1.1 Introduction

An extensive body of clinical and epidemiologic research suggests that stressful life events are casually implicated in a variety of undesirable effects on functioning and health. The effects described range from lowering the grade-point averages of college freshmen to sudden death. However, at the same time that these studies have discovered many possibly pathogenic effects of stressful life events, they have raised questions.

Our reasoning on this issue is based on a psychosocial model of the stress process.
1.2 Stressor

In selye’s research[^130,^131^], for example, a stressor is defined as any agent that produces stress. Stressors are demands made by the internal or external environment that upset balance, thus affecting physical and psychological well-being and requiring action to restore balance[^89^].

There are many complex factors that determine whether the organism’s response to stress leads to adaptation and resilience, or maladaptation and dysfunction. Many psychiatric disorders, including depression, post-traumatic stress disorder, and other anxiety disorders, result from an interaction between genetic factors and exposure to a sufficiently sensitizing environmental stressor. An appreciation of the concept of stress and its basic biological underpinnings is essential to the understanding of both health and disease processes.

The stress response is characterized as having two modes of operation or state. The first state is an immediate arousal in response to the stressor to enable adaptive behaviors and the second state is a slower process that promotes recovery, behavioral adaptation and return to normality.
Stressors can be divided into four main categories:

1. Physical stressors that have either a negative or, in some situations, a positive psychological component;
2. Psychological stressors that reflect a learned response to previously experienced adverse conditions;
3. Social stressors reflecting disturbed interactions among individuals;
4. Stressors that challenge cardiovascular and metabolic homeostasis.

1.3 Psychosocial Stress:

To study the psychosocial stress process we need to know how to identify stressful life events. For our purpose it will be useful to group stress studies of human subjects into three categories; Analogue experiments, specific life event studies and comprehensive life event studies.

1.3.1 Analogue Experiment:

Analogue experiments with human subjects like those with animal subjects, often use physical stressors such as electric shock or noise, which are easily manipulated and measured.
Stress studies using human subjects also involve stimuli described in cognitive or affective terms. Situations characterized as new, intense, rapidly changing, sudden or unexpected, including (but not requiring) approach to the upper thresholds of tolerability.

At the same time, stimulus deficit, absence, of expected stimulation, highly persistent stimulation and fatigue-producing and boredom—producing among others, have also been described as stressful, as have stimuli leading to cognitive misperception, stimuli susceptible to hallucination, and stimuli calling for conflicting responses.

1.3.2 Specific life events:

Stress researchers working in natural life settings have studied the effects of a number of specific stressful life events, such as widowhood, severe injury and loss of job etc., The stressful life events are not limited to those that are inherent in the life cycle; and their domain extends beyond a set of dramatic and obvious life events.

1.3.3 Comprehensive life event studies:

In these studies the subjects were sampled on some basis other than their participation in particular life events. The class of stressful life events, since lists of events to be inquired about must be constructed and must make sense to the persons being studied.
“Life Charts” recording case histories of patients admitted to treatment for medical problems, defined stressful life events as those “Whose advent is either indicative of or requires a significant change in the ongoing life pattern of the individual”.

*Events that are followed by dysfunctional behavior or illness are stressful; stressful events induce dys-functional behavior or illness.* In practice some investigators advocating idiographic measures of stressful life events have done just this, since they have taken their measures of stressfulness after subjects have experienced particular events in association with, for example, an automobile accident or a heart attack.

The experienced person’s judgement will to a much greater degree reflect the particular values of these contextual factors as he/she experienced them. Therefore, we predict that the judgments of the inexperienced about a given event will be less variable than the judgments of those who have experienced this event.

Modern medicine has had relatively little interest in cognitive functions, psychological techniques, or the effects of nuances of belief, faith, self-suggestion, or yogic exercises on internal functions in treatment regimes. On the other side of the therapeutic coin, Psychology has fostered few formal applications for medicine.
There are, however, emerging concepts, of the cause and treatment of emotional, psychosomatic and related problems, now popularly designated as stress-related problems, that are directed toward both psycho-physiological relationships in health and illness and the influences of higher order mental functions.

And although relationships between psychosocial causes and psycho-physiological effects are increasingly assumed and experimentally supported, little, in the way of unifying concepts has been offered by theorists.

The bio scientific isolationism between psychology and medicine has been so great as to make their respective research and approaches mutually exclusive in theory if not in practice.

1.4 Current concepts of psychosocial stress

Although research and clinical thinking about stress problems of psycho-social organ is undergoing revision, most of the evidence and concepts derive from three peculiarly segregated disciplines; psychology, psycho physiology, and psychosomatic medicine. Each of these related but separate and unconsolidated, specialities subscribes to the same too principles; First, that in general if human emotions are inappropriately or inadequately expressed, tension occurs, resulting in either emotional or psychosomatic disorders; and second, that the implementing mechanisms
involve general or selective activation of aspects of neurophysiologic, neuroendocrine, or immune systems. The three disciplines, however, deal with quite different aspects of psycho-physiological relationships on both conceptual and practical levels. Psychology concentrates on subjective factors of emotion; psychophysiology concentrates on physiological correlates of emotion; and psychosomatic medicine concentrates on psychosocial factors related to specific psychosomatic disorders.

All three specialties rest on very insubstantial notions of emotions and emotional reactions. They generally begin with the assumption that environmental situations activate the physiological mechanisms manifesting the signs and symptoms of stress disorders, and do not deal with factors activating the emotions.

1.5 Classification of Stress:

In attempts to organize source of human stress, the general class is usually designated as environmental stress with subclasses of psychological stress. (e.g. loss of love, unconscious conflicts), social stress (e.g. cultural restrictions, technological change), economic stress (unemployment, poverty) and physiological stress (physical, chemical, bacteriological). This classification scheme catalogs the possible sources of stress and does not attempt to identify the nature of stress.
Current evidence for common mechanisms of the multiple varieties of stress–related disturbances suggests that a more exact, prognostic classification would be more helpful in understanding the stress process.

Table 5.1.1 lists the major categories of stress systems, the several elements implied by the general concept, and examples of stress in order of increasing complexity. Systems subject to stress may be physical, physiological and nonphysical with both subjective and physiological expression.

The elements implied are: (1) the system involved; (2) the nature of the external force; (3) the response (4) the mechanisms involved in producing the response, and (5) the mechanisms involved in resisting the external force.

The nature of stress for simple inorganic systems can be easily described as in Table 5.1.1 stress reactions of animal physiological systems are also well understood from the work of cannon and of selye, who have documented the physiological and biochemical responses to direct and imminent physical stress. Beyond this, difficulties arise when the concept of stress is applied to phylogenetically higher animals and to the complex systems of modern man.
Table 5.1.1: Operational Classification of Stress

Stress = Change within a system induced by an external force

<table>
<thead>
<tr>
<th>SYSTEM</th>
<th>EXTERNAL FORCE (STRESSOR)</th>
<th>RESPONSE</th>
<th>INTERNAL MECHANISMS (PRODUCING DISTRESS)</th>
<th>RESISTING MECHANISMS (ADAPTATION)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple inorganic</td>
<td>Physical (pressure, heat, cold)</td>
<td>Strain (Change in shape, structure)</td>
<td>Inorganic elements; molecules</td>
<td>Opposite force</td>
</tr>
<tr>
<td>Low organic (bacteria plants)</td>
<td>Physical</td>
<td>Change in shape, structure, direction or location</td>
<td>Ion exchange; simple reflexes</td>
<td>Secretions; regeneration, inclusion</td>
</tr>
<tr>
<td>Higher animals, primitive man</td>
<td>Physical; threats to physical well being; threats to group</td>
<td>Local and general physical arousal; flight or flight aggregation</td>
<td>Interacting neural networks; specialized organs; fostering systems</td>
<td>Coordinated neural and hormonal systems, primitive control of external sources.</td>
</tr>
<tr>
<td>Socialized man</td>
<td>Predominantly nonphysical; threats to social well-being and survival; intellectual pressure</td>
<td>Primarily intellectual, emotional perceptual, change of consciousness; secondly physiological arousal</td>
<td>Higher order brain functions; abstract thought; ability to order and to project language</td>
<td>Awareness, understanding, social coping, exploring resources and alternatives; securing relevant information.</td>
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</table>
1.6 Some psychological and physiological disturbances believed to be caused by, Related to, or Aggravated by psychosocial stress.

**Emotional:** Anxiety, insomnia, tension headaches aging, sexual impotency, neuroses, phobias, alcoholism, drug abuse, learning problems, general malaise

**Psychosomatic:** Essential hypertension, auricular arrhythmias, ulcers, colitis, asthma, chronic pain, ache, peripheral vascular disease.

**Organic:** Triggered by stress, epilepsy, migraine, herpes, angina, coronary thrombosis rheumatiod arthritis.

**Psychological adjustment problems:** eg. Anxiety of classroom learning (moderate interference in satisfying/ fulfilling human potential)

**Sociological problems:** e.g Chronic unemployment; delinquency (socially undesirable, socio-economic impoverishment and instability) Aggravated or prolonged distress in illness of any origin.

“Worry” or “Worry syndrome”, This term encompasses all of the subjective emotional activities concerned in social stress reactions and further, implies the dominant role of cognitive activity. Worry covers both conscious and unconscious worry, and is made up of the well-known elements of apprehension, anxiety feelings of insecurity, uncertainty in adequacy conflict, frustration and related emotions.
All of these expressions of subjective emotion are rooted in an intellectual concern about social activity.

1.7 General cognitive measures modifying the cognitive defects in social stress reactions.

If the cognitive processing scheme outlined has validity, it should enable us to identify areas of defective function and to suggest appropriate and effective treatment procedures. Both the processing and implementing phases of social stress reactions can be analyzed for specific defects that lead to problems and illness.

The first defect is the lack of information for the cognitive intellectual processes adequately to perceive the reality of social situations, relationships, and dynamics, and hence the lack of adequate information to understand or solve or cope with the perceived social problems.

The second defect is the lack of physiological proprioceptive information to the homeostatic regulating systems as a result of the failure of the mind-brain to recognize the body’s physiological reactions. (i.e) The failure to appreciate the information about body changes related to the perceived problem. If what the reacting systems need to resist stress is information, then treatment should supply the information needed.
Information about the social reality, about the inappropriateness of certain emotional reactions, and about social coping mechanisms can be supplied through a variety of sources such as psychotherapy, cognitive therapies, counselling, meditation, and related techniques. To remedy the defect in recognizing body tensions and physiological reactions, information about how and when the body is reacting to stress, about the inappropriateness of excessive body reactions, and about how to discriminate productive from unproductive physiological activity can be supplied through techniques such as biofeedback, yoga, progressive relaxation, autogenic training imagery, practice, and other body awareness techniques.

Since the physiological and psychological reactions are actually concurrent, both psychosocial and psychological information in the treatment procedures might be expected to provide greater benefits than either alone.
Fig 1.7.1: Relationship between cognitive actions and physiological stress reactions. (Schematized from a report by Kasl and Cobb, 1970), on blood pressure changes in factory workers as they might relate to cognitive events in reactions to social stress. Times are approximate.

Also relying largely on subjective reports, it appears that the awareness and understanding of the reaction process and how to resist it contribute toward subjective relaxation with consequent improvement in perception, broadening of focus, and more productive thought.
1.8 Psychoneuroendocrine Approaches to the study of stressful person-Environment Transactions.

This thesis reviews some experimental approaches to the psychoneuroendocrinology of human stress and coping, centered on research concerning the sympathetic adrenal medullary system carried out in our laboratory.

1.9 Conceptual frame and Research strategy

The susceptibility of the sympathetic adrenal medullar system to psychological factors was first demonstrated by Walter B Cannon and his associates at Harvard during the early part of the century results from a series of experiments on cats to formulate the “emergency function theory of adrenal-medullary activity, stating that many of the physiological effects of adrenaline serve the goal of preparing the organism to meet threatening situations involving fear or rage or pain. Noradrenalin, the medullary homologue of adrenaline, is the adrenergic neuro-transmitter as well as adrenal medullary hormone.

Stress, in this context is regarded as a process of transactions between the individual and his environment and hormonal measurements are seen as tools by which new insights can be gained into the dynamics of these transactions.
The key notion guiding our research is that the effective of psychosocial factors in arousing the adrenal medullary system is determined by the individual cognitive appraisal of their meaning and the context in which the stimuli are embedded, rather than by the physical properties of the stimuli.

### 1.10 Methodological considerations

Research on the psychological significance of the adrenal medullary hormones has been greatly facilitated by the development of fluorimetric techniques for estimating free catecholamines in urine, with the results that relevant data can be obtained by sampling urine while persons are engaged in their ordinary daily activities.

Thus, a first demonstrably by von Euler and Lundberg (1954), these methods are well suited to the study of psychosocial influences in everyday life. *Only a small fractions of the liberated amines is excreted in urine as free adrenaline and noradrenalin but this fraction shows a high degree of intraining individual constancy overtime.*

For a comprehensive review of adrenal medullary secretion and its neural control. A detailed review of sources of error in urinary catecholamine measurement.
Provided the conditions under which urine is sampled are carefully standardized, catecholamine excretion rates constitute sensitive indices of psychological impact of the environment\textsuperscript{[37]}.

1.11 Manipulating Controllability

We have been particularly interested in the issue of personal control, on the assumption that \textit{a person who is in a position to regulate stimulus input may be able to maintain both physiological arousal and psychological involvement at an optimal level over a wide range of stimulus conditions}.

Conditions characterized by \textit{uncertainty, unpredictability and lack of control} usually produce a rise in adrenaline output. The influence of situational control on the adrenal medullary response can be studied in laboratory experiment; high uncertainty was induced by telling the subject that each change in his/her heart rate, which was recorded continuously, would automatically release an electric shock to his/her left hand. In actual fact, shocks were given according to a pre-determined schedule, the same routine being followed.
1.12 The cost of Achievement: Rising the Body’s thermostat of Defense

When a person performing a task is confronted with an increase in task demand, he/she may adopt one of two principally different strategies, either maintaining performance at a constant level by increasing his/her effort, or keeping his/her effort constant and letting performance deteriorates. The former strategy exacts a higher “subjective cost” as reflected in self-reports of various aspects of psychological involvement, positive (e.g., effort interest) as well as negative (e.g., distress, discomfort).

The “physiological cost” will be higher, too, as reflected in neuroendocrine autonomic, muscular, and cortical indices of arousal, although there is no direct evidence of a causal relationship between hormones and disease, data from several sources suggested that increased hormone secretion is in fact potentially dangerous, since, if it is lost too long are is repeated too often it may cause functionally disturbances in various organs and organ system, which, in turn, may lead to diseases.

In the studies reviewed above we have seen how a person who deals with acute environmental demands by “raising the thermostat may have too “pay a price” in terms of increased psychological involvement and physiological arousal.
It may then be asked whether adjustment to short-term demands is likely to have lasting after effects, reducing the person’s ability to cope with subsequent requirements and, probably, threatening his/her health and well-being. It seems reasonable to regard the duration of the response evoked by temporary disturbances in daily life as a key determinant of their potential harmfulness. *In other words, the speed with which a person “unwinds” after stressful transactions with his/her environment, will influence the total wear and tear of the organisms.*