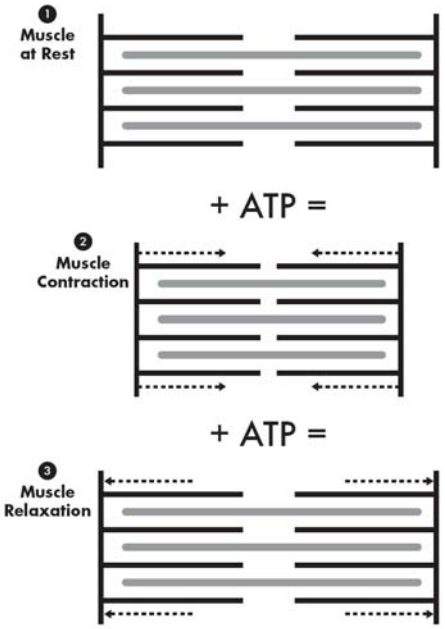
The Amazing Sarcomere

The microscopic sarcomeres that are responsible for all or our movements. They are simple machines that have overlapping filaments that slide back and forth on each other. While you are at rest (1), the overlap is neutral until you add ATP to the sarcomere. During contraction (2) the filaments use the ATP to slide inward and shorten the sarcomere. Then the same effort is needed to relax (3) the sarcomere along with a requirement for additional ATP.



Just how far can you make a muscle move? These microscopic sarcomeres will contract most efficiently when their entire capable range of contraction is utilized. A muscle fiber (or single muscle cell) is made up of thousands of these sarcomeres, and thousands of fibers make up the muscle groups that actually move our bodies.

If you looked at a sarcomere through a microscope, or at the sarcomere illustration, you'd see overlapping filaments can only overlap so far to reduce the sarcomere to its shortest width. Conversely, the sarcomere can only stretch so far and still maintain a certain amount of overlap, or a contraction is not possible. Our joints, bones, ligaments, and tendons usually prevent this overstretching from happening.

Not so, however, for certain other types of muscle tissue (without limiting joints). The heart—the body's most important muscle—is a prime example. Congestive heart failure or CHF, a condition in which the muscle's pumping capability is impaired, is an example of sarcomere failure. In this condition, the fibers are stretched to a point where the sarcomere fibrils not overlap anymore, making a muscular contraction difficult and then impossible.
The same holds true for normal muscular contractions during exercise. Both an overstretched muscle and an incomplete muscle contraction result in less force, less strength and decreased muscle function. A good ROM during exercise will maximize your sarcomeres' capabilities and your physical results.