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# Effects of Semi-Rigid Ankle Stabilizers on Volleyball Players in 2 Different Types of Vertical Jumps

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## Abstract

**Introduction:** Volleyball players use ankle stabilizers in order to prevent injury, but wonders whether this affects the performance of vertical jump.

**Objective:** To analyze the effect of semi-rigid ankle stabilizers in vertical jump. Methods: The stabilizer was tested on 15 subjects that performed volleyball block jumps and counter movement jumps in two conditions (with and without stabilizer).

**Results:** Vertical jump height showed no significant difference between the conditions (with and without stabilizer), however, showed a significant difference ($p<0.05$) between jump types.

**Conclusion:** We can see that there is no difference between using and not stabilizer, but there is a significant difference between types of jump.

**Keywords:** Sport performance; Team sports; Counter movement; Blocks

## Introduction

In team sports, like basketball, volleyball, handball and soccer, one of the most performed actions by the athletes are jumps. This basic fundament is made to achieve some endpoints during a game. Sometimes, the execution of a jump may not happen in the best feasible way and this could end up in an ankle injury during landing. About 86% of these injuries are torsions caused by a wrong landing position of the feet during jumps [1] Volleyball players are more susceptible to this kind of injury, basically because they perform jumps all long the game [2-5], during blocks and attacks. Fortes [6] found out that blocks were responsible for most of the injuries among volleyball players during a regional championship.

Consequently, to avoid such injuries, there was a rise in the use of ankle stabilizers. The most popular ones are the stabilizer with 2 semi rigids rods that avoid inversion of the ankle. It can also be found other kinds of stabilizers known as Brace, that are orthopedic boots that also avoid inversion and eversion of the ankle or tapes that are used as ankle stabilizers [7,8].

As a result of the raise of stabilizers' use, some issues about performance disturbing during vertical jump came across [9].

Anjos and Saldanha [10] analyzed the effect of the stabilizer in women's volleyball players during some simulated gestures of block and attack and didn't find significant difference in data, indicating that more studies should be conducted to analyze the angles of the ankle so some different pattern in the movement could be observed.

Ambegaonkar et al. [11] compared 3 types of ankle stabilizers towards a vertical jump test (an agility test and a balance test) finding difference in the agility test between the conditions with and without the stabilizer. Cordova et al. [1] performed a review about the same subject and found that some minimum decrease in performance could be found in agility tests, velocity and vertical jump. However, the work of Cordova was not conclusive about the real effects of stabilizers, leaving an open gap for further research.

Based on information mentioned above, the aim of this work is to analyze the effects of ankle stabilizers in vertical jump in two kinds of jump: block jump and countermovement jump.

## Methods

### Sample

Fifteen amateur university female volleyball players, with 6 hrs of training per week, no historic injuries in the last year, age of 22.06 ± 2.98 years, height of 1.69 ± 0.07 m and weight of 63.04 ± 7.64 kg, took part in the study. The sample was chosen by convenience.

### Instruments

An ankle stabilizer from Active Ankle, model T2, medium size was used in the study (Figure 1). The stabilizer has two rigid lateral structures fixed by an articulator and a single tape, allowing anatomical accommodation of the malleoli, as well as movements of plantar flexion and dorsiflexion [10].

**Figure 1:** Active ankle stabilizer.

For data acquisition a force plate (model BP400600-HF-2000) and AMTI Acquisition Software, v4.2 was used with an acquisition frequency of 500 Hz. The 2 kinds of vertical jumps were performed in the force plate and the flight time was used to measure height achieved by the athletes considering the equation:

$h=g.t2.8-1$,

Where, h=height, g=gravity e t=flight time.

## Experiment trials

Before each trial the volunteers signed an informed Consent Term, approved by the Research Ethics Committee of the Faculty of Health Sciences of the University of Brasília, stating their participation in the trial.

During the trials, the volunteers were familiarized with the 2 types of jumps and the experiment procedures. A total of 12 jumps were performed by each volunteer, 3 jumps doing the block movement with and without the stabilizer with 1 min of rest between then and more 3 jumps with countermovement with and without the stabilizer as shown in the Figure 2. The sequence of jumps was randomized between volunteers; the change of the stabilizers (2 times) was done by the research team, to avoid differences in the use of the ankle stabilizer.

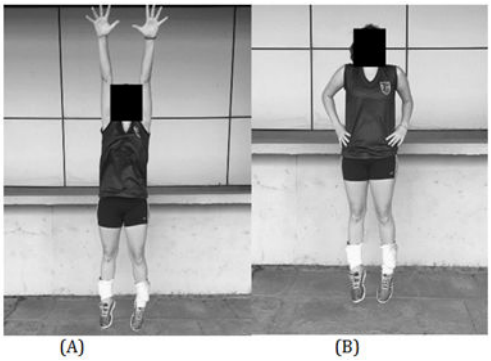


**Figure 2:** Block jump (A) and countermovement jump (B).

For the data collection of the vertical jump simulating the gesture of the volleyball block, the volunteer was instructed to position herself over the force platform with two parallel feet. From this initial position, the volunteer performed the movement of the normal block, with the hands initially positioned at the chest height, where she could give impulse with the lower limbs, jump with the arms making extension along the aerial phase and landing with lower limb flexion. In the jump with countermovement, the volunteer made the jump, also being able to take impulse with lower limbs, but with the hands placed in the waist, statically.

## Statistical analysis

The comparison between jumps height and conditions with or without ankle stabilizers was performed by a two ways ANOVA of repeated measures using the software SPSS version 22.

## Results

The mean performance values reached by the volunteers during the countermovement jump (with and without the stabilizer) were respectively 0.24 cm and 0.25 cm. The mean performance values reached by the volunteers during the Volleyball block jumps (with and without the stabilizer) were respectively 0.27 cm and 0.28 cm.

The two ways ANOVA for repeated measures found $p<0.05$ for the types of jump, indicating a significant difference between jumps. For the conditions with or without stabilizer, the p values were 0.405 for the test within subject contrast and 0.541 for the test between subject effects, indicating that there was no significant difference. Figure 3 shows the mean values obtained in the ANOVA test, the green line represents the block jump and the blue line the countermovement jump.

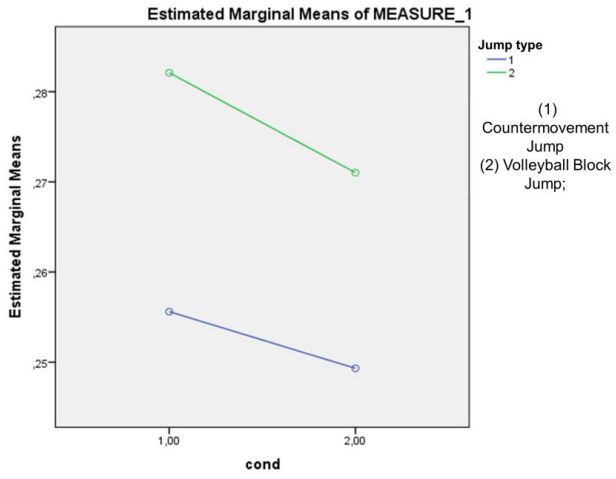


**Figure 3:** Graph of Analysis of Variance (ANOVA) with mean values for the two types of jumps. Jump type: 1: Jump with countermovement, 2: Block jump. Condition 1: No stabilizer, and Condition 2: With stabilizer.

## Discussion

The active ankle stabilizer didn't show significant difference between the volunteers jump performance, as also was found in the studies of Anjos and Saldanha [10]; Ambegaonkar et al. [11]; Cordova et al. [1].

However, is good to emphasize that the protocols used in the studies to evaluate the difference in performance are not similar among studies and there are few studies that evaluate the real movement that the athletes execute during a match. One of them performed by Anjos and Saldanha [10] used a volleyball attack gesture; however he also did not find significant differences regarding the use of stabilizer. Nevertheless, Massa [12] concluded that there is a difference in the vertical jump between volleyball athletes in the adult and juvenile category with and without the ankle stabilizer.

Therefore, it is important to consider the whole movement that represent the best performance of the athlete and evaluate this gesture. As was seen in our study, the countermovement jump has a significant lower value in comparison with the block jump in both conditions (with and without the ankle stabilizer). Probably this difference is due to the way the jump is performed by the players, as they were volleyball players they were more familiar with the block jump than with the countermovement jump. Another point that can be considered is that, the position of the arms is not similar in the 2 types of the jump and this can affect the position of the center of mass and perhaps increase the height achieved in the volleyball block jump, unfortunately this variable (center of mass) was not measured in this work.

The effects associated to the gender were also not evaluated, as our sample was chosen by convenience. Perhaps future studies should also evaluate the performances difference with and without stabilizers related to gender and measure the output power.

Thus, it is evident that if we want to achieve a solid result regarding the effect of the use of a semi rigid stabilizer on vertical jump performance and other skills, standardizations need to be made, once vertical jump and other gestures depend on the interaction of elements such as physical components, anthropometric, technical, tactical, environmental and perceptive [13]. So, the results would not be so different and also suggesting that the players should be evaluated in conditions similar to the game.

## Conclusion

We concluded that the Active Ankle stabilizer didn't affect the height of the jump in both types of jump. However, a significant difference was found comparing the types of jump (countermovement and block), where the blocking gestures jump obtained greater results.

Further research is necessary, given the wide variety of results and conclusions found in different studies.

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