

Working Model[®] Simulates Biomechanics at Berkeley

When humans and other animals hop or run, they literally bounce along the ground using muscles, tendons, and ligaments to store and return elastic energy. Past research has shown that the mechanics of these bouncing gaits can be accurately modeled by a simple spring-mass system. The model consists of a point mass representing the body mass of the subject and a linear compression leg spring. This spring mass model has been shown to accurately predict the mechanics of all running, hopping, and trotting mammals studied to date.

At the Biomechanics Laboratory at the University of California at Berkeley, Professor Claire Farley and Professor Rodger Kram are studying the mechanics of bouncing gaits through both human data collection and computer simulation. Working Model is used to create virtual experiments on the spring mass model. This allows Farley and Kram to test hypotheses even before bringing subjects into the laboratory. Current research is focusing on alterations in the stiffness of the leg spring. Although the leg spring maintains a constant stiffness at different speeds of forward running, experimental evidence shows that humans can change the stiffness of their leg spring. Through Working Model simulations, they can alter gait frequencies and surface characteristics that study the properties of the leg spring.

In addition to research applications, Professor Farley currently uses a Working Model 20 unit lab-pack in her undergraduate Musculoskeletal Biomechanics course. Through the use of a computer screen projection device, the simulations illustrate key concepts during class lectures. The students then have hands on experience using the simulations to conduct virtual laboratory experiments, allowing students to conduct their own investigations and become familiar with the scientific method.

Working Model's user friendliness and versatility even allows it to be used in a variety of disciplines outside of engineering at Berkeley. Undergraduate classes currently being taught with the software include biology, pre-physical therapy, and veterinary science.