Chapter II

REVIEW OF RELATED LITERATURE

The research scholar had a detailed literature search to provide background information for the present study. Data on the most appropriate training regimens for hockey are sparse. Despite this handicap, various sources of literature available in the libraries and internet were searched thoroughly to find out the most critical studies pertaining to the present problem which are presented in this chapter.

Shergill, Singh and Tung\(^1\) conducted a study to evaluate the importance of a set of specific physical fitness components as contributors in Hockey playing ability. On the basis of available literature, 22 relevant test items were selected to measure fitness components. The sample consisted of 100 female hockey players, from four Universities of Punjab (India). The age of the players ranged between 18 to 24 years. The stepwise regression was applied to assess the importance of different variables in predicting hockey playing ability. The result of t-ratios suggested that endurance run test, standing broad jump test, grip strength (left hand), vertical jump test, wrist flexion test, age, height and weight were significantly important in evaluating the hockey performance. Also, the results failed to find support for speed as an important predictor of hockey playing ability.

Kansal, Verma and Sidhu\textsuperscript{2} in their study of Indian hockey players found that the goalkeepers and backs were heaviest followed by halves and forwards. In contrast, the forwards had the highest aerobic capacities, followed by the halves, backs and goalkeepers.

Carter et. al.\textsuperscript{3} studied the physiques of hockey players at the 1976 Olympic Games in Montreal from Argentina, Kenya, Malaysia, Australia and New Zealand. Most of these hockey players had somatotypes in the dominant mesomorphy region of the somatochart but there was a wide dispersion of physique which Carter and his colleagues suggest, probably reflects both the ethnic grouping and the playing position on the field.

In their study of a top class Indian hockey players, Malhotra et. al.\textsuperscript{4} divided the players into groups according to playing position. They found that goalkeepers were shortest, had the lowest percent lean body weight and the lowest aerobic capacities but the highest percent fats. The forwards in contrast were the lightest, had least percent fat but had the highest percent lean body weight and aerobic capacities. The backs were tallest and had percent fats, percent lean


body weights and aerobic capacities intermediate between the goalkeepers and forwards. The goalkeepers in the study were, however, the most agile, a characteristic important for success in this position on the hockey field.

Anaerobic power in relation to field position of 90 Indian hockey players has been studied by Bhanot and Sidhu. These players included 10 goalkeepers, 16 backs, 20 half-backs and 44 forwards. The goalkeepers possess maximum and forwards possess minimum anaerobic power while in vertical velocity, the former are the fastest and the latter are the slowest. In body weight, the backs are heaviest followed by half backs, goal keepers and forwards. Among backs, the lefts are heavier, faster and have more anaerobic power than rights. In half-line players, the centre-half backs are followed by left-half-backs and right-half-backs both in body weight and anaerobic power, while in vertical velocity, the left-half-backs are the fastest and centre-half-backs are the slowest. Among forwards, the centre-forwards are heaviest with maximum anaerobic power and are followed by inside – forwards and outside – forwards, whereas, in vertical velocity, the inside – forwards are fastest followed by centre – forwards and outside – forwards.

The top class English female hockey players measured by Bale and

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Bale and McNaught\textsuperscript{7} were less endomorphic than a group of female New Zealand hockey players somatotyped by Johnston and Watson\textsuperscript{8} using the Parnell M4 method. The halfbacks and forwards tended to be lighter and less endomorphic than the backs and goalkeepers. They had the lowest percent fats but they had highest step scores for cardiovascular fitness, the highest vital capacities and the highest explosive strength scores. Discriminant analysis between the defensive players (backs and goalkeepers) and attackers (halfbacks and forwards) indicated significant difference between these groups in endomorphy, total skinfolds, absolute fat and step test scores. The findings of Bale and McNaught – Davis however, did not support those of Johnston and Watson that a high mesomorphy rating is an important characteristic of attack player in women hockey but they do suggest that, like men hockey players, women who play in attack positions are slimmer and fitter than those who play in defensive positions.

Wharten\textsuperscript{9} predicted the relationship between field hockey playing ability and fitness components in which Schmithal French Hockey Test and AAHPER Test were used. A significant relationship was found between the scores on the Youth Fitness Test and Field Hockey Achievement Test.


\textsuperscript{9} M.H. Wharten, “An Investigation of Youth Fitness Test as a Predictive measure of Skill Development in Field Hockey”, \textit{Completed Research in Health, Physical Education and Recreation}, Vo. 4, (1962) : 49.
Verma et. al.\textsuperscript{10} compared the anaerobic power of sportsmen representing different categories of sports (Athletics, Basketball, Football and Hockey). It was hypothesized that each player representing his respective sport required different type of anaerobic power. The study concluded that the intersportive differences in the anaerobic power were statistically significant according to the respective sport.

Scott et. al.\textsuperscript{11} conducted a study on aerobic and anaerobic analysis of 162 elite male hockey players. The study suggested that conditioning programme for field hockey players should include both aerobic and anaerobic training as the success of individual player depends upon his fitness with respect to the specific requirements of the game.

While studying motor fitness components, Uppal and Dutta\textsuperscript{12} reported that speed, grip strength, agility balance and kinesthetic perception contribute to hockey playing ability.


Marshall\textsuperscript{13} found that sprinting is one of the important contributors to excellent hockey performance. He further observed that sprinting is equally important irrespective of gender. This ability helps in continuous running as well as quick recovery.

Mathur, Torioh and Igbokwe\textsuperscript{14} studied somatotype ratings and percentage body fat of 131 elite Nigerian male athletes, average 24.2 years of age, and belonging to badminton (n = 18), basketball (n = 30), field hockey (n = 24), handball (n = 16), judo (n = 18) and soccer (n = 25) which showed that basketball, handball and soccer players were taller and heavier and had low percent fat values as compared with the other athletic groups. Judokas and hockey players were endomesomorphs. Other sports groups were predominantly ectomesomorphs.

In an effort to describe the physique associated with regular involvement in sports activity, Tariola, Salokun and Mathur\textsuperscript{15} studied the somatotypes of a group of 51 elite male athletes comprising sprinters (n = 10), basketball (n = 12), soccer (n = 15) and field hockey (n = 14) players and 11 male non athletes. The subjects’ physiques were assessed using the Heath – Carter anthropometric somatotype method. The findings indicated that the non athletes (3.5) were significantly more


endomorphic (p less than 0.05) than the soccer players (2.5) and sprinters (2.4). The sprinters (3.6) and basketball players (3.7) had markedly higher ectomorphic ratings (p less than 0.05) as compared with the hockey players (2.0). The mesomorphic component did not differentiate the groups.

Unique requirements of field hockey include dribbling the ball and moving quickly in semicrouched posture. Reilly and Seaton\textsuperscript{16} examined the net physiological strain due to dribbling on 7 male hockey players and found that dribbling increased energy expenditure by $15 - 16 \text{ KJ min}^{-1}$ above that observed in normal running. Heart rates and perceived exertion were also increased. Posture in dribbling is likely to cause lower back pain and shrinkage of spinal length. The peculiar postural requirements of field hockey seem to cause physiological strain and spinal loading in excess of orthodox motion.

Studies conducted by Mokha et. al.\textsuperscript{17} to find out the effect of training on weight and certain physiological parameters of Indian female hockey players with respect to their field positions revealed that after training there is a reduction of body weight in all the categories of players, the maximum being in halves (2.5 kg). There is an improvement in the percentage recovery in heart rates of all the categories of players.


players except the halves where the recovery is much less at the end of the training camp as compared to the values in the beginning of the camp.

The morphological characteristics of the elite male field hockey players of stature 176.3 cm and mass 75.2 kg studied by Scott\textsuperscript{18} were identified as ecto-mesomorphic. The lean build of the subjects was evident with a fairly low percent body fat (11.1%). However, grip strength in both right (54.0 kg) and left (53.1kg) measures was above that of the norms for male adults and there was no significant difference between left and right grip strength. The players were also found to have good leg length with little variability amongst the players.

Ninety-four senior A-male rugby players were assessed by Quarrie et. al.\textsuperscript{19} on a number of anthropometric and physical performance assessments and to highlight differences between the positional categories of players within the forwards and backs. The forwards were categorised into props, hookers, locks and loose forwards. Backs were categorised into inside, midfield and outside backs. Categories within the forwards were compared with each other, as were the categories within the backs. The anthropometric characteristics of forwards differed significantly between positional categories. Front row forwards (props and hookers) possessed highly endo – mesomorphic somatotypes and typically rated very low


ectomorphy. Props possessed greater body mass than hookers. Locks and loose forwards were taller than the front row forwards. In terms of physical performance fewer differences were observed. Hookers performed better than props on an aerobic assessment. Locks and loose forwards were faster than the front row forwards on a 30 m sprint from a running start. The inside backs were shorter and lighter than the midfield and outside backs. It was concluded that the combination of anthropometric characteristics and physical performance attributes observed allows players to best meet the demands imposed on them by their position.

Anthropometric and performance data were collected on 65 US rugby players (mean age = 26.3 years) by Carlson et. al.\textsuperscript{20} to make comparison on these characteristics by player position and performance level. Anthropometry included stature, body mass, nine skinfolds, two girths and two bone breadths. Skinfold patterns, estimated percent fat and Heath – Carter somatotypes were calculated from anthropometry. Motor performance measures included standing vertical jump, 40 yard dash, 110 yard dash, shuttle run, repeated jump in place, push-up, sit-up and squat thrust. Descriptive statistics were used for the total sample as well as selected sub – groups. Discriminant function analyses were employed to determine which combination of variables best discriminated between position and level of performance for the anthropometric and performance data. Forwards were found taller, heavier and had more subcutaneous adiposity than backs. Additionally, forwards and backs differed in somatotypes, with forwards being more endo-

mesomorphic than backs and with a greater scatter about their mean. The anthropometric variables that best discriminated between backs and forwards were body mass, femur girths, with 88% correctly classified using these variables. The motor performance variables that best discriminated between backs and forwards were repeated jumps in place, push-up and standing vertical jump, with 76% correct classification using these variables. Classification into three playing levels was unsatisfactory using either anthropometric or motor performance variables. These data can be used to assess present status and change in players, or potential national players, by position to locate strengths and weaknesses.

Anthropometric and somatotype variables related to strength were studied by Bale et. al.\textsuperscript{21} to investigate the differences in somatotype, percent fat, and strength in relation to body mass of two groups of American football players. One hundred and forty-three football players (85 high school and 58 college) were classified into five weight groups (< 73 kg, 73-82 kg, 83-91 kg, 91-100 kg, > 100 kg). Most of the somatotypes were dominant mesomorphs for the high school player and endomesomorphs for the college player. The weight groups in both the high school and college footballers showed significant differences in percent fat, somatotype and strength measures between the lower and higher weight categories. A higher mesomorphic component was a more important factor determining strength in the college player. While a lower ectomorphic component contributed more in the high school player.

Reilly et. al. applied a comparative test battery on thirty one young soccer players (16 elite and 15 sub – elite) to investigate distinguishing characteristics of elite players. 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 and technical skill etc. The most discriminating of the measures were agility and sprint time. The elite players were also significantly leaner, possessed more aerobic power and were more tolerant of fatigue. They were also better at dribbling the ball, but not shooting. The authors concluded that the test battery used may be useful in establishing baseline reference data for young players being selected onto specialized development programmes.

German male national junior players were examined by Groger, Oettl and Tusker in respect to weight, height, age and body mass of the lower extremities. The average age was 16.8 (± 1.4) years with an average height of 179.6 (± 6.3) cm and weight of 73.9 (± 8.9) kg. By position, defence men were as tall as forwards but heavier. Players in the age of 15 to 17 years had a higher mean relative maximum force in leg – extension than players in the age of 18 to 19 years. Forwards had better relative explosive force in leg – extension but a higher force deficit in knee flexion and extension.

Evaluation of anthropometric, physiological and skill related tests for talent

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identification in female field hockey was done by Keogh, Weber and Dalton\textsuperscript{24} with a purpose to develop an effective testing battery to distinguish between regional representatives and local club level female field hockey players. Representative players were significantly leaner and recorded faster times for the 10 – m and 40 – m sprints as well as the agility run. They also had greater aerobic and lower body muscular power and were more accurate in the shooting accuracy test, \( p < .05 \). No significant differences between groups were evident for height, body mass, speed of decrement in 6 X 40 – m repeated sprints and hand grip strength. These results indicated that percent body fat, sprinting speed, agility, dribbling control, aerobic and muscular power, and shooting accuracy can distinguish between female field hockey players of varying standards and hence talent identification programs for female field hockey should include assessments of these physical parameters.

Hirata\textsuperscript{25} reported that the mean height and weight of the Indian gold medal winning team at the Tokyo Olympics were 173 cm and 69.2 Kg respectively. The Pakistan and all the non-Asian teams were taller and heavier than this. The mean somatotype of the Indian state level players studied by Sodhi and Sidhu\textsuperscript{26} was 3.3 : 3.8 : 2.8. The average of 32 national probables for the Indian team


was found to be 3.6 : 4.1 : 2.9 and that of 16 players on the Pakistan national team was 2.8 : 4.3 : 2.5. The goalkeeper of the Indian state-level players described by Sodhi and Sidhu was the most endomorphic and the least mesomorphic. The Indian state level hockey players were compared with counterparts in soccer and it was found that for all outfield positions, the hockey players had more fat and were heavier relative to stature than the Indian state soccer players. This finding is supported by a study by Withers, Roberts and Davies which found that male South Australian state hockey players had marginally higher percentage body fat than a comparable group of state soccer players (16.7 vs 15.7). The mean percentage body fat of the 162 elite players from 12 South African club teams competing at the Senior Provincial tournament was 11.1 ± 3.3%. There was a relation between the mean percentage body fat for the team and its finishing position in the tournament.

Lemmink, Gemser and Visscher determined the reliability of two field hockey specific tests: the shuttle sprint and dribble test (shuttleSDT) and the slalom sprint and dribble test (slalomSDT). The shuttle sprint and dribble performance 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 shuttleSDT

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27 Ibid


required the players to perform 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 slalomSDT 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\(^\circ\) confidence interval of the mean difference indicating that no bias
existed between the two measurements. With the exception of delta shuttle time
(0.79), all intraclass 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. It
was concluded that shuttleSDT and the slalom SDT are reliable measures of sprint
and dribble performances of young field hockey players.