Chapter II

REVIEW OF RELATED LITERATURE

Great sincere efforts have been made by the research scholar to locate the literature related to this study. The research scholar has come across and gleaned through various kinds, Dissertation Abstracts International, different websites, relevant books and encyclopedias, and other periodicals properly, carefully and critically to excerpt related literatures. Through these sources, very little work has been done on specific talent search test in soccer. Nevertheless, sufficient work has been carried out in allied fields, evidenced by specific doctrine. The research scholar tried at his best level to cover even the review of a single item to fulfill the study as much as possible on the basis of this chapter. It is therefore, has been considered to divide the review of the related literature into three parts as cited below.

Soccer Related Reviews

Crawford\(^1\) constructed a battery of soccer skill tests yielding a multiple correlation of 0.80 with the criterion of judge’s rating by using 30 women majors in physical education. The tests are – (1) Dribbling, (2) Foot passing and receiving, and (3) Passing and trapping.

The respective coefficients for validity and estimated reliability from split-half correlations were (1) 0.73, 0.89; (2) 0.58, 0.84 and (3) 0.45, 0.88. As noted the best single test was the dribble test. The multiple regression equation for the battery was 1.5 test 1 + test 2 + 1.8 test 3 -123.

Talton\textsuperscript{2} investigated the selected physical and physiological assessment as predictor of successful high school football performance by selecting 156 football players who were classified by coaches into or unsuccessful player category based on performance in the 1971 football season.

An early and inclusive test of soccer skill of girls was described by Venderhood,\textsuperscript{3} which, while not scientifically devised, covered important elements of soccer, including dribbling; trapping; place kick for accuracy; dropped ball kick for distance; volley for distance with forehead, shoulder, hip, or knee; throw-down (securing ball from opponent within a 6-yards circle); tackling; corner kick; and goalkeeper’s test. The test description includes a suggested scoring graph to facilitate analyzing an individual’s ability and to afford a basis for assigning team positions.


Yeagley⁴ constructed a test battery for measuring basic soccer skills of beginning players. Four test items were selected namely, dribbling, wall volley, juggling and heading. The validity of each of the four test items was examined with two different criteria: (1) the ratings of four judges on the soccer juggling skill and (2) the composite standard score of the four tests. A multiple correlation of 0.76 was reported between the criterion (the judges’ ratings) and the dribbling and juggling tests. The addition of the wall volley and heading test increased the multiple correlation to only 0.78; thus, recommended that dribbling and juggling be used if a short form is wanted. With a sample of male physical education majors who were beginning soccer players, the following internal consistency coefficients were reported: dribbling, 0.91; wall volley, 0.90; juggling, 0.95 and heading, 0.64.

Bhattacharya⁵ constructed an objective skill test battery in soccer for professional students of physical education. The subjects were 130 men students of Bachelor 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,

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0.92 and 0.95 were obtained for the above test items respectively. The validity co-efficient obtained was 0.94.

Berg, Lavoie and Latin\(^6\) studied the physiological training effects of playing youth soccer. The purpose of the investigation was to determine if a 9 weeks youth soccer program had any effect on cardiorespiratory fitness (VO\(_2\)max and VO\(_2\)submax), peak knee torque, and flexibility. Subjects were twenty-sixth grade boys, 11 of whom were members of a YMCA soccer team; 9 were normally active boys who served as a control groups. Mean ages (±SD) were 11.8±0.34 and 11.5±0.60 years for the soccer and control group, respectively. Initial VO\(_2\)max values of 49.83 and 47.42ml.kg\(^{-1}\).min\(^{-1}\) for the soccer and the control group, respectively, are similar to those reported in the literature for untrained normal boys of this age. Results indicated that playing soccer three times weekly increased VEmax (L. min\(^{-1}\)) and reduced VO\(_2\)max (ml. kg\(^{-1}\).min\(^{-1}\)) at a sub maximal running speed (all P’s <0.05), while no change in VO\(_2\)max was noted. No significant training effect was observed in peak knee torque or flexibility subsequent to soccer training. It was concluded that effects of playing soccer in these subjects resulted in no change in cardiorespiratory fitness, peak knee torque, or flexibility.

Ramadan and Byrd\textsuperscript{7} studied to describe certain structural and functional characteristics of elite soccer players and to make comparisons by position, with other groups of athletes, and with other data on soccer players. Percentage body fat, estimated from skin folds, indicated that this group of athletes was lean (8.9\%) and that goalkeepers were less lean and midfielders more lean than players of other positions. The Health-Carter Somatotype method yielded a balanced mesomorphic configuration (2.06-4.50-2.08), about in the center of the distribution of elite athletes. Aerobic power (\(\text{VO}_2\text{max}=51.9 \text{ ml.kg.}^{-1}\text{min}^{-1}\)) and anaerobic power (119.6 \(\text{kg.m.sec}^{-1}\)), determined by open circuit spirometry and the vertical jump, respectively, were both intermediate in comparison with other groups of elite athletes. By position, goalkeepers had lower aerobic power and higher anaerobic power than players of other positions. The study was concluded that elite soccer players fall about the mean of outstanding athletes from other sports in terms of leanness, somatotype, and metabolic potential.

Ramadan's\textsuperscript{8} purpose of the investigation was to \(\text{VO}_2\text{max}\) examine the maximal oxygen consumption, maximal anaerobic power (\(\text{AP max}\)),


\textsuperscript{8} Jasem Mohammed Ramadan, "Selected Physiological, Psychological and Anthropometric Characteristics of the Kuwaiti World Cup Soccer Team," \textit{Dissertation Abstracts International}, Vol. 46, No. 4 (October 1985): 924-A.
body composition (BC), somatotype (ST), the profile of Mood Status (POMS) and the State-Trait-Anxiety (STA) characteristics of the Kuwaiti World Cup soccer team. It was reported that the Kuwaiti team exhibited moderately high aerobic (51.9 ml.kg.⁻¹min⁻¹) and anaerobic power (119.6 kg.m.sec⁻¹), both values being significantly higher for world class athletes in general.

Johnson⁹ 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 was 15 feet away from the wall. The reliability co-efficient for the test was 0.92 for consecutive trials. Validity was determined by rank-difference correlation between scores on the test investigator’s ranking 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 third, second and first team varsity soccer players.

McDonald¹⁰ studied the use of volleying a soccer ball against a backboard as a test of general soccer ability. With college men as

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subjects, he obtained the following correlations between scores on the test and the ratings of 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 groups.

The mean total distance covered was 10225(±SD=580) m, for the seven players. Of the total distance, covered 42.9% was at a low intensity, 42.6% at medium intensity and 7.5% at high intensity. During the first half, the players covered 444m more than in the second half. Mean heart rate during the first half was 169 beats min⁻¹; for the second half the mean value was 165 beats min⁻¹. This corresponds respectively to 86.75 and 84.4% of the maximal heart rate. During the match, players were working at about 75% of their maximal aerobic capacity. Consequently, playing soccer was deemed to be highly demanding in terms of distance run, heart rate and oxygen uptake, the relation varied between the individual players and so no general outline was found. The physiological measurements suggested that the mean training intensity should be high (approximately 75% of VO₂max) to prepare the players for real match-play conditions.
Costa\textsuperscript{11} has investigated the football player’s personality and reported that the high competitive of the game requires in a real champion a well-balanced strong, disciplined, conscientious, self-controlled and self-assured personality.

Bhanot\textsuperscript{12} studied in maximal anaerobic power of Indian soccer players according to playing position. The study was conducted on 84 soccer players at Netaji Subhash National Institute of Sports, Patiala. They included 8 goalkeepers, 26 backs, 13 half-backs, and 37 forwards. The mechanical work output, described as anaerobic power by Margaria et al. (1966), was estimated from maximal vertical velocity and body weight differences between positions were examined with multiple “t” test.

The results were calculated as Goalkeepers’ body wt. 62.46±5.53kg, vertical velocity 1.976±0.21m.s\textsuperscript{-1} and anaerobic power 1210±161w; Backs’ body wt. 65.20±6.54kg, vertical velocity 1.714±0.19m.s\textsuperscript{-1} and anaerobic power 10966±150w; Half-backs’ body wt. 60.80±6.78kg, vertical velocity 1.748±0.20m.s\textsuperscript{-1} and anaerobic power 1042±90w; and Forwards’ body wt. 58.29±5.12kg, vertical velocity 1.748±0.20m.s\textsuperscript{-1} and anaerobic power 1042±90w.

and anaerobic power 1040±109w. It was clear that soccer play does vary in anaerobic power profiles according to their field positions.

Chin et al. studied the physiological characteristics of elite Asian Junior Soccer players. The purpose of the study was to evaluate the Cardiorespiratory fitness and isokinetic muscle strength of elite junior soccer players in Hong Kong. It was conducted in conjunction with the selection of the Hong Kong team to the 1989 Gothia Cup held in Sweden. Twenty-one top junior soccer players were selected as subjects for the study. The means (±SD) were observed: age 17.3±1.1 years; height 72.5±6.2cm; weight 62.8±7.0kg; body fat 5.2±1.8%; forced vital capacity (FVC) 4.6±0.61L; maximal oxygen up-take (VO2max) 58.6±2.9ml.kg⁻¹.min⁻¹; anaerobic threshold (AT) 76.7±10.2% of VO2max; peak isokinetic dominant knee extensor and flexor strengths 3.28±0.37 Nm.kg⁻¹ and 1.84±0.24 Nm.kg⁻¹; hamstring to quadriceps peak torque ratio (H/Q) 56±0.6% measured at 60°s⁻¹. Hong Kong players appeared to have comparable aerobic power, light body weight, poor flexibility and above average isokinetic muscle strength compared to other international junior soccer players. Training programs to improve the contra-lateral knee

muscle imbalance and to increase the fast speed movement capability of the non-dominant knee flexors are recommended.

Stephens, Bredemeier and Shields\textsuperscript{14} constructed a measure designed to assess players' descriptions and prescriptions for moral behaviour in Youth Sport Soccer. The study had utilized a variety of qualitative and quantitative measures, assessing such constructs as values, moral reasoning, behavioral norms, and observed and self-described behaviour. The purpose of this study is to design a quantitative instrument to assess several dimensions of moral functioning in relation to issues of fair play in sport. Specifically, preadolescent girls' self-described action tendencies, legitimacy judgments, moral motives, and perceptions of team norms for unfair play (cheating, aggression, and lying to an official) in youth sport soccer are assessed. Results indicated high internal consistency for the measure, Judgment about Moral Behaviour in Youth Sport Questionnaire (JAMBYSQ), across the three contexts. Findings were consistent with current moral development scholarship, including the work of Bredemeier and Shields Damon and Eisenberg. Results were discussed within the current moral development literature.

Wisloff, Helgerud and Hoff\textsuperscript{15} studied the strength and endurance of elite soccer players. The major purpose of the study was to examine whether there exists a relationship between pre-seasonal physiological tests and performance results in the soccer league. Further, it investigated maximal oxygen up-take and maximal strength in proportion to body mass for soccer players. A secondary aim was to establish some normative data of Norwegian elite soccer players. Two teams from the Norwegian elite soccer league participated in the study. The study was concluded that for soccer players, maximal oxygen uptake should be expressed in relation to body mass raised to the power of 0.75 and maximal strength in relation to body mass raised to the power of 0.67 when running and strength capacity among players with different body mass. Midfield players had significantly higher maximal oxygen uptake compared with defense players using the traditional expression ml.kg\textsuperscript{-1}.min\textsuperscript{-1}, while no significant differences were found expressing maximal oxygen uptake either absolutely (L.min\textsuperscript{-1}) or in relation to body mass raised to the power of 0.75 (ml.kg\textsuperscript{-0.75}.min\textsuperscript{-1}) among players grouped by position. There was a significant correlation (r=0.61, P>0.01) between squat 1RM and vertical jump height for defense and forward players were significantly higher compared with midfield players.

Mean results from the laboratory test were 63.7ml.kg\(^{-1}\).min\(^{-1}\) or 188.6ml.kg\(^{-0.75}\).min\(^{-1}\) for maximal oxygen uptake, 150kg or 8.0kg.m\(^{-0.67}\) for 90° squats, 79.9kg or 4.4kg.m\(^{-0.67}\) for bench press. Mean values of vertical jump height were 54.9cm.

Chaudhary\(^{16}\) investigated the relationship of speed, strength and agility with playing in soccer. Twenty male soccer players of Kendriya Vidyalaya, Calcutta, were selected as subjects. The finding of the study indicated that speed of the subjects was very reliable for predicting players’ ability (rating judged by a panel of three experts for each subject during the game) obtained was 0.597. It further reveals that the correlation values between standing broad jump, agility and playing ability were 0.444 and −0.526 respectively. All the above mentioned three values were found significant at 0.05 level of confidence. Further the correlation values between sit-ups, pull-ups, push-ups and playing ability obtained were 0.102, 0.258 and 0.430 respectively. These values indicated the low positive relationship.

Singh\(^{17}\) constructed a specific test battery of motor fitness for football players. The subjects were fifty male football players of

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L.N.I.P.E., Gwalior. The Pearson’s Product Moment Correlation (r) was used to know the contribution of all items of football-to-football performance. The results of the study shows that kicking for distance, 70m run, 1 mile run and WM agility run with ball contribute much to playing ability in football among motor fitness.

Ostojic\(^{18}\) studied to describe structural and functional characteristics of elite Serbian soccer players and to make comparisons with non-elite counterparts. One of the teams in the study (Squad A; nA = 16) completed in the professional First National League while the other team (Squad B; nB=16) played in the amateur Third Division. Physiological measurements were made in 32 players, during the final week of the preparatory training period. Subjects from Squad A were older (23.8±3.4 vs. 21.5±3.2 years, p<0.05) and more experienced (7.5±3.1 vs. 4.8±2.8 years, P<0.05) as compared to players in Squad B. Players from Squad B had significantly lower estimated VO\(_2\) max values compared with elite subjects in Squad B had significantly lower estimated VO\(_2\)max values compared with elite subjects in Squad A (42.9±6.6 vs. 53.5±8.6 ml.kg\(^{-1}\), P<0.05). In addition, the highest heart rate frequencies during the last minute of the 20-m shuttle run test were lower in elite

players (183.1±6.1 vs. 189.9±8.1 beats min⁻¹, P<0.05). Vertical jump height was significantly higher in Squad A (47.6±5.7 vs. 46.2±5.5 cm, p<0.05) and estimated percentage of fast muscle fibers (fast twitches) was higher in Squad A as compared to Squad B (62.8±7.7 vs. 57.4±8.1%, p<0.05). The results of the present study support previous investigation indicating a strong relationship between aerobic fitness, anaerobic power and performance results in elite soccer.

Reilly et.al.¹⁹ studied on a multidisciplinary approach to talent identification in soccer. The requirements for soccer play are multifactorial and distinguishing characteristics of elite players can be investigated using multivariate analysis. The aim of the present study was to apply a comprehensive test battery to young players with a view to distinguishing between elite and sub-elite groups on the basis of performance on test items. Thirty-one (16 elite, 15 sub-elite) young players matched for chronological age (15-16 years) and body size were studied. Test items included anthropometric (n=15), physiological (n=8), psychological (n=3) and soccer specific skills (n=2) tests. Variables were split into separate groups according to somatotype, body composition, body size, speed, endurance, performance measures, technical skills,

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anticipation, anxiety and task ego orientation for purposes of univariate and multivariate analysis of variance and stepwise discriminant function analysis. The most discriminating of the measures were agility, sprint time, ego orientation and anticipation skill. The elite players were also significantly leaner, possessed more aerobic power (9.0±1.7 vs 55.5±3.8ml.kg⁻¹.min⁻¹) and were more tolerant of fatigue (P<0.05). They were also better at dribbling the ball, but not shooting. The study was concluded that the test battery used may be useful in establishing baseline reference data for young players being selected onto specialized development programmes.

Al-Hazaa²⁰, et. al. studied to assess the aerobic and anaerobic characteristics of Saudi elite soccer players, and to examine the interrelationship between measures of aerobic and anaerobic power in the elite soccer players. Twenty-three outfield elite soccer players representing the Saudi national team participated. Their means (±SD) for age, body mass, height and estimated fat percent were: 25.2±2.3 years; 73.1±6.8kg; 177.2±5.9cm; and 12.3±2.7%, respectively. Cardiorespectory parameters, including maximal oxygen uptake (VO₂max), were assessed by open-circuit spirometry during graded treadmill running. Anaerobic

power measures were obtained using Wingate anaerobic test, and included peak power (PP), and average power for 5 sec (AP 5), 10 sec (AP 10), 20 sec (AP 20) and 30 sec (AP 30). Mean (±SD) values for \( VO_2 \text{max} \) in absolute and relative to body mass were 4.16±0.341 min\(^{-1}\) and 56.8±4.8 ml.kg.\(^{-1}\) min\(^{-1}\), respectively. Such \( VO_2 \text{max} \) value was 118% and 80% of those reported for Saudi college males and distance runners, respectively. The ventilatory anaerobic threshold (Tvent) averaged 43.6 ml.kg.\(^{-1}\) min\(^{-1}\). There were no significant differences in \( VO_2 \text{max} \) and Tvent between players based on positions, although the midfielders and the centre-backs had the highest and the lowest individual values for both measures, respectively. Values (±SD) of PP and AP 30 were 873.6±141.8 w (11.88±1.3 w.kg\(^{-1}\)), and 587.7±55.4 w (8.02± 0.53 w.kg\(^{-1}\)), respectively. Only in absolute PP & AP 30 were the centre-backs significantly superior to the other players. In addition, \( VO_2 \text{max} \) was inversely related to PP (\( r = -0.54; p<0.05 \)) and positively related to AP 30 (\( r = 0.45; p<0.05 \)). It was concluded the aerobic power, expressed relative to body mass, of Saudi elite soccer players was in the lower range of values normally reported in the literatures for elite soccer players. Both PP and AP 30 were somewhat lower than values previously reported for elite soccer players from other countries.
Bunc and Psotta\textsuperscript{21} studied the physiological profiles of 22 young soccer players (mean age = 8.0±0.3 years, body mass = 28.2±3.2kg, body height = 132.4±4.3cm and body fat = 19.4±1.6 percent) were measured by the incremental exercise protocol on the treadmill with 5 percent inclination. All boys systematically trained at least 2 years with a minimum of two training units per week. During preseason, they trained two times per week, and during the competitive season they trained at least three times and completed in one or two games per week. Mean VO\textsubscript{2 max}.kg\textsuperscript{-1} was 56.7±4.9 ml.kg\textsuperscript{-1}min\textsuperscript{-1}. Mean value of maximal running speed on a treadmill with 5 percent of inclination was 12.0±0.9km.h\textsuperscript{-1}. Mean values of R\textsubscript{max} = 1.11±0.07. The selected functional variables at the ventilatory threshold (VT) level corresponded to VO\textsubscript{2}.kg\textsuperscript{-1} = 42.9±5.0ml.kg\textsuperscript{-1}min\textsuperscript{-1}, mean values of percent VO\textsubscript{2 max}.kg\textsuperscript{-1} at VT level were 76.5±1.3 percent, mean speed of running was 10.5±1.2km.h\textsuperscript{-1}, mean values of percent V\textsubscript{max} at VT level were 87.5±1.9 percent. The mean of energy cost of running was 4.28±0.19J.kg\textsuperscript{-1} m\textsuperscript{-1}. According to the results, it was concluded that the physiological characteristics of young soccer players about 8 years old should be as follows: VO\textsubscript{2 max}.kg\textsuperscript{-1} higher than 55ml.kg\textsuperscript{-1}min\textsuperscript{-1} in defenders, and

higher than 60 ml.kg.\(^{-1}\)min\(^{-1}\), in midfielders and forwards. Maximal speed of running on the treadmill with 5 percent of inclination should be higher than 12 km.h\(^{-1}\) in all players, the running speed at anaerobic threshold (5 percent) higher than 10.5 km.h\(^{-1}\), percent VO\(_2\)max at anaerobic threshold level higher than 77.0 percent, and the energy cost of running lower than 4.20 J.kg.\(^{-1}\)m\(^{-1}\). As in other sports where skills play a decisive role, the physiological data cannot be the sole predictor of competitive success. On the other hand, we must note that these physiological norms and standards are necessary conditions for success in high levels of soccer competition. The norms play decisive role in talent selection.

Donald\(^{22}\) et. al. studied the relationship between football playing ability (FPA) and selected anthropometric and performance measures were determined among NCAA Division I-A football players (N = 40). Football playing ability (determined by the average of coaches’ rankings) was significantly correlated with vertical jump (VJ) in all groups (offense, defense, and position groups of wide receiver-defensive back, offensive linemen-defensive linemen, and running back-tight end-linebacker). Eleven of 50 correlations (groups by variables), or 22%, were important for FPA. Five of the 11 relationships were related to VJ.

Forward stepwise regression equations for each group explained over half of the criterion variable, FPA, as indicated by the $R^2$ values for each model. Vertical jump was the prime predictor variable in the equations for all the groups. The findings of this study are discussed in relation to the specificity hypothesis. Strength and conditioning programs that facilitate the capacity for football players to develop forceful and rapid concentric action through plantar flexion of the ankle, as well as extension of the knee and hip, may be highly profitable.

Castagna et. al.\textsuperscript{23} investigated the activity profile of young soccer players (mean age 11.8 ± 0.6 years; N = 12) with the aim of providing information for the development of training strategies. Data for movements of each player were obtained using 2 cameras that aimed at the subject throughout the match (Play Controller, Phromos, Italy). Encoders transmitted camera movements to a computer. The collected signals were then converted into distances, times, and speed attained at arbitrarily selected match categories. Players were monitored during official 11 vs. 11 matches (N = 12), with each match consisting of 2 halves, each lasting 30 minutes played on a regular soccer pitch. Mean total match distance amounted to 6,175 ± 318 m. During the second half,

players covered 5.5% less distance (p>0.05). At speeds between 13.1 and 18.0 km.h\(^{-1}\), players covered 12% less distance during the second half (p<0.05). Players stood still 11% of the total time played (3,789 ± 109 seconds). At speeds faster than 18 km.h\(^{-1}\), players performed 33 ± 4 bouts during match play, with a mean time length of 2.3 ± 0.6 seconds per bout. Mean time interval between two successive maximal sprint bouts was 118.5 ± 20.5 seconds. Players stood still longer during the course of the second half (229 ± 76 seconds vs. 173 ± 61 seconds, p<0.05). Players tended to play in small areas of the football pitch and spent 9 % of the total match time at high intensity. In order to promote more active space coverage of the young player, at least for the age considered in the present study, the dimensions of the football pitch and the number of players should be reduced.

Hooks\(^{24}\) studied to determine the children’s participation motives in organized youth soccer and their perceived competence for playing soccer vary by age and level of play. The participants in this study were 276 male youth soccer players, aged 11 to 16 years old, from the upstate region of South Carolina. The sample consisted of 110 recreational level players and 166 classic level players, who were divided into the age

groups of 11 to 12 year-olds (N = 103), 13 to 14 year-olds (N = 87), and 15 to 16 year-olds (N = 86). They were further separated into the two levels of play, resulting in a recreational level age grouping of 11 to 12 year-olds (N = 40), 13 to 14 year-olds (N = 32), and 15 to 16 year-olds (N=38) and classic level players age grouping of 11 to 12 year-olds (N=63), 13 to 14 year-olds (N = 55), and 15 to 16 year-olds (N = 48). A 2×3×8 repeated measures analysis of variance revealed significant differences (P<0.05) due to the effects of age \(F(2, 276) = 10.15, P \leq .001\) and the interaction of age and level of play \(F(14, 528) = 3.43, P \leq .001\), level × motive \(F(7,264) = 7.61, P \leq .001\), and age×level × motive \(F(14, 528)) = 2.41, P \leq .003\) were also significant.

The analysis of the data collected via Harter’s (1979) Self-Perception Profile for Children revealed that there were no significant difference (P≤ 0.05) in the groups’ perceived competence in soccer based upon age \(F(2, 276) = .549, P \leq .58\), level of play \(F(1, 276) = .49, P \leq 0.222\), nor the interaction of age and level of play \(F(4,276) =1.64, P \leq 1.165\).

Singh\(^{25}\) constructed soccer playing ability test on the basis of fundamental skills as dribbling, kicking, receiving, heading, feinting, tackling and ball sense. Total of 108 male soccer players between the age

of 15 and 19 years, who were adopted by SAI at different hostels of Eastern Region (Kolkata) and North-Eastern Region (Imphal and Guwahati), were taken as the subjects of the study. The study consisted of 32 test items. The data were analyzed by using the statistical techniques such as descriptive analysis, Pearson’s Product Moment Correlation and Factor Analysis. To develop the norms, Hull scale technique was applied and by 6-sigma scale grading was developed. Out of 32 test items he developed 9 suitable test items are as WM dribbling, receiving a bouncing ball with sole of the foot, repeated wall-rebounds (5ft), dribbling and kicking for distance, 30yds dribbling, dribbling and ground pass (15yds), shooting a stationary ball in the goal (25yrvds), heading for accuracy (12ft), and aerial pass a stationary ball (20yrd) to measure the soccer playing ability.

Holt\textsuperscript{26} studied to identify and examine psycho-sociological competencies and environmental conditions underlying the talent development experience of elite male adolescent athletes from Canada and England who aspired to become professional soccer players. Participants were 20 international soccer players (Mean age=16.8years) and 14 soccer players (Mean age=16.2years) and six coaches employed by professional soccer clubs in England. Both Canadian and English

\textsuperscript{26} Nicholas Loke Holt, “Toward a Grounded Theory of the Psychological Competencies Involved in Becoming a Professional Soccer Players,” \textit{Dissertation Abstracts International}, Vol. 64, No. 7 (January 2004): 2421A-2422A.
findings indicated that important psychological competencies involved in the talent development process for soccer were developing discipline, cultivating ambition, becoming resilient, and benefiting from the perceived availability of social support from parents and friends. Canadian soccer players faced several obstacles related to the talent development structure for soccer in Canada, and the absence of a nationwide adult professional league. Findings were discussed on talent development, and a theory of the psychological competencies involved with becoming a professional soccer player presented.

A Soccer Ball-Juggling test was developed by Lichtman\textsuperscript{27} evaluates general ball handling skills and eliminates the need for facility setting-up, and individual administration, due to judgment calls as seen in most existing passing and dribbling tests. The Ball-Juggling Test required participants to repeatedly tap, or contact a soccer ball using any body part except the hands and arms, as many times as possible within 30sec period. Participants included 70 female and 96 male kinesiology majors enrolled in a required skill class for 7 weeks of instruction at a university in Texas. The results of this study suggested that the Soccer Ball-

Juggling Test is a reliable and valid tool that assesses Ball-handling ability in soccer.

Davis et.al.\(^{28}\) investigated on physical characteristics that predict functional performance in division I college football players. The purpose of this investigation was to examine the relationship among 6 physical characteristics and 3 functional measures in college football players. Data were gathered on 46 NCAA Division I college football players. The 3 response variables were 36.6m sprint, 18.3m shuttle run, and vertical jump. The 6 regresses variables were height, weight, percentage of body fat, hamstring length, bench press, and hang clean. A step-wise multiple regression analysis was performed to screen for variables that predict physical performance. Regression analysis revealed clear prediction models for the 36.6m sprint and 18.3m shuttle run. The results of this investigation will help strength and conditioning specialists better understand the variables that predict athletic performance in Division I college football players.

Nishijima et.al.\(^{29}\) studied on the structure of soccer talent assessment by coaches. The purpose of the study was to verify structure of soccer talent of youth players assessed by coaches. A qualitative casual


\(^{29}\) Takahiko Nishijima et.al., “The Structure of Soccer Talent Assessment by Coaches,” (Cited from [www.taiiku.tsukuba.ac.jp/se/1_1E/09/index-e.html-2k]).
effect analysis using Delphi method with six experts in soccer coaching was carried out to analyze qualitative structure of soccer talent. A questionnaire consisting of 38 items was developed to collect data on major factors of soccer talent. The qualified 243 soccer coaches assessed soccer talent of 504 youth players of various levels in their youth generation, including 156 of professional level, 175 of national level, and 173 of regional level. Reliability of the questionnaire items was verified using Cronbach’s co-efficient alpha, and validity of the questionnaire items was verified using confirmatory factor analysis and invariance. Hierarchical factor structure of soccer talent was verified using structural equation modeling. It was concluded that the major factors of soccer coaches were physical and motor ability, individual motor skill and individual tactical skill, and these factors constructed the sequential causal effect relationship.

Mukherjee, Mukhopadhyay and Ghosh\textsuperscript{30} had a physiological study on children to make the physiological profile of child footballers. The study attempted to investigate the same, in the age group of 10-11 years with especial reference to VO\textsubscript{2}max and pulmonary capacities. The study was conducted on 23 children who have been selected in a Football

Academy at Chandigarh. At the time of evaluation, these children had training age of one year. The aerobic capacity or maximum oxygen uptake capacity (VO₂max) was estimated with the help of a COSMED K4 portable telemetric analyzer (COSMED, Italy), following a graded protocol of exercise on a bicycle ergometer, till exhaustion. The initial load was 1 watt.kg⁻¹ and was increased at the rate of 0.5 watt.kg⁻¹ after every 2 min till exhaustion. The physiological variables were recorded every 30 sec interval. The anaerobic threshold level of the subjects was determined by gas exchange method from the deviation point of Vₑ-VCO₂, Vₑ-VO₂ relationship and breathing equivalent. The respiratory profiles, like Forced Vital Capacity, FEV-1 and peak expiratory flow rate were estimated using a computerized spirometer. The mean relative VO₂max of these child footballers was 56.6±3.9 ml.kg⁻¹min⁻¹ and the AT VO₂ was 79.5±7.3% VO₂max. These were comparable to those of the adult players. The static and dynamic lung volumes depended more on the corporal data than the training status. The study highlights that training can improve aerobic adaptation in the child footballers like adults and thus the VO₂max and anaerobic threshold level of the child players reach a comparable status to the adult footballers. The lung capacities of the child footballers depend more on age, height and weight than the
training adaptation and for this reason the lung capacities of the child players are lower than their adult counterparts.

Stewart and Meyers studied on motivational traits of elite young soccer players. The purpose of the study was to investigate motivational characteristics of that group and ascertain if age or the position played impacted those traits. Following written informed consent, 66 elite, young male soccer players from two age groups completed the Sports Attitude Inventory (Willis, 1992) and Levenson’s Locus of Control Scale (Levenson, 1981). Data were grouped for analyses by birth years and primary position played (forward, midfielder, defender or goalkeeper). Statistical analysis indicated a significant effect by age, but not by position. Univariate results indicated that older players were more motivated to avoid failure and were less prone to place locus of control on external or chance oriented sources than younger players. Both findings have implications for coaches in the development of elite teenage soccer players and serve as rationale for further study.

Stroyer, Hansen and Klausen studied the physiological profile and activity pattern of young soccer players during match play. The purpose of the study was to examine aerobic demands and activity

patterns during match play in young soccer players with respect to competition level, age, and biological maturity. Ten nonelite players (NbP) and nine elite players (EbP) in their early puberty (12 yr), and seven elite players (EeP) in their late puberty (14 yr) were studied. Heart rate (HR) and activity pattern were recorded during match play, whereas corresponding VO\textsubscript{2} and HR values were obtained during sub-maximal and maximal treadmill tests in the laboratory. The maturity status was assessed from testicular volume. The result was drawn that there was no difference in VO\textsubscript{2max} was observed between the non-elite and the elite players in the beginning of puberty (58.7±5.3 vs 58.6±5.0ml O\textsubscript{2}.min\textsuperscript{-1}kg\textsuperscript{-1}), whereas the elite players in the end of puberty were significantly more fit (63.7±8.5ml.O\textsubscript{2}. min\textsuperscript{-1}Kg\textsuperscript{-1}). During match play, a higher HR was recorded in the elite players in the beginning of puberty than their non-elite counterparts, whereas the two elite groups showed the same HR responses, (HR) 1\textsuperscript{st} half/2\textsuperscript{nd} half-NbP : 162/157; EbP: 177/174; EeP: 178/173). The elite players in the end of puberty thus performed absolute and relative VO\textsubscript{2} min\textsuperscript{-1} and mlO\textsubscript{2} min\textsuperscript{-1} compared with the non-elite players during both halves, corresponding to more time spent in standing/walking in the non-elite group. The elite players in the end of puberty showed higher absolute VO\textsubscript{2} values during match play than the
young elite players but identical relative aerobic loads. It seems that the midfield/attack group had the highest absolute VO₂max and was performing at the highest HR during the matches. It was concluded that the study showed that young soccer players are highly specialized both according to playing level and position on the field.

Chamari³³ et.al. presented a new test to assess aerobic performance in soccer by means of a specific dribbling track: the Hoff test. It was further determined whether improvement in maximal oxygen uptake was reflected in increased distance covered in the Hoff test. 18 male soccer players (14 years old) were tested both in the laboratory and using the Hoff test before and after 8 weeks of soccer training. The distance covered in the Hoff test correlated significantly with maximum oxygen uptake, and improved by 9.6% during the 8 weeks training period, while maximum oxygen uptake and running economy improved by 12 and 10%, respectively. Backward multiple regressions showed maximum oxygen uptake to be the main explanatory variable for the distance covered in the Hoff test. The study demonstrated a significant correlation between laboratory testing of VO₂max and performance in the Hoff test. Furthermore, training induced improvements in VO₂max were reflected

in improved performance in the Hoff test. It was suggested that it should be a goal for active U-15 soccer players to cover more than 2100 meters in the Hoff test, as this requires a VO_{2max} of above 200 ml.kg(0.75)"{1 min"{1}, which should serve as a minimum in modern soccer.

**Skills, Motor Abilities, Psychological and Physiological Related Reviews**

Charies\(^{34}\) carried out a study on personality traits and performance in gymnastics to determine the personality traits of 100 gymnasts and to relate factors to variables of success, level of performance and experience. The personality traits were determined by the administration of 16 P.F. test by Cattell. Subjects were the women gymnasts who had participated in the mid-west collegiate gymnastic competition for women. Chi-square was applied to test the significance of deference found in the comparison. The findings of the study indicated that the women gymnasts differed significantly on eleven of the sixteen personality factors.

Relationship of selected physiological and psychological factors to the beginning swimmer’s ability to perform the crawl stroke was determined by Crites\(^{35}\), who used 40 subjects from two beginning

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swimming classes. The beginning classes met for 40 minutes twice a week. Prior to any swimming instruction, measurements were collected shoulder rotation, shoulder extension strength, hip extension strength, body composition, swimming anxiety, and swimming ability as measured by the Fox Power Test (revised). After five weeks of crawl stroke instruction, measurements were again collected on swimming anxiety and swimming ability. Pearson’s Product Moment Correlation was used to analyze the data. It was found that: (i) shoulder rotation, shoulder extension strength, hip extension strength and body composition were not significant factors in the performance of crawl stroke, and (ii) a significant relationship was indicated between swimming anxiety and the ability to perform the crawl stroke.

Deshaiès\textsuperscript{36} developed predictive equation of Junior Ice Hockey. One hundred and sixteen Quebec Junior Major League Hockey players were measured on 14 variables falling in biological, psychological and specific motor skill categories. These variables were included in a Stepwise Regression Analysis with the ice hockey playing ability as the criterion variable. A predictive equation was obtained (P<0.05), which included in following four variables: forward speed skating, motivation,

visual perceptual speed, and anaerobic power. The correlation co-efficient obtained was 0.74. The 55% of the variance in Ice Hockey playing ability accounted for by the psychological profile was larger than that observed individually for either the biological (17%), psychological (20%) or the specific skill profile (33%).

Peterson\textsuperscript{37} conducted the study to predict the basketball performance by using psychomotor, cognitive, and anthropometric measures. Forty-three female members of the to four teams in the 1979 Missouri Small College Basketball Tournament served as subjects. The contributions of GPA, anaerobic by power, 15 yard dash, 30 yard dash, total body RT, TRT, height and weight to basketball performance was determined by a specially designated formula by H.K. Kay. Height (r = .388) was the only significant (P = .05) predictor. The 15 yard dash, total body RT, and power were next. The R for the four top variables was .56 (P < .01).

Martin and Peterson\textsuperscript{38} in cooperation with the dissuasion of intramural at the University of Illinois studied group cohesiveness as a determinant of success and member satisfaction in team performance.


Over 1200 male university under graduate students divided into 144 basketball teams were used as subjects. These teams participated in league play on the basis of their residential affiliation. The member of the team stayed together. A questionnaire instrument was used to assess each team level of cohesiveness was administered one day before the first league game. One the basis of their responses they were categorized into low, moderate and high cohesive teams. The results were equivocal.

Khan\(^{39}\) described on utility of psychological assessment in selection of top level sportsmen and sportswomen, and explained to develop psychological test battery can be used for the psychological assessment of sportsmen, it is a foremost step to identify the areas which need to be appraised. Attention and concentration, perception, imagination and thinking, memory, learning capabilities, presence of mind and judgement, intelligence, reaction time, motivation, personality traits, attitudes, morale, will power and determination, group cohesiveness etc. are important psychological components which should be assessed so that norms can be prepared.

These areas mentioned could serve as a psychological model for the assessment of overall psychological potentials of the sportsmen who aspire to be at the top level in the competitive sports.

Dutta\textsuperscript{40} conducted a study on 74 male hockey players in the age group of 18 to 24 years studying in different Indian universities. He administered IPAT anxiety scale to the subjects and come to the conclusion that low level of anxiety contributes to superior performance in hockey.

Yeigletu,\textsuperscript{41} reported that the speed, anaerobic capacity and agility are significantly related to performance in 100m run. Therefore while selecting potential sprinters these motor abilities may be given due consideration.

Carron, Widmeyer and Brawley\textsuperscript{42} developed an instrument to assess cohesion in sports team- the group environment questionnaire. It has fourfold. The first purpose was to demonstrate the need to develop an instrument assess a group cohesion while the second was to outline a


conceptual model of group cohesion upon which such an instrument could be based. This model reflected four related constructs, which were the priori bases for developing a large item pool and initial versions of the Group Environment Questionnaire (GEQ). The purpose was to outline the four projects conducted to obtain construal related information and to develop and initial version of the GEQ. The final purpose was to outline the two reliability and validity studies conducted with two deferent sports team samples. The results of these studies revealed that an 18-item version of the GEQ was internally consistent, reliable across studied, and content validity. The GEQ in comprised of four scales reflecting the constructs of group integration-task, group integration social, individual attraction to group-task, and individual attraction to group social.

Tenenbaum et. al.\textsuperscript{43} studied the physical and psychological prerequisites for gymnastic talent development. A battery to tests, which included (a) pull-ups on bar, (b) standing broad jump, (c) shoulder flexibility, (d) co-ordination, and (e) sit-ups. Following one month, the subjects were given a battery of psychological measures, which included concentration, frustration and anxiety. Two competitions after one year were used as criterion measure. Multilinear regression revealed that 58

percent of the variance in gymnastic performance was explained by psychological variables, particularly concentration, need persistence and ego defense. High potential gymnasts performed better on all test.

Sports Achievement Motivation Questionnaire (Kamlesh, 1987) and the attribution questionnaire more administered by Bujurke to fifty male athletes who participated in the inter-university athletic meet. Analysis of data revealed significant relationship of achievement motivation to performance of the athletes in 100m and 800m whereas 500m run, discuss throw and long jump performance were not found to be statistically significant.

Spink and Carron investigated to examine the relationship of group cohesion to adherence in women participating in exercise classes. Two measures of adherence were examined absenteeism and lateness. Results from a stepwise discriminant analysis conducted on the absenteeism data revealed that the two absenteeism groups could be differentiated on the basis of their endorsement of individual attractions to the group-task (ATG-T) and social (ATG-S), with individuals who were absent less reporting greater ATG-T and ATG-S than those who

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were absent more. The results of a stepwise discriminant analysis conducted on the lateness variables revealed that ATG-T significantly differentiated between the two groups. Individuals who were late less scored higher on ATG-T than did those who were late more often. These findings provide support for the suggestion that selected aspects of group cohesion play a role in the adherence behaviour of female exercise participants.

Chartrand, Towdy and Danish\textsuperscript{46} designed a psychological skills inventory for sports contained 45 items designed to measure six psychological skills related to athletic performance. The present study examined selected psychometric properties of the PSISR-5. Results of the confirmatory factor analysis, conducted using intercollegiate athletes (N = 340), indicated that the predicted six-factor model did not fit the data. Model modifications were examined but fail to provide an adequate fit. Internal consistency estimates for five of the six scales also indicated poor reliability. The results are discussed in relation to the applied use of the PSISR – 5. Emphasis in placed on the need to carefully evaluate the psychometric characteristics of instruments that are designed for use in applied sport psychology.

Spink\textsuperscript{47} studied to examine whether perceptions of team cohesiveness could be used to predict intention to participate during a following season. In Study 1, female participants in recreational ringette teams completed the Group Environment Questionnaire after completing the season. Intention to return for the next season also was assessed via questionnaire. Discriminant function analysis revealed that those intending to return for the next season held significantly greater perception of social cohesion. In Study 2, a replication of Study I using elite ringette team members, perception of social cohesion once again proved to be reliable predictors of intention to participate next season. Elite female athletes who indicated that they would return for another season were most likely to perceive the social cohesiveness with their team as high. Both studies support the conclusion that perceptions of social cohesiveness are positively related to the intention to continue to participate.

Smith and Christensen\textsuperscript{48} investigate the role of physical and psychological skills as predictors of performance and survival in professional baseball was studied in a sample of 104 minor league


baseball players. Psychological and physical skills were largely uncorrelated with one another and appear to be measuring separate and independent skill domains. Preseason scores on the Athletic Coping Skills Inventory (MCSI-28) and coaches’/managers’ ratings of the same skills on an ACSI Rating Form each accounted for as much performance variance in batting average (approximately 20%) as did physical skills when differences in the latter were statistically controlled, and the psychological measurers accounted for substantially more variance in pitchers’ earned run averages than did the expert ratings of physical skills. The psychological skills measures also predicted athletes’ survival in professional baseball 2 and 3 years after they were obtained. Bayesian hit rate analyses indicated substantially increased survival predictability over simple base rate predictions.

Hellandsig\textsuperscript{49} conducted a study on talented teenage athletes of both sexes performing explosive, endurance and team sports as well as risk and safe sports were three times (age 15-16: N=352; age 16-17: N=305; age 17-18: N=285) to predict high performance and discontinuation in sport at age 18-19 years from scores on a range of motivational styles. They were recruited from the most promising performers of different

sports, mainly in Western Norway. They all completed Norwegian various of questionnaires on competitiveness, win- and goal- orientation (Sport Orientation Questionnaire: Gill and Deeter, 1988); sensation seeking (Short Sensation Seeking. Scale: Madsen, Das, Bogen and Grossman 1987); optimism (Life Orientation Test: Scheier and Carver, 1987); a new scale on so-called reactive and proactive negativism (the Negativism Dominance Scale: McDermott and Apter, 1988) as well as questions constructed to measure the importance of friendship and physical competence in sport attributed to self, sport mates and to the coach. Information about level of performance in sport and discontinuation at age 18-19 years were also obtained.

Competitiveness, win orientation and the importance of physical competence in sport, attributed to self and to sport mates, predicted high performance in all types of sport, whereas high performance in different sports was predicted from proactive negativism (intrinsically provoked hostile actions), with high scores among explosive sport performers and low scores among performers of team sports. High performance in endurance sports was best predicted from high scores on goal orientation and the importance of friendship attributed to self. A significantly more optimistic lifestyle was predominant among skilled performers of risk sports compared to skilled performers of safe sports. Scores in the
medium range for win orientation in previous years also predicted high performance in risk and safe sports. Discontinuation was best predicted from reactive negativism (extrinsically provoked hostile actions) and proactive negativism among males.

Skills, Motor Abilities and Physiological Related Reviews

Hicks\textsuperscript{50} constructed and evaluated a battery of five badminton skills. Data were collected from three judges rating on the subjects ability to execute the selected skills in a game situation; tournament scores; total judges’ evaluation of overall playing ability; the performance scores for each of 20 trials on the clear test, smash test, overhead drop shot test, and strategy test; and scores for each of 3 trials on the footwork test. It was concluded that the strategy, clear and smash tests are valid and retable measures whereas the overhead drop shot and footwork test are not valid tests to measure a beginning players’ ability.

Illner\textsuperscript{51} suggested the construction and validation of a skill test for the drive in field hockey. Beginning high school players, physical education major and association players were tested on their ability to drive the ball to the left and to the right after 5 weeks of instruction and or


practice. Speed and accuracy were considered to be the important aspect of the drive and were therefore included on the skill test. Scores were obtained for each component and were then combined into a single score by means of additive and multiplicative techniques.

Statistical evidence presented included studies of objectivity, reliability, validity, target adequacy and scoring. The test was found to be objective ($r = 0.97$ and higher), reliability ($r = 0.72$ and higher) and valid measure of an individual's ability to execute the drive.

Antrim\textsuperscript{52} designed a continuous test item to predict and evaluate basketball playing ability 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 judges' ratings as a criterion score and found that the time for the test related to the criterion more highly than the separate parts. Agreement among the judges was 0.87. A validity coefficient of 0.74 resulted when the player rankings were correlated 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 this condition the reliability coefficient was estimated to be 0.82.

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Atkinson\textsuperscript{53} developed regression equations using physical traits and class commitment as predictors for determining potential skill in beginning tennis, badminton, and handball for college men. The physical traits used were: agility, power, hand-eye coordination and visual anxiety. Skill level was determined by a round robin tournament in each sport. Subjects were 140 college men enrolled in beginning classes for each sport and taught by the whole-part method. Control subjects included 138 students enrolled in other beginning classes and taught by the part method. Another purpose of the study was to determine if practice in the sport would significantly improve scores on the physical traits. A paired ‘t’ was used. A ‘t’ was used to compare experimental and control groups. Conclusions were: class commitment is probably an integral part of skill attainment in the sports studied; students taught tennis and badminton by the whole-part method experience greater gains in agility and hand-eye coordination; students taught tennis by the part method experience greater gains in shoulder girdle power.

Robert\textsuperscript{54} attempted to predict potential of 67 football players from their scores on a football potential test. The test battery consisted of motor items as well as football skill items. Substantial correlations were


obtained between most test items and the test criterion—the sum of T-scores. Size as depicted by McCloy’s classification Index (C.I.), had a negative non-significant correlation with the criterion. The discriminative power of the battery was evidenced by highly significant correlation between the tests. It was concluded that athletic potential in football could be predicted by testing. In second part of the body, football teams from three different strata of competition were evaluated on the basis of the test battery. The battery substantiated a stepwise progression between the teams on most items, with significant differences being noted. The test showed validity, in that the test criterion (the sum of T scores) was significantly different between the teams.

Michele\(^5^5\) developed a test battery for predicting football ability at the college level. The major purpose of the study was to explore the possibility of developing a regression equation whereby football ability could be predicted from an analysis of selected orthopedic measures, strength tests, power measures, balance, standing height and body weight. 14 measures were determined on each of the 56 scholarship football players at the University of Arkansas, who were selected for the study. In addition, 6 assistant football coaches, 3 offences and 3 defenses, rated

each offensive and defensive player respectively. The rating on football ability was used the criterion.

The results of the study seem to justify the following conclusions for the predictions of football ability for scholarship football players at the University of Arkansas: (1) Tibian torsion, bow legs, standing height, body weight, Margaria Kalamen Anaerobic Power test and knee flexion are the best measures for the prediction of football ability in this study; (2) Strength tests using a cable tensiometer, are not good predictors of football ability; (3) Fleishmann’s Static Balance test is not a good indicator of football ability; (4) Tibian torsion and bow legs indicate that orthopedic measuring are of value in predicting football ability and (5) Margaria Kalamen Anaerobic Power test a good measure of football ability.

Matheson\textsuperscript{56} studied the relationship between swimming and selected physiological, anthropometric development and skill variables in 10-12 years old females competitive swimmers. Forty girls were tested and data were collected for selected variables. Each subject completed 400 yards and 50 yards time trials and later classified into top and bottom level groups. The inter-correlation matrix indicated that best predictors of

\textsuperscript{56} Zaille Matheson, “Selected Physiological, Anthropometric and Skill Variables Contributing to Success in 10-12 Year Old Female Competitive Swimming”, \textit{Completed Research in Health, Physical Education and Recreation}, 20 (1978): 293.
swimming performance were height, aerobic capacity, and stroke efficiency.

Chapman\(^\text{57}\) determined what, if any, predictive qualities could be identified in a group of skilled women field Hockey players. The subjects were 106 players who participated in the international selection and training camps sponsored by the U.S. field hockey association during the summer of 1978. The study investigated anxiety, visual perception, manual dexterity, ball control and dynamic balance. Five tests were used to assess the predictor variables: (a) Sports competition anxiety test, (b) Herkowit's moving embedded finger test, (c) Chapman ball control test, and (d) Scott sideward leap test.

Level of camp participation determined by player selection based on subjective evaluation of field hockey playing ability, served as the criterion measures in the study. A stepwise discriminating function analysis determined that the three discriminating variables — dynamic balance, ball control and anxiety could predict correct group membership 78.95\% of the time.

Admand and Florence\(^\text{58}\) took physiological and anthropometric measures of a group of young women, mean age 16.2 years, who had


\(^{58}\) Burke J. Admand and Bruce C. Florence, “Physiological and Anthropometric Assessment of Successful Teenage Female Distance Runners”, \textit{Research Quarterly}, 50.2 (October 1979): 180.
been training regularly by running approximately 50 miles per week for 2 years. Their mean VO$_2$max of 63.24 ml.kg.$^{-1}$min.$^{-1}$ is among the highest over recorded in a group of young women. Anthropometric measures included selected segment lengths, diameter, skin-folds, and circumferences. These young women appeared to be of average height, low in body weight, subcutaneous body fat, have a high component of ectomorphy and a smaller overall skeletal frame work than non athletes.

The purpose of the Dangwal$^{59}$ 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 test were:

1. Speed of the ball
2. Stopping and Shooting
3. Interception and clearance
4. Receiving and passing
5. Tapping with only left hand or, tapping through wooden blocks
6. Dribbling through wooden blocks

7. Speed with optimum ball control

8. Dodging towards right and left

9. Running with ball while changing direction

10. Specific speed endurance

11. Test of relative performance

Reliability was found through test-retest method, Product Moment Method between two sets of scores. Validity also was there by 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.

Poole\(^60\) and Nelson constructed a badminton skill test battery for high school and college students of both sexes. The skill tests selected were long serve test, forehand clear test, and backhand clear test was 0.81, 0.90 and .78 respectively. The validity for long serve, forehand clear and backhand clear that was reported 0.51, 0.70, 0.56 respectively with the results of tournament play.

Joseph\textsuperscript{61} determined the relationship of power, agility, shoulder flexibility, arm length and leg length to volleyball playing ability. Thirty male volleyball players of the Lakshmibai National College of Physical Education, Gwalior, were selected as subjects. Power was measured by Sargent jump, agility by 40m shuttle run, shoulder flexibility by graded stick and arm length by steel tape, and the playing ability was based on the average subjective judgement of three experts. Product Moment Correlation was used to statistically analyze the data and it was concluded that: (i) power is the most reliable single variable in prediction of playing ability of man volleyball players; (ii) arm length and leg length are also reliable variables in prediction of playing ability of male volleyball players and (iii) the variables of agility and shoulder flexibility show insignificant relationship in prediction of playing ability of male volleyball players.

Raman\textsuperscript{62} conducted tests on 30 male cricket players from graduate and undergraduate courses at Lakshmibai College of Physical Education, Gwalior in order to determine the relationship of grip strength, leg power, agility and hand and foot reaction time to performance in cricket. Data

was collected on grip strength (grip dynamometer): leg power (standing broad jump), agility (40 yard shuttle run) and hand and foot reaction time (electronic reaction timer) and performance was the average of subjective rating of three experts during practice and match situations. Product moment correlation was employed to statistically treat the data. It was concluded that: (i) hand and foot reaction time in the most important variable in the prediction of performance of a cricketer; (ii) leg power is another important variable in the prediction of performance in cricket; (iii) grip strength is also an important variable in prediction of cricket playing ability and (iv) agility in not an important factor in the prediction of performance in cricket.

Saggu[^63] studied on selected general motor ability components and anthropometric measurements as predictors of basketball playing ability. 20 male students of L.N.C.P.E., Gwalior, those who had been training themselves for basketball were selected. The selected variables were measured as, speed by 50m dash, agility by 4 x 100 m shuttle run, abdominal strength by sit-ups, shoulder strength by pull-ups, leg strength by vertical jump and anthropometric measurements were height, weight, leg length and trunk length. Product Moment Correlation Method and

Analysis of Variance were employed respectively. Only speed, agility and height were significantly related to basketball playing ability.

Sharma\textsuperscript{64} studied on the assessment of physical fitness components as prediction factors of running broad jump. Fifty male students of L.N.C.P.E., Gwalior were employed as subjects whose selection was based on random basis. The data pertaining to the selected physical fitness components i.e. speed, strength, agility, cardiovascular endurance and flexibility was collected by administering the standard test of 50m dash, standing broad jump, leg dynamometer, squad thrust, 12min Cooper’s Run-Walk test, and sit and reach test respectively. Product Moment Method of Correlation and Partial Correlation Method were employed. The findings revealed that except agility and cardiovascular endurance, other components were significantly related to the running broad jump performance.

Durereha\textsuperscript{65} constructed an objective skill test in hockey. 60 schoolboys from nine to twelve classes of Senior Secondary Schools of Uttar Pradesh in the session 1984-85 were selected as subjects. Their ages were 15 to 18 years. A panel of three experts who were technically


qualified in hockey assessed the general hockey ability of the subjects. The experts through observing the performance of the subjects in the real game situations did the evaluation. Three combination skill test items as (a) angular hitting and stopping for one minute test item, (b) pass receiving, dribbling and hitting test item, and (c) dribbling and goal shooting test item were administered.

The finding of the study indicated that the reliability coefficient obtained from the tests ranged 0.91 to 0.94 (angular hitting and stopping for one minute = 0.92, pass receiving, dribbling and hitting = 0.94, and dribbling and goal shooting = 0.91). Objectively coefficient of test ranged from 0.91 to 0.96. Thus, all the test items were highly reliable and objective and significantly related to the performance measured.

Singh\textsuperscript{66} studied the physiological variables of basketball players. The results showed that 9 physiological variables height, grip strength, left grip strength, by press, vertical jump, resting heart rate, anaerobic fitness and flexibility were good predictions of performance in basketball. Blood pressure (systolic and diastolic) was found non-significant predictions.

Beiter\textsuperscript{67} constructed a study for the prediction of football playing ability. 46 players served as subjects and using general and specific motor performance tests. The 18 tests included measurements of strength, power, speed, agility and body composition. All raw data were converted to T-Scores. Multiple regression analysis selected the top 4 tests to estimate the sum of 18 T-scores. None of the 18 items profile significantly predicted starters in the Spring Game. Multiple regression to predict coaches’ rating (mean of 5 coaches) produced an R=0.66 using 1-RM bench press, power clean, 7 skinfolds, blocking RT, and Margaria Kalamanm anaerobic power. Contrary to results of other studies to predict success in football, the test battery developed in this study did not distinguish between starters and non-starters. Possession of speed, strength and size does not guarantee success in highly skilled game such as football.

Kansal\textsuperscript{68} described SAI basketball skill test battery (1992) for spotting and nurturing of basketball talent among young boys and girls.

This test battery meant for 10 to 14 year boys and girls consists of the following three test items:


1. Wall pass test
2. Dribbling test
3. Jumping and turning in the air

The purpose of these test items are to measure the basketball speed passing or throwing ability, dribbling skill in handling the basketball while body in moving and the whole body angular flexibility while the body in moving respectively.

Kansal\textsuperscript{69} described SAI volleyball test (1992) for measuring the volleyball skill of 10 to 14 years old children for sporting talent at young age. This test consists of the following three test items:

1. Accuracy of service test item
2. Wall volleying test item
3. Medicine ball throw test item

The purpose of these test items is to measure the ability of exactness of service, subjects’ control on volleyball pass and general throwing ability of the potential volleyball players respectively.

Kansal\textsuperscript{70} described SAI athletics skill testing for spotting talent at young age. As usual for other SAI sports skill tests, the “Athletics” skill test also consists of three test items, which are enlisted below:

\textsuperscript{69} Ibid, pp. 307-310.
\textsuperscript{70} Ibid, pp. 323-325.
1. 60 m. sprint
2. 300 m run
3. Tennis throw

These three test items are aimed at determining the subjects’ skill ability in sprinting event, speed endurance capacity and throwing capacity respectively.

Kansal\(^{71}\) described the SAI hockey skill testing for talent spotting at young age in his book Test and Measurement in Sports and Physical Education.

This test consists of the following three test items.

1. Shooting in the target (goal)
2. Balancing the ball on the stick
3. Moving with the ball

These three test items aim at measuring the ball shooting ability, balancing ability and control ability of the hockey player respectively.

Kansal\(^{72}\) described the SAI badminton skill test consists of 3 test items, which in being used to spot badminton talent from the 10-14 years old school boys and girls.

\(^{71}\) Ibid, pp. 328-330.
\(^{72}\) Ibid, pp. 318-321.
These 3 test items are given below –

1. Badminton shuttle run test item
2. Tennis ball throw test item
3. Standing backward jump item

Pramanick\textsuperscript{73} studied on physical and physiological variables as predictors of playing ability of badminton players. He used Pearson’s Product Moment Correlation (zero order) and Wherry Doolittle Method Of Multiple Correlation to find out the relationship between dependent variables (playing ability) and independent variables (physical and physiological), and the combined effect or contribution of physical and physiological to playing ability respectively on 25 badminton players of Maharashtra state. Regression equation statistical technique was employed to predict the badminton playing ability from total 22 test items of physical and physiological to playing ability respectively on the data of 25 badminton players. Only seven test items namely arm length, age, endurance, height, reaction time, speed and trunk length was significant. Further, most effective and powerful predictors were only four test items namely reaction time, height, arm length and endurance to the playing ability confirmed by forward stepwise multiple regression equation analysis.

Gogia\textsuperscript{74} developed a model for identification of talent for competitive summing among age group. It was developed on the selected 10 anthropometric variables, 6 physical variables and 4 physiological variables. He used the multiple correlation and regression equation statistical techniques on the data of 200 male swimmers out of 260 swimmers between the age group of 9 to 12 years. Out of total 20 test items, 8 test items for 9 years, 6 test items for 10 years, 12 test items for 11 years, and 13 test items for 12 years old had been developed for determining on free style swimming performance which are applicable for talent search.

Keogh, Weber and Dalton\textsuperscript{75} developed an effective test battery for female field hockey 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 liner for the 10m and 40m sprints as well as the Illinois agility run (with or without dribbling hockey ball). Rep players also had greater aerobic and lower body muscular power and were move 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 40m repeated sprints, hand-grip 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 programs for female field hockey should include assessments of these physical parameters.

Mastrangelo et. al.76 Investigated for predicting anaerobic capabilities in 11-13 year-old boys. Thus study first established regressions to predict maximal anaerobic power and then cross-validated these prediction equations for relative (watts per kilogram of body mass) and absolute (watts) mean and peak anaerobic power using the 30-second Wingate test as the power measure were determined for 40 boys (age, 11-13 years). Percentage of body fat, free fat weight, mid-thigh circumference, and 30m dash were the independent predictive variables with the generated regression equations subsequently cross-validated using 20 different boys (age, 11-13years). Significant correlation (Pearson’s ‘r’) was found for the cross-validation subjects between the measured power outputs and predicted power outputs for relative mean power (r =0.48, P<0.05), absolute mean power (r = 0.77, P<0.01), and absolute peak power (r = 0.76, P<0.01). Using paired ‘t’-tests, no

significant mean differences (P>0.05) were found for the same subject between actual and predicted power outputs for relative mean power, absolute mean power, and absolute peak power. Prediction of maximal anaerobic power from selected anthropometric measurements and 30m dash appears tenable in 11-13 year-old boys and can be accomplished in a simple cost – and time – effective manner.