

Digital assistant teaches runners healthier running style

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Professor Antonio Krüger and Felix Kosmalla developed a wearable assistant that trains the runner to move properly. Credit: Oliver Dietze

Studies show that heel runners have an overall injury rate that is approximately twice as high compared to forefoot runners, according to

Antonio Krüger, professor of computer science at Saarland University in Saarbrücken. There, Krüger is the leader of the Innovative Retail Laboratory at DFKI, and with Professor Julia Knopf, manages the newly founded Research Center for Digital Education. Hence, he was also interested in the question of whether runners could learn a new movement through information technology alone. "An effective analysis of running technique can only be provided by professionals or expert coaches using slow-motion videos. Amateur athletes have no access to this. However, as more and more people run long distances, exposing themselves to the risk of knee injuries and stress fractures, answering this question is more necessary than ever before," says Krüger.

Supported by his team, Antonio Krüger developed the running assistant Footstriker. The prototype is worn by the runner on the body and ensures the correct movement with the help of electro-stimulation (EMS). The painless surges come from electrodes that the runner sticks to the calf. The runner also carries the necessary EMS generator and the control unit, an Arduino microcontroller, on the body. In the shoes are insoles equipped with pressure sensors. The sensors allow researchers to see not only whether the runner is striking with the heel, middle or forefoot, but also whether the foot is straight on the ground or in the air. If the foot is in the air and the heel has previously been recognized, the control unit triggers a faint, painless current impulse and the calf muscle folds the foot forward. The [runner](#) now strikes with the middle or forefoot, protecting his health and running more efficiently.

The computer scientists have tested their running assistant on 18 people between the ages of 24 and 36 years. They were able to prove that using Footstriker during a run over three kilometers leads to significantly fewer heel-first strikes compared to the classic voice commands of a personal trainer. "After the run with Footstriker, we interviewed the runners. The result: They could describe the new, correct movement in their own words, although we had not provided any information about it.

Obviously, they had learned it only with the help of the running assistant," reports Krüger. He was supported during development by Mahmoud Hassan, Florian Daiber, Frederik Wiehr and Felix Kosmalla.

At the computer fair Cebit, the researchers invite every visitor to try out the Footstriker on the treadmill (Stand G75, Hall 27).

Provided by Saarland University

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