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Analysis on the Effect of Core Training Program on Some Physical and Motoric Characteristics for Female Volleyball Players Aged 8-11

8-11 Yaş Arası Bayan Voleybolcularda Core Antrenman Programının Bazı Fiziksel ve Motorik Özelliklere Etkisinin İncelenmesi

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Abstract:
The purpose of this study is to analyze the effect of core training programs on some physical and motoric characteristics in female volleyball players aged 8-11. In volleyball, the necessity for teams to play to 25 pts and to win 3 sets makes the duration of the game changeable. In the meantime, a volleyball player makes 250-300 explosive movements. 50-60% of these movements are jumping, 30% is high-speed movements and change of positions and 15% is falling. Core training contains the exercises for training the muscles that control and stabilize abdominal, waist and hip movements. SPSS (18.0 version) statistics package program was used in the analysis of data and presentation of the findings obtained as tables. Frequency, percentage, preliminary and final test values of data obtained have been calculated. In conclusion, it can be stated that core training programs applied to volleyball players are affective on physical and motoric parameters of athletes. It has been specified that muscle strength of athletes increases after the core training program, and a significant difference at a level of $p<0,05$ was found especially in leg muscle strength. While the muscles of athletes gain more strength after the training program, the injury risk and fatty tissue may reduce.

Keywords: Volleyball, Core Training, Motoric and Physical Characteristics

Özet:
Çalışmanın amacı; 8-11 yaş arası bayan voleybolcularda core antrenman programlarının bazı fiziksel ve motorik özelliklere etkisinin incelenmesidir. Voleybol oyununda; Takımların her sette 25 sayı ve toplam 3 set kazanması gerekliliği oyun süresini değişken kılmaktadır. Bu süre içinde bir voleybolcu patlayıcı kuvvet içeren 250–300 hareket gerçekleştirmektedir. Hareketlerin toplamına bakıldığında sıçramalar %50-60'ını, yüksek hızda hareketler, yer değiştirmeler %30'unu ve düşmeler %15'ini içermektedir. Core antrenman karın, bel ve kalça hareketlerini kontrol ve stabilize eden kasların antrene edilmesine yönelik alıştırmaları içerir. Verilerin analizinde ve bulguların oluşturulup tablo halinde sunulmasında SPSS (18.0 versiyon) İstatistik paket programı kullanılmıştır. Elde edilen verilerin frekans ve yüzde ön test ve son test değerleri hesaplanmıştır. Sonuç olarak yapılan voleybol sporcularına uygulanan core antrenman programlarının sporcuların fiziksel ve motorik parametreleri üzerinde etkili olduğunu söylenebilir. Sonuç olarak; sporcuların core antrenman programı sonrası genel olarak kas gücünün arttığı, özellikle bacak kaslarının kuvvetinde $p<0,05$ düzeyinde anlamlı fark bulunmuştur. Sporcularda antrenman programı sonrası kaslarının güçlenmesi ile birlikte sakatlık risklerinin azalacağı ve yağ dokusunda da düşüş görülebilecektir.

Anahtar Kelimeler: Voleybol, Core Antrenman, Motorik ve Fiziksel Özellikler

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The purpose of all sports branches is to increase the performance of athletes through developing the biomotor attributes required by the related sports after ensuring physiological harmony. Volleyball with a history of over a century is a dynamic team play containing ever-changing positions and complex movements that require sophisticated athletic skills. Such important biomotor characteristics as general and specific endurance, reaction speed, explosive power, special quick power, endurance in quick power are prominent among the efficiency elements that athletes in volleyball must have (Wulf, 2007).

Jump is a movement pattern used in attacks and defense (spike, block and jump serve) and it is one of the most important factors having direct effect on the result of the game. Jumping skill specific to this branch is defined as the athlete's ability to jump as far as possible horizontally and as high as possible vertically and it is randomly performed many times during the match. Jumping skills of athletes must be much higher than the average values in order to gain advantage during the game and to be successful. Therefore, jumping skills are considered as an indisputable necessity affecting the success in volleyball by trainers and athletes (Sheppard et al., 2007). There isn't a time limit in volleyball matches. They can last for 2-3 hours, strength and endurance are needed for this reason. The necessity for teams to play to 25 pts and to win 3 sets makes the duration of the game changeable. In elite men's and women's volleyball matches, average duration of the game is 90 minutes and each set lasts for 20-25 minutes. In the meantime, a volleyball player makes 250-300 explosive movements. 50-60% of these movements are jumping, 30% is high-speed movements and change of positions and 15% is falling. Spike and block behaviors being one of the key aspects of winning a match include explosive power (Çelenk and Yıldıran, 2000). Core training exercises have become the most supported concept within fitness industry in recent years. There are some books and articles addressing only this topic. What is known about core training is that its roots go back to rehabilitation literature and it is used for therapeutic reasons for the injuries in lower back. However, core training exercises are applied for commercial purposes right now. Core exercises are also suggested to healthy individuals in order to increase their functional capacity and to improve athletic skills (Willardson, 2007).

Traditional endurance exercises have been rearranged to highlight the core training. This rearrangement includes doing these exercises on unbalanced surfaces rather than balanced ones, on foot rather than by sitting and doing one-way exercises rather than two-way ones (Willardson, 2007).

Core training has been getting tremendous attention in recent years and have become a major element of training plans (Riewald, 2003). Core training is a kind of exercises done with the individual's own body weight and aiming to strengthen the lumbopelvic muscles and deep muscles that keep the spine balanced (Atan, 2013). Although different names stand for core training, the training philosophies applied in antiquities both in the East and the West are grounded on to develop a strong foundation (Brungardt et al, 2006).

Core training highlights the strength and condition of regional and surface muscles (Clark, 2001). Surface muscles are rectus abdominis, obliquus 5 externus adominis, m. latissimus dorsi and erector spinae. These muscles are generally composed of type II fibers and control the flexion and extension of body. Regional (deep) muscles are transverse abdominis, multifidus and pelvic 5res5. These are generally composed of type I fibers directed to the body endurance (Brungardt

et al, 2006).

Core training can be defined as an exercise specifically designed for a core muscle or muscle activity. Core muscles include abdominal lower muscles and latissimus dorsi and they are responsible for the power transfer between the lower and upper half of body. Core muscles play an important role for daily activities and immobilizing the spine during weightlifting exercises for the welfare of lower dorsal part (Fig, 2005).

Body control and balance can be improved with core training, the injury risk can be reduced by strengthening many big and small muscles and the efficiency in movements or in transitions between the movements increases depending on the increase in balance (Herrington and Davies, 2005).

Core is also defined as "power region" or "power house". It is known as the region where the body's center of gravity exists and most importantly all movements start. Core power is defined as the muscular control that is required in this region in order to maintain the functional stability of lumbar spine.

METHOD

Measurements of the athletes who participated in this study were taken from the Female Volleyball Players studying in Muğla Anatolian Imam Hatip High School Secondary School.

Claw Power Test: A Takei brand digital hand dynamometer is adjusted to the athlete's hand, two measurements were made for each hand in standing position and without touching anywhere with arms, the best values were recorded as right and left claw power.

Scoring: Claw power measurement is repeated for 3 times and the best value is recorded.

Height and weight measurement: Height and weight measurement of all athletes was conducted with professional medical scales on bare foot and with shorts. Heights were recorded in cm and body weights were recorded in kg.

Dorsal Power measurement: The purpose of this test is to measure the extensors of dorsal region and lower back. It was performed with Takei brand digital dynamometer measuring leg and dorsal power. Athletes came up on the dynamometer and pulled the chain by applying maximum power. The best result after two times of trying was recorded as the athletes' measurement of dorsal and lower back power in kg.

Vertical jump: It is used to measure the distance between the point a subject can reach by stretching out to (soles on the floor) and the point she can reach by jumping.

Leg Strength Measurement: Electronic dynamometer was used to measure the strength, 1 second of preparation and 3 seconds of applying force were given. The values taken in libre were changed into kilogram and recorded afterwards. While the subjects stood upright on the device, chain length was adjusted in a way to keep the grip knee-level.

Subjects bended their knees to 90º flexion in order to pull the grip while their back was straight and then they pulled the grip with maximum force crosswise. After a 1-minute rest, soles were raised with a 4-cm hard object (wedge) and power measurement was repeated.

Skinfold measurements: Triceps skinfold measurement was taken above the triceps muscle between the edge of shoulder and elbow, subscapular skinfold measurement was taken from 2.5 cm below the scapula towards the midline of body, calf skinfold measurement was taken from the inner part of leg from the highest point of calf by placing on an elevated surface while the knee is in 90º flexion.

Tape measure and funnels were used to for field measurement and to determine the fields. Such materials as ball, polar watch and whistle were used to play the game.

SPSS (18.0 version) statistics package program was used for the analysis of data and presentation of findings as tables. Frequency, percentage, preliminary and final test values of data obtained were calculated.

FINDINGS

Table 1: T-test Results for the Comparison of Motoric Characteristics

	$\bar{x}$	ss	n	p
Balance	5,30	3,23	10	,032
Balance, final	4,30	2,31	10	
Flexibility	14,00	2,10	10	,006*
Flexibility, final	15,30	1,88	10	
20 m. speed	5,26	1,55	10	,007*
20 m. final	4,64	1,56	10	
Vertical jump	207,60	7,84	10	,094
Vertical final	209,50	7,64	10	

*: p>0,05

According to Table 1, Preliminary and final test were performed with the purpose of ensuring that whether physical parameters of athletes affect trainings. Significant differences weren't found among such physical parameters as hand strength, balance and back strength in the measurements (p>0,05).

Table 2: T-test Results for the Comparison of Physical Characteristics

	$\bar{x}$	ss	n	p
Leg strength	17,66	2,94	10	,000*
Leg strength final	18,31	3,05	10	
Hand strength	7,34	1,97	10	,207
Hand final	7,45	2,01	10	
Back strength	22,37	3,34	10	,933
Back final	22,32	3,19	10	
Fat rate	14,15	1,15	10	,005*
Fat final	13,40	1,17	10	

*: p>0,05

According to Table 2, significant differences were observed at a level of p<0,05 in leg strength measurement of athletes. In the fat rate measurement of athletes, significant differences

were found at a level of p<0,05 between the preliminary and final test measurements of physical parameters.

DISCUSSION AND CONCLUSION

The first thing that comes to the minds of athletes is abdominal region speaking of the core region; however, this is wrong. Core region covers the part from neck to the gluteal area. As upper and lower extremities work in harmony in our body (Otman, 2012). In the study conducted with the purpose of finding the effect of athletes' core training programs on some physical parameters, significant differences were found in preliminary and final test results of some parameters and important changes didn't occur in others.

As a result of the analyses, it wasn't found a significant difference at a level of p<0,05 in balance parameters of athletes before and after the program. Otman (2012) expressed in his study on core training in swimmers that static positions, lower and upper extremities of the age group of 8-14 are in harmony thanks to the core training programs. This statement doesn't show parallelism with our study performed on the same age group. Regarding the elasticity which is another test in the study, a significant difference of p<0.05 wasn't found in athletes who applied core training program. But an increase was established in their elasticity. While there wasn't any significant difference in 20 meter speed, preliminary and final test results of athletes, it can be said that athletes speed up after the core training program. It can be suggested that the program applied and the development of athlete's muscle strength lead to increase in speed.

According to Table 2, it is possible to say that athletes gain more strength after core training. It is also possible to say that there is a considerable decrease in fat rate depending on the increase in muscle strength. The biggest significant difference of p<0,05 is observed in leg strength of athletes after the 8-week core training program. As the subject group is volleyball players and they are always in jumping positions, we can say that leg strength of the athlete who gain strength after the training increases considerably.

In line with the results obtained from our research, it has been concluded that core training prevents occurrence of some injuries and yields positive results for performance. Hibbs et al. (2008) have questioned whether core training is an exercise directed to increasing the performance or decreasing the injury risks. Such statements as the core training can improve performance and minimize the injury risk and new trainings will provide more strength support our study. The reason of this can be that core training programs increase the muscle strength of athletes and elevated muscle mass become more resistant to injuries.

In a study published on the official website of Turkish Volleyball Federation (TVF), it is stated that core training increases the strength of many big and small muscle groups, improves the body control and balance, reduces the injury risk and enhances the efficiency in movements or the transitions between movements depending on the increase in balance. These findings of TVF show parallelism with the result of our study that the strength of muscle group increases after the core training and injury risk considerably decreases. In a studies of Gamble and Cond (2007) the expressions that core training provides protection in rehabilitation process, an strength increase is obtained in hip abductor muscles (gluteus medius, minimus) with core training, and it reduces lower back injuries show parallelism with our study.

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