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Impact of Enhancing Balance and Strength in Young Volleyball

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ABSTRACT: *Balance training has the potential to improve performance in selected components of muscle development by focusing on balance training, muscle strength, power, and movement speed during directional changes. An essential element in improving volleyball performance is balance training, which also has a positive effect on addressing posture problems in volleyball players. While heavy training may positively impact an athlete's performance, it can also have negative effects, particularly regarding the risk of injury to these players in various parts of the body. Methodology: Studies were selected to review protocols for measuring balance and posture, as well as exercise programs that have been used to enhance balance, strength, and spinal health. The literature referenced comes from electronic data sources on websites such as PubMed, ResearchGate, Google Scholar, and Scopus, primarily from the last 10 years. Considering that the works cited in this material are among the quality studies addressing the phenomenon of postural asymmetry, balance, and strength, both in the context of scientific research and in developing quality and sustainable training programs for youth volleyball, for both men and women, we have formulated and organized theoretical concepts along with testing and intervention protocols to meet the goals and objectives of our study.*

Key words*: Balance, Strength, Volleyball, Young.*

1. Introduction

Given that accurate technique execution requires continuous repetition of the same action, this can lead to athlete injuries. The biomechanics of various movements involved in volleyball, especially shooting and serving, repeated continuously, including anatomical-functional data of the volleyball player, cause the highest number of injuries in the shoulder region (± 11.2%) and the spinal column (± 9.7%) (Seminati & Minetti, 2013d). Another crucial element in improving performance in volleyball is the training of body balance or equilibrium. Proper execution of a volleyball shot, starting with the approach, jump, and then hitting the ball, requires good balance training. Asymmetric animation and shoulder belt movement models create an imbalance and weakness of the muscles, thus increasing the risk of shoulder injuries (Grabara, 2014c). Volleyball is a technically well-coordinated game. Perfecting this technical element requires a lot of work and continuous repetition, making it one of the sports susceptible to overuse injuries. In volleyball, individuals playing at a professional level are thought to be prone to overuse due to the repetition of asymmetric body movements. There are several reasons that negatively affect athletes and lead them towards injuries, one of which is overuse injury. Overuse injuries can be caused by the wrong posture of the athlete, movement mechanics, or incorrect techniques during overhead hits, service execution, or preparatory movements for shooting (Lewis et al., 2005).

Stability of balance, multidirectional movement, and actions related to jumping, including hitting and blocking, are essential for success in volleyball (Sheppard et al., 2007).

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Balance training has the potential to enhance performance in selected components of muscular development by focusing on balance training, muscle strength, power, and movement speed during directional changes.

Further, Sheppard demonstrated that balance training has the potential to induce improvements in selected components of physical fitness (i.e., balance, muscle strength, power, speed). Additionally, force production in unstable conditions is necessary for effective execution. In another study, it was emphasized that during the development of the training program, postural issues associated with hitting and blocking should be considered, requiring the preservation of balance (Fuchs et al., 2020).

Due to the importance of postural control and muscle strength/force for overall competitive performance in volleyball, these results suggest that young volleyball players should implement dynamic plyometric protocols that include exercises with maximum and sub-maximum loads during warm-ups to enhance subsequent performance, balance, and muscle strength (Hammami et al., 2022). Moreover, there is evidence of alleviating effects from long-term equilibrium training if performed before strength or plyometric training (Chaabene et al., 2021). Therefore, the regular integration of balance exercises before specific volleyball training is recommended for optimizing and developing performance in young female volleyball players (Hammami et al., 2021).

The researchers found that a block of balance workouts before strength training resulted in greater neuromuscular efficiency than strength training after balance training. Therefore, it was established that balance training had a facilitating influence on future strength training. In other words, balance training adds to improving the results of a future strength training program. Balance training (BT) is a well-defined type of training in many sports and is used to improve postural control. There is evidence that performance improvements after BT may translate into other measures of physical performance, such as muscle strength and jump height. Therefore, relying on the literature, it can be said that the effects of muscular balance training (BT) influence the balance performance in young athletes, and both short-term and chronic adaptations to this type of training translate into other results of physical performance. According to Granacher, balance training resulted in a significant improvement in postural control. The physiological adaptations highlighted during training processes seem to provide conclusions for the findings observed in this study (Granacher et al., 2010). These results may have an impact on improving the performance level in various sports and reducing the prevalence of lower extremity injuries.

Balance training seems to be an adequate intervention to enhance postural control and balance ability in athletes. While there is ample evidence on the long-term effects of BT on physical fitness components in young individuals, less is known about the short-term or immediate effects of specific or isolated BT sessions on physical performance. Moving further into this issue, we find that balance training may be effective for improvements in postural and neuromuscular control. However, as a result of low methodological quality and training differences, continuous research on this phenomenon is recommended (Zech et al., 2010).

2. Methodology

It has been noticed by numerous studies that problems with the spine bring a series of problems to athletes in general, but especially to volleyball athletes. A recent systematic literature review showed a positive relationship between postural stability and athlete performance level. Asymmetry problems can put a volleyball player at risk for trauma. This would prevent the sportsman from carrying out a training with full capacity, to ensure an improvement of the techniques, which would provide him with an increase in the sports level.

Studies were selected to review protocols for measuring balance and posture, and exercise programs that have been used to improve balance, strength, and spinal health. The literature used refers to electronic data sources, on websites such as: PubMed, Research Gate, Google Scholar, Scopus and mainly belongs to the last 10 years.

The tests that can be used to check balance and posture are:

2.1. Laboratory Tests

a. Measurements to evaluate stability parameters with the Leonardo platform.The "Leonardo Mechanography" electronic platform is part of the group of medical devices. It consists of two platforms with 4 (four) sensors each. We can choose some of the tests of the Leonardo platform, which serve to

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measure the balance in athletes, how can it be, balance with one and two legs and balance with one and two legs with eyes closed.

b. Assessment of posture with the electronic posture instrument "ZEBRIS MEDICAL GmbH"

Through state-of-the-art computer programs, a tripod-mounted sensor, infrared rays, ultrasound, and an arsenal of markers analyze the posture, configuration, and articulation of the vertebral column.

2.2. Field Tests

a. One leg bent knee balance test.
b. Steady Balance Test.
c. Modified dynamic balance test.

3. Results

It is believed that athletes with postural deviations may be more susceptible to injury/trauma (Watson, 1995), therefore measures should be taken to both prevent and correct these problems. In another study, important elements of postural control were defined as the control of the position of the body in space for the purposes of balance and orientation (Shumway-Cook & Woollacott, 2000). For this reason, relying also on the literature, it is thought that observing the balance of the shoulders is one of the most important components of the physical examination in athletes who have dominance of using one hand over the head. (Burkhart et al., 2003). Random repetition of specific movements in games and training can lead to the accumulation of unilateral load, which results in the creation of an incorrect composition of postural positions. Postural defects are defined as asymmetry in the frontal and horizontal planes and abnormal, i.e., deepened or flattened, anteroposterior spinal curvatures (Grabara, 2012). According to another study carried out by Roza et al, the correct posture can also be characterized by the symmetrical positioning of the head in relation to the longitudinal axis, the slight arch of the chest, the same length of the upper and lower limbs and the correct arch of the feet (Rosa et al., 2013).

4. Discussion and Conclusions

Designing a training process is crucial for the efficiency of a coach and, consequently, for the team. A coach must be prepared before starting a sports season with a well-thought-out strategy and program to achieve his objectives. Training programs can be prepared based on several goals that the coach aims to achieve in his sessions, such as physical, technical, or tactical preparation of the team. Before implementing a program, the coach must take into account the current condition of his players, the issues they may have, with the aim of addressing them. Many coaches implement mini-programs within their main program to improve various aspects and issues that players may have, such as a mini preparatory phase in the middle of the season or mini-programs that can be carried out at the end of sessions to improve physical parameters (strength, speed). Effectively implementing this training program would make it possible to improve the components that contribute to enhancing the athletes' performance and, consequently, the team's performance towards achieving the final objectives that every team should have. Another very important element in improving performance in volleyball is balance training. Also, in studies we find that a good postural balance reduces the risk of sports injuries and their negative consequences for the athlete's physical condition and career (McKeon & Hertel, 2008). Shepard has further shown that balance training has the potential to induce performance improvements in selected components of physical fitness (ie, balance, muscle strength, power, speed). Also, force production in unstable conditions is necessary to perform effectively, he continues (Sheppard et al., 2007). Therefore, it is recommended to regularly integrate balance exercises before performing volleyball sport-specific training in order to optimize and develop performance in young female volleyball players (Hammami et al., 2021). The main goal of our study is to build an exercise program with specific exercises according to some case studies. Based on randomized controlled observational results, have shown that muscle strengthening exercises alone are less effective than corrective exercises in improving thoracic kyphosis (Feng et al., 2018).

Since it has been noted that physical activity can affect spinal deviations by many authors, the posture of the athlete's body has become an area of interest for many researchers. Random repetition of specific movements in games and practice can lead to the accumulation of unilateral load, which results in incorrect composition of postures. In theory, if these postural adaptations are corrected, then dysfunction is reduced in

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all other body systems. In our country, it has been noticed that there has been little interest in this problem. Trainers or even physical education teachers are more focused on the implementation of their training or teaching programs, ignoring the problems that athletes or children with the spine may have. But this brings negative consequences in the healthy growth of children as well as in injuries and reduced sports performance in volleyball athletes.

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