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Comparison Between the Foot Arch Index and Speed of School Boys

KEYWORDS

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ABSTRACT *The aim of the study was to compare the speed of the school boys with high, normal and low foot arch indexes. To serve this purpose 150 subjects were selected from Nellore district of Andhra Pradesh, of which 50 each from high, normal and low foot arch index groups. The age, height and weight of the subjects ranged from 14 to 17 years, 155 to 169cms and 42 to 57kgs respectively. The arch index was determined as the ratio between mid foot area divided by the whole foot print area. The speed was assessed by following 30mts. flying start. The data collected was subjected to one way analysis of variance to determine the significant difference between the groups. It was found that the normal foot arch index group was significantly better than the low and high foot arch index groups in speed and high arch foot index group was significantly better than low foot arch index group.*

Introduction:
Sport is as old as human society itself. It is an institution, which has its own traditions and values. Being an institutionalized and competitive activity, it involves vigorous physical exertion or the use of relatively complex of physical or structural advantages of individuals. Successful performance in sports competitions at various levels were based on the innovations of the new techniques and selection of the participants based on the structural or anatomical designs of the individuals.

The foot is highly complex system capable of producing balance and propulsion of the body. The foot is the foundation for the whole body and its actions will affect other parts of the body and indeed, its function will be affected by numerous forces acting upon it. The two principle components of foot function are the motions of pronation and supination[2].

The foot has to act as a pliable platform to support the body weight in the upright posture and also as a level to propel the body forwards in walking, running or jumping. To meet these requirements, the human foot is designed in the form of elastic arches or springs. The arches are segmented, so that they can best sustain the stresses of weight and of thrusts. An arched foot is distinctive feature of an individual[3].

The arches of the foot distribute body weight to the weight bearing areas of the sole, mainly the heel and toes. Out of the latter, weight is borne chiefly on the first and fifth toes. The lateral border of the foot bears some weight, but this is reduced due to the presence of the lateral longitudinal arch. The arches act as springs (mainly the medial longitudinal arch) which are of great help in walking and running. They also act as shock absorbers in stepping and particularly in jumping. The concavity of the arches protects the soft tissues of the sole against pressure[5].

Absence or collapse of the arches leads to flat foot (pes planus), which may be congenital or acquired. The effects of a flat foot are

a) Loss of spring in the foot leads to a clumsy, shuffling gait.
b) Loss of the shock absorbing function makes foot more liable to trauma and Osteoarthritis.
c) Loss of concavity of the sole leads to compression of the nerves and vessels of the sole[4].

Physical fitness is the capability of the heart, blood vessels, lungs and muscles to function at optimal efficiency. Optimal efficiency means the most favorable health needed for the enthusiastic and pleasurable participation in daily tasks and recreation activities. Basic components of physical fitness are strength, flexibility, cardio-respiratory endurance and speed.

Successful performance in sports competitions at various levels were based on the innovations of the new techniques and selection of the participants based on the structural or anatomical designs of the individuals and based on the training or coaching methods. Day by day high level research in the field of sports is going on to find out the ingredients like structural posture of anatomical advantages that are responsible for the betterment of sports performance and facilitating the talent selection for competitions.

The human foot is a highly complex structure with 26 major bones and more than 30 synovial joints. It plays a role in load support and shock absorption during propulsion. Hence the foot is the interface with the ground during the propulsion. The differences in foot structures may result in differences in rate of propulsion. So the scholar had taken foot arch index as a variable to test its effect on speed.

Methodology:
To attain the purpose 150 school boys (50 each from high foot arch index, normal foot arch index and low foot arch index) were selected from Nellore District of A.P. Foot arch index was assessed by the graphical method established by Cavanaugh and Roger[1]. To assess Foot Arch Index the area of the mid foot was divided by the total area of the foot print, ignoring the toes.

Foot Arch Index = B / A+B+C

B = Area of the mid foot

A = Area of the rear foot

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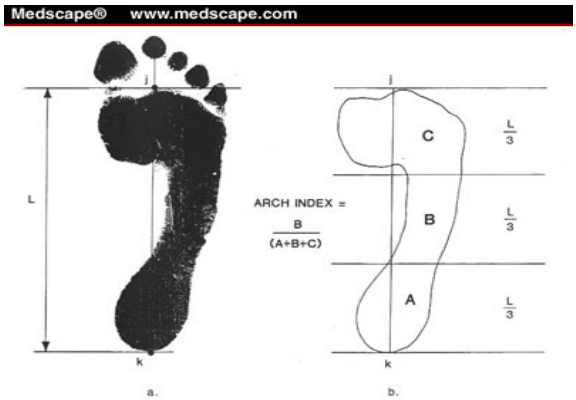

C = Area of the fore foot

Figure1: Dynamic foot print obtained during walking

The criterion variable of the study, speed was measured by 30mts flying start. The collected data on speed was also analyzed by the statistical technique analysis of variance for the differences in the categorical variables. Scheffe's test was applied as a post-hoc test to determine which of the paired means were significantly differed in speed. The level of significance was set at 0.05 level.

The data collected from three categorical groups (i.e. high, normal and low foot arch index) was subjected to analysis of variance and the results were presented in table-I.

Table - I
ANLYSIS OF VARIANCE FOR THE DATA ON SPEED OF HIGH, MEDIUM AND LOW FOOT ARCH INDEX STUDENTS

Source of Variance	Sum of Squares	Degrees of Freedom	Mean sum of Squares	F ratio
Between Groups	1.03	2	0.52	8.07*
Within Groups	2.34	147	0.06	

*Significant at 0.05 level

Table - I indicates that the calculated `F' ratio, 8.07 is higher than the table value, for significance with degrees of freedom 2 and 147. It reveals that the categorical groups (high, normal and low foot arch index) are significantly differ in speed at .05 level. Further to identify which of the paired means are significantly differ scheffe's test was applied as a post-hoc test. The results of the post-hoc test were presented in table - II.

Table - II
SCHEFFE'S TEST FOR THE MEANS OF HIGH, NORMAL AND LOW FOOT ARCH INDEX GROUPS IN SPEED

Means of 30 mts run in sec.			Difference	Critical difference
High f.a.i.	Normal f.a.i.	Low f.a.i.		
4.72	4.49	--	0.23*	0.22
4.72	--	4.86	0.14	0.22
--	4.49	4.86	0.37*	0.22

*Significant at .05 level

Table - II shows that the mean difference between high foot arch index group and normal foot arch index group 0.23 sec and normal foot arch index group and low foot arch index group 0.37 sec are higher than the critical difference 0.22 sec. It indicates that these two pairs are significantly differed in 30mts running performance. Further the observation of the means indicate that normal foot arch index group is significantly better than high foot arch index group and low foot arch index group. The difference between high foot arch index group and low foot arch index group 0.14 sec is less than the critical difference 0.22 sec. It reveals that there was no significant difference between the two means. It was found that the normal foot arch index group was better in speed (30 mtrs flying start) when compared to high foot arch index group and low foot arch index group. There was no significant difference between high foot arch index group and low foot arch index group in speed.

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