

Figure 8

Isometric contractions, compared to work-loop contractions, have a larger proportion of XBs in a force producing state at end-systole (red vs. blue lines in subplot 1).

Therefore, end-systole in an isometric contraction is characterized by a more efficient use of sarcomere length (subplot 2, the isometric data (red) requires less length than the work-loop data (blue) to produce equivalent ES force.

To unite the isometric and WL end-systolic force-length curves, work-loops have to maintain force at shorter sarcomere lengths.

We achieved this by boosting magnitude and duration of XB recruitment (resulting in the green lines in figure 8)

With a larger proportion of XBs in a force-producing state, isotonic force is maintained at lower sarcomere lengths. This adjustment allows sarcomeres to maintain isotonic shortening until the force-equivalent isometric sarcomere length is reached (the green line matches the red line in subplot).

Interestingly, to achieve the same end-systolic force-length, sarcomeres that undergo isotonic shortening require a larger proportion of XBs in a force-producing state at end-systole (subplot 1: the green line is above the red line). Other mechanisms involving XB distortion must be at play.

