REVIEW OF RELATED LITERATURE

“The literature in any field forms the foundation upon which all future work will be built”

- J.C. Agrawal

The research scholar has gone through related literature available which are relevant to the present study. The relevant studies from various sources which the investigator has come across are enumerated below:

Shoukeh, Mismar & Hisham (2013) conducted a study on a criterion – referenced test battery to assess overall ability in team handball. The purpose of the study was to construct the team handball skill test battery, based on criterion measurement in order to evaluate the overall ability of pertinent skills for rudimental level in the game. Students were (N=60) from the Faculty of Physical Education at Yarmukh University in the Northern part of the Hashemite Kingdom of Jordan. Those students were chosen purposively while registering in two team handball classes, each of which had (N=30) students during the academic year 2011-2012. The researchers utilized descriptive methodology by designing the proposed test battery, which comprises of overhead pass, ball catching and shooting with forward jump and represents the overall ability of individuals in the game. In order to achieve the objective of the study, selected procedures and techniques have been used to check for scientific coefficient of the tool based on criterion tests and measurement, with considering some indicators such as validity, reliability and objectivity. Data were collected by examining the students of the study throughout using the proposed test battery at the end of the course. The results revealed that the skill test battery was valid, reliable and objective and could be a practical tool to obtain certain and similar objectives. The study recommends adopting this test battery with the criterion reference based measurements to assess overall ability in team handball by assigning students on mastery and non-mastery states.
**Review of Related Literature**

**Joseph Suma (2013)** conducted a study the purpose of this study was to construct a test battery to assess the basketball playing ability of women basketball players of age between 18 and 25 years. To achieve the purpose of this study, 150 subjects who have represented the state or university were selected from the states of Kerala and Tamil Nadu. The newly constructed test batteries were administered on them by the investigator three times with a break of one day in between. The same tests were administered on them independently by other three qualified testers after three days. The selected subjects were assessed subjectively by a panel of three experts. The data thus collected in this manner were analyzed statistically to test the reliability, objectivity, validity of these tests and to construct norms.

**Suresh & Kalidasan (2010)** constructed a new skill test battery and to develop standard norms for Field Hockey players. Initially 23 test items were designed on 6 fundamental skills. A pilot study was conducted on 52 male Field Hockey players from Chennai region age ranged from 17 to 20 years. They were regular practitioners in the astro turf surfaces. After extensive critical analysis 9 skill tests were finalized. Validity, reliability and objectivity were established on all selected test items. To arrive the final test battery four hundred and fifty four male college level Field Hockey players excluding goal keepers were randomly selected from various colleges of Tamilnadu state, India and their age ranged between 17 and 20 years with the mean age of 18.8, ± 1.9 years. After administrating the 9 skill test items to the above said subjects it was found that there was an inter-relationship between the performances of selected test items. The factor analysis yielded two factors which were named as ‘stick work ability’ and ‘accuracy in ball playing ability. The final test battery included the following skill tests namely speed dribbling, shooting from 16 yards, straight flick, slap hit, multi target push and straight drive hit. Finally norms were developed using percentiles and 6-sigma scale.

**Viswanathan (2010)** conducted a study on construction of hockey skill test battery for Tamil Nadu school boys of fourteen to sixteen years. After the preliminary investigation which resulted in identification of HRP test items, a sample of 164 school boys who represented in the state level Republic day sports were chosen as the subjects and then HRP test items were administered on them. The playing ability of
of Related Literature

Each subject was determined by subjective rating by a panel of three experts during the competition. Intra-class reliability for internal consistency of the three trials of the HRP test items was established by employing, repeated measures Two-Way ANOVA Model as described by Safrit and Wood (1989). The reliability coefficients of HRP test items, the ‘R’ value ranged between 0.889 and 0.974. A Final Test Battery (FTB) was constructed by the administration of all the ten HRP test items and subjected to Factor Analysis using Principal Component Analysis and Varimax Rotation Method. Performance percentile norms were developed for each of the Final Test Battery (FTB).

Purashwani Pushpendra, Datta A. K, and Purashwani Manoj (2010) were conducting a study. The purpose of study was to construct the norms for evaluating performance of players in Table Tennis Skills Test. For this purpose 816 male, 410 Junior and 406 Senior, state and national level Table-Tennis players of different states in India were randomly selected to serve as subjects. The performance of Table Tennis players in Table Tennis test battery of four test items, Namely, Alternate Push Test, Target Service Test, Alternate Counter Test and Fore Hand Drive on Target Test with foot movement after playing backhand push, The data was collected by administering the test for the selected test items during the Summer Coaching Camps and Regular Training Sessions of various districts, different Ranking Table Tennis Tournaments and State and Inter-District Table-Tennis Championships in the year 2006. The data, which was collected by administering tests, was statistically treated to develop norms for all the test items. The two normative scales, namely, the Percentile Scale and 7 Sigma Scale were constructed for the junior and senior table tennis players of state and national level. The norms were constructed by using Percentile and 7 Sigma Scale techniques analyzed through statistical packages, the scores were further classified into five grades i.e. very good, good, average, poor and very poor under Normal Distribution.

Elferink (2010) determined whether youth athletes with an "average" (regional), "high" (sub-elite), and "very high" (elite) level of performance differ with respect to their self-assessed tactical skills, 191 youth Field Hockey players (mean age 15.5 years, s = 1.6) completed the Tactical Skills Inventory for Sports (TACSIS) with
scales for declarative ("knowing what to do") and procedural ("doing it") knowledge. Multivariate analyses of covariance with age as covariate showed that elite and sub-elite players outscored regional players on all tactical skills (P < 0.05), whereas elite players had better scores than sub-elite players on "positioning and deciding" (P < 0.05) only. The sex of the athletes had no influence on the scores (P > 0.05). With increasing level of performance, scores on declarative and procedural knowledge were higher. Close to expert performance, declarative knowledge no longer differentiated between elite and sub-elite players (P > 0.05), in contrast to an aspect of procedural knowledge (i.e. positioning and deciding), where elite players outscored sub-elite players (P < 0.05). These results may have implications for the development of talented athletes.

Gabbett (2010) investigated the physiological demands of women's Field Hockey competition and compared these demands to those experienced during game-based training activities. Fourteen elite women Field Hockey players (mean ± SD; age, 23.3 ± 3.2 years; maximal oxygen consumption, 53.5 ± 4.3 ml x kg(-1) x min(-1)) participated in this study. Global positioning satellite (GPS) system analysis was completed during 19 training appearances and 32 Australian Hockey League (AHL) appearances. All training sessions consisted of game-based activities (i.e., small-sided training games) that were played on a reduced-sized pitch. Movement was recorded by a global positioning satellite unit sampling at 5 Hz. Data were categorized into discreet movement velocity bands, corresponding to low-intensity (0-1 m.s(-1)), moderate-intensity (1-3 m.s(-1) and 3-5 m.s(-1)), and high-intensity (5-7 m.s(-1) and >7 m.s(-1)) activities. Players covered 6.6 km (range: 3.4-9.5 km) over the course of the match. Midfielders spent more time and covered greater distances in high-intensity running (i.e., >5 m.s(-1)) than strikers and defenders. The number of high-velocity and high-acceleration efforts over the course of a match was greater in midfielders. In comparison to competition, game-based training sessions resulted in more time spent in low-intensity (i.e., 0-1 m.s(-1)) activities and less time spent in moderate (i.e., 1-3 m.s(-1) and 3-5 m.s(-1)) and high-intensity (i.e., 5-7 m.s(-1) and >7 m.s(-1)) activities. Although game-based training is likely to be useful for improving the skill levels of players, the skill activities used in the present study did not reflect the physiological demands of competition, with players spending more
time in low-intensity activities and less time in high-intensity activities than competition. Modifications in training group size and drill design and complexity may better simulate the physiological demands of competition.

**Lopez (2010)** analyzed the kinematic sequencing in the penalty corner drag flicks of elite male and female Field Hockey players of international calibre. Thirteen participants (one skilled male drag flicker and six male and six female elite players) participated in the study. An optoelectronic motion analysis system was used to capture the drag flicks with six cameras, sampling at 250 Hz. Select ground reaction force parameters were obtained from a force platform which registered the last support of the front foot. Twenty trials were captured from each subject. Both player groups showed significantly ($p < 0.05$) smaller ball velocity at release, peak angular velocity of the pelvis, and negative and positive peak angular velocities of the stick than the skilled subject. Normalized ground reaction forces of the gender groups were also smaller than that of the skilled drag flicker. By comparing these players we established that the cues of the skill level are a wide stance, a whipping action (rapid back lift) of the stick followed by an explosive sequential movement of the pelvis, upper trunk and stick.

**Suresh & Kalidasan (2010)** evaluated the slap hit in Field Hockey on astro turf. To achieve the purpose of the study, three test items were designed by the investigators, after analyzing the various factors. These test items were three direction hitting, multiple target hitting and target hitting. The above said test items were administered to sixty seven male Inter-collegiate level Hockey players and their age ranges from 17 to 20 years ($\text{Mean} = 17.72, \text{SD} = \pm 1.64$). In order to find out the reliability, objectivity and validity correlation analysis was used. Based on the test-retest method, the reliability coefficient score on tests item reveals that it was acceptable according to arbitrary standards for the evaluation of physical performance tests. But, the acceptable coefficient for validity was observed only in multiple target hitting. Among the three test items, multiple target hitting was most appropriate to measure the slap hit in Field Hockey on astro turf.
Singh Rajpoot (2009) constructed Skill related fitness test for hockey players. For the purpose of this study 100 university level hockey players who were participants of West Zone Interuniversity Hockey Tournament held at Gwalior at Lakshmibai National Institute of Physical Education during October 2008 were selected as subjects.

In the process of preliminary construction of the test two types of Hockey Fitness Course with 5 different variations were as constructed in preliminary stage. In all the five variations of Hockey Fitness Test Course fundamental skills were appropriately placed. The five Hockey Skill related fitness test were HSRFT-V₁, HSRFT-V₂, HSRFT-V₃, HSRFT-V₄ and HSRFT-V₅. Correlation coefficient was observed when the five fitness test whose performance and playing ability performance were correlated. i.e. 0.527, 0.623, 0.861, 0.592 and 0.664 respectively. The HSRFT-V₃ fitness test course with highest correlation coefficient value 0.86 was found to be most appropriate and true representative as measuring tools for playing ability related skill based hockey fitness ability.

HSRFT-V₃ Hockey Skill related Hockey Fitness Test is finally developed in this study characterizes versatile in terms of its scientific characteristics, comprehensiveness as all inclusive. The fundamental skill related seven testing items that were included within the HSRFT-V₃ fitness test course are extremely significant from the point to measure Skill Related Fitness Test Course for the reason of having extremely high level of face validity and logical justification. Apart for this the scientific characteristics of HSRFT-V₃ Hockey Skill Related Fitness Test is established i.e. Reliability, Objectivity and Validity with significant statistical method and criterion values.

The norms and grading criteria of the HSRFT-V₃ Hockey Skill Related Fitness Test provides scientific interpretation of Fitness test performance scores with percentile norms. And grading criteria developed on six sigma criterion scale as- A – Excellent, B – Good, C – Average, D – Satisfactory and E-poor provides a highly meaningful interpretive criteria for assessing the hockey specific fitness level of an individual player. This grading criterion scale hence has further research and hockey fitness training implications.
Bergman (2009) developed a test battery for the analysis of selected physical and performance attributes of the United States’ Olympic team Hand ball players. The purpose of this investigation was to construct a team handball test battery that would be reflective of the skills, abilities, physical fitness components and anthropometric factors that contribute to high level of performance, and to establish a data base of performance by the National team Handball players. Additional purpose for developing the test included using the test to screen potential players at the national level, to provide teachers in the schools and colleges with tests that are inexpensive and easy to administer, and to provide self-administered tests that would train the athletes to improve their performance in team handball. Test items included:

- Anthropometric Measurements
- Hand grip strength
- Running speed
- Vertical Jump
- Accuracy of throw
- 50m dribble test
- Jump and throw test
- Endurance test

The test was conducted on the United States National Team, at the United States Sports Academy in Daphne, Alabama in June 1995 prior to the Atlanta Olympic Games. There were 20 players in attendance, age ranging from 22.01 to 31.73 years with an average of 26.69 years.

Burr (2007) purposes were (a) to determine the measurement device and jumping protocol most appropriate for testing the leg power of elite Hockey players and (b) to assess the relationship of leg power measurements to Hockey playing ability as indicated by draft selection order. Comparisons were made of leg power measurements from the top 95 players entering the National Hockey League Entry Draft using 2 devices (Vertec and Just Jump) and 2 jump protocols (countermovement and squat). Players’ leg powers were ranked from highest to lowest power using each
device and protocol and were correlated with draft selection order. Vertec leg power measurements were highest (5,511-5,631 W), but there were no significant differences in power between the 2 jumping protocols on either device. Vertec squat jump provided the highest correlation (0.47) between leg power ranking and selection order and was judged to most closely approximate the full body coordinated movements involved in Hockey. The Vertex device using a squat jump protocol is most appropriate for coaches and fitness specialists to use when evaluating Hockey potential based on the off-ice leg power measurements of elite Hockey players.

Fleming (2006) carried out a qualitative analysis of elite Hockey players (n = 22) was performed to obtain their perceptions immediately after a competitive match. The significant surface characteristics that emerged as part of an inductive analysis of their responses were grouped together and formed five general themes or dimensions: player performance, playing environment, pitch properties, ball interaction and player interaction. Each dimension was formed from a hierarchy of sub-themes. During the analysis, relationships between the dimensions were identified and a structured relationship model was produced to highlight each relationship. Players’ responses suggested that they perceived differences between pitches and that the majority of players considered a ‘hard’ pitch with a ‘low’ ball bounce facilitating a ‘fast’ game speed was desirable. However, further research is required to understand the relative importance of each theme and to develop appropriate measurement strategies to quantify the relevant engineering properties of pitch materials.

Kerr & Ness (2006) conducted a study to determine those variables that significantly affect push-in execution and thereby formulate coaching recommendations specific to the push-in. Two 50 Hz video cameras recorded transverse and longitudinal views of push-in trials performed by eight experienced and nine inexperienced male push-in performers. Video footage was digitized for data analysis of ball speed, stance width, drag distance, drag time, drag speed, centre of massy displacement and segment and stick displacements and velocities. Experienced push-in performers demonstrated a significantly greater (p < 0.05) stance width, a significantly greater distance between the ball and the front foot at the start of the push-in and a significantly faster ball speed than inexperienced performers. In
addition, the experienced performers showed a significant positive correlation between ball speed and playing experience and tended to adopt a combination of simultaneous and sequential segment rotation to achieve accuracy and fast ball speed. The study yielded the following coaching recommendations for enhanced push-in performance: maximize drag distance by maximizing front foot, ball distance at the start of the push-in; use a combination of simultaneous and sequential segment rotations to optimize both accuracy and ball speed and maximize drag speed.

Sunderland (2005) reported that nine well trained, unacclimatized female Hockey players performed the Loughborough Intermittent Shuttle Test (LIST) interspersed with three Field Hockey skill tests in hot (30 degrees C, 38% relative humidity) and moderate (19 degrees C, 51% relative humidity) environmental conditions. Field Hockey skill performance declined in both the hot and moderate conditions following 30 and 60 min of the LIST compared with pre-LIST values (P < 0.01). This decrement in performance was compounded in the hot environment with a 6% poorer performance in the heat recorded for the second skill test at 30 min (P < 0.05, hot 101.7 ± 3.6 vs moderate 95.7 ± 2.9 s; mean ± s(x)). However, no difference was found in the decision making element of the skill test. Fifteen metre sprint times were slower in the hot condition (P < 0.01). In the hot environment, rectal temperature (P < 0.01), perceived exertion (P < 0.05), perceived thirst (P < 0.01), blood glucose concentration (P < 0.05) and serum aldosterone concentration (P < 0.01) were higher. Estimated mean (± s(x)) sweat rate was higher in the hot trial (1.27 ± 0.10 l.h(-1)) than in the moderate trial (1.05 ± 0.12 l.h(-1)) (P < 0.05). Body mass was well maintained in both trials. No differences in serum cortisol, blood lactate, plasma volume or plasma ammonia concentrations were found. These results demonstrate that Field Hockey skill performance is decreased following intermittent high intensity shuttle running and that this decrease is greater in hot environmental conditions. The exact mechanism for this decrement in performance remains to be elucidated, but is unlikely to be due to low glycogen concentration or dehydration.

Lemmink (2004) conducted a study on evaluation of the reliability of two field hockey specific sprint and dribble tests in young field hockey players. To determine the reliability of two field hockey specific tests: the shuttle sprint and
dribble test (Shuttle SDT) and the Slalom sprint and dribble test (Slalom SDT). The shuttle sprint and dribble performances of 22 young male and 12 young female field hockey players were assessed on two occasions within 4 weeks. Twenty one young female field hockey players took part in the slalom sprint and dribble test twice in a 4 week period. The Shuttle SDT required the players to perform three 30 m shuttle sprints while carrying a hockey stick alternated with short periods of rest and, after a 5 minute rest, three 30 m shuttle sprints alternated with rest while dribbling a hockey ball. The Slalom SDT required the players to run a slalom course and, after a 5 minute rest, to dribble the same slalom with a hockey ball. There were no differences in mean time scores between the two test sessions. The mean differences were small when compared with the means of both test sessions. With the exception of the slalom sprint time, zero lay within the 95% confidence interval of the mean differences indicating that no bias existed between the two measurements. With the exception of delta shuttle time (0.79), all intra-class correlation coefficient values for the Shuttle SDT, met the criterion for reliability of 0.80. Intra-class correlation coefficient values for Slalom SDT were 0.91 for slalom sprint time, 0.78 for slalom dribble time, and 0.80 for delta slalom time.

Keogh (2003) developed an effective testing battery for female Field Hockey player by using anthropometric, physiological, and skill related tests to distinguish between regional representative (Rep, n = 35) and local club level (Club, n = 39) female Field Hockey Players. Rep players were significantly leaner and recorded faster times for the 10-m and 40-m sprints as well as the Illinois Agility Run (with and without dribbling a Hockey ball). Rep players also had greater aerobic and lower body muscular power and were more accurate in the shooting accuracy test, p < 0.05. No significant differences between groups were evident for height, body mass, speed decrement in 6 x 40-m repeated sprints, handgrip strength, or pushing speed. These results indicate that %BF, sprinting speed, agility, dribbling control, aerobic and muscular power, and shooting accuracy can distinguish between female Field Hockey players of varying standards. Therefore talent identification programme for female Field Hockey should include assessments of these physical parameters.
Nieuwenhuis (2002) analyzed the kinanthropometric, motor-physical and psychological variables and specific Field Hockey skills that influence Field Hockey performance at the age of 14 to 15 years. The two top girls Field Hockey teams in the North West Province (South Africa) U/15 (under 15 age group) Field Hockey league (\(n = 27\)), as well as the two teams who ended at the bottom of the league (\(n = 25\)), were exposed to a test battery. The 52 subjects were classified according to their league results as successful and less successful. The test battery consisted of nine Field Hockey skills tests, 16 kinanthropometric tests and six physical-motor ability tests and two sport psychological tests. A statistical analysis of the data was done for descriptive purposes and statistical significances between the successful and less successful players were determined. Results indicated meaningful differences in some variables. A prediction function was therefore developed consisting of eight variables that successfully distinguished between successful and less successful 14 to 15 year old female Field Hockey players.

Cinii (2000) conducted a “Study of an Easy Skill Test battery in Basketball – Selection of Items”. As the opportunities for school education and lifelong sports increase, the demand for measuring motor skill objectivity is easily increasing. This paper is intended as an investigation of content validity of 21 items of basketball skill test by factor analysis. These items measured for reliability and criterion-related validity by Taken chi and Yamasaki. As a result of the investigation of these validities the following two points were clarified: - Basketball skills which have been studied so far can be classified into three types; ‘quick ball moving ability’, ‘ball throwing ability and jumping ability’, and ‘dribble return’ are outstanding items for use in a simple basket ball skill test battery in investigating each skill by both construct validity and criterion related validity.

Thomas (2000) conducted a study construction and standardization of specific physical fitness test for soccer players. The subjects of this study were 150 football players who represented their districts in the inter-district football tournament of the Kerala State and the age group of the subjects between 17 and 21 years. Eighteen tests were administered to 150 soccer players. As a result of factor analysis the following
six factors were identified as per the loadings, that is endurance, speed, muscular endurance, flexibility, agility and muscular power respectively.

**Yilla and Sherrill (1998)** validated the Beck battery of quad rugby skill tests. The purpose was to develop a valid and reliable battery of quad rugby skill tests. Participants were 65 adult male, quad rugby athletes. Construct validity was established in two modified Delphi rounds by a panel of international experts. For concurrent validity, Spearman rho correlation between coaches ‘rankings of players’ skills and scores ranged from 0.63 to 0.98 for the total battery. For construct validity, principal factor analysis with oblique rotation revealed two factors. Intraclass reliability co-efficient ranged from 0.94 to 0.99. The battery includes five tests: maneuverability with the ball, pass for accuracy, picking and pass for distance.

**Bella (1997)** conducted a study on the construction of a battery of objective skill tests in hockey to assess the playing ability of high school boys of age ranging from 14 to 16 years. To achieve this purpose, one hundred subjects were selected at random from the boys’ schools from Chennai, Trichy, Dindigul, Madurai and Palayamkottai. The selected subjects were assessed subjectively by a panel of three experts. The data thus collected in this manner were analyzed statistically to test the reliability, objectivity and validity of these tests and to construct norms. The scientific authenticity of the battery of skill tests was established by computing the correlation of coefficient. It was found that

1. The battery of objective skill tests satisfies the criterion of scientific authenticity in reliability, objectivity, validity and administrative feasibility.

2. There is a significant correlation between the total scores of the test battery and the hockey playing ability assessed by the experts subjectively.

3. The multiple correlations between hockey playing ability assessed by the experts and the scores of the test battery are significant.

**Mehrotra Akhil (1996)** constructed an objective skill test battery in field hockey for university level field hockey players. The subjects were 300 male players of different colleges playing at university level in India. Their age ranged from 17 to
25 years. A pilot study was also conducted on 20 subjects randomly chosen from the same population.

The general hockey playing ability of the subjects was assessed by a panel of three experts. The evaluation was done through observing the performance of the subjects in the real game situations.

The hockey test consisted of three items namely – one minute angular passing and receiving, rolling and passing and dodging and goal shooting. The scientific authenticity of the test battery was established by computing reliability, objectivity and validity.

The reliability obtained for one minute angular passing and receiving, rolling and passing and dodging and goal shooting were 0.93, 0.90 and 0.92 respectively. The objectivity was established by administering the test in the same manner with help of an expert. The coefficients for objectivity thus obtained for one minute angular passing and receiving, rolling and passing and dodging and goal shooting were 0.96, 0.91 and 0.95 respectively. The validity of the test item obtained with the help of composite score of each subject and correlated them with the scores on playing ability of the subjects as rated by a panel of three judges. The validity coefficient obtained was 0.89 in the case of each test item also performance of the subjects were correlated with the playing ability and the values of coefficient obtained were .696, .586 and .655. It is evident that the hockey skill tests constructed by the scholar measures what it intended to measure.

Therefore, the hockey skill test constructed by the research scholar is reliable, objective and valid to be used for the college and different university level hockey players.

Pal Madan Mohan (1992) constructed an objective skill test battery in soccer for young soccer players. The subjects were 48 students of different faculties of B.H.U. Varanasi. There age ranged from 17 to 20 years. The tests battery consisted of three items namely kicking for distance, kicking for accuracy and dribbling the ball. The scientific authenticity of the test was established by computing the reliability, objectivity and validity. The coefficient of reliability obtained for kicking for
accuracy, kicking for distance and dribbling the ball were .96, .92, .92 respectively. The coefficient of objectivity for kicking for accuracy, kicking for distance and dribbling the ball were .98, .96 and .91 respectively. The validity of the test item obtained with the help of composite score of each subject and correlated them with the scores a playing ability of the subjects as rated by a panel of three judges. The validity coefficient obtained was .92 in the case of each test item also performance of the subjects was correlated with the playing ability and the values of coefficient obtained were .77, .59, and .85. It is evident that the skill tests constructed by the scholar measures what it purports to measure.

**Thomas (1991)** constructed a specific test battery of motor fitness for hockey players. For the purpose of the study fifty five college hockey players of Jiwaji University, Gwalior was selected. The multiple correlations yielded five specific motor fitness tests, namely speed, endurance, power, flexibility and agility. All five tests (20m, six points run and two hand medicine ball throw and trunk flexion and court agility) showed high significant relationship with the hockey playing ability. The battery of tests developed by the researcher has the ability to predict the specific motor fitness of hockey players.

**Mc Donald (1991)** studied the use of volleying a soccer ball against a backboard as a test of general soccer ability. With college men as subjects, he obtained the following correlations between scores on the test and the ratings by playing ability by their coaches: 0.94 for varsity players, 0.63 for junior varsity players, 0.76 for freshmen varsity players and 0.85 for the combined group.

**Singh Gurubaz (1989)** constructed and standardized specific physical fitness test for boys volleyball players. He took 100 players of intercollegiate and district level. Wherry-do-little method of multiple correlations was employed to extract the test items out of 26 variables. A test battery formed was administered to the volleyball players to formulate the norm. The study concluded that (i) the battery of tests developed by the researcher has the ability to predict the specific fitness of volleyball players, (ii) the five tests selected (spike jump, W.M. Run, Squat thrust, basketball throw and wrist flexion) showed highly significant relationship with the volleyball playing ability.
Dureha D.K. (1987) constructed an objective skill test in hockey. The finding of this study indicated that reliability coefficient obtain from the different test items ranged from 0.91 to 0.93. The objectivity coefficient of test ranged from 0.91 to 0.96 and the validity as whole was obtained 0.91. The validity coefficient correlation of angular hitting and stopping for one minute = 0.55, pass receiving dribbling and hitting = -0.70 and dribbling and goal shorting was = -0.57. here the negative sign shows positive correlation between playing ability and other tests because time factor was involved. Through the statistical analysis it is clear that the second order correlation coefficient showed decreased values than the zero order correlation, which inferred that all three selected test were significantly related to the performance measured. It is evident through the multiple correlations that all the selected tests were significantly related to the criterion measured i.e. RC 123 - .835. Therefore the hockey skill test constructed is reliable, objective, and valid to be used for the students studying in grade ninth to twelfth.

Sharma (1987) constructed and standardized specific physical fitness test for badminton players. Data on one hundred college and district level players of North India were collected. The analysis brought out seven factors to which suitable names were given. Out of seven factors, five were considered meaningful to select test items from each. The item having highest loading in each factor was included in the test battery. The battery so selected was administered to 500 badminton players to develop norms. The selected five factors were trunk strength, flexibility, badminton agility, badminton endurance arm-leg explosive strength and the test items selected to constitute specific physical fitness test for badminton players were sit-ups, court agility, trunk flexion, six corners endurance and softball throw. Factor analysis technique was used to select the test items out of twenty variables.

Kirubakaran (1986) conducted a study on the construction of a battery of objective skill test in hockey for Madras University players. For the purpose of this study the investigator has selected 32 men college students belonged to the age group of 19 to 25 years who had enough experience in the game representing the college or university. The tests on speed, dribble, dodging, passing ability and target hitting were conducted to measure the offensive playing ability of the hockey players. The
scientific authenticity of the battery of skill tests was established by computing the correlation of coefficient. It was found that

1. The battery of objective skill tests satisfies the criterion of scientific authenticity in reliability, objectivity, validity and administrative feasibility.

2. There is a significant correlation between the total scores of the test battery and the hockey playing ability assessed by the experts subjectively.

3. The multiple correlations between hockey playing ability assessed by the experts and the scores of the test battery are significant.

Sangral (1986) objectives were (i) to identify major fundamental skills and skill combinations in Hockey (ii) to construct and standardize a battery of skill tests purely on objective lines, (iii) to prepare norms in each skill for players at different levels of inter-college, inter-university, combined university, state and national levels, and (iv) to present a standardized procedure for grading Hockey players. The sample for test construction consisted of 63 male experienced Hockey players. The sample included 17 inter college players, 15 inter-university players, nine combined university players, 19 state level players, and three national level players. However, for working out norms, the sample consisted of 500 male Hockey players who participated at different levels in the year 1984-85. The skills and skill combinations selected for playing Hockey were 25 yard goal shooting, dribble and push, scoop for accuracy, dribble and hit, and self hitting and stopping. The test was constructed on the basis of items linked with these five skills. The reliability of the test was established against each item with the test-retest method. The reliability coefficient varied from 0.78 to 0.91. The validity for each of the test items was established against the rating by judges about playing ability. The validity coefficient varied from 0.40 for dribble to 0.77 for self hit and stop. On factor analysis of test scores, self hit and stop, scoop for accuracy, and dribble and push came out as independent factors. The multiple regression equation showed that the factors self hit and stop, scoop for accuracy, and dribble and push, measured total Hockey playing ability sufficiently. So the test battery was formed of three tests, namely dribble and push, scoop for accuracy, self hit, and stop. After factor analysis the test battery had test-retest
reliability coefficient 0.91, and validity against judgment by judges was 0.81. The norms were established for inter college, inter-university, combined university, state, and national level players separately. The study showed the following: The mean difference in performance in dribble and push amongst three groups inter college, interuniversity and state level players, was not significant but the mean differences were significant in case of intercollegiate, interuniversity and national level players. In case of scoop for accuracy, the national level group was significantly better in performance in comparison to intercollegiate, interuniversity, combined university and state level groups. The national level group was found to be much superior, on the self hit and stop test than any other group.

Nirmala (1985) constructed four test items in hockey. One shooting accuracy test, hitting and stopping accuracy test, parallel pass test and diagonal pass test. The study were 44 female students of higher secondary and taken from different schools of Trivandrum. These tests were devised by research scholar mainly because all of that involved the testing of fundamental skill in hockey which are required in a normal as well as highly competitive game.

The scientific authenticity of the test was established by computing reliability, objectivity, Validity. The coefficient of reliability for shooting accuracy, hitting and stopping accuracy, Diagonal and parallel pass were .80, .68, .95, .63, and .86 respectively establishing. Reliability of the test was administered on the both occasions by the investigation herself.

For objectivity and the tester was taken and in the same manner the same tests were administered and the coefficient for objectivity were .60, .93, .86, .87 and .84 respectively and these value indicate that the skill items were objective.

The validity of the test item obtained with the help of composite score of each subject and correlated them with the scores a playing ability of the subjects as rated by a panel of three judges. The validity coefficient obtained was .92 in the case of each test item also performance of the subjects were correlated with the playing ability and the values of coefficient obtained were .85, .88, .89, .85 and .94. it is
evident that the skill tests constructed by the scholar measures what it purports to measure.

It may be concluded that the hockey skills test constructed meet the criteria of the authenticity that is the test items are reliable, objectives and valid.

Bhattacharya (1984) constructed an objective skill test battery in soccer for professional students of physical education. The subjects were 130 men students of physical education. The test battery consisted of 4 items, namely kicking for distance, kicking for accuracy, heading for distance and dribbling the ball. The reliability of 0.96, 0.92, 0.92 were obtained for the above test items respectively. The validity coefficient obtained was 0.94.

Champman’s (1982) was constructed a reliable and valid Test for the individual Skills of ball control in women Field Hockey. Although the sample size was relatively small, the reliability of data (total three trials) was acceptable (R = .89) while the description of the Chapman Ball Control Test suggested logical validity – a special case of content validity (1975). There was also significance difference the mean of two team’s performances which indicated that the Test has construct validity. Positive correlation of the total the player’s assigned ranking in stick work ability and ball control scores established concurrent validity for the Test. Predictive validity was determined by results from the separate univariate F Test in the further study by the investigation.

Dangwal (1981), study was to measure specific element constituting the playing ability of state level hockey players. The subjects were Netaji Subhash National Institute of Sports regular trainees and three experts working as coaches were appointed as experts for ranking the players. The tests were: Speed of the ball

1. Stopping and shooting
2. Interception and clearance
3. Receiving and passing
4. Tapping with only left hand or Tapping through wooden blocks.
5. Dribbling through wooden blocks.
6. Speed with optimum ball control
7. Dodging towards right and left.
8. Running with ball while changing direction
9. Specific speed endurance
10. Test of relative performance.

Reliability – Through test retest method Product Moment Method between two sets of scores.

Validity – Spearman’s Rank Correlation Coefficient between rank of the subjects and corresponding rank of the subject according to the scores. The test was able to rank the subject for their attacking and defending ability separately. The test for dodging and test for specific endurance requires further investigations.

**Hahn (1980)** conducted a study on Knox basketball test as a predictive measure of overall basketball ability in female high school basketball players. The Knox basketball four test items were administered to 198 girls from 9 MOS Higher Secondary School during basketball tryouts and prior to any students being cutout from the team. The stepwise multiple regression procedure was used to analyze the predictive value of this test. The only test item that significantly predicted (P 0.05) the selection of players to the varsity and junior varsity teams was the dribble shoot test. The dribble shoot test also correlated significantly with the coaches’ rankings of junior varsity players and varsity players. The speed pass and speed dribble significantly predicted the division between the junior varsity and varsity players. Although the comparisons were significant, the skill tests accounted for only 11.1 percent to 28.3 percent of the total variation in the dependent variables.

**Mor and Christian (1979)** developed a skill test battery to measure general soccer ability. Forty-five male college students participated in this study. They were classified into three groups: varsity team players, intramural divisional championship players and physical education soccer class players.

Five tests were investigated in this study. The three test items namely dribbling, passing and shooting together made up a battery with acceptable reliability
and validity, and the other two tests required special equipment that would rarely be found in schools and added little to the overall battery. The criterion measure was rating scale developed and used by three soccer experts. Each subject was evaluated during actual matches played. Each test was correlated measure. The coefficients obtained were: dribbling 0.731; passing, 0.776 and shooting 0.912. using the test-retest method, the reliability coefficients were: dribbling 0.795; passing 0.961 and shooting 0.984. The objectivity coefficients were: dribbling 0.998; passing 1.0 and shooting 0.999. A multiple correlation analysis was used to select the test battery. The following multiple correlation coefficients were obtained for the various test battery combinations: passing 0.776; passing + dribbling 0.79 and passing + dribbling + shooting 0.913.

Watson (1978) prepared test items for the physical fitness tests consisting of long jump or vertical jump, 50-yard dash, sit-up, stick jump and 300 yard distance run. The norms were established for each test items for girls and boys according to chronological age. Percentile table were constructed based on the results of investigation. Watson further recommended that in elementary level, there should be some test items and norms to evaluate should girdle strength.

Bontz (1978) considered some skill test items of soccer to measure the important skills of dribbling, passing and trapping. If one has the time and space, this would make an excellent second test. The test was administered to 125, 5th grade and 6th grade children from two school systems, yielding reliability coefficient of 0.33 by the odd-even method. The validity coefficients were 0.92 for one group of 92 subjects and 0.53 for the remaining 32 subjects with a criterion of subjective rating.

Dish (1977) conducted a study to analyze a test battery constructed to describe and predict volleyball playing capacity in college and high school women. The following criteria were used for selecting a test for initial inclusion into the battery:-

i. The test is related to a basic motor ability important for playing volleyball.

ii. The test can be reliably administered in mass situations.

Age was selected as a test variable for the purpose of creating age adjusted norms. Height and reach were selected because of their importance for volleyball
players. Weight and percentage of body fat were included as well as aerobic capacity. The vertical jump and triple hop were selected as measure of jumping capacity. The 20 yard dash and agility run were selected to measure destined dimensions of speed body movement. The pilot testing, information about the reliability, and stability of the tests was obtained by testing 63 high school and college age females. Results of the various stages of analysis indicate that the test battery is a valid and reliable predictor of volleyball playing capacity for females. A generalized prediction equation for classification purpose was not derived. However, the use of performance profiles of the data is a viable means of selecting, classifying, and diagnosing in a variety of situations.

Brar (1975) was evaluate an objective Skills Test in Field Hockey which have dribbling and hitting, pass receiving, fielding and drive and dribble and goal shooting. Sixty four student of B.P.E. class of LNCPE, Gwalior and 125 boys of the Government Secondary School, Patto Hira Singh, served as subject for the study. Scores made by the later group were used for developing norms.

The three objective Tests were administered after five practice session and the average of three trials in each of the Tests was as the score made by each students. Three additional Tests were given to 15 randomly selected student of LNCPE, Gwalior after two days of the first administration of the Test for computing the reliability coefficient of the Test. The criterion measure for validating the objective Tests was the average of the rating situation, judged by three experienced teacher in Field Hockey.

Inter correlation amongst three Tests as with the criterion measure, norms for students and regression equation based the score made in three Tests were computed.

The result of the study seems to indicate that validity coefficient showed only a modest correlation between all the three Tests and Field Hockey playing ability.

Clarke (1974) developed a study of validation of a basketball potential skill test. The study was concerned with the development of basketball potential skill test and the examination of its validity, reliability and objectivity. A subjective analysis of the game and a review of pertinent literature resulted in the identification
of three player success factor area: - anaerobic power, hand and eye coordination and agility. Seven tests of these areas were administered during the year 1971-72 to forty four basketball oriented students who had divided themselves into sub groups of twenty five candidates and nineteen non-candidates by individual decisions regarding inter – collegiate basketball candidacy. Bi-serial correlation was utilized to determine validity coefficient for each test with the most valid in each area comprising the final battery. Those retained were jump and reach (work) anaerobic power, 30 second under basket shot, hand eye coordination, four way boomerang agility. Validity, objectivity, and reliability were computed and they were 0.915, 0.994, and 0.896 respectively. A multiple regression equation was developed.

**Furness (1973)** developed a test for penalty-kicking performance for SHS boys, 14 to 16 years of age. The Ss (N=78) were members of a varsity soccer team (N=21), J.V. soccer team (N=22) and a randomly drawn group of non-soccer players (N=35). To make the test game – like a regulation soccer goal (24 ft x 8 ft) was divided into three different scoring areas depending on their distance from the centre of the goal. The test items consisted of accuracy and velocity measures. Multiplying the M velocity score of the 20 trials derived a penalty kick index (PKI) by the total accuracy point value. The validity of the test was establishing by utilizing deductive reasoning, divergent groups and judges ratings. Reliability of the test was established by the interclass V method. The three divergent groups differed significantly (p<0.05) in velocity and in PKI but not on accuracy. The velocities co-efficient for infraclass V were 0.95 for tester 1 and 0.93 for tester 2. The accuracy V for test 1 and tester 2 were 0.31 and 0.28 respectively.

**Hicks (1973)** conducted a study using 64 college women enrolled in badminton classes. Originally the investigator wanted a 5-item battery of valid and reliable tests, but concluded by recommending 3 items: a clear test, a smash test and a strategy test. Reliability was determined by the odd even method using 20 trials for each test item. It was reported that each of the reliability co-efficient exceeds at least three times its standard error, a rule of thumps method of interpreting the significance of coefficients. It was also accounted for the lower reliability of the strategy item by explaining that it involved 3 different skills rather than a single one. Validity was
determined in 4 different ways. Three judges observed and rated the same player simultaneously on 5 separate skills during game play in a round robin tournament. These separate ratings were later combined to arrive at an evaluation of playing ability. The round robin tournament consisted of 7 games of singles with 11 points constituting a completed match. The criterion measure was the total number of points scored during 7 matches. The combined criterion included the tournament play results and the total judges’ evaluations. The judges’ evaluation of a player’s overall playing ability in a game situation was the most dependable criterion. The strategy item demonstrates that skills can be measured in a game-like situation. The clear and smash tests require the player to execute these strokes from a moving position.

Antrim (1972) designed a continuous test item using 26 college women in a beginning basketball class. The test included 3 phases: dribbling, shooting and rebounding, and finally passing and catching. She used judge’s rating as a criterion score and found that the time for the total test related to the criterion score and found that the time for the total test related to the criterion more highly than the separate parts. Agreement among the judges was 0.87. A validity co-efficient of 0.74 resulted when the player rankings were correlated with the total time of the test. The reliability was estimated in several ways, but was highest when the test was preceded by 2 practice trials, followed the next day by 2 trials which were totaled. Under these conditions, the reliability co-efficient was estimated to be 0.82.

Childress (1972) conducted a study, the purpose of which was to identify the components of high school basketball playing ability and to construct an evaluative tool for classifying high school basket ball players into populations identified as successful and unsuccessful. Twenty four test items were selected through a review of related literature as valid measure of the components of high school basketball ability. The test items were administered to 106 high school basketball players and the resultant data were analyzed through the utilization of the principle axes method of factor analysis with various criterions for rotation. Seven factors were isolated and six factors were identified as agility, speed, relative muscular endurance, basketball speed manipulation, gross muscular strength, total body movement time and manual dexterity. One factor was unidentifiable in terms of common test items with high
factor of loadings. The test batteries were constructed first consisting of 7 items loading highest on the isolated factors; the second was composed of 10 test items. The first battery utilized in a discriminate function analysis effectively classified the 106 subjects into two populations identified as successful and unsuccessful basketball players. The results of this study indicated that the components of basketball ability could be isolated, measured and utilized to construct an evaluative tool for classifying players into populations identified as successful and unsuccessful.

**Henry (1970)** was proven on 31 college and High School Field Hockey players in experience from 2 years to 6 years. She studied on item testing; Friedel, Strait and Steward decided that the Friedel Test was most suited to modification. Two judges rated the players on general ability such as footwork, stick work and body control which they were performing (20) twenty trials of modified Test and six trials of Strait Test. The agreement between judges was reported to be \( r = .97 \), Test retest (Reliability) validation was done by correlating scoring with expert scoring with performance in the Test.

**Perry (1970)** was investigated to two previously established Field Hockey Skills Tests. Tests were modified and administered during two successive class meeting to 115 colleges. Each was rated by three judges while playing the position of her choice in game. The score earned on the Skills Test was correlated with a criterion score derived from the judge’s ratings to yields a validity coefficient. The Test retest reliability coefficient for the modified Schmithals French Ball Control Test was .70 and validity coefficient was .64. The Test reTest reliability coefficient for modified Stewart wall rebound Test was .78, and validity coefficient was .71. The modified Stewart wall rebound Test was the more acceptable according to statistical analysis.

**Julee A. lliner (1969)** was prepared the construction and validation of a skill test for the drive in field hockey for high school players. Physical education and associations players were tested on their ability to drive the ball to the left and to the right after five weeks of instruction and or practice. Speed and accuracy were considered to be the important aspects of the drive and therefore included in the skill test. Score were obtained for each component and were than combined in to a single score by means of additive and multiplicative techniques. Statistical evidence
Review of Related Literature

presence included studied of objectivity, reliability, validity target adequacy and scoring. The test was found to be an objectives (r = .97 and higher) reliable (t = .72 and higher) and valid measures of an individual’s ability to execute the drive.

Harrison (1969) studied many books and basketball tests to determine that shooting, passing, dribbling, and jumping were evident as the 4 general skill areas of basketball. The test items are similar to ones located in other batteries, but are combined in a common 30 second time period which enhances the ease of administration. Harrison worked with boys in the seventh, eighth, and ninth grade to develop the items and analyze them for validity and reliability. Each item had to meet the following practical standards:

1. Each test was to be performed by each student in a 30 second time period, because the 4 tests of the battery were to be performed simultaneously and timed by a central timer.

2. The students were not to receive assistance during the performance of the tests.

3. Each test was to be scored and recorded by the student assistants.

4. By following the specified directions, the administration of the proposed 4 item battery was to be completed in a 55 minute period for a class of less than 50 students.

The test – retest method was used to determine the reliability based on the scores recorded by 20 boys from each of the 4 grades, plus 20 boys from the High school varsity team. The reliability co-efficient for each test was computed by correlating the better raw score of the first administration with the better raw score of the second administration, given 7 days later. To obtain the reliability for the battery, the raw scores were converted to T-scores and the T-scores for the 4 tests were totaled to get a total battery score. Three criteria were used to establish validity based on the performance of 23 members of a High School Varsity basketball team:- • The Johnson Basketball Test of 3 items. • Peer ratings by 3 members of the Basketball Team, and • Jury ratings by 3 Physical educators and Coaches observing 2 scrimmages. Once the validity had been investigated using the varsity team and both
the regular students and the varsity players had been involved in the reliability estimates, then 100 students in each grade were tested to compute the T-score norms for each of the 4 items. The boys had completed a basketball unit prior to taking the battery.

Mackenzie (1969) has conducted a study on the evaluation of a battery of soccer skill tests as an aid to classification of general soccer ability. 38 subjects from general physical education classes and 10 subjects from the varsity soccer team were selected. Each subject was tested and evaluated by 5 judges on his ability to perform the skills of trapping, dribbling and kicking a lateral moving ball, in addition to the Mc Donald Kickboard Test. Data were processed using the Smillie Stepwise Multivariate Regression. Formulas were determined which explained 68.97% of the variability as seen by the experts and when used with data in the range of this study, they present a resultant useful on the 1-100 point scale of general soccer ability.

Stubbs (1969) conducted an exploratory study in Girls Basketball Relative to the Measurement of Ball Handling Ability. Stubbs used 3 different groups in the process of various revisions to refine the ball handling test. Twenty six Physical education majors were used in the first group, later she used 30 High-school freshmen girls, and for the third and final revision, she used a group of 25 High-school freshmen girls. Each group had participated in either a 4 or 5 week basketball unit. The students were evaluated on general basketball ability by the class instructor using a 10 point rating scale during actual game situations. A validity coefficient of 0.738 was achieved when the ratings were correlated with the better of 2 trials on the test.

Stewart (1968) was gave a Test college women for measuring Field Hockey Skills. Student of Field Hockey classes or members of Inter-Collegiate Field Hockey team were Tested on five items during the seventh week of school in three institutions. The back board Test was found to be objective and reliable. The Fielding and Drive, Goal Shooting and ball control were unsatisfactory.

Holland (1965) conducted a study on the predictive value of selected variables in determining the ability to play basketball in small high schools. Measures included speed, agility, upper arm strength, power, ball-handling ability, reaction
time, shooting ability, passing ability, height, weight, age and previous experience. The criterion was the rating of basketball playing ability of each squad member of his coach. The most important variables were experience, ball-handling ability, passing ability and shooting ability. The weighted index with $R=0.76$ was basketball ability score $(-1.54)$; number of years experience $(1.23)$; score on speed dribble $(0.26)$; score on wall volley $(0.15)$; score on shooting test $(10.11)$.

**Johnoson (1963)** also developed a wall volleying soccer test for college men. The test area or the target dimensions are same as the regulation soccer goal. The restraining line is 15 feet away from the wall. The reliability coefficient for the test was 0.92 for consecutive trials. Validity was determined by rank difference correlation between scores on the test investigators’ rankings of soccer ability at various levels. The correlation 0.98 for college men in required physical education classes, 0.94 for physical education major students, and 0.81, 0.84 and 0.58 respectively, for 3rd, 2nd and 1st team varsity soccer players.

**Kowert (1962)** constructed a badminton ability test battery for men. The judges’ rating scale yielded reliability co-efficient of .88 when correlated with the class rankings of the subject’s playing ability. An ‘r’ of .97 was obtained for the reliability of the judges’ rating scale as determined by the inter-class correlation between the sum of the three judges’ rating and the scores obtained for the diagonal run. Miller’s Wrist Volley and French’s Long Serve Tests, was 0.84. It was found that the badminton playing ability of the male college students $(N=46)$ could be successfully measured by the multiple regression equation containing the variables of the diagonal run test, French’s Long Serve Test and Miller’s Drist Volley Test.

**Strait (1961)** was constructed and evaluated a Field Hockey Skills Test. The Test required the use of a back board and included the Skills of Fielding, Dodging, Dribbling and Driving. The Test had a reliability coefficient of 0.87 for Smith College students of 0.86 for the member of the Hampshire Field Hockey association. Using the rating of three judges as a criterion the validity for the students was 0.61. For the member of the Hampshire Field Hockey association was 0.60 and for the member of the North East Field Hockey association sectional team members 0.76. The Test was equally suitable for evaluation of attack and defense position players.
Singh Harbans (1959) was prepared two Test items which included “Dribbling and Hitting” and “Dribbling and Goal Shooting”. The subjects for study were 107 men students of two arts colleges of Punjab. He validated the Test against the subjective rating of the two experts, who were national umpires in Field Hockey. The Dribbling and Hitting Test gave a validity of .78 and the validity of Dribbling and Goal Shooting Test was .80. He correlated the two Tests in order to determine if they measured different aspects and the result was 0.41. He also prepared T – scale for college men.

Friedel (1956) was proposed a single Test item in Field Hockey for high school girls whom she called as “Pass Receiving, Fielding and Drive”. The reliability of Test was calculated by the half split method with the help of spearman Brown formula found to be .90 for the left side and .77 for the right side. The validity was found .87 when correlated with Schmithal French ball Control Test.

Brady (1949) constructed a repeated volleys test as a measure of general volleyball playing ability for college men.

In this test, a single target is marked on a wall. A 5 ft long horizontal line, 11½ ft from the floor is marked on a smooth side of a wall. Vertical line is extended upward towards the ceiling at the ends of the horizontal line. Subject stands where he wishes and throw the ball as many times as possible in one minute. Only legal volleys are counted i.e. they must be volleys not thrown balls and must hit the wall within the boundaries of the target.

In this test 522 college men and 15 YMCA expert players were used. Reliability co-efficient of 0.93 was calculated between repeated tests by the subjects during the same testing period. For validity, a co-efficient of 0.86 is repeated between the scores on the tests and the combined subjective judgment of four qualified observers.

Schmitals and French (1940) constructed a three item test of achievement in Field Hockey skill for college women. The item includes ball control, goal shooting, fielding & drive, with a criterion of expert judgment the item validity ranged from 0.44 to 0.48 with a multiple correlation of 0.62. Spearman brown formula estimates
the split half reliability for the items ranged from 0.90 to 0.92. The best combination of two skill factors was found to be goal shooting left and fielding & drive.

Johnson (1934) experimented with nineteen basketball test items, checking each for validity and reliability. Two batteries of tests were finally proposed, to measure the following: (a) basketball ability, composed of three test items: field goal speed test, basketball throw for accuracy and dribble; (b) potential basketball ability, composed of four test items, none of which requires ball handling: footwork, jump and reach, dodging run and IOWA revision of the Brace test. The battery reliability and validity for the ability test, 0.89 and 0.88 respectively; for the potential ability test, however, had reliability coefficients ranging from 0.73 to 0.80. In securing validity, a biserial correlation of 0.88 was obtained between test scores and ‘good’ and ‘poor’ groups of basketball players; the good group was composed of boys who made a high school basketball squad and the poor group was composed of those who did not make the squad.