Between the Footwear and the Forces

Engineering and PE Join in Biomechanics Research Project on Joint Stress During Exercise

By Chris Floyd

Thanks to a collaborative effort between the VMI departments of mechanical engineering and physical education, people soon may be looking at the way they exercise differently.

Supported by a grant from the Jackson-Hope Foundation, Maj. Joyce Blandino approached the project from the mechanical engineering side, and Lt. Col. Mike Krackow, from the physical education side. They took a look this summer at how the forces exerted during certain exercises can affect the body. With the help of Cody Ellis '17, the group will analyze the data over the next year and plan to expand their research in the future.

"This is the beginning of a whole biomechanic study," said Blandino. "The final outcome is trying to develop a better training regimen for a certain exercise or even for rehabilitation. We're excited."

The team used the grant money to purchase a force plate and an electromyography machine, which records the electrical activity produced by muscles, to study 11 subjects. The volunteers completed several repetitions of back squats while wearing combat boots and running shoes, as well as a round with no footwear at all. Analysis of the more than 100 videos the team has to study could determine which type of footwear is optimal for this kind of exercise.

"Now we have a bunch of things to compare and see the relationships," explained Ellis, who participated as part of his Summer Undergraduate Research Institute project. "We're trying to ... find correlations between the footwear and the forces."

"Your muscles and joints deteriorate because of all of that friction and the forces put on them," added Blandino. "How much force your shoes absorb can help reduce the forces you experience in your joints and will reduce the risk of injury."

But the study was not all about the shoes people wear when they exercise. Krackow explained that there was much more to it than that.

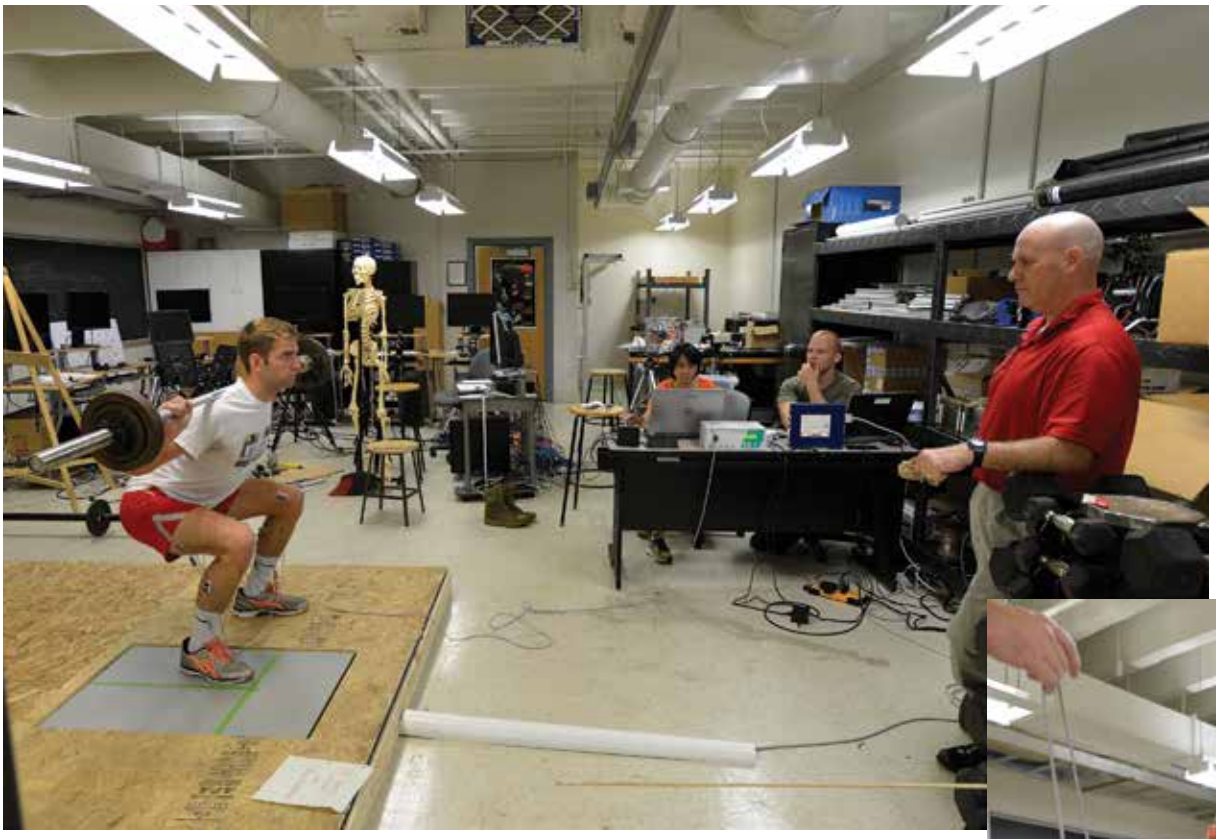
"Once we know what a normal [joint] looks like, we can compare it to what a pathological one looks like," he said. "We can predict which muscles will be most active and which will be least active. We can change things to emphasize muscles that are weaker."

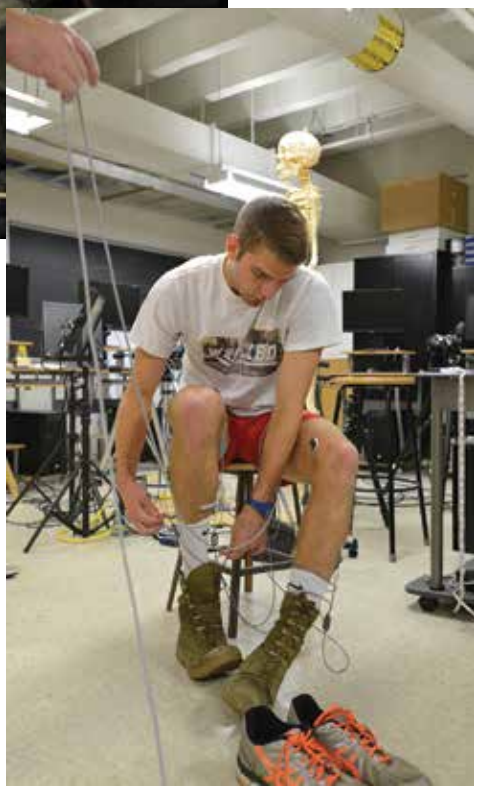
The researchers anticipate using the equipment they purchased in both engineering and physical education classes, and once they crunch the numbers from this summer's research, they foresee their studies continuing in several directions.

Blandino said this summer's study is focused on helping active people to develop better exercise routines. As the research continues, however, she hopes that their findings will eventually take them into the realm of developing better prosthetics.

"This is a really, really long project," she said. "We're just in the beginning stages of it."

To see more photos, visit *VMINews.tumblr.com*, post date June 30.





Maj. Joyce Blandino, Cody Ellis (seated), and Lt. Col. Mike Krackow observe as test subject Zachary Heard '16 performs squats. At right, Heard dons sensors in preparation for the test.– *VMI Photos by H. Lockwood McLaughlin.*