Supplementary Information (SI)

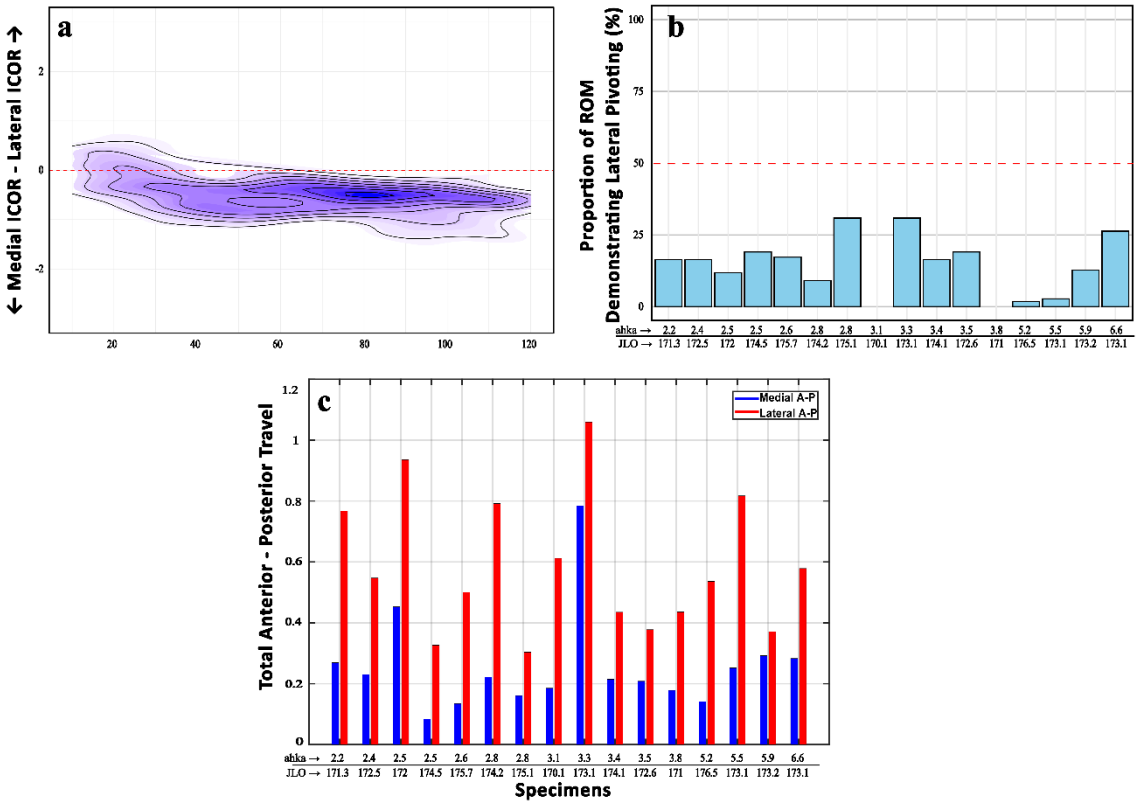

Fig. 1S Pivoting motion for CPAK Type III specimens during passive flexion.

a) Density plot of the instantaneous center of rotation (ICOR) for all CPAK type III specimens throughout the passive flexion (10°–120°), with density represented by a color gradient from white (low density) to dark blue (high density). (b) Proportion of range of motion (ROM) demonstrating lateral pivoting for the cohort of CPAK type III specimens (n=16). (c) Total anterior-posterior travel of the medial and lateral femur condyles projected on the tibial plateau. Total travel was defined as the summation of the travel between every consecutive knee flexion angle across the range of motion for each specimen, calculated separately in absolute terms for both the medial and lateral translations. The red dashed line indicates equal proportions for (a) and (b), respectively. Both the ICOR and total travel data are normalized to the size of each specimen's tibial plateau. The bar plots are ordered from minimum to maximum aHKA values.

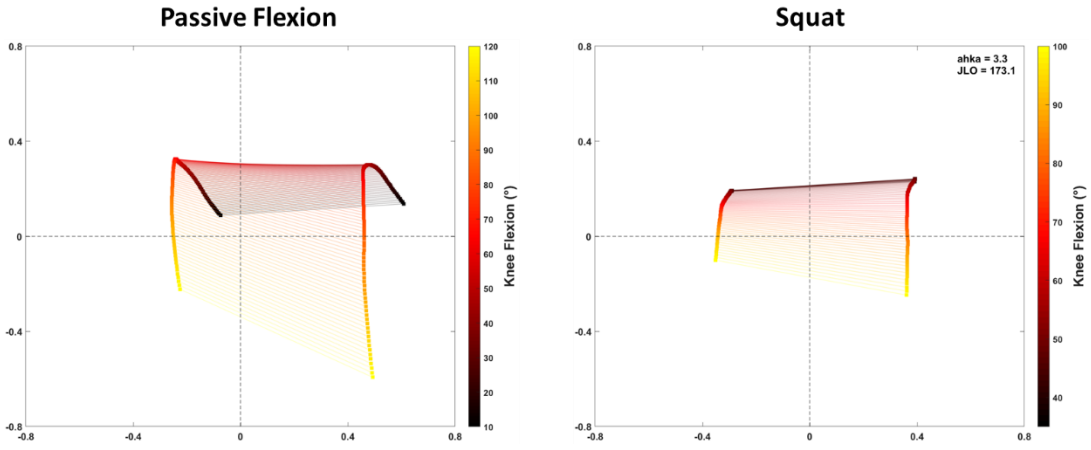

Fig.2S Femoral rollback pattern for specimen 1 observed during passive flexion (10° – 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective centers of the medial and lateral femoral condyles. Data were normalized to the size of the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents anterior/lateral.

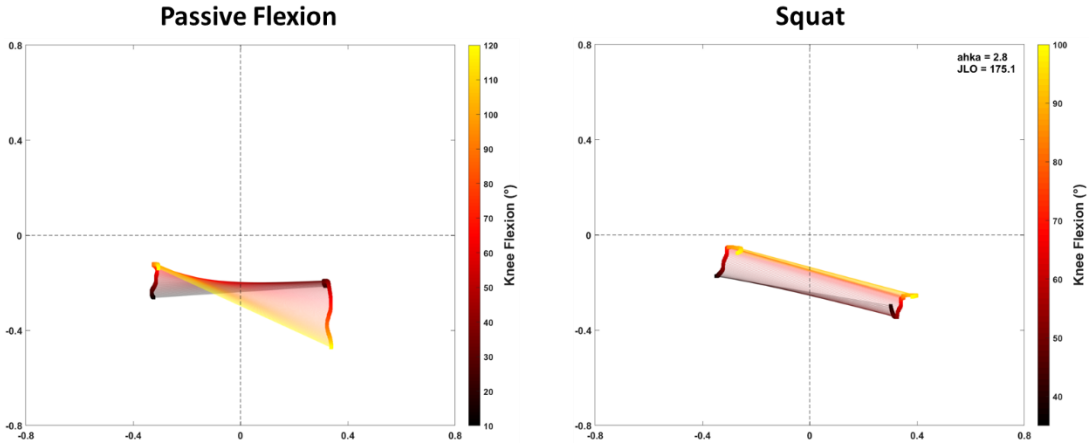

Fig.3S Femoral rollback pattern for specimen 2 observed during passive flexion (10° – 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective centers of the medial and lateral femoral condyles. Data were normalized to the size of the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents anterior/lateral.

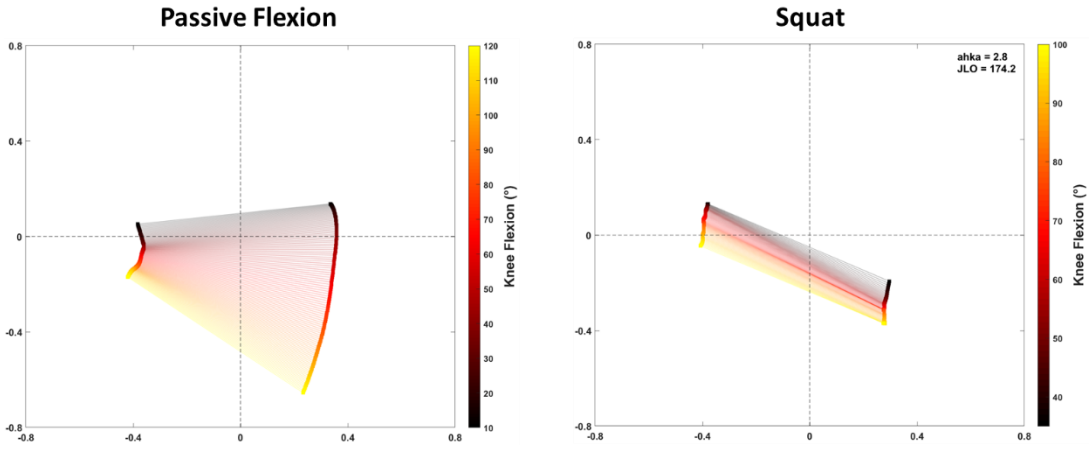

Fig.4S Femoral rollback pattern for specimen 3 observed during passive flexion (10° – 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective centers of the medial and lateral femoral condyles. Data were normalized to the size of the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents anterior/lateral.

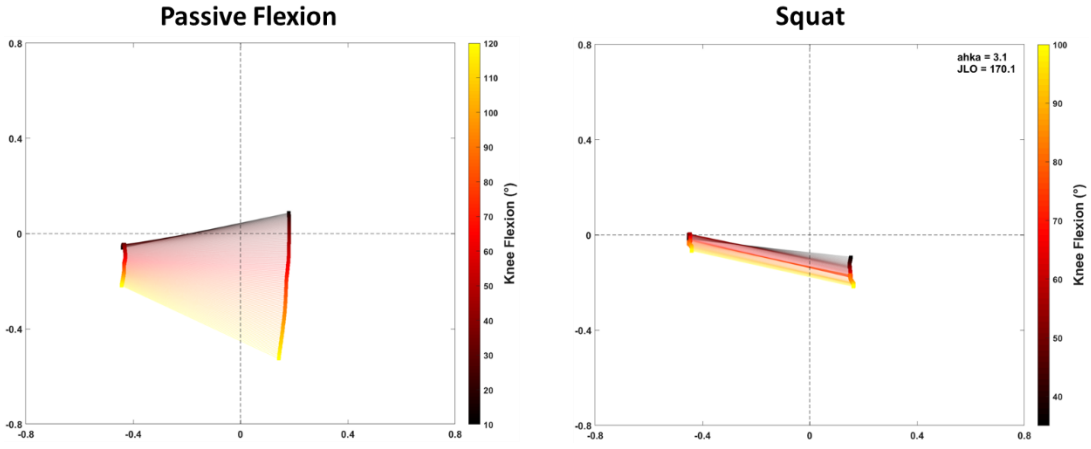

Fig.5S Femoral rollback pattern for specimen 4 observed during passive flexion (10° – 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective centers of the medial and lateral femoral condyles. Data were normalized to the size of the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents anterior/lateral.

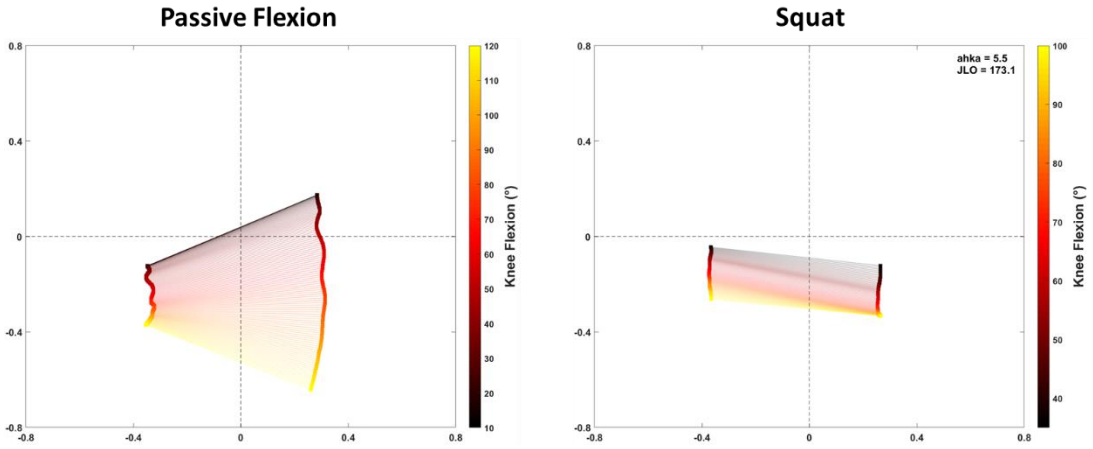

Fig.6S Femoral rollback pattern for specimen 5 observed during passive flexion (10° – 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective centers of the medial and lateral femoral condyles. Data were normalized to the size of the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents anterior/lateral.

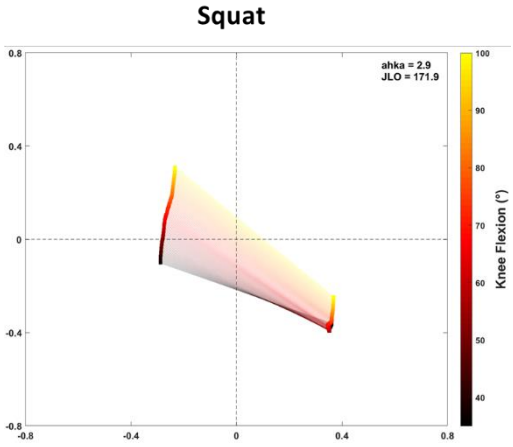

Fig.7S Femoral rollback pattern for specimen 6 observed during loaded squatting motion (35° – 100°). Solid dots represent the respective centers of the medial and lateral femoral condyles. Data were normalized to the size of the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents anterior/lateral. The passive flexion data for specimen 6 is not available.

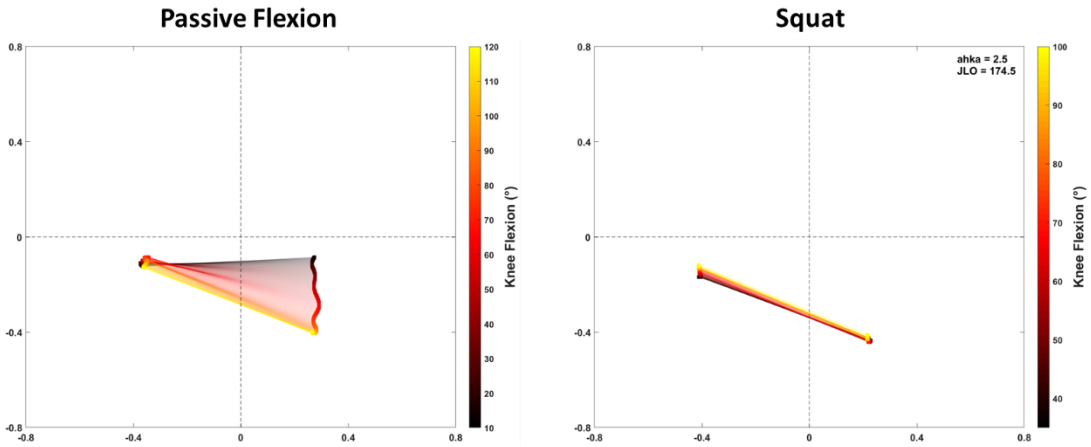

Fig.8S Femoral rollback pattern for specimen 7 observed during passive flexion (10° – 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective centers of the medial and lateral femoral condyles. Data were normalized to the size of the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents anterior/lateral.

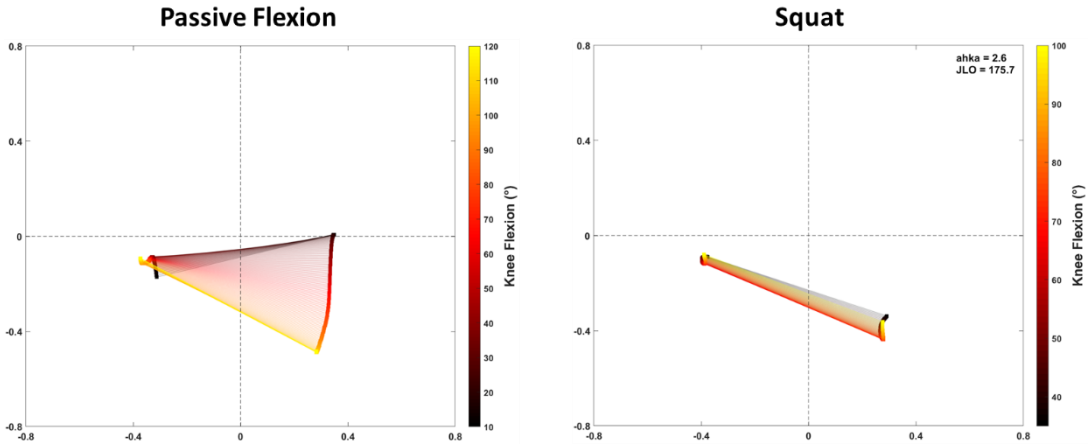

Fig.9S Femoral rollback pattern for specimen 8 observed during passive flexion (10° – 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective centers of the medial and lateral femoral condyles. Data were normalized to the size of the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents anterior/lateral.

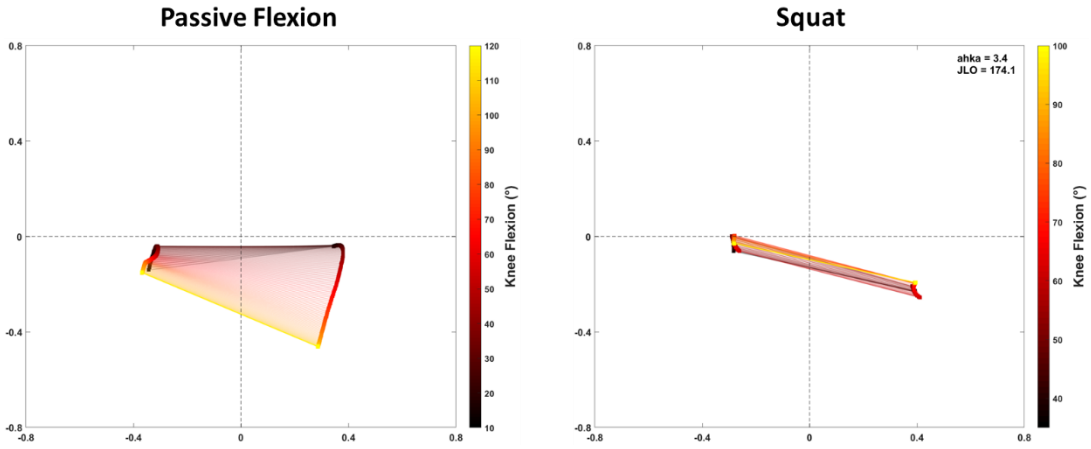

Fig.10S Femoral rollback pattern for specimen 9 observed during passive flexion (10° – 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective centers of the medial and lateral femoral condyles. Data were normalized to the size of the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents anterior/lateral.

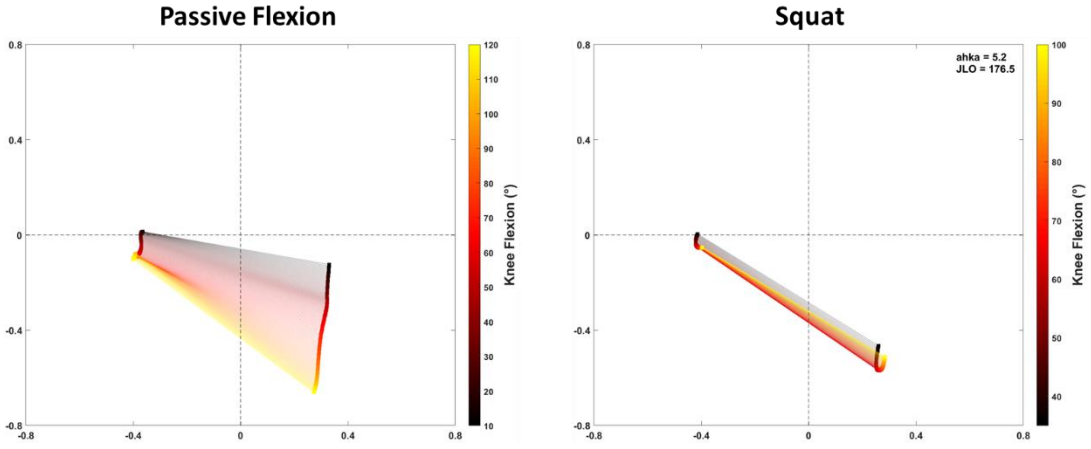

Fig.11S Femoral rollback pattern for specimen 10 observed during passive flexion (10° – 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective centers of the medial and lateral femoral condyles. Data were normalized to the size of the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents anterior/lateral.

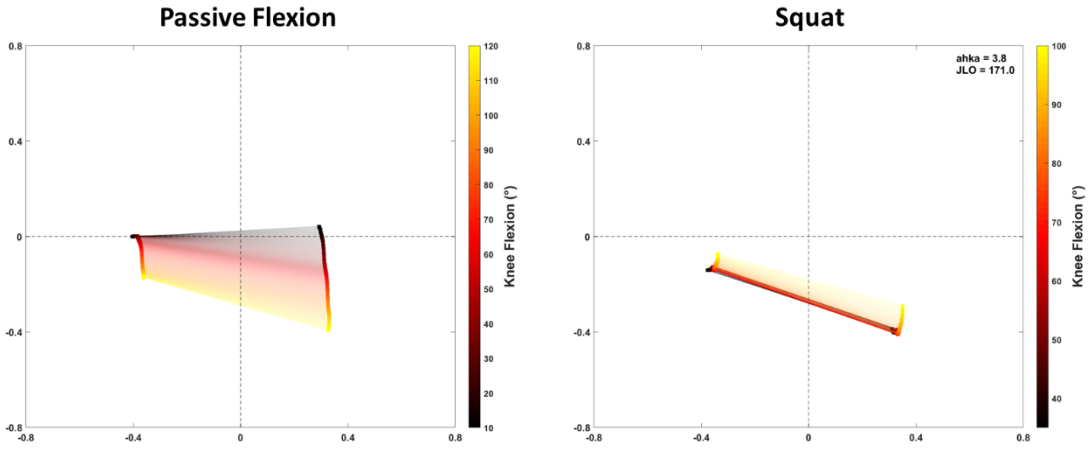

Fig.12S Femoral rollback pattern for specimen 11 observed during passive flexion (10° – 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective centers of the medial and lateral femoral condyles. Data were normalized to the size of the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents anterior/lateral.

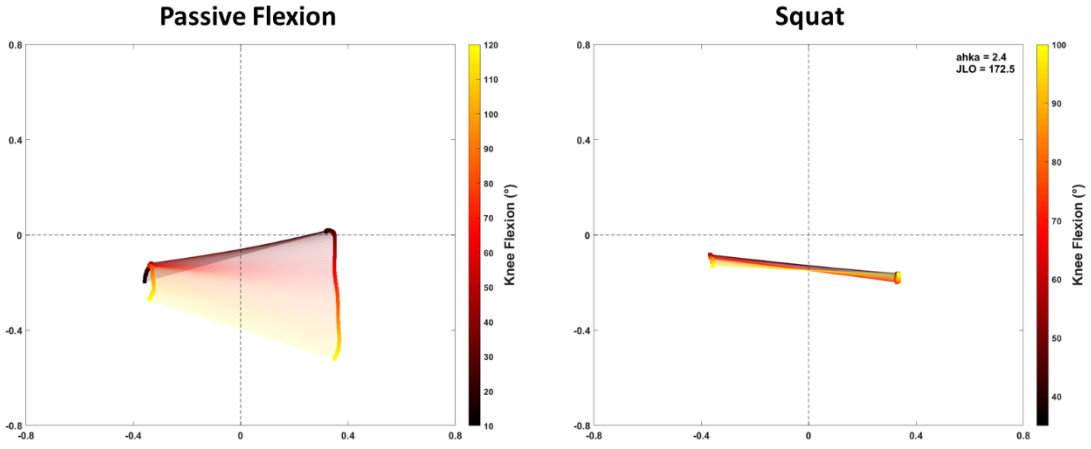

Fig.13S Femoral rollback pattern for specimen 12 observed during passive flexion (10° – 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective centers of the medial and lateral femoral condyles. Data were normalized to the size of the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents anterior/lateral.

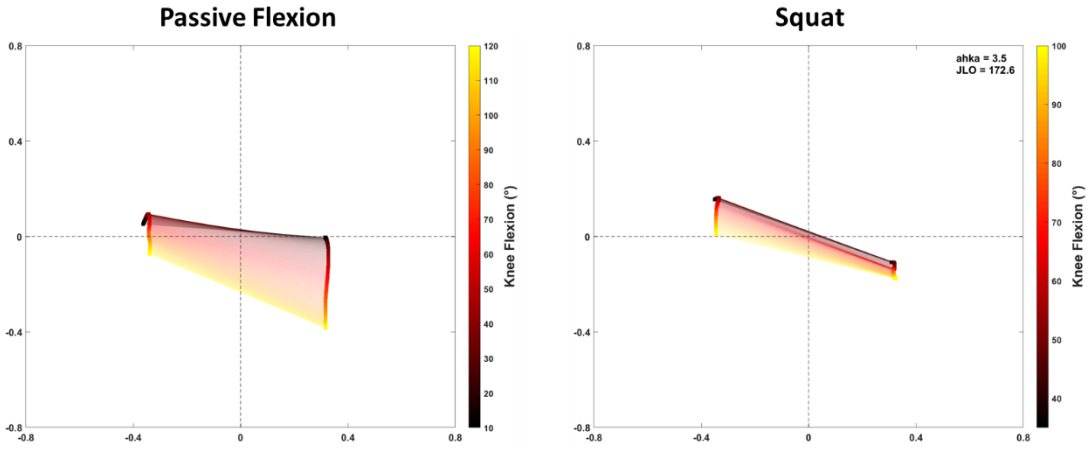

Fig.14S Femoral rollback pattern for specimen 13 observed during passive flexion (10° – 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective centers of the medial and lateral femoral condyles. Data were normalized to the size of the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents anterior/lateral.

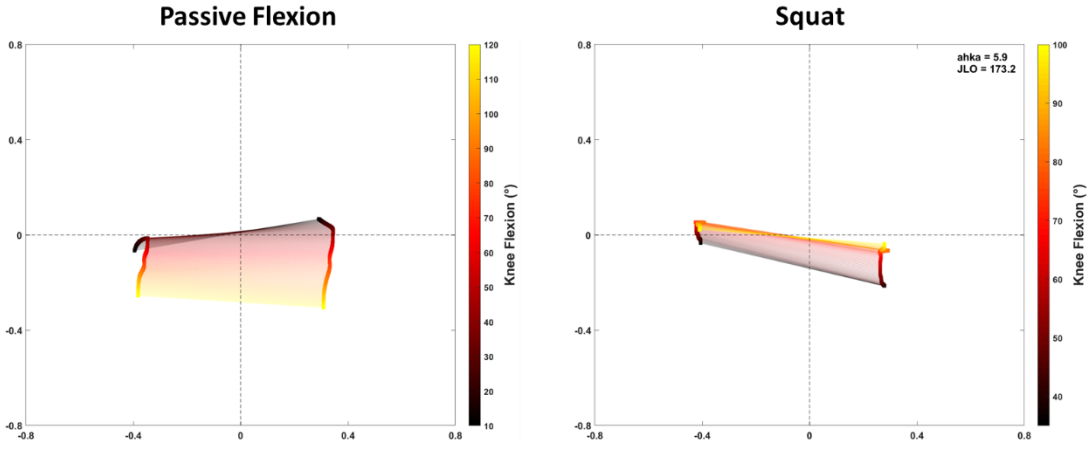

Fig.15S Femoral rollback pattern for specimen 14 observed during passive flexion (10° – 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective centers of the medial and lateral femoral condyles. Data were normalized to the size of the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents anterior/lateral.

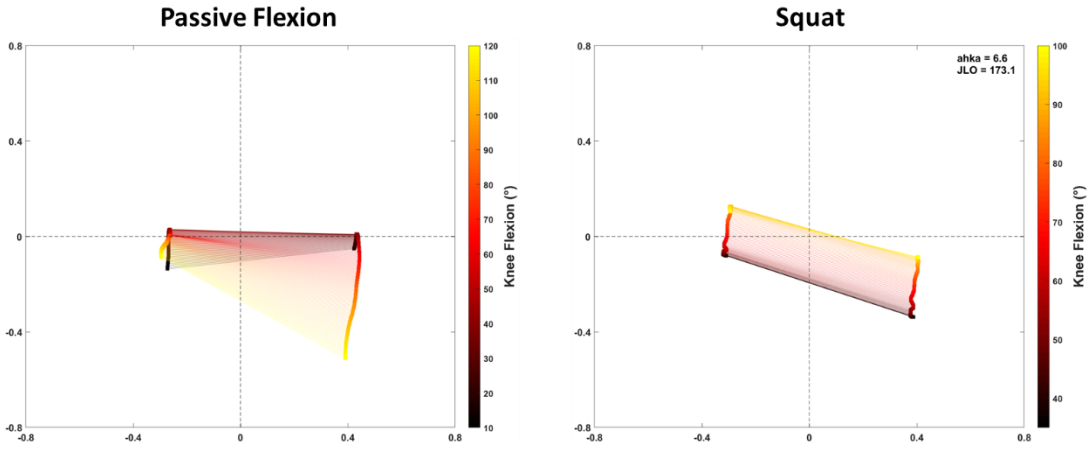

Fig.16S Femoral rollback pattern for specimen 15 observed during passive flexion (10° – 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective centers of the medial and lateral femoral condyles. Data were normalized to the size of the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents anterior/lateral.

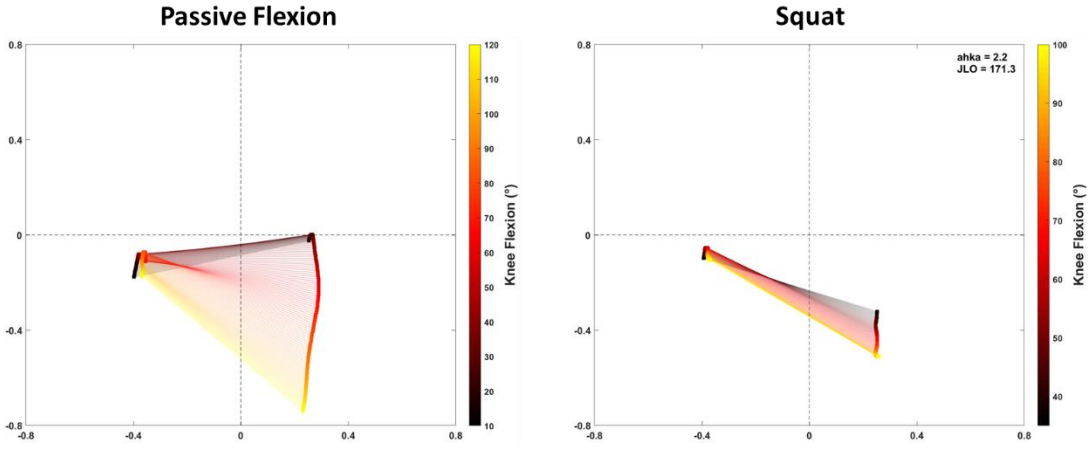

Fig.17S Femoral rollback pattern for specimen 16 observed during passive flexion (10° – 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective centers of the medial and lateral femoral condyles. Data were normalized to the size of the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents anterior/lateral.

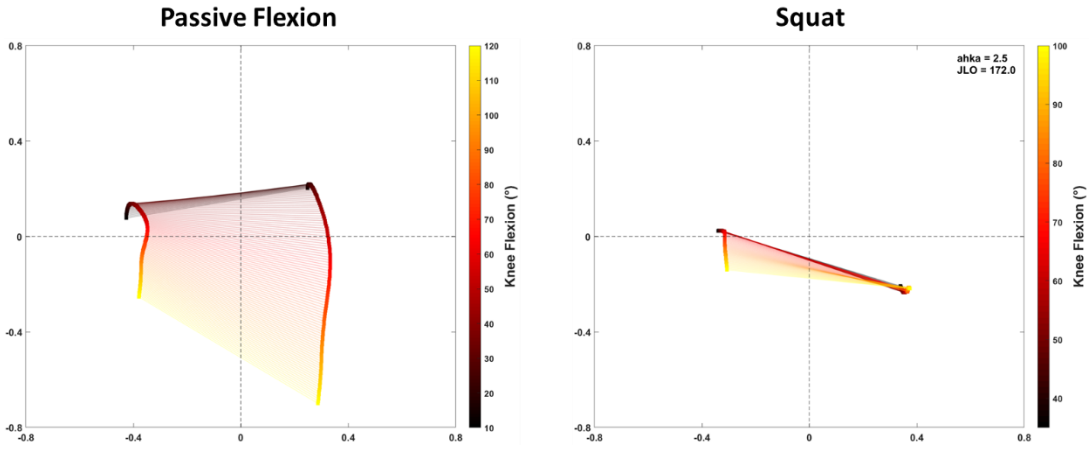

Fig.18S Femoral rollback pattern for specimen 17 observed during passive flexion (10° – 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective centers of the medial and lateral femoral condyles. Data were normalized to the size of the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents anterior/lateral.