

A comparative study of reaction time, dynamic balance and co-ordination among the players of hockey, volleyball, football and cricket players

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■ ABSTRACT

The present study was carried out with a view to compare the reaction time, balance and co-ordination of the hockey, volleyball, football and cricket players. It was hypothesised that there might be significant difference in reaction time, dynamic balance and co-ordination of hockey, volleyball, football and cricket players. For the purpose of the study total 60 subjects were randomly selected from Degree College of Physical Education, Amravati 15 subjects from each game of hockey, volleyball, football and cricket. The minimum study of participation was intercollegiate level and the age of the subject ranged between 18 to 25 years only male players were chosen for the study. The subjects were tested on reaction time measured in second using Nelson's hand reaction time test, dynamic balance measured in points using modified bass test of dynamic balance and co-ordination measured in seconds using eye hand and eye foot co-ordination test. To analyze the collection of data the one way analysis of variance and L.S.D. Post Hoc Test statistical techniques were employed. The findings of the statistical analysis revealed that the Hand reaction time ($F = 2.97$), Foot reaction time ($F=4.79$), Dynamic balance ($F=5.47$) and Eye hand co-ordination ($F=3.46$) showed significant differences among hockey, volleyball, football and cricket, whereas Eye foot co-ordination ($F=0.55$) did not show significant difference among the selected players of different games. From the findings of L.S.D. Post hoc test it is also learnt that hockey players were significantly superior than the football players in hand reaction time. Football players were significantly superior than hockey, volleyball and cricket players in foot reaction time football players significantly superior than the hockey and cricket players and dynamic balance, in case of eye hand co-ordination the hockey players showed superior performance than the volleyball and cricket players which was statistically significant.

■ **KEY WORDS :** Reaction time, Dynamic balance, Co-ordination, Performance

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India is one of the developing country in the world in various fields but in the field of games and sports it has shown a very poor performance in advanced

countries like U.S.A., Germany, Russian and China etc. Rapid progress in the field of games and sports has taken place and their international achievements have made

possible due to research, experimentation and application of scientific knowledge in games and sports.

As sport has developed into a distinct scientific discipline in itself and each nation is trying with each other to produce top class player to win laurels in international competitions considerable research is devoted to identify factors that will be predictive of achieving high level of skill in a given sports with proper coaching.

Dynamic balance is considered as an ability to maintain stable position while performing a task (Winter *et al.*, 1991). Dynamic balance is desirable in sports that require stability while athlete is moving and quickly reacting to changing circumstances. Balance is maintained by the vestibular, visual and somatosensory system along with centre of gravity and centre of mass. A player may face perturbations against his dynamically balanced position either by the opponent or by the player themselves while changing directions to avoid an opposing player or while passing or kicking a ball. These perturbations are large and need strong stabilization (Lloyd *et al.*, 2003). Balance ability has a significant effect on athletic performance (Hrysomallis, 2011). Athletes have presented with superior balance ability compared to non-athletes; suggesting that sports participation improves balance (Bressel *et al.*, 2007; Thorpe and Ebersole, 2008; Aydin *et al.*, 2002; Lephart *et al.*, 1996; Davlin, 2004 and Matsuda *et al.*, 2008). Athletic training stimulates neurosensory pathways which improve balance and proprioception (Aydin *et al.*, 2002 and Lephart *et al.*, 1996). Poor balance ability has been associated with an increased risk of ankle injury in a number of sports (Hrysomallis, 2007).

Soccer or football is a contact sports in which there has been a greatly increased interest and enthusiasm in recent years. Participation in soccer is said to be increased 11.4 per cent to 21.8 per cent annually.

Advancing the ball with kicks running with it, passing to other teammates, trying to forward it to the opponents end of the field, shooting in between the goal posts and scoring a point, this is football. The winning team is the one that has scored more member of points (goals) when a specified length of time has elapsed.

Field hockey is a popular sport for men and women in many countries around the world in most countries, especially those in which ice hockey is not very prominent it is simply known as hockey.

Pakistan and Indian national teams dominated men's hockey until early 1980's winning four of the first five world cups, but have become less prominent recently with Netherlands, Germany and Australia gaining importance in late 1980's then strong hockey playing nation include Spain, Argentina and South Korea. But the Netherlands predominant international women's team before hockey was added to Olympic events.

Volleyball is usually played with the hands or arms, but players can legally strike or push the ball with any part of the body. The fundamental skills of volleyball game are servicing, receiving, passing, smashing and blocking. These fundamental skills are very essential for improvement of volleyball game. This game provides a wide opportunity for the development of Flexibility, Speed, Agility, Power, Reaction time, Balance, Muscular strength, Muscular endurance and Co-ordination of all parts of body.

Cricket is played between two team 11 players on a grassy field, in the centre of which are two wickets - the equivalent of baseball's 'base'. Cricket as a bat and ball, team game played during the summer in the British Isles and several countries influenced by the British such as Australia, New Zealand, India, Pakistan, South Africa and West Indian nations. Cricket match is fought out by both teams with all resources of spirit technique at the command of players.

Reaction time is the time that elapses between the movement a stimulus is detected by the brain and the movement of response starts. Tests have confirmed that nobody can react in less than 0.110 of a second (Uppal *et al.*, 2004; Hodgking, 1963 and Latter, 1976).

Reaction time is time taken to process information and to initiate a movement after receiving a stimulus reaction time its role on the performance level of the players in various sports and games (Mendryk, 1960, Bharat and Sindhu, 1980 and Pistochini, 1968).

The static and dynamic body balance was probably measured for the first time by Dr. Ruth Bass in 1939. Nelson developed a balance test which could measure both static and dynamic balance abilities of the individual through a single test.

In the same year Johnsm and Leach (1968) modified the Bass test of dynamic balance which has been commonly used to measure one's ability to land accurately and to balance while in various unstable less stable and other precarious position (Kansal, 1996).

Co-ordination is the ability to integrate muscles movements into an efficient pattern of movement. Co-ordination make the difference between good performance and poor performance. The efficiency of skill patters depends upon the interrelation of speed, agility, balance and muscle movements into as well co-ordinated pattern (Jan, 1972).

The neuro-muscular co-ordination of the individual which includes his ability to learn new skill and finally achieve competency in physical activities as essential to all phases of physical education activities for developing such co-ordination, therefore, should be considered (Clarke, 1967 and Chowdhary, 1980).

Different games required different body position of quick reaction time, balance and co-ordination to execute any skill successfully. The game of hockey, volleyball, football and cricket players are necessary of all the mention variable as to have well control and to give pass or short at the target successfully. Hence, the researcher is intended to undertake this study.

■ METHODOLOGY

The main purpose of the study was to find out the difference in reaction time, dynamic balance and co-ordination among the players of hockey, volleyball, football and cricket. The study was delimited to the male players of hockey, volleyball, football and Cricket. The age of the subjects was ranged from 18-25 years. The study was also delimited to variables like, hand reaction time, foot reaction time, dynamic balance, eye-foot co-ordination and eye-hand co-ordination.

The data pertaining to the study were collected on the players of Degree College of Physical Education, Amravati. 15 male players from each games namely hockey, volleyball, football and cricket were selected as the subject for this study. The average age of the subject was 21 years ranged from 18-25 years their minimum status of participation was intercollegiate level.

Test and criterion measures for testing were

Reaction time was measured by using the following tests.

- Nelson’s hand reaction time

- Nelson’s foot reaction time.

The score was recorded in seconds.

Dynamic balance was measured by using modified bass test and the score was recorded in number as point.

The data was collected on the selected subjects by administrating the appropriate tests. Before collection of data the scholar explained the purpose of study to subjects so as to they put their best. All collected data were systematically arranged in the table for further statistical calculation. One way analysis of variance statistical technique (F-ratio) was employed to determine the difference among the players of four selected game for each variable independently.

■ OBSERVATIONS AND DISCUSSION

The data collected on 15 subjects from each hockey, volleyball, football and cricket players on reaction time, balance and co-ordination were computed by using one way analysis of variance (F-ratio) statistical technique. The result pertaining to these have been presented in the following tables.

An analysis of Table 1 indicates that Hand reaction time differs significantly among the players of four selected games namely hockey, volleyball, football and cricket because the calculated F-value of 2.97 is higher than the required F-value of 2.776 at .05 level.

Since the F-test was found to be significantly through one way analysis of variance, the LSD Post hoc test was applied to assess the significance of mean difference between the paired means for Hand reaction time the differences as shown in Table 2.

The findings of Table 2 reveals that the mean of and reaction time significantly differs in between football and hockey players the mean difference value of 0.026 is higher than the critical difference value of 0.024 at .05 level of confidence. It is also learnt from the above table that the mean difference values for football and volleyball (MD = 0.013), football and cricket (MD=0.023), and hockey and volleyball (MD=0.013), hockey and cricket (MD=0.003) and volleyball and cricket (MD=0.010) are less than that of Critical difference value of 0.024 hence,

Table 1 : One way analysis of variance for the data on hand reaction time among the players of hockey, volleyball, football and cricket				
Source of variance	Degree of freedom	Sum of square	Mean sum of square	F-ratio
Between the groups	3	0.01	0.0035	2.97*
Within the groups	56	0.066	0.0011	

* indicate significance of value at P=0.05

Tabulate $F_{.05}(3,56) = 2.776$

all these mean difference value of 0.024 hence all these mean difference are not statistically significant. The mean values of all the selected hockey, volleyball, football and cricket games are depicted in Fig. 1.

An analysis of Table 3 indicates that foot reaction time differs significantly among the players of hockey,

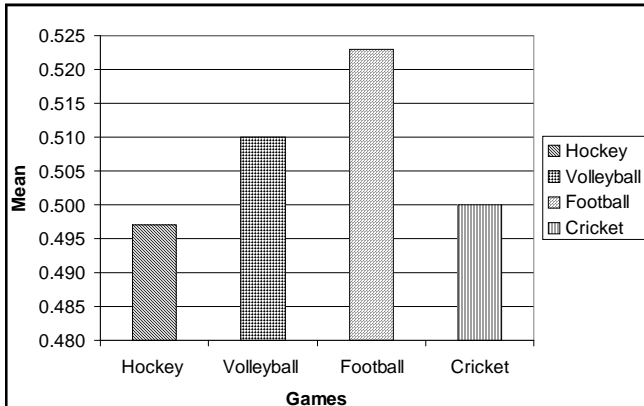


Fig. 1 : Showing difference between the means hand reaction time of hockey, volleyball, football and cricket players

volleyball, football and cricket because the calculated F-value of 4.79 is higher than that of tabulated F-value of 2.776 at 0.05 level.

Since the F-test was found to be significant through one way analysis of variance, the LSD post hoc test was applied to access the significance of mean difference between the paired means of hand reaction time has been shown in Table 4.

The findings of Table 4 reveals that the mean of foot reaction time of football players significantly differs than the hockey players (MD=0.035), volleyball players (MS = 0.048) and cricket players (MS = 0.050) as the obtained mean difference value are higher than the critical difference value of 0.028 at 0.05 level of confidence. It is also learnt from the above table that the mean difference values for hockey and volleyball (MD = 0.013), hockey and cricket (MD = 0.015) and volleyball and cricket (MD = 0.002) are less than the critical difference values of 0.028, hence all these mean difference are not statistically significant. The mean differences are graphically shown on Fig. 2.

Table 2 : Difference between the paired means of hand reaction time among the players of hockey, volleyball, football and cricket

Means				Mean difference	Critical difference
Hockey	Volleyball	Football	Cricket		
0.497		0.523		0.026*	0.024
	0.510	0.523		0.013	0.024
		0.523	0.50	0.023	0.024
0.497	0.510			0.013	0.024
0.497			0.50	0.003	0.024
	0.510		0.50	0.010	0.024

* indicate significance of value at P=0.05

Table 3 : One way analysis of variance the data on foot reaction time among the players of hockey, volleyball, football games

Source of variance	Degree of freedom	Sum of square	Mean sun of square	F-ratio
Between the groups	3	0.021	0.007	4.79*
Within the groups	56	0.082	0.00146	

* indicate significance of value at P=0.05

Tabulated $F_{0.05(3,56)} = 2.776$

Table 4 : Difference between the paired means of foot reaction time among the players of hockey, volleyball, football and cricket

Mean				Mean difference	Critical difference
Hockey	Volleyball	Football	Cricket		
0.465		0.430		0.035*	0.028
	0.478	0.430		0.048*	0.028
		0.430	0.480	0.05*	0.028
0.465	0.478			0.013	0.028
0.465			0.480	0.015	0.028
	0.478		0.480	0.002	0.028

* indicate significance of value at P=0.05

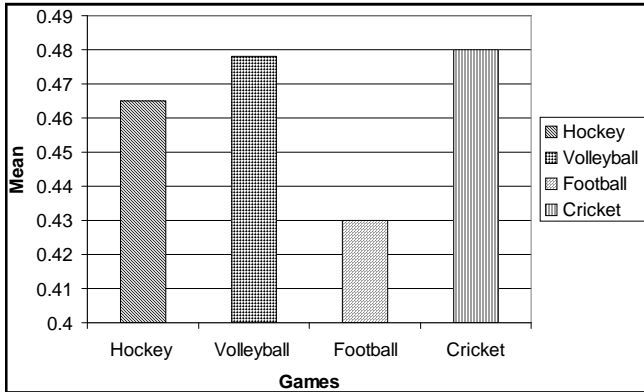


Fig. 2 : Showing difference between the means of foot reaction time of hockey, volleyball, football and cricket players

Analysis of Table 5 indicates that Dynamic balance differs significantly among the players of four selected games namely hockey, volleyball, football and cricket because the calculated F-values of 5.47 is higher than that of tabulated F-value of 2.776 at 0.05 level.

Since the F test was found to be significant through one way analysis of variance, the LSD Post hoc test was applied to assess the significance of paired mean difference between the groups for dynamic balance is shown in Table 6.

The findings of Table 6 reveals that the mean of dynamic balance significantly differs in between football

and hockey players (MD=22.34), football and cricket players (MD = 17.00) and hockey and volleyball players (MD = 18.00) as the mean difference values are higher than the critical difference value of 12.71 at 0.05 level of confidence. It is also learnt from the above table that the mean difference values for football and volleyball (MD = 4.34), hockey and cricket (MD = 5.32) and volleyball and cricket (MD = 12.68) are less than the critical difference values of 12.71, hence all these mean differences are not statistically significant. The mean difference are shown on Fig. 3.

An Analysis of Table 7 reveals that Eye hand co-

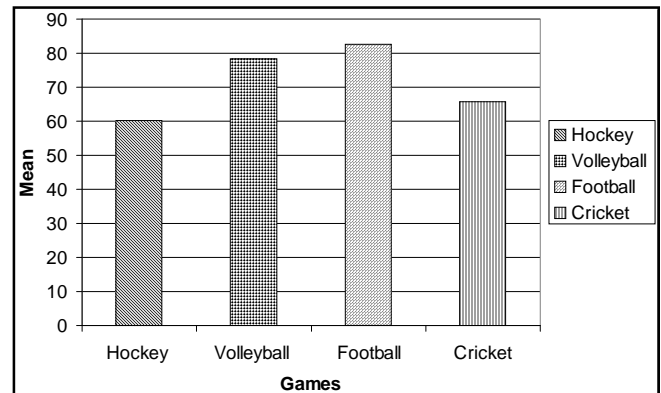


Fig. 3 : Showing difference between the means of dynamic balance of hockey, volleyball, football and cricket players

Table 5 : One way analysis of variance for the data on dynamic balance among the players of hockey, volleyball, football and cricket				
Source of variance	Degree of freedom	Sum of square	Mean sun of square	F-ratio
Between the groups	3	4947.33	1649.31	5.47*
Within the groups	56	16893.33	301.67	

* indicate significance of value at P=0.05
Tabulated $F_{0.05(3,56)} = 2.776$

Table 6 : Difference between the paired means of dynamic balance among the players of hockey, volleyball, football and cricket					
Hockey	Mean			Mean difference	Critical difference
	Volleyball	Football	Cricket		
60.33		82.67		22.34*	12.71
	78.33	82.67		4.34	12.71
		82.67	65.67	17.00*	12.71
60.33	78.33			18.00*	12.71
60.33			65.65	5.32	12.71
	78.33		65.65	12.68	12.71

* indicate significance of value at P=0.05

Table 7 : One way analysis of variance for the data on eye hand co-ordination among the players of hockey, volleyball, football and cricket				
Source of variance	Degree of freedom	Sum of square	Mean sun of square	F-ratio
Between the groups	3	145.25	48.42	3.46*
Within the groups	56	783.33	13.99	

* indicate significance of value at P=0.05
Tabulated $F_{0.05(3,56)} = 2.776$

ordination differs significantly among the players of hockey, volleyball, football and cricket because the calculated F-values of 3.46 is higher than that of tabulated F-value of 2.776 at .05 level.

Since the F-test was found to be significant through one way analysis of variance, the LSD Post hoc test was applied to assess the paired mean difference between the groups for Eye hand co-ordination, the differences are shown in Table 8.

The findings of Table 8 reveals that the mean of Eye hand co-ordination significantly differs in between hockey and volleyball players (MD=3.40), hockey and cricket players (MD = 3.80) are higher than the critical difference value of 2.74 at 0.05 level of confidence. It is also learnt from the above table that the mean difference value of football and volleyball players (MD = 2.54), volleyball and cricket players (MD = 0.40) are less than the critical difference values of 2.74, hence all these mean differences are not statistically significant. The mean difference are pictures quely shown in Fig. 4.

An Analysis of Table 9 indicates that Eye foot co-ordination does not differs significantly among the players of four selected games hockey, volleyball, football and cricket because the calculated F-value of 0.55 is less than that of tabulated F-value of 2.776 at .05 level.

Since the F-test was found to be significant through one way analysis of variance, the LSD Post hoc test was not employed.

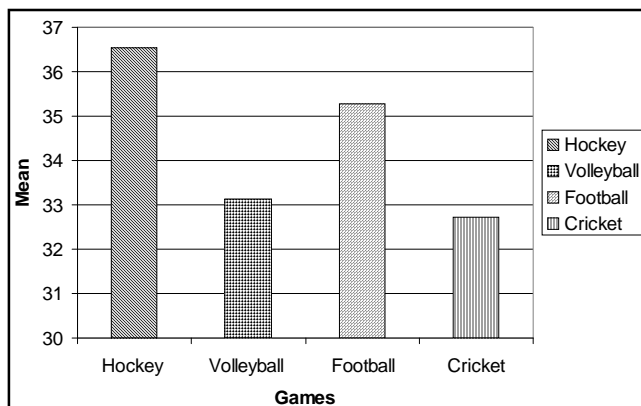


Fig. 4 : Showing difference between the means of eye hand co-ordination of hockey, volleyball, football and cricket players

Conclusion :

With in the limitation of the present study and on the basis of findings the following conclusion was drawn.

The finding of the study revealed that there were significantly differences in hand reaction time, foot reaction time, dynamic balance and eye hand foot reaction time, dynamic balance and eye hand co-ordination among the hockey, volleyball, football and cricket players.

There was no significant mean difference among the hockey, volleyball, football and cricket players in eye foot co-ordination.

The finding also revealed that hockey players have shown significantly better performance than the football players in hand reaction time.

The result of the study also revealed that the football players had shown superior foot reaction time than

Mean		Football	Cricket	Mean difference	Critical difference
Hockey	Volleyball				
36.53		35.27		1.26	2.74
	33.13	35.27		2.14	2.74
		35.27	32.73	2.54	2.74
36.53	33.13			3.40*	2.74
36.53			32.73	3.80*	2.74
	33.13		32.73	0.40	2.74

* indicate significance of value at P=0.05

Source of variance	Degree of freedom	Sum of square	Mean sun of square	F-ratio
Between the groups	3	5.38	1.79	0.55*
Within the groups	56	181.2	3.23	

* indicate significance of value at P=0.05

Tabulated $F_{0.05(3,56)} = 2.776$

hockey, volleyball and cricket players whereas there were no significant mean differences in between hockey and volleyball, hockey and cricket, volleyball and cricket players.

The findings also showed that the football players possessed super dynamic balance than the hockey and cricket players and volleyball players also showed significantly better performance than the hockey players in dynamic balance.

The result showed that the hockey players were superior in eye hand co-ordination than the volleyball and cricket players.

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