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Abdominal Strength vs. Speed in Female College Athletes

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ABSTRACT

Abdominal strength may be contributed to the speed at which you run. Using the McPherson College Women's soccer team, I tested to see if abdominal strength played a role in speed in 10 soccer players. I measured the weight, BMI (Body Mass Index), and abdominal strength before workouts started along with the 40, 100, and 200 yard sprints. They then did abdominal workouts for about 20 minutes, three times a week, for six weeks. I repeated the measurements of their weight, BMI, abdominal strength and the three sprints after the six weeks of workouts. I also took their height, arm length, and torso length and along with weight and BMI, used those to make sure none of them had an effect on my results. My results showed that speed only increased on the 100 yard sprint with increased abdominal strength. In the 40 and 200 yard sprints, the speed decreased with increased abdominal strength. There was no significant correlation between any of results except for the difference in weight and the difference in abdominal strength along with the difference in BMI and the difference in abdominal strength. Meaning that people who weighted more, tended to through the ball further and people with an increase in their weight, their BMI's also increased (directly related to each other). There was also not a great enough difference with pre and post weight and BMI. There however was a great enough difference that it wasn't due to chance with the pre and post 40, 100, 200 and abdominal strength changes. With increased abdominal strength, the time for the 40 and 200 yard sprints increased with increased abdominal strength, while the time for the 100 yard spring decreased with sprint time. Abdominal strength was shown to increase speed on an average sprint, opposed to a short sprint or a longer sprint.

Keywords: *abdominal strength, female collegiate athletes, sprinting.*

INTRODUCTION

Having core strength is defined as the ability to control the position and motion of the trunk over the pelvis to allow optimum production, transfer and control of force and motion to the terminal segment. (French, 2008). When the core is strong it helps with the transfer of energy from the larger torso to the smaller extremities, which can help relieve joints from stress. Having and maintaining a strong core results in core stability which then results in being able to maximize force generations and decrease joint loads when doing activities like running or throwing.(Kibler, 2006). It allows the proper alignment of the spine and pelvis while limbs are moving. With less joint loads, there is less stress being put on joints, which will help to keep joints healthier and not cause pain. Speed is also defined as sprinting which is when someone runs a short distance at their top speed.

A toned core is very helpful and important for athletes. A toned midsection has the functions of stability and force generation and is involved in almost all activities like running, kicking, and throwing. (Borghuis, 2008). Core strength will help maximize the potential of all extremities. In addition to a strong core being helpful to athletes' performances, it is also helpful in the fact that a strong core helps with the prevention of injuries. Research has found that having an unstable core can lead to pain in other parts of the body. The knee is one of the major parts of the body that is a victim of core instability during exercise. (Borghuis, 2008). The knee can be a victim because when the core isn't strong, it causes the hips to rotate inside along with the tibia to rotate inwards also. This in turn causes the knee to tract tilted inwards instead of up and down. It is found that lower extremity injuries can cause back pain in the future from poor muscle endurance since the lower extremity injuries prevent the athlete from participating in sports. Athletes with a strong core have good balance and stability which is crucial for an athlete. Having these two key components helps to prevent the athlete from injuring them self, which allows the athlete to perform at their best. They will be able to run at their highest speed since they will not be injured. There have been a couple of experiments that tested the effect of abdominal strength on different types of speed. There was a study done with 57 elite male athletes and 14 elite female athletes along with 87 normal people that ranged from 18-22 years old. They used an isokinetic technique to measure the maximum torque in the core during lateral flexion and flexion and extension. The results showed that the more elite athletes produced more than the normal people of each gender. (Andersson, 1988).There have been similar studies done where other muscle groups such as calves and thighs were measure to compare the effect that they had on speed as well.

I want to take the definition of abdominal strength (the ability to control the position and motion of the trunk over the pelvis to allow optimum production,

transfer and control of force and motion to the terminal segment) and compare and see if there is any kind of correlation with the definition of speed (when someone runs a short distance at their top speed.) With all of this information on the abdomen and with myself being an athlete, I want to see if having a stronger abdomen affects the speed of an athlete. I will also take into consideration the height, weight and BMI (Body Mass Index) of each athlete I test. I will do a before and after evaluation of these things. I want to have the athlete do an abdominal workout three times a week for six weeks. I will also test the athletes' abdominal strength and speeds before doing the workouts by having then throw in a ball and also run 40, 100 and 200 yard sprints. Then after six weeks I will re-evaluate their speeds along with their weight, BMI and abdominal strength. I will then compare the results.

MATERIALS AND METHODS

I started off with talking to Dan Hoffman about the different ways of measuring abdominal strength and which one he believes will help me out the most. The next part of my experiment was to get permission for a couple different things. I had to talk to my soccer coach, Robert Talley and get his approval to us the McPherson College Women's Soccer Team for my experiment. I also needed to get my proposal accepted from the Institutional Review Board in order for my experiment to actually happen.

In order to find out if abdominal strength and speed had an effect on one another, I used the McPherson's College Women's Soccer Team. I tested them in 40 yards, 100 yards, and 200 yard sprints.

I recorded their results before they started abdominal workouts. I also measured their abdominal strength as well as weight and BMI to insure that weight loss didn't improve speed.

Once I had their measurements and had them recorded, they performed six weeks of abdominal workouts, three times a week. I then recorded all the information again.

The abdominal workouts consisted of different forms/styles of crunches along with planks. Each workout lasted for fifteen minutes. Each person picked a different form/style of crunch to do. We started off with doing 15 of each style. As time went on, and their abdominal strength increased, the amount they had to do for each repetition also increased. Each week increased by five.

After six weeks, I got their final measurements. I again took their sprint times, followed by abdominal strength, weight and BMI. I compared the before and after results. I compared to see if there is any kind of correlation that abdominal strength had on the effect of speed by using a paired t-test.

RESULTS

With each measurement I took, I noticed that the abdominal strength in eight out of the 11 increased, one of the 11 decreased, one of the 11 stayed the same and one of the 11 was voided because she got hurt and couldn't finish the experiment. As far as weight and BMI goes five of the 11, weight and BMI increased, two of the 11, weight and BMI decreased and three of the 11 stayed the same and one of the 11 was again voided. For the 200 yard sprint nine of the 11 speed increased, one of the 11 speed decreased and one of the 11 was voided. For the 100 yard sprint, the results were completely opposite. Nine of the 11 speed decreased, while one of the 11 speeds increased and one of the 11 was voided. Lastly, for the 40 yard sprint, eight of the 11 speed increased, while two of the 11 speed decreased and one of the 11 was voided.

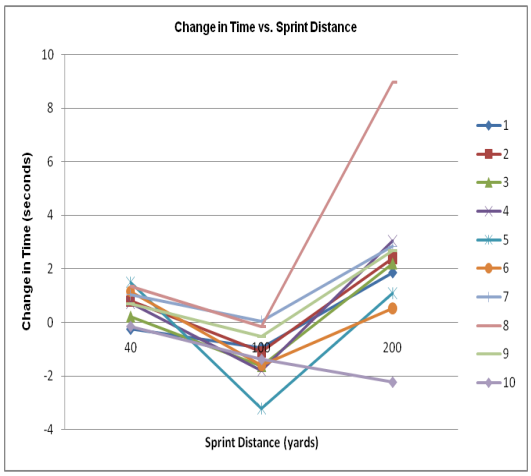

Figure 1: Change in Time vs. Sprint Distance. Difference in the before and after times (seconds) of the 40, 100, 200 yard sprints.

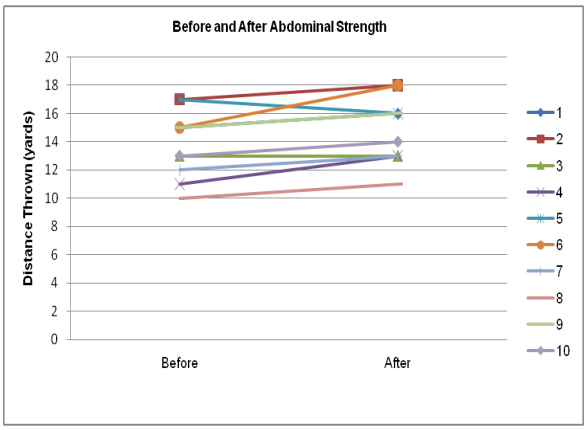

Figure 2: Distance (yards) thrown (abdominal strength) before and after workouts.

DISCUSSION

There was no significant correlation between any of results except for difference in weight and BMI before and after the abdominal workouts with the difference in abdominal strength before and after the abdominal workouts. The non significan, St correlations were not applicable to P>0.050, while the two that had a correlation were P<0.050. There was also not a great enough difference that is due to chance with pre and post weight and BMI. Weight was only had P=0.089, meaning it is P>0.050, but it also was stated that negative results should be interpreted cautiously. BMI had P=.442, meaning that P>0.050, but it as well stated that negative results should be interpreted cautiously. There however was a great enough difference that it wasn't due to chance with the pre and post 40, 100, 200 and abdominal strength changes. For all of these to be due not to chance, P<0.050. For the 40 yard sprint, P=0.005, the 100 yard sprint, P=0.002, the 200 yard sprint, P=0.020 and for the abdominal strength, P=0.027.

My results can relate back to the experiment Andersson did with seeing how much torque each athlete or normal person produces. Athletes produced more torque in the core, which was used in the hip, allowing an athlete to run faster. However, this was only true for the 100 yard sprint. Another experiment was one that Stanton did. He used swiss ball training to improve core strength and then looked at the effect it had on running. Stanton found that there wasn't a positive correlation with running and abdominal strength. It was found that swiss ball exercises improved core strength without improving physical performances. (Borguis, 2008). This could reason why the 40 and 200 yard sprint times increased.

If I were to go back and re-do this experiment. The first thing I would change would to have more people participate in it, so that I have more results to compare. I would like to have around 30 people compared to the 14 I started with and 10 I ended with. I also would have done one on one exercises with everyone because about half way through workouts, people started to slack and not put very much effort in the abdominal workouts, we were doing three times a week. The last thing I would change, would be to have a longer time frame than six weeks of workouts. I would prefer 18 weeks and then re-test them every six weeks so that there is a lot of data to compare and you can also see how each person is coming along through the process.

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