

# Sensitivity study oks003 - Calibration prestretch bounds

In this sensitivity study we used force-driven simulations starting with the model in the imaging position, applying four different loads for AP, IE and VV. Only one ligament prestretch was changed at the same time, where the other three ligament prestretch values were set to 1.0. Eight different Python scripts were run, 2 AP scripts (ACL & PCL), 4 IE scripts (ACL, PCL, MCL & LCL) and 2 VV scripts (MCL & LCL). Four separate simulations with different applied forces were applied per script:

- AP simulations: -50N, 50N, -100N, 100N
- IE simulations: -2000Nmm, 2000Nmm, -4000Nmm, 4000Nmm
- VV simulations: -4000Nmm, 4000Nmm, -8000Nmm, 8000Nmm

In this sensitivity study the following prestretch value ranges were investigated (in steps of 0.01):

- ACL: 0.75 - 1.0
- PCL: 0.95 - 1.2
- MCL: 0.95 - 1.2
- LCL: 0.85 - 1.1

We also performed FE simulations (applying a flexion rotation of 1.57 rad) for the same prestretch ranges but in steps of 0.05, to investigate the effect of the prestretch values.

To investigate the results we looked at run time, resulting kinematics and converged time steps. Some sensitivity study results were not clear to select a certain range but gave insight in the working of the model.

The results can be found in: *Calibration prestretch bounds - OKS003.pptx*

Based on the results we chose the following prestretch factor ranges:

- ACL = 0.75 - 0.95
- PCL = 1.05 - 1.25 (outside test range, but results suggest it might need to be higher)
- MCL = 0.90 - 1.05 (outside test range, but results suggest it might need to be higher)
- LCL = 0.85 - 1.05