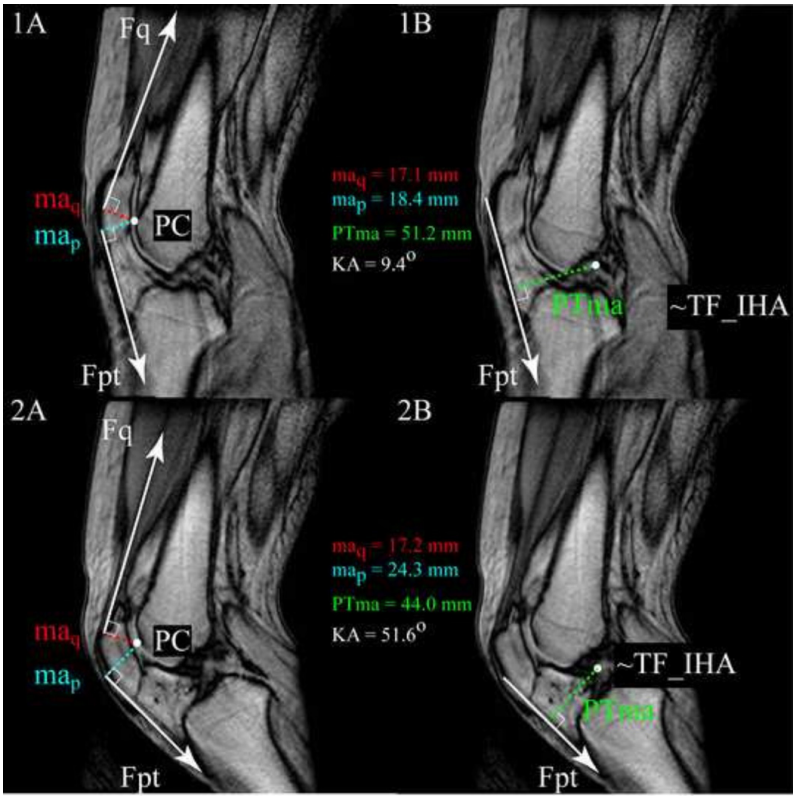
Link used for Moment Arm ratio of Patellar Tendon Force to Quadriceps force about the patellofemoral joint: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4662057/



Link used for finding moment arm of patellar tendon force about tibiofemoral joint: https://me.queensu.ca/People/Deluzio/JAM/files/6.26.2009_Stacey.pdf

Table 1
Maximum patella tendon moment arm length, the angular position where it occurs and method of calculation as reported in the literature (M: male, F: female)

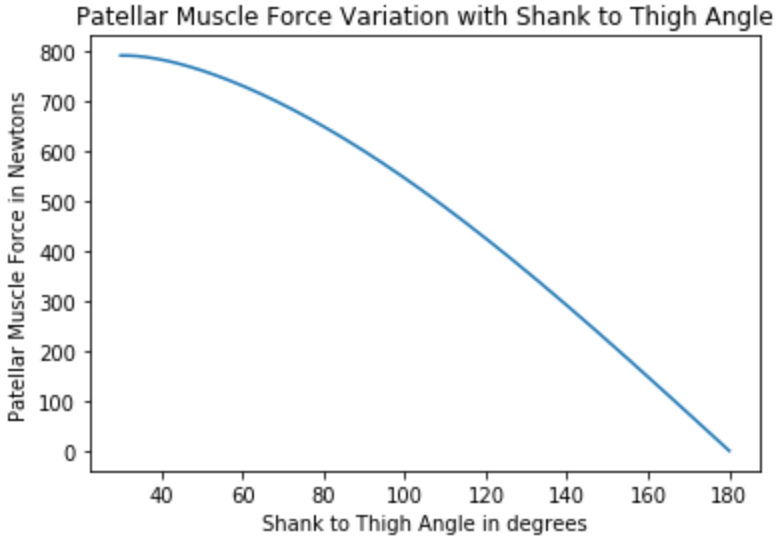
	n	Age	Height (m)	Body mass (kg)		Peak moment arm (mm)	Knee flexion angle (deg)	Method
Smidt (1973)	26	28	1.76	82	In vivo	49	30	ICR
Krevolin et al. (2004)	6	–	–	–	In vitro	51.9	45	ISA
Imran et al. (2000)	–	–	–	–	2D-model	54	30	IP
Gill and O'Connor (1996)	–	–	–	–	2D-model	41.9	~120	IP
Baltzopoulos (1995)	5	20.8 (SD 3. 9)	1.79 (SD 0.03)	79 (SD 7.2)	In vivo	39.87	45	TFCP
Kellis and Baltzopoulos (1999)	10	23 (SD 1.5)	1.74 (SD 0.04)	74 (SD 3.8)	In vivo	42.6	45	TFCP
Nisell et al. (1986) M	10	27	1.82	75	In vivo	46.2	60	TFCP
Nisell et al. (1986) F	10	23	1.67	59	In vivo	37.9	60	TFCP
Wretenberg et al. (1996) M	10	29 (SD 5)	1.81 (SD 0.06)	79 (SD 7.8)	In vivo	50.8	0	TFCP
Wretenberg et al. (1996) F	7	25 (SD 5)	1.65 (SD 0.03)	60 (SD 6.7)	In vivo	47.1	30	TFCP
Herzog and Read (1993)	5	79.2	–	–	In vitro	52.8	30	TFCP
Lindahl and Movin (1967)	15	–	–	–	In vivo	48	30	TFCP
Yamaguchi and Zazac (1989)	–	–	–	–	2D-model	43	40	TFCP
Lu and O'Connor (1996)	–	–	–	–	2D-model	47.9	40	TFCP
Buford et al. (1997)	15	55.9	–	–	In vitro	51.1	0	TE

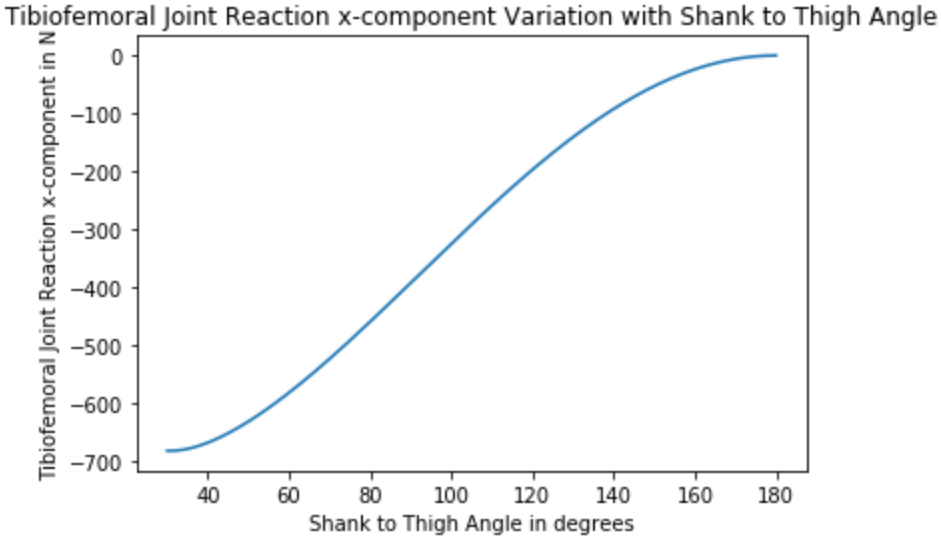
The computations were performed for 1500 steps in a python notebook and it can be found in the link below:
https://github.com/tarunprasadoff/College/blob/master/MOHM/MOHM%20Endsem%20Question%204.ipynb

Some of the computed Values:

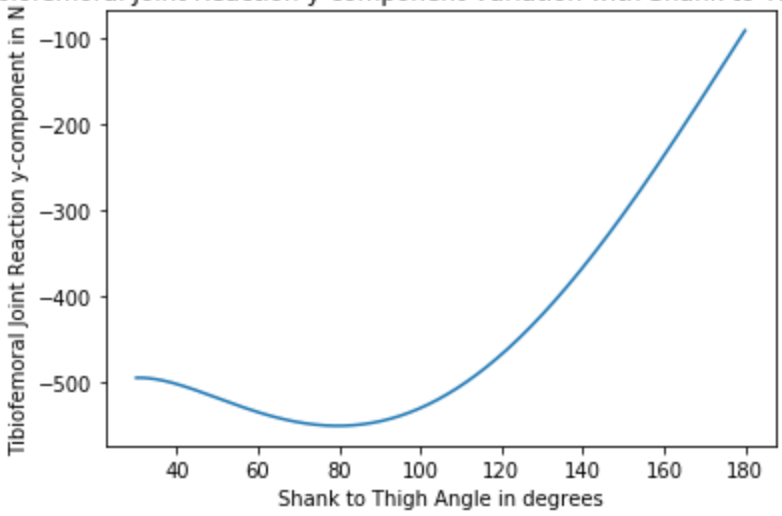
	phi	MFP	Jx	Jy	Jm	Qx	Qy	Qm
0	30.000000	7.920383e+02	-6.808197e+02	-495.831551	842.237714	1.533002e+03	4.156011e+02	1.588339e+03
1	30.100067	7.920551e+02	-6.808485e+02	-495.815897	842.251765	1.533067e+03	4.140670e+02	1.588001e+03
2	30.200133	7.920692e+02	-6.808729e+02	-495.802630	842.263671	1.533122e+03	4.125397e+02	1.587656e+03
3	30.300200	7.920809e+02	-6.808929e+02	-495.791728	842.273453	1.533167e+03	4.110194e+02	1.587305e+03
4	30.400267	7.920900e+02	-6.809086e+02	-495.783172	842.281129	1.533202e+03	4.095058e+02	1.586948e+03
5	30.500334	7.920967e+02	-6.809201e+02	-495.776941	842.286719	1.533228e+03	4.079990e+02	1.586585e+03
6	30.600400	7.921009e+02	-6.809273e+02	-495.773015	842.290240	1.533244e+03	4.064990e+02	1.586216e+03
7	30.700467	7.921027e+02	-6.809303e+02	-495.771375	842.291712	1.533251e+03	4.050056e+02	1.585840e+03
8	30.800534	7.921020e+02	-6.809292e+02	-495.771999	842.291151	1.533249e+03	4.035188e+02	1.585459e+03
9	30.900600	7.920989e+02	-6.809239e+02	-495.774869	842.288578	1.533237e+03	4.020387e+02	1.585071e+03
10	31.000667	7.920935e+02	-6.809145e+02	-495.779963	842.284007	1.533216e+03	4.005651e+02	1.584677e+03
11	31.100734	7.920857e+02	-6.809011e+02	-495.787264	842.277458	1.533185e+03	3.990981e+02	1.584278e+03
12	31.200801	7.920755e+02	-6.808837e+02	-495.796750	842.268947	1.533146e+03	3.976375e+02	1.583873e+03
13	31.300867	7.920631e+02	-6.808622e+02	-495.808403	842.258490	1.533098e+03	3.961834e+02	1.583462e+03
14	31.400934	7.920483e+02	-6.808369e+02	-495.822203	842.246105	1.533041e+03	3.947357e+02	1.583045e+03
15	31.501001	7.920313e+02	-6.808076e+02	-495.838131	842.231807	1.532975e+03	3.932943e+02	1.582622e+03

1485	178.599066	1.041441e+01	-1.177088e-01	-101.511741	101.511809	2.650449e-01	-7.914351e-01	8.346366e-01
1486	178.699133	9.670554e+00	-1.014945e-01	-100.768021	100.768072	2.285352e-01	-7.349454e-01	7.696578e-01
1487	178.799199	8.926694e+00	-8.648106e-02	-100.024275	100.024312	1.947295e-01	-6.784465e-01	7.058394e-01
1488	178.899266	8.182827e+00	-7.266855e-02	-99.280504	99.280531	1.636278e-01	-6.219391e-01	6.431037e-01
1489	178.999333	7.438954e+00	-6.005698e-02	-98.536712	98.536730	1.352303e-01	-5.654239e-01	5.813703e-01
1490	179.099400	6.695075e+00	-4.864639e-02	-97.792898	97.792910	1.095371e-01	-5.089017e-01	5.205567e-01
1491	179.199466	5.951191e+00	-3.843682e-02	-97.049067	97.049074	8.654822e-02	-4.523731e-01	4.605779e-01
1492	179.299533	5.207302e+00	-2.942831e-02	-96.305219	96.305223	6.626374e-02	-3.958388e-01	4.013468e-01
1493	179.399600	4.463409e+00	-2.162087e-02	-95.561357	95.561359	4.868373e-02	-3.392996e-01	3.427745e-01
1494	179.499666	3.719513e+00	-1.501454e-02	-94.817483	94.817484	3.380824e-02	-2.827562e-01	2.847702e-01
1495	179.599733	2.975614e+00	-9.609325e-03	-94.073598	94.073599	2.163732e-02	-2.262092e-01	2.272417e-01
1496	179.699800	2.231712e+00	-5.405255e-03	-93.329706	93.329706	1.217102e-02	-1.696594e-01	1.700954e-01
1497	179.799867	1.487809e+00	-2.402339e-03	-92.585807	92.585807	5.409348e-03	-1.131074e-01	1.132367e-01
1498	179.899933	7.439049e-01	-6.005851e-04	-91.841905	91.841905	1.352338e-03	-5.655406e-02	5.657023e-02
1499	180.000000	5.642105e-14	-3.454793e-30	-91.098000	91.098000	7.172230e-30	-4.289319e-15	4.289319e-15

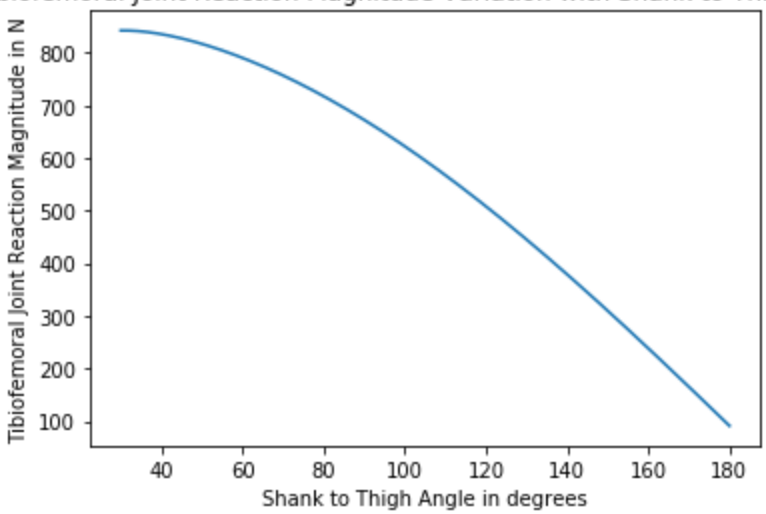

Patellar Muscle Force Variation with Shank to Thigh Angle
Patellar Muscle Force in Newtons
800
700
600
500
400
300
200
100
0
40
60
80
100
120
140
160
180
Shank to Thigh Angle in degrees


Tibiofemoral Joint Reaction x-component Variation with Shank to Thigh Angle
Tibiofemoral Joint Reaction x-component in N
0
−100
−200
−300
−400
−500
−600
−700
40
60
80
100
120
140
160
180
Shank to Thigh Angle in degrees

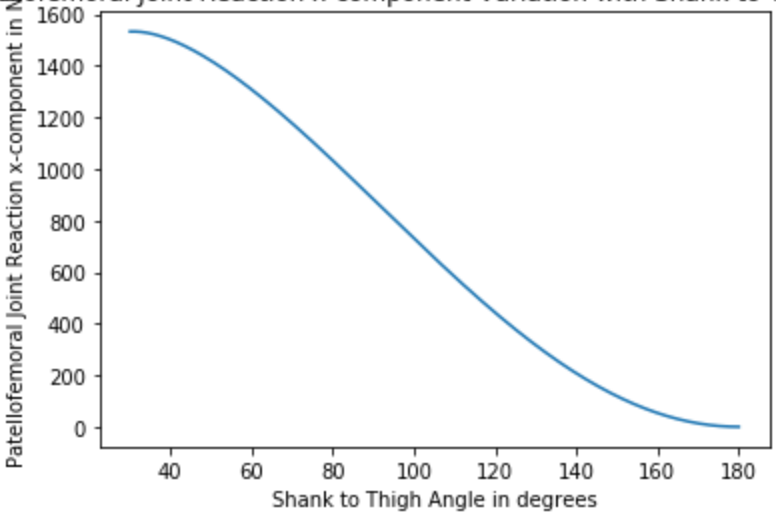
Tibiofemoral Joint Reaction y-component Variation with Shank to Thigh Angle



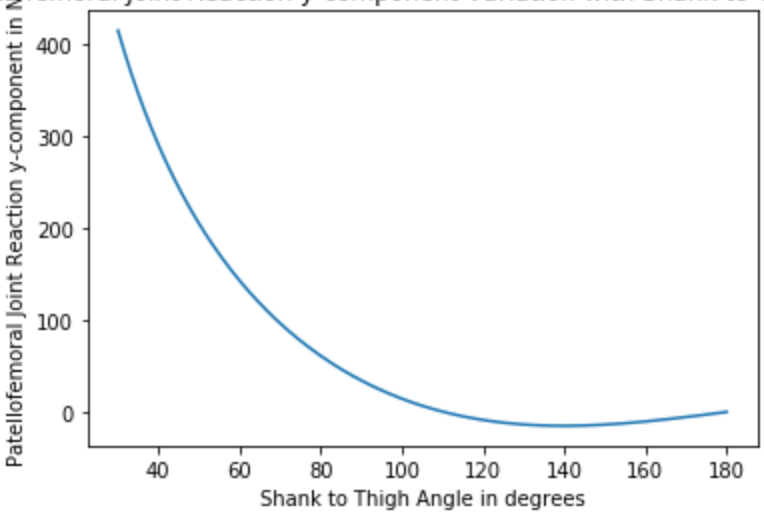
Tibiofemoral Joint Reaction Magnitude Variation with Shank to Thigh Angle



Patellofemoral Joint Reaction x-component Variation with Shank to Thigh Angle



Patellofemoral Joint Reaction y-component Variation with Shank to Thigh Angle



Patellofemoral Joint Reaction Magnitude Variation with Shank to Thigh Angle