CHAPTER II

THEORIES AND CONCEPTUAL CLARIFICATION

1. Protein Energy Malnutrition

2. Intelligence

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PROTEIN ENERGY MALNUTRITION

A nutritionally balanced diet is a must for normal physiological and psychological functions in a living organism. A healthy body becomes the instrument for the highest human achievements for which adequate quantity and quality of nutrition is essential. (Devadas, 1977).

Starvation, whether selective or general and any particular deficiencies in the nutritional intake makes the body susceptible to malnutrition. Once malnutrition sets in, it effects adversely all the internal organs and also the mental abilities and outward behaviour, since these have a strong base in internal organs.

A specific form of malnutrition exists in the Protein Energy Malnutrition (PEM), which is best considered on its causative factors and spectrum of disease with its severe forms manifesting themselves clinically classified as Marasmus, Kwashiorkor, and Marasmic Kwashiorkor. Marasmus, primarily a starvation disease of infancy results from a deficiency of dietary protein, calories and all other vital nutrients as well. While Kwashiorkor, more common in second and third year of childhood, results primarily from dietary deficiency of protein, quality, quantity or both. However, other nutrients such as calories, vitamins etc may be nearly adequate. The condition with mixed symptoms of both Marasmus
and Kwashiorkor is known as Marasmic Kwashiorkor. In other words, the entire range of mild to severe manifestations of nutritional deficiencies, in which low protein intake is a common denominator but consumption of carbohydrates and fat as sources of energy varies, are referred to by the term Protein Energy Malnutrition.

**Definitions:**

**Nutrition:**

1. "Nutrition may be defined as the process by which the organism utilizes food." (Ke Cance, 1962)

2. "The process whereby living organism take in, and transform extraneous solid and liquid substances necessary for maintenance of life, growth, the normal functioning of organs and the production of energy." (Ke Laren and Donald, 1972)

3. "Nutrition may be defined as a science which deals with the food materials which the living organism takes in and the processes through which these materials maintain life and sustains all the vital activities of the organism. It is a science which deals with the control of health in so far as it is affected by the food we eat." (Oxford Dictionary).

**Human Nutrition:**

"The scientific discipline that deals with nutrition in man in particular and is concerned with nutritional
requirements, food consumption, the nutritive value of foods and diets, the relationship between diet, health and disease and with research in these fields."

(McLaren and Donald, 1972)

Nutritional Status:

"Nutritional status is the state of the body produced by the process and results from the balance between the supply of nutrients on one hand and the expenditure by the organism on the other." (McCance, 1962)

Malnutrition:

1. "Malnutrition is an inadequacy in the quantity and/or quality of the diet that is in calorie or protein intake, which could over a period, result in either loss of normal body weight or reduction in physical activity or both." (FAO, 1963)

2. "The lack of a sufficient quantity or quality of nutrients to maintain the body system at some definable level of functioning." (Kallen, 1973)

Assessment of Nutritional Status:

The nutritional status of an individual is evaluated by comparing several physical and bio-chemical criteria. Rajlakshmi and Ramakrishnan (1967) have suggested the following criteria for the assessment of the nutritional status.

1. Height, weight and other body measurements in relation to established norms.
2. Dietary intake as compared to desirable intakes.
3. General appearance and the presence or absence of clinical symptoms of nutritional deficiency.
4. Feeling of well-being, freedom from symptoms such as fatigue, listlessness, irritability and other symptoms often associated with deficiencies. (While their absence indicates health and well-being, their presence may be due to both nutritional and non-nutritional factors).
5. Physical stamina and endurance - Performance under standard conditions.
6. Biochemical assessment involving the analysis of blood, serum, urine, blood cells and other body tissues and fluids, load tests, balance studies.
7. Radiological assessment (mainly for the assessment of skeletal status).
8. Investigations for the presence of infections, intestinal parasites or other factors which interfere with the normal assimilation of nutrients.

However, by using the following indicators available, assessment of a child's nutritional status can be easily done with minimum equipment.
1. Weight with relation to age.
2. Weight with relation to height.
3. The mid-arm circumference/head circumference ratio.
Classification of PEM:

Many classifications have been proposed which have been based on different criteria such as clinical signs, symptoms and anthropometric measurements. Since the classification based on clinical signs tends to be qualitative and subjective, thus more complex, have not gained widespread use for research purposes. Such classification includes the classification of McLaren et al., (1967); Wellcome classification (1970) and Burgess et al., (1969).

An easily workable and widely used classification based on expected weight for age has been described by Jelliffe (1966), using the 50th percentile of the Boston standards. In this system four groups are defined at the intervals of 10% deficit in body weight. Thus 70 to 80%, 60 to 70%, 50 to 60% and below 50% are considered as 1st, 2nd and 3rd and 4th grade of malnutrition respectively. This classification arose as a modification of earlier proposed classification by Gomez (1956). This classification has been adopted by Government of India, in ICDS (Integrated Child Development Scheme) and is currently in use. (National Institute of Public Co-operation and Child Development, 1988, Personal Communication).

Same classification is used in the present investigation also for grading the children in various degrees of malnutrition.

Types of PEM:

Kwashiorkor:

The term 'Kwashiorkor' is derived from West African word
meaning - the deposed child. Initially Kwashiorkor was attributed to infectious diseases such as congenital syphilis, worm infestations etc. One of the earliest description of Kwashiorkor by Cecily Williams (1933, 1935) attributes the skin changes to various deficiency conditions. It was not until after the second world war, that it became widely accepted that Kwashiorkor was due to a deficiency of protein in the diet. (McCance and Widdowson, 1968).

In many countries of Africa, Asia and South America Kwashiorkor is a common condition amongst the poor population living below the poverty line. It was observed in these countries that the foods consumed by affected children was of starchy type (providing enough calories but without protein) such as Cassava, Tapioca, Sago, Yams, Bananas etc.

Welbourn (1955) assessed dietary intakes of Kwashiorkor children in Kampala (Uganda) and reported that the average protein consumption of affected children was only 33% of the recommended child's needs. Thus a primary protein malnutrition seemed clear cut and apparent cause of the clinical syndrome. (Moody, 1963; Annegers, 1973).

Many such studies carried out in various parts of the world especially Africa have examined the regional dietary patterns and have all arrived at the conclusion that frank Kwashiorkor occurred whenever the diets had a low protein to energy ratio.

Kwashiorkor is found predominantly in older infants and young children whose requirements for protein and energy have
not been met for some time. The general clinical features considered for establishing a diagnosis of Kwashiorkor are: Anorexia (loss of appetite) Diarrhoea (watery stools) Anaemia (deficiency of hemoglobin) Growth retardation, Super imposed infections of bacterial or viral type, reversible skin and hair changes, Peeling dermatosis and liver enlargement with fat accumulation. A main feature is oedema (swelling over the whole body). Such features give a Kwashiorkor child another name "Sugar Baby".

Profound and complex psychological changes have been observed in children with Kwashiorkor, such as listless apathy, unhappiness, misery and easy irritability. Apathy is a very characteristic feature and the child appears constantly unhappy. Neurological features though are rare but some few children do have tremors which resemble parkinsonism (Davidson et al, 1973). All these abnormalities manifest together with clinical sign and symptoms to give a striking and a constant picture (Geber and Dean, 1956).

The complexity of the changes are influenced by socio-cultural factors (Jelliffe, 1966), abnormalities in the structure and function of the brain (Nelson and Dean, 1959). Marked improvement in behaviour and emotional tone has been reported in those children who survive, although a completeness of psychological recovery has not been established (McLaren et al, 1973).
Marasmus:

The term Marasmus is derived from a Greek word meaning "to waste". Dietary marasmus in the childhood is equivalent of starvation in adults (Davidson et al, 1973). Contrary to Kwashiorkor, Marasmus is characterised by a gross wasting of muscle and subcutaneous tissues, marked stunting of growth but no oedema.

Prolonged and severe dietary inadequacy resulting from poor diets or reduction or absence of breast feeding, numerous and recurrent infections, rapid succession of pregnancies, and other urban influences predispose to Marasmus. The general clinical features considered for establishing a diagnosis of Marasmus are: Severe growth retardation with gross underweight, extreme wasting of body tissues. There is a characteristic dry, dehydrated and shrunken appearance of skin, weak and atrophic muscles giving a skin and bone appearance.

In a Marasmic child there is failure to thrive, irritability, fretfulness and apathy is frequent. Most infants are ravenously hungry. Psychological disturbances specially resulting from lack of mothers love and care can depress the appetite and hence may be a factor in causation of marasmus (Davidson et al, 1973). A marasmic child is also known as "cry baby" which denotes emotional state and misery.

Marasmic Kwashiorkor:

In areas where both kwashiorkor and marasmus are endemic, there exist certain children who present intermediate form of both these condition with mixed clinical features. These children
are classified as Marasmic Kwashiorkor. Oedema is present and body weight is less than 60% of expected standard for age. In Jamaica, it was seen that whereas the mean age, age distribution and weight deficit for age are the same in kwashiorkor and marasmic kwashiorkor, the degree of stunting is significantly greater in marasmic kwashiorkor, which suggests that duration of illness in marasmic kwashiorkor is greater than in kwashiorkor. Mixed psychological changes, skin and hair changes and other clinical features as described in marasmus and kwashiorkor are also commonly found in such children (Alleyne, 1978).

Causative Aspects of Malnutrition:

Causative factors have come to our notice while working on various incidence estimates. Substandard housing, poor sanitation, inadequate water supply, unemployment, lack of education etc are some of the factors which can cause malnutrition specially in urban illiterate areas where the condition exist in a wider range. The decline in breast feeding is probably a more effective causative factor of malnutrition common amongst the upper and lower class society, since the percentage of working mothers has increased. A study in urban Tehran and a nearby rural area showed that although 80% of urban mothers started breast feeding, only 40% could continue for three months and by the end of 6 months only 20% were breast feeding. Whereas in rural area 80% of the mothers breast fed their children for at least 12 months (Winick, 1976). In a study on urban slum children it has been observed that boys
have more mental health problems than girls, which brings the influence of sex also as a factor related to psychosocial development and temperamental characteristics. (WHO Chronicle, 1977). According to Ornelas (1973) the causes of malnutrition are:

1. During early weaning human milk is replaced almost exclusively by less nutritional foods leading to a low intake of protein and energy.

2. Calorie deficiency present in PEM, is aggravated by deficiencies of vitamins and protein.

3. Recurrent infections, infestations and diarrhoea.

4. Ignorance and misery as super imposing factors.
   Ignorance is accompanied by superstitions and taboos with respect to quality and quantity of food consumed.

Endozien (1970) lists the environmental causes of malnutrition as:

1. Factors that limit the production and availability of food.

2. Factors that limit the utilization of available food supplies.

3. Factors that alter individual nutritional requirements such as during disease and infections.

Alleyne (1978) has described social factors causing PEM are Separation, Food taboos, Broken homes, Family size and Poverty.
Cecily Williams (1933) in her original description of kwashiorkor has noted a prime feature effecting PEM as the child deposed from the breast by the conception of a new fetus. This practice of sending the child to live with grandparents once a second pregnancy has begun, and the trauma of a sudden separation from the mother can by itself result in a loss of appetite and nutrient deprivation. These facts are also supported by Burgers and Dean (1962).

Many communities in developing countries have strict ideas about what is eatable and what is not, thus leading them to have a limited access to different foods. Jelliffe, (1969) noted that in islands of eastern caribbean, it is believed that when a child is on milk, he has in his stomach a bag of curdled milk which must be removed before he can live satisfactorily on other foods. This removal is effected by a variety of dietary restrictions, laxatives and herbal medicines. In some such taboos it is difficult to bring change due to a well seated religious basis, but it can be overcome by careful nutrition education (Stanfield, 1971).

Separation of child from his mother or father due to broken home has worse effect on a child than temporary separation. The importance of this to the development of kwashiorkor has been stressed by Mc Cance (1971) and also earlier by Jelliffe (1969).

Large families and birth order are other factors that can decide which children become at special risk. Morley, et al (1968) have observed that a family with more than seven
Children, results in a higher incidence of kwashiorkor, whereas studies in India reported by Gopalan (1969) have found severe incidence with a cut off at three children. It was thus felt that in India if family size could be limited to three children, it would reduce the incidence of severe malnutrition significantly by about 60%.

The overriding role of poverty in the aetiology of nutritional diseases especially PEM has been well established. Many childhood diseases achieve their worst effects in poor socially deprived homes and in the case of PEM also, it is considered to be primarily a problem of poor countries and of the poorest sections of the community within these poor countries. Following illustration shows interrelationships between factors leading to malnutrition (ODA, Advisory Committee on Protein, 1974).

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Failure of income to meet needs ➔ Insufficient food intake ➔ Infants and children with increased susceptibility to disease.

Increased food requirements by child ➔ Ill children

Compensating increase in pregnancies

Decreased earning capacity.

Less adequate adults.
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Dead children

Increased food requirements by pregnant and lactating women
Problems of people switching from rural to an urban existence is another causative factor in the development of malnutrition. Overcrowded living condition accentuates cross infection and the interaction between cross infection and a poor dietary intake, which predisposes the development of malnutrition especially in third world countries.

PEM is a complex syndrome, intricately interwoven with the child's environment, growth and development. The problems of its long term effects are equally complex and hence it is necessary to appreciate each of these effects, since the ultimate height and weight, intellectual achievement, also emotional temperament, disease process and longevity cannot be easily measured by short term follow up. Thus in order to deal with any effect it is necessary to consider the whole spectrum of severity, duration, type and timing of PEM.

Of special importance is ultimate intelligence and the effects of PEM on growth, mental development and normal physiological aspects, since these effects substantially alter the quality of life of an individual and his usefulness and effectiveness to society.

**Physiological Aspects of PEM:**

The consequences of PEM upon physiological processes such as growth etc., are directly or indirectly due to an insufficient supply of energy and amino acids which are the basic requirements for the body. There is a failure of vital functions and these consequences can be said to be reactions
of the body to reduced protein and energy intakes, and its inability to adapt, indicating basic necessity.

The earliest effects of PEM on physiological processes in a child are (1) Slowing down or cessation of growth which leads to stunting, (2) Failure to digest and absorb food leading to diarrhoea, loss of water and vital salts, (3) Alterations of chemical composition of cells such as the accumulation of abnormal fat in liver, (4) Increased turnover of body proteins leading to muscle wasting and anaemia. (Davidson et al, 1973).

Physiologists and Biochemists have shown innumerable effects and there is a plethora of information on all these aspects which are due to a deficient protein intake. In summary if children do not get sufficient quality and quantity of adequate food they fail to grow properly in all respects.

K CANCE (1975) in his results on effect of PEM on growth from animal studies, has given importance to the timing of malnutrition. Specially the adverse effect of malnutrition or encouraging effect of rehabilitation during the critical time which he considered, before or immediately after birth, is more prominently observed. Observing retardation in height and maturation, Mc Cance stated that an adequate diet given after weaning would result in rapid growth.

Briers, Hoorweg and Stanfield (1975) studied the bone age and height of a group of Ugandan children aged from 11 to 17 years, half of whom had been acutely malnourished at an age
from 9 months to 2 years, matched individually for age, sex, tribe and socio economic status with the control half. They found significantly reduced height but no difference in bone age. This study indicated that subsequent nutrition had been sufficiently adequate in the previously malnourished group to allow for a catchup of skeletal maturity, but that the stunting (reduced height) which was likely to be permanent, was evidence that the malnutrition had straddled a 'critical period'.

Alleyne (1973) concludes that in regard to human PEM, long continuing and marginal malnutrition is also responsible for the permanent stunting of growth in most developing countries. The 'critical period' concept advanced during animal studies is not as clear cut in human studies since long term studies are awaited in humans, moreso growth in height is not the only skeletal measurement which may be affected by malnutrition. Malnutrition also results in reduction of head and arm circumference.

**PEM and Mental Development**

There seems little doubt that many children who suffer from PEM subsequently pass through their formative years with their mental faculties partially dimmed by the disease. (Davidson et al, 1973).

Schrimshaw (1969) has given evidence for the permanent and damaging effects of early malnutrition on the functions of the nervous system.
There is however much speculation as to whether such brain damage is irreversible and leads to impairment of intellectual development. Winick (1970) has shown that brain cells increase in number rapidly up to 6 to 10 months after which time the total number of brain cells remain fixed for life. During this period, from birth to 10 months the brain is probably more susceptible to irreversible nutritional damage. This period may be the 'critical period' as mentioned by many authors, however no clear cut confirmation has been reached for this critical period in human studies on the vulnerable central nervous system (Davidson et al, 1973).

Measurements of behaviour and achievement in animals like rats, dogs, monkeys following malnutrition during the critical period have demonstrated differences in ability to learn, in balance and dexterity (Smart, 1971).

Comparing and extrapolating animal findings to human situation is complex and it is difficult to find a relevance, since there is a vast difference in the time scale of growth spurts (Dobbing, 1974).

In the human situation brain growth and development take place in an environment in which many factors other than malnutrition are at work, any of which may have retarding, distorting or stimulating effects on long term development.

The effects of PEM upon mental development have been studied in two types of approach. One approach is to define the effects of PEM on brain size as measured by head circumference.
and other such medical measurements, while the other approach is to study intelligence and performance as an aspect of brain function.

It is also universally agreed that children exposed to the whole environment of disadvantage associated with PEM perform significantly less on intelligence tests when they are compared with control children from a reasonably good environment who have not been malnourished. Cabak et al (1965) Stoch and Smythe (1967); Champakam, Srikantia and Gopalan (1968) have also provided convincing evidence in their studies that the malnutrition syndrome impairs a child's performance on different tests of mental and psychomotor function.

In Cape Town South Africa, Stoch & Smythe (1963) carried out elegant follow up studies on severely malnourished children in the first year of life, followed up until the age of 7 years, showed both a reduced brain growth as reflected by head circumference and a lower I.Q. than a control group.

A wide variety of tests have been given to the children malnourished, and most show a general impairment of ability. There is no clear cut evidence that cerebellar function is specifically impaired, though on the whole general reasoning and spatial perceptual abilities seem to be most severely affected, with short term memory and learning ability, less severely and language ability least of all. (Cravioto et al, 1966; Klein et al, 1975; Moorweg & Stanfield, 1976).

During acute PEM maternal child interaction is reduced. Prospective studies in Guatemala (Cravioto and De Licardie, 1972)
showed that a reduction of interaction between mother and child preceded malnutrition. Richardson, Birch and Hertzig, (1973) attempted to score the stimulation, a group of malnourished and control boys had received at home. On this basis they were able to distinguish four subsets: They were malnourished boys low and high on "intellectual" stimulation and non-malnourished boys low and high on "intellectual" stimulation. The I.C. measurement at between 6 to 10 years of age showed the expected order, that is the malnourished boys low on stimulation were 18 points below the non-malnourished boys high on stimulation, with the two intermediate groups in the middle. The inactivity associated with PEM may well reduce mother-child interaction which in turn, further reduces the ultimate potential.

A malnourished child is silent with apathetic immobility and spends less time in activities requiring high energy expenditure. This may be a natural adaptive mechanism for energy conservation in order to overcome the deficit in energy intake. (Rutishauser & Whitehead 1972)

Despite numerous human studies, no clear cut confirmation has been reached in regard to the 'Critical period' of the development during which the PEM syndrome exerts an enhanced effect on a vulnerable central nervous system (CNS). Some studies report that the younger the child, the greater would be the ultimate effect (Cabak and Hajdanvic, 1965; Cravioto and Robles, 1965; Hertzig et al, 1972; McLaren et al, 1973; Richardson, Birch & Hertzig, 1973; Hoorweg and Stanfield, 1976), whereas there are also some studies which report that, many
children suffering acute PEM at a younger age fared better when tested subsequently. (Chase and Martin, 1970; Evans, Moodie and Hansen, 1971). Such contradiction in reports gives rise to problems of interpretations.

INTELLIGENCE:

Intelligence is a term we derive or infer from our observations of the individual differences in some kinds of behaviour. The concept of intelligence has been with us for a long time. Some two thousand years ago, Plato and Aristotle singled out cognitive from orectic factors in behaviour and Cicero coined the term "Intelligentia" which has since assumed universal acceptance. (Eyseneck, 1969). Spearman (1927) reported that the Monarchic view of a unitary thing called intelligence was popular as far as the 15th century. Both Cyril Burt, 1955 and Spearman, 1927 give credit to Herbert Spencer for bringing this term into psychology, who had earlier emphasized its role in biology. Having defined life as "the continuous adjustment of internal relations to external relations," Spencer believed that this adjustment is achieved by virtue of intelligence in man.

Both Herbert Spencer and Francis Galton while introducing the concept of intelligence believed in the importance of general ability, and distinguished it to be different from special abilities. Their views were later adopted and then amplified by leading neurologists. Burt himself accepted the
theory of general cognitive capacity probably dependent upon the number, complexity of connections and organization of the nerve cells in the cerebral cortex. This general hypothesis is still perfectly tenable and accepted by many modern neurologists.

Early in the century, powerful support for these ideas came from two sources. Spearman, developing the techniques of factor analysis first suggested by Karl Pearson, showed extensive statistical evidence and was a formidable advocate of general abilities, even to the extent of denying any importance to more specific abilities. On the other hand Alfred Binet in France produced the first satisfactory scale for assessing differences in intelligence. Burt, using such standardized tests demonstrated that many children certified as mentally deficient, were in fact within the normal range of intelligence and were backward rather than defective.

In the succeeding years the work of these pioneers was extended and refined, but few fundamental developments occurred.

To explain differences among people in their mental capacity, such as the ability to solve problems, to acquire, recall and utilize information, to reason and to make inferences, we need some term or concept. The term intelligence fulfilling these needs is used to explain differences in mental ability that are the product of age and maturation. As an example, differences between an eight year old and a twelve year old, in thinking and problem solving, as well as
individual difference among children who are of the same age and level of maturation, for instance, the difference between ten year old bright and dull children.

The three interrelated categories of mental functioning are:

1. The Cognitive or Intellectual Functions:
   They include comprehension, thinking, judgement, inventiveness, skill, information and utilization of past experiences.

2. The Emotional Responses to Life Situations.

3. The Connative Functions:
   These manifest themselves through the instincts, urges, drives, appetites, action tendencies, degree of initiative and manner of persistence in striving for a goal.

Conceptual Clarifications:

Intelligence and Aptitude — Apitude is a specific ability to perform a specific or a particular kind of work whereas intelligence is a general ability required for any kind of performance. Aptitude tests are specifically designed to allow us to predict future proficiency in a particular skill whereas intelligence tests gives us a overall view of level of individuals general abilities. Aptitude tests tend to be narrow in scope and limited to performance in a particular skill, for example the Seasnore tests of musical talent which attempt to measure discrimination of pitch, loudness, time, timbre.
rhythm and memory for tones. These talents cannot be predicted by intelligence tests. The intelligence tests are usually constructed for people to have a reasonably equal chance of performing well regardless of such factors as schooling or past experience, whereas aptitude tests are not free from such confoundings.

Intelligence and Achievement - Intelligence is generally an attribute or ability to deal with various kinds of problem situations in day to day life, whereas achievement is the consequence of the application of intelligence in real life situations. The achievement tests are aimed at measuring what a person has already learnt in some special area, for example a standardized achievement test is given to determine how much mathematics, literature, reading skill etc. a person may have learnt, whereas intelligence tests are aimed to measure any mental ability that an individual may possess.

Intelligence and Knowledge - A layman generally confuses intelligence with knowledge, which is a medium through which we measure intelligence.

Definitions:

Intelligence is such an abstract construct that until now none of the definitions is completely satisfactory and logically explanatory. Most of the definitions are descriptive in nature or functional in operation. It is a kind of mental ability or potentiality which is described vividly by many psychologists.
While various tests were invented to measure intelligence, attempts were continued in the direction of precisely defining intelligence, yet in outcome no satisfactory and acceptable agreement on its definition could be achieved. As Spearman (1927) puts it, intelligence became a mere vocal sound, a word with so many meanings that finally it had none. He further quoted J.S. Mill in a statement that described the situation well "The tendency has always been strong to believe that whatever receives a name must be an entity of having an independent existence of its own. And if no real entity answering to the name could be found it was then imagined that it was something peculiarly abstruse and or mysterious.

According to Peterson, even Binet never stated in published form a formal definition of intelligence. Binet initially stressed on memory, imagery, voluntary attention and judgement which he regarded as a high form of adaptability to a task. His emphasis later turned on to problem solving operations wherein the decided four steps namely, Direction, Adaptation, Autocriticism and Comprehension (Guilford, 1967).

A shortcoming of many definitions of intelligence is that they contain undefined terms. Recently Sternberg and Detterman (1979) have suggested that one's intelligence is just the degree and extent to which one resembles a prototypically intelligent person. Because no single characteristic defines the prototype, there can be no adequate process based and fully encompassing definition of intelligence.
Intelligence is generally assumed to be a kind of general attribute, more or less of which exists in everyone and this determines how any individual will be able to deal with various kinds of problem situations. This global concept has been extremely popular since it has been successful in practice.

In 1950 Freeman (Shaffer and Lazarus, 1952) classified definitions of intelligence into four types. Hence this type classification is also used for categorizing some of the well known and well accepted definitions.

1. First type of definition places its emphasis on the adjustment or adaptation of the person to his total environment or its aspects. In this type, definition of Webster's New International Dictionary (1952) can be placed which states, that Intelligence is the capacity for knowledge and understanding, especially as applied to the handling of novel situations, the power of meeting a novel situation successfully by adjusting one's behaviour to the total situation.

   Burt (1909) and William Stern (1914) have also defined intelligence on the same lines. Burt in his definition has given importance to different psycho-physical combination in the adjustment to new situation.

2. The second type of definition stresses on learning ability as the important feature in intelligence.

   Supporting this type Goddend (1945) has defined intelligence as the degree of availability of one's experience for the solution of his present problems.
3. Third type of definition of intelligence stressed upon the ability to carry on, abstract thinking. Stressing on abstract ability Terman (1921) states that an individual is intelligent in proportion to his ability to carry on abstract thinking. Defining intelligence on the similar lines Binet (1911) has included comprehension, invention, direction and criticism. Binet and Simon (1916) have given some importance to the ability to judge, reason and then comprehend.

4. This fourth type of definitions are more comprehensive in the sense that they combine and enlarge the other three types of definitions. This view of intelligence is very well explained in Oxford Dictionary as - "Intelligence is the available ability as measured by intelligence tests or by other social criteria to use one's existing knowledge to meet new situations and to solve new problems, to learn, to foresee problems, to use symbols or relations, and to think abstractly. It is an ability to use with awareness the mechanism of reasoning whether conceived as a unified intellectual factor or as the aggregate of many intellectual factors or abilities."

Also supporting this view is the definition of Stoddard (1943) who has not only very well explained the comprehensive aspect of intelligence, but also
has associated it with emotional forces. Further Wechsler (1944) has covered intelligence with all the three aspects: cognitive, conative and affective, of conscious state.

There are many other definitions of intelligence which are logical and descriptive in statements, but these statements are stated in such a way that it is difficult to have any idea of how the kind of intelligence specified can be measured. For instance the definition of Munn (1946) which states that the human "Intelligence is flexibility or versatility in the use of symbolic processes."

**Kinds of Intelligence :**

Thorndike (1927) has opined that intelligence is not a unitary factor but a set of 'Intelligences.' He stated that the mind must not be regarded as a functional unit alone, nor even as a collection of a few general faculties, but rather as a multitude of functions, each of which involve content as well as form. He suggested the existence of at least three sets of intelligence.

1. **Social Intelligence :** Ability to understand and deal with persons.

2. **Concrete or Mechanical Intelligence :** Ability to understand and deal with things as in skilled trades and is working with the appliances of science.
3. Abstract Intelligence: Ability to understand and deal with verbal and mathematical symbols. The merit of this classification lies in the fact that it indicates many and several realms in which persons might be functioning and implies that separate and sufficiently specialised tests might be devised to measure how effectively persons are functioning in each.

Detenninants of Intelligence:

Guilford (1967) has considered the following factors in determining the level of intelligence.

(A) Physical basis of Intelligence:

(B) Environmental and other Conditions:
1. Socio economic status, 2. Environmental enrichments,
3. Educational and Intellectual Deprivation,
4. Conditions connected with birth,
5. Environmental deprivations such as underprivileged homes and Institutional life.

Theories of Intelligence:

1. The Two Factor Theory - This theory developed by the British Psychologist Spearman (1904, 1927) is essentially statistical in nature. He believes, that all intellectual activities are primarily dependent upon, and are all expressions of a common factor of mental activity. This
general factor, designated by the symbol 'g' is possessed by all individuals but in varying degrees, since people differ in mental ability. This factor operates in all mental activities, though in varying amounts, since the mental tasks differ in respect to their demands upon general intelligence.

This general factor can be observed and known only through psychological tests. Spearman concludes that the principal distinguishing characteristic of a test with high 'g' requires insight into relationships, for example in solving an arithmetical problem, the subject has to grasp the relationships between the data presented with reference to the propositions given in the problem and deduce the correct answer. The 'g' content in this task is high. By contrast if the subject merely has to repeat simple multiplications or add a few numbers, no special insight is necessary and hence the amount of 'g' involved is very small. When variations in measured intelligence that were not explainable in terms of 'g' factor, they were then attributed to specific or 's' factor, each of which is specific to a particular type of activity. These are the two factors which are central to this theory.

2. The Multi Factor Theory: Explaining his theory Thorndike states that there are a large number of separate, distinct characteristics which make up intelligence. There is no general intelligence but only specific abilities. It is constructed by a multitude of separate factors or elements,
each one being a minute element of ability. Any mental act, involves a number of these minute elements operating together. Any other mental act would also involve a number of the elements in combination. Hence, if performance on these two mental tasks are truly correlated, the degree of correlation is due to the number of common elements involved in these acts. For instance if two types of mental activities A and B are more highly correlated than A and C, the reason according to this theory would be that the first pair has more elements in common than does the second pair.

3. **Group Factor Theory**: According to Thurstone certain mental operations have in common a primary factor which gives them psychological and functional unity, which differentiates them from mental operations of type other. These mental operations, then constitute a 'group'. A second group of mental operations has its own unifying primary factor, a third group has a third and so on. These primary mental abilities as designated by Thurstone (Anastasi, 1982) are -

a) **Verbal Comprehension**       - V
b) **Word Fluency**                - W
c) **Number**                      - N
d) **Space**                       - S
e) **Associative Memory**          - M
f) **Perceptual speed**            - P
g) **General Reasoning**           - R
4. **Hierarchical Theories**: An alternative schema for the organization of factors has been proposed by a number of British Psychologist including Burt (1949) and Vernon (1960) and by Humphreys (1962) in America. At the top of the hierarchy, Vernon has placed Spearmans 'g' factor, followed by group factors and 's' factors respectively.

Humphreys (1962, 1970) also suggests a hierarchical model and suggests that single test may be classified into more than one hierarchy. He proposes that the test be made heterogeneous with regard to all facts. For example, if we wish to measure verbal ability, we should do so with items like vocabulary, analogies and series completion. If we have to measure a persons ability to solve problems of analogies, we should include items such as verbal, numerical, pictorial and special analogies.

5. **Structure of Intellect Model**: Proposed by Guilford and Hoepfner (1971), the procedure followed to explain intelligence is in total contrast to hierarchical theories and seeks separate factors for each homogeneous cell in a three way classification. This box like structure of intellect model (SI) classifies intellectual traits along the three dimensions of a hypothetical cube.

   a) **Operations** - is what the respondent does and thus includes cognition, memory, divergent and convergent production and evaluation.

   b) **Contents** - is the nature of materials or information
on which operation are performed and thus include the figural symbolic letters and numbers, semantic words and behavioural attitudes and needs.

c) **Products** - is the form in which information is processed by the respondent, and hence are classified into units, classes, relations, systems, transformations and implications. Guilford believes that each person is a unique composite of a great many different intellectual abilities, involving three components, a cognitive operation, a specific content and a specific product. A child who is exceptionally good at memorising long poems, would illustrate the operation of memory with a semantic content and a relational product. Guilford has visualized intelligence as a cube containing 120 cells, *(6 x 4 x 5 categories)* each of which representing a unique intellectual ability. This theoretical idea of the 'Cube' is, itself an example of convergent cognitive process with semantic content and a system as a product.

6. **Piaget's Theory**: This theory takes the form of an early hierarchical model *(Piaget, 1950)*. There are four major periods of intellectual development each of which is characterized by a set of stages namely -

- **a)** Sensory motor period ranges from 0 to 2 years.
- **b)** The pre-operational period ranges from 2 to 7 years.
- **c)** Period of concrete operations ranges from 6 to 11 years.
- **d)** Period of formal operations ranges from 11 to 16 years.
7. **A Motivational - Experimental Theory of Intelligence**

Hays (1962) feels that intelligence is nothing more than a collection of learned abilities and that individual differences in intelligence are produced by drives, which are inherited tendencies. These drives engage the individual in activities conducive to learning.

**Physiology of Intelligence**

One of the Binet's main contributions was to show that anything such as details of nerve connections, sensations, perceptions, or muscular movements, could be utilized as a means of measuring the relative mental status of children, since direct sensory approaches could not measure intelligence (Stoddard, 1943).

Intellect has been associated with cerebral cortex, which has the largest set of integrating centres in the human brain. Through millions of synaptic connections in the grey matter of cerebral cortex, any stimulus input can cause a response output. Assuming that capacity to learn and retain the maze habit in rats is symptomatic of the intellectual capacity, Lashley (1929) states that quality and quantity of functional cerebral tissue is positively related to intelligence. Later Dalton who carried out microscopic examination of a large number of brains, showed that the receptive cortical layer is underdeveloped in the idiot and imbecile (Freeman, 1948).

Some other studies by Goldstein, have pointed out the relationship of frontal lobes with mental behaviour Stoddard
(1943), He based his findings by studying site, extent and nature of lesion. However, he was unable to adequately record and analyse the different psychological changes involved.

A close relationship between intelligence and language also exists since the physiological processes that underlie speech run through the nervous system. A functional disturbance can adversely affect both.

The Concept of the Intelligence Quotient (I.Q.):

Binet compared mental abilities of different children by first determining their mental ages and then finding out by how many months or years a particular child was advanced or retarded from the median child of that age. But this method was scientifically faulty which resulted in faulty interpretations. For example he observed that a 4 year old child having a mental age of 3 years was almost on the border of mental deficiency, while another child of 16 years of age, but having a mental age of fifteen years was quite normal.

It was thus realised that, it was not proper to compare children merely by their mental age. The necessity for an absolute measure to compare children of different ages was felt. This requirement was fulfilled by the German Psychologist Stern, in the form of the Intelligence Quotient (I.Q.) or mental ratio. Thus the mental age of a child as determined by the Binet scale, divided by the child's chronological age and then multiplied by 100 gives an integral value of this quotient.

Thus: \[ \text{I.Q.} = \frac{\text{Mental Age}}{\text{Chronological Age}} \times 100 \]
Subsequently, this concept of I.Q. has been put to practical uses in schools, hospitals and psychological laboratories to detect mental deficiency. This concept gained wide acceptance amongst parents as a social measure of superiority and I.Q. was considered as the most important attribute of their child. For lay public I.Q. is often a shorthand designation for intelligence, whereas it is an expression of an individual's level of mental ability in relation to age. It is both a reflection of prior educational achievement and a predictor of subsequent educational performance.

There are two schools of thought regarding the factors effecting I.Q. and its consistency. The first one believes that I.Q. represents a person's inherent ability and hence is not influenced by environmental conditions. This intelligence quotient remains stable throughout life and does not change with mental growth. Thus accordingly, a child who has an I.Q. of 120 at 10 years age, will have roughly the same I.Q. at an age 13. They also assume that every individual has a ceiling, a point above which he will not be able to profit from experience in a particular activity, and that ceiling is governed by hereditary factors.

The second school of thought strongly believes that I.Q. or any other measure of intelligence is not a measure of an individual's inherent capacity. It is believed to be influenced by education, environment and by the personality of the individual. They assume that I.Q. is changeable by modification in environment. Rise and fall in I.Q. may also result from
both fortuitous and planned environmental changes. Major change in family structure, sharpness or drops in family income level, may also produce conspicuous increases or decreases in I.Q. (Bloom, 1976; Reshick and Glasir, 1976).

**Development of Mental Tests:**

History of mental tests starts from Galton in 1870 who observed and remarked on the individual differences. In 1889 Kraeplin used various tests, which he considered more mental than those of Galton. Later in 1897, Hermann Ebbinghaus studied fatigue in school children, by using tests of memory span and sentence completion.

Although Alfred Binet is the pioneer of mental testing some other workers have preceded him in distinguishing between insane feeble minded individuals by language tests. Subsequently Seguin in 1907 pioneered the medical training of feebleminded individuals by exercising their sensory and motor functions. The Italian, S.de'Sanctis, devised a series of six tests designed to identify feebleminded children in the age group of 7 to 16 years, which included memory for colours, recognition of forms, reasoning involving relations and other thinking. Later many workers have supplemented, revised and standardised the various tests. (Guilford, 1967).

In the early years, mental testing in America centered around the work of Cattell, who was influenced by Darwinian spirit of the times and hence was keen to identify the significance of individual differences. He used for the first time
in print the expression 'mental test'. However due to lack of intercorrelations and validity of the large test battery his mental tests did not gain wide acceptance.

Terman (1916) added a few tests in the Binet scale and came out with the standardized Stanford-Binet scale. Later two new forms, L and M based upon 1916 revision, were published (Terman and Merrill, 1937). A new combined L-M form is also now available (Terman and Merrill, 1960). Changes brought about in these successive revised forms were in order to extend the scale to the superior adult level and make available some national norms.

Later Wechsler devised a new scale to measure intelligence to overcome some criticism of Binet scale in regard to test categories according to age. Wechsler's initial scale known as Wechsler Bellevue Intelligence Scale (WBIS) was composed of tests in two categories, verbal and performance and they were designed to give more room at the top for adults. A similar scale known as Wechsler Intelligence Scale for Children (WISC) was developed later and the WBIS now bears the title, "Wechsler Adult Intelligence Scale" or WAIS (Wechsler, 1958).

The need for mass or group intelligence testing was felt, in order to selecting or rejecting recruitment to Army. The American Psychological Association came out with two test batteries, Army Alpha examination for Officers and Army Beta examination for illiterates. These were a set of performance or non verbal tests. Widespread acceptance of psychological
testing procedures led to development of numerous aptitude tests and many group tests both for children and adults.

The multiple aptitude tests were developed also due to the failure of Binet or Wechsler scale to predict success in special, less verbal, less academic endeavors such as professionals - mechanics, office clerks, artists and musicians.

The United States Employment Service further developed the General Aptitude test Battery under the guidance of Thorstone (Guilford, 1967). Based on factor analysis on Air-force personell, Guilford-Zimmerman Aptitude survey has also been constructed.

Since the limitation of Binet tests at the lower end of the age scale became quite apparent and since there was a desire to know more about a child's mental potentialities even in the cradle, the first infant scale designed by Kuhlmann extended the Binet scale down to the four month level. Later Arnold Gesell and his coworkers constructed the Gesell Developmental schedules. Other known infant scales are Cattell Infant Intelligence scale and the Merrill – Palmer Scale of Mental Tests.

**EMOTION**

The word 'emotion' comes from two origins, one meaning 'to upheave' or 'to shake' and the other derived from the word 'Motive,' meaning 'to move'. This has originated from Latin 'e' (out) and 'movere' (to move).
The common origin of motives and emotions makes them closely related. A person suffering tense emotional upsets, may find himself unable to pursue goals and satisfy motives, that normally would be compelling. Leeper feels that all our sustained and goal directed behaviour is emotionally toned, and that it is the emotional tone which directs long sequences of behaviour. (Morgan and King, 1975).

Young (1943) traces the origin of emotion within a psychological situation, which means the emotional disturbance arises from the psychological relationship existing between the environment and the organism. Objectively, this becomes a stimulus - response relationship.

**Concept Clarification**

**Emotion and Sentiment**

Shand, in his work on the foundations of character in 1914, has distinguished between emotion and sentiment (Cox, 1978). He states that in emotion, the person is always aware of the object causing emotion and circumstances related to the emotion, whereas sentiment is a habitual response to an object, which persists even when the person is no longer thinking about the object. Love and hate are the best examples of the sentiment. He further states that sentiment is a system of emotional dispositions connected with a common object and common end. He saw sentiment as a way of organizing emotional experience and expression.

Later Kagan (1975) made his observations about emotion
and sentiment and differentiated them by stating that, basic emotional experience is a pleasant or unpleasant sensation shorn of intellectual symbolization whereas sentiment, can be defined as mood plus intellectual content.

**Emotion and Stress:**

The experience of stress is usually described in association with emotions such as anger, anxiety, depression, fear, grief, guilt, jealousy and shame, thus making stress an emotional experience. Lazarus (1976) has termed the negatively toned emotions or unpleasant emotions as the "stress emotions"; and considers them solely as products of the occurrence of stress.

**Emotion and Temperament:**

Emotion is a disturbed organic state or a reaction which involving bodily changes, originates from a psychological situation. Whereas temperament refers to the persistent type of affective reaction made by a person. The term temperament characterizes the affective aspect of the personality as a whole, whereas emotions are situational, differing according to the situation.

**Emotion and Feeling:**

Emotion is a state of mind where as feeling is considered as the after effect of emotion. Feeling has direction and can be explained in terms of positive - negative or pleasant - unpleasant experience. On the other hand emotion is the specific shade of experience which can not be narrowly explained as
positive or negative. For instance, Jealousy and Fear both have negative feelings but they are different emotions.

**Definitions of the Terms Used:**

**Emotion:**

1. "The bodily changes follow directly, the perception of the exciting fact and our feeling of the same changes as they occur, is the emotion." (James W., 1921)

   This definition is relatively a simple one that emphasizes on the perception of the background, that directs the person's attention. Due to this the feeling and subsequent change in the whole experience is then considered.

2. "Emotion can be explained as the intense but temporary bodily behaviour initiated by some stimulation which is sufficient to bring about action of endocrines, increased muscle tones, increased sensitivity etc which then stimulates the internal receptors and the organism feels emotional." (Gray, 1935)

   This definition emphasizes on bodily changes, which are hereby elaborated and specified. According to Gray these changes are to be felt.

3. "Emotion is a strongly affective state involving diffuse somatic reactions and rather widespread, and centrally aroused visceral changes. Furthermore, a complete description of an emotion or emotional behaviour includes the mental, somatic and visceral variables." (Lund 1939)
This definition gives equal footage to psychological variables as to the physiological ones. It states that feeling is psychological but what is felt, are mainly the physiological changes.

4. "Emotion is a pattern of organic response. Emotional disturbances contain marked bodily changes in the smooth muscles and glands. These bodily changes then distinguish emotional upset from non-emotional upsets or disturbances, such as being lost, startled, disoriented." (Young, 1941).

This definition is more physiologically oriented, to the extent of stressing upon the importance of bodily changes in separating emotional and non-emotional disturbances. The description of non-emotional disturbances helps one in understanding the difference between both kinds of disturbances.

5. "Emotion is a mental feeling or affection such as pleasure or pain, desire or aversion, surprise, hope, fear etc, as distinguished from cognitive or volitional state of consciousness. It is a matter of muscular and glandular involvements in action. In modern scientific usage, the term emotion has multidimensional referents that include verbally expressible subjective experiences, concomitant internal physiological changes and observable motor behaviour." (Oxford Dictionary, 1971).

This descriptive definition of emotion has included
the involvement of feelings in the concept of emotion. Along with giving both physiological and psychological aspects, it has described the cognitive aspect of emotions also. This definition may be considered as more expressive both in terms of description and concepts than previous definitions.

However, following definition of P.T. Young (1943) may be considered as one of the best defined:

"An emotion is an acute disturbance or upset of the individual which is revealed in behaviour and in conscious experience, as well as through widespread changes in the functioning of viscera (smooth muscles, glands, heart and lungs) and which is initiated by the factors within a psychological situation."

**Adjustment:**

"Adjustment essentially means that a person with certain resources faces a situation which imposes a certain degree of stress." (Anderson, 1950).

"A very general meaning of adjustment is the process of living itself, the dynamic equilibrium of the total organism or personality. (Patty and Johnson, 1953).

The concept of adjustment is related to the needs on one end and satisfaction of these needs, adjustment is the psychological ability of the individual to satisfy the needs in order of preference by the help of available resources or by developing new resources with minimum of
creating any hazardous effects on any part of the environment. (Dr. P. H. Raval, Personal Communications).

Maladjustment:

"Those who falter or fail in the adjustment process may be considered emotionally immature, maladjusted or mentally ill." (Patty and Johnson, 1953).

The condition of an individual who is unable to adapt or adjust himself adequately to his physical, occupational or social environment, usually with repercussions on his emotional life and behaviour. (The Penguin Dictionary of Psychology, 1984).

Classification of Emotions:

An age old way of classifying emotions is into three categories, pleasure, fear and anger, amongst which the latter two are disquieting emotions. They involve tension and disturbance of the organisms responses, both internal and external. Anger is a "fight" reaction, whereas fear reflects reaction of "flight" or "fright". On the other hand, pleasure can not be so easily simplified since partly, it is relief from fear and anger and hence a calming of the organism, and partly involves excitement. (Morgan, 1965).

In reviewing the systems of emotions which have been worked out by psychologists and philosophers, Young (1943), lists the following classifications.

Descartes specified six primary emotions: admiration,
love, hate, desire, joy and sadness. Spinoza mentioned only three: joy, sadness and desire. Jorgensen claimed that there are six fundamental elements: fear, happiness, sorrow, want, anger, shyness etc. Watson described three primary emotions: fear, rage and love. Thomson, enumerated dozens of compound emotions, which he analyzed into their components. Shand listed seven primary emotions: fear anger, joy, sorrow, curiosity, repugnance and disgust. W. Dougall describes the primary emotions as: fear, disgust, wonder, anger; subjection, elation and tenderness. Allport reduced the facial expression of emotion to six elementary roots: pain-grief, surprise-fear, anger, disgust, pleasure and intellectual abilities such as doubt. Stratton described a system of emotions including undifferentiated excitement, elation, depression and the differentiated fear anger and affection. Yerkes give a scale of moods, weak emotions, strong emotions and passions. James distinguished between the coarser emotions (grief, fear, rage, love) and the subtler emotions (including moral, intellectual and aesthetic feelings).

From the above mentioned classification of emotions by different research workers, it is clearly understood that there is little agreement but more discrepancies. Therefore it has not been possible to describe emotions in one single classification so far, which is universally accepted.
Determinants of Emotion:

In his original treatise, Young (1943) has considered the following factors as determinants of Emotion:

1. Intense motivation
2. Conflict
3. Frustration
4. Release of Tension
5. The psychological situation

Aspects of Emotion:

Emotion has three aspects: Sensory, Motor and Motivational, and thus emotion can be an experience, a kind of behaviour or a motive. (Tom Cox, 1978).

1. Emotional Experience: Humans and animals not only act emotional they also feel emotional, the only difference is that humans can give verbal reports of such emotional experience, while animals cannot and hence only be inferred from their behaviour. Plutchik (1962) assumes anger, joy, fear and sorrow, as primary emotional states which vary in intensity and thus produce shades of emotional experience. Kagan’s (1975) treatment of emotional experience can be understood in terms of a pleasantness and unpleasantness, where unpleasantness is related to pain and pleasantness is related to pleasure. Supporting Kagan’s writings, Maclean (1975) places emotions on an agreeable – disagreeable plane, while Brady (1975) considers emotions as appetitive (pleasant) and aversive (unpleasant) stimuli evoking emotional responses. Kagan further states that our pattern of
emotional responses is tutored or shaped by our cognitive (intellectual) processes. The results of present investigation have supported these views of Kagan.

2. Emotional Behaviour: Emotional behaviour primarily involves musculature of the body. In man, these reactions of somatic emotional type are smiling, laughing, crying, screaming, running in flight, startled responses to a sudden loud sound and various facial expressions of emotion. Whereas animals show some of these reactions but also different like snarling, purring, yelping, tail wagging, barring of fangs, hissing and certain other patterns of facial and bodily reaction that go along with them.

3. Autonomic Responses: In both man and animals, a variety of autonomic response accompany emotion, such as there is the pallor of fear, in which blood tends to leave the head. There is fainting, which is a more extreme case of circulatory change accompanied by loss of consciousness and changes in bodily posture. Increase or decrease in the heart rate or in blood pressure also occurs in emotion. Secretions of various glands may be increased or lowered, with resulting changes in the metabolism of the body.

Tom Cox (1978) has described pleasant and the unpleasant emotions in form of sympathetic and parasympathetic responses. For example warmth stimulation,
when it is not so intense as to produce pain, is
generally 'pleasant' and it produces dilation of
blood vessels.

Theories of Emotion:

1. James Lange Theory: According to this theory conscious
state is the cause of emotional behaviour. James in
1884 looked for causes of this conscious state in the
reactions of the body to stimuli that led to anger,
fear, or joy. He believes that we do not run because
we are afraid, but we are afraid because we run.
He therefore places psychic process secondary to
bodily process. To these theorists a perceived stimulus
became a conscious emotional stimulus after reaction
to the stimulus began. Thus emotion - eliciting events
excite bodily changes by a pre-organised reflex
mechanism (Cannon, 1927).

believes that stimuli caused behaviour is a direct
result of action on the sense organs and nervous
system, without involvement of consciousness. For
him rage is attack, fear is flight and lust is sexual
behaviour. He also believes that the complex emotional
behaviour of adults to varied stimuli resulted from
conditioning.

3. Theory of Autonomic Response: According to this theory
different autonomic nervous system responses lead to
different emotion. The parasympathetic nervous system reactions are necessary to positive or pleasurable emotions whereas the sympathetic nervous system reactions are necessary for unpleasant or negative emotions.

4. Theory of Cannon Bard: Cannon while studying the behaviour of decorticate cats, observed that such animals did not respond to stimuli except in a reflex fashion. Certain stimuli which in normal controls caused merely moving away, whereas in decorticates an immediate and integrated rage attack behaviour pattern (Sham rage), since the animal lacked the sensory and nervous equipment to direct the behaviour. He suggested that centres in the posterior part of the hypothalamus organize the behaviour patterns and are responsible for the major emotional states, by stimulating the cerebral cortex to give rise to the conscious state appropriate to the emotion. He believed overt behaviour, autonomic responses and conscious states in emotion were aroused by stimuli from the sense organs that reached appropriate centres in the hypothalamus. Other emotions could be added by learning conditioning. In summary Cannon (1927), regarded hypothalamus as the critical part in the mechanism of emotion, the action of which leads to both bodily reaction and the experience of emotion. Hence emotion is regarded as an epiphenomenon of CNS activity. (Cannon, 1929).
5. Papez-McLean Theory: This theory is a gradually evolving set of notions about a system of nervous centres that perhaps control, rather than organize emotional behaviour. In 1937 Papez suggested this notion of a circuit which controls emotional behaviour. This circuit consisted of various structures from cerebral cortex to cingulate gyrus through hippocampus, hypothalamus, fornix and anterior thalamus. Such circuits integrate perception with emotional behaviour.

6. Activation Theory of Lindsley: According to Lindsley (1951) sensory pathways such as Ascending Reticular Activating System (ARAS) and Diffuse Thalamic Projection System (DTPS) both involving the limbic system are involved in emotional behaviour. They serve as 'cue' to arouse and motivate emotional behaviour.

   Besides the earlier theories, Strongman (1978) has also included the following theories:

7. Theory of Emotions and Feelings: This theory by McDougall depends on some basic biological considerations and attempts to distinguish between emotions and feelings. He argued that emotions and feelings occur as adjuncts to the basic processes, since they come from the way in which we perceive our environment and our various bodily changes. McDougall further proposed that two feelings, pleasure and pain modify all goal directed behaviour.

8. Behavioural Theories: This Harlow and Stagner's theory of emotion is based on a conditioning model. They suggest
that there are innate, undifferentiated, basic feelings. Emotions are the conditioned form of these which we learn to refer to, in particular ways. The feelings, the emotional conditioning, and the social learning of labels are each mediated cortically and subcortically.

J.R. Millenson in his modern behaviouristic theory believes that emotional changes come about through a process of classical conditioning, either enhance or suppress other, non-emotional behaviour. Gray, in his behavioural tradition, views emotion as comprising of three distinct systems, each of which is grounded in relationships between reinforcing stimuli and response systems. 1) When approach predominates, the reinforcing stimulus is a conditioned stimulus for reinforcement or non-punishment. 2) When behavioural inhibition predominates, the reinforcing stimulus is a conditioned stimulus for punishment or non-reward. 3) When the fight/flight system predominates, the reinforcing stimulus is an unconditioned punishment or non-reward.

Psychoanalytic and Experiential Theories: Rapaport while providing an introduction to the psychoanalytic approach to emotion, asserts that the psychic processes underlying emotion are unconscious and that affects have been variously viewed as psychic energies, discharge processes of psychic energies, and manifestations of instinctual conflict.

The central point is Pradine's theory is the concept
imagination. He suggests that through imagination (and belief) memory images become more affective and active. Both sentiments and emotions spring from imagination, pointing to the adaptive nature of one and maladaptive nature of the other.

J. Hillman bases his theory on Aristotle's four causes: efficient cause, material cause, formal cause and final cause and has respectively considered the symbolic perception of the objective psyche, energy, the total pattern of the psyche and change or transformation as the causes of emotion.

J. P. Sartre argues that the emotional subject and the object of the emotion are inextricably bound up wherein emotion is an attempt to make a qualitative change in an object, to give it an altogether new quality without changing it substantively. Directed by consciousness, the body changes its relationship with the world and the world is suddenly seen with new qualities.

10. Cognitive Theories: N. Bull's theory of emotion lays great stress on motor behaviour and also implies that consciousness or cognition sets limits on emotion, almost by default. Thus if a person consciously realizes the full implications of a potential motor sequences, no emotion is possible. Whereas, if he is less than fully aware, then the sequence of motor behaviour is fragmentary or incomplete and emotion is experienced.
P.V. Siminov's theory can be presented in terms of information theory. Siminov gives a definition of what he calls negative emotion: $E = - N (I_n - I_a)$ where emotion equals need times the difference between information and the available information. In this, information is the possibility of reaching a goal due to a particular communication. Thus, if an organism can not organize itself appropriately through lack of information, then the nervous mechanism leading to negative emotions start to act.

H. Leventhal proposes an information processing model of emotion. This model integrates four mechanisms or systems. (1) An interpreting mechanism which turns on emotional reactions. (2) An expressive system, feedback from which will define the subjective quality of emotion. (3) An instrumental action system. (4) A bodily reaction system which maintains the instrumental system.

S. Schachter states that emotional states which are characterized by a general arousal of the sympathetic nervous system are interpreted and classified by clues from the situation which brought them about and also from our typical mode of perception. Physiological arousal occurs and is given its precise direction by our cognitions which brought it about. In short, Schachter's basic idea is that emotions are controlled through a very close inter-relationship and interaction between physiological arousal and cognitive appraisal.
K. B. Arnold's theory depends on the assumption that we can gain most knowledge about brain function in emotion by a cognitive analysis. This enables one to identify the physiological mediation of the process running from perception to emotion and action. Arnold regards appraisal as complementing perception and producing a tendency to do something when this tendency is strong; it is called emotion.

R. Lazarus developed a theory of emotion that emphasizes on a person's appraisal, or interpretation of environmental situations. (Morgan and King, 1975). This theory believes that emotion is a complex and patterned physiological response and a set of tendencies to action that are triggered by a person's appraisal of events in the environment.

The Physiology of Emotion:

The presence of physiological changes in emotional states was early recognized by James Lange, and later Sherrington, considerably clarified the main implication of emotion and physiological changes, and enumerated three theoretical possibilities (Rapaport, 1950): 1) that the psychic part of emotion rises first and its neural correlate then excites the viscera. 2) that the same stimulus concurrently excites the mind and the nervous centers controlling the viscera. 3) that the emotional stimulus acts on the nervous centers controlling the viscera resulting in emotional reaction.

Later many other psychologists extended the concept of
physiological basis of emotion but differed in their conception, which have been dealt with the theories of emotion. Main physiological changes that go along with emotion are largely under the control of sympathetic nervous system, which is a set of nerves and their connections outside the C.N.S. forming a part of autonomic nervous system.

NEURAL CONTROL OF EMOTION (Cox, 1978)

Information from the Internal and External Environment.

One of the most sensitive physiological signs of emotions is the galvanic skin response also called as psychogalvanic reflex and the electrodermal response.
In this a decrease in the resistance of the skin to the passage of an electric current takes place. The galvanic skin response turns out to be a delicate index of the amount of secretion of the sweat glands, which is observed in some of the emotional states.

Respiration, which serves two main functions of ventilating the lungs and supplying the air pressure needed to vibrate the vocal chords, is prominently affected in emotional states. The disturbances of respiration occur during crying, laughing, startle, fear, and other states of excitement.

Circulation of the blood, changes during sleep, exercise, mental activity, and as well as in emotional states. The blush of shame and embarrassment, the pallor of fear, the rapid pounding of heart in excitement and rage are apparent disturbances in cardiovascular processes. Rate and amplitude of pulse, distribution of the blood and change in blood pressure are the other changes that feature prominently in emotional states.

Adjustment:

The concept of "adaptation" originated in biology and was a cornerstone in Darwin's theory. There it referred to the biological structures and processes that facilitated the survival of species. This biological concept of adaptation was borrowed and changed somewhat by the psychologists and renamed "adjustment", to emphasize the individual's struggle to get along or survive in his or her social and physical environment. (Lazarus, 1976).
The term "adjustment" appears in diverse uses. A very general meaning is the process of living by itself. A healthy person lives smoothly, whereas a less healthy person gets upset easily. The maintenance of homeostasis may be considered as the "general adjustment process". A second use of term refers to the state of being adjusted, wherein the individual's pattern of adjustment is important through which he maintains his own personality structure. A third use relates to the relative adequacy or efficiency of the individual's adjustment techniques. Necessity for adjustment arises when unfulfillment of our needs causes stress which in turn places an adjustive demand on the organism. Stress may occur on a biological or psychological level, mainly due to three reasons: external frustration, internal frustration and conflicts. All these three factors arouse emotional disturbances for which an organism has to follow an adjustive pattern.

The particular emotional states accompanying reactions to adjustive demands may vary greatly, but two specific emotional patterns were considered as specially important: (Coleman, 1956). 1) Frustration arouses hostility, 2) Threat arouses anxiety.

Some other psychological adjustive reactions are:
1) Attack, hostility, aggression,
2) Flight, withdrawal, fear,
3) Compromise, substitution,
4) Ego defence mechanisms.

Emotional Adjustment:

In day to day life one continuously encounters petty
annoyances and satisfactions, larger frustrations and successes, which either frustrate us or give relief from frustration. In each of them some conscious emotion or feeling is evoked. A disturbed psychological state indicates a need for adjustment. The relation between emotion and adjustment is revealed by one's emotional behaviour towards conflict, frustration or relief from frustration. Shaffer as quoted by Young (1943) has said that emotion is a type of response that is important for adjustments.

Maladjustment:

An organism is considered to be maladjusted if he or she fails in the adjustment process. Such individuals are visualized on a continuum extending from minor emotional problems to serious mental illness. Their difficulties may show in attitudes towards themselves such as lack of confidence or guilt feelings. Their maladjustment also shows in their relationships with their fellowmen. The emotionally induced anguish of such individuals is as painful as illness caused by germs or injury, but to most laymen they appear merely lazy, queer, affective, difficult or prejudiced.

Maladjustments reveal themselves in the form of anti-social behaviour, pain or general inability to accept one's self for others. These difficulties are accentuated under stress, like stress of war has always been followed by the appearance of specific type of illness which has seemed clearly a result of war experiences. Apart from producing bodily disease, stress can damage adjustive effectiveness...
for two main reasons. First, stress emotions are very demanding of the person's attention, as such they serve as distractions that interfere with productive thinking and skilled behaviour. Second, the stress emotions, or rather the conditions that bring about them, mobilize desperate and often unrealistic efforts to rescue the individual from difficulty.

Maladjusted behaviour in the face of life stresses often results from attempts to regulate distressing emotions by means of avoidance or defense mechanism such as denial. These mechanisms are motivated in part by the wish to prevent confrontation with a harmful or threatening event and to regulate the distress produced by thinking about it. The individual becomes maladjusted when he or she is prevented from taking effective step to adjust the self with the problem.

Maladjustment has many manifestations but in one way or other, it reflects in various kinds of behavioural problems. Now a days emotional adjustment is measured through a series of behavioural problems the individual is expressing.