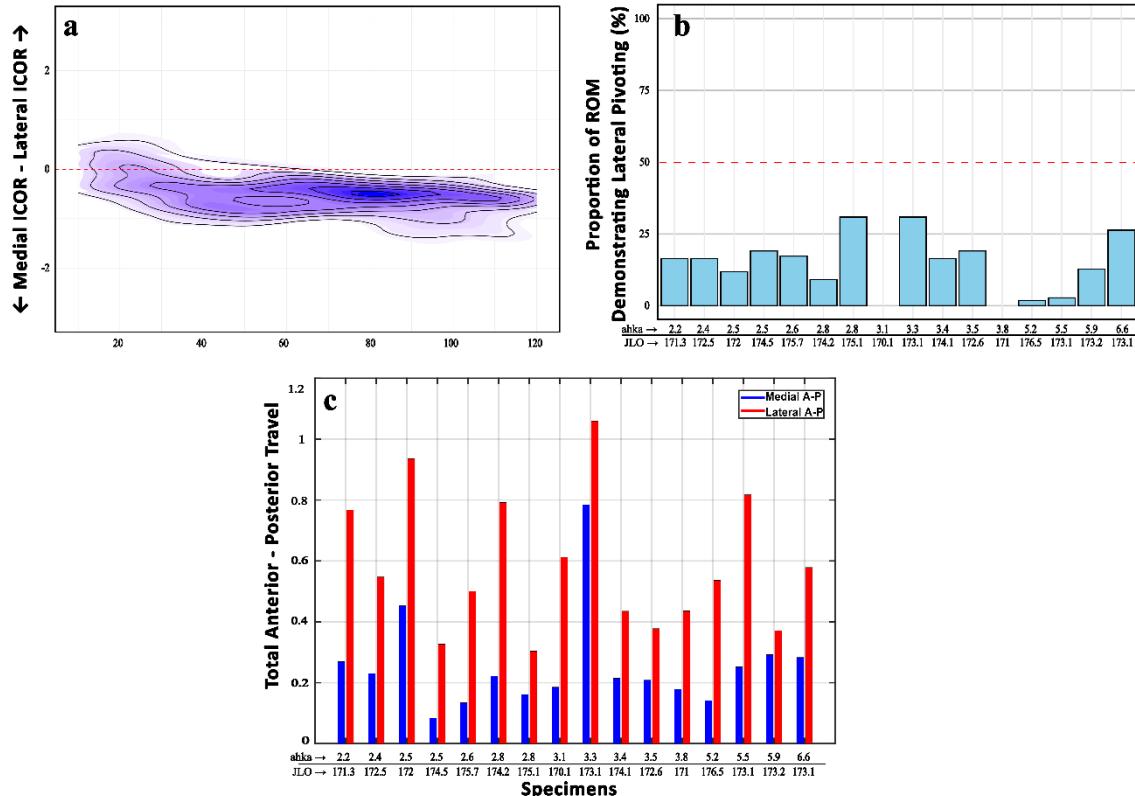


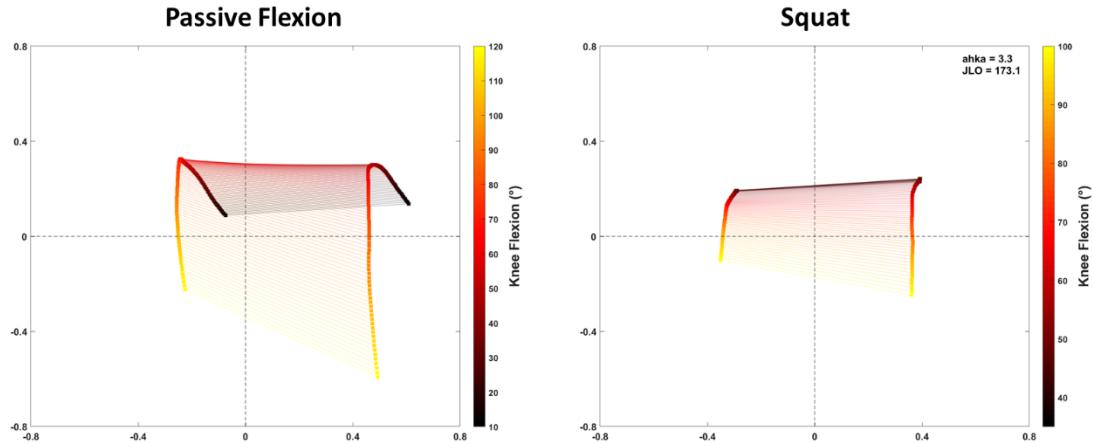
1 **Supplementary Information (SI)**



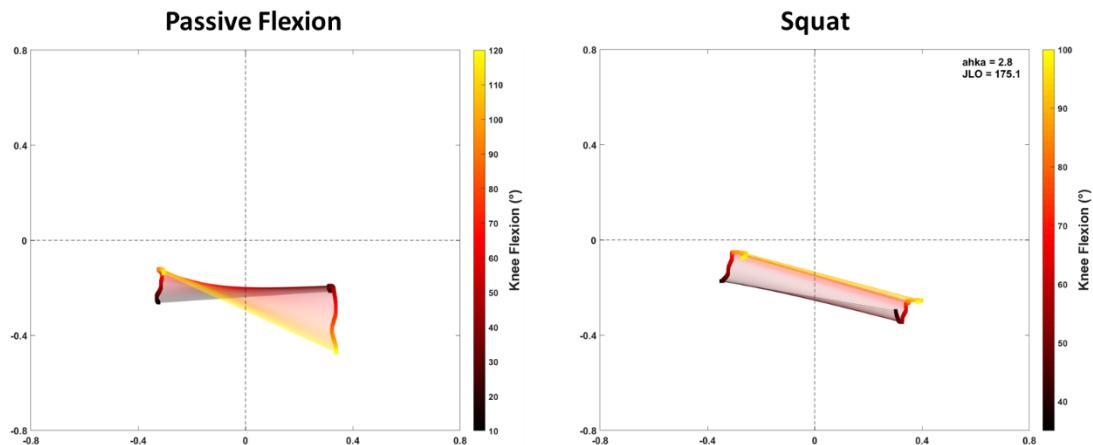
2

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

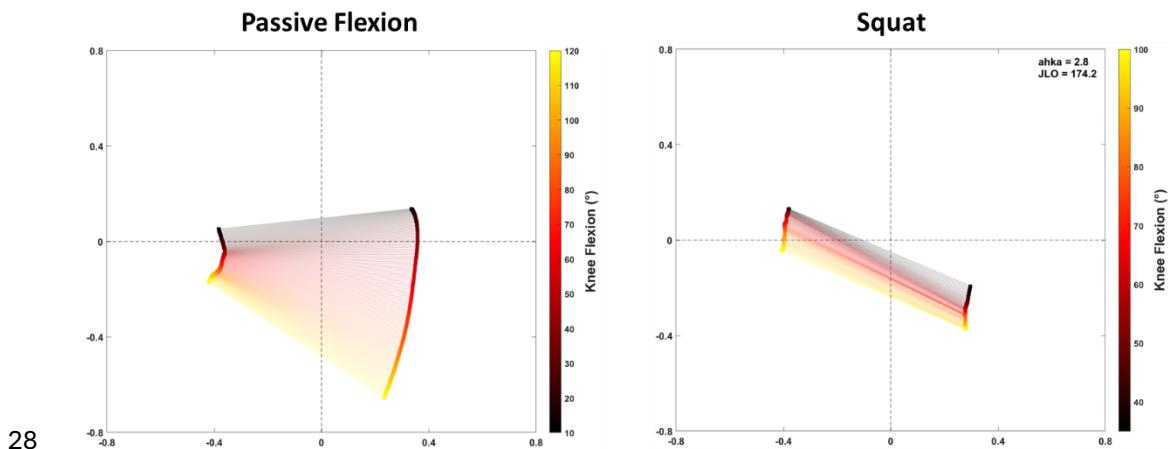
4 a) Density plot of the instantaneous center of rotation (ICOR) for all CPAK type III
 5 specimens throughout the passive flexion (10°–120°), with density represented by a color
 6 gradient from white (low density) to dark blue (high density). (b) Proportion of range of
 7 motion (ROM) demonstrating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



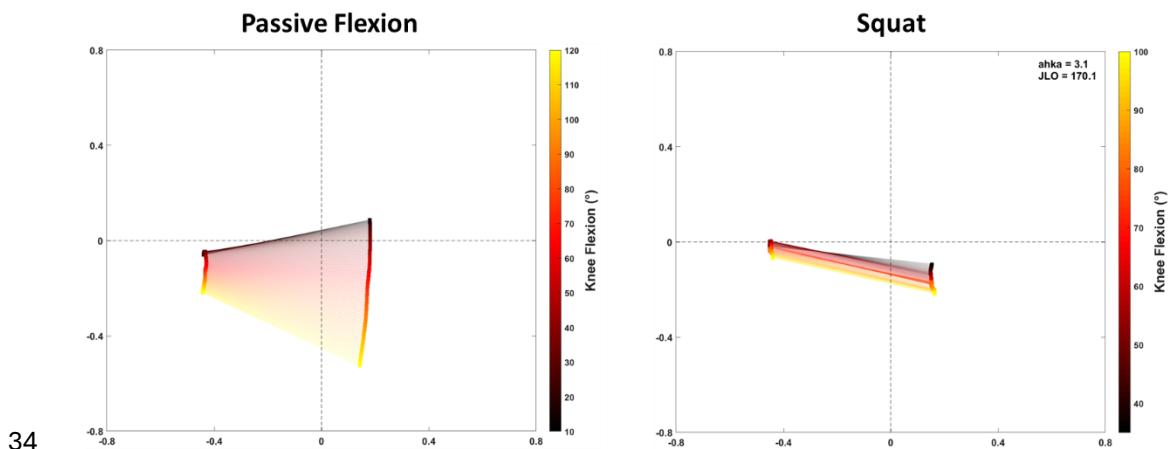
16 **Fig.2S** Femoral rollback pattern for specimen 1 observed during passive flexion (10° –
 17 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective
 18 centers of the medial and lateral femoral condyles. Data were normalized to the size of
 19 the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents
 20 anterior/lateral.
 21



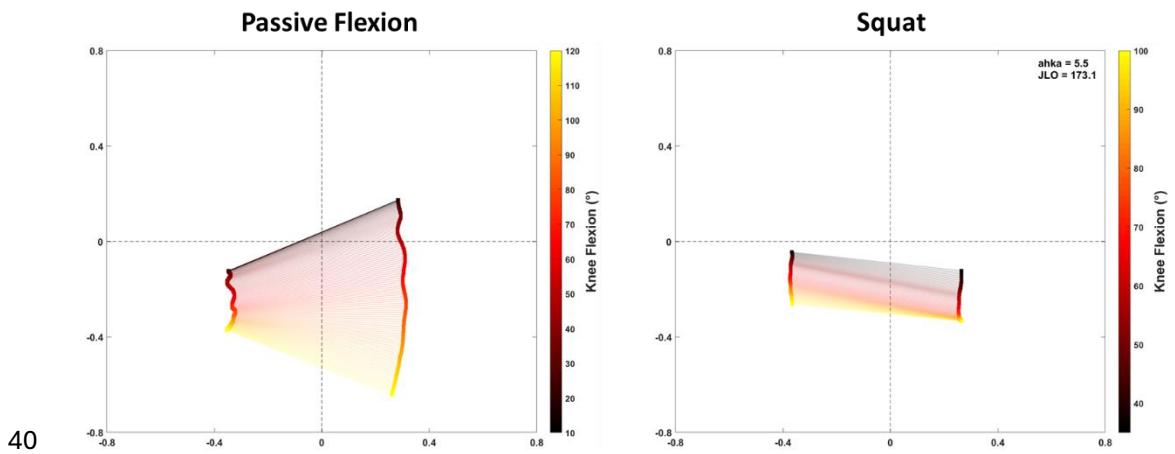
22 **Fig.3S** Femoral rollback pattern for specimen 2 observed during passive flexion (10° –
 23 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective
 24 centers of the medial and lateral femoral condyles. Data were normalized to the size of
 25 the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents
 26 anterior/lateral.
 27



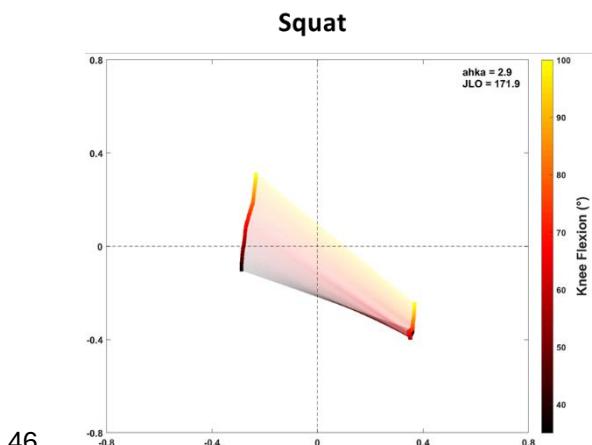
29 **Fig.4S** Femoral rollback pattern for specimen 3 observed during passive flexion (10° –
 30 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective
 31 centers of the medial and lateral femoral condyles. Data were normalized to the size of
 32 the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents
 33 anterior/lateral.



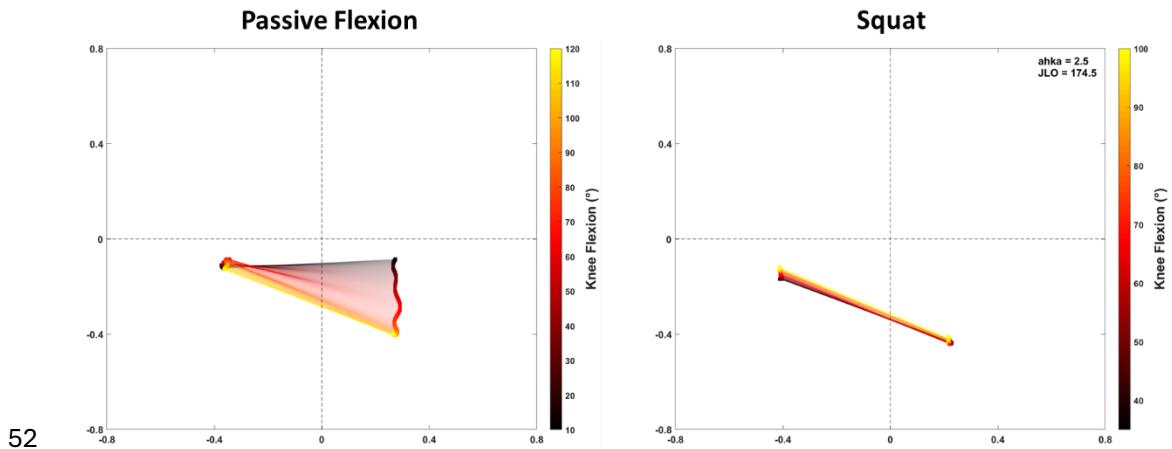
35 **Fig.5S** Femoral rollback pattern for specimen 4 observed during passive flexion (10° –
 36 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective
 37 centers of the medial and lateral femoral condyles. Data were normalized to the size of
 38 the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents
 39 anterior/lateral.



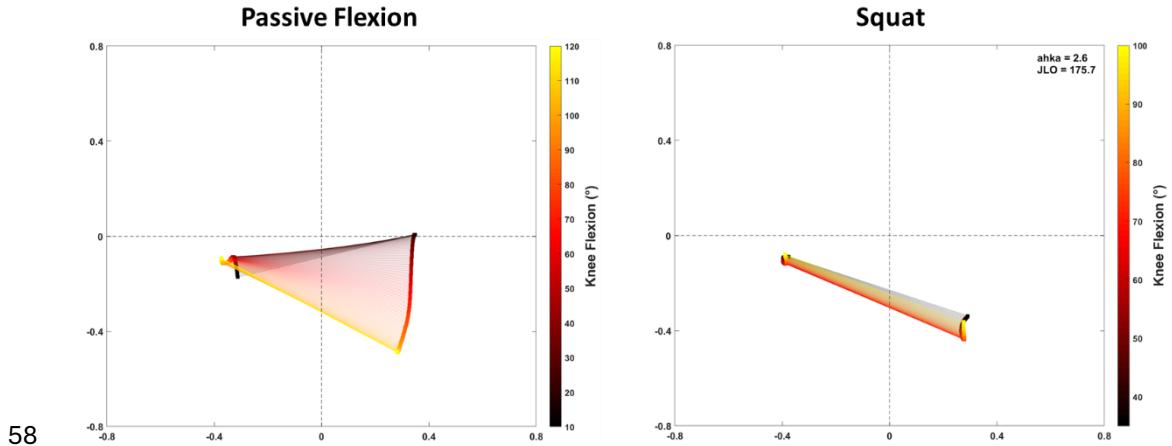
40 **Fig.6S** Femoral rollback pattern for specimen 5 observed during passive flexion (10° –
 41 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective
 42 centers of the medial and lateral femoral condyles. Data were normalized to the size of
 43 the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents
 44 the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents
 45 anterior/lateral.



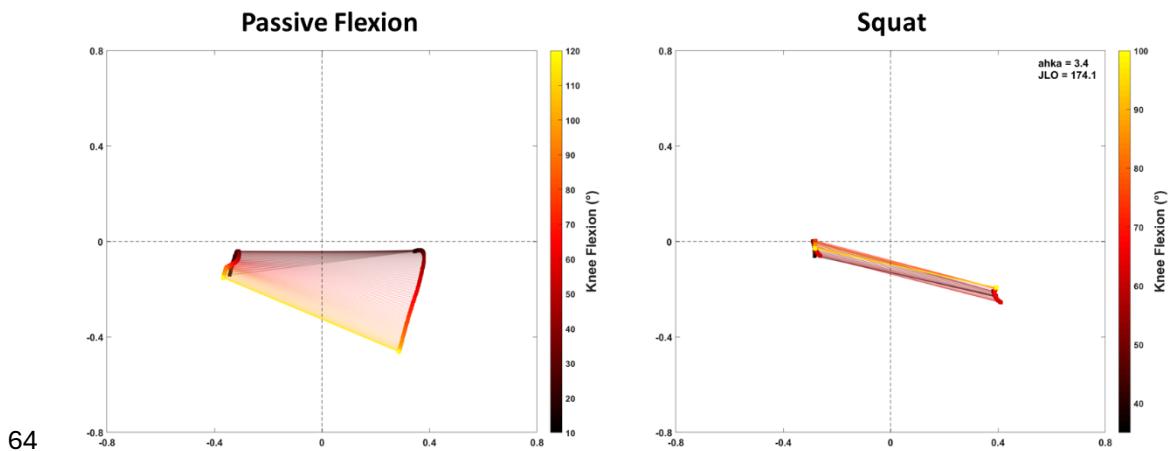
46 **Fig.7S** Femoral rollback pattern for specimen 6 observed during loaded squatting motion
 47 (35° – 100°). Solid dots represent the respective centers of the medial and lateral femoral
 48 condyles. Data were normalized to the size of the specimen's tibial plateau. -0.5
 49 represents posterior/medial and 0.5 represents anterior/lateral. The passive flexion data
 50 for specimen 6 is not available.



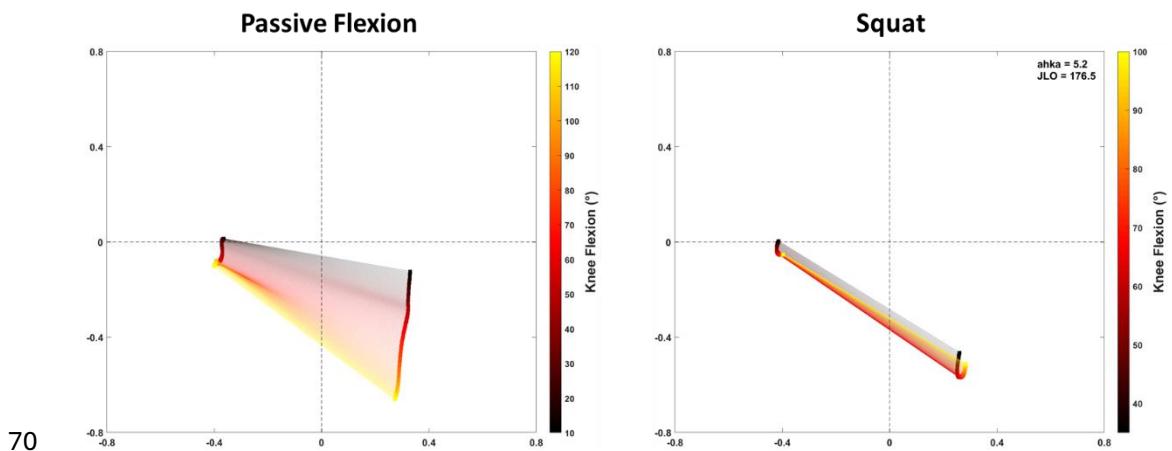
52 **Fig.8S** Femoral rollback pattern for specimen 7 observed during passive flexion (10° –
 53 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective
 54 centers of the medial and lateral femoral condyles. Data were normalized to the size of
 55 the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents
 56 the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents
 57 anterior/lateral.



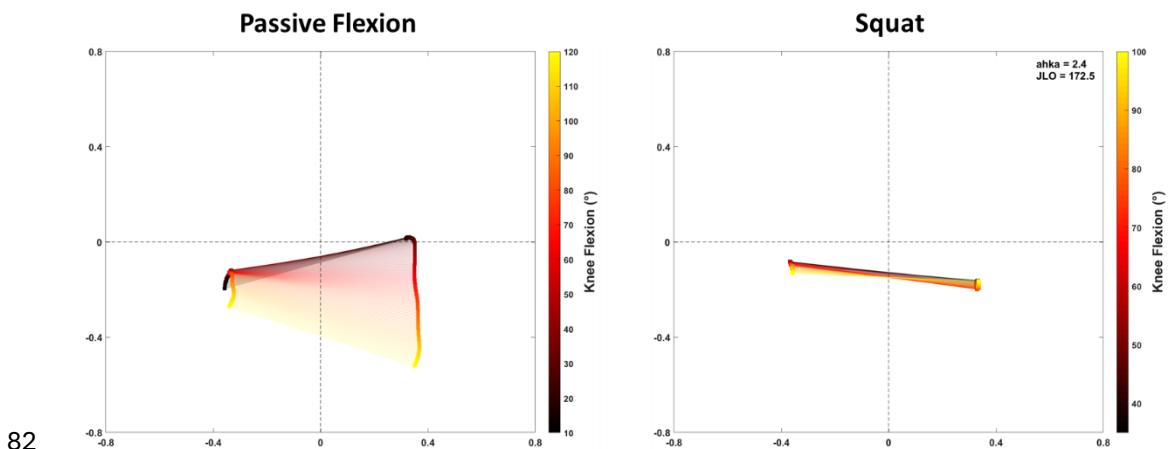
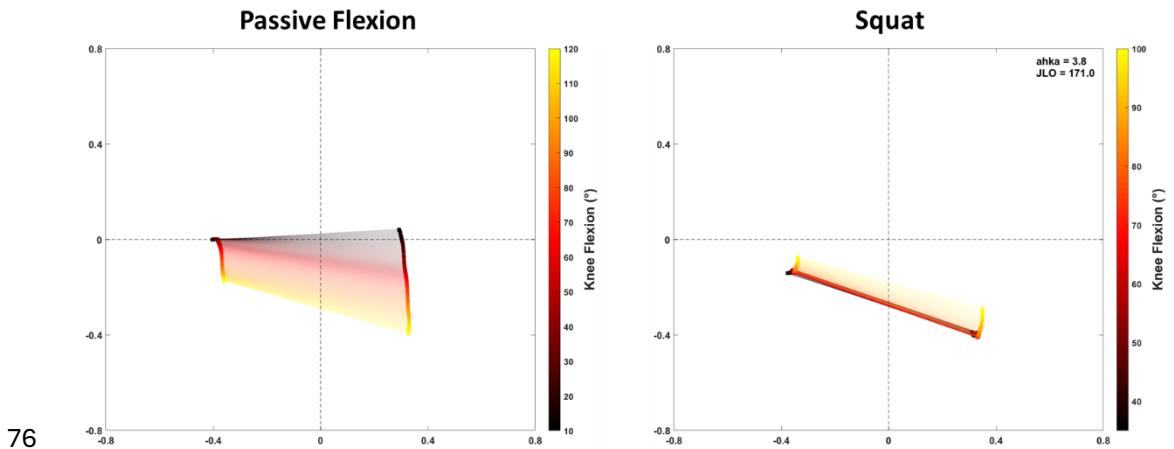
58 **Fig.9S** Femoral rollback pattern for specimen 8 observed during passive flexion (10° –
 59 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective
 60 centers of the medial and lateral femoral condyles. Data were normalized to the size of
 61 the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents
 62 the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents
 63 anterior/lateral.

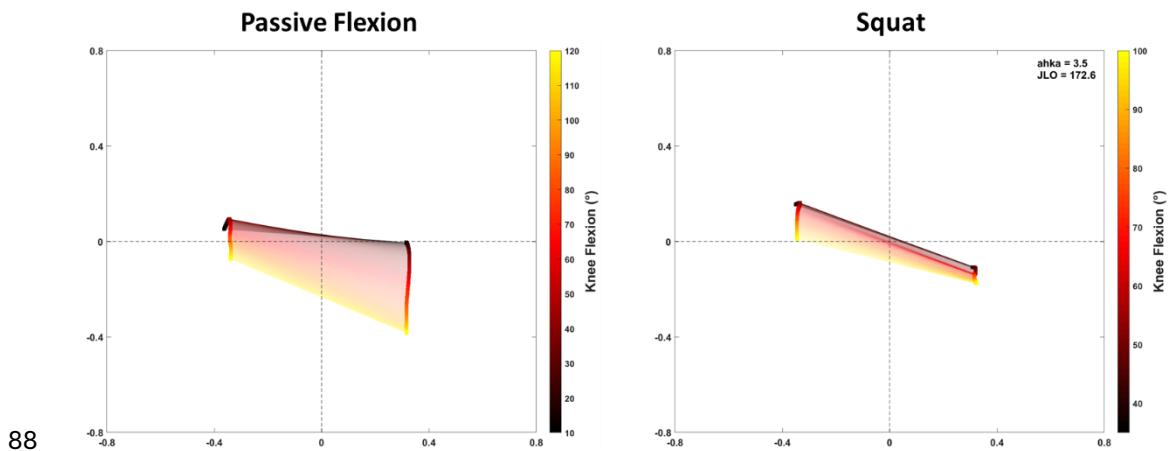


64 **Fig.10S** Femoral rollback pattern for specimen 9 observed during passive flexion (10° –
65 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective
66 centers of the medial and lateral femoral condyles. Data were normalized to the size of
67 the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents
68 anterior/lateral.

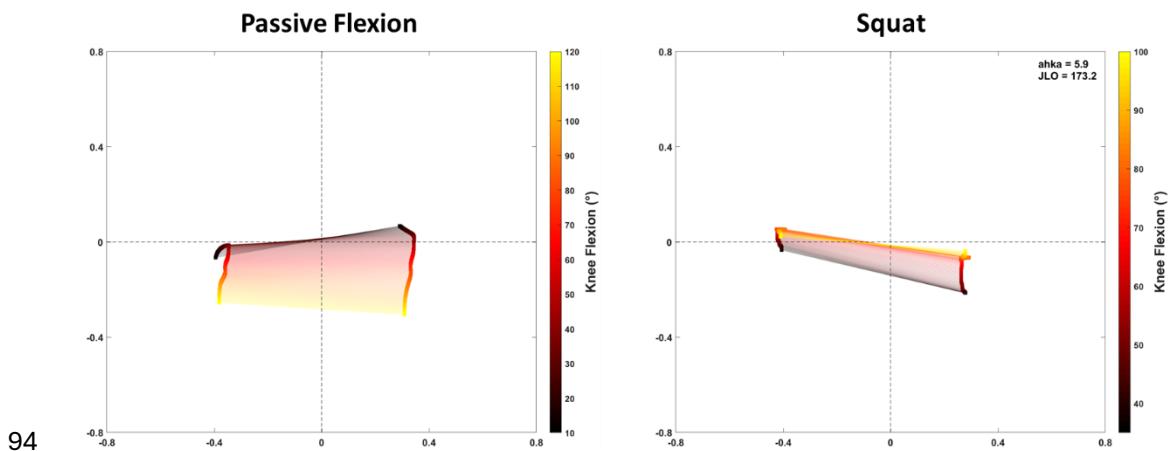


70 **Fig.11S** Femoral rollback pattern for specimen 10 observed during passive flexion (10° –
71 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective
72 centers of the medial and lateral femoral condyles. Data were normalized to the size of
73 the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents
74 anterior/lateral.

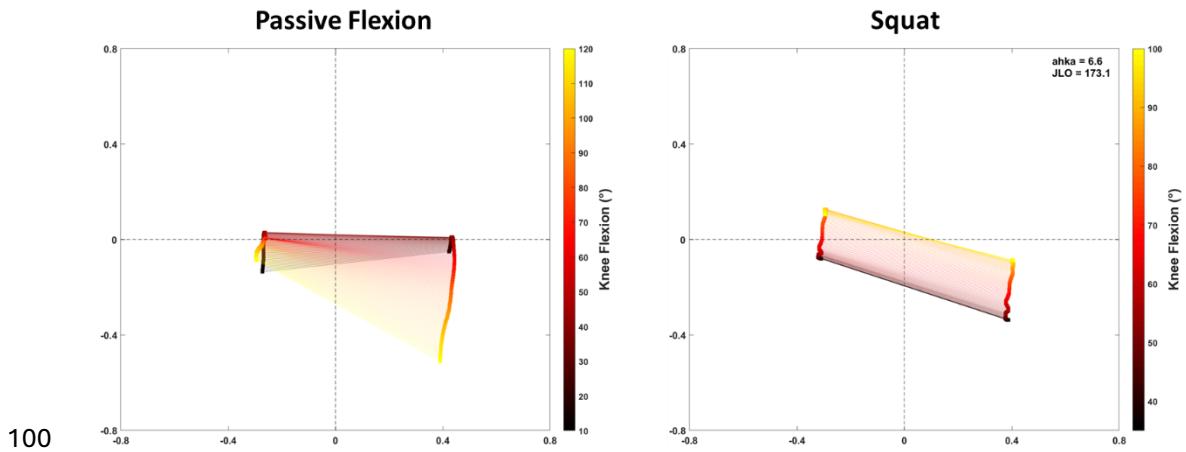




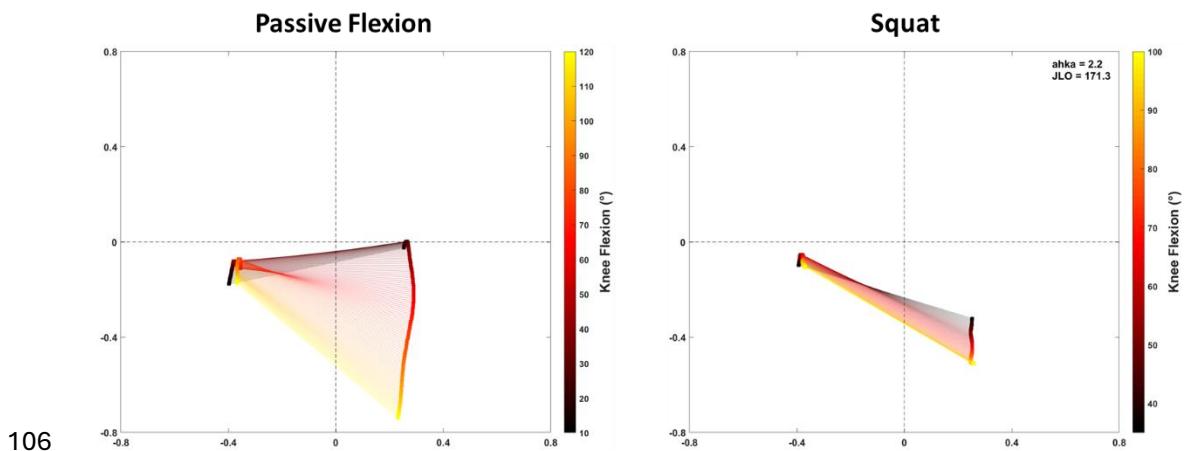
88 **Fig.14S** Femoral rollback pattern for specimen 13 observed during passive flexion (10°
 89 – 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective
 90 centers of the medial and lateral femoral condyles. Data were normalized to the size of
 91 the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents
 92 anterior/lateral.



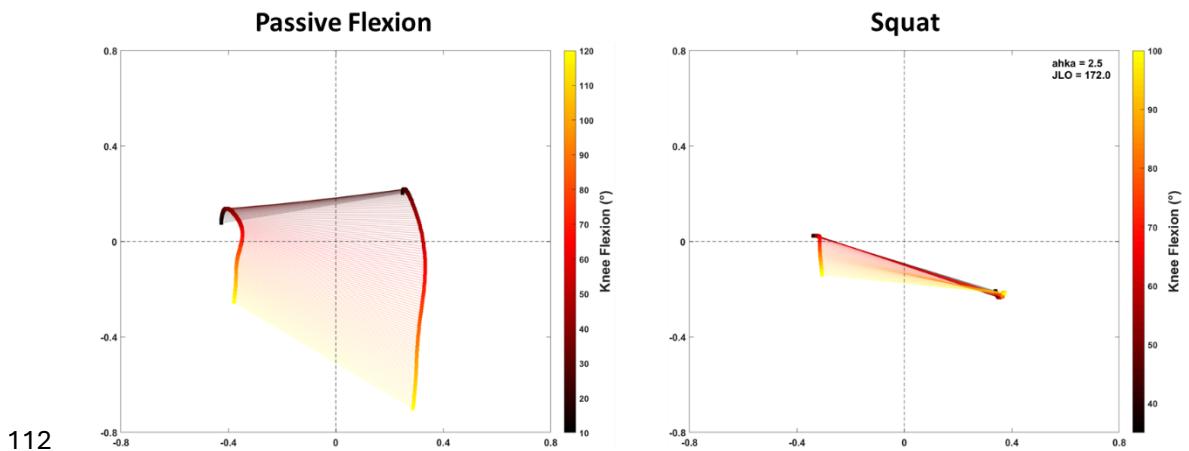
94 **Fig.15S** Femoral rollback pattern for specimen 14 observed during passive flexion (10°
 95 – 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective
 96 centers of the medial and lateral femoral condyles. Data were normalized to the size of
 97 the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents
 98 anterior/lateral.



101 **Fig.16S** Femoral rollback pattern for specimen 15 observed during passive flexion (10°
 102 – 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective
 103 centers of the medial and lateral femoral condyles. Data were normalized to the size of
 104 the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents
 105 anterior/lateral.



106
 107 **Fig.17S** Femoral rollback pattern for specimen 16 observed during passive flexion (10°
 108 – 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective
 109 centers of the medial and lateral femoral condyles. Data were normalized to the size of
 110 the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents
 111 anterior/lateral.



112 **Fig.18S** Femoral rollback pattern for specimen 17 observed during passive flexion (10°
 113 – 120°) and loaded squatting motion (35° – 100°). Solid dots represent the respective
 114 centers of the medial and lateral femoral condyles. Data were normalized to the size of
 115 the specimen's tibial plateau. -0.5 represents posterior/medial and 0.5 represents
 116 anterior/lateral.

118