

Evaluating the Effect of Six Weeks Strength Training on the Speed of Sprinters Among Debre Markos University Male Sport Science Students, Ethiopia

Awoke Tibebe¹ Mekuriaw Demeke¹ Birhanu anjetie²

Department of sport science, Debre Markos university PO box 269 Debre Markos , Ethiopia

Abstract

This study attempted to explore the effect of strength training on the speed of sprinters among Debre Markos University sport science students. Purposive sampling technique was used to select six male student athletes from the total population of 32 male their year sport science department students. The subjects under this study took part in training programs performed in strength and speed training for consecutive six weeks. The variables selected for this study were measurement of calf, thigh, chest, biceps and triceps circumference and speed of 100m and 200m pre and post six weeks training. The data were analyzed by using SPSS soft wear and paired t-test with comparison of means at 95% confidence interval by using pre and posttest. The results indicated there were significant improvement on selected variables weight, biceps and triceps muscle circumference and speed of 100m and 200m ($p < 0.05$). In other variables like calf, thigh, chest had a change but not much significance like above variables. The mean differences (MD) between pre and post tests for weight wear 1.4, biceps triceps 2.5, chest 0.5 thigh 0.833, calf 0.5 and speed of 100m 0.143, 200m 0.6. This study confirmed that conditioning exercise training with active rest was significant to improve the speed, coordination, agility, balance, power and reaction time variables. The study showed that student athletes who were exposed to strength exercise retraining have revealed positive outcomes on speed.

Keywords: - agility, athlete, balance, coordination, reaction time, speed, strength, training

DOI: 10.7176/JTHS/48-01

Publication date: March 31st 2020

1. INTRODUCTION

Sprinting has a high technical demand on athletes. The coordinative and technical demand (neuromuscular) can only be judged from a subjective point. Most important is that a sprinter has a good start technique and sprint running technique so as to be able to be repeat the movement pattern repetitively(cyclical pattern) without loss of form.(Fridrotterns kera, 2012)

The effects of strength training on sprinting performance has been well acknowledged in a number of studies with the majority reporting improved running performance(Gamble,2010). A strength base of training is considered critical to sprinting development and the force production of muscle is improved as the muscle hypertrophy is increased (Hradyk, 2005 and Moore, et.al, 2004). Hypertrophic and neutral adaptations are commonly used to induce structural changes in muscle morphology and an increase the rate of force development (Verkhoshansky, 2006). Approaches maximal velocity the time foot contact the ground becomes shorter 100-200m/s (Plisk, 2008).The contribution of the stretch shortening cycle and the need for adequate reactive strength increases.

Speed is a fine motor skill and can be increased by applying principle of motor learning to speed training (Gambeta, 2007). A Successful sprinter must have the ability to exert great force against the surface of the ground in a shorter time period than a less successful sprinter, which indicates that the successful sprinter generates greater power or ground reaction forces (Alexander, 1989 and Ward et al., 2000).

A sprinter performance is mainly determined by the force and speed with which muscle can contract and relax because of the cyclic motion, the correct time of the change from contraction (force application) to relaxation (Schmolinsky 1983,Pfaff 2001). Resisted sprint training is used to increase force output at the ankle, knee and hip in and effect to increase stride length (Lockie,Murphy and sprinks,2003). Popular resisted sprint training method includes resisted toweling, weighted vests, parachutes, and uphill training. Resisted sprint toweling is an effective method of increasing sprint speed. The sprint motion is directly loaded by pulling a sled, tire or weighted sledge (Behrens and simonson 2011).

1.2 Statement of problem

Force production, Anthropometry, physiology, biomechanics, and technic plays a major role in speed of athletes specifically sprinters (Cook, 2003). While giving the training to the athlete the coach and the athlete should know the importance of resistance training on speed fitness quality to get a positive outcome. However, many of our cubs and projects at different regional states do not attempt to develop strength components of fitness for the improvement of their athletes speed. So this leads our country to focus on middle and long distance, especially

long distance running only. For this reasons that the researcher got initiated to investigate the effect of strength exercise on speed performance of sprinters

1.3 Objective of the study

1.3.1 General objective

The general objective of this study was to evaluate the effect of six weeks strength training on the speed of sprinters among Debre Markos university third year male sport science students.

1.3.2 Specific objective

The specific objective of this study were

- To identify the relationship between strength training and the speed of sprinters.
- To assess the impact of strength on the speed of sprinters.
- To determine exercises that develops the strength of muscles.

1.4 Research questions

- What is the effect of strength exercise on speed fitness of sprinters?
- How to identify the relationship between strength training and the speed of sprinters?
- Dose strength training has an effect on the speed of sprinters?

3. RESEARCH METHODOLOGY

3.1 Study Area Description and Period

This study was conduct in Debre Markos University located in East Go jam zone to the eastern part of Debre Markos town and far from Amhara National Regional State town Bahir Dar 265km and from the capital city of Ethiopia, Addis Ababa 300km and its altitude is 2446m above sea level and its astronomical location is 10 degree with 21 minute North latitude and 37 with 43 minute East longitude.

3.2 Study Design

This study used experimental (pre-posttest) study design to evaluate the effect of strength training on the speed of sprinters.

3.3 Source of Data

The source of data used in this research study was primary data. The primary data was obtained or collected from the experimental variables according to the designed parameters. Before and after training test measurements was given on the sprinters weight, biceps and triceps, calf, thigh, and chest muscle circumference, 100m and 200m speed to evaluate the effect of strength training on the speed of sprinters.

3.4 Study Population

This study was conducted on 32 male third year sport science students to evaluate the effect of strength training on the speed of sprinters.

3.5 Sample Size and Technique

The sample size of this study was selected 6 male student athletes from the total population of 32 male third year sport science students and the sampling technique were purposive sampling technique because the samples are selected based on their training participation in short distance.

3.6 Data Collection Tools

This study used test or experimentation method to measure speed of sprinters and size of the muscle by using tape, stopwatch, cones, whistle and track to run.

3.6.1 Testing Procedure

First the variables of anthropometry of the selected student athletes (chest, biceps and triceps, thigh, calf muscle and their weight) wear measured Then 10 minutes of warming up by easy to moderate intensity running on the track with 8 minutes of dynamic warming up exercise. After completing the above exercise per-test had taken by running with a maximum seed covered 100m on track by using stopwatch the time they scored is recorded. On the next day 200m speed test on the track were taken. Then strength and speed training had practiced in the gym and on the track for 6 weeks within 4 days per a weak. After 6 weeks training measure the muscle size and weight and then post -test had taken with a maximum speed covered 100m then record their time in the next day 200m would test and record their time.

3.7 Data analysis

The data was analyzed and interpreted in descriptive statistical analysis by computerized statistical packaging software (SPSS). The paired t- test was used to compare the pre and post test data by calculating the t-value, mean and standard deviation on table.

4. Data Analysis and Interpretation

The strength and speed training was provided for 6 weeks with the frequency of 4 days. The selected variables were measured two times before (pre) training test and after (post) training test. The variables were; weight, calf, thigh, chest, biceps and triceps muscle circumferences and 100m, 200mspeed. The data was analyzed through paired t- test.

Table 1 The pre and post training test results for a variable weight mean \pm SD(standard deviation) and N= number of students they participate in experiment.

Variable	N	PT	POT	mean difference	Significance
Weight(kg)	6	59.5 \pm 1.99	60.9 \pm 1.68	1.4	0.017*

PT= Pr training test; POT=Post training test, $P < 0.05^*$ significance and the data in the form of mean \pm ST (standard deviation).

The data showed from table 1 was significantly improved in their weight. The cause behind the improvement in their weight was due to the well programmed and organized training that was conducted for 6 weeks. The pre and post training test mean values for weight was 59.5 and 60.9. This showed that after the delivery of 6 weeks training there was significance on the weight of third year male sport science students. Therefore the mean difference of this weight was 1.4. In case of this post training test was 1.4 greater weights than pre training test. So this was due to the effect of strength training on incremental of body weight.

Table 2 The pre and post training test results for a variable biceps triceps muscle circumference, mean \pm st(standard deviation).

Variable	N	PT	POT	Mean difference	Significance
Biceps, triceps circumference	6	25.8 \pm 0.75	28.3 \pm 1.4	2.5	0.01*

PT=pre training test, POT=post training test, $p < 0.05^*$ =significance and the data in the form of mean \pm SD(standard deviation). N=number of students in experiment.

The data from table 2 showed that there was significant improvement in their biceps and triceps muscle circumference on third year male sport science students.

The cause behind the improvement in their biceps and triceps muscle circumferences was due to the well programmed and organized training that was conducted for 6 weeks. But the main purpose of this study was to evaluate the effect of strength training on the speed of sprinters.

The pre and posttest mean values for biceps and triceps was 25.8 and 28.3 respectively. This showed that after the delivery of 6 weeks training there was significance a significance difference in the biceps and triceps muscle circumference. Therefore the mean difference of this biceps and triceps muscle circumference 2.5. So this was due to the effect of strength training on increment of muscle circumference. So our muscle was increase muscle contraction also increase, then due to muscle contraction speed is increase.

Table 3 the pre and post training test results for a variable chest circumference mean \pm SD(standard deviation)

Variable	N	PT	POT	Mean difference	significance
Chest circumference	6	90.83 \pm 1.169	91.33 \pm 0.816	0.500	0.415*

PT= pre training test, POT=post training test, $p < 0.05^*$ =significance and the data in the form of mean \pm SD(standard deviation). N= number of students in experiment.

The data table 3 showed that there was no significantly improve their chest muscle circumference because $p > 0.05$ their significance value is 0.415 but the pre and post training mean values of a chest muscle size was 90.83 and 91.33 respectively. The mean value difference was 0.5 this not much significance. This showed that after the delivery of six weeks training there was no significance difference on the chest muscle size but there is a little change.

Table- 4 : the pre and post training test result for a variable thigh muscle size (mean \pm SD).

variable	N	PT	POT	Mean difference	significance
Thigh circumference	6	47.50 \pm 2.588	48.33 \pm 1.633	0.833	0.363*

PT=pre training test, POT=post training test, $p < 0.5^*$ =significance and the data in the form of the mean \pm SD standard deviation, N= number of students participate in experiment.

The data table -4 shows that there was no significantly improve their thigh muscles size because $p > 0.05$.the pre and post training mean value for thigh muscle was 47.50 and 48.33 respectively. The mean value difference 0.500, this was not significance. This showed that after the delivery of six weeks training there was no a significance difference in thigh muscle, but there was a little significance.

Table -5: the pre and post test result for a variable calf muscle size mean \pm SD(standard deviation) .

Variable	N	PT	POT	Mean difference	significance
Calf circumference	6	32.83 \pm 1.472	33.33 \pm 1.633	0.500	0.76*

PT=pre training test, POT=post training test, $p < 0.05^*$ =significance and the data in the form of the mean \pm SD standard deviation, N= number of students participate in experiment.

The data from the above table showed that there was not a significance improvement in their calf muscle size because $p > 0.05$. Their significance value is 0.76, but the pre and post training mean values for calf muscle size was 32.83 and 33.33 respectively and the mean value difference was 0.05 this was not much significant. This showed that after the delivery of six weeks training there was no significance difference, but there was a little change.

Table -6: the pre and posttest training result for a variable 100m speed mean \pm SD(standard deviation).

Variable	N	PT	POT	Mean difference	significance
100m speed	6	12.38 \pm 0.47	12.22 \pm 0.51	0.143	0.014*

PT=pre training test, POT=post training test, $p < 0.05^*$ =significance and the data in the form of the mean \pm SD standard deviation, N= number of students participate in experiment.

The data showed from table 6 was significantly improved in their speed of 100m. The cause behind the improvement in their speed of 100m was due to the well programmed and organized training that was conducted for 6 weeks.

The pre and posttest mean values for 100m speed was 12.38 and 12.22 respectively. This showed that after the delivery of 6 weeks training there was significance on the speed of 100m male third year sport science students. Therefore the mean difference for the speed 100m was 0.0143 then post training test had greater speed than pre training test by 0.0143. So this was due to the effect of strength training on the speed of sprinters.

Table 7 the pre and posttest training result for a variable 200m speed mean \pm SD(standard deviation).

Variable	N	PT	POT	Mean difference	significance
200m speed	6	26.52 \pm 1.114	26.468 \pm 1.083	0.600	0.036*

PT=pre training test, POT=post training test, $p < 0.05^*$ =significance and the data in the form of the mean \pm SD standard deviation, N= number of students participate in experiment.

The data showed from table 7 was significantly improve in their speed of 200m was due to the well programmed and organized training that was conducted for 6 weeks.

The pre and posttest training test mean values for 200m speed was 26.52 and 26.4683 respectively. This showed that after the delivery of 6 weeks training there were significance on the speed of 200m of male third year sport science students. Therefore the mean difference for the speed 200m was 0.60 then post training test had greater speed than pre training test by 0.60 .So this was due to the effect of strength training on the speed of sprinters.

A successful sprinter must have the ability to exert great force against the surface of the ground in a shorter time period than a less successful sprinter, which indicates that the successful sprinter generates greater power or ground reaction forces (Alexander, 1989 and Wey and et al., 2000).

5. Results, Discussion, Summary, Conclusions and Recommendations

5.1 Results and Discussions

Speed and strength training program was provided for 6 weeks with the frequency of 3 days per week. The selected variables were measured two times; pre training test and post training test. The data was analyzed through paired t test. The results for each variable were discussed as follows.

The pre and post training test mean difference values for weight 1.4, thigh 0.833, calf 0.500, chest 0.500, biceps and triceps 2.5, 100m, 0.143, and 200m 0.600. This showed that after the delivery of 6 weeks training there was a significance difference in speed and their muscle circumference among Debre Markos third year male sport science students. The pre and post training test p value of variables were weight 0.017*, thigh 0.0363*, calf 0.76*, chest 0.415*, biceps and triceps 0.01*, 100m 0.014*, and 200m 0.036*. The above showed that there was significantly an improvement in all variables of thigh, calf, chest, biceps and triceps muscle circumference, weight and 100m, 200m speed that they had test among Debre Markos university third year male sport science students. So, this showed that 95% of confidence interval of the difference. This was due to the effect of strength training on the speed of sprinters. Maximum strength is most important during the acceleration phase due to a high amount of force needed in order to overcome inertia. (Gamble, 2010; lentz hrydyk, 2005). This study was also in agreement with the study of entitled biomechanical basis of human movement by (Hamill and knutzen, 2009) running velocity can be increased by increasing stride length, stride rate or both. At higher speed; stride length can only increase so much due to anatomical limitations, but, stride rate can continue to increase as the athletes, learns to run more effectively and makes greater gains in strength and power. So, strength training can have an effect on the speed of an individual sprinter.

5.2 Summary

This research was conducted on 6 Debre Markos University third year sport science students. All subjects under study took part in an organized training program and they began the strength and speed training program with appropriate intensity, duration, and the type of exercise and load of exercise.

This study assessed and tried to evaluate the effect of strength training on the speed of sprinters among Debre Markos University third year male sport science students. The major finding of this investigation was the increment or improvement of muscle circumference like calf, thigh, biceps and triceps, weight, and speed.

The analysis of data were done through paired t- test to see the difference if there any. The level of significance was set as 0.05.

As the tests result indicated that there was an improvement in their weight, biceps and triceps ,100m, and 200mspeed from pretest to posttest due the strength and speed training program ,but calf, thigh, and chest muscle circumferences did not much significantly increase (improve)as weight, biceps and triceps, 100m and 200m speed.

5.3 Conclusions

Based on the major finding of the study i draw conclusions

- Strength training programs or exercises contribute to the improvement of speed among Debre Markos university third year male sport science students. Therefore, sprinters those participating in in strength training is advantageous, because their time they record at the time of posttest were decrease, in case of this speed were increased.
- Strength training contributes to the improvement of speed for sprinters among Debre Markos University third year sport science students.
- As a result this study was found that there was an improvement in some selected variables (weight, biceps and triceps, 100m and 200m after 6 weeks training program.
- Therefore, sprinters those participating in strength training were advantageous.

Reference

- Baechale, J.R and R.W Earle, 2002 essentials of strength training and conditioning 2nd edition Champaign 11, human kinetics
- Cook G 2003 athletic body in balance Champaign 11, human kinetics
- Cronin, J and K, Huansen, 2005 strength and power prediction of sports speed journal of strength and conditioning research 19:349-357
- Gamble, 2010 strength and coordination for team sports specific physical preparation for high performance , new work, NY: Rutledge.
- Gambeta V, 2007 Athletic development, The art and science of functional sports conditioning
- Hamil, J and K.M. Kuntzen 2009 biomechanical bases of human movement 3rd edition Philadelphia
- Lockie Murphy, A and Spinks C.D 2003 effects of resisted towing on sprint
- Pfaff, D, 2001 personal conversation
- Plisk, A.I.J 2008 speed, agility and speed endurance development
- Schmolisky, G 1983 track and field sport Verla berlin
- Ward Smith A, J and D.F Radiford 2000, Investigation of the kinetics of anaerobic metabolism by analysis of the performance of elite sprinters, Biomech, 33