BRIEF REVIEW OF LITERATURE

Tokumnosuke (1988) clarified the effects of the alteration of the rules on the exercise intensities, skills and tactics in the handball game. Heart was recorded continuously throughout the game and VO2 max was determined by means of the step wise aerometry. Distance that players ran and dribbled was pursued and recorded by the investigator. In the newly modified local rules, players must be throwing off from the goalkeeper line. Therefore, the time for the next commencement of the same was shortened. Owing to this change of the rule, it was found that the total distances that the players ran and dribbled the number of shoots and the possibility of the fast break offense were increased. The average HR of the new local rule exceeded that of the international rule through the whole game. Though the HR of the new local rule remained unchanged through the whole game, the heart of the first period was reduced by about ten beats/min in 2 period in the case of the international rule. We estimated the exercise intensities of the players at the 90-98% VO2 max in the new local rule and the 75-90 % VO2 max in the international rule. From these results, we concluded that the alteration of the rules in Japan was successful to facilitate the activations of the handball game, for example, the speed of the player; the offensive method and the number of shoot chance.

The purpose of this study Singh, J. & Raj Kumar (2008) was to prepare the 'norms profile' of specific skills of handball players with a view to compare and evaluate further planning of handball game as its not being practiced in our country at present. So, an objective was set by the researchers to prepare the norms for each important specific skill of handball game at school, university and senior level of performance. Total of five hundred eighty six (N=586) players of handball were examined during School National championship (N=200), All India Inter University championship (N=195) and Senior National championship (N=191). The tests of specific skills of Handball, standardized by Singh (2008) were used for record the specific skills of handball players. The percentile values were distributed through SPSS. These prepared norms are presented in tabular form. The research evaluation highlights that there is an increase of specific skills with
participation level of handball players. Speaking specifically, the 'different levels' include the level of school to university and then from university to senior level. The implicational interpretation will result in the form of an increased competitive ability of the players.

Lidor, R., and Falk, B. (2005) conducted a study titled, 'Measurement of talent in team handball: the questionable use of motor and physical tests'. The purpose of this study was to identify motor, physical, and skill variables that could provide coaches with relevant information in the selection process of young team handball players. In this study total 405 players (12-13 years of age at the beginning of the testing period) were recommended by their coaches to undergo a battery of tests prior to selection to the Junior National Team. This number is the sum of all players participating in the different phases of the program. However, not all of them took part in each testing phase. The battery included physical measurements are height, weight, 4 x 10-m running test, medicine ball throw and standing long jump, 20-m sprint from a standing position and a 20-m sprint with a flying start, slalom dribbling test used for data collection. Comparisons between those players eventually selected to the Junior National Team 2-3 years later with those not selected demonstrated that only the skill test served as a good indication. In all other measurements, a wide overlap could be seen between the results of the selected and non selected players. It is suggested that future studies investigate the usefulness of tests reflecting more specific physical ability and cognitive characteristics.

Won, O.M. (1988) studied the relative contribution of physical fitness and skill domain according to different skill level of handball players. Thirty three physical fitness and handball skill measures chosen from physique (6 items), muscular strength (5 items), muscular endurance (3 items), muscular power (5 items), agility (3 items), balance(3 items), flexibility (3 items), cardio respiratory (2 items), and handball skills (4 items) domain were tested on national representative (N=21), University(N=34), high school (N=30) handball players. In order to investigate the relative contribution, communalities of 9 physical fitness and handball skill domains were evaluated for each
different skill level group. The result indicated that degree of contribution of total variance were increasing tendency from 44.17% to 57.08% as the handball skill level increased. It implies that higher skill level groups are more explainable from 33 measures chosen than the lower skill level groups. In mean contribution to total variance for each 9 physical fitness and handball skill domain; physique, flexibility, cardio-respiratory, endurance and handball skill domain were relatively high (11.50% to 14.45%), agility, muscular strength and endurance domains were moderate (10.65% to 11.50%), muscular power and balance domain were relatively low (8.88% to 9.70%). But these tendencies not always same each different skill level group.

The purpose of this study Sporis, G., & Vuleta, D. (2005) was to describe the structural and functional characteristics of elite Croatian handball players and to evaluate whether the players in different positional roles have different physical and physiological profiles. According to the positional roles, players were categorized as goalkeepers (N=13), wing players (N=26), backcourt players (N=28) and pivot players (Nx=25). The goalkeepers were older (p < 0.01), and the pivot players were more experienced (p < 0.01) than the backcourt players. The wings were the shortest players in the team. The pivots were tallest and heavier than the backcourt and wing players (p < 0.01), whereas the backcourt players were tallest then wings (p < 0.01). Goalkeepers had more body fat than he backcourt and wing players (p < 0.01). The backcourt players had a lower percentage of body fat. The backcourt players were the quickest players in the team when looking at values of maximal running speed on a treadmill. The Goalkeepers were the slowest players in the team (p < 0.01). The best average results concerning maximal heart rate were detected among the backcourt players. There were no statistically significant differences between the players positions when measuring blood lactate and maximal heart rate. A strong negative correlation was found between body fat and maximal running speed (r = -0.68, p <0.01).

Koc, H., & Tekin, A. (2012) conducted a study titled, ‘The Effect of acute exercises on Blood hematological parameters in handball players’. This study was conducted in order to determine the influence of five-day handball competitions on hematological levels of male handball players. 12 elite male handball players with an average age of
22.16±1.85 years participated in this study on voluntary basis. Physical measurements including body height, body weight, body-mass index and body fat percentages, and hematological levels of the handball players were analyzed before (BC) and after the competitions (AC). In order to determine hematological levels, blood samples with 5 ml EDTA (Ethylenediaminetetraacetic acid) were taken from the forearm ante-cubital area in line with hygiene rules before and after competitions, and erythrocyte, leucocytes and blood platelet parameters were analyzed in laboratory with using auto-analyzers. Measurement results were presented as average and standard deviation. Student T-test for dependant samples was used in order to make a comparison between BC and AC values. SPSS 13.0 Package software was used for data evaluation <0.05 values were considered to be significant. As a result of the study, the decrease in BC and AC values for body weight, body-mass index, body fat percentages, MCV, MCH, CH and LY and the increase in RBC and NE values were found significant. Conclusively, erythrocyte, leucocytes and blood platelet levels display different behaviors vis-a-vis acute competition-like exercises.

Ingebrigtsen., Jorgen., Rodabl., Stein., Jeffreys., & lan. (2012) This study first aimed to examine strength, speed and jumping abilities in 29 male and 29 female junior elite handball players, and secondly to compare Under-18 and Under-16 players in the selected parameters. Players were chosen by the Norwegian Handball Federation (NHF) and all were tested in strength (squat and bench press), speed (10 in, 30 m and 6 x 30 m repeated sprint ability) and jumping abilities (CMJ and SJ). Anthropometric qualities were also measured. Independent t-tests were applied in order to reveal possible mean differences between the U-18 and U-16 players within each sex. No significant differences in anthropometry were observed between the U-18 and U-16 players within either sex. Furthermore, researchers did not observe any significant between group differences among the male players in any of the tested performance parameters. On average, however, the U-16 male (N=14) players performed better in all the tests compared to the U-18 (N=15) male players. Similarly, researchers did not find any significant differences in test performances between U-18 female players and U-16 female players. Still, a few trends (p<0.1) were observed as female U-18 (n=14)
players, were found to sprint faster on both 10 and 30 m, and to jump higher in SJ versus female U-16 (N=15) players. The empirical findings do not confirm the hypothesis of pubertal development and muscle growth leading to taller and heavier U-18 players. Furthermore, we expected U-18 players to perform better in all tests when compared to U-16 players. Again, the data did not substantiate this, although female U-18 players tended to perform better in sprint and SJ compared to the U-16 players.

Povoas Susana, C.A., Seabra., Andre., F.T., & Antonio, N.C. (2012) this study aimed to analyze elite team handball physical and physiological demands during match play. Time-motion (N=30) and heart rate (N=60) analyses were performed throughout ten official matches. The defined locomotors categories were standing still, walking, jogging, fast running, sprinting, backwards movement, sideways medium-intensity movement and sideways high-intensity movement and playing actions studied were jumps, shots, stops when preceded by high-intensity activities, changes of direction and one-on-one situations. During matches the mean distances covered were 4370 +/- 702.0 m. Around 80% , total time was spent standing still (43.0 +/-9.27%) and walking (35.0 +/- 6.94%), and only 0.4 +/- 0.3 1% with sprinting. The most frequent high-intensity actions were stops, changes of direction and one-on-one situations. Effective mean HR was 157 +/- 18.0 bpm (82 +/- 9.3% of HR max) and total HR was 139 +/- 31.9 bpm (72 +/- 16.7% of HR max). HR, time spent in high-intensity activities, frequency of stops, changes of direction, one-on-one situations and most intense periods of the game were higher during the first half than during the second half (p <= 0.05). The opposite was observed for the number of time-outs and the time between each change of activity (p = 0.00). Handball is an intermittent exercise that primarily utilizes aerobic metabolism, interspersed by high-intensity actions that greatly tax anaerobic metabolism. Additionally, exercise intensity decreases from the first to the second half of the match, suggesting that neuromuscular fatigue may occur during the game. The training of elite handball players should comprise exercises targeting the ability to perform specific high-intensity actions throughout the game and to rapidly recover during the less intense periods.
The purpose of this study Ignjatovic., & Aleksandar. (2011) was to examine the effects of medicine ball training on the strength and power in young female handball athletes. Twenty-one young female handball players (age: 16.9 +/- 1.2 years) were randomly assigned to experimental and control groups. Experimental group (N=11) participated in a 12-week medicine ball training program incorporated into the regular training session, while controls (N=10) participated only in the regular training. Performance in the medicine ball throws in standing and sitting positions, one-repetition maximum (1RM) bench and shoulder press and power test at two different loads (30% and 50% of 1 RM) on bench and shoulder press were assessed at pre and post-training testing. The athletes participating in the medicine ball training program made significantly greater gains in all medicine ball throw tests compared to the controls (p<0.01). Also, the experimental group made significantly greater gains in bench and shoulder press power than control group (p<0.05). Both training groups (E) and (C) significantly (p<0.05) increased 1RM bench and shoulder strength, with no differences observed between the groups. Additionally, medicine ball throw tests showed stronger correlation with power tests, then with 1RM tests. These data suggest that 12-Week medicine ball training, when incorporated into a regular training session, can provide greater sport-specific training improvements in the upper body for young female handball players.

Vaara., Jani P., Kyrolainen., Heikki., Niemi., Jaakkc., & Kcijo. (2011) conducted a study titled, 'Associations of maximal strength and muscular endurance test scores with cardio respiratory fitness and body composition'. The purpose of the present study was to assess the relationships between maximal strength and muscular endurance test scores additionally to previously widely study measures of body composition and maximal aerobic capacity.846 young men (25.5 +/- 5.0 yrs) participated in the study. Maximal strength was measured using isometric bench press, leg extension and grip strength. Muscular endurance tests consisted of pushups, sit-ups and repeated squats. An indirect graded cycle ergo meter test was used to estimate maximal aerobic capacity (VO2max). Body composition was determined with bioelectncal impedance. Moreover, waist circumference (WC) and height were measured and body mass index (BMI)
calculated. Maximal bench press was positively correlated with push-ups (R2=0.37, p<0.001), grip strength (R2=0.12, p<0.001) and sit-ups (R2=0.12, p<0.001) while maximal leg extension force revealed only a weak positive correlation with repeated squats (R2=0.05, p<0.001). However, moderate correlation between repeated squats and VO2max was found (R2=0.30, p<0.001). In addition, BMI and body fat correlated negatively with muscular endurance (R2=0.10-0.22, p<0.001), while FFM and maximal isometric strength correlated positively (R2=OJ3-0.20, p<0.001). In conclusion, muscular endurance test scores were related to maximal aerobic capacity and body fat content, while fat free mass was associated with maximal strength test scores and thus is a major determinant for maximal strength. A contributive role of maximal strength to muscular endurance tests could be indentified for the upper, but not the lower extremities. These findings suggest that push-up test is not only indicative of body fat content and maximal aerobic capacity but also maximal strength of upper body, whereas repeated squat test is mainly indicative of body fat content and maximal aerobic capacity, but not maximal strength of lower extremities.

Vila, H., Manchado, C., Rodríguez, N., Abraldes, V. P., Alcaraz., & Fferraquat, C. F. (2011) conducted a study titled, 'Anthropometric profile, vertical jump and throwing velocity, in female elite handball players by playing positions'. The aim of this study was to describe anthropometric characteristics, throwing velocity, hand grip and muscular power of the lower limbs in female handball players and to identify possible differences in these parameters in terms of individual playing positions (center, back, wing, pivot and goalkeeper). A total of 130 Spanish female elite handball players participated in the study (25.74 +/- 4.84 years; 14.92 +/- 4.88 years of playing experience). Anthropometric assessment was performed by all subjects following the International Society for the Advancement of Kinanthropometry (ISAK) protocols. Furthermore, all subjects performed a vertical jump test (Squat Jump and Countermovement Jump). Hand grip and throwing velocity in several situations were also assessed. A one-way analysis of variance ANOVA and a Tukey post hoc test were used to study differences among individual playing positions. Wings were less heavy, shorter and showed less arm span, than goalkeepers, backs and pivots. (p<=0.001). Additionally pivots were heavier than
centers. Backs and pivots exhibited higher muscular mass than wings. Total player's somatotype was mesomorphy-endomorphy (3.89 - 4.28 - 2.29). Centers showed higher throwing velocity levels than wings in 9 m throws from just behind the line, with a goalkeeper. Backs exhibited higher hand grip values than wings. Statistical differences have been established between wings and others specific playing positions, especially with pivot and backs. Coaches can use this information in order to select players for the different specific positions.

Pesters (2011) conducted a study titled, 'Injuries in Icelandic male team handball players. The objective of study was to examine and document the incidence, nature and severity of injuries in male team handball. Players from all (eight) premiership and six best (of eight) second division teams were invited to participate. The selection was based on the 2006-2007 league position. 159 players from seven premiership and 4 division teams entered the study. 109 players from four premiership and 2 division teams finished it from all 86 injuries was recorded, 53 (61.6%) acute and 33 (38.4%) overuse injuries. The injury incidence was 15.0 injuries per 1000 player hours during games and 2.2 injuries per 1000 player hours during training. Acute injuries were most common in knees (26.4%). Overuse injuries were most frequent in low back/sacrum/pelvic region (33.3%). No difference was in incidence of injuries between teams. Back court players were most frequent injured, goalkeepers least. 22.4% of the players used ankle braces during games and most training sessions. 28.2% used tape on fingers. The total injury incidence is similar than in previous, comparable studies. However, higher rate of overuse injuries in low back/sacrum/pelvic region raise questions about training methods and preparation for the Icelandic team handball players.

Zech, A., & Steib, S. (2012) conducted a study titled, 'Effects of localized and general fatigue on static and dynamic postural control in male team handball athletes'. The objective of this study was to determine the effects of whole-body and localized fatigue on postural control in stable and unstable conditions. Nineteen male team handball players were assessed in 2 sessions separated by 1 week. Treadmill running and
single-leg step-up exercises were used to induce physical fatigue. The main outcome measures were center of pressure (COP) sway velocity during a single-leg stance on a force plate and maximum reach distances of the star excursion balance test (SEBT). The COP sway velocity increased significantly (p < 0.05) after general (+47%) and localized fatigue (+10%). No fatigue effects were found for the SEBT. There were no significant correlations between COP sway velocity and SEBT mean reach in any condition. The results showed that although fatigue affects static postural control, sensor motor mechanisms responsible for regaining dynamic balance in healthy athletes seem to remain predominantly intact. Thus, data indicate that the exclusive use of static postural sway measures might not be sufficient to allow conclusive statements regarding sensor motor control in the non injured athlete population.

Lenzcn., & Bcnoil. (2009) conducted a study titled, 'Analysis of Team Handball Players Decisions: An Exploratory Study'. This exploratory study aimed to investigate elements involved in decision making in team handball live situations and to provide coaches and educators with teaching recommendations. The study was positioned within the framework of the situated-action paradigm of which two aspects were of particular interest for this project, the relationship between planning and action and the perception-action coordination. Qualitative methods used, which linked video observation of six female elite player's actions during two championship matches and self-confrontation interviews. Player's verbalizations reflected that their decision making included the following: (a) perception (visual, auditory, tactile and proprioceptive), (b) knowledge (concepts, teammates and opponents characteristics, experience) (c) expectations (opponents and teammates intentions) (d) contextual elements (score, power play, players on the field, match difficulty). Findings were discussed in terms of teaching implications.

Vuleta & Dinko. (2003) determines the relationship between variables of shooting for a goal and the final outcome of handball match. The data were collected from 38 games of the 2000 Men's European Championship, played in Zagreb and Rijeka. Twelve indicators of scoring efficiency, redistricted for each national team, constituted the
sample of manifest variables, whereas the criterion variable was a binary outcome of match-victory or defeat. The basic statistical procedures and regression analysis were used. Almost half of all the shots performed (44.61%) were executed from the back-court players positions (field shots). The winning teams were considerably more efficient in fields shot and in 7m throws than the defeated ones-(43.20%) and (76.53%) as compared to (32.52%) and (65.76%), respectively. The statistically significant multiple correlation of .71 means that the predictor variables share 50% of common variance with the final results of the observed matches. The winning teams had more successful field shots, 6m-centre shots and wing shots and fewer unsuccessful 6m-centre and field shots and 7m throws. Scoring efficiency from a distance and from the 6m line differentiates the successful teams (winners) from the unsuccessful (defeated) ones.

The purpose of this study Chelly M.S., & Hermassi, S. (2011) was to examine the activity profile of elite adolescent players during regular team handball games and to compare the physical and motor performance of players between the first and second halves of a match. Activity patterns (video analysis) and heart-rate (HR) responses (telemetry) were monitored in top national-division adolescent players (18 men, aged 15.1 ± 0.6 years) throughout 6 regulation games (25-minute halves with a 10-minute interval). The total distance covered averaged 1,777 ± 264 m per game (7.4% less in the second than in the first half, p > 0.05). Players ran 170 ± 24 m at high intensity and 86 ± 12 m at maximal speed, with 32 ± 6 bouts of running (duration 2.3 ± 0.3 -, seconds) at speeds > 18 kmh(-1); they stood still for 16% of the playing time. The mean HR during play was 172 ± 2 bmin (-1) (82 ± 3% of maximal HR). Blood lactate concentrations at the end of the first and second halves were 9.7 ± 1.1 and 8.3 ± 0.9 mmoL (-1), respectively (difference p < 0.05). The study conclude that adolescent handball players cover less distance and engage in fewer technical actions in the second half of a match. This indicates that team handball is physiologically very demanding. The practical implication is that coaches should seek to sustain performance in the second period of a game by modifying playing tactics and maximizing both aerobic and anaerobic fitness during training sessions.
Lopez, C.M., & Platen. (2012) conducted a study titled, 'Motion analysis in handball'. The presentation gives a short overview on the available computer and video-analysis systems in team sports in the fields of biomechanics, for the determination of the muscular status of a player, for the planning of training and analysis of competition, for the technical and tactical analysis of a match, as well as for the determination of the physiological demands like run distances, velocities and sports specific movements. Researchers give some examples of the combined analysis of heart rates and run distances and velocities in female top level handball teams also summarize the needs and information that should be available for a trainer in order to optimize and individualize training and performance during competition.

Singh, R.M. (1986) prepared physical fitness norms for the high school boys and Punjab state. Data were collected on 5000 subjects from various schools in the state. The test that was administrated consisted on eight items, viz, standing broad jump, sit and reach test, agility run, sit-ups bent knee, 50 meter dash, push-ups(chair), cricket ball throw and 600 meters run and walk. The percentile norms for physical fitness tests were found to be valid and suitable to assess the physical fitness level of the high school boys in the age group of 12 through 15 years.

Kangane S.E. (2005) Development and Standardization of Test Battery for the Selection of Junior Handball Player of Maharashtra, in this study total 600 Male student are taken as a subject from Maharashtra. The purpose of this study was to develop and standardize test battery for junior Handball player of Maharashtra. Selected test items are used for this study, 12min r/w, Sit ups, Push up, Handgrip, Vertical jump, 50m dash, Sit and Rich, Height, Weight, fat%, BMI, B.P, P.P.E.R, R.R., Skill test of Handball.

Sreedevi, R. (1984) constructed norms using the AAPHER fitness test for girl in secondary schools. Her subjects were eight girl students of VIIth and IXth standard studying in Kendriya Vidyalaya, Gwalior.

Monga, R. (1984) constructed a Physical Fitness test battery for girls student (age: 10 to 14 years) of Delhi. Norms were established on a sample of 5000 girls belonging to different socioeconomic groups, age range physical standards. Both T-scale and Percentile norms were established. Validity (face validity, criterion related validity and
factorial validity) and reliability of the test revealed acceptable values. The reports indicate that the test battery was found to be easily usable in school as per available 
Morrison, L.L. (1965) administered a twenty-items criterion battery to 120 college women at Madison college during a four-week period T-score were summed for each category of test items (body impetus giving impetus to an object and using an implement to give impetus to an object) and for the battery of twenty items. The data were treated by means of the BIMD 34 programme. A three-item and a five-item battery were selected to predict basic sport skill ability. The validity coefficient, reliability and objectivity coefficient was calculated and norms for five groups of ability were developed for both tests. Fitness test had been constructed by North.

Carolina State (1961) The test items were thirty second bent-knee sit-ups, thirty second side stepping, standing broad jump and thirty second squat, thrusts for boys and girls, in addition, boys of ages twelve to seventeen performed full push-ups and all girls and boys of ages nine to eleven were designated as follows: inferior, poor, average, good and excellent. Performed a modified form of pull-ups. Percentile norms were available separately for boys and girls at each age nine through seventeen years.