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Jorie Ballun

Kyle Zobeck

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An Improved Method for Quantifying the Stiffness of Running Shoes

Jorie Ballun, Kyle Zobeck

Departmental Affiliation: Mechanical Engineering
College of Engineering

The purpose of running shoes is to protect feet from injury by stabilizing motion and cushioning impact. As material technology and product testing develop, shoes can offer more protection through advanced designs. A typical test for running shoes is a flexion test in which the shoe is bent through a fixed angle and the applied force is measured. Most tests bend the forefoot of a shoe, but this characterizes stiffness over a limited portion of the shoe. The goal of this research is to develop an improved flexion test by evaluating and quantifying the stiffness of running shoes in both the forefoot and mid-foot sections. To facilitate the measurement of shoe flexion at various locations, an apparatus was designed so that the distance between the fixed end of the shoe and the applied load is adjustable, adapting to a range of shoe sizes and bend lengths. Preliminary data agree with established tests and illustrate a difference in stiffness values at the two locations. As more testing is performed with more bend locations, a better shoe stiffness profile can be determined. The results generated with this testing method will be used to better evaluate shoe design and performance for injury prevention.

Information about the Authors:

The College of Engineering was approached by a local podiatrist, asking for a team to perform research for an idea he had about the correlation between shoe stiffness and lower leg injuries. Kyle Zobeck and Jorie Ballun were chosen to perform the material testing portion of the project since they expressed an interest in the subject. Both are student-athletes and appreciate the design and performance of quality shoes. Currently, they are developing their test method and working on pairing the information with research on impact forces exerted on feet during the gait cycle in order to determine if there is a correct amount of shoe stiffness that will reduce common runners' injuries such as plantar fasciitis. Ideally, their work will create opportunities for improvement in the shoe design and podiatry fields.

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Student Contact: jorie.ballun@valpo.edu