Chapter 1

INTRODUCTION

Right from the conception to the completion of maturity, a growing child passes through various stages of growth and development. In case of males, generally it takes about twenty years to complete the growth to attain maturity and in case of females this period is shorter by about two years. The growth is generally viewed as increase in height, weight and size, development has to do more with the functioning of the body. More precisely, growth represents an increase in mass while development indicates an organization of the mass with respect to its functional abilities. They may go on simultaneously, but also proceed independently of each other.

The growth and development can be studied from different aspects. The physical and physiological developments, motor developments and psychological and sociological developments are the important aspects of growth and development as far as sports and physical education are concerned. All these aspects grow together with integral and differential paths of growth passing through adolescence. Although, the growth and development follows a pattern in general, there are wide variations and differences within the pattern.

The time of growth and development in children is a period during which physical and physiological changes takes place. During this period, the child’s body increases in size and the organ develops and matures until they function on the
level required to meet the demands of daily life and the physical activities of a typical adult. The time span from early childhood to maturity brings about a great increase in physical performance capacity.

The process of growing to maturity has been defined as an increasing ability to adapt. One goal of physical education and sport is to provide activities that promote this adaptation. To accomplish this goal, physical education teachers and coaches should be aware of physiological consequences of maturation process. Such knowledge may prevent injuries and perhaps supplement natural growth.

Growth of the children amongst the various groups which make up a contemporary society reflects rather accurately the material and moral conditions of the society.

There is a conviction that more is known about the growth and development of children and adolescents the better education and health care can be provided by the society and government can serve the need of the individual child in a world of technology and changing environmental condition.


Much of the processes of the growth is difficult to measure or to analyze. However, some of the bodily changes accompanying the growth are concrete and visible. The most conspicuous of these are increasing stature and weight.\(^4\) Growth is measured in dimensions such as height, weight, volume and thickness of tissues can be compared with the standard of normal value to interpret the data more meaningfully, i) to derive the comparative information of the measurements of any one child to other children of the same age and sex, or ii) to get the comparative information of the child's present measurement with his former rate of growth and pattern of progress.\(^5\)

To determine children’s potential for motor qualities at a given age we must consider the status of their physical growth and maturation. The assessment of physical growth and maturation requires the knowledge of normal growth patterns and understanding of growth measures. The knowledge of normal growth includes not only the average extent of growth at a given age, but also the normal variation of growth.\(^6\) Hence, the growth measurement is a valuable tool for the coaches and physical education teachers where this knowledge prompts them for the realistic estimation of child’s capabilities, goal setting and planning the


effective programmes to optimize the process of growth and development.

It is very important to understand the principles of growth and development when planning and implementing programmes for children and youth. The children are not miniature adults. They should not be treated as such. It is very important that the current growth and development knowledge be applied in designing and instituting programmes to develop the capacities that will lead to athletes achieving their ultimate potential.\textsuperscript{7}

Motor development is undoubtedly the most important aspect for coaches, physical education teachers and sports scientists. The motor development like other aspects of growth and development is not uniform throughout the period from childhood to the completion of maturity. Various factors develop at different speed in different age periods. Assessment of various components of motor development provides important information about the quality of sporting potentialities which intern serve as a guideline to identify the most gifted and talented children. Thorough understanding of the quality of motor development offers the basic information for formulations and implementations of physical education and sports training programmes, thus optimize the performance ability at a given age and prevents the possible harmful effects of training.

Information about the quality of different aspects of growth and

development in the children facilitates the base for the classification of participants into a instructional groups and formulation of standard norms with respect to that population. A regular periodic assessment of various aspects of growth and development provides the professionals a stage to diagnose an individual’s strength and weakness in the components. So that the developmental needs can be identified. Individual objectives can be established and a realistic programme can be designed.

The assessment of growth in children and comparing the results with average values can help to detect abnormal growth. Besides that, these data can be used to teach the children about the basic concepts of heredity and environmental influences. Knowledge of the growth processes can alleviate children’s anxieties about their body size. These anxieties often come about because of the timing differences in maturation rate. These differences often leave the late maturer feeling of inadequate or inferior. The teacher can make the children aware of the changes likely to take place in their bodies and help them to set reasonable goals for their physical endeavours in the interim before they reach adult stage.8

After having known the details of various stages of growth and development in a growing child, various aspects of growth and development, its

pattern of development and the utility of these knowledge for practical purposes in sports and physical education, it is also essential to know the various factor which are influencing the phenomena of growth and development.

It is known that growth is the result of continuous action of several environmental factors on the human genetic potential. The environmental factors may be natural or social, which are regarded as molder and become responsible frame which acts upon the individual profoundly and characterizes all aspects of growth and development.

One of the natural process of unfolding growth and development is the chronological age. The chronological age carries both hereditary and environmental influences and has been associated with motor developments.  

The difference in motor performance as motor out comes are indicative of physical fitness and such differences can stem from multifarious influences of varied factors interacting in complex coordinations. Hereditary factors which cannot be controlled, are found interacting with all pervasive environmental factors. Factors like climate, culture, lifestyle, etc., do form a module for the expression and realization of potential motor abilities. As a factor of biological heritage, the ethnic and racial differences have been observed as an influencing


10 Ibid.
factor of growth and development.

Several studies revealed that varied environmental conditions of social, economical, nutritional, constitutional and demographic factors influences all the aspects of growth and development of a child directly or indirectly. The natural environment or the geographical conditions such as topography, altitudinal variations and climatic conditions have conferred the remarkable influences on growth and development of children, thus resulting in a significant qualitative differences in its various aspects.

Before discussing the influences of various geographical conditions on the human performance variables, it is essential to know the meaning and description of the term geography.

Geography is a science which has for its object the description of the earth's surface, treating of its form and physical features, its natural and political divisions, the climate, the production, the population, etcetera. It is frequently divided into mathematical, physical and political groups. In other words geography deals about the description of land, sea, air and distribution of plants and animals.  

Keeping some of the geographical factors into considerations, several

studies have been conducted to explore the knowledge to explain the qualitative
differences which may exists in the various aspects of growth and development
among the inhabitants of different geographical conditions. The altitudinal
variations and climatic conditions are obviously registered their influence on the
various aspects of growth and development.

Sidhu et al 12 studied the effects of age and altitude on physical growth and
performances, found significant differences in physical performances among
natives of two different altitude. Muelier et al 13 studied about the growth of
anthropometric variables of high altitude population and found that growth in
general is retarded among them and also found greater chest circumference and
small body size. Singh and Jaydhas 14 studied the physical fitness and physiological
variables among sea coast and high altitude native children of secondary school
level. They found significant differences in some of the physical fitness variables
and also found significant differences in cardiorespiratory endurance and
haemoglobin concentration which was high in high altitude population. No

12 L.S. Sidhu, S.S. Dhaliwal and S.P. Singh. "Age changes in Growth and

13 W.H. Muelier, V.N. Schrill, W.J. Schrill, P. Sofo and Rothhammer. "A
Multinational Andean Genetic and Health Programmes: Growth and Development

14 Jasraj Singh and S. Jaydhas, "Comparison of Physical Fitness and
Selected Physiological Variables of Sea Coast and High Altitude Living School
significant differences were found in resting heart rate and vital capacity.

Grovel and Reeves\textsuperscript{15} studied the exercise performance of young male natives residing at two altitudes of 300 meters and 3100 meters above mean seal level and found that, the young natives of low altitude were superior athletically to those from high altitude. Kollias\textsuperscript{16} revealed that aerobic capacity is similar in high altitude residents and those who were brought to high altitude. The maximum heart rates were similar among all the groups and peak work load was highest in new comers to high altitude and lowest in the case of residents of high altitude. Nobel\textsuperscript{17} states that the aerobic power is significantly depressed by 3.2\% for each 300 meters (1000 feet) above 1600 meters (5000 feet).

There are not too many studies are available in our country to explain the influences of different geographical conditions on various aspects of growth and development in a child. However, on the basis of available information explored by few researchers, it is understood that the different geographical conditions have evidence of definite bearings, thus resulting in variations in human performance variables.


\textsuperscript{17} Noble, \textit{Physiology of Exercise and Sports}, p. 470.
The present study is an attempt in this direction where the investigator carried out investigations to explore the knowledge pertaining to the variation in physical and physiological variables which may exist among the young growing children who are the natives of different geographical conditions of Karnataka state. It is not surprising that in an area of 1, 92, 204 Sq kms that Karnataka spans, we have to encounter an amazing variety of topographical expressions, from gentle Coastal to most spectacular heights from which water falls cascade for over even 200 metres. Even small scale maps of the state brings out with much clarity the fundamental, natural landscape divisions and altitudinal variations between the Coastal plain, the rugged Malnad region and the table-land, the maiden of South and North. Each of these natural regions or physiographic regions are characterized by distinct features of geography in terms of its topographical, altitudinal and climatic conditions. Hence, for the purpose of the study, the investigator opted the four physiographic regions to represent the different geographical conditions of Karnataka state.

The Coastal plain stretches eastward inland from Arabian sea for a length of about 320 Kms, width ranging from 12 to 64 Kms broader in the south and narrower in the north to the foot of the western ghats, the highest elevation in this plain seldom exceeding 120 metres above the sea level. Its climate is hot but equable with ample and reliable rainfall. The climate of this region is warm and

---

moist. The mean monthly temperatures vary from 24° C to 31° C. The humidity of Coastal plain during March - April is 30 to 40% and during July - August is

The Malnad or mountainous country - is essentially a hilly country and forms the eastern boundary of the Coastal plains. It is extended all the way from north to south and varies in width from 45 to 100 Kms. The major area of this region is elevated between 940 to 1950 metres from sea level. The temperature is much lower than in Coastal region depending upon the elevation. The average lowest temperature during January is 11° C to 14° C and during April the higher maximum is 32° C to 34° C. The humidity during March - April is 30 to 40% and during July- August is 90%. 20

The Northern maidan is a plateau of monotonous nature and with an elevation about 625 metres. Climatically the region is dry with hot summers, warm winters and rather undependable rains. The mean monthly temperature varies between 22° C to 25° C in January and 28° C to 35° C in May. The prevalence of drought and scarcity condition is a rule rather than the exception. The humidity during March - April is five to ten percent and during July - August it is 60 to


20 Ibid.

21 Ibid.
The **Southern maidan** forms the core of the state and the elevation is ranging from 690 to 1800 metres from the sea level. It is a cool and equable temperature region. The temperature vary from 15°C to 21°C in January and 29°C to 32°C in July. The humidity ranges from 10 to 20% during March- April and 60 to 80% in July - August.  

Understanding the qualitative differences in the development of physical and physiological variables among the children belonging to these different geographical conditions of Karnataka state helps the professionalists in the field of physical education and sports in many ways. This knowledge serves the most basic and vital information for all practical purposes of physical education and sports profession right from the talent identification, diagnostic approaches, formulation and implementation of training programmes and so on.

Based on these geographical conditions of Karnataka state, as a factor of natural force of environment, as there are no investigations carried out so far, the investigator made an attempt to design a comprehensive procedure with which exploring the qualitative differences in the status of physical and physiological variables among the boys of 12 to 16 years of age belonging to different geographical conditions of Karnataka state. The investigator also put forth the effort to assess the developmental pattern in the selected variables among the specified groups.

---

Ibid.
**Statement of the Problem**

The purpose of this investigation was to analyze the variations in physical and physiological variables among the boys of 12 to 16 years of age belonging to different geographical conditions of Karnataka state.

**Delimitations**

1. The study was delimited to the four physiographic regions, which represents the different geographical conditions of Karnataka state, namely, Northern maidan, Southern maidan, Malnad and Coastal plain.

2. The study was delimited to the boys of 12 to 16 years of age who are the natives of four physiographic regions.

3. The study was delimited to 60 boys from each age group from four physiographic regions of Karnataka state.

4. The study was delimited to the following physical variables which includes two physical development variables and four motor performance variables. They are:
   a) Height
   b) Body Weight
   c) Speed
   d) Explosive strength
   e) Agility
   f) Flexibility
5 The study was delimited to the following physiological variables. They are

   a) Relative maximal oxygen uptake
   b) Absolute maximal oxygen uptake

**Limitations**

1. Certain factors like diet, daily routine, lifestyle, socio-economic status, etcetera which might have affected on the selected variables were considered as limitations of this study.

2. No special motivational techniques were used during the administration of test period. Therefore, the differences that might have occurred in the performances due to lack of motivation was considered as another limitation.

3. The physiological variables were measured by administering the field test protocol. The differences in the values obtained in comparison with laboratory method was considered as limitation of this study.

4. The chronological age of the subjects was taken from the school records only and maturity status of the subjects could not be considered to ascertain their biological age.
Hypothesis

It was hypothesized that there would not be significant variations in physical and physiological variables among the boys of 12 to 16 years of age group, belonging to four physiographic regions of Karnataka state.

Definition and Explanation of Terms

Physical Variables

The term physical variable includes the physical development and motor performance variables. The term physical development refers to the increase caused by the biological processors in which the child becomes bigger in size, in volume and heavier in weight. The term motor performance refers to the ability of a person to perform motor skills such as speed, explosive strength, agility, endurance, balance and neuro muscular coordination in an efficient manner.

Motor Performance Variables

Speed:

Speed is the ability to execute motor action, under given condition in minimum possible time. Speed ability is highly movement specific.


Explosive strength:

Expending a maximum amount of energy in one or a series of strong sudden movement.

Agility:

Agility is the ability to change the direction of the body or body parts rapidly. It is a performance factor representing the co-ordinative ability.

Flexibility:

Flexibility is the range of movement about a joint. Individual differences in flexibility depend upon physiological characteristics that influence the extensibility of the muscle and ligaments surrounding a joint.

Physiological Variables

The term physiological variables refers to the functional abilities of various systems of human body.

25 Davis, Bull, Roscoe and Roscoe, Physical Education and the Study of Sports, p 265


27 Ibid p 248
Maximum Oxygen Uptake

The maximal oxygen uptake can be defined as the maximal amount of oxygen that can be consumed per minute during the maximal exercise and it is abbreviated as $V_O^2_{\text{max}}$.\(^{28}\)

Relative Maximal Oxygen Uptake (Relative $V_O^2_{\text{Max}}$):

The relative maximal oxygen uptake (relative $V_O^2_{\text{max}}$) refers to the maximal oxygen uptake when expressed relatively to the body mass (the amount of tissue that must be supplied). In this case, the most common unit is milli litre per Kilogram of body weight per minute.\(^{29}\)

Absolute Maximal Oxygen Uptake (Absolute $V_O^2_{\text{Max}}$):

Maximal oxygen uptake expressed in volume (litres) per unit of time (minute), which describes the absolute power of the cardiorespiratory system.\(^{30}\)

Geography

Geography is a science which has for its object the description of the earth’s surface, treating of its form and physical features, its natural and political divisions, the climate, the production, the population, etcetera. It is frequently divided into mathematical, physical and political groups. In other words

\(^{28}\) Noble, *Physiology of Exercise and Sports*, p. 96-97.

\(^{29}\) Ibid.

\(^{30}\) Ibid.
geography deals about the description of land, sea, air and distribution of plants and animals.  

**Physiographic Divisions or Natural Regions**

The Physiography is the science of physical geography which deals about the information pertaining to earth's final surface arrangements namely, surface features, the climate, the populations, vegetation, etcetera.  

**Significance of the Study**

The present study may be significant in the following ways:

1. This study may provide the information regarding the status of physical and physiological variables among the boys of 12 to 16 years of age group belonging to four physiographic regions of Karnataka state.

2. The present study may highlight the vital information regarding the qualitative differences in the selected physical and physiological variables among the boys of 12 to 16 years of age group belonging to four physiographic regions of Karnataka state.

3. The present study may bring out the information regarding the developmental pattern of selected physical and physiological variables

---


among the boys of 12 to 16 years of age group belonging to four physiographic regions of Karnataka state.

4. The present study may reveal important information and new ideas for the construction of physical education curriculum for the school children of 12 to 16 years, living in four physiographic regions of Karnataka state.

5. The study may provide important guidelines to the coaches and physical education teachers for identification of talented children among the boys of 12 to 16 years of age group belonging to four physiographic regions of Karnataka state.