-living technique can accurately predict their response to situations that may arise in real life.

Researchers interested in the diverse pathways between emotions and health should strive to incorporate the complex findings regarding emotions and health behavior that have been derived from diverse research areas into more comprehensive and integrative theoretical frameworks. With the notable exception of the C-SHIP framework and the parallel-processing model, efforts in model building have been sparse. However, model building should not consist of including an increasing number of variables in ever more complex models. In contrast, we suggest that researchers rigorously evaluate variables and their hypothesized relationships to other factors in a given model. These tests should be conducted both experimentally in laboratory settings that sim-
ulate the appropriate health contexts, as well as naturalistically in the field, employing both quantitative and qualitative methods. Only then can we be confident that our theoretical models are valid for predicting health-related behavior.

The role of emotions in cancer screening research needs further exploration. We hope that this chapter has sensitized researchers as well as clinicians to the necessity of examining and incorporating emotion variables in their research programs. Furthermore, we hope that cognitive researchers from areas that traditionally do not have a health focus will be persuaded to adopt such an outlook in their future research.

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NOTE

1. Though the distinction between “affect” and “emotion” is clouded by the imprecision of language, affect is here understood to be a “basic invariant building block of emotional life derived from the human mind’s capacity to engage in processes of valuation” (i.e., judging whether something is helpful or harmful; see also Russell & Barrett, 1999). It follows that affect is tantamount to a felt experience of valence—the specific quality of goodness or badness that both is experienced as a feeling state (with or without conscious awareness) and demarcates a positive or negative quality of a stimulus. Such feelings can be used as information for judgment and decision making (Schwarz & Clore, 1988), and this usage can be termed “the affect heuristic” (Slovic, Finucane, Peters, & MacGregor, 2002). By contrast, emotions, such as cancer-related worry, are in this context taken to be akin to what William James (1884) called “the more complicated cases in which a wave of bodily disturbance of some kind accompanies the perception of the interesting sights or sounds, or the passage of the exciting train of ideas” (p. 188). Both strong, visceral emotions such as fear and anger, and much subtler feelings—the “faint whisper[s] of emotion” we call affects—can play a role in risk perceptions and behavior (e.g., Lerner & Keltner, 2000; Slovic & Peters, 2006).

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