conducted a study on, Characteristics of Sprint Performance in College Football Players. To investigate sprinting strategy, acceleration and velocity patterns were determined in College football players ($n = 61$) during performance of a 9.1-, 36.6-, and 54.9-m sprints. Acceleration and velocity were determined at 9.1-m intervals during each sprint. Lower-body strength and power were evaluated by 1 repetition maximum (1-RM) squat, power clean, jerk, vertical jump, standing long jump, and standing triple jump. Sprint times averaged 1.78 ± 0.11 seconds (9.1 m), 5.18 ± 0.35 seconds (36.6 m), and 7.40 ± 0.53 seconds. Acceleration peaked at 9.1 m (2.96 ± 0.44 $m{\cdot}s^{-2}$), was held constant at 18.3 m (3.55 ± 0.0.94 $m{\cdot}s^{-2}$), and was negative at 27.4 m (−1.02 ± 0.72 $m{\cdot}s^{-2}$). Velocity peaked at 18.3 m (8.38 ± 0.65 $m{\cdot}s^{-1}$) and decreased slightly, but significantly at 27.4 m (7.55 ± 0.66 $m{\cdot}s^{-1}$), associated with the negative acceleration. Measures of lower-body strength were significantly related to acceleration, velocity, and sprint performance only when corrected for body mass. Lower-body strength/BM and power correlated highest with 36.6-m time (rs = −0.55 to −0.80) and with acceleration (strength $r = 0.67$-0.49; power $r =$ 0.73-0.81) and velocity (strength $r = 0.68$-0.53; power $r = 0.74$-0.82) at 9.1 m. Sprint times and strength per body mass were significantly lower in lineman compared with linebackers-tight ends and backs. The acceleration and velocity patterns were the same for each position group, and differences in sprint time were determined by the magnitude of acceleration and velocity at 9.1 and 18.3 m. Sprint performance in football players is determined by a rapid increase in acceleration (through 18.3 m) and a high velocity maintained throughout the sprint and is independent of position played. The best sprint performances (independent of sprint distance) appear to be related to the highest initial acceleration (through 18.3 m) and highest attained and maintained velocity. Strength relative to body mass and power appears to impact initial acceleration and velocity (through 18.3 m) in contribution to sprint performance.

Buchheit, et al., (2010), conducted a study on Improving Acceleration and Repeated Sprint Ability in Well-Trained Adolescent Handball Players: Speed Versus Sprint Interval Training. The purpose of the current study was to compare the effects of speed/agility (S/A) training with sprint interval training (SIT) on acceleration and repeated sprint ability (RSA) in well-trained male handball players. Methods: In addition to their normal training program, players performed either S/A (n = 7) or SIT (n = 7) training for 4 wk. Speed/agility sessions consisted of 3 to 4 series of 4 to 6 exercises (eg, agility drills, standing start and very short sprints, all of <5 s duration); each repetition and series was interspersed with 30 s and 3 min of passive recovery, respectively. Sprint interval training consisted of 3 to 5 repetitions of 30-s all-out shuttle sprints over 40 m, interspersed with 2 min of passive recovery. Pre- and posttests included a countermovement jump (CMJ), 10-m sprint (10m), RSA test and a graded intermittent aerobic test (30-15 Intermittent Fitness Test, VIFT). Results: S/A training produced a very likely greater improvement in 10-m sprint (+4.6%, 90% CL 1.2 to 7.8), best (+2.7%, 90% CL 0.1 to 5.2) and mean (+2.2%, 90% CL –0.2 to 4.5) RSA times than SIT (all effect sizes [ES] greater than 0.79). In contrast, SIT resulted in an almost certain greater improvement in VIFT compared with S/A (+5.2%, 90% CL 3.5 to 6.9, with ES = –0.83). Conclusion: In well-trained handball players, 4 wk of SIT is likely to have a moderate impact on intermittent endurance capacity only, whereas S/A training is likely to improve acceleration and repeated sprint performance.

Rogers, Timothy James, (2010), conducted a study on, The effect of high intensity running training on work capability in football (soccer). The purpose of this study was to evaluate the effect of a high intensity interval training protocol on aerobic power and physical performance in competitive matches. Twenty-five (25) players were recruited from a national Under 20 men's football (soccer) program. Players were randomly assigned to one of two intervention groups; - A high intensity interval training intervention group - A control group. The intervention group completed a 10 minute interval training session, three times a week comprised of two sets of eight bouts of 15 second shuttles at approximately 120% of maximum aerobic speed, for a four week period. The control group performed a juggling exercise that was matched for time with the intervention group. Participants were not blinded to the intervention. Pre and post intervention testing involved physiological field testing including the Multi-stage Shuttle Test (MSST), vertical jump and 20m sprint time. In addition, pre and post intervention match analysis data were derived from GPS devices. Three games were analyzed pre and post intervention. Changes between the intervention and control groups, across the entire group from pre to post were analysed. Results showed a significant improvement in the intervention group over the control group for aerobic power (p=0.0089), but no significant changes in vertical jump (p=0.3823) and 20m sprint time (p=0.0682). Match analyses from GPS data showed no differences between the groups for total distance, average distance covered per minute (meterage) and high intensity running variables. However, match analysis data when grouped for the all participants showed significant improvements in 1st III half meterage (p=0.0001), 2nd half meterage (p=0.001), 1st half versus 2nd half differences (p=0.001), 1st 15 minutes versus last 15 minutes meterage (p=0.026), high intensity running distance (p=0.001) and total high intensity running efforts (p=0.026) following comparisons of pre to post intervention data. Conclusion: Overall the study showed high intensity interval training based on a percentage of maximum aerobic speed during the season provided an effective means of improving aerobic power without negatively impacting on anaerobic performance. However, the absence of a significant transfer to match performance when compared with a control group may be due to multiple factors in elite junior development squads. The match data may also indicate that playing at a higher level than previously experienced may have had a positive effect on match performance for all participants. Transferring quantifiable training outcomes into match performances remains a challenge in team sports.

Buchheit, Mendez-Villanueva, Quod, Quesnel, Ahmaidi, (2010), conducted a study on "Improving acceleration and repeated sprint ability in well-trained adolescent handball players: speed versus sprint interval training. The purpose of the study was to compare the effects of speed/agility (S/A) training with sprint interval training (SIT) on acceleration and repeated sprint ability (RSA) in well-trained male handball players. In addition to their normal training program, players performed either S/A (n = 7) or SIT (n = 7) training for 4 wk. Speed/agility sessions consisted of 3 to 4 series of 4 to 6 exercises (eg, agility drills, standing start and very short sprints, all of <5 s duration); each repetition and series was interspersed with 30 s and 3 min of passive recovery, respectively. Sprint interval training consisted of 3 to 5 repetitions of 30-s all-out shuttle sprints over 40 m, interspersed with 2 min of passive recovery. Pre- and posttests included a countermovement jump (CMJ), 10-m sprint (10m), RSA test and a graded intermittent aerobic test (30-15 Intermittent Fitness Test, V(IFT)). Results showed S/A training produced a very likely greater improvement in 10-m sprint (+4.6%, 90% CL 1.2 to 7.8), best (+2.7%, 90% CL 0.1 to 5.2) and mean (+2.2%, 90% CL -0.2 to 4.5) RSA times than SIT (all effect sizes [ES] greater than 0.79). In contrast, SIT resulted in an almost certain greater improvement in V(IFT) compared with S/A (+5.2%, 90% CL 3.5 to 6.9, with ES = -0.83). Hence it was concluded that well-trained handball players, 4 wk of SIT is likely to have a moderate impact on intermittent endurance capacity only, whereas S/A training is likely to improve acceleration and repeated sprint performance.

Harrison, Bourke, Gillian, (2009), a study was undertaken to investigate whether an Resisted Sprint (RS) training intervention would enhance the running speed and dynamic strength measures in male rugby players. Fifteen male rugby players aged 20.5 (± 2.8) years who were proficient in resisted sledge training took part in the study. The subjects were randomly assigned to control or RS groups. The RS group performed two sessions per week of RS training for 6 weeks, and the control group did no RS training. Pre- and post-intervention tests were carried out for 30-m sprint, drop, squat, and rebound jumps on a force sledge system. A laser measurement device was used to obtain velocities and distance measures during all running trials. The results show a statistically significant decrease in time to 5 m for the 30-m sprint for the RS group ($p = 0.02$). The squat jump and drop jump variables also showed significant increases in starting strength ($p = 0.004$) and height jumped ($p = 0.018$) for the RS group from pre- to post-testing sessions. The results suggest that it may be beneficial to employ an RS training intervention with the aim of increasing initial acceleration from a static start for sprinting.

Ross, Ratamess, Hoffman, Faigenbaum, Kang, Chilakos, (2009), conducted a study on, Effects of Treadmill Sprint Training and Resistance Training on Maximal Running Velocity and Power. The purpose of the present study was to examine the independent and combined effects of resistance and treadmill sprint training on maximal sprint velocity and power. Twenty-five male athletes (age = 19.8 ± 1.5 years, height = 181.2 ± 7.9 cm, body mass = 88.9 ± 10.9 kg) were matched for 30-m sprint times and assigned to 1 of 3 training groups: 1) sprint training only (ST), 2) resistance training only (RT), or 3) combined sprint and resistance training (SRT) for 7 weeks. Periodized resistance training was performed 4 $d \cdot wk^{-1}$ (3-4 sets of 6-10 repetitions). The treadmill sprint training program was performed 2 $d \cdot wk^{-1}$ and consisted of 8-12 sets of maximal sprints for 40-60 m at 0-25% of each athlete's body mass, with rest intervals of 2-3 minutes on a treadmill that was user driven and that enabled loading via a magnetic braking system. Peak 30-m sprint times, power and average velocity attained during maximal sprint trials on the treadmill, and 1-repetition maximum (1RM) squat were determined pre and post training. The 30-m sprint times improved significantly only in the SRT group, and a trend for improvement ($p = 0.06$) was observed in the ST group. All groups significantly increased treadmill sprint velocity. However, the SRT and ST groups increased significantly more than RT. Only the SRT Group increased treadmill sprint peak power. All training groups increased 1RM squat strength significantly by 6.6-8.4 kg, with no differences observed between groups. The results of this study showed that 7 weeks of sprint training on a newly designed treadmill resulted in significant kinematic and kinetic improvements in sprint performance. Of practical significance, treadmill sprint training enhanced land-based sprint performance.

Harrison, Bourke, Gillian, (2009), conducted a study on, The Effect of Resisted Sprint Training on Speed and Strength Performance in Male Rugby Players. The purpose of this study was to investigate whether an RS training intervention would enhance the running speed and dynamic strength measures in male rugby players. Fifteen male rugby players aged 20.5 (+/- 2.8) years who were proficient in resisted sledge training took part in the study. The subjects were randomly assigned to control or RS groups. The RS group performed two sessions per week of RS training for 6 weeks, and the control group did no RS training. Pre- and post-intervention tests were carried out for 30-m sprint, drop, squat, and rebound jumps on a force sledge system. A laser measurement device was used to obtain velocities and distance measures during all running trials. The results show a statistically significant decrease in time to 5 m for the 30-m sprint for the RS group ($p = 0.02$). The squat jump and drop jump variables also showed significant increases in starting strength ($p = 0.004$) and height jumped ($p = 0.018$) for the RS group from pre- to post-testing sessions. The results suggest that it may be beneficial to employ an RS training intervention with the aim of increasing initial acceleration from a static start for sprinting.

Mujika, Santisteban , Castagna, (2009), conducted a study on, In-Season Effect of Short-Term Sprint and Power Training Programs on Elite Junior Soccer Players. The aim of this study was to examine the effects of 2 in-season short-term sprint and power training protocols on vertical countermovement jump height (with or without arms), sprint (Sprint-15m) speed, and agility (Agility-15m) speed in male elite junior soccer players. Twenty highly trained soccer players (age 18.3 ± 0.6 years, height 177 ± 4 cm, body mass 71.4 ± 6.9 kg, sum skinfolds 48.1 ± 11.4 mm), members of a professional soccer academy, were randomly allocated to either a CONTRAST ($n = 10$) or SPRINT ($n = 10$) group. The training intervention consisted of 6 supervised training sessions over 7 weeks, targeting the improvement of the players' speed and power. CONTRAST protocol consisted of alternating heavy-light resistance (15-50% body mass) with soccer-specific drills (small-sided games or technical skills). SPRINT training protocol used line 30-m sprints (2-4 sets of 4 × 30 m with 180 and 90 seconds of recovery, respectively). At baseline no difference between physical test performance was evident between the 2 groups ($p > 0.05$). No time × training group effect was found for any of the vertical jump and Agility-15m variables ($p > 0.05$). A time × training group effect was found for Sprint-15m performance with the CONTRAST group showing significantly better scores than the SPRINT group (7.23 ± 0.18 vs. 7.09 ± 0.20 $m \cdot s^{-1}$, $p < 0.01$). In light of these findings CONTRAST training should be preferred to line sprint training in the short term in young elite soccer players when the aim is to improve soccer-specific sprint performance (15 m) during the competitive season.

Taskin, (2009), conducted a study on, Effect of Circuit Training on the Sprint-Agility and Anaerobic Endurance. This study examines the effects of hill slope on acute over speed running. This study considers both acceleration and supra-maximal velocity. Forty-four athletes ran 40-yard sprints, on 5 different hill slopes, ranging from 2.1° to 6.9°. Forty-yard sprint times and 10-yard split times were recorded using the Brower Timing System Speed-trap II. Analysis reveals that 40-yard and 10-yard sprints performed on hill slopes of approximately 5.8° were optimal compared to flatland running and the other slopes assessed. Sprinting on a 5.8° slope increased the subjects' maximal speed by 7.09% ± 3.66% and increased the subjects' acceleration by 6.54% ± 1.56%. Strength and conditioning professionals who train athletes for speed should develop and use over speed hills or platforms with slopes of approximately 5.8° in order to maximize acute sprinting velocity and acceleration.

Caruso, et al., (2009), conducted a study on Impact of Acceleration on Blood Lactate Values Derived From High-Speed Resistance Exercise. Acceleration, or an increase in the rate of movement, is integral to success in many sports. Improvements in acceleration often entail workouts done at intensities that elicit higher blood lactate concentrations (BLa). The purpose of the study is to assess the impact of acceleration on BLa. Methods required subjects (n = 45) to perform 4 workouts that each involved two 1-minute sets of hip- and knee-extension repetitions on an inertial exercise trainer (Impulse Training Systems, Newnan, Georgia). Subjects performed 2 workouts comprised solely of phasic or tonic repetitions; their sequence was randomized to prevent an order effect. Before and 5 minutes after exercise, subjects' BLa were assessed with a calibrated analyzer (Sports Resource Group, Hawthorne, New York). Post and delta (post-pre) BLa both served as criterion measures for multivariate analysis. Average and peak acceleration values, derived from both phasic and tonic workouts, served as predictor variables. Results showed statistical significance ($p < 0.05$; $R = 0.2534$) and yielded the following prediction equation from phasic workouts: delta BLa = 1.40 + 1.116 (average acceleration set 1)--0.011 (peak acceleration set 1)--0.634 (average acceleration set 2) + 0.005 (peak acceleration set 2). Conclusions suggest delta BLa variance, which represents the increase of the metabolite incurred from workouts, is most easily explained by average acceleration values, which describes the mean increase in the rate of movement from phasic workouts. To improve an athlete's tolerance for acceleration-induced BLa increases, workouts should be tailored with respect to the muscles involved and the duration of exercise bouts of their chosen sport.

Baker, Newton, (2008), conducted a study on, Comparison of Lower Body Strength, Power, Acceleration, Speed, Agility, and Sprint Momentum to Describe and Compare Playing Rank among Professional Rugby League Players. The purpose of this study was to describe and compare the lower body strength, power, acceleration, maximal speed, agility, and sprint momentum of elite first-division national rugby league (NRL) players (n = 20) to second-division state league (SRL) players (n = 20) players from the same club. Strength and maximal power were the best discriminators of which players were in the NRL or SRL squads. None of the sprinting tests, such as acceleration (10-m sprint), maximal speed (40-m sprint), or a unique 40-m agility test, could distinguish between the NRL or SRL squads. However, sprint momentum, which was a product of 10-m velocity and body mass, was better for discriminating between NRL and SRL players as heavier, faster players would possess better drive forward and conversely be better able to repel their opponents' drive forward. Strength and conditioning specialists should therefore pay particular attention to increasing lower body strength and power and total body mass through appropriate resistance training while maintaining or improving

10-m sprint speed to provide their players with the underlying performance characteristics of play at the elite level in rugby leagues.

Alcaraz, Elvira, Linthorne, (2008), conducted a study on Effects of Three Types of Resisted Sprint Training Devices on the Kinematics of Sprinting at Maximum Velocity. The study was to compare the kinematics of sprinting at maximum velocity to the kinematics of sprinting when using three of types of resisted sprint training devices (sled, parachute, and weight belt). Eleven men and 7 women participated in the study. Flying sprints greater than 30 m were recorded by video and digitized with the use of biomechanical analysis software. The test conditions were compared using a 2-way analysis of variance with a post-hoc Tukey test of honestly significant differences. We found that the 3 types of resisted sprint training devices are appropriate devices for training the maximum velocity phase in sprinting. These devices exerted a substantial overload on the athlete, as indicated by reductions in stride length and running velocity, but induced only minor changes in the athlete's running technique. When training with resisted sprint training devices, the coach should use a high resistance so that the athlete experiences a large training stimulus, but not so high that the device induces substantial changes in sprinting technique. We recommend using a video overlay system to visually compare the movement patterns of the athlete in unloaded sprinting to sprinting with the training device. In particular, the coach should look for changes in the athlete's forward lean and changes in the angles of the support leg during the ground contact phase of the stride.

Hill-Haas, Bishop, Dawson, Goodman, Edge, (2007), conducted a study on Effects of rest interval during high-repetition resistance training on strength, aerobic fitness, and repeated-sprint ability. The effect of altering the rest period on adaptations to high-repetition resistance training is not well known. Eighteen active females were matched according to leg strength and repeated-sprint ability and randomly allocated to one of two groups. One group performed resistance training with 20-s rest intervals between sets, while the other group employed 80-s rest intervals between sets. Both groups performed the same total training volume and load. Each group trained 3 days a week for 5 weeks [15- to 20-repetition maximum (RM), 2 - 5 sets]. Repeated-sprint ability (5x6-s maximal cycle sprints), 3-RM leg press strength, and anthropometry were determined before and after each training programme. There was a greater improvement in repeated-sprint ability after training with 20-s rest intervals (12.5%) than after training with 80-s rest intervals (5.4%) (P = 0.030). In contrast, there were greater improvements in strength after training with 80-s rest intervals (45.9%) than after training with 20-s rest intervals (19.6%) (P = 0.010). There were no changes in anthropometry for either group following training. These results suggest that when training volume and load are matched, despite a smaller increase in strength, 5 weeks of training with short rest periods results in greater improvements in repeated-sprint ability than the same training with long rest periods.

Spinks, Murphy, Spinks, Lockie, (2007), conducted a study on, The Effects of Resisted Sprint Training on Acceleration Performance and Kinematics in Soccer, Rugby Union, and Australian Football Players. Acceleration is a significant feature of game-deciding situations in the various codes of football. However little is known about the acceleration characteristics of football players, the effects of acceleration training, or the effectiveness of different training modalities. This study examined the effects of resisted sprint (RS) training (weighted sled towing) on acceleration performance (0-15 m), leg power (countermovement jump [CMJ], 5-bound test [5BT], and 50-cm drop jump [50DJ]), gait (foot contact time, stride length, stride frequency, step length, and flight time), and joint (shoulder, elbow, hip, and knee) kinematics in men (N = 30) currently playing soccer, rugby union, or Australian football. Gait and kinematic measurements were derived from the first and second strides of an acceleration effort. Participants were randomly assigned to 1 of 3 treatment conditions: (a) 8-week sprint training of two 1-h sessions [middle dot]wk-1 plus RS training (RS group, n = 10), (b) 8-week non-resisted sprint training program of two 1-h sessions[middle dot]wk-1 (NRS group, n = 10), or (c) control (n = 10). The results indicated that an 8-week RS training program (a) significantly improves acceleration and leg power (CMJ and 5BT) performance but is no more effective than an 8-week NRS training program, (b) significantly improves reactive strength (50DJ), and (c) has minimal impact on gait and upper- and lower-body kinematics during acceleration performance compared to an 8-week NRS training program. These findings suggest that RS training will not adversely affect acceleration kinematics and gait. Although apparently no more effective than NRS training, this training modality provides an overload stimulus to acceleration mechanics and recruitment of the hip and knee extensors, resulting in greater application of horizontal power.

Girold, Calmels, Paul, (2006), a study was undertaken to determine whether the resisted-sprint in over strength (OSt) or the assisted-sprint in over speed (OSp) could be efficient training methods to increase 100-m front crawl performance. Thirty-seven (16 men, 21 women) competition-level swimmers (mean = SD: age 17.5 +/- 3.5 years, height 173 +/- 14 cm, weight 63 +/- 14 kg) were randomly divided into 3 groups: OSt, OSp, and control (C). All swimmers trained 6 days per week for 3 weeks, including 3 resisted or assisted training sessions per week for the groups OSt and OSp respectively. Elastic tubes were used to generate swimming over-strength and over-speed. Three 100-m events were performed before, during, and after the training period. Before each 100-m event, strength of the elbow flexors and extensors was measured with an isokinetic dynamometer. Stroke rate and stroke length were evaluated using the video-recorded 100-m events. In the OSt group, elbow extensor strength, swimming velocity, and stroke rate significantly increased ($p < 0.05$), while stroke length remained unchanged after the 3-week training period. In the OSp group, stroke rate significantly increased ($p < 0.05$) and stroke length significantly decreased ($p < 0.05$) without changes in swimming velocity. No significant variations in the C group were observed. Both OSt and OSp proved to be more efficient than the traditional training program. However, the OSt training program had a larger impact on muscle strength, swimming performance, and stroke technique than the OSp program.

Blaszevich, Jenkins, (2002), conducted a study on effect of the movement speed of resistance training exercises on sprint and strength performance in concurrently training elite junior sprinters. The aim of the study was to determine the effects of 7 week high and low velocity resistance training on strength running performance in nine male elite junior sprint runners (age 19 years, best timing 10.89+/- 0.21 seconds; mean +/- seconds). The athletes continued their sprint training throughout the study, but their resistance training programme was replace by one in which the movement velocities of hip extension and flexion, knee extension and flexion and squat exercises varied according to the loads lifted (i.e 30-50% and 70-90% of 1-RM in the high and low velocity training groups respectively). There were no between group differences in hip flexion or extension torque produced at 1.05, 4.74 or 8.42 rad x s(-1), 20 metre acceleration or 20 meter flying running times, or 1-RM squat lift strength either before or after training. This was despite significant improvements in 20 meter acceleration time ($P<0.01$), squat strength ($P<0.05$), iso-kinetic hip flexion torque at 4.74 rad x s(-1) and hip extension torque at 1.05 and 4.74 rad x s(-1) for the athletes as a whole over the training period.

Although velocity specific strength adaptations have been shown to occur rapidly in untrained and non concurrently training individuals, the present results suggest a lack of velocity-specific performance changes in elite concurrently training sprint runners performing a combination of traditional and semi-specific resistance training exercise.

John Cronin, Peter J McNair, Robert N Marshall, (2001), conducted a study on "Developing explosive power: A comparison of technique and training". The influence of contraction type and movement type on power output of the upper body musculature was investigated across loads of 30–80% 1RM. Twenty seven males (21.9±3.1 years, 89.0±12.5 kg, 86.32±13.66 kg 1RM) of an athletic background but with no weight training experience in the previous six months volunteered for the study. The results were compared using multivariate analysis of variance with repeated measures ($p \leq 0.05$). It was found that the combinations of load, movement and contraction type affected mean and peak power in different capacities. Mean power output for rebound motion was 11.7% greater than concentric only motion. The effect of the rebound was to produce greater peak accelerations (38.5% - mean across loads), greater initial force and peak forces (14.1% - mean across loads) and early termination of the concentric phase. Peak power output was most influenced by the ability to release the bar, the greater mean velocities across all loads (4.4% average velocity and 6.7% peak velocity) attained using such a technique appeared the dominating influence. Loads of 50%–70% 1RM were found to maximize mean and peak power. Loading the neuromuscular system to maximize mean or peak power output necessitates an understanding of the forcevelocity characteristics of the training movement and the requirements of the individual related to the athletic performance and their training status.

Jeffrey, (2001), conducted a study on "A Comparison of the Effects of Interval Training vs. Continuous Training on Weight Loss and Body Composition in Obese Pre-Menopausal Women". The purpose of this study was to investigate the role exercise intensity plays in reducing body weight and percent body fat in overweight women. Subjects were randomized to either a high intensity interval training group (IT) or a lower intensity steady state training group (ST). Each group exercised 3 times per week for 8 weeks and expended 300 kcal per exercise session. VO2 max, body composition, and resting metabolic rate (RMR) were measured pre and post training. RMR was measured after exercise at week 2 to see if intensity levels affected RMR. VO2 max and body composition improved in IT but not in ST. Neither group showed a change in RMR from pretest to posttest; however, IT had an increase in RMR 24 hours post-exercise whereas ST did not. These findings show that high intensity interval exercise produces improvements in body composition, fitness, and acute RMR compared to low intensity steady state training.

Marimuthu, (2002), conducted a study on, Effect on varied velocity resistance training followed by speed training on selected speed and strength parameters. Sixty subjects were selected at random and divided into four groups. Group 1 underwent high velocity resistance training followed by speed training, Group 2 underwent medium velocity resistance training followed by speed training, Group 3 underwent low velocity resistance training followed speed training and Group 4 was control group. The dependent 't' test and the one way analysis of covariance were used to find out the significant improvement and significant differences respectively. The Scheffe's test was applied as post hoc test. The results of the study indicated that all the experimental groups has significantly improved the selected variables and also the high velocity resistance training followed by speed training is found to be better than other two groups on speed, stride length, stride frequency, arm strength, explosive strength, elastic power and strength endurance.

Sharin, et al., (1997), conducted a study on The effect of Reaction Training vs Sprint Training on Speed and Power. Female soccer players (N=23) participated in reaction, sprint training or control programme. The control programme did not engage in any extra training. The reaction group used a device to provide sound and light cues for explosive movements. Both forms of training produced improved performance over the control group. There was no difference between either forms of training indication that traditional sprint training was just as effective as was a form of training that required specialized equipment and conduct. Traditional sprint training is as effective as specialized device dependent training designed to increase reaction and movement time.

Donati, (1995), conducted a study on "The development of stride length and stride frequency in sprinting", Running speed is the product of stride length and stride frequency. Athletes achieve their maximum speed only by adopting a specific ratio between length and frequency of stride and any significant alteration in the length or frequency will cause a reduction in speed. A study was made of 25 (15 male and 10 female) high level sprinters. Each one was required to run a number of times over distance varying between 60 and 100 meters, with adequate rest periods between the runs. Stride length was changed at each run and data were plotted in a graph. A point at which two lines meet was used to indicate the time and the number of strides that the athlete should, in theory, be able to achieve. Sample of effective training methods to improve performance are given.

W.Young, et al., (1995), conducted a study on Relationship between strength qualities and sprinting performance**.** To find out the relationship between strength measures and various phases of sprinting performance were determined. Elite junior track and field athletes (M=11, F=9) performed maximum 50 meters sprints being timed at 2.5, 5, 10, 20, 30, 40 and 50 meters. Resultant applied forces were measured with two force platforms. 27 measures of strength and speed-strength were measured from the height jumped and force-curve from take-off using pure concentric, stretch shortening cycle and isometric muscular contractions. The best predictor of starting performance (2.5 meter time) was the peak force relative to bdoy weight generated during a jump from a 120 degree knee angle (concentric contraction). The single best correlate of maximum sprinting speed was the force relative to body weight applied at 100 meters from the commencement of a loaded jumping action. The angle of the legs to generate the best start over 2.5 meters should be in the leg vicinity of 120 degree at the knees. Maximum running speed depends upon the ability of the runner to generate force quickly, that is, in about 100 meters, almost the length of time that the foot is in contact with the ground. The contact time for males averaged 101 and 108 meters for females. Thus, unless strength training trains the ability of the legs to generate forces in a very short time, that is, with maximum explosive force, slower training would not assist in the development of running speed. Strength training for sprinters should emphasize the most rapid development of leg forces.

Delecluse, et al., 1995 conducted a study on Influence of high-resistance and high-velocity training on sprint performance. The purpose of this study is to analyze the effect of high-resistance (HR) and high-velocity (HV) training on the different phases of 100-m sprint performance. Two training groups (HR and HV) were compared with two control groups (RUN and PAS). The HR (N = 22) and HV group (N = 21) trained 3 d.wk-1 for 9 wk: two strength training sessions (HR or HV) and one running session. There was a run control group (RUN, N = 12) that also participated in the running sessions (1 d.wk-1) and a passive control group (PAS, N = 11). Running speed over a 100-m sprint was recorded every 2 min. By means of a principal component analysis on all speed variables, three phases were distinguished: initial acceleration (0-10 m), building-up running speed to a maximum (10-36 m), and maintaining maximum speed in the second part of the run (36-100 m). HV training resulted in improved initial acceleration ($P < 0.05$ compared with RUN, PAS, and HR), a higher maximum speed ($P < 0.05$ compared with PAS), and a decreased speed endurance ($P < 0.05$ compared to RUN and PAS). The HV Group 1mproved significantly in total 100 m time ($P < 0.05$ compared with the RUN and PAS groups). The HR program resulted in an improved initial acceleration phase ($P < 0.05$ compared with PAS).

Ken Vick, conducted a study on, Improving Running Speed and Acceleration with a Resisted Sprint. Sprinting speed is considered an important component of performance in many sports. Full speed in sprinting is not obtained until acceleration has taken place for 30-60m. The majority of sprints in most team sports last for less than that distance, making acceleration more important than full speed. Resisted sprinting is a method commonly employed to improve acceleration and speed. High school football players (n=18) participated in this study during the off-season. There was a control group (CNT) and an experimental group (RES) training 2 times per week for 4 weeks on a commercially available resisted sprint ergometer. Subjects were tested pre and post treatment on 9.1m (10 yd.), 36.6m (40 yd.), and 91.4m (100 yd.) sprints as well as agility (AGL) and vertical jump (VJ) tests. The RES group improves significantly in all performance tests; 9.1m (0.1 ± .23), 36.6m (0.27 ± .41), 91.4m (0.65 ± 2.1), VJ (1.89 ± 7.5), and AGL (.18 ± .49). The CNT group showed no significant changes. There was also a significant difference between the changes in performance between the two groups in every test. This protocol using a resisted sprint ergometer improved speed and acceleration in high school athletes in a short time period. (www.woodway.com)

CHAPTER III
METHODOLOGY

3.1. INTRODUCTION

This chapter describes in detail the procedures adopted for selection of subjects, selection of experimental variables, pilot study, experimental design, training programme, criterion measures, reliability of the data, test administration, collection of data and statistical treatment of data involved in the study.

3.2. SELECTION OF SUBJECTS

The study was designed to find out the comparative effects of different sprinting training on selected speed parameters among College men students. For the above purpose 60 students from Madras Christian College, Tambaram were randomly selected as subjects and their age was between eighteen and twenty one years.

3.3. EXPERIMENTAL DESIGN

The study was formulated as pre and post test random group design, in which sixty students were divided into four equal groups. The experimental group – 1 (n = 15 AS) underwent Acceleration Sprinting, the experimental group – 2 (n = 15 RS) underwent Repetition Sprinting, the experimental group – 3 (n = 15 IS) underwent Interval Sprinting and group – 4 (n = 15 CG) served as control group.

3.4. SELECTION OF VARIABLES

Based on the relevant literature reviewed and in accordance with view of professional experts in Physical Education, the following speed parameters were selected.

3.4.1. Dependent Variable

"A dependent variable is that condition that is observed and measured that is expected to be affected in some way as a result of the manipulation of independent variable" (Morehouse,1975).

Speed Parameters

1. Speed
2. Speed Endurance
3. Explosive Power
4. Elastic Power
5. Anaerobic power
6. Agility

3.4.2. Independent Variable

"Main variable is one under consideration that is manipulated by the researcher with subjects randomly assigned to various groups or testing conditions" (Jenson, 1979).

Group 1	:	Acceleration Sprinting (AS)
Group 2	:	Repetition Sprinting (RS)
Group 3	:	Interval Sprinting (IS)
Group 4	:	Control Group (CG)

3.5. SELECTION OF TESTS

The present study was undertaken primarily to assess the comparative effects of different Sprinting training, (Acceleration Sprinting, Repetition Sprinting, Interval

Sprinting) on selected speed parameters such as, Speed, Speed Endurance, Elastic Power, Anaerobic power, Explosive Power and Agility among College men students.

As per the available literatures, the following tests were used to collect relevant data on the selected dependant variables and they were presented in the table-1.

TABLE – 1

SELECTION OF THE TESTS

S.No.	Variables	Tests
1	Speed	50 meter run
2	Speed Endurance	150 meter run
3	Elastic Power	Bunny – Hop test
4	Anaerobic Power	Maragaria Kalamen Step Test
5	Explosive Power	Vertical Jump
6	Agility	4 x 10 meters Shuttle run

3.6. CRITERION MEASURES

From the literatures and with the consultation of professional experts, the selected dependent variables were measured with the help of the following criterion measures for this study to test the hypotheses. The criterion measures adopted for the studies measuring the speed parameters variables are given below.

3.6.1. Speed

Speed was measured by using 50 meters run test. The running time was recorded in seconds.

3.6.2. Speed Endurance

Speed Endurance was measured by using 150 meters run test. The running time recorded in seconds.

3.6.3. Elastic Power

Elastic power was measured by using five strides bounding from the start line. The covered distance was measured in meters.

3.6.4. Anaerobic Power

Anaerobic power was measured by using Maragaria - Kalamen Step Test. The data were recorded in kg-meters/seconds, and the unit of measurement was in watts.

3.6.5. Explosive Power

Explosive power was measured by using vertical jump test and the unit of the measurement was recorded in centimeters.

3.6.6. Agility

Agility was measured by 40 x 10 meter shuttle run and the unit of the measurement was recorded in seconds.

3.7 ORIENTATION OF SUBJECTS

Before collection of the data, the subjects were oriented about the purpose of the study. The investigator explained the training procedure and the selected speed parameters. The subjects had a standard warm-up prior to the test and, during a preliminary visit to the field, they had been familiarized with all the test protocols.

The students had experienced these testing procedures several times before the commencement of the experiment.

3.8. RELIABILITY OF THE DATA

Test and retest method was followed in order to establish the reliability of the data by using ten subjects at random. All the dependent variables selected in the present study were tested twice by the same personnel under similar conditions. The intra class co-efficient correlation was used to find out the reliability of the data and the results have been presented in table 2.

TABLE – 2

INTRA CLASS CO-EFFICIENT OF CORRELATION VALUES ON SELECTED CRITERION VARIABLES

S.No.	Variables	'R' Values
1	Speed	0.98
2	Speed Endurance	0.95
3	Elastic Power	0.97
4	Anaerobic Power	0.99
5	Explosive Power	0.98
6	Agility	0.95

* Significant at 0.01level of confidence

(The table value required for significance at 0.01 level of confidence was with df 14 is 0.767)

3.9. INSTRUMENTS OF RELIABILITY

Instruments such as stop watch and measuring flexible tape were used for this study. All instruments were in good working condition. Their calibrations were tested and found to be accurate enough to serve the purpose of the study.

3.10. SUBJECTS RELIABILITY

The subjects' reliability was established by test-retest method. Ten students were selected from Madras Christian College, Tambaram and they were tested twice by the same tester under the similar conditions on each criterion variable. The intra class correlation was used to find out the subjects' reliability with test-retest scores on each criterion variable separately.

3.11. COMPETENCY OF THE TESTER

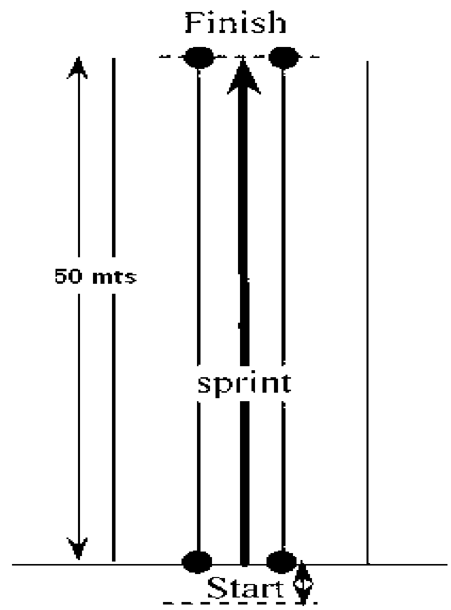
The investigator learned the procedures and methods to handle and operate the instruments to administer the tests. Measurements were taken by the investigator himself using standard equipments.

3.12. COLLECTION OF DATA

Acceleration Sprinting, Repetition Sprinting and Interval Sprinting were given as per the training schedules of three alternate days in a week for 12 weeks. The pre and post test data on the selected criterion variables were collected by administering the test as per the standardized procedures at prior and after 12 weeks of the training programme.

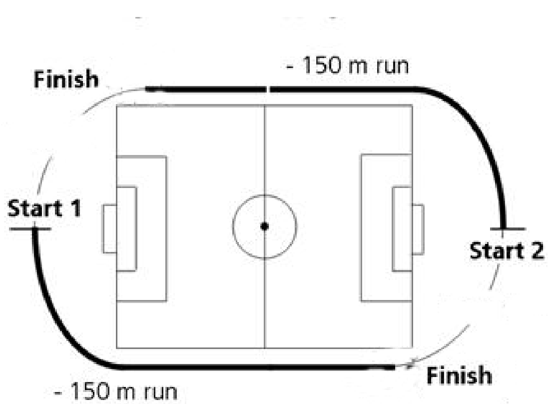
3.13. ADMINISTRATION OF TESTS

3.13.1. Speed - 50 Meters Run



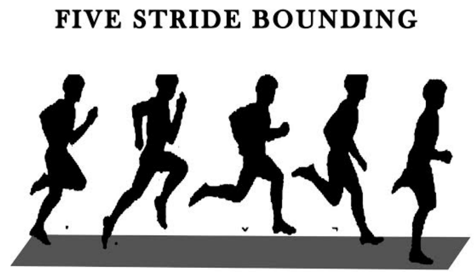
The purpose of test was to assess speed. The equipments used were measuring Tape, Starting Clapper, and Stop watch. The standing start method was adopted for this purpose. The time elapsed from the clap to the runner crossing the finishing line was taken as the test score. The fractions were rounded to the next largest one tenth of a second. For this purpose digital electronic watch was used. Two trials were conducted with sufficient rest in between. The best two trials were recorded as test score.

3.13.2. Speed Endurance - 150 meters run



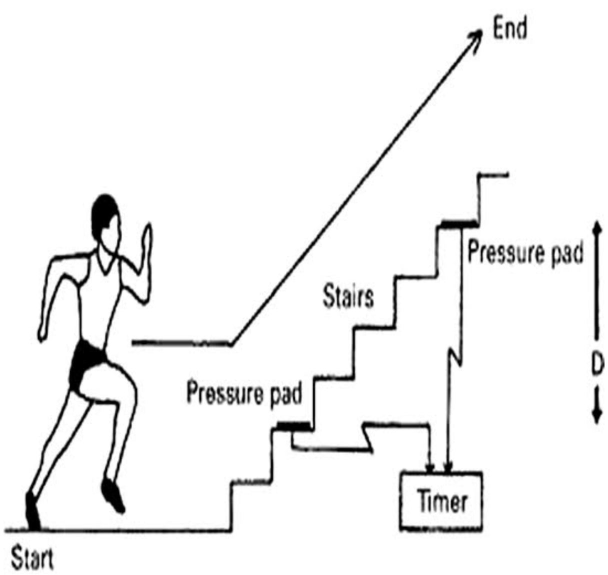
The purpose of the test was to measure the speed endurance of an individual for a given distance. The equipments used for the test were Stop watch, whistle, finishing stand, paper and pencil. The subject was asked to take positions behind the starting line after a short warm up. The starter gives the signal ‘GO’ and the administrator switches on the stop watch. The subject runs as fast as possible and crosses the finishing line which is 150 meters away from the starting line. The watch for a designated runner is stopped when the subjects cross the finish line. The score is the elapsed time to the nearest tenth of a second taken for the subject between the starting and finish line.

3.13.3. Elastic Power- Bunny Hop Test



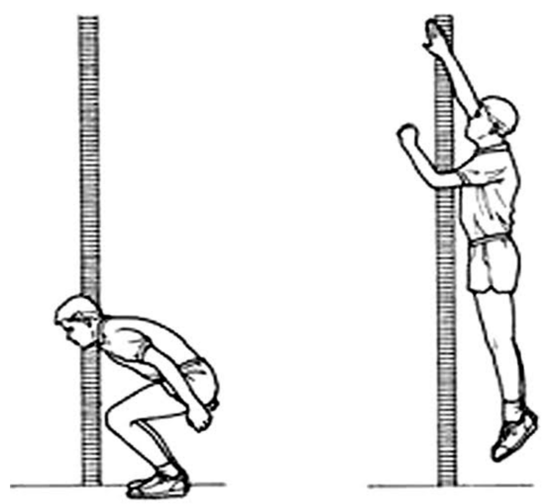
The purpose of the test was to measure the Elastic power. The equipment used was Measuring tape. The procedure prescribed by Loren Seagrove was employed to measure the Elastic Power. The subject took the position on the starting line. When he completed the five strides bounding (Bunny Hops) the performance is measured from the nearest break to the starting line, 3 trials were given. The 5 stride bounding test (bunny hop) for distance will provide the best assessment of an individual's power capacity. The best performance was recorded to the nearest 0.01 meters.

3.13.4. Anaerobic Power - Maragaria Kalamen Step Test



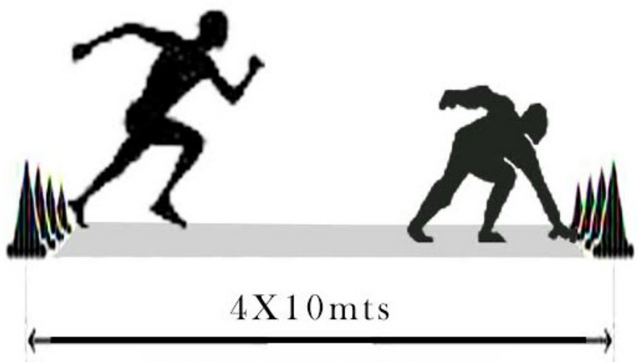
The purpose of the test was to measure the anaerobic power of subjects. The equipments used were Margaria stair Sprinting tester with switch mats and time counter. The equipment consisted of two switch mats, and a clock of counter. The first switch mat was placed on the third step of the stairs and the second switch mat on the ninth step. The 'Counter' connected by both the switch mats that were placed at an appropriate place outside the stairs between the two switch mats for convenient viewing by researcher and his associates. The subject was to start at a point six meters from the first step of the stairs. He was given start using ‘on your marks, get set and whistle’ (for 90). The subject stands towards the stairs, looks at his first step on his strong foot on the first switch mat placed on the third step by skipping first two steps of the stairs. At his first step started the clock would be started in counter three and his next step was on the sixth step, skipping steps four and five. The subject’s strong foot again landed on the switch mat placed on the ninth step skipping steps seven and eight, at this point the clock is stopped in the ninth counter. The subject continued his Sprinting beyond ninth step and stopped. The counter should note the time taken for the anaerobic Sprinting of the subject from Step III to Step IX of the stairs to the nearest hundredth (100) of a second. The researcher noted down the timings clocked by the subjects and the anaerobic power and the results were computed using the Matthews (1991) formula.

3.13.5. Explosive Power - Vertical Jump



The purpose of Vertical jump was to assess the Sprinters explosive power ability. The group of participants warmed up actively to 10 minutes before the test and initially the subject chalked the end of his finger tips and stood by the side of a wall, and resting both feet on the ground then he reaches up as high as possible with one hand raised up and marked on the wall with the tip of the finger (m_1), his feet still resting on the ground. Then the subject from a static position jumped as high as possible and marked the wall with the chalk on the tip of his fingers (m_2). The assistant measured and recorded the distance in centimeters between m_1 and m_2. The athlete repeated the test three times and the best one was recorded as score.

3.13.6. Agility - Shuttle run test (4x10 meters)



The purpose of the test was to measure the agility of the subjects. The equipments used were measuring tape, stop watch, whistle and lime powder. In order to conduct the agility test, two parallels lines were marked at the distance of 10mt. The subject stood behind the starting line. On signal, he ran to the other line, touched it with his hand and returned to the starting line. This procedure is repeated for 4 times continuously. Two trials were given and the best trial was taken into account. The score was the elapsed time recorded in seconds and one tenths of seconds for the better of two trials.

3.14. ESSENTIAL TRAINING GUIDELINES (ACSM)

3.14.1. Intensity

Exercise intensity dictates the specific physiological and metabolic changes in the body during exercise training. Exercise prescription depends on the subjects program goals; age, capabilities, preferences, and fitness level and should stress, but not overtax, the cardiopulmonary and musculoskeletal system.

3.14.2. Duration

Duration and intensity of exercise are inversely related, the higher the intensity, the shorter the duration of the exercise. Exercise duration depends not only on the intensity of exercise but also on the subjects' health status, initial fitness level, functional capability, and program goals. For improved health benefits, the American College of Sports Medicine (ACSM) and the American Heart Association (Nelson et al. 2007) recommend that every individual accumulate, 150 min / wk or more of moderate – intensity aerobic exercise. This amount of physical activity can be achieved in either one continuous bout (30 min) of exercise on each of 5 days or in multiple bouts of shorter duration throughout the day (e.g. 10 min bouts, three times a day) depending on the subject's functional capacity and time constraints. ACSM (2010) recommends increasing exercise duration, rather than intensity, in the initial stages of the exercise program. For most subjects, the duration of aerobic, resistance, and flexibility exercise workouts should not exceed 60 min. This will lessen the chance of overuse injuries and exercise "Burnout"

3.14.3. Frequency

Frequency typically refers to the total number of weekly exercise sessions. Research shows that exercising 3 days a week on alternate days is sufficient to improve various components of physical fitness. However, frequency is related to the duration and intensity of exercise and varies depending on the subject's program goals and preferences. When improved health is the primary goal of the exercise program, ACSM and the American Heart Association (AHA) recommend either 3 days/wk of vigorous – intensity exercise or 5 days / wk of moderate – intensity exercise.

3.14.4. Progression of Exercise

Throughout the exercise program, physiological and metabolic changes enable the individual to perform more work. For continued improvements the cardiopulmonary and musculoskeletal systems, must be progressively overloaded through periodic increases in the frequency intensity, and duration, of the exercise.

3.15. PILOT STUDY

A pilot study was conducted for the purpose of finalizing and deciding upon the intensity and duration of the different Sprinting training programme. The pilot study was conducted with twenty subjects to know the suitability of different Sprinting training and to find out the difficulties and short comings of the study. Further, it helped to ensure the accurate measurement of selected speed parameters among College men students.

3.16. TRAINING APPROACHES OF THE PRESENT STUDY

The selected subjects were divided into four equal groups namely Experimental Group - 1 (Acceleration Sprinting, AS), Experimental Group - 2 (Repetition Sprinting, RS), Group- 3 (Interval Sprinting, IS) and Group – 4 (Control Group, CG) served as control group. The pre-test was taken from the subjects prior to the administration of the different trainings. The subjects were involved with their respective training programme for three alternate days per week for a period of twelve weeks under the personal supervision of the research scholar. At the end of twelve weeks, the post – test was taken on selected criterion variables.

3.17. TRAINING PROGRAMME

The control group was not exposed to any specific training. The experimental groups 1, 2 and 3 were subjected to twelve week of Acceleration sprinting, Repetition Sprinting and Interval Sprinting respectively. Every training session lasted for 60 to 90 minutes. The training program was scheduled for the morning between 6.30 am and 8.00

am. The subjects underwent their respective programme under strict supervision prior to and during every session. Subjects underwent a 10 minute warm up and 10 warm -down exercises which included jogging, stretching, striding and push-ups. All the subjects involved in the training were questioned about their stature throughout the training period. None of them reported any injuries. However, muscle soreness was reported in the early weeks, but it subsided later. Attendance was calculated for the training groups by dividing the total member of training sessions by the number of sessions presented.

3.18. ADMINISTRATION AND ORGANIZATION OF TRAINING

The investigator conducted the Acceleration Sprinting, Repetition Sprinting and Interval Sprinting programme at the Madras Christian College ground. The investigator could personally supervise and ensure proper execution of the training with the help of trained coaches.

3.18.1 Training Intervention for Group 1: Acceleration Sprinting (AS)

1 to 4 weeks:

During the first four weeks the subject performed the distance of 150 meters with two repetitions. The numbers of sets was two. The recovery in between repetition was 90-100 beats/min and the recovery in between set was 10 minutes. The total volume for the first four week was one thousand eight hundred (1800) meters.

5 to 8 weeks:

During 5th to 8th week the subject performed the distance of 150 meters with three repetitions. The total numbers of sets was two. The recovery in between repetition was 90-100 beats/min and the recovery in between set was 10 minutes. The total volume of this week was two thousand seven hundred (2700) meters.

9 to 11 weeks:

For the period of 9th to 11th week the subject performed the distance of 150 meters with four repetitions. The total numbers of set was two. The recovery in between repetition was 90-100 beats/min and the recovery in between set was 10 minutes. The total volume of this week was three thousand six hundred (3600) meters.

12th week:

During the twelfth week the subject performed the distance of 150 meters with two repetitions. The total numbers of set was two. The recovery in between repetition was 90-100 beats/min and the recovery in between set was 10 minutes. The total volume of 12th week was one thousand eight hundred (1800) meters.

TABLE – 3

ACCELERATION TRAINING SCHEDULE

1 to 4 weeks

Days	Distance	Rep	Sets	Load	Volume
Monday	50 meters Striding 50 meters Fast Striding 50 meters Sprinting	2	2	600 meters	1800 meters
Wednesday	50 meters Striding 50 meters Fast Striding 50 meters Sprinting	2	2	600 meters	
Friday	50 meters Striding 50 meters Fast Striding 50 meters Sprinting	2	2	600 meters	

Load = Distance x Repetitions x Sets Volume = Total load of the weeks
Recovery in-between repetitions – 90-100 beat/min
Recovery in-between sets – 10 Minutes

5 to 8 weeks

Days	Distance	Rep	Sets	Load	Volume
Monday	50 meters Striding 50 meters Fast Striding 50 meters Sprinting	3	2	900 meters	2700 meters
Wednesday	50 meters Striding 50 meters Fast Striding 50 meters Sprinting	3	2	900 meters	
Friday	50 meters Striding 50 meters Fast Striding 50 meters Sprinting	3	2	900 meters	

Load = Distance x Repetitions x Sets Volume = Total load of the weeks
Recovery in-between repetitions – 90-100 beat/min
Recovery in-between sets – 10 Minutes

9 to 11 weeks

Days	Distance	Rep	Set	Load	Volume
Monday	50 meters Striding 50 meters Fast Striding 50 meters Sprinting	4	2	1200 meters	3600 meters
Wednesday	50 meters Striding 50 meters Fast Striding 50 meters Sprinting	4	2	1200 meters	
Friday	50 meters Striding 50 meters Fast Striding 50 meters Sprinting	4	2	1200 meters	

Load = Distance x Repetitions x Sets Volume = Total load of the weeks
Recovery in-between repetitions – 90-100 beat/min
Recovery in-between sets – 10 Minutes

12th week

Days	Distance	Rep	Set	Load	Volume
Monday	50 meters Striding 50 meters Fast Striding 50 meters Sprinting	2	2	600 meters	1800 meters
Wednesday	50 meters Striding 50 meters Fast Striding 50 meters Sprinting	2	2	600 meters	
Friday	50 meters Striding 50 meters Fast Striding 50 meters Sprinting	2	2	600 meters	

Load = Distance x Repetitions x Sets Volume = Total load of the weeks
Recovery in-between repetitions – 90-100 beat/min
Recovery in-between sets – 10 Minutes

3.18.2 Training intervention for Group 2: Repetition Sprinting (RS)

1 to 4 weeks:

During the first four weeks the subject performed the distance of 100 meters with three repetitions. The total numbers of set was two. The recovery in between repetition was 90-100 beats/min and the recovery in between set was 10 minutes. The total volume of the first four weeks was one thousand eight hundred (1800) meters.

5 to 8 weeks:

For the period in between 5th to 8th week the subject performed the distance of 100 meters with three repetitions. The total numbers of set was three. The recovery in between repetition was 90-100 beats/min and the recovery in between set was 10 minutes. The total volume of the 5th to 8th week was two thousand seven hundred (2700) meters.

9 to 11 weeks:

For the period in between 9th to 11th week the subject performed the distance of 100 meters with four repetitions. The total numbers of set was three. The recovery in between repetition was 90-100 beats/min and the recovery in between set was 10 minutes. The total volume of this week was three thousand six hundred (3600) meters.

12th week:

During the twelfth week the subject performed the distance of 100 meters with three repetitions. The total numbers of set was two. The recovery in between repetition was 90-100 beats/min and the recovery in between set was 10 minutes. The total volume of 12th week was one thousand eight hundred (1800) meters.

TABLE – 4

REPETITION SPRINT TRAINING SCHEDULE

1 to 4 weeks

Days	Distance	Repetitions	Sets	Load	Volume
Monday	100	3	2	600 meters	1800 meters
Wednesday	100	3	2	600 meters	
Friday	100	3	2	600 meters	

Load = Distance x Repetitions x Sets Volume = Total load of the weeks
Recovery in-between repetitions – 90-100 beat/min
Recovery in-between sets – 10 Minutes

5 to 8 weeks

Days	Distance	Repetitions	Sets	Load	Volume
Monday	100	3	3	900 meters	2700 meters
Wednesday	100	3	3	900 meters	
Friday	100	3	3	900 meters	

Load = Distance x Repetitions x Sets Volume = Total load of the weeks
Recovery in-between repetitions – 90-100 beat/min
Recovery in-between sets – 10 Minutes