THE ROLE OF STRESS IN THE ADAPTATION TO SELF-DESTRUCTIVE BEHAVIORS

A Thesis Presented to the Faculty of California State University, Hayward

In Partial Fulfillment of the Requirements for the Degree Master of Science in Counseling

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June, 1988
ABSTRACT

This study investigated the subject of stress from an interdisciplinary orientation with the intent of formulating a premise as to what motivates people to pursue behaviors which, based on their predisposing relationship to illness and mortality statistics, are self-destructive.

A theory was proposed which accounts for the prevalence and perseverance which typify the propensity to indulge in self-destructive behaviors.

According to this theory, behaviors detrimental to health are enabled by the increasing availability of various substances which make it increasingly possible to self-regulate stress. The motivation to regulate stress is affect based. Optimal levels of arousal are sought, while the corresponding exhaustion and depression are avoided. Because of the strong relationship between illness and depression, the avoidance of depression is adaptive. Self-destructive behaviors which have the immediate effect of eliminating or reducing depression may be simultaneously adaptive and maladaptive predicated upon the instinct to survive.

The result is that the stress induced corresponding emotions of anxiety and depression are being bifurcated in a
manner which has implications for the functioning of stress as a survival mechanisms, and possibly for the evolving composition of the brain.
THE ROLE OF STRESS IN THE ADAPTATION

TO SELF-DESTRUCTIVE BEHAVIORS

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July 20, 1988
ACKNOWLEDGMENTS

I am indebted to several people for their contributions which led to the initial quest for information leading to the basis of this study.

To my husband, William Linscott, who made the observation: "If people were to awaken to find the earth covered with two feet of sewer sludge, they would adapt to living in two feet of sewer sludge". This seemed like a reasonable assumption to me. It caused me to question the formidable nature of the ability to adapt which became a foundation for the historical and evolution aspects of this study.

To my professor, Dorlesa Barmettler-Ewing, who observed that persons can maintain a state of intense arousal for only so long, and then exhaustion sets in. This led me to wonder about the nature of the relationship between the affective states of anxiety and depression. It became the basis for questioning the inevitability of depression based upon the presence of arousal. Additional thanks go to Dr. Barmettler-Ewing, my thesis advisor, for her direction and patience in guiding me throughout the lengthy process of producing this thesis.
I would also like to thank my reader, Dr. Alan Monat, for his considerate recommendations and contributions in the field of stress research, his precision of thought, his interest, and his encouragement.

Thanks go also to Gilbert Shepard, MFCC, for his assistance in the formative stages of the work for providing information, feedback and motivation.

I would like to thank my mother, Lucille Dougherty, for her eager interest in my work, for her devotion to collecting and presenting me with information which she found, and for her valued opinions.

Finally, appreciation goes to Dorothy Boutcher Ford, an employee of the California State University Library, for personally extending herself in the endeavor to obtain the many research articles I requested from other libraries.
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CHAPTER I
INTRODUCTION

Statement of the Problem

Why do relatively large numbers of individuals compromise their health by not desisting in behaviors which have been implicated in disease and death?

The intent of this study is to determine what motivates individuals in our society to engage and persist in self-destructive behaviors.

How is it that human behavior is not motivated exclusively by the pursuit of health in the interest of self-preservation?

Sigmund Freud (1920/1961), a trained neurologist and the father of psychoanalysis, in his search for the cause and treatment of neurotic behavior proposed that humankind is behaviorally driven by instincts or psychological urges. Freud is perhaps best known for his formulation of the psychosexual stages of human development. His underlying theoretical premise was that instincts exert a powerful force in human motivation, and that the instinctual sex drive in particular is a potent influential factor in human development. The sex drive is part of Eros, or life instinct. Yet another, even more controversial, instinct
was proposed by Freud. This is the instinct of death or Thanatos as it was later called.

According to Freud (1920/1961), the two instincts, life and death, coexist in a state of conflict. Sex, a manifestation of Eros, is evinced as a state of physical tension and excitation, and a sense of belongingness and unity with another. The death instinct, predicated on Freud's observation of the human compulsion to repeat, represents a basic human drive to attain complete quiescence, total freedom from stimulation and need, and absolute autonomy from the world.

Freud's observations, made more than sixty years ago, seem to describe a phenomenon that is today no less observable, and no less controversial. The phenomenon is that humankind, judging by its behaviors, appears still to be caught in the dilemma of possessing these two opposing urges. What has changed since Freud is the accumulation of sixty years of human knowledge. Research efforts throughout this period, particularly in the area of stress, appear to offer much to the understanding of human behavior. If stress may be roughly defined as stimulation, then Freud's opposing instincts might be evidenced by the human propensity to either engage in or avoid stress. Accordingly, one might access stress research in hopes of
obtaining some clues as to the nature of those motivations which run counter to the instinct of self-preservation.

There is another reason aside from that of motivation to explore the field of stress. Perhaps the most widely recognized contribution of stress research lies in the area of health and illness. Stress has been implicated in the onset of disease. Stress research, then, might serve to provide definition for what is and what is not conducive to a state depicted by the absence of illness.

Finally, stress might be viewed from an evolutionary or an historical perspective with the purpose of providing both a context for the study as well as an implied directionality. For the purpose of illustration, contemporary human society may be thought of as existing at the extreme of an evolutionary continuum. The earliest hominid lies at the lowest end of that continuum. Contemporary humankind is currently at the highest end of that same continuum. One might predict that in the future, the progeny of contemporary humankind will occupy that position at the highest end of the continuum, thus usurping the position now enjoyed by their currently breathing forebears. Past, present, and future each derives meaning from its relative position over time. Likewise, the relationship between stress and human behavior might be justifiably explored as a part of this evolutionary process.
Further rationale for assuming an historical perspective has to do with the outcome of this study. The form of this study is not so much a statement as an inquiry honed into a proposition. In the form of an inquiry, this study will examine data of a theoretical and hypothetical nature. An historical perspective will be taken in the pursuit of the inquiry in order to provide a basis for the credible formulation of a proposition. This is in recognition that one sure validation of any theory, or proposition, lies in its ability to withstand the test of time.

Background of the Problem

We live in a society where homicide, suicide, cirrhosis of the liver, cardiovascular disease, and cancer rank among the top eleven causes of mortality (United States Department of Health and Human Services, 1986). If a society can be judged in part by its malaise, what do these statistics say about the society within which we live? First, that there is a real potential for dying by violence --either at the hands of another, or by self-destruction. Few would argue that suicide is not self-destructive. Perhaps it would be wise to consider adjunctive behaviors such as alcoholism, eating disorders, and cigarette smoking as self-destructive behaviors.
Cigarette packages as a matter of education are required by law to disclose that smoking cigarettes causes heart disease, lung cancer, and emphysema. Yet, surveys indicate that 90% of Americans know that cigarette smoking is a health hazard (Whelan, 1986). So, it is not out of ignorance that people continue to engage in this self-destructive behavior. And although the consumption of cigarettes has been declining since 1964, still there is a heavy investment in spite of the consequences. The investment takes the form of the per capita consumption of cigarettes which was estimated at 3,447 in 1983 according to an extract from the Federal Trade Commission report to Congress filed pursuant to the Federal Cigarette Labeling and Advertising Act ("Cigarette advertising", 1985). The investment also lies in sheer numbers of individuals who engage in this behavior; there are an estimated 47 million Americans addicted to cigarette smoking (Perlman, 1988).

There is a financial investment. Tobacco is America's sixth largest cash crop with cigarette taxes making a six billion dollar annual contribution to the government.

There are approximately ten million alcoholics in the United States (Lahey & Ciminero, 1980) in spite of the fact that cirrhosis of the liver, one of the consequences of alcoholism, ranks among the leading causes of death. The alcoholic can expect a lifespan of ten to twelve years
shorter than that of the non-alcoholic (Lahey & Ciminero, 1980). There is nothing new here; in fact these statistics seem to be relatively stable over time. What is curious is that these statistics persist so steadfastly despite what is known about the destructive effects of alcoholism.

While the incidence of alcoholism seems to be relatively stable over time, there are some disturbing trends to be found among the young. Obesity, which has been linked to heart disease and diabetes, is a growing problem and appears to start at an increasingly early age. In the last fifteen years, the proportion of children who are obese has risen by more than forty percent (Carey & Taylor, 1987). Most of these obese children will grow to be obese adults at risk for heart disease and diabetes. Another trend is that the incidence of suicide for persons under the age of thirty-five increased by twenty-two percent between the years of 1958 and 1982, making suicide the third leading cause of death for that age group (Weed, 1985).

Yet, bookstores display a proliferation of health and self-help books indicating that at least a portion of the literate public is interested in health related issues. Recent government regulations prompted by consumer rights advocates require that the labels of food and cosmetic products disclose ingredients so that educated choices about what to use, and what not to use can be made.
At the same time, there appears to be a growing belief, exemplified by Congressional legislations, that medical services ought to be universally accessible. According to the Employee Benefit Research Institute (1987), the Federal Government is expressly concerned about the fact that the number of Americans without medical insurance is rising at a time when the lack of insurance seriously hampers one's ability to receive medical care. The 99th Congress, for example, approved six bills effecting expanded medical health insurance coverage.

Based on these observations of public and legislative concerns, it might be concluded that health is valued. How, then, does one account for the fact that the Surgeon General's most recent report indicates that two-thirds of all illnesses before the age of sixty-five are preventable (Miller, Springen, Gordon, Murr, Cohn, & Drew, 1988)?

A dichotomy exists between society's expressed concern for health versus the vital statistics of our nation which make it clear that ill-health is to a great extent self-imposed.

Assumptions Underlying the Research Questions

Several assumptions were made while formulating the research questions. Effectively, they served to focus the
research effort. Following is a list of those assumptions:

1. Physical Illness was selected as a topic at the exclusion of mental illness. One assumption basic to this research is that there is a general acceptance among mental health-care professionals that stress is a predisposing factor to psychological illness. This assumption is based on the multiaxial evaluation criteria in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM III-R), which is published by the American Psychiatric Association (APA, 1987) and used in the diagnoses of mental disorders. Axis IV of the diagnostic criteria consists of evaluating psychosocial stressors as these are contributors to both the development and exacerbation of mental disorders. Prognosis is made, at least in part, on the basis of the presence of psychosocial stressors.

Upon observation, the relationship of the impact of psychosocial stressors on physical health appears to be relatively unaccepted and unused by practitioners of the medical professional from whom individuals seek care. The objective is to provide relief from symptoms. Medical doctors are neither oriented nor trained to identify or ameliorate social or psychological factors which may predispose and maintain a state of illness.

The assumption is that the relationship between
social and psychological factors and illness might be stronger and have greater relevance if there is a relationship between stress and physical illness. Therefore, this inquiry will focus on stress and physical illness at the exclusion of mental illness.

By definition, this focus appears to dichotomize illness into discreet mental and physical categories. This distinction is merely a convenience for the purpose of narrowing the research topic. It is hoped that the reader will discern that a dichotomy between mental and physical processes is contrived, and that an intent of this inquiry is to examine to what extent and how psychological factors are involved with illness.

2. Motivation per se is presumed to exist. The assumption is that motivational and reinforcing forces exist as evidenced by the perpetuation of self-destructive behaviors. Specific theories of motivation and reinforcement will not be examined. The author admits that circular thinking is involved because the presence of behaviors is being used as evidence of the existence of the motivation to indulge in these behaviors.

3. Finally, there is the problem of defining stress. This is a comprehensive problem since there is no universally accepted usage of the term. It is assumed that the reader will gain an understanding of stress as this
inquiry unfolds. This is both an assumption and a goal of the inquiry itself.

Research Questions

1. What can empirical research reveal about the phenomenon of stress, its relationship to illness, and the factors which mediate that relationship?

2. In what ways has humankind been influenced by the ability to adapt to environmental stressors?

3. What are the historical perspectives of illness and stress?

4. What are the biological, psychological, and emotional correlates of illness?

5. How might stress related behaviors be viewed in terms of the processes of adaptation, motivation, and addiction?

Operational Definitions

Adaptation

Adaptation is a process. It involves the faculties of accommodation, adjustment, and/or change. The process occurs simultaneously on several levels: biological, social, and cultural. Inherent in adaptation is the concept of specialization which attaches both hereditary and evolutionary significance to the process.
Anxiety

The DSM III-R (APA, 1987) lists four symptoms representative of the emotional state of anxiety: motor tension, autonomic hyperactivity, apprehensive expectation, and hyperattentiveness. Although these depict anxiety, some measures will be used exclusive of others in the research. For instance, animal researchers might measure hyperactivity and conclude that the animal is experiencing anxiety. Human researchers might depend upon subjective description of autonomic hyperactivity from their subjects. The syndrome is useful for descriptive purposes, but it must be cautioned that not infrequently one symptom is observed, and the others are inferred.

Coping

Monat and Lazarus (1985) define coping as the employment of an effort intended to master conditions of threat or challenge when a routine or automatic response is not readily available. This involves the implementation of new behavioral solutions or the adaptation of existing solutions in order to meet demands imposed upon the organism.
Depression

Not to be confused with clinical depression, the term as used represents dysphoric mood. When the term clinical or major depression is used, the emotional state meets the diagnostic criteria for major depressive episode in the DSM III-R (APA, 1987).

Health

Health is often thought of as the absence of illness. For this inquiry, health will be expanded to represent a state of mental and physical well-being.

Immunocompetence

Immunocompetence is essentially the measurable ability of an organism's immune system to defend against a challenge. The reader is cautioned that the following classic cellular/humoral descriptive division of immune function appears to be simplistic (Stein, 1981).

One type of immunologic reaction is humoral. Humoral immunity involves the production and release into the blood and other body fluids of immunoglobulin or antibody. The synthesis of antibodies is the body's normal response to the presence of antigens. An increased measure of immunoglobulin would signify that the body is attempting to defend itself against an antigen challenge, and is therefore at risk.
The other type of immunologic reaction is cell-mediated. T lymphocytes are produced by the thymus. B lymphocytes are produced by the bone marrow in mammals. The functioning of these cells can be measured in terms of their ability to kill invading cells, to reproduce when stimulated, and/or to produce antibody. In addition, these cells or their subtypes may be redistributed or undergo alteration (Jemmott & Locke, 1984).

Ontology

Technically, ontology is the science of the study of being (cf. May, 1980). This application will view being with a comparative intent as existing historically in time within a context which is at once environmental and societal.

Self-destructive Behaviors

Among behaviors mentioned in terms of self-destruction are:

1. Suicide

2. Drug abuse where there are known health hazards associated with the behavior. These include cigarette smoking, and alcoholism. More controversially, long term usage of prescription drugs which have known health risks in terms of side effects, and which might be less effective than non-drug prescriptions (eg. diet, exercise, and
relaxation) which pose no health risks are also considered. An example of this is the hypertension drugs prescribed to a potential market of 37 million Americans who are judged to have the disease (Graedon, 1985).

3. Disorders of eating and nutrition

This is not meant to serve as an exhaustive description of what constitutes self-destructive behaviors. Those listed are presented in the text for illustrative purposes. A better understanding of the significance of their usage can be derived within the context of the text.

Stress

The term stress has been variously defined. For the purpose of this study, Lazarus' (1966) definition of stress as an area of concern or a field of study is appropriate.

Stressor

A stimulus which has the potential for evoking a stress-reaction. In animal research, for example, a common stressor is pain.

Methodology

A theoretical model comprised of dialectic inquiry is employed throughout. Each chapter will have an individual methodological orientation within this
theoretical framework. These will now be presented in order, as they evolved.

Chapter II

Chapter II has an empirical orientation. Historic, contemporary, and classic research studies in the field of stress and physical illness will be sought. Particular attention will be given to research involving cancer and heart disease because of the high mortality rates associated with these diseases.

What can empirical research reveal about the phenomenon of stress, its relationship to illness, and the factors which mediate that relationship? This is Research Question 1, to be addressed in Chapter II in the format of a literature review. The review is intended to provide an understanding of the field of stress research by presenting some of the major categories of study.

The stress/illness relationship will first be explored as it relates to immune functioning. Because the immune system functions as the body's defense against disease, if psychosocial stress is found to be related to impaired immune functioning and subsequent illness, then a necessary condition will be met for directly implicating psychological factors in the onset of illness.
Next, life event studies will be presented as these classically comprise the basis of support for the relationship between psychosocial stress and illness. One particularly potent psychosocial stressor which has been the subject of human research, bereavement, will be examined. Research will be sought which attempts to synthesize the measure of immune function and illness in response to this single life event stressor.

Conditioned immune response research will be examined briefly. These studies are relevant because they demonstrate the powerful influence that the mind has over the immune system. Essentially, these studies formulate an empirical analog for the observed clinical effectiveness of placebo medication.

An area of research that has interesting implications from a biomedical perspective is learned helplessness because of the findings on differential biological analgesic response in conjunction with cognitive/emotional factors.

Underlying this inquiry, the researcher is exploring empirical evidence within these five research categories for the assumption that psychological factors mediate illness.

Chapter III

In Chapter III, the orientation becomes ontological. Having looked at stress empirically, the inquiry now
proceeds out into the world to provide a pragmatic understanding of stress as a part of life. The intent is to leave the controlled environment of laboratory research and reach out into the world by accessing sources which describe the existence and define the reality that is manifest. In this chapter, citations may reference such sources as newspapers, business journals, and occupational studies.

How humans have changed or adapted over time is the focus of this chapter. Is there something to be learned from our developmental history, through evolution, that might be useful in formulating a response to the problem of what motivates people to engage or persist in behaviors that are self-destructive? And, can an examination of this past in comparison to the present provide a teleological perspective with implications for the future? With these questions in mind, Chapter III will address Research Question 2: Historically, in what ways has humankind been influenced by the ability to adapt to environmental stressors?

Chapter IV

As in Chapter II, stress and illness will be examined. Where Chapter II will be empirically oriented, Chapter IV will focus on the relationship between stress and illness unrestricted in orientation between empirical and
ontological approaches of study. Although the orientation is unrestricted, the focus of the inquiry will become reductionistic. Because the reasoning is deductive, encompassing an expanded data base, literature reviews will be used more extensively than in other chapters.

In general, what is known about the etiology of illness? How does stress relate to this? Is there a common denominator which is related to both stress and illness which also is meaningful relative to the forces of adaptation and motivation? These are the questions underlying the inquiry into the historical perspectives of illness and stress emphasizing the biological, psychological, and emotional correlates of illness. It is within these correlates that an attempt will be made to find a common denominator. Therefore, to be addressed in Chapter IV are Research Questions 3 and 4: What are the historical perspectives of illness and stress? What are the biological, psychological and emotional correlates of illness?

Chapter V

Do people persist in engaging in seemingly self-destructive behaviors because of mechanisms of adaptation, motivation, or reinforcement? If so, what might these be? These questions form the basis for further research.
In Chapter V, the problem stated as the purpose of this inquiry will be addressed. Having arrived at Chapter V with a cumulative understanding of the human experience of stress, it will now be appropriate to respond to the problem statement from which this study began. That is, a determination of what motivates individuals in this society to engage and persist in self-destructive behaviors will be postulated.

Motivation will be explored within the contexts of stress and four components of addiction—prevalence, compulsivity, denial, and tolerance. The topic of Chapter V will be Research Question 5: How might stress related behaviors be viewed in terms of the processes of adaptation, motivation and addiction.

Consistent with Chapter IV, research will be gleaned from a variety of sources, although there will be less reliance upon literature reviews.

Significance of the Problem

Much research has been done on stress. And much research has been done on illness. Incorporating these research efforts, many works have been written on the benefits of a holistic health model geared toward health maintenance as opposed to illness treatment. It is not the intent of this inquiry to attempt to replicate or in some
way improve upon these respected endeavors. Rather, these areas will serve as a springboard in a generic search through the various disciplines of evolution, history, anthropology, sociology, biology and psychology for an integrative analysis of those factors which may serve to motivate and reinforce seemingly self-destructive attitudes and behaviors. The search is for a rational explanation for why these motivations and reinforcements exist. The approach varies from those mentioned because it is not only to the behavioral level but also to the motivational level within the gestalt of human existence that this inquiry will look to for clues offering an assist in deciphering the problem. Therefore, the approach is philosophical. It is rather more like analyzing possible reasons for why the sky is falling versus providing Chicken Little with the prescription for an umbrella. Both avenues of approach are not only valid and necessary, but they combine to reveal more knowledge than either avenue could provide on its own.
Is illness the result of stress? There seems to be a growing acceptance that this is the case. Between the years 1980 and 1986, there was a 400% increase in stress related occupational disability claims according to the California Workers' Compensation Institute, and about 80% of these claims were validated by some form of compensation (Green, 1988). These figures may be consistent with a national trend which reveals that the percentage of stress claims doubled between the years of 1980 and 1983 (Cain, 1986).

Might this growth in claims indicate that an increasing credibility is being given to the published findings of stress research, which have tended to demonstrate a reciprocal relationship between biological and psychosocial factors in health and disease?

What is the empirical basis for this belief? Restated as Research Question 1 to be addressed in this chapter is: What can empirical research reveal about the phenomenon of stress, its relationship to illness, and the factors which mediate that relationship?
The Significance of Stress Research

It is appropriate at this point to explore the applicability of stress research to this inquiry. In other words, what does this empirical pursuit into the field of stress research have to offer, and what might be some of the limitations of this approach?

It might be argued that the scientific method is itself an impediment to the investigation of health. Since empirical research is performed with a stimulus/response orientation, measuring health becomes problematic. If health is considered to be the normal state of existence, how does one formulate an experiment where a specific isolated condition can be related to this normative state? However, to control and manipulate those factors which have been implicated in the etiology of illness lends a feasibility to this pursuit of inquiry that would otherwise be lacking. Given this viewpoint, the value of stress research is that noxious stressor stimuli can be isolated and measured in terms of specific physical response, illness being one of these responses.

It is in stress research that illness, as a criterion variable, assumes a degree of statistical predictability. Illness susceptibility factors can be isolated. In concrete terms, what this means is that a potential of stress research is the provision of practical
information which can be applied toward the prevention of illness.

Of particular importance from a health perspective is that measures of response are statistically analyzed. What this means is that averages are obtained in order to make generalizations about what can be considered a normative response. The mere fact that results are subjected to these statistical analyses suggests that individual differences are an integral component of the response reaction. Why else would there be a need to obtain averages? If all subjects reacted identically to a given stimulus, there would be no need for obtaining a hypothetical mathematical value to represent the theoretical construct of "normative". The fact is that the human response is individual and variable. Prescribed drug dosages serve to illustrate this point. Dosages are really a kind of normative estimation. The norm is based on that amount most likely to produce positive results in the largest numbers of users. With any given individual, however, the drug itself may be ineffective, or may cause an allergic reaction. Ultimately, the optimum dosage may well be a kind of trial and error determination of that amount which provides the greatest symptom relief and produces the slightest side effects.
It would be wise to remember, therefore, that while normative response data are illustrative from a stimulus/response perspective for elucidating generalized relationships between stress and illness, factors which differentiate between organisms that are more resistive to illness symptoms may be more informative from a health perspective. Researchers in the stress field are investigating these factors. Within this orientation, it has become apparent that the maintenance of health is complex and it is to some extent mediated by individual characteristics.

**Stress: An Historical Perspective**

**Beyond Darwin**

Crile was influenced by Charles Darwin in his postulation of the Kinetic Theory (Crile, 1916). His research, done at the turn of the century, is interesting in part because it reflects the state of technology of that point in time. He used animals as subjects, and arduously examined changes in tissue cell structure. His admiration of that new wonder, the automobile, led him to compare the "crude" mechanisms of the human body with the smooth operation of an automobile.

Crile's theory was founded on the idea that certain "organs", notably the brain, adrenals, liver, thyroid, and
muscles function interdependently to transform energy into an adaptive motor response. Emotions, an integral part of this process, are an expression of this motor activity. This process functions in the interest of self-preservation embodying Darwin's concept of survivability. Crile noted that various stimuli produced identical changes in the brain, adrenals, and liver. He used the term "stress" to describe the activity of these organs in both the production of energy and the reparation process subsequent to energy expenditure.

The effects of "strain" cause the weakening of some one link less hardy than the rest which disrupts the balance maintained by the normal functioning human system. Disease is a result of a disruption in this balance. But disease itself is related to every factor in the life of the species.

The early empirical research of Crile (1916), which was based upon structural changes in tissue cells, led to the theory that organisms experience stress which depletes finite stores of energy resulting in disease, and that this phenomenon occurs within a physiologically, psychologically, and socially interrelated milieu.

**Homeostasis**

Two widely recognized and respected pioneers in the field of stress are Walter Cannon and Hans Selye. Cannon
(1932) introduced the concept of physiological homeostasis whereby the internal mechanisms of the body interact with and respond to the external environment by maintaining an internal equilibrium. The body, and in particular the autonomic nervous system, has the capacity to maintain a highly sensitive yet volatile state of functioning in order to preserve the condition of relative constancy, or homeostasis, necessary to maintain life. Only a brief lapse in the interactive functioning of body organs, cells, and tissues, to provide for the requirements of oxygen, temperature, and necessary fluid amounts and compositions can be lethal. While this may seem somewhat elementary, especially in view of the simplistic manner in which it has just been summarized, there is another aspect of the phenomenon of homeostasis introduced by Cannon for which the preceding is a basis.

Cannon (1932) found it remarkable that most of the physiological reactions which he described occur most noticeably in the accompaniment of the powerful emotions of rage and fear. It is these fundamental emotions which have served multitudes of generations in their evolutionary struggle for existence in a savage, life threatening, competitive environment. The physical reactivity of the body served adaptively to mobilize the violent displays of energy essential to the struggle for survival. This energy
is evidenced by specific physiological changes which occur in conjunction with powerful emotions: deep breathing; rapid heartbeat; a rise in blood pressure; a shift in blood concentrations away from the stomach and intestines to the heart, central nervous system and muscles; cessation of digestive processes; a rise in blood sugar; and the release of adrenalin (epinephrine). Organisms in which these adjustments could be made most rapidly and efficiently were at a competitive advantage over those opponents whose adjustments were less rapid or less effective.

Thus, evolutionary survival was enhanced by the surge of physical strength which presented in accompaniment with the emotions of rage and fear as the internal mechanisms of homeostasis adjusted to the organismic requirement to summon physical resources in the presence of threat.

The General Adaptation Syndrome

As the result of many years of animal research, Selye (1976) formulated a compatible, if not extended, view of the homeostatic process. Selye was interested in the measurable manifestations of the organism's biological response to threat. He came to the conclusion that there are common characteristics of the threat response, and he termed these common sets of characteristics the General Adaptation Syndrome (CAS). The organism's entire or
nonspecific physiological reaction to life threatening circumstances was termed stress. Stress was measurable relative to the indices of adrenocortical enlargement, thymus and lymph node atrophy, and intestinal ulceration. Stressors were any condition which prompted this physiological response syndrome. So, the physical reactions observed by Cannon (1932) came to be viewed in terms of the adaptation of glandular components of the sympathetic nervous system which were required to function under duress at maximum levels in order to maintain homeostasis and sustain life.

The process of this homeostatic adaptation to stress was broken down by Selye (1976) into three identifiable stages which he termed alarm reaction, resistance, and exhaustion. The alarm reaction, or first stage of the stress response, is analogous to those physical reactions previously observed by Cannon (1932). The alarm reaction triggers metabolic changes which enable the organism to maintain a level of energy to meet the demands of the stressor. The stage of resistance is experienced by the organism as the sustenance of this increased energy level.

The stage of resistance is comprised of specific biological responses. The hypothalamus is stimulated into excreting corticotrophin releasing factor (CRF) which the pituitary reacts to by producing thyrotropic hormone (TTH)
and adrenocorticotropic hormone (ACTH). TTH stimulates the thyroid to increase general body metabolism. ACTH stimulates the outer portion of the adrenals to produce corticoid hormone which may be subdivided into two types: the anti-inflammatory glucocorticoids (cortisol and cortisone) which affect glucose metabolism, and the proinflammatory mineralocorticoids consisting of desoxycorticosterone (DOC) and aldosterone. Epinephrine and norepinephrine are released by the inner portion of the adrenals, increasing heart rate and blood pressure. The thymus and lymph nodes become impaired in their ability to produce lymphocytes and eosinophils, thus impeding the body's immune system to combat viral and bacterial agents, and allergic reactions respectively.

The stage of resistance is limited, however, because the body's ability to maintain this level of energy is terminal. Adaptation is finite. The third stage is one of exhaustion. The body is either relieved of its need to continue functioning in the adaptive mode, or the organism becomes ill and/or dies.

Selye (1976) proposed that stress induces the diseases of adaptation which can be divided into three classifications. Those diseases related to corticoid activity affect the kidney, heart, and blood vessels. These include hypertension, heart attack, and kidney malfunction.
Inflammatory diseases consist of infections, allergies, arthritis, and rheumatic illness. Other diseases include nervous and mental diseases, sexual derangements, digestive disorders, metabolic diseases, and cancer.

**Contemporary Stress Research**

**In Perspective**

The impact of Selye's findings in the 1930's was astounding in terms of the profuse amount of research on the relationship of stress and disease which followed. These research efforts can be simplistically and arbitrarily categorized for conceptual purposes into two broad classifications: biological and psychological.

The biological researchers are exploring the interaction of stress on biochemical and neurological body processes (Selye, 1983). These researchers, in effect, have expanded on Selye's original work which examined primarily adrenocortical measures of stress. For ethical reasons, animals are often employed as subjects. Meaningful implications are generalized to humans. A study by Riley (1981) will be presented which exemplifies this type of research effort.

Learning theorists of the psychological bent also traditionally employ animals as research subjects. The process of aversive conditioning has made stress an
inseparable element in many of these experiments. Although stressors such as pain and deprivation have been widely used, they are used as catalysts or motivators for studying learned adjustments to the environment which are instrumental for survival (Domjan & Burkhard, 1986). The learned helplessness studies presented at the end of this chapter are illustrative of this approach to research.

Psychological researchers interested in cognitive-emotional aspects of behavior necessarily employ human subjects (cf. Geen & Donnerstein, 1983; Spielberger, 1972). One advantage of human subjects is that subjective self-report measures can be used. The subjects can communicate their emotions and thoughts, these do not have to be inferred by the researcher. Another advantage to using human subjects is that generalizations about human behaviors do not have to be implied from animal responding. Some of the life event research to be presented in this chapter is representative of this approach.

There is, however, much overlap between these categories. Biological researchers sometimes use human subjects, and they sometimes look at variables of learning and cognition-emotion. Also, psychological researchers sometimes measure biological responses. And they too use both animals and humans as subjects. If this all seems a little muddled, do not be discouraged; such is the current
state of stress research. One conclusion that might be made from this is that there is a recognition among researchers that there is an interrelatedness among their various and specific fields of interest, and that valid meaningful conclusions are more likely obtained when as many factors as possible, independent of field of interest, are accounted for.

Even in the area of human research, the relationship between emotion and cognition remains elusive. There is no known causal relationship between emotion and cognition. There are more than forty theories on the subject of emotion alone (Spielberger, 1972). A classic study by Schachter and Singer (cited in Spielberger, 1972) demonstrated the importance of cognition to the experience of arousal and emotion. Human subjects were injected with epinephrine to induce a state of sympathomimetic arousal. Whether the subjects experienced euphoria or anger depended upon the social setting in which they were placed. It was the individual's cognitive appraisal of the situation that determined which emotion was elicited.

The subject of an existence of a relationship between cognition and emotion remains the subject of debate. Some theorists contend that emotion functions independently of cognition, while others maintain that cognitive appraisal is a necessary precondition for emotion (cf. Lazarus, 1984).
Some psychologists, notably Albert Ellis, have concluded essentially that there is no difference; that cognition and emotion are one and the same (Ellis, 1962). For the purposes of this inquiry, no distinction will be made. It is widely recognized, however, that sympathetic arousal accompanies the emotional experience of anxiety and anger (Geen & Donnerstein, 1983; Restak, 1984; Selye, 1976).

A general observation that might be made at this point, having taken both an historical and a more contemporary perspective of stress research, is that sympathetic reactivity appears to be as integral to the concept of stress and its relationship to illness as it is to the emotions.

Stress and Immunocompetence

Perhaps one of the most interesting contemporary areas of biological research involves stress and the immune system (Berczi, 1986; Jemmott & Locke, 1984; Miller, 1985; Stein, Schiavi & Camerino, 1976). The functioning of the immune system is necessary for survival as it is the primary means of defense against pathogenic microorganisms, parasites, and possibly against cancer (Berczi, 1986).

It is noteworthy that there is an increasing tendency for biological researchers to come to the conclusion that interaction among the nervous system, the
endocrine system, and immune systems is tantamount to the homeostatic functioning of the body's defense against illness and disease (Berczi, 1986; Stein et al., 1976). So, from the tissue cell technology of the turn of the century to the sophisticated radioimmunoassay methods of today, a philosophy of the etiology of illness which incorporates a concept of mental and biological equilibrium remains fundamentally unchanged.

The theory is not that stress causes disease, but that stress interacts with immune system functioning rendering the organism more susceptible to illness and disease.

One possible way to test such a hypothesis would be to apply stressors and measure immunocompetence. Riley (1981) in a series of sophisticated mouse studies related immunologic functioning to psychosocial factors and psychological stress. The studies accounted for the following variables: genetic vulnerability, the differential sensitivity to stress of neoplasms, baseline stress levels, and the phenomenon of temporal alternation of immunosuppression and immunoenhancement.

In these studies, genetically resistant mouse strains were used as experimental subjects, and genetically susceptible strains were used as controls. This procedure would tend to implicitly enhance the strength of the
relationship between stress and tumor growth because the mouse strain groups were not only not matched, but were mismatched in a manner which would result in the least variance. Stress sensitive neoplasms of lymphosarcoma and melanoma were shown to regress in genetically resistant mice in the absence of stress. Therefore, these neoplasms were used for the study. Environmental stressors such as noise, cage density, and handling were controlled in order to establish baseline stress levels. A rotation device was employed to facilitate states of chronic anxiety as the stressor, as opposed to introducing an acute stressor such as pain. Stress was applied in different temporal relationships to neoplasm injection.

The results indicated significantly that the most conspicuous biochemical reaction to stress is the decreased level of immunocompetence which is strongly related to tumor growth where genetic enhanced regression would normally occur in the absence of stress.

While Riley's research (1981) is impressive, apparently there is inconclusive evidence in the field. Riley notes that previous studies which failed to account for confounding relationships may have had spurious results, thereby contributing to the seemingly inconclusive relationship between stress and cancer as a whole. And Miller (1985) states that the great majority of studies in
the literature have used only two groups, one stressed and one unstressed, and most of these sampled the two groups at only a single point in time. Miller has suggested that studies which control for dosage and time may help to clear up some of the paradoxical results of previous studies.

Psychological research has employed human subjects to explore the relationship between stress and immunocompetence in relation to cognitive-emotional factors. A projective design was used by Glaser, Kiecolt-Glaser, Speicher, and Holliday (1985) to measure changes in herpes antibody levels in relation to stress test anxiety and loneliness in a sample of forty-nine medical students. The study involved taking three blood samples at different periods of time and assessing scores obtained from the UCLA Loneliness Scale. There were significant changes across the three sample points relative to herpesvirus antibody titers. The lowest levels of antibody titers were found in the low stress sample. In addition, high loneliness subjects had significantly higher Epstein-Barr virus antibody titers than low loneliness subjects. These findings tend to support the hypothesis that stress related immunosuppression can significantly modulate herpesvirus latency.

McClelland, Ross, and Patel (1985) also employed a projective design to measure salivary immunoglobulin A (a
measure of B-cell immune function) in relation to test anxiety in a sample of forty-six students. Three saliva samples were taken over a period of several days, and the subjects completed the Thematic Aptitude Test designed to elicit thoughts about power, affiliation and achievement. The study revealed that the examination stimulated adrenergic activity which subsequently depressed immune function for those with a strong power motive.

These studies are examples of the types of research currently being done which interrelate emotional states, immunologic function, and sympathetic activity. Of seemingly greater import, however, is that findings of these types of studies, though inconclusive, demonstrate that one of the immediate effects of stress may be to reduce the effectiveness of the immune system.

Life Events

Another area of research in the field of stress and illness involves life events. Navy physicians Holmes and Rahe (1967) hypothesized that change itself is a source of stress. Based upon their research of thousands of Navy personnel they were able to find significant relationships between life changes prior to sea duty and the probability of developing a serious illness while at sea. They formulated a cumulatively scored impact scale for Life
Change Units (LCUs), from most severe (death of a spouse) to least severe (minor violations of the law) (See Appendix A).

A follow-up study of Norwegian naval men (Rahe et al., 1974) confirmed the original results and indicated that illness symptoms and life change were less strongly related when the number of intervening variables and the length of time between life change and symptom onset increased. The Life Change Unit approach has been faulted for a variety of reasons (Lazarus, 1981). Perhaps most important in terms of future research is the criticism that the relationship between life change events and physical illness, though significant, is relatively weak. Other researchers may have been motivated to look for variables which would strengthen the weak but significant relationship between life event stressors and illness.

Theorell (1976) conducted studies on construction workers. He studied the two psychosocial variables of chronic discord and subacute life change relative to physical and emotional illness. Theorell's measures were a discord index which was comprised mainly of irritability and life dissatisfaction levels, and a modified version of the Holmes and Rahe life change index which excluded the most severe stressful life events. Chronic neurosis was measured by a questionnaire designed to provide evidence for such symptoms as: depression, fatigue, sleep disorders, anxiety,
blackouts, and excessive use of drugs or alcohol. Physical examinations two years after the study began were used to measure blood pressure, take electrocardiogram (ECG) readings, and perform various blood tests. Findings indicated that the high discord high life change group had a greater incidence of chronic neurosis and significantly higher blood pressure levels. There was no excess illness among the low discord high life change subjects.

Medical researchers Brodsky, Sato, Iseri, Wolff, and Allen (1987) studied eighty consecutive patients referred for cardiac arrest. They were interested in the phenomenon of sudden cardiac death which has been related to a variety of stressful situations. In this study, nine of the eighty people seen for care showed no evidence of structural cardiovascular disease. Two of these subjects declined to participate in the study and one was eliminated based on a possible drug reaction. Of the six remaining patients, it was found that five had suffered severe emotional trauma prior to experiencing heart irregularities. Sympathetic nervous system tone was evaluated and found to be elevated among these patients. These researchers concluded that cardiac symptoms in a portion of their patient population were a reaction to psychological stress induced by traumatic life circumstances. Subsequent successful pharmacological treatment with a beta blocker seems to affirm that
hypothesis. (Beta blockers are drugs which interrupt the stress reaction by preventing epinephrine from reaching the heart.) It is interesting to note that five of the six subjects were experiencing various degrees of depression. Equally interesting is the fact that one of the subjects first experienced symptomatic palpitations on the very day of the funeral of her husband.

**Bereavement.**

Studies on the impact of an individual major life event might support the hypothesis that stressful life events can lead to illness. One life event stressor which has been studied to some extent is conjugal bereavement, rated by Holmes and Rahe (1967) as the most severe of the life changes stressors (See Appendix A).

Mortality and morbidity measures are used in bereavement research. Although mortality studies are not the subject of this investigation, they merit mentioning. Stroebe, Stroebe, Gergen, and Gergen (1985) reviewed the literature on the subject of bereavement and mortality. Using longitudinal and cross-sectional studies as well as death statistics, they formulated these conclusions:

1. Compared with married controls, mortality rates among the widowed are excessive. The specific relationship between mortality and the loss of a spouse (the "loss
effect") is unclear because of the relevance of other factors such as gender, age, and marital status to death statistics.

2. Among the recently bereaved, the leading cause of death is heart disease. After heart disease, cirrhosis of the liver, cancer, and suicide are the leading causes of death among the bereaved. Compared to other diseases, psychological factors can significantly affect the etiology of heart disease, cirrhosis of the liver, cancer, and suicide. Psychological factors, therefore, are prominent in the relationship between bereavement and mortality.

Longitudinal studies which relate morbidity and bereavement can be used to investigate specific psychological factors such as those alluded to in mortality studies as the "loss effect". The role of anticipatory grief within the relationship between bereavement and illness, for example, was the subject of at least one study (Gerber, Rusalem, Hannon, Battin, & Arkin, 1975). In addition to the stress of conjugal bereavement, the factors of gender and chronicity were related to illness. This research found that physical illness is more likely to occur in men whose wives died of chronic illness than men whose wives died of acute illness. It was concluded that survivors who experienced an extended period of anticipatory grief suffered more physical illness after their loss.
Two additional studies on conjugal bereavement related this stressor to compromised immune functioning. Bartrop, Lazarus, Luckhurst, Kiloh and Penny (1977) correlated bereavement to diminished lymphocyte function. Bereaved spouses were age, race, and gender matched to controls. Eight weeks subsequent to bereavement, there was a lower lymphocyte response to mitogenic stimulation among the bereaved spouses compared to the controls. This response, however, was absent two weeks after bereavement, and the two groups did not differ in plasma cortisol concentrations or in actual T-cell or B-cell counts. Conversely, findings of Schleifer, Keller, Camerino, Thornton, and Stein (1983) indicated that lymphocyte depression occurred immediately after bereavement and persisted for two months or more, even when the bereavement was preceded by the chronic stress of prolonged spousal illness.

While the few bereavement studies presented tend to support the hypothesis that life events predispose illness, it is evident that there is not a great deal of specific concurrence concerning the relationship of life events and illness. One of the big problems seems to be related to the length of time between the life event and symptom onset. There could be an indeterminate number of confounding variables that intervene between the event and the illness.
Also, subjective self-reports may be confounded by attitudinal factors. And illness seems to be measured in a variety of ways, each of which may be questionable in terms of validity.

Along these lines, it has been suggested (Creed, 1985) that, in bereavement studies, it is necessary to know many more details about life circumstances at and following the event of bereavement in order to understand the relationship between physical illness and bereavement.

**Hassles.**

Even less acute levels of life events than those measured by Theorell (1976) or those observed by Brodsky et al. (1987) may be examined. Lazarus (1981) hypothesized that the frequency, duration, and intensity of daily hassles, such as misplacing or losing things, might have a stronger relationship to physical illness than the more acute events measured by Life Change Units. He performed a pilot study of 100 socioeconomic, age, and stability homogenous individuals. This prospective study consisted of a variety of questionnaires completed over a period of one year. The questionnaires were designed to measure health status, psychological symptoms, and emotional states. Checklists on hassles and uplifts were obtained. Additionally, subjects completed two life events scales, one
at the beginning of the year and one at the end of the year. It is interesting that a moderate relationship between life events and illness was found only when the comparison was made for the period of time covering the two and one half years prior to the study and illness at the completion of the study—a three and a half year time interval. Greater intensity and frequency of reported hassles bore a stronger correlation to mental and physical health than did life events for the time studied. These results seem to reaffirm the relationship of major life events to health, but, more critically, they demonstrate the importance of intervening life circumstances in the study of life events and illness. The subjective reports of intensity and frequency of hassles may have further implications.

**Conditioned Immune Response**  

A case might be made for the relative eminence of the brain over the immune system based on the findings of learning theorists. Ader, Cohen, and Bovbjerg (1982) classically conditioned immunosuppression in rats. The rats were permitted to drink a novel saccharin solution and then injected with the immunosuppressive drug cyclophosphamide. After several days, the rats were injected with foreign blood cells. A subsequent antibody measurement indicated that the immune system did suppress antibody production in response to the cyclophosphamide. The saccharin solution
became a conditioned stimulus because when the rats were re-exposed to the saccharin solution and foreign blood cells in the absence of cyclophosphamide, their immune response was once again suppressed.

In a correlate to this study (Bovbjerg, Ader, & Cohen, 1984), classically conditioned immunosuppression was extinguished by repeated exposure to the saccharin solution in the absence of cyclophosphamide.

It is difficult to believe that stress was not a confounding variable in these studies. Although the rats did demonstrate an associative process between the saccharin and subsequent malady, it might be reasonable to speculate that the rat, which is extremely sensitive to ingested toxins (Domjan & Burkhard, 1986), experienced high levels of stress as the result of having to ingest a substance associated with malaise, and that the hypothesized immunosuppressive components of the stress reaction might have affected the immune response.

The extinction study is perhaps more supportive of a stress influence than the immunosuppression conditioning study. In the extinction process, the rats were exposed to one fewer stressor, the handling and discomfort associated with the injection of cyclophosphamide. This difference in procedure between the immunosuppression and the extinction studies might tend to impact the confounding variable of
stress. This is so because the learned association, and therefore the distress, was between the saccharine solution and subsequent malaise not between the cyclophosphamide and subsequent malaise. Therefore, how does one distinguish between the associative properties and the stressor properties of that difference in procedure? It may be that a significant amount of stress was extinguished confounding the results of the relationship between learning and immunosuppression.

**Learned Helplessness**

Learning theory experiments on the phenomenon of learned helplessness also related biological function to properties of cognition and emotion. They indicate that when the same stressor is applied under conditions which likely pre-empt differential cognitions, there are different biological results. A pilot study performed by Jackson, Alexander, and Maier (1980) revealed that rats exposed to inescapable tail shock for many trials at relatively low levels of shock intensity demonstrated a deterioration in responding when the shock intensity remained constant. These researchers had to increase the levels of shock in order to prevent a demise in responding over trials from affecting the results of their study.
This adaptive deterioration in responding has been attributed to a phenomenon called stress induced analgesia (Jackson et al., 1980; Maier et al., 1980; Moye, Coon, Grau, & Maier, 1983; Moye, Hyson, Grau, & Maier, 1983; Ross & Randich, 1984). What this means is that the animals actually experienced a reduced sensitivity to pain in the presence of a physically painful stressor, such as shock. It is interesting to think that at least some organisms can adapt to one type of stressor (pain), by a compensatory biological process which produces analgesia. At least as interesting, from a biomedical perspective, is that there are at least two of these analgesic processes which seem to be differentially related to cognition and emotion.

Ross and Randich (1984) injected rats with naloxone, an opioid receptor antagonist, and then subjected them to brief electrical shock followed by placement on hotplates where jump response or paw licking latencies were noted. It was found that naloxone had no diminishing effect on response latencies. It could therefore be concluded that the type of analgesia experienced was not of an endogenous opioid source.

Animals subjected to inescapable shock have been found to respond differently to opioid antagonists. Maier et al. (1980) conducted a series of five experiments comparing the opioid response of rats treated with inescapable shock to
rats treated with escapable shock. It was found that analgesia incurred as the result of exposure to inescapable shock is prevented or reversed as the result of injection of the opioid antagonist naltrexone. Analgesia incurred as the result of exposure to escapable shock was not affected by naltrexone injection. It was concluded that a necessary condition for a hypothesis implicating pituitary Beta-endorphin specifically as the opioid produced in reaction to stress resulting from exposure to inescapable shock was met. (Although the role of Beta-endorphin in immunoregulation is unclear, it appears that it may have an immunosuppressive effect (Berczi, 1986).)

Two additional learned helplessness studies (Moye, Coon et al., 1983; Moye, Hyson et al., 1983) demonstrated that rats who experienced escapable shock prior to the exposure to inescapable shock were, in effect, immunized against the analgesic effects related to inescapable shock alone. It was concluded that a perception of control was realized as a function of successful experience, and that this perception of control was instrumental in negating a sense of helplessness and mediating the analgesic effect.

There are several important observations that can be made from these learned helplessness studies. First, analgesia is a component of at least some stress reactions. Second, cognitive attributions which have been shaped by
prior experience, or learned, have been found to mediate the stress reaction. Third, the stressor itself is less critical to the stress reaction than the perception of control. Fourth, there is evidence that cognition or emotion is associated with differential bio-amine responding.

**Summary**

Chapter II has consisted of a sampling of the literature on stress research in the format of a review. Both historical and contemporary research was presented. Four major categories of contemporary stress research were explored—immunocompetence, life events (including bereavement), conditioned immune response, and learned helplessness. These areas of research were addressed in order to answer **Research Question 1**: What can empirical research reveal about the phenomenon of stress, its relationship to illness, and the factors which mediate that relationship?

**The Phenomenon of Stress**

1. The stress reaction is comprised of three stages: alarm, resistance, and exhaustion.

2. The ability to maintain the stage of resistance is finite. Where relief is not obtained, the stage of exhaustion is manifest by disease and/or death of the
organism.

3. The response to stress occurs on three levels: biological, emotional, and physical.

**The Relationship Between Stress and Illness**

4. Selye (1976) proposed that stress induces the diseases of adaptation which include: hypertension, heart attack, and kidney malfunction, infections, arthritis, allergies, digestive disorders, metabolic diseases, and cancer. Contemporary research continues to investigate the relationship between stress and these disorders.

5. The body's defense against disease is maintained by a complex interaction among the nervous system, immune system, and endocrine system which is not completely understood. It is generally thought that stress compromises immunity by disrupting the homeostatic functioning of these systems.

**Mediating Factors**

6. Distressing major life events have been found to be related to illness with some degree of consistency. There is some evidence that distressing minor life events, or daily hassles, are also potentially unhealthy.

7. Distressing feeling states such as: loneliness, powerlessness, helplessness, irritability and life dissatisfaction have been found to strengthen the
relationship between stress and illness vulnerability in some of the research.
CHAPTER III
ONTOLOGICAL STRESS

As Crile (1916) and Cannon (1932) have suggested, our very survival mechanism—the ability to adapt, to respond to threatening situations with a competitive edge, is related to stress. There are two ways of looking at this. An organism when presented with a threatening situation mobilizes its bodily resources in preparation for either physically defending itself or for beating a fast retreat. This response is situation specific and there are physiological components which are measurable.

Yet another way of viewing stress in relation to adaptation, is by exploring how stress might be an influence in the human experience of existing in the world.

The pioneer of stress research has stated: "Virtually all human activity involves stress..." (Selye, 1974, forward). Stress is a part of life was the conclusion of researchers examining experiments on noise and social stressors (Glass & Singer, 1972). If these observations are correct, then an inquiry into stress based solely on empirical research with its emphasis on scientific description would be incomplete. A simple analogy might illustrate this point: if we were to attempt to know a painting using the same empirical approach by which we have
attempted to understand stress, we would find that we know something about the canvas and the colors, but nothing about the image which is the object of our experience.

In this chapter, an endeavor will be made to pursue stress into the realm of human existence by answering Research Question 2: In what ways has humankind been influenced by the ability to adapt to environmental stressors?

Measurability when it is presented in a historical perspective is problematic. Speculation is involved because there are no baseline measures in most cases. For instance, it may be determined that there is a genetic component to depression. While it is known that evolutionary changes occur at the genetic level, there is no basis of comparison from which to determine whether a greater proportion of the population is genetically predisposed to experience depression now than at other times in history. So, if one were to propose, for example, that the human species is evolving toward a state of adaptation to depression the onus of proof would necessarily be of a theoretical nature.

Bearing this in mind, one would expect that adaptation itself is somewhat controversial. And adaptation, at least from its anthropological inception, has been the subject of much heated debate.
Adaptation: An Historical Perspective

Darwin (1872) proposed his revolutionary treatise on evolution in the mid-nineteenth century with his publication of *The Descent of Man*. The idea that man might have evolved from what are commonly believed to be lower forms of life was oppositional to most Protestant and Christian religious interpretations of the biblical book of Genesis. The thought that the human species could possess such a formidable degree of adaptability as to structurally undergo vast change over time as a survival mechanism was, however, too imploring a subject to be ignored by those with investigative minds.

Darwin (1872) was a pragmatist. The world was his laboratory. And he reveled in the miracle of individual differences. Darwin took exception to the "naturalist" perspective that individual differences are unimportant. Individual differences, Darwin believed, are the foundation of the process of natural selection; the very heart of survival of the species.

Adaptation has gained in acceptance since Darwin's time. Cannon's (1932) concept of homeostasis provides a basis for understanding adaptation as an organismic process. But the distinction between species adaptation and organismic adaptation is artificial. If it is accepted that
adapting is the ability to make changes and accommodations for the sake of survival, then organismic and species can be viewed as two levels of the same process.

There is an important temporal distinction, however, between organismic and species adaptation. Homeostasis, or organismic adaptation, occurs in the present. For example, your eyes are focused right now on this page. If you were to look up, your eyes would immediately accommodate your need to see at a distance by refocusing. Species adaptation as a function of natural selection, on the other hand, is oriented to the past. Williams (cited in Noonan, 1987) states that natural selection does not prepare organisms for future survival. Further, where adaptation is predicated upon what has been reproductively successful in the past, environmental changes may render once adaptive features useless or even disadvantageous. The adaptation of natural selection, then, might be instrumental in species extinction where the organism is unable to maintain homeostatic functioning.

It has been observed that changing conditions appear to be related to disease (Dubos, 1959; Wells, 1956). It has been hypothesized also that changes in life circumstances (life events), are a source of illness predisposing stress (cf. Holmes & Rahe, 1967). Might illness and extinction
both be results of the process of adaptation which differ primarily in degree?

**Adaptation and Stress**

**The Modulating Brain**

Has the ability to adapt rendered humankind capable of experiencing stress in larger amounts than in the past? In empirical terms, habituation, or decremental responding as a function of increased exposure, may support this notion. An example of habituation to a stressor was provided in the learned helplessness research of Jackson, Alexander, and Maier (1980) presented in Chapter II. In this rat study, the intensity of the stressor, pain, had to be increased in order to compensate for a lack of responding as a function of increased exposure over time. On an organismic level, then, stress itself might be something that can be adapted to.

The evolutionary development of the brain is another source of information that can be turned to for an answer regarding the human capacity to adapt to increasing amounts of stress over time.

By taking skull measurements, anthropologists have been able to estimate the brain capacities in cubic centimeters of the modern human and his early ancestors (Moore, 1964). The earliest hominid, Australopithecus, lived about one million years ago and had a brain capacity
that ranged between 450 and 650 cubic centimeters. Neanderthal lived about 75,000 years ago. The capacity of Neanderthal's brain is estimated to be between 1,400 and 1,600 cubic centimeters. (The brain of the average twentieth century European is 1,500 cubic centimeters.)

How and why the capacity of the hominid brain more than doubled in less than one million years remains a mystery. But there are always theories. It has been thought that human progress through evolution, and perhaps the human essence itself, could be revealed by identifying whatever it is that distinguishes humans from lower life forms.

Anthropologist Richard Leakey (Leakey & Lewin, 1978) deviates from the widely accepted position that the ability to make and use tools is what distinguishes humans from other forms of life. Actually, according to Leakey, man is not the only primate to use and make tools. Chimpanzees manufacture a probe for obtaining termites by selecting and stripping a branch of its leaves and rough bark. And although this may sound like a rather primitive accomplishment, an anthropologist who attempted the same was highly unsuccessful. There is another factor to consider, says Leakey. During the time period when the human brain was undergoing its most rapid growth, stone tool technology advanced slowly from sharp rocks to crude tool types such as
scrapers and hand axes. According to Leakey, it was the challenges, pressures, and demands of social life with its "ever-changing relative uncertainties" that prompted the evolution of human intelligence.

It would be simplistic to assume that intelligence can be inferred by measuring the skull housing capacity of the brain. Were this the case, elephants would be infinitely more intelligent than humans.

There are structural differences other than size which differentiate the human from the non-human brain (Moore, 1964). As animals ascend the evolutionary scale; the cerebrum, or thinking part of the brain, becomes more convoluted and actually increases in size. As the cerebrum increases in size, the areas of the brain which govern instinct become proportionally smaller (Moore, 1964).

In his formulation of the concept of the triune brain, MacLean (1973) has proposed that the brain has changed in size, function, and orientation as an adaptive process through evolution. According to this theory, the brain is comprised of three separate but intimately related "brains". The reptilian brain is the most primitive of the three. It appeared first in the evolutionary process, and enabled man when his earliest instinctive behaviors of hunting, homing, territoriality, and mating were essential for survival. The orientation of the reptilian brain is
outward—to the environment. The second "brain", the limbic system, surrounds the core of the reptilian brain. As the governor of emotion, the limbic system has an internal orientation. The third "brain", the cerebral cortex, or outer layer, is thought to have evolved over the past two million years. It is capable of sophisticated problem-solving, memorizing, and planning, and it provides us with the ability to anticipate the future. According to MacLean (1973), the newly acquired cerebral cortex seems to thrive on novelty and change.

To reiterate: the newly acquired parts of the brain which govern intelligence seem to thrive on novelty and change. The law of natural selection dictates that individuals who were more intelligent, and more adaptive to change had the greatest potential for survival. If, as has been proposed, change is related to stress, might the human brain have evolved a greater capacity to endure stress as a function of survivability? But MacLean (1973) is saying that we have evolved to thrive on novelty and change. Has our brain evolved an appetite for stress?

The Etiology of Survival

Might pace-of-life be a measure indicative of a tolerance for stress? If the process of natural selection has resulted in a propensity to experience higher rates of
change, then a comparison might be made between our ancestors and ourselves in manner of existence.

The Neolithic Age

The ability to drink milk is thought to be a result of the Neolithic Revolution which began about 12,000 years ago. During this era, man was adapting to a radically changing environment. The melting glaciers of the Great Ice Age resulted in a spread of forests, and a change of fauna that fostered habitation in regions once covered with ice. As the climate changed and their accustomed food, the reindeer, moved north; humans began a slow mass migration into Europe from the south. Still, the reindeer was becoming increasingly rare. The change in climate had imposed conditions which were no longer conducive to a hunting and gathering existence. The changing conditions probably brought disease, but they also fostered adaptation to a new type of existence. This was an existence of settlement and animal domestication, including dairying (Wells, 1956).

In an environment of declining food source, the ability to metabolize a variety of products brought with it the advantage of supply: an independence from the necessity of striving to meet dietary requirements from increasingly rare supplies (Kretchmer, 1981).
Kretchmer's (1981) presentation of food as a selective agent in evolution provides an example of the influence of natural selection on genetics. The ability of a people to metabolize the food milk appears to be important both because it is genetically linked, and because it is a determinant of the cultural evolution of a people.

The ability of adults to digest milk is believed by Kretchmer (1981) to be the result of genetic mutation. Human babies can digest milk because their systems maximize the production of the enzyme lactase during the perinatal period. This lactase enzyme enables the body to metabolize the lactose or natural sugar content of the milk. However, the production of the enzyme declines to a very low level at the end of the suckling period, rendering an intolerance for the digestion of milk. Ethnic cultures that are descended from non-milking people such as the Bantu, Thai, and Pima Indians have a high proportion of milk-intolerant people in their population. Among these particular cultures the percentage of milk-intolerant people ranges above the 90th percentile. In general, most of the human adult population follows this pattern of mammalian lactase activity and milk-intolerance. Danes, Finns, and Caucasian Americans who are progeny of milk-consuming peoples, on the other hand, range below 20% in the incidence of milk intolerance as a proportion of the population.
According to Wells (1956), the daily life of these milk-drinking peoples was similar to that of geographically isolated peasants in Europe at the beginning of the eighteenth century. Crafts consisted of pottery making, plaiting and weaving, and the constructing of stone tools. Industry revolved around hunting/gathering, agriculture, and the domestication of animals.

So, how might the manner of human existence have changed over time? Several observations may be made from what has just been presented:

1. Survival for our ancestors consisted of a subsistence life style where there was a direct contingency between occupation and consumption.

2. Technology was developing slowly, the simple crafts of early Neolithic man evolved over a period of nearly one million years.

3. Survival was predicated upon the ability for humankind to adapt to an unpredictable and uncontrollable environment. The human relationship to the environment was unilateral because humankind had little resource for impacting an environment which dictated accommodation for the sake of survival.

The premise at this point is that humans have evolved into a manner of existence that is qualitatively different from that of the past. But, the manner of today's
existence in the above three areas will need to be explored to see if this premise has validity.

**Contemporary Existence**

"In a word, society substitutes for the world revealed to us by our senses a different world that is the projection of the ideals created by society itself" (Durkheim, 1953, p. 1310).

**The Phenomenon of Stress**

It was suggested in Chapter II that the psychosocial phenomenon of stress is becoming increasingly recognized as an antecedent of illness. Statistical evidence of this recognition can be found in the workplace. Employers are increasingly being held accountable for debilitating illnesses related to the emotional stress of their employees. Worker's compensation stress claims doubled between the years 1980 and 1983 (Cain, 1986), and this trend is expected to continue (Cain, 1986; Rothman, 1986). At the same time, there appears to be a growing acceptance among people in the health field that psychosocial factors are a component of illness. The National Institute for Occupational Safety and Health (NIOSH) was established following the passage of the Occupational Safety and Health Act of 1970. The function of this organization is to conduct research and gather information about employees'
occupational safety and health. NIOSH has recently added psychological disorders to the list of leading work-related illnesses and injuries (Rothman, 1986).

Increased attention to stress, as a phenomenon, might indicate that there is a growing awareness on the part of the American public about factors which predispose illness. It has been nearly thirty years since Dubos (1959) made the distinction between illness etiology and symptom relief. Regarding diabetes, for example, Dubos has stated that diabetes is not caused by a lack of insulin any more than fire is caused by the lack of water. Dubos’ work is a revered classic in the field of health, and he has been widely cited. Also, it has been over forty years since stress research first appeared in the Psychological Abstracts. Since then, there has been a prolific amount of research in the area. Results of published findings in stress research permeate the media. Could it be that the employee of forty years ago blamed his ulcer on over-acidity, while today’s employee looks to occupational stress for the cause? The prospect of compensation might be a factor tipping the scales in favor of the latter.

Technology

As every individual, therefore, endeavours as much as he can both to employ his capital in the support of industry, and so to direct that industry that its produce may be of the greatest value; every individual
necessarily labours to render the annual revenues of the society as great as he can. He generally indeed neither intends to promote the public interest, nor knows by how much he is promoting it. ...[H]e intends only his own gain, and he is in this, as in many other cases, led by an invisible hand to promote an end which was no part of his intention (Smith, 1937, p. 423).

That stress is becoming a widely recognized phenomenon does not preclude the possibility that there is something about the occupational environment of today which renders it more stress-evoking than in the past. Two recent surveys reported in Newsweek indicate that a large number of people view their jobs as a source of stress (Miller et al., 1988). In a survey conducted by the advertising agency of D'Arcy Masius Benton and Bowles, it was concluded that three-quarters of Americans find their jobs stressful. The results of a study taken by the National Center for Health Statistics showed that more than half of the 40,000 workers surveyed reported experiencing high or moderate levels of stress during the prior two week time period.

It was about forty years ago that the term "automation" first appeared in the United States (Parkman, 1972). It may be coincidental, but the term "stress" received definition by Selye at about the same time (Selye, 1976). It has been speculated by some that one possible reason for this increase in occupational stress is automation (Cain, 1986; Suplee, 1988). But it would be simplistic to blame the machine, a sophisticated tool, for
stress. It is more likely the manner of existence of a technology dominated society that is related to stress rather than the machine itself.

We live in a world where technological advances are occurring at increasingly rapid rates (Parkman, 1972; Toffler, 1980). Eight years ago Toffler (1980) proposed that we are on the brink of a revolution which he defined as a period in evolution distinguished by an increasing pace of change.

An increasing pace of change may be a factor in the relationship between automation and stress. In the business world where time is money, machines economize time. With automation came the stop-watch procedures of work simplification which were used to measure and implement the most time-efficient worker performance (cf. Nadler, 1957). Today, the monitoring of employee performance continues, but the procedures are more sophisticated. The office employee of today can be monitored, paced, and surveyed electronically. Efficiency is defined, measured, and tracked in terms of speed and accuracy. To this end, work can be simplified and reduced to a repetitive process which is advantageous to the employer who can economize time in order to increase profitability. This is, in fact, the philosophical basis for the application of division-of-labor and assembly-line production procedures.
The computer has made a highly competitive industry of artificial intelligence, and information processing; it is based on a market where speed is imperative to a survival which is economic. This industry has resulted in the commonplace usage of video display terminals. The NIOSH, as early as 1981, reported that the clerical use of computers and video display terminals produces a higher level of stress than air-traffic control (cited in Suplee, 1988). And the Federal Office of Technology Assessment has indicated that psychological stress may stem from higher expectations of speed and efficiency, electronic monitoring of work flow, and the isolation associated with working on terminals (cited in Cain, 1986). Workers may feel pressured and dehumanized by the perception that their value as a worker is tied to their ability to perform fast a task which is abstract to their survival.

The perception of employees that their value as a worker depends upon speed is well-founded. One does not have to take a college course in Economics to have this perception. Eckhouse (1987, April 13) published an article in the San Francisco Chronicle defining productivity as: "The amount of goods or services generated by each hour of work" (p. 28). He cited unpublished Bureau of Labor Statistics findings which show that between the years 1973 and 1985 productivity in United States service industries
fell 0.6 percent a year. During that same time period, productivity growth was the lowest of the nine industrial countries; and in 1986, non-financial corporations showed no increase in productivity. Eckhouse (1987, April 13) makes a statement that these decreases in productivity will extract a cost in terms of our standard of living.

**The Essence of Time**

Time is an important commodity to an organism whose lifespan is finite.

"Time is the ultimate symbol of domination. Those who control others' time have power, and those who have power control others' time" (Levine, 1987, p. 30). Levine (1987) has observed ten rules which govern waiting and which support his statement:

1. Time is money.
2. Since time is money, it is governed by the economic principles of supply and demand.
3. What is waited for is perceived as valued because it commands time.
4. Who waits is a function of status.
5. The length of the line determines the degree of importance attached to that which is waited for.
6. Privileged individuals do not wait. They delegate waiting to others.
7. Time is power. Powerful people have the capacity to make others wait. They can choose to exercise this power. The willingness on the part of others to wait acknowledges and legitimizes this power.

8. Time is a powerful commodity. Waiting can exert a potent force on the obstacles of life.

9. The offering of time can be a gift.

10. The norms of waiting are strictly enforced.

Time also is something to be allocated in the pursuit of goals. That is, time is a commodity to be economized in the pursuit of getting from where we are to where we want to be.

In fact, there appears to be little value ascribed to being engaged in living as a process independent of the abstract construct of time. Observation itself can lead to this conclusion.

**Travel.**

Americans have become habituated to driving sixty miles an hour on crowded freeways. Yet, this activity would probably be most fear provoking for a person unaccustomed to such travel. Traffic accidents account for most cases of death by accidental causes and are the leading cause of years of potential life lost before the age of sixty-five (Premature mortality, 1988). Considering the incidence of
traffic injuries and fatalities, fear would be a very reasonable response. Yet many drivers seem to exhibit boldness not fear.

People expect travel to inconvenience them as little as possible with respect to lost time. The supersonic jet, a marvel of modern technology, can travel approximately 3,000 miles in less than six hours. At least some individuals experience an instinctive sense of relief when the wheels touch ground.

Entertainment.

In this culture, speed is not merely something that one is subjected to. How people indulge in leisure activities indicates that there might be an increasing human affinity for speed. Computer video games provide an opportunity to achieve pleasure from winning where fast responding is critical. Television provides a fast-paced diversion where the rapid delivery of one-liners is appreciated as a source of wit and humor. Commercial television interruptions are even faster. Within a matter of seconds, a product can be presented so successfully as to profitably influence mass consumption. And is it possible that the fast beat of the music many people enjoy is synchronized, as an echo, to the tempo of our existence?
The ecosphere.

The World Commission on Environment and Development, a United Nations commission, has warned that current ecological trends are threatening to radically alter the planet, and many of its species, including humans. A news article on the findings of this commission printed in the San Francisco Chronicle (Shabecoff, 1987, April 27) warns:

Among the trends are the alteration of the Earth's atmosphere by the burning of fossil fuels, the destruction of the protective ozone layer by man-made chemicals, the destruction of tropical forests, the accelerating extinction of plant and animal species, the spread of deserts, the acid-poisoning of lakes and forests, and the toxification of air, soil and water (p. 11).

The Commission further states that only when economic growth and environmental protection are realized as inseparable will sustainable human progress be attained, and it suggests that the affluent nations adopt a lifestyle that is less taxing on the Earth's resources by reducing the per capita usage of energy. We are being told to slow down for the preservation of our planet and ourselves.

Values

The World Commission on Environment and Development (Shabecoff, 1987) admonishes that affluent nations need to adopt a lifestyle that is less energy consuming. But people want to live in affluent societies; and to them, in search of a better life, they will immigrate from their homelands.
It is to this affluent, dominant, society that people accommodate and acculturate. Viewed as an evolutionary process, Anthropologists Harding, Kaplan, Sahlins, and Service in their book *Evolution and Culture* (1966) have formulated what they refer to as the Law of Cultural Dominance: "...that cultural system which more effectively exploits the energy resources of a given environment will tend to spread in that environment at the expense of less effective systems" (p. 75).

This Law of Cultural Dominance provides a context within which acculturation as a process assumes theological significance. Values, as an element of the cultural system, may be evolving in a manner which complements an energy consuming fast paced manner of living. Examples of acculturation drawn from recent local history serve to illustrate this point.

McWilliams (1968) describes the plight of Mexican immigrants to the United States in the 1940's. At that time, most Mexican immigrants came to the United States from a folk culture—a small, isolated, non-literate, homogenous society where there was little division of labor and where there was a direct contingency between production and consumption. Many of these people were poor and undernourished; they came from a feudalistic society where there was no opportunity to alter their status. So, they
came, often under contract to particular employers, to work for amounts of money that were low by American standards. It is axiomatic according to McWilliams (1968) that these people suffered culture shock and sought what little solace they could by living within enclaves of people who shared their culture and their values.

McWilliams (1968) has observed that discrimination against these people was rampant and was attributed to both racial and biological factors. Racially, Mexicans were viewed stereotypically as violent and lawless. Biologically, because of their Indian blood, they stereotypically were seen as shiftless and improvident. The cultures clashed. A result of this cultural clash was open violence. In the summer of 1943, the "Zoot-Suit Race Riots" exploded in the city of Los Angeles. For one week racial violence ensued within the city, and that disturbance resulted in a chain-reaction of violence in other cities which sporadically continued through the month of July.

This was not the last of the Los Angeles race riots. O'Toole (1973) in his discussion of black social anthropology describes the destruction of the Watts area of Los Angeles, a large black ghetto, in terms of dysfunctional anticipatory socialization; that is, the sense of rootlessness and anomie that arises when groups of individuals are blocked from realizing the aspirations which
they are led to believe are theirs to achieve. According to O'Toole (1973), the process of social adaptation appears to evolve through the various stages of isolation within a subculture, identification with the values of the dominant society, and insurrection. A subsequent stage of adaptation appears to be the institutionally acceptable attempt to educate and legislate an equitable social balance. One of the stages of acculturation, then, according to O'Toole (1973), is identification with the values of the dominant society.

Values are more than mere mental constructs. If they are, as we have seen, related to behavior on a cultural level; they are also related to behavior on an individual level. In working with individuals, Williamson (cited in Ewing, 1966) observed that: "Behavior of all types originates in value commitments and frequently in conflict and confusion about value motivation" (p. 28).

In short, values as a component of an evolving cultural system motivate both collective and individual behavior in response to societal ideals.

Stress and Health Care

Health care.

It might be predicted that the behavioral orientation of health care institutions will be
representative of the values of the cultural system. Cultural values, in fact, may be a limiting factor where improved health is the goal.

In industry, the measurement of productivity in terms of the quantity of goods and services generated during the passage of one hour's time represents a value that has a corollary in the health profession. The value is that "more" is better. This can be seen by a persistence in the belief that increased numbers of medical facilities and doctors is the hallmark of a healthful society.

A newspaper article on the front page of the San Francisco Chronicle for January 4, 1988 rated Bay Area cities on quality of life (McLeod & Stone, 1988). Among the criteria were doctors and hospital beds per capita. More doctors and hospital beds per capita are indicative of a higher quality of life, according to these media reporters. Also among the criteria were socio-economic status indicators: mean household income, home values, cultural facilities, and number and per capita amount of retail stores.

Yet, it has been found in a series of studies performed by rural sociologists at Cornell University and the University of Arkansas (Miller & Stokes, 1978; Miller & Smith, 1980; Miller, Voth & Danforth, 1982) that increases in health resources give no assurance of decreasing
mortality rates. Mortality rates were found to fluctuate more consistently in accordance with the socioeconomic factors of education, occupation and income; and less by the quantity of resources (with the exception of nurses who teach and counsel). They found that rural areas have the lowest rates of total mortality; and their data further show that the distribution of medical care resources is relatively unimportant in explaining differential mortality. It was posited that the medical care system operates less effectively on deaths owing to chronic conditions and more effectively on situations which require acute curative intervention.

"More is better" might be considered from another perspective. Perhaps more health care is an indication of a poorer quality of life, not a better one. It might be argued that increased health care costs (cf. Rothman, 1986) might be at last partly due to an increased demand for health services.

An aging population may account for an increased demand for health services (cf. Rothman, 1986; Teitelman, 1987) to the extent that one believes that good health is necessarily antithetical to the aging process. In other words, Americans seem to expect that health will decrease necessarily as a factor of age. This may be true of our culture, but it may be an unfounded assumption. Human
longevity remains mysterious: in areas of Ecuador, Kashmir, and the Caucasus exist peoples who have among them disproportionate numbers of hearty centurions (Leaf & Launois, 1973). By Western standards, the vital signs of these people exude youth. Also by Western standards, there is a noticeable lack of affluence and technology. No one seems to know precisely why more technologically sophisticated peoples do not possess at least a commensurate standard of health.

Might an expansion in health services actually belie an underlying malaise of a people? Some statistics derived from the field of occupational research indicate that this might be so. A study of their own employees performed by Control Data was based on health claims and employee health survey data (Control Data, 1982). This study revealed that among Control Data employees smokers have 25% higher health care costs than non-smokers; employees who do not exercise have 36% higher health care costs than those who exercise; and employees who are overweight have 7% higher health care costs than those who are not overweight. Another example of this is the alcoholic employee. Alcoholic employees tend to use three times as many illness benefits, place five times as many claims for workman's compensation, and experience nearly three times as many accidents as non-alcoholic workers (Pati & Adkins, 1983).
If drug usage can be construed as a measure of morbidity, then it can not be too comforting to know that the pharmaceutical industry is fast growing and highly lucrative. At 24% pretax, the drug industry has the highest profit margin of any industry in the United States, and that margin is rising ("These Stocks", 1987). Teitelman (1987) states that the most explosive growth prospects in the drug industry are for those drugs used to treat hypertension. One of the largest money makers is captopril which gets marketed by the E. R. Squibb detail people for hypertension, by Princeton Pharmaceutical for congestive heart failure, and by Squibb/Novo for diabetes. Captopril is being used as a replacement for beta blockers which caused depression and fatigue (Teitelman, 1987). Drugs provide fast symptom relief. In a society which values rapidity, drugs are a panacea for health. In this context, health may be defined as symptom relief.

Stress.

In a society which treats physical health and mental health separately, it might be that what economists refer to as the Law of Diminishing Returns has been realized (cf. Hailstones & Brennan, 1970). That is, perhaps the most productive usage of the combination of factors related to health is not being employed. More specifically, the factor
of physical symptom relief may be disproportionate to the factor of mental health care in the pursuit of health. It is not that medical doctors, hospitals, and drugs serve no useful function. But one function that these may serve is to enable us, as a society, to engage in and endure greater amounts of stress.

Rothman (1986) has estimated that only two percent of health benefit costs are spent on keeping people well. This is understandable since medical doctors are paid to treat ill people. Stress research consistently indicates that there is a potential for diagnosing and treating predisposing physical illness factors in the mental health field. Good mental health may yield good physical health.

Yet, psychiatric insurance coverage has always been less generous than other medical coverage, and it has been more vulnerable to coverage cutbacks (Brady, Sharfstein & Muszynski, 1986). These researchers undertook an analysis of data from the U. S. Bureau of Labor Statistics Level of Benefits Surveys for the years 1979 through 1984 to see if rising medical costs were having an effect on private insurance coverage for mental illness. It was revealed that although the number of employees with psychiatric benefits has increased, a greater percentage has restrictions on those benefits. On the whole, fewer than ten percent have outpatient psychiatric coverage that is equal to their
coverage for other medical problems. In addition, there is a downward trend in coverage for treatment by clinical psychologists. Fewer than 36% of those with coverage were covered for outpatient treatment by clinical psychologists, while 96% were covered for outpatient treatment by psychiatrists.

A study is being conducted by the National Institute of Mental Health (NIMH) Epidemiology Catchment Area Program (ECA) to assess mental disorder prevalence, incidence, and service use rates in specified adult community populations (Locke & Regier, 1985). Although the study is not complete, and the population was not chosen to be representative of the American public, the data are presented as the best estimates available. According to this study, it is estimated that 18.7 percent of the adult population has a mental disorder which is diagnosable. What is surprising is that less than one-fifth of the individuals comprising this population used any mental health service during the six month period of time studied.

If mental health care treatment is this poor among that percentage of the population which is diagnosable in terms of mental illness, what might we expect to be given care-wise to those who are not yet diagnosable in terms of mental or physical illness? This is difficult to determine, but it might be roughly estimated that of the fifteen to
eighteen percent of the total medical claims which are attributed to psychiatric care, a portion of the remaining 82-85% should be attributed to medical problems caused by mental health conditions (cf. Rothman, 1986).

Summary

Research Question 2 is: In what ways has humankind been influenced by the ability to adapt to environmental stressors? The reply to this question may be summarized by the following nine statements:

1. Stress is a part of living. It can be adapted to.

2. Species changes occur, in part, as the result of accommodating change. The ability to endure the resistance stage of stress which accompanies the change process may result in the evolutionary adaptation of a species.

3. Stress is a survival mechanism. Evolution produces survival mechanisms with an orientation to the past. Human responses function in the present at a level of immediacy which has the potential of rendering survival mechanisms useless or disadvantageous.

4. The brain itself might be evolving in size, function, and orientation in response to stress. The brain may have evolved a greater capacity to endure stress.

5. Intelligence is displacing instinct as a
dominant function of the brain.

6. Humankind may have evolved an appetite for novelty and change which exponentially increases the potential for experiencing chronic amounts of stress.

7. The pace of life is quickening. Change occurs more rapidly than in the past. Fast-paced cultures which harness and consume disproportionately vast amounts of environmental energy enjoy a standard of living which is attractive and enviable. These cultures are spearheading the future direction of the human race.

8. Societal expectations and values have been founded and are reinforced by a precarious socio-economic structure where a competitive marketplace dictates that a people function in the interest of economic survival to produce the most goods and services in the least amount of time. Individuals have less control over the socio-economic structure governing their lives than in the past.

9. Humans are enduring ever increasing levels of stress.
CHAPTER IV
STRESS AND PHYSICAL ILLNESS

A distinction has been made between empirical and ontological approaches to the field of stress. In Chapter II, a survey of empirical research on stress and illness was presented. Stress was examined as a phenomenon which could be described and measured in scientific terms. In other words, how stress is relevant to illness within the scope of the scientific method has been explored. One of the recognized limitations of the scientific method found involved the intervening variable of time in longitudinal studies which employed human subjects. The problem is that unmeasured events occurring over time may serve as confounding variables which challenge the validity of the experimental results (cf. Creed, 1985; Lazarus, 1981). Given this limitation, the focus of the inquiry was expanded to provide for an understanding of the human context within which stress occurs.

In Chapter III, therefore, an ontological approach was taken in recognition of the fact that humans do not exist at points of time separate from their experiences of existence in its entirety, and this includes an environment which is itself evolving. What the human milieu has been and is now was searched in order that
stress, as viewed within the historical context of human existence, might be given a teleological relevance.

With a broader understanding of the significance of the process of existing to the phenomena of stress, this inquiry will now proceed to refocus on stress and illness using a deductive process of research where both empirical and the ontological realms of observation may be accessed. Research Question 3 is: What are the historical perspectives of illness and stress? Research Question 4 is: What are the biological, psychological, and emotional correlates of illness? Research Questions 3 and 4 will be addressed in this chapter.

**Historical Perspectives**

That microorganisms are the specific cause of illness was first eloquently questioned by Dubos (1959). Dubos observed that the presence of pathogens in the body can bring about disease, but usually this is not the case. He noted a general pattern between microbial pathogens and other living things. Exposure to a novel pathogen may bring about serious disease in much of the population. However, the epidemic subsides as an adaptive process occurs between the host population and the infective agent. It may be said that a resistance or immunity has developed. Anyone who has ever suffered from "Montezuma's revenge" can attest to
this phenomenon. In this case, microorganisms in the
drinking water produce illness symptoms in the American
tourist. This same microorganism has no effect on the
native Mexican population because they have adapted to the
presence of the microorganism. These people have developed
an immunity to the illness.

Dubos (1959) postulated, in fact, that
microorganisms might be more an effect than a cause of
disease. The true cause of disease, according to Dubos,
results from an internal or external disequilibrium
involving such factors as weather conditions, food
availability, working habits, and emotional stress. The
doctrine of specific etiology has failed to determine the
causes of cancer, arteriosclerosis, mental problems and many
other disorders, and the pursuit for a single cause may be
futile, because most disease states are the indirect outcome
of multiple factors.

It is fitting that Dubos' words are today revered as
a classic contribution to the field of health. Certainly
time has strengthened his position. A glance at comparative
mortality statistics of the years 1900 and 1983 attests to a
medical conquest over death rates attributable to
pathogenic disease, inflammatory disease, and infant
mortality (Donabedian, Solomon, Axelrod, Wyszewianski,
Lichtenstein, 1986) (See Appendix B). Masses of the
population no longer die from tuberculosis, diphtheria, and typhoid bacilli as they did in 1900. Immunization now renders us resistant to these diseases. The inflammatory diseases of nephritis and gastritis are less lethal now than in 1900. Anti-inflammatory drugs no doubt play an important role in this regard. And longevity statistics have received a boost from a substantial decrease in infant mortality.

However, the medical conquest of disease symptoms is still disease specific. For example, an unhealthy individual of today may be getting relief from gastritis by taking an ulcer medication. That same individual might be expected to die from heart disease or cancer. This expectation is consistent with statistics which show that almost three out of four deaths in the United States today are the result of the four leading causes of death: heart disease, cancer, stroke and accidents, respectively (Donabedian et al., 1986; United States Department of Health and Human Services, 1986). Meanwhile, the stress factors which might serve to render the individual susceptible to a disease state go largely unattended.

**The Problem of Prevalence**

**The Paradox of Illness**

When Selye (1976) was a nineteen year old medical intern, as might be expected, he was exposed to a gathering
of obviously ill individuals. While these individuals displayed apparent malaise, the symptoms were so generalizable as to make diagnosis nearly impossible. In other words, people were ill but they could not be diagnosed because disease specific symptoms evaded detection. Selye was both appalled and intrigued by the paradox that illness symptoms could be so pervasive as to be indefinable as illness per se. It was then that he formulated the general syndrome concept which was to be the foundation for his GAS theory.

It appears that the medical profession has developed a greater degree of sophistication since Selye's time. Yet, while the existence of a relationship between illness and stress would be tough to dispute, the nature of that relationship, at least as far as research is concerned, is full of controversy. For the most part, the measurable import of stress on illness is limited to the extent that stress still eludes diagnostic evaluation. An exception to this is Post Traumatic Stress Syndrome, a psychological state of distress which results from acute exposure to an identifiable stressor (American Psychiatric Association, 1987).

There are simply too many variables to formulate a one to one correlation between a specific stressor and a particular illness. It seems that investigators are
grappling with the same paradox relative to stress that Selye (1976) observed in conjunction with illness; that is, the phenomenon of stress is so pervasive and generalizable as to be nearly indefinable in terms of diagnosis. The case against specific etiology may be as applicable to stress as it is to illness.

The Paradox of Stress

Miller (1985) in a review of the literature notes that a wide variety of stressors has been implicated as risk factors in such ailments as: gastrointestinal disorders, hypertension, sudden heart failure, myocardial infarction, stroke, diabetes, cancer, multiple sclerosis, tuberculosis, influenza, pneumonia, as well as such afflictions as colds, headaches, and insomnia.

If it can be assumed that a myriad of stressors has in common an illness susceptibility response, then some explanation is needed to account for the diversity of symptoms within this illness response. Why, for example, does one person experience hypertension while another develops diabetes? One explanation is found in diathesis-stress theory (Lahey & Ciminero, 1980). According to this theory, a genetic predisposition to a disorder is inherited. Not all bodily functions are equally strong within any given individual, and these strengths vary among
individuals. So when stress is encountered, the effects will be most destructive to the weakest part of the body which varies among individuals according to genetic inheritance. A simple analogy best serves to illustrate diathesis-stress theory. Think of the body as a chain comprised of a series of steel links. These links are of varying gauges. When the chain is stressed by applying oppositional force, that link which is weakest breaks first. Genetic inheritance, then, can be viewed as a mediator between the stressor and the specific illness reaction. The advantage of the diathesis-stress theory is that it accounts for the observation that specific illnesses are disproportionately distributed across families.

There is another way of looking at this propensity to experience illness differentially that does not exclude the possibility of a genetic component to illness susceptibility. The functioning of the immune system can be examined in response to stress. Indeed, this appears to be the current trend in research.

**Stress and the Biological Correlates of Illness**

If it is theorized that stress is implicated in illness, regardless of the malady, it would seem that a relationship between stress and the immune system would tend
to support this hypothesis. Research in this area is new and inconclusive. Nonetheless, some interesting observations have been made.

The immune system is not static even in the absence of an identifiable stressor. It fluctuates in accordance with such things as circadian rhythm (Restak, 1984), and may be modulated by such factors as age, sex, and genetics (Monjan, 1981). Logistically, these immune system fluctuations cannot be bifurcated into either a weak (bad) or a strong (good) response. Meinecuk (1985) states that there are in reality four consequences of incompetence within the immune system:

- Immune responses that are too weak to nonself entities from without permit infections; responses too weak to nonself entities from within permit cancers; responses too strong to nonself entities from without permit allergies and fatal anaphylactic shock; and responses too strong to nonself entities from within—i.e., self entities misperceived as nonself—permit autoimmune disorders (p. 406).

Stress has been related to illnesses in each of the four categories presented by Meinecuk (1985). In the first two categories, infection and cancer, immunosuppression is related to disease; in the second two categories, allergies and autoimmune disorders, immunoenhancement is related to disease. Let us briefly glance at each of these categories respectively.

In their review on psychosocial factors, immunologic mediation, and human susceptibility to infectious diseases,
Jemmott and Locke (1984) concluded that stress is associated with an increased incidence of a variety of infectious diseases. LaBarba (1970) concluded in a review of the literature on stress and cancer research that experimental stress increases the rate of growth of certain experimentally induced tumors.

Stein (1981) in a review of the literature emphasizing a biopsychosocial approach to immune function and medical disorders, has found evidence of psychosocial factors and immune mechanisms contributing to the susceptibility of allergy, although the interaction of the two is still unclear. Solomon (1981) has reviewed the literature implicating stress events in the onset of autoimmune diseases, particularly rheumatoid arthritis.

Ader and Cohen (1985) in a review of the literature have concluded that most often stress has been found to suppress immune responses. However, they add, the same stressor can enhance or suppress different immune responses, and an elevation in adrenocortical steroids (the traditional stress reaction measure) has been associated with both enhancement and suppression of immune function.

In fact, according to Monjan (1981) some types of chronic stress have been demonstrated to enhance immunologic function. He cites animal studies which employed overcrowding, noise, and electric shock as stressors.
What these studies which measure the stress response in terms of immunocompetency have in common with those which measure the stress response in terms of adrenal reactivity is inconclusiveness. There is a possible explanation for this inconclusiveness which incorporates both the adrenal and the immune system.

It might well be that there is a greater number of variables to account for than are consistently controlled for across studies. Researchers are learning that it is unrealistic to expect that there is a standardized physiological response that fluctuates homeostatically with consistency. Monjan (1981) has stated:

It is now clear that stress is associated not only with a single hypophyseal-adrenal axis but evokes, instead, a multihumoral response. As the neural pathways which oversee the endocrine systems are elucidated, it becomes more evident that the patterning of the release of hormones is dependent upon both the experiential history of the individual and the current internal milieu. The animal of this decade appears not to reestablish a prior homeostatic level after perturbation but enters into a new stochastic balance (p. 216).

It is important to note that Monjan's observation is based upon animal research.

Lazarus (1966) has presented two principles of phylogetic development which might lend applicability of Monjan's statement to human functioning. These are that as species rises in the phylogenic scale: 1) behavior is less instinctive and increasingly more dependent upon learning, and 2) there is a greater diversity of individual
differences. It might be expected, then, that human hormonal responsivity is even more variable than that of other species in terms of individual differences and learning. What this all means is that the hormonal secretions of the adrenal, the hypothalamus/pituitary, and the endocrine systems are interactive and patterned. This patterning is individualized to the extent that it is influenced by personal experience and an existing hormonal status both of which are affected by their temporal relationships to stress, age, genetics and sex. Additionally, this individualistic hormonal patterning mercurially reorganizes itself after a stressful experience. Given these variabilities, it is not difficult to see why research is a challenging task. And the function of stress becomes one of perturbation—a catalyst by which to measure response and thereby learn more about the biology of the human organism.

It has been determined that there is a variance among stressor stimuli and among biological reactions which results in a degree of inconclusiveness with regard to the stress illness relationship. Yet, life event research has shown that there is a correlation between stress and illness in humans. As in biological research, life event research has demonstrated that individual differences and learning are mediating factors for stress in humans. In the case of
life event research, direct results regarding personality traits and cognitive attributions may be drawn as these are measurable with human subjects.

Pertinent to this discussion are mediating factors, or variables which intercede between the stressor and the response. These might prove to be significant since specific stressors appear to be differentially and inconclusively related to malaise. Might there be factors more strongly related to illness than stressor stimuli which seem to have the potential of differentially evoking biological responses?

**Psychobiology and Illness**

It is interesting to think that the brain is constructed such that two of its components involved with immunoregulation also govern emotion. Ader (1981) states that evidence implicates the hypothalamus and its intimate neighbor the limbic system in the immunoregulatory process. These centers of the brain are also instrumental in governing emotion (MacLean, 1973; Restak, 1984). Perhaps emotion has a biochemical correlate—a recipe, so to speak—that varies richly in accordance with other factors.

Biologically, humoral responses are differentially related to emotion where the stressor remains the same. The experience of stress, then, is not stressor specific. It
can be concluded from learned helplessness studies which employ the stressor pain that the depressive feelings of helplessness and hopelessness are related to the production of Beta-endorphin which functions as an analgesic. Where the stressor remains the same in studies which vary the situation to eliminate the feelings of helplessness and hopelessness, Beta-endorphin is not the active analgesic produced (cf. Maier et al., 1980). Additionally, norepinephrine and epinephrine seem to vary relative to the perception of control over a stress evoking situation for human subjects (Fisher, 1984). A subject may secrete less epinephrine and more norepinephrine in relation to the experience of control.

Depressives hypersecrete cortisol, and endogenous depressives also tend to show a measurable dysregulation in the secretion of Beta-endorphin (Matthews et al., 1986). Although the immunoregulatory effects of humoral responses are still unclear, Beta-endorphin is thought to be immunosuppressive (Berczi, 1986). Stress and depression are so closely related that cortisol levels, as measured by dexamethasone suppression, may be as indicative of stress as depression (Baumgartner, Graf, Graf, & Kurten, 1985).

Throughout this inquiry a relationship between stress and illness has been evidenced. In Chapter II it was found that empirical support exists for the mediating role
that psychological and emotional factors have on the stress response and on the immune response. It would seem that a case might be made for the relative importance of these psychological and emotional factors in the etiology of illness.

**Psychology and Illness**

It is possible that psychological variables are more strongly related to the illness response than either the stressor stimulus or the dependent variable, a biological measurement of immunological or adrenal origin, which is assumed to be the primary predictor of illness susceptibility.

LaBarba (1970) conducted a review of the literature on environmental factors, stress and cancer. He concluded that both emotional and personality variables are implicated in the etiology and pathogenesis of malignant tumors which are the second leading cause of death in this country (Donabedian et al., 1986; U.S. Department of Health and Human Services, 1986).

Heart disease is the leading cause of mortality in the United States (Donabedian et al., 1986; U.S. Department of Health and Human Services, 1986). One area of research into the relationship between psychological factors and heart disease can be referenced as "Type A". Fischman
(1987) has reviewed the literature on Type A research. Stress-prone people labeled Type A according to certain "action-emotion" characteristics have been defined in part by their risk of heart attack which has been found to be three times greater than that of Type B, or non-Type A, individuals. The original Type A personality was typified by behaviors indicating ambitiousness, aggressiveness, competitiveness, and impatience signifying a sense of time urgency; and emotional responses of irritation, hostility, and anger. The existence of a Type A personality has become controversial because research has not borne conclusive results. It may be that a fixed personality trait syndrome is not the characteristic of the Type A individual after all. Instead, it may be reflective of an approach that some people take which produces stress in competitive situations.

According to Lazarus (1966), it is the intervening variable of threat that distinguishes psychological stress from other categories of stress. Stress itself is mediated by cognitive processes, primarily by the individual's assessment of the degree of strength possessed by the stressor, and his or her perceived ability to stave off harm which is mediated by such individual psychological characteristics as intellectual resources, education and knowledge, motive strength, and general beliefs about the
environment. The physiological measure of the stress reaction is the vestige of a certain psychological state.

There are similarities between these psychological mediating factors and the humoral measures of the stress reaction. Both relegate the stressor to a secondary level of importance. The stressor appears to be of secondary importance as microorganisms are of secondary importance in the incidence of illness. Specific stressors and/or microorganisms may precede illness, but neither necessarily results in illness. Given this secondary role of stressors, it is deemed unnecessary to delve into the many potential stressors identified by researchers for the purposes of this inquiry. The assumption is that potential stressors are pervasive. Both psychological mediating factors and humoral measures have been presented in terms of differential patterning which is dependent upon individual characteristics. Biological measures of the stress response and how they relate to stress and illness have been dispensed with because of inconclusive evidence of the stress illness relationship in terms of humoral measurability. The complexity of the biological response of the human organism to defend itself when threatened to the extent that it is individually variable makes it a poor candidate for further pursuit. The same thing may be said
For the psychological component of stress. It too, is complex and highly individualized.

For instance, it is commonly accepted in the field of psychology that social support is a mediator for stress. There has been research to support this notion (cf. Cohen, 1985); and for the most part it is probably a sound tenet. However, it may not be true in the field of organizational psychology. It may be that disgruntled employees who lend emotional support to each other strengthen the relationship between the stressor and the strain (Kaufmann & Beehr, 1986). Yet another tenet in the field of psychology that has received acclaim and wide acceptance has been that of the power of positive thinking. While the power of positive thinking may serve some people well, it is likely not generalizable to a segment of the population. Pessimism may be a mediator for the fear of failure (Norem & Cantor, 1986). At least some people apparently use negative thinking in a positive way to improve performance. Meditation has been promoted as an inducer of relaxation and a reliever of stress. Yet, there is evidence from research done by Leon Otis, a psychologist at the Stanford Research Institute (now SRI International), that meditation can be stress provoking for some individuals (Hassett, 1978). Otis found in a series of studies that a substantial minority of long-term practitioners of Transcendental Meditation
reported experiencing chronic anxiety, confusion, frustration, depression, and/or being withdrawn.

So, what is left? It all seems very nebulous and tenuous, this relationship between stress and illness. I have apparently summarily dispensed with stressors, biological reactions and illness, and psychological reactions and illness. Of the three, the psychological component may be the most meaningful. In the search for a common psychological thread that binds stress and illness, emotion is the most pervasive.

Stress and Emotion

Mason (1975) believes that the stress field was misled by Selye's concept of stress because it integrated emotional stimuli as stressors in addition to physical stimuli resulting in the assumption that psychological stress is merely a component of the biological stress phenomenon. Emotional stimuli, says Mason, are among the most potent and pervasive natural stimuli capable of increasing pituitary-adrenal cortical activity. In fact, the great diversity of physical stress stimuli have in common the single factor of emotional arousal. He views emotional arousal as the common denominator of the stress reaction. His argument is strengthened by citing several experiments where physical stressors such as fasting and
heat failed to produce a stress reaction when emotional variables were controlled.

In their study of life event research, Dohrenwend and Dohrenwend (1981) concluded that research has consistently demonstrated a strong correlation between physical illness and emotional disturbance.

It is important to bear in mind that emotion is simply one element of an elusive constellation of variables related to both stress and illness. But for our purposes, it might be more pragmatic to examine stress and illness in terms of emotion than in terms of either adrenal or immunological measures. This is true because emotion, above all other factors, may play a singularly important role in motivational forces which have health related outcomes. (This will be discussed in greater detail in Chapter V.)

Emotion and Illness

Selye (1974) proposed that both distress and euphoria have equal detrimental effects on the body; that the physiological reaction is independent of the felt emotions of either distress or euphoria respectively. This does not seem to be the case. In fact, learned helplessness studies demonstrate that feelings of helplessness and depression do result in a separate physiological reaction which is related to illness.
The single emotion most likely to be strongly related to both stress and illness is depression.

Although stress and immunocompetency is the subject of much research in the field, the specific stressor induced mood state for the most part has gone unobserved and unmeasured in these studies. An exception to this is a study comprised of 77 Israeli women who had undergone the stress of abortion. Naor, Assael, Pecht, Trainin, and Samuel (1983) correlated separately the mood states of anxiety, guilt, and depression with immunocompetency. Depression was found to correlate most highly with the compromised lymphocyte response to mitogenic stimulation.

In a review of the literature on the prevalence of depression in the medically ill (Rodin & Voshart, 1986), the authors suggest that approximately one-third of medical inpatients report mild or moderate symptoms of depression, while up to one-fourth may suffer from a depressive syndrome. Studies of depression among outpatients indicate that depressive symptoms are present in 12% to 36% of that population, depending upon the assessment criteria used. It is important to note that causality has not been established. That is, it is unknown by these statistics whether depression results in illness or illness results in depression. But what is revealing is that the psychological
component of illness, symptoms of depression, are frequently unrecognized and untreated.

It has been found that depressive illness can be diagnosed and measured by the early escape of plasma cortisol concentrations in the Dexamethasone Suppression Test (DST). Although the etiology of DST nonsuppression is unknown, it has been proposed that the phenomenon may be more strongly related to stress than to depression (Baumgartner et al., 1985). This would tend to make one believe that the measurable relationship between stress and depression is close enough to be considered, at least by some, as nondistinguishable.

Chronic stress may be a precipitator for major depression (Breslau & Davis, 1986). In one study, elderly depressive individuals were found to have a 2.6 times higher mortality rate than age equivalent nondepressives, and these deaths were found to be related to cardiovascular disease (Rabins, Harvis, & Koven, 1985).

It would be a mistake to assume too simplistic a relationship between depression and illness. But it might at least be speculated that it is the factor of depressiveness, more than stress itself, which may render a vulnerability to illness. Using this speculation as a hypothesis, this inquiry will now be directed to the phenomenon of depression.
Both Seligman and Beck have formulated theories which propose that cognitive processes play a causally antecedent role in the onset of depression (Eiser, 1986; Sahakian & Sahakian, 1986). In support of this premise, cognitive therapies have made an impressive impact on the treatment of depression. But this does not mean that cognitive processes play a causal role in the onset of depression. It may be that cognitive attributions are more a result than a cause of depression. This has been suggested by Brewin (1985) in a review of the literature. Cognitive attributions may be more reflective of positive and negative coping styles; this is why they become important predictors in the recovery of depressive episodes.

If one were to accept a causal role for cognition in the etiology of depression, it would be at the expense of the importance of the role of environmental factors--the precipitating stressors--distressing life events. By returning to life event studies, it can be seen that the premise of cognitive attributions has its limitations. It would not be spurious to assume that an individual who has endured a loss, job termination for example, might have difficulty making a positive interpretation of that loss. It would be inappropriate to conclude that a subsequent depression was caused by a negative attribution of the event. It may well be normative to experience some
dysphoria as the result of a job loss. The same case might be made more strongly in the event of bereavement.

As in the Type A discussion, it might be more useful and consistent to think of cognitive attributions as neither a cause nor an effect, but as a mediating attitude effecting an approach which may render one vulnerable to stress. For example, perfectionistic attitudes have been found to be a mediator between stress and depression (Hewitt & Dyck, 1986). Task completion where one holds perfectionistic attitudes may result in depression not because of the task, but because of the approach taken to achieve the task.

Consider, for the sake of argument, a case where depression does not appear to be strongly correlated to illness as the stressor life event.

Of all the significant life change events, conjugal bereavement is considered to be the most stressful (Homes & Rahe, 1967). This might be interpreted to mean that illness is most likely to result from the death of a spouse than any other life event. This observation is supported by bereavement studies. Grief is a common reaction to the loss of a spouse. Yet, as Fisher (1984) notes, only about three percent of bereaved people are likely to be treated for depression. Here is an instance where one of the most potent stressor illness relationships is apparently statistically unrelated to depression. There are two
possible conclusions that may be drawn from this. First, it may be hypothesized that the bereaved do not experience depressive symptoms and that is why they do not seek treatment. This seems unlikely.

Second, the validity of treatment-seeking as a measure of the phenomenon of depression might be questioned. Relief for depression may be available through methods other than sought psychological treatment. Fisher (1984) cites a study by Brown and Harris (1978) where the prevalence of depression in working-class women at home suggests that the nature of the condition may actually predispose against help-seeking.

Indeed, help-seeking may well be a last resort in the relief of the symptoms of depression. It may be that people can adapt to depressive mood states. One of the expected ways this might be accomplished is through various methods of avoidance. As Lazarus (1966) states: "Avoidance is one of the most basic and universal of all action tendencies" (p. 262). If depression is a symptom of stress, perhaps symptom relief is being attained from stress-avoidant behaviors. If stress is, as has been proposed in Chapter III, more pervasive; then this might account for the evidence of an increase in both stress and stress avoidant behaviors. The inference is that exceptions to the depression illness relationship may not be indicative of the
absence of depression as might be assumed. These exceptions may be sources of information about the prevalence of stress and self-destructive behaviors as well as the nature of depression.

Summary

This chapter has responded to Research Questions 3 and 4. Research Question 3 is: What are the historical perspectives of stress and illness? Research Question 4 is: What are the biological, psychological, and emotional correlates of illness? In summary, seven points may be made:

1. A specific etiology for illness has not been established. Illness can best be understood in terms of susceptibility factors.

2. The experience of stress is not stressor specific. Therefore, a single etiology approach is no more applicable to stress than it is to illness.

3. A common paradox exists for both illness and stress. The paradox is that of sheer pervasiveness. Both etiologic and diagnostic criteria receive definition from specific syndromes where a diversity of factors makes permutation the norm. An existing condition may be nonexistent by definition because of limitations inherent in the process of definition.
4. The biological and psychological correlates of the relationship between stress and illness are complex and multifactorial. Inconclusiveness of research findings in this field is common.

5. Individual differences and learning are related to both the biological processes and the psychological processes of the stress illness relationship. This lends an element of uniqueness to findings which makes generalizability problematic.

6. Emotion may be the most meaningful common denominator of the biological and psychological components of the stress illness relationship.

7. The single stress induced emotion which is most strongly related to illness is depression.
CHAPTER V
STRESS RELATED EMOTIONALITY, MOTIVATION, AND ADDICTION

In this chapter, emotions related to stress will be explored as both adaptive and motivational forces. It may well be that motivation may elucidate the paradox of why we humans persist in behaviors that are both self-destructive and avoidant of life. To this end, the inquiry will now proceed to Research Question 5: How might stress related behaviors be viewed in terms of the process of adaptation, motivation, and addiction?

It was proposed in Chapter IV that emotion is inseparable from stress. It was further posited that emotion may be the most meaningful common denominator of the stress illness relationship, and in particular, that a single emotional component of stress, depression, may have a stronger relationship to physical illness than does stress itself.

In Chapter III it was concluded that stress is inextricably intertwined with adaptation; and that the human brain has adapted through evolution with a greater capacity to respond to stress. Indeed, the brain may have developed an appetite for stress.

Sapolsky (cited in "Scared Sick", 1987) has concluded that humankind has evolved maladaptively. The
interrelationship of the immune system and the nervous system has insured survival for situations involving short-term physical stress. Under these conditions, the nervous system registers threat which temporarily compromises the immune system in order to mobilize the physical strength necessary to meet the immediate demands of a survival where flight and fight are adaptive responses. These systems are regulating in a manner which makes us susceptible to illness where stress caused by psychological events is prolonged. Prolonged or chronic stress, as opposed to short-term stress, is thought to be a relatively new evolutionary development and a consequence of the expansion of the brain to meet the complexity of an intensely social way of life. That is, our brain with its predilection for stress no longer functions in the interest of our survival, but in our demise. This is a possibility to explore.

Adaptation: For Better or for Worse

The propensity to use drugs, both licit and illicit, has been associated with stress. This behavior might also be related to extinction. At least one researcher has found that drug intoxication and addiction are naturally occurring phenomena among many species of animals. Siegel (cited in Greenberg, 1983) has studied intoxication among animals extensively both in laboratory settings and in the
wild. He has found at least twenty-eight species that gravitate toward alcohol. Elephants in Africa, for example, will consume alcohol in the form of fermented fruit, and by breaking into grain storage facilities and stills. Siegel has found that the incidence of intoxication has risen as animals have been increasingly threatened by poachers, draught, and the loss of range forests to timber companies. He confirmed this relationship between environment and intoxication in a study where he restricted elephants to two acres of land for one month. There was a three-fold increase in the consumption of alcohol. Siegel, then, believes that drug taking is a natural biological response which increases as a function of stress. There is some basis for the premise, therefore, that drug taking may be a natural coping mechanism for stress. But Siegel goes one step further. Species extinction, he says, is a possible result of drug ingestion. He believes that this is what happened to the dinosaurs.

Some 225 million years ago angiosperms, which comprise the major groups of flowering plants, began to flower. They produced two substances: hydrolysable tannins which have a bitter taste, and aromatic, amino-acid-based alkaloids--bitter tasting substances that constitute the major groups of psychoactive drugs. The dinosaurs, some of which ate about a ton of foliage a day, failed to evolve a
taste distinction for bitterness. They also failed to evolve effective livers which could detoxify the alkaloids. As a result, says Siegel (cited in Greenberg, 1983), drug overdose contributed greatly to the demise of the dinosaur.

That we humans are evolving toward our own extinction at an increasingly fast pace is viewed as a controversial, if not revolutionary concept. And it may be a moot point, given the immediate potential for nuclear devastation. The state of our technology, it seems, is evolving faster than we. But, extinction is the exception to the historical experience of the human species. The fear of extinction is the reality, extinction itself has remained but a phantom. Doomsday sayers have been around for a long time, and they yet knock on doors. Consider, for instance, the Aztecs. They too knew that existence is tenuous. Present the god with the sacrificial gift, they thought, and do not patronize by offering something of low value. So that the sun would rise, they offered human life—the most precious of all gifts. But time has taught us that we can, after all, take the rising sun for granted because it rises on scientific principles which lie beyond our control.

It may well be that the human of today would not be able to survive if suddenly transported to the year 51,988. But has not this observation been made of the cave-dweller of fifty-thousand years ago who, if magically transported
across time, to the New York City of today would die instantly? So, perhaps this is an evolutionary reality—that the human species changes in unpredictable ways which prevent us from ever returning to our previous state of existence. Is this not the very nature of the evolutionary process? Humans are proactive in the evolutionary process. Humans have a greater impact on the environment now than in the past. The alteration of the planet's ecosphere which is being attributed to the contemporary human lifestyle attests to this. At the same time, there is less dependence upon the forces of nature for human survival than ever before. For example, water supplies can be diverted to arid land making it habitable, and clouds can be seeded for rain where the food supply is threatened by lack of water. Survival has become increasingly more dependent upon the human capacity to manipulate the environment. The experience of adaptation is more to an environment of our own creation. Pollution is the concern. Adaptation to natural forces appears to be diminishing by comparison.

At the same time, we humans have become increasingly more adept in the art of manipulating our internal environments with an extensive variety of chemicals. Because humans do not exist separate from their environment, it might be that the manipulation of these external and internal milieus is related.
Meanwhile, it might be wise to consider that the Aztecs were correct; if the sun does not rise tomorrow, we will all die. Still the basic reality is that human existence, life, is ultimately dependent upon uncontrollable forces which are yet to a great degree beyond our scope of knowledge. In short, we do not know where we are going, but we are headed there rather fast. If the pace were not to our satisfaction, would we not slow it? What motivates us to run the race in spite of the consequences?

**Stress and Arousal**

Fear and anxiety comprise the initial emotional response to stress. These emotions are adaptive to the extent that they function to enable the organism to act protectively in the face of threat. The alarm phase of the stress response is one which produces a state of readiness physiologically by mobilizing physical strength, and psychologically through the elicitation of a state of fear and anxiety.

Anxiety is almost always defined in psychology dictionaries as an unpleasant or distressing emotional state which motivates avoidance responding (Dushkin Publishing Group, Inc., 1973; Gregory & Zangwill, 1987; Reber, 1985). This has merit. Phobic behavior, for instance, serves as a prime example of anxiety avoidant behavior. Yet, anxiety
states are not always motivational in terms of avoidance behaviors. There are many instances where anxiety is not only tolerated and adapted to, but actually sought in a variety of ways including overt behavior and ingestion. These may be more common than we realize. States of anxiety may be emotionally reinforcing.

While it may seem less apparent in the case of emotion, both the behavioral and psychological responses have a performance orientation which remains intact and functioning as long as the perception of threat persists. The emotional state and the behavioral response are separable to the extent that they do not co-vary. That is, the stress emotions of anxiety and fear, signaling hyperarousal, sometimes result in an impaired performance, and sometimes in enhanced performance. It seems rather that it is the individualistic interplay of emotions which motivate performance behavior rather than any inherent motivational properties which might be attributed to the particular stressor.

Janis (1982) conducted research on the morale of military men during World War II. He found that tension and anxiety increased over time for both combat ground troops and air combat crews who were exposed to continued action. One might expect that sick calls increased as a function of time in these circumstances. This was not the case. There
was actually an inverse correlation between longevity and severity of experienced tension and anxiety and sick call. Janis attributed this ability of air crew members to withstand increasingly large levels of anxiety and tension to two factors: first, the desire to complete the thirty missions required to end the tour of duty, and second, the influence of other crew members. But it seems that social influence might be seen as the greater motivation. For example, it can be seen that social influence forms the basis for the second explanation. The first explanation might also be interpreted in terms of social influence. Here, the flyer was faced with two logical options. He could either goal orient himself to the completion of the missions, or goal orient himself to the avoidance of the flight missions—possibly by spending time in sick bay. Avoidance of fear and anxiety evoking stimuli is the norm, at least in laboratory studies. The potential consequence of flight was death. The consequence of sick bay was social ostracism and perhaps lowered self-esteem. It might be concluded that death defying maneuvers were experienced in order to avoid social ostracism, and that fear and anxiety were tolerated in increasingly large doses in order to avoid aversive feelings such as rejection.

The relationship between anxiety and performance may be seen outside the dire circumstances of war. People who
say "I perform better under stress" know what they are talking about. Optimum levels of stress evoked anxiety have been found to improve memory, concentration, and overall performance (Restak, 1984). In fact, optimum levels of anxiety improve not only performance but render one more socially competent and acceptable among peers. Dovidio and Norris (1975) found that pairs of college students matched for participation in a high stress experiment produced the most helpful and cooperative acts. Likewise, the results of a study of nurses (Motowildo, Packard, & Manning, 1986) showed that anxiety and fear of negative evaluation had a positive affect on sensitivity and consideration for co-workers.

The friendly attitude directed toward co-workers most likely results in a reciprocal social support network where mutual sensitivity and consideration are the rewards for maintaining levels of anxiety and fear. This is perhaps why it has been shown that social support does not necessarily attenuate stress, but may in fact strengthen the relationship between stress and strain (Kaufmann & Beehr, 1986). The stress associated feelings of anxiety, fear, and dissatisfaction actually function pragmatically. This can be discerned as the "misery loves company" form of social support. Individuals may be motivated to maintain chronic
levels of anxiety and fear, because these are socially reinforced by feelings of belonging and acceptance.

The state of anxiety may be motivationally reinforcing, at least for some individuals, because it cues the subsequent affective experience of achievement. McClelland, Atkinson, Clark, and Lowell (1976) cite evidence that the need for achievement is instilled and subsequently motivated by either positive or negative affective expectation. In a classic study by Winterbottom (cited in McClelland et al., 1976), it was determined that mothers who used rewards such as hugging, kissing or bestowing a treat or privilege for the fulfillment of achievement demands have sons whose average achievement score is twice that of mothers who use more attenuated means of affective arousal. The implication is that achievement is motivated by expectation of emotional reward--of feeling good.

So, anxiety and fear, at least for some individuals can be endured on a relatively long term or chronic basis when there is some expectation of either emotional reward or emotional punishment.

Arousal and Stress-Seeking

Not only can anxiety and fear be endured, but there is evidence that some people actually engage in stress-seeking behavior.
Stress-seeking has been related to achievement, and this achievement also has cultural implications (Torrance, 1968). Torrance defines stress-seeking as responding to challenge, attempting the difficult, testing limits, and accepting the risk of making a mistake. High-achieving cultures are those comprised of a relatively high number of stress-seeking individuals who possess a reasonable expectation of success. In other words, stress and achievement are more normative in high-achieving cultures. So, cultures that expect to participate competitively in the world in order to achieve a desirable standard of living will most likely be those that revere and reward achievement oriented behaviors. Achievement, then, is a cultural value which may become internalized disproportionately according to culture.

Tanner (1976) believes that when stress levels fall too low for normal stimulation, people actively seek stress. Stress-seeking may assume a level of consistency that resembles compulsive or addictive behavior. He proposes that the stress reaction may be addictive to those who thrive on competition, danger, or challenge. Two obvious examples of stress-seekers are auto-racers and mountain-climbers. But successful executives, athletes, entertainers, and politicians also qualify. It is the desire to conquer fear that distinguishes these individuals,
according to Tanner. Individuals, then, are driven by an intrinsic need for stimulation. For stress-seekers, the philosophy seems to be: find a fear and conquer it.

Houston (1968) has a slightly different philosophy of what motivates stress-seeking. In his career as a Naval physician, he trained over fifty-thousand fliers. He directed the first major study of acclimatization to high altitude—an event, by the way, that in the absence of homeostatic physiological adaptation would cause death. Mountain climbing is his sport. The mountain climber, according to Houston, abhors danger because it is beyond his control. The climber derives great satisfaction from controlling his fear. He strives to excel; and when he does, he is rewarded with an addictive exhilaration.

Klausner (1968) proposes that there are different categories or types of stress-seekers. Two of these types seek stress in response to threat, or inner forces; in other words, in reaction to a perceived need to prevail. Some seek-stress in arduous ways, while others engage in stress for a pleasant thrill. With a little imagination, this can be translated into two modes of stress-seeking: aggressive responders who react to defeat the emotion of fear, and goal oriented pursuers who are enthralled with the thrill of victory.
The point is that there is some emotional reward for engaging in stress-seeking behavior. The desire to overcome or control fear, and to achieve or excel in the face of challenge are factors that impel one to engage in stress-seeking. But why bother to excel, achieve, meet challenges, and overcome fear? If there were some intrinsic value to these particular behaviors, then people would engage universally in their pursuits. It is rather the altered mood state of exhilaration and the emotional high that is sought.

There is some evidence that sensation-seeking activities may have biochemical correlates. Based upon studies of racing drivers, Carruthers (cited in Fisher, 1984) found that noradrenaline levels doubled immediately before a race and quadrupled by the end. The drivers described the effect as "getting a glow". It may be that the effect is sought.

There is yet another type of stress seeker who lends credence to a biochemical factor. Individuals diagnosed as sociopaths seek stimulation in socially unacceptable ways. They are the classic bad boys of psychiatry, participating in a seemingly endless series of antisocial often illegal scrapes. These individuals also generally exhibit autonomic hypoactivity (Lahey & Ciminero, 1980). It is believed that the failure of sociopaths to learn avoidance behavior, i.e.
learn from their mistakes, is related to this hypoactivity. Schachter (1971) conducted a series of experiments using sociopaths and normals as subjects. He has concluded that reactivity to epinephrine is the best predictor of avoidance learning ability. This reactivity is, according to Schachter, the most distinguishing characteristic of sociopathy. It might be that the antisocial activity is related to an inability to learn avoidance behavior, while the propensity to seek activities is a form of stimulation-seeking compensatory to a state of hypoarousal.

Other Forms of Arousal-Seeking

If arousal is a pleasurable experience for many individuals, then one would expect to see large numbers of people engaged in behaviors which are conducive to states of anxiety.

Stress-seeking is not for everyone. Perhaps it is only for those who like to earn their emotional pleasure in arduous ways. Optimum levels of anxiety can also be achieved through ingestion.

Caffeine is a stimulant and anxiogenic agent which increases plasma cortisol levels as well as subjective ratings of anxiety and energy (Charney, Heninger, & Jatlow, 1985). Caffeine may induce adrenal medullary hyperplasia (Gilbert, 1981). In 1979 the adult per capita coffee
consumption in the United States was about two average cups per day. Caffeine in this dosage is a behavioral and metabolic stimulant. This dosage has been found by Costill (cited in Clark & Burfoot, 1983) to increase physical stamina and endurance. In larger dosages it can induce elevated levels of anxiety, headache, and even delirium. And withdrawal symptoms implicate caffeine as a potentially addictive substance. Tea, although generally not as potent as coffee is another caffeine containing substance. Sugar and caffeine seem to have a synergistic effect; this is not surprising since sugar itself strongly affects the body and may affect mental function and mood as well (Weil & Rosen, 1983). Colas and chocolate are stimulants in this category.

It is estimated that currently there are about fifty million young and middle-aged Americans who smoke (Perkins, 1985). This amounts to about one-fourth of the population, so smoking is also a prevalent behavior. In a study conducted by Doyle (1979), it was found that nicotine raises circulating catecholamines. (The term catecholamines is used to describe the neurotransmitters norepinephrine, epinephrine, and dopamine.) Nicotine acts as a stimulant, and a mood modifier. Novice smokers sometimes experience an alternation in mood often described as "light-headedness" after smoking. O'Connor (1985) concluded in a study of seventy-five smokers that there are three motivational types
of smokers: high stress smokers rely on smoking for task
distraction (avoidance), low activity smokers who wish to
modify their current affective state, and relaxation smokers
who smoke because it is a pleasurable activity.

If stimulants are used addictively to obtain some
optimal degree of metabolic functioning and altered mood
state, then one would expect to see evidence of cross-
tolerant ingestion. Sugar consumption might serve this
purpose. A government researcher (Lecos, 1980) has found
that Americans get about twenty-four percent of their
calories from refined sugar. And the per capita consumption
is rising. It rose from approximately 115 pounds per person
in 1962 to approximately 128 pounds per person in 1978.
Sugar consumption, like caffeine and nicotine usage, is
prevalent. Smokers complain of weight gain when they
abstain from smoking. Eating may become a substitute
activity for these smokers. But even more specifically;
smoking may influence dietary preferences, and diet may
influence the rate of smoking evidenced by the observation
that smoking leads to a drop in the consumption of sweet-
tasting high caloric foods (Perkins, 1985). Sugar increases
metabolism resulting in quick energy. Aherns has found that
sugar is also related to elevated blood pressure because it
In the absence of nicotine, it may be that the lift once
derived from smoking is replaced by the lift obtained from eating greater amounts of sugar. Sugar, then, appears to be cross-tolerant with nicotine.

Most of us, it seems, gravitate toward some form of combined quick energy and pleasant affective state through ingestion alone. In seventeenth century Europe, coffee was a new and unapproved drug. Between 1900 and 1970 world production of sugar rose from eight million to seventy million tons. Americans now get about twenty-four percent of their calories from sugar (Consumers Union, 1978). Tobacco was introduced by American Indians to Europeans in the 1500's. It was a crude substance and was used rather sparingly, and inhaled deeply to alter mood. Prohibition of the new drug did not work, even when the penalty for possession was death (Weil & Rosen, 1983). The marijuana of the sixteenth century was tobacco. Stimulants are widely used and they are being adapted to in increasingly prolific amounts.

The motivation to use low doses of socially acceptable drugs may not be all that different from the motivation to use street drugs. Even among heavy, chronic (illicit) drug users, it has been proposed that the need for stimulation or change underlies the tendency to experiment with a variety of drugs and that those same needs affect how many are tried (Spotts & Shontz, 1984).
Depression and Stress-Avoidance

Recall that the stage of adaptation, which is distinguished by increased vigor, is exhaustive. Arousal has an aversive counterpart, particularly when it is intense or chronic. Anisman and Zacharko (1982) in a review of the literature on stress and depression have proposed that the effects of stressful experiences on affective state may be related to the depletion of several neurotransmitters including norepinephrine, dopamine, and serotonin. Other individual difference factors including organismic, environmental, and experiential influence the vulnerability to depression.

Where arousal attenuation behaviors are prevalent, inference might be made regarding the pervasiveness or chronicity of arousal or stimulation. Arousal-avoidance combined with arousal-seeking might serve as an individualistic stress regulatory mechanism. This mechanism might have a singularly specific and adaptive goal—the avoidance of pain, exhaustion, depression, and illness. Hedonism may well be adaptive.

The mechanisms of behavioral action, ingestion, and drug taking used to optimally energize people are the same as those used to optimally relax them. In these instances,
arousal-inducing activities are avoided; ingestion of food is independent of hunger, and drugs that depress the nervous system are used. What these have in common with arousal-seeking is not only that they satiate, but that they appear to be motivated by mood, and they have biological correlates.

Some children are inherently inhibited and withdrawn. It has been found that these same children demonstrate a high physiological responsiveness to mild stress as measured by heart-rate (Asher, 1987). It is believed that this overreactivity to stress is felt as immobilizing fear, which serves as an inducement to avoid, and manifests in behaviorally inhibitive behavior (Asher, 1987). These children are biologically vulnerable to stress. There may be an illness correlation because the children studied were more colicky, constipated, and irritated as infants; they were also more allergy prone. It has been postulated that these children may be susceptible to certain physical illnesses. Asher, in an attempt to generalize his findings, has noted that most of these same behaviorally inhibitive responses are also seen in adults diagnosed with affective disorders of anxiety and depression; and that monkeys exhibiting the same response have been treated successfully with anti-depressant drugs.

Any given individual, then, may be biologically
predisposed to experience stress, depression, and illness at levels exceeding the norm. It can be concluded that individuals will be expected to behaviorally adapt to their biological humoral pattern by either seeking, or avoiding stress.

Food may be used to counter the effects of stress and depression. It is elementary to state that food ingestion is related to obesity. Mandenoff, Fumeron, Apfelbaum, and Margules (1982) found that they could abolish diet-induced obesity in rats by injecting them with naloxone. They concluded that the analgesic endogenous opioid peptides encourage obesity. Recall that endogenous opioid peptides are released in situations where uncontrollable stress is encountered.

Then again, eating, as smoking, may be used compulsively as a form of task-avoidant behavior. Cantor (1981) in another rat study induced polydipsia in food deprived rats. Those animals which demonstrated a greater analgesic effect also were more aggressive, and exhibited more adjunctive behaviors such as eating. He concluded that stress induced arousal was experienced as an aversive condition which would be attenuated in intensity by oral behavior. The finding that there is a relationship between analgesic effect and eating is consistent with the Mandenoff et al. (1982) study. Cantor concluded that eating was also
related to emotional arousal as measured by aggressive behaviors. It has long been theorized that excessive eating is motivated by the experience of arousal.

It would be best, however, to not get too carried away with the arousal theory of eating based on animal studies. Schachter (1971) studied obesity and eating behavior in humans rather extensively. He concluded that his initial hypothesis that eating among the obese was related to arousal state was not sound. Schachter found that eating was more a function of external cues of taste, sight, smell, and the joy of chewing. Eating was indulged in, in other words, for sensual pleasure.

It is reasonable to speculate that this indulgence in eating for sensual gratification has an avoidance counterpart. Eating may be pleasurable because of the way it affects the brain. It has been found that consumption of particular nutrients affects brain composition, and that corresponding administration of such nutrients may be useful in modifying neuronal functions (Wurtman, Hefti, & Melamed, 1980). These researchers are even more to the point when they state that all neurotransmitters whose syntheses are now known to be influenced by precursor availability are produced by compounds that must be at least partially obtained by the diet. Shortages of the neurotransmitters norepinephrine and serotonin are believed to be causally
linked to depression (Restak, 1984). Food consumption may be related to the craving of a particular micronutrient, specifically carbohydrates. In a series of studies Wurtman (1984) found that treatments which increase the release of serotonin release within the brain reduce carbohydrate consumption among obese individuals who temporally crave carbohydrates.

It may be that the component of the stress reaction most closely related to over-eating is the metabolic avoidance of depression.

Depressants in low doses actually make people feel stimulated (Weil & Rosen, 1983). Weil and Rosen suggest that this may be because the inhibitory mechanisms of the brain are the first to shut down. This would explain the dichotomy of why, when the depressant functions to suppress the central nervous system, the mood state is elevated. At any rate, the result is a real panacea. The body gets a physiological respite from the energy sapping forces of adaptation, while the depressive mood associated with exhaustion is replaced by a pleasant euphoria.

Probably the most widely used depressant drug is alcohol. Baum-Baicker (1985) has concluded in a review of the literature that alcohol in moderate amounts is effective in reducing stress. In low and moderate doses, it relieves tension, depression and, self-consciousness; while it
increases the pleasant feelings of happiness, euphoria, and conviviality. These are psychological benefits. There are also performance benefits. Like caffeine, in low doses alcohol improves certain types of performance. For example, it may be that low doses of alcohol facilitate short-term memory in individuals of average intelligence when the dosage is ingested after the learning task. In terms of prevalence, in 1979 almost one-fourth of all adults in the United States were reported as moderate drinkers. Another one-third were reported as light drinkers. Almost sixty-eight percent of the adult population in the United States are light to moderate alcohol drinkers. Among the one-third who abstain as with the nine percent who drink heavily, there are higher rates of clinical depression.

There may also be physical benefits to be derived from light to moderate consumption of alcohol. In reviewing this subject, Whelan (1988) remarks that probably the "best-established" effect of alcohol consumption is a decrease in the risk of developing coronary heart disease. And, where depression is higher among abstainers and heavy drinkers, longevity has been found to be lower for these two groups in comparison to light and moderate imbibers.

The General Adaptation to Drugs (GAD)

It has been noted that the propensity to use drugs to levels of intoxication is not uniquely human. Other
species imbibe. It has been pointed out that this is a natural phenomenon. Additionally, drug taking was not invented in the twentieth century. Leavitt (1982) has cited examples of drug-taking among ancient peoples.

Only the most common and socially acceptable drugs were used in the foregoing presentation for purposes of illustration. Prescription drugs, over-the-counter-drugs, and illicit drugs have not been discussed. A brief look at these will now be taken in order to provide some understanding of the prevalence of drug-taking in this society. Drug usage is a factor of availability. Perhaps at no time in history have drugs been more available than today. According to Freibel (cited in Leavitt, 1982), seventy percent of all drugs now prescribed were unavailable or unknown twenty years ago. There are more than 20,000 of these prescription drugs, and somewhere between 100,000 and 200,000 non-prescription products (Leavitt, 1982).

The prevalence of illicit drug usage is difficult to measure objectively. But the media, at least, would have us believe that this behavior is both prevalent and problematic. The use of and addiction to illicit drugs might be revealing in terms of motivation.

Milkman and Sunderwirth (1983) have proposed that self-induced changes in neurotransmission are at the root of addictive behavior. This should sound familiar by now as
smoking, caffeine ingestion, and excessive eating have been similarly presented. They also state that individuals do not become addicted to drugs, but rather to the satiation, arousal, or fantasy experiences that can be achieved through them. This too should sound familiar because stress-seeking and avoidance behaviors were presented earlier as mood motivated. Drug preference depends upon the user, but the drug type of choice is related to coping style. Through clinical observation these researchers have found that those who use heroin usually cope with stress through relaxation and isolation. Individuals who perceive the environment to be hostile and threatening, bolster their sense of potency by using amphetamine or cocaine. While those who characteristically rely on imagery, daydreaming, and altered thought processes to reduce tension prefer hallucinogens such as LSD.

**Stress as an Addiction**

Proving that stress is a twentieth century addiction would be a challenging endeavor, and beyond the scope of this study. This stance will now be taken, however, in the form of a hypothesis. Four phenomena are suggestive of this tenet...compulsivity, prevalence, denial, and tolerance.
Prevalence and Compulsivity

That stress is prevalent has been previously established. Prevalence is, of course, not singularly indicative of addiction. To illustrate this point, eating bean sprouts might have increased over the past decade, but few would argue that people are addicted to bean sprouts. Compulsivity is the key element. People do not compulsively eat bean sprouts. As has been demonstrated, considerable numbers of people do compulsively engage in stress related behaviors and substances to the extent that most of us may be dying of stress related illness. Additionally, behaviors increasingly seem to be oriented around regulating stress demonstrated by the motivation to seek, avoid, and control (cope with) stress. If addiction can be defined, at least in part, in terms of preoccupation then Americans are addicted to stress.

Denial

If stress is addictive, it should have some measurable shared characteristics with substance addictions. One of the most insidious elements of addictive behavior is the mechanism of denial. If it is conceded that there is a problem, there is an implication that something has to be done about it. Because altered behavior is not the goal, the problem is denied. This is particularly true in the
addiction to alcohol where the alcoholic is often the last to admit to a dependency on the drug.

Denial also occurs with the substance nicotine. Despite the ban on broadcast advertising, money spent on advertising cigarettes increased from 1.24 billion dollars in 1980 to 2.64 billion dollars in 1983. Advertising campaigns were directed at associating smoking with high-style living; economic, professional and social success; and healthy activities such as sport events ("Cigarette advertising", 1985). The fact is that smoking most likely causes cancer, but people are successfully influenced to purchase the product because of its implied relationship to personal success and health. This is denial.

Likewise, food products are marketed inversely in accordance to the nutritive value of the food. Among the not marketed are fruits and vegetables, while relatively non-nutritional foods are advertised for their nutritional value. For example: cholesterol-free egg substitutes, Crisco shortening, Skippy peanut butter, and Mazola corn oil margarine have been marketed as healthful products based upon the absence of cholesterol (Novelli, 1981). At the same time, cholesterol lowering agents and hypertension relievers have the most explosive growth prospects in the drug industry (Teitelman, 1987). Smoking is related to this. Doyle (1979) notes that the benefits of all this
hypertensive treatment appear to be less effective than cessation of smoking in the lowering of risk for coronary heart disease. Non-nutritious foods are purchased and consumed to promote good health while the use of hypertension drugs, which are less effective than eliminating associated destructive behaviors is mushrooming. In fact, there appears to be some empirical support for the suggestion that hypertension drugs may do more harm than good (cf. Graedon, 1985). As if to add insult to injury, hypertension agents are notorious for causing depression as a side-effect.

Denial has been found to be related to stress in several studies. Chodoff (1970), from his work with concentration camp victims, believes that denial was one of the most important personality defenses which contributed to survival during the holocaust. Jamner and Schwartz (1986) used human subjects who were measured on the factor of self-deception, and subjected them to the stressor of electrical shock. They found significant differences between high and low self-deceptors in their subjective experience of pain. Physical pain apparently has a subjective component which may be related to the mechanism of denial. Mai (1986) in a study of transplant patients found that denial was manifest in ninety percent of the patients. Additionally, half of the subjects expressed feelings of euphoria prior to the
transplant. Hackett and Cassem (1970) state that denial of fear is common among heart patients in life-threatening circumstances, and that this denial is most likely an adaptive coping mechanism. These findings demonstrate that denial is a mechanism of stress, and that denial can function adaptively by enabling endurance. Denial, however, may also be detrimental where endurance is not the best alternative. The denial of pain, for instance, may keep one from getting proper treatment. In general, denial may be useful in some situations and detrimental in others (cf. Lazarus, 1985).

Tolerance

A key diagnostic criterion for drug addiction is the development of tolerance (APA, 1987). The substance must be used in increasing quantities in order to compensate for a diminishing effect. The subjective stress experience (felt stress) seems to diminish as a factor of age. Organizational psychologists have found that as people mature, they may develop a psychological tolerance for stress (cf. Parasuraman & Alutto, 1984). Raelin (1985) has associated higher rates of burnout, apathy, and alienation among mid-career stage employees. These factors attenuated with age.

As with drug tolerance, the psychological affects of stress may decrease but the potentially harmful affect on
the body does not. With stressed rats Ritter and Pelzer (cited in Anisman & Zacharko, 1982) found that the depletion of norepinephrine is more pronounced in older animals than younger ones. Sapolsky's research (cited in "Scared Sick", 1987), shows that the adrenal glands of aged rats are unable to suppress the production of glucocorticoids after a stressful event has ended.

If the hormonal stress response in humans is affected by age, it might not be too presumptive to assume that the neurochemical response to stress is also influenced by age. It might be that as people age, their subjective experience of stress lessens while their physiological reaction becomes more labile. This would explain why older people are able to psychologically adapt to and endure the increasing stressors that accompany the aging process. These include some of the most potent life event stressors such as personal loss and failing health which makes them increasingly dependent on medication and on others (helplessness).

**Summary**

How might stress related behaviors be viewed with respect to the processes of adaptation, motivation, and addiction? In response to this, Research Question 5, nine points may be made repectively.
Adaption

1. The stress reaction is misappropriated to the detriment of survival under conditions of chronic endurance.

2. Survival is becoming increasingly more dependent upon the human capacity to manipulate the internal and external environments.

3. The stress reaction which was conceived and controlled by natural evolutionary processes is proceeding on its evolutionary course under human regulation.

Motivation

4. Exposure to chronic stress naturally induces compensatory relief-seeking behaviors (e.g. drug taking) which have an increased potential for being used self-destructively because of the synergistic effects of stress.

5. Chemical agents can be used to induce arousal and to relieve depression. Humans now have at their disposal a plethora of chemical agents which may accommodate the predilection to endure chronic stress.

6. The initial affective states of the stress response, arousal or anxiety, are motivationally reinforcing at optimal levels. Biologically these states increase metabolic functioning.

7. A decrease in metabolic functioning, the
counterpart of arousal, is experienced as physical exhaustion and emotion depression. People are motivated to avoid this component of the stress response.

8. Activity-seeking or avoiding, mild stimulants, and food agents are used on a regular basis to obtain some optimal degree of metabolic functioning and altered mood state.

Addiction

9. There is evidence based on characteristics of prevalence, compulsivity, denial, and tolerance that stress is addictive.
CHAPTER VI

CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

Synopsis

Material has been presented which supports the notion that human behavior is not motivated exclusively by the pursuit of health in the interest of self-preservation. A few cogent statements may be made in justification of this notion.

According to the surgeon general, two-thirds of all illnesses before the age of sixty-five are preventable (Miller et al., 1988).

Mental health is intimately related to physical health and well-being. Emotional stress is implicated as a predisposing factor in many illnesses including: cancer, gastrointestinal problems, hypertension, heart disease, arthritis, allergies, flu, asthma, and fatigue.

It has been estimated that two percent of health-benefit dollars are spent on keeping people well (Rothman, 1986). The maintenance of health and the prevention of illness is not the purview of a medical system where treatment is limited by the ability to identify and diagnose an existing affliction which is producing debilitating symptoms.
Fewer than ten percent of those with medical insurance have outpatient psychiatric coverage that is equal to their coverage for other medical problems. In addition, fewer than thirty-six percent of those insured have coverage for outpatient treatment by clinical psychologists (Brady et al., 1986).

In summary, this nation is disproportionately invested in treating physical symptoms compared to providing potentially preventive emotional health care services.

At the same time, behaviors which have been found to be detrimental to health are engaged in at alarming rates. Several vital statistics illustrate this. Forty-seven million Americans are addicted to cigarettes (Perlman, 1988). Approximately ten million Americans are alcoholics (Lahey & Ciminero, 1980). Obesity is a growing problem. The proportion of obese children has risen more than forty percent in the last fifteen years (Carey & Taylor, 1987). Suicide is the third leading cause of death for people under the age of thirty-five (Weed, 1985).

In summary, it may be concluded that states of well-being and ill-health are, to a great extent, self-determined. To this end, the stress related psychological and emotional states which are often related to health and to health compromising behaviors are less attended to than the disease states to which they are related.
Given this apparent failure on the part of large numbers of individuals to maintain well-being the problem became one of discovering why:

Why do relatively large numbers of individuals compromise their health by not desisting in behaviors which have been implicated in disease and death?

Conclusions

A Theory on the Adaptation to Self-destructive Behaviors

The challenge to adapt, or change, is stressful. Humankind has evolved in a manner which indicates an increasing predilection to endure, if not seek, stress. Human society is itself a living testimony to this phenomenon.

The stress response evolved as an adaptive survival mechanism for a life-style which has undergone rapid alteration. Many features of contemporary living combine to make chronic stress endemic. The exposure to chronic stress induces relief-seeking behaviors which may be used self-destructively.

A proliferation of chemical substances enables people to self-administer desired levels of stress and/or stress relief. Potential for problems of stress regulation are inherent where motivation factors predispose stress levels which conflict with natural tendencies. The stress related
emotional states of anxiety and depression are strong motivational forces. In general, optimal levels of arousal, or anxiety are sought and the counterpart depression is avoided.

The stress related emotional component of depression, though often unrecognized and untreated by the medical profession, is strongly related to physical illness. The avoidance of depression may be instinctive where the relationship to physical illness is strong. Therefore, relief seeking behaviors which are self-destructive on one level may be part of a survival instinct aimed at avoiding physical illness by eliminating a predisposing depression. This theory accounts for vital statistics which demonstrate the prevalence and perseverance which typify self-destructive behaviors.

To the extent that depression can be avoided, arousal can be employed. The emotions of anxiety and depression which are interrelated under conditions of stress, are being independently manipulated in a bifurcating process. Where depression is related to stress, the avoidance of stress or the restriction of arousal is adaptive because depression is regulated in this manner. This is most likely how the survival mechanism evolved.

Where depression can be controlled by substances which alter the neurochemistry of the brain, the experience
of arousal is relieved from its limitation. If arousal becomes adapted to in increasingly large doses by the controlled relief of depression, it may be that functioning is and will become increasingly dependent upon sources which alter the neurochemistry of the brain.

**Limitations of This Study**

The breadth of the subject made it necessary to proceed through the inquiry process in an abbreviated fashion which precluded thorough and exhaustive study. Subjectivity was necessarily involved in the process of information selection where some areas were investigated more thoroughly or exclusively of others.

Topics and ideas were developed with a brevity which may have cost in terms of the comprehensive presentation of ideas. Had the areas been expanded, a more interesting and convincing argument might have been proffered. This is indeed regrettable, because there is an enormous amount of information which is both interesting and informative that was unaccessed and/or unemployed.

A related limitation involves non-specificity. This is particularly evident in the lack of precise definition of terms such as "stress", and in the loose way in which emotions were addressed. Emotions are, after all, seldom
pure. The motor response to depression, for example, can either be agitated or retarded. And affect may be simultaneously comprised of a variety of emotions. A result of this non-specificity is that the inquiry became circular. In its most basic representation, the premise was derived from defining the components of stress, illness, and motivation relative to emotion and vice versa.

Where the above limitations were the result of the breadth of the study, there were also limitations imposed because the study was in some respects narrow. A limitation of this type involved the chosen population. Restricting the inquiry, with few exceptions, to the United States precluded making comparisons among nations and cultures. It would have been instrumental to the formulation of a theory to include other populations, particularly where the focus was to a great degree societal.

The above limitations, however, were by design and not by accident. The study was intended to account for bias as much as possible. Logical processes were used to arrive at specific topics and areas of inquiry. It was stated in the Introduction chapter that the nature of the study would be theoretical, and that the overall methodology would be dialectic. This means that when I started, I did not know what the conclusions would be. The dialectic process reduced the possibility of bias which would have resulted
from ad hoc research selection had the author been initially invested in certain conclusions.

At the same time, an attempt was made to provide the reader with an understanding of the analytic process and the direction of the inquiry as it evolved. This was done in some cases by presenting the most apparent of the various options for further inquiry and explicitly supporting the selected option through rational argument as in Chapter IV, where deductive reasoning was specified as a methodology. Contemporary literature reviews were used as a concise means for representing conclusions based on data too exhaustive for this approach. Literature reviews by researchers with expertise in their specific disciplines, were used to fill gaps. Replicating these researchers' efforts was initially deemed beyond the scope of this study.

Related to the theoretical nature of the design, speculation was sometimes employed. It was not the author's intent to present a concept beyond dispute, if this is indeed at all possible. Rather, the intent was to explore some interesting combination of credible ideas which have some common empirical and experiential bases.
Recommendations

For Further Research

Of particular interest would be intercultural or international comparative studies on the experience of stress. Why, for example, does the United States have the highest incidence of illicit drug use of any country in the industrialized world? (Adessa, 1988). What can culturally ascribed cognitions reveal about the relationship between coping mechanisms, and the environment? What might a comparison of contemporary international morbidity statistics reveal about differential characteristics of illness? How are quality of life and longevity factors related to technological advancement?

Research on individual attitudes, coping skills, and behavioral adaptation particularly to chronic stress might be expanded to provide more information for individually tailorable diagnostics and treatment. For example, many current treatment modalities for stress prescribe relaxation. What alternatives might there be? Are stress-seekers, for example, more vulnerable to illness and disease than stress-avoiders? If not, relaxation might be a valuable but simplistic approach to the "cure" for stress, particularly where relaxation conflicts with culturally ascribed values.
It has been stated that the brain is believed to have adapted over time by increasing in size, and structurally changing. Is there a bio-amine component to this process of the evolving brain? If so, how is it affected?

**Therapeutic Implications**

Emotional well-being needs to be recognized by primary care physicians as a viable diagnostic criterion implicating the need for mental health care services in the treatment of the individual. Physicians currently prescribe drugs irrespective of the mental health component of illness. This means that factors which may have predisposed the illness are largely unaddressed and ignored as the symptom is ameliorated. Well-being, therefore, is not attained; and the factors which may have rendered the individual susceptible to a state of disease in the first place persist.

Mental health professionals need to apply a broader approach to the issue of stress. Environmental factors which motivate and reinforce have implications regarding the potential for the success of the treatment. For example, providing a seminar on relaxation techniques to a group of Type A executives whose organizations reward them for their productiveness is not likely to produce more than transitory
relief for these individuals. Education, as has been demonstrated from cigarette labeling, has limitations in effecting behavior change; and by now it might be expected that many people, including executives, have been exposed to the concept and the values of relaxation.

Treatment wise, it might be more productive to address motivational factors in addition to the physiological response, otherwise a health system which provides symptom relief at the exclusion of addressing predisposing factors will continue.
REFERENCES


Cigarette advertising and promotion outlays more than double in three years--Sales fall, however. (1985, October). Smoking and Health Reporter, p. 8.


APPENDICES
APPENDIX A

THOMAS H. HOLMES and RICHARD H. RAHE

TABLE 3. SOCIAL READJUSTMENT RATING SCALE

<table>
<thead>
<tr>
<th>Rank</th>
<th>Life event</th>
<th>Mean value</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Death of spouse</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>Divorce</td>
<td>73</td>
</tr>
<tr>
<td>3</td>
<td>Marital separation</td>
<td>65</td>
</tr>
<tr>
<td>4</td>
<td>Jail term</td>
<td>63</td>
</tr>
<tr>
<td>5</td>
<td>Death of close family member</td>
<td>63</td>
</tr>
<tr>
<td>6</td>
<td>Personal injury or illness</td>
<td>53</td>
</tr>
<tr>
<td>7</td>
<td>Marriage</td>
<td>50</td>
</tr>
<tr>
<td>8</td>
<td>Fired at work</td>
<td>47</td>
</tr>
<tr>
<td>9</td>
<td>Marital reconciliation</td>
<td>45</td>
</tr>
<tr>
<td>10</td>
<td>Retirement</td>
<td>45</td>
</tr>
<tr>
<td>11</td>
<td>Change in health of family member</td>
<td>44</td>
</tr>
<tr>
<td>12</td>
<td>Pregnancy</td>
<td>40</td>
</tr>
<tr>
<td>13</td>
<td>Sex difficulties</td>
<td>39</td>
</tr>
<tr>
<td>14</td>
<td>Gain of new family member</td>
<td>39</td>
</tr>
<tr>
<td>15</td>
<td>Business readjustment</td>
<td>39</td>
</tr>
<tr>
<td>16</td>
<td>Change in financial state</td>
<td>38</td>
</tr>
<tr>
<td>17</td>
<td>Death of close friend</td>
<td>37</td>
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<tr>
<td>18</td>
<td>Change to different line of work</td>
<td>36</td>
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<tr>
<td>19</td>
<td>Change in number of arguments with spouse</td>
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<td>20</td>
<td>Mortgage over $10,000</td>
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<td>21</td>
<td>Foreclosure of mortgage or loan</td>
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<td>22</td>
<td>Change in responsibilities at work</td>
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<tr>
<td>23</td>
<td>Son or daughter leaving home</td>
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<td>24</td>
<td>Trouble with in-laws</td>
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<td>25</td>
<td>Outstanding personal achievement</td>
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<tr>
<td>26</td>
<td>Wife begin or stop work</td>
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<td>27</td>
<td>Begis or end school</td>
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</tr>
<tr>
<td>28</td>
<td>Change in living conditions</td>
<td>25</td>
</tr>
<tr>
<td>29</td>
<td>Revision of personal habits</td>
<td>24</td>
</tr>
<tr>
<td>30</td>
<td>Trouble with boss</td>
<td>23</td>
</tr>
<tr>
<td>31</td>
<td>Change in work hours or conditions</td>
<td>20</td>
</tr>
<tr>
<td>32</td>
<td>Change in residence</td>
<td>20</td>
</tr>
<tr>
<td>33</td>
<td>Change in schools</td>
<td>20</td>
</tr>
<tr>
<td>34</td>
<td>Change in recreation</td>
<td>19</td>
</tr>
<tr>
<td>35</td>
<td>Change in church activities</td>
<td>19</td>
</tr>
<tr>
<td>36</td>
<td>Change in social activities</td>
<td>18</td>
</tr>
<tr>
<td>37</td>
<td>Mortgage or loan less than $10,000</td>
<td>17</td>
</tr>
<tr>
<td>38</td>
<td>Change in sleeping habits</td>
<td>16</td>
</tr>
<tr>
<td>39</td>
<td>Change in number of family get-togethers</td>
<td>15</td>
</tr>
<tr>
<td>40</td>
<td>Change in eating habits</td>
<td>15</td>
</tr>
<tr>
<td>41</td>
<td>Vacation</td>
<td>13</td>
</tr>
<tr>
<td>42</td>
<td>Christmas</td>
<td>12</td>
</tr>
<tr>
<td>43</td>
<td>Minor violations of the law</td>
<td>11</td>
</tr>
</tbody>
</table>

Percent of All Deaths, by Specified Causes of Death¹ (USA, 1900 and 1983)

<table>
<thead>
<tr>
<th>Disease</th>
<th>1900</th>
<th>1983</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diseases of the Heart</td>
<td>25</td>
<td>20</td>
</tr>
<tr>
<td>Cancer</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Cerebrovascular Diseases</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Accidents</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Chronic Obstructive Pulmonary Disease</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pneumonia &amp; Influenza</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Diabetes</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Suicide</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Cirrhosis of Liver</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Arteriosclerosis</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Homicide</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Early Infancy</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Nephritis</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Tuberculosis</td>
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<td>10</td>
</tr>
<tr>
<td>Gastritis</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Diphtheria</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Typhoid</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

¹ Shows the 11 leading causes of death in 1900 (based on data from states that had death registration) and in 1983, with the latter arranged in descending order of importance.

Sources:


Publisher's Letter Granting Permission to Use The Social Readjustment Rating Scale

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APPENDIX D

Author's Letter Granting Permission to Use The Social Readjustment Rating Scale

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

School of Medicine
Department of Psychiatry and Behavioral Sciences. RP-10

June 21, 1988

Terry Linscott
3100 Marvelle Lane
Concord, California 94518

Dear Terry Linscott:

Thank you for your letter of June 15, 1988, regarding the Social Readjustment Rating Scale. Dr. Holmes is pleased to give you permission to use the scale in your thesis.

Thank you again for your interest in Dr. Holmes's work.

Sincerely yours,

Pat Burns

Pat Burns, Secretary
to Thomas H. Holmes, M.D.
Professor Emeritus
May 11, 1988

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3100 Marvelle Lane
Concord, CA 94518

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Tracy Flynn
Administrative Secretary