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**Dr. Gayatri Pandey**
Assistant Professor,
Lakshmibai National Institute of Physical Education, Gwalior, Madhya Pradesh, India

**Jayashree Acharya**
Professor, Lakshmibai National Institute of Physical Education, Gwalior, Madhya Pradesh, India

**Vivek Pandey**
Professor Lakshmibai National Institute of Physical Education, Gwalior, Madhya Pradesh, India

**Corresponding Author:**
**Dr. Gayatri Pandey**
Assistant Professor,
Lakshmibai National Institute of Physical Education, Gwalior, Madhya Pradesh, India

# Comparison of coordinative and proprioceptive abilities among selected team games

**Dr. Gayatri Pandey, Jayashree Acharya and Vivek Pandey**

**Abstract**
Dynamic balance is one of the greatest physical predictors of athletic success which measured by proprioception and coordination (BMS 1.0, 2008). Balance exercises are facilitate proprioception pathways under competitive circumstances effectively (Hanney, 2000) [3] and possibly reduce the time between neural stimuli and muscular response (Zachazewski *et al*., 1996). This research compares the coordinative and proprioceptive abilities of hockey and football players. Thirty male subjects (15 each), age ranged between 17 to 23 years (mean ± SD; 20±1.15 years) and weight 67±3.22kgs were selected randomly. Foot eye coordination and proprioception were assessed by using the sensbalance software v2 system where the subjects were asked for controlled and precise movement along the front-back & left-right axis and in proprioception, test was conducted in two parts (to move to a target point with visual feedback & without visual feedback). Hand-eye coordination was assessed by Vienna test system (Test form S1- 10 minutes). The two-sample t-test was applied and level of significance is set at 0.05. The mean and SD of hockey and football players on foot-eye coordination were 6.89±1.80 & 4.03±1.20; on proprioception 8.16±3.54 & 8.95±5.43 and on hand-eye coordination were 27.53±7.22 & 19.20±2.84 respectively. The obtained t value in foot-eye coordination and hand-eye coordination is 5.10 and 3.71, which is greater than the required value of 1.70 at 0.05 (28 df), thus signifying the difference between hockey and football players. No significant difference was observed in the factor of proprioception $t_{.05}$ (28) = (.470). The above findings clearly indicate that the footballers were better on foot-eye coordination whereas hockey players had an upper hand in hand-eye coordination. Proprioception as an ability is required by both the sport group athlete thus signifying the requirement of the nature of sport.

**Keywords:** Coordinative ability, proprioceptive ability, team games

## Introduction
The participation in games and sport has lots of significance; one of them is neuromuscular development which leads to increase in motor abilities such as agility, balance, power, speed, kinaesthetic perception, reaction time, coordination and sports skill. For achieving success in field of sports, setting of high level of performance that encourage body awareness or movement competence which provide the opportunity for athletes to develop physical literacy. Initially this might include the opportunity to experience a sense of balance and coordination and to develop the ability to move with control, precision and clarity. Each sport has its own special techniques. Special technique implies not only the special movements necessary for the sports concerned, but all the related general and complementary movements. Winning a championship in sports, especially in team sports such as football and hockey requires a collective effort. Successful hockey players need to execute fundamental technique and use their intelligence and physical prowess, including proper body balance, muscular strength, endurance, flexibility hand-eye coordination, kinaesthetic sense and agile speedy movement (Anders with Myers, 2008) [1].

The immense popularity of soccer does not mean that it is an easy game to play successfully. Football is a highly ordered analytical game in which players continually have to deal with a complex and frequently and rapidly changing environment. In competitive sports, beautiful and graceful movements are a product of well-developed technical skills and coordinative abilities. The speed of learning of skill and its stability is directly dependent on the level of various coordinative abilities. Coordinative abilities are needed for maximal utilization of conditional abilities, technical and tactical skills (Singh, 1991) [12].

Various mechanisms of the human body work collectively to provide a coordinative, smooth, efficient, and safe platform for presenting general and specific skill. Proprioception is the capacity of the body to determine where all of its parts are positioned at any given time in other words it is an unconscious perception of movement and spatial orientation arising from stimuli within the body itself. Steinhaus declared that our muscles can see more than the eyes. Proprioception is the sense that permits us to perceive the position and movement of the body in space. It is involved in all static and dynamic activities, facilitates the body to be stable and oriented and contributes to all complex neuromuscular processes underlying balance, gait and postural control (Shumway-Cook & Woollacott, 1995) [10]. A mounting body of facts indicates that proprioceptive training can improve athletes' strength, coordination, muscular balance, and reaction time **(**Owen, (n.d.).

Coordinative abilities (dexterity) rely on the movement control and directive processes: they are of critical importance in many sports. Co-ordination is the key word especially in team games, each players coordination comprises of neuro-motor and neuro-sensory action which direct to neuromuscular coordination. Coordination is defined as the "ability of the performer to integrate various types of body movements into specific pattern". Hand-eye coordination is a complex neurological process. It is the ability to track the movements of the hands with the eyes, thus enabling the eyes to send important signals to the brain about hand movement **(**Thompson). It describes the ability of the body's visual system to process information received through the eyes and uses it to direct the movements of the hands. Foot- eye coordination refers to the link between visual inputs or signals sent from the eye to the brain, and the eventual foot movements one makes in response. Both static and dynamic balance needs integration of visual, vestibular, coordination and proprioceptive inputs to produce an efferent response to direct the body within its base of support (Irrgang *et al.,* 1994; Guskiewicz and Perrin, 1996) [5, 2]. Football and hockey is probably the well-liked game of the world but there is still limited scientific information available concerning the coordinative abilities and proprioceptive abilities of players.

**Objective:** The objective of the present study was to compare foot-eye coordination, hand-eye coordination and proprioceptive abilities among hockey and football players.

## Material and Methods

To achieve the objective of the study total thirty players, among them fifteen interuniversity level male hockey players (ILMHP) and fifteen interuniversity level male football players (ILMFP) who were regularly participating in their course work activity classes and respective game training programs, with the age ranged between 17 to 23 years (mean±SD; 20±1.15 years) and weight 67±3.22kg were selected randomly as the subjects for this study from L.N.I.P.E Gwalior.

The data on the selected variables were collected by using standardize test. Foot-eye coordination and proprioception were assessed by using the sensbalance software v2 system (SSS) and hand-eye coordination was assessed by Vienna test system (VTS test form S1- duration 10 minutes). While taking the data on Foot-eye coordination the subjects were asked for controlled and precise movement trajectory starting at the center, in one direction, back in the opposite direction and returning to the centre along the front-back & left-right axis. In proprioception, test was conducted in two parts in first part subjects were instructed to move to a target point with visual feedback and in second part without visual feedback. Hand-eye coordination was assessed by VTS (Test form S1-10 minutes) "Time in ideal range", this screening form is ideal for obtaining a quick idea of the respondent's hand-eye coordination ability. The output of the proprioception measurement is the visualization of the movement pattern during Part 2 was considered. The average of sway in the four directions (front, back, left & right) the difference in angle between the actual movements to the target was measured as data. Similarly the average of the output value in the form of deviation from the ideal trajectory was considered as data for eye-foot coordination.

**Statistical Technique:** Statistical analysis was done with SPSS 20.0. Mean and standard deviation was calculated as descriptive statistics and for comparing the selected motor abilities among male hockey and football players the independent t-test was employed and the level of significance was set at 0.05 level of confidence.

## Results and Discussion

The descriptive statistics and results of the two-sample t-test which were acquired in order to discover the differences of ILMHP and ILMFP on selected motor abilities are presented below.

**Table 1:** Descriptive Statistics on foot-eye coordination, hand-eye coordination and proprioception of ILMHP and ILMFP

| Variables | Team | N | Mean | SD |
|---|---|---|---|---|
| Eye-Foot Coordination | ILMHP | 15 | 6.89 | 1.80 |
| | ILMFP | 15 | 4.03 | 1.20 |
| Eye-Hand Coordination | ILMHP | 15 | 27.53 | 7.22 |
| | ILMFP | 15 | 19.20 | 4.84 |
| Proprioception ability | ILMHP | 15 | 8.16 | 3.54 |
| | ILMFP | 15 | 8.95 | 5.43 |

Table 1 shows the mean & standard deviation of ILMHP and ILMFP on foot-eye coordination was 6.89±1.80 & 4.03±1.20; on hand-eye coordination 27.53±7.22 & 19.20±2.84 and on proprioception was 8.16±3.54 & 8.95±5.43 respectively. The mean scores are illustrated in Figure 1.

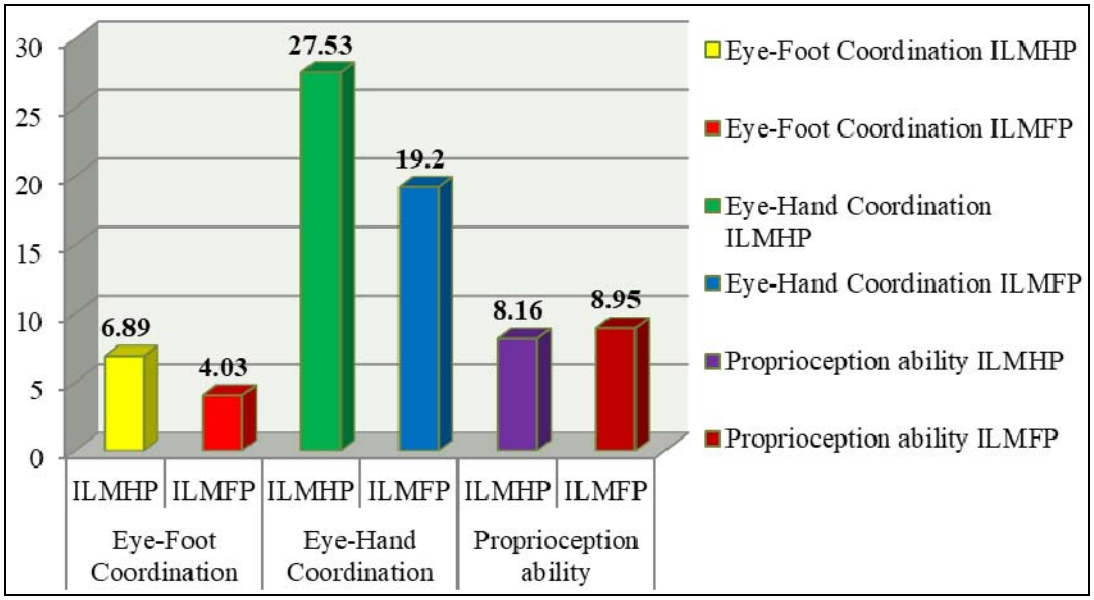


**Fig 1:** Mean Scores on Foot-eye Coordination, Hand-eye Coordination and Proprioception of ILMHP and ILMFP.

**Table 2:** Comparison of Mean on foot-eye coordination, hand-eye coordination and proprioception of ILMHP and ILMFP

| Variables | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | |
|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference |
| Eye_ Foot Coordination | Equal variances assumed | 3.10 | .09 | 5.10 | 28 | .000 | 2.85 |
| | Equal variances not assumed | | | 5.10 | 24.39 | .000 | 2.85 |
| Eye_ Hand Coordination | Equal variances assumed | 1.37 | .25 | 3.71 | 28 | .001 | 8.33 |
| | Equal variances not assumed | | | 3.71 | 24.46 | .001 | 8.33 |
| Proprioception ability | Equal variances assumed | 1.6 | .22 | .47 | 28 | .642 | -.79 |
| | Equal variances not assumed | | | .47 | 24.11 | .642 | -.79 |

Table 2 represents the F-value (Levene's test) and t value. This F value is insignificant as p value is .09 which is more than the .05. Thus assumption equality of variance is accepted. Further t-statistics, obtained t value in foot-eye coordination and hand-eye coordination is 5.10 and 3.71 respectively, which is greater than the required value of 1.70 at 0.05 (28 df), thus signifying the difference occurs between hockey and football players. But obtained value on proprioception $t_{.05}$ (28) = .470 is less than the required value, this indicates insignificant difference.

The findings of this research paper showed that in foot-eye coordination interuniversity level male football players are significantly better than interuniversity level male hockey players; in hand-eye coordination interuniversity level male hockey players are significantly better than interuniversity level male football players. This may be because of nature of the games. The football players perform the skills with the foot, these soccer skills requires players to make pinpoint passes, free kick with precision, fake out the defence and dribble the ball. Foot-eye coordination helps the players to stop a soccer ball with his foot and make adjustments to intercept the ball (Livestrong, 2015) [7]. This leads to the enhancement of foot-eye coordination in footballers and this ability assist the athletes to keep their head up during ball handling which maximizes their performance. On the other hand the hockey players show their performance by handling the ball with the help of the stick. Hockey is an excellent sport for those who want to improve their hand-eye coordination (Bragg, 2014) [8]. Hockey skills forces the players to use hand-eye coordination to pass, receive, hit and shoot etc. the ball while being guarded by someone who is trying to keep the players from doing all these required skills. Measuring the distance, force and flight that needs to be put on a ball for goal shooting through a horizontal hoop is a skill made more difficult by the constraints of opposing defenders and a game clock, these could be the reasons that hockey players had an upper hand in hand-eye coordination. Further both sport group athletes were showing equal proprioceptive ability because proprioception as ability is required by both group athletes equally. The reason could be attributed to the fact that the nature of game, dimension of the ground, system of play of the game are similar for both group players. Another reason could be that both the group were undergoing a similar curriculum and had been adequate trained, so no difference were detected.

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