The sprinters participated in the events of 100mts and 400mts did not differ from each other in explosive strength and maximum leg strength.

Fernandez, Zimek, Wiewelhove, Ferrauti, (2012), conducted a study on High-intensity interval training vs. repeated-sprint training in tennis. The aim of this study was to compare the effects of high-intensity interval training (HIIT) and repeated-sprint training (RST) on aerobic fitness, tennis-specific endurance, linear and repeated-sprint ability (RSA), and jumping ability. Thirty-one competitive male tennis players took part in a training intervention of 6 weeks. The players were matched into 3 groups, HIIT (n = 11), RST (n = 12), or control group (CON, n = 9). The results showed significant time × intervention interactions for VO(2)peak, with a significant increase in the VO(2)peak level of 6.0% in HIIT ($p = 0.008$) and 4.9% in RST ($p = 0.010$), whereas no changes occurred in CON. However, the following differences were found between the intervention groups: The HIIT-induced greater improvements in tennis-specific endurance (HIIT 28.9% vs. RST 14.5%; $p < 0.05$) and RST led to a significant improvement in RSA (i.e., reduction in the mean sprint time of 3.8%; $p < 0.05$). Neither training strategy induced any effects on jumping and sprinting abilities. Both training interventions showed similar improvements in general aerobic fitness. Also, the present results suggest that RST represents a time-efficient stimulus for a simultaneous improvement of general and tennis-specific aerobic fitness as well for RSA.

Rania Mohamed Abdallah Ghareeb, (2011), Effect of Training Program for Speed Endurance Development on Serum Beta-Endorphin, Lactic Acid, Lactate Dehydrogenase Enzyme and Numerical Achievement Level of 1500 m Running Female Competitors. The research aimed at putting a suggested training program for developing the speed endurance and examining its effect on some biochemical variables (beta-

endorphin, lactic acid and lactate dehydrogenase enzyme (LDH)) and the numerical achievement level of the 1500m running female competitors. The researcher used the experimental method via the experimental design of one group with pre and post measurements. The research community included 10 female players for 1500 m running competition who represented Gharbia athletic team. Results showed that the suggested training program for developing the speed endurance affects positively with statistical significance on the biochemical variables (beta-endorphin, lactic acid and LDH) and affects positively on the numerical achievement level of the 1500 m running female competitors. The researcher concluded that the suggested training program improve the numerical achievement of 1500 m running female competitors through the positive effect on lactic acid production and LDH response with decreasing beta- endorphin concentration in blood which indicates reduction of the stressful effect of 1500m running.

Lockie, Murphy, Knight, Janse de Jonge, (2011), conducted a study on, Factors that Differentiate Acceleration Ability in Field Sport Athletes. The purpose of this study was to determine the biomechanical and performance factors that differentiate sprint acceleration ability in field sport athletes. Twenty men completed sprint tests for biomechanical analysis and tests of power, strength, and leg stiffness. The sprint intervals analyzed were 0–5, 5–10, and 0–10 m. The subjects were split into a faster and slower group based on 0- to 10-m velocity. A 1-way analysis of variance determined variables that significantly ($p \leq 0.05$) distinguished between faster and slower acceleration. All subject data were then pooled for a correlation analysis to determine factors contributing most to acceleration. The results showed that 0- to 5-m (~16% difference) and 0- to 10-m (~11% difference) contact times for the faster group were significantly lower. Times to peak vertical and horizontal force during ground contact were lower for the faster group. This was associated with the reduced support times achieved by faster accelerators

and their ability to generate force quickly. Ground contact force profiles during initial acceleration are useful discriminators of sprint performance in field sport athletes. For the strength and power measures, the faster group demonstrated a 14% greater countermovement jump and 48% greater reactive strength index. Significant correlations were found between velocity (0–5, 5–10, and 0–10 m) and most strength and power measures. The novel finding of this study is that training programs directed toward improving field sport sprint acceleration should aim to reduce contact time and improve ground force efficiency. It is important that even during the short sprints required for field sports, practitioners focus on good technique with short contact times.

Argus, Gill, Keogh, Blazevich, Hopkins, (2011), conducted a study on Kinetic and Training Comparisons between Assisted, Resisted, and Free Countermovement Jumps. The purpose of this investigation was to (a) determine the kinetic differences between assisted, free, and resisted countermovement jumps and (b), investigate the effects of contrast training using either assisted, free, or resisted countermovement jump training on vertical jump performance in well-trained athletes. In part 1, 8 recreationally trained men were assessed for force output, relative peak power ($PP \cdot kg^{-1}$) and peak velocity during the 3 types of jump. The highest peak force was achieved in the resisted jump method, while $PP \cdot kg^{-1}$ and peak velocity were greatest in the assisted jump. Each type of jump produced a different pattern of maximal values of the variables measured, which may have implications for developing separate components of muscular power. In part 2, 28 professional rugby players were assessed for vertical jump height before and after 4 weeks of either assisted ($n = 9$), resisted ($n = 11$), or free ($n = 8$) countermovement jump training. Relative to changes in the control group (1.3 ± 9.2%, mean ± *SD*), there were clear small improvements in jump height in the assisted (6.7 ± 9.6%) and the resisted jump training group (4.0 ± 8.8%). Elastic band assisted and resisted jump training are

both effective methods for improving jump height and can be easily implemented into current training programs via contrast training methods or as a part of plyometric training sessions. Assisted and resisted jump training is recommended for athletes in whom explosive lower-body movements such as jumping and sprinting are performed as part of competition.

Upton, Ross, (2011), conducted a study on Assisted and Resisted Sprint Training, finding out the Effects on 13.7 M Speed, Speed with Direction Change, and Peak Power in Division I Female Soccer Athletes. The purpose of the study was to determine the effectiveness of assisted and resisted sprint training in enhancing short distance speed, speed with direction change, and peak power in Division I female soccer athletes. Subjects consisted of 27 NCAA Division I female soccer athletes, they completed a 4-week, 12-session sprint training program, which included assisted supra-maximal sprinting utilizing bungee cords (AST), resisted sprinting utilizing a portable variable resistance system (RST), and maximal sprinting (TST). During each training session, subjects in their respective groups completed 10 repetitions, with three minutes' rest between repetitions, of 18.3 m sprints followed by an 18.3 m deceleration to a jog. Dependent variables were 13.7 m speed (s), T-Test with direction change (s), vertical jump (cm), and peak power (W). The researchers chose the T-Test with direction change because it more closely replicates the movements in soccer, as opposed to the traditional shuffle T-Test. Peak Power (W) was calculated using the Sayers et al. equation [Peak Power (W) = 60.7 x Jump Height (cm) x Body Mass (kg) - 2055). Timings were collected using an infrared beam timing system. Results: Were expressed as pre- to post-intervention change and analyzed utilizing a one-way ANOVA.

Upton, David, (2011), conducted a study on The Effect of Assisted and Resisted Sprint Training on Acceleration and Velocity in Division IA Female Soccer Athletes. This investigation evaluated the effects of a 4-week, 12-session training program using resisted sprint training (RST), assisted sprint training (AST), and traditional sprint training (TST) on maximal velocity and acceleration in National Collegiate Athletic Association (NCAA) Division IA female soccer athletes ($n = 27$). The subjects, using their respective training modality, completed 10 maximal effort sprints of 20 yd (18.3 m) followed by a 20-yd (18.3 m) deceleration to jog. Repeated measures multivariate analyses of variance and analyses of variance demonstrated significant ($p < 0.001$) 3-way interactions (time × distance × group) and 2-way interactions (time × group), respectively, for both velocity and acceleration. Paired *t*-tests demonstrated that maximum 40-yd (36.6-m) velocity increased significantly in both the AST ($p < 0.001$) and RST ($p < 0.05$) groups, with no change in the TST group. Five-yard (4.6-m), 15-yd (13.7 m), 5- to 15-yd (4.6- to 13.7-m) acceleration increased significantly ($p < 0.01$) in the AST group and did not change in the RST and TST groups. Fifteen- to 25-yd (13.7- to 22.9-m) acceleration increased significantly ($p < 0.01$) in the RST group, decreased significantly ($p < 0.01$) in the AST group, and was unchanged in the TST group. Twenty-five to 40-yd (22.9- to 36.6-m) acceleration increased significantly ($p < 0.05$) in the RST group and remained unchanged in the AST and TST groups. It is purposed that the increased 5-yd (4.6-m) and 15-yd (13.7-m) accelerations were the result of enhanced neuromuscular facilitation in response to the 12-session supramaximal training protocol. Accordingly, it is suggested that athletes participating in short distance acceleration events (i.e., ≤15 yd; ≤13.7 m) use AST protocols, whereas athletes participating in events that require greater maximum velocity (i.e., >15 yd; > 13.7 m) should use resisted sprint training protocols.

Espen , **Shaher**, **Thomas**, **Eystein**, (2011), conducted a study on, The effect of 40-m repeated sprint training on maximum sprinting speed, repeated sprint speed endurance, vertical jump, and aerobic capacity in young elite male soccer players. The purpose of this study was to examine the effect of 10 weeks' 40m repeated sprint training program that does not involve strength training on sprinting speed and repeated sprint speed on young elite soccer players. Twenty young well-trained elite male soccer players of age (±SD) 16.4 (±0.9) years, body mass 67.2 (±9.1) kg, and stature 176.3 (±7.4) cm volunteered to participate in this study. All participants were tested on 40-m running speed, 10 × 40-m repeated sprint speed, 20-m acceleration speed, 20-m top speed, countermovement jump (CMJ), and aerobic endurance (beep test). Participants were divided into training group (TG) (n = 10) and control group (CG) (n = 10). The study was conducted in the pre-competition phase of the training program for the participants and ended 13 week. The results of this study indicate that the repeated sprint program had a positive effect on several of the parameters tested. However, because the sample size in this study is 20 participants, the results are valid only for those who took part in this study. Therefore, we advice to use repeated sprint training similar to the one in this study only in periods where the players have no speed training included in their program. Furthermore, the participants in this study should probably trained strength, however, benefits were observed even without strength training is most likely to be caused by the training specificity.

Zafeiridis, et al., (2010), conducted a study on the effects of resisted sled-pulling sprint training on acceleration and maximum speed performance. The purpose of the present study was to examine the effects of resisted (RS) and un-resisted (US) sprint training programs on acceleration and maximum speed performance. Twenty-two male students completed RS (n=11) or US (n=11) sprint training programs. The RS group

followed a sprint-training program with 5 kg sled pulling and the US group followed a similar sprint-training program without sled pulling. The training program consisted of 4x20 m and 4x50 m maximal runs, and was applied 3 times/week for 8 weeks. Before and after the training programs the subjects performed a 50 m run and the running velocity of 0(-1)0 m, 10(-2)0 m, 20-40 m and 40-50 m was measured. In addition, stride length and stride frequency were evaluated at the 3(rd) stride in acceleration phase and between 42-47 m in maximum speed phase. The RS improved running velocity in the run sections 0(-1)0 m and 0(-2)0 m, while in US group the running velocity in all run sections in acceleration phase remained unchanged ($p>0.05$). In contrast, RS training had no effect on running velocity in maximum speed phase, whereas US improved running velocity in 20-40 m, 40-50 m, and 20-50 m run sections ($p<0.05$). Stride rate increased only after RS in acceleration phase (+7.1+/-2.9%; $p<0.05$), whereas stride length increased only after US in maximum speed phase (+5.5+/-2.5%; $p<0.05$). Sprint training with 5 kg sled pulling for 8 weeks improves acceleration performance (0(-2)0), while un-resisted sprint training improves.

Clar, Stearne, Walts, Miller, (2010), conducted a study on, The Longitudinal Effects of Resisted Sprint Training Using Weighted Sleds vs. Weighted Vests. The purpose of this study was to determine the longitudinal effects of weighted sled (WS) and weighted vest (WV) sprint training on maximum velocity sprint performance and kinematics. 20 male collegiate lacrosse players were randomly assigned to a WS group ($n = 7$) towing 10% body mass, a WV group ($n = 6$) loaded with 18.5% body mass, or an un-resisted (UR) active control group ($n = 7$). All subjects completed 13 training sessions over 7 weeks. Pre- and post-test measures of sprint time and average velocity across the distance interval of 18.3 to 54.9 m were used to assess sprint performance, whereas high-speed video (300 Hz) and motion-analysis software were used to analyze stride length,

stride rate, ground contact time, and flight time. A 3 × 2 repeated measures analysis of variance was performed for each dependent variable and revealed no significant between-group differences for any of the sprint performance or kinematic stride cycle measures. Effect size statistics suggested small improvements in 18.3- to 54.9-m sprint time and average velocity for the UR group but only trivial improvements for the WS and WV groups. With regard to sprint performance, the results indicate that WS and WV training had no beneficial effect compared with UR training. In fact, for the loads used by WS and WV in this study, UR training may actually be superior for improving sprint performance in the 18.3- to 54.9-m interval.

Matthews, Comfort, Crebin, (2010), conducted a study on Complex Training in Ice Hockey: The Effects of a Heavy Resisted Sprint on Subsequent Ice-Hockey Sprint Performance. The aim of the study was to investigate the acute effect of a heavy resisted sprint when used as a preload exercise to enhance subsequent 25-m on-ice sprint performance. Eleven competitive ice-hockey players (mean ± SD: Age = 22.09 ± 3.05 years; Body Mass = 83.47 ± 11.7 kg; Height = 1.794 ± 0.060 m) from the English National League participated in a same-subject repeated-measures design, involving 2 experimental conditions. During condition 1, participants performed a 10-second heavy resisted sprint on ice. Condition 2 was a control, where participants rested. An electronically timed 25-m sprint on ice was performed before and 4 minutes after each condition. The results indicated no significant difference ($p = 0.176$) between pre (3.940 + 0.258 seconds) and post (3.954 + 0.261 seconds) sprint times in the control condition. The intervention condition, however, demonstrated a significant 2.6% decrease in times ($p = 0.02$) between pre (3.950 + 0.251 seconds) and post (3.859 + 0.288 seconds) test sprints. There was also a significant change ($p = 0.002$) when compared to the times of the control condition. These findings appear to suggest that the intensity and duration of

a single resisted sprint in this study are sufficient to induce an acute (after 4 minutes of rest) improvement in 25-m sprint performance on ice. For those athletes wishing to improve skating speed, heavy resisted sprints on ice may provide a biomechanically suitable exercise for inducing potentiating before speed training drills.

Meysam, Rouholah Fatemi, Alireza, (2010) conducted a study on Relationship between speed, agility and anaerobic power of 14-16 years elite soccer Players. Identifying the physiological characteristics and existing relationships between these variables as the most effective factors for assessing and selecting the soccer players. The present study seeks the answer to this question that is there any relationship between speed, agility and anaerobic power of 14-16 years elite footballers? In order to achieve the study purpose, 20 elite soccer players from the adolescents football league in Tehran (mean age, 15.25±1.15 years, height 172.3±2.90 cm and weigh 61.1±2.97 kg) volunteered to participate in the study a week before the 88-89 season of football league competition. To assess the anaerobic power of the subjects, Sargent vertical Jump, to measure the speed, 10 m sprint test and to assess the agility, 9×4 m tests used. Inferential data analysis and Pearson correlation test using 11.5 version of SPSS software and the significance level of a=0.05 used to data analyzing. The results showed that there were significant relationships between the speed and anaerobic power (r=0.904, p=0.001), speed and agility (r=0.976, p=0.001) and anaerobic power and agility (r=0.884, p=0.001) of 14-16 years elite football players. In the present study, significant relationships observed between the measured factors and this indicates on football coaches' attention to these factors and identical training programs to improve these factors in soccer players.

Ronald K. Hetzler, et al., (2010), conducted a study on modification of the Margaria-Kalamen test for football players. The football stair climb test (FST) protocol

used in this study increased the vertical displacement (20 steps, 3.12 m) so that the mean best time for the test was 2.048 6 0.267 seconds. Fifty-eight Division I-A football players volunteered to participate (mean 6 SD age = 20.2 6 1.8 yr, height = 184.1 6 7.7 cm, weight = 102.5 6 19.4 kg). Subjects performed 25 trials with 30 to 40 seconds of rest between trials. Test-retest reliability was determined using 34 subjects by way of intra-class correlation coefficients with a value of 0.73 for peak power and SEM of 105.4 W, indicating an acceptable level of reliability. Subjects were divided into 3 groups by position: linemen (Line), skill, and linebackers (LB). Alpha level was p , 0.05. Peak power was 1674.5 6 300.8, 1712.6 6 251.5, and 1388.6 6 210.4 W for the LB, Line, and Skill groups, respectively. Groups were significantly different (p ,0.0001), with the LB and Line found to be more powerful than the Skill group. Peak power continued to increase throughout the 25 trials in the Skill and LB group but plateaued after approximately 17 trials in the Line group. It was concluded that the FST was a reliable test for measuring peak anaerobic power in collegiate football players, which, theoretically, should provide more accurate measures of peak power caused by increased vertical displacement and longer duration, resulting in a decreased influence of cheating strategies during test administration.

Cinzia Benvenuti, Carlo Minganti1, Giancarlo Condello, Laura Capranica, Antonio Tessitore, (2010), conducted a study on Agility assessment in female futsal and soccer players. The aim of this study was to assess the reliability of a reactive visual stimuli agility field test (RVS-T) and to evaluate differences in RVS-T and planned (PVS-T) agility performances between female soccer and futsal players. Sixty-six female players belonging to Italian teams of regional level were recruited to the study. The experimental apparatus consisted of four lighted spherical visual stimuli connected to a computer able to randomly generate three different sequences. Differences between RVS-

T and PVS-T performances were calculated to evaluate the decision-making time (DMT) of players. significant difference emerged only for RVS-T and DMT, whereas similar performance between groups resulted for PVS-T. The RVS-T proved to be reliable tool to evaluate agility in field conditions. Players showed better RVS-T and DMT performances with respect to soccer counterparts.

Maio Alves, Rebelo, Abrantes, Sampaio, (2010), conducted a study on, Short-Term Effects of Complex and Contrast Training in Soccer Players' Vertical Jump, Sprint, and Agility Abilities. The purpose of this study was to analyze the short-term effects of complex and contrast training (CCT) on vertical jump (squat and countermovement jump), sprint (5 and 15 m), and agility (505 Agility Test) abilities in soccer players. Twenty-three young elite Portuguese soccer players (age 17.4 ± 0.6 years) were divided into 2 experimental groups (G1, n = 9, and G2, n = 8) and 1 control group (G3, n = 6). Groups G1 and G2 have done their regular soccer training along with a 6-week strength training program of CCT, with 1 and 2 training sessions·wk−1, respectively. G3 has been kept to their regular soccer training program. Each training session from the CCT program was organized in 3 stations in which a general exercise, a multiform exercise, and a specific exercise were performed. The load was increased by 5% from 1 repetition maximum each 2 weeks. Obtained results allowed identifying (a) a reduction in sprint times over 5 and 15 m (9.2 and 6.2% for G1 and 7.0 and 3.1%, for G2; $p < 0.05$) and (2) an increase on squat and jump (12.6% for G1 and 9.6% for G2; $p < 0.05$). The results suggested that the CCT induced the performance increase in 5 and 15 m sprint and in squat jump. Vertical jump and sprint performances after CCT program were not influenced by the number of CCT sessions per week (1 or 2 sessions·wk−1). From the obtained results, it was suggested that the CCT is an adequate training strategy to develop soccer players' muscle power and speed. Brechue, Mayhew, Piper, Fontaine, 2010,