REVIEW OF RELATED LITERATURE

Research scholar has made sincere efforts to locate both critical and allied literature pertaining to the present study. Relevant studies reviewed from various sources have been cited below.

Wilcox\textsuperscript{1} conducted a study on comparison of two weight training methods designed to develop leg strength. The purpose of this study was to compare a vertical leg press method of developing by strength with a method utilizing bench squats, on selected college men students.

The subjects were divided in to two groups, Groups I utilized a vertical leg press machine and Group II used bench squats. Each group met twice a week for 50 minutes over a ten-week period. The pre test and post test mean difference between groups different significantly favouring Group I, on the vertical leg press method with a respect to total leg strength and vertical jumping. The improvement of group I was statistically significant at or beyond the 0.01 level of confidence. Vertical leg press method of developing strength produced significant improvements in total leg strength and vertical jumping or a method utilizing bench squats.

Paish\textsuperscript{2} has expressed that running upon short slopes, sand hills,

\textsuperscript{1}Ronald jack Wilcox, “A Comparison of Two Weight Training Methods Designed to Develop Leg Strength,” Dissertation Abstracts International 32 (October 1971): 1908.
\textsuperscript{2}Will paish, “Sprinting speed.” Track technique 56 (June 1974): 1797.
harness running, weight training etc. All of which will have the beneficial effect to the sprinters. By adopting a well-balanced training programme including assisted speed activities, sprinting activities, specific strength training and pure strength training improved performance will result. Harness running is likely to be more beneficial to the sprinters.

Ecker\(^3\) expressed that speed is the product of two factors, stride length and stride frequency. Increasing either factor (without an offsetting decrease in the other factor) automatically increase a runner’s sprinting speed. From training standpoint, it appears that the stride length is more important of the two factors. Stride length can be increased by increasing the leg strength. Stride frequency, however, is largely an in born characteristic. Although it might be possible to improve stride frequency slightly through training, it appears that this improvement also brings about a corresponding shortening of stride length.

Capen\(^4\) in his study to determine the effects of four methods of weight training on strength, utilized eight groups of university freshmen. He concluded that those methods, which employ heavy weight so as to allow a maximum number of five executions, are probably superior methods for the development of the muscular strength.


Turpin\(^5\) studied the effects of the frequency of running speed in junior high school girls. Three seventh grade and three eight classes were pre-tested on the 50 yard dash. One class each from each grade level ran once a week, three times a week and five times a week. All the six classes were re-tested after eight week. No significant difference was found among the group on 50-yard test.

Englebrecht\(^6\) senior athletic coach of Great Britain pointed out that Soviet sprinters are increasingly pacing more emphasis on exercises of ballistic nature with medicine ball as means of gaining explosive strength and coordination and so improving speed.

Westcott\(^7\) carried out a study on female response to weight training. The purpose of this study was to compare the effects of three different systems on strength development in female subjects of different ages. The subjects were 14 females ranging from 18 years to 27 years of age. The results of this study demonstrate that girls and women who engage in systematic weight training can increase their muscular strength. Finally, the positive response to strength training exhibited by the pre adolescent group should not go un-noticed. Strength training can be safe, enjoyable, and physically rewarding activity for girls. For others, the strength gains may provide a degree of confidence and a basis for further athletic achievement.

\(^6\)Rita Englebrecht, "Use of Medicine Ball in Sprint Training Exercises," Track Technique, 97 (Fall 1987): 3088.
Les\(^8\) studied the effect of three selected training programmes on running speed. An initial test and re-test measuring running speed for thirty 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, interspersed sprinting and stair running in addition to a standard weight training programme. The controlled group received only weight training in each class period. The thirty-yard dash test was re-administered after eight week of training. All groups improved significantly with no differences were noted among different groups.

Richardson\(^9\) selected 280 high school physical education males to investigate the effect of frequency and intensity of various training schedules on running performances. Three days per week practice schedules was found to be as effective as five days per week practice schedule for improving speed performance of the subjects.

Sweeting\(^{10}\) conducted study on the effects of various running and weight training programmes on sprinting speed. Running, weight training, combined weight training and no training were given to 100 college men for 30 yards. Analysis of various showed that a systematic running programme increases sprinting speed.


significantly more than weight training or no training, with equal total training time, running alone was as effective as running plus weight training and weight training alone was not better than no training.

Gregory\textsuperscript{11} conducted a study on analysis of the comparative effects of down hill versus level training circuits on the running speed, stride length, stride frequency and leg strength. The subjects of the study were varsity soccer players. Two groups of subjects numbering nine each were randomly assigned for the study. The treatment period lasted five weeks during which the subjects ran fifteen to forty yard sprint at the beginning of each practice session. Pre and posttests were conducted. The findings of the study were as follows. The down hill method of training significantly improved the stride length. But down hill method of training did not significantly increase in running, speed, stride frequency and leg strength though some improvements were observed.

Barnes\textsuperscript{12} studied the effect of weight training on speed in 100-yard dash. Two groups of nine boys were acquated initially on 100 yards dash time. One group had 14 weeks of physical education with basketball, tumbling, volleyball, didge ball and the other group spent on equal time in progressive weight training with three sets of eight repetitions in half squats, curls and full knee bents. Both groups ran two 100 yards dashes for three per week, fifteen


\textsuperscript{12} Richard Barnes, “The effects of weight training on speed in the 100 yards,” Completed Research in Health, Physical Education and Recreation 6 (1964) : 60.
minutes rest between. The main gain of physical education group was from 13.3 to 13.1 sec. and the mean gain of weight training group was 13.4 to 12.7 sec.

Uppal and Singh\(^{13}\) conducted a research study on comparative effects of Harness running weight jacket running on leg strength, length of the stride and Sprinting speed. The subjects for the study were 45 male students of classes tenth and eleventh. The average of the subjects was sixteen years. During the experimental period of six weeks, the group A trained using Harness running, group B performed running with weight jacket, group C did not perform any activity. Training was carried out thrice a week for both Harness running and weight jacket running. The subjects ran over a distance of 80 meters. After the six weeks experimental period the following conclusions were drawn:

1. Leg length can be effectively improved by administering a systematic resistance training programme comprising of Harness running and weight jacket running.

2. Harness running contributes to a significant increase in length of the stride.

3. Sprinting speed can be effectively improved by administering a systematic programme comprising of harness running and weight jacket running.

4. Weight jacket running was not found effective in improving length of the stride.

5. No significant change in leg strength, length of the stride and sprinting speed in case of control group is obviously a reflection of their inactivity.

Uppal¹⁴ carried out a study on fifty-four girls students studying in ninth, tenth and eleventh classes, age between fourteen to seventeen years to see the effect of varied frequencies of speed training on sprinting speed. Acceleration runs were administered as a training means for improving speed. On the completion of the six week experimental period, the following conclusions were drawn:

1. To bring about significant improvement in sprinting speed at least three training units per week planned on alternate days are required.

2. For the development of sprinting speed training thrice a week was found to be as effective training five days a week.

3. Speed performance can be improved by training, thrice or five days in a week on a systematic programme of acceleration runs.

Jamaludeen\textsuperscript{15} compared the effects of differential races and pace races on sprinting speed. 45 students of Kerela were selected at random as subjects for the study. The average age of the subjects was 17 years ranging between 16 to 18 years. The subjects were randomly assigned to two experimental Groups (A and B) and control Group (C) each consisting of 15 subjects. During the differential races and Group B trained with pace races. The subjects trained thrice on alternate days. Time taken by the subjects for 60 meters was considered as the criterion measure. Following were the conclusions drawn:

1. Differential races and pace races are effective training means for improving sprinting speed.

2. Differential races and pace races produced equal training effects in improving sprinting speed.

3. Improvement of sprinting speed in the case of groups trained with differential races and pace races was significantly higher then the control group.

Thomas \textsuperscript{16} conducted study on the effect of acceleration runs and ins and outs run on sprinting speed. Forty-five boys students between age of 13-16 years were selected as subjects. The subjects were divided into two experimental groups and one control group with 15 subjects in each. One of the experimental

\textsuperscript{15} Jamaludeen, "Comparative Effects on Differential Races and Pace Races on Sprinting Speed" (Unpublished Master's Thesis, Jiwaji University, 1982).

groups performed acceleration runs and other group did ins and outs for a period of eight weeks. A pre test and post test of 50 meters run was ins and outs run are effective training means for improving sprinting speed and both the acceleration runs and ins and outs run have equal training effect in the improvement of sprinting speed.

Edward 17 revealed through his study the effect of isometric and dynamic weight training exercises upon strength and speed of movement. Ninety-six students were divided into two groups. One group of students did no weight training while the other group used isometric contractions, rapid contractions or slow contractions in six barbells exercises, performed three days a week for nine weeks. Initial and final strength scores and speed of movement scores against no resistance were obtained, gains in strength were accompanied by gain in movement speed with and without resistance but the difference between the exercise groups were not significant at the .05 level.

Bosen 16 former Chief National Athletic Coach of India conducted and experimental with four sprinters, using a motorcycle with an attached handle behind it for the athlete to hold. They were pulled at speeds more than they were accustomed to in normal sprinting. Athletes had six weeks of conditioning training and six weeks of pre-comparative speed training before the experimental training

16 Eno O. Bosen, “Experimental Speed Training,” Track Technique 75 (Spring 1979): 332.
method was used. After six week of experimental period, the following conclusions were drawn:

1. The use of outside agent like a motorcycle does help in developing faster times over the short sprint distances.

2. Starting practice from block must force a part of the total training in order to overcome the imbalance from the forward lean body position and extra leg speed gained by the sprinters using this method.

3. This method not only increase speed which can result in fast times over a given distance, but also results in an increase in stride length, relaxation and general running form.

Manrah\(^\text{19}\) studied the effects of two progressive weight-training programmes on strength speed and power of college females. Seventy-one females volunteers enrolled in weight training courses as PSU were assigned, on the basis of initial strength, to one of two weight training group or a control group for an eight weeks study. Group I (N= 24) performed a progressive resistance weight training programmes employing three sets of six R.M. weights three times per week. Group II (N=23) performed a progressive speed training programme in which three sets of six repetitions using 25 percent of their 1-RM weights, were performed as rapidly as possible, three days per week, the control group

(N=24) participated interesting only. The 1-RM bench press was used to measure strength. A similar movement was used for measuring speed (minimal resistance pressed as rapidly as possible) and power (resistance of 50.70% of 1-RM pressed rapidly as possibly). Subjects were tested three times, before training began after four weeks, and at the end of the programme. ANOVA technique revealed that all groups were similar in strength and power prior to training but not in speed. Differences among groups in final strength and power were determined using two factors. ANOVA with repeated measures on the one factor, ANOVA technique (to adjust for initial differences) disclosed differences among groups in final speed. Schffe’s test showed that only the weight training groups has significant increase in the three variables, no significant differences between groups were found using Pearson’s Product Moment Coefficient, no relationship was found among the changes in strength, speed and power as a result of weight training.

Rynda 20 studied the effectiveness of interval training programme on the improvement of speed in running the 220-yard dash in young women. Thirteen healthy college women aged 19-22 years were divided into a group that had no special training programme, a group trained only with 50 yard sprints and a group trained on alternate days with 60 yards sprints and 300 yards runs four days per week. All the subjects were tested before and after the five weeks programme in the 220 yard dash, in leg strength, and for

energy metabolism and heart rate in an all out and a standardized ten minutes treadmill run. The trained groups showed greater improvement than the un-trained group and improves significantly in all out and a standardized ten minutes treadmill run. The sprint training improved their maximum ventilation significantly and made a greater gain in leg strength. Although this and the other gains were not significant.

Chui 21 compared the effects of isometric and dynamic weight training exercises on strength and on the speed of execution of single movement. Seventy-two male subjects formed three experimental groups and performed weight training exercises, Group I (Isometric Contraction Method), Group R (Rapid Dynamic Contraction Method), and Group S (Slow Dynamic Contraction Method). Twenty-four male subjects formed the control group-A cable tensiometer was used to obtain eight strength scores for each subjects. Speed of movement times against no resistance in six movements and against resistance in the same movements is specified increments was taken. Group I, Group R and Group S, gained in strength and at the same time gained in speed of movement measured against no resistance and resistance. Gains in strength and gains in speed of movement against no resistance and resistance made by the use of the one method are not significantly greater (P=0.05) than gains made by the use of the other method.

Hines \textsuperscript{22} carried out a study of the effect of the callisthenic direct practice sprint training and weight training to the improvement of performance in baskets per minutes, dodging dribble, forty feet dash, jump shot, vertical jump and wall bounce tests. He found out that there was no significant difference among treatment groups on the basket per minute, 40 feet dash, jump shots, vertical jump, wall bounce and composite measure of the six criterion tests. Group sprint training was significantly superior to group direct practice and weight training on the dodging dribble test. Group calisthenics was superior to the direct practice on the dodging dribble test. All training produces significant improvement over 12 weeks experimental period on the basket per minute, dodging, dribble, 40 feet dash, vertical jump and wall bounce tests. Group calisthenics, direct practice, and weight training produced significant improvement in the jump shot test. Group sprint training result in no significant changes in the jump shot test.

Colloway\textsuperscript{23} 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 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.


\textsuperscript{23} Bill Colloway, "Weight Conditioning for Athletes," Athletic Journal 57 (October 1976) : 50
In order to have a successful weight lifting programme the single most important factor is the coach. He can have the most sophisticated weight equipment in the world but if he does not direct the programme from start to finish it will disintegrate.

Hooks\textsuperscript{24} has pointed out that weight training can improve strength and speed simultaneously. 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 muscles to contract successfully with a burst of speed, will produced increased strength and speed.

Jarver\textsuperscript{25} while explaining power points out that mechanically speaking, power is the rate of doing work and could therefore say that in human performances, power is effectively a produce of strength and speed. (force and velocity). In the performance of physical skill, it may be more approximately described as ability to apply maximum force in the short time.

Hamak\textsuperscript{26} conducted a study to determine the effect of a selected progressive resistance running programme on circulo respiratory efficiency power and free running speed. Forty-five male subjects were divided into three equated groups: interval running, resistance running (employing an exer-genic) and control group.

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

Roy\textsuperscript{27} compared the effect of acceleration running, resistance running and sand running on sprinting speed, explosive leg strength and length of the stride. 60 boys of Tripura were selected at random as subjects for the study. Age Group of subjects were fifteen to seventeen years. The subjects were divided at random in three experimental groups and one control group with 15 subjects each. Group A trained with acceleration run, Group B with resistance run and Group C with sand running, while control Group D did nothing. After a six week experimental period the following conclusions were drawn:

1. Sprinting speed and explosive leg strength can be improved by administering a training programme of acceleration running, resistance running and sand running.

2. Length of the stride can be improved by administering a programme of resistance running and sand running, whereas acceleration running is not effective in improving the length of the stride.

\textsuperscript{27}Arunabha Roy, \textit{"Comparative Effects of Acceleration Running, Resistance Running and Sand Running On Sprinting Speed, Explosive Leg Strength and Length of the Stride,"} (Unpublished Master's Thesis Jiwaji University, 1980)
3. Resistance running was superior to accelerate running and sand running in improving the length of the stride.

Oyster\textsuperscript{28} studied fourteen women championship tennis players on a high intensity weight-training programme for seven weeks. Significant strength increases were found in the lower extremity measurement of ankle planto flexion and hip flexion. All other strength measures, except elbow strength, showed increases although not significant. These strength increases were accompanied by concomitant decreases in all girth measurement calf girth, pictorials and lower arm girth decreased significantly. Three of the our skin fold measurement also decreases although not significantly. There was also a decreased in present body fat and alight decrease in weight. Neither of these was significant.

Remigino\textsuperscript{29} U.S. Olympic Track Coach has expressed an opinion that an overall muscular strength is essential for success in the dashes. The development of strength with emphasis on conditioning the hamstring and buttocks is most important since these are the muscles that deliver the power in driving from the starting blocks and extending the hips and knees in acceleration. Building muscular strength can best be accomplished by setting up a regular strength programme early in the feel. The use of weight, calisthenics and 2 to 4 miles of cross-country running are especially beneficial early in the training schedule.


\textsuperscript{29}Lindy Remigino, "Workout Techniques for Sprinters," \textit{Best of Track and Field from the Coaching Clinic} ( New York: Parker Publishing Company Inc., 1975), pp. 36-37.
Kaledin\textsuperscript{30} conducted a test to find out the effects of work out programme of varying intensities would have on the programme of 14-16 years of age. He tested several components of intensity (distance, running speed, recovery) on members of the Leningrad Pioneer Palace sports school who had averaged 3-5 years of previous training. Tests were conducted by using sports medicine and biomechanical procedures. Several training methods were employed to discover how these would develop speed and how the body reacts to the training load. It was discovered right from the start that a mixture of short and relatively long distance runs with fixed recovery intervals had the best stimulus to the organism. The use of only short or long distance was less effective to develop speed and speed endurance. An optimum mixture of short and relatively long training distances was then tested by employing different recovery intervals. It revealed that short recoveries between repetitions brought about better adjustment of the body and faster improving performances. It was also observed that recovery intervals influenced the changes in training load for more than the length of the distance (duration of work).

Bose\textsuperscript{31} compared the effects of three types of training loads on jumping ability. Eighty boys of Gwalior were selected at random as subjects for the study. The subjects were randomly assigned to 3 experimental Groups (A, B, C) and one (1) Control Group (D). Each consisting of 20 subjects. Following were the conclusions drawn:

\textsuperscript{30} S. Kaledin, “How Much High Intensity Sprint Training,” Track Technique 64 (June 1976) : 2026-2027.

1. Experimental groups B and C differed significantly on jumping ability-training loads.

2. There was a significant difference among the posttest means of four groups on jumping ability training loads.

3. Paired mean difference between Groups B,D and Groups C,D were found to be significant.

Kapoor\textsuperscript{32} compared the effects of physical conditioning programme on the physical fitness for the factors related to long distance and middle distance runners at university level. The age of the subjects ranged from 17-25 years. The subjects were randomly assigned to two (2) experimental groups (A and B) and Control group (C) each consisting of 50 subjects. Following were the conclusions drawn:

1. There was significant improvement in the variable of speed, whereas no such significant changes of even slight change were noticed in the case of control Group.

2. There was significant improvement in endurance. Leg and arm strength improved significantly and shoulder flexibility and agility also improved.

H.P.E – Forum\textsuperscript{33} To compare the anthropometrics measurement and physical fitness level of eighth grade students. 1140 students

\textsuperscript{32} Kapoor, S.S “Compared the effect of physical conditioning programme on the physical fitness for the factors related to long distance and middle distance runners at university level.” \textit{Indian Educational Abstracts, N.C.E.R.T.} 6 (Jan 1999), p.34.

of Nepal were selected at random as subjects for the study. The average of the subjects was 14 years. The subjects were randomly assigned to 3 groups i.e. 500 each from plain area, 500 each from Hill area and 140 each from Himalayan area. On the basis of product-moment coefficient of correlation matrix and findings of the present research work, it may be concluded that:

1. There was no significant relation in between muscular strength and anthropometrics measures, but the muscular endurance was found to be significantly correlated with leg length.

2. Cardio-respiratory endurance was significantly correlated with age, weight, leg length, thigh girth, and chest girth. Whereas the speed was correlated significantly with arm girth and abdominal girth.

3. Muscular endurance was significantly correlated with muscular strength and cardio respiratory endurance.