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The effect of strength training on power, speed and flexibility in case of Woldia university third year male sport science department students

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Abstract: The **objectives** of this study was to investigate the effect of strength training on power, speed and flexibility of Woldia University third year male sport science department students. It also attempts to determine the effect of strength training on power, speed and flexibility. **Method**: In order to attain their purpose data was gathered from the sample population using simple random sampling method. The study was carried out on ten (10) male students in Woldia University third year male sport science department students. The data was collected by use of measurement of power, speed as well as flexibility by application of tests like vertical jump, 20 meter dash and sit and reach. The data was analyzed and compared with the help of statistical procedures in which arithmetic mean (mean), standard deviation (S.D) and paired t-test by using SPSS VERSSION 20 were employed. **Result** suggests that maximum strength training is strongly associated with dynamic power. In addition maximum strength training is strongly associated with speed but not flexibility. Hence the finding of this study indicates that before this time students do not exercise effective strength training to bring power, speed and flexibility. Based on the major findings above, the researcher concluded that by effective strength training practice students develop better power, and speed. But the result shows by effective strength training practice students do not develop flexibility or there is no significance change of flexibility.

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Key words:- Strength training, power, speed, flexibility

Back ground of the study

Strength training is the use of resistance to muscular contraction to build the strength, anaerobic endurance and size of skeletal muscle. There are different method of strength training the most common is being the use of gravity or elastic force to oppose muscle contraction when properly strength training can provide significant functional benefit and improvement in overall health and well-being, including increased bone density, muscle, tendon and ligament strength and toughness, improve joint function, reduce potential for injury, increase metabolism and improve cardiac function **(Shaw, B.S; Shaw, I.(2005).**

Strength training commonly uses the technique of progressively increasing the force out put the muscle through incremental increase of weight, elastic tension or other resistance, and use a variety of exercise and type of equipment to target specific muscle groups. Strength training is primarily anaerobic activity, although some proponents have adapted it to provide the benefit of aerobic exercise through circuit training. Strength training differ from body building, weigh training ,power lifting and strong men, which are sports rather than form of exercise although training for them is inherently inter connected with strength training as it is shot put, discus, and highland game. Many other sports use strength training as part of their strength training regimen, notably football, wrestling, basketball and track and field. **(Schwarzenegger, Arnold (199).**

Strength training with isometric exercise was popularized by Charles atlas from the 1930 onwards. The 1960 saw the gradual introduction of exercise machines into the skill related strength train gyms of the time .strength training become increasingly popular in the 1980 following the release of the body building movie pumping iron and the subsequent popularity of Weight training a component of body building and weight lifting, weight trained is a technique for developing muscle strength by progressively lifting increasing amount of weight **(weight lifting guide 2004, emilwz @weight training guide.net).**

Isometric training, exercise or isometrics is a type of strength training in which the joint angle and muscle do not change contraction.

Power-the ability of muscle to quickly generate force over a very short period of time (the ability to exert a maximal force as quickly as possible

as in jump accelerating and throwing. power gives the athletes explosive ability to run faster and jump high, and it can be improved lifting weight and running against resistance. **(BY PATRICA A. Duster PhD's, P, H, 1997).**

Speed –ability to perform a movement in a short period of time or ability of an athlete to move as fast as possible. Speed is not just how fast someone is can run, but it is dependent on its acceleration (how quickly they can accelerate from stationery position). Maximal speed of movements and also speed maintenance's (minimizing deceleration) movement speed requires strength and power.**(Schoenfeld, Brad (2002).**

Flexibility- control range of motion of a specific joint. The range is the function of elasticity of tendon, ligament, surrounding soft tissue control the function of strength and each degree of motion, especially at end of ranges. Joint stability and consequent protection against injury are best achieved through a balanced physical conditioning program designed to improve both muscle strength and flexibility. Flexibility and strength training should be considered interdependent. Since are involved in the degree and quality of movement across a joint. Strength the muscle, surrounding stretched joint helps stabilize the joint and improve muscular function, thus decreasing the risk of injury. **(PATRICA A. DUSTER PHD. M. P. HI. 1997).**

1.2. Statement of the problem

John Hancock center for physical activity and nutrition (2012), studied at Tufts university have shown that strength training is one the best ways to fight the weakness and the frailty. Done regularly, strength training builds bone and muscles and helps to preserve strength, independence and energy. Additionally, he said that people who are strength trained can reduce the signs and symptoms of many diseases and chronic conditions like, arthritis, osteoporosis, heart diseases and back pain that people who are not strength trained.
Based on this, the investigators observed that these problems also displayed on third year sport science students. Therefore students who are lower in strengthen unable to bring power, speed and flexibility. Some of the obstacles are students do not exercise effective training to bring power, speed and flexibility are problems in physical fitness level and training methodology. This fact triggered the investigators to conduct this study by examine the following questions:

- ❖ To what extent strength training enhance power of students?
- ❖ To what extent strength training enhance speed of students?
- ❖ To what extent strength training enhance flexibility of students?

Hypothesis

H_o = Strength training has no significance effect on flexibility, speed and power.

Hi = Strength training has significance effect on flexibility, speed and power.

Objective

The general objective of this research was to determine the effect of strength training on power, speed and flexibility in Woldia University third year male sport science department students.

Specific objective

The specific objectives of the study were:

- ✓ To find out to what extent the effect of strength training will have on power.
- ✓ To find out to what extent the effect of strength training will have on speed.
- ✓ To find out to what extent the effect of strength training will have on flexibility.

Significance of the study

The study would provide a number of benefits:

- ➢ It would help to understand more about effect of strength training on power, speed and flexibility.
- ➢ It would help to understand the advantage of conducting strength training on power, speed and flexibility.
- ➢ To promote awareness the participation of students towards strength training relating to power, speed and flexibility.
- ➢ It would serve as a bench mark for students to conduct further research on relating topics and as reference to understand the effect of strength training on power, speed and flexibility.

Delimitation of the study

The study would be better if it covers the whole community of Woldia University; however, in order to get enough time, financial resource and voluntary participants this study was conducted on Woldia University of sport science 3rd year 10 male students by assessing the effect of strength training on power, speed and flexibility.

Limitation of the study

While conducting this study, the researcher encountered three major limited factors that can have effect on the quality of the research work. The limitations faced in conducting the study were:

- ❖ Shortage of enough time.
- ❖ Shortage of reference book and internet access.
- ❖ Unable to control some external variables. Such as nutrients activities of participants outside training program.

Definition of terms

- ✓ **Flexibility**- control range of motion of a specific joint.

- ✓ **Iso-metric exercise**- exercise involved muscle contraction without the muscle or joint moving.
- ✓ **Power**- the ability of muscle quickly generates force over a very short period of time.
- ✓ **Speed**- ability to perform a movement in a short period of time or ability of an athlete to move as fast as possible.
- ✓ **Strength training**- is the use of resistance of muscular contraction to build the strength, anaerobic endurance and size of skeletal muscle

Study design

The study was experimental type of study in order to investigate the effect of strength training on power, speed and flexibility in Woldia University sport science 3rd year male students.

Study area and population

The study was conducted in Amhara region; North Wolo zone, Woldia University which is located in Northern part of Ethiopia. Geographically the study area is located approximately 525 km far from Addis Ababa and 5 km from Woldia town. It has latitude 11□50 north and longitude 39□36 east *(retrieved from http//www.wikpedia.com).* This study was going to conduct on Woldia University, Faculty of Natural and computational science, Department of Sport science 3rd year male students would be taken as a target population. There were about 37 regular male 3rd year sport science department students in Woldia University in 2009 E.C.

Sample size determination and sampling techniques

The investigators selected 10 male students from third year sport science department students under the study randomly by using lottery method and use for the study. When the researchers took 10 male students from the total population of 37 male students had its own purpose. That is to reduce waste of time and according to researcher's income to reduce cost (financial resource) to perform the required outcome (result), when appropriate sample size is making in order to acquire the required information. The following information would be used:

N=total population to total number of male 3rd year sport science department students.

S=sample population (sample number of 3rd sport science department students). So the investigators chooses the samples (specimens) by using simple random sampling technique to get qualify and valid information.

Table A. Total and sample of the student

Third year male sport science department students.	
N	S
37	10

Source of data collection

In this research different data collection approaches were employed:

These approaches were the primary data collection methods. In the primary data collection method, the researcher selected voluntary students to gather available information by testing 3rd year male sport science department students.

Data collection instrument

In order to get necessary information regarding to investigation on the effect of strength training on power, speed and flexibility in Woldia University department of sport science 3rd year male students. The researchers used pre-test and post-test to conduct this study. The investigators were gather the relevant information by using sit and reach test, vertical jump test and 20 meter dash test as instrument assisted by materials. i.e. measuring tape, stop watch, whistle, pen, paper, box and vertical jump ladder was used to collect the data during the test.

Resistance training guidelines and exercise

The American college of sport medicine (ACSM) recommends that strength training program should be performed a minimum of two non-consecutive days each week, with one set of 8 to 12 repetitions for older and frail individual 8 to 10 exercise should be performed that target the major muscle group.

	Free weight	Body weight
Chest	Supine bench press	Push-ups
Back	Bent –over barbell rows	Pull-ups
Shoulders	Dumbbell lateral raise	Arm circles
Biceps	Barbell/dumbbell curls	Reverse pull-ups
Triceps	Dumbbell kick backs	Dips/dig-ups/
Abdomen	Weighted crunches	Crunches prone planks
Quadriceps	Back squats	Body weight lunges
Hamstrings	Stiff-leg dead lifts	Hips-ups

Concerning the training, the researchers used the resistance guidelines and modified it to some extent due to time constraint and the participants were students and it was very difficult to get according to the first program prepared; the researcher tried to modify the guidelines in such away: 4 days in a week (totally 24 days in 6 weeks), moderate intensity, but; the intensity differs in each individuals and duration (70 minutes per day), with 8-10 repetitions per set and 4-7 sets per exercise.

Test administration

To conduct the research, the researchers prepared testing methods of 20 m run test for speed, vertical jump for power and sit and reach test for flexibility of individual students.

Procedures for power, speed and flexibility

The participants were performed warming up exercise activities for all three tests for 10-15 minutes before starting test.

Vertical jump tests

This test were performed the athlete stands side on the wall and reaches up with the hand closed to the wall. keeping the feet flat on the ground, the pint of the finger tips is marked or recorded, this is called standing reach test, the athlete then stands away from the wall and leaps vertically as high as possible using both arms and legs to assist in protecting the body upwards. Best of three attempts was recorded. The difference in distance between the standing reach height and the jump height was the score.

20 meter dash test

The researchers used stop watch, cone markers, and flat and clear surface to conduct the test. The test involved running a single maximum sprint over 20 meters, with the time recorded. Start from stationary position, one foot in front of the other. The front foot should be on or behind the starting line and then the result have taken by giving two trials and best time was recorded.

Sit and reach test

This test involved sitting on the floor with legs stretch out straight ahead with bare foot. The soles of the foot were placed flat against the box. Both knees were locked and press flat to the floor. With the palms facing down wards, and the hands on top of each other or side by side. The subject reaches forward along the measuring line as far as possible. Ensure that the hands remain at the level, no one reaching further forward than the other. The participants were asked to pull forward their body as much as possible and the possible for one to two seconds while the distance was recorded. The score was being recorded to the nearest centimeter or half inch as the distance reaches by the hand.

Method of data analysis

After the researchers gather the data, the statically technique could be used. In this research there were mean, standard deviation; paired ´t´ test by using SPSS VERTION 20 t test and systematically in table and graph was applied to find out significance of the effect of strength training on power, speed and flexibility of the selected variables and descriptive statement.

RESULT

The chapter deals with the result and discussion of the data obtained from students through test. For this purpose 10 male students were taken randomly as total respondents or sample out of 37 students. The data which obtained from the student are displayed in mean, standard deviation, paired‘t’ test by using SPSS VERTION 20 processed systematically in table and graph.

Table 1. Demographic characteristics of participants.

Unit	Mean (SD)
Age	23.3 (0.95)
Weight	56 (6.00)
Height	1.70 (0.05)

From the above table 1, the characteristics of the participants were analyzed in the form of mean and standards deviation as age =23.3±0.95, weight =56±6.00 and height =1.70±0.05.

Table 2. Selected variable and their criteria measures.

No	Variables	Criteria measures
1	Power	Vertical jump test
2	Speed	20 meter dash
3	Flexibility	Sit and reach test

From this table.2, the criteria measure indicates that by what type of test we measure variables which mean power, speed and flexibility.

Table 3. Test results of the two tests (in mean±SD).

No	Variables	Pre-test	Post-test	p-value
1	Power(cm)	39.55±13.63	41.3±7.00	0.00
2	Speed(t)	3.23±0.21	3.11±0.22	0.00
3	Flexibility(cm)	14.22±7.42	13.5±7.25	0.52

SD=standard deviation

As above table.3, show that the mean and standard deviation of strength training individuals of male sport science students. These values were recorded as variable of pre-test power= 39.55±13.63, speed=3.23±0.21 and flexibility=14.22±7.00; post-test power=41.3±7.00, speed=3.11±0.22 and flexibility=13.5±7.25 respectively.

Table.4. Comparative analysis of power between pre-test and post-test of third year sport science male students.

No	Group	Number	Mean	SD	Df	't' value	p
1	Pre-test	10	39.55	13.63	9	47.22	0.00
2	Post-test	10	41.30	7.00			
3	Pre-post difference	10	1.75	6.63			

As above table.4, A paired sample t- test was conducted to assess whether their difference in found between the mean of the two tests shows that the mean and standard deviation show that value on the power variable pre-test (before exercise)and post-test (after exercise)male students were recorded. The result shows there were significance difference between the mean power of pre-test (39.55±13.63), post-test (41.30±7.00); pre-post difference of mean and standard deviation (1.75±6.63); 't' (9)=47.22, p<0.05 respectively. Therefore by performing effective strength training every individual could improve his or her power.

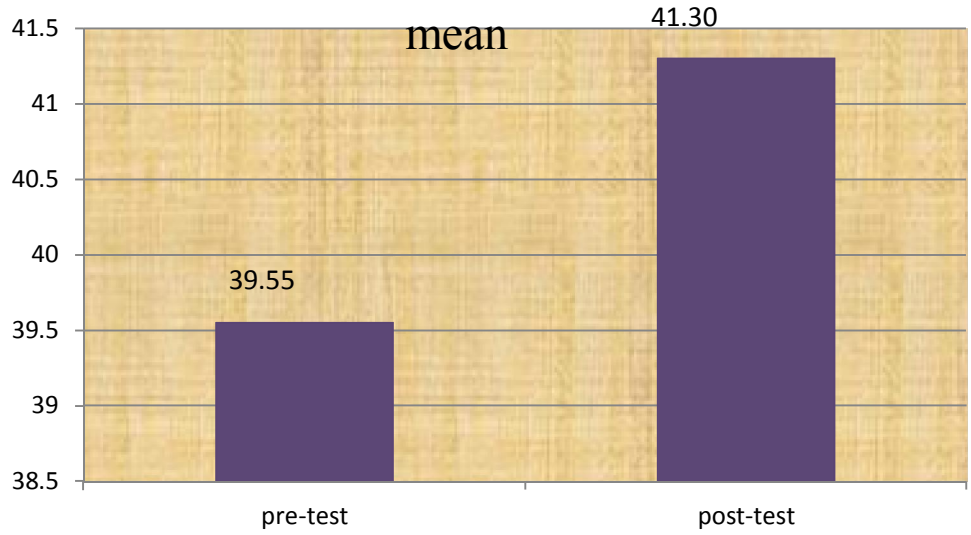

Figure 1 comparative analysis of power between pre-test and post-test of 3rd year sport science male students.

From the above Figure 1, indicates that the mean of the pre-test was 39.55 and the post-test 41.30. Therefore it indicates that there were great differences between the two means or there was great pre-post difference. The 'p' value was p<0.05, so there was significant change of power by performing strength training.

Table.5. comparative analysis of speed between pre-test and post-test of 3rd year sport science male students.

No	Group	Number	Mean	SD	Df	't' value	'P' value
1	Pre-test	10	3.23	0.21	9	42.22	0.00
2	Post-test	10	3.11	0.22			
3	Pre-post difference	10	0.12	0.01			

As above Table.5, A paired sample t-test was conducted to assess whether their difference in found between the mean of the two tests shows that the mean and standard deviation; show that value on the speed variable of pre-test and post-test male students were recorded. The results shows there was a significance difference between

the mean speed of pre-test (3.23±0.21) and post-test (3.11±0.22); pre-post difference of mean and standard deviation (0.12±0.01); t (9)=42.22, p<0.05. So there was a significance change of speed by performing strength training.

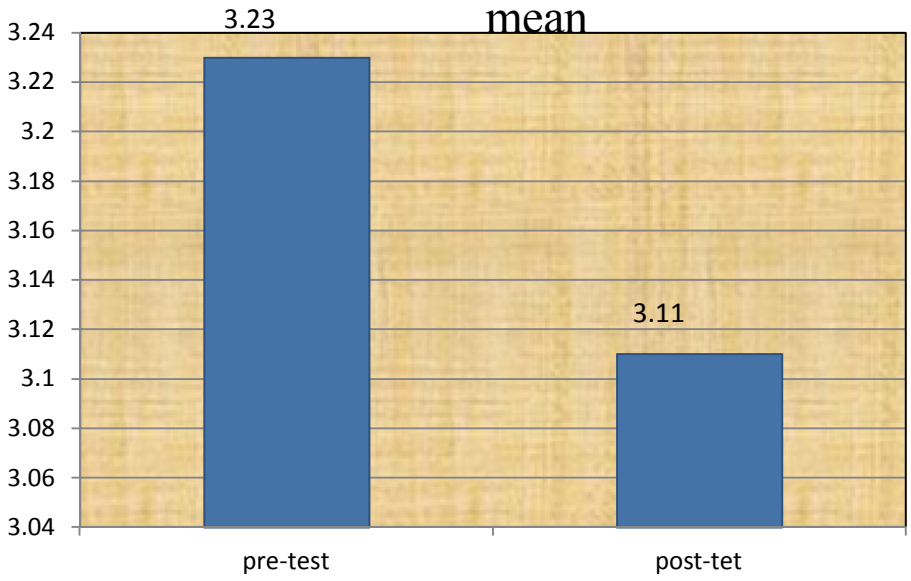

Figure 2. comparative analysis of speed between pre-test and post-test of 3rd year sport science male students.

From the above figure 2, indicates that the mean and standard deviation of the pre-test was 3.23 and the post-test was 3.11. Therefore it indicates that there was difference between the two means or there was a pre-post difference. The p value was p<0.05, so there was significance change of speed by performing strength training.

Table.6. comparative analysis of flexibility between pre-test and post-test of 3rd year sport science male students.

No	Group	number	Mean	SD	Df	't' value	P value
1	Pre-test	10	14.22	7.42	9	6.05	0.052
2	Post-test	10	13.52	7.25			
3	Pre-post difference	10	0.7	0.17			

As above table 6, A paired sample t-test was conducted to assess whether their difference in found between the mean of the two tests shows that the mean and standard deviation shows that value on the flexibility variable of pre-test and post-test male students were recorded. The results shows there was no significance difference between the mean flexibility of pre-test (14.22±7.42) and post-test (13.52±7.25); pre-post difference of mean and standard deviation (0.7±0.17); t (9)=6.05, p>0.05 respectively.

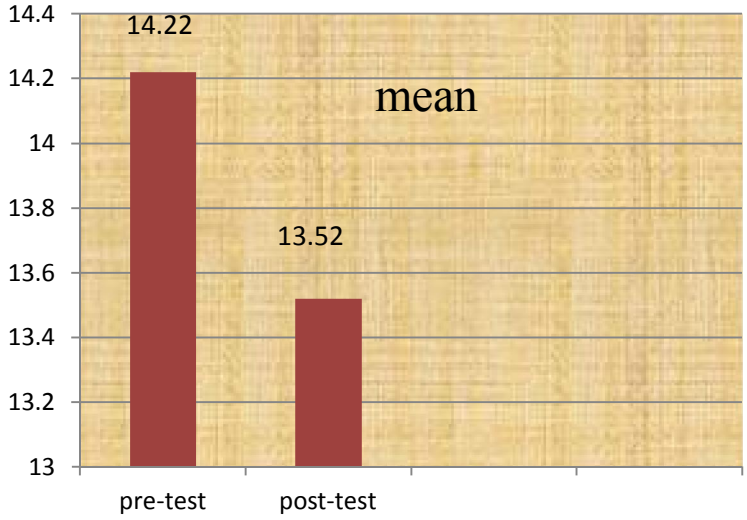

Figure 3. comparative analysis of flexibility between pre-test and post-test of 3rdyear sport science male students.

From the above figure.3, indicates that the mean and standard deviation of the pre-test was 14.22, the post test was 13.52. Therefore it indicates that there was no significance difference between the two mean or there was little pre-post difference of the two means. The p value was $p>0.05$, so there was no significance change of flexibility by performing strength training.

DISCUSSION

The primary finding in this investigation was the six week effect of strength training program on power, speed and flexibility.

These results suggest that the effective strength training has significant changes in speed. In the study (Fletcher & Hartwell, 2004), the effective strength training has no significant changes in speed. Specifically, our results suggest that when students doing strength training they can improve speed.

In our result the effect of strength training has significant changes on power. In the study (Caro, Riek & Carson, 1997), strength training has changes in power. So the result suggest that when students doing strength training they can develop their power.

These results suggest that there were no changes in flexibility. In the study (Hetu & Christie, 1998), also suggest that strength training has no significance changes on flexibility.

In closing, a six week strength training program has significance change on power and speed; whereas no significance changes in flexibility.

CONCLUSION

On the basis of the results the following conclusions are drown:

- ✓ Effective strength training has a positive effect on the development of power.
- ✓ Additionally, Strength training has a positive effect on the development of speed. However; strength training has no a positive effect on flexibility.

Generally, it was concluded that by proper strength training practice, individual trainer develops better power and speed but do not develop flexibility.

RECOMMENDATION

- ➢ As power, speed and flexibility are the major qualities for strength trainer the coaches, training organizations or club managers should give attention for power, speed and flexibility training.
- ➢ Runners and jumpers should perform strength training to improve their speed and explosive power respectively.
- ➢ In addition to proper strength training well-balanced nutrients and recovery have

significant effect on the improvement of power, speed and flexibility. So, to compensate the energy cost of the trainer, training organization should facilitate and provide all the nutrients for their trainer.

- Future studies should not only use male participants and use control variables.

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