INVESTIGATING THE IMPACT OF SPECIALIZED TRAINING PROGRAMS ON YOUNG VOLLEYBALL PLAYERS: ENHANCING BALANCE, STRENGTH, AND SPINAL HEALTH

Arben KACURRI[1*], Junida POGONI[2]

[1]Sports University of Tirana, Sports Research Institute, Tirana, Albania
[2]Sports University of Tirana, Faculty of Physical Activity and Recreation, Tirana, Albania
*Corresponding authors: akacurri@ust.edu.al

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Abstract. *It may happen that heavy training has a positive effect on the athlete's performance, but on the other hand it can have a negative effect, in terms of the risk of injury to these players, in different parts of the body. An essential element in improving volleyball performance is balance training, which also has a positive effect on improving posture problems in volleyball players. 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. Thus, the main focus of this paper was the improvement of physical parameters such as: strength and balance, in young volleyball players through the programs and protocols evidenced in the literature. 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. Bearing in mind that the works cited in this material are among the quality ones that deal with the phenomenon of postural asymmetry, balance and strength, both in the service of scientific research and in the service of developing quality and sustainable training programs for the development of volleyball for youth, for both men and women, we have formulated and organized theoretical concepts and test and intervention protocols for the goals and objectives of our study.*

Keywords*: volleyball; balance; spinal health; exercise.*

Introduction

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.

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, 2014).

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, 2013).

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).

Success in volleyball necessitates multidirectional movement, balance stability, and skills associated with jumping, such as hitting and blocking. Balance training can improve performance in specific aspects of muscular growth by emphasising balance, muscle strength, power, and movement speed during directional shifts. Certain components of physical fitness, including balance, muscular strength, power, and speed, can be improved through balance training. Moreover, force generation under unstable conditions is essential for proficient execution. A separate study highlighted the necessity of addressing postural concerns related to hitting and blocking in the formulation of the training programme, necessitating the maintenance of balance. These findings indicate that young volleyball players should implement dynamic plyometric training, as postural control and muscular strength are essential for competitive success. These incorporate exercises with both maximal and sub-maximal loads during warm-ups to enhance subsequent performance, balance, and muscular strength (Hammami et al., 2022). Furthermore, data suggests that long-term balance training can have relieving effects when conducted prior to strength or plyometric exercise (Chaabene et al., 2021). Consequently, the consistent incorporation of balancing exercises prior to targeted volleyball training is advised to enhance and cultivate performance in young female volleyball athletes (Hammami et al., 2022).

Before strength training, the researchers found that a series of balancing exercises yielded greater neuromuscular efficiency than strength training conducted after balance training. Thus, it was concluded that balance training enhanced future strength training. In other words, balance training enhances the outcomes of a subsequent strength training regimen. Balance training (BT) is a well delineated training modality in several sports, employed to enhance postural control. Evidence suggests that performance enhancements following BT may correlate with various indicators of physical performance, including muscle strength and jump height. Consequently, based on the literature, it can be asserted that muscular balance training (BT) affects balance performance in young athletes, with both short-term and chronic adaptations resulting in improvements in other aspects of physical performance. Granacher reported that balance training led to a substantial enhancement in postural control. The physiological adaptations emphasised during training procedures appear to corroborate the findings observed in this study (Granacher et al., 2010). These findings may enhance performance levels in diverse sports and diminish the incidence of lower extremity injuries. Balance training is an effective technique for enhancing athletes' postural control and balancing abilities. While the long-term effects of BT on physical fitness are well-documented, there is limited knowledge regarding the short-term or immediate impacts of specific BT sessions on physical performance in young individuals. Subsequent examination of this issue indicates that balance training may be beneficial for improving postural and neuromuscular control. However, due to inadequate methodological quality and training discrepancies, we recommend continuous research on this phenomenon (Zech et al., 2010).

Methodology

Numerous studies have indicated that spinal issues pose a range of challenges for athletes, particularly those involved in volleyball. A recent systematic literature analysis indicated a positive correlation between postural stability and athletic performance level. Asymmetrical issues may predispose a volleyball player to injury. This would prevent the athlete from training to their full potential, thereby hindering the development of techniques that could enhance their competitive performance.Research was conducted to evaluate procedures for assessing balance and posture, as well as training regimens implemented to enhance balance, strength, and spinal health. The literature cited pertains to electronic data sources from websites such as PubMed, ResearchGate, Google Scholar, and Scopus, primarily during the past decade. The assessments available for evaluating balance and posture include:

1. Laboratory analyses

We are conducting measurements to assess stability parameters using the Leonardo platform.The "Leonardo Mechanography" electronic platform is classified as a medical device. It has two platforms, each equipped with four sensors. We can select many tests from the Leonardo platform that assess balance in athletes, including single-leg and double-leg balance, as well as single-leg and double-leg balance with eyes closed.We are conducting an evaluation of posture using the electronic posture device "ZEBRIS MEDICAL GmbH". Utilising advanced computer software, a tripod-mounted sensor, infrared rays, ultrasound, and a variety of indicators, the posture, arrangement, and articulation of the vertebral column is meticulously analysed.

2. Field evaluations

This is a. one-legged knee flexion balance assessment. b. Steady Balance Assessment c. Modified Dynamic Balance Evaluation

Results

Athletes with atypical posture are believed to be at greater risk of injury; thus, steps should be implemented to avoid and rectify these issues. A separate study identified key components of postural control as the regulation of body posture in space for balance and orientation (Shumway-Cook & Woollacott, 2000). Consequently, based on the literature, it is believed that assessing shoulder symmetry is a critical aspect of the physical examination for athletes exhibiting unilateral upper extremity dominance (Burkhart et al., 2003). The arbitrary repetition of particular actions in games and training can result in the buildup of unilateral strain, leading to the development of improper postural alignment. An essential component in enhancing volleyball performance is balance training. Research indicates that optimal postural balance diminishes the likelihood of sports injuries and their adverse effects on an athlete's physical health and career (McKeon & Hertel, 2008). The primary objective of our research is to develop a workout regimen tailored to unique case studies. Randomised,

controlled observational data indicate that muscle strengthening exercises alone are less efficient than corrective workouts in enhancing thoracic kyphosis (Feng et al., 2018).

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.

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 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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