Chapter II

REVIEW OF THE RELATED LITERATURE

The scholar made a sincere effort to locate literature related to this study. The relevant studies gained from various sources are arranged year-wise in descending order and enumerated below:

Keith\(^1\) took thirty untrained college males participated in a 10 week study comparing the effects of three different types of training on 800 meter run performances. All subjects were engaged in 20-30 minutes of endurance running three times a week. In addition to the endurance running, subjects participated in either hill training, sprint training, or weight training three days a week. The hill training consisted of repeated 30 second sprints.

up an 8% graded hill. Sprint training included distance ranging from 50 to 300 metres with 2-3 minutes recovery periods between sprints. The weight training included cleans, squats, calf-raises, leg-extension and leg curls. Each exercise was performed in 3 sets of 8-10 R.M.

Only the hill and sprint groups showed significant differences between pretest and post test 800 meter run performance. It was concluded that concurrent weight on endurance training, is not an effective way to improve 800 meter run performance of untrained subjects.

Groups comparison revealed that both hill and sprint training resulted in significantly greater changes than weight training \((P < .02)\).

Sprint training significantly improved leg flexion torque at slow and fast speeds. ANCOVA results, however failed to establish significant differences between training groups on the adjusted post test isokinetic strength measures.
Hill and sprint training resulted in nearly identical changes in the parameters tested. It was concluded that they are effective training methods for improving 800 meter run performances in untrained subjects. Endurance capacity, anaerobic capacity and percent body fat were significant singular co-related to 300 meter run performance ($P < .01$).

Mazumder\textsuperscript{2} studied the changes in motor fitness component and playing ability resulting among soccer players at two stages of physical education and conditioning programme.

He concluded that: (i) during the first stage of physical education and conditioning programme speed, maximum leg strength, agility and playing ability were improved, (ii) during second stage only maximum leg strength and agility improved significantly, (iii) the break in between the stages of training diminishes

\textsuperscript{2} Shymal Mazumder, "Changes in Motor Fitness Components and Playing Ability Resulting Among Soccer Players at Two Stages of Physical Education and Conditioning Programme" (Unpublished Master's Thesis, Jiwaji University, 1986).
the improvement of playing ability, maximum leg strength and agility. The speed was unaffected, (iv) the total years of physical education and conditioning programme was proved to be of value in improving motor fitness component and playing ability.

The purpose of Amusa and Sohi's study was to examine the changes in muscular strength, muscular endurance, muscular power, speed, agility, cardio-respiratory endurance and body composition in college age soccer players following a twenty weeks training. The study concluded that all the muscular capacities, speed, agility and cardio-respiratory endurance improved significantly, whereas a reduction in fat percentage was also seen.

Peter's study was designed to determine the effectiveness of muscular strength and power development using the external pulley system and free weight training method with slow and fast speed of training. Twenty five high school boys and seven girls were randomly assigned to four groups receiving three training seasons per week over a seven week period. Each subject was tested for strength and power before and after training programme. Analysis of co-variance indicated that fast rate of training produced greater improvements in knee extensive strength (P<0.05) and a fast rate training produced the best gain in vertical jump performance (P<0.05).

Spielman has conducted this study on the influence of isotonic and isokinetic weight

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training on vertical jumping proficiency. College males (N=28) were Ss in a study to investigate this. Isotonic and isokinetic training were assigned to the two exp. groups with the third group serving as control. Training for the exp. groups consisted of isotonic circuit training on a universal weight machine and isokinetic training on a leaper machine. Data analysis included a reliability and reproductibility assessment and ANOVA to determine whether sig. mean changes had occurred between the groups. Tukey's W-procedure was used to identify the source of sig. (P.05) difference from those of the controls. Although there was no significant difference between mean performances of the 2 groups, the isokinetic group experienced a higher level of improvement (8.7 percent, 7.3 percent).

Young compared the effect of an experimental programme of physical education to the

present curriculum of physical education on the physical fitness of the kern H.S. District. Pre and post tests were administered to 213 boys and girls in 1.5 mile run for aerobic endurance, in 440 yards run for anaerobic endurance in sit-up tests for strength and sit up and reach test for flexibility. Comparisons between treatments were no significant difference between treatments for any of the five tests.

Mc Namara's study was designed to compare the effects of three physical fitness training programmes on selected psychological and somatic (body composition, posture, flexibility, muscular strength, muscular endurance and cardiovascular endurance) variables on both males and females. Three treatments (Army Readiness, Calisthenics and Weight Training) were administered for ten weeks. Statistical analysis of data indicated that physical fitness training enhanced

all the somatic variables irrespective of training programme.

Mendez investigated the relative effectiveness of two training programme i.e., progressive resistance exercise and sprint training in the improvement of sprinting velocity was determined. Two random groups of subjects (N=31) were formed:— group I (N=16) participated in a weight training programme using the universal real runner a pressive resistance exercise machine while group II (N=15) participated in sprint training programme. Subject were pre and post tested on the 60 yards dash, each time allowing one practice run by each student. The duration of the experiment was seven weeks, which included 20 periods of exercise. ANCOVA was used to determine significance of differences between the two groups (P.05). No significant differences were detected between the weight training and sprint training programmes. Both

training programmes showed small but non-significant decreases in mean times for sprinting 60 yards.

Lawman\(^9\) investigated the effect of toe-training on the development of certain bio-mechanical factors of sprinting speed i.e., stride length, stride frequency and dynamic range of motion of the femoral shaft. All subjects (N=25) were devided randomly into experimental group and control group. Training programme was established thrice a week for a six week periods. After six weeks post-test conducted for investigation showed that (i) subjects who were engaged in toe training significantly increased speed, (ii) control group did not significantly increase in speed and the only identified variables which showed a significant positive change was flexion of the femoral shaft, (iii) total sample (N=25) significantly increased in speed, dynamic range of motion and femoral flexion.

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Calloway\textsuperscript{10} conducted a study on coaches who lead athletes away from weight training either have limited knowledge of muscle development or will not take the time to understand strength and its relationship to sports.

The more powerful an athlete is the more successful, he or she will be in a given skill practicing sports is not enough. In order to gain extra power an athlete must work with an over load.

In order to have a successful weight lifting programme the single most important factor is the coach. He can have the most sophisticated weight equipments in the world but if he does not direct the programme from start to finish it will disintegrate.

\textsuperscript{10} Bill Calloway, "Weight Conditioning for Athletes" \textit{Athletic Journal} 57 (October 1976): 50.
Thomas conducted a study for ten weeks on the effects of a programme of progressive resistance exercise on strength, muscle girth and body composition. Fifty two college women participated in the study 20 serving as control group and 32 participated in progressive resistance exercises on the universal gym. weight training apparatus. The result of the study revealed significant increases in strength within the experimental group on six of the eight strength tests, no significant increase in strength within the control group with the exception of the test for knee flexion, and significant increases for the experimental group over the control group in the elbow flexion, knee extension and shoulder horizontal adduction strength test.

Helixon studied the effect of a heavy resistance training programme upon running and jumping performance of first year high school trackmen. Twenty four subjects were randomly assigned either to an experimental group which engaged in weight training five days a week for six week or to a control group which engaged in no weight training. Result showed no significant difference between the experimental and control group at the conclusion of the experiment.

Mayers examined and compared the effect of training highly conditioned varsity soccer players on running circuits of 1.86 degree down-hill and zero degree during a competitive season. The specific questions with which this


study was concerned were the effects of down-hill and level circuits on a varsity soccer players' maximum running speed, stride length, stride frequency and leg strength. After a five weeks of training the study concluded that:

1. The down-hill methods of training significantly improved the stride length of the varsity soccer players.

2. The down-hill method of training can be effectively used as a supplementary sprint training method.

3. The down-hill methods of training did not significantly increase running speed and stride frequency.

Sorenson\textsuperscript{14} conducted a study to compare the effects of conventional high repetitions

and modified high repetition weight training programmes on strength and cardio-vascular endurance. Fifty four male students were randomly divided into three groups. Group-A followed a conventional weight training programme and served as a control group. Group-B followed a modified high repetition weight training programme. Group-C followed a high repetition weight training programme. No significant difference were found among or within groups except for bench press, where Group-A and B were superior to Group-C and dead lift, where Group-A was superior to Group-C.

Bolt selected 71 volunteers and randomly assigned them to one of the two jogging regimen e.g. slow jog regimen and fast jog regimen and the third (non jog) continued their sedentary habits. The subjects trained thrice a week for twelve weeks.

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weeks. It was concluded that slow jog regimen and fast jog regimen of training significantly improved cardio-vascular fitness.

16 Wilcox compared the vertical leg press method of developing leg strength with a method utilizing bench squats on selected college male students. The subjects were pretested and post-tested for (1) total leg strength, (2) vertical jumping, (3) planter flexion (4) knee extension, (5) hip extension and (6) hip flexion. The experimental period consist of eight weeks or sixteen classes meeting. In conclusion the data seemed to indicate that a vertical leg press method may have produced significant improvement in total leg strength and vertical jump over the method of utilizing bench squat. The result seemed to indicate that there neither a vertical leg press nor a bench squat method will develop the leg strength over a short period of time.

Panny investigated the effects of resistance running on speed, strength, power, muscular endurance and agility. The training programme consisted of four forty minutes season per week for six weeks.

Result indicated that:

1. A training programme of resistance running alone or supplemented by weight training, iso-metric contraction, and repetitive sprinting would significantly increase speed, leg strength, leg power, muscular endurance and agility.

2. Resistance running supplemented by isotonic leg exercises, isometric contraction and repetitive sprinting will not improve standing broad jump ability as significantly as speed, leg strength, muscular endurance and agility.

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3. Orthogonal comparison revealed upward trends in improvement of all variables during the six week training programme.

Edward conducted a study on the effect of circuit training, weight training and interval training on circulo-respiratory endurance. Fifty one college males from development physical education classes at the university of Mexico were randomly assigned to one of the three exercises programme. The subjects trained for a ten week period at their respective exercises programmes. Pre-test and post-test measures of circulo-respiratory endurance were administered under some experimental conditions. The analysis of variance showed no significant differences between the three exercises programme in the measure of circulo-respiratory endurance.

Corbett compared the exercises frequency after an equal length of time and after an equal number of training session. S.H.S. boys (N=28) were assigned to one of four groups, three of which were experimental and one control, one of the experimental groups trained twice a day five days/weeks, a second once a day five days/weeks; the third three times/week. All the three groups used the same basic isotonic programme to exercise the upper arm muscles. After 6 weeks of training of the experimental groups displayed significant increases in isotonic strength. However no significant difference between any of the experimental groups emerged when compared after an equal length of training time, nor when the experimental groups were compared after an equal number of training periods.

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Hansen conducted a study on the effect of three selected weight training programmes on muscular strength endurance, girth and cardiovascular endurance. He took thirty freshman and varsity football players from the 1963 South Dakota State University Football Teams were randomly divided into 3 groups. One group used a modification of the Delorme-Wetkins Method of training, the second group followed the traditional strength training method, while the third followed a circuit training programme. Training covered a period of 7 weeks, 3 times a week. Test for muscular strength, endurance and girth were administered before the programme began, at the end of 3 weeks of training, and at the conclusion of training programme. All groups significantly improved on all the parameters and there was no significant difference between the groups.

Ommen \(^{21}\) studied the effectiveness of explosive running in addition to weight training as measured by leg-strength, reaction and performance times of football players in off session training programme. Subjects in the control and experimental groups participated in an eight weeks weight training programme and in addition, the experimental group experienced an explosive running programme. Pre and post tests for reaction and performance times in the 10 yds. agility run, 20 yds. sprint and leg strength were administered. Weight training and explosive running did not improve reaction and performance time of the football players. The weight training programme significantly improved leg and foot extension.

Tressel \(^{22}\) notified the effects of selected


resistance exercise programme upon muscular strength and speed. The training devices used were: correct O-Sizer, Exer-Genic and Weight Training. Male college student (N=120) were assigned to four groups with the groups assigned to three treatment groups, plus one control group assigned by random techniques. An initial and final test was administered. Larson muscular strength test was used as the measure of dynamic strength. McCloy strength test for boys was used to determine static strength and an electric timer was used to measure speed. The result of the study disclosed the treatments were equally effective in improving dynamic and static strength.

All three experimental groups improved significantly as compared to the control in all the individual dynamic strength measures and in the majority of the individual strength measures.
Rogers conducted a study to determine the effect of weight of football uniforms on speed and agility. The uniforms were classed as heavy (18 1/2 lbs), medium (16 3/16 lbs) and light (14 1/2 lbs). The subjects performed two speed runs and two agility run with the uniform and without a uniform. The selected football uniforms had an effect on the speed and agility of the subjects. Almost all groups comparisons as the uniform weight decreased, speed and agility performances were faster. The strength index of the players had a significant effect on speed but did not effect agility.

Hamak conducted a study to determine the effect of a selected progressive resistance

Wm Dudley Rogers, "A Study to Determine the Effect of the Weight of Football Uniforms on Speed and Agility" Completed Research in Health, Physical Education and Recreation 10 (1968): 111.

running programme on free running speed, circulo-respiratory efficiency and power. Male subjects (N=45) were divided into three equated groups: interval running, resistance running (employing an Exer-Genic) and control.

The effects of a six week training programme were determined by a pre-test, initial post test and final post test for free running speed, power developed by the legs, oxygen debt repaired and elapsed time for a 600 yard run. Significant improvement was found in oxygen debt repair (.05 level) and elapsed time for a 600 yard run (.01 level) between the interval and control group.

Delok 25 studied the effects of specific resistance programme on strength and speed of a specific motor movement in the discus throw and freshmen non-athletes (N=30) were randomly designed into three groups on the

basis of arm strength, test score: an experimental
group with weight training, an experimental
group with specific resistance (exergenic)
and a control group. The training period was
six weeks with pre and post test administered.
Strength of angular horizontal abduction flexion
arm movement, strength of combined leg extension
and hip movement and speed of a specific motor
movement of discus throwing were investigated.
Application of the analysis of variance and
Duncan's new multiple range test to the data
indicated that the specific resistance training
programme was more effective than weight training
in developing strength. Neither of the programmes
appeared to be effective in increasing a specific
motor movement of the discus throw (speed).

Kusintz conducted a study on the
effects of progressive weight training upon
running speed and circulo-respiratory endurance.

Ivan Kusintz, "A Study of the Effects
of Progressive Weight Training Upon Running
Speed and Circulo-respiratory Endurance" Completed
Research in Health, Physical Education and
The dependent variables of running speed and endurance were measured before and after a 12 week training period as follows: speed: - 50 yard dash, endurance: McCloy endurance quotient and the 300 yards run and muscular strength: the McCloy strength index revision. The experimental group practised progressive weight training and running while the control group practised only running. The data were subjected to analysis of variance, two-way factorial analysis of variance and pearson's product moment correlation. The conclusions were: progressive weight training and running are more effective than running only in developing running speed and endurance as measured by the 300 yards run: and individuals who began training with initial low strength do not make greater gains in the dependent variables than those with initial high strength.

Les\textsuperscript{27} studied the effect of three selected

training programmes on running speed. An initial test and re-test measuring running speed for 30 yards were administered to three experimental groups and one control group. Following the initial test, the experimental group received a particular running programme including repetition sprinting, interpressed sprinting and stair running in addition to a standard weight training programme. The control group received only weight training in each class period. The 30 yards dash test was re-administered after eight weeks of training. All groups improved significantly with no difference were noted among different groups.

Charles 28 conducted a study on the effect of selected explosive weight training exercises upon leg strength, free running speed

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and explosive power. He took an experimental group of 20 fresh male volunteers who were selected randomly from transpoline and hand ball classes. The experimental group went for a 5 week explosive weight training programme with four session per week and three circuits of the exercise per session. The groups were tested before and after the programme. The experimental group made significantly greater improvement in leg strength, but not in running speed or explosive power.

Kennison and James\(^2^9\) made a study on the effects of four training programmes on the acquisition of speed and accuracy in motor performance. One group practised with a regulation basketball another group with regulation ball and had supplemental isometric exercise, the third used the weighted ball plus isometric

\(^{29}\) Kennison and E. James, "The Effect of Four Training Programmes on the Acquisition of Speed and Accuracy in Motor Performances" Completed Research in Health, Physical Education and Recreation 9 (1967): 59.
exercises. After a present and final list researcher concluded that shooting accuracy improved significantly for the two groups using the regulation ball but not the two groups using the weighted ball rather than the isometric exercises interaction. No significant gains were made in passing accuracy.

In a study Hess\textsuperscript{30} randomly divided the soccer team members (17) into a control group and an experimental group that used progressive resistance exercises to develop hip flexion and knee extension strength for 7 weeks. All subjects were proficient in kicking a stationary ball with the instep. All subjects had pre-post test for kicking distance (average of 5 longest of 20 kicks) and leg strength (sum of the hip flexion and knee extension strength).

Analysis of co-variance showed that

the experimental group improved significantly more in kicking distance at the 0.01 level. The "t" ratio showed a significant increase in leg strength at the 0.01 level for the experimental group but not for the control group.

Jaimitra took fifty four randomly selected male subjects to determine the effects of selected exercises on the physical fitness of secondary adults. The subjects were divided into two groups. One experimental group and other control. Experimental group was subjected to a training programme in selected exercises for six weeks. The study concluded that there was significant gains in mean of experimental group in abdominal and leg power and decreased in resting pulse rate.

Dintiman conducted a study on effect


of various training programme on running speed. The main purpose of the study was to determine whether a flexibility training programme and a weight training programme would effect running speed when used as supplements to the conventional method of training sprinters.

One hundred and forty five subjects, randomly assigned to one of five training groups, were tested for flexibility, leg strength, the running speed before and after an eight week training period. Results showed that both weight training and flexibility training as supplements to sprint training significantly increased running speed as compared to an unsupplemented sprint training programme.

In a study Buck compared two programmes of weight training in regard to their effects

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upon the development of muscular strength and endurance. Forty-nine male college students were tested before and after seven weeks of weight training on eleven calisthenics and barbell exercises requiring muscular strength and endurance. Upper arm girth measurement were taken with elbow flexed forcefully. Subjects were assigned randomly to a weight group (25) training with heavy weight and few repetitions and a Rap Group (24) using lifting weight and more repetitions. Both groups made substantial gains in each test. The weight group had greater average in seven of the twelve tests with three significant, beyond the 0.02 level of confidence. The Rap Group was significantly superior in none of the tests.

Brown conducted the study on the effect of circuit training on the physical

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fitness on grade 5 girls. Two classes were tested on the AAHPER fitness test before and after eight weeks of regular physical education classes. The experimental class, chosen by chance, had a supplemental 10 minute circuit training programme before each class. Both classes showed significant gains in total score. The experimental group showed significant gain on all tests except the 50 yard dash. The control group showed significant gain on all tests except the pull-ups (modified) and 50 yards dash. The mean difference between groups were not significant, but the experimental class made greater gain except in the shuttle run. The supplemental circuit training produced generally better but not significantly better result than the regular programme.

Hooks has pointed out that weight training can improve strength and speed simult-

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taneously. He suggested that weight training programme that over loads the muscle with enough weight to ensure strength gains, and at the same time, enables the muscle to contract successfully with a burst of speed, will produce increased strength and speed.

Berney and Bangerter selected eight male subjects of college age for the comparison of three programmes of progressive resistance exercises. The subjects were divided into three groups and each group used a specific variation of progressive resistance exercises for an eight week period. Initial and final measurements of muscular circumferences and strength were taken. Data were statistically treated by analysis of variance. All the three methods show significant strength gain that were not significantly different from each other, while there was no significance

in muscular circumference.

Joe selected 40 junior high school boys participating in a weight training programme, two days a week for six months. Seventeen boys served as a control group. The test items consisted of the junior Amature Athletic Union physical fitness test, anthropometric measurements the california test for personality. The experimental group registered a significant difference at the .05 level of confidence, over the control group in anthropometric measurements and the five out of six physical fitness test items, while no significant improvement was found in personality test.

Davis attempted to analyse the effects

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38 Jack F. Davis, "Effects of Training and Conditioning for Middle Distance Swimming Upon Various Physical Measures" Research Quarterly 30 (December 1959).
of training and conditioning for the 200 yard crawl stroke events upon the physical condition of non-varsity swimmers. Selected measures of Cardio-vascular condition, general physical fitness, gross strength, motor fitness, strength of the muscle groups primarily utilized in swimming the crawl stroke, and the strength decrements of the muscles were taken before and after the experimental period in order to evaluate the effects of this period. In addition, the relationship between speed in swimming the 200 yards crawl stroke event and the various selected tests were studied. As a result of the training and conditioning programmes, scores on test batteries used to measure physical fitness, motor fitness and gross strength improved significantly. No significant difference was obtained for cardio-vascular condition. Further no co-efficient of correlation was obtained that was sufficiently high to be of value for prediction of swimming time.
selected IOWA Motor Fitness Test and the AAHPER Youth Fitness Test to determine the changes in physical fitness of junior and senior girls, after two semesters of physical education and after a period with no formal physical education. Significant gains occurred in abdominal strength, explosive power, coordination, flexibility and speed during the semesters of physical education but significant loss in physical fitness was noticed following the period of non-participation.

Chui carried out a study on the effect of systematic weight training on athletic power. He conducted his study with 50 subjects divided into two groups namely Group-A 23 subjects and Group-B 22. Subjects of Group-A increased the amount of potential power through systemic weight training exercises whereas Group-B did not show much consistent increase.

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40 Edward Chui, "The Effect of Systematic Weight Training on Athletic Power" *Research Quarterly* 21 (October 1950): 188.