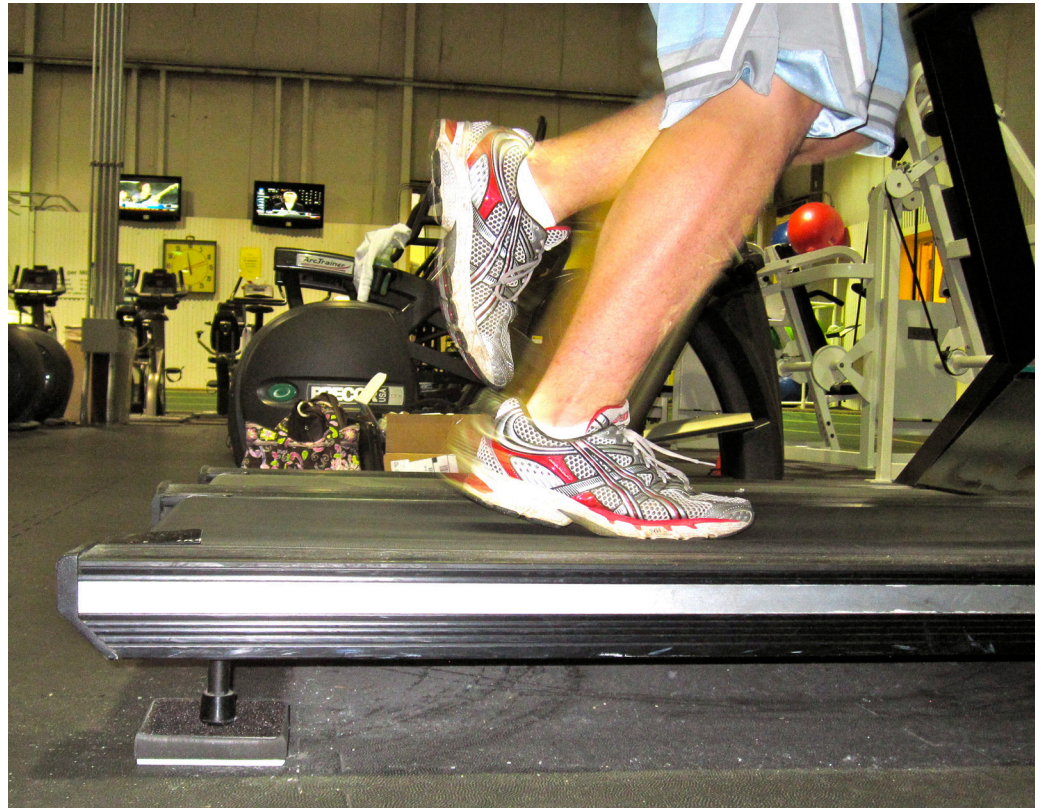


TESTING TREADMILL IMPACT

Overview

Challenge
Accurately measure the impact that running on a treadmill has on joints.

- Solution**
- YEI 3-Space™ Wireless
 - YEI 3-Space™ Wireless Dongle



When a runner and entrepreneur had an idea for a new product, he needed a low-cost way to gather quantitative data on its effectiveness.

Background

As the popularity of running has increased, so has the number of joint injuries due to impact. Each year, more than 5.5 million people seek treatment for knee problems making it the most commonly injured joint¹.

While moving from the sidewalk to the treadmill has its benefits, this doesn't necessarily lessen impact on joints. Older equipment, fewer surface variations, and a change in stride form can all lead to joint stress.

This led a recreational runner and entrepreneur to develop a device prototype with the aim of reducing joint impact while walking or running on a treadmill. The device consists of special impact-absorbing blocks placed under the rear feet of the treadmill between the treadmill and the floor that would cushion the runner's foot strike and relieve some of the impact felt by the joints.

Challenge

Anecdotal reports by Beta-users were favorable, with users reporting they felt better using treadmills with the device than without it. It was now necessary to collect quantitative data on the effect of the device on the joints.

Information about joint impact needed to be measured, collected, and analyzed in a way that did not distract from the natural movement of the runner. Wires, cords, and large apparatus could have caused discomfort and unnatural movements leading to inaccurate data.

¹ National Institutes of Health, US Department of Health and Human Services. National Institute of Arthritis and Musculoskeletal and Skin Diseases. Handout on Health: Sports Injuries. Apr. 2009. Web. 22 Nov. 2011. <http://www.niams.nih.gov/Health_Info/sports_injuries/>.

Solution

Because the YEI 3-Space™ is enabled by micro-electro-mechanical system (MEMS) technologies it can be smaller, use less power, and cost less than traditional measurement systems all while allowing it to be used in natural situations - in this case, directly on a treadmill.

In partnership with the Southern Ohio Medical Center's Life Center in Portsmouth, Ohio, volunteers each wore a YEI 3-Space™ Wireless Sensor that transmitted data to a computer by way of the YEI 3-Space™ Dongle. Participants reported no discomfort, distraction, or interference with their normal stride as a result of wearing the sensor.

Volunteers used two different treadmills, one of which was identified by Life Center staff as being the least comfortable as reported by users. For each treadmill, volunteers completed a short session measuring the impact:

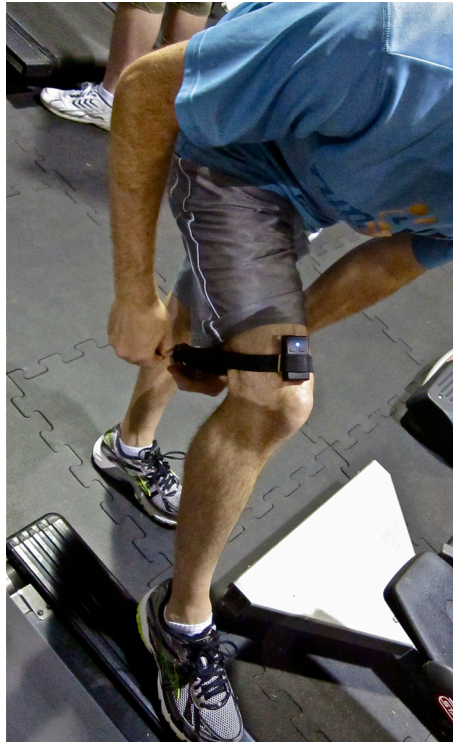
- On both the ankle and the knee joints.
- While walking and while running.
- With no shock absorption device and with 2 different versions of the device.

The collected data was then analyzed for trends in the initial strike impact and the average impact across the stride.

In each set of data, the YEI 3-Space™ Wireless Sensor easily distinguished between walking and running gaits, and showed the transition between them as well.



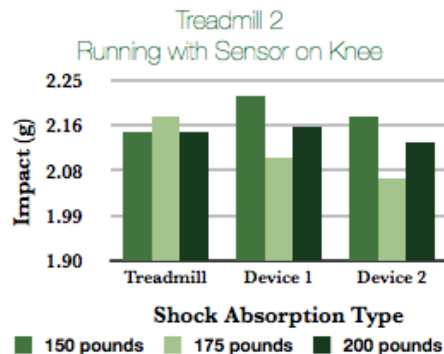
Real-time results provide instant feedback while the ability to save data enables for later analysis to identify trends.



As expected, the impact on the knee was less than the impact on the ankle, as the lower leg absorbs some of the impact before it was transmitted higher up the leg to the knee.

The data was also precise enough to allow the pattern of each particular participant to be easily identified. The most experienced runner had an impact gait that was the most consistent, while the non-runner showed heavy impacts as he "fell" forward onto each step heavily.

With this information, the device creator was able to accurately quantify the effectiveness of the device for further development and marketing in a cost effective manner.



Key Benefits

- Small footprint makes the YEI 3-Space™ well-suited for situations where natural movement or extended periods of measurement outside of a lab are desired.
- Low cost allows for single experiment/patient use.
- No wires or cords to restrict movement resulting in greater comfort and more accurate results.
- Easily integrated into other devices or systems
- Real-time results can also be saved for later analysis to identify trends

For more information about how the YEI 3-Space can solve your challenge, please contact us at YEI Technology
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