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CHAPTER – I
INTRODUCTION

In this chapter of research report the study has been introduced with its historical background and relevance to the field of physical education. It also contains statement of the problem, purpose of the study, delimitations and limitations of the study, definition and explanation related terminologies, tentative assumption in form of hypothesis and significance of the study.

1.1 GENERAL INTRODUCTION

The hierarchy of education system prevailing in our country, includes the stages of (i) Pre-primary, (ii) Primary, (iii) Secondary, (iv) Higher Secondary, (v) College and (vi) University education.

Among them primary and secondary schooling complete the basic education. College and University Education aim at specialized area of study and research, and high-secondary stage of education is the transitional phase between the basic education and specialization.

In general the students of higher secondary stage involve themselves more on academic areas with the purpose of being able to achieve higher grade, which helps them to select desirable subject areas for their college and university education. Apart from the academic preparation students of higher secondary stage reach physical and physiological maturity more than 80% – 90%. Volcanic psychological changes during adolescence also reach to an apparent stability.

It is very necessary to have an in depth study about the physical build, motor capacity and psychological characteristics of this population. The body build in terms of somatotype classification will indicate their ability and characteristics for physical activity performance. It is expected that this aspect will have significant relationship with motor performance. The psychological profile determines behavioural pattern of individuals. According to literature this psychological make up also bears relationship with physique and motor ability.
Research findings have indicated that the students of higher secondary stage are most appropriate for starting high level performance in most of major games and sports. So this stage appears as a dilemma for the young group of students. In one side they have the potentiality for achieving high level performance in physical and motor activities and in other side they become compiled to remain away from participation in games & sports activities because of academic pressure.

The present condition of education also has not made any provision for physical education for this intermediate group of students. So, it is very important to study the condition of this population in respect of their physical, motor and psychological aspects of personality.

Literature indicates that the somatotyping characteristics has pronounced influence on physical make-up of individual, psychological characteristics and even proneness towards disease. It also has been found that somatotyping profile indicates behavioural pattern of individuals.

It is a common fact that no two human physique are exactly alike in the universe. Equally obvious that no two personalities and performances are alike. The morphological and structural differences among human beings are unique and that is why no two humans are alike in body form. Even the identical twins (monozygotic) can be identified separately from each other although they develop from the single ovum and share exactly similar genetic characteristics. There is a remarkable difference in physique, temperament, personalities, performance, disease susceptibility etc. between any two persons. This difference was present from early existence of human beings.

In 430 B. C., Hippocrates, the Italian anthropometrists designed two types of physique such as Habitus phthisicus (tall and thin) and Habitus apoplecticus (short and fatty).

Rostan (1828) classified the human physique into three categories viz. type digestive, type musculature and type cerebral. These terminologies, however, are not in vague.

Baneke (1878) described the human physique into three varieties. These were: hyperplastic, normal and hypoplastic.
An Italian physician Viola (1904) during the early part of the twentieth century devised a method of human physique analysis by utilising body measurements. He grouped physique as:

a) longitype having relatively long limbs compared to the trunk, massive thorax compared to the abdomen, and greater transverse diameters relative to the antero-posterior ones;
b) brachitype or broad type, having the characteristics opposite to those of the longitype;
c) normotype which fall in between the above two categories and

d) mixed type who show characteristics of different types in different parts of the body, i.e. they may be brachitype in one part, longitype in the other and normotype in still another.

Kretschmer (1921), a German psychiatrist, in the beginning of the twentieth century, gave a detailed account of the characteristics of three categories of humans which were named as pyknic or fatty, athletic or muscular and leptosome or lean. His method was based on making anthroposcopic observations on the human subjects. Kretschmer also correlated the physique with the characteristics including the temperament of the person.

W. H. Sheldon in 1940 introduced the concept of somatotype in "The variation of Human Physique". Somatotyping is considered to be the classification of human physique based on body shape and size, but in brief it is the quantification of size and shape of human body. According to Sheldon et al. (1940, 1954) "Somatotypes are morphophenotypic ranges along continua of variation which possess constantly recognizable characteristics and are the functional end products of the whole genetic and develop-mental complex".

The term ‘Endomorphy’ reflects the component of physique which quite obviously is derived from the innermost embryonic layer – the endoderm. The characteristic endomorphs who exhibit fatty deposition and soft rounded features seem to be the result of the predominance of digestive viscera. There are tendencies of overeating therefore the body assimilates more than what is actually needed. This results in the excessive fat storage resulting in fatty deposits. The middle embryonic layer or mesoderm produces bones, muscles and connective tissues. These constituents are present in the second component of physique or mesomorphy. Relatively large surface area of the body predominates in the ectomorph. The outer embryonic layer or
ectoderm forms the skin, nails and sensory organs. These features derived from ectodermic layer are most prominent in ectomorphs.

After Sheldon, there were other methods were also developed by different Anthropometrists for somatotyping, such as:

- Cureton method (1947),
- Hooton’s method (1951),
- Bullen and Hardy’s method (1952),
- Parnells method (1958),
- Damon’s Anthropometric method (1962),
- Petersen’s method for children (1967).

After the introduction of somatotyping in 1940, the genetic and constitutional basis of Sheldon’s system were questioned. However, many investigators found the concept of somatotyping potentially useful, and several developed modifications of Sheldon’s system.

In 1951, Cureton developed a system that combined inspectional photoscopy, palpation of musculature, skinfold measurements using a Franzen caliper, height-weight ratios, and assessments of strength and vital capacity. Although Cureton claimed that this somatotype estimate was sufficiently similar to Sheldonian ratings but for practical purposes, the ratings clearly differed on ectomorphy (Carter and Heath, 1971).

In 1959 Hooton developed a modification of Sheldon’s technique by making estimates of “fatty development”, “muscular development and strength of body framework”, and by deriving “attenuation” from scaled height-weight ratios. He stated that these corresponded to endomorphy, mesomorphy and ectomorphy respectively. The ratings were essentially phenotypic and were not age-adjusted. When compared to the method of Sheldon (1940), Hooton’s first component ratings were more liberal and the second component was rated more strictly. Further, Hooton did not limit the sum of the three components to 9 through 12.

In 1958 Parnell was the first to use anthropometry to derive somatotype ratings that would correspond with the photoscopic ratings of Sheldon. Skinfolds, bone
diameters and girths, in addition to age, height, and weight were measured and entered in a M-4 deviation chart. This chart was developed for children aged 7 and 11 years and for adults. Parnell substituted the terms fat (F), muscularity (M) and linearity (L) for the three components and indicated that the M-4 ratings were phenotypes. Age adjusted scales were used so that different measurements would give the same somatotype at later ages.

Lastly Barbara Heath and J. E. Lindsay Carter in 1967 modified Sheldon’s somatotyping method and developed the Heath-Carter somatotyping method. This method has been widely accepted by scientific communities and becomes the only standard method of somatotyping. There are three methods for obtaining a Heath-Carter Somatotyping –

i) The photoscopic somatotype,
ii) The anthropometric somatotype,
iii) A combination of these two methods.

They also suggested that this somatotyping had three components and each component had some characteristics. The Heath-Carter method of somatotyping described below is “The Heath Carter Anthropometric Somatotype Method” requires the following anthropometric measurements for obtaining the somatotype: Height, Weight, Triceps skinfold, Subscapular skinfold, Supraspinale skinfold, Calf skinfold, Humerus biepicondylar diameter, Femur biepicondylar diameter, Biceps girth, Calf girth. Exact decimal rating of endomorphy can be assigned from the measurements directly using the following equation of Carter (1980): Endomorphy = −0.7182 + 0.1451(X) − 0.00068(X)² + 0.0000014(X)³ Where X is the sum of triceps, subscapular and supraspinale skinfolds, which should be corrected for the height of the subject. Mesomorphy = (0.858 × humerus width) + (0.601 × femur width) + (0.188 × corrected arm girth) + (0.161 × corrected calf girth) − (height × 0.131) + 4.50. Ectomorphy rating can be directly calculated from Height-Weight Ratios (HWR = Height/ Weight × 0.33) employing the following equation of Carter (1980): Ectomorphy = HWR × 0.732 − 28.58. If HWR < 40.75 but >38.25, then Ectomorphy = HWR × 0.463 − 17.63. If HWR < 38.25, a rating of 0.1 is to be assigned.
**Endomorphy** : The first component is endomorphy and is characterised by roundness and softness of the body. In Layman’s terms endomorphy is the “fatness” component of the body. Anteroposterior diameters as well as lateral diameters tend towards equality in the head, neck, trunk and limbs. Features of this type are predominance of abdomen over thorax, high square shoulders and shoot neck. There is a smoothness of contours throughout, wish no muscle relief. They have wide hips and narrow shoulders, fairly slim wrists and ankles.

**Mesomorphy** : It is characterised by a square body with hard, rugged and prominent musculature. The bones are large and covered with thick muscles, legs, trunks and arms are usually massive in bone and heavily muscled throughout. Outstanding characteristics of this type are forearm thickness and heavy wrist, hand and fingers. The thorax is large and the waist is relatively slender. Shoulder is broad, the trunk is usually upright and the trapezius and deltoid are quite massive.

**Ectomorphy** : The third component includes predominant characteristics as linearity, fragility and delicacy of body. This is the leanness component. The bones are small and the muscles are thin. Shoulder drop is seen consistently in the ectomorph. The limbs are relatively long and the trunk short, however this does not necessarily mean that the individual is tall. The abdomen and the lumber curve are flat, while the thoracic curve is relatively sharp and elevated. The shoulder is mostly narrow and padding in muscle relief. There is no building of muscle at any point on the physique. The shoulder girdle lacks muscular support and padding at the scapulae tend to wing out posteriorly.

**Classification of Somatotypes** : A variety of somatotypes with varying strength of different components are observed when studied in large population. For the sake of convenience, these somatotypes can be referred in the following generalised categories :

*Balanced endomorphy* : The first component is dominant and the second and third components are equal (or do not differ by more than one-half unit). 
Example – 7-2-2, 6-2-2 or 5-3-3.
Mesomorphic endomorph: Endomorphy is dominant and the second component is greater than the third.
Example – 6-3-1, 6-4-2, 5-4-1.

Mesomorph-endomorph: The first and second components are equal (or do not differ by more than one-half unit) and the third component is smaller.
Example – 5-5-1, 5-5-2, 4-4-2.

Endomorphic mesomorph: The second component is dominant and the first component is greater than the third component.
Example – 2-6-1, 4-6-2, 4-5-1.

Balanced mesomorph: The second component is dominant and the first and third components are less and equal (or do not differ by more than one-half unit).
Example – 2-7-2, 2-6-2, 3-5-3.

Ectomorphic mesomorph: The second component is dominant and the third component is greater than the first component.
Example – 1-6-3, 2-6-3, 1-5-4.

Mesomorph-ectomorph: The second and third components are equal (or do not differ by more than one-half unit) and the first component is lower.
Example – 1-5-5, 1-4-4, 2-4-4.

Mesomorphic-ectomorph: The third component is dominant and the second component is greater than the first component.
Example – 1-3-6, 2-3-6, 1-4-5.

Balanced ectomorph: The third component is dominant and the first and second components are equal and lower (or do not differ by more than one-half unit).
Example – 2-2-7, 2-2-6, 3-3-5.
Endomorphic ectomorph: The third component is dominant and the first component is greater than the second component.
Example – 3-1-6, 3-2-6, 4-1-5.

Endomorph-ectomorph: The first and the third components are equal (or do not differ by more than one-half unit) and the second component is lower.
Example – 5-1-5, 4-1-4, 4-2-4.

Ectomorphic endomorph: The first component is dominant and the third component is greater than the second component.
Example – 6-1-3, 6-1-3, 5-1-4.

Central: No component differs by more than one unit from the other two, and consists of ratings of 2, 3, 4.

Somatotyping and physical fitness and motor performance: First type (Endomorphs) does not like to help for movement activities of high intensity and of long duration. In the field of games and sports they prefer body building, weight lifting, wrestling and some such combative sports. But with very high level of endomorphic component it is not possible to achieve high level performance in any type of sports and games.

Second type of body is mesomorph. The physical fitness for this class is very high order and they excel in sprints, jumps and in throws. They also exhibit high level performance in most of the games and sports where physical fitness becomes a decisive factor of performance.

In the field of games and sports third type of individuals (Ectomorphs) prove their efficiency in long distance running and other long endurance activities.

Somatotyping and Psychological Characteristics: The individual of this class (Endomorphs) prefer eating. They are lazy but simple in nature. They are extrovert and social. They do not like to go for mental work of high intensity.

The second type of body build is mesomorph. Mentally they are self reliant,
self dependent, enthusiastic and energetic. They always go for high intensity physical work with higher level of confidence. They are tenable and they possess positive frame of mind towards training and competition.

Third type wants to remain and work alone. They are not social and do not have friends. They are introvert in nature.

Changing Somatotypes: The three body type descriptions could be explained as difference in body composition, which can be altered by specific diets and training techniques. After a period of significant weight loss, a person who was once considered as an endomorphy may begin to instead resemble an ectomorphy. Likewise an athletic mesomorphy may begin to look more like an endomorph as he ages and loses muscle mass. However, some aspects of somatotype can not be changed, for example, a characteristics of an endomorphic body type is wide shoulders as well as a wide wrist. Ectomorphs may have narrower shoulders and slimmer wrists. Although muscle and adipose mass can be changed, the bone structure associated with endomorphs can not be changed.

Somatotyping and Personality: The word ‘personality’ is a derivation from ‘Persona’ which originally means ‘theatrical mask’ worn by dramatist personae or actors in a play in the days of ancient Greek civilization. This idea—though a farfetched one—came from Allport and was later embodied in more modern personality theories by Carl Jung who considered that ‘persona’ was at the outer edge of the self, a mask worn by the person in response to the demands of social convention. It was a role given to the individual by his culture, the part he was expected to play in life, in other words, his public personality (image). This concept accounted for only a small segment of the total personality profile, the great majority relegated to more ‘inner’ self. Thus the popular conception of personality refers to a certain cluster of traits that is socially pleasing and effective. Allport, having theorized on personality, concluded, “Personality is the dynamic organisation within the individual of those psychophysical system that determine his unique adjustments to his environment” (S. Jayaswal, 1974). Like Allport, many other psychologists have defined personality. An
overview of the definitions of personality given above crystalizes the following common points:

a) Personality is more than physique alone Mind and Soul / Spirit are its inextricable aspects.

b) There is a complete integration between various aspects of personality.

c) It is not a static construct but a dynamic concept.

d) Personality emerges out of the interaction between “the genetic potential” and environmental forces.

e) Notwithstanding commonalities, uniqueness of each individual must need be recognized.

Throughout the ages, attempts have been made to classify individuals on the basis of their characteristics. To a limited extent, these attempts have been successful. However, individual differences are found to be so acute that, at times, generalizations have been difficult for a foolproof way of classifying individuals or personalities.

Hippocrates identified for personality categories viz. (a) Phlegmatic (Introverted and stable), (b) Sanguine (Extraverted and stable), (c) Melancholic (Introverted and unstable) and (d) Choleric (Extraverted and unstable).

In 1921 Kretchsmer published ‘Physique and Character’, that dealt with basics of the modern type approach to personality. He investigated relationship between physique and mental disorders in 400 patients and proposed three main types of physique: (a) Aesthenic – fragile narrowly built physique – associated with schizophrenia (thought disorders); (b) Athletic – muscular type and (c) Pyknic – plump physique – associated with manic depression.

More unusual types of physique were grouped together under the title ‘dysplastic’.

Sheldon (1942), following on from this, tried to relate physique to normal behaviour. Developed taxonomies of physique and temperament and identified three components of body structure: (a) Endomorphy (plump) – predominance of fat, built for comfort not speed, (b) Mesomorphy (muscular) – predominance of muscle and tissue, strong and resiliant and (c) Ectomorphy (frail) – predominance of skin and nervous system, large brain, not suited to physical labor.
Sheldon somatotyped 200 Caucasian males and followed their lives for 5 years – a clear picture of personality emerged:

Endomorphs – relaxed, easy going, love creature comforts.
Mesomorphs – bold, assertive, action-oriented.
Ectomorphs – restrained, inhibited and apprehensive.

Sheldon – temperament has 3 aspects: (with manifestations in personality)
Most people have some degree of each quality of temperament. Temperament quality was said to correspond with the somatotypes. Study of 200 men over 5 years (1942) assessing associations between temperament and components of the somatotype found high correlations between physique and temperament that it should theoretically fit (www.dyer-smith.com/martyn/psychology/persona2.htm).

Mesomorphs – Somatonia – courageous, bold, energetic, assertive, risk taker
Endomorphs – Visceratonia – relaxed, easygoing etc.
Ectomorphs – Cerebrotonia – mental overintensity, apprehension, inhibition, tendency toward secretiveness.

Sheldon’s ideas aren’t influential in personality psychology today but he stressed a theme that emerged later as important: he was convinced that personality, along with body type, was inherited. He believed it but could not test it.

According to Burger, acceptance of genetic influence on personality has coincided with growing recognition that personality cannot be separated from other biological factors. We can identify differences between people in terms of brain wave activity, hormone levels, heart rate responsiveness and other physiological features.

Carl Jung has classified various types of human personality in the following manner:

**Extrovert**: An extrovert is interested in his / her environment. Such individuals are practical persons of action and enjoy mixing with others. These persons are not unduly sensitive and prepared for the rough and tumble of life. The extrovert has a tendency to remain involved in worldly material activities and affairs. Such individuals tend to be social and take special interest in social affairs. Such individuals increase acquaintance with others, take interest in sports and games. They achieve quick
adjustment with novel situations. These athletes are dominant and sociable. They are talkative, self-assured and headstrong.

**Introvert**: An introvert is more interested in the inner world of thought and feeling than in outer world of affairs and actions. Such individuals do not easily mix with others. They are sensitive and easily hurt. Such individuals are usually shy, timid and withdrawn type and show little interest in worldly affairs. They like to have as little conversation and contact with others as possible. They are easily saddened.

**Ambivert**: An individual may show both introvert and extrovert tendencies in different situations. Hence, the idea of permanently dubbing an individual as an introvert or extrovert does not find favour of the psychologists. Most of us are really ambiverts. Individuals of this kind exhibit the characteristic of the introvert in some situations and those of the extrovert in other circumstances. For instance, an individual may be a good speaker and an expressive writer, but he/she prefer to work in solitude.

**Somatotyping and Disease**: The relationship between somatotype and disease has been first investigated by Sheldon et al. (1940, 1954, 1969). Being a psychologist himself, he wanted to relate somatotype with abnormality of behaviour and function. Sheldon et al. (1969) studied psychotic patterns with somatotype and found that paranoid thought disorder patients were localized towards mesomorphic ectomorph type of physique where these two components were almost equal and lacking in endomorphy. On the other hand, hebephrenic paranoids were showing a physique where endomorphy and ectomorphy were equally poised but with a lack of mesomorphy. The manic depressives were equally endowed with endomorphy and mesomorphy and lacked ectomorphy. Catell and Metzner (1993) also found associations of behaviour and somatotype on the much expected lines given by Sheldon. There is a linking of abdominal fat with somatotype components as investigated by Rosique et al. (1994). In case of patients of coronary artery disease (CAD), endomorphy was significantly correlated with abdominal circumference, the abdomen-to-hip ratio and the abdominal sagittal diameter, whereas mesomorphy was not related to these indicators of abdominal adiposity following partial adjustment
(Williams et al. 2000). On the other hand, ectomorphy was inversely related to the indices of general and regional adiposity. This study suggests that adiposity and muscularity are important features in terms of increased CAD risk, whereas linearity is beneficial. According to a study by Herrera et al. (2004), the correlation between ectomorphy and both systolic and diastolic blood pressure showed that as ectomorphy increased the blood pressure decreased, except for the oldest age group. Endomorphy and mesomorphy showed a stable correlation pattern with blood pressure in males indicating a neutral stance of these components in determining the blood pressure, while in females this pattern was more irregular and less consistent. The persons with high levels of SBP and DBP had mean somatotypes, which were closer to those of other male groups characterized by myocardial infarct, coronary heart disease and the risk of hypertension, indicating that these somatotypes may be associated with cardiovascular risk factors. The individuals who had a cardiovascular risk profile are more endomorphic and mesomorphic and less ectomorphic than those with a lower cardiovascular risk profile. Endomorphy which represented relative fatness tended to be positively related to risk factors in older females, whereas ectomorphy or relative linearity tended to be negatively related to risk factors in older males. Comparison of somatotypes of those individuals who were represented at the extremes of the distributions for each risk factor, lower as well as higher, fell in line with the other results. Persons with higher risk profile tended to be more endomorphic and mesomorphic and less ectomorphic than those with a lower risk profile.

The Framington study showed that hypertension increased 10-fold in subjects who were more than 20% over ideal weight (Gordon & Kannel, 1976) but a causal relationship was inconclusive. Periods of weight gain are associated with hypercholesterolaemia.

There is relationship between diabetes mellitus and obesity, operative mortality and risks of anaesthesia are increased in the massively obese (Mann, 1974). Orthopaedic complications such as degenerative changes in the weight-bearing joints of the legs and vertebral column are related to obesity as are muscular disabilities, particularly of the lower back. One of the less well understood aspects of obesity is
psychosocial health. The obese may suffer a restricted social life and employment discrimination which could result in a variety of psychological handicaps.

Pulmonary tuberculosis is a disease of ectomorphic body type or at least of persons with a low weight for their height.

Coronary thrombosis is also certainly related to physique, the incidence being higher in persons of high weight for height. It seems that both above average fat and above average muscle contribute to the susceptibility (Tanner, 1977).

Sing et al. (2003) are of the opinion that the distribution of disease among individuals, families, and populations result from interactions between the effects of many susceptible genes and many environmental exposures. All quantum regulatory mechanisms ultimately become integrated to produce the disease phenotype (Sing et al., 1992; Strohman, 2002; Dennis, 2003). Many organic diseases seem to have a complex multifactorial etiology where neither the genetic nor environmental inputs of an organism act independently to cause disease. Even complete information about an individual’s hereditary constitution or exposures to adverse environments cannot predict with certainty the onset, progression, or severity of disease. Sing et al. (2003) reinforced the viewpoint to adopt holistic models to unravel the mystery of disease by focusing on every single factor including the morphological structure and physique and state that “An unwillingness to adopt a realistic biological model for health when designing and analyzing studies of disease might be the greatest deterrent to answering these questions that are most relevant to the practice of medicine without prejudice”.

Twenty first century has been characterised by significant changes in life style and socio-cultural values. Although games and sports have enjoyed important position from time immemorial, in the 21st century the life style of people undergoes a thorough and radical change. Life has become faster but people have become more sedentary due to new inventions of science. Now people have new gadgets and gizmos that hardly allow them to be active physically. Now we are just one step away from our goal as everything seems to be a push-button affair. So physical fitness is not so much necessary as it was in the last century. The food habit, daily living pattern of sedentary nature and less participation in games and sports have induced noticeable
changes in body build, motor fitness and personality traits. Under this situation it is significant to analyse the selected physical, motor and personality characteristics of higher secondary male students. This thought has instigated the present researcher to take up the present problem.

1.2 STATEMENT OF THE PROBLEM

Present study was planned for understanding somatotyping profile and physical, motor and personality characteristics of rural and urban higher secondary male students. Accordingly, the problem was stated as “AN IN-DEPTH STUDY ON RURAL-URBAN DIFFERENCES IN RELATION TO SOMATOTYPING PROFILE AND PHYSICAL MOTOR & PERSONALITY CHARACTERISTICS OF HIGHER SECONDARY MALE STUDENTS”.

1.3 PURPOSE OF THE STUDY

The purposes of the present study were as follows :

i) To observe the difference in somatotyping profile between rural and urban group of higher secondary male students,

ii) To find the differences in physical parameters between rural and urban group of higher secondary male students,

iii) To look into the differences in performance related fitness between rural and urban higher secondary male students,

iv) To observe the differences in personality characteristics between rural and urban group of higher secondary male students,

v) To observe the rural and urban differences in relation to somatotyping profile and physical, motor & personality characteristics of higher secondary male students.

1.4 DELIMITATION OF THE STUDY

The study was carried out with following delimitations :

i) Only higher secondary students were selected as subjects for this study.

ii) Only 300 rural and 200 urban male students were studied in the present investigation.

iii) All the subjects were selected from three districts of West Bengal only.
iv) To study physical profile some selected parameters such as height and weight of the subjects were considered.

v) To study performance related fitness some selected components were considered. These were locomotor speed, agility and leg-explosive strength.

1.5 LIMITATION OF THE STUDY

The present study was conducted with following limitations:

i) The equipment which was used to measure anthropometric parameters were not of very high quality.

ii) Interest, motivation, attitude and such other mental factors were also limiting factors for analysing psychological profile of the subjects.

iii) The environmental conditions of different test days were not exactly similar. Changing of environmental condition, were beyond the control of the researcher.

iv) Non-availability of time and finance was also limiting factors for the study.

v) The nature of surface of the ground of different schools were different and far from an ideal surface; performance time for such a study recorded in such surface may be considered as a limiting factor.

1.6 DEFINITION OF TERMS

In order to understand the basic concepts of the problem of this research, the following terms should be specifically understood as follows:

**Age**: Age has been understood as the chronological period of life. After birth the years, months and days that have been passed, indicated the age of an individual. Age indicates the state of maturity. There may be different ages of a person such as chronological age, anatomical age, physiological age, mental age etc. In the present study chronological age has been understood as the age of the subject.

**Height**: Body height is the vertical length above the base of support. It is the tallness. It is measured as the perpendicular distance between the supportive base and the vertex.
Weight: Body weight indicates the heaviness of the body of a person. It is caused due to the gravitational pull acted on the mass of the body. It is measured in kg unit.

Somatotyping: Somatotyping is the quantification of size and shape of human body. Somatotyping is a unique method for the classification of human physique which was first invented by Sheldon et al. (1940) and later modified by Heath and Carter (1967). Somatotype expresses the human body in a three-number rating representing i) Endomorphy, ii) Mesomorphy and iii) Ectomorphy. Somatotyping is genetically influenced though environmental influence may have noticeable dominance on somatotyping.

Performance related Fitness: Performance related fitness has been identified as that part of motor fitness which helps an individual to achieve high level of performance in movement activities depending on the components mostly hereditary in nature. The performance related components are speed, power, balance, co-ordination, agility, reaction time etc.

Speed: Speed is considered as the distance covered per unit time. Speed may be either movement speed or locomotion speed. In the present study the locomotion speed was considered. If distance remains constant, time taken to cover the distance becomes the measure of speed. In the present study time taken to cover 50 yards was considered as the measure of speed.

Agility: Agility is the quickness and readiness of movement. It is the ability to change the position of the body with skill and control when faced with some sort of stimulus or opposing movement. Agility requires a combination of skill such as co-ordination. Explosive strength and acceleration speed is measured by zigzag run. In the present study the time taken to complete 4 × 10 yards shuttle run was considered as the measure of agility.

Leg Explosive Strength: Leg explosive strength is called leg power. It is the maximum possible strength exerted by leg muscle within a short time interval. Leg
power is considered as a vital physical fitness component for games and sports. Leg power can be measured by field tests like Standing Broad Jump, Squat Jump, etc. In the present study the jumping distance in Standing Broad Jump test were considered as the measure of leg power.

**Urban Area**: In the present study urban area was understood as per specification of 1971 census. The Urban Area had the following three basic characteristics (D. Souza, 1987).

i) A population more than 5000.

ii) A population density more than 1000 per quarter mile.

iii) More than three fourth of the working persons of the area would be of non-agricultural occupation.

**Rural**: In contrast of urban area, rural area was understood in the present study by a relative predominance of agriculture occupation and by the closeness of the people to a natural environment in comparison with the urban population. There would be a greater social homogeneity, and lesser territorial, occupational and vertical social mobility. For rural people there would be a greater proportion of face to face social contact and the interpersonal relationship would be of longer duration.

### 1.7 HYPOTHESIS

Present investigation was based on following hypotheses:

- **H₁**: There would be no difference in somatotyping components between rural and urban group of subjects.
- **H₂**: There would be no difference in physical structure between rural and urban group of subjects.
- **H₃**: Both the rural and urban group of subjects would be similar in performance related fitness.
- **H₄**: Both the rural and urban group of subjects would be similar in personality characteristics.
- **H₅**: There would be no relation between somatotyping components and performance related fitness.
1.8 SIGNIFICANCE OF THE STUDY

It is believed that the results of the study will be helpful for physical education and sports in the following ways:

i) From the results the body type of rural and urban groups of higher secondary male students will be known.

ii) The performance related fitness of rural group of higher secondary male students will be understood.

iii) The performance related fitness of urban group of higher secondary male students will be known.

iv) The personality profile of rural and urban subjects of higher secondary level male students will be ascertained.

v) The relation between somatotyping components and personality characteristics of rural group of subjects of this stage will be studied.

vi) The relation between somatotyping and performance related fitness of urban group of higher secondary male students will be understood.

vii) The difference in somatotyping components between rural and urban group of subjects will be known.

viii) From the results the difference in performance related fitness between rural and urban group of subjects will be understood.

ix) Results of the study would provide important information for future research in the relevant field.