A Stress-Coping Model

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A MODEL or scientific paradigm, according to Thomas Kuhn,[1] is a set of interrelated assumptions about classes of phenomena. Models have a heuristic value, in that they have a closely linked protocol or set of procedures for observing and analyzing the phenomena. For an applied discipline such as nursing, models can be useful because they combine theoretical assumptions, research-based knowledge, diagnostic problem-solving, and clinical intervention. A model is a link between concept and action, and can function as a tool to coordinate the structure and process of a research program designed to improve the effectiveness and therapeutic value of nursing practice.

Development of a stress-coping framework or model for nursing research has been attempted by Goosen and Bush,[2] and Roy.[3] Numerous other frameworks with possible utility for nursing exist.[4, 5-22] However, as Wild and Hanes[21] indicate, framework development is incomplete given the lack of continuity of basic theo-

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retical and operational constructs. Few attempts have been made to develop a dynamic model—one which maps the entire adjustive process and recognizes the complete interaction between individual and environment.

One stress-coping model, described later, has been developed as a conceptual framework for a department of nursing research in an acute care cancer center and will be used as a theoretical foundation for studies the department undertakes.

BACKGROUND

Stress

Stress arises from a transaction between individual and environment when the individual construes stimuli as damaging, threatening, or challenging. In general, stress situations involve awareness of demands that tax or exceed available resources as appraised by the individual. Demands can be of several types: social, cultural, psychological, and physiological, but basically each represents a change in balance between the demand and the resources to deal with it. Stressors, or stimuli that produce stress, differ in quality and intensity for each individual, and they may act together to augment, intensify, or reduce the total effect. Stress threshold and tolerance levels differ with each person, and depend on genetic and constitutional make-up, past experience, self-concept and other factors. Stress is particularly important in health because it has the potential to impair human functioning.[23]

Beginning with the work of Hans Selye,[24] researchers have sought, over the past three decades, to describe and analyze the effects of stress. Selye and others found that the demands imposed on a person by internal and external environments can cause difficulty, fatigue, exhaustion, and even death, if not counterbalanced by forces that contribute to maintaining his or her integrity. How the human organism maintains integrity was the subject of further research in the 1970s. From that work a science of stress, coping, and adaptation has evolved.

A substantial branch of stress research has addressed itself to the physical and physiological manifestations of stress. In the initial phase of stress exploration, Selye[24] proposed and demonstrated a general syndrome arising from the application of specific physical stresses to animals. His *general adaptation syndrome* and its characteristic physiology dominated the experimental domain until recently. Mason et al[25] proposed more specific responses based on the type of stressor and the associated functioning of specific hormonal axes and their many related substrates.

The trend in stress analysis research is heavily in favor of a cognitively based theory.[26-30] Stress is a generic entity involving many variables working in concert rather than any one specific negative emotion, stimulus, or response. This idea

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has moved stress research from an emotion or arousal context to one in which the individual's interpretation and evaluation of a stimulus-filled environment becomes the basis for a response to the stress experience, and in which emotions and physiological responses are viewed as by-products of cognition.

The cognitive branch of stress research is based on Piaget's developmental psychology, according to which innate schemata are the underlying basis for growth and life. Piaget described the interaction between person and environment as an assimilation-accommodation process whereby people assimilate the environment and accommodate their own structure to learn and survive.[31] Using this framework, other cognitive psychologists suggest that a mental operation underlies and affects the physiological level of response.

Some researchers using a cognitive approach identify levels of awareness or consciousness and their variations over time and experience in humans in the normal course of living. Levels of consciousness, information, representation (imagery, conceptualization and language), and the chemical and structural bases of memory are basic components of the cognitive process.[32] Proponents of the cognitive interpretation of stress such as Averill and Opton,[33] Lazarus,[4,23] Monat and Lazarus[34] and others have outlined an appraisal process whereby the individual continuously scans the environment for stimuli and then operates upon it through a careful and continual evaluation of threat to system survival.

The essential point of the cognitive approach is that in the critical progression of events occurring after stressor-person impact, cognitive functioning occurs which encompasses all neurological levels of system control, autonomic regulation, elicitation of feeling states, sensory selection processes, and individual and species preservation; and the cortical structure contributions of memory and mental operation. The latter two functions, taken together, form a basis for thought and evaluation.

Coping

Study of the dynamics of adaptation has focused on the natural counterpart to stress, known as coping. The multiplicity of coping strategies utilized to bring about change and growth is seen as the linkage between stressor impact and adaptation. Lazarus,[23] in his systematic model of the stress-coping process, identifies two elements of coping: (1) problem-solving and (2) regulation of emotion. He emphasizes that cognitive appraisal of the stress situation occurs as a primary condition, and that emotional and other response categories follow the appraisal.

A constellation of coping strategies, rather than any single one, ultimately brings about adaptation and growth—the maintenance of integrity. Initial direction of the process is controlled by cognition, but the total coping response is comprised of cognitive activity, emotions, and physiological response *in interaction*. Therefore, in the development of a model, literature will be reviewed in terms of cognitive, emotional, and physiological responses to stressor impact and the known options within each.

 LITERATURE REVIEW

Cognitive Response to Stress

Although information about the environment is largely processed at the level of the cerebral cortex, subcortical areas of the brain contain important structures through which information processing and arousal are mediated. The cerebral cortex handles memory, symbolic representation, and thinking and reasoning. Several subcortical structures direct sensation to the cortex and are source structures for generalized arousal, certain specific emotions, and visceral regulation for somatic survival. These structures receive feedback through chemical signals from the pituitary gland and autonomic nervous system via the hypothalamus, and some information from the internal and external environment directly.[18] The role of the subcortical nervous system structures as sources of arousal, certain emotions, and somatic integrity has been demonstrated.[35-41] The concept of cognition, then, is expanded to incorporate the broader context of neural control, rather than solely cortical control of emotion and physiological responses. However, coping responses are governed principally by cortical level integration.

Posner[42] has identified two major components of thinking and reasoning ability: (1) mental structure and (2) mental operations. The structure of thinking and reasoning ability includes long- and short-term memory systems and their codes, and the capacity for abstraction and concept formation. Memory has three qualitative codes: (1) imagery, the internal representation of sensory experience; (2) enactive, the learning, reproduction, and preservation of motor skills and movement; and (3) symbolic, the representation of language and other characters that represent reality in another form. Memory is organized so that input can be selected, organized, changed, and retrieved with varying amounts of effort. Abstraction and concept formation allow people to move from the immediate sensation of form, color, and size to identification of patterns and their differences.

Mental operations are considered the dynamic components of thinking and reasoning and include:

1. Tools of symbolic logic: deduction, inference, evaluation, interpretation, and understanding the unstated assumptions with which people operate on perceived stimuli.
2. Levels of consciousness: facilitating both sensory and motor systems and implied by the degree of alertness or changes in performance and brain activity. Generally the more reflexive mental operations are preserved as consciousness decreases. Thatcher and John[32] have identified six levels of information input and processing that correlate with the extent of cortical activity and progressively higher levels of consciousness or awareness: (1) sensation, or reflex response; (2) perception, or interaction between sensation and memory; (3) reorganization of basic processes; (4) processing of multisensory perception as experience; (5) sequential or long-term memory; and (6) symbolic representation and critical thinking. Diurnal patterns, pharmacologic depressants and stimulants, and internal and external environmental conditions,

such as amount and rate of stimulus input, age, and physical condition may affect level of cognitive functioning. To comprehend an individual's cognitive coping pattern, understanding of his or her position on the awareness scale described above is essential.

3. Problem solving: the global process by which a person moves from problem identification to solution and evaluation. The objective of problem solving is to achieve new representations through the performance of mental operations.[42] The process includes identifying the problem or initial representation, collecting information or using search strategies, operating on the information or incubation, and determining a solution or termination. Neisser[43] summarizes the process well when he defines cognition as the way in which sensory inputs are "transformed, reduced, elaborated, stored, reconciled and used."

Lazarus[23] has outlined the cognitive process during primary appraisal of the stress situation. The individual's initial evaluation of the stress situation in terms of his or her well-being produces one of three possible appraisals of the stressor: (1) irrelevant; (2) benign, resulting in positively toned emotions; or (3) stressful, resulting in negatively toned emotions. If the stimuli are appraised as stressful, further differentiation occurs and includes: (1) harm or loss, injury or damage already done; (2) threat, anticipated trauma has not yet occurred, assuming a hostile and dangerous environment with the self as lacking in resources to master it; or (3) challenge, opportunity for growth, mastery, or gain, assuming the demands are difficult but not impossible, using existing or acquirable skills. The cognitive phase of the primary appraisal determines the intensity and quality of emotional response to any transaction.

Emotional Response to Stress

The literature reflects considerable disagreement among researchers regarding concepts of emotion. While there is agreement that different emotions exist and are initiated by cognitive processes, many different interpretations of the fundamental dynamics of emotions exist. Researchers also disagree about the exact relationship between outward expressions and their underlying emotions. No consensus exists on whether emotion is a symptom secondary to cognition or an independent entity,[44] but there is growing recognition that affect and cognition are closely linked.

Plutchik et al[45] have developed a systematic model of emotion, identifying four pairs of basic bipolar emotions: (1) fear-anger, (2) joy-sadness, (3) acceptance-distrust, and (4) expectancy-surprise. A constellation of defense mechanisms, diagnostic categories, and behaviors is associated with each bipolar pair. Although Plutchik et al are psychoanalytically oriented, their model does imply that thinking and judgment go into the choice of emotion, and that the specific emotion felt is a product of some objective on the part of the individual.

For the purposes of the present stress-coping model, the defense mechanisms that Plutchik et al associate with specific

Table 1. Emotion, Defense, and Behavior

Emotion	Defense	Behavior
Joy	Reaction formation	Hyperactivity
Sadness	Compensation	Attempts to regain loss Takes on characteristics of loss
Acceptance	Denial	Overlooks or ignores
Distrust	Projection	Uses blame
Surprise	Regression Fantasy Acting out	Crying Daydreaming Impulse-activity
Anticipation	Intellectualization Rationalization Undoing Sublimation	Redefines, recategorizes Makes excuses Cancels out Transforms direction of energy
Fear	Repression Introjection Isolation	Forgetting, loss of memory Nonadmission Lack of feelings
Anger	Displacement	Attack-like Aggressive

Source: Adapted from Plutchik R, Kellerman H, Conte HR: A structural theory of ego defenses and emotions, in Izard CE (ed): *Emotions in Personality and Psychopathology.* New York, Plenum Press, 1979, pp 227-260.

emotions will be considered general labels for the behavioral response as shown in Table 1.

The model of Plutchik et al differentiates the eight specific emotions qualitatively from anxiety. Anxiety is regarded as general energy arousal that, over time and experience, is refined into specific dominant emotions.

Emotions can vary in both duration and intensity. When an emotion is prolonged over time, according to Weisman,[46] it becomes a *mood;* when prolonged over an even longer period of time, to the extent that the emotional state becomes almost a trait fixed in the personality, it becomes an *attitude.* Arieti[47] has devised a similar classification, but calls the groupings *first-*, *second-*, and *third-order emotions.* Intensity might be defined as complexity or a tightly woven set of emotions that present themselves as a syndrome. Conflict and guilt are examples of the complex interaction of several emotions and represent another dimension of the nature of emotion.

Current understanding of emotion, then, suggests that (1) emotion occurs as a consequence of the person's evaluation of the environment; (2) emotion is a feeling state with physiologic parameters; (3) emotion is experienced initially in global form and later refined into specific basic emotions; (4) emotions may be classified according to type, duration, and intensity—characteristics that change over time and events.

Following the cognitive evaluation of a stressor, a person determines the degree of threat and the resources available to meet

the demand. Almost simultaneously, a fluctuation in general anxiety takes place, followed by a refinement of the energy into one or more specific emotions. The resultant response is a translation of the emotion into a behavior. Over time and many reappraisals an emotional response may become increasingly fixed and trait-like within the personality, and may play an important role in determining the ultimate adaptation. For the purpose of this model, emotion will be considered an intervening variable having a powerful and direct effect on behavioral response.

Physiological Response to Stress

The literature identifies three major physiologic transmitters of stress reaction: (1) hormonal stimulation, (2) sympathetic activation, and (3) end-organ response. All three are interrelated and interdependent.

The early work of Cannon,[48] later extended by Euler,[49] laid the groundwork for understanding the sympathetic-adrenal-medullary system and its responsiveness to emotion.[26,50] Recent work by Frankenhauser,[51] Levi,[52] and Mason[53] has explored the role of physiology in adaptation to stress in more detail. The sympathetic nervous system provides for neural activation and neurotransmission of chemical substrates through multiple pathways and many levels of integration that assure, by convergence and redundancy, appropriate functional responses when the organism is thrown off balance.[54]

Mason[53,55] has identified a number of neuroendocrine axes, each responding to different emotions and different stressors. The multiple endocrine secretory changes involve growth hormone, prolactin, ACTH and cortisol, luteinizing and follicle-stimulating hormones (androgens, estrogens), thyroid-stimulating hormone and thyroxine, vasopressin, oxytocin, epinephrine and norepinephrine, and insulin. To determine the effect of each axis, Mason used tests of 17-OHCS, epinephrine, norepinephrine, butanol-extractable iodine (thyroid index), growth hormone, insulin, testosterone, ERIO (androgen metabolite), estrone, and urinary volume. Variances in levels of each of these substances in relation to one another have begun to produce certain predictive patterns in response to certain stressors and emotions. In carefully controlled studies, Mason stressed primates with four discrete stressors (heat, cold, hunger, and exercise) and found different patterns or profiles of hormonal excretion in response to each. This finding is important evidence to support a theory of *specific* adaptational response in opposition to Selye's notion of a general arousal response common to all emotion and stress situations. Although Mason and associates have also documented unique hormonal profiles in studies with parents of leukemic children and in army recruits undergoing basic training,[56,57] much more research is needed in this area.

Neural activation by hormonal secretion and sympathetic passage terminates in end-organ response. The classic end-organ reactions are cardiac changes, dilation of coronary vessels, vasodilation in voluntary muscles, vasoconstriction in the intestinal tract, decreased peristalsis, and metabolic actions that mobilize glucose and fat metabolism.[54] In the stress-coping model, neurotransmission occurs simultaneously

with emotional response. End-organ changes are considered to be behavioral outcomes of the process.

STRESS-COPING MODEL

A stress-coping model has been developed by the authors to provide theoretical direction for a department of nursing research and as a foundation for generating research proposals. This model represents what Kuhn calls a "class of phenomena" with its set of interrelated assumptions, including those of structure and process.[1]

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Structure of the Model

The structure of the stress-coping model is represented by a set of definitions of model components.

Stress: A situation in which environmental demands, internal demands, or both tax or exceed the adaptive resources of an individual, social, or tissue system.[34]

Coping: A process characterized by continuous use of goal-directed strategies that are initiated and maintained over time and across encounters by means of cognitive appraisal and regulation of emotion and physiologic response.[23] Modes of coping include motor and expressive behaviors aimed at neutralizing the stressor(s), and regulation of emotional and physiologic response aimed at preservation of integrity.

Appraisal: The total comprehension of stress including related coping strategies, neurocognitive activity, affective and physiologic responses, and behavioral outcomes. Primary appraisal focuses on evaluation of the stressor array; secondary appraisal and later reappraisals concentrate on effectiveness of coping responses and changes in stress configuration.

Neurocognitive activation: Evaluation of a stimulus array at any given moment in time utilizing the neurocognitive apparatus for stress interpretation.

Affective response: Arousal of a feeling state as a consequence of neurocognitive activation. Characteristics include type, intensity, and duration with close linkage to simultaneously occurring biochemical and physiologic changes. Primary appraisal involves a generalized global anxiety reaction. Secondary appraisal refines the general response into more specific emotions associated with the stress situation. Later reappraisals and ultimate adaptation may reflect mood states and attitudinal development.

Physiological response: Changes in secretion of substances and activation of sympathetic nervous system pathways in response to the cognitive "fight," "flight," or "freeze" command. The pattern of activation generally coordinates with affective response and occurs as a function of neurocognitive evaluation. Primary appraisal reflects a generalized response where pituitary-adrenal axis activity predominates. Secondary appraisal and subsequent reappraisals reflect interaction patterns of multineuroendocrine axes secretion. Ultimate adaptation may reflect

cellular, tissue, organ, and system effects of physiologic response over time. Immediate results are measured directly or indirectly through end-organ response.

Behavioral response: All neurocognitive, affective, and physiologic responses to the stress situation may be measured by direct observation of expressive and motor actions, self-report indices, or end-organ response levels. Primary appraisal includes behaviors in response to the stressor impact. Secondary appraisal and subsequent appraisals focus behavior on initial coping strategies and their effectiveness in neutralizing the stress situation.

Adaptation: The result of coping efforts to maintain integrity by establishing balance between demands and the power to deal with them.[23] Desirable outcomes include minimum impairment of human functioning; economical balance among demands, power or resources, and cost; strengthening of assimilation and accommodation modes within the system; growth and learning; achievement of acceptable goals.

The Stress-Coping Process

The process of stress-coping is depicted in the model as a flow of events occurring over time and across encounters. Coping with stress represents a gradual movement toward specified goals and is a necessary characteristic of growth. Coping strategies consist of the neurocognitive, affective, and physiologic responses to a stress situation and may be observed in the behavioral response dimension.

Figs 1 to 3 depict the stress-coping process in increasingly specific terms. Fig 1 shows the process in its broadest, most general form.

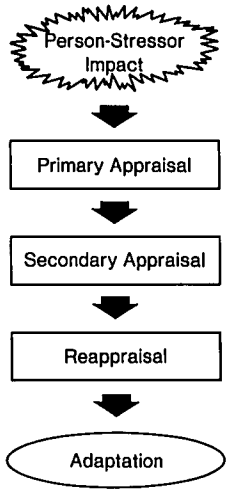

Fig 1. Stress-coping process (over time and events).

The first phase of coping includes a primary appraisal consisting of a neurocognitive evaluation of the stress configuration, the initial affective response, the corresponding physiologic response, and

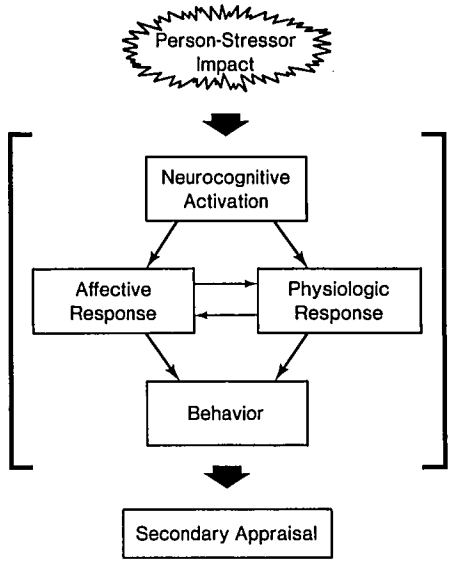

Fig 2. Primary appraisal.

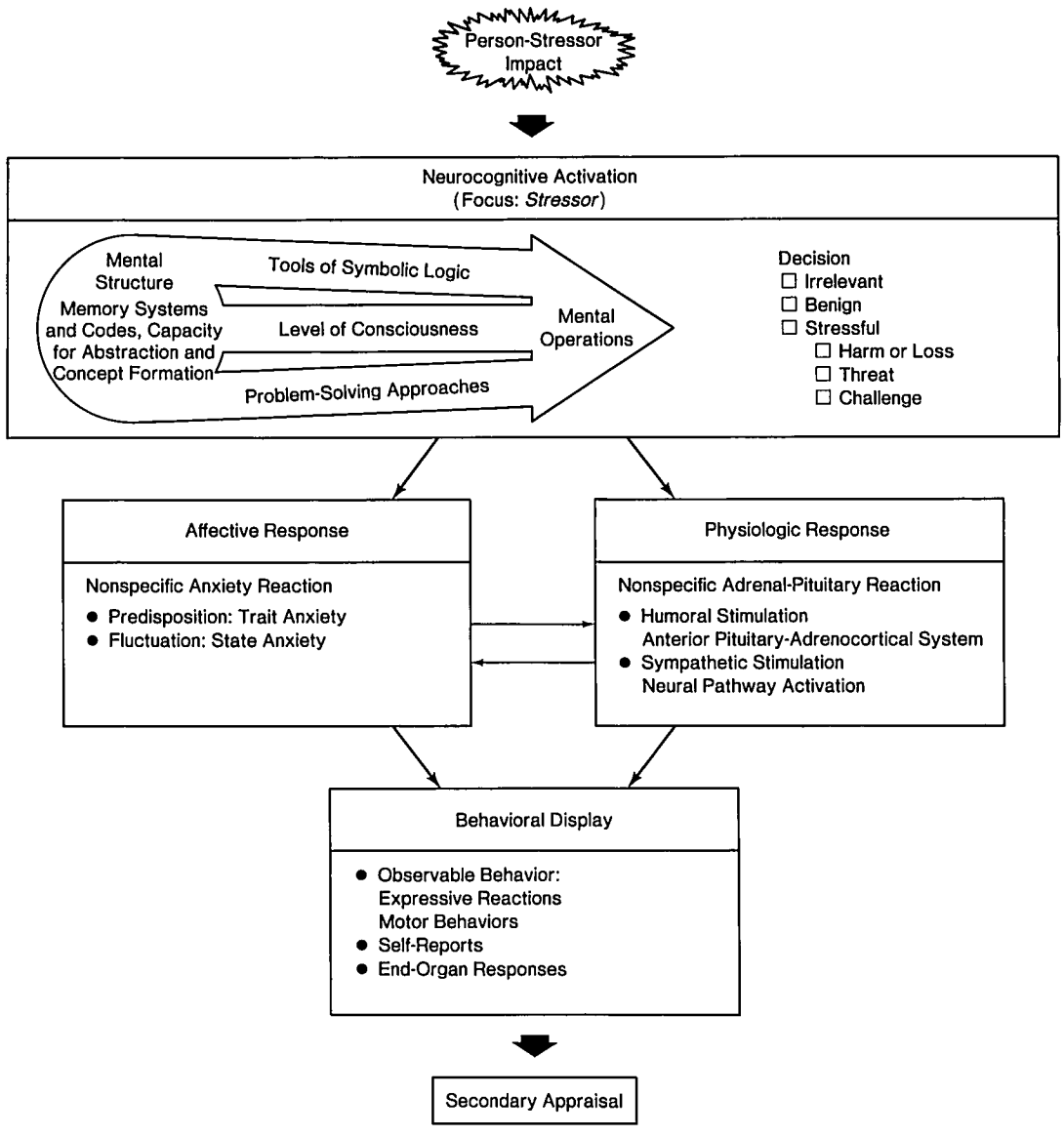

Fig 3. Coping phase 1: primary appraisal.

the resultant composite coping behaviors that occur as precursors to the secondary appraisal or second neurocognitive evaluation.

Fig 2 demonstrates the connections among cognitive appraisal as defined by Lazarus,[23] the affective response based on the work of Izard,[44] Plutchik et al,[45] Weisman,[46] and others, and the physiologic response from the findings of Frankenhauser,[51] Mason,[53] and Sigg.[54]

Fig 3 amplifies the major components of primary appraisal.

Fig 4 depicts the next phase of coping

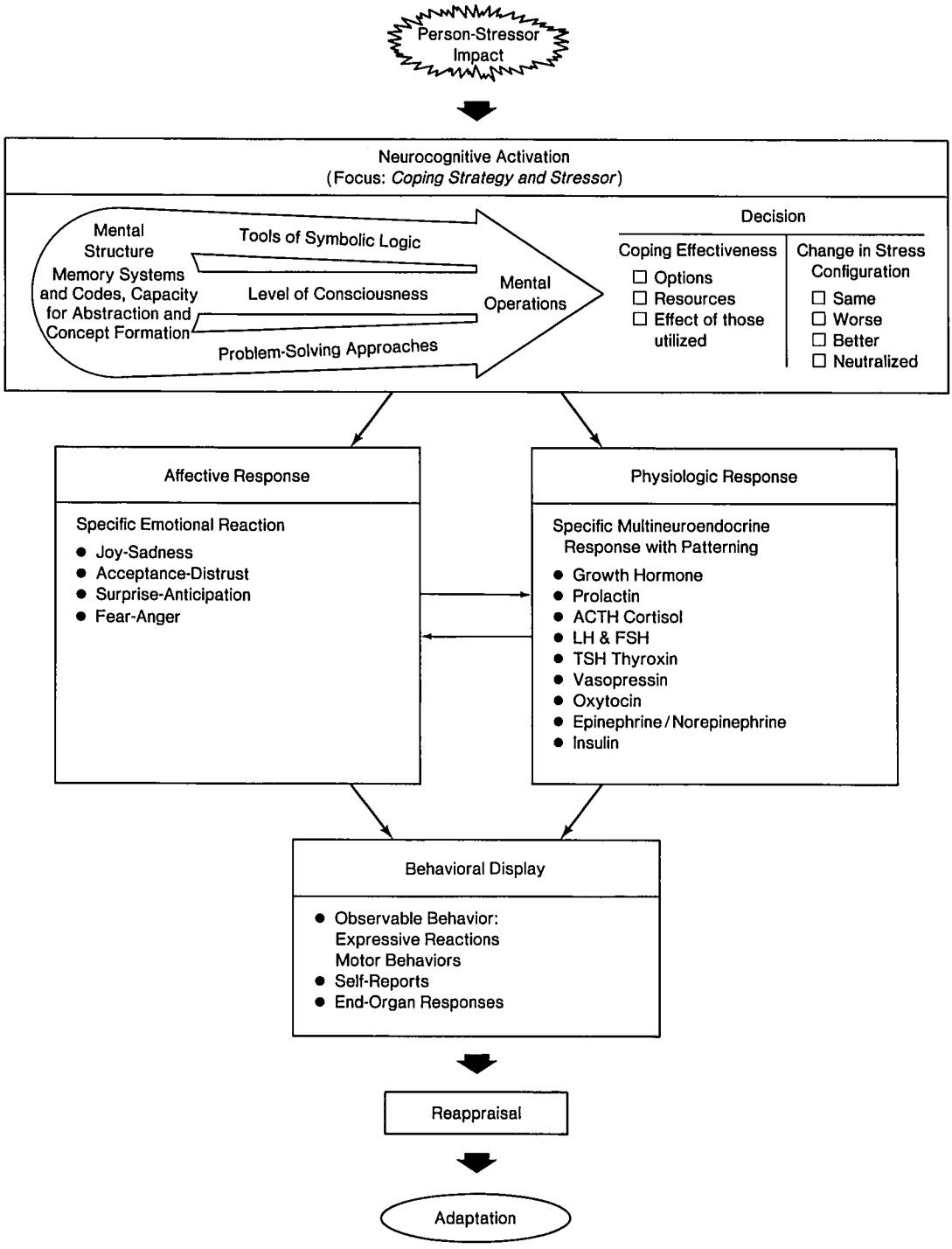

Fig 4. Coping phase 2: secondary appraisal.

where a secondary appraisal occurs using the same operational sequence as the primary appraisal, but with a different focus. Here attention is focused on the effectiveness of the coping strategies that occurred during the primary appraisal and on subsequent changes in the stress configuration.

The model suggests that following the initial person-stressor impact and its related cognitive interpretation, there are three dependent variables: (1) fluctuation of emotion, (2) fluctuation of endocrine profile, and (3) behavioral response. As a rule, all responses tend to move from general to specific in character. Following the primary appraisal, a secondary appraisal or reappraisal occurs, which uses feedback from the initial transaction to reappraise the relevance and meaning of the stressor; evaluate coping options, resources, and the effect of those used initially; and change the primary appraisal of the event. Reappraisal continues repeatedly until adaptation or neutralization of the stressor occurs. The ultimate adaptation is unique for each individual and occurs within a range of effectiveness from maintenance of ideal integrity to death.

The model suggests that following the initial stressor-person impact and its related cognitive interpretation, there are three dependent variables: (1) fluctuation of emotion, (2) fluctuation of endocrine profile, and (3) behavioral response.

It should be noted that the time required for the entire process varies with each person and each event. The process, from primary appraisal to adaptation, is continuous in nature, and can be represented by a helical, multidimensional figure (Fig 5).

Model Utilization and Evaluation

Thomas Kuhn defined paradigms or models as "universally recognized scientific achievements that for a time provide model problems and solutions to a community of practitioners."[1(pviii)] He proposed the use of paradigms or models as a way to connect the several distinct views of nature—all or most of which have scientific, observational, or pragmatic merit—held by youthful sciences.

Modeling orders questions relating to fundamental entities and their interaction, seeks answers in logical and sometimes predictive sequence, and then allows for further discovery, expansion, growth, and validation of the model.

A model is a class of interrelated assumptions closely linked to a set of methods or procedures for measuring observations and analyzing data. The proposed model offers a description of response to stress and the process by which one grows and survives. The assumptions are deliberately broad and general, thus inviting further specification. Further specification is accomplished by entering the model at one or more points and raising questions. This process allows for generation of research problems and questions and guidance in the analysis of data.

The proposed model can be entered at a number of points, singly or simultaneously, including:

- Nature of the stressor,

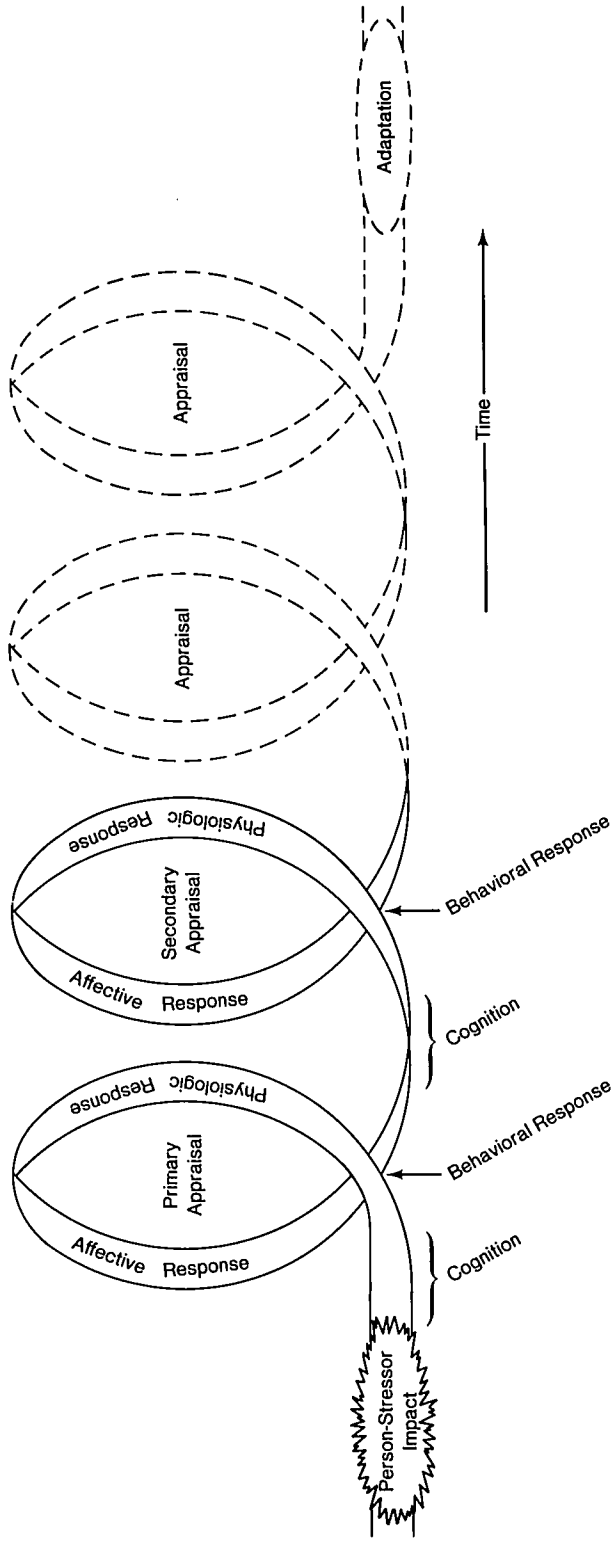

Fig 5. Helical process of coping and adaptation over time.

- Exploration of the entire coping response or parts thereof,
- Exploration of a mediating variable or its relationship to another (regulation of emotion, physiological response),
- Identification of adaptive outcomes,
- Multiple determinants of the stress-coping process,
- Tool or instrument development,
- Exploration of one or more variables in the behavioral response dimension and the patterning of those responses,
- Outcome of primary appraisal,
- Further definition of secondary appraisal, and
- Exploration of modes of coping: information-seeking, direct action, inhibition of action, intrapsychic.

Regular, periodic evaluation of the model, with further specification through research, will generate new knowledge and provide new direction for nursing diagnoses and intervention. The knowledge and insights generated and reinvested in the model will allow for further specification of component parts and continuous expansion of the entire form. The original idea of the model is dynamic in that it becomes increasingly complex, generating an extension of knowledge that allows for further problem identification, and, more importantly, solutions that may be applied in practice.

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