Chapter 1
INTRODUCTION

Ultimate aim of education is preparation of individuals for life by bringing about harmonious developments of all aspects of an individual’s personality. Physical Education is an integral part of total educational process. The two unique objectives of physical education are the development of physical aspect of the personality by promoting the physical fitness and neuromuscular coordination, and development of the social aspect by cultivation of social virtues in individuals through participation in big muscle activities like sports. Bucher\(^1\) defines physical education as follows:

Physical Education, an integral part of total educational process is a field of endeavour that has as its aim the development of physically, mentally, medium of physical activities that have been selected with a view to realising these outcomes.

Individual differences among boys and girls pose a big problem to the workers in the field of Physical Education in particular. Physical Education workers are well aware of the

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fact that the boys or girls of the same age differ greatly from each other in various physical and motor traits. The differences are likely to be more pronounced at the secondary school level at which the boys and girls being in the early stages of adolescence are subject to prepubertal spurt in growth. Physical traits that are not subject to appreciable improvement through exercise like maturity and body size measures have been classified as non-developmental traits, and such traits impose limitations on physical performance.²

One of the foremost problems faced by physical educators in the practice of their profession was how to equalize as far as possible the physical differences that existed among the boys and girls for physical performance. They were also aware that if this problem was left unsolved would leave the smaller and weaker children not only frustrated and disinterested but also exposed to physical hazards while in competition with those who are more nature and superior in size and strength.

This fact cannot be ignored by physical educators committed to improvement of physical fitness of students, and selection and preparation of participants for competitions.

It is a sound educational policy as well as an inescapable duty of physical education teachers to apply appropriate procedures to enable boys and girls to realise their best potential through participation in physical education classes and sports competitions within the framework of limitations imposed by their physical traits.

Classification of boys and girls into homogeneous groups with respect to their motor ability is a workable proposition to control the problem of individual differences, as physical performance depends on elements of motor ability—physical fitness and motor fitness measures as well as limbs and eye coordination. Clarke\(^3\) observes:

The usual system of scheduling physical education classes by free periods after all academic classes are formed should be abandoned. This whole presentation of individual differences cries out that this practice is wrong. Means must be adopted for effective grouping for and / or ensure reasonable homogeneity of motor potentialities and to provide an adequate opportunity for meeting individual physical fitness needs.

Hughes and Williams highlight the need for classification particularly for sports competitions in the upper elementary school and afterwards where he states that after the age of ten fourth grade, boys and girls should

\(^3\)Ibid. p.21.
be separated in all the competitive events as they exhibit great variations in physiological age and accordingly considerable variations in strength, skill and size.\(^4\)

The basis for classification however becomes important. Obviously, and procedure of ensuring homogeneity should be least time consuming and feasible. Use of easily assessable biometric correlates of motor ability from such factors as age, or height or weight or any combinations thereof, as an aid to classification could be considered as feasible. A lead in this direction was given by several investigators who offered several indices for classification of Caucasian boys and girls in United States, using factors of age, height and weight, in the early decades of this century. (McCloy, 1927, 1932; Neilson and Cozens, 1932; Reilly, 1917; Delaney, 1928; Neilson, Trieb and Cozens, 1936; Hetherington and Stolz, 1922; Espenschade, 1963; Gross and Casciani, 1962).

In many schools in United States it is reported that age alone as a single factor for classification is being used.\(^5\)

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Clarke⁶ clarifies that physical education classes in the schools of United States are generally formed on school grades or school levels having the effect or an age classification which is "Woefully weak", and that the nature and extent of individual differences are so great at a given age that an age classification is unjustifiable.

MeCloy, and Neilson and Cozens classification indices based on factors of age, height and weight are stated to have limited applicability to secondary school girls. Bovard and Cozens⁷ observe that the "multiple correlation coefficients between the three factors and performance are much lower than for boys, and a conclusion which seems quite obvious might be that these factors have much less influence upon performance with girls than with boys". Clarke⁸ concurs with the view and states that "various studies have revealed the inadequacy of age, height and weight in combination or singly for the classification of secondary school girls and college women".

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There is no evidence of any investigation reporting the applicability or otherwise of these classification indices reported in the literature to Indian boys and girls. A couple of studies have been directed towards framing norms for McCloy's, and Neilson and Cozen's classification indices for selected groups of Indian boys (Bhat, 1972; and Mallikarjuna; 1974). Thomas (1967)\textsuperscript{9} strikes a note of caution as follows:

McCloy's and Neilson and Cozen's classification indices are worked out for American students. Their build and height are different from that found in Indian schools and colleges. Therefore to that extent, there would be disparity when directly applied for classifying Indian students. These formulae just show the relative importance and effect of the three factors or age, height and weight.

Some classification formulae, one for European Schools and another for Indian Schools as Madras formula along with classificatory norms have been reported.\textsuperscript{10}

\textbf{(a) For European Schools}

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\text{Classification Index} = \frac{4 \times \text{age} + \text{height} + \text{weight}}{3}
\]


\textsuperscript{10}Ibid. pp.53-54.
(b) For Indian Schools

Classification Index = $\frac{1}{2}$ height + weight

Bombay classification table based on age, height and weight, applicable to boys and girls is also reported in the literature. There is no authentic information available in the literature regarding the genesis of these formulae.

A few combinations of the factors age, height and weight have been suggested as follows, for construction of standard formulae for application with respect to Indian boys and girls.

1. Age $\times$ Weight $\times$ Height

2. Weight $\div$ Height $\times$ Age

3. Height $\times$ Age

4. Height $\times$ Weight

5. Age $\times$ Weight

6. Weight $\div$ Height

7. Height $\div$ Age

8. Weight $\div$ Age

\(^{11}\text{Ibid. pp.54-55}\)

\(^{12}\text{Ibid. p.56}\)
In Bangalore City School Systems height as a single factor classification is used for classification of boy and girls for competitions. There is no evidence to show that even this practice is scientifically founded.

McCloy\textsuperscript{13} was perhaps the earliest one to recognize the inadequacy of age, height and weight as factors for classification. In his study of "the influence of chronological age in Motor performance", he concludes that the relationship of age and motor performance as also the height and weight is non-linear and recommends that there should be a restudy entirely of the problem of relationship of age, height and weight with performance with the hope that such studies might offer more useful formulae than those that we have at present.

The studies attempting to evolve classification formulae for secondary school girls are highly limited (Neilson and Cozens, 1932; Delaney 1928), McCloy's (1927) classification index placing higher emphasis on weight due to the Chinese data (girls) indicates that any classification formula does not merit universal application.

Hence there is a felt-need for evolving a suitable method for classification on scientific lines applicable to secondary school girls in particular in this country. It could be more useful if investigations are undertaken on a regional basis in evolving such a classification procedure.

STATEMENT OF THE PROBLEM

The purpose of the study was to evolve and suggest a method for homogeneous group of secondary school boys of Amravati Reason based on statistical evaluation of the coefficients of determination of the biometric factors of age, height and weight individually and in various combinations with respect to the motor ability and sifting the best correlate there from.

HYPOTHESES

The following are the hypotheses formed to guide the study.

1. It is hypothesised that some of the attitude combination of height and weight are age height and weight may yield a basis for new method for forming homogeneous groups for boys in the secondary school.

2. Even though changes in the linear growth (height) with age may not be so pronounced in the secondary schools, still among the factors of age, height and weight considered singly, height may provide a basis for suggesting a single factor.

3. Even though changes in linear growth (height) with age may not be so pronounced in secondary school girls compared to boys, still among the factors of age, height and weight considered singly, height may provide a basis of suggesting a single factor classification index.

4. Some of the body build indices, (various height-weight ratios) reported in the literature like the Quetelet’s Index,

\[ \text{\textsuperscript{14}} \]

Inverse Ponderal Index, and Tuxford Index may also have a significant correlation with the motor ability and provide a basis for computing a classification index for secondary school

5. It was also hypothesized that some of the additive combinations of height and weight or age, height and weight may yield a basis for suggesting a classification formula for boys in the secondary schools.

SIGNIFICANCE OF THE STUDY

The study was considered significant from the following view points.

1. At present no satisfactory homogeneous groups method is available for use with secondary school boys of the country.

2. The present study attempting to provide a method of forming homogeneous groups for the secondary school boys.

3. The study incidentally would help in testing the applicability of Koka Exponent Numbers.

4. At present no satisfactory classification procedure is available for use with secondary school boys and girls of this country. The present study attempting to provide a homogeneous method for the secondary school boys was considered to make a useful contribution to the profession in that direction.

5. The study incidentally would help in testing the applicability of MeCloy’s or Neilson and Cozen’s classification indices to Indian boys.

6. Some Indian School Systems are reportedly following a Madras formulae for classification and Bombay classification table, the genesis and validity of which have not been reported in the literature. The present study would throw light on the
justification or otherwise of these practices.

DEFINITION OF TERMS

The following are the definitions of some of the terms used in this study.

**Classification** – It is a process of grouping heterogeneous individuals to homogeneous clusters.

**Motor Ability**\(^{15}\) – The present acquired innate ability to perform motor skills of a general or fundamental nature, exclusive or highly specialized sports or gymnastics.

**Multiple Correlation**\(^{16}\) – The correlation between a dependent or criterion variable and the sum of a number of Independent variables which are weighted so as to give a maximum correlation.

**Regression Equation**\(^{17}\) – A technique used to predict the most likely measurement in one variable from the known measurement in another.


\(^{16}\)Ibid.

\(^{17}\)Ibid., p.585.
Coefficient of Correlation\textsuperscript{18} – A ratio which expresses the extent to which changes in one variable are accompanied by or are independent upon changes in a second variable.

Coefficient of Determination – Amount of information given by the independent variables in predicting the performance.

Coefficient of regression – In simple linear regression equation, the coefficient of regression is the multiplier (constant) which is associated with the single independent variable.

Partial Regression Coefficients – In the multiple linear regression equation the partial regression coefficients are the multipliers (constants) associated with the independent variables.

A Matrix – A set of scores arranged in rows and columns. That is, a set of $mn$ elements arranged in $n$ columns of order $m \times n$ read as $m \times n$ matrix.

Inverse of a Matrix – A matrix is said to be inverse of the other if the product of two matrices is an identity matrix when the identity matrix has one in the diagonal positions and zero in the off diagonal positions.