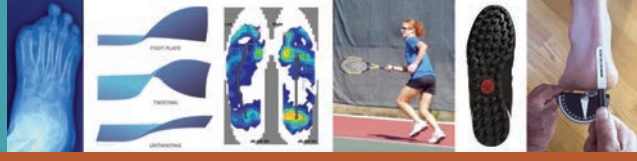

Pickleball Injuries in the Foot and Ankle

The uniqueness of this popular sport results in predictable ailments.

BY ELIZABETH BONDI, DPM

Pickleball was first started in 1965 by a Washington State Senator, Joel Pritchard. While often compared to other racket sports such as tennis, paddleball, and platform tennis, pickleball has its own unique features. The court is smaller than that of a tennis court and players use a paddle and a ball similar to a wiffle ball. It can be played as singles or doubles and either indoors or outdoors.

Over the past 3 years, pickleball has experienced a surge in popularity, with a growth rate reported by the Sports and Fitness Industry Association of 158.6%. This increase in growth can be attributed to multiple factors, including improvements in personal well-being, physical fitness, socialization, and reported life satisfaction as well as reduced stress levels. Additionally, pickleball is relatively easy to learn and can be played by individuals of any age and ability. In fact, the average age for pickleball players is around 35 years old. However, as the popularity of the sport has increased, so has the media attention surrounding the supposed increase in the number of reported pickleball-related injuries. Despite these reports, research looking into injury rates in pickleball, especially in the lower extremity, is lacking.

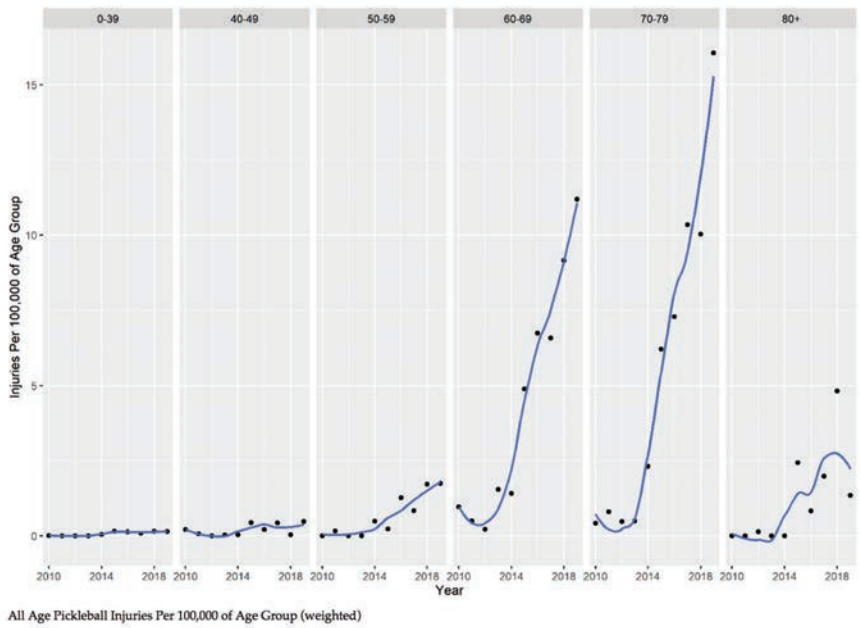

Figure 1: Chart showing the number of pickleball related injuries per age group between 2010 and 2018 (Weiss, H et al. (2021) Non-fatal senior pickleball and tennis-related injuries treated I the United States emergency departments, 2010-2019. Injury Epidemiology)

Existing Research

A couple of research studies that have focused on pickleball-related injuries were performed by Opara, et al. in 2024 and Weiss, et al. in 2021. It has been reported that pickleball injuries primarily occur in players 50 years of age or older, representing around 90% of all injuries (Figure 1).

These injuries tend to peak during the first three months of the year. It has been suggested that this timing may be due to "snowbirds" seeking warmer climates that will allow for more outdoor activities and which are in locations where pickleball is extremely popular. Additionally, around that time, many people create New Year's resolutions that include being more active, which may include trying new sports such as pickleball.

Weiss reported that the most common mechanisms for a pickleball injury were slip/trip/fall/dive, which accounted for 63.3% of injuries overall. Injuries tend to occur equally between men and women, although the type of injury is typically different. Women are approximately 3.5 times more likely to suffer a fracture and men are 3.5 times more likely to sustain a strain or sprain. Additionally, younger athletes sustain approx-

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imately two times as many fractures compared to more senior players.

When specifically looking at the lower extremity, the data is extremely limited. Opara, et al. reported that while the foot was the most frequently injured part of the lower extremity in pickleball and paddleball related injuries, ankle sprains were actually the most common lower extremity injury at 21.7%, followed by Achilles tendon rupture at 12.1%. They also noted that the most common mechanism for a lower extremity injury was due to a sudden change in direction, accounting for 54% of these injuries. Additionally, men were seven times more likely to injure their lower leg, usually the calf or Achilles tendon.

Overuse vs Acute Injuries

Injuries in pickleball can be the result of overuse or an acute injury. Overuse injuries that are more commonly seen in pickleball players include plantar fasciitis, stress fractures, tendinitis, metatarsalgia, and plantar fasciitis. These injuries are typically caused by the repetitive pounding on a hard surface, improper footgear, and/or inadequate training. Acute injuries such as fractures and tendon ruptures can also occur in pickleball players. These injuries are typically secondary to a sudden turn or pivot, jumping, abrupt stopping and starting, or improper footgear. While most pickleball injuries tend to be overuse injuries, the majority of acute injuries tend to be in the lower extremity. Most of these injuries can be treated conservatively with rest, ice, compression, elevation, orthotics, braces, taping, physical therapy, shockwave therapy, deep water running, injections, and proper education. However, surgery is occasionally required.

So, why are these injuries occurring and what can be done to help prevent or reduce the risk of these injuries? Pickleball has some unique features that may place players at risk for injury. This sport requires quick movements as well as frequent changes in direction and in pace. Additionally, unlike many other racket sports, there is an area on the court called the "kitchen" (Figure 2). It is the area in front of the net that a player cannot cross in certain situations. Therefore, players may need to stop suddenly to slow their momentum so that they do not enter this area. This can require sudden eccentric activity in the lower extremity muscles that may lead to injury. Furthermore, many pickleball players are either current or past tennis players. The "kitchen" area requires a completely different mental and physical processing as well as a change in technique and footwork when players are at the net compared to tennis. The period where a player is adjusting these changes may put him/her at an increased risk for injury as well.

Figure 3: Left (yellow) side of the ball represents an outdoor pickleball, whereas the right (orange) side is an indoor pickleball. (Elara, Loren. Indoor vs. outdoor pickleballs-what's the difference? 01/28/2023. https://dashpickleball.com/indoor-vs-outdoor-pickleballs/)

Unlike many other racket sports, there is an area on the court called the "kitchen". It is the area in front of the net that a player cannot cross in certain situations.

Poor technique and improper training may also contribute to injuries as it can impact a player's balance and can lead to overcompensation and excessive biomechanical stresses. Finally, there are different balls for indoor versus outdoor play (Figure 3). The outdoor balls are harder with smaller holes, which tend to play much faster with the ability to reach speeds up to 30-40 mph. If a player is not ready for this change in speed, his/her balance and mechanics can be affected.

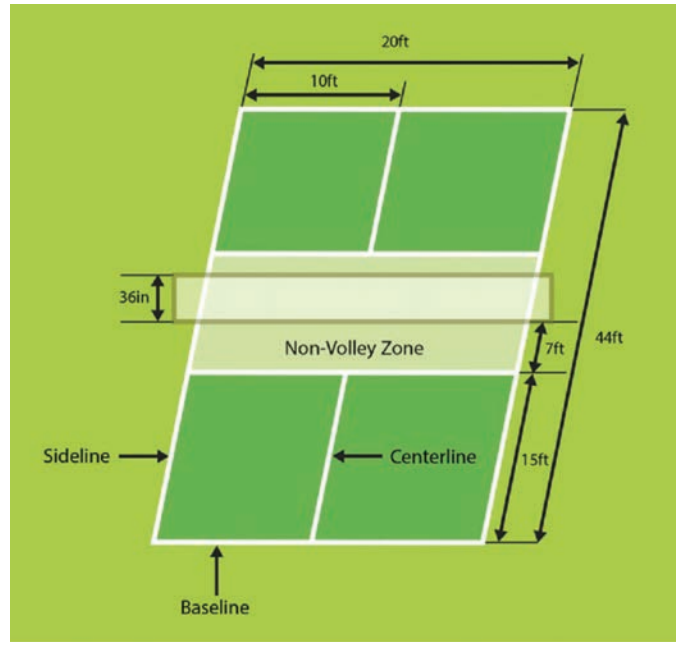

Figure 2: Dimensions of a pickleball court. The "non-volley zone" is also known as the kitchen. (Vitale, K, Lui, S., et.al (2020) Pickleball: review and clinical recommendations for this fast-growing sport. Current Sports Medicine reports. 19(10: 406-413.)

The Importance of Footgear

There are some additional special considerations that should be noted. One of the most important factors is footgear. It is essential that pickleball players wear shoes designed for the sport. Often, players will wear a running shoe instead of a court shoe,

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However, running shoes are meant for linear motion, not lateral motion, and therefore do not offer the appropriate support and stability. Court shoes are designed with a toe guard, reinforced upper, and forefoot lateral flange to provide some durability and stability to the foot during lateral motion and toe drag (Figure 4). These shoes also include a midsole shank that helps to maintain the shape of the shoe and provide some "rebound" back into the legs when pushing off to change direction. These shoes also have a firm heel counter and supportive ankle collar which provide some rearfoot stability and minimize heel movement within the shoe.

Figure 4: Various features of pickleball shoes (K Swiss. https://kswiss.com/products/07916-421-m)

There are both outdoor and indoor pickleball shoes. Outdoor shoes have increased outsole durability and a firmer rubber outsole to improve the longevity of the shoe. The tread is also different to adapt to the various court surfaces such as asphalt or concrete. Indoor shoes have a softer outsole rubber and more mesh on the upper to make them lighter. These shoes are designed for more of a gym laminate playing surface. Outdoor pickleball shoes can be used if playing on this surface as well, but players should be aware that if there is water or sweat on the floor, it can be more slippery. If playing on an indoor tennis court, then either outdoor pickleball shoes or tennis shoes would be appropriate.

It is important that players wear proper footgear and that they understand why that is important.

Not only is the court surface important when deciding what shoes to wear, but it may also play a role in injuries regardless of footgear. The court surface can impact the ball speed and ball height, which can affect a player's balance and technique. Additionally, the surfaces have varying degrees of shock absorption. Concrete and asphalt courts are stiff and rigid and don't offer a lot of shock absorption, which may lead to some overuse injuries. However, an acrylic top coating can be applied over these harder surfaces to help minimize shock and strain by providing some additional cushioning. Other surfaces, such as a sport court or gym laminate, tend to offer more cushioning compared to concrete and asphalt. Additionally, concrete can be slippery when wet and can increase the risk of skidding and falling, whereas asphalt is relatively skid-resistant even when it is wet. It is also important to be aware of any cracks in the court, which can pose a fall hazard or abruptly change the direction of the ball, leading to an off-balance shot.

Patient Education

To date, there is no published literature that offers pickleball-specific training or equipment recommendations. However, with some of these potential injury risks in mind, an important factor in trying to reduce injury occurrence or recurrence is patient education. It is important that players wear proper footgear and that they understand why that is important. Especially with older athletes, it is imperative that they learn to start and stop appropriately and learn proper technique and footwork. Many athletes may benefit from a "pre-habilitation" program which has been defined as a program designed to improve fitness and focus on

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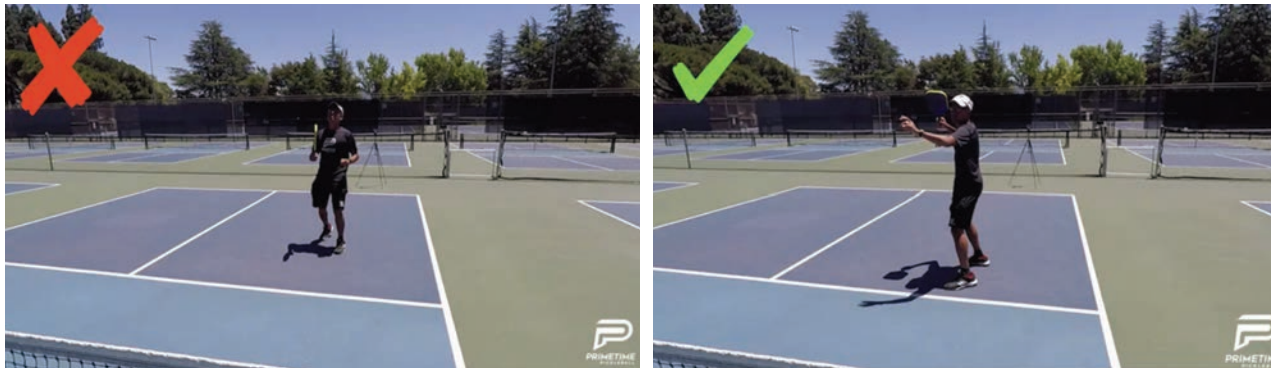

Figure 5: Demonstration of a proper drop step on an overhead compared to backpedaling. (#1 Overhead Smash Killer. A Dangerous Mistake You May Be Making. Primetime Pickleball. https://primetimepickleball.com/1-overhead-smash-killer-a-dangerous-mistake-you-may-be-making/)

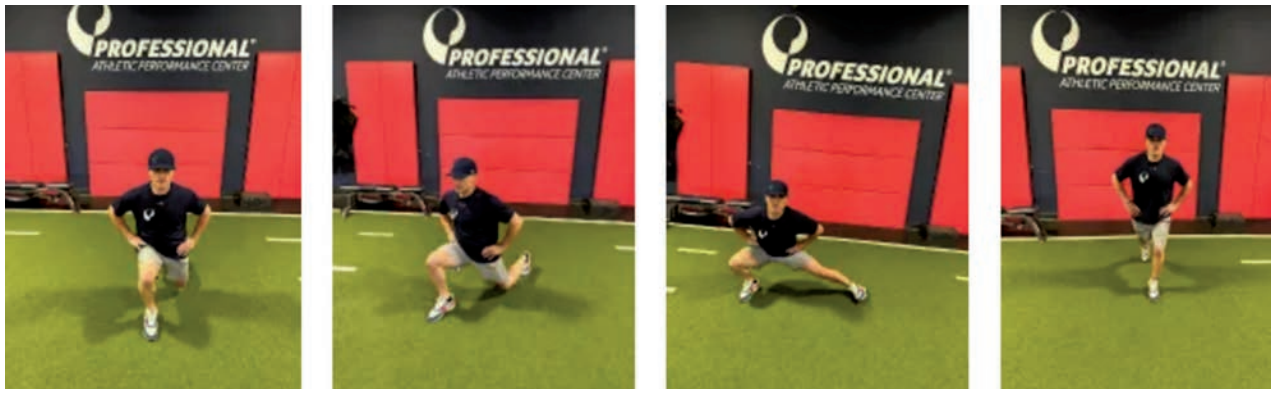

Figure 6: Proper warm-up and stretching with pickleball related movements is important. (Essential Tips to Prevent Pickleball Injuries: A Physical Therapist's Perspective. Professional Physical Therapy. 08/08/2023. https://www.professionalpt.com/essential-tips-to-prevent-pickleball-injures-a-physical-therapists-perspective-blog/)

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sport-specific function prior to starting a sport with a high injury risk or returning to a sport after an injury. Attention should also be placed on developing balance, coordination, and proprioception to minimize fall risk. Additionally, working on core and gluteal muscle strength is important as many of the movements in pickleball involve being in a lunge or squat position, which requires pelvic stability. Players must learn to get sideways and drop step on overheads as opposed to back pedaling (Figure 5). Injuries in pickleball can occur when a player backpedals because he/she either trips or loses balance. As a result, he/she may fall backwards, potentially leading to an upper extremity or head injury.

It is also important to keep the ball contact point in front of the body and not hit off the back foot as this can impact balance and stability, potentially leading to an increase in biomechanical stress on the upper and lower extremities. Emphasis should also be placed on players performing a proper warm-up with dynamic stretching prior to activity, and adequate cool-down after play (Figure 6). Often, a physical therapist, trainer, or coach can help an athlete develop these skills.

Summary

Overall, pickleball is a sport that has experienced significant growth in recent years. As a result, it has received a lot of attention regarding injury rates. As previously noted, there is not a significant amount of research that exists pertaining to injuries in pickleball, especially relating to the foot and ankle. There is no clear evidence to suggest that pickleball players are at a greater risk of injury compared to players of other racket sports. However, depending on the level and competitiveness, pickleball is not as low impact as initially thought. This sport involves frequent quick and hard changes in direction, which can lead to an increase in stress and strain on the bones and joints in the lower extremity, which may, in turn, contribute to injury risk. In addition, there are some important considerations specific to pickleball, such as footgear, court surface, and training that are important to understand and can be used to educate patients on how they may be able to reduce their injury risk. **PM**

This sport involves frequent quick and hard changes in direction, which can lead to an increase in stress and strain on the bones and joints in the lower extremity.

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