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## Exploration study of common injuries and preventions in volleyball

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### Abstract

Every sport has injury problems. Some of them are "overuse", types of injuries such as those seen in joggers' ankles, lower legs, and knees, while others are acute injuries. In volleyball, finger injuries have gone down over the years due to more passing with the forearms, but ankle sprains have increased because people are jumping higher and more often in spiking and blocking. Passing, digging, and setting are quite safe, but blocking and spiking increase the risk of hand, shoulder, knee, and ankle problems. Scientific studies of injuries do not report a consistent incidence of problems. Generally speaking, volleyball is a very safe game, but as spiking, blocking, and diving for digs have become more commonplace, injury rates have risen over the years due to this more aggressive play.

**Keywords:** Injuries, preventions, volleyball

### Introduction

Every Sport has injury problems. Some of them are "overuse", types of injuries such as those seen in joggers' ankles, lower legs, and knees, while others are acute injuries such as when a basketball player sprains an ankle. In volleyball, finger injuries have gone down over the years due to more passing with the forearms, but ankle sprains have increased because people are jumping higher and more often in spiking and blocking. And allowing the jumpers to land on or over the center line has increased these injuries even more.

Passing, digging, and setting are quite safe, but blocking and spiking increase the risk of hand, shoulder, knee, and ankle problems. Over 55 percent of all injuries are due to jumping or landing. As you would expect, playing on a soft surface such as sand greatly reduces the number of injuries. In fact, there are 75 percent fewer injuries on sand than on a hard court.

We are finding more overuse injuries: Jumper's knee, cruciate ligament tears inside the knee, inflamed tendons, the thigh and leg bones, shoulder problems, the stretching of muscles, the rotator cuff muscles. The most common types of acute injuries are sprained ankles or wrists, jammed fingers, or twisted knees. Hand injuries, sprained ankles, injuries to the ankles and knees, the lower extremities. When players are older; older women have more overuse injuries, while older men have more acute injuries. Elite players have twice the injury rate of less, accomplished players. The highest level of injury risk is for young players during their growth spurt. If the Player has had injuries earlier from volleyball or another sport, there is a risk of re-injury. Poor hitting or jumping and landing technique results in an increased risk of injury. Injuries can occur if there is an imbalance of muscle strength.

### When Injuries occur

Scientific studies of injuries do not report a consistent incidence of problems because some studies are done with elite players in tournaments, while others are done in physical education classes. But we can surmise from the studies that there are more injuries at the beginning of a season than later - due to poor condition and poor skills; and that there are more injuries as the intensity of the game increases, such as in tournaments. There is a higher rate of injuries during game increases, such as in tournaments. There is a higher rate of injuries during games than during practice time. Generally speaking, volleyball is a very safe game, but as spiking, blocking, and diving for digs have become more commonplace, injury rates have risen over the years due to this more aggressive play.

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## Types of Volleyball Injuries

The sport of volleyball is a very physically demanding sport, regardless of what position you play. Across all positions, there are 4 common injuries that volleyball players suffer from. They are lateral ankle sprains, muscle strains, patellar tendinopathy or “Jumper’s Knee”, and shoulder overuse injuries. The positions that are at the highest risk of injuries are outside hitter, followed by middle blocker, libero, setter, then opposite. Most injuries occur without contact from another person and overuse injuries.

Four of the most common injuries that volleyball players suffer from are:

1. Lateral ankle sprain (15.6%)
2. Muscle strain (quadriceps and abdomen) (7% combined)
3. Patellar tendinopathy (Jumper’s knee)
4. Shoulder overuse injury

### Lateral Ankle Sprain

Throughout the course of your volleyball career, you have most likely “rolled your ankle” at least once. Many times, during athletics, this injury happens when quickly cutting and changing directions or jumping and landing. Although this type of injury is common with volleyball players, there are exercises and steps that you can take to either prevent a first-time ankle sprain or to prevent recurrent ankle sprains.

**Mechanism of Injury:** Usually caused by a sudden twisting, turning, or rolling of ankle to one side resulting in an inversion and plantar flexion position. Many times, during athletics, it happens when quickly changing directions or jumping and landing.

**Prevention:** Neuromuscular training (proprioceptive training) is effective to prevent recurrent lateral ankle sprains. However, evidence for prevention of first-time ankle sprains is lacking. There are several risk factors, which can be targeted if classified as modifiable risk factors and used as preventative measures. These include decreased ankle mobility, reduced awareness of the position in movement of your foot and ankle and decreased postural control. In addition, other risk factors include decreased strength, coordination, and cardiorespiratory endurance.

**Treatment:** Supervised physical therapy results in improved ankle strength and proprioception, quicker return to work and sport than a home program. Manual joint mobilization to address ankle dorsiflexion range of motion is reported to decrease pain. Manual therapy combined with exercise results in even better outcomes.

### Muscle Strain (Quadriceps and Abdomen)

Another common injury in volleyball is a muscle strain particularly in the quadriceps and abdomen muscles. A muscle strain occurs when the muscle is overstretched or torn. When this happens, it usually causes localized pain and generalized weakness of that muscle when you attempt to use that muscle.

**Mechanism of injury:** disruption of the muscle tendon unit typically occurring when the muscle is activated while being stretched (eccentric contraction). When a muscle strain occurs, it causes localized pain and generalized weakness of the muscle when activity using that muscle is attempted. Regarding a quadriceps strain, there are three common mechanisms of injury: sudden deceleration of the leg, violent

contraction of the quadriceps (sprinting), or rapid deceleration of an overstretched muscle (quick change of direction)

**Prevention:** Evidence shows that regarding hamstring strain injury prevention, eccentric hamstring exercises substantially reduce the incidence of these types of injuries. Another study revealed that a muscle imbalance between eccentric hamstring strength and concentric quadriceps strength resulted in a 4-fold increased risk of injury to the hamstring muscle. These concepts, in theory, can be applied to the prevention of other muscle strain injuries. Prevention of quadriceps strain includes increasing flexibility and strength of the quadriceps, particularly eccentric strength. Eccentric control of the quads is important for that muscle to be able to control the forces experienced during landing from a jump.

### Patellar Tendinopathy (Jumper’s Knee)

Many volleyball players experience pain in the front of their knee every time they jump and when they run. This pain can be signs of patellar tendinopathy, or more commonly called Jumper’s Knee. This injury is very common in athletes that perform an excessive amount of running and jumping. Common signs of Jumper’s knee are pain beneath your kneecap when moving, pain when bending at the knee, stiffness in the knee while jumping, kneeling, or squatting, and pain with jumping.

**Mechanism of injury:** Jumper’s knee is caused by irritation of the patellar tendon due to excessive or repetitive overload on the tendon. It is very common in athletes that perform a lot of running and jumping, in sports such as volleyball and basketball, and more prevalent when jumping on harder surfaces.

**Prevention:** Eccentric loading of the quadriceps muscle, lumbo-pelvic stabilization, and hamstring stretching can be utilized to prevent patellar tendinopathy. There is evidence stating that a prophylactic training regime of eccentric knee extensor training can effectively prevent sports-related anterior knee pain. Evidence also points towards core weakness as contributing to anterior knee pain.

### Treatment/Exercises

Staged progression of loading the patellar tendon.

**Stage 1:** Isometric loading (if you have at least a 3/10 pain during exercises moving the knee). Aim for 5 repetitions of 45 seconds

- Seated knee extension isometric holds
- Perform at 30°-60° of knee flexion
- Wall squat

**Stage 2:** isotonic loading (keeping a load on a muscle while it is moving). If you have < 3/10 pain

- Goblet squat
- Spanish squat

**Stage 3:** Energy storage loading

- Squat jumps
- Lunge jumps
- Volleyball block or spike approach

**Stage 4:** Return to sport

### Shoulder Overuse

Regardless of the position that you play, volleyball players

use their shoulders constantly. Whether you're serving or swinging, every athlete (from liberos to outsides) needs to make sure their shoulders stay healthy and strong. The shoulder is loaded and challenged greatly during overhead motions. This leads to the most common type of shoulder injury with volleyball players: overuse of the shoulder joint.

**Mechanism of injury:** The exact cause of overuse shoulder pain in volleyball players is not completely understood, mainly because every player is drastically different, and every body moves in a different way. However, there have been several factors that have been identified in elite volleyball players that are present in those athletes that suffer from chronic overuse of their dominant shoulder. These factors include decreased shoulder range of motion, and decreased rotator cuff strength or imbalance. The rotator cuff is a group of muscles that surrounds the shoulder joint and keeps your shoulder stabilized. (It is not clear as to the extent to which biomechanical factors play a role in shoulder pain. However, several factors have been identified in the dominant shoulder of elite volleyball players that serve as risk factors for shoulder pain. These include shoulder range of motion, rotator cuff strength or imbalance.)

**Prevention:** Addressing the risk factors for developing shoulder pain can help in preventing the onset of shoulder pain. Improving shoulder range of motion, and strengthening the muscles surrounding the shoulder. During overhead serving and hitting, the shoulder is highly loaded and challenged in an eccentric manner of the shoulder external rotators. Strengthening and training these muscles, in the same way, they will be required to work during volleyball can help prevent future injuries. It is also noted that deficits in internal rotation range of motion have been linked to an increased risk of shoulder injuries.

With advanced and elite volleyball players, we are finding more overuse injuries. The continual jumping and landing of hitters/stickers and blockers can result in "jumper's knee" (an inflammation of the tendon that holds the kneecap), as well as cruciate ligament tears inside the knee and inflamed tendons where the muscles used in jumping are attached to the thigh and leg bones. About 45 percent of elite players have complained of knee injuries from overuse.

Stickers / Hitters are more likely to develop shoulder problems both from the stretching of muscles in the upper back (the infra-spinatus muscle) and from the force developed in the rotator cuff muscles in the spike and the serve. For most players, acute injuries are more common. The most common types of acute injuries are sprained ankles or wrists, jammed fingers, or twisted knees. Hand injuries account for about half of the reported injuries in school classes. Sprained ankles are second, with an incidence of about 25 percent. At the higher levels of play, injuries to the ankles and knees are more likely, with half of all injuries being to the lower extremities. Some studies show that the ankles are more often injured, while others show that knees are more often the problem. Head and upper - body problems are not a major type of volleyball injury. However, a broken nose or extreme twists of the neck (cervical vertebrae) or lower back (Lumbar vertebrae) do occur, less than 15 percent of all volley ball injuries are to the trunk and head.

Arm, shoulder and hand injuries make up about 35 percent of volleyball injuries. As mentioned, the overhand actions of serving and hitting can cause some problems to the tendons and muscles of the shoulder joint. Elbows don't seem to be a

problem, but a few cases of forearm problems have been reported. The wrist and hand are often problems, however, there are eight bones in the wrist with five hand bones attaching to them, as well as two thumb bones and three in each finger giving, a large number of places where a fracture or a sprain (overstretching / rupturing of the ligaments that hold one bone to another) can occur.

About 25 percent of injuries are to the fingers, with another 25 percent to the thumbs, Blocking is the major cause of finger and thumb injuries. Research in Italy at all levels of play has indicated that the floater serve and spike both stretch nerves that may eventually become painful. A major problem in both Techniques is a weakness in the muscles that rotate the upper arm in the shoulder. These muscles can be strengthened by doing the rotator cuff exercises. Leg, ankle, and foot injuries are common in any sport involving running and jumping. Basketball and Volley ball players as well as high and long jumpers are prone to the same types of knee, lower leg, and ankle overuse injuries.

However, acute injuries in volley ball can also occur in these areas when the knee is twisted or hit from the side or the ankle is twisted during landing. As you might accept, blocking and spiking are the activities during which most lower - leg acute injuries occur.

### Risk of Injuries

There are gender differences in the occurrence of injuries. Male players are more likely to acquire "jumper's knee" (an injury to the patellar tendon) and shoulder injuries, while female players are more at risk for fractures and knee ligament injuries. Even though beach volleyball is generally safer than indoor play, sand players are more susceptible to Achilles tendon problems.

### Prevention and Safety Measures to Reduce Injuries

Wear pads to protect your knees or elbows, wear ankle braces to prevent ankle sprains. Do rotator cuff exercises to reduce shoulder problems from serving and hitting. Do leg exercises to condition the leg muscles for the maximum efforts. Consider the use of orthotics and / or cushioned heel cups if you have foot problems. Use ankle stabilizers to reduce ankle sprains. Play on dry wooden floors. Injuries can often be prevented by using proper techniques and by effective strengthening of the muscles. Protective pads, orthotics and braces, ankle stabilizers, can greatly reduce the risk of injury. The risk of injuries in volley ball is increased in the following conditions

- When players are older; older women have more overuse injuries, while older men have more acute injuries.
- Elite players have twice the injury rate of less, accomplished players.
- The highest level of injury risk is for young players during their growth spurt.
- If the Player has had injuries earlier from volley ball or another sport, there is a risk of reinjury.
- Poor hitting or jumping and landing technique results in an increased risk of injury.
- Injuries can occur if there is an imbalance of muscle strength; for example, if the muscles in the front of the thigh (quadriceps) are much stronger than those in the back of the thighs (hamstrings).
- If the level of competition is higher; the pressure can result in injuries.
- It is more dangerous to play on concrete than on wood or linoleum floors.

- Playing on different surfaces (such as concrete or wood) increase the injury risk over playing on just one surface regularly.

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#### **Prevention and Safety Measures to reduce injuries**

- Wear pads to protect your knees or elbows if they are in danger of injuries from the position you play.
- Wear ankle braces to prevent ankle sprains.
- Do rotator cuff exercises to reduce shoulder problems from serving and hitting.
- Do leg exercises to condition the leg muscles for the maximum efforts they must accomplish during practices and games.
- Consider the use of orthotics and / or cushioned heel cups if you have foot problems Use ankle stabilizers to reduce ankle sprains.
- Use knee pads to reduce knee injuries from hitting the floor
- Play on dry wooden floors, (High - Friction or non - skid surfaces such as concrete increase risk as do low friction or slippery or wet surfaces).
- Strengthen the muscles of the legs and shoulders through the use of resistance exercises.
- Injuries can often be prevented by using proper techniques and by effective strengthening of the muscles.
- Protective pads, orthotics and braces, particularly ankle stabilizers, can greatly reduce the risk of injury.
- General strength programme for fitness and specific programme for volley ball exercise.

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