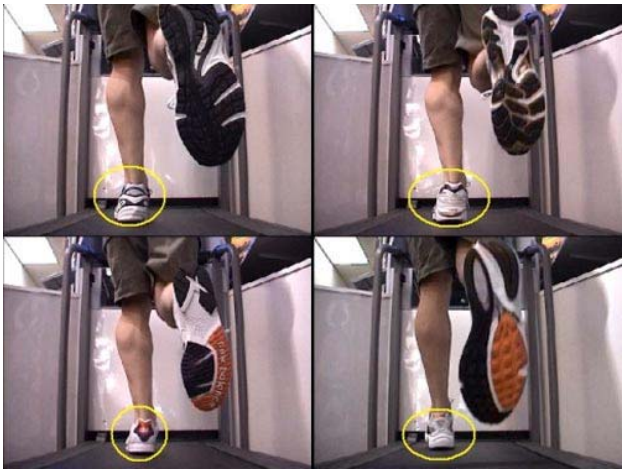
What do you do with a 2D Gait Analysis or 2D Sport-Specific Analysis?

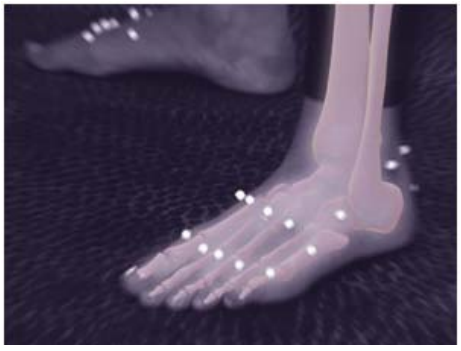
We use novel video-analysis technology to film and analyze your walking or running stride, your cycling pedal stroke under various load, or any sporting skill such as a golf swing, tennis serve, baseball pitch, throw etc… [see www.siliconcoach.com if you are interested to see the software]. A frame-by-frame analysis is conducted to provide you with strengths and weaknesses of your technique. Biomechanics experts typically use this software to understand mechanisms of injury and optimize performance.



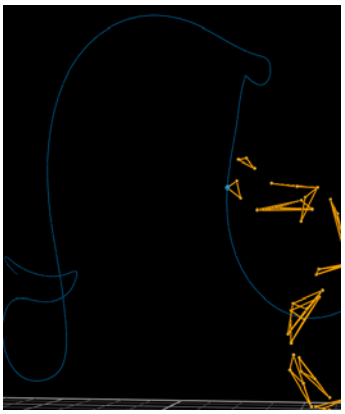
For example, a patient suffering from recurring hamstring strain injuries might be filmed from multiple views (front-on and side-on) and the software is used to synchronize the video and measure variables of interest, such as hip flexion and knee extension angles. These data provide information that can be useful to understand mechanisms of injury or provide ways to improve future performance. Coaches and fitness enthusiasts (recreational through competitive) use similar software to improve their understanding of the technical aspects of their sport to achieve that "perfect" swing, "perfect" running gait, "perfect" bike set-up.

At the end of the analysis, you will receive a copy of the video footage on a CD with any relevant measurements and comments related to injury risk and enhancing performance. You can play back this CD on a regular DVD player or computer.

What is 3D Gait and Sport-Specific Analysis?



Using multiple video cameras and a 3D motion capture system (VICON), we can obtain an accurate representation of the 3D movements of your body segments when you perform a certain sporting task. This system works by tracking small reflective "markers", attached to the individual [see graphic on right] and triangulating the position of these markers in 3D space. The markers are lightweight and minimally interfere with natural movement. Our motion capture system has very high resolution (4MegaPixels per camera) and is capable of capturing movements at very high speeds (up to 1000 frames per second). This allows us to accurately calculate variables such as rear-foot movement when the foot contacts the ground, or the maximum velocity and 3D trajectory of a golf club or tennis racquet [image on left].



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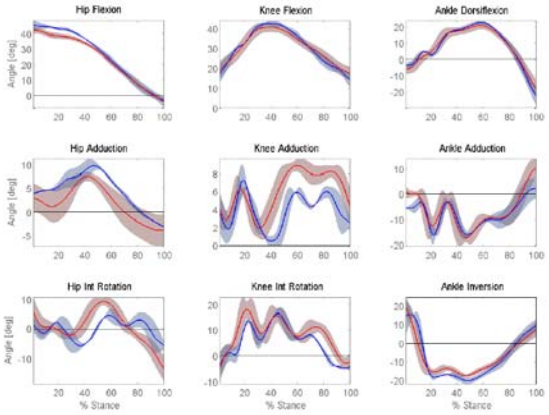
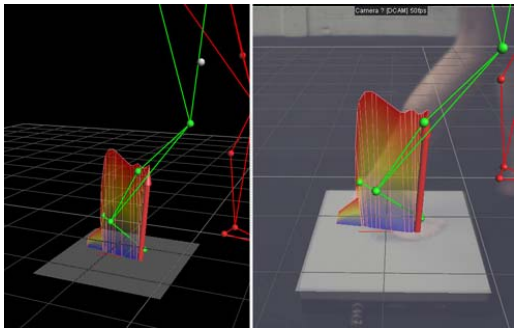
Post-processing of the data enables the calculation of 3D rotations (joint angles) of each segment [see graph on right]. These data can be combined with external force measurements, such as ground reaction forces from a force plate [see image below] to calculate the loading on joints and provide information about how your muscles contribute to performing different tasks.



At the same time as collecting the 3D data, we will also film you with a standard video camera and provide you with a CD, similar to that provided in the 2D analysis.



At the end of the 3D analysis, we will explain the data to you and provide you with knowledge of how to prevent musculoskeletal injuries and/or improve your performance.

What should I wear?

We ask that you wear sports clothing that will not obstruct the camera from seeing markers or joints of interest. Basically, the more skin showing the better! Short running shorts and tight fitting exercise tops are ideal. When we capture the video, we want to replicate as close as we can the natural environment in which you would normally perform the skill of interest. A gait analysis for example will involve walking or running at a pace similar to what you would normally use, in the same running shoes with any orthotics that you might currently be using. In a sport-specific analysis, you should also bring the equipment you normally use for that skill, such as your own tennis racquet or golf clubs.

How long does it take?

The 2D analysis can be performed in approximately one hour, including filming and feedback. This depends in part on whether filming is performed indoors or out in the field. The 3D analysis takes about one hour to collect the data, plus another hour to process and analyze the data. You can arrange to come back for the post-analysis consultation.

How much does it cost?

The 2D analysis costs $250 and the full 3D analysis costs $600. Stanford alumni, staff, or students are eligible for a considerable discount on these prices, so make sure you let us know if you are Stanford affiliated!

For additional information on biomechanical analyses at the Human Performance Lab, contact

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