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### **Exercise Considerations**

Please consult with a physician before beginning the exercises in this book. A physician can effectively determine which exercises are appropriate for you or your clients, and if any exercises should be avoided or modified.

### Disclaimer

The Hidden Cause of Your Plantar Fasciitis Pain is primarily an educational resource and is not intended to take the place of the advice and recommendations of a physician. If you suspect you or your client has a health problem, please have him or her seek the services of a physician or qualified healthcare professional.

Exercise is an ever-changing science. As new research and clinical experience broaden our knowledge, changes in exercise and exercise prescriptions are inevitable. The

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# Preface

Thank you for supporting one of my dreams!

I have always dreamed of being a writer. The book you are reading is one of those writing dreams coming true. I hope you take from it as much as I have gotten out of its research and production.

### Pass this Book On

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Rick Kaselj

# About Rick Kaselj

Rick Kaselj, M.S. (Exercise Science), B.Sc. (Kinesiology), PK, CPT, CEP, CES



Rick Kaselj specializes in active rehabilitation and fitness. He works in one-on-one and group rehabilitation settings, educating and training people who have been injured at work, in car accidents, and during sport activities.

Rick has combined his rehabilitation experience and passion for research to develop a variety of courses and presentations for fitness professionals, Kinesiologists, and healthcare providers. Rick has given over 260 presentations to more than 5000 fitness professionals across Canada and USA.

These courses include:

- Core stability of the shoulder
- Exercise rehabilitation for the shoulder, lower back, hip, or knee
- Foam roller essentials
- Intro and advanced core stability
- Intro and advanced stability ball exercises
- Postural assessment and exercise prescription
- Injury-free running
- Save your shoulders
- Training for better golf

Rick strives to balance his work life with his personal fitness endeavours and travel. He has trained for and competed in the Manitoba Marathon, the 225 km Ironman Canada Triathlon, and the 160 km Sea2Summit Adventure Race in Whistler, BC.

He recently hiked 4,300 km along the *Pacific Crest Trail* from Mexico to Canada and mountain biked the 5,000 km *Great Divide Mountain Bike Route* over the Rocky Mountains from Mexico to Canada. An avid traveler, Rick has toured three continents and visited 17 countries.

In 1997 he graduated with his Bachelor of Science degree in Kinesiology from Simon Fraser University. Rick recently completed his Masters of Science degree focusing on corrective exercise and therapeutic exercise for the rotator cuff. Rick currently works as a lecturer, Kinesiologist, personal trainer, and exercise rehabilitation specialist in and around Vancouver, British Columbia, Canada.

To learn more about Rick Kaselj, please visit www.ExercisesForInjuries.com

# Introduction to Plantar Fasciitis



Plantar fasciitis is an overuse injury involving the plantar fascia, a tough, fibrous band of tissue that supports the longitudinal arch of the foot. Also known as jogger's heel, tennis heel, or policeman's heel, plantar fasciitis is one of the most common injuries affecting athletes and individuals who are habitually on their feet for long periods of time. It can progress and lead to severe heel pain, usually described as knife-like, especially during the first few



steps in the morning.

According to the American Academy of Podiatric Sports *Medicine*, heel pain is the most common presenting symptom of patients who seek treatment from podiatric practitioners. It is estimated that each year, **10% of foot injuries associated with running are attributable to plantar fasciitis** (Buchbinder, 2004).

The feet support the weight of the entire body, playing a critical role in stability, locomotion, and propulsion. Therefore, any injury or pain involving the feet is a cause for concern and should not be ignored. Plantar fasciitis is a painful and debilitating condition that calls for immediate treatment and intensive exercise rehabilitation. Therefore, preventive exercises, early detection, and timely-management are very important.

### Anatomy of the Foot and Plantar Fascia

The feet are involved in two functions that require a highdegree of stability: weight bearing and propulsion. Moreover, the foot must be flexible and strong enough to accommodate uneven surfaces or terrain, and to absorb shock when walking (Bolgla & Malone, 2004).

Evolution enabled humans to walk upright in a locomotive fashion. This form of motion is energy-saving, and it allows

us to use our hands to perform other activities. However, our bipedal (two foot) design can place a great amount of stress on the lower extremities, especially on the feet. The foot's anatomical structure demonstrates the amount of stress to which it is continuously exposed. Each foot is composed of 28 bones, 33 joints, 19 muscles occurring in 4 layers, and a network of blood vessels, nerves, and soft tissues. The feet are supported by a total of 56 bones, a number that represents 25% of the bones in the human body.

The arch is the most important structure of the foot, as it endures the entire body weight and absorbs a great amount of stress with every step. Therefore, any alteration or injury involving the arches can have a drastic effect on balance and gait.

Technically, the **foot has three arches**: the medial longitudinal arch, the lateral longitudinal arch, and the transverse arch. The medial longitudinal arch, which is the highest arch, functions as the chief load-bearing structure in the foot (Glasoe, Yack & Saltzman, 1999).

Plantar fascia is a non-elastic, tough band of tissue which runs from the calcaneus, or heel bone, to the heads of the long bones – the bones that form the ball of your foot. The plantar fascia forms the arch of the foot. It provides stability during stance, gait, and other weight bearing activities. Around and within the fascia are receptors supplied by plantar nerves, which mediate pain sensations. To help absorb the shock of walking, a fat pad in the heel bone covers the plantar fascia. A damaged plantar fascia, especially at its attachment point on the heel bone, may give rise to plantar fasciitis.

### The Gait Cycle and Plantar Fascia



Understanding the mechanics of the foot can help explain the development of plantar fasciitis. Connecting the hind foot and the fore foot, the plantar fascia undergoes tension during gait (walking). The action of the plantar fascia during weight bearing is compared to a windlass or a rubber band. When there is no weight on the foot and

plantar fascia, the elastic band is relaxed. As weight is put on the foot and the plantar fascia, the elastic band stretches out. A band that is too short results in a high arch, whereas a band that is too long results in a low arch, which is commonly termed flatfeet.

The gait cycle refers to the continuous repetitive pattern of walking. One complete gait cycle consists of 2 main phases: the stance and the swing. The stance phase is the part of the cycle where the foot is in contact with the ground. The swing phase is the period when the foot is off the ground. The stance phase is further discussed, as it has a more significant effect on a plantar fascia injury.

#### The stance phase has 3 sub-phases:

- **Contact phase** The phase is initiated when the heel strikes the ground and ends when the entire foot comes in contact with the ground. The foot has to be flexible and mobile during this phase to adapt to any uneven terrain.
- Mid-stance In this phase, the weight is shifted from the back of the foot to the fore foot. The stance phase is the period when the stance limb bears the body's entire weight; therefore, it is during this period when the foot is most susceptible to injuries. The arch of the foot flattens to absorb the stress of ground contact and the plantar fascia is stretched.
- Propulsion This phase begins as soon the heel is lifted. The toes are pushed off to propel the body forwards. It is during this phase that the windlass effect occurs. The plantar fascia is tightened over the plantar surface at the base of the toes, raising the arch. This allows the stance foot to become an efficient lever. Exaggerated or prolonged propulsion phase can increase the risk of plantar fascia injury.

# What Causes Plantar Fasciitis?



The causes of plantar fasciitis may be numerous. The term *fasciitis* is believed to be inaccurate because the damage incurred by the plantar fascia is mainly brought about by degenerative changes owing to overuse or re-injury, which may occur with or without inflammation. Microtrauma (Small microscopic injuries) and degeneration are commonly caused by prolonged or repeated overstretching of plantar fascia due to walking, jumping,

landing, and running. Weakened foot and lower leg muscles, a tightened Achilles tendon, or any activity in which the weight is taken on the ball of the foot can put a lot pressure on the fascia, resulting in plantar fasciitis. Like tendons, the planter fascia is poorly supplied with blood; therefore, once it is damaged, the healing process may be markedly slow.

Decreased healing response, in addition to decreased elasticity that comes with aging and repetitive tearing, puts the middle-aged population especially at risk of plantar fasciitis. As you get older, the plantar fascia usually loses its ability to stretch. The fat pad on the heel also thins and weakens, decreasing its ability to absorb the shock or pressure of walking. Excessive pressure applied on the heel damages the plantar fascia, making it vulnerable to swelling, tearing, and bruising.

## **Prevalence and Risk Factors of Plantar Fasciitis**



Plantar fasciitis is the most common cause of heel pain. Around 2 million Americans are treated for plantar fasciitis on an annual basis. This figure accounts for 11 to 15% of all foot symptoms that needed professional or medical treatment each year (Singh, Silverberg & Milne, 2009). Plantar fasciitis is among the top five causes of

**foot injuries in professional athletes.** Athletes, who constantly perform activities in which the weight is taken on the ball of the foot, such as running, jumping, and landing, are at greater risk for plantar fasciitis. Cross-country and track runners, tennis players, basketball players, volleyball players, and sprinters are also at risk.

Plantar fasciitis is experienced by non-athletes, as well. The unadjusted incidence rate of plantar fasciitis in U.S. military services was 10.5 per 1000 persons-years (Scher et al, 2009). It is estimated that 10% of the general population in the United States will experience plantar heel pain in their lifetime (Crawford, Atkins & Edwards, 2000).

Plantar fasciitis is most common among people ages 40 to 60, though runners below the age of 20 are also susceptible. Women are two times more susceptible than men to develop plantar fasciitis.

Obesity, habitual barefoot walking, prolonged wearing of house slippers, inactivity, and high-impact aerobic exercises can increase the risk of plantar fasciitis. Speed workouts, graded hill work outs, and plyometrics (athletic jumping workouts) are also implicated in plantar fascia degeneration. Rigorous exercises and error training errors have been identified as important causative factors for this painful condition. In addition, high-risk behaviors, such as running on unpadded or poorly padded surfaces and using shoes with minimal cushion are known predisposing factors. These practices can place a lot of stress on the heel during activity.

### Signs and Symptoms of Plantar Fasciitis



Repeated trauma or chronic pressure placed on the plantar fascia can constantly irritate the nerves that carry pain signals, resulting in severe, intense, or burning heel pain. The pain is commonly felt in the arch area or on the underside of the heel bone and may extend to the toes. The pain is most severe with the first steps after a long period of non-weight bearing rest. Painful walking after a night's sleep is a chief complaint of patients with plant fasciitis. The pain may be severe enough to cause intolerable barefoot walking.

In advanced cases, the pain may radiate with a tingling sensation. The pain lessens as the day goes on, but prolonged standing and walking and localized application of manual pressure appear to intensify the pain. Movements in which the forefoot moves towards the lower leg, such as heel-raises and toe-walking (Walking on tip-toes), can increase the pain. The windlass test, in which the forefoot is passively moved towards

the body, can elicit heel pain. This makes it one of the most important tests used to diagnose plantar fasciitis. Antalgic posture, which involves walking or standing on the foot's lateral border, is also a common indicator of plantar fasciitis.

Plantar fasciitis usually affects unilaterally. Bilateral symptoms are more likely caused by systemic arthritis.

# **Plantar Fasciitis Prevention**



The first line of treatment, which is almost always the most effective, is prevention. Stretching the calf (Gastroc or Gastronemius) after activity is recommended minimize to the microtrauma incurred during running, jumping, or landing.

Wearing good quality shoes is a common suggestion, but it is one of the most essential preventive measures against plantar fasciitis. Well-fitting and comfortable shoes with good heel

supports are recommended. If your arch is too high or if you have flatfeet, over the counter or customized orthotics may be inserted into your shoes for better arch support.

**Excess weight** adds stress to the plantar fascia, most especially during the mid-stance phase where the arch flattens to absorb shock during ground contact. Losing weight through diet and exercise may help lessen the pain. You may consult your physician to determine how much you need to lose and which weight reduction method is the best one for you.

If your job requires **prolonged or static standing on a hard surface**, you may apply padding on the floor to lessen the pain and pressure.

# **Plantar Fasciitis Treatment**



Plantar fascia is not adequately supplied with oxygenated blood, which makes the recovery time longer than most less complicated cases of musculoskeletal injuries. The treatment and rehabilitation process, which may range from six weeks up to six months, can be a tedious and frustrating task; however, with consistent treatment applications, complete recovery from plantar fasciitis is highly attainable. It is estimated that 82 out of 100 patients with plantar fasciitis can achieve complete recovery within five months after initiating treatment (Johnson, 2008). Recoverv is widely attributed to the positive effects of different treatment combinations, most of which are conservative. Compliance with non-surgical interventions including multimodal treatment approaches generated success rates of 70 to

89.5% (Sorensen, Hyer & Berlet, 2009).

Non-surgical measures for the treatment of plantar fasciitis include rest, icing, stretching and strengthening exercises, oral intake of non-steroidal anti-inflammatory medications, corticosteroid injections, orthotic use, weight loss, physical therapy, night splinting, and heel pads.

#### Rest

Rest is the simplest and most important treatment for plantar fasciitis. If you are having heel pain, it is best to rest your foot until the inflammation or pain goes away. Activity modification and avoidance of pain-inciting activities contribute to successful pain relief. Running and jumping can be replaced by less stressful activities like swimming and cycling. If the pain is extremely severe, use of crutches, casting, or immobilization in a walker boot may be considered.

#### lcing

Ice should be used as an adjunct therapy, as it is known to decrease pain, swelling, and inflammation of tissues. Ice can be applied to the sore area for 15 to 20 minutes, four times daily, to relieve the pain. You may also roll the bottom of your foot on a frozen cylinder for five minutes after periods of activity and before sleeping. Ice cylinders are made by freezing water in plastic bottles or cups. You may also massage the heel of the foot by applying water frozen in Styrofoam cups in circular motions for five to ten minutes.

#### Non-steroidal Anti-Inflammatory Medications and Corticosteroid Injections

During the acute phase of plantar fasciitis, oral intake of non-steroidal medications in conjunction with stretching exercises may be useful to reduce inflammation. Ibuprofen, ketoprofen, or fluribiprofen are prescribed to relieve mild to moderate pain. These drugs are known to inhibit the synthesis of prostaglandins, which activate the inflammatory and pain responses in the body.

Steroid injections are administered if the pain occurring due to plantar fasciitis fails to respond to customary conservative measures. Corticosteroids are successful in controlling the pain, but it is recommended that a patient must not have more than three steroid injections within a year. Repeated steroid use can cause fat pad atrophy and plantar facial rupture.

#### **Shoe Modification**

Footwear plays a critical role in preventing and treating plantar fasciitis. It is best to use shoes with excellent shock-absorbing qualities. The shoes must feel comfortable and should foster good foot postures.

#### Orthotics

Overpronation, a condition in which the foot arches roll excessively inward, can cause excessive plantar fascia tension – a significant factor in plantar fasciitis development. Orthoses are mainly used to control and reduce this dysfunction by maintaining the foot in its neutral position. In addition to the reduction of plantar fascia tension, over-the-counter and custom-made orthoses increase stability in stance and gait and provide passive plantar fascia stretch.

#### **Night Splints**

Use of dorsiflexion (Top of the foot towards the shin.) night splints during sleep maintains the ankle joint in neutral position, keeping the plantar fascia and Achilles tendon constantly stretched throughout the night. This is helpful in decreasing the plantar fascia pain and microtrauma during weight bearing in the morning.

### Exercise

#### **Stretching Exercises**

An excellent exercise regimen for plantar fasciitis includes gentle, prolonged, and painfree stretching exercises of the Achilles tendon complex (tendon that is attached to the heel and calf), plantar fascia, and gastrocnemius-soleus complex (Two muscle in the calf area of the lower leg.). Among all conservative measures, it is believed that stretching exercises have the highest success rates for pain relief.

The plantar fascia stretches are, by far, the most valuable exercises in treating plantar fasciitis. It is recommended that you do these exercises first thing in the morning, before walking. The following plantar fascia stretches can be done three times daily:

- Stand with your hands against the wall. The affected leg is positioned slightly behind the other leg. Securely keep your heels flat on the floor. Keeping the injured leg straight and your heels on the ground, gradually lean forward, and bend the uninjured leg until you feel a stretch in the lower part of the injured leg. Hold the position for 10 to 15 seconds, and release. Repeat the exercise 5 to 10 times.
- Sit on a well-supported chair, and place the affected foot on the opposite knee. Grab the affected heel using the opposite hand and let the other hand pull the toes back, most especially the big toe. A stretch should be felt within the arch. Hold the stretch for 10 to 30 seconds, and release. Repeat the exercise 5 to 10 times per session or as tolerated. You may perform this exercise thrice a day.
- Another way to do the previous exercise is to sit on the floor with the legs straight. Loop a resistant band around the foot of the leg to be stretched. Gently pull the forefoot towards the knee, and hold the stretch for 10 to 30 seconds. Repeat 5 to 10 times or as tolerated. You may push your foot against the band to strengthen your calf.

Achilles tendon stretch, hamstring stretch, stair stretch, toe stretch, and soleus stretch are some stretching exercises that mainly focus on improving the flexibility of the plantar fascia.

### **Strengthening Exercises**

An exercise regimen for plantar fasciitis must include strengthening exercises for the foot muscles. Strong intrinsic foot and lower leg muscles are necessary to sufficiently support the foot, which is constantly exposed to stress, and to maintain a healthy arch. It is suggested that strengthening exercises should be initiated once the affected foot demonstrates improved flexibility during stretching exercises, without experiencing pain.

A tight calf muscle can put additional stress on the injured plantar fascia, which may aggravate the condition or further slow down the healing process. The calf is located on the posterior (or back) leg, just below the thigh. This powerful and large muscle group is involved in most lower leg activities, such as standing, walking, jumping, and running.

Using your toes to pull a towel or pick-up marbles conditions the foot's intrinsic muscles and the toe flexors that support the arch. Wall lunges, toe pulls, toe walking with opposite-ankle dorsiflexion, and toe tapping are only few of the most recommended strengthening exercises.

#### **Towel stretch**

Sit tall as you place the affected foot on a towel on the floor. Using your toes, tuck or pull the towel towards you. Afterwards, push the towel away, also through your toes. Repeat the exercise until fatigued. As your strength improves, place a weighted object, such as a can of soda, on the other end of the towel.

#### Marble pick-ups

For this exercise, marbles are placed next to an empty cup on the floor. Sit tall and using your toes, pick-up one marble at a time and put it into a cup.

# **Contraindicated Exercises**

In general, any exercise that causes pain should be avoided. During acute pain, it is recommended to rest the affected foot and avoid high-trauma sports activities, which involve repetitive running, jumping, and landing. Exercising on hard or uneven surfaces must be avoided.

If a prescribed exercise causes pain, it must be stopped at once. It is recommended to consult your physician or physical therapist for a possible change of exercise regimen. Decrease your distance when walking and avoid walking toward the top of a slope.

### Keys to Exercising

- Symptoms of plantar fasciitis are usually worse after awakening. To reduce pain, it is recommended to start stretching your plantar fascia before getting out of bed. Before sitting up, flex your foot up and down 10 times. Follow this exercise with towel stretch. Put a long towel at the bedside before sleeping. Keeping your back straight, loop the towel around the top of the affected foot. Gradually pull the towel towards your body.
- After exercising, you may apply ice massage to the affected area or you may roll a cold soda over the arch of your foot for five minutes to relieve or prevent pain. Ice pack applications for 15 to 20 minutes are also recommended.
- Massage the plantar fascia by running your thumb or fingers along the fascia. It is best to ask your physical therapist to teach you how to do this technique appropriately.
- You may ask your athletic trainer or physical therapist to tape your plantar fascia for improved activity tolerance during exercise and weight bearing activities. Taping is also known to distribute the applied stress away from the fascia.
- Before exercising, do your warm up exercises, consisting of plantar fascia and heel cord stretches for 5 to 10 minutes. After exercising, do your cool down exercises for 5 to 10 minutes.
- Wear well-fitting and comfortable athletic shoes with good heel support when exercising. Choose shoes with excellent shock absorbing qualities.

# Science Has Finally Revealed!

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"Get Instant Plantar Fasciitis Pain Relief In Just <u>5</u> Minutes!"



