

Taking off: Spring-based technology could see Usain Bolt hit 50mph

Wearable device has the potential to boost human running speeds by 50 per cent

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A wearable spring-based contraption that attaches to the legs has the potential to boost human running speeds by 50 per cent, according to researchers who hope to build the first prototype over the next year.

Scientists came up with the concept after computer models showed that it was possible to dramatically increase the amount of energy people put into each running step by enabling them to do work when their feet are in the air.



The device, which leads to what the researchers concede is an “unconventional means of running”, could set the stage for a new Olympic sport, they believe, and be adopted by police forces and emergency rescue teams. According to the scientists’ calculations, if Usain Bolt mastered the contraption, his top speed would rocket from 27.8mph to nearly 50mph.

“We wanted to see what physics allows and then explore it further by developing a device,” said David Braun, an engineer who works on human augmentation at Vanderbilt University in Nashville, Tennessee.

“This shows us how far we can push the boundaries and what key features we should focus on to develop the new technology.”

Braun hit on the idea after studying the mechanics of running and cycling. While the fastest human running speed on the flat is close to 28mph, the equivalent top cycling speed is nearer 50mph. Much of the difference is due to bicycles being in contact with the ground the whole time and the pedalling mechanism which allows the rider to power along constantly.

“When you look at world-record running, the foot is on the ground only 20 per cent of the time, so for 80 per cent of the time it is in the air and not providing any energy for motion,” Braun said.

What is needed, he reports in *Science Advances*, is a way for runners to do work when their feet are off the ground.

Braun and his colleagues used computer models to test a number of theoretical devices that took into account air resistance, the power limit of the human leg and the energy that is lost when the foot impacts the ground. They concluded that a spring-powered device that attached to the legs could give runners the boost they sought.

The principle behind the device is to store energy by compressing a spring when the runner lifts and bends their trailing leg before they swing it forwards. When the leg moves forward, the spring is locked and remains compressed until the foot hits the ground. Only then is the energy released to power the runner forwards.

“This allows runners to do work during the aerial phase of the running motion,” Braun said. “It’s the key to borrowing the benefits of cycling and using them in running.”

A second requirement is for the springs to be “programmable” so that the stiffness can be increased as the runner picks up speed. This can be done with a mechanism that steadily shortens how much of the spring can be compressed, since shorter springs are stiffer than longer ones.

The effect, Braun said, is comparable to the gears on a bike that are switched up as the cyclist rides faster.

Just as ice-skating and cycling take time to grasp, so might the final contraption take some mastering, the researchers admit.

And while Braun hopes to have a demonstration model finished in a year, it may take several more years of development to reach its full potential.

“At the early stage, it will look like an exoskeleton, but in the later stages we hope it will look like a shoe,” he said. “It’s one thing to build a prototype but quite another to miniaturise it.” - Guardian

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