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Editorial

Yogavyayama is a very common term in India even in the remote areas. To find out the origin of this term I have started a very extensive research on 'Science of exercise : Ancient Indian Origin'. Indian civilization is one of the oldest in the world. Vedas the oldest literature in the world was originated in India. There were many Upaveda like Dhanurveda, Ayurveda etc. Ayurveda (science of long and healthy life), world oldest record of medical practice, might be the first source of the term Yogavyayama. According to Ayurveda human is the combination of body, mind and spirit. Jointly they are working in the healthy body. Ayurveda strongly recommended to practice regularly Vyayama (exercise) for the body and Yoga for the mind and spirit. For that reason Ayurvedacharyas prescribed Yogavyayama for long and healthy life. From the ancient time India was familiar with this science. It was forgotten due to local ignorance and western influences. Spread this ancient wisdom all over the world.

Editor

PHYSICAL GROWTH AND NUTRITIONAL STATUS OF 10 TO 14 YEARS OLD BOYS OF THE RAJBANSI COMMUNITY OF COOCHBEHAR WEST BENGAL INDIA

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ABSTRACT

There are so many races and ethnic communities in the different parts of India and each of this particular group of people have some specific characteristics in respect of biological structure, social customs and habits.*Rajbansi*, a Hindu social group of people living in the extreme northern region of West Bengal is an ancient tribe originally from the ancient Koch Kingdom. They appear to be a mixed lineage. On the west their affinities are with the Dravidians stock and on the east with the Mongolians. Present study was conducted to assess the physical growth and nutritional status of the 10 to 14 years old school going boys belong to '*Rajbansi*' community. Total 1000 school going boys of 10 to 14 years age belongs to this Rajbansi community have been selected randomly from different schools of CoochBehar for the present study. Multiple group design was adopted and five independent groups were formed according to the age of the boys. Total thousand boys were divided into equal five age groups and each age group included 200 boys. The criterions measured for the present project were height, weight and BMI. All statistical calculations were done by using standard statistical software. Result revealed that the height and weight were increased with different rate in respect to age. Peak growth period of height and weight were found at 13 – 14 years age. But the BMI values of this community boy for all age groups were lower than the International as well as the National standard which showed their poor nutritional status. Thinness was more prevalence than obesity and overweight among the 10 to 14 years aged boys of this *Rajbansi* community.

Key words: Physical growth, Nutritional status, Rajbansi community

Introduction

There are so many races and ethnic communities in different part of the world They share a way of life and a commitment to the ideas, norms, and material things that constitute there way of life (Coakley, 2003). Hruschka (2009) reported that cultural beliefs about

race and ethnicity influence health, well being and social relationship. *Rajbansi*, a Hindu social group of people living in the extreme northern region of West Bengal, India have been very little studied. It is an ancient tribe originally from the ancient Koch Kingdom (Khan Chowdhury, 1936). They appear to be a mixed lineage. On the west their affinities are with the Dravidians stock and on the east with the Mongolians. The word Rajbansi means literally "Royal community". They have a rich cultural heritage, social custom, ritual, traditions and own language. Most of the people of this community lives in the villages and are deeply rooted to the soil and have retained many of their ancient customs and habits. They have faith in supernatural powers. Rituals to propitiate them are still to be found in this community. Their marriage, customs and religious rituals have a distinct characteristic of their own. Their sports, jokes, common sayings and songs reveal their simple nature and intelligence (Sanyal, 1965).Several studies were conducted to reveal growth and nutritional status of different ethnic and racial boys at different part of the world (Chakraborty et al. 2008; Ayoola, 2009; Ghosh et al. 2009; Kulaga et al. 2010; Pereira, 2010; Yabanci, Kilic and Simsek, 2010; Mondal and Sen, 2010, Dahinten et al. 2011 etc). Objective of the present study was to search the physical growth as well as health status of 10 to 14 years old boys belong to the Rajbansi community of CoochBehar, West Bengal, India.

Meterials and Methods

Total 1000 school going boys of 10 to 14 years age belong to Rajbansi community of CoochBehar have been selected randomly from different schools of CoochBehar for the present study. The students were studying in class V to IX in their respective school and attend the daily classes regularly. Only those boys who's parents and grandparents were also from Rajbansi community have been selected as subject for this study. The criterions measured for the present project were physical growth and nutritional status. Physical growth was assessed by measuring height and weight and nutritional status was measured by calculating BMI.

Height and weigh machine were used to measured height and weight. BMI was calculated with the standard equation (weight in Kg/ Height^2 in Meter).

Multiple group design was adopted and five independent groups were formed according to the age of the boys. Total one thousand boys were divided in equal five age groups and each age group included 200 boys. Mean and SD of height and weight were computed for each age group i.e. 10years, 11years, 12 years, 13years, and 14 years and ANOVA was administered to find out statistical significance of the differences among means of these several groups. To find out the exact location of the difference between means post

hoc test was administered. All statistical calculations were done by using standard statistical software.

Result and Findings

The mean values and standard deviation of the height and weight of the boys for 10 to 14 years age have been presented in Table-1. As the mean values were different for different five age groups, the technique of one way Analysis of Variance (ANOVA) was adopted to test the significance of differences among different mean values. The result is presented in Table-2. From Table-2 it is seen that the F-values were statistically significant and in order to identify the exact location of the difference, method of Least Significance Difference (LSD) was used as a post hoc test. Result presented in Table-3.

It is understood from the Table-1 that height increased continuously as the age of the present subject increases from 10 to 14 years. Table-3 indicated that the increase in height between 10 to 11 years, 11 – 12 years, 12 – 13 years and 13 – 14 years age group were 4.33, 4.88 cm, 5.41 cm and 5.55 cm respectively and all these values found statistically significant. So it is revealed that the height of the present boys increased as the age grows from 10 to 14 years and the peak velocity of increase was taken place between 13 to 14 years of age.

It is observed from table-1 that mean weight of the subjects increased continually as the age of the present subject increases from 10 to 14 years and maximum increase in weight was noticed for the age between 13 to 14 years. Table-3 indicated that the increase in weight from 10 - 11 years, 11 – 12 years, 12 – 13 years and 13 – 14 years age group were 1.93 kg, 3.18 kg, 3.88 kg and 4.12 kg respectively. All these values were found statistically significant except for 10 – 11 years age group.

Nutritional status of the subjects was assessed by measuring Body Mass Index (BMI). Table-1 shows that BMI also increased gradually year to year for the present subjects as their age grows from 10 – 14 years.From Table-3 it is observed that the difference in BMI between 10 – 11years, 11 -12 years and 13 – 14 years age group were 0.08, 0.53 and 0.55 respectively which were statistically not significant but the difference in BMI between 12 -13 years age group was 0.69 which has found statistically significant in 0.05 level.

Table-1 : Mean values and SD for height, weight and BMI of different age groups

Selected variable	Different age groups					Statistical Parameters
	10 years	11years	12 years	13 years	14years	
Height	131.01 ± 6.42	135.34 ± 7.86	140.22 ± 8.02	145.63 ± 8.18	151.18 ± 10.34	Mn SD
Weight	25.73 ± 5.08	27.66 ± 5.02	30.84 ± 6.69	34.72 ± 7.44	38.93 ± 9.97	Mn SD
BMI	14.91 ± 2.03	14.99 ± 1.48	15.52 ± 1.88	16.21 ± 2.09	16.76 ± 2.54	Mn SD

Table-2: F-values for height, weight and BMI of different age groups

Statistical Parameter	**Height**	**Weight**	**BMI**
F-value	94.135**	56.874**	15.354**
P value	.000	.000	.000

** Significant at both 0.05 and 0.01 level

* Not Significant at both 0.05 and 0.01 level

Table-3: LSD of different age group

Fitness components	10 yrs – 11 yrs	11 yrs – 12 yrs	12 yrs – 13 yrs	13 yrs – 14 yrs
Height	4.33**	4.88**	5.41**	5.55**
Weight	1.93*	3.18**	3.88**	4.21**
BMI	0.08*	0.53*	0.69**	0.55*

** Significant at 0.05 level.

* Not Significant at 0.05 level.

Discussion on Findings

There has been several numbers of researches in different countries which focused on the physical growth status of the boys for this age group. Height and weight of the present subjects increased continuously as the age grows from 10 to 14 years for this community boy. Highest increase for both these parameters has been found in the age of 13 to 14 years for present subjects. The height and weight of the present boys have been compared with International (WHO, 2007) and National standard (ICMR, 1990) in figure-1 & Figure-2 respectively. It is revealed from the comparison that the height and weight of the present subjects was always below from the National standard as well as International standard for all age groups.

Height of the present subjects were compared with available existing data (Kerala State Sports Council, 2009; Musaiger and Gregory 2000) and found lower for each age group for present boys than the boys of Kerala (India), Japan and Baharin but height of present boys was found higher for all age groups than the rural boys of Karnataka, India (Hunsel et al. 2010). The height of the present subjects have also been compared with rural and urban Bengali boys of West Bengal (Ball, 2993; Konar, 2010) and found the height of this community boy was lower than them. The differences in height were more in respect of urban Bengali boys than rural Bengali counterpart.

The weight of the present subjects has been compared with national standard and results presented graphically in Figure-2. It is clear from Figure-2 that weights for the different age groups of present boys were lower than the National standard (ICMR 1990). The difference in weight with national standard was found highest for 13-14 years age group for present boys. After compared with existing available data (Kerala State Sports Council, 2009; Musaiger and Gregory 2000) the lower weight status was also found for present boys than the boys of Kerala (India), Japan and Baharin but weight of present boys was found higher for all age groups than the rural boys of Karnataka, India (Hunsel et al. 2010). The weight of present subjects was also compared with Rural and Urban Bengali boys (Ball, 2993; Konar, 2010) and found that the weight of the present boys was lower for each age group than the rural and urban Bengali boys. This difference in weight was found higher with urban Bengali boys than the rural Bengali counterpart.

BMI for the different age groups of present subjects increased as the age of the boys' increases. Peak velocity was found for the age of 12 to 13 years. Least increased was noticed for present boys in this variable at the age of 10 -11 years. The BMI for different age groups of present boys has been compared with International standard (WHO, 2007) and National standard (ICMR, 1990) which have been presented graphically in

Figure-3. The mean values of BMI for the present boys also lower than the International standard as well as National standard. The present boys were also poorer in respect of BMI than the rural and urban Bengali boys of West Bengal (Ball, 2993; Konar, 2010). This difference was increased as the age grows. From the available data poorer level of nutritional status was also found for present boys than the boys of Kerala (India), Japan and Baharin.

Prevalence of severe thinness, thinness, overweight and obesity among each age group of present subjects have been shown graphically in Figure-4. It is revealed from the Figure-4 that thinness was more prevalence than overweight and obesity in every age group. It also shows that percentage of severe thinness increased as the age grew.

Results of present study revealed that height, weight and BMI for present boys increased continuously and linearly as age grows from 10 to 14 years. This pattern of growth in terms of height, weight and BMI for the present boys was similar and supported by several other studies (Manna 1996, Musaiger and Gregory 2000, Ball 2003, Haboubi and Shaikh 2009, Konar 2010, Hunsel et al. 2010, Ireton, Carrillo and Caro 2011, Rosario, Schienkiewitz and Neuhauser 2011). However, changes in BMI for urban Bengali boys with increasing age as reported by Ball (2003) were not similar with present finding. This difference between the present subjects with urban counterpart was might be due to urban nature of that sample who were belongs to the higher socio economic status.

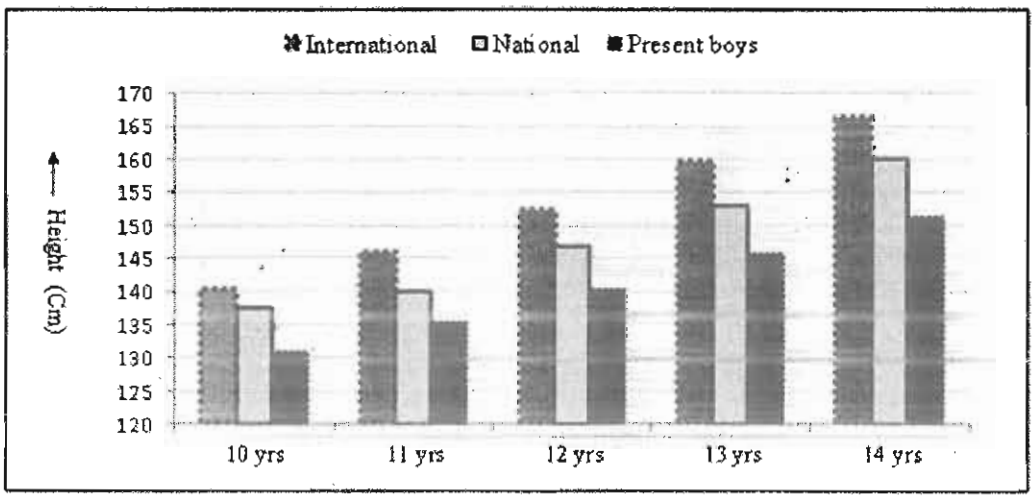

Figure-1: Comparison of Height of the present boys with International and National standard

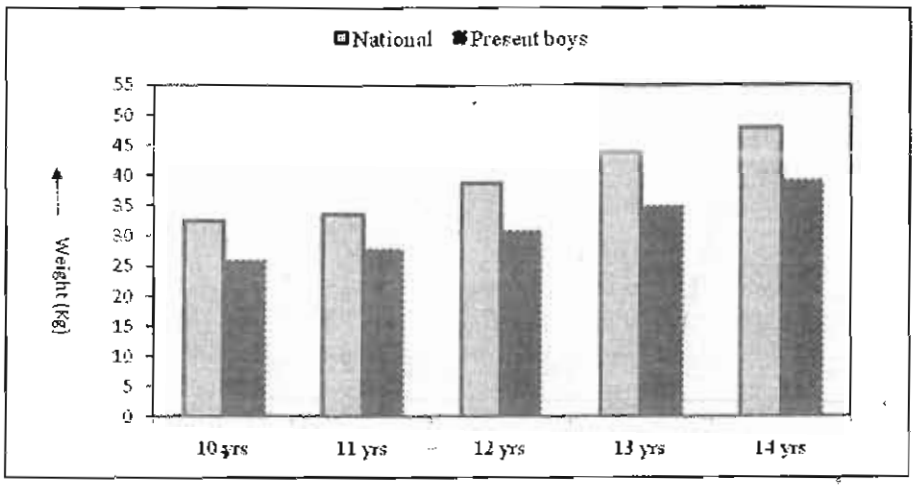

Figure-2: Comparison of Weight of the present boys with National standard

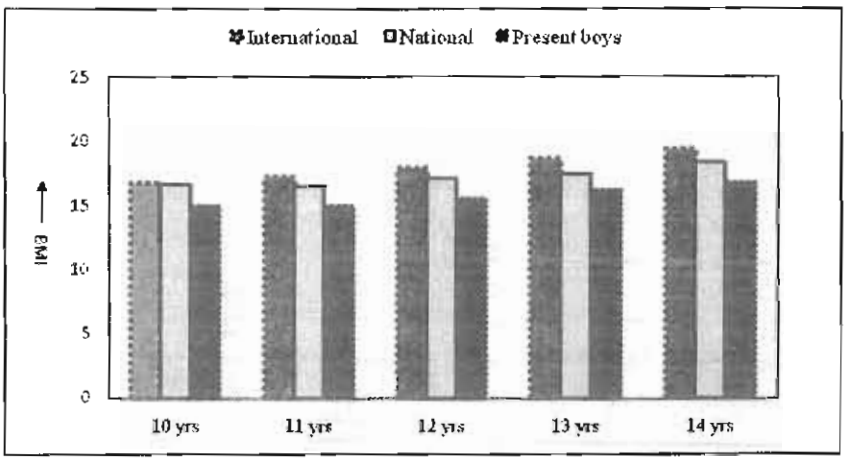

Figure-3: Comparison of BMI (Kg/m^2) of the present boys with International and National standard

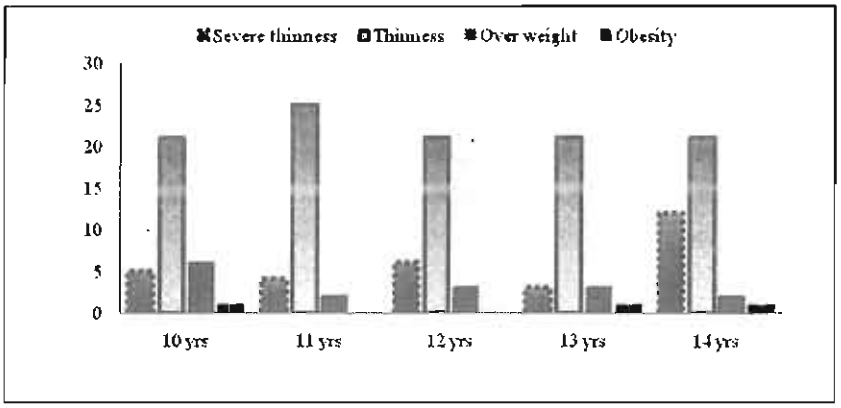

Figure-4: Prevalence of severe thinness, thinness, overweight and obesity among each age group

Several other studies conducted on the same aged boys belong to such third world countries as well as developing countries like India and reported lower physical growth status in terms of height, weight and BMI. Thakor et al. (2006) reported below level of physical growth for urban adolescents (10-15 years) in Gujrat, India than the ICMR and NCHS standard. Petroski et al. (2008) also found physical growth for the boys of Continguiba, Northeast Brazil were below than NCHS standard in terms of height and weight. Ayoola et al. (2009) also reported below standard of physical growth status in respect of international standard for 5 – 20 years aged rural children of Nigeria. Ghosh et al. (2009) reported existence of high prevalence of under nutrition in Katmandu valley, Nepal and found physical growth status specially height and weight were far below than the recommended WHO standard.Hunshal et al. (2010) revealed that the physical growth status of rural boys of Karnataka were significantly below than the ICMR as well as NCHS standard for 10 to 13 years.

Several factors affect the physical growth of the children. It is influenced by both genetic and environmental factors. Different races and ethnic communities of different region of the world might have specific genetic characteristics of physical growth. The difference in physical growth rate for the present boys from the other findings, as researcher thought might be due to the genetic potential of this ethnic group. Among the environmental issues, socio-economic and demographic factors are most important in worldwide context (Haboubi and Shaikh, 2009). The difference in these facts for the present community boys from the other subjects may also be due to the difference in nutritional and socioeconomic status between those populations. These differences might also be occur due to the difference in life style, society culture, food habits, educational level, and climatic condition between these populations.

The lower growth status in terms of height, weight and poorer health status in respect of BMI as found in the present project might be due to the fact that the subjects of this study were from lower socio-economic background. A high prevalence of under nutrition exists among the children in this community was reported by Mondal and Sen (2010). This might be also due to the fact that the boys were from a particular ethnic/racial group and had specific genetic characteristics of growth. The other possibility might be considered for this reason as the cross-sectional nature of the study.

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COMPARISON OF RIGHT AND LEFT HAND GRIP STRENGTH AMONG UNIVERSITY LEVEL CRICKET, HANDBALL, VOLLEYBALL AND BASKETBALL PLAYERS

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Abstract

The purpose of this study was to observe the right and left hand grip strength among cricket, handball, volleyball and basketball players. To achieve the purpose of the study 25 cricket players, 32 handball players, 30 volleyball players and 28 basketball players aged between 18-28 years was selected. The male players selected in this study had right hand as dominant hand and left hand as non dominant hand. Grip strength was measured on both right and left hand. Grip dynamometer was used for grip strength measurement. For statistical analyses One Way ANOVA of unequal sample size was performed. When F ratio was found to be significant Scheffé S post hoc test was applied to determine the significant paired mean differences for unequal sample. This statistical work was done with help of SPSS 11.5 and outputs reproduced as it is. The result of the study shows a statistically significant difference for right ($F=11.77, p< 0.05$) and left ($F=9.50, p< 0.05$) hand grip strength among cricket, handball, volleyball and basketball players. It is concluded that handball players are better in right hand grip strength when compared to cricket, volleyball and basketball players, however cricket players are better in left hand grip strength when compared to handball, volleyball and basketball players.

Keywords: Grip strength, cricket, handball, volleyball, basketball

Introduction

Athletes undergo many daily functions and sporting events which require high activity levels of the flexors musculature of the forearms and hands. These muscles play a vital role in grip strength. However, grip strength plays a key role in injury prevention and overall strength development (Budoff, 2004; Fry, *et al.*, 2006; Smith, *et* al., 2006; Yasuo, *et al.*, 2005).

Handgrip strength is the maximal power of forceful voluntary flexion of all fingers under normal biokinetic conditions (Gandhi, *et al.*, 2010). Handgrip strength determines

the muscular strength of an individual (Ling, *et al.*, 2010; Fool, 2007). It is an important indication of general health and is regarded as one of the most reliable clinical methods for estimating strength (Nachon, *et al.*, 2002; Hager-Ross and Schieber, 2000). Handgrip strength is important for catching and throwing the ball in different team sports. Also, when the fingers are longer and hand surface variables greater than required for grasping an object (ball), fingers will less widely spread, and grasping an object will become more efficient and less fatiguing (Nag, Nag and Desai, 2007).

In grip sports, like cricket, volleyball, basketball and handball, the longer the finger, the better the accuracy of the shot or throw. All shots and throws are finished with the wrist and fingers. It can be proposed that athletes with longer fingers and greater hand surface also have greater grip strength (Visnapuu and Jürimäe, 2007). Handgrip strength is also important in determining the efficacy of different treatment strategies of hand and in hand rehabilitation (Gandhi, *et al.*; 2010). The handgrip measurement may be used in research, as follow-up of patients with neuromuscular disease (Wiles, *et al.*, 1990), as a predictor of all cause mortality (Ling, *et al.*, 2010), as the functional index of nutritional status, for predicting the extent of complications following surgical intervention (Wang, *et al.*, 2010), and also in sport talent identification (Clerke, *et al.*, 2005).

The purpose of this study was to observe the right and left hand grip strength among cricket, handball, volleyball and basketball players.

Methods

Material and method

Toaccomplish the purpose of the study 25 cricket, 32 handball, 30 volleyball and 28 basketball players who represented university teams were selected. The age of the selected male subjects ranged between 18-28 years. In this study subjectswho had right hand as dominant hand and left hand as non dominant hand was selected and grip strength was measured on both hands. Exclusion criteria were set upon our knowledge of some genetic, psychological, neurological or chronic diseases affecting hand function and anthropometric characteristics (Malina & Buschang, 1984; Brill & Stier, 1999). Diseased or disabled persons were excluded from the study according to the mentioned criteria. Informed consents of all participants were obtained.

Grip strength

Grip dynamometer was used to measure the grip strength. The participant sat on a chair with the elbow flexed at 90° and the forearm in semi pronation lying on an arm rest. The participants were asked to squeeze the dynamometer three times with dominant hand.

There was a one minute resting period between each squeeze in order to overcome fatigue. The mean value of three squeezes was taken into account.

Statistical analysis

Statistical analyses were performed with SPSS for windows Release 11.5. For statistical analyses One Way ANOVA of unequal sample size was performed. When F ratio was found to be significant Scheffé S post hoc test was applied to determine the significant paired mean differences for unequal sample.

Results

Table 1 : Comparison of grip strength among cricket, handball, volleyball and basketball players

Grip Strength	Groups	N	Mean ± SD	SOV	Ss	df	Ms	*F*
Right Hand	Cricket	25	66.32 ± 18.13	B	8075.83	3	2691.94	11.77*
	Handball	32	70.00 ± 14.58					
	Volleyball	30	50.43 ± 12.90	W	25369.32	111	228.552	
	Basketball	28	61.21 ± 15.45					
Left Hand	Cricket	25	68.96 ± 15.44	B	6667.04	3	2222.34	9.50*
	Handball	32	63.15 ± 15.75					
	Volleyball	30	46.56 ± 14.47	W	25945.74	111	233.74	
	Basketball	28	56.50 ± 14.97					

*Significant ($p < 0.05$)

Right hand grip strength

There was a significant difference in right hand grip strength values among cricket, handball, volleyball and basketball players (Table 1). The Scheffé S post hoc test was applied to determine the significant paired mean differences on right hand grip strength. Table 2 revealed a significant difference between cricket vs. volleyball, handball vs. volleyball, handball vs. basketball volleyball vs. basketball players. Handball players found dominate on right hand grip strength.

Left hand grip strength

There was a significant difference in left hand grip strength values among cricket, handball, volleyball and basketball players (Table 1). The Scheffé S post hoc test was applied to determine the significant paired mean differences on left hand grip strength. Table 2 revealed a significant difference between cricket vs. volleyball, cricket vs. basketball, handball vs. volleyball and volleyball vs. basketball. Cricket players found to dominate on left hand grip strength.

Table 2 : Scheffé's post hoc test on grip strength among cricket, handball, volleyball and basketball players

GripStrength	Groups Difference		Mean Difference	CI
Right Hand	Cricket	Handball	-3.68	7.60
		Volleyball	15.89*	7.73
		Basketball	5.11	7.87
	Handball	Volleyball	19.57*	7.27
		Basketball	8.76*	7.41
	Volleyball	Basketball	-10.78*	7.52
Left Hand	Cricket	Handball	5.81	7.68
		Volleyball	22.4*	7.81
		Basketball	12.46*	7.95
	Handball	Volleyball	16.59*	7.36
		Basketball	6.65	7.49
	Volleyball	Basketball	-9.94*	7.60

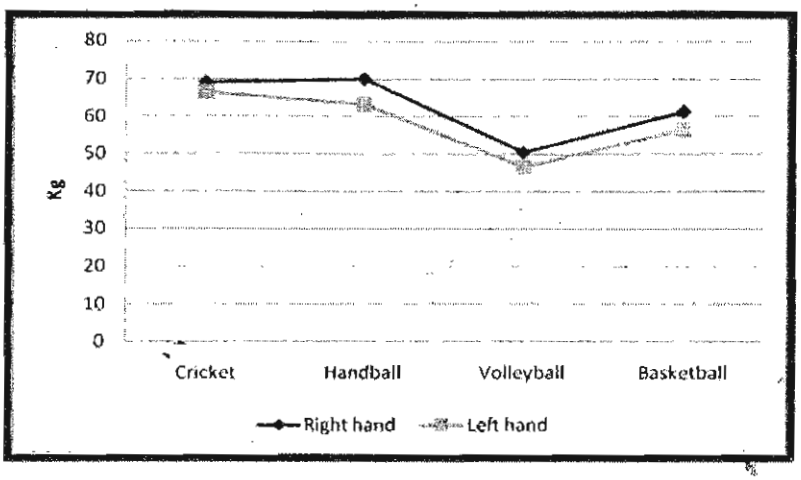
*Significant ($p < 0.05$)

Discussion

There are various studies concerning the effects of sports on anthropometric measurements and physical status of the human body (Lozovina & Pavicic, 2004). In the present study the effect of three different sports branches on the hand grip strength was evaluated.

In this study there was a significant difference among the groups on right and left hand grip strength. Handball players had the greater grip strength on right hand than the other sports person and cricket players had the greater left hand grip strength than the other players (Figure 1).

Figure 1 : GRIP STRENGTH AMONG CRICKET, HANDBALL, VOLLEYBALL AND BASKETBALL PLAYERS



Hand grip strength is a general term referring to the muscular strength and force that they can generate with their hands. The strength of a hand grip is the result of forceful flexion of all finger joints, thumbs, and wrists with the maximum voluntary force that the subject is able to exert under normal biokinetic conditions. Hand grip strength is a significant predictor of performance in various sports activities such as lawn tennis (Lucki & Nicolay, 2007), volleyball (Melrose, Spaniol, Bohling, & Bonnette, 2007), ten-pin bowling (Tan, Aziz, Teh, & Lee, 2001), rock climbing (Watts, Newbury & Sulentic, 1996).

The people prefer to use one hand rather than the other is a remarkable behavioral asymmetry, and means that the preferred hand often performs skills better than the nonpreferred hand (Kinoshita, 1998). Genetic and familial influences, as well as social and cultural factors (Porac, 1995), have been considered to underlie handedness. Better skill performance in one hand can be seen as a training effect from more frequent use of one hand (Cho, *et al.*, 2006). Tsuji, and his colleagues (1995) opined that grip strength was one of the determinant factors of radial bone mineral density in the dominant forearm of young college athletes. Whereas, Ducher, and others (2004) found that forearm bone mineral content adjusted to lean tissue mass or grip strength was higher on the dominant side, suggesting that tennis playing exerted a direct effect on bone. This might be the reason that cricket players showing best in left hand grip strength. This study concluded that handball players were found better in right hand grip strength and cricket players in left hand grip strength.

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EFFECT OF SAND AND LAND PLYOMETRIC TRAINING ON SPEED AND EXPLOSIVE POWER AMONG KABADDI PLAYERS

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Abstract

The purpose of this study was to compare the effects of two different training protocols : sand and land plyometric training on vertical jump and speed among kabaddi players. Thirty subjects (18 to 21 years age) were randomly assigned as volunteer to participate in three groups: sand plyometric training group (n = 10), land plyometric training group (n = 10), and control group (n = 10). 12 weeks of training, 3 days a week was employed on the subjects. Pre and post test on vertical jump and speed was administered. Data were analyzed by analysis of co-variance (ANCOVA). Schiff's test was used as a post hoc test to determine which of the paired mean differ significantly. Results showed that all training treatments elicited significant ($p < 0.05$) improvement in all tested variables. However, the sand plyometric training group produced improvements in vertical jump performance and leg strength that were significantly greater performance in compare with the land and control group. This study provides support for the use of a traditional and plyometric drills to improve vertical jumping ability and explosive performance in general.

Key words: Plyometric training, Speed, Explosive power

Introduction

Plyometric exercise has been in practice for many years, (Edwin Rimmer, 2000) to develop the explosive power of athletes. It is a type of training that develops the ability of muscles to produce force at high speeds (produce power) in dynamic movements; these movements involve a stretch of the muscle immediately followed by an explosive contraction of the muscle. This pattern of muscle contraction is known as the stretch-shorten cycle (SSC) (Norman 1979.). Plyometric exercises include vertical jumps, during which the athlete jumps as high as possible "on the spot," and bounds, during which the athlete leaps as high and as far as possible, thus moving the body in the horizontal and vertical planes. It is generally accepted that the more specific training exercises to a competitive movement, the greater the transfer of the training effect to performance (Delecluse, 1995). Athletes such as sprinters, who require power for moving in the horizontal plane, engage in bounding Plyometric exercises, whereas athletes such as high jumpers and volleyball players, who require power to be exerted in the vertical direction, train using vertical jumping exercises

(Chu, 1992).Plyometric is a means of encouraging the muscle to achieve maximal force rapidly and therefore serving to increase explosive-reactive power through a range of motion and is a popular training approach (Lockwood, 2004).

The purpose of the study is to find out effect sand and land plyometric training on speed and explosive power among kabaddi players.

Methodology

Selection of the subjects

Thirty men kabadi players from Annamalai University were randomly assigned as volunteer to participate in this study. The Mean ±: age 18 ± 3 years (range 18to 21 yrs), height 1.74 ± 0.05m, body weight 73.2 ± 9.26 kg.

Training protocol

The plyometric training program is designed and is divided into three groups : Group I Sand plyometric training (SPTG) (n = 10), group II Land plyometric training (LPTG) (n = 10), and group III control (CG) (n =10).The Plyometric training box is 40cm height and 80cm width. The land Plyometric box is placed in a smooth surface and sand Plyometric box is placed a designed Pit with filtered river sand the size of the pit 3 feet length, 3 feet Width and 2feet depth. Subjects in each training group trained 3 days per week and session and 60 min per day. All subjects continued with their normal athletic training and games.

Statistical Analysis

The selected variables for which data were collected from three groups prior to and after experimentation on selected variables were statistically examined for significant difference, if any, by applying the analysis of covariance (ANCOVA) with the help of SPSS package. The level of significance was accepted at $P < 0.05$.

Results

TABLE –1 : Analysis of Variance & Covariance of Pre, Post and Adjusted Post Test on Speed

	CG	ATWG	ATWOG	Source of Variance	Sum of Squares	df	Mean Squares	F- ratio
Pre-Test Means	7.56	7.56	7.58	BG	0.005	2	0.003	0.01
SD (±)	0.35	0.38	0.38	WG	8.06	57	0.42	
Post - Test Means	7.52	6.81	7.27	BG	5.11	2	2.55	14.28*
SD(±)	0.32	0.46	0.46	WG	10.19	57	0.17	
Adjusted Post - Test Means	7.52	6.82	7.25	BG	5.06	2	2.53	58.73*
				WG	2.41	56	0.04	

* Significant at 0.05 level

Table 1 shows the pre-test means of CG, SPTG, and LPTG on speed. The F-value needed for significance for df (2, 57) at _ < 0.05 level was 3.15. The obtained F-value for the pre-test mean on speed was 0.05 which was not found to be significant. In post test analysis the F-ratio on the speed variable was 14.28. The analysis of covariance adjusted the differences in pre test means with posttest means between the sand and land plyometric training and control groups. The F-value needed for significance for df (2, 56) at < 0.05 levels was. The F-value obtained from testing the adjusted means between the sand and land plyometric training and control groups on speed was 58.73which was statistically significant.

TABLE-2 : Analysis of Variance & Covariance of Pre, Post and Adjusted Post Test on Explosive power

	CG	ATWG	ATWOG	Source of Variance	Sum of Squares	df	Mean Squares	F- ratio
Pre-Test Means	46.20	45.30	45.75	BG	8.10	2	4.05	0.12
SD (±)	5.75	5.84	5.67	WG	1891.15	57	33.17	
Post - Test Means	47.40	51.00	48.90	BG	130.80	2	65.40	1.88
SD(±)	6.13	5.75	5.76	WG	1976.6	57	34.67	
Adjusted Post - Test Means	46.94	51.45	48.90	BG	203.89	2	101.94	160.24*
				WG	35.62	56	0.63	

* Significant at 0.05 level

Table 2 shows that the pre-test means of CG, SPTG, and LPTG on explosive power. The F-value needed for significance for df (2, 57) at _ < 0.05 levels was 3.15. The obtained F-value for the pre-test mean on explosive power was 0.12. It was found to not be significant. In post test analysis the F-ratio on the variables such as explosive power was 1.88. The analysis of covariance is adjusting the differences in pre-means with post-test means between the sand and land plyometric training and control groups. The F-value needed for significance for df (2, 56) at _ < 0.05 levels was missing number!. The F-value obtained from testing the adjusted means between the sand and land plyometric training and control groups on explosive power were160.24. It was found to be significant.

Discussion

The use of plyometric training has been advocated for several years as a means of improving performance in sports and activities in which lower-body power plays a key role in success (Fatouros, 2000).During a plyometric movement, the muscles undergo a very rapid switch from the
eccentric phase to the concentric phase. This stretch-shortening cycle decreases the time of the amortization phase that in turn allows for greater than normal power production (Potteiger, 1999).The muscles stored elastic energy and stretch reflex response are essentially exploited in this manner, permitting more work to be done by the muscle during the concentric phase of movement (Hedrick, 1996). Training programs that have utilized plyometric exercises have been shown to positively affect performance in power-related movements such as jumping (Blattner, 1979).In the present study, improvements were seen in vertical jump height and vertical jump power.

Conclusions

The present study observed 12 weeks of plyometric training in a land and sand environment. It is concluded that the subjects with sand plyometric training group had shown greater improvement comparable to the subjects with land and control groups.

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COMPARISON AMONG DIFFERENT ETHNIC TRIBLES OF NORTH-EAST INDIA ON HEALTH-RELATED PHYSICAL FITNESS

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Abstract

Physical fitness is one of the most critical foundation factors for sports performances. The health-related fitness is basis of physical fitness that is required for sports as well. The health-related fitness status provides valuable information about health status to various governmental agencies for health policy planning, health infrastructure development, providing health services etc. Considering such significance of health-related physical fitness research scholar conceptualized this study to compare and investigate the health-related fitness status of ethnic tribes of Northeast India. For that purpose a total number of 1400 tribal boys and girls from 14 ethnic tribes of seven states of Northeast India for four different groups i.e. 11 – 12 Boys, 11 – 12 Girls, 13 – 14 Boys, and 13 – 14 girls has been tested. AAPHERD Health-Related Physical Fitness namely; One-mile Run, Body Composition, Sit-and-Reach and Sit-ups were selected to test the health-related physical fitness. Data were analyzed by descriptive statistics as well as analysis of variance. Statistical analysis in terms of Analysis of variance revealed existence of significant variability among different tribes on overall health-related fitness status.

Key Words: Health related fitness, Ethnic tribe

Introduction

Physical fitness is one of the most critical foundation factors for sports performances. As it is foundation factor it is prerequisite for better performance in sports. In the continuous search for sports talent, development of sports talent it was necessitated that potential community or populations be identified from whom future sports talent potential etc. could be identified and trained. But considering the feasibility aspect of investigation health-related physical fitness becomes more relevant as it refers multipurpose objectives. This form of fitness is basis of physical fitness that is required for sports as well. The health-related fitness status provides valuable information about health status to various governmental agencies for health policy planning, health infrastructure development, providing health services etc. The study was delimited to minimum two ethnic tribes of seven states of Northeast

India namely : Adi and Akas of Arunachal Pradesh, Mishing and Bodo of Assam, Meities and Kukis of Manipur, Khasi and Garo of Meghalaya, Mara and Lushai of Mizoram, Angami and Chakhesang of Nagaland, Tipeerah and Reang of Tripura and 100 subjects (male and female both) from each tribes with two age groups 11 – 12 years and 13 – 14 years. Timing of testing subjects, climatic conditions, Topography and geographical conditions of different states have considered as the limitations of the study. The aim of this study is to compare and investigate the health-related fitness status of ethnic tribes of Northeast India.

Material and Methods

Subject: Northeast India was purposefully selected as this region of India has been most dominant sporting power of the country. Scholar had also intention to identify the specific ethnic tribe group whose health-related fitness status could be considered as potential for the training of selective sports. For that purpose a total number of 1400 tribal boys and girls form 14 ethnic tribes of seven states of Northeast India namely, Adi and Akas of Arunachal Pradesh, Mishing and Bodo fof Assam, Meities and Kukis of Manipur, Khasi and Garo of Meghalaya, Mara nad Lushai of Mizoram, Angami and Chakhesang of Nagaland, Tipeerah and Reang of Tripura were tested in the different items of health-related physical fitness. Four different groups i.e. 11 – 12 Boys, 11 – 12 Girls, 13 – 14 Boys, and 13 – 14 Girls data were collected in each tribe of each state to find out the differences of health–related physical fitness between the tribes. Of the above sample, 25 subjects have been selected from each tribe in each group.

Procedure: The four items of AAPHERD Health-Related Physical Fitness namely; One-mile Run, Body Composition (Triceps and Subscapulr), Sit-and-Reach and Sit-ups were selected to test the health-related physical fitness. Data of AAPHERD Health-Related Physical Fitness Test of 14 ethnic tribes were analyzed by doing descriptive statistics as well as analysis of variance. The level of significance was set at .05.

Result

The statistical analysis of data collected on 1400 subjects have been presented in Table 1 – 4. Percentile scale has been constructed to convert raw score into standard score. Descriptive statistics were employed to identify the status of central cherecteristics in terms of Measure of Centeral Tendency and simple variability. The One-way Analysis of Variamce was applied for comparing the means of all selected ethnic tribes of each selected states of Northeast India. The F – ratio or hypothesis was tested at .05 Level of Significance.

TABLE-1 : MEAN AND 'F' VALUE OF 11 – 12 YEARS BOYS

Sl No	TRIBES NAME	ONE MILE RUN (min)	PERCENT BODY FAT (%)	SIT UPS (Count)	SIT-AND-REACH (cm)	OVERALL HEALTH STATUS (Stand Score)	F ratio
1.	Mishing	10.88	26.02	27.92	26.52	216.8	
2.	Bodo	10.06	24.90	31.28	30.04	202.8	
3.	Adi	10.36	23.15	27.84	28.04	185.8	
4.	Akas	10.48	23.20	25.88	27.28	226.6	
5.	Kukis	10.08	22.02	34.04	31.20	253.6	3.99*
6.	Meities	10.15	23.02	33.04	31.04	245.6	
7.	Garo	11.68	26.39	23.36	24.28	150.0	
8.	Khasi	10.20	23.73	28.76	26.40	212.8	
9.	Lushai	9.79	21.09	27.04	29.68	235.4	
10.	Mara	10.80	24.64	21.92	25.80	172.4	
11.	Angamis	9.85	24.16	26.84	28.84	223.0	
12.	Chakhesang	9.78	21.73	29.36	28.44	233.8	
13.	Tipeerah	11.64	26.75	27.48	20.92	153.6	
14.	Reang	10.38	26.10	27.24	27.16	191.6	

* Significant at .05 Level. Tab. $F_{.05}(df = 13,336) = 1.79$.

Table-1 reveals that (i) There is a significant difference on health-related fitness among the tribal boys of 11 – 12 years as the calculated F = 3.99 is found to be higher than the tabulated $F_{.05} = 1.79$.

(ii) In One Mile Run test, the mean performance value is concerned the mean value of Chakhesang of Nagaland (9.78 minutes) was recorded best time and Garo of Meghalaya (11.68 minutes) was recorded the worst time.

(iii) In Percent Body Fat, the mean percent body fat is concerned the mean value of Lushai of Mizoram (21.09%) was the best score and Tipeerah (26.75%) of Tripura was the worst score.

(iv) In Sit-ups performance the mean value of Kuki of Manipur (34.04 count) was the best and Mara of Mizoram (21.92 count) was the worst.

(v) In sit-and reach performance the mean value of Kukis of Manipur (31.20 cm) was the best and Tipeerah of Tripura (20.92 cm) was the worst.

(vi) The over all health status is concerned the mean value of Kukis of Manipur (253.6) was recorded best and Garo of Meghalaya (150.0) was the worst.

TABLE-2 : MEAN AND 'F' VALUE OF 11 – 12 YEARS GIRLS

Sl No	TRIBES NAME	ONE MILE RUN (min)	PERCENT BODY FAT (%)	SIT UPS (Count)	SIT-AND-REACH (cm)	OVERALL HEALTH STATUS (Stand Score)	F ratio
1.	Mishing	11.81	26.02	23.08	27.04	181.2	
2.	Bodo	10.68	20.57	30.16	29.28	259.0	
3.	Adi	10.91	24.57	26.84	25.88	208.0	
4.	Akas	11.08	25.84	27.56	26.44	204.8	
5.	Kukis	11.32	26.78	25.92	25.96	190.2	
6.	Meities	10.15	22.04	33.12	28.84	256.8	4.00*
7.	Garo	12.25	29.04	21.44	24.88	145.0	
8.	Khasi	11.83	25.15	25.12	24.20	178.6	
9.	Lushai	9.96	22.04	30.24	28.68	250.8	
10.	Mara	10.23	25.46	26.32	28.04	218.8	
11.	Angamis	10.84	27.25	30.92	28.68	214.6	
12.	Chakhesang	10.40	25.21	32.28	27.28	231.4	
13.	Tipeerah	11.44	26.16	24.16	23.76	170.8	
14.	Reang	11.13	25.61	25.84	24.88	185.6	

* Significant at .05 Level. Tab. $F_{.05}(df = 13,336) = 1.79$.

Table-2 reveals that (i) There is a significant difference on health related fitness among the tribal girls aged 11 – 12 years as the calculated F = 4.00 is found to be greater than the tabulated $F_{.05} = 1.79$.

(ii) In One Mile Run test as far as the mean performance value is concerned the mean value of Lushai of Mizoram (9.96 minutes) was recorded best and Garo of Meghalaya (12.25 minutes) was the worst.

(iii) In Percent Body Fat as far as the mean percent body fat is concerned the mean value of Bodo of Assam (20.57%) was the best and Garo of Meghalaya (29.04%) was the worst.

(iv) In Sit-ups performance the mean value of Meities of Manipur (33.12 count) was the best and Garo of Meghalaya (21.44 count) was the worst.

(v) In sit-and reach performance the mean value of Bodo of Assam (29.28 cm) was the best and Tipeerah of Tripura (23.76 cm) was the worst.

(vi) As far as overall health status is concerned the mean value of Bodo of Assam (259.00 score) was the best and Garo of Meghalaya (145.00 score) was the worst.

TABLE-3 : MEAN AND 'F' VALUE OF 13 – 14 YEARS BOYS

Sl No	TRIBES NAME	ONE MILE RUN (min)	PERCENT BODY FAT (%)	SIT . UPS (Count)	SIT-AND-REACH (cm)	OVERALL HEALTH STATUS (Stand Score)
1.	Mishing	9.18	20.35	26.12	26.72	197.2
2.	Bodo	8.47	20.27	37.20	33.08	262.0
3.	Adi	9.48	19.48	28.16	27.64	209.4
4.	Akas	9.92	20.13	28.88	25.76	198.0
5.	Kukis	8.63	19.20	33.60	31.72	252.4
6.	Meities	8.04	17.62	26.96	30.68	240.2
7.	Garo	10.83	24.29	22.20	25.60	138.0
8.	Khasi	10.63	23.81	24.32	24.64	151.6
9.	Lushai	8.93	16.96	28.04	28.12	228.0
10.	Mara	9.51	19.55	27.44	26.40	202.0
11.	Angamis	7.92	17.12	29.72	31.64	260.6
12.	Chakhesang	8.63	18.08	27.88	30.16	234.8
13.	Tipeerah	11.09	23.09	25.56	24.84	155.0
14.	Reang	10.42	22.64	24.20	26.12	170.0

* Significant at .05 Level. Tab. $F_{.05}$ (df = 13,336) = 1.79.

Table-3 reveals that (i) There is a significant difference on health related fitness among the tribal boys aged 13 – 14 years as the calculated F = 6.59 is found to be greater than the tabulated $F_{.05}$ = 1.79.

(ii) In One Mile Run test as far as the mean performance value is concerned the mean value of Angamis of Nagaland (7.92 minutes) was recorded best and Tipeerah of Tripura (11.09 minutes) was the worst.

(iii) In Percent Body Fat as far as the mean percent body fat is concerned the mean value of Lushai of Mizoram (16.96%) was the best and Garo of Meghalaya (24.29%) was the worst.

(iv) In Sit-ups performance the mean value of Bodo of Assam (37.20 count) was the best and Garo of Meghalaya (22.20 count) was the worst.

(v) In sit-and reach performance the mean value of Bodo of Assam (33.08 cm) was the best and Khasi of Meghalaya (24.64 cm) was the worst.

(vi) As far as overall health status is concerned the mean value of Bodo of Assam (262.00 score) was the best and Garo of Meghalaya (138.00 score) was the worst.

TABLE-4 : MEAN AND 'F' VALUE OF 13 – 14 YEARS GIRLS

Sl No	TRIBES NAME	ONE MILE RUN (min)	PERCENT BODY FAT (%)	SIT UPS (Count)	SIT-AND-REACH (cm)	OVERALL HEALTH STATUS (Stand Score)	F ratio
1.	Mishing	9.34	18.67	30.56	27.92	192.2	
2.	Bodo	9.21	18.74	34.08	30.52	216.8	
3.	Adi	9.09	17.92	33.80	29.96	218.6	
4.	Akas	8.33	15.54	36.28	31.76	252.2	
5.	Kukis	8.99	18.96	33.92	30.20	222.2	
6.	Meities	8.14	16.33	34.52	29.92	242.8	4.33*
7.	Garo	10.04	19.80	24.04	25.68	148.8	
8.	Khasi	10.15	20.59	25.56	26.24	153.4	
9.	Lushai	8.75	18.26	32.20	26.44	203.8	
10.	Mara	8.46	18.52	31.48	28.92	209.0	
11.	Angamis	7.99	15.35	35.76	32.04	262.4	
12.	Chakhesang	8.04	18.02	32.36	28.68	227.8	
13.	Tipeerah	10.35	15.95	22.80	27.92	172.8	
14.	Reang	9.99	18.87	25.28	26.24	176.4	

* Significant at .05 Level. Tab. $F_{.05}$ (df = 13,336) = 1.79.

Table-4 reveals that (i) There is a significant difference on health related fitness among the tribal girls aged 13 – 14 years as the calculated F = 4.33 is found to be greater than the tabulated $F_{.05}$ = 1.79.

(ii) In One Mile Run test as far as the mean performance value is concerned the mean value of Angamis of Nagaland (7.99 minutes) was recorded best and Tipeerah of Tripura (10.35 minutes) was the worst.

(iii) In Percent Body Fat as far as the mean percent body fat is concerned the mean value of Angamis of Nagaland (15.35%) was the best and Khasi of Meghalaya (20.59%) was the worst.

(iv) In Sit-ups performance the mean value of Akas of Arunachal Pradesh (36.28 count) was the best and Tipeerah of Tripura (22.80 count) was the worst.

(v) In sit-and reach performance the mean value of Angamis of Nagaland (32.04 cm) was the best and Garo of Meghalaya (25.68 cm) was the worst.

(vi) As far as overall health status is concerned the mean value of Angamis of Nagaland (262.40 score) was the best and Garo of Meghalaya (148.80 score) was the worst.

Discussion

Findings from statistical analysis have revealed and established significant differential status in terms of health-related fitness among the two selected age and sex groups of fourteen (14) tribes. Health and fitness status of a population specify ethnic tribal groups are direct depiction of genetical endowment as well as lifestyle, the common livelihood patterns, cultural ethos, believes and their genetical endowment. In addition to these factors diatec pattern based on local availability of corps etc. also plays significant role in the determination of physical structure. Hence, it can be said health and fitness status of any given ethnic tribe is manifestation of resultant effect of all the above factors. Though the tribes living in hilly areas of these seven states were off from similar geographical terrain and altitude, Diatec pattern, local corps as a stable food, lifestyle etc. and cultural ethos were significantly different and hence differential health status was found. Among the hilly tribes Mara, Garo, Khasis are dominated by matriarchal system and were found significantly poorer physical prowess when compared to their counterpart hilly tribes like Kukis, Meities, Chakhesang, Angamis, Adis, Akas who have history of active lifestyle, warrior culture, dietary emphasis, celebration of festivals with games and local sports which involves local form of combative etc. Among the plain tribes Bodos largely depending on agriculture, absolute believer of warrior culture and celebration of festivities with sports which requires physical prowess were found to be superior fitness status in contrast to the other ethnic plain tribes namely Mishing, Tipeerah and reang who have history of living contended life, dominated by other tribes, timid and docile and no culture of warrior clan development which might have made them lesser physically active.

Conclusion

In the process of conducting and successfully completing this study research scholar had extensively revealed critical literatures deliberated with experts, statistical findings have been critically discussed in the light of facts and reasons. On the basis of all above the research scholar would like to infer judiciously following conclusions:

1. The fourteen ethnic tribal namely Mishing, Bodo, Adi, Akas, Kukis, Meities, Garo, Khasi, Lushai, Mara, Angamis, Chakhesang, Tipeerah and Reang who were compared on health-related physical fitness were found to be of varying level of fitness status. The trend in the fitness status for the boys and girls of two age groups were found to be as follows:

- The fitness trends of 11 to 12 years boys were as Kukis> Meities> Lushais> Chakhesang> Bodos> Angamis> Adis> Khasis> Akas> Reang> Mishing> Mara> tipeerah> Garos.
- The fitness trends of 11 to 12 years girls were as Bodo> Meities> Lushai> Chakhesang> Mara> Angamis> Adis> Akas> Kukis> Reang> Mishing> Khasis> Tipeerah> Garos.
- The fitness trends of 13 to 14 years boys were as Bodo> Angamis> Kukis> Meities> Chakhesang> Lushai> Adis> Mara> Akas> Mishing> Reang> Tipeerah> Khasi> Garos.
- The fitness trends of 13 to 14 years girls were as Angamis> Akas> Meities> Chakhesang> Kukis> Adis> Bodo> Mara> Lushai> Mishing> Reang> Tipeerah> Khasis> Garos.

2. Based on statistical findings with statistically significant criteria the tribe groups namely Bodos, Kukis, Meities, Adis, Akas, Lushai, Angamis and Chakhesang were found to be superior than the Mishing, Garo, Khasi, Mara, Tipeerah and Reang.
3. The ethnic tribal groups irrespective of belonging to geographical location whether plain or hilly terrain topography were found to be of high fitness status as well as low fitness status. As the findings showed hill tribe namely Kukis, Meities, Lushai, Angamis, Chakhesang, Adis and Akas were of superior health-related fitness status. While ill tribes Mara, Garos and Khasis were of lower fitness status.
4. Similarly Bodos of plain tribe were found to be superior in fitness status while other plain tribes like Mishing, Tipeerah and Reang were of lower fitness status.
5. It is also concluded more than topographic location of the ethnic tribal groups it is dietary habits, cultural ethos, lively hood, trend which were significantly crucial factor in determining the health status of the tribes.
6. Bodos, Kukis, Meities, Angamis, Chakhesang, Adis, Akas and Lushai who were found to be superior level of health-related physical fitness status can be considered for further specific physical fitness test and could be oriented to training in games and sports to identify feature potential talent.
7. The Govt. of India, Dept. of Health of concerned States, health policy makers should note the poor status of health-related fitness status of the tribes Garo, Khasis, Mishing, Tipeerah and Reang. For remedial actions and investigate upon the factor causing the inferior health status.
8. In the process of conducting and completing this study the research scholar have developed percentile Scale based norms for converting raw score to the Standard score for meaningful interpretation of overall health status. It is recommended that this

scale can be utilized by research scholars conducting investigation on health-related fitness for the tribal people.

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EFFECT OF STAIR CLIMBING AND SAND DUNE RUNNING ON SELECTED ENDURANCE PARAMETERS AMONG FOOTBALL PLAYERS

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Abstract

Stair climbing and sand dune running training are suitable exercises to burn fat and improves the condition of heart and lungs. The aim of this research is to find out the effect of stair climbing and sand dune running on selected endurance parameters. For this purpose, randomly selected thirty football players from different departments of Annamalai University were divided into three groups, stair climbing, sand dune running and control group. Stair climbing exercise group after a warm up for 5 minutes underwent climbing stairs having 18 steps with vertical height of 3 meters with variation of slow, medium, high, medium and slow speed walk and sprints alternatively and finished each session with cool down exercises. Sand Dune running group, after a warm up for 5 minutes underwent climbing sand dune with vertical height of 4 meters and elevation at 45° with variation of slow, medium, high, medium and slow speed running alternatively and finished each session with cool down exercises and the sessions lasted for 40 minutes in each day, on alternate days, forming three days a week and for eight weeks. Statistical analysis of pre and post test means through ANCOVA and Scheffe's post hoc test proved that there was significant improvement in selected endurance variables, strength endurance and cardiorepiratory endurance due to stair climbing training and sand dune running. It was concluded that stair climbing can be better utilized for improving endurance variables than sand dune running, especially among football players.

Key words : Stair Climbing, Sand Dune Running,Strength Endurance, Cardio respiratory Endurance.

Introduction

Stair climbing training is a suitable exercise to burn fat and improves the condition of heart and lungs. Lejeune et.al. (1996)reported that walking or running on sand, has a profound

effect on the mechanics and energetics of locomotion. Walking on sand requires 2.1-2.7 times more energy expenditure than does walking on a hard surface at the same speed; while running on sand requires 1.6 times more energy expenditure than does running on a hard surface. Currently there is wide interest to identify the most effective methods of training for strength and endurance development and this is of special significance for physical education programmes in schools and colleges. Training is usually defined as systematic process of repetitive, progressive exercise or work involving the learning process and acclimatization. (Lawrence, 2002). Evidences showed the difference between the trained and untrained individuals that the former is able to increase the cardiac output and transport oxygen to the working muscles at a higher rate than the latter (Clark and Albert, 1952).Muramatsu et.al. (2006)investigated the energy expenditure of jumping on sand and on a firm surface and found the energy expenditure of jumping in the sand condition was equivalent to 119.4 +/- 10.1% of the one in the firm surface condition. Moritz and Farley (2006)found that humans simultaneously adjust leg compression magnitude and timing, as well as mechanical work output, to conserve center of mass dynamics on damped surfaces, hence runners may use similar strategies on natural energy-dissipating surfaces such as sand, mud and snow for improved strength endurance. The purpose of this research was to find out the effect of stair climbing and sand dune running on selected endurance parameters among football players.

Methodology

To achieve the purpose pre and post test random group research design was adapted and thirty football players from various departments of Annamalai University, were randomly selected and their age group was between 18 to 23 years. The were divided into three groups (n = 10) as Group I, Group II and Group III, in which Group I underwent stair climbing and Group II underwent sand dune running for a period of eight weeks and Group III acted as control group. Stair climbing exercise group after a warm up for 5 minutes underwent climbing stairs having 18 steps with vertical height of 3 meters with variation of slow, medium, high, medium and slow speed walk and sprints alternatively and finished each session with cool down exercises. Sand Dune running group, after a warm up for 5 minutes underwent climbing sand dune with vertical height of 4 meters and elevation at 45° with variation of slow, medium, high, medium and slow speed running alternatively and finished each session with cool down exercises and the sessions lasted for 40 minutes in each day, on alternate days, forming three days a week for eight weeks.

Strength endurance, assessed by Bent knee sit ups, and Cooper's 12 minutes run / walk test for measuring cardio respiratory endurance of the subjects were selected as

endurance variables. The collected data prior to and after completion of the experimental period on selected variables were statistically examined by applying Analysis of Covariance (ANCOVA). In all the cases to test the significance, 0.05 level of confidence was fixed. Since three groups were involved, whenever significant results were found, Scheffe's post-hoc test was used to find out the significant difference between the paired means of groups.

Results

Table-1 : Results on Calculation of Analysis of Covariance on Endurance Variables

Calculation of Analysis of Covariance on Strength Endurance								
	Stair Climbing Group	Sand Dune Running Group	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained F
Pre Test Mean	39.10	40.80	40.70	Between Within	18.2 412.6	2 27	9.10 15.28	0.60
Post Test Mean	44.40	43.10	41.50	Between Within	42.2 423.8	2 27	21.10 15.70	1.34
Adjusted Post Test Mean	45.40	42.55	41.04	Between Within	94.5 80.6	2 26	47.25 3.10	15.24*
Mean Diff	5.30	2.30	0.80					
Calculation of Analysis of Covariance on Cardiorespiratory Endurance								
Pre Test Mean	1994	2059	2086	Between Within	44727 473370	2 27	22363 17532	1.28
Post Test Mean	2245	2185	2109	Between Within	92907 455390	2 27	46453 16866	2.75
Adjusted Post Test Mean	2285	2175	2078	Between Within	196986 172391	2 26	98493 6630	14.85*
Mean Diff	251	126	23					

Required $F_{(0.05)(2,27)} = 3.354$, $F_{(0.05),(2,26)} = 3.369$ *Significant

Table-2 : Scheffe's Post Hoc Analysis Results

Post Hoc Analysis for Strength Endurance				
Stair Climbing Group	Sand Dune Running Group	Control Group	Mean Difference	Reqd. C.I
45.40	42.55	41.04	2.85*	2.04
45.40		41.04	4.36*	2.04
	42.55		1.51	2.04
Post Hoc Analysis for Cardiorespiratory Endurance				
2285.46	2175.21		110.26*	94.53
2285.46		2078.33	207.13*	94.53
	2175.21	2078.33	96.88*	94.53

*Significant

Discussion

The results presented in Table 1 and 2 proved that stair climbing has significantly improved strength endurance, as measured by bent knee sit ups than sand dune running and control groups. It was also found that stair climbing and sand dune running trainings were significantly improved cardio respiratory endurance comparing to control group. While comparing between the treatment groups, it was found that stair climbing is better than sand dune running.

Lejeune et al. (1996) reported sand running requires 1.6 times more energy expenditure than does running on a hard surface. Muramatsu et al. (2006) investigated and found the energy expenditure of jumping on sand was less than in walking and close to in running. Moritz and Farley (2006) suggested runners may use surfaces such as sand, mud and snow for improved strength endurance. Gottschall et al. (2010) recommend for double step stair climbing for improved metabolic and muscular strength. Koegelenberg et al. (2008) was of view that stair climbing may replace formal exercise testing at much lower costs. The findings of this study are in agreement with the theoretical knowledge cited in respect of stair climbing and sand dune running.

Conclusion

It was concluded that the stair climbing and sand dune running programs has resulted in significant improvement on endurance variables and stair climbing can be better utilized for improving endurance variables than sand dune running, especially among football players.

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SPORTS COMPETITIVE ANXIETY AMONG SOFTBALL PLAYERS: A PSYCHOLOGICAL PROBE

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Abstract

The purpose of the present investigation was to examine the sports competitive anxiety between medalist and non-medalist male softball players. In the present study, the subjects for data collection were collected from All India Inter-university male softball championship. The subjects were purposively selected in case of medalist and randomly in case of non-medalist. The sample consisted of seventy six (N=76) Inter-university male softball players which further divided into two groups (n=38) medalist and (n=38) non-medalist male players in the age group of 17 to 25 years. To measure the level of sports competitive anxiety of the subjects, sports competition anxiety test constructed by Marten's (1977) was applied. The't' test was applied to find out the significant differences between medalist and non-medalist male softball players. The results revealed significant differences between medalist and non-medalist male softball players on the variable sports competitive anxiety. It has been observed that medalist group had exhibited moderate anxiety level than their counterpart non-medalist group which demonstrated higher level of competitive anxiety.

Keywords : Sports competitive anxiety, medalist, non-medalist, softball players

Introduction

Performing to the best of abilities has become more relevant in today's sports, because of the extensive media exposure. Sports are at the peak of their popularity all throughout the world, cutting across the barriers of richness or poverty, nationality, race or religion. In order to sustain the tremendous expectations of the fans and also to maintain a high ranking in the international arena, it is important to perform well. Self confidence, strong resolve and humility to accept defeat are the best tools to counter the effects of anxiety. Anxiety is not a disease that a sportsperson can get rid of, once and for all. It has to be used as a booster to improve performance, to achieve sporting glory.

Anxiety can be classified in two ways; trait anxiety and state anxiety. State anxiety is situational stress induced by situations in the game. A sportsperson's autonomic nervous system is aroused in this state which is the natural reaction of any individual. On the other hand, trait anxiety can be thought of as a world view that an individual uses when coping with stress. In sports, individuals who are state anxious and low on the trait anxiety in tough situations, often deliver good performances consistently. Whereas, athletes who have higher levels of trait anxiety, added with the state anxiety, tend to perform below expectations. According to Link (1993) anxiety starts gradually and increases step by step. In case not to be controlled, it rises and irritates the people. Anxiety indications may be bone pains, being tired, headache, nervous, poor sleeping, forgetting, hesitations, hypochondriacs etc.

Freud (1936) revealed that anxiety is something felt, unpleasant effects of state or condition. This state is characterized by all that is covered by the word nervous apprehension or anxious expectation and different discharge phenomena. Competitive anxiety is a negative emotional state that is generated when a person feels unable to cope with competitive demands. This subjective perception of failure resulting loss of self-esteem. The increase mental stress of sports competition can cause player to react both psychologically and physiologically in a manner that can negatively affect their sports performance. They may become tense, faster heart beat, cold sweat; they worry about their performance in their competition and they find it hard to concentrate on their events/games. Such situation clearly indicates towards anxiety, which is often faced by the players during the competitions. Anxiety is produced by the fear of failure in an sport competition. Athletes are not only afraid of losing the contest or scoring less point than usual, but not performing as well as they have expected to. Psychologically, anxiety is a very important phenomenon. Therefore, the present study was conducted to assess the differences between medalist and non-medalist male softball players on the variable sports competitive anxiety.

Method

In the present study, the subjects were from All India inter-university male softball championship. The subjects were purposively selected in case of medalist and randomly in case of non-medalist. The sample consisted of seventy six (N=76) Inter-university male softball players which further divided into two groups (n=38) medalist and (n=38) non-medalist male players in the age group of 17 to 25 years. Sports competition anxiety test developed by Marten's (1977) was applied. The't' test was applied to find out the significant differences between medalist and non-medalist male softball players.The level of significance was set at 0.05.

Results

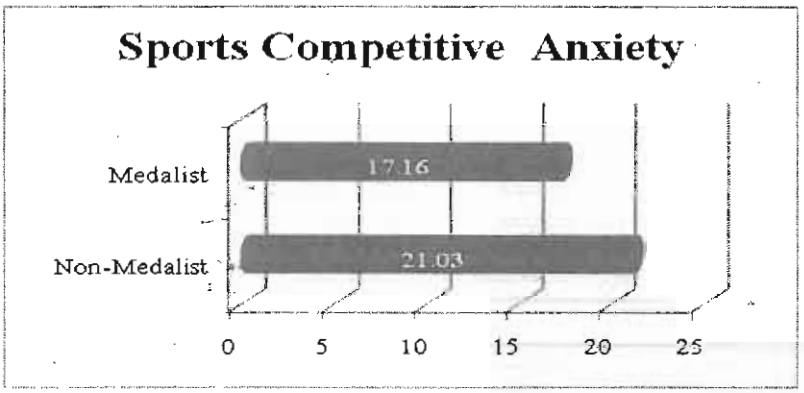
TABLE-1 : Sports Competitive Anxiety of Medalist and Non-medalist Male Inter-University Softball players

S. No.	Variable	Medalist Players = 38		Non-Medalist Players = 38		Mean Diff.	SEDM	t-value
		Mean (Score)	SD	Mean (Score)	SD			
1	Sports Competitive Anxiety	17.16	3.796	21.03	3.650	3.87	0.854	4.531*

*Significant at 0.05 level t >2.00(df=74)

The results shown in Table-1 indicate significant differences on the variable of Sports Competitive Anxiety between medalist and non-medalist male softball players. The medalist players had mean value 17.16 and SD value 3.796 whereas non-medalist players had mean value 21.03 and SD value 3.650. The 't'-value 4.531 as shown in the table-1 was found significantly higher than the table value of 2.00 which was required to be significant at 0.05 level of significance with (df=74). Medalist players had exhibited moderate sports competitive anxiety than the non-medalist players who had demonstrated higher competition anxiety (Fig-I).

Figure-I : Sports competitive anxiety between medalist and non-medalist male softball players



Discussion

Anxiety is uneasiness and feeling of foreboding when a person is about to embark on a hazardous venture, it is often accompanied by strong desire to excel. Sports performance

nearly every concern of human endeavor is thought to be affected somehow by anxiety. It is evident from the obtained mean values that the medalist players demonstrated moderate competitive anxiety than the non-medalist players who had higher level of competitive anxiety because of less competitive experience/exposure. Morgan and Johnson (1978) revealed that successful athletes possess higher perceived ability, greater satisfaction and a lower state of anxiety than less successful athletes. Marten et al. (1975) described relationship of competitive anxiety and sports performance and found that state anxiety registered by a person in a competitive situation is determined by the person's perception of the likelihood of success. Cratty (1973) reported that all anxiety is not disruptive. An optimum level seems to be needed to perform well. On the other hand, if the athlete is too anxious performance is likely to be less desirable. Further, it can be observed that anxiety is a general trait as well as a temporary state of being and makes it clear that a moderate amount of anxiety in players is often an aid to excel better in sports competitions/situations.

Conclusion

It can be concluded from the above findings that significant differences were found between medalist and non-medalist softball players in sports competitive anxiety. It is further concluded that medalist male softball players had exhibited controlled sports competitive anxiety than non-medalist male softball players who on the contrary demonstrated higher sports competitive anxiety.

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AN EXPERIMENTAL APPROACH TO PSYCHOMOTOR EDUCATION IN PRESCHOOL EDUCATION

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Abstract

The purpose of this study is to present the results arrived at as a result of the implementation and evaluation of an experimental program of psychomotor education for preschool children. The research sample was 116 children aged 3 - 4 years old who were attending public preschool classes in Symbiosis International School during the school year 2006 - 2007. The children were split in two groups (experimental and control group). The research process was comprised by three phases: psychomotor skills testing at the beginning of the year, implementation of the psychomotor program in the experimental group (for 12 consecutive weeks), and further psychomotor testing which evaluated the effectiveness of the program. Data collection was carried through the 'checklist of psychomotor ability' by Kalliopi Trouli, 2003, was used for the data collection which comprised of 90 items. The research results showed that the experimental program of psychomotor education, which was followed for the experimental group, resulted in the improvement of psychomotor skills assessed by the checklist (those were body concepts and skills, space concepts, and time concepts) in comparison with the control group which followed a typical preschool class schedule. The overall progress of the experimental group was statistically significant ($t = 9.441$, $df = 114$, $p < .001$). The findings of this research showed that psychomotor education can play a decisive role in the development of fundamental concepts such as body, space, time.

Keywords: Psychomotor Education, Preschool Education.

Introduction

Psychomotor education is a type of education which uses body activity to achieve the holistic development of the child : body, mind and social development (Zimmer, 2007; De Lievre, & Staes, 2006). This type of education, which promotes the contemporary needs for academic, social and athletic success, should have a primary place in preschool

education, according to Bolduc (1997). Through psychomotor education the children acquire and develop abilities and skills which give them the potentiality to physically and mentally adapt various conditions and solve problems they come through during the exploration of the environment. Through this process, the mental image children develop for their body is going to function as a point of reference for movement in space. In this way, children learn to organize themselves in space in relation to objects and the others. The development of this movement awareness comes along with time awareness. The body, space and time are, therefore, fundamental concepts which the children have to grasp and develop during their preschool years since those concepts comprise the basic components of people's psychomotor development. Through the use of psychomotor activities, psychomotor education connects theory to practice and reinforces the experiential and active development of knowledge. It becomes a prime means for approaching and teaching about body, space and time. Furthermore, psychomotor activities which combine the fundamental concepts with their body ascription follow the basic principle of cross thematic teaching which is the concept–centred organization of school knowledge, according to Matsagouras (2004). Based on the above theoretical basis an experimental research was devised which aimed at exploring the effect of a specially designed program of psychomotor education for the development of fundamental cross thematic concepts and skills in children of preschool age. The main research hypothesis was that children following this program would achieve better performance in learning the body, space and time concepts than those which follow a typical preschool schedule.

Method

Participants

The research sample was 116 children aged 3 – 4 years old attending public nursery schools in Symbiosis International School during the school year 2006 - 2007.

Psychometer abilty Test

The constructed 'checklist of psychomotor ability'by Kalliopi Trouli, 2003, was used for the data collection which comprised of 90 items. This checklist included items that assessed the development of body concepts and skills (recognition of body parts, movement execution following verbal descriptions, reproduction of a body posture and gesture following a model, recognition and distinction of fingers), space concepts (up/down, front/back, behind, right/left, on the child's body, one upon the other, relations to objects with different space orientation etc.), time concepts (movement execution in a specific order, reproduction of rhythm units). The checklist internal consistency was high according to Crombach Alpha coefficient ($\alpha = .891$).

Procedure

The participants were split in two groups (the experimental and the control group). There were 53 children in the experimental group and 63 in the control group (this difference was due to the different population of the physical education classes). Following that, an experimental process was designed in three phases. In the first phase, at the beginning of the school year, an assessment of psychomotor skills and abilities of all the children in both groups was done. Afterwards, the program in the classes that comprised the experimental group (45 minutes, twice a week, for 12 consecutive weeks) was implemented, whilst the control group followed a typical nursery schedule. In the third phase there was a new assessment of all the children, which evaluated the effects of the experimental program.

Data Analysis

The statistical package SPSS was used for the analysis of the data. Inductive analysis which was carried out for the testing of the research hypothesis compared the two group performances before and after the implementation of the program. Thus, t-test was used for independent samples. The significance level was set at $p < .05$. The equivalence of the two groups in all the psychomotor items was also tested before the program implementation ($t = -.943$, $df = 114$, $p = .348$).

Results

Table 1 shows the means and standard deviations of the two groups (experimental and control group) in the items that measured the knowledge, understanding and awareness of body, space and time concepts, before and after the implementation of the program. The analysis shows that there is statistically significant difference between the means of the experimental and control group after the implementation of the program. More specifically, the experimental program of psychomotor education implemented helped the experimental group to improve in the following: a) body concepts and skills ($t = 8.356$, $df = 114$, $p < .001$), b) space and space orientation concepts ($t = 6.921$, $df = 114$, $p < .001$) and c) time concepts ($t = 7.257$, $df = 114$, $p < .001$) in comparison with the control group which followed a typical nursery schedule. The overall improvement of the experimental group in the psychomotor items ability was statistically significant ($t = 9.441$, $df = 114$, $p < .001$).

Table 1 Means and Standard Deviations of the Performance for the Two Groups before and after the Experimental Program

Items	Experimental group		Control group		Experimental group		Control group	
	Pre-test Mean	Pre-test SD	Pre-test Mean	Pre-test SD	Post-test Mean	Post-test SD	Post-test Mean	Post-test SD
Body concepts & skills	33.28	5.924	34.51	7.284	46.42	4.276	37.37	7.223
Space & space orientation concepts	12.42	3.968	13.24	4.599	19.66	3.391	14.76	4.230
Time concepts	8.98	3.377	9.00	3.394	14.00	2.287	10.13	3.424
Total of psychomotor ability	54.679	10.681	56.746	12.601	80.075	7.822	62.54	12.319

Discussion

The results of the research showed that children who followed the experimental program of psychomotor education had better performance in the items which tested their knowledge, understanding and awareness of basic body, space and time concepts. Findings of the research are in agreement with those of other experimental studies which used movement to achieve learning in preschool years (Goti, Derri, & Kioumourtzoglou, 2006; Riga, 2005; Zaragas 2005; Kampas, Proviadaki, Kelaraki, & Xanthi, 2003; Trouli 2003). The above research studies focused on learning different body, space and time concepts and skills in different manifestations as well as the use of movement to achieve reading and handwriting skills. Current research regarding children's practice in psychomotor activities highlights that experience of body, space and time concepts through and within movement can help children improve their movement control, orientation skills, self-esteem, sense of security, and the children's confidence on their own mental skills, and enables the transfer of this knowledge in other areas (De Lièvre, & Staes, 2006; Weikart, 1987; Le Boulche 1984). In this experimental program, movement became the means to the activation of children's thinking and learning of basic cross thematic concepts and skills. The research findings, although of a limited validity and generalization due to the small size of the sample, showed that psychomotor education can play a vital role in the learning of fundamental concepts (body, space, time), which are also offered for cross thematic and interdisciplinary teaching in preschool education.

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RELATION BETWEEN KNEE ANGLE AND PERFORMANCE IN VERTICAL JUMP

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Abstract

Purpose of the study was to analyze and understand the relation between knee angle and vertical jumping height .Twenty four male subjects within the age ranged from 14 to 22 years were selected as subjects. Performance in vertical jumping was measured for different knee flexion within the range of 60° to 130°. Knee angle for jumping was controlled by a dip regulator. The knee angle was measured by a manual Goniometer. Results indicated that the vertical jumping performance increased with the increase of knee angle from 60° to 110° and thereafter the vertical jumping performance decreased with increase of knee angle. The heighest vertical jumping performance was obtained with the knee angle of 110°. Values of coefficient of correlation confirmed the positive relation between knee angle and vertical jumping height for the range from 60° to 110° of knee angle and negative relation for the range from 110° to 130° of knee angle.

Key words: Vertical jump, Depth jump, Fundamental movement.

Introduction

Vertical jump is a fundamental and basic movement exercise used in a wide variety of games and sports. It is also used as an exercise to improve leg explosive strength. For this importance considerable interest has been focused on understanding the nature of vertical jump. A number of research studies have been done to analyze different mechanical parameters involved in this exercise and their influence on the jumping performance. Martin and Stull (1969) and Wilson (1975) experimented with effect of different foot spacing on vertical jumping performance. Bosco (1983), Brown et al. (1986) and McGown et al. (1983) conducted research on effect of depth jumping on improvement of leg power. Clarke and Smith (1978) and Sargent (1969) worked on the effect of the combination of knee angle and foot spacing on performance of vertical jump. Present investigation was planned to analyze the relationship between knee angle and performance in vertical jump.

Procedure

Twenty four male school and college students within the age group of 14 to 22 years, volunteered as subjects for the present study. The mean age, weight and standing vertical reach of the subjects were 17.9±1.8 years, 51±7.5 Kg and 210±9.5cm respectively. The subjects were allowed to take initial stance for jumping with foot spacing between 5" to 10" as per findings of Martin and Stull (1969). From stance the subject flexed hip, knee and ankle joints to lower body's Cg to achieve a position for vertical jump with a particular knee angle. The knee angle was measured by a manual Goniometer. From this position the subject jumped vertically upward as high as possible and put a mark on the wall at the highest reach. The difference between the highest reach with a jump and the standing reach was considered as the vertical jumping performance for that knee angle. Following this procedure Vertical jumping heights of the subjects were measured for seven different knee angles from 60^0 to 130^0 with an interval of 10^0.

Results and discussion

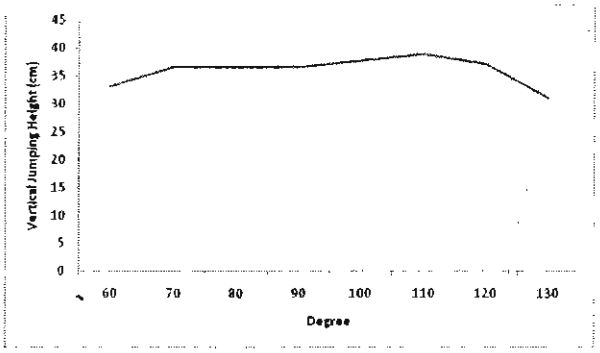
The mean values of vertical jumping height for different knee angles have been shown in Table –I.

Table-I : Mean vertical jumping height for different knee angles

Knee angle (Degree)	Vertical jumping height (cm)
60°	33.16 cm
70°	36.55 cm
80°	36.58 cm
90°	36.60 cm
100°	37.86 cm
110°	39.00 cm
120°	37.19 cm
130°	31.12 cm

It is seen from the table values that the vertical jumping height was increasing with increase of knee angle from 60^0 to 110^0. After that the vertical jumping height decreased gradually with the increase of knee angle. Change of vertical height with increase of knee angle from 60^0 to 130^0 has been shown in Fig. 1. It is seen from the figure that the highest vertical jumping height was achieved with the knee angle of 110^0 before which the jumping height showed increasing trend. But after 110^0 the jumping height showed decreasing trend.

Figure-1 : Changes of vertical jumping height with increase of knee angle



To analyze the relationship between knee angle and vertical jumping height, the co-efficient of correlation was computed between knee angles and respective vertical jumping height for two different ranges. Table –II shows the results.

Table-II : Coefficient of correlation between jumping height and knee angle

Range of knee angle	Co-efficient of correlation (r)
60^0 -110^0	0.83
110^0 - 130^0	-0.95

From the table values of coefficient of correlation, it is clearly understood that there was a highly significant positive correlation between knee angle and vertical jumping height for the range from 60^0-110^0 and there was a highly significant negative correlation between knee angle and jumping height for the range beyond 130^0.

From the above results the following regression equations were developed.

For the range of 60^0-110^0, the equation was:

$$Y = 0.09506x + 32.4292$$

For the range of 110^0 - 130^0, the equation was:

$$Y = 58.242 - 0.16335\ x$$

Discussion on the Results

Results of the present study indicated that the there was a positive correlation between knee angle and vertical jumping height from 60 to 110 degrees, and thereafter the relation becomes negative. When compared this results with those of other leading

researchers, it becomes evident that Hess (1975) reported better vertical jumping height with initiated movement for the range of 65 to 95 degrees of knee angle. In another study Martin and Stull (1969) reported that the greatest vertical jumping height was obtained for the knee angle of 115 degrees. Difference between the results of the present study and those of others might be due to the fact that the subjects of the present study were rather different in respect of physical maturity and training.

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RELATIONSHIP OF SELECTED BIOMECHANICAL VARIABLES TO THE TECHNIQUE OF FRONT FOOT OFF- DRIVE IN CRICKET

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Abstract

The purpose of the study was to determine the relationship between selected kinematic variables to the technique of Front Foot Off Drive in Cricket. Five (N=5) male cricket players who represented LNIPE, Gwalior, were selected as subjects for the study. Sequential photography technique was used to film the subjects. Joint Point Method was used in order to obtain the values of selected angular kinematic variables from developed stick figure. Height of Center of Gravity was calculated by segmentation method. To determine the degree of relationship between selected kinematic variables with the batting performance in front foot off- drive, Pearson's Product Moment Correlation Method was used. The results have shown the significant values of coefficient of correlation at right hip joint and left hip joint at the moment stance and left knee joint at the moment contact. Insignificant relationship was shown between the height of center of gravity at the selected moment of the subjects in front foot off drive.

Keywords : Kinematic Analysis, Back Lift, Front Foot Drive, Center of Gravity

Introduction

Earlier studies have illustrated the biomechanical principles related to cricket batting and evaluated the effectiveness of coaching cues Davis (1983); Elliot *et al.* (1993); Stretch *et al.* (1995). However most of the studies have addressed the descriptive (kinematic and kinetic) aspects of the game. Gibson and Adams (1989) used a split-image filming technique to examine the time course of the batting action of an international batsman when facing a fast medium bowler and a bowling machine set at same velocity.

Since Drives are the basic strokes in cricket. The post-impact bat horizontal velocity for the drive was significantly greater than that for the forward defensive stroke where there is less of a follow-through, as it is a defensive stroke. Given that batting is such an important part of the game, it is surprising that little biomechanics research has been undertaken in this area of the sport. The biomechanics of the off-drive and on-drive have been found to be very similar, with only minor differences occurring in their execution. Batting in cricket is a quintessential example of a dynamic interceptive action in sport, and an ideal vehicle for studying interactions between perception and action (Stretch *et al.* 2000). The aim of the drive is to hit the ball with sufficient force to score runs, while still maintaining control of the ball (Stretch *et al.*, 1998). The success of the stroke can be ascertained from the resultant end-point linear speeds and the interaction between bat and ball. Stretch *et al.* (1998) reported that, in the drive, which requires the ball to be hit with both power and accuracy. The post-impact bat horizontal velocity for the drive was significantly greater than that for the forward defensive stroke where there is less of a follow-through, as it is a defensive stroke.

Therefore, the research scholar felt worth while to investigate the front foot off drive technique so that a good technique is determined and coaches, Physical Education teachers will be able to employ it for better performance. Thepurpose of thisstudy wastoidentify the relationship of selected kinematic variables to the technique in front foot off drive.

Methods

The subjects for the present study were five (N=05) male cricket players from LNIPE, Gwalior. All subjects ranged between the chronological age of 18-24 years and were right handed batsman who participated in the West-Zone Intervarsity tournament for LNIPE, Gwalior. To determine the degree of relationship between selected kinematic variables with the batting performance of Front Foot Off Drive in Cricket, Pearson's Product Moment Correlation Method was used.

Criterion Measures

The technique of front foot off drive in cricket of each selected subjects were taken as the criterion measures for the purpose of the present study. The technique was recorded on the basis of the following Criteria which is explained in Table-1.

Table-1 : EVALUATING CRITERIA OF FRONT FOOT OFF DRIVE IN CRICKET

Sl.No.	*Components*	*Points*
1.	Stance	2
2.	Back lift	2
3.	Footwork	2
4.	Downswing & Impact	2
5.	Follow-through	2
	Total	10

Procedure of Collection Data

The technique of the subjects, filming protocol, analysis and the way anthropometric measurements obtained are described as under.

Technique of the Subjects

The technique of the subjects on front foot off drive in cricket was collected on the basis of evaluation by three judges. The score of the judges were considered as the final points obtained by each batsman.

Collection of Data and Filming Protocol

The Sequential Photographic technique was employed for the biomechanical analysis of front foot off drive in cricket. A NIKON MODEL F-90 (with motor drive) camera was used for the purpose of the study. The camera was placed at a distance of 11 feet at frontal plane; the height of the camera (lenses) was fixed at a height of 1.17 metre from the ground. For obtaining individual sequential photography, the subjects were photographed in a controlled condition. The kinematic variables of the body were calculated at moment stance and contact point. The author developed stick figures on the photographs from which selected kinematic variables were calculated. The stick figures were developed by using joint point method.

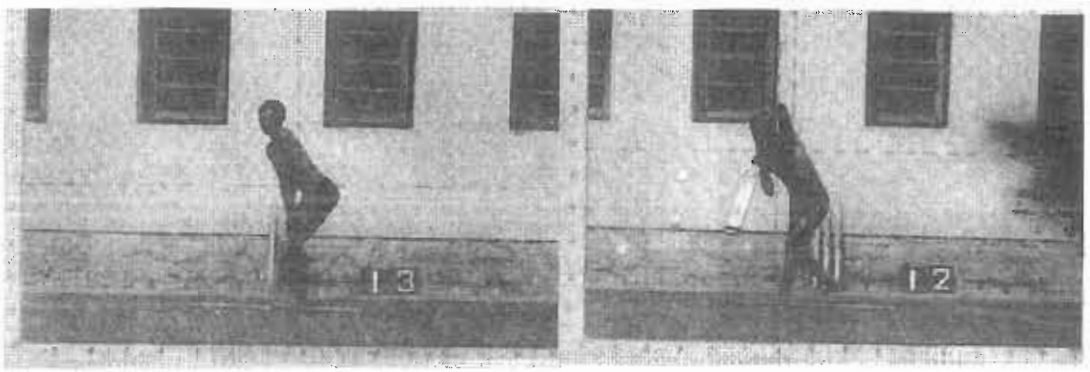
Procedure for Location of Center of Gravity

The center of gravity of the body at the moments was determined by segmentation method. This method was used to find the distance of the center of gravity of a body from some arbitrarily chosen line. This was done from a photograph which provided information concerning (a) weights of various parts or segments of the player's body (arm, forearm, hand, thigh etc.) and (b) location of the center of gravity of these segments. The location of center of gravity of body segments is presented in Table-2:

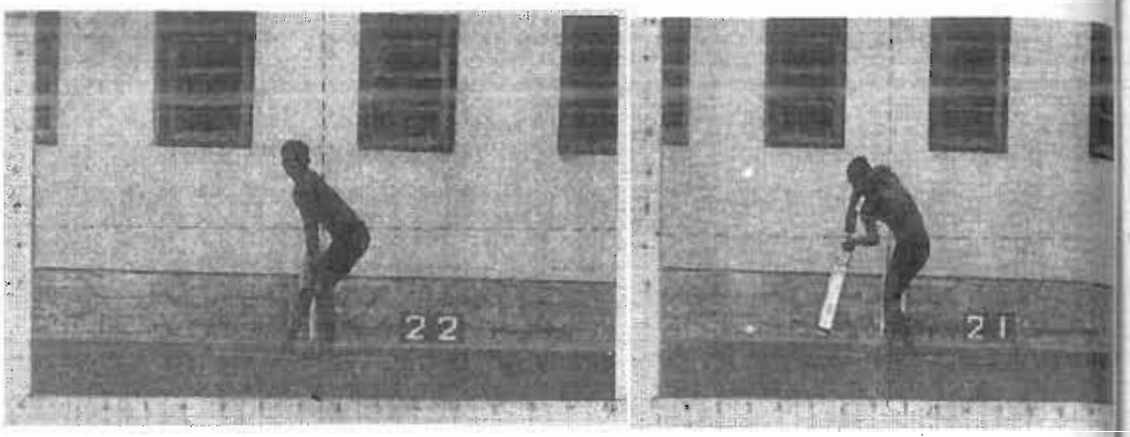
TABLE-2 : LOCATION OF CENTRE OF GRAVITY OF BODY SEGMENTS

S.LNO.	Segment	C.G location Expressed as percentage ofTotal Distance Between Reference Point.
1	Head	46.4% to vertex; 53.6% to chin-neck interseet
2	Trunk	38% to suprasternal notch;62%to hip axis
3	Upper Arm	51.3% shoulder axis; 48.7% to elbow axis
4	Fore Arm	39% to elbow axis; 61% to wrist axis.
5	Hand	82% to wrist axis; 18% to knuckle three
6	Thigh	37.2% to hip[axis; 62.8% to knee axis
7	Calf	37.1% to knee axis; 62.9% to ankle axis
8	Foot	44.9% to heel; 55.1% to hip of the longest toe

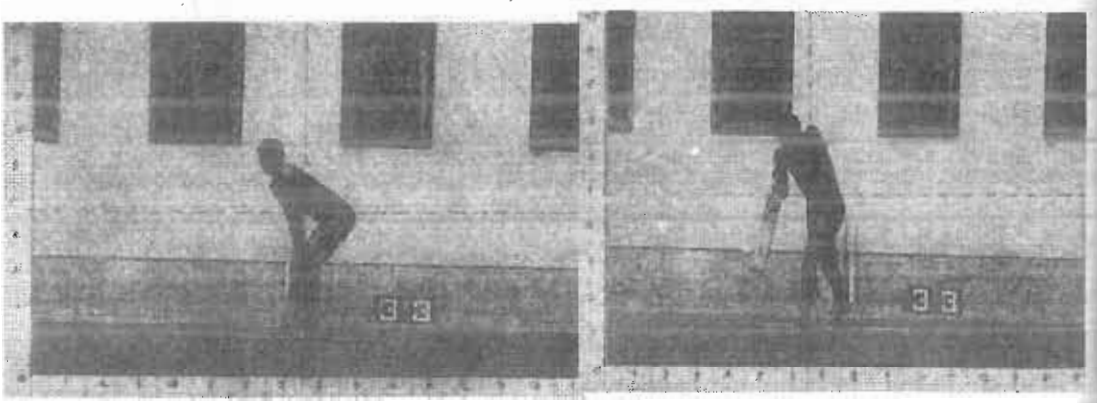
Photograph and Elegon of Various Moments of Subject 1

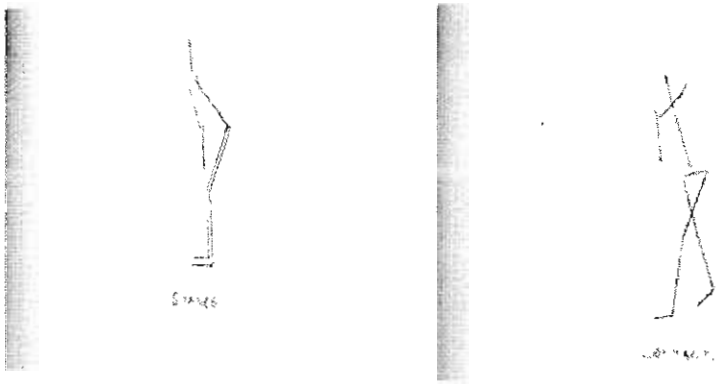


Photograph and Elegon of Various Moments of Subject 2

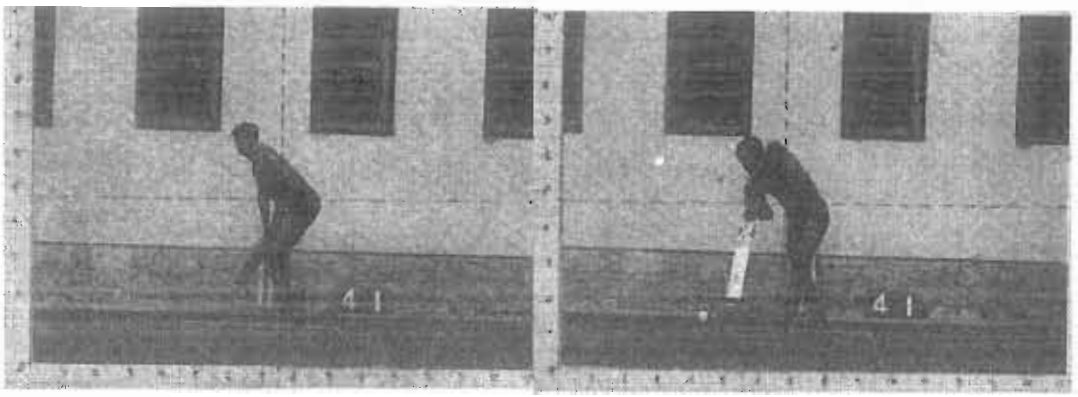


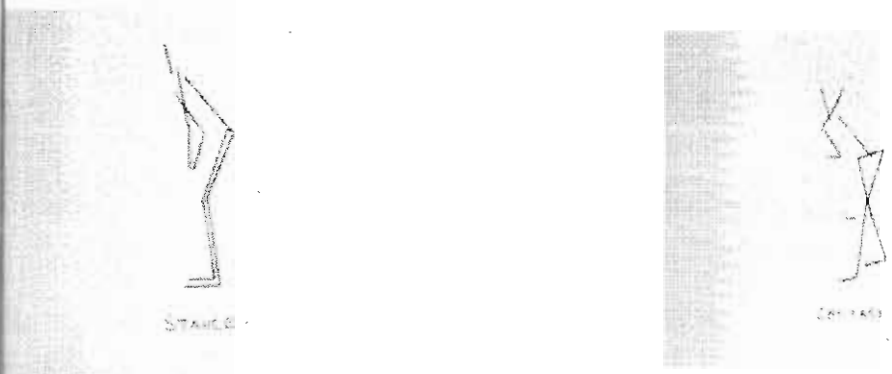
Photograph and Elegon of Various Moments of Subject 3



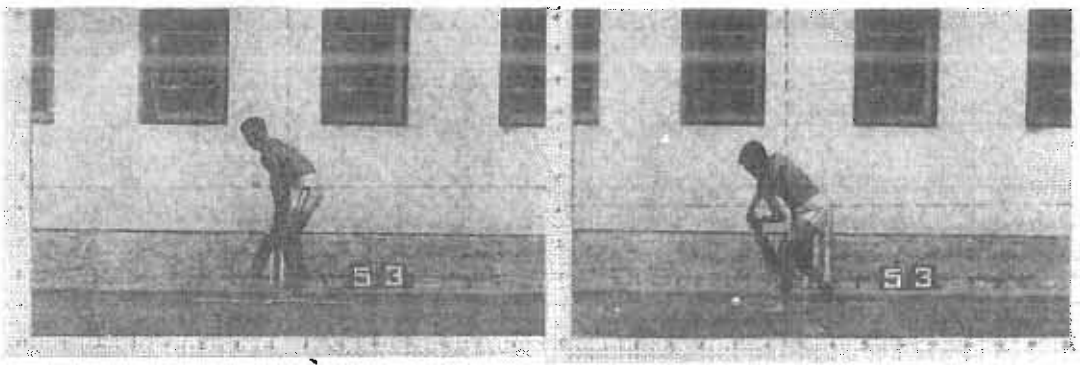


Photograph and Elegon of Various Moments of Subject 4





Photograph and Elegon of Various Moments of Subject 5



Result

The relationship of selected angular kinematic variables with the performance of Front Foot Off drive in Cricket is presented in Table-3:

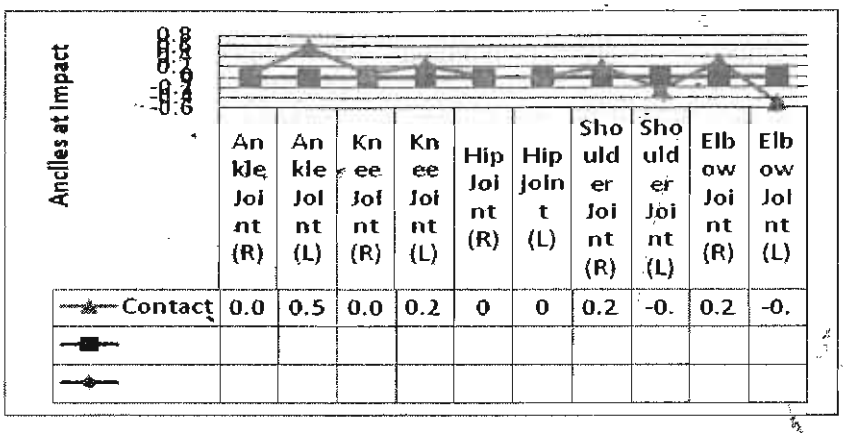
Table-3 : Mean and coefficient of correlation of selected biomechanical variables of the moment stance and contact with the technique of front foot offdrive in cricket (N = 5)

Sl. No	ANGLES		STANCE MEAN	STANCE 'r'	CONTACT MEAN	'r'
1	Ankle Joint	(R)	98	0.05	88	-0.51
2	Ankle Joint	(L)	95.4	0.59	117	-0.39
3	Knee Joint	(R)	151.8	**0.09**	159.2	-0.64
4	Knee Joint	(L)	148.6	0.24	157.2	-0.02
5	Hip Joint	(R)	124	**0.96***	93.2	0.95*
6	Hip joint	(L)	123	0.96*	132.6	-0.51
7	Shoulder Joint	(R)	23.6	0.2	18.4	0.47
8	Shoulder Joint	(L)	29.8	-0.26	85.4	0.24
9	Elbow Joint	(R)	148.8	0.29	50.8	0.72
10	Elbow Joint	(L)	166.6	-0.49	138.0	-0.02

*** Significant at 0.05 level. r = 0.88**

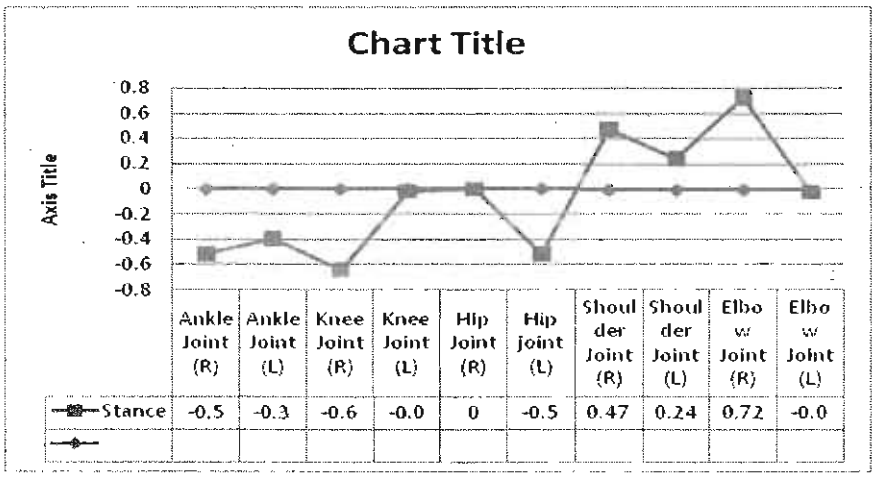
Since calculated value of 'r' for the right hip joint and left hip jointis higher than tabulated value of 'r' (=0.878), we accept the hypothesis. Thus correlation between angular kinematic variables of off drive with the batting technique of the subjects in cricket is significant at 0.05 level of significance. The graphical representation of relationship of selected biomechanical variables at moment stance with the technique of front foot off drive in cricket is presented in figure-1:

Figure-1 : RELATIONSHIP OF SELECTED BIOMECHANICAL VARIABLES AT MOMENT STANCE WITH THE TECHNIQUE OF FRONT FOOT OFF DRIVE IN CRICKET (N = 5)



The graphical representation of Relationship of Selected Biomechanical Variables at Moment Contact with the Technique of Front Foot Off Drive in Cricket is presented in figure-2:

Figure-2 : RELATIONSHIP OF SELECTED BIOMECHANICAL VARIABLES AT MOMENT CONTACT WITH THE TECHNIQUE OF FRONT FOOT OFF DRIVE IN CRICKET (N=5)



The relationship of height of center of gravity at the moment Stance and Contact with the Technique of Front Foot Off Drive in batting in Cricket presented in Table-3:

Table-4 : MEANS AND COEFFICIENT OF CORRELATION OF SELECTED LINEAR KINEMATIC VARIABLES AT SELECTED MOMENTS WITH THE TECHNIQUE OF SUBJECTS FRONT FOOT OFFDRIVEIN CRICKET (N=5)

Sl. No.	Variables (Height)	Stance		Contact	
		Mean (Degree)	'r'	Mean (Degree)	'r'
1.	Height of Centre of Gravity	92.4	-0.75	95.5	0.25

The results of the Table-4shows that at the height of centre of gravity at selected moments has insignificant relationship withthe technique of subjects front foot off drive in cricket.

Discussion

In case of selected biomechanical variables, none of the angular biomechanical variables has exhibited significant relationship with the technique of subjects in front foot off drive. However at the moment stance and contact right hip joint and at the moment stance left hip joint showed a high and significant relationship with the technique of subjects in front foot off-drive. In angular kinematic Variables only three values of coefficient of correlation at selected moments were found significant but this trend does not mean that the angles at different joints at selected moments do not play any important role while executing front foot off-drive. As in this study research scholar have ascertained the relationship, individually at selected joints left and right side, their might be a significant relationship when we study their cumulative or upper body joints or lower body joints relationship with the technique of the subjects in the front foot off- drive.

The relationship of selected linear kinematic variable (height of centre of gravity at selected moments) with the technique of the subjects at selected moments was found insignificant. As in the study the research scholar was only confined to the relationship of height of centre of gravity at selected moments with the technique of the subjects in the front foot off drive but significant relationship may be obtained by studying the path or

displacement of centre of gravity at selected moments. A significant result may also be obtained by increasing the sample size or by using the sophisticated equipments, like cinematographic techniques. On the whole, it may be ascertained that the variables which have shown high positive relationship with the technique of subjects in front foot straight drive along with these variables, other motor components also might have contributed to the technique of the subjects, in front foot straight drive. The low values of coefficient of correlation of these variables with the technique may be due to small sample size and non - availability of sophisticated equipments.

Since, the results have shown insignificant relationship with the kinematic variables to the technique of subjects in the front foot straight drive, so the hypothesis as stated earlier is not accepted in those variables.

Conclusions

Based on the analysis and within the limitations of the present study, following conclusions were drawn : Angle at the right hip joint and left hip joint has shown positive relationship with the technique of subjects in front foot off drive during the moment Stance and moment contact.

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TAKE-OFF KINEMATICS OF BACKWARD SALTO IN FLOOR EXERCISE

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Abstract

Background : Backward take-off is one of the most important and frequently used components of Floor exercise routine in artistic gymnastics and can occur at any point of a routine.

Methodology : The purpose of the study was to investigate the biomechanical characteristics of dynamic take-off in backward salto performed by five male gymnasts in the floor exercise. Change of vertical and horizontal velocities during take-off and take-off angle were the selected kinematic parameters for analysis. The movement during take-off action was recorded by a videographic camera and the recorded movements were analyzed by using movement analysis software.

Result : Analysis of the data for male gymnasts revealed, that the mean vertical velocity of the body was 4.14 m/s (± 0.49) at active take-off and -1.26 m/s (± 1.36) at touch-down indicating a mean increase of 129%. The mean horizontal velocity of CM at touch-down was 1.44 m/s and horizontal velocity at take-off was zero. So, the mean decrease in horizontal velocity was 100% during take-off. The mean take-off angle was 71.6Ú.

Conclusion : Results of the study indicate that the take-off action of backward salto involved reduction in horizontal velocity and increase in vertical velocity.

Key words: *Take-off kinematics, Backward salto, Floor exercise.*

Introduction

In analyzing the back salto following a tumbling series, biomechanical considerations of the center of mass must be made to produce an efficient performance. Variables such as angle of attack (the angle at which the gymnast is at take-off with respect to the horizontal) and velocities at take-off must be calculated to provide an understanding of proper performance. The purpose of the take-off of the back salto is to project the gymnast to a maximum vertical height and allow the completion of one revolution about the mediolateral axis (Cornelius, 1996). Given this factor, one would expect to see a sizeable angle of attack,

high vertical velocities, and low horizontal velocities. According to Sands (1999), gymnastics skills revolve around Newton's third law, the action-reaction principle. As is true in the back salto, forceful blocking (e.g. little time on the ground and complete extension at take-off) off the ground prior to flight would allow for maximum vertical height in the skill. However, it has been shown that many gymnasts do not take advantage of this principle, tending to show incomplete extension of their bodies during the take-off phase of many jumps and skills (Sands, 1999). The vertical velocity achieved at take-off, along with how much time the gymnast spends on the ground during the take-off phase, are important variables in the amount of vertical height achieved by the gymnast. Greater lift is achieved with shorter take-off times, although mathematically this would not seem to be the case, since the vertical lift is expressed as vertical force multiplied by time (George, 1980; Schmidt, 1980). George (1980) explains this paradox stating that the magnitude of vertical forces increases at a proportionally greater rate as the time decreases. Accordingly, the position the gymnast is in at take-off also relates to how high the gymnast will be projected, and at what angle. When the feet come into contact with the ground at the end of the preceding skill the feet should be behind the line of gravity so a backward rotation can ensue once the gymnast is off the ground (George, 1980; Schmidt, 1980). Bowers, Fie, and Schmid (1981) support the idea of pushing downward and forward on the ground in the opposite direction of intended rotation to attain the desired skill. Angle of attack is mentioned as being less than 90° (Bowers, et al., 1981; George, 1980); Hay (1993) states approximately 70° as optimal. The purpose of this paper is to provide biomechanical information related to the take-off of a back salto immediately after a round off has been performed.

Methodology

Five National level male Gymnasts with age ranged from 18-20 years, (average weight 55.25kg and average height 163cm) were selected as subjects for the present study. They had ten years training experience with the performance of senior national level.

In the present study the main task was to biomechanically analyze the take-off action of forward salto where velocity, take-off angle and path of CM (Centre of Mass) were considered as measuring criteria.

The subjects of the study were at first assembled in a hall and explained the purpose of the study. Their anthropometric measurements viz. age, height, and weight were measured. Subsequently, the take-off actions of the subjects were recorded using a video camera. This recording was done observing all the principles of scientific filming. The camera was placed

on the left side of the subject. The lateral distance was 18.80 meters and the height of the camera was 1 meter. The camera axis was positioned at the perpendicular direction of the movement. The camera frequency was 30 fps. Finally, the recorded movements of the subjects were analyzed by using appropriate software.

The data were collected in two phases. In first phase the selected anthropometric measurements such as age, height, and weight were taken in a rest condition and in the second phase mechanical parameters such as horizontal velocity during take-off, vertical velocity during take-off, angle of take-off foot and trunk at touchdown, angle of take-off foot and trunk at take-off, and movement of CM in horizontal and vertical direction during take-off were measured during jumping.

Results and Discussion

Velocity of take-off was measured both in horizontal as well as vertical directions for both touchdown as well as active stretching phases of total movement structure of take-off.

Table-I show the values of horizontal velocity at touch down and take-off of the subjects of the group along with mean and SD values.

Table-1 : Horizontal Velocity of CM during Take-off of backward salto

Sub. No.	Horizontal Velocity(m/s)		Decrease in velocity (%)
	Touch-down	Take-off	
1	0.9	0.0	100
2	0.9	0.0	100
3	2.7	0.0	100
4	1.8	0.0	100
5	0.9	0.0	100
Mean	1.44	0.0	100
SD	± 0.80	±0.0	

Results revealed from Table-I that the Horizontal Velocity at touch-down of CM for backward salto is 1.44 m/s (±0.80). The Horizontal Velocity at take-off of CG for backward salto is 0.00 m/s (±0.00). The Horizontal Velocity at take-off decreases by 100%.

Table-2 shows the values of Vertical velocity at touch down and take-off of the subjects of the group along with mean and SD values.

Table-2 : Vertical Velocity of CM during Take-off of backward salto

Sub. No.	Vertical Velocity(m/s)		Increase in velocity (%)
	Touch-down	Take-off	
1	-2.7	4.5	160
2	0.0	4.5	100
3	-2.7	4.5	160
4	-0.9	3.6	125
5	0.0	3.6	100
Mean	-1.26	4.14	129
SD	± 1.36	± 0.49	

In the respect of Vertical Velocity at touch-down of CM for backward salto is -1.26 m/s (±0.1.36). The Vertical Velocity at take-off of CG for forward salto is 4.14m/s (±0.49). The Vertical Velocity at take-off increases by 129%.

Table III shows the take-off angles of all the subjects of the groups.

Table-3 : Angle of Take-off of backward salto

Group	Forward salto				
Sub. No.	1	2	3	4	5
Take-off angle in degrees	71"	77"	69"	69"	72"
Mean	72"				

The take off angle of backward salto followed by round-off in male artistic gymnastics is 72^0

Conclusion

Results of the study indicate that the take-off action of backward salto involved reduction in horizontal velocity and increase in vertical velocity. This may be due to the fact that the purpose of take-off is to convert the horizontal velocity to the vertical velocity for lifting the body to a considerable height so that the gymnast can get required time to execute

the skill during air borne position. Comparing to the take-off for long jump it is seen that the percentage of conversion in this case is much higher for vertical velocity and considerably lower for horizontal velocity to meet the specific demand of the situation.

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KINEMATIC ANALYSIS OF BACKLIFT TO THE TECHNIQUE OF FRONT FOOT STRAIGHT DRIVE IN CRICKET

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Abstract

The purpose of the study was to determine the relationship between selected kinematic variables of backlift and batting performance in front foot straight drive. Five (N=5) male cricket players who represented Visva-Bharati University, WB, were selected as subjects for the study. Videography technique was used to film the subjects in frontal plane of the back lift. Joint point method was used in order to obtain the values of selected angular kinematic variables from developed stick figures with the help of Kinovea software. Height of center of gravity was calculated by segmentation method. The performance in batting was recorded by the scores in front foot straight drives, which was obtained by using a Five Point scale by three judges. To determine the degree of relationship between selected kinematic variables with the batting performance in front foot straight drive, Pearson's Product Moment Correlation Method was used. The results have shown the significant values of coefficient of correlation of right hip joint and left hip joint of the selected kinematic variables and had no significant relationship between the height of center of gravity at the moment of back lift with the batting performance infront foot straight drive .

Keyword : Kinematic analysis; Back lift; Front foot straight drive; Center of gravity

Introduction

Modern techniques of sports performance analysis enable the sport scientist, coach and athlete to objectively assess, and therefore improve upon, sporting performance. They are an important tool for any serious practitioner in sport and, as a result, performance analysis has become a key component of degree programmes in sport science and sports

coaching. (Peter O'Donoghue ,2009). Biomechanics is an essential part of sport today. In simple terms it enhances the technique of a player in an efficient manner. (Elliott Bruce, 2004)

It was found that when the batsman was facing the bowler, he initiated his backswing at a consistent time before the ball release Stretch *et al.* (2000). The biomechanical analysis is the most objective and substantial investigation in the field of cricket. Several biomechanical studies have been conducted on the swing of a cricket ball and the technique of fast bowling; these are well documented in a review by Bartlett et al. (1996). No research has yet evaluated how coaching style influences the kinematics of batting. The skill of batting in cricket is an intricate combination of mental, physical, perceptual, technical and tactical prowess (Weissensteiner et al., 2008). One important aspect of cricket batting, particularly in the shorter forms of the game, is the ability to play strokes into gaps in the field, despite the type of delivery bowled. (Marc Portus, et al. 2010). Davis (1983) provided insight into the technique of batting and questioned some of the established principles of coaching cricket skills; however, these results were not obtained under well-controlled experiments. Dr Rene E. D. Ferdinands , (2005) explained that the front foot straight drive is merely an extension of the front foot defensive stroke. If the biomechanics of the stroke is efficient, then the drive can be hit with tremendous power even if the backlift just extends above the waistline. This can give an important advantage against fast bowling, and during the beginning period of an innings when the margin for error is small. This is the basic technique for all the drives with some variations. Stretch et al. (1998a) reported that the backlift for the drive was 0.09 m higher than for the forward defensive, similar to recommendations in the coaching literature (Greig, 1974; Reddick, 1979; Tyson, 1985; MCC, 1987;Khan, 1989) and to the findings of Elliott et al. (1993).This observation suggests that the batsman made an initial choice of stroke before the start of the downswing of the bat (Stretch et al., 1998). A correct back lift allows free stroke play by starting body and bat movement and setting up the correct downswing. It should allow all the necessary body levers (hands, arms, shoulders, hips, and head) to work and move together in the same direction i.e. the line of the ball. Of these influencing factors, no research has been attempted to establish the relationship of kinematic variables of back lift with the front foot straight drive in cricket and as a result this study was undertaken to evaluate the relationship of selected kinematic

variables of back lift to the front foot straight drive in cricket. The study was delimited to five (N=05) male university players of eighteen to twenty five (18-25) years of age of Visva-Bharati University, W.B. The Backlift was recorded in one plane only. Selected linear and angular kinematic variables were:

Linear Kinematic Variables : 1. Height of center of gravity at highest point of backlift.

Angular Kinematic Variables: 1. Ankle joints 2. Knee joints 3. Hip joints 4. Shoulder joints 5. Elbow joints

Methods

The subjects for the present study were five (N=05) male intervarsity level cricket players from Visva-Bharati University, West Bengal, India. All subjects ranged between the chronological age of 18-24 years and were right handed batsman who participated in the East-Zone Intervarsity tournament for Visva-Bharati. To determine the degree of relationship between selected kinematic variables of backlift with the batting performance in cricket shot, Pearson's Product Moment Correlation Method was used.

Criterion measure and scores of subjects on cricket shot

The technique of Front foot straight drive in batting of each selected subjects were used as the criterion measures for the purpose of the present study. The performances of the subjects were assessed by three judges. The technique was recorded on the basis of the following Criteria which is explained below:

Design variables: 1.Set-up: Grip, Stance & back lift , 2. Front foot movement, 3. Weight Transfer, 4.Impact 5.Follow Through

Collection of data and filming protocol

The Videography technique was employed to register the back lift. Panasonic 3CCD video cameras were used for the purpose of the study. The camera was placed at a distance of 11 feet at Frontal Plane; the height of the camera (lenses) was fixed at a height of 1.07 metre from the ground. For obtaining individual Videography, the subjects were photographed in a controlled condition. The kinematical variables of the body were calculated at moment back lift. The authors developed stick figures on the photographs from which selected kinematical variables were calculated by using Kinovea Software. The stick figures were developed by using Joint-point method.

joint point method

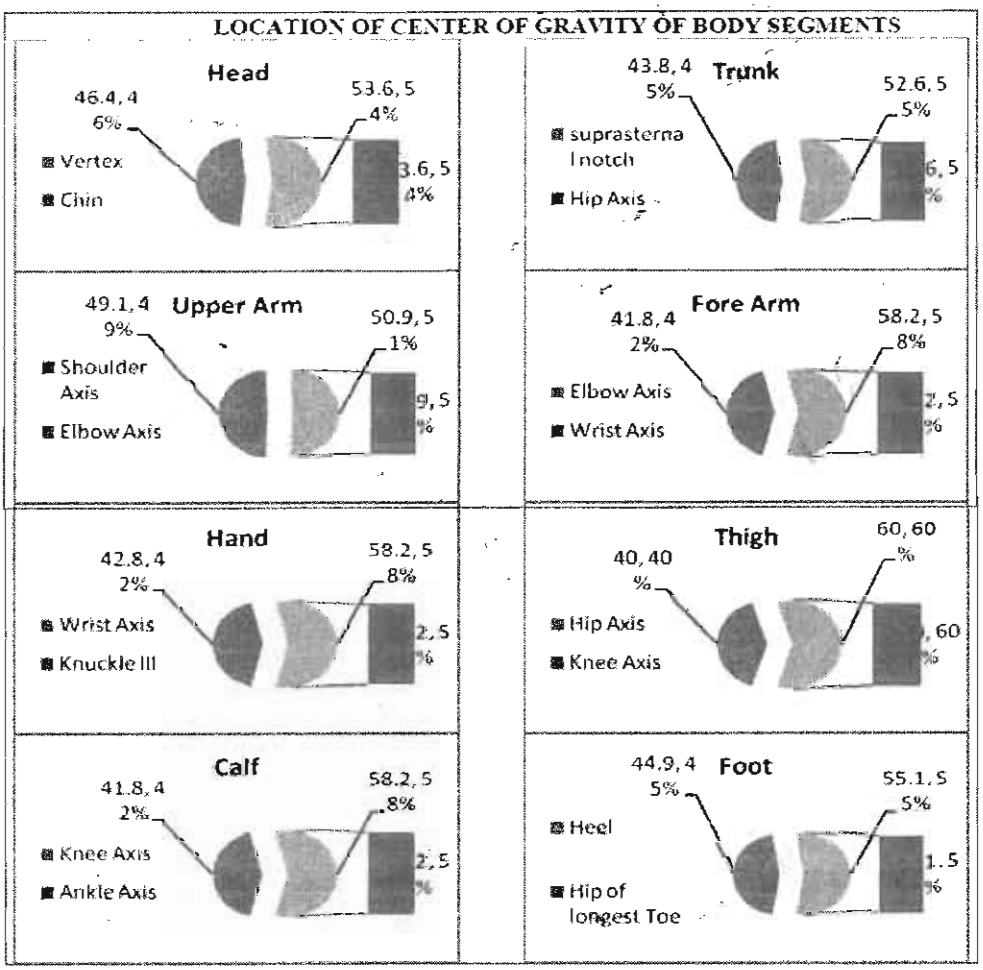
Procedure for location of center of gravity

The center of gravity of the body at the moment of release was determined by segmentation method. This method was used to find the distance of the center of gravity of a body from some arbitrarily chosen line. This was done from a photograph which provided information concerning (a) weights of various parts or segments of the player's body (arm, forearm, hand, thigh etc.) and (b) location of the center of gravity of these segments. The location of center of gravity of body segments is presented in table-1:

Table - 1
LOCATION OF CENTER OF GRAVITY OF BODY SEGMENTS

S.No.	Segment	Center of Gravity Location Expressed as Percentage of total Distance between Reference Points
1.	Head	46.4% to Vertex : 53.6% to chin-neck intersect
2.	Trunk	43.8% to suprasternal notch: 52.6.0% to hip axis
3.	Upper Arm	49.1% to shoulder axis : 50.9% to elbow axis
4.	Fore Arm	41.8% to elbow axis: 58.2% to wrist axis
5.	Hand	42.8% to wrist axis: 58.2.0% to knuckle III
6.	Thigh	40.0% to hip axis: 60.0% to knee axis
7.	Calf	41.8% to knee axis: 58.2% to ankle axis
8.	Foot	44.9% to heel: 55.1% to tip of longest toe

Fig-1 : The graphical representation of location of center of gravity of body segments



Result

The relationship of selected angular kinematic variables at the Backlift with the performance of subjects in Cricket shot is presented in table-2:

Table- 2 : MEANS AND COEFFICIENT OF CORRELATION OF SELECTED ANGULAR KINEMATIC VARIABLES OF BACKLIFT AT FRONTAL PLANE WITH THE FRONT FOOT STRAIGHT DRIVE IN CRICKET (N=5)

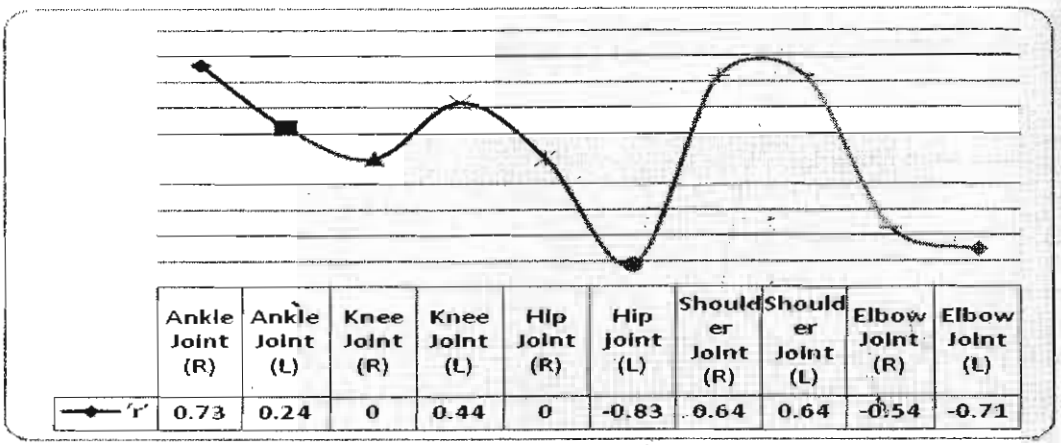
Sl.No	ANGLE		MEAN	'r'
1	Ankle Joint	(R)	121.8	0.73
2	Ankle Joint	(L)	103.4	0.24
3	Knee Joint	(R)	170.4	**0.92***
4	Knee Joint	(L)	162.2	0.44
5	Hip Joint	(R)	88	**0.95***
6	Hip joint	(L)	116.8	-0.83
7	Shoulder Joint	(R)	172.8	0.64
8	Shoulder Joint	(L)	105.2	0.64
9	Elbow Joint	(R)	58	-0.54
10	Elbow Joint	(L)	95.8	-0.71

*** Significant at 0.05 level. = 0.88**

The hypothesis was accepted since, calculated value of **'r'** for the right knee joint and right hip jointis higher than tabulated value of **'r'** (=0.878). Thus correlation between angular kinematic variables of back lift with the performance of subjects in Cricket shot is significant at .05 level of significance.

The graphical representation of relationship of selected angular kinematic variables at moment of back lift with the performance of subjects in front foot straight drive is presented in figure-2:

Figure-2 : RELATIONSHIP OF SELECTED ANGULAR KINEMATIC VARIABLES OF BACKLIFT AT FRONTAL PLANE WITH THE FRONT FOOT STRAIGHT DRIVE IN CRICKET (N=5)



The relationship of height of center of gravity at the Backlift with the performance of subjects in front foot straight drive is presented in table -3:

Table-3 : MEANS AND COEFFICIENT OF CORRELATION OF SELECTED LINEAR INEMATIC VARIABLES OF BACKLIFT AT FRONTAL PLANE WITH THE FRONT FOOT STRAIGHT DRIVE IN CRICKET (N=5)

Sl. No.	Variables (Height)	Stance	
1.	Height of Centre of Gravity	Mean (Degree) 47.91	'r' 0.5

The results of the Table-3shows that at the Frontal Plane the height of centre of gravity at back lift had insignificant relationship with the batting performance of the subjects in front foot straight drive.

Discussion

The angular kinematic variables at the moment back lift the right knee joint and right hip joint exhibited significant relationship with the performance of subjects' front foot straight drive. It may be done to the fact that any skill execution in cricket is not solely depending on one or two joint movement; it is the combination of movement at different joint so it does not mean that the angles at different joints at selected moment do not play any important role while executing front foot straight drive.

The relationship of selected linear kinematic variable (Height of C.G at selected moment) with the technique of front foot straight drive of the subjects at selected moments were found insignificant. Since in the present study the scholars were only confined to the relationship of height of G.G at the selected moment with the technique of the subjects in front foot straight drive in cricket.

A significant result may also be obtained by increasing the size of the sample and using the sophisticated equipments like cinematography technique. The low values of coefficient of correlation of these variables with the technique may be due to small sample size and non -availability of sophisticated equipments.

Since, the results have shown significant relationship with the kinematic variables of backlift to the technique of subjects in the Front Foot Straight Drive, so the Hypothesis as stated earlier is accepted in those variables. As no research has been attempted earlier to establish the relationship of kinematic variables of back lift with the technique of front foot straight drive in cricket as a result this study was not corroborated to any other studies.

Conclusions

Based on the analysis and within the limitations of the present study, following conclusions were drawn:

The angular kinematic variables of back lift; right hip joint and left hip joint has exhibited significant relationship with the technique of subjects in front foot straight drive

This research needs further investigation like Biomechanical study of the variability of the batsman's movements. Obviously, there is also a need for scientific research into batting in women's cricket, which has been insufficiently researched.

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STUDY ON COMMITTED FOULS DURING FIFA WORLDCUP 2010

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Abstract

In the game of soccer, teams manipulated space and time in order to score goals and prevent scoring by opponent. Analyzing how these two aspects govern game performance is essential for proper understanding of the game. The intent of offensive strategy is to create space and time to open scoring opportunities. Defensive strategy aims to constrict space and limit time in the hope of denying the offence. During game, these offensive and defensive tussles pressurize players to act unlawful or take unfair challenge which is considered as fouls by the referee. Present study was planed to analyze the fouls committed by footballers during FIFA world cup 2010. Information regarding fouls in form of data was obtained from official expert match analyst. Thirty two teams one sixty players who committed more number of fouls were as subjects for the present study. The ANOVA was used to test the significance of fouls committed by the players of different positions. Result indicated that there was no significant difference among mean value of fouls committed by footballers of different positions.

Key word: Fouls, FIFA, World cup

Introduction

In soccer, a foul is inappropriate or unfair act by a player as deemed by the referee. A foul may be intentional or accidental and it usually occurs to prevent opponent to scoring or to prevent defending during scoring. Soccer playing is based on some movements like running, jumping, heading, shoulder pushing, dribbling, kicking, shielding, striking and tackling. But during game situation the execution of this movements become reckless and unlawful to the conduct of soccer law and causes injuries to a player, hampering rhythm, loose ball possession, defiling the beauty of the game, and instigate spectators to turn violent. In soccer

each of eleven players on a team is assigned to a particular position depending upon on the formation deployed. The position - defenders, midfielders, forwards describes the players' role and their area of operation on the field. The objective of this study was to analyze the fouls committed by the footballers during FIFA World Cup 2010.

Methodology

A total of 160 players were analyzed during FIFA world cup 2010. Five players committing more number of fouls from each 32 teams were considered subjects of this study. Players were divided into three groups on the basis of position of play. Thus there were 57 defenders; 59 midfielders and 44 forwards. Selected factors for analysis were height and committed fouls by the players. Information regarding height and fouls in form of data were obtained from post match analysis provided by experts and obtained through www.fifaworldcup2010.

Results

Table-1, shows the mean and S.D of height of three different groups of players analyzed in this study.

Table-1 : Height of the Soccer players

Position of play	Total no. of players	Mean & S.D of height of players
Defenders	57	180.47 ± 6.39 cm
Midfielders	59	179.77 ± 5.50 cm
Forwards	44	183.59 ± 6.76 cm

It was observed that the average height of the defenders, midfielders and forwards were 180.47 ± 6.39 c.m., 179.77 ± 5.50c.m and 183.59 ± 6.76 c.m. respectively. Forwards were taller than midfielders and defenders.

Table-2, shows the mean and S.D of fouls committed by the three different groups of players.

Table-2 : Mean and S.D of committed fouls by three different positions in soccer

Position of play	Total no. of players	Total no. of foul committed	Mean & S.D of committed fouls
Defenders	57	380	6.67 ± 6.12 cm
Midfielders	59	451	7.64 ± 7.03 cm
Forwards	44	339	7.70 ± 5.34 cm

That the fouls committed by forwards were higher than both of the groups of defenders and midfielders. Fouls committed by the defenders were lowest among the groups.

As there were differences among the groups of footballers in respect of number of fouls committed, the method of analysis of variance was followed to test the statistical significance of the difference. Table-3 shows the results.

Table-3 : ANOVA among mean score of committed fouls

Source of variance	Sun of table square	Degree of freedom	Mean square	F Value	Calculated F value
Between group	36.68	2	18.34	4.08	1.9
With in group	1513.97	157	9.64		

It is clear from the Table-3 that calculated value of F was lesser than the required table value to be significant at 0.05 levels. Therefore, it was understood that the inter group difference in respect of committed fouls was not statistically significant.

Inter group difference of fouls committed was calculated in percent values in order to understand a clear estimate of the cases. Table-4 represents the results.

Table- 4 : Percentage analysis of total committed foul by the players

Position of play	Percentage differences
Defenders vs Forwards	15.44%
Midfielders vs Forwards	0.78%
Defender vs Midfielders	14.54%

It is understood from Table - 4 that the forwards committed 15.44% more fouls than the defenders. Midfielders were very similar to the forwards in committed fouls and defenders committed 14.54% less fouls than the midfielders.

Discussion

A possible concern regarding present study was the relationship between height and fouls of the players respective to the tactical position (defense, midfield, forward) of play. Defenders were keep in mind about foul during defending because a foul increases scoring opportunity more in set piece situation on the other hand forwards were more desperate to turn scoring opportunity any how into a goal and midfielders were trying to win the ball possession or to keep the ball possession and also to assist the defenders and forwards in every moments during game situation. The results of this study found forwards were

committed more fouls and they were taller among the other two groups of players. Result obtained by previous researcher in this respect the theories of cognition provide a useful theoretical frame work to argue for an automatic association between perception of height and dominance based on recent advances in cognitive psychology demonstrating that humans ground their conceptual thinking perceptually. In other words, people's mental representations of abstract concepts (such as dominance and power) are embodied in modal information about space and the body (such as height and position of play). Hence, thoughts about power and dominance are automatically connected to a vertical dimension in space. When people think about power, they automatically interpret up, above and large cues for power and down, below and small as cues for powerless. The same height dominance association is further consolidated through experience when taller children use their physical superiority to coerce smaller children, or when taller adults use their physical advantage to demonstrate dominance and gain superiority.

The analysis of German Bundesliga (2001-2007) yielded that foul perpetrators were on average taller (182.82 ± 6.10 c.m) than foul victims (181.94 ± 6.30 c.m). The analysis of UEFA champion's league (2001-2007) also yielded the similar result, foul perpetrators were on average taller (181.37 ± 5.84 c.m) than foul victims (180.59 ± 5.96 c.m).

Conclusion

On the basis of result obtained out of data analysis the following conclusion was made :
i. The forwards are taller than the midfielders and defenders. ii. There is no statistical difference in committing fouls among soccer players as defenders, midfielders and forwards. iii. Percentile analysis confesses that forwards are committed largest percentage of fouls and the defenders committed least amount of fouls, midfielders are very similar to that of forwards.

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A REPORT ON CORPORATE SOCIAL RESPONSIBILITY : CHANGING LIVES THROUGH SPORTS

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An international conference on "the Corporate Social Responsibility (CSR): Changing Lives through Sports" was Organised by FICCI at Aditya Birla CSR Centre for Excellence, New Delhi. The purpose of the Conference was to provide an opportunity for organisations with active CSR programmes to discuss and learn about the value that sport can bring to society. The Conference highlighted the accelerated pace that a sport for developmental approach offers to develop projects, rapidly fostering the creation of communities which are healthy, active and behave responsibly. It further emphasized the bond which sport can create between organisations and the communities they work for, by enhancing community connections and helping to cement a sense of institutional belonging. The Conference started with the opening remarks of Paresh Tewary, Director, FICCI Aditya Birla CSR Centre for Excellence. He formally welcomed all the participants and explained the need and purpose of holding the conference. He highlighted the status of underprivileged children in India and expressed concern of the shortage of open spaces and playfieldsespecially in urban India. He urged corporate representatives present to join hands to promote the development of children and youth through the medium of sports. In his Key note addressRob Lynes, Director, British Council, India emphasized, the inclusive nature of sports and its potential to reach out to everyone by highlighting the possibilities of engagement of multiple stakeholders stressing the importance of sports and physical education in the lives of individuals. In the Conclusion Mathew Spacie, Founder and CEO of Magic Busthrown light on future prospect and the need accordingly about the attachment of corporate sector towards the developmental programme through sports. Special Guests of Honour Kapil Dev, former Captain, Indian Cricket Team strongly expressed his wish regarding the engagement of the corporates with sports. Jagbir Singh, former India player and Olympian, Hockey hopes about involvement of corporate sector for the development of infrastructure and technical support for athletes.

The first technical session was on "Introduction to Sport and Development: Sport as a catalyst for Social Change". The moderator was Vivek Joshi, CSR Advisor, GAIL. The first speaker Mr. Swaran Singh Chhabra, Sports Development Advisor, Commonwealth Secretariat, stressed about the importance of sports in different social issue such as the improvement of lives of girls and women, combat against teenage pregnancy, HIV/AIDS prevention in different underdeveloped countries. He told the importance of sports for wholesome development. Sophie Beauvais, Director, International Relations, Australian Sports Commission, dreamed regarding the social bond building through sports. Mr. Gastler, Executive Director, YUWA, emphasised the need to moderate the pace of sport for development interventions and build activities up to a gradual pace. Vivek Joshi made the closing remarks for the session thanking all panellists and the audience for their overwhelming response and interest to know more.

The second technical session was on "Sports and CSR: The Social Case for Sport". The moderator was Novy Kapadia, Football Analyst and Commentator. The first speaker Mr. Tarun Puri, Managing Director, Nike India talked about the manifold benefits of creating access for children and youth to sport. Through a video clip, he shared the experience of Nike's SOWETO project in South Africa, which provides life skills training and HIV awareness to kids through sport and has reached out to nearly 20,000 kids. Kirk Harrison, Head, Barclays Spaces for Sport, described how sport-based CSR activities can be effectively linked to business, while disseminating specific messages through these sports. Dinesh Agarwal, Head, NTPC Foundation and GM CSR NTPC, said about the specific allocation for rural sports in their CSR budget. He said that sport provides a platform which encourages community involvement and breaks down social hierarchies, provided there is adequate focus on local needs and issues. Kishore Taid, Director, Baichung Bhutia Football Schools, said about the performance development through good coaching irrespective of latent potential. He emphasized on the participation through passion and fond about the ethical value of sports. Mr. Satendra Bajwa, Founder, Khelshala, shared his own experiences as a player and international coach of squash, about the development of youth through his organization 'Khelshala'. In closing remarks for the session Novy said about the need of corporate involvement and praise the involvement of former Indian football player towards the promotion of the sport.

The third session was on "Growth and employability in the sports sector – an opportunity for brand building". The moderator was Vivek Ramchandani, Coordinator,

Australian Sports Outreach Program (ASOP), India. The first speaker was Rahul Verghese, Founder and CEO – Running and Living Infotainment,shared his vision of enabling brands, organisations and individuals to unleash their potential through organised run events, which enable individuals to realize their dreams, build health, self-confidence and develop a positive attitude. Mrs. Prerna Langa, VP, ICICI Foundation for Inclusive Growthexpressed her conviction that sports could be strategically used when it came to CSR. What she had learned at this conference had opened up her mind to the enormous potential the sport for development approach carries. Mr. Pooran Pandey, Director, Times Foundation stressed the importance of CSR in promoting a sports culture in India. He said about the formation of the triangle of society, business and environment through CSR. Mr. Hakimuddin Habibulla, Founding Trustee, Go Sports Foundationtalked about the inclusion of Paralympic sports within the corporate CSR agenda. Mr. Viren Rasquinha, CEO, Olympic GoldQuest, the former Indian hockey captain, cited his organization of how the sports sector can provide employment to former athletes who develop the skills to train elite sports persons to reach their highest potential and was convinced about the corporate funding for the promotion of sports.

Mr. Vivek Ramchandaniin his concluding remark told about the long-term goal and focus of the conference to encourage investment in CSR initiatives which promote grass roots sport as a means for individual, social and community development. In order for any meaningful sport development activity children's regular participation is necessary. Referring to the government's *Panchayat Yuva Khel aur Krida Abhiyan* (PYKKA), a massive rural grass roots sport development mission, with a 10-year budget exceeding Rs. 5,000 crores and a focus on 'Sport For All'. He said CSR projects should take cognisance of the funding available to village *panchayats* under the PYKKA scheme and endeavour to develop complementary sport for development project models to ensure sustainability.

The vote of thanks was delivered by Mr.Matthew Spacie. He thanked FICCI Aditya Birla CSR Centre for Excellence, the British Council, the ASC for their support and all the moderators, panellists and participants for their interest and active participation in the discussion and expressed his hope that the conference had achieved its objective of demystifying the concept of sport for development and peace in all spheres of life.

Note : This article is an extract from the summery of the conference proceedings of the 'Corporate Social Responsibility: Changing Lives through Sports' organised by FICCI Aditya Birla CSR Centre for Excellence, on 14th February 2011, FICCI, New Delhi.

LOOKING THROUGH A TIME MACHINE

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H.G. Wells at one time drew a canvas of the future situation about man's personal self and surroundings through his imaginary time machine. If we look through a time machine approximated at several millenniums back, we would also have to draw a canvas imagining livelihood, fitness status and lifestyle of the time as compared to ours in this 21st century.

Several millenniums back our prehistoric ancestors used to walk on all fours; their livelihood, fitness status or lifestyle were not very great different from the later progeny of cave & forest dwellers. Their livelihood also comprised of some search for food, self-protection from the vagaries of nature and from unfriendly forces. Their lifestyle habits were rustic, wild but ever alert. Under such circumstances they had to remain fit for any eventuality, ready for instant response. They had to acquire a fitness level commensurate with their living conditions under most unfavorable surroundings, but by then they had assumed the biped stance leaving aside their animal like quadruped habit, thanks to getting their arms free from locomotive duty.

Things gradually changed from prehistoric to cave & forest dwelling, thence towards civilization through, the course, several steps like igniting fire, learning harvesting, and storing food grains. As a result of all these spectacular changes they found time to think, time to plan for further change and development. Change after change occurred. Sudden invention of 'steam' led to mechanization and gradual transition towards wonders of science and technology. Such vast changes ultimately may indicate a living pattern which will gradually drift man away from nature, although man, the animal, and man, the human, were all born, grown, and designed to live under natural settings.

Now imagine yourself living in air-conditioned living rooms, traveling in air-conditioned vehicles, working in air-conditioned work places, using the lift or the escalator to avoid stair-climbing, and eating nothing raw, green, natural foods while developing habits of taking palatable, spicy and savory dishes almost uncongenial for the digestive process. All these disturbing inputs to an organism designed to be nature-friendly and active, most

often will lead to hypo-kinetic disorders and diseases unless, of course, appropriate remedial measures are adopted through our therapeutic regimen.

Time elapsing, our time machine may bring you at the door of the next millennium or still further were you may find yourself at the space satellite township or at the oceanic under-water colony! Thanks to advancement of science & technology, man has landed in moon apart from orbiting the space and establishing space stations. And you may not be wondering if your great grand children would some day spend their honeymoon rendezvous at the moon itself! Shuttling between mother earth and moon or any other plant might be as easy as shuttling between Calcutta and Delhi or London or New York! And the back stage fact is that you yould rquire nearly a year's special training for space journey fitness and against space living hazards.

Such a situation may happen because of ceratin chages in the geo-physical set-up in our earth. Not only that the the limited land-mass on the earth's surface will be shrinking because of global warming whereby sea water level will be rising and engulfing landmass here and there. Apart from this danger, land for cultivation may greadually be converted into industrial plant sites because of more and more demands for industrialization and for jobs. As a result of all these changes there will be shrinking of land space for human habitation and less cultivable space for agricultural food production.

The above factors may eventually lead to finding alternative space for human settling, and search for alternative source for food. In fact, research has already been stared for these two alternatives. For human settling, scientists and explorers have already started working on setting up alternative settlements at space satellite stations and also at under-water colonies under the depth of oceans. And for alternative source for food, scientists have started examining the viability of growing edible sea plants under the ocean.

So if we look at the time machine approximated at some few millenniums ahead, our future generations might be availing of these opportunities in order to survive against perils of gradual extinction.

Imagine the pattern of livelihood, the lifestyle and the fitness status of such a time. The same factors were important during our prehistoric days or the cave & forest dwelling days, the same factors are important during our civilized and technologically advanced days, and will most potently be important during our entry into the space living age! So be prepared, and get ready with your programmes for producing such fit people who would be able to withstand hitherto in an unaccustomed and unnatural influence for the surroundings, and thrive against all odds to live and move forward further beyond our imaginations now.

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