A COMPARISON OF SHOD RUNNING, MINIMALISM, AND INJURY TYPES
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Introduction

Over the last decade, a fierce debate has emerged between doctors, athletes, and casual runners over which is the safest way to run. On one side, many supporters state that running puts incredible stress on the human body, and one’s feet in particular. As a result, they recommend that runners wear sturdy, supportive footwear to reduce the risk of getting injured. Proponents on the opposite side of the debate, however, say that the best way to prevent running injuries is to strengthen one’s legs by eliminating foot support altogether and focusing on good running form instead. Both sides give firsthand accounts of how their debilitating foot or lower leg injury was remedied by learning to run with or without foot support.

The term “shod running” means wearing typical running shoes with a cushioned midsole and varying levels of ankle and arch support. The word “minimalist” refers to runners who run with thin slipper-like shoes with no midsole, arch, or ankle support. Occasionally, they run with no shoes at all (Boddicker, 2010).

This report will provide a brief background on running and analyze the characteristics of both shod running and minimalism. It will discuss some of their advantages and drawbacks. It will give a detailed overview of each type and analyze the types of injuries in each category.

A Brief History of Running and Foot Support

The history of modern running footwear is provided to give a long-range perspective of running. Without understanding the past, one would have difficulty evaluating and making decisions in the present and future.

Our Ancestor’s Shoes. Over the last several thousand years of recorded history, humans have worn a vast variety of shoes. Most of them were very basic, such as straw sandals or leather moccasins. Even those who ran long distances wore only thin, flat-soled shoes, or ran with no shoes at all. Despite their lack of technologically advanced footwear, humans still proceeded to travel and populate the planet.

Modern Technology. In the nineteenth century, England experienced a resurgence in competitive running, fueling a demand for racing shoes. The first type of “modern” running shoes were racing flats with cleats, developed in the late 1800’s. Subsequent generations featured a flat rubber sole with a canvas upper, which came to be called “sneakers” or “plimsoles.” Shoes like these continued to be developed through the 1960’s with minor variations (Kippen, 2010). Then, in the 1970’s, Nike developed the first wedge-heeled running shoes, revolutionizing the running shoe industry. This began the era of fitness jogging, cushioned shoes, and ankle support. The age of modern running is supported by the idea that people can improve their natural abilities through using running shoes to alter their biomechanics and increase efficiency.
Minimalism

“Minimalist running” refers to running in either unsupportive footwear or with no shoes at all. A minimalist shoe has no raised heel, arch support, pronation (inward ankle roll) control, and has limited cushioning. Since barefoot runners often use minimalist shoes and vice versa, these two categories are treated as one due to their biomechanical similarities.

The “Less Is Better” Philosophy. Several studies have analyzed the way people run in different types of shoes or with bare feet. In one study, researchers had people run on treadmills with and without shoes. They found that, the less cushioning under the runner’s foot, the more softly they landed. This is because, when sensing a hard surface underfoot, they automatically used their legs and feet to cushion the landing. Conversely, when sensing a softer surface, the runners’ feet slapped down hard, searching for stability underneath. (Squadrone & Gallozzi, 2009)

Because of this phenomenon, minimalist runners have found that they can run just as comfortably and more quietly than shod runners. Also, their running form is different. Instead of landing heel first like most shod runners, they use their forefoot (ball of foot) to absorb just enough shock for them to land comfortably on their heel. In running vernacular, landing heel first is called “heel striking,” and landing toes first is called “forefoot striking.” (Lieberman, Venkadesan, Daoud, & Werbel, 2010)

For example, when a human lands barefoot from a jump, they instinctively land on their toes before settling on their heels. Without the cushioning of shoes, landing heel-first would be painful. Barefoot running uses this principle of forefoot shock absorption, as can be seen in Figure 1.

Figure 1. How to Run With a Forefoot Strike. From feetus.co.uk. Retrieved November 22, 2013, from http://www.feetus.co.uk/blog/2013/03/why-should-i-adopt-a-barefoot-running-style/
Benefits. While running has been strongly implicated to cause knee injuries, researchers have found that a minimalist running style can reduce this risk. The impact force of a forefoot striker is more less pronounced than that of a heel striker. Whereas the heel striker has an impact transient (a rapid increase in force), that “shockwave” is absent in the forefoot striker, as can be seen on the graph on the right side of figure 2 (Lieberman et al., 2010). Figure 2 illustrates the differences in force applied to the ground for three different modes of running. The three graphs show the amount of force on the ground with respect to time for two running steps. Heel striking while barefoot causes a severe impact transient (the first spike in force). The transient was blunted by wearing cushioned shoes, but not eliminated. Forefoot striking, however, makes the transient disappear entirely, implying a smoother loading of the joints and muscles in the legs (Warburton, 2001). Biomechanical researchers have proposed that this gentler landing may reduce the risk of contracting chronic knee injuries after years of running (Johnson, n. d.). However, no long-term studies have been performed yet to verify this theory.


Also, the dangers of accidental injury may be lower with minimalist runners due to the stronger tissue in their lower legs. Running with little protection forces runners to pay attention to how they land and balance on their feet, increasing proprioceptor response (sense of balance) and surefootedness (Warburton, 2001). This way, if they accidentally take a bad step, their quick reflexes and strong lower legs can greatly reduce the risk of sustaining injuries.

Drawbacks. The greatest drawback with minimalist running is the long transition period. The natural, shock-absorbing forefoot strike uses tissues that were previously underworked. Consequently, running this way can cause repetitive stress injuries at first. Most researchers and doctors recommend taking a slow, gradual approach to minimalist running. Some sources say it can take a few weeks to learn this new style; others say it can
take at least a year. While running in thin shoes is easy for a few meters, it can take months or even several years to build one’s endurance to handle steep hills, rough trails, and long distances. Transitioning requires patience and persistence. It takes time to learn proper running form and strengthen lower leg tissues, thereby reducing the risk of injury. (Lieberman et al., 2010)

Minimalist shoes also offer a precarious lack of protection from the environment. Running over sharp gravel, roots, and glass can be painful, and even more so when barefoot. A moment’s inattentiveness could result in a bruised or cut foot. Because of this, minimalist running requires constant focus and a quick eye for spotting hazards.

**Shod Running**

“Shod running” refers to wearing a specific type of shoe, and not just shoes in general. Shod runners use shoes with a cushioned midsole, a raised heel, and optional ankle support and motion control (Boddicker, 2010). These types of shoes will be, in this report, referred to as “athletic shoes” since they are the most widely adopted type of shoe for athletic activities and competitions.

**Types of Shoes.** The most common types of support available in athletic shoes are orthotic insoles (also referred to as “orthoses”) and pronation control. Orthotics are often viewed as an easy fix for many biomechanical issues such as flat arches and leaning ankles. Doctors typically prescribe functional orthotics to correct abnormal biomechanics or foot deformities and allow a person to run without pain (Rosenberg & Swierczewski, 2000). Orthotics insoles are also used by larger or weak-ankled runners who need additional pronation control (Blue, 2011). “Pronation” describes the inward rolling of the ankle that occurs when the runner’s foot hits the ground.

**Usage.** The majority of the running population today uses supportive, cushioned shoes. Their ease of use, wide availability, and relatively short training period have made them the preferred choice of most athletes and casual runners. Also, these shoes are a necessity to people who have foot or leg issues and would not be able to run without sturdy shoes (Maurer, 2012). Many average runners, when asked, say that they prefer these shoes because they feel more confident and secure when running in supportive footwear, even if they don’t need the extra margin of safety.

**Benefits.** Athletic shoes are very easy to use. They do not require the long period of acclimation that minimalist shoes need. This type of shoe is much more “form-forgiving,” meaning that poor running form such as slumped posture and over striding (landing with the foot in front of the hips rather than below or slightly behind) are less likely to cause painful injuries. In contrast, over striding with minimalist footwear has an extremely high chance of causing debilitating injuries (Maurer, 2012).

Additionally, athletic shoes require less lower-leg strength to run in because it is easy and relatively comfortable to heel strike. Heel striking does not use the calf and ankle muscles as vigorously as forefoot striking does. That is why these shoes have a very short acclimation period.
Issues. The strongest benefit of cushioned athletic shoes can also be their greatest detriment. Since deviations from proper running form do not cause as serious of injuries with shod runners as they do with minimalists, there is little incentive to improve running form. Rather, when shod runners experience pain, their typical reaction is to buy a new pair of shoes, and not evaluate potential mistakes in their running form. However, due to their limited ability to improve running form, “running shoes should be considered protective devices [from dangerous and painful objects], rather than corrective devices” (Warburton, 2001, para. 9).

Also, heel striking, the most common landing in shod running, has been implicated to cause knee injuries due to the increased shock from landing on the cushioned heel. As mentioned earlier, the human body naturally lands harder on softer surfaces (Squadrone & Gallozzi, 2009). Some researchers have also concluded that the cushy midsole dampens the tactile feedback the brain needs to run correctly (Quinn, 2011). Ironically, the increased impact caused by soft midsoles that were intended to reduce shock may damage one’s knees over time.

Injuries

The last section of this report discusses types of injuries and their relative prevalence in shod and minimalist running styles. Shod runners tend to injure joints, whereas minimalists tend to develop stress fractures, tendonitis, and ligament injuries in their lower legs.

Types. There are two main types of injuries: soft tissue injuries and bone/joint injuries. They vary in painfulness, causes, and required recovery time. Soft tissue injuries, such as a sprained ankle, tendonitis, and plantar fasciitis can be very painful in an advanced state but have a comparatively short recovery time. Minor injuries do not usually require a complete stop in training. Conversely, bone/joint injuries can be more debilitating and require a longer time to heal. Most stress fractures can take eight to sixteen weeks to heal and require a break from running, and may also need crutches (Aschwanden, 2011). Chronic joint pain, especially in the knees, has affected almost all runners at some point in their running career.

Shod vs. Minimalist Running Styles. Due to its recent emergence, statistics on minimalist running are limited. The author was unable to find which minimalist injuries were statistically the most prevalent. Overall, no long-term studies have been conducted to study the differences in injury rates between these two running styles (Johnson, n. d.). The types of injuries sustained, however, have documented differences.

Since minimalist running form uses the feet, lower leg muscles, and tendons to absorb the shock of running, these areas are vulnerable to injury. Transitioning into minimalist form too quickly can cause stress fractures, extremely sore muscles, and tendonitis, particularly with the Achilles tendon. The most common injuries for beginners are foot stress fractures, Achilles tendonitis, and ligament injuries (Parekh, 2013).

Shod runners, on the other hand, tend to injure their joints. Forty-two percent of total injuries occur in the knee, with another 11% affecting the hip/pelvis. Another other 30% affect the foot, ankle, and lower leg (Crossman, 2011).
Summary

Despite our ancestors’ high level of activity without cushioned shoes, many people today would not be physically active without sturdy foot support. Also, there are some who have crippling biomechanical defects in their feet or legs that would not allow them to run without prescribed shoes. However, runners on the opposite end of the spectrum say that many average runners do their feet a disservice by shielding them from the ground. Minimalist running, they say, is a foolproof way to learn proper running form from the ground up.

Overall, when evaluating running styles, a runner should not ask if he/she would become injured. Rather, they should consider what injuries they are willing to work through in their running career. Statistically, injury rates for both running styles remain high. However, the types of injuries sustained are different. Shod runners have a high incidence of leg joint injuries. Conversely, minimalist runners tend to experience foot injuries and tendonitis in their lower legs. Unfortunately, there is no single solution that will guarantee injury-free running for everyone. Multiple doctors and researchers agree that the best way to reduce the risk of injury is to develop good running form by any method, know one's capabilities and not push them too far, and remain vigilant for any early sign of injury or excessive stress while running.
References


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