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Research Paper

Maximalist vs. Minimalist Running Shoes

The mode injury rate in runners is around 50% per year. In other words, half of the running population gets injured in some way every year (Van Mechelen). As a competitive runner who logs 25-30 miles a week, the most important thing to me is keeping my body healthy and injury free. That means choosing the right pair of shoes is critical. When I started running, I truly believed in minimalist shoes, until I ran into a major hip alignment injury. After my injury, I switched to a more plush neutral shoe. I fell in love with the maximalist shoe going through 4 pairs of them, until I developed a stress fracture in my foot. Ever since I started alternating between maximal and minimal shoes, I haven't had any major injuries.

Runners tend to have a lot of variety when it comes to training, with various distances, speeds, surfaces, and types of workouts. Because of the variations in training, runners should wear shoes that maximize each workout. You should not wear the same type of shoe for every run or workout. By rotating between different types of running shoes you will not only maximize your training, but you will also help prevent injury.

In the study *The Influence of Minimalist and Maximalist Footwear on the Kinetics and Kinematics of Running,* the kinematics of running in various shoe types were compared. Maximalist, minimalist and conventional shoes were wore by twelve male runners, who ran over an embedded force plate. The kinematics of each male runners were collected with an eight-camera motion capture system, accelerometer and one way repeated measures "ANOVA". The instantaneous loading rate and peak tibial acceleration were significantly larger in the minimalist (305.58 BW/s and 9.54 g) compared to the maximalist (141.67 BW/s and 7.99 g) and conventional (127.30 BW/s and 6.73 g) shoes. In addition, peak tibial internal rotation was

significantly larger in the minimalist (9.64°) compared to conventional (6.88°) footwear. These results indicate that runners may be placed at an increased risk of injury if they continuously run in minimalist shoes (Sinclair, Jonathan, et al.).

The Effects of Minimalist and Maximalist Footwear on Achilles Tendon Load in Recreational Runners was published by the same author. In this study, twelve runners ran in three different types of shoes. They ran in the New Balance 1260v2 which is a conventional shoe, the Hoka One One which is a maximalist shoe, and the Vibram Fivefingers which is a minimalists shoe. They collected each runner's kinematics and kinetics to determine loads in the Achilles tendon (ATF) in each different shoe. Their results showed the peak ATF was significantly larger in minimalist footwear (5.97±1.38 body weight (BW)) compared to maximalist (5.07±1.42 BW). In addition, the ATF per mile was significantly larger in the minimalist shoes (492.31±157.72 BW) compared to both maximalist (377.31±148.06 BW) and conventional (402.71±125.51 BW) shoes. Again, given the results, this study shows that continual running in shoes with minimal support may increase runners risk for an injury, specifically an Achilles tendon injury (Sinclair, Jonathan, et al.).

Runners reported higher rates of injury and pain with minimal (less structured) shoes in the study *Switch to Minimalist Running Shoes Tied to Injuries, Pain*. After three months of switching from a traditional shoe to a variety of minimalist shoes, runners participating in the study had 2-3 times as many injuries compared to the runners who stuck with traditional shoes. The article quoted Dr. Michael Ryan of Griffith University and the British Journal of Sports Medicine. He believed that runners who switched to full-minimalist shoes without previous experience may have been forced to change their running form, and that might account for the

highest injury rate being seen in the group wearing minimalist shoes. "Runners need to be aware of the risks when running in minimalist shoes, but I still think this footwear category has a big role to play in improving the quality of running form and potentially reducing injury risk in the long term, with proper guidance from an experienced running coach or medical professional, " he said (Doyle).

The article *Ground Reaction Force Differences between Running Shoes, Racing Flats, and Distance Spikes in Runners* measured the differences in ground reaction forces between regular running shoes, racing flats, and distance spikes .The results concluded that the ground reaction forces are significantly increased when running in competitive footwear (such as racing flats or spikes) as compared to regular running shoes. From this conclusion "the data may be used to better inform competitive runners, coaches, and trainers of possible increased risk of injury when determining the frequency and duration of the use of competitive footwear in training." (Logan, Suzanna, et al.)

The studies above indicate how minimalist shoes can increase injury if they are not used correctly. When you purley run in just a minimal shoe you will be more susceptible to an injury. But, when you do run in a minimalist shoe correctly it can improve your running form and strengthen your muscles. Minimalist shoes are best for speed workouts and races, you shouldn't be running in a minimal shoe during long, high mileage runs.

On the other hand, some studies show that running purely in maximalist shoes cause an increased risk of injury. According to the *New York Times*, the past few years athletes have embraced barefoot running and minimal shoes, but now the minimal trend has completely flipped. Recently there has been a rise in "maximalist" shoes- with their chunky look, and their

plush cushion, they have now become “the sport's new wonder product” (Crouse, Lindsey.“Forget Barefoot; New Trendsetter in Running Shoes is Cushioning”).

The study *Increased Vertical Impact Forces and Altered Running Mechanics with Softer Midsole Shoes* tested midsole hardness in running shoes and its effect on runners. At the beginning of this study all 93 runners who ran a minimum of 30 minutes per week, were healthy and injury free. The results were that as midsole hardness decreased the vertical impact peak increased. The soft shoe having the largest vertical impact peak (mean (SE): 1.70BW (0.03)) followed by the medium midsole shoe (mean (SE): 1.64BW (0.03)) and finally the hard midsole shoe (mean (SE): 1.54BW (0.03)). “This study provides experimental evidence that shoe midsole hardness can in fact affect vertical force impact peaks during running. Even more importantly, the results from this study showed that softer midsole shoes can actually increase external vertical force impact peaks. This contradicts the popular belief that softer midsole shoes should reduce impact peaks during running.” (Baltich, Jennifer, et al)

Leo Manzano is an Olympic medalist in the 1,500 meters. He runs in the most popular maximalist shoe brand, Hoka One One, which has double the cushioning of standard running shoes. He was struggling with plantar fasciitis, an inflammation in his foot, Manzano said the condition disappeared just a week after he tried the shoes last March. “In July, he became the fifth fastest American in the 1,500m.” (Crouse, Lindsey.“Forget Barefoot; New Trendsetter in Running Shoes is Cushioning”) Despite his devotion to Hokas, Manzano said to keep his feet strong he ran shorter distances barefoot or in light minimal flats. Manzano felt that the higher cushioning of his Hokas suited his higher mileage. Jay Dicharry, a biomechanist in Bend, Oregon suggested that extreme shoes like the Hokas might be best used in moderation. “They

could be good for easy runs," he said. "But when you're doing a speed workout, you want to go back to firmer footwear that helps your body explode off the ground." (Crouse, Lindsey)

Like Leo Manzano many runners swear by paralleling their shoes for specific workouts. In the study *Can Parallel Use of Different Running Shoes Decrease Running-Related Injury Risk?* determined if rotating between different running shoes naturally would decrease the risk of a running related injury (RRI). RRI was defined as a "physical pain or complaint, located at the lower limbs or lower back region, sustained during or as a result of running practice and impeding planned running activity for at least 1 day." (Malisoux, Laurent) Two hundred and sixty-four runners participated in an twenty-two week study. One-third of the participants (n = 87) experienced at least one RRI during the observation period. The adjusted Cox regression analysis revealed that the parallel use of more than one pair of running shoes was a protective factor [hazard ratio (HR) = 0.614; 95% confidence interval (CI) = 0.389-0.969]. This study indicates that running in multiple types of shoes can help prevent injury (Malisoux, Laurent).

With many studies indicating that purely running in a maximalists shoes are tied to an increased risk of injury and purely running in minimalists shoes are also tied to an increased risk of injury, we can conclude that you shouldn't run in just one type of shoe. Each shoe has it's advantages and disadvantages. Minimalist shoes maximize speed workouts and races, while maximalist shoes are good for recovery and are best for long distance runs. Runners should parallel their different types of shoes with their workouts to prevent injury and maximize their training.

Works Cited

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