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An investigation into evaluating motor fitness variables as indicators of performance in field hockey players

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Abstract
The purpose of this study was the motor fitness variables as predictors of playing ability of hockey players. 30 male hockey players were selected for the study by random age group between 18 to 21.The subjects were at least once or twice represented from their college. For assessing the motor fitness test, (power, agility, speed and endurance) were selected and for assessing the playing ability of the hockey players (zigzag dribbling with hockey ball, 50 meters dash with ball scoping the hockey ball) test were selected for collecting the data. The new score all the test items converted into standard score using 'Z' scale to get the single score. For analyzing these data, the multiple correlation (R) and simple correlation that is Pearson's 'r' was used to significant correlation 0.05 level confidence was used. The assessment of motor fitness variables as a predictor of playing ability in hockey of hockey players. The motor fitness test and playing ability test were conducted to get a single score for motor fitness test and playing ability test, all the scores of the test items converted into standard score, using the "Z" scale. The data so obtained was recorded and analyzed statistically, multiple correlation of co-efficient between hockey playing i.e. zig – zag dribble with ball and motor fitness variables (0.832) and between the hockey playing ability i.e. scooping the ball and motor fitness variables (0.810) were shown significant correlation at 0.05 level of confidence with 28 degree of freedom value of 0.790.

Keywords: Zig-Zag dribbling, motor fitness, hockey, playing ability, power, agility, speed and endurance.

Introduction
Sports constitute organized competitive pursuits that demand intense physical effort or the application of intricate physical abilities. Hockey, a team sport played outdoors akin to football and cricket, involves two teams, each comprised of 11 players. The game unfolds on a turf or a firm, muddy surface, employing curved or hooked sticks and a solid ball. The primary objective is to propel the ball into the adversary's goal by striking it with the stick. Referred to as 'Field Hockey' to distinguish it from 'Ice Hockey', a closely related yet considerably faster game played on the solid, frozen expanse of ice. The literature review encompasses the systematic exploration for information pertaining to a specific subject, constructing a comprehensive overview of the existing knowledge on that subject. In the pursuit of a deeper comprehension and insight into the research problem, the investigator diligently conducted an extensive review of literature relevant to the study's topic.

The aim of the current investigation is to evaluate motor fitness variables as potential predictors of hockey playing proficiency among hockey players. Numerous studies in the past have delved into similar examinations across various sports such as football, basketball, volleyball, and handball. In an effort to provide context for the ongoing study, the researcher has undertaken a concise review of these prior research endeavors. The study will specifically explore how these factors correlate with the athletes' performance in field hockey-related tests, both with and without a ball [1]. The study aims to conduct a comprehensive analysis of various physical abilities, such as strength, speed, endurance, agility, and other relevant factors. By identifying the most influential physical attributes, the research seeks to establish a clear distinction between players selected for the National Project for Hockey [2].

The study aims to contribute to the field of sports science by offering a nuanced understanding of how selected motor parameters evolve over a training macro cycle among elite field hockey players [3]. The study is designed to explore the simultaneous impact of agility, hand-eye coordination, and waist flexibility on dribbling skills in field hockey players [4].
The study seeks to understand the nuanced distinctions in performance attributes that are indicative of skill progression at different stages of development in the field of hockey [5]. The findings highlight the importance of considering multiple anthropometric measures when assessing strength in different muscle groups. These insights may have implications for sports training [6]. The study likely involved the evaluation of a range of general motor abilities, which may include components such as agility, speed, strength, coordination, and endurance. By comparing handball and hockey players are at the national and interuniversity levels [7]. The primary objective of this study was to develop a test that is both valid and reliable, specifically tailored for field hockey players [8]. The findings of this study suggest that the two fitness tests under investigation should not be employed interchangeably, as they appear to be indicative of different hematological mechanisms [9]. The investigation likely involved assessing various physical determinants, including but not limited to speed, agility, endurance, and cardiovascular fitness [10]. The valuable tool for identifying nurturing talent in the sport, aiding in the selection of players with the potential for success at higher competitive levels [11-12].
The study focused on analyzing the physical parameters and age of current hockey players in the National Hockey League (NHL) [13]. To address these gaps, future research in this area should employ more holistic methodologies that consider the interconnectedness of physical fitness and technical skills [14]. This study likely involved the analysis of various parameters, such as height, weight, strength, endurance, agility, and coordination, among others [15]. The study likely sought to provide insights into the balance, flexibility, strength, and coordination of participants, with a particular focus on identifying any asymmetries [16]. Effectiveness of using modified equipment as a training strategy for improving the performance of young field hockey players [17]. The study likely involved an examination of various physical attributes, such as height, weight, strength, speed, and endurance, as well as the age of players [18]. The study revealed that lower limb explosive strength serves as a robust predictor of both linear speed and agility in young roller hockey players [19]. The study aimed to discern whether chronic use plays a role in shaping perceptions related to comfort and acceptance of mouth guards [20].
Moreover, the study was designed to have practical applications for physical education teachers and coaches. The outcomes were envisioned to aid in the selection of hockey players and assist in the planning of training and coaching schedules. By identifying the specific motor fitness components that correlate with playing ability, educators and coaches could tailor their interventions to address the unique needs of each player.
The study was further delimited to on playing abilities of Hockey Zig-Zag dribble with ball, 50 mts. Dash with ball and Scooping the ball, factors like diet daily routine habits are not be controlled and height have an effect on the results. No specific motivational techniques were used during testing lack of motivation may affect the performance and also on the results. Atmospheric temperature was not taken into consideration during the time of test administration. The study could be an exhaustive one, because of the paucity of literature on this subject. Motor fitness may be defined as a readiness or preparedness for performance with special regard for big muscles activity without undue fatigue. It concerns the capacity to move the body efficiently with force over a responsible length of time.

Methodology

In this section, we elaborate on the process of subject selection, variable selection, data collection, criteria for measurement, test administration, and the statistical procedures utilized for data analysis.

Selection of subjects

For this study, a sample of thirty male participants was randomly chosen from the population of hockey players in Visakhapatnam.

Selection of variables

The choice of variables was made with consideration for their significant impact on sports performance, the practicality of data collection, and the researcher's available time. The selected variables align with these criteria.

Orientation of subjects

To obtain full co-operation from the subjects the investigator explained the test verbally, then demonstrated before them various test one after the other. Which the subjects have to perform and some subjects performed the test as model. Doubts and apprehensions if any in the minds of the subjects were explained by the investigator.

Motor Fitness Components

The independent variables were selected taking into consideration the most contributing factors to the performance of motor skills. The selected independent variables for this study were: Speed, Agility, Power and Endurance.

Criterion Measures

The hypothesis was tested using the following criteria for measurement.

Motor Fitness Components

Speed: For measuring the speed 50 mts. dash was used.
Agility: For measuring the agility 4 x 10 mts. Shuttle run was used.
Power: For measuring power vertical jump was used.
Endurance: For measuring the endurance, 12 minutes run or walk test was used.

Administration of Tests and Collection of Data

Speed: 50 mts. Dash
Purpose: To measure Speed
Equipment: A Stop Watch, Tape, Chunnam
Procedure: Upon positioning themselves behind the starting line to acquire test results, two subjects were directed to run simultaneously upon receiving a signal.
SCORING: The recorded score represented the time taken to complete the course, rounded to the nearest 1/10th of a second, measured from the starting signal to the finishing line.

Agility (4 x 10 Yards Shuttle Run)

Purpose: To measure how rapidly body position can be accurately changed in an activity.
Equipment: Two wooden blocks measuring 2 x 2 x 4 inches

each, along with a stopwatch.

Procedure: Mark two parallel lines on the floor, spaced 30 feet apart (utilizing the width of the volleyball court as a suiTable area). Position the wooden blocks behind one of the lines, with pupils starting from behind the other line. Upon a signal, pupils run to the blocks, pick one up, return to the starting line, and place the block behind the line. Subsequently, they run back, pick up the second block, and carry it back across the starting line. If two timers are available, two pupils can run simultaneously. To streamline the process, alternate the race start points, conducting two trials.

Scoring: Record the time of the better of the two trials, rounded to the nearest tenth of a second.

Power
Purpose: To assess leg power through jumping ability.
Equipment: A yardstick, a piece of chalk, and a smooth wall surface located no less than 12 feet from the floor.
Procedure: The subject was instructed to stand with one side facing a wall, with heels together and holding a piece of chalk in the hand nearest to the wall. While keeping the heels on the floor, the subject reached upward as high as possible and made a mark at the height of their jump.
Scoring: The score was determined by measuring the number of inches between the standing reach and the jump marks, rounded to the nearest ½ inch. Three trials were permitted, and the best trial was recorded as the final score.

Endurance
Purpose: For measuring the speed in meters.
Equipment: Stop Watch
Procedure: The testing group was divided into two, with each student partnering up. While one student ran, the partner was responsible for tracking the laps. The partner's role was to count the laps completed within the allocated time. At the eleven-minute mark, the instructor announced the remaining time. When the twelve minutes concluded, the instructor blew the whistle, prompting the runner to note the marking they had just passed.

Scoring: The observing partner communicated the number of full laps the runner had completed. The runner then reported their score, denoting laps and the count of 50-meter zones covered on the last lap.

Hockey Skill Test
The dependent variables were selected taking into consideration the most contributing factor to the performance of hockey skills. The following variables were selected:
1. Zig-zag dribbles with ball.
2. 50 mts. dash with ball.
3. Scooping the ball for distance.

Zig-Zag Dribble with Ball
Purpose: To measure the zig-zag dribble with dribbling ability.
Equipment: 50 ft. Foot area marked, stop watch, chairs, and hockey ball.
Procedure: 5 chairs were kept in 10 ft., apart from the starting line. Subject was asked to stand behind the starting line. As soon as start was given, subject had to start dribble the ball in a zig-zag manner and he should return back to the starting line.
Scoring: Score was time taken to complete the course was recorded between the starting signal and the finishing line.

50 Meters Dash with Ball
Purpose: To measure ability to make a fast take off after receiving the ball and dribble for 50 mts
Equipment: 50 Mts. area marked with starting and finishing line. Hockey ball, stick and stop watch.
Procedure: The subject was asked to stand behind the starting line. When the signal is given he starts dribble the ball for 50 mts. simultaneously, stop watch was also started. After subject crossed the end line, stop watch was stopped.
Scoring: The score was determined by the time taken to complete the course, rounded to the nearest 1/10th of a second, measured from the starting signal to the finishing line.

Scooping the ball
Purpose: To measure the scooping abilities or to push the ball fast.
Equipment: One straight line marked, measuring tape, stick and hockey ball.
Procedure: The subject was asked to stand behind the straight line the subject had to scoop the ball for a distance. The first bounce of the ball was taken for measuring the distance.
Scoring: The distance was measured to the nearest of the meters measuring from the meter marker. Best of three chances were recorded.

Statistical Technique: The purpose of the study was to access the motor fitness variables as predictors of playing ability in Hockey. Multiple correlations were computed to analyze the data.

$$R\ 1.23 = \sqrt{\frac{r_{12}^2 + r_{13}^2 - 2r_{12}\ r_{13}\ r_{23}}{1 - r_{23}^2}}$$

Equipment Used: Stop watches calibrating to one tenth of second were used for collecting the data. A Casio college fx-100B calculator was used to calculate the collected data.

Analysis and interpretation of data: The statistical analysis of data related to performance on motor fitness variables (speed, agility, power and endurance) and playing ability data (zig-zag dribble with ball 50 mts. dash with ball and scooping the ball) collected on 30 male college hockey players. The raw scores of subjects are given in Appendix "A" and "B".

Scoring of data: The scores are the time taken by the subjects to complete the test from starting to finish.

Level of confidence: To determine the predictive capacity of motor fitness variables for hockey playing ability, the significance level was set at 0.05, which was deemed appropriate for this study.

Analysis of Data: The assessment of motor fitness is variables as a predictor of playing ability in hockey of the hockey players. The motor fitness test and playing ability test were conducted to get a single score for motor fitness test and playing ability test, all the scores of the test items converted into standard score, using the "Z" scale. The data so obtained was recorded and analyzed statistically.

Table I: The co-efficient of the reliability thus obtained is presented

Co-efficient of reliability of test-retest score			
Tests	**Zig-Zag**	**50 mts. DASH**	**Scooping**
Power	0.925*	0.873*	0.858*
Agility	0.747*	0.753*	0.742*
Speed	0.796*	0.855*	0.944*
Endurance	0.843*	0.932*	0.875*

* Significant at 0.05 level of confidence. N = 30, r = .05, (28) = 0.396.

Fig 1: Co-efficient of reliability of test-retest score.

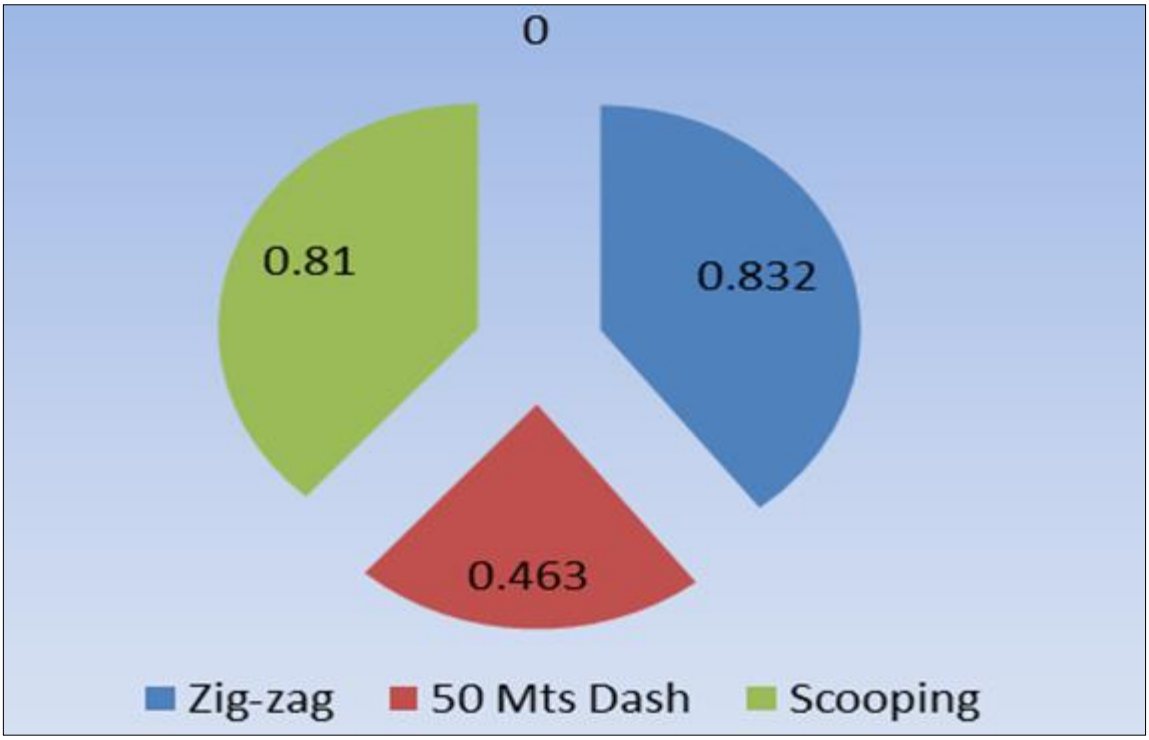

Fig 2: Multiple correlation of coefficient of speed, agility, power and endurance.

An analysis of multiple correlations of co-efficient of playing ability with motor fitness variables data are presented in Table II.

Comparisons between playing ability in hockey and motor fitness variables: Table II reveals that multiple correlation of co-efficient between hockey playing i.e. zig-zag dribble with ball and motor fitness variables (0.832) and between the hockey playing ability i.e. scooping the ball and motor fitness variables (0.810) were shown significant correlation at 0.05 level of confidence with 28 degree of freedom value of 0.790. However there was no significant correlation between the playing ability of 50 mts. dash with ball and motor fitness variables (0.463) at 0.05 level of confidence.

Table 2: Multiple correlation of coefficient of speed, agility, power and endurance

Tests	Z-Value
Zig - zag dribble with ball	0.832*
50 mts. Dash with ball	0.463
Scooping the ball	0.810*

*Significant at 0.05 level of confidence with 0.790.

Table 3: An analysis of co-efficient of inter correlation between playing ability of hockey and motor fitness variables

Co-efficient of inter-correlation			
Tests	**Zig-Zag**	**50 mts. Dash**	**Scooping**
Power	0.258*	0.340	0.374*
Agility	0.408*	-0.433*	-0.375*
Speed	0.385*	-0.420*	-0.418*
Endurance	-0.362*	0.369*	0.290

*Significant at 0.05 level of confidence with 0.360 value.

The Table III reveals that significant correlation was found between the vertical jump (0.374), Agility and Zig-zag dribble with ball (0.408), Agility and 50 mts. Dash with ball (0.433), Agility and Scooping the ball (0.375), Speed and Zig-zag dribble with ball (0.385), Speed and 50 mts dash with ball (0.420, speed and scooping the ball (0.418), endurand and zig-zag dribble with ball (0.362), endurance and 50 mts dash with the ball (0.369) at 0.05 level of confidence with value at 0.360. However there was no significant correlation found between the vertical jump and zig-zag run with ball (0.258) vertical jump and 50mts. Dash with ball (0.340) and endurance and scooping the ball (0.290) 0.05 level of confidence with value of 0.360.

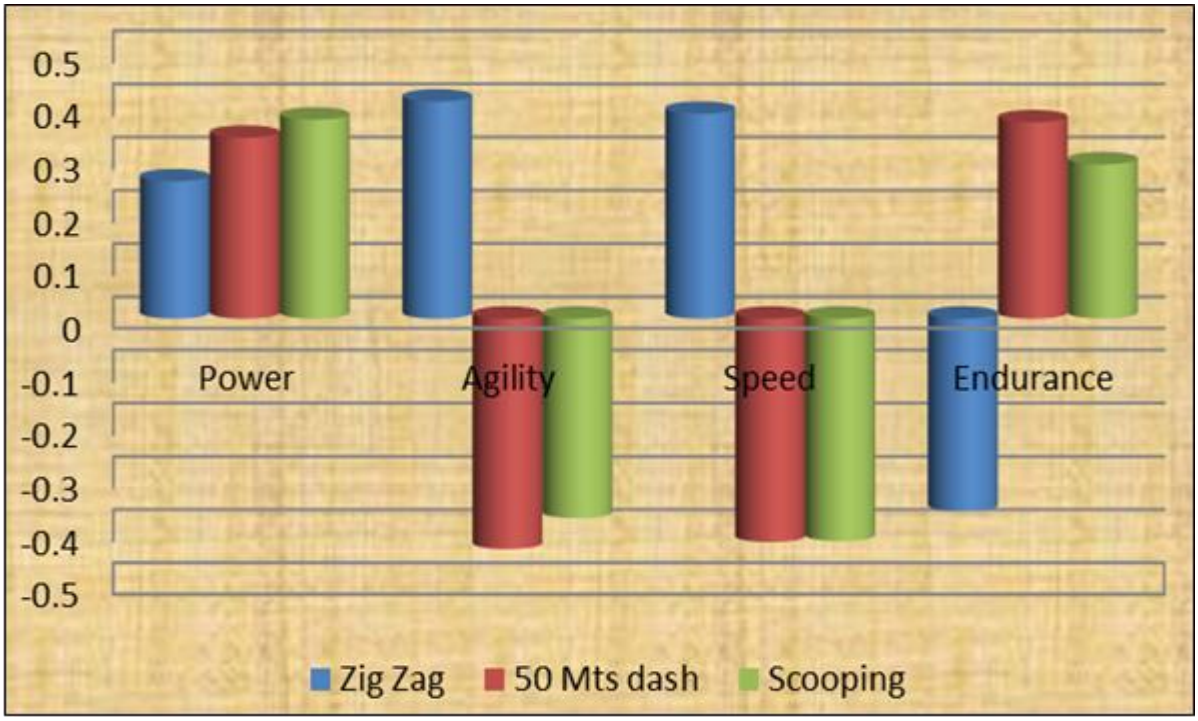

Fig 3: Co-efficient of inter-correlation

It is evident from the result of the study that playing ability in Hockey, a person must have strength, cardio respiratory endurance, agility, speed, with dribbling the ball, stopping, hitting, scooping the ball etc. The assessment of motor fitness variables as a predictor of playing ability in Hockey. The motor fitness test and playing ability test for analysis of multiple correlation of coefficient of inter-correlation between playing ability of hockey and motor fitness variables. It has shown a significance correlation. It was due to the fact that the nature of the game that requires in hockey, dribbling, stopping, hitting, scooping, pushing, passing the ball, attacking and blocking the opponent, change of direction and quick, stop, scooping the ball are some essential features to zig-zag dribble with ball test and scooping ball over significantly correlated with motor fitness variables.

Where as the hockey game also requires fast running. Quick stopping and power for hitting, scooping the ball is essential. So the scooping of the ball test is shown significant correlation with motor fitness test. Whereas, the combination effect of the different components analyzed a high correlation of coefficient was obtained which indicated that all the selected motor components significantly influenced on hockey playing ability in Hockey test. The result of the multiple correlation of coefficient analysis sums to indicate that it is possible to make reasonable accurate prediction of playing ability in Hockey on the basis of motor fitness variables. Explosive powers and strength has a greatest loading in multiple correlation in positive direction. Because of the nature of the game which requires fast running, quick stopping and powerful pushing of the ball. Cardio vascular

Endurance is also been found to be of value in correlation in the positive direction. Because the game of hockey is of a long duration and successful performance needs high cardio-respiratory efficiency. The agility has been found to be valuable in correlation in negative direction. This is because of the fact that a higher score value indicates the poor performance in shuttle run and 50 mts. dash. In hockey, dribbling with opponent, changing of direction and quick stopping for scooping or hitting the ball are some essential factors and they need a high demand of agility.

Conclusion

On the basis of the result, the following conclusions were drawn: In multiple correlation of coefficient between hockey's playing ability test that is zig-zag dribble with ball test score and motor fitness variables. Whereas in hockey playing ability test i.e. scooping the ball and motor fitness variables were show significant correlation. However there was no significant correlation was found between the 50 mts. Dash with the ball and motor fitness variable scores. In simple correlation i.e. speed has got significant correlation with zig-zag dribble with ball, 50 mt dash with ball and scooping the ball. Whereas the agility also shown significant correlation with zig-zag run with ball, 50 mts. Dash with ball and scooping the ball. However the endurance also shown highly significant correlation with zig-zag run with ball and 50 mts. Dash with ball. However there was no significant correlation between the scooping of the ball and endurance test. Whereas in vertical jump test, score with zig-zag dribble with ball, 50 mts. Dash with ball, and scooping the ball test scores were not found significant correlation.

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