CHAPTER – II

REVIEW OF THE LITERATURE

2.1 Review of Related Literature

The selection of a topic, the development of a hypothesis, and the application of deductive reasoning to the issue all benefit from a survey of relevant literature. It facilitates understanding and supports the conclusions with relation to the research problem.

The researcher scholar has reviewed the relevant literature that is readily available, relevant to the current investigation, and has been presented in this chapter.

Gandhi (2021) the study was to determine how weight training, plyometric training, and their combination affected volleyball players' motor components. 120 male college volleyball players between the ages of 18 and 25 were chosen at random as subjects for this study from among the colleges connected to Veer Narmad South Gujarat University in Surat, Gujarat (INDIA). The chosen participants were separated into four groups of 30 participants each: a control group, a weight training group, a plyometric training group, and a combination of training groups. The three experimental groups received training for 10 weeks (three days per week), but the control group received no training at all. Speed, muscular endurance, agility, flexibility, and explosive power were the criterion variables used for this investigation. Using standardised test items, the chosen variables were evaluated both before and after the training session. The information gathered for the four groups both before and after the experiment. Numerous statistical methods, including the dependent t-test, the univariate analysis of covariance (ANCOVA), and the post hoc pair-wise comparison utilising the LSD test analysis, were used to conduct the analysis. The volleyball players' chosen motor component characteristics, such as speed, muscular endurance, agility, flexibility, and explosive power, were considerably enhanced by the plyometric training group. The improvement of the selected motor component characteristics, such as speed, muscular endurance, agility, flexibility, and explosive power, varied significantly between the weight training, plyometric training, and combination of weight training and plyometric training groups. All of the selected motor component characteristics, including speed, muscular endurance, agility, flexibility, and explosive power, were found to be better improved by combining weight training and plyometric exercise in comparison to the plyometric and weight training groups.

To determine the impact of various strength training regimens on the jumping capacity of amateur female volleyball players, **Goudas et al. (2020)** conducted a study. 48 female volleyball players between the ages of 18 and 32 (MSD=24.54.2) were split into two groups: an experimental group and a control group (N=16). For eight weeks, the athletes in the experimental groups underwent the following strength training: GROUP 2: resistance training and TRX-training combined with plyometric exercises. GROUP 1: TRX-training combined with plyometric activities. The sole practise being done by the Control Group was field volleyball. The two experimental groups engaged in a similar training regimen that included plyometric workouts for 8 weeks after which there was a 4-week detraining period. Six jumping tests—the squat jump, countermovement jump, countermovement jump with arm swing, drop jump, block jump, and attack jump—were measured at baseline, after 8 weeks, 16 weeks, and 20 weeks. For amateur female volleyball players, TRX training along with plyometric exercises and/or resistance training may result in a considerable improvement in their ability to jump. TRX exercises can therefore be incorporated into the training process when the training stimuli are differentiated and varied. TRX exercises can therefore be incorporated into the training process when the training stimuli are differentiated and varied. Additionally, adding plyometric workouts to a players' circuit training programme may improve their capacity to jump even more. As long as a maintenance training programme featuring jumping exercises is carried out, the majority of training adaptations can be kept during the detraining period.

Rodrigo et al. (2020) In order to evaluate the impacts of plyometric jump training (PJT) on volleyball players' vertical jump height (VJH), compared changes to those seen in a matched control group. The databases of PubMed, MEDLINE, Web of Science, and SCOPUS were searched for relevant articles. Only studies and randomized-controlled trials with pre- and post-intervention evaluations of VJH were considered. There were no age or sex limits and only healthy volleyball players were involved. Two authors independently extracted the data from the included studies. The study was evaluated using the Physiotherapy Evidence Database scale. Fourteen studies were meta analyzed from 7,081 records. For VJH, a moderate Cohen's d effect size was found (ES = 0.82, p 0.001), along with moderate heterogeneity (I2 = 34.4%, p = 0.09), and there was no evidence of publication bias (Egger's test, p = 0.59). No significant differences were found when moderator variables were analysed for PJT programme duration (8 vs. >8 weeks, ES = 0.79 vs. 0.87, respectively), frequency (2 vs. >2 sessions/week, ES = 0.83 vs. 0.78, respectively), total number of sessions (16 vs. >16 sessions, ES = 0.73 vs. 0.92, respectively),sex (female vs. male, ES = 1.3 vs. 0.5, respectively), age (≥19 vs. <19 years of age, ES = 0.89 vs. 0.70, respectively), and volume (>2,000 vs. <2,000 jumps, ES = 0.76 vs. 0.79, respectively). In summary, it seems that PJT is successful in causing improvements in volleyball players' VJH. Both male and female volleyball players, in various age groups, can improve their VJH with relatively low volume and frequency programmes. Although PJT appears to be safe for volleyball players, it is advised that an individualised approach, according to player position, be implemented, with some players (such as the libero) less equipped to withstand PJT pressures.

Ruffieux et al. (2020) compare the effects of countermovement jump (CMJ) and drop jump (DJ) training on non-professional female volleyball players' ability to jump for volleyball, 26 female volleyball players (15–32 years old) were divided into two training groups: a CMJ group (20.4–3.1 years, 171.0–3.0 cm) and a DJ group (22.0–4.4 years, 168.2–5.0 cm), who completed a six-week jump training (two sessions per week, 60 jumps per session). To reduce the effect of improved motor coordination on the disparities between groups regarding the enhancements of jump performance, each group executed 20% of the jumps in the jump type of the other group. Four different jump types, including the trained and volleyball-specific jump types, had their jump height measured both before and after the training. Despite the fact that all training methods considerably increased jump height, CMJ training was far superior in all jump types (17 vs. 7% on average; p 0.001). This shows that training with a high number of CMJs is more beneficial than one with a high percentage of DJs, at least for non-professional female volleyball players and a six-week training period. We propose that the slower stretch-shortening cycle during CMJs, which appears to be more particular to these players and activities, may be responsible for this. These results ought to help volleyball coaches create the best jump workouts.

Devrim and Erdem (2019) looked into how two distinct strength training models affected volleyball players' balance, agility, and strength. The study included 45 female athletes who played volleyball in a private club and had an average age of 12.08 0.82. Core-plyometric (KRP) (n=15), core quick strength (KRC) (n=15), and control (KNL) (n=15) groups were formed from the athletes who took part in the study. Within the parameters of the study, the KRC group followed core training with rapid strength training and the KRP group followed core training with plyometric exercise. The KNL group kept practising volleyball. For eight weeks, the trainings were held two days a week. All three groups were subjected to height, weight, BMI, t-test, standing long jump, flamingo balance, and throw-in tests before and after the study. The significance threshold was established as $p < 0,05$ after a statistics package programme was used to examine the data from the pre- and post-test. In the KRP and KRC groups, the T-test revealed a significant difference ($p < 0,05$). No significant differences were identified in the averages of the height, standing long jump, throw-in, and flamingo balancing tests when the differences between the groups were investigated ($p>0.05$), although the KRC group considerably outperformed the KNL group in the t-test.

In order to find out whether an 8-week offseason conditioning programme for youth female volleyball players enhanced performance on three vertical jump protocols and agility time, **Hale et al.** (2019). An 8-week prospective cohort repeated measures experimental design was used in the current investigation. Eleven female youth volleyball players (aged 15.1 2.7) finished an 8-week mesocycle offseason conditioning regimen that was divided into two distinct blocks of conditioning (strength and plyometric/agility) that lasted for four weeks each. Strengthening activities were performed twice weekly (for 60 minutes each) during the first four weeks of conditioning (weeks 1-4). Power-based ploymetric and agility workouts were performed twice weekly (for 60 minutes each) throughout the second four weeks of conditioning (weeks 5-8). The pre- and posttesting periods saw a considerable improvement in each of the four variables. The heights of the three vertical jump protocols all increased significantly with moderate effect sizes (BVJ: 37.1 vs 40.9, p.000; CMJ: 43.9 vs 46.7, p.000; AVJ: 53.3 vs 58.7, p.001). Additionally, after completing the 8 weeks of offseason conditioning, the agility times dropped with a significant effect size (d =.871) (9C: 25.3 versus 23.6, p.000). Across all four factors, the average improvement was 7.7%.

Raghvin (2019) study was to determine what impact two volumes of plyometric training on various surfaces paired with SAQ drills had on junior volleyball players' performance metrics. The study was limited to 60 junior high school volleyball players from St. Antony's Girls High School for the aforementioned aim. The individual was between the ages of 12 and 14. The experimental group 1 (n = 15, LVPMS - SAQ) of the chosen four trainings does low volume plyometrics while using SAQ drills on a mud surface. The experimental group 2 (n = 15, MVPMS - SAQ) engages in a moderate volume plyometric exercise on a mud surface while also doing SAQ drills. The third experimental group (n = 15, LVPGS - SAQ) engages in low volume plyometric exercises in conjunction with SAQ drills on a grassy area. The moderate volume plyometric exercises performed by experimental group 4 (n = 15, MVPGS - SAQ) in conjunction with SAQ drills were designated as independent variables. As dependent variables, the performance metrics of speed, explosive power, agility, anaerobic capacity, cardio-respiratory endurance, muscular endurance, and balance were set. With the aid of standardised testing tools, all performance characteristics were examined. The training intervention was confined to three days per week for a period of 12 weeks. With the help of standardised test items, the chosen performance characteristics were evaluated. ANCOVA was used to determine the significant adjusted post-test mean difference of three groups with regard to each parameter. The dependent t-test was used to determine the significance of the pre-test to post-test mean difference in each group for each parameter. A pair-wise comparison between groups was performed with regard to each parameter to determine the results. The 0.05 level of significance was used in order to test the hypotheses. The findings unmistakably demonstrated that after 12 weeks of training, the selected four training greatly improved on the chosen performance measures.

The benefits of plyometric training on volleyball players' performance are discussed by **Silva et al. (2019).** Which leaves 21 studies in total for in-depth analysis? Results indicated that strength (four studies), horizontal jump (four studies), flexibility (four studies), and agility/speed (three studies) were the other significant abilities evaluated in plyometric training interventions. The vertical jump (15 studies) was the predominant ability studied in these interventions. Additionally, it was shown that female athletes who were young (under 18) were the subjects of the most research. Plyometric training appears to improve volleyball players' vertical jump, strength, horizontal jump, flexibility, and agility/speed, according to the research that were reviewed. To fully comprehend the advantages of plyometric training on volleyball players' performance, more research is necessary.

Thattarauthodiyil et al. (2019) evaluated the effects of plyometric training and plyometric exercises combined with dynamic stretching on female student volleyball athletes' vertical jump height (VJH). 90 female volleyball players who ranged in age from 18 to 22 years old participated in this randomised controlled trial over the course of eight weeks. With 30 people in each group, the participants were divided into two experimental groups and one control group. Before beginning the exercise regimen, the Sargent Jump Test was used to evaluate the vertical jump performance of each participant. Up to the training program's conclusion, the performance of VJH was re-evaluated every two weeks. The findings of the current study demonstrated a significant improvement in VJH in both experimental groups at the conclusion of every two weeks. At the conclusion of the eighth week, VJH's greatest effect was seen. Both experimental groups' results were significantly better than those of the control group (P 0.05). But when compared to the experimental Group 1 group, the dynamic stretching with plyometric exercise group performed considerably better on the VJH (P 0.05). The findings of this study indicate that the most beneficial training regimen for female college volleyball players to improve their vertical jump performance is dynamic stretching combined with plyometric workouts.

Vivek and Sing (2019) determine the impact of plyometric training on volleyball players' explosive strength. Plyometrics is another name for training for jumps. It is a method of exercise intended to increase physical strength and explosiveness. Thirty athletes, ages 14 to 18, were chosen at random from the Spider Volleyball Club in Puducherry for this purpose. The chosen subjects were divided into experimental group A and control group B at random. There were 15 subjects in each group. Group B served as the control group while Group A underwent training for six weeks as the experimental group. Upper body and lower body explosive strength were the variables chosen for this investigation. A standing wide jump test was performed to assess lower body explosive strength while a 2 kg medicine ball throw was utilised to assess upper body explosive strength. The pre- and post-test findings were statistically processed using ANOVA. According to the study's findings, upper and lower body explosive strength significantly improved in the experimental group compared to the control group. The study aids in performance enhancement and volleyball skill development.

Cankaya (2018) will explore how plyometric jump training affects vertical jump as well as how these exercises relate to physical fitness and other distinguishing qualities in female volleyball players. 10 female volleyball players that were licenced and actively playing at Bursa Nova Sports Club in Turkey made up the study's sample. 6 training sessions total per week, 3 sets per training session, and 30 jumps per set equal 24 training sessions. It employed the Bosco test. The remaining 4 vertical jump measurement tests, including the test to determine the vertical jump measurements, were conducted on Sundays, one day before the plyometric experiments began. The Tanita Body determined the body's makeup. As a consequence, a statistically significant correlation between the vertical jumps, one of the defining traits of volleyball players, was found. It can be argued that the plyometric exercises performed on the volleyball players were beneficial and had an inversely proportionate relationship with body fat, the amount of fat in the body, and vertical jump.

Kong (2018) to investigate the effects of an 8-week unilateral and bilateral plyometric training programme on young female volleyball players' agility and jump performance. 62 female volleyball players from secondary schools were randomly assigned to one of three groups: the control group (CON), the unilateral plyometric training group (UP), and the bilateral plyometric training group (BP). In addition to their regular volleyball training, the subjects had 15 unilateral or bilateral plyometric training sessions over a period of 8 weeks for the UP and BP. The subjects merely practised regular volleyball drills for the CON. Before and after the intervention, all subjects took a pre-test and a post-test. The countermovement vertical jump, squat jump, five consecutive block jumps, standing long jump, and T agility test were used to evaluate jump ability and agility performance. The results were analysed using 2-way ANOVAs with repeated measurements (3 groups x 2 times). The results showed that after 8 weeks of unilateral and bilateral training, there were no differences ($p > 0.05$) in the performance of the CVJ (right leg and left leg), RBJ, SLJ, and T agility tests. The majority of performance outcomes can be improved with both unilateral and bilateral training, and neither programme is considerably superior to the other in terms of enhancing agility and jump performance.

Kumaran and Sheikh (2018) to ascertain the impact of plyometric training on college men's volleyball players' capacity to jump vertically. Twenty male students ($n = 20$)

ranging in age from 18 to 24 years old were chosen at random as subjects. The chosen subjects were divided into two equal groups at random, one for each of the ten (n = 10) strengths of the training group (TG) and the control group (CG). A twelve-week plyometric training schedule with three sessions per week on each day was completed by the experimental training group. In addition to their normal activities, the control group did not participate in any additional training. For the current study, the standing vertical jump was used to assess the criterion variable of vertical jumping ability. The gathered data were analysed using analysis of covariance (ANCOVA). The findings showed that the selected subjects' jumping performance significantly improved (p 0.05) after plyometric training. In every case, the degree of confidence was set at 0.05.

Ramlan et al. (2018) compared the impact of 4 weeks of plyometric training on volleyball players' ability to jump on a grass surface against a concrete surface. Squat jumps (SJ) and countermovement jumps (CMJ) were used to evaluate the vertical jump. According to the findings of this investigation, the 4-week intervention significantly improved SJ and CMJ in the post-test for both grass surfaces and concrete surfaces (p 0.05). However, there was no discernible difference between the grass surface and the concrete surface ($p > 0.05$). These results imply that plyometric training may have similar training-induced effects on the neuromuscular variables that are relevant to the effectiveness of the stretch-shortening cycle across a variety of surfaces.

Desta (2017) A case study involving male volleyball players from the Ethiopian Premier League was used to analyse some selected anthropometric characteristics and the impact of plyometric training on explosive jumping ability. Both experimental and control groups had baseline measurements taken, as well as measurements after six weeks of training. The effects of standalone and combined resistance and plyometric training activities have been demonstrated in several meta-analyses. To significantly alter body composition and metabolic markers, an experimental programme needed to run for at least 5 to 14 weeks. The same testing technique was used for both the experimental and control groups. 48 male volleyball players from clubs in the Ethiopian premier league were chosen as the study's sample; they ranged in age, weight, height, and body mass index (BMI). Two equal groups of subjects were randomly assigned, and a six-week training programme was administered to each group. Multiple variables were measured at the start of the experiment (pre-test) and at the conclusion of the trial after 6 weeks (post-test). The volleyball players trained for six weeks using a 120-minute training programme prior to the experimental group implementing their own training regimen. The main goal was to improve the participants' strength, speed, endurance, and jumping capacity. Finally, measurements were made when this training programme was over. Analysis of the differences between the pre-test and post-test data was done. All seven groups' average difference was calculated. Additionally, measurements of dispersion like the standard deviation and measures of central tendency like the mean were calculated. They employed t-tests for comparisons with significant differences. Finally after the pre-test and post-test of the variables the results shows that there are significant differences between pre-test and post-test of the experimental and control groups in Ethiopian premier league male volleyball players.

To ascertain the results of a 5-week plyometric training programme on female volleyball players, see **Kristicevic et al. (2016).** In this study (15), 54 female volleyball players took part. Height, standing-reach height, body mass, vertical jumps, and particular volleyball jumps were the tests chosen for standard anthropometry. On the pre-training exams, there were no significant differences for any variable between the experimental and control groups, indicating good matching between the two groups. In the plyometric group, a five-week training regimen was used. For squat jumps, there was a noticeable amount of interaction between the groups. SJ and CMJ significantly improved after plyometric training. However, in no vertical jump test did the control group demonstrate any appreciable improvements. In conclusion, young female volleyball players who completed a 5-week plyometric training programme performed better on specific vertical jump tests. Spike and block jumps did not significantly change after the plyometric training programme, though.

Conducted by **Stojanovic et al. (2016)** was to ascertain if plyometric training improved the vertical jump (VJ) performance of amateur, collegiate, and elite female athletes. There were six electronic databases looked up. The physiotherapy evidence database scale was used to rate each study's methodology. The inclusion criteria were met by a total of 16 studies. Plyometric training most likely had a moderate impact on countermovement jump (CMJ) height performance, according to the meta-analysis (ES = 1.09; 95% confidence interval [CI] 0.57-1.61; I2 = 75.60%). The performance of CMJ height was most likely very slightly impacted by plyometric training programmes lasting fewer than 10 weeks (ES = 0.58; 95% CI 0.25-0.91). But plyometric training that lasted longer than 10 weeks most likely had a significant impact on CMJ height (ES = 1.87; 95% CI 0.73-3.01). Concentric-only squat jump (SJ) height was likely only slightly affected by plyometric training (ES = 0.44; 95% CI 0.09 to 0.97). After 6 weeks of plyometric exercise, similar effects on SJ height were seen in young (ES = 0.49) and amateur (ES = 0.35) athletes, respectively. Plyometric exercise had a sizable effect on CMJ height with arm swing (ES = 1.31; 95% CI 0.04 to 2.65). The drop jump (DJ) height performance showed the strongest plyometric training effects (ES = 3.59; 95% CI 3.04 to 10.23).

According to **Johson (2015),** study is to determine how male volleyball players' body composition indices and other aspects of physical fitness are affected by sports-specific plyometric training. Thirty (30) male volleyball players from Telangana State Social Welfare Residential Junior College, Armoor, Nizamabad, Telangana, India, participated in the study to achieve its goals. These participants were divided into two groups of 15 each: the control group and the volleyball-specific plyometric training group. The following physical fitness elements were chosen as dependent variables for the current study: speed, agility, leg explosive power, standing vertical jump and reach with both hands, three stride vertical jump and reach with both hands, abdominal strength endurance, arm explosive power, and aerobic capacity. The volleyball-specific plyometric exercise that was given three times per week for a period of twelve weeks was chosen as the independent variable in the current study. While CONG remained inactive, the VSPTG received training. Before and after the twelve-week training period, physical fitness tests were administered to all of the subjects. An analysis of covariance (ANCOVA) was used to look at group differences, and a paired t test was used to determine changes within the group from pre to post at a significance level of 0.05. The results of this study show that after twelve weeks of volleyball-specific plyometric training, leg explosive power, standing vertical jump and reach with both hands, and three stride vertical jump and reach with both hands all considerably increased.

Pereira et al. (2015) Young female volleyball players from the high school were determine how an 8-week combined jump and ball throwing training programme affected their upper and lower extremity performance. The experimental group (n = 10) and the control group (n = 10) were each made up of ten young female volleyball players competing at the district level in Scholar Sport in High School. In addition to their regular volleyball practise, the experimental group also engaged in additional plyometric and ball-throwing drills. The control group only participated in their routine training session. With improvements ranging from 5.3% to 20.1% in strength performance, the experimental group significantly outperformed the control group (medicine ball and volleyball throwing: $P = 0.00$; counter movement jump: $P = 0.05$). The control group's strength performance did not vary significantly ($P > 0.05$). Conclusions: Young female volleyball players' physical performance can be greatly enhanced by an 8-week combined jump and ball throwing training programme. For all physical education instructors and volleyball coaches, these findings may be helpful.

Kesh (2014) study is to ascertain how plyometric training exercises affect volleyball players' ability to develop explosive leg strength. The study of whether the use of a plyometric programme has the same impact on the efficacy of explosive strength among volleyball-specific block jumps, spike jumps (in the case of both two-feet and single foot jumps), the depth jump, and the triple standing jump would be especially helpful for training. For the study, 22 male volleyball players from various coaching facilities were enlisted. The subjects ranged in age from 16 to 19 years old. They were split into the Speed Strength Training group and the Plyometric Training group, each of which received equal training. Consequently, each experimental group consisted of ten people. Bent-knee sit-ups, pull-ups, three-mile runs, and speed-strength tests such the 30-meter sprint, three-jump, and standing broad jump were chosen as a deeper variable for motor fitness. After a preliminary shooting ability test, the subjects in both groups will get eight weeks of plyometric and speed-strength training. The final tests on all the variables were administered once the eight-week period was complete, and the data was collected for analysis using various test items. The collected data were properly analysed using the statistical methods of mean, SD, correlation, and t-ratio. The study's findings showed that speed-strength training increased volleyball service velocity. The take-off height for spiking was successfully improved by the speed-strength training method. Plyometric training led to an improvement in the two-foot take-off height for volleyball players' spiking.

Kousi et al. (2014) investigate the impact of volleyball training on prepubescent boys' jumping performance as well as the efficient application of elastic energy throughout various jumps. Thirty (30) preadolescent males aged 9 to 11 made up the sample, of whom fifteen (15) participated in volleyball (VA) and fifteen (15) did not (NA). The best value for each type of jump was chosen and recorded. Each participant performed three squat jumps (SJ), countermovement jumps (CMJ), and drop jumps (DJ) from a height of 5 to 50 cm each 5 cm. With the use of the portable electronic Ergo jump, measurements were taken. Platform Bosco. The ANOVA method (repeated measures analysis of variance) 2x12 and 2x10 with Bonferroni correction was used for the statistical analysis. The findings showed that VA considerably outperformed NA in terms of jump height and flying time for all jump types (P 0.05). Regarding ground contact duration and power output, no variations between VA and NA were discovered (P0.05). Additionally, VA showed significantly higher jump height and flight time values in CMJ compared to DJ (P0.05), whereas NA showed the reverse pattern (p>.05). Overall, there were no discernible variations in contact time or power production between the different DJ heights among preadolescent males (P>0.05). In conclusion, jumping performance is enhanced by volleyball training. To offer a better performance in DJ compared to CMJ, all preadolescent males, including VB and NA, were unable to make the most of the stretch-shortening cycle.

Kumar (2014) attempted to pinpoint high-intensity plyometric training, anaerobic training, and cross-training modalities for enhancing volleyball players' motor fitness, physiological makeup, and skill factors. One hundred (N=100) male volleyball players who competed in intercollegiate and state tournaments in the 2012–2013 academic year were chosen as the study's subjects in order to achieve its goals. They were between the ages of 19 and 23. High-intensity plyometric training was performed by the experimental group I, anaerobic training by the experimental group II, cross training by the experimental group III, and control exercises by the experimental group IV. Agility, speed, explosive power, flexibility, co-ordination, resting heart rate, respiratory rate, VO2max, breath holding time, anaerobic power, set, attack, block, pass, and serve were chosen as the dependent variables from the motor fitness, physiological, and volleyball abilities aspects. Prior to and immediately after the training periods, selected dependent variables were assessed on all experimental groups. The 't' test and analysis of covariance (ANCOVA) were used to assess the acquired data to find differences. The

Scheffe's test was used as a post-hoc test to ascertain the paired mean differences whenever the 'F'-ratio for adjusted post-test mean was determined to be significant. For all situations, the level of significance was set at 0.05 level of confidence. The results showed that high-intensity plyometric training, anaerobic training, and cross-training programmes significantly improved the volleyball players' anaerobic power, resting pulse rate, respiratory rate, VO2max, flexibility, co-ordination, and various other motor fitness variables. Additionally, the results showed that the high-intensity plyometric training, anaerobic training, and cross-training programmes significantly enhanced the volleyball players' set, attack, block, pass, and serve ability characteristics.

Nageswaran (2014) the study was to determine how ladder and plyometric training affected certain biomotor characteristics in college-aged male students, including speed, explosive power, muscular strength, flexibility, balance, and agility. 45 college-aged men were randomly chosen from the SMK Fomra Institute of Technology in Chennai, Tamil Nadu, India, to participate in the study. Simple random sampling was used to assign the chosen individuals at random (n=15) to one of three groups: experimental group I, experimental group II, or control group. Groups I (n=15) and II (n=15) both conducted plyometric training for twelve weeks on three alternate days per week in addition to the regular programme, while group III (n=15) served as the control group. For this study, the following variables—Ladder Training Group, Plyometric Training Group, and Control Group—were chosen as independent factors and speed, explosive power, muscular strength, flexibility, balance, and agility as dependent variables. On the chosen dependent variables, each subject underwent testing two days before and right after the study period. The studies were conducted using a variety of statistical methods, including the dependent t-test, the one-way ANCOVA and the post hoc pair-wise comparison with the Scheffe's test analysis. According to study findings, plyometric and ladder training greatly enhanced athletes' speed, explosive power, muscular strength, flexibility, balance, and agility.

Plyometric VS. Pilates Exercises on the Muscular Ability and Components of Jumping in Volleyball Players by **Parekh et al. (2014).** Using a straightforward random sample approach, 30 people were chosen at random from the population and split into two equal groups. Plyomeric training was given to Group A, and Pilate instruction to Group B. Results were measured both before and after the program's three sessions, which were scheduled alternatively every week for six weeks. The height of the vertical jump, the block jump, the attack jump, and the Agility T test Results: In Groups B (Pilate) and A (Plyometric), To evaluate the statistical difference between the parameters at the 0.5% level of significance, the data was statistically analysed using paired 't' test and independent 't' test. All data were given as mean, SD. In this study, we found that both groups (A and B) improved volley ball players' vertical jump height, block jump, and attack jump through agility testing. However, we advise volleyball players to engage in plyomertic training.

Radu et al. (2014) Young volleyball players' levels of reactive force and specific lower limb power were evaluated. Three pre-tests including 15 female volunteers each included 15s jumps, 30s jumps, and a stiffness test carried out in accordance with the Bosco Protocol utilising the opt jump Next System. A post-test was used following a plyometric training course of 10 weeks. The flight times, contact times, height jumps, and power demonstrated considerably higher scores post-test for the 15s and 30s jumps tests when compared to the pre-test. For the stiffness test, no factors showed any signifcant differences. We come to the conclusion that a ten-week plyometric training regimen improves anaerobic power in terms of contact time, flight time, height jumps, and power jumps.

Young female non-elite volleyball players' maximum strength and jumping performance were compared before and after an in-season resistance training routine by **Augustsson (2013).** Ten female volleyball players, aged 19 (or 2), participated in a 26-week in-season resistance training programme. The players' lower-extremity maximal strength was assessed using the 1-rep max squat test, and their functional performance and power were evaluated using the vertical jump (VJ) test. The squat test showed a significant improvement of 69% (p=0.005) and the VJ test showed a significant improvement of 9% (p=0.008). The VJ test and the 1 RM squat test had a very strong significant correlation (r=0.68, r 2 =0.47, p=0.0014) both before and after the test (r=0.88, r 2 =0.77, p=0.001). The difference found between the squat tests and VJ tests' coefficients of correlation (r=0.68 and r=0.88) was significant (p0.001). Additionally, there was a good correlation between the 1RM squat and the VJ test and body weight at both the pre- and post-tests (r=0.89, r 2 =0.79, p=0.001) (p0.001). This study shows that among young female volleyball players, maximum squat strength is a significant predictor of jumping height. Therefore, female volleyball players may think about concentrating on strength training to enhance their jumping ability.

Karver (2012) uses volleyball players to study the effects of plyometrics on two distinct types of surfaces. The study carefully contrasted sand and ground. Twenty-one volunteers signed up for the study, and two training groups were created for them. There were groups for both ground plyometric training and sand plyometric training. For six weeks, the participants worked out twice a week. Both a pre-test and a post-test vertical jump height test using a vertex measuring device were completed by each participant. In general, both the ground group and the sand group increased their vertical jump heights. The investigation revealed that when it came to raising their vertical jump height, there were no appreciable differences between the ground group and the sand group. The study's findings suggest that volleyball players can benefit from plyometric training on the ground and on the sand. Both the ground group and the sand group improved their vertical jump heights, enabling them to compete at a higher level in the game.

Vassil and Bazanovk (2012) sought to determine the effectiveness of a planned plyometric training programme on the force capacities of young volleyball players during their regular training session. In a 16-week period, a plyometric training programme was used with twenty-one young volleyball players, ages 12 to 19, in attendance. Nine male and twelve female volleyball players were present. Three control tests were conducted. All subjects took part in the following tests: the standing long jump, the depth jump long jump, the maximal vertical jump height, the maximal vertical jump height in 10 seconds, and the medicine ball tosses up and overhead against the wall in 10 seconds. Based on test findings and statistical analysis, athletes' legs and arms can reliably improve their speed. The results of the standing long jump, depth jump long jump, and maximal vertical jump height tests, which demonstrated the explosive power of the legs, did not provide a discernible difference ($P>0.05$). The maximum vertical jumps made in 10 seconds and medicine ball tosses, which demonstrate speed and force improvement, differed significantly (P 0.01).

Makaruk et al. (2010) to investigate how extra loading during drop jump training affects power. 42 untrained physical education students who had prior plyometric training experience took part in a six-week training programme that met three times per week. Three training groups were assigned randomly to the subjects: a control group (CON), one with and one without a weight vest (VEST; 5% body weight). Concentric peak power (PP), force (FPP), and velocity (VPP) at peak power, as well as time between eccentric and concentric peak power (TPPEC), were measured before and after training in countermovement jumps (CMJ) and drop jumps (DJ) from a height of 0.3 metres. The PP in CMJ was significantly improved by the FREE and VEST groups (p 0.05), but only in the FREE group did VPP significantly rise (p 0.05) and TPPEC significantly fall (p 0.05). Only the FREE group in DJ demonstrated the improvement of PP and VPP. TPPEC in DJ was considerably lowered (p 0.05) in the FREE group and significantly raised (p 0.05) in the VEST group. It may be inferred that, as compared to a conventional drop jump training programme, utilising more load during drop jump training does not result in superior gains in power output.

In a study, **Abass (2009)** compared the effects of three different types of plyometric training on the strength of the leg muscles in 40 untrained male university students between the ages of 18 and 27. They were split up into four groups of one volunteer each at random. The depth jumping, rebound jumping, and horizontal jumping exercises were performed by three of these groups as the experimental groups, and the fourth group functioned as the control group. The experimental groups underwent various plyometric training regimens throughout the course of twelve weeks. To ascertain whether or whether there was a significant mean difference between groups, analysis of covariance statistics was used. Only depth jumping and rebound jumping training, according to the results, significantly affected the subjects' leg muscular strength.

According to **Carlson et al. (2009),** the goal of the current study was to assess the effects of weight training, weight training combined with plyometrics, and weight training combined with the VertiMax® on vertical jump. 37 collegiate athletes were used as the subjects, and they were divided into four training groups: strength (S), strength-plyometric (P), strength-VertiMax® without arms (VNA), and strength-VertiMax® with arms (VA). Every group finished a six-week training course. Within all groups, there were no statistically significant improvements in pre-post vertical jump. Between the four training groups, there were no discernible variations in the vertical jump at the post-test. All groups' pre- and post-test effect sizes were quite small. The results of this study show that throughout a 6-week period, strength training, plyometric training, and jump training had no different effects on vertical jump.

Lehnert et al. (2009) evaluated changes in observed speed and explosive power predispositions both during and after the training programme. They also validated a plyometric training programme. A group of 11 female youth volleyball players (n) was subjected to the programme twice weekly for a total of eight weeks. Prior to, during, and following the intervention, their real degree of locomotor and explosive speed was assessed. The tests used to determine the levels were the 6 6 m shuttle run, the vertical jump when standing, and the vertical jump while approaching. During the testing period, test scores' average values showed positive gains, but the dynamics of the changes in explosive power and speed were distinct. When the final measurements were taken six weeks following the training program's conclusion, there were additional gains in every trait. Examining the variations in test results between the follow-up group before and six weeks after the intervention's conclusion focused on objectively and statistically significant alterations in the motor predispositions of the volleyball players (p .05. The program's outcomes are consistent with the idea that plyometric exercises are useful techniques for helping young athletes enhance their explosive power and speed.

We examined the impacts of a six-week plyometric training programme during the second half of the preliminary phase of the annual training cycle in **Milic et al. (2008)** to ascertain the effects of plyometric training on the explosive strength of cadet volleyball players. 46 individuals, all 16 years old (6 months), made up the sample. There were 23 volleyball players in the experimental group, with an average height and weight of 186.35 and 70.57, respectively. The control group was made up of 23 high school kids who had not been exposed to the plyometric approach as part of their physical education lessons. They had average body weights of 68.91 and 6.48 and heights of 177.35 and 4.80 respectively. Eight tests of explosive leg strength made up the sample of measuring devices: the standing depth jump, the standing triple jump, the two-foot take-off block jump, the right foot take-off block jump, the left foot take-off block jump, the two-foot take-off spike jump, and the standing take-off spike jump. We were able to establish a statistically significant difference in explosive strength in favour of the experimental group using both a multivariate and univariate statistical method. For the two-foot and one-foot take-off jumps, we saw an increase in explosive strength.

Studied by **Tipsword (2006)** the impact of a five-week plyometric training programme and two-week recuperation period on high school female volleyball players was Utilising a single group, a pre-experimental study design was carried out. design of the pre-post test in which each subject underwent the same instruction. In this study, participants underwent five weeks of training, including two days of plyometrics and one day of weight training. Following a two-week period of recovery, the individuals were instructed not to engage in any plyometric exercises. The individuals' vertical jump heights were calculated using a vertex and an established plyometric programme during training. Between the two testing sessions, from the pre-test to the post-test, a significant improvement was noted. The vertical jump heights also went up more between the post-test and follow-up test to draw the conclusion that plyometric exercise and recuperation do significantly affect high school volleyball players' vertical jump heights.

Nair (2005) study was to determine the combined effect of anthropometric factors and motor ability components on the spike jump and three different block jump variations. Thirty male volleyball players between the ages of 18 and 21 who participated in the 2003 Under 19 Boys World Championship in Tailand served as the study's participants. They attended the Indian National Coaching Camp as part of their preparation. The dependent variables chosen for this study were spike jump, block jump from a static posture, block jump after stepping, and block jump after cross stepping. Right knee extension strength and the performance of the block jump from a static posture were shown to be substantially connected by multiple correlations, which were computed to determine the combined contribution offset of independent factors. The study's findings show that volleyball players' block jumps from a standing position, after side stepping, and after cross stepping are positively correlated with speed.

Michal (1985) looked at 45 boys who were chosen at random to compare the effects of a depth jump and a jump squat on their ability to jump vertically. Three times per week for eight weeks, training was provided. He discovered that the depth jumps and jump squat increased his ability to jump vertically because the box was three feet high. Additionally, he discovered that depth jumps are more demanding than jump squats. The depth jump group has performed better.