Chapter II
Review of Related Literature

It also serves as a frame of reference. Browsing in a library, internet, etc. confirms that information exists related to this study. The present researcher while browsing the library came across a large source of information, researcher found that those reviews have provided to be quite invaluable focus in planning this research. The review of literature has served several purposes like confirming, synthesizing, analyzing, relating and determining the rational of the present research. Much has been written in regards to the skill and performance in basketball, and offensive and defensive skill but only a brief summery of the done problems very closely related to the one at hand is given here. The literature review is organized around important topics given below.

- Review related to Sports Performance Analysis
- Review related to Sports Skill
- Reviews Related to Video Graphic Analysis
- Other Related Reviews

2.1 Review Related to Sports Performance Analysis

Gorton, Beatrice (1979)\(^1\) selected 4 male and 4 female Ss selected from I.U. Varsity Men’s and Women’s Basketball Teams during the 1975-1976 season completed 3 shooting trials at a distance of 15 ft. directly in front of the basket. Force plate recordings and 16 mm filmed records were obtained simultaneously for all shooting trials performed. Two LOCAM 16 mm cameras running at 200 fps were placed perpendicularly at the front and side of the motion. A force platform was used to record kinetic measures for the final step to take-off. The average time for the execution of the jump short varied little for all Ss. There were some temporal differences between the men and the women during the 3 phases of the motion. Movement patterns varied between the men and the women. The men exhibited a greater M vertical
impulse per unit of mass. The better jumpers recorded a greater total vertical impulse and horizontal thrusting impulse. It is possible through the use of force platform equipment and cinematography to identify selected kinetic and kinematic parameters that are important in highly skilled basketball shooting. Development of shooting ability is dependent upon the mechanical efficiency of these parameters. The men were more efficient shooters than the women.

**Hamilton, George R.** (1963)\(^2\) Subjects were 13 high school basketball players who threw each type of pass to the top of the opposite free throw circle 25 times after recovering a rebound and after receiving a throw in. The locations for starting and completing passes were standardized so comparison was made for accurate passes on the basis of time to the nearest 0.01 sec. and inaccurate passes were tallied. The hook pass was .056 sec. faster from the rebound and .029 sec. faster from the throw in with the significance at the .01 and .05 levels respectively. The hook pass was more accurate from the rebound and the baseball pass from the throw in but the respective chi-squares of 0.253 and 0.711 were not significant.

**Bushman, Ben Robert.** (1963)\(^3\) selected to determine, by 16 M.M. motion picture film analysis, the most desirable speed and height of an excellent overhand flat volleyball serve as judged by a board of experts and as tested by the ability of an opponent team to return the serve. A serve that traveled low to the net and with maximum speed but stayed in bounds was the most difficult to return.

**Cherry, Aubrey Lee** (1969)\(^4\) Basketball players (N=37) from 4 SHS and (N=23) from 28\(^{th}\) grade teams were administered the Johnson Basketball Ability Test and the Knox Basketball Test, alternating trials of each test. Rank-order correlations of the test performances with the coaches’ subjective ranking of players and also the coaches’ ranking with the height of the players were employed. Spearman’s rho coefficients ranged from -.20 to .70 for the Johnson test and the coaches’ ranking in the SHSs, with .83 and .50 for the intermediate schools. The rest for the Knox Test and the coaches ranking ranged from -.10 to
.74 in the SHSs and was .46 and .50 in the intermediate schools. The rs for coaches’ ranking and player height ranged from -0.52 to 0.18 in the SHSs and were 0.47 and 0.12 in the intermediate schools. Data obtained indicated doubtful value in using either or both of the tests to rank basketball players. There was some indication of the tests’ value as a motivator to further develop certain basketball skills.

Chappell, Robert (1971)\textsuperscript{5} study was undertaken to devise a standardized and utilitarian battery of test items that could be used as an aid in selecting players, equating teams, grading and measuring progress, or for motivational purposes. Male 9\textsuperscript{th} grade students (N=58) at a SHS were tested on a battery of 8 test items and measured on certain anthropometric items, the results from which were correlated with a subjective rating by coaches of the Ss’ ability to play basketball in the game type situation. A .73 correlation between the composite 8-item battery score and the subjective rating was found. A 4-item test battery consisting of the tip-in test, vertical jump, baskets in 30 sec., and the 50-ft. dash approached the validity level of 8-item battery and could therefore be used as standardized basketball battery. Factors of age, ht. and wt. were relatively unimportant to the criteria.

Kamineneski, C. D. (1980)\textsuperscript{6} selected 2 exp groups and a control group was compared in the identification of movement errors for selected basketball skills. All groups were given pre and post criterion tests. The groups were composed of PE majors of Southern Missionary College. Between tests the exp groups viewed the instructional unit for skill error analysis using videotaped replay film developed for the study. Evaluation techniques included ANOVA. It was found that the video unit was effective in teaching error analysis; PE majors who did not view the unit could not make sig scores on criterion tests; there was no sig diff between groups in learning to analyze the dribble; there is no sig diff between mental and written practice in learning to perceive simple movement errors; and practiced learning is essential for competence the error analysis.
Evenhouse, John Allen. (1979) recorded the data which was analyzed by r and regression analysis. Sig correlations (p<.70) were found between point total difference and points per possession (r=.70) diff in shooting percentage (r=64) and diff in defensive rebounds (r=.58). Regression analysis showed that these 3 variables together accounted for 75% of the variance in point total diff. It was concluded that points per possession, diff in field goal % and diff in defensive rebounds are sig related to point total diff and at the high school sophomore level, a team which achieves .70 points per possession should win the game.

Breitlow, Dale H. (1979) in his study determined the effect of man-to-man, zone, and combination basketball defenses on field goal shooting, rebounding and team success. Comparisons were made in each of these areas to determine possible strengths, weaknesses and vulnerable areas for each type of half-court defense. Data were collected during the 1976-77 season of the Cambridge SHS boy’s varsity basketball team and its opponents covering 21 games. Statistics were kept for the time each team played in each defense plus the field goal and rebounding totals while in that defense. Statistics were analyzed in terms of percentages and total figures only, without further statistical test. Sig in each area is based on the comparison of means and is basically a value judgment based upon past experience. Findings of the study includes: success for man-to-man over zone defenses occurred in 9 of 13 games; shooting % emerged as the highest indicator of success 85.7%, with rebounding next with 76.2%; opponent’s shooting % was higher versus zone than man to man; range 1 resulted in a higher shooting % while the corners allowed the greatest number of shots; 79.9% of all rebounds were secured in range 1; man-to-man defense allowed the opponents a greater number of field goals in range 1 against a man-to-man defense than against a zone defense. Combination defenses were not played enough by either team to obtain any viable information.

Coughlin, M. (1984) he selected 3 female varsity high school basketball teams. 2 teams were randomly assigned to an E group and one team was assigned to
a C group. All Ss participated in a skill-building program designed to improve basketball foul-shooting ability. All were administered a foul-shooting accuracy test consisting of 20 free throws taken 2 at a time, 4 times during the 7 wks of the study. Ss in the E group participated in goal-setting conferences with the investigator after each of the 4 testing sessions. Athletes in the E group were instructed to set goals which were realistic, positive, attainable, and based on their past performances. A 2 X 4 ANOVA with repeated measures on the second factor (testing periods) was used to analyzed the data. No diff (p>.05) were found between the two groups in foul-shooting performance. No diff (p>.05) were found in foul-shooting performances across the 4 testing sessions. Also, no diff effect or interaction was found between the testing sessions and the 2 groups (E and C).

Hunter, Martha J. (1971)\textsuperscript{10} took two films, 1 of a 6-player and the other of a 5-player game, were analyzed. After determining the % of passes and shots at goal, no significant difference was found between the no. of times that the following passes (book, 1-hand bounce, 1-hand shoulder, 1-hand underhand and 2-hand bounce) and shots (hook, jump and overhead set) were used in either game. The 2-hand chest pass, 2-hand underhand pass and 1-hand set shot were used more frequently in the 6-player game, while the 2-hand overhead pass, the jump pass, the lay-up shot, and the 2-hand set shot were used more often in the 5-player game. X2 revealed no significant difference in the number of intercepts, dribbles, jump balls, rebounds, turnovers, violations, or fouls used in either game.

Zendong, E. (1987)\textsuperscript{11} examined the aggressiveness of Ball State University Basketball players in relation to foul, stealing the ball and rebounding behaviors. Twelve individuals were selected on the basis of participation in 27 games of the 1986-87 regular basketball seasons. The Ss were average 20.25 yr in age, 6.46 ft in height and 195 lb in weight. The study included the completion of the 16 PF Questionnaire test to isolate the aggression characteristic. The tests were scored and the standard values on aggression
were correlated with the annual game statistics on fouls, steals and rebounds. The standard scored on aggression was also correlated with the foul, stealing and rebounding behaviors per playing time. A high pos r (.736, P < .01) was found between the Ss' aggressiveness and the fouling behavior. Moderate r (.595 and .577, P < .05) were discovered between the Ss' aggressiveness, stealing and rebounding behaviors. On the other hand, the fouls and rebounds collected per playing time correlated low and negative with the aggressiveness standard scored (-.354 and -.333, P > .05). The results of this study have led

Mc Ginnis, Richard A. (1975)\textsuperscript{12} took descriptive and quantitative variables of the one-hand jump shot in basketball as demonstrated by highly skilled and moderately skilled male Ss were analyzed and compared cinematographically, 3 volunteers, two highly skilled and one moderately skilled shooters, were filmed by 216 M.M. cameras (64fps) from the sagital and frontal planes of action as Ss shot an average of 5 shots each, of which 4 were analyzed. All jump shots were taken from a distance of 502.92 cm from the center of the basket and 168.81cm from the edge of the baseline at an angle of 10 from the horizontal. Nine descriptive and seven quantitative variables were analyzed individually as the film was viewed on a data analyzer projector. Results indicated that the ht of jump during the act of shooting has no significant value and is an individual factor. The two highly skilled Ss demonstrated pointing the elbow toward the target whereas the moderately skilled violated this aspect. It was concluded that skilled shooters demonstrated a greater magnitude of follow-through, greater wrist hyperextension and flexion during release of the ball, released the ball before the peak of the jump was achieved, and that the success of the jump shot was probable on determined by any single factor or simple combination of factors.

Eventhouse, John Allen. (1979)\textsuperscript{13} recorded the data which was analyzed by r and regression. Sig correlations (p<.70) were found between point total diff and points per possession (r=.70) diff in shooting percentage (r=.64) and diff in defensive rebounds (r=.58). Regression analysis showed that these 3 variables
together accounted for 75% of the variance in point total diff. It was concluded that points per possession, diff infield goal % and diff in defensive rebounds are sig related to point total diff and at the high school sophomore level, a team which achieves .07 points per possession should win the game.

**Lemberger, Kathleen F** (1982) the purpose of his study was to compare starting and reserve basketball point guards in the speed and accuracy of response to an Open Player Identification Test (OPIT). The OPIT consisted of slides of basketball patterns viewed from 3 diff perspectives. The 3 perspectives were an aerial, diagram and ground level view. Female varsity high school starting (n=11) and reserve (n=9) basketball point guards were asked to select an open player on the OPIT. Two-way ANOVA with repeated measures on 1 factor (view) revealed no sig diff (p > .05) by position, view or the interaction of the factors for correct responses, speed of responses and speed of correct responses.

**Williams, Tillman D.** (1983) took the problem to investigate the selected “natural” traits of quickness, speed, jumping power, shooting success, agility, height and weight to determine what relationship these traits had to the game performance of male college basketball players. Basketball players (N=50) were tested to evaluate their “natural” traits. Conference basketball statistics were kept and used to compute a stat game performance for each S. The simultaneous solution and the forward step-wise inclusion technique of the multiple regression analysis were administered to the raw data to determine the individual and group correlation of the independent variable (“natural”) traits to the dependent variable (Stat game performance). Of the “natural” traits only shooting success was found to have a sig correlation (p < .05) to stat game performance. All of the “natural” traits accounted for only a small amount of the variance of the stat game performance.

**Pampuch, Elroy J.** (1958) included the sample from the University of Wisconsin varsity basketball team and its opponents, 1957-58 seasons. The 1958 Wisconsin Interscholastic State High School basketball tournament was
also included. The study concluded that defensive foul greatly outnumber the fouls called on the offense; a higher percentage of foul were called in the second half than in the first; more fouls were called against the losing teams than the winning teams; the new sixth foul rule has been a factor in reducing the percentage of points scored from the free throw line; and the winners scored more free throws and fewer fouls than the losers.

Zendong, E. (1987) examined the aggressiveness of Ball State University basketball players in relation to fouling, stealing the ball and rebounding behaviors. 12 individuals were selected on the basis of participation in the 27 games of the 1986-87 regular basketball seasons. The Ss were average 20.25 yr in age, 6.46 ft in height and 195 lb in weight. The study included the completion of the 16 PF Questionnaire test to isolate the aggressiveness characteristic. The tests were scored and the standard values on aggressiveness were correlated with the annual game statistics on fouls, steals and rebounds. The standard scores on aggressiveness were also correlated with the fouling, stealing and rebounding behaviors per playing time. A high pos r (.736, P < .01) was found between the Ss’ aggressiveness and the fouling behavior. Moderate r (.595 and .577, P < .05) were discovered between the Ss’ aggressiveness, stealing and rebounding behaviors. On the other hand, the fouls and rebounds collected per playing time correlated low and negative with the aggressiveness standard scores (-.354 and -.333, P > .05). The results of this study have led the investigator to conclude that the personality trait of aggressiveness does not strongly favor the stealing and rebounding behaviors.

Ryan, D. (1988) tested the hypothesis that kinematic factors (predictor variables) could account for variance in shooting accuracy among players of wide ranging abilities in the basketball free throw. 67 Ss of varying skill levels from beginning basketball players to former Olympians and NBA draft choices were initially pretested to determine their shooting accuracy. From the Ss pretested, 25 right handed M Ss were selected on the basis of free-throw percentage of accuracy ranging from 30% to 100%. The data were derived by
means of a cinematographically anal and manual digitizing from overhead, frontal and sagittal perspectives. Stepwise multiple regression analysis was applied to the data testing 60% of the Ss and cross validating on the remaining 40%. Of the 27 predictors tested the following predictors accounted for 84% of the variance in accuracy: (1) More accurate shooters demonstrated slight backward (vertical) lean of the trunk from the horizontal (93 to 100°) at the ready position; (2) More accurate shooters positioned the long axis of their feet within a range of (14 to 18°); (3) More accurate shooters utilized a greater degree of right foot segment elevation from the floor. This study has led to increased knowledge of the kinematics which was critical to accurate free-throw shooting. They should also help to facilitate the teaching and acquisition of free-throw shooting.

Potter, Glenn R. (1976)\(^{19}\) divided the team into 5 geographic districts. Data were collected from a total of 259 games resulting in a total of 3,655 possessions. The dependent variables were the X time of possession and the no. of possessions exceeding 30 sec. The independent variables were: districts, teams, games, home vs visiting teams, differences in score and reasons for loss or possession. The following conclusions were made: the closer the score, the longer the teams tend to maintain possession of the ball in the last 3 min of play; the home team tends to control the ball longer than the visiting team in the last 3 min of play; and there is little need for a 30 sec time limit in the last 3 min of play in NCAA Div I basketball.

2.2 Review Related to Sports Skill

Scanlon, William M. (1968)\(^{20}\) tested 15 skilled college varsity basketball players under dark conditions with only the designated target area visible for focusing for three different floor positions took place. The distribution of shots was arranged according to the Latin square table designation. Analysis of the data revealed that focusing on the entire target (basketball ring covered with luminous paint) was superior to focusing attention to either the front or back
of the ring. Further, focusing on the back of the ring was superior to focusing on the front of the ring.

Walter, Ronald J. (1968) selected male senior high school varsity basketball players (N=81) were administered the AAHPER Basketball Skills test for boys. The results of the skill tests were correlated with the results of a subjective rating chart which was devised to parallel the objective tests. Correlations were made in relation to each of the 7 individual teams and in relation to the group as a whole. With the combined group, only the front shot, the foul short, and the under basket shot were correlated significantly with the corresponding rating criteria.

Strain, David F. (1969) in the years 1961 through 1968 conducted a study on 30 juniors and 21 seniors of the Rapid City High School basketball varsity teams, who had completed the sophomore, junior, and senior basketball season, furnished the data for the formulation of three predictive equations from the relationship of individual sophomore game statistics and varsity point production. In the development of the multiple regression equations, five predictor variables, successful free throw average per game, field goal percentage, and rebound percentage were correlated with the success variable as measured by varsity point production.

Dudley, Jimmie E. (1967) made accurate recording of all shots attempted in 21 varsity games played by Eastern Illinois University’s basketball team during the 1966-67 seasons. Successful shots were re-evaluated so that those made within the free-throw line area were given a one-point evaluation instead of two points. The actual total score of each game was readjusted to see what the outcome might have been if the shots in the free-throw area were counted as one point. Results: the one-point field goal would have changed the outcome of three of the games, made another a tie, and reduced the scores of all games. It was concluded that more games would have been altered in the outcome if the players were playing under the one point field goal scoring method.
Chaloupecky, Robert (1967)\textsuperscript{24} male basketball players (N=22) were tested on jump, set, and foul shots at baskets of different heights. Results showed that shooting ability at the 10 foot basket was significantly better than at the 11 foot basket. Accuracy between the three shots and at the two baskets was significantly different for all means tested. Shorter players were better shooters on all 3 shots at both baskets. Taller players adjusted more easily when transferring from the 10 foot to the 11 foot on the set and jump shots while the shorter players adjusted better on the free throw. A questionnaire answered by leading college and professional coaches showed that 83 percent of them favored the 10-foot basket.

Drury, Leon A. III (1967)\textsuperscript{25} selected freshman and junior varsity college basketball players were randomly assigned to a control or an experimental group for the purpose of determining the effects of a selected set of isometric exercises on the players' leg strength, power, and muscular endurance during the season. After an 8-week program and retesting and data treatment by an analysis of variance and Duncan multiple range test, it was concluded that even though the leg strength did improve significantly, the functional value of this strength was not shown since there was no concomitant change in muscle power and stamina.

Cotter, Linda Louise (1978)\textsuperscript{26} used Sport Cohesiveness Questionnaire, a measure of group cohesiveness, was administered previous to and following the season to 138 members of the women’s basketball teams from 2 college conferences in northern CA. Success was determined by % of games won. The data were analyzed by stepwise multiple linear regression analysis, discriminate function analysis and ANOVA. The .05 level of sig was used for all tests. The cohesiveness variables Closely Knit and Power, the satisfaction variable Satisfaction General, and the motivation variables Task Orientation and Affiliation Orientation were sig predictors of success. The variables Power, Closely Knit and Enjoy Playing with Others were sig in discriminating between success groups. Scholarship schools differed from non-scholarship schools by
scoring sig higher on Self Orientation and sig lower of Affiliation Orientation. Successful and unsuccessful teams did not differ on preseason to postseason cohesiveness changes. Several of the variables can be used to predict success and discriminate between successful and unsuccessful groups. Season changes in cohesiveness do not affect success. By administering the questionnaire the results may be used by players and coaches to predict success and better understand the interaction attitudes of the team members.

**Gaunt, Sharon J** (1979) investigated the factor structure of basketball skills in the domain of human motor performance to identify the robust factors in that domain. A battery of 20 tests representative of the dimensions of shooting, passing, jumping, moving without the ball, and moving with the ball was administered to 167 High School girls. A theoretical model of the hypothesized dimensions of basketball skill was defined by the use of 4 factor analytic models employing 2 rotational schemes. Results were obtained from these 8 derived solutions, 3 of the 4 factor analytic models yielded 4 factors in each of the 2 rotational schemes. The 4th model yielded 11 factors in each derived solution. Robust factor I was best interpreted as dribbling and best represented by the Dribble test. Robust factor II was designated explosive leg strength and best represented by the Standing Broad Jump. Robust factor III was interpreted to represent lay-up shooting and best measured by Field Goal Speed and Jump for ht. Factor IV was designated passing and best represented by the Push Pass for Accuracy. Based on the findings of the study, the hypothesized dimensions of basketball playing ability were not supported. The multidimensional model resulting from this investigation is represented by dribbling, explosive leg strength, lay-up shooting and passing.

**Gorton, Beatrice** (1979) selected four male and four female Ss from I.U. Varsity Men's and Women's Basketball Teams during the 1975-1976 season completed three shooting trials at a distance of 15 ft. directly in front of the basket. Force plate recordings and 16 mm filmed records were obtained simultaneously for all shooting trials performed. Two LOCAM 16 mm cameras
running at 200 fps were placed perpendicularly at the front and side of the motion. A force platform was used to record kinetic measures for the final step to take-off. The average time for the execution of the jump short varied little for all Ss. There were some temporal differences between the men and the women during the three phases of the motion. Movement patterns varied between the men and the women. The men exhibited a greater M vertical impulse per unit of mass. The better jumpers recorded a greater total vertical impulse and horizontal thrusting impulse. It is possible through the use of force platform equipment and cinematography to identify selected kinetic and kinematic parameters that are important in highly skilled basketball shooting. Development of shooting ability is dependent upon the mechanical efficiency of these parameters. The men were more efficient shooters than the women.

Weisbein, Harold. (1980) conducted a study on 91 varsity basketball players with free throw shooting records from 11 small four-year colleges in the OK, AR area. Biorhythm cycles were plotted based on Student’s birth date. ANOVA was performed on the various biorhythm combinations to test for difference in shooting percentage. ANOVA indicated a significant difference and ‘t’ tests indicated superior free throw shooting when the biorhythm combination was physical-critical, emotional-down. These results tend to refute the traditional claim for biorhythm.

Breitlow, Dale H. (1979) did a study with the purpose to determine the effect of man-to-man, zone, and combination basketball defenses on each of the following: field goal shooting, rebounding and team success. Comparisons were made in each of these areas to determine possible strengths, weaknesses and vulnerable areas for each type of half-court defense. Data were collected during the 1976-77 season of the Cambridge SHS boy’s varsity basketball team and its opponents covering 21 games. Statistics were kept for the time each team played in each defense plus the field goal and rebounding totals while in the defense. Statistics were analyzed in terms of percentages and total figures only, without further statistical test. Sig in each area is based on the
comparison of means and is basically a value judgment based upon past experience. Findings of the study include: success for man-to-man over zone defenses occurred in 9 of 13 games; shooting % emerged as the highest indicator of success (85.7%), with rebounding next with 76.2%; opponent’s shooting % was higher versus zone than man to man; range 1 resulted in a higher shooting % while the corners allowed the greatest number of shots; 79.9% of all rebounds were secured in range 1; man-to-man defense allowed the opponents a greater number of field goals in range 1 against a man-to-man defense than against a zone defense. Combination defenses were not played enough by either team to obtain any viable information.

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Evans, Betsy (1971) used Q-sort technique in an attempt to discern an changes in self-concept among the PSU Women’s Basketball Team and an instructional class after exposure to a team situation. Pre- and post-test scores for the team, the team’s major subdivisions, and the control group were compared. No significant changes were found to occur for the members of the team either collectively as a unit or as various subdivisions. The control group evidenced a significant change in self-concept. The pretest comparison between the team and the control group revealed a significant difference. However, the posttest analysis failed to show a significant difference between the two groups. This might suggest that change in the self-concept probably
occurs upon initial exposure to the team situation and attains stability as further exposure occurs or that change is too slow to be revealed in a short-term research investigation.

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**Bandy, Nancy L.** (1979)\(^{36}\) selected 94 head girls’ varsity basketball coaches from 64 Class A and 30 Class AA public SHS in southern IL. Data were collected through questionnaires and analyzed through descriptive statistics which included means, standard deviations and percentages and t-tests for independent samples. Equal opportunity in boys’ and girls’ basketball programs was found in the following areas: schedule of practice times for separate facilities; travel and per diem allowance provision of competitive facilities; provision of supplies; provision of medical and training facilities;
release time for coaches; extracurricular activities sponsored by coaches; responsibility for the scheduling of varsity games and for the hiring of varsity officials; and provision of printed basketball schedules. Unequal opportunity in boys’ and girls’ basketball programs was found in the following areas: no. and types of sports offered; levels of competition; schedule of games and tournaments; provision of locker room, practice facilities and equipment; budgets; no. of coaches; salaries of coaches and of officials; and school newspaper coverage. In all areas of inequality, boys’ basketball programs were superior to girls’ basketball programs.

Pipho, Armin Paul (1963) determined the relationship between the position on the floor from which a shot is attempted and the area to which the shot rebound, rebounds of 3,6000 field-goal attempts from 18 different areas on the court and 200 rebounds of free-throw attempts were charted under practice conditions and the rebounds of all field-goal (1,123) and all free-throw (377) attempts in 23 high-school basketball games were charted. The findings can be used to position good rebounders better and to devise offensive patterns providing better recovery of missed shots.

Holt, Laurence E (1963) compared the straight arm stroke and the elbow flexion-extension (circular) stroke in handball. Velocity was computed from the interval, measured by the Hale Reaction-Performance Timer, between striking the handball from a stationary mounting and contact with the front wall. For 11 subjects, a significant difference in time beyond the .01 level favored the flexion-extension stroke. Film analysis revealed leverage superiority for this method and showed that it required considerably less time to execute.

Coughlin, M (1984) Ss for this study were members of 3 female varsity high school basketball teams. 2 teams were randomly assigned to an E group and one team was assigned to a C group. All Ss participated in a skill-building program designed to improve basketball foul-shooting ability. All were administered a foul-shooting accuracy test consisting of 20 free throws taken 2
at a time, 4 times during the 7 wks of the study. Ss in the E group participated in goal-setting conferences with the investigator after each of the 4 testing sessions. Athletes in the E group were instructed to set goals which were realistic, positive, attainable, and based on their past performances. A 2 X 4 ANOVA with repeated measures on the second factor (testing periods) was used to analyze the data. No diff (p>.05) were found between the two groups in foul-shooting performance. No diff (p>.05) were found in foul-shooting performances across the 4 testing sessions. Also, no diff effect or interaction was found between the testing sessions and the 2 groups (E and C).

Alverson, G. D (1986)\textsuperscript{40} study provided a reason to survey the 3A and 4A basketball coaches in the state of Utah who have coached on a varsity level within the past 10 years (1976-1986). 75 coaches were sent a questionnaire. 40 written responses were received and an additional 15 personal interview responses obtained. The results of the survey and the personal interviews with the match-up zone coaches showed that the winning percentage of the match-up zone teams was 78, whereas the winning percentage of the other 41 teams using another defense was 56. The diff was found to be sig at the .01 level. It is anticipated that this study will encourage all basketball coaches to look into the match-up zone philosophy and determine if it could work for them.

Sutton, Michael G (1979)\textsuperscript{41} investigation was undertaken to determine if there were any sig diff in missed field goal attempts in basketball falling short or long of the basket in selected men’s college basketball games, and whether those errors were different in the first half, second half, or the complete game. Films and videotapes of the home games of 3 North Carolina college basketball teams were studies, and data were recorded. Shorts were recorded as short or long for each 3 time periods: first half, second half, and the complete game. There were 1353 shots recorded from 36 games, and these data were analyzed using a Chi Square test. It was concluded that shooting errors in men’s college basketball games appeared to be mixed in terms of missing short or missing
long, similar in type during each half and for the entire game, and similar in
type for both the home and visiting teams.

**Lutes, Warren C. (1961)** took ten rebound zones were assigned and both
high school and college games were charted in terms of origin of shot and zone
into which ball rebounded. Chi-square was used to see if given zones received
significantly more rebounds than others on shots taken from each of the ten
zones. The author made recommendations in terms of placement of
rebounders based upon the site from which the shot was taken. In both high
school and college games, more missed shots were taken from the left side of
the court than from the right side. The Study did not include successful shots.

**Ahart, Frederick C. (1973)** Basketball free throw shooting efficiencies of the
1972-73 Roscoe central school varsity team were compared against score
differential categories (1-4, 5-8, and 9+ points ahead and behind). In the points
ahead category, free throw efficiencies were 53%, 72%, and 55%, respectively;
in the points behind category, free throw efficiencies were 50%, 69%, and 53%,
respectively. Results were interpreted from the perspective of the inverted-U
performance-arousal theory. McNemar’s differences between proportions test
revealed significant differences in free throw efficiency only in the 5-8 points
ahead category were the team shot better than the expected efficiency (57%).
Notwithstanding the statistical analysis, free throw efficiency exceeded the
expected efficiency only under the 5-8 point differentials (moderate
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another defense was 56. The diff was found to be sig at the .01 level. It is anticipated that this study will encourage all basketball coaches to look into the match-up zone philosophy and determine if it could work for them.

Girouard, James E. (1967) noted that the most desired position for shooting in an actual game is within a 15 ft. range. The investigator contended that a shooter would be more accurate if practice for accuracy started close to the basket and gradually moved back. Twenty inexperienced college men practiced shooting from pretest marked positions of 9, 15, and 21 ft. wit the position to be used rotated every third day during the course of the experiment. The 4,800 shots taken under specific conditions were subjected to an analysis of variance. There was found to be no significant difference in the accuracy of goal shooting after practicing at the various distances. Therefore, the investigator’s contention was refuted.

Johnson, Joann M. (1958) took Fifty-three women students enrolled in basketball classes were given three selected tests of basketball playing ability: the half-minute shooting test, the passing test, and the shuttle test. When the scores made by the subjects on trial one were compared with their scores on trial two and the coefficients were stepped up by the spearman-Brown formula for the sum of two trials, estimated reliability coefficients of .93, .94 and .91 were found for the respective tests.

Finanger, Ketnon E. (1957) took the data for this study were taken from the Wisconsin High School home basketball games (N = 7) and the Wisconsin Interscholastic Athletic Association State High School basketball tournament (N = 11). Comparisons were made between winners and losers on rebound location, type of rebound, foul location, and shooting percentages. The winning teams controlled both offensive and defensive rebounds. The defensive team obtained the majority of rebounds after missed free throws. Defensive fouls greatly outnumbered (5 to 1) the offensive fouls and the percentage of fouls called in the second half was greater than those called in
the first half. The winning teams attempted more free throws, scored more free throws, and committed fewer fouls than the losing teams.

**Wagner, Cloyd G (1962)** with Forty-two seventh grade boys were divided into three equated groups on the basis of skill in field goal shooting, speed dribbling, free throw accuracy, and wall volleying. The groups practiced the motor skills for different lengths of time twice a week for six weeks and were tested at two-week intervals. Tests to measure retention were administered three weeks after the final test following practice. Relatively long practice periods promoted greater learning during the early phases of practice but relatively short periods of practice appeared just as productive after some skill had been developed. Relatively long practice periods developed more consistent performance than shorter practices and learning occurred during periods of on physical practice after some degree of skill had been developed.

**Rogers, Bettejoe (1962)** A 4-item physical fitness test and a 2-item basketball skills test were administered to 99 freshmen women in four equated groups before and after seven weeks of prescribed physical activity comprising: Group I, isometric exercises and basketball; Group II, basketball; Group III, conditioning exercises and basketball; group IV, conditioning exercises. The groups were effectively equated initially although Group II was significantly higher in squat thrusts than the other three groups. Within-group comparisons showed that on the physical fitness test items significant gains were made by Group I on the sit-ups and obstacle race, by Group III on the sit-ups, and by group IV on sit-ups, pull-ups, squat thrusts, and the obstacle race. On the basketball skills test, group I made significant gains on both half-minute shooting and wall-passing and Group IV made significant gains on wall-passing. No significant differences were found among the groups on the total score for the physical fitness test. Group IV was inferior to the other

**Dehnert, Annette Ella (1962)** studied the effects were investigated of a kinesiological and a conventional method of instruction upon the development of the two-hand chest shot for free throws. The elements of a successful free
throw were defined for all subjects as accuracy, angle of projection, and velocity. There were two control and two kinesiological or experimental groups with two teachers, each of whom had one control and one experimental group. A 2 X 2 factorial analysis of variance was used to examine the data for all three variables. Non-significant values of F were found for all treatments and variables except for that of teacher effects on velocity performance. Standard deviations and coefficients of variation were computed for the angle of projection and velocity scores. The control groups showed a greater variation from the mean for velocity and approximately the same variation for angle of projection when compared with the experimental groups.

Helmly, R.C. (1989) studied advanced visual cue usage in 1 on 1 basketball using an occluded film technique. Skilled and novice Ss viewed a series of randomly presented occluded film sequences of a pt guard performing 5 different 1 on 1 basketball moves. Their task was to determine which of the 5 moves was being performed. The results showed: (1) the skilled players were able to utilize more advanced visual cues than the novice Ss; (2) the skilled players were better able to utilize advanced visual cues during shorter viewing times than their novice counterparts; (3) the most utilized visual cues occurred between the time the ball came off the floor and touched the extended hand of the dribbler during the last dribble prior to the move and the time the basketball had moved 2 basketball widths away from the midline of the guard’s body towards its final destination; and (4) that ball flight is not needed to accurately determine a 1 on move. The specific advanced visual cues available and/or utilized were also identified.

Ahart, Frederick C (1973) studied basketball free throw shooting efficiencies of the 1972-73 Roscoe central School varsity team were compared against score differential categories (1-4, 5-8, and 9+ points ahead and behind). In the points ahead category, free throw efficiencies were 53%, 72%, and 55% respectively; in the points behind category, free throw efficiencies were 50%, 69%, and 53, respectively. Results were interpreted from the perspective of
the inverted-U performance-arousal theory. McNemar’s differences between proportions test revealed significant differences in free throw efficiency only in the 5-8 points ahead category where the team shot better than the expected efficiency (57%). Notwithstanding the statistical analysis, free throw efficiency exceeded the expected efficiency only under the 5-8 point differential (moderate activation?). Results provide partial support for the inverted-U theory.

2.3 Reviews Related to Video Graphic Analysis

**Peek, Ronald W** (1968)^53^ has conducted a study to plot the path of the shoulder, hip, ankle, and center of gravity of the entire body, and to determine how the movement of the arms, hips, legs, and body as a whole were related to the performance of the skill. Several giant swings of outstanding performers were filmed and only the best ones, as judged by a jury of experts, were selected for analysis. Thirteen specific conclusions were reached from the evidence yielded, which should aid performers and coaches of this skill. For other investigators, recommendations were offered about cinematographically and mechanical analysis techniques and other skills to be analyzed.

**George, Gerald S. (1967)**^54^ has stated eight specific hypotheses dealing with velocity, acceleration, center of gravity and body position were investigated by analyzing the skill as performed by 3 expert performers. Specific conclusions were reached for each of the hypotheses which can serve as a source for students studying mechanical analysis as well as performers and coaches who are concerned with the execution of the skill.

**Armitage, Jeanne Elaine. (1958)**^55^ the problem was to construct a series of slides with an accompanying recorded narration illustrating the official rules and techniques of officiating girls volleyball. The opinions of 21 out of 32 state volleyball chairmen listed in the 1957-59 DGWS Volleyball Guide were obtained through a questionnaire-type survey. Pictures were taken illustrating the rules and techniques of volleyball officiating selected by the chairmen. A script was written to clarify and explain the rules and techniques illustrated in
each slide. The completed series consisted of 60 slides and was evaluated by a jury of two nationally rated volleyball officials, three physical education instructors, and three physical education students.

Eckert, Patricia Clare. (1958) the selection of the elements of composition making up the general content of the film was based on a review of related research and literature, information obtained through use of interview opinionnaires, the writer’s personal experience, and discussion with other dance instructors. The film includes a technique demonstration, example of how the dance idea governs the elements of composition, and the showing of two completed dances. The filming was executed by the chief photographer at the University of Colorado. Titles and a chart listing the elements of composition were inserted. The film was reviewed by three professional photographers who expressed the opinion that the film, were it produced with accompanying sound, would have excellent market value and by a jury of 17 physical education teachers who expressed the opinion that the film would be a valuable teaching aid to instructors of modern dance.

Dawson, Mary Lou. (1979) a 3 dimensional analysis was used to identify the kinematic parameters assoc with the performance of the approach of the flop style high jump action and the identification of the kinetic parameters associated with the take-off phase of the flop style high jump action. Two LOCAM phase locked cameras were used to film 8 jumpers performing 6 trials at varying Hts. Camera speed was set at 150 fps to assure accurate estimates of key phases of the approach run. A 4 X 4 ft force platform was placed at the take-off point. This force platform recorded forces on an oscillo graph data graph. Forces were recorded in vertical, horizontal right and left, and of the center of gravity of the body. 10 members from each of the IU men’s and women’s varsity gymnastic teams were used as Ss. Each S executed 3 trials of a round off back handspring sequence while being filmed with a 16 mm LOCAM camera. One trial for each S was selected for analysis by 3 rated judges. The film data were analyzed by using the FILMDAT computer program which
provided information concerning the velocities, displacement, and accelerations of the various body parts. 5 kinematic variables were statistically analyzed using MANOVA. 4 other variables were analyzed descriptively. A sig diff (P< .01) was found between males and the females in the execution of the round off. The univariate F-tests showed a sig diff at the .05 level between the 2 groups on only 1 of the 5 variables tested. The descriptive analysis found that males and females obtained similar measures on all the factors considered. Males had a greater distance between the hands and feet at the landing of the round off than did the females. This greater distance was a result of the greater anthropometric measures of arm length, leg length, body height and a lower body center of gravity.

Deep, David P (1963)^58 An analytical study was made of each running play in the 1962 offense and from this a 16mm training film and manuscript were developed to illustrate the play for linemen and backs in the consistency running offense. A consistency play is one which gains three or more yards at least 60 percent of the time with plus yardage in at least 80 percent of the attempts.

Bushman, Ben Robert.(1963)^59 The problem was to determine, by 16mm motion picture film analysis, the most desirable speed and height of an excellent overhand flat volleyball serve as judged by a board of experts and as tested by the ability of an opposing team to return the serve. A serve that traveled low to the net and with maximum speed but stayed in bounds was the most difficult to return.

Fleming, L. K.(1980)^60 The purpose of this study was to compare learning in identifying tennis errors between 3 exp group using a videotape program of instruction and a control group. Learning was defined as gain scores between the pre and post test. The groups were composed of PE majors from BYU who had some form of instruction in tennis. ANCOVA showed that the use of a videotape unit is effective in learning to identify performance errors and teaching cues in tennis, especially the serve. The results also showed that a
videotape using experts to demonstrate performance errors in tennis is more effective than a videotape of beginners performing the errors.

Kamineneski, c. d. (1980)\(^2\) exp groups and a control group were compared in the identification of movement errors for selected basketball skills. All groups were given pre and post criterion tests. The groups were composed of PE majors of Southern Missionary College. Between tests the exp groups viewed the instructional unit for skill error analysis using videotaped replay film developed for the study. Evaluation techniques included ANOVA. It was found that the video unit was effective in teaching error analysis; PE majors who did not view the unit could not make sig scores on criterion tests; there was no sig diff between groups in learning to analyze the dribble; there is no sig diff between mental and written practice in learning to perceive simple movement errors; and practiced learning is essential for competence the error analysis.

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**Hudson, Jackie Lee. (1974)**

Three mutually exclusive groups of college women basketball players were filmed during performance of the 1-handed basketball free throw. The Ss were members of a beginning level basketball instructional activity class at Purdue University (N=9), members of the Purdue University women’s varsity basketball team (N=7), and members of the U.S. women’s basketball team for the 1973 World University Games (N=9). ANOVA procedures were used to determine if the groups exhibited differences in any of 10 biomechanical measurements or shooting accuracy. Stepwise regression methods were used to predict the shooter’s accuracy percentage and the likelihood of making a given shot. Stepwise discriminant procedures were used to predict the group to which each S should belong.

**Mersereau, Michele Rae. (1974)**

Four female Ss were filmed at age 22 mo and age 25 mo. Data obtained from the film were used to calculate various biomechanical variables. A sub problem was to investigate the effect of general motor development, as measured by the Bayley Scale of Infant Motor development, on the development of running. Developmental trends were identified for kinetic energy values of the segments of the right lower extremity, the kinetic energy of the total body, the instantaneous horizontal component of velocity of the body center of gravity, stride length, the time in fight during 1 running stride, and the proportionate duration of time spent in fight during 1 running stride. Kinetic energy appeared as a particularly useful indicator of the developmental change in the running pattern of female infants
at 22 and 25 mo of age. A slight relationship was found between running speed and general motor development as measured by the BSIMD.

**Hosinski, John Philip. (1965)** Sixteen boys with basketball experience were divided into two groups. One group was taught 6 options of the shuffle offense in basketball with a traditional on-the-floor presentation. The other group was presented the same material by means of a programmed presentation on the IBM 7010/1440 Data Communications System. The group receiving the programmed presentation exhibited a better knowledge of the material on 4 written knowledge tests. This was significant at the .05 level. No significant differences were found in either group’s ability to perform the offense.

**Griffiths, Anne M. A. (1970)** the drive and 5-iron shot of 10 college women were cinematographically studied to determine what specific movement patterns were necessary for the execution of a successful golf drive. Results obtained from selected measurements and tracings were compared among the Ss to identify the factors that appeared to be essential for a well-executed drive. Conclusions drawn were that the movement patterns were essentially the same for both clubs, and the golfer’s ability to control clubhead movement was an influential factor in attaining lift and distance. Greater distances were attained by Ss who had a relatively greater amount of shoulder turn than hip turn on the backswing, a greater amount of wrist cock just prior to contact, and a more “upright” swing plane, while golfers who “topped” the ball had a tendency to lift their arms in the hitting area.

**Higgins, Lynne P. (1970)** fourteen cartridge Super 8mm loop films were developed as a teaching and/or testing device for error analysis in power volleyball, to be used in the professional preparation program of PE major students. The loop films included 4 loops of the correct execution of the set, bounce pass, serve, and spike and 10 loops illustrating errors committed in the execution.

**Zimmerman, Patricia (1970)** Women PE majors (N=4) enrolled in 2 badminton classes served as Ss. Both the control and experimental groups received the
task method of instruction. However, in addition, members of the experimental group were able to view their own performance on videotape and the performance of experts on loop films. At the end of the instructional unit, selected badminton skills were measured by means of a battery of tests consisting of the French Short Serve test and the French Clear test. There were no significant differences between the means of the 2 groups for any of the skill tests. The task method of teaching with the addition of these visual aids was not superior to the task method without the visual aids.

Reid, Dianne A (1970) determined was whether there was a difference in volleyball serving ability at the end of a 5-wk. instructional period between a group of 31 college girls taught how to serve by means of a teaching method using the videotape recorder and another group of 25 girls taught the same skill by conventional means. Both groups were given a Volleyball Power Serve Test as a pretest. All classes met for 1 hr., 3 days/wk., but Ss in the experimental class were taped during only 1 of these lessons. The plan for taping was as follows: the experimental class was divided into 3 groups, A, B, and C. A met on Saturdays for 3 wk. To be videotaped and was further divided in 4 groups of 3. Each group of 3 participated in a pre filming practice, a filming practice (6 serves), a viewing of (6 serves), a viewing of the tape of the filmed practice during which corrections were given by the investigator, and a post filming practice. Total time spent on the serve in 1 session for each girl was 15 min. The control class also spent 15 min./wk. practicing the serves in a similar rotation. A posttest indicated that although both groups improved significantly in serving ability there was no difference between the groups.

Bothner, K. E. (1992) video image processing has become a convenient and powerful tool to represent mvmt. The capability to interface a computer with a video source to perform motion anal makes this technology ideal for fields such as biomechanics. A short turnaround time between filming and the accumulation of data makes video more efficient than cinematography, and the portability enables researchers to collect data in many diff settings. Video
anal systems on the market today have two drawbacks, however. First, the cost of fully developed systems may deter some users. Second, the user has little or no input into the software development, making modifications of input parameters, image manipulation processes, and output formats impossible, in this study, a video-based motion anal system was developed with full documentation of each stage of the process, from hardware acquisition to algorithms implemented in the software. With this knowledge, accessibility to this technology will be increased, which should enhance and augment future research in the field.

Chiles, B. (1979)\textsuperscript{71} he constructed a video tape and test guide which would aid officials in recognizing fouls and violations in SHS girls’ basketball games using NFR was produced. To determine what calls Illinois SHS Girls’ Basketball Officials most frequently misjudge, a questionnaire was sent to the coaches of the 32 final teams in the 1977 Illinois Girls’ State Basketball Tournament Series. The results served to determine what game situations were included in the final tape. Westerner SHS Varsity Girls’ Basketball Team participated in the filming procedure. Dressed in home and away uniforms, they scrimmaged for an hour and a half without officials. Video tape cameras at 2 positions recorded the action. The video tape was edited into 22 situations in which the official viewing the tape was asked to make a decision. A test guide was written for the official.

Ercanbrack, Deanne, (1971)\textsuperscript{72} Stick figures were prepared from films using a Kodak Microfilm Reader and were analyzed to determine body positions and timing. Mathematical calculations determined velocities and trajectories of the jumps. Two Ss were filmed; I performed the front somersault and the other the back. The front somersault skier jumped 87 ft. at 52 ft/sec at an angle of 38\textdegree{} with the horizontal in 2.13 sec. The back somersault skier jumped 111 ft. at 55.9 ft/sec at an angle of 40\textdegree{} with the horizontal in 2.57 sec. A successful jump can be accomplished at 50 ft/sec on an incline of 30\textdegree{}. The skier has approximately 2 sec to complete the somersault. The circumduction of the arms in the
direction of the somersault will slow or stop the motion and in the opposite
direction will speed up the rotation. Beginning skiers should not attempt these
stunts; more advanced skiers should do so only with professional instruction
and proper hill and snow conditions; and the skier should be experienced in
diving and/or rebort tumbling.

**Blank, Anita M. (1971)**

He selected Sixteen mm B/W film was used to photograph the clear stroke performance of 3 undergraduate women who participated in the 1971 DGWS National Intercollegiate Badminton Championship. Analysis of the Ss' movement revealed that although the gross motor patterns were similar, individual variations existed in the backswing motion, forward motion of the racket arm, and follow-through action.

**Gautn, Sharon J. (1976)**

Female (N=3) and male N=3 varsity basketball players were filmed performing a jump shot at the free throw line. Primary phases of the shot studied were preparation for the jump, flight, ball release, and follow-through. Selected mechanical components of the jump shot were studied and compared among Ss of the same sex and between male and female groups. Time intervals of the phases and velocity and trajectory of the ball were calculated. Findings supported the following conclusions: performance of the jump shot varies among Ss of the same sex as well as between male and female shooters; although authorities recommend techniques which contribute to proper execution of the jump shot, these techniques are modified by various performers, thus there is a great deal of individuality in techniques used in execution of the jump shot.

**Monahan, Jane (1975)**

The effectiveness of 2 instructional tools for teaching breast self-examination (BSE), a motion picture film and a simulated breast model, was examined. It was hypothesized that both techniques would be successful, but the model would be more effective because it used the visual, auditory, and tactile senses, and offered an opportunity for practice, while the film used only the visual and auditory senses. Invitations were sent to 140 randomly chosen women living on the UF campus. The 1st 69 respondents
were then randomly assigned to 1 of 3 equal groups: Ss who were individually instructed by a 10 min film entitled Teaching breast Self-Examination, Ss who were given a 5 min lecturer’s demonstration on the breast model known as “Betsi,” coupled with 5 min of practice, and control Ss who received no instruction. Each S was then rated on her ability to perform a BSE by 2 trained observers who used an instrument developed by the author which consisted of a checklist of the behaviors which constitute BSE. In addition, raters gave a subjective evaluation of the performance. ANOVA on the checklist scores showed a significant difference at the .01 level between the control group and both groups that received instruction. This would imply that although much information is available though the mass media individual instruction is needed for this population. ANOVA did not show a significant difference in learning between those who saw the film and those who used the breast model. It is concluded that for this population women learn as effectively from passively watching a film showing a live model performing BSE as they do from watching a live demonstration on a model and practicing. Significant X2 (p < .01) on the qualitative scores supported the above conclusions. It was recommended that for this population selection for methods for teaching BSE should be based on size of group, availability of equipment, and finances.

Millslagle, D.C. (1986) 30 female college students consisting of 15 experienced (EX) and 15 novice (N) basketball players scanned 64 sport slides consisting of structured (STR) and unstructured (UNSTR) play for the presence or absence of a target item (basketball) and hurdle item (orange triangle) projected for a 5-sec period. After the 5-sec viewing, players recalled as many players as possible on a grid depicting the basketball court. 2 randomized RMD ANOVA models indicated that: EX players’ overall visual search speed of target detection and player recall were faster and sig diff than that of N players; the overall accuracy in detecting the target item was similar for both EX and N players; both groups of players could accurately detect and recall a STR play better than in UNSTR play, with the EX player being superior in both situations;
and the speed of detection of both groups of players was not affected by the
diff in STR and UNSTR plays. The finding pertaining to the control of visual
search was that the presence or absence of the hurdle item did not affect
speed by experience level or accuracy of detection, indicating that the visual
search of both EX and N players may have operated under target control.

**Cook, David L. (1982)** ss were 32 tenth grade students who were randomly
assigned to an exp group and a control group. All Ss were pretested and
posttested for free throw (FT) shooting accuracy by taking 25 shots. 7 practice
sessions were conducted between the 2 testings. The C group received verbal
instruction before each practice session; the exp group received verbal
instruction and viewed a film of an advanced player shooting FTs before each
session. All Ss completed 15 FTs during each practice session. Analysis by
ANCOVA showed no sig diff (p > .05) between the 2 groups in FT shooting
accuracy. The correlated t-test was used to assess changes in accuracy
between pretest and posttest for both groups. A sig increase (p < .05) was
found for the exp group but not the C group.

**Bartkowiak, Don. (1959)** Six performers of different experience levels (two
college seniors, two college freshmen, two high school seniors) performed
three basic wrestling moves (double-leg drop, switch, sit-out). Two motion
picture cameras were used to obtain a view from two planes. The film was Tri-
X Reversal, indoor, f-28 exposure, 16 mm, run at 24 frames per second.
Definite patterns of movement existed among the wrestler. The more
experienced performers adhered to basic principles of movement. There was a
great variance among performers. The time to complete a double leg-drop
varied from one second to 1.433 seconds; the switch, one second to 1.900
seconds and the sit-out varied from .666 seconds to 1.266 seconds.

**Koller, Barbara A. (1973)** subjects (N = 4) performed 3 trials each for
purposes of analysis. One intent was to determine what similarities existed in
the performances of the subjects and if significant differences could be found
as they related to the variables. A secondary aim was to study consistency
among and within subject performance. The best performance is characterized by greater horizontal distance, greater vertical height, forward hip flexion, and back hip extension at the midpoint, and extension of the knees and ankles at the midpoint. The trunk was kept erect throughout the leap. Body lean at takeoff affected vertical height and horizontal distance achieved. Subjects are more consistent for: body lean at takeoff, back ankle action, angle of the trunk and pelvis on the hip, vertical changes in the center of gravity. Subjects were not consistent for: horizontal distance achieved, front knee action, front ankle action. Subjects are consistent within individual trials for: horizontal distance, vertical height of the center of gravity, ankle flexion prior to takeoff, front and back knee action at the midpoint, and body lean at takeoff.

Surburg, Paul r. (1966) took the subjects, 183 male junior college students, were divided into six experimental groups and a control group who were tested before and after an 8-week period with the Broer - Miller tennis test. Three groups received audio, visual, or audiovisual instruction three times a week and then practiced the forehand drive mentally. The other three experimental groups had the same instruction but did not practice mentally. The mental practice groups all made significant gains and were superior to the other experimental groups. Audio-mental practice was superior to the other methods.

2.4 Other Related Reviews

Scanlon, William M. (1968) tested 15 skilled college varsity basketball players under dark conditions with only the designated target area visible for focusing for 3 different floor positions took place. The distribution of shots was arranged according to the Latin square table designation. Analysis of the data revealed that focusing on the entire target (basketball ring covered with luminous paint) was superior to focusing attention to either the front or back of the ring. Further, focusing on the back of the ring was superior to focusing on the front of the ring.
Strain, David F (1969) during the years 1961 through 1968, 30 juniors and 21 seniors of the Rapid City High School basketball varsity teams, who had completed the sophomore, junior, and senior basketball season, furnished the data for the formularization of 3 predictive equations from the relationship of individual sophomore game statistics and varsity point production. In the development of the multiple regression equations, 5 predictor variables, successful free throw average per game, field goal percentage, and rebound percentage were correlated with the success variable as measured by varsity point production.

Evenhouse, John Allen (1979) recorded data were analyzed by r and regression. Sig correlations (p<.70) were found between point total diff and points per possession (r=.70) diff in shooting percentage (r=.64) and diff in defensive rebounds (r=.58). Regression analysis showed that these 3 variables together accounted for 75% of the variance in point total diff. It was concluded that points per possession, diff in field goal % and diff in defensive rebounds are sig related to point total diff and at the high school sophomore level, a team which achieves .70 points per possession should win the game.

Sutton, Michael G. (1979) investigation was undertaken to determine if there were any sig diff in missed field goal attempts in basketball falling short or long of the basket in selected men’s college basketball games, and whether those errors were different in the first half, second half, or the complete game. Films and videotapes of the home games of 3 North Carolina college basketball teams were studied, and data were recorded. Shorts were recorded as short or long for each 3 time periods: first half, second half, and the complete game. There were 1353 shots recorded from 36 games, and these data were analyzed using a Chi Square test. It was concluded that shooting errors in men’s college basketball games appeared to be mixed in terms of missing short or missing long, similar in type during each half and for the entire game, and similar in type for both the home and visiting teams.
Hudson, Jackie Lee (1974)[^85] three mutually exclusive groups of college women basketball players were filmed during performance of the 1-handed basketball free throw. The Ss were members of a beginning level basketball instructional activity class at Purdue University (N=9), members of the Purdue University women’s varsity basketball team (N=7), and members of the U.S. women’s basketball team for the 1973 World University Games (N=9). ANOVA procedures were used to determine if the groups exhibited differences in any of 10 biomechanical measurements or shooting accuracy. Stepwise regression methods were used to predict the shooter’s accuracy percentage and the likelihood of making a given shot. Stepwise discriminate procedures were used to predict the group to which each S should belong.

Sutton, Michael G. (1979)[^86] this investigation was undertaken to determine if there were any sig diff in missed field goal attempts in basketball falling short or long of the basket in selected men’s college basketball games, and whether those errors were different in the first half, second half, or the complete game. Films and videotapes of the home games of 3 North Carolina college basketball teams were studies, and data were recorded. Shorts were recorded as short or long for each 3 time periods: first half, second half, and the complete game. There were 1353 shots recorded from 36 games, and these data were analyzed using a Chi Square test. It was concluded that shooting errors in men’s college basketball games appeared to be mixed in terms of missing short or missing long, similar in type during each half and for the entire game, and similar in type for both the home and visiting teams.

Hunter, Martha J. (1971)[^87] he took two films, 1 of a 6-player and the other of a 5-player game, were analyzed. After determining the % of passes and shots at goal, no significant difference was found between the no. of times that the following passes (book, 1-hand bounce, 1-hand shoulder, 1-hand underhand and 2-hand bounce) and shots (hook, jump and overhead set) were used in either game. The 2-hand chest pass, 2-hand underhand pass and 1-hand set shot were used more frequently in the 6-player game, while the 2-hand...
overhead pass, the jump pass, the lay-up shot, and the 2-hand set shot were
used more often in the 5-player game. X2 revealed no significant difference in
the number of intercepts, dribbles, jump balls, rebounds, turnovers, violations,
or fouls used in either game.

**Lutes, Warren C.(1961)** Ten rebound zones were assigned and both high
school and college games were charted in terms of origin of shot and zone into
which ball rebounded. Chi-square was used to see if given zones received
significantly more rebounds than others on shots taken from each of the ten
zones. The author made recommendations in terms of placement of
rebounders based upon the site from which the shot was taken. In both high
school and college games, more missed shots were taken from the left side of
the court than from the right side. The Study did not include successful shots.

**Gautn, Sharon J.(1976)** with Female (N=3) and male N=3) varsity basketball
players were filmed performing a jump shot at the free throw line. Primary
phases of the shot studied were preparation for the jump, flight, ball release,
and follow-through. Selected mechanical components of the jump shot were
studied and compared among Ss of the same sex and between male and
female groups. Time intervals of the phases and velocity and trajectory of the
ball were calculated. Findings supported the following conclusions:
performance of the jump shot varies among Ss of the same sex as well as
between male and female shooters; although authorities recommend
techniques which contribute to proper execution of the jump shot, these
techniques are modified by various performers, thus there is a great deal of
individuality in techniques used in execution of the jump shot.

**Johns, Ellen J.(1976)** after reviewing literature possible components of
individual game play were listed and given to a sample of 10 veteran KY. At
least 8 favorable responses were needed for a comen KY Girls’ SHS
Tournament. The Ss were the 80 starting players. At all opening round games,
5 raters used the sheet and 7 judges (college coaches from institutions
granting female basketball scholarships) viewed the games and responded
“yes” or “no” for scholarship consideration. The judges had a set criteria to implement. As the judges’ votes were tabulated, a player with 4 or more “yes” votes was categorized for scholarship consideration. The sheet’s reliability was .984 using Kendall’s Coefficient of Concordance. Judges selected 9 players for scholarship consideration, 8 of whom received the 8 highest sheet totals. The statistics sheet was found a reliable and valid tool aiding in the selection process by separating the more highly skilled from the other players.

**Eventhouse, John Allen. (1979)**[^1] he recorded data were analyzed by r and regression. Sig correlations (p<.70) were found between point total diff and points per possession (r=.70) diff in shooting percentage (r=.64) and diff in defensive rebounds (r=.58). Regression analysis showed that these 3 variables together accounted for 75% of the variance in point total diff. It was concluded that points per possession, diff infield goal % and diff in defensive rebounds are sig related to point total diff and at the high school sophomore level, a team which achieves .07 points per possession should win the game.

**Williams, Tillman D. (1983)**[^2] the problem was to investigate the selected “natural” traits of quickness, speed, jumping power, shooting success, agility, ht and wt to Determine what relationship these traits had to the game performance of male college basketball players. Basketball players (N=50) were tested to evaluate their “natural” traits. Conference basketball statistics were kept and used to compute a stat game performance for each S. The simultaneous solution and the forward step-wise inclusion technique of the multiple regression analysis were administered to the raw data to determine the individual and group correlation of the independent variable (“natural”) traits to the dependent variable (Stat game performance). Of the “natural” traits only shooting success was found to have a sig correlation (p < .05) to stat game performance. All of the “natural” traits accounted for only a small amount of the variance of the stat game performance.

**Finanger, KETNON E (1957)**[^3] the data for this study were taken from the Wisconsin High School home basketball games (N = 7) and the Wisconsin...
Interscholastic Athletic Association State High School basketball tournament (N = 11). Comparisons were made between winners and losers on rebound location, type of rebound, foul location, and shooting percentages. The winning teams controlled both offensive and defensive rebounds. The defensive team obtained the majority of rebounds after missed free throws. Defensive fouls greatly outnumbered (5 to 1) the offensive fouls and the percentage of fouls called in the second half was greater than those called in the first half. The winning teams attempted more free throws, scored more free throws, and committed fewer fouls than the losing teams.

Pampuch, Elroy J. (1958)\textsuperscript{94} the sample used in this study included the University of Wisconsin varsity basketball team and its opponents, 1957-58 season. The 1958 Wisconsin Interscholastic State High School basketball tournament was also included. The study concluded that defensive foul greatly outnumber the fouls called on the offense; a higher percentage of foul were called in the second half than in the first; more fouls were called against the losing teams than the winning teams; the new sixth foul rule has been a factor in reducing the percentage of points scored from the free throw line; and the winners scored more free throws and fewer fouls than the losers.

Ahart, Frederick C. (1973)\textsuperscript{95} studied basketball free throw shooting efficiencies of the 1972-73 Roscoe central School varsity team were compared against score differential categories (1-4, 5-8, and 9+ points ahead and behind). In the point's a head category, free throw efficiencies were 53%, 72%, and 55% respectively; in the points behind category, free throw efficiencies were 50%, 69%, and 53, respectively. Results were interpreted from the perspective of the inverted-U performance-arousal theory. McNamara’s differences between proportions test revealed significant differences in free throw efficiency only in the 5-8 points ahead category where the team shot better than the expected efficiency (57%). Notwithstanding the statistical analysis, free throw efficiency exceeded the expected efficiency only under the 5-8 point differentials
(moderate activation?). Results provide partial support for the inverted-U theory.

2.5 Summary of Review

The researcher came across a considerable number of studies dealing several study with performance, skill, experimental, analytical interventions have taken place, which has proved a continuous development in the field of basketball. Vast research has taken place in these game, though Gorton, Beatrice was the first person who used two LOCAM 16 MM cameras for research in shooting in 1979. Majority of the studies dealt with factors like shooting, passing, free throw, defense, and type of fouls. There are many of them like cherry, Aubrey lee from 1969 is continued research on basketball skill test of Johnson. It was evident that all these factors are directly proportional to level of performance. The review of literature presented above has proved that all the basic skill in basketball are being important for the performance of the player were performance cannot be calculated with only one skill to be taken into consideration and all the factors collectively are responsible for the performance of the player. Several studies dealing with academic achievement suggested that high level of physical activity, exercise behavior, affect performance of player in the match which the player is playing. It is also found that the high level of physical fitness with skill development have made a drastic change in performance of the player. Most of the reviews also suggest a research ongoing development in basketball, though the researcher being a basketball player, know the changes in the game which has taken place in the field of basketball. So a continues research work may help the coaches, players to develop the game.

It was therefore considered desirable to undertake this research which will through light on the direct skill which are being used in tournament

So the researchers choose the state championship and national championship and recorded the matches which have really helped to see the matches and find out the conclusion.
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