An evolutionary-based model of health and viability

A model of health and viability, as influenced by a wide variety of psychosocial variables, is presented. This model is based on the principle that illness and death sometimes serve an evolutionary function by maximizing natural selection prospects of other group members. Thus, evolutionary viability within the social context (personal contribution to one's social network) is a crucial health factor; life events, life style determiners, control perceptions, and viability emotions are other important concepts within the model. This model points to the possibility that the full scope of clinical practice may require assisting patients in regaining a sense of viability; nursing may be particularly relevant to this need because of the opportunity for intense interpersonal contact with patients.

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IN ATTEMPTS to understand the nature of health and disease, one central issue has been the distinct differences among people in susceptibility to health problems. Some disease-prone persons fall victim to multiple illnesses simultaneously or in quick succession, and others living under similar conditions remain remarkably free of health problems. Hinkle[1] concluded that among similarly aged adults, more than one-half of all illness episodes are experienced by fewer than one-fourth of the subjects. Less healthy individuals not only become ill more frequently and with greater severity, but they also have a greater variety of conditions.

These differences cannot be explained by differences in exposure to disease agents. With many health problems (eg, coronary heart disease), exposure to pathogens is not an issue. With other conditions, exposure rates exceed incidence rates by a wide margin; exposure may be a necessary, but not a sufficient, condition for illness onset. This is true in relation to some

acute, infectious conditions, such as clinical mononucleosis, in which the Epstein-Barr virus is implicated, as well as in relation to some chronic conditions, such as cancer. Thus, much health research now emphasizes the identification of risk factors rather than causative agents; such risk factors interact in leading to varying levels of disease susceptibility in the presence of viral, bacterial, chemical, or other agents.

Psychosocial risk factors, such as number of recent life-change events, as well as physiological risk factors, such as elevated serum cholesterol, have been identified. In statistical terms, risk factors are characteristics that increase the probability of a disease condition being detected, but they do not lead to predictions with any certainty. For example, although smoking is a key risk factor in the development of lung cancer, the majority of heavy smokers do not contract this disease, and some nonsmokers do. Similarly, although stressful life events have been consistently related to later illness onset in numerous studies with varied methodologies, correlations have been small, generally accounting for less than 10% of variance.[2]

Both smoking and stressful life events may be general in their effects, leading to any of a variety of diseases, rather than to one specific disease. Based on the understanding that health outcomes are rarely the result of a single cause leading to a single effect, there is some movement toward the development of biopsychosocial models in which multiple biological, psychological, and social variables are considered simultaneously. Within such a model, it is appropriate to focus on overall patterns of health, rather than on specific health problems.

Many biochemical, physiological, and anatomical aspects of health and disease are already well understood, but in the creation of a model of health, psychosocial variables may be of primary importance. The weight of evidence from psychosocial studies of health indicates clearly that emotions, social relationships, and the way persons view their lives affect the degree of healthiness; these are important health behaviors. In addition to stressful life events, the wide variety of psychosocial variables implicated in health outcomes include type A behavior pattern, locus of control, power motivations, contingency hopefulness, activity levels, adaptive flexibility, psychological integrity, transcendent beliefs, alienation from self, anomie, social supports, trust, loneliness, uselessness, pessimism, confusion, depression, and anxiety.

However, such variables are highly interrelated; they are defined and manifested by overlapping sets of behaviors and thought processes. If systematic multivariate research hypotheses are to be created and tested, it is necessary that this assortment of psychosocial variables be organized and integrated into a unified model of health.

EVOLUTIONARY ASSUMPTIONS

Based on review of a wide assortment of studies using psychosocial variables, it is contended that an integration can most successfully be achieved when evolutionary genetic assumptions are used as a key element in the building of a model. First, given that people live in groups (families, tribes, clans, societies, and cultures) and are dependent for survival on others within these groups, it may be assumed that the

well-being of any person is tied to the well-being of the groups. Thus, people enmeshed in viable effective groups have advantages over those who are not.

Such advantage refers to having a better chance in the natural selection process. From the evolutionary viewpoint, the greatest significance of a person's life is the role as a depository of genes passed from the former generation. If evolutionary success is attained, these genes or some part of them is passed to the next generation. Group viability is an important factor enabling an individual to achieve such evolutionary success.

Second, group viability is maximized to the extent that there is some built-in mechanism for elimination of members who draw more from the group than they contribute, or are likely to contribute in the future. To the extent that group selection processes have been operative throughout human history, groups have prospered in which there is a tendency for the group to be relieved of the burden of members who make little contribution to group well-being or who actually detract from it. Within such a framework, illness and death serve important evolutionary functions.

The central contention is that evolutionary selection processes have favored the well-being of groups with members who have a genetically determined tendency toward self-destructiveness, among those persons who have a sense of not contributing toward the survival of the group gene pool. This tendency would be an efficient evolutionary mechanism for promoting group survival at the expense of the least productive members. The existence of such a mechanism would be consistent with Darwin's[3] belief that natural selection operates at the level of the family. It is also consistent with such concepts as kin selection, inclusive fitness, and reciprocal altruism propagated in the more modern field of sociobiology.

From this perspective, the assortment of psychosocial variables that have proven valuable in health research can be integrated into a single evolutionary-based model with implications for health practice. If the model is correct, then an important part of clinical nursing practice should be discovery of methods by which a person can re-establish a sense of viability when this viability is threatened.

EVOLUTIONARY MODEL

The unique contribution of this model of health based on evolutionary principles is its integration of a wide assortment of psychosocial concepts and variables. The model inter-relates six major concepts, and each of these has several identified components (Table 1). It is likely that as this model is used and refined, new components of these major concepts will be proposed; such modifications would be consistent with the spirit in which the model is offered.

A pictorial representation of the model is presented in Fig 1. The placement of six major concepts indicates their primary, temporal order, and arrows depict major probable causal relationships, which lead to health outcomes.

Some of these concepts (life events and health outcomes) are familiar to most health researchers; others are established concepts organized into a new format (life-style determiners, control perceptions,

Table 1. Means of viability model concepts and component elements

Concepts and components	Meaning
Evolutionary viability within social context	Extent to which person functions in promoting survival and well-being of group
Social context	Network of connecting links (eg, communication and interactions) between person as an individual and as member of family, society, and other group
Power	Personal control over life circumstances for oneself and for others (Person cannot contribute to social well-being without power)
Life events	Major happenings determining the nature of a person's life course; some are primarily practical, but most involve shifts in social context
Developmental events	Events resulting from growth, age, or maturation (eg, birth, 1st day of school, or death)
Chance events	Events resulting from personal actions or circumstances (eg, automobile accident or moving to a different country)
Life-style determiners	Elements of personality and learned adaptive strategies that shape the way viability is played out in the face of life events
Activity	Inclination to set and rigorously pursue life purposes and goals
Flexibility	Readiness to shift life pattern when necessary, in order to adapt to practical contingencies to find new satisfactory social contexts
Integrity	Tendency to balance deep internal feelings, preferences, desires, and fantasies with practical external conditions so as to fit the two together with minimal stress and maximal satisfaction
Transcendence	Sense that life has positive purpose in relation to patterns greater than oneself; may be religious, societal, or altruistic
Control perceptions	Perceptions of how circumstances can be controlled in pursuing personal purposes and duties; perceptions may differ from reality of control in social context
Contingency hopefulness	Expectation of ability to shape specific practical circumstances (eg, driving to grocery store or getting high grade on examination)
Power motivation	Desire to achieve and maintain control of significant goods, services, and rewards within wider social context
Moral/ethical power inhibitions	Perceptions of ethical restraints relative to correctness of pursuing or not pursuing control over circumstances in life context
Perception of actual control	General sense of how things have actually worked out in control pursuits; not necessarily accurate reflection of actual control
Satisfaction/frustration balance	Perception of extent of success or blockage of control efforts
Viability emotions	Affective reactions deriving from sense of being viable participant in social order either because of control efforts or because of blessing of having been accepted as viable participant
Acceptance vs abandonment	Feeling of being enmeshed in or excluded from significant social relationships
Usefulness vs uselessness	Feeling of contributing or not contributing in significant social groups
Optimism vs pessimism	Feeling that future does or does not hold positive possibilities
Clarity vs confusion	Feeling of ability or inability to understand life circumstances so that satisfactory life course can be accomplished
Health outcomes	Psychological, behavioral, and physical states resulting from viability emotions in combination with other factors

Table 1. (*continued*)

Concepts and components	Meaning
Psychological comfort vs distress	Extent of experiencing general satisfaction with life or depression and anxiety, which undermines well-being
Self-maintenance vs self-destructive behavior	Extent to which one engages in behaviors that preserve health (eg, proper nutrition) and refrains from activities that show failure to take care of physical self (eg, smoking or suicide) or extent to which one does the reverse
Physiological function vs dysfunction	Extent to which one is in optimal physical condition or has cardiovascular, immunological, and other impairments

and viability emotions); and one (evolutionary viability in the social context), although it is firmly grounded in previous research and theory, represents a proposition that may seem novel to some health scholars.

Evolutionary viability within social context

Evolutionary viability refers to the extent to which a person contributes to the evolutionary survival of the group in which that person participates. For such a contribution to be made, a person must be enmeshed in a social network to which he or she may contribute and must have a degree of power or personal effectiveness such that personal actions or, perhaps, merely presence will have an impact on the welfare of others.

A growing body of evidence is now documenting the role of social connections as a health factor. For example, in a

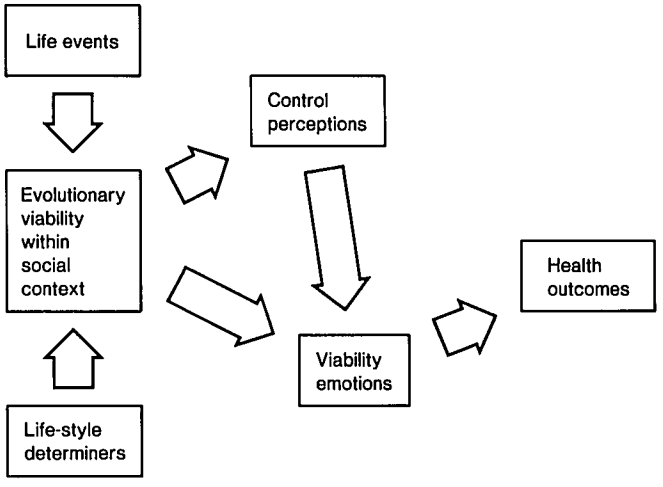

Fig 1. Pictorial representation of relationships between concepts in an evolutionary-based model of viability and health.

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nine-year follow-up of almost 7,000 randomly selected residents of Alameda County in California, those with least extensive social and community ties had a higher death rate than those with most extensive ties.[4] The age-adjusted risk associated with poor social ties was 2.3 for men and 2.8 for women. This relationship between social involvement and mortality was not explainable by initial health status, health practices, or use of preventive health services.

As may be expected based on the concept of evolutionary viability, social contacts seem most relevant to health in times of threat. Some clinical studies have focused on this situation. Nuckolls, Cassel, and Kaplan[5] found that among pregnant women undergoing life crises, lack of social support was associated with a high rate of pregnancy complication. McClelland and Jemmott[6] found that among college students who had social problems, as well as problems in other areas of life, respiratory infections were more frequent. Such studies are supported by animal experimentation in which the presence of the animal's mother[7] or littermates[8] during experimentally induced stress is associated with reduced negative health consequences.

Other researchers have taken the approach of identifying specific personality styles as leading to proneness to specific disease. For example, type A behavior pattern is known to increase the risk of coronary heart disease[9]; and the possibility of a cancer-prone personality, characterized by acquiescence, dependence, and controlled reaction to early loss is receiving increasing attention.[10] Traits of this sort have also been reported to relate to the course of cancer.[11] Pelletier[12] has summarized similar literature related to rheumatoid arthritis, ulcerative colotis, and migraine.

Based on review of studies related to five forms of health problems, Cassel[13] concluded that although the specific descriptions had some variation, all involved deprivation in meaningful social relationships. Another commonality among these descriptions is the possibility that personal effectiveness (ie, the power to influence personal well-being and that of others) is limited. DeCatanzaro,[14] in reviewing the epidemiology of suicide, comes to the even more explicit conclusion that suicide is most prevalent among those whose death is least likely to impact negatively on survival of the gene pool; for example, people who do not have children and those whose ability to care for children (eg, the unemployed) is impaired.

Based on such reviews, it might be legitimate to conclude that the absence of evolutionary viability may lead to any of a variety of self-destructive processes, including suicide and a wide selection of illnesses. The physiological mechanisms through which this occurs remain a mystery, although the work of Bouvard[15] on hypothalamic activity as well as the more recent discovery of brain endorphins might provide some useful clues.[16]

Stressful life events

Life for each person is a sequence of developmental happenings and chance events, which determine how well the

developmental sequence is played out for the well-being of the person and the social grouping in which the person participates. Some events are primarily practical in their consequences (eg, getting a raise), but more important events often involve direct shifts in the social context (eg, death of a relative or marriage). There is substantial evidence from a variety of sources that such events, especially when they occur in clusters, are often precursors to adverse health changes. For example, in an early study among a group experiencing extraordinary life changes (Indian migrants to Lima, Peru), there was also an extremely high rate of illness.[17] Prospective study has revealed that among enlisted men on naval cruises, life change during the 6-month period prior to deployment is associated with illness during the 6-month cruise.[2] Warren et al[18] found that both perceived stress and occurrence of specific problematic events in seven categories were associated with the onset of multiple sclerosis. Stuart and Brown[19] reported that in a sample of college students, life-change events related to frequency of accidents, as well as to frequency of disease.

Much research on this topic has involved use of the Social Readjustment Rating Scale (SRRS) and its subsequent modifications[20]; in the SRRS, each of 43 events is associated with a numerical weight representing the amount of change required by that event. However, another interesting line of research focuses on the single event considered to be, by far, the most serious in its adaptive consequences: death of a spouse. During bereavement, immune reactions are depressed, and high death rates have been noted, especially as a result of coronary thromboses, other heart disease, and cancer.[21]

Frederick[22] has proposed that during grief, production of ACTH by the pituitary gland is not moderated by the level of circulating cortisol, as it is normally. In this situation, excess ACTH leads to hypersecretion of cortisol, an adrenal hormone known to inhibit immune reactions. Among the variety of other physiological and biochemical phenomena implicated in the commonly observed relationships between illness and stressful life events are the general adaptation syndrome described by Selye[23] and the conservation-withdrawal response described by Engel and Schmale.[24]

Stressful life events and the changes in social relationships that such events bring about often present threats to the sense of being a viable, contributing member of groups in which the person participates. This has led, throughout the evolutionary history of humans, to development of numerous biological mechanisms through which stressful life events, especially when clustered, severe, or prolonged, lead to increased susceptibility to a variety of health problems.

Life-style determiners

Events happen to a person, sometimes as a result of circumstances beyond the person's control, but sometimes as a consequence, at least in part, of personal actions. Despite the intransigence of certain life events (for example, the inevitability of death), a person may do much to shape the course of life and thus to influence viability. Each person develops a style of life, which serves as a pattern for responding to events as they occur and for influencing the nature of future events. These combinations of personality elements and learned adaptive strategies are referred to as life-

style determiners. Four crucial life-style determiners with demonstrated relationships to health have been identified: activity, flexibility, integrity, and transcendence. Each of these influences the person's viability within the social context.

Overall, these four life-style determiners seem to act in conjunction with life events to impact on evolutionary viability within the social context. To the extent they are present, they act as health-promoting factors, and they are of special importance in maintaining viability during life crises.

Activity

The setting and pursuing of life goals and purposes is known to mitigate the potentially adverse health consequences of stressful experiences.[25] When a person responds to an unpleasant situation by taking action designed to change the situation or make it more bearable, the likelihood of subsequent health damage is reduced. In animal research, the ability to take aggressive action in response to a stressful stimulus has been associated with limited gastric ulceration.[26] Among humans, those displaying the tendency to express anger when faced with an anger-provoking situation have lower rates of hypertension than those who do not;[27] and a state of high arousal prior to cholecystectomy is correlated with reduced pain and shorter hospital stays.[28]

Two longitudinal studies focusing on dependency, the opposite of constructive activity,[29,30] have concluded that this style of interacting with the environment is associated with general ill health and premature death.[29,30] The evolutionary significance of activity may be that through vigorous pursuit of life goals, a person meets environmental challenges, thus augmenting prospects of genetic survival, not only for the individual, but also for the group in which the individual participates.

Flexibility

The shifting of personal life pattern as necessary to adapt to external contingencies is another crucial variable. The relationship between life change and illness may be limited by the extent to which the person has a general disposition of tolerating changes in life.

Using a scale that differentiates subjects based on optimal stimulation level, Cooley and Keesey found that although a significant relationship existed between life change and illness among those least inclined to seek new experiences, there was no such relationship among those who were most inclined to seek new experiences.[31] In a study by Boyce and associates,[32] inconsistency in daily routines protected children from the negative health changes that often follow major life crises. Totman, Reed, and Craig[33] found, contrary to their expectations, that cold symptoms were more severe, rather than less severe, in research subjects who had experienced a psychological manipulation designed to increase commitment to a particular course of action. Hinkle et al[34] demonstrated that among Chinese residents of the United States, the principal factor differentiating those with a high frequency of illness from those with a low frequency was whether they perceived the changes and difficulties they had faced as threats to a set pattern or as interesting variations in which new opportunities might be discovered.[34]

Taken together, these studies support the suggestion that flexibility as an aspect of life style serves as a health-promoting

factor. In evolutionary terms, plasticity of behavior in response to changing circumstances was almost certainly of survival benefit to persons and groups throughout the course of human development, especially in times of crisis.

Integrity

Integrity requires that a person relate to inner subjective experience while accepting the pragmatic contingencies of the external world. Numerous programs of psychotherapeutic intervention with the physically ill are based on the premise that illness occurs when life is not consistent with internally perceived needs; several current research results are consistent with this understanding.

In treadmill testing,[35] persons characterized by the type A behavior pattern, compared with others, pushed themselves closer to their physiological limits while claiming to experience less fatigue. This lack of sensitivity to bodily needs may be a factor in the higher rate of heart disease among type A individuals.

Kasl et al[36] found that among susceptible West Point cadets, lack of consistency between degree of commitment to a military career and academic performance related to the likelihood of contracting mononucleosis. In a study of executives experiencing a high degree of stress, Kobasa[37] demonstrated that those scoring higher on "alienation from self" developed more illness; in a similar study, Marx and associates[38] reported that, among students who had recently experienced a clustering of life changes, those with the highest level of life fulfillment showed the lowest illness rates. In the classic report on research involving 3,500 subjects, it was concluded that among the most ill patients, there often seemed to be a feeling that social obligations interfered with the satisfaction of personal needs.[17]

Overall, there is substantial evidence that the tendency to balance internal feelings with the practical circumstances of life may be associated with better-than-average health. This association is probably derived from the need within any particular social group to depend on various individuals to fulfill various important roles; thus, differences in patterns of behavior among persons is a survival asset to the group, and suppression of these unique inclinations detracts from the probability of low mortality in the group.

Transcendence

Transcendence is the sense that life is oriented toward purposes greater than oneself, whether this involves God, human welfare, or some more limited cause. The health-promoting potential of strong belief systems can be seen in numerous findings, which relate religion to general health,[39] blood pressure,[40] cancer pain,[41] and psychological health.[42] It can also be seen in Frankl's[43] observations on the importance of value commitments to chances of survival among prisoners in Nazi death camps and in the effectiveness of the shaman, who combines the roles of priest and

The fourth identified life-style determiner is transcendence: the sense that life is oriented toward purposes greater than oneself, whether this involves God, human welfare, or some more limited cause.

healer, within primitive cultures.[44] The evolutionary foundation of transcendence probably derives from the likelihood that persons with the greatest commitment to religious or socially altruistic purposes contribute most to the well-being of their communities. Thus, the health of such individuals strengthens the genetic survival prospects of the community.

Control perceptions

The realities of viability in the social context; of the life events experienced; and of the activity, flexibility, integrity, and transcendence with which a person acts affect perceptions of the extent to which a person can influence the circumstances of life. These perceptions may differ from the reality of control in numerous ways, but even when they are inaccurate, these perceptions, themselves, exert an impact on health outcomes.

Contingency hopefulness, the expectation that an action taken will somehow affect existing circumstances, is based on past experience in taking similar actions. Seligman[45] has demonstrated that, when faced with an aversive stimulus, lack of contingency between personal actions and consequences leads to learned helplessness: a syndrome involving a disinclination to attempt to solve personal problems. Visintainer et al[46] have established that, among rats, the experience of contingency reduces cancer suspectibility. Among people, such contingency hopefulness may be a crucial factor in determining the practice of good health habits, which is itself a predictor of physiological health status.

Power motivation, the desire for control over reinforcing elements, influences the extent to which a person strives to obtain rights to goods, services, and rewards from others. Such striving may yield positive results; however, the more control is desired, the greater is the possibility that personal desires will go unrealized and that a sense of failure will result. Thus, in situations in which control cannot be obtained, persons characterized by type A behavior (probably high in power motivation) are more prone to the giving-up behavior accompanying learned helplessness than those with type B behavior.

This extreme response to lack of control may contribute to the association between type A behavior pattern and coronary heart disease. Furthermore, McClelland and Jemmott[6] demonstrated that university students who had a great need for power and were experiencing life events that threatened their sense of power had more severe instances of illness over a semester than did other students.

Power inhibitions, restraints in pursuing achievement of control because of ethical or religious beliefs, serve as a check on excess power motivations. Such restraint has been a theme of the great religions in their frequent urgings that people should accept those elements of life that are beyond personal control; it is also an important philosophical element of the egalitarian principles on which democratic societies are based.

To the extent that power inhibitions are an element in transcendent conceptions, enabling a person to see a positive value in a role involving little potential for control, such inhibitions are of health benefit. When a person accepts a given place in life, he or she avoids the persistent stress that stems from striving for more than can be

achieved. However, individuals in whom great power inhibitions are combined with great need for power have increased risk of developing hypertension over a 20-year period;[47] they also experience a high rate of illness as students, especially when they are undergoing life-change events related to power pursuits.[6] Both effects may be attributed to chronic sympathetic arousal in such persons.

Perception of actual control, ie, a sense of how control pursuits have influenced outcomes in life, is best operationalized by the locus of control variable. Since the pioneer study by Seeman and Evans,[48] internality (the perception that personal behaviors generally influence the reinforcements received) has most often been associated with positive health behaviors.[49] Internality appears to protect the type A person from the anxiety reactions sometimes associated with coronary prone behavior. However, Lowery and DuCette[50] found that among persons with diabetes, internally controlled individuals showed poorer health outcomes after the first three years; this may be interpreted to indicate that in situations with a strong element of unpredictability, internality interferes with compliance and, thus, leads to negative health outcomes.

To the extent that a person is successful in control efforts, that person may be said to have a positive satisfaction/frustration balance. This construct may account for the finding of Lowery and Ducette,[50] as well as that of Burke and Weir,[51] that although top-level, type A, prison administrators experienced substantial stress, they had notably low physiological risk factors related to cardiac disease. Whereas the internally controlled diabetes patients were frustrated in their attempts to maintain control over the condition, the top-level, type A prison officials probably met relatively few impediments to their exercise of power and, thus, little frustration.

Williams et al[52] found that among the various components of the type A pattern, hostility was the most important in predicting coronary artery disease. This hostility seems to occur in reaction to perceived threats to meeting important goals; it is, thus, a reflection of the satisfaction/frustration balance.

The importance of hostility, engendered by blockage of goal-oriented pursuits, illustrates that the relationship between control perceptions and health outcomes is not direct; rather, as shown in the evolutionary model in Fig 1, control perceptions, as an interacting combination of elements, influence health outcomes indirectly by impacting on personal feelings about a given place in the social order. Control perceptions serve to promote health to the extent that the synthesis of hopefulness, motivation, and inhibitions allow a person to feel maximally viable in relating to life circumstances. But if desires and ambitions exceed their potential to be realized, serious frustration leading to a sense of social inviability may result.

Viability emotions

As a person processes perceptions of control, which are themselves shaped by personal viability within the social environment as affected by life events and lifestyle determiners, a person either develops a sense of being a viable participant in the social order who may influence the reinforcements received personally and by others or has the sense of not being a viable

participant. This sense of viability is emotion laden in its content.

Development of viability emotions is not dependent on cognitive understanding of a situation. For example, reaction of an infant to parental abandonment is not limited by the intellectual developmental level of the infant. Furthermore, viability emotions may become deeply ingrained, based on the early experience or on a small number of key events, so that the emotions are unresponsive to current perceptions or detract from the ability to perceive with accuracy. Although four different bipolar components comprising the substance of viability emotions are identified here, there is some overlap between them, and it appears that the negative pole of each leads to a common outcome: the triggering, to some extent, of self-destructive processes.

Acceptance versus abandonment

The impact of the feeling of acceptance versus that of abandonment is well established in the literature of child development. In the classic study comparing institutionalized children experiencing maternal deprivation and those kept with their mothers in prison, Spitz[53] noted that the deprived children showed not only slowed development but also a high mortality rate, despite hygienic conditions. Harlow's[54] subsequent studies on deprivation in young monkeys indicated that attachment needs are genetically based, independent of the need for food, and most pronounced in stressful situations.

However, such needs are not restricted to the young. Of the five life-change events identified by Holmes and Rahe[20] as requiring the greatest adjustment, four involve abandonment issues (death of a spouse, divorce, marital separation, and death of a close family member). The usefulness of Holmes and Rahe's tool in predicting subsequent illness may result largely from the psychological potency of the abandonment factor. A sense of abandonment appears, also, to be a principle element in voodoo death.[44]

Additionally, studies have documented that illness is associated with distance from others. Thomas[55] found that lack of a close relationship with parents, as reported in early adulthood, predicts later cancer, and in a study of terminally ill children, Spinetta and associates[56] obtained complementary results. A wide variety of illness and handicap conditions have been hierarchically ordered, based on the extent to which they are associated with distance from others.[57] It is commonly understood that illness leads to stigma and abandonment. The sense of having been abandoned also leads to illness in what can become an inescapable cycle.

Usefulness versus uselessness

From control perceptions and evolutionary viability, a personal sense of usefulness or uselessness also develops. Throughout the history of the evolutionary origins of humans, each organism, during its lifetime, faced a series of challenges, and its success in meeting these challenges determined the likelihood of survival, not only for that particular individual, but also for the group. The contention is that the feeling of usefulness that accompanies the meeting of challenges is an emotional necessity. For example, rats who receive escapable electrical shock are less susceptible to cancer than those who are not shocked.[46] Apparently, rats housed in laboratory cages,

provided with food and water, and protected from extreme temperatures benefit from the opportunity to respond to an environmental challenge.

In humans, feelings of usefulness derive from the contributions made within the social structure. High mortality rates among the unemployed and the retired, as well as among those who are not socially involved and those who are recently widowed, reflect this quality. When feelings of uselessness rather than usefulness are dominant, self-destructive processes are automatically triggered.

Optimism versus pessimism

Optimism versus pessimism, a function of the person's evaluation of past events and of future prospects, has been identified as a determinant of later goal-directed behavior.[58] In a classic series of experiments, Richter[59] found that rescuing rats from a stressful situation prevented subsequent sudden death, which would otherwise be expected; it appears that the rescued rats developed a hopefulness, which augmented their effectiveness in responding to later threat.

Optimism versus pessimism, a function of the person's evaluation of past events and of future prospects, has been identified as a determinant of later goal-directed behavior.

Among recently handicapped persons, tendencies to deny the existence of problems are associated with rehabilitation progress; and in a wide variety of situations, visualizing positive outcomes seems to augment the possibility of success. Among persons with cancer, the patient's image of the disease process is a predictor of subsequent disease state. Endogenous opiate peptides (endorphins) may be among the psychobiochemical links between these psychological and disease processes.[16]

Clarity versus confusion

Clarity is the sense that an adequate understanding of one's life can be achieved; confusion is the sense that it cannot be achieved. Confusion results from the overworked effort to find a solution to a problem, culminating in the conclusion that there is no solution. Such a feeling may be verbally manifested by the declaration, "I just don't understand anything anymore," reflecting a lack of confidence in the ability of one's mind to solve future problems. This emotional response leads to impaired decision making, as the person ceases the effort to predict future outcomes. Persons high in need for power, persons low in transcendental orientation, and persons already experiencing a sense of abandonment, uselessness, and pessimism may be most susceptible to such feelings of confusion.

The possible long-term advantage of the externally controlled person in certain illness situations with an unpredictable course and the health benefit that stems from strong religious commitments may both relate to resistance to the onset of confusion provided by such belief structures.

Overall, the components of viability emotions identified as being of primary importance within the proposed model each carry potential for affect, which

ranges from strongly positive to strongly negative. These components derive from combination of control perceptions and the other concepts discussed here; they lead to health outcomes on a variety of levels.

Health outcomes

When viability emotions are primarily negative, they trigger the onset of a self-destructive process in the forms of (a) psychological distress, (b) malproductive behavior, (c) and physiological dysfunction. Within the evolutionary model, these three phenomena are conceptualized as component elements of health outcomes, and for each element, one may observe signs of maximum health, as well as these indications that pathological, self-destructive processes are operating.

Psychological comfort or discomfort may be a direct result of viability emotions reflecting the presence or absence of feelings of acceptance, usefulness, optimism, and life clarity. When affect is primarily negative, a state of depression or anxiety may be apparent; when affect is primarily positive, the person expresses a general satisfaction with life.

Behavior that is oriented either to self-maintenance or to self-destructiveness is another component of health; the seven health practices identified by Belloc and Breslow[60] are prime indicators of personal status, as is any history of suicidal ideation or reckless, accident-prone behavior. Such behaviors, which constitute observable manifestations of the will to live or the lack of the will to live seem to occur as a general consequence of viability emotions.

Physiological function versus dysfunction, as determined through physical examination, illness history, laboratory procedures, and general fitness is contended also to reflect the viability emotions derived through concepts of the evolutionary model.

The mediation of viability emotions is a necessary connecting link between the variety of psychosocial factors conceptualized here and the variety of physical illness conditions that the psychosocial factors may precipitate. It has been established through numerous research studies that heart disease, cancer, and general illness rates each vary with psychosocial factors. Multiple neurological, hormonal, cardiovascular, and immunological mechanisms are implicated in this effect. These various mechanisms were developed over the eons of evolution because they served to enhance the prospects of group survival by eliminating those group members whose emotions reflected limitations in ability to contribute fully to the group welfare.

FEEDBACK WITHIN THE EVOLUTIONARY MODEL

In the pictorial presentation of the evolutionary model (Fig 1) and in the text, the relationships between major concepts in the model are made to appear somewhat unidirectional. This was necessary for clear exposition in describing the pathway thought to be of primary evolutionary importance in leading to the onset of automatically triggered self-destructive processes. However, the reality of relationships among the six major concepts presented is probably substantially more complex. For example, life events do not occur in a vaccum. They result, in part, from

life-style determiners, control perceptions, viability emotions, and even actual viability within the social context. Furthermore, the onset of a serious illness is, itself, a notable life event. Thus, five new arrows could be drawn, each originating at a box representing one of these concepts and each ending at life events.

Likewise, health outcomes influence viability emotions as well as being influenced by them. Personal state of health also has important implications relative to viability in the social context and to personal perception of one's ability to exercise control. Even such matters of life style as the activity with which a person determines and pursues goals and the flexibility with which major life changes are faced may be adversely influenced by an illness.

Rather than specifically mentioning each possible causal/temporal relationship, it may simply be stated that each of six major concepts may be both a cause and an effect of each other concept, so that change in any one element may lead to changes throughout all model elements. In Fig 1, however, an attempt has been made to identify those lines of influence that may be most indicative of the primary causal linear sequence. Establishment of the validity of this model awaits further research.

INTERVENTION POINTS

The use of evolutionary assumptions in the development of a model of psychosocial factors in health is not intended to imply that a laissez-faire approach toward illness should be taken; that would be a serious distortion. Instead, this model is intended to guide creation and refinement of intervention approaches to be used by clinicians in interrupting self-destructive cycles. One central purpose of such intervention would be to impact on health outcomes by restoring the person's sense of viability. These interventions would be based on the assumptions that evolutionary viability is not a static entity and that it is not necessarily perceived accurately by the person.

Intervention may occur in relation to any of the six major concepts identified in this model. Evolutionary viability within a social context may be influenced through psychotherapeutic, educational, or community health intervention designed to improve a person's adaptability relative to the social environment or, as suggested by Norbeck,[61] to enhance social support. For example, programs on parenting skills for adolescent mothers may be expected to augment evolutionary viability in both generations. The potential in this area is not limited to any particular clinical discipline.

In some situations, life-change events are subject to influence by a clinician, as when, for example, a client seeks advice relative to a major personal decision; more often, however, the nature of life-change events serves not as an intervention point, but rather, as an assessment point and possibly as a warning signal that a person may be in a period of high susceptibility. Frequent physical examination, as well as counseling, may be appropriate during periods of bereavement, and more generally, whenever life events of major magnitude are occurring, especially if these events have implications for the person's social relationships.

Life-style determiners, control perceptions, and emotional consequences, like

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evolutionary viability itself, may be altered through educational, psychotherapeutic, and behavior modification interventions. Programs designed to reduce tendency toward type A behavior and to increase locus of control internality have been the subject of some experimentation; clinical use of relaxation and visualization is well established in some fields (eg, childbirth) and receiving increasing attention in others.[62,63] Interdisciplinary research involving experts in diverse areas (psychotherapy, religion, pharmacology, and clinical nursing) would be needed to determine how a clinician might work to affect such qualities as integrity, power inhibition, or optimism.

Interventions relative to health outcomes, including psychological, behavioral, and physiological components, have been nursing's traditional domain. This evolutionary model indicates that in implementing such interventions, clinicians should be alert to the possibility that as one health problem is resolved, other automatically triggered self-destructive processes may be initiated in the same individual, especially among clients who are most in need. Since such processes are related to a multiplicity of causes, a variety of intervention strategies should be considered. To the extent that the evolutionary model presented here is an accurate reflection of the reality of health and illness causation, intervention relative to evolutionary viability, life-style determiners, and viability emotions would be especially important aspects of health promotion among those who are most frequently ill.

REFERENCES

1. Hinkle LE: Ecological observations of the relation of physical illness, mental illness, and the social environment. *Psychosom Med* 1961;23:289-296.
2. Rahe RH: Life change and subsequent illness reports, in Gunderson EKE, Rahe RH (eds): *Life Stress and Illness*. Springfield, Ill, Charles C Thomas, 1974, pp 58-78.
3. Darwin CR: *The Origins of Species*. London, John Murray, 1859.
4. Berkman LF, Syme SL: Social networks, host resistance, and mortality: A nine-year follow-up study of Alameda County residents. *Am J Epidemiol* 1979;109:186-204.
5. Nuckolls KB, Cassel J, Kaplan BH: Psychosocial assets, life crisis and the prognosis of pregnancy. *Am J Epidemiol* 1972;95:431-441.
6. McClelland DC, Jemmott JB: Power motivation, stress and physical illness. *J Human Stress* 1980;6:6-15.
7. Liddell H: Some specific factors that modify tolerance for environmental stress, in Wolff HG, Wolf SG, Hare CC (eds): *Life Stress and Bodily Disease*. Baltimore, Williams & Wilkins, 1950, pp 155-171.
8. Conger JJ, Sawrey W, Turrell ES: The role of social experience in the production of gastric ulcers in hooded rats placed in a conflict situation. *J Abnorm Soc Psychol* 1958;57:214-220.
9. Friedman M, Rosenman RH: *Type A Behavior and Your Heart*. Greenwich, Conn, Fawcett, 1974.
10. Wellisch DK, Yager J: Is there a cancer-prone personality? *CA* 1983;33:145-153.
11. Derogatis LR, Abeloff MD, Melisaratos N: Psychological coping mechanisms and survival time in metastatic breast cancer. *JAMA* 1979;242:1504-1508.
12. Pelletier KR: *Mind as Healer: Mind as Slayer*. New York, Delta, 1977.
13. Cassel J: Psychosocial processes and "stress": Theoretical formulation. *Int J Health Serv* 1974;4:471-482.

14. DeCatanzaro D: *Suicide and Self-Damaging Behavior: A Sociobiological Perspective.* New York, Academic Press, 1981.
15. Bouvard EW: The effects of social stimuli on the response to stress. *Psychol Rev* 1959;66:267-277.
16. Hubman M: Endogenous opiates and pain. *Adv Nurs Sci* 1982;4:62-71.
17. Wolf S, Goodell H: *Harold G Wolff's Stress and Disease.* Springfield, Ill, Charles C Thomas, 1968.
18. Warren S, Greenhill S, Warren KG: Emotional stress and the development of multiple sclerosis: Case-control evidence of a relationship. *J Chronic Dis* 1982;35:821-831.
19. Stuart JC, Brown BM: The relationship of stress and coping ability to incidence of diseases and accidents. *J Psychosom Res* 1981;25:255-260.
20. Holmes TH, Rahe RH: The social readjustment rating scale. *J Psychosom Res* 1967;11:213-218.
21. Parkes CM, Benjamin B, Fitzgerald RG: Broken heart: A statistical study of increased mortality among widowers. *Br Med J* 1969;1:740-743.
22. Frederick JF: The biochemistry of bereavement: Possible basis for chemotherapy. *Omega* 1983;13:295-303.
23. Selye H: *The Stress of Life.* New York, McGraw-Hill, 1956.
24. Engel GL, Schmale AR: *Conversation-Withdrawal: A Primary Regulatory Process for Organismic Homeostasis.* New York, Elsevier, 1972.
25. Gal R, Lazarus RS: The role of activity in anticipating and confronting stressful situations. *J Human Stress* 1975;1:4-20.
26. Weiss JM, Pohorecky LA, Salman S, et al: Attentuation of gastric lesions by psychological aspects of aggression in rats. *J Comp Physiol Psychol* 1976;90:252-259.
27. Gentry WD, Chesney AP, Gary HE, et al: Habitual anger-coping styles: Effect on mean blood pressure and risk for essential hypertension. *Psychosom Med* 1982;44:195-202.
28. Ray C, Fitzgibbon G: Stress arousal and coping with surgery. *Psychol Med* 1981;11:741-746.
29. Greenberg RP, Dattore PJ: The relationship between dependency and the development of cancer. *Psychosom Med* 1981;43:35-43.
30. Vaillant GE: Natural history of male psychological health: IV. What kinds of men do not get psychosomatic illness? *Psychosom Med* 1978;40:420-431.
31. Cooley EJ, Keesey JC: Moderator variables in life stress and illness relationship. *J Human Stress* 1981;7:35-40.
32. Boyce WT, Jensen EW, Cassel JC, et al: Influence of life events and family routines on childhood respiratory tract illness. *Pediatrics* 1977;60:609-615.
33. Totman R, Reed SE, Craig JW: Cognitive dissonance, stress and virus-induced common colds. *J Psychosom Res* 1977;21:55-63.
34. Hinkle LE, Christenson WN, Kane FD, et al: An investigation of the relation between life experience, personality characteristics, and general susceptibility to illness. *Psychosom Med* 1958;20:278-295.
35. Carver CS, Coleman AE, Glass DC: The coronary-prone behavior pattern and the suppression of fatigue on a treadmill test. *J Pers Soc Psychol* 1976;33:460-466.
36. Kasl SV, Evans AS, Niederman JC: Psychosocial risk factors in the development of infectious mononucleosis. *Psychosom Med* 1979;41:445-466.
37. Kobasa SC: Stressful life events, personality, and health: An inquiry into hardiness. *J Pers Soc Psychol* 1979;37:1-11.
38. Marx MB, Garrity TF, Somes GW: The effect of imbalance in life satisfactions and frustrations upon illness behavior in college students. *J Psychosom Res* 1977;21:423-427.
39. Shaver P, Lenauer M, Sadd S: Religiousness, conversion, and subjective well-being: The "healthy-minded" religion of modern American women. *Am J Psychiatry* 1980;137:1563-1568.
40. Graham TW, Kaplan BH, Cornoni-Huntley JC, et al: Frequency of church attendance and blood pressure elevation. *J Behav Med* 1978;1:37-43.
41. Yates JW, Chalmer BJ, St James P, et al: Religion in patients with advanced cancer. *Med Pediatr Oncol* 1981;9:121-128.
42. Ness RC: The impact of indigenous healing activity: An empirical study of two fundamentalist churches. *Soc Sci Med* 1980;14B:167-180.
43. Frankl VE: *Man's Search for Meaning.* New York, Washington Square, 1959.
44. Cannon WB: "Voodoo" death. *Psychosom Med* 1957;19:182-190.
45. Seligman MEP: *Helplessness: On Depression, Development, and Death.* San Francisco, WH Freeman, 1975.
46. Visintainer MA, Volpicelli JR, Seligman MEP: Tumor rejection in rats after inescapable or escapable shock. *Science* 1982; 216:437-439.
47. McClelland DC: Inhibited power motivation and high blood pressure in men. *J Abnorm Psychol* 1979;88:182-190.
48. Seeman M, Evans JW: Alienation and learning in a hospital setting. *Am Sociol Rev* 1962;27:772-783.
49. Arakelian M: An assessment and nursing application of the concept of locus of control. *Adv Nurs Sci* 1980;3:25-40.
50. Lowery BJ, DuCette JP: Disease-related learning and disease control in diabetics as a function of locus of control. *Nurs Res* 1976;25:358-362.
51. Burke RJ, Weir T: The type A experience: Occupa-

tional and life demands, satisfaction and well-being. *J Human Stress* 1980;6:28-38.

52. Williams RB, Haney TL, Lee KL, et al: Type A behavior, hostility, and coronary atherosclerosis. *Psychosom Med* 1980;42:539-549.
53. Spitz RA: Hospitalism: A follow-up report. *Psychoanal Study Child* 1946;2:113-117.
54. Harlow HF: Love in infant monkeys. *Sci Am* 1959;200:68-74.
55. Thomas CB: Precursors of disease and death: The predictive potential of habits and family attitudes. *Ann Intern Med* 1976;85:653-658.
56. Spinetta JJ, Rigler D, Karon M: Personal space as a measure of a dying child's sense of isolation. *J Consult Clin Psychol* 1974;42:751-756.
57. Harasymiw SJ, Horne MD, Lewis SC: A longitudinal study of disability group acceptance. *Rehabil Lit* 1976;37:98-102.
58. Tiger L: *Optimism: The Biology of Hope.* New York, Simon & Schuster, 1979.
59. Richter CP: On the phenomenon of sudden death in animals and man. *Psychosom Med* 1957;19:191-198.
60. Belloc NB, Breslow L: Relationship of physical health status and health practices. *Prev Med* 1972;1:409-421.
61. Norbeck JS: Social support: A model for clinical research and application. *Adv Nurs Sci* 1981;3:43-59.
62. Campbell DF, Dixon JK, Sanderford LD, et al: Relaxation: Its effect on the nutritional status and performance status of clients with cancer. *J Am Diet Assoc*, to be published.
63. Nath C, Rinehart J: Effects of individual and group relaxation therapy on blood pressure in essential hypertensives. *Res Nurs Health* 1979;2:119-126.