

**COMPARING THE RANGE OF MOTION USING THE X-ISER MACHINE
AND DIFFERENT SPORTING ACTIVITIES.**

The pedals on The Xiser Machine™ allow a step height of eight inches which equates to a varied range of motion at the knee joint depending upon height, body form, and feet positioning on the machine. Although the range of motion has been biomechanically optimized, many individuals mistakenly compare the range of motion to other stepping type machines that allow for a larger range of motion, and, mistakenly assume that a larger range of motion is better. This assumption is incorrect for a number of reasons that are summarized below, but essentially using a larger range of motion than the Xiser allows, unnecessarily increases the risk of injury.

When using the machine for low-moderate intensity stepping where the form allows for the body's center of gravity to move vertically up and down (traditional stepping), the maximum angle that the knee can go through in the step phase (bent to straight) typically varies from around 55° - 65° for a 6 ft. individual. The angle could increase slightly for shorter individuals or would decrease slightly for taller individuals. By moving the foot further back on the pedal, the angle that the knee works through is increased for all individuals, typically a 10° increase can be realized by having only the ball of the foot on the pedal. This range of motion is virtually identical to walking or jogging up a flight of stairs (one step, at a time) and is far greater than walking or jogging along flat ground.

When using the machine in the Short Burst Exercise Form, the range of motion is the same as traditional stepping except that the starting and finishing angles are larger. In addition, it is important to realize that the purpose of the Short Burst Exercise Form is to create a situation whereby the quadriceps, hamstrings, gluteals, and calf muscles are forcefully contracting continuously through the downstroke and the up-stroke in order to maintain the body's center of gravity in a constant position. This form can generate rapid (> 300 steps per minute) sprint cycles with no recovery phase for the involved muscle groups. Consequently, the form is excellent for training the "drive/contact/power" phase of running and sprinting and for improving lower body power in general. Further more, the specialized form can significantly contribute to the strength and responsiveness of stabilizer muscles in the lower torso, thus enhancing agility, balance, and proprioception. This type of ballistic training can help athletes to maintain both power and correct form through extreme states of fatigue.

The angle that the knee moves through in the "force generating phase" (foot in contact with the ground) of running varies around 45° for sprinting to 62° for the first step coming out of the blocks for a 100-m sprinter. The angle decreases gradually with decreasing running velocity and is as small as 30° in power activities such as vertical jumping or football linemen pushing and driving at the line of scrimmage. In sprinting, it is the "recovery" leg (no contact with the ground) that moves through a much larger range of motion where the hip-flexor power helps generate speed. It should be realized therefore, that using The Xiser Machine™ as a conditioning and strengthening tool for athletes effectively challenges the "contact phase" of running and sprinting without the impact and stress to the tendons, ligaments, and joints. Consequently, the machine can increase the amount of high-intensity training in which the athlete can engage without increasing the risk of injury. The unit is not designed to specifically work on the strength and conditioning of the hip-flexor muscles in relation to the "recovery phase" of the sprint cycle. For athletes, the unit is, and is meant to be, like many other excellent training tools and techniques, a complement to existing conditioning protocols.

Therefore, it should be realized that The Xiser Machine™ provides more than enough range of motion for general fitness training, while preventing unnecessary stress to the joints associated with a large "drive phase" often seen on machines that allow the knee to work through too large of an angle. It should be realized that there is a significant carry over in terms of joint range of motion strength beyond the actual range that is trained. A great example of this is with our own Director of Research and Program Development, Dr. Mark J. Smith, who has most likely used the Xiser Machine more than anyone with the unit also comprising more than 90% of his training. It is the X-iser Machine and the Short Burst Training that has allowed Dr. Smith to demonstrate an ability to complete 50, consecutive, one-legged "pistol squats." For those unfamiliar with this exercise, the range of motion needed covers the maximum range at the knee joint using one's body weight on just one leg! So training on the X-iser Machine with a lower range of motion than is used in other activities still provides the strength needed to complete an exercise that requires a greater range of motion.

Finally, the increased range of motion allowed by other equipment does not increase the energy output which is actually dictated by the work load placed on the muscles. One experience on the X-iser Machine in the Short Burst Exercise Form at high speed will quickly eradicate any confusion!

