WEB OF SCIENTIST: INTERNATIONAL SCIENTIFIC RESEARCH JOURNAL
ISSN: 2776-0979, Volume 3, Issue 1, Jan., 2022

CORRECTIONS IN JUMPING IN THE DEFENSIVE BLOCK AGAINST AN OPPONENT IN VOLLEYBALL

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Annotation
The aim of this study was to analyse the adjustments in technique made by a voleyball player when shooting against an opponent. Volleyball has become one of the most widely played participant sports in the world. Participation requires expertise in many physical skills and performance is often dependent on an individual's ability to jump and land. The incidence of injury in volleyball is similar to the rates reported for sports that are considered more physical contact sports.

Keywords: Training, jumping technique, frequency, block

Introduction

Studies on jump height have focused on the relationship between jump motion and high contact point as well as changes in jump height measurements. With respect to the former, Takanashi (2018) focused on spikes and investigated the effectiveness of the three-step run-up and appropriate step width. Another study of competitive college women spikers showed significantly high values for jump height and knee joint torque (Muramoto et al., 2014). With respect to the latter topic, Wnorowski et al. (2013) reported that game time jump height among top men players in Poland fluctuated between 77-90% of maximum values, and among top women athletes in Argentina, it was reported that there was no decrease in post-match maximum jump height (Esper, 2003).

The DS position in volleyball is the defensive specialist. This is one of the roles on the team along with the setter, the middle blocker, the outside hitter, opposite hitter, and the libero.

Defensive specialists are the players that have sound passing skills and great digging. Between the libero and the DS, you have 2 roles that are focused on ball control. Their job is to start every play with a great pass.

The hallmark of a defensive specialist needs to be consistency. They are a reliable role player who provides consistent good passes during serve receive, consistent digging, good defensive coverage, and possibly good serving.

This spot is known as either the middle blocker or middle hitter. The team's tallest athlete tends to play here. Their additional height can help the player excel in this role. On defense, the middle blocker blocks the center area of the net and has to be ready for the opponent's quick middle attacks. But they also need to move to either side to help teammates close blocks with the opposite hitter and outside hitter.
On offense, they play near the setter to execute fast attacks. The middle hitter must be able to read the setter and adjust their approach to get the most of their attack. They can also act as a decoy to help confuse opponents and spread out their blockers.

Responsibilities

- Read the opponent's hitters to set up blocks.
- Block opponent's shots.
- Use quick attacks on offense.
- Act as a decoy on offense.

It is important to consider that spikes and blocks are not only jumps, but jump-landing sequences. In particular, the landing phase requires dissipation of the kinetic energy generated during the jump. Newtonian mechanics dictates that increases in jump height (most prevalent in elite volleyball players) must be accompanied by a proportional increase in the kinetic energy that must be properly absorbed to avoid injury (Dufek and Zhang, 1996). These landings often result in the creation of ground reaction forces on the order of five times body weight (Adrian and Laughlin, 1983). The deleterious effects of these forces may be compounded when considering that a front row player may jump and land many times during a regulation match.
The mechanisms and frequencies of injury in volleyball are intriguing and well documented. The jump-landing sequence is the most common source of injury in volleyball (Briner and Kacmar, 1997). In fact, blocking and spiking are linked with over 70% of volleyball injuries (Watkins and Green, 1992). More specifically, the landing techniques used in volleyball can potentially be related to lower extremity energy absorption and likelihood of injury (Dufek and Zhang, 1996). Stacoff and colleagues, (1988) found an initial vertical impact force of approximately 1 to 2 BW at forefoot touchdown for males performing a block. Heel contact resulted in a second peak force ranging between 1 BW to 7BW. The authors observed that the height of the jump was less important than knee angle in predicting the magnitude of the force with increased knee extension producing more force during landing. Thus, technique plays an important role during landing in volleyball.
Jumping and landing movements are fundamental features of many sporting activities and have received considerable research attention. Previous research on

landing has concentrated on the implications of the impact and the resulting loads placed on the body as well as the injury potential of various landing situations. For example, Kovacs and colleagues, (1997) indicated that the landing technique used by the individual (forefoot vs. heel-toe landing) has significant implications regarding the forces transmitted to the body and the body's ability to dissipate these forces. Accordingly, the jumping and landing techniques utilized by volleyball players may influence their likelihood of injury during the jump landing sequence. Ferretti et al., (1992) hypothesized that the high number of jumps and the likelihood of losing balance due to deviations in jumping technique are the primary causes of injury during volleyball (Ferretti et al., 1992). The vast majority (90%) of volleyball injuries occur in the lower extremity with the knee joint being particularly vulnerable (Gerberich et al., 1987). Knee injuries are of particular importance because they are associated with more lost time from sports participation than other injury sites (Solgard et al., 1995).

Though it is known that knee injuries are a common problem in volleyball and that technique influences the magnitude of the forces transmitted to the lower extremity during landings, little research exists regarding the prevalence of jumping and landing techniques in elite female volleyball. Thus, the purpose of this study was to quantify the number of jumps performed by elite female volleyball players in competitive matches and to determine the relative frequency of different jumping techniques. A secondary purpose of this investigation was to discuss implications for physical education professionals, coaches, and researchers.

Some of these studies have also included analysis of the jump shot under diVerent conditions, as the variability in the performance of the shot is determined by a number of factors (SaÂ enz and IbaÂnÄez 1995) such as arm action (standard, hook and lay-up), previous technical action (dribble, reception fake), previous movement of the legs (stationary or running), ®nal movement of the legs (with or without jump), body orientation, height and distance of the shot, and opposition. For example, Elliott and White (1989), Walters et al. (1990), Miller and Bartlett (1993) and Satern (1993) studied the eVects of increased shooting distance in the jump shot, whilst Gabbard and Shea (1980) and Chase et al. (1994) analysed the eVects of equipment modi®cations on children and jump shot performance. Of these in¯uencing factors, no research group has attempted to establish the eVects of opposition on the movement characteristics of the jump shot. As the technical performance of the shot may be expected to change with the presence of opposition, then practising the jump shot skill without realistic opposition may be less bene®cial to skill development and maintenance. Therefore, the aim of this study was to determine the in¯uence of the

presence of an opponent on jump shot technique. This aim was met by investigating the biomechanical characteristics of jump shot technique with and without an opponent.

The execution of the jump shot is subject to all types of stimuli, external contingencies and attentional mechanisms. For this reason, and in order to control these variables, it was necessary to analyse the action using a protocol similar to that encountered in competition, where the variables manipulated are controlled and those that in¯uence it is kept constant. The manipulated variable was the presence or absence of opposition, while the controlled variables were the previous technical action (running and stop), body orientation and distance of the jump shot. Two video cameras were used at 50 Hz to record the performance of the shots. The ®rst was placed at a distance of 10 m from where the shot was to be made with an orientation of 45º to the direction of the shot, and the second was situated 11 m from the shot with an orientation of 45º to the direction of the shot and 90º to the orientation of the ®rst camera. The cameras were started approximately 3 s prior to the beginning of each shot and were not switched off until the ball passed through the hoop to ensure the recording of a sufficient portion of the performance to permit analysis of release variables. After positioning the cameras, and before filming the shots, a reference object was filmed. The reference object was so oriented that the x- axis was in line with the direction of the shot, the z-axis was perpendicular and horizontal to the direction of the shot and the y-axis was perpendicular to the plane of the floor, and from that static position the player ran along a line . During his run, the player received a ball from player P at a point 2 m before reaching the shooting position. At the instant of receiving the ball, the player stopped and he finally made the shot. The opponent, situated in the horizontal projection of the hoop, O, remained in that position until the moment in which the ball left the passer's hands. The opponent, at that moment, at random, either remained in that position or moved to intercept the ball, sometimes succeeding in doing so. This protocol was continued until each player had performed 15 successful shots. Eight shots by each player (four with and four without opposition) were selected for analysis, the criterion being those where the ball passed through the hoop without touching either it or the backboard.

In conclusion, it can be stated that players attempt to release the ball more quickly and from a greater height when confronted with an opponent. This strategy lessens the chance of the opponent intercepting the ball. Players realize this strategy by approaching more rapidly and positioning the body in a more upright position at the initiation of the upward movement of the ball. This manoeuvre gives players greater initial height but also a more stable base for generating a greater initial velocity of the

ball. The greater initial knee position restricts the ability of the player to jump and therefore he performs a quicker but less powerful jump, while the more rapid upward movement of the ball helps to increase the joint angles at shoulder and elbow at release and this, combined with a more upright trunk, helps the ball to attain a greater height and a more vertical angle of projection.

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