

CHAPTER 1

HUMAN STRESS

1.1 INTRODUCTION

Every life thrives and survives as happily as possible in an over-changing environment. Microbes, plants and many of the single-celled to multi-celled organisms placed lower on the evolutionary scale achieve this harmony by means of more or less automatic cellular responses or instincts evolved in accordance with 'survival of the fittest' dictum. Higher organisms like human being, whose brain is sufficiently complex is endowed with sense of logic and ethics, can learn to control their hereditary impulses.

Stress has many different definitions, but its concept goes back to prehistoric era. Primitive men felt the need to adapt when he was tired, tensed, sick or unhappy. He could neither name it nor fathom its causes and mechanisms. As time passed by he pinned it to an entity and associated it to a supreme being. The mere existence of the primitive men was a sufficient proof for him to believe that there is a greater entity, a creator, whose power and wisdom was far beyond his comprehension. Every ancient codes, ethics created were to satisfy the creator and avert his displeasure. Excitement, feel of loneliness, fear, guilt, loss etc., which disturbed the physical and mental health

were viewed by the primitive men as the power of an entity and not as the one called now as stress [48].

1.2 Earlier research on stress

Philosophers view the very definition of the stress in different perspective. Some consider it as an absence of inner peace, while others describe it as the loss of one's control or any change experienced by an individual. Plainly, stress is expressed as any stimulus or challenges that goes way deep to upset our normal function and disturbs our mental and physical health. Based on the circumstances which has the ability to induce stress, internal circumstances such as illness, pain, emotional upset or external circumstances such as death, family problems, financial problems creates a state of anxiety exceeding one's ability to cope up with them. Such external factors or forces are called stressors [119, 120].

In early 1950's, psychiatrists found ways to quantify the effects of stressful events. Events like divorce, death, job change, pregnancy, marriage and retirement can take their toll. The larger the amount of stress an individual face the more likely the damage done to their health.

1.3 Types of stress

Based on its impact, stress can effect an individual and it is classified in to four types [15, 21, 120]

a) Physical stress

Physical stress includes illness, noise, toxins, hormonal or chemical imbalances, dietary stress, inadequate oxygen supply, trauma, physical labor and pollution.

b) Psychological stress

It includes guilt, jealousy, fear, shame, resentment, worry, anxiety and self-criticism, loss of sense of control, beliefs and attitudes.

c) Psychosocial stress

Psychosocial stress includes relationship difficulties, lack of social support and isolation.

d) Psychospiritual stress

It includes a joyless life, meaningless work, a crisis of values, meaning and purpose.

In this modern age of high technology whose scientific innovation and luxunal conveniences like cellphone, laptop, microwave, and television has increased our drive to remain productive and advanced us in to the next age of super technology, it has considerably decreased our leisure time leading to all unhealthy life styles and thereby increasing techno stress [87].

Intervening variable	Stimulators	Measures
Arousal	Novelty, Uncertainty, Hunger/Thirst	Physiological variables, Behavioral variables
Psychological Stress	Frustration ,Conflict, Fear	Affective ,Anxiety disorders
Physical Stress	Pain, Heat, Cold Toxins	Adrenal hypertrophy, Gastric ulceration

Table1.1: Relationship between Arousal, Psychological and Physical stress

1.4 Short and long term stress

The acute or short term stress is intense, caused by events such as a loud noise or a near miss of accident on the highway, but disappears quickly. The physique responds with fight or flight response.

The chronic or long term stress stays over a longer duration of time even for a month altogether. They often suppress the immune system, increase the blood cholesterol level and loss of calcium from bones. It drives an individual crazy making them hypertensive leading to tiredness, chronic pain, restless, weight loss or gain, drinking or smoking behaviours, feel irritable, depressed and difficulty in thinking. The quality of relationship slowly deteriorates and social withdrawal can also occur. As stress can affect health, research conducted in the 1960's and 1970's showed that social detachment was often associated with increased risk of mortality and morbidity [15].

1.5 Stress is omnipresent

All stress situations are not identical, for they are never seen in isolation. Stress cannot be produced in pure form without a stressor, as a stressor initiates stress with or without the functioning of nervous or hormonal systems.

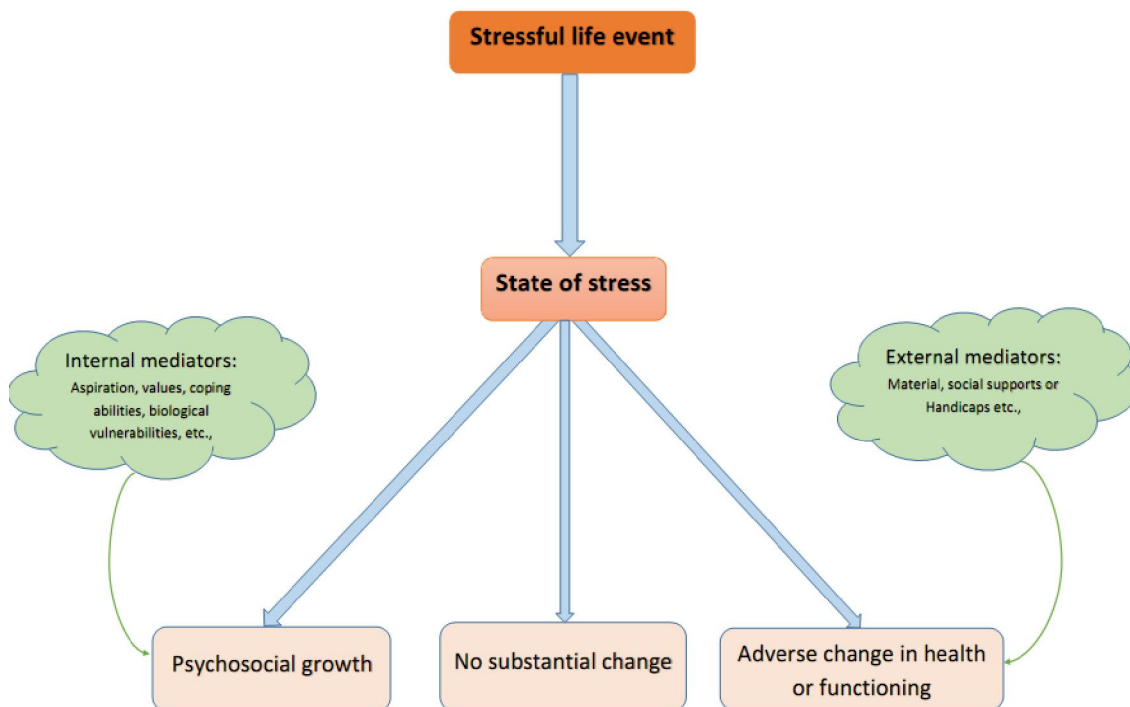


Figure 1.5.1: Model of life Stress process

The fact that all stress situations are not identical doesn't nullify their non-specificity for both the event and their responses are self-evident [33]

The circumstances that sheds light on the above is listed as

1. Stressors are always accompanied by peculiar side effects.

2. Internal or external predisposing or immunizing factors modify the response.

The above figure depicts the comprehensive description about psychosocial stress. It starts with a proximate of recent events in the life of an individual. The initial step that triggers the model is based on the distinction emphasized by Selye [121] and others [33, 80] between a stressor and the immediate reaction to that event.

An individual in a state of stress is usually inferred rather than observed, so the next step of the model portrays the dependence on the mediation of situational and personal factors that constitute the context in which this state occurs. The final step in the model leads to one of the three general outcomes where a person may

(1) Undergo psychosocial growth

(2) Resume his life without substantial permanent change (or)

(3) Experiences a drastic change in his health (or) functioning

Stress is not a logic phenomenon as it can exist in various degrees. Different demands and different intensities of same demands, never cause equal stress reactions.

1.6 Lazarus model for stress

The most widely regarded model for psychosocial stress is the transactional model (or interactional model) of Richard Lazarus [80, 81, 112]. It

defines stress as an occurrence during the arousal of an imbalance between demands and resources, the ongoing nature of balance and imbalance. It also emphasizes the influence of environment on people and people on environment. Thus any instability in person- environment -encounter has implications on both the person and environment.

Lazarus model (figure 1.6.1) starts with the evaluation of a person's particular event i.e., situation of demand. The primary appraisal concerns with whether occurrence of negative outcome is possible in an encounter. An appraisal of harm indicates that the demand has already been done, while an appraisal of threats means the harm is likely to happen in the near future. He also defines an appraisal of challenge, where an individual believes the possible outcome can be achieved rather than protecting against the negative one.

The secondary appraisal is where in which an individual attempt to gather all possible option available for dealing with the threat, harm and challenge. Such option may be internal or external and may be resources or responses [84].The difficulty and the attractiveness of this model is its effectiveness. It allows us to understand stress as a combination of personal issues and concerns that change over time as well as the resources and responses, where a person calls upon stressors also change over time. Thus a stress response is a transactional one, where the balance of demand and resources defines stress.

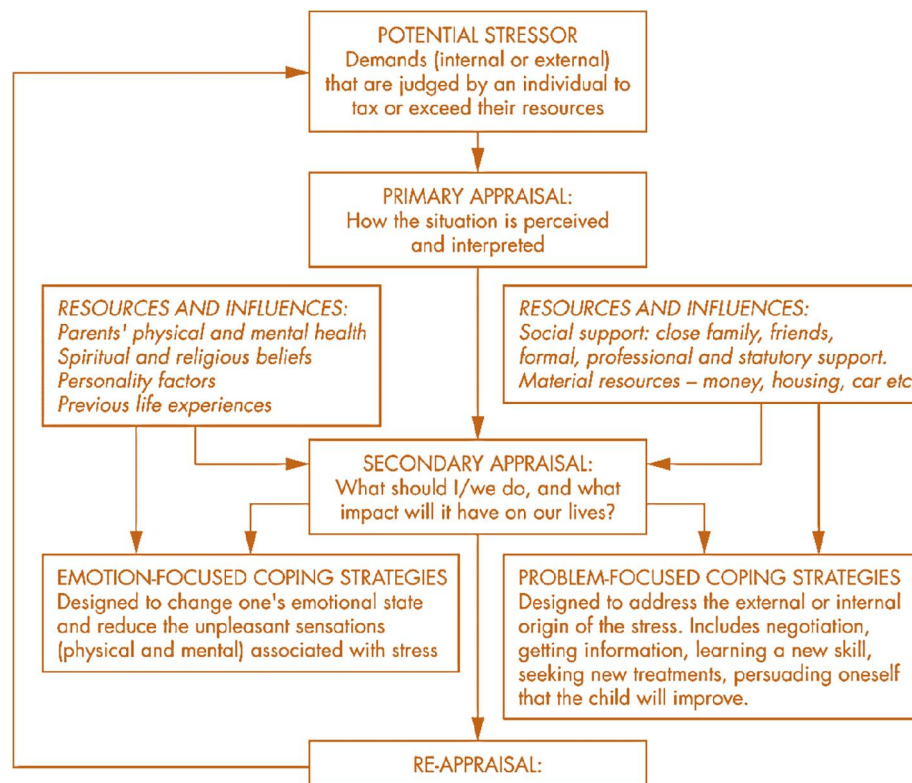


Figure 1.6.1: Lazarus model

1.7 Stress and Disease

A relatively little interest by modern medicine were shown in cognitive functions, psychological techniques or the effects of nuances of belief, faith, self-suggestion or yogic exercise on interval functions in treatment requirements. On the other side of the therapeutic coin, psychology has fostered few formal applications for medicine. Emerging concepts of the cause and treatment of emotional, psychosomatic and related problems, not popularly designated as stress-related problems that are directed towards both psychophysiological 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 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 [118].

Stress affects the psychological and physical health of individuals. It is the cause of many diseases and the hormones released when a person is under stress seriously weaken immunity, potentially damage cognitive ability, increase exhaustion, depression and anger, etc., and open the body to all types of infections.

Stress related diseases can be broadly divided into four categories:

Prolonged stress, by upsetting our body's chemistry and other responses, can lead to or lower our resistance to disease and illness. The stress hormones released when a person is greatly under weakens immunity, potentially damages cognitive ability, increase fatigue depression and anger and opens the body to all types of infections [80, 82].

1. **Cardiovascular Disorder:** It includes cardiovascular physiology, essential hypertension and vasospastic phenomena.
2. **Respiratory Disease:** It includes allergy, Bronchial asthma and hyper ventilation.

3. **Musculoskeletal Disorder:** It includes skin disorders, the immune system and Psychological manifestation of stress response.
4. **Gastrointestinal Disorder:** It includes gastrointestinal physiology, peptic ulcer, ulcerative colitis, irritable bowel syndrome, esophageal reflex.

Many individuals have experienced cardiovascular, vascular, gastrointestinal, muscular and neurological, skin and other diseases due to stress. The term 'psychosomatic' is used to indicate the relationship between psychological process and behavior on the one hand and somatic structures/system or bodily organs on the other. While a normal person is able to discharge emotional tension through appropriate verbal expressions or physical activities, in psychosomatic disorders, the usual channels of emotional outlet are largely blocked and the tension is discharged through conversion to somatic symptoms. Psycho emotional tensions can cause a number of organic diseases and these are on the increase all over the world [14].

1.8 Recovery from short-term stress

The duration of the response evoked by temporary disturbances in daily life is a key determinant of their potential harmfulness. In other words, the speed with which a person "unwinds" after stressful transactions with his environment, will influence the total wear and tear of the organism. In this context it is noteworthy that individuals tend to differ with regard to the

temporal pattern of their GnRH release during stress. Comparisons between persons classified as rapid and slow “adrenaline decreaseers” support the assumption that a quick return to physiological baselines, after energy mobilization induced by short-term exposure to a heavy mental load, implies an “economic” mode of response [13, 53].

Conversely, a slow return to baseline indicates poor adjustment in the sense that the person “over responds” by spending resources which are no longer called for. In agreement with this reasoning, results from a laboratory study showed that “rapid decreaseers” tended to be psychologically better balanced and more efficient in achievement situations.

Because of these reasons, the final aim of this thesis goes in the direction that there is a need for analyzing the nature of time to return to physiological baselines after energy mobilization induced by short-term exposure to a heavy mental load, which may be considered as a stochastic process with continuous time and discrete or continuous state space.

An equally important finding of psychologist [120] is that the time for “unwinding” varies predictably with the individual’s state of general well-being. For example, in a group of industrial workers, the proportion of “rapid decreaseers” was significantly higher after a vacation period that had improved the workers physical and psychological condition than before.

1.9 Effects of stress

The outcome of the research findings detailed above sheds light to focus on the after effects of overload at work. An elaborate theory on stress was developed by Selye [120] of stress with several implications. The implication of this theory is that [21, 33, 81]

- 1. The effects of stresses are cumulative i.e., the damage produced by stressors accumulates over time.**
- 2. These effects are involved in serious pathology when they overwhelm one's ability to cope.**
- 3. Stress may be additive because responses to different threats are the same, an individual's reaction to a threat will be augmented or added to by his or her reaction to the previous exposure to threats.**

Many contributions by various researchers were made on physiological aspects of stress. Manson [90, 91] for example, has argued against a non-specific model of stress, showing that the endocrine systems exhibits different pattern of response to different threats.

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, rheumatoid arthritis.
Psychological adjustment problems	Ex: Anxiety of classroom learning (moderate interference in satisfying/fulfilling human potential)
Sociological problems	Ex: Chronic unemployment, delinquency (socially undesirable, socio-economic impoverishment and instability)
Aggravated or prolonged distress in illness of any origin	

Table 1.2: Some Psychological and Physiological disturbances believed to be caused by, elated to, or aggravated by psychosocial stress

The plausibility of the various assumptions to make depends partly on the kind of stress which is being adapted. The term ‘stress’ is being used in a sense to include the stress due to workload, loss of energy, weakness of the body etc.

It is also true that there are many factors associated with the stress effects and it is not possible to take cognizance of all such related factors. To cite one example consider, while building a Mathematical model, the incubation period which is highly random and long in character. The results embodied in this thesis are based on the concepts of reliability theory.