* Typical passive joint stiffness values are low until the extremes of the range of motion are approached (e.g., 2-5 Nm/rad for most major joints over the mid-range; reviewed in Winters and Stark, 1985).

Winters, 1. M., and Stark, L. (1985) Analysis of fundamental human movement patterns through the use of in-depth antagonistic muscle models. IEEE Trans. Biomed. Engng., BME-32: 826-840.

* The ratio of muscle length to tendon length must be estimated since CE(PE) element length depends only on muscle length, while SE length depends on both muscle and tendon length

Felix E. Zajac and Jack M. Winters(1990) Modeling Musculoskeletal Movement Systems: Joint and Body Segmental Dynamics, Musculoskeletal Actuation, and Neuromuscular Control.**(Also inverse dynamics)**

* An important factor in the mechanical behaviour of muscle is the passive elastic component in series with the active contractile one (see Hill I949a). This acts as a buffer when a muscle passes abruptly from the resting to the active state, and it accumulates mechanical energy as the tension of the muscle
* **The fibers run, on the average, only half the full length of the muscle; the other half must be tendon. (Kse ratio!)**
* It is impossible to examine the properties of the series elastic component in a resting muscle; the contractile component at rest is so extensible that a load is taken almost ken almost entirely by the PE.

A.V.Hill(1950) The series elastic component of muscle

* Kse--"short-range" stiffness or "high frequency" stiffness --- However, all techniques have produced concave upward load-extension curves, with peak element extensions between 2% and 8%.//(well represented by the classic exponential relation of Eq. 5.3) for about 3-4% extension----Toe ---7%)
* However, these are relatively short and would have to extend considerably for overall muscle extension to reach 4%

Jack M. Winters (1990) Hill-Based Muscle Models: A Systems Engineering Perspective