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Tested: The Sole of a Winner

The Breakdown takes to the road

By [Adam Weiner](#) Posted 04.09.2009 at 8:30 am



A few weeks back we analyzed some of the features of the innovative Newton Running shoe in terms of the relevant physics principles. While at the time the point was to assess the theory behind the shoes, it was suggested that I put them to the test in my "lab." In other words, out on the roads and trails where, being of the distance-runner species, I generally spend at least an hour per day. While this is in no way any kind of systematic scientific experiment (which is beyond the scope of my resources), based on my personal experience with the shoes, I'll make an informal attempt to further address the claims made by the two Newtons (Running and Isaac!).

Let's address the two major issues from our previous article.

1) As we discussed last time, a mid- to fore-foot strike is a more efficient way of running than heel striking. Does running in the Newton shoes force you into a mid- to fore-foot strike?

That's easy. They sure do. It's those "actuator lugs" on the sole of the shoe, which make it very awkward to strike with the heel. You have to land mid-foot on the lugs or it feels like your foot is unnaturally tilting backwards. Running in the shoes does feel a bit odd at first, even for a mid-foot striker like myself, so if you try them, be aware they do take some getting used to. Because the lugs come down several millimeters below the rest of the sole, it feels like there's a small but perceptible mound under the ball of your foot, upon which you are balanced while running. As with barefoot running, you feel most comfortable in the Newtons when you run "light on your feet," landing mid- to fore-foot. However the feel is really rather different from barefoot running, due to that ridge of lugs underneath the ball of your foot.

2) As per the claim, do the actuator lugs really have superior elastic properties that conserve and return energy more effectively than "regular" running shoes?

This is a very interesting question, it turns out. According to the analysis from the previous article, physically it appears quite unlikely that the actuator lugs can store an amount of elastic energy significant enough to improve running economy. While the elasticity of the lugs may well be greater than in the sole of a traditional shoe, the amount of potential energy stored in the shoe itself will be negligibly small when compared to the total energy of the runner's stride. Does this mean that the claim of greater energy efficiency is bogus? Not necessarily! One thing that stands out for me while running in these shoes on a smooth hard surface (asphalt) is that during the time between foot strike and push-off -- that is, when my foot is in contact with the ground -- the lugs grip really well. There is no slipping.

If so, then it's possible that these shoes actually might improve running economy. My (highly subjective) experience during my test runs was one of less effort than usual at a given pace. This, of course, could be a purely psychological artifact -- maybe I was just excited to try out a new pair of fancy shoes. To really determine if this is true would require a controlled experiment with multiple runners over a long period of time. (Well worth the effort, I think, by the way!)

However, if there is an improvement in running economy compared to standard shoes, I hypothesize that it's not the elastic properties of the lugs that makes the difference. Rather, it's the friction between the lugs and the road that does the trick. Interestingly, while browsing the Newton website, I was interested to find that one of the features they advertise is low friction. I think that they're getting that one sort of backwards. A large amount of static friction between a running shoe and the running surface is a good thing. We're not talking about getting stuck to the pavement like a fly on some half-dried puddle of grape juice. We're talking about a no-slip foot strike.

With my current non-Newton shoes, I can often feel a small but perceptible slide during contact with the ground. The muscles have to work harder to make small adjustments every time this happens, which results in a decrease in stride efficiency. So with the Newtons,


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although the energy stored in the lugs themselves may not be a major factor in improving economy, the energy saved in the body due to less slipping -- the result of a large amount of static friction between the shoes and the road -- may well be.


Newton Running represents a relatively new innovation in the design of running shoes: an attempt to create shoes that facilitate a more natural and energy-efficient stride, an attempt to return us to our barefoot running roots without having to cut up our feet. Despite all of the cushioning and stability features of most "traditional" contemporary running shoes, the incidence of running injury is actually greater now than in the days of those primitive Pumas and Adidas. Is this because cushioned shoes with thick heel counters have taken us away from a more natural running stride? How well Newton Running shoes are able to resolve this and take us back to that ideal stride is not yet certain, but it's a worthwhile endeavor and a thought-provoking new option in the world of running shoes.

Finally, what of barefoot running itself, the true au-naturel version of the sport? Its devotees swear by it. Look for an investigation into this controversial topic a few weeks down the road!

Adam Weiner is the author of [Don't Try This at Home! The Physics of Hollywood Movies](#).

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[BeZen](#)

04/09/09 at 9:39 am

I recently purchase the Vibram Fivefinger shoes to simulate barefoot running and have been impressed with how they have corrected my stride and eliminate knee pain on long runs. Can the author or anyone else compare the Newtons to Fivefingers? My running friends are put off by the appearance of the Fivefingers (with the individual toes) but I may be able to get them to look at these because of their more conventional appearance. I also now notice that my original running shoes (Brooks) have a footbed that slants forward, putting the heel of the foot above the ball. Do these shoes have that same issue?

[link to this comment](#)

[bcheck555](#)

04/09/09 at 1:03 pm

Well if you do partake in an extended investigation, please throw the Vibram Fivefingers in the mix as well.

[link to this comment](#)

[sirisaac](#)

04/10/09 at 11:17 am

Nice follow up post. Interesting, comprehensive review.

[link to this comment](#)

[jaredsweet](#)

04/10/09 at 12:58 pm

I run in both Fivefingers and Newtons and I have to say that Newtons are more of a running shoe and Fivefingers are more of a novelty. Unlike, Fivefingers, Newtons are built for just running and running well. They both get you into an ergonomically better position however the Newton shoe allows you to adjust that position from extreme forefoot to midfoot in order to find your comfort zone. Fivefingers put you into one position and it is a very extreme forefoot. Kudos to the crew at Newton for sending a pair of shoes to this reviewer. Additional Kudos for coming out with new colors and a protective heel guard for those off times when the heel bounces off the ground on the longer runs. My wife is a good triathlete who could no longer run from knee pain. She tried Brooks, Pearl, Vibram, even Nike and was about to give up when she found Newton. The staff at Newton help pick out the shoes that could curtail her pain and discussed the right position for her. She is now able to run and enjoy her workouts without limiting knee issues. Try to find that at any other shoe manufacturer! The shoes may not have significant elastic properties as this reviewer points out (and I cannot test) however the benefit of being able to use your foot for the shock absorbing purpose that it was made combined with the faster turnover and proper body alignment that Newton puts you in can be the biggest benefit to a serious or amateur runner. On the professional side of the spectrum Josh Cox just set the American record for a 50k and he wore

Newtons for that run. They are fast! They are stable! and they are the most comfortable uppers that I have ever worn! Great review on a much needed subject. Keep up the great articles!

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