

## **Wearable Technologies Playing an Increasing Role in Athlete Performance Assessment**

Interest among members of the coaching community in what is now called “wearable technology” has increased in recent years as the price of these various devices drops and information and how coaches and athletes might benefit from them becomes more available.

Back in the nineties, researchers acknowledged that there was a need for valid and reliable instrumentation for assessing physical fitness and sports performance. Reed Hoyt and Peter Weyand, working out of Harvard’s Concord Field Station Locomotion Lab, were two of the first to explore the possibilities of using technology to assess and analyze human locomotion. They presented their views in an article entitled “Advances in Ambulatory Monitoring Using Foot Contact Time to Estimate the Metabolic Cost of Locomotion.”

Hoyt’s vision involved using FCMs—or foot contact monitors—to estimate the metabolic cost of locomotion. These monitors could be a major step forward in terms of being able to assess various forms of physical activity. The FCM Hoyt had in mind at the time was a simple electronic device that could measure the time the foot was in contact with the ground—as well as the time in the air—during each stride a runner might take.

According to Hoyt, these kinds of monitoring devices could be used by individuals in their normal sports settings without the need for complex and invasive equipment. In other words, assessments would be based on normal walking and running activities and not tied to lab-based treadmill testing.

A major “selling point” for pursuing this kind of technology was its ability to define the metabolic cost of numerous load bearing tasks for those in the military. The armed forces were clearly interested in any wearable monitoring device that could clarify possible causes for training related injuries.

Finding a way to determine what troops are experiencing when the intensity, duration, and frequency of their training increases could be used to determine how these activities could be adjusted to reduce injury and help soldiers meet their physical fitness requirements.

I was first introduced to FCM research back in 2001 when I visited Dr. Weyand at his Harvard Lab. I was intrigued because I saw the possibility of this technology benefitting not just troops in the field but the kinds of high school athletes coached. The data from these FCMs could provide insights on the kinds of training adjustments that might help to reduce injuries.

The problem: These early FCM’s could not account for uphill or downhill running. Also, they couldn’t track movement vertically and laterally as well as horizontally. That would require advancement in what is now known as 3D accelerometer technology. That advancement is now upon us.

Over twenty years ago, Reed Hoyt and Peter Weyand envisioned FCM monitor technology as rapidly improving. This was tied to progress in fields of electronic sensors, micro processing, data storage, and telemetry. Scientists at the time referred to these FCMs as “personal status monitors,” and saw their value in helping to answer practical scientific questions. I saw them as helping me be a better coach.

Many predicted that such devices would eventually drop in price--something in the range of fifty to one hundred dollars, clearly making them attractive to consumers as well as research labs. Though the price of these monitors is still double these initial projections, it is still close to the price of what most of my athletes pay for one pair of top end running shoes.

Hoyt predicted that the data from these contact monitors could be plugged into a computer for downloading. He also considered the possibility of some kind of display on the shoes, or watch like wrist monitor. What many researchers didn't predict was the rapid advancement in cell phone technology. Hoyt knew that things were changing quickly in terms of miniaturization of electronics, but I think he would be amazed by how current advancements have turned these monitoring devices into what amounts to mobile mechanics labs.

These advances have certainly benefitted my work with high school athletes in terms of injury assessment and performance analysis.