

## THE EFFECTS OF ANKLE BARCING TO THE VOLLEYBALL PLAYERS PERFORMANCE

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### **Nəşr tarixi**

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**Annotation:** Volleyball is characterized by short and quick movements. The repetitive jumping and side-to-side movements required in volleyball increase the risk of injuries to the foot and ankle. Ankle injuries, particularly sprains, are the most common injuries sustained in volleyball. Ankle bracing used extensively to enhance ankle joint stability, prevent injury occurrence, and mitigate severity. Ankle braces are not mandatory in volleyball but it commonly used during the rehabilitation period after ankle sprains by the players for a long time. There are some adverse effects of bracing. Pressure to the muscles surrounding the joint can result additional damage such as muscle weakness. Muscle weakness can impair athletic performance can decrease jumping height. We measured and compared vertical jump height on braced and unbraced conditions. The results showed that, the tallest jump, less time for jumping and maximal force impulse were accounted for the unbraced condition.

**Key words:** Volleyball, Jump height, Ankle, Brace, Force plate, Time.

**Introduction:** Volleyball is one of the most popular team sports in Azerbaijan. Women's volleyball team of Azerbaijan play in the high league since 1955. This sport is playing at a rectangular area, by two teams separated by a

net at the center line. (1) Volleyball is characterized by short and quick movements. Satisfactory performance of the volleyball player depends on these parameters (2.).

The vertical jump is very important for serving, spiking, and blocking. Vertical jump height allows players to achieve the contact with the ball above the net and creates more advantageous conditions for spiking or serving. Volleyball players and coaches are advised to focus on maximization of vertical jump height and optimization of attack technique (3). Jumping parameters may affect injury incidence in volleyball.

Ankle is the mostly injured part in volleyball and accounting for up to half of all volleyball-related injuries.

Average 78% of ankle injuries are related to repetitive jumping and hitting the ball overhead (4). Direct contact and contactless mechanism most frequently reported cause of injuries.

Injuries occurred in spiking (32%) and in blocking (28%). The majority of the injuries occurred at the net, mainly when landing after blocking or attacking. Landing, accounts approximately 40% and approximately 17% of them occur on landing on opposing player's foot (5).

Ankle ligament sprains demonstrating 44.1% of game injuries and 29.4% of practice injuries (5). Frequency of encountering ankle sprains more or less the same between males and females. Ankle injuries carry a high risk of re-injury. More than half of the injuries (57%) occurred twice or three times. Re injury risk is highest in the year immediately following the initial sprain (6, 7).

High risk of occurrence of ankle sprains caused to design various ankle supports such as braces.

There are advantages and disadvantages of this method (8). Advantages are easy wearing and undressing, protective effects of the acute injuries adjustability of fastening or lace tension regulation, cost effectiveness (9).

Disadvantages are possible slipping during use, the weight of the brace, inadequate stabilization, affecting sports performance (31).

An ankle brace is a garment that is worn around the ankle joint in order to immobilize the joint after injury and the rehabilitation process

Ankle braces are not mandatory in volleyball but is common during the rehabilitation period after ankle sprains. . Fear of recurrent injury is the reason for players to use braces for a long time after previous injury or only for protection the ankle. Even sometimes volleyball players preferably wore ankle braces during the period of practice and game for a long time to protection against injury. Ankle braces are worn less than during training time than on the game. But professionals believe that some even the slightest amount of pressure can result in additional damage

A vertical jump is an act of raising one's center of mass higher in the vertical plane solely with the use of one's own muscles. On jumping activity muscles do extra work in a short amount of time and quickly switch from an eccentric action to a concentric contraction.

Vertical Jump height performance is the essential factors for volleyball, especially for blocking and attacking. Jumping parameters may influence athlete's performance. For these reasons we decided to investigate impact of ankle brace to the vertical jump performance. Different researchers conducted in order to determine the effect of ankle bracing on vertical jump performance.

**Litrature review.** Results in most of the researches have shown that different braces des not effects vertical jump height negatively.

Macpherson K in 1995 tested the effect of (semi-rigid and soft shell) prophylactic ankle stabilizer to the vertical jump performance on twenty-five high school football players. They determined that bracing did not facilitate or adversely effects vertical jump (11).

Pienkowski D tested the effect of universal, Kallassy, and Air-Stirrup ankle braces, on twelve high school basketball players. They were concluded that prophylactic ankle bracing does not inhibit athletic performance (12).

Zachariah J observed the effects of ankle braces on lower extremity electromyography and performance during vertical jumping. He tested 5 males and 5 females by wearing soft shell (AE) and semi-rigid (T1) ankle braces during a Vertical Jump Test. Vertical jump height was not significantly affected ( $p > .05$ ) (13).

Contrary to these studies some investigations observed decrease on vertical jump with ankle brace.

Tina L C tested the effects of ankle bracing on vertical jump performance and lower extremity kinematics and electromyography (EMG) activity. Twenty healthy college athletes participated in testing procedure. They performed five jumps with no brace on the first day, and five jumps with both ankles braced on the second day. An average of the three highest jumps each day was used for analysis. Braced vertical jump performance significantly decreased ( $p = .002$ ) as compared with the unbraced condition (14).

Macrum et al. and Hopper et al conducted some experimental tests on EMQ to reveal dysfunctions on the lover leg muscles with brace condition during vertical jump. He observed that, ankle bracing does not affect gastrocnemius anterior tibialis muscle activity but alters the peroneus longus, gastrocnemius and soleus muscles on EMQ (15) .

On the contrary this idea Santos MJ saw reduction on peroneus longus and medial gastrocnemius activity with ankle bracing on EMG (16). Taking to the account all of these results we decided to test ankle brace on volleyball payers. Such different results created interest to test jump performance on volleyball players

In this study we tested the effects of ankle brace and vertical jumping high

among young volleyball players. According to the questionnaire given to athletes who participating in the championship of Azerbaijan 2018-2019 follows that, most players use the Aurafix Ankle Support Ref 404 ankle brace when injured and the recovery period. Some of them use this braces for a long time. For this reasons we decided to test Aurafix Ankle Support Ref 404 (17)

### Material and methods

**Participants:** Twenty female volleyball players from Azerbaijan second Volleyball Division were employed for the study. The participants were healthy players. Exclusion criteria included a lower extremity or ankle injury within the last 6 months and cardiovascular problems. Players' average age  $19\pm 1,23$  years, average weight  $64\pm 7,8$  kg; average height  $176\pm 5,8$  cm. All of the subjects signed the consent to participate in the study. The Ethical Committee of ASAPES approved the study.

#### Tested Brace

Tested brace (Aurafix Ankle Support Ref 404) made from neoprene material. Around the malleolus, the stabilizing inner and outer plastic plates are produced separately in accordance with the position of malleolus. It can be completely opened, thus it is easy to use. The figure-8 elastic transverse strap provides extra support.

#### Force Platform

We measured vertical jump height on Bilateral Force Plate. It is an optical measurement system. Strong and rigid steel platform with 8 sensors is suitable for vertical jump assessment. Bi-lateral design allows comparison between left and right leg.

**Testing procedure.** The participants were called twice with an interval of 24 hours. At the same time in the morning both days at 11 pm. The first visit was a familiarization session. They instructed to correctly perform the jump. They jumped on both feet on the platform by bending at the knees and lowering into a 90 degree squat position while hands are on hip. They were required to practice between 5 and 10 jumps. They were separated into five groups of four people and all of them were instructed to come for warm

up on next day with one hour break between each group.

On the next day jump tests were performed in two conditions – no brace and with brace on one foot. One brace used Maximum for 3 players

Initially all participants did 30 minutes warm up under the close supervision of 1 research and 1 physical education teacher, who demonstrated the proper technique for each movement. The first 5 minutes consisted of jogging at a comfortable phase around the volleyball court (09-18 meter). Hip and lower back, chest and hamstring, lying quadriceps, calf, triceps and side bend stretch were stretched during next 10 minutes. They performed 5 stretches for 30 seconds, relaxed for 5 seconds. Warm up continued with 15 minutes dynamic exercise which progressed from moderate to high intensity. Dynamic exercises were speed skips, heel kicks, trunk twists, skipping straight-leg toe touches drop squat carioca, push-ups, sprint series, high knee skip.

Tests were carried out in the volleyball court, under the natural environmental conditions ( $23-24^{\circ}\text{C}$  temperature). During jumping test verbal encouragement was used to motivate athletes to continue the test. The vertical jump height was calculated automatically by computer. Following the warm up participants immediately moved to the experiment area for the jump test. Subjects stood in the center of the force platform in an upright position with their hands on hips and were instructed to flex their knees ( $\sim 90^{\circ}$ ) and jump.

Firstly they jumped without brace on barefoot on two legs, then with prophylactic ankle brace on firstly left and then right leg (Aurafix Ankle Support Ref 401, on a Jump Platform testing machine and recorded). They stood on the force plates on the position and firstly they jumped three times on two legs without brace. After these players dressed an ankle brace on left ankle and jumped three times with two legs then dressed the brace on

right ankle and jumped three times their maximal vertical jumps. All jump sessions were performed with between 3 seconds each jump trial and 3 minutes rest. Single leg braced and pair legs jumping tests were recorded on computer.

The one highest vertical jump for each condition with braces and no braced were used for analysis.

**Data analyses.** Three maximal vertical jumps, time used for jump, force impulse for each condition were recorded by computer. From each vertical jump trial we calculated the average jumps for per subject. We used collected data for analysis. The data were Table 5. Descriptive statistics and  $M \pm SD$

analyzed on (IBM SPSS software version 13) (19). We used Descriptive statistics in order to determine mean of mentioned parameters were reported for all variables.

The dependent variables were analyzed. No braced results compared with left foot braced and right foot braced conditions results.

Paired sample's test ( $p < .05$ ) was used to compare the means of each dependent variable from the independent variable across conditions. Pre and post values for vertical jump height were compared.

## RESULTS

Vertical Squat Jump Parameters			
	Jump Height (m/s)	Time used (s)	Force Impulse FI (Ns)
Jump on two feet no brace	0,29±0,6	0,73±0,1	154±32
Jump on two feet left ankle braced	0,28±0,05	0,76 ± 0,06	152±27
Jump on two feet right ankle braced	0,27±0,04	0,82±0,8	143±19

The results showed that, the tallest jump, less time and maximal force impulse were accounted for the unbraced condition. According to the results left leg braced condition numbers were less than unbraced

condition. Between results the least numbers are belong to the right ankle braced jumps. We recorded the lowest jump height in longer time than the others.

Table 6.

Paired sample's test			
	Jump Height	Time	FI
Pair analysis for brace condition with left ankle braced VAROO1	P=0,001	P=0,102	P=0,233
Pair analysis no brace condition with right ankle braced VAR 0002	P=0,00	P=0,035	P=0,021

As a result P is smaller than 0.05 and it is a significant result.

Significant statistical difference was observed among no braced and braced conditions. Our outcomes reveal that, wearing an ankle brace decrease vertical jump height. Athletes without brace jumped significantly higher compared with braced conditions. In addition the obtained results illustrate that wearing the brace on right ankle decreases jump height more than on the left ankle.

**Discussion.** According to the received results we concluded that ankle brace decreased vertical jump height on female volleyball players. Vertical jump height was decreased by nearly 1 cm for left foot braced and nearly 2 cm for the right foot braced conditions. These results are supported by previous research using soft-shell style braces.

Less research's results are the same as ours . Tina L C tested the effects of ankle bracing on vertical jump on twenty healthy college athletes. Braced vertical jump performance significantly decreased.

However, much more outcomes have been observed that vertical jump performance is not affected by ankle bracing (14).

Ambegaonkar compared effects of 3 ankle stabilizers, tape, lace-up (Swede-O Ankle Lok), and semi-rigid (Air-Cast Air-Stirrup) braces, and a nonsupport control on vertical jump They decided that, ankle stabilizers do not affect jumping (20).

Christine B. while testing effects of two semi rigid prophylactic Ankle Stabilizers (active ankle Training Brace and air cast sport stirrup) on speed, agility, and vertical jump on basketball players he also came the same conclusion that, bracing did not facilitate vertical jump of high school basketball players(21).

**Conclusion.** The impact of ankle braces on parameters of jumping is sometimes questionable. The purpose of our study was to determine the effect of commonly using (soft-shell) ankle brace on vertical jump and force impulse on volleyball players. The effect of ankle bracing on athletic performance generally, is studied by its effect on vertical jump, speed and agility in different sports. The commonly studies show that ankle bracing has no, or only a small effect on vertical jump height. Investigations carried out either both legs braced or unbraced at the same time.

If we take into account that, usually one of the feet is exposed to ankle sprain, athletes usually wear brace on one foot for a long period of time. That's why we tested players only one foot braced but only in first use. We observed significant decrease



on vertical jump, increase on required time to jump and decrease in the force impulse among unbraced and braced jumps. In volleyball decrease in vertical jump may lead to the late contact with the ball. We saw during our tests that jumping height reduces more when right foot of player is braced than the other conditions. All players that participated in our tests were right handed. So their dominant foot is the right one. The results show us when dominant foot is braced height of jumping gets lower and required time gets longer. If we assume that, these results happened in the first use of brace, long term use of ankle braces can make these results even worse. Players need maximal height in lowest time period on jump and use of ankle brace may delay their contact with ball. In addition, prolonged use of brace may adversely influence muscle's and ligament's function To determine this effect long term use of braces on volleyball players should be tested more in future investigations. It is advised to volleyball players to use other prophylactic methods for injury reduction. But we should take in account that ankle brace can be used in serious injuries because of its advantage of reducing re-injury. For preventative purposes to muscles and ligament's stronger different types of exercises should be advised for volleyball players

Specific injury prevention programs should be developed for ankle sprains in volleyball players.

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**Влияние голеностопного корсета на высоту прыжка у волейболисток.**

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**Аннотация:** Волейбол характеризуется короткими и быстрыми движениями. Повторяющиеся прыжки и поперечные движения, необходимые в волейболе, увеличивают риск травм стопы и голеностопного сустава. Травмы лодыжки, особенно растяжения связок, являются наиболее распространенными травмами, полученными в волейболе. Растяжение голеностопного сустава широко используется для повышения стабильности голеностопного сустава, предотвращения возникновения травм и смягчения тяжести. Растяжение голеностопного сустава не являются обязательными в волейболе, но они обычно используются в период реабилитации после растяжений голеностопного сустава игроками в течение длительного времени. Однако,

спортсмены длительное время могут использовать корсеты для голеностопного сустава. Есть некоторые побочные эффекты бодрящего. Давление на мышцы, окружающие сустав, может привести к дополнительным повреждениям, таким как мышечная слабость. Мышечная слабость может ухудшить спортивные результаты, может снизить высоту прыжка. Мы измерили и сравнили высоту вертикального прыжка в условиях использования корсета и без него. Результаты показали, что самый высокий прыжок, и меньшее время для прыжка и максимальная сила импульса наблюдались без использования корсета.

**Ключевые слова:** Волейбол, высота прыжка, голеностопный сустав, корсет, время

**Aşiq baldır korsetinin qadın voleybolçuların oppanma hündürlüyünə təsiri.**

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**Xülasə:** Voleybol qısa və cəld hərəkətlərlə xarakterizə olunan idman növüdür. Təkrarlanan tullanma və cəld hərəkətlər bu idman növündə açıq baldır oynağında zədələnmə riskini artırır. Aşiq baldır oynağı zədələri xüsusən də bu oynaqdakı bağların dartılması ən çox rast gəlinən problemdir. Zədələrin rastgəlmə riskini azaltmaq, zədələnmədən sonrakı bərpa dövründə və yenidən zədələnmənin qarşısını almaq məqsədi ilə idmançılar bu vasitədən geniş istifadə edirlər. Zədələnmə riskinin azaldılması məqsədi ilə bu vasitənin istifadəsi voleybolda məcburi deyil. Lakin bəzi hallarda idmançılar uzun müddət açıq baldır korsetindən istifadə edirlər. Sadalanan təsirlərinə baxmayaraq bu tip vasitələr idmançılarının tullanma hündürlüyünə və performansına təsir edə bilər. Aparduğumuz təcrübə əsnasında korsetdə və korsetsiz tullanma nəticəsinin müqayisəsi zamanı müəyyən etdik ki, açıq baldır oynağı korsetinin istifadəsi zamanı