

Validation of converted gait2354 model

The converted MJC model has been tested under the three categories below and with the accuracy of:

- Step 1: XML Conversion Validation

Check multi-body forward kinematics (using endpoints), approximation of custom/coupling joints & conditional/moving path points

Mean error:nan cm; std: nan cm

- Step 2: Muscle Kinematics Validation

Check muscle moment arms as indication how muscle wrap over joints

Mean error:0.2583 cm; std: 0.5249 cm

- Step 3: Muscle Kinetic Validation

Check muscle force-length relationship as indication of how similar of them in generating forces

Mean error:0.2044 Fmax; std: 0.3943 Fmax

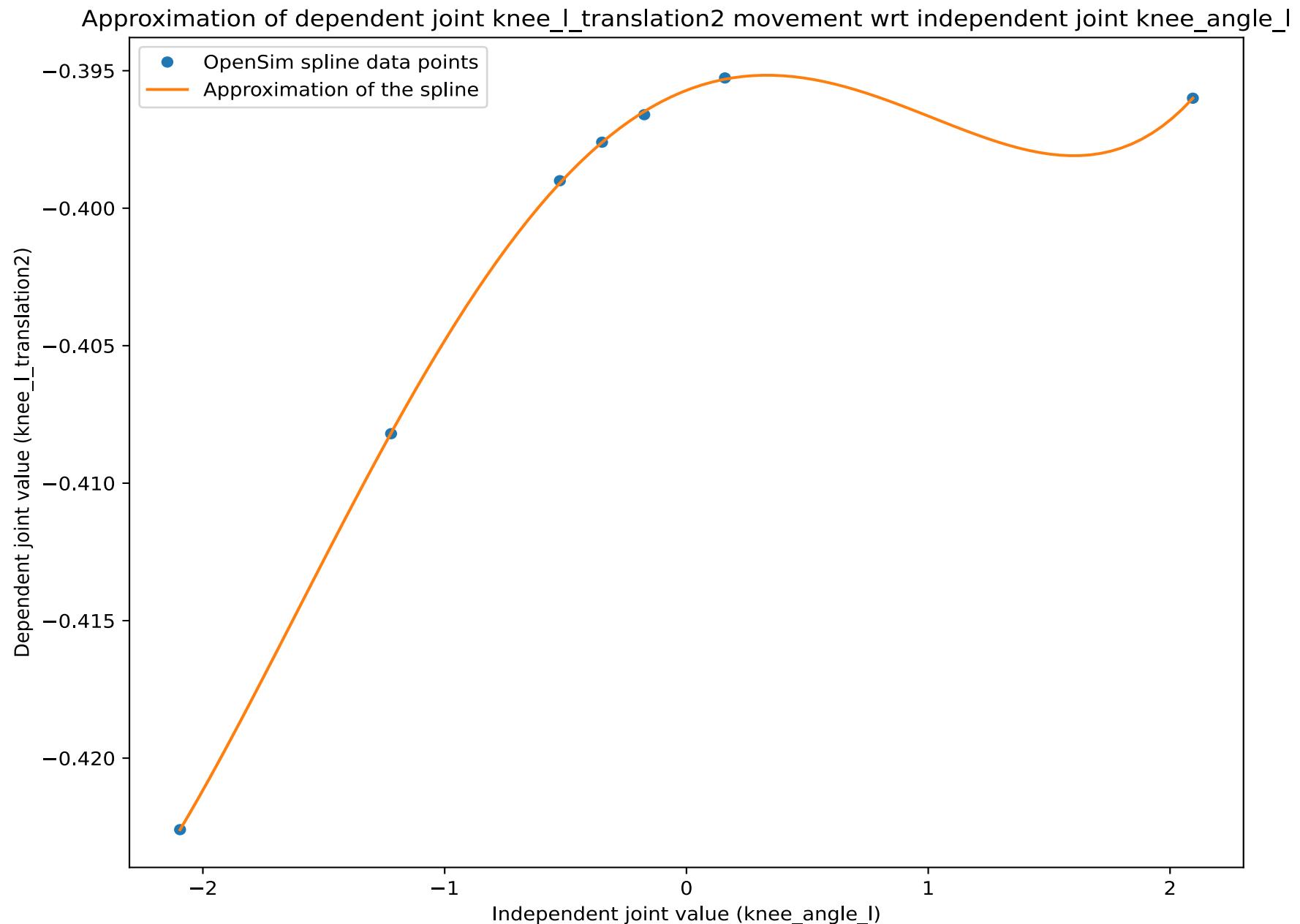
Step 1: xml Conversion Validation

Randomly pose the model with 10 configurations within the joint limits. In each posture, the endpoints(markers) global locations of Osim and Mjc models are extracted and compared. Box plot of their mean-std errors are plotted together. Individual endpoint differences of these 10 postures are also plotted in the VLT folder, but not included inside this report.

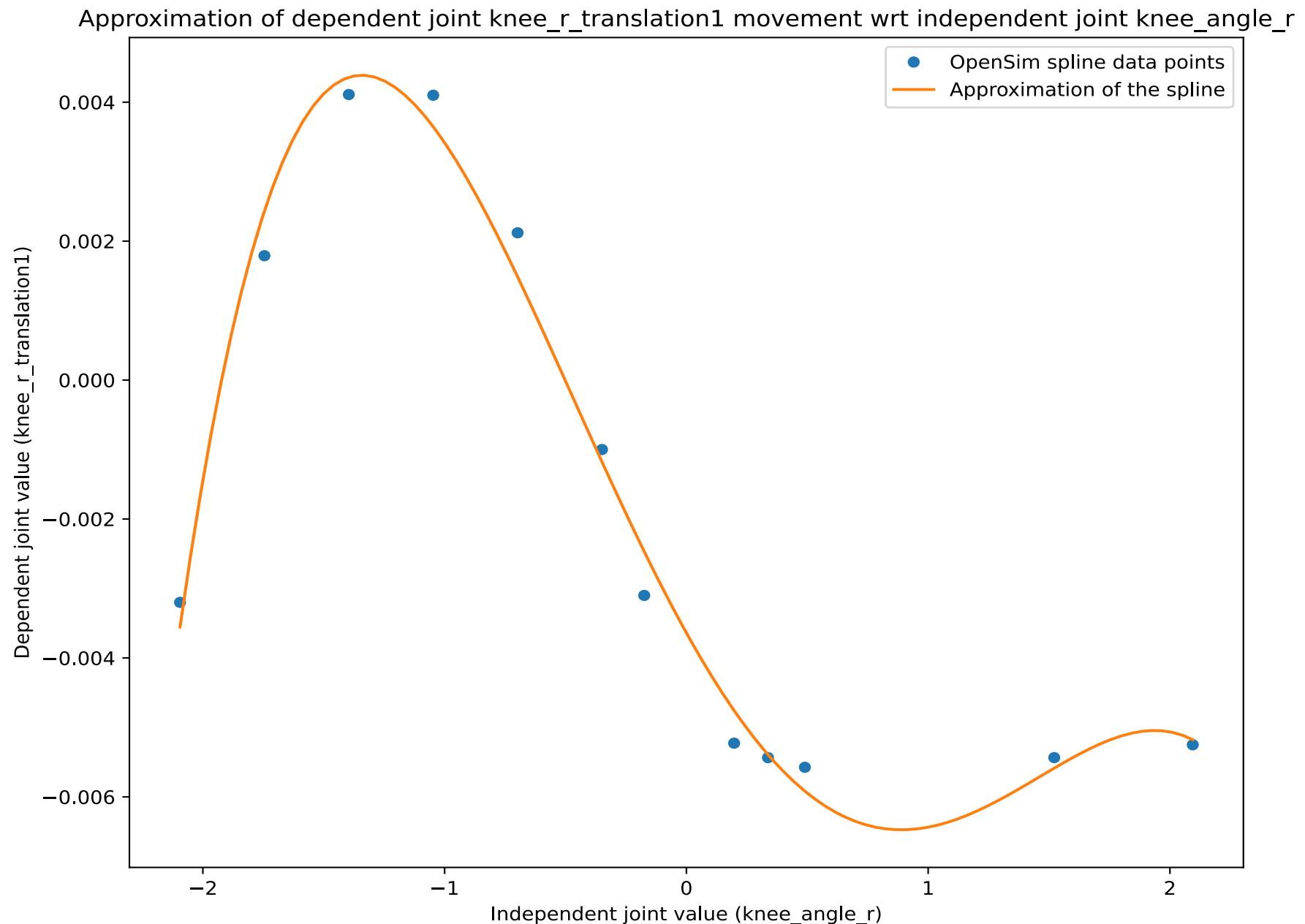
Besides the endpoint check, the approximation of customer joints, coupling joints, conditional/moving path points are plotted and attached. In these plots, blue dots/lines represent their setup in the OpenSim model. Yellow dots/lines represent the approximations in the MuJoCo model.

NO End Points found in the model.

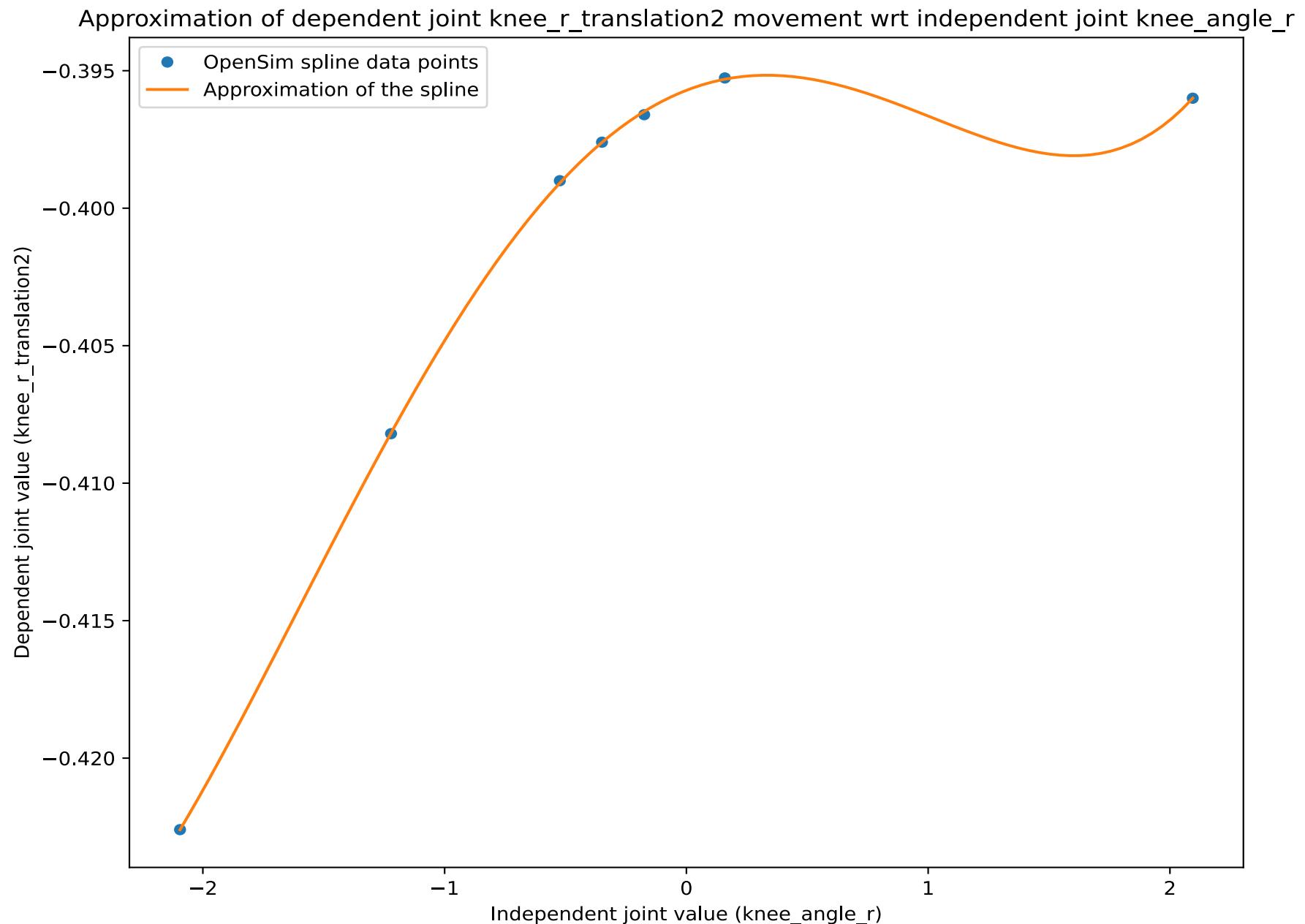
Approximation of custom joints



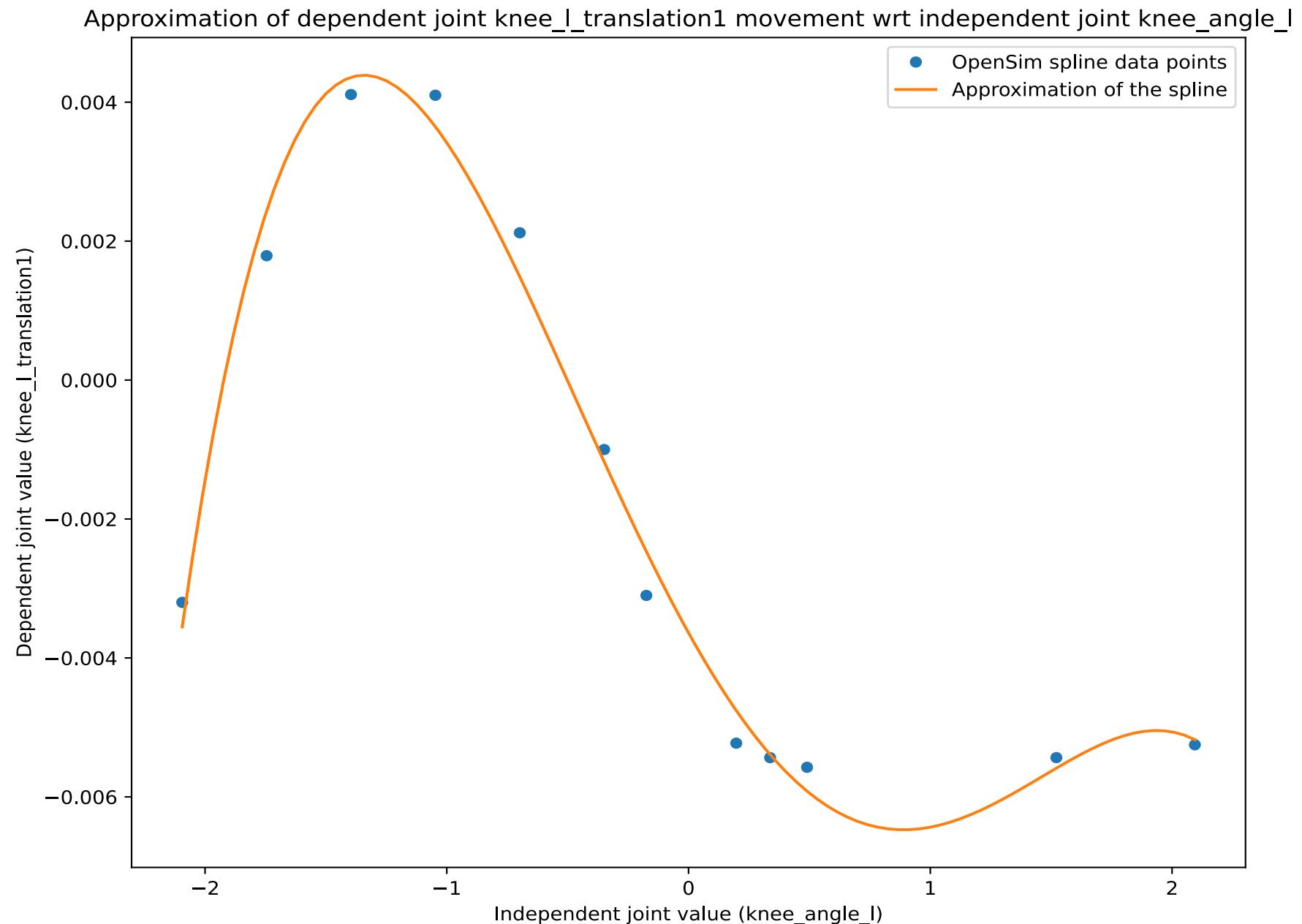
Approximation of custom joints



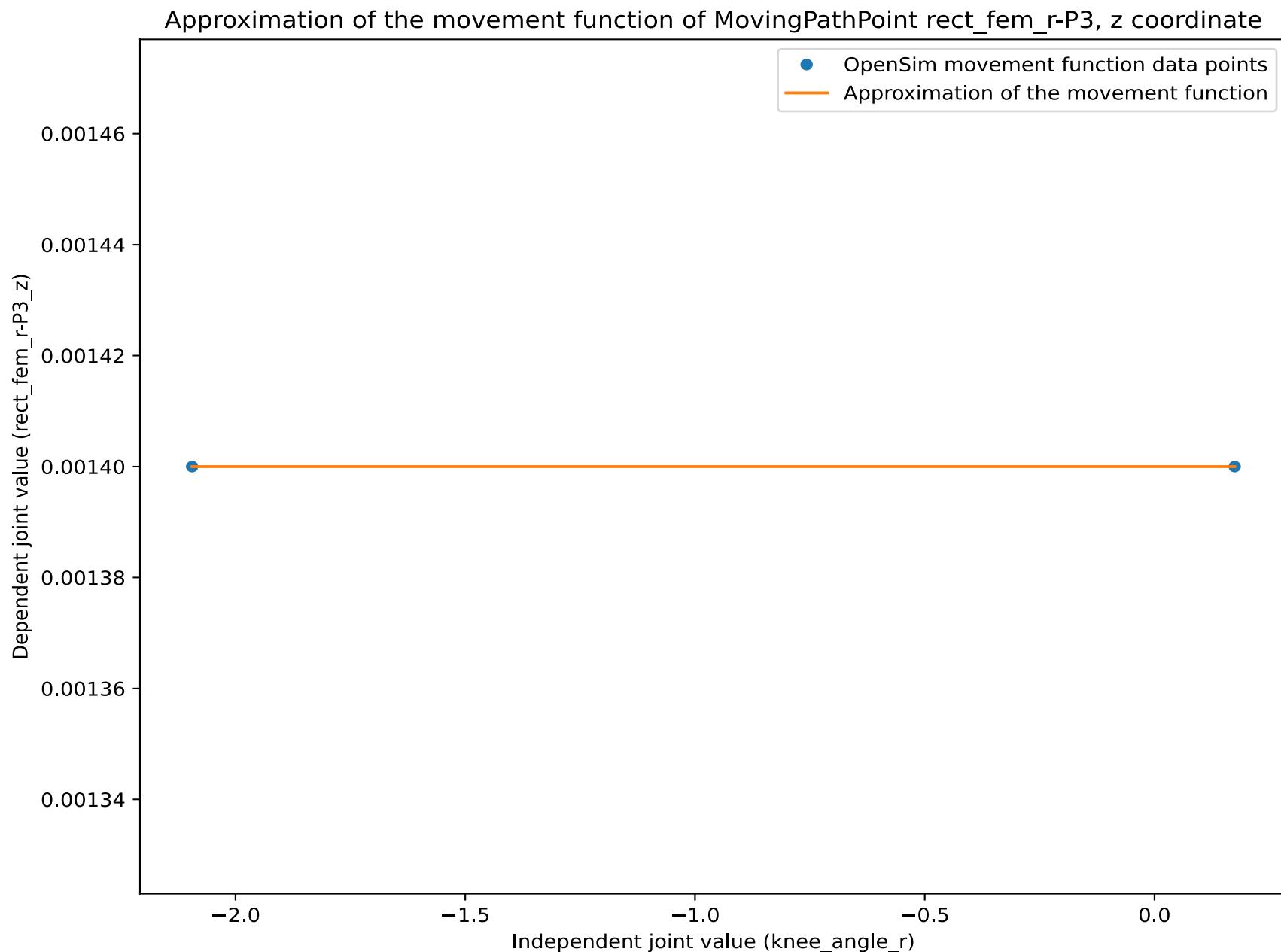
Approximation of custom joints



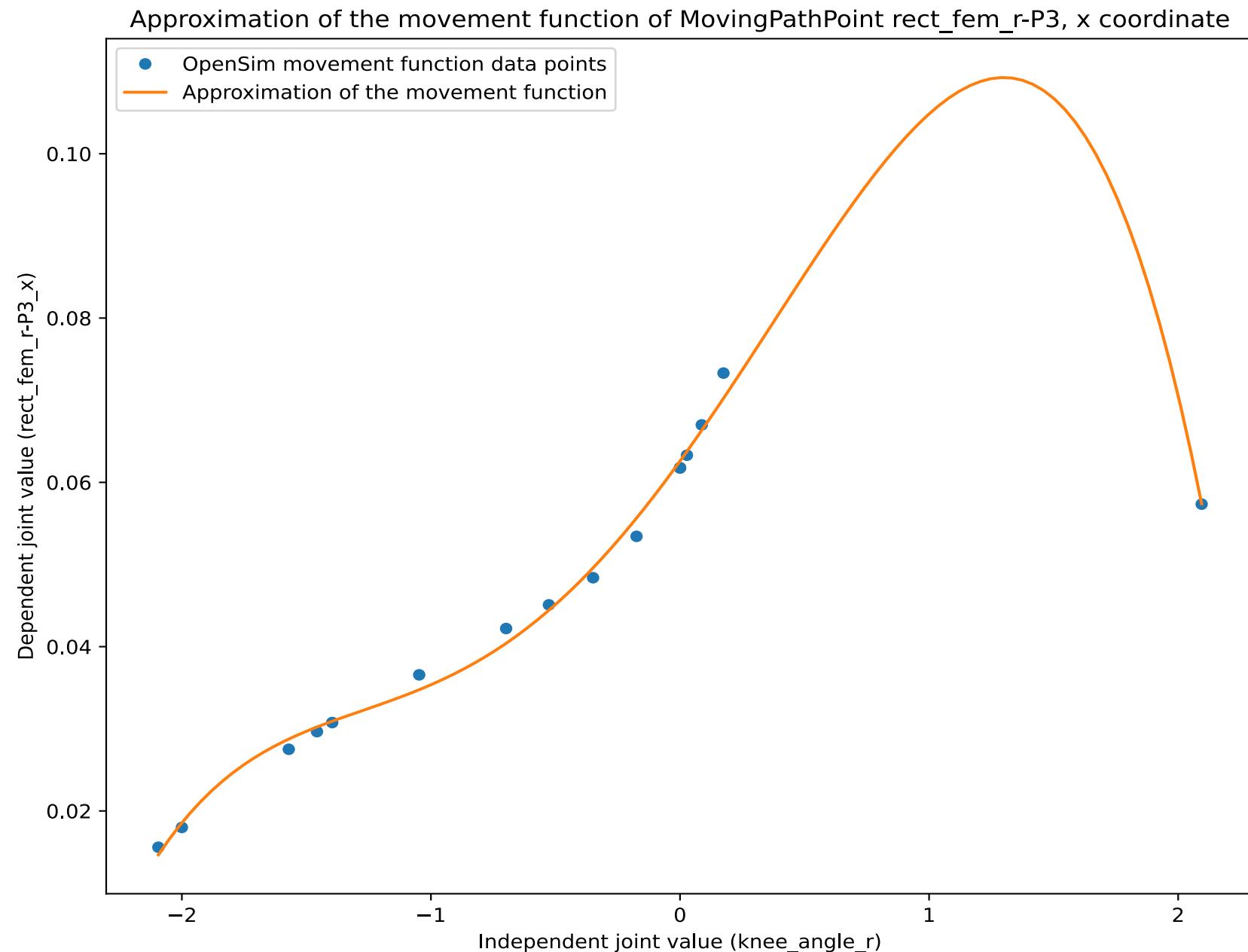
Approximation of custom joints



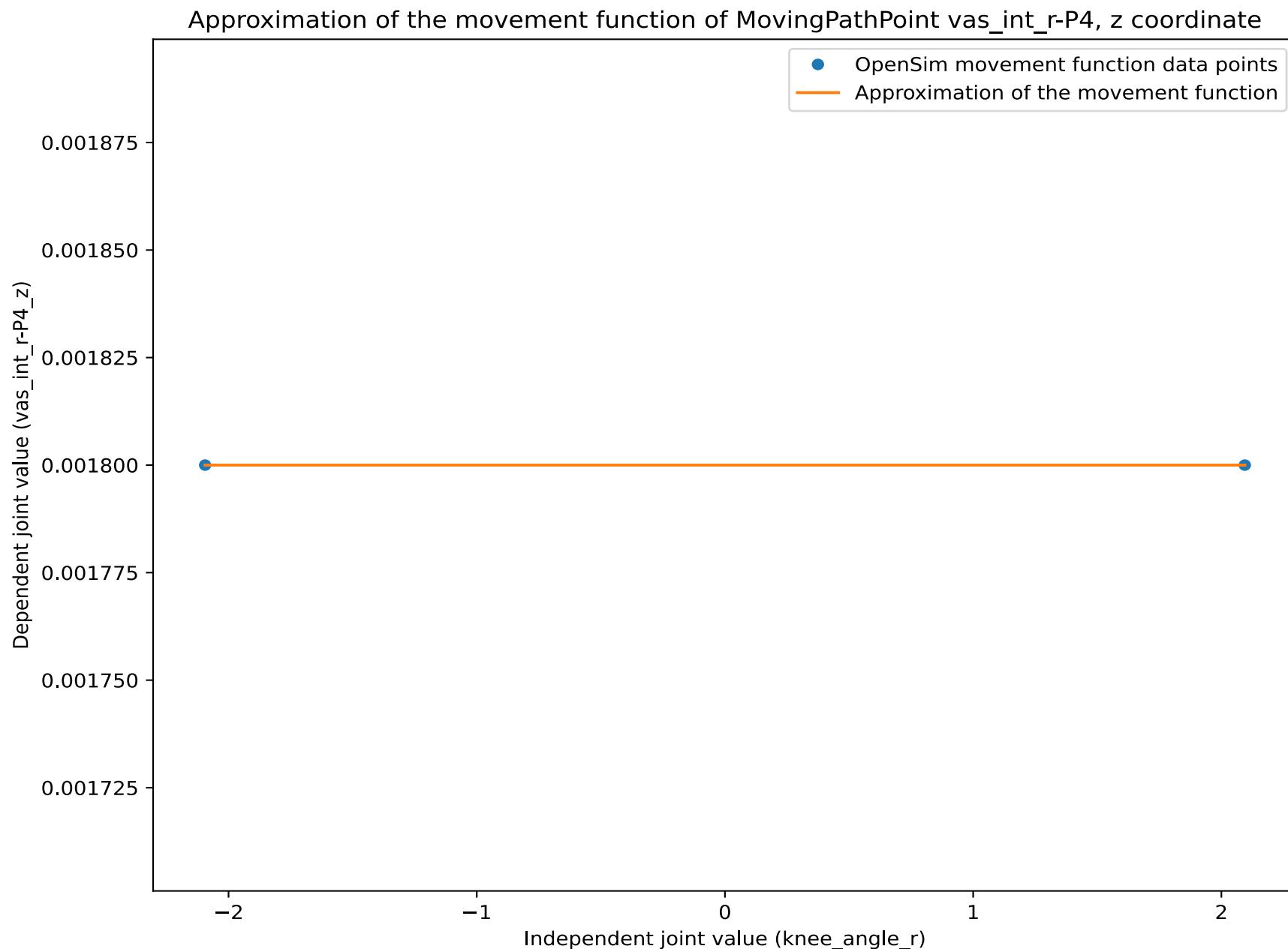
Approximation of moving path points



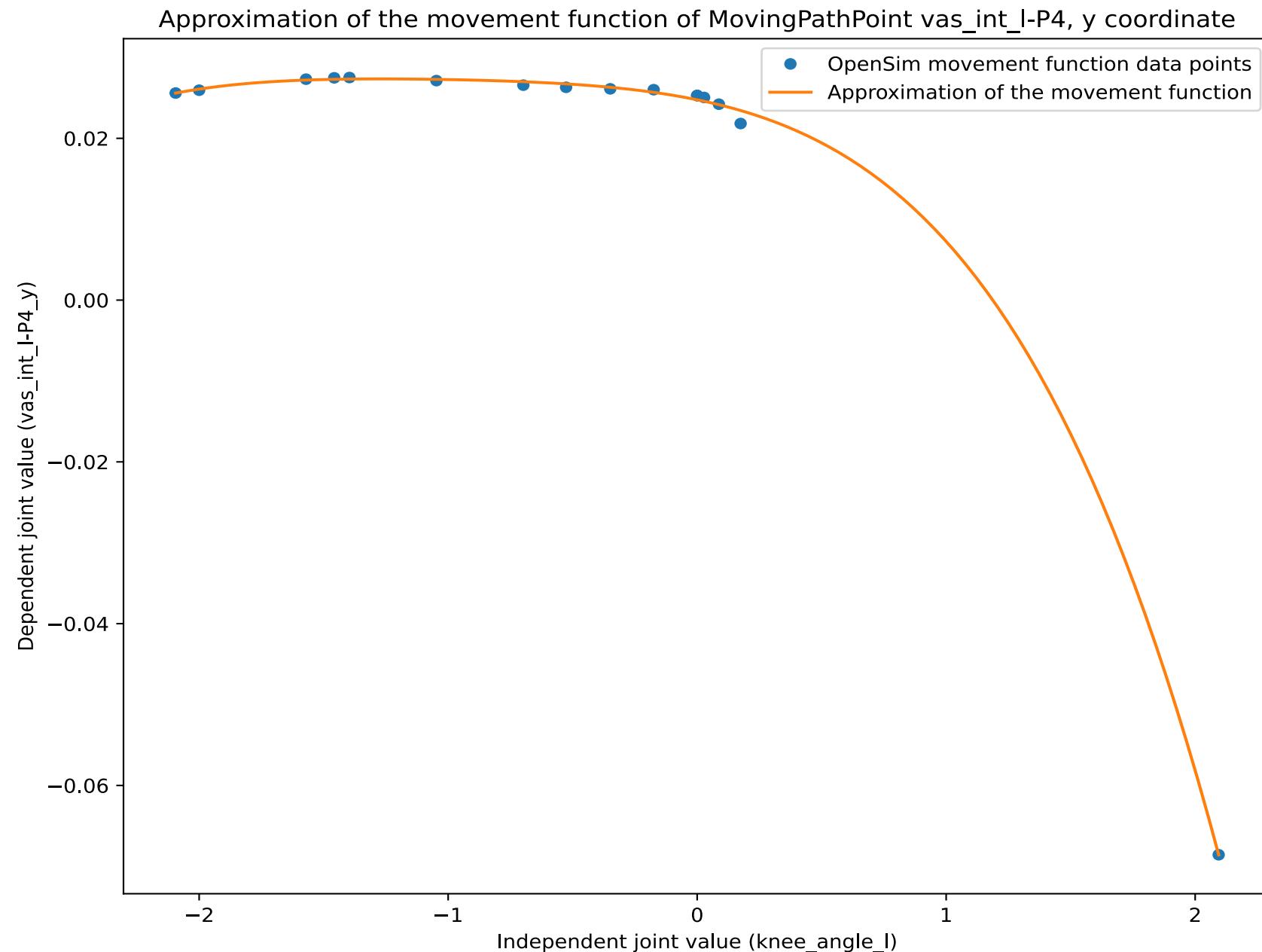
Approximation of moving path points



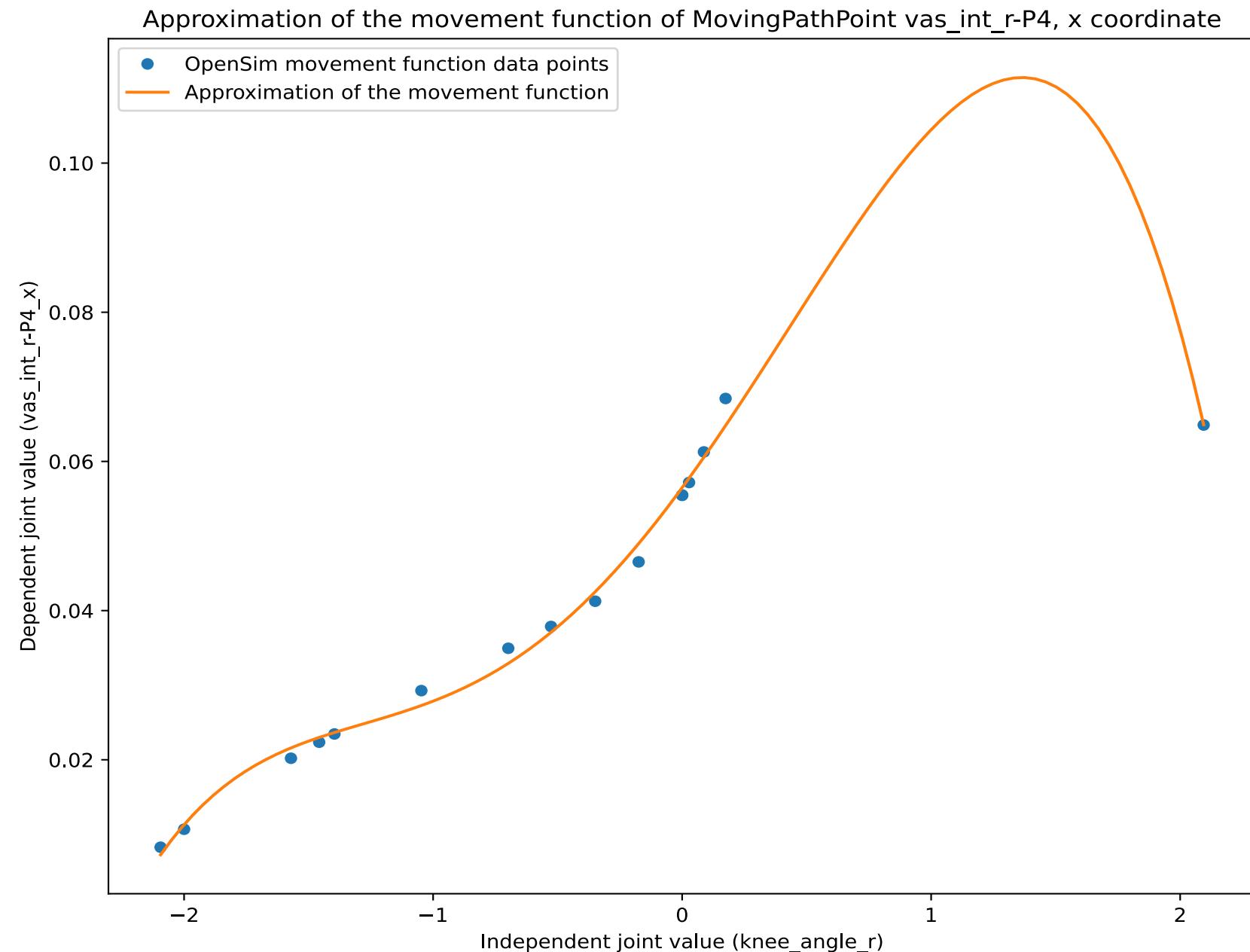
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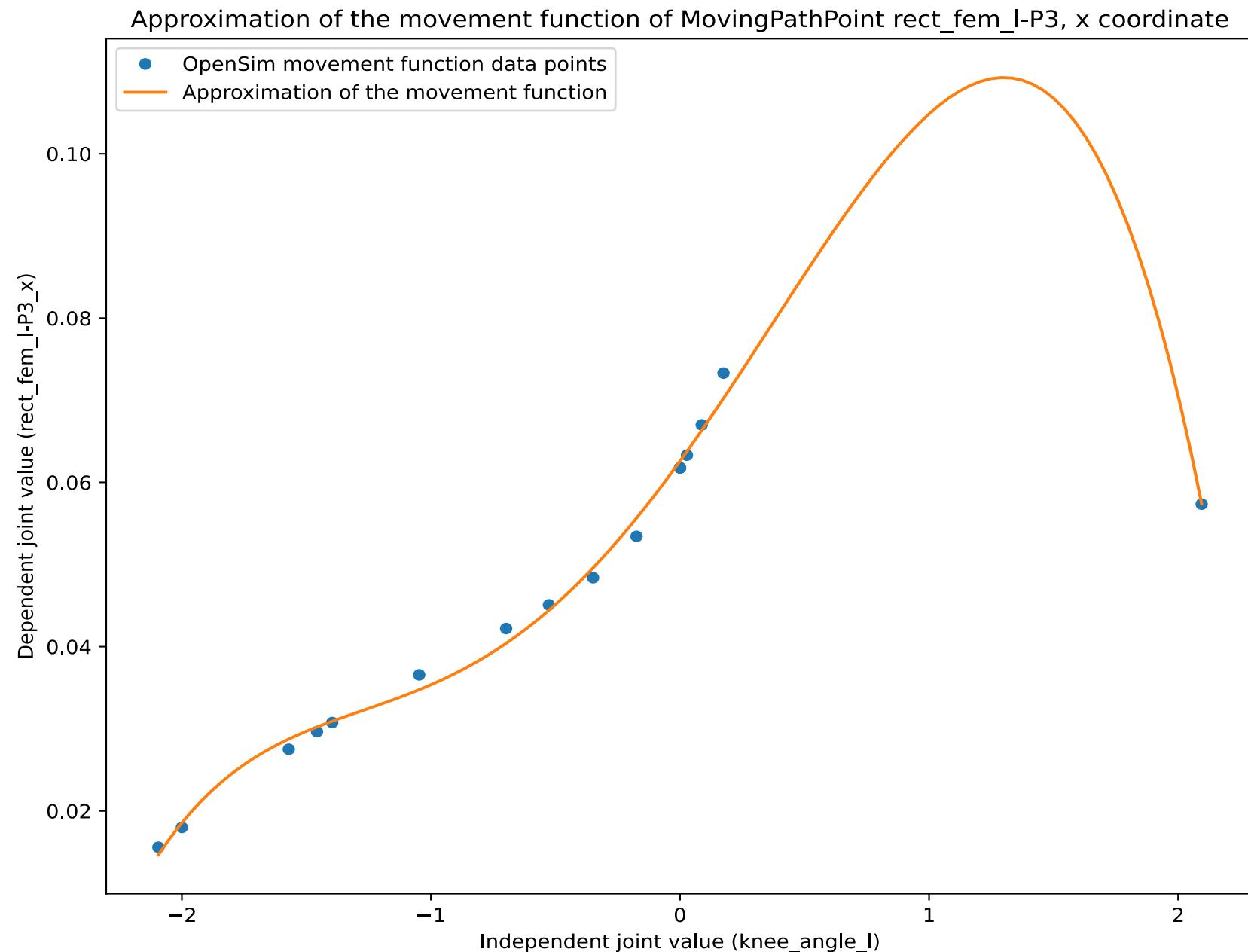
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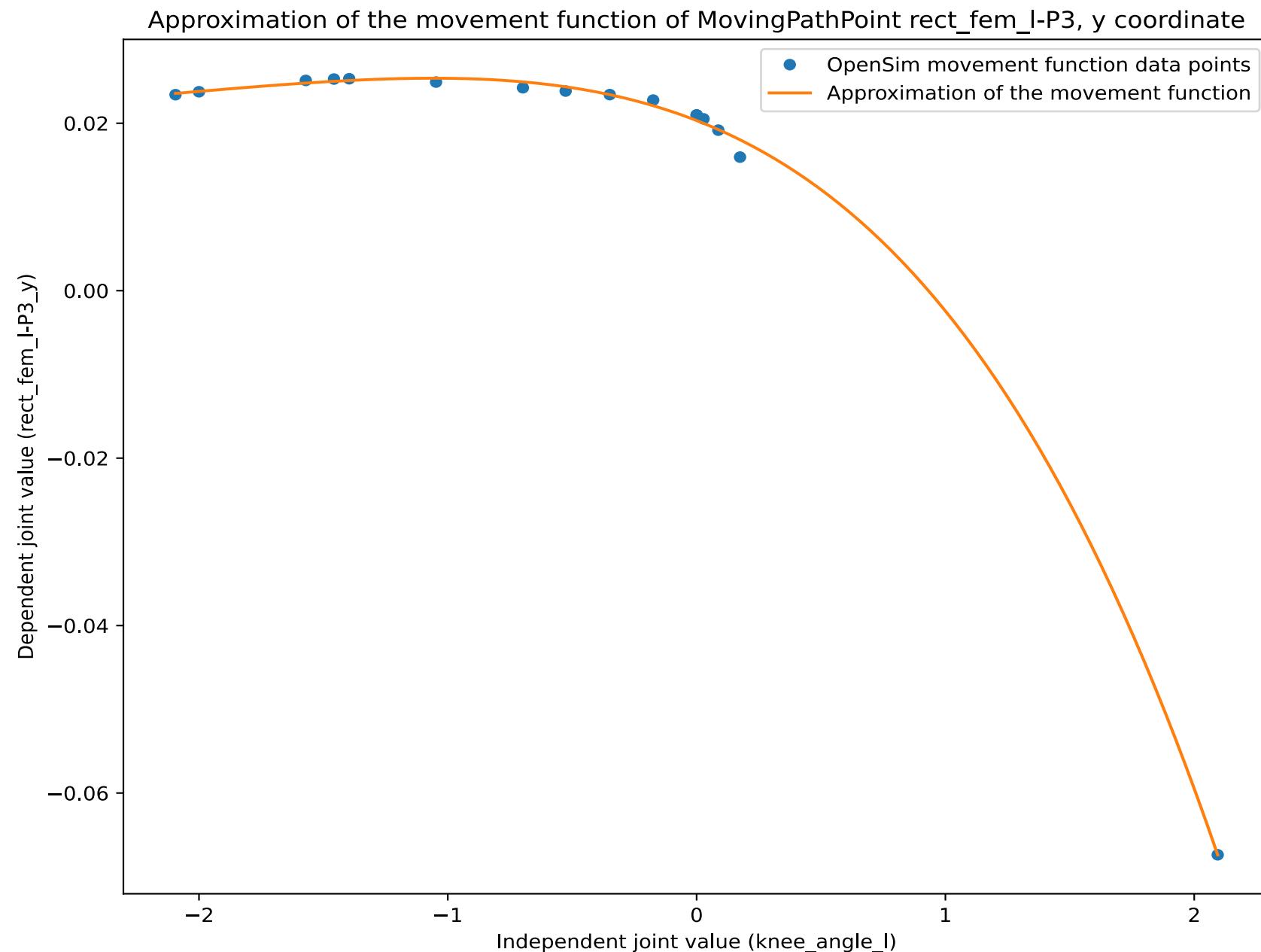
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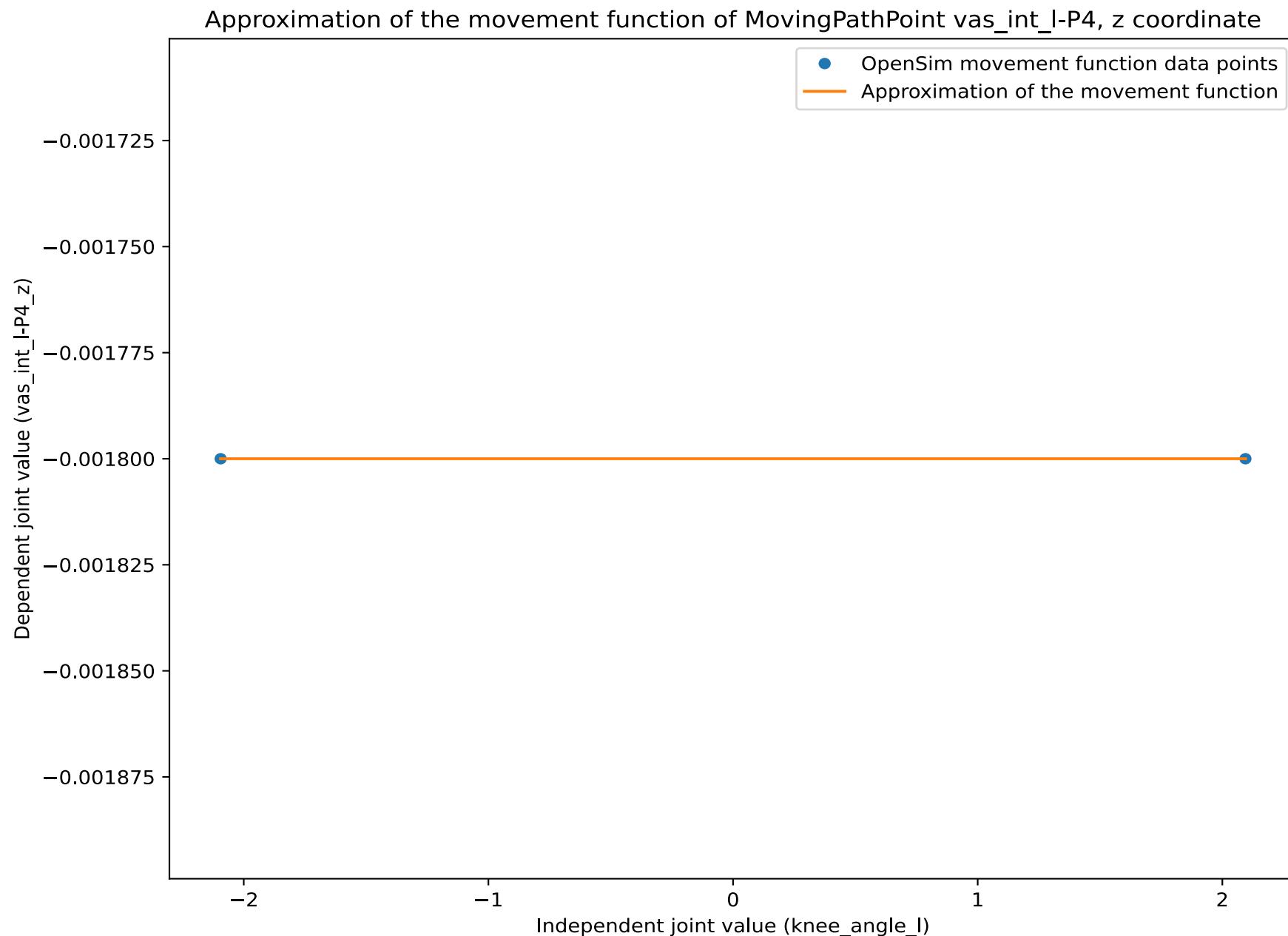
Approximation of moving path points



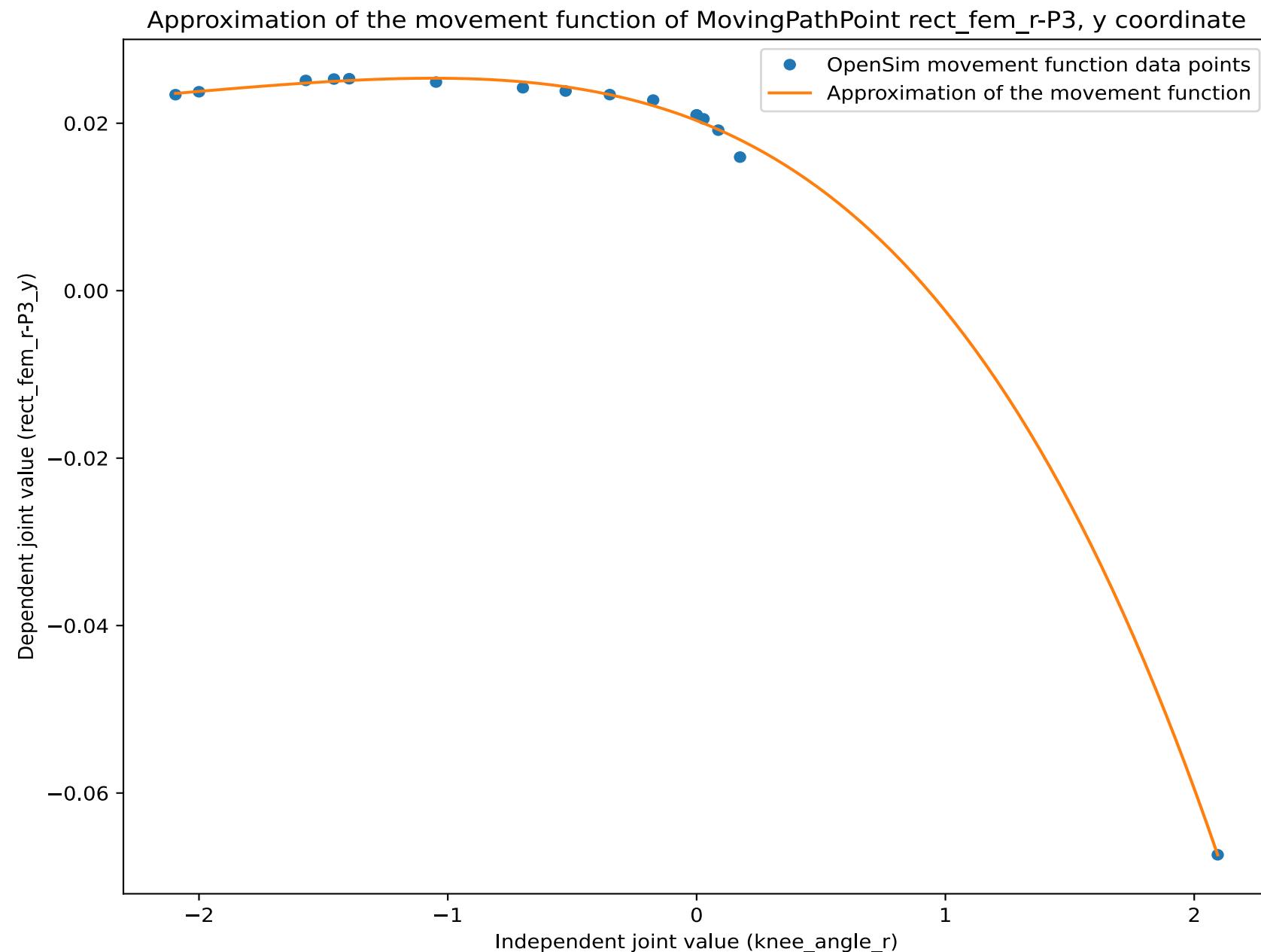
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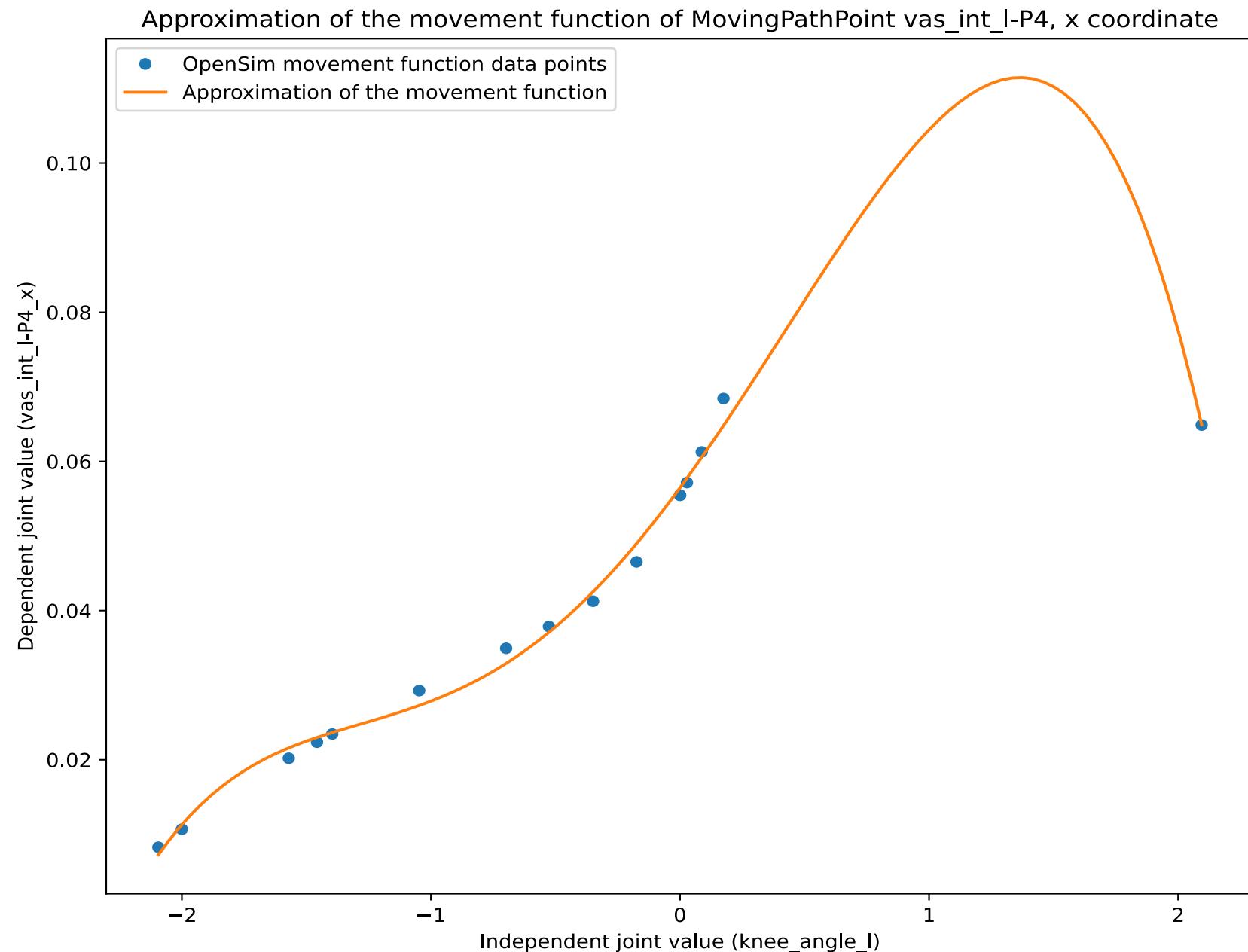
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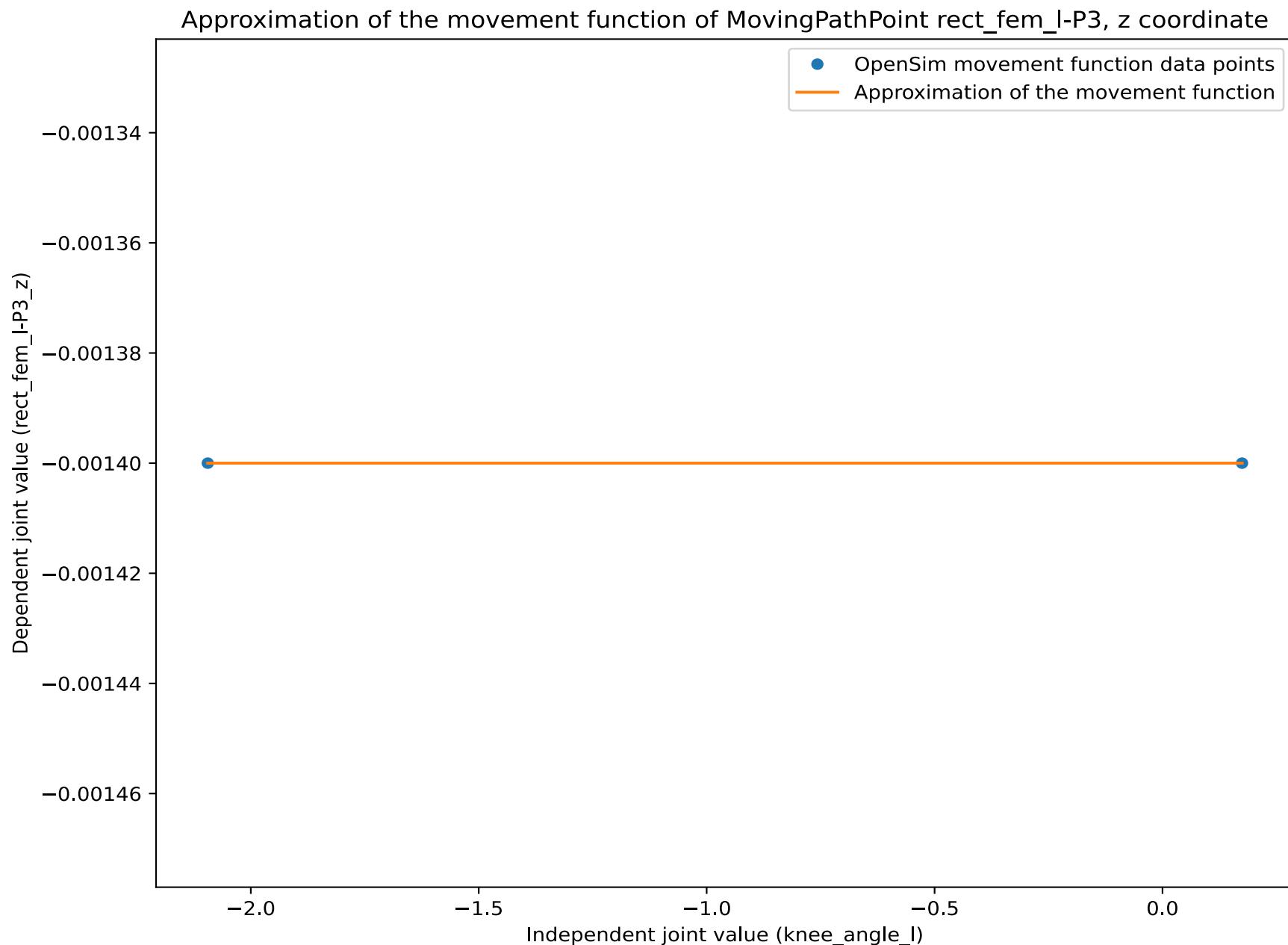
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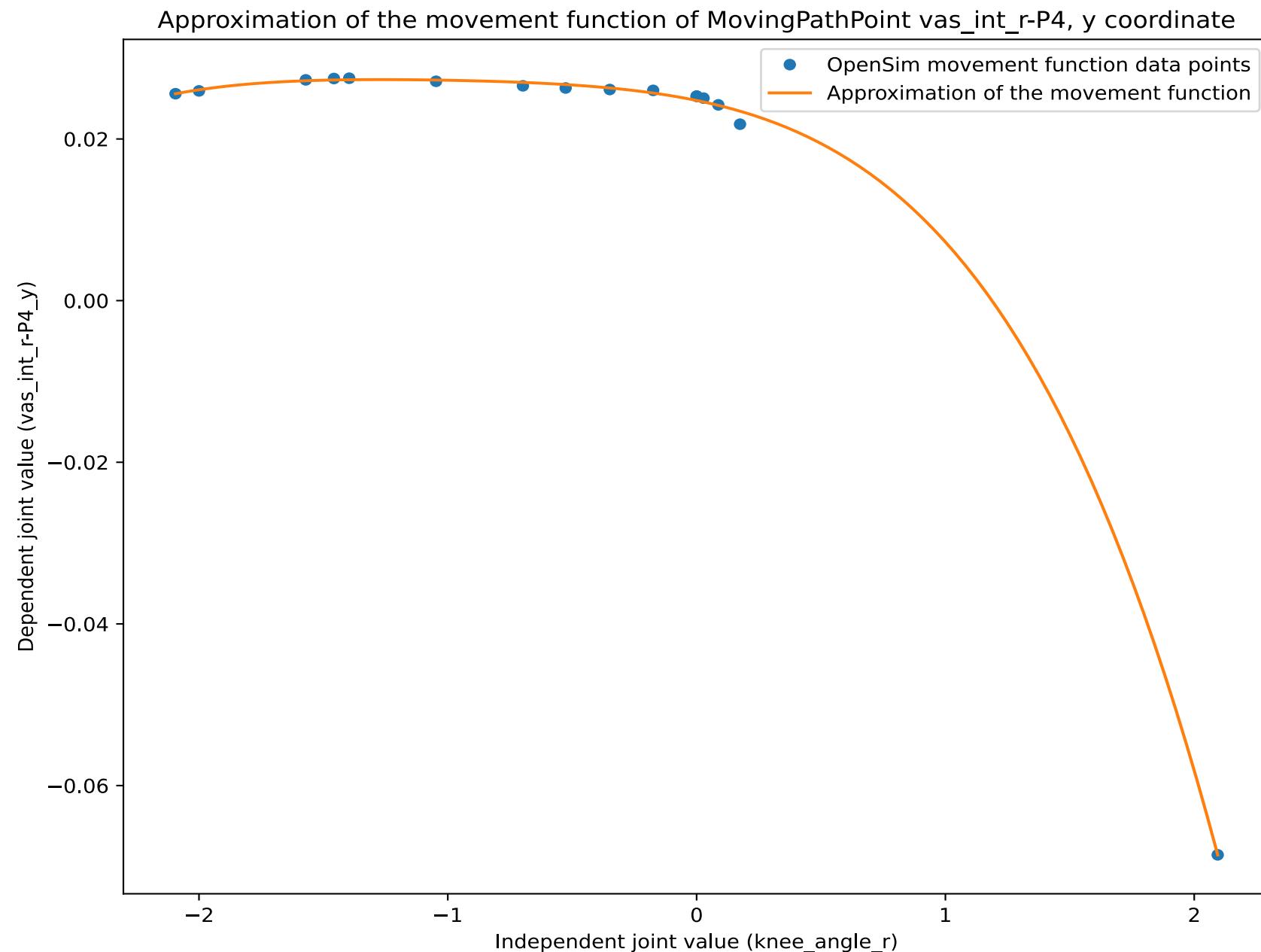
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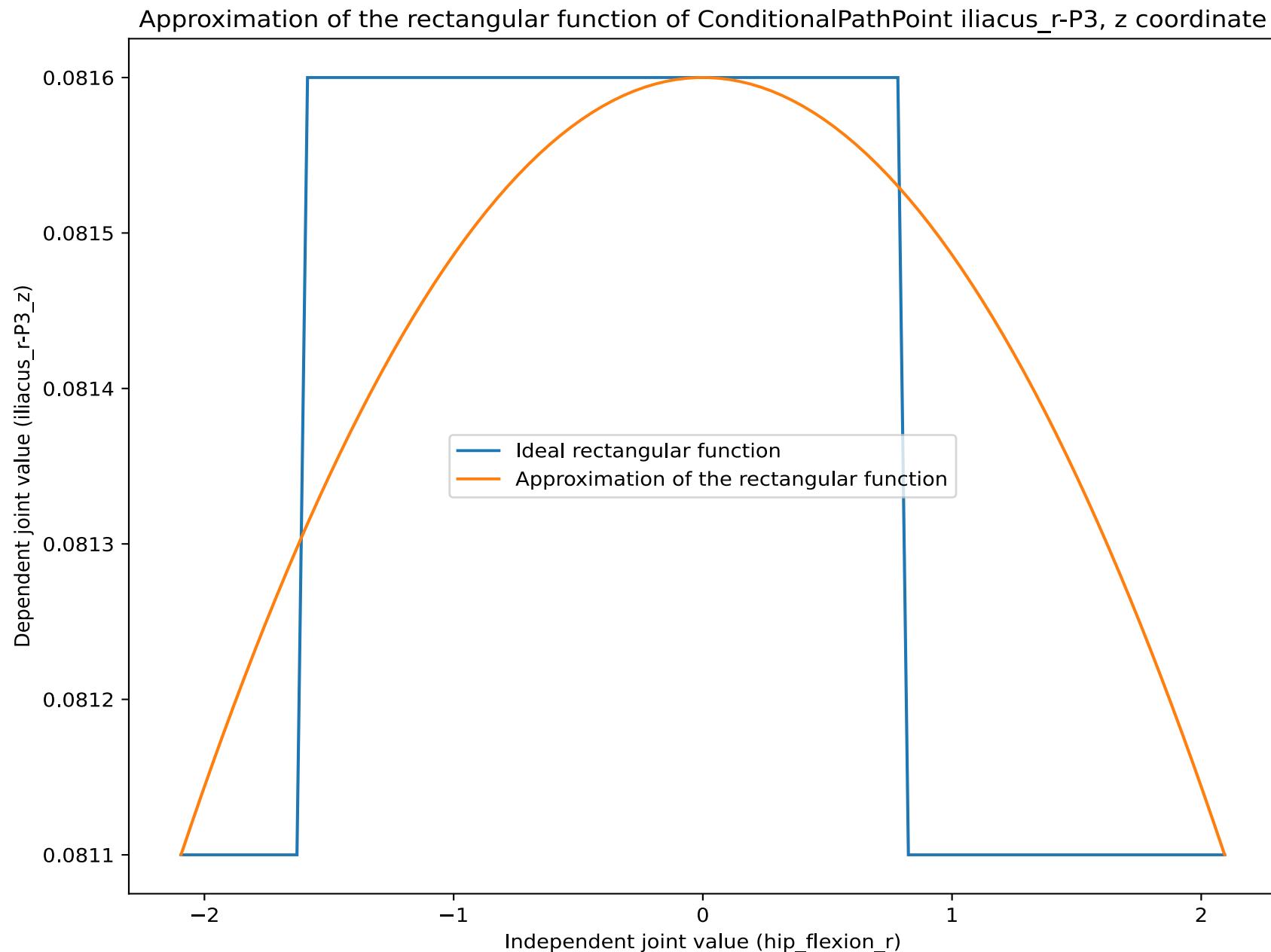
Approximation of moving path points



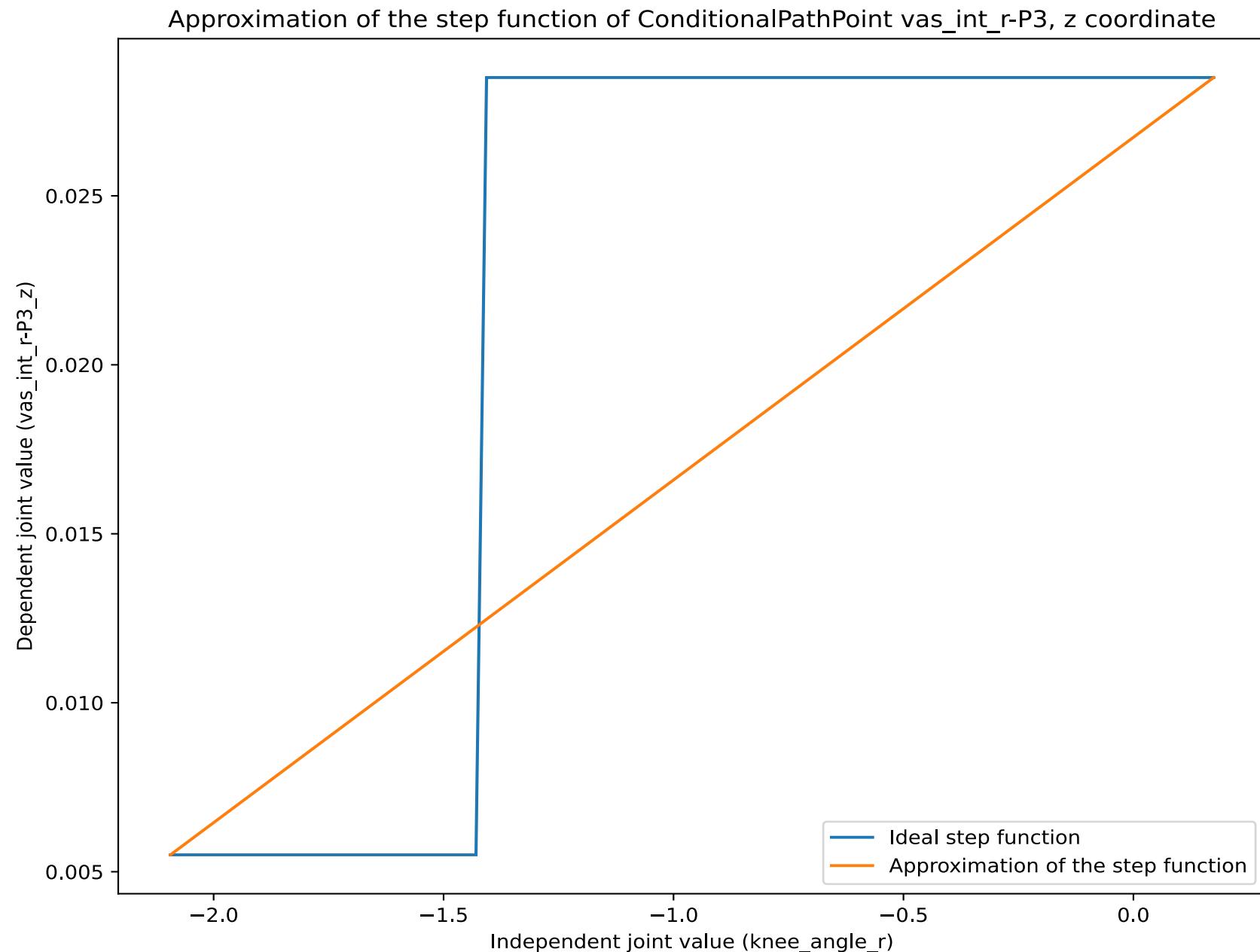
Approximation of moving path points



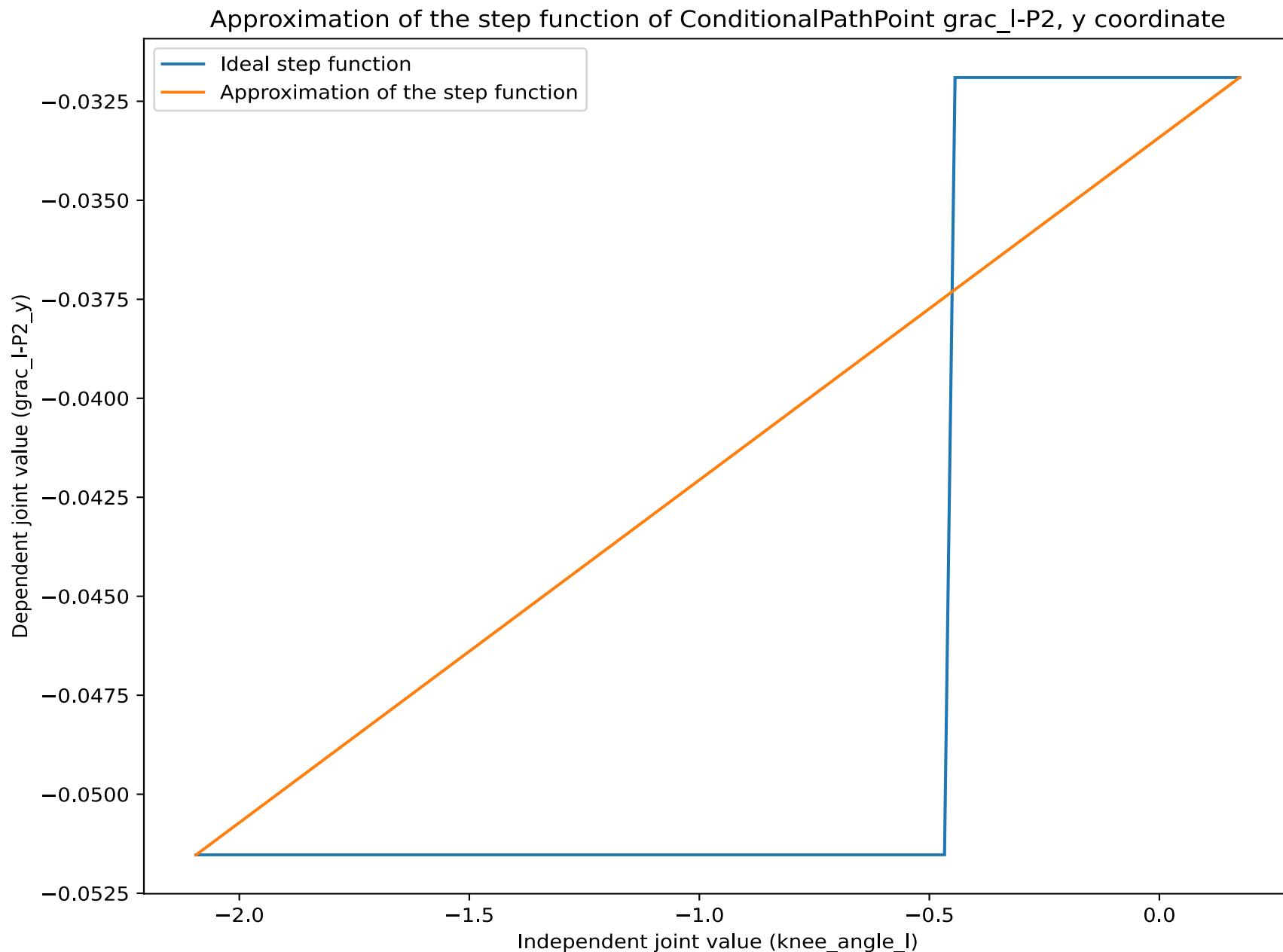
Approximation of conditional path points



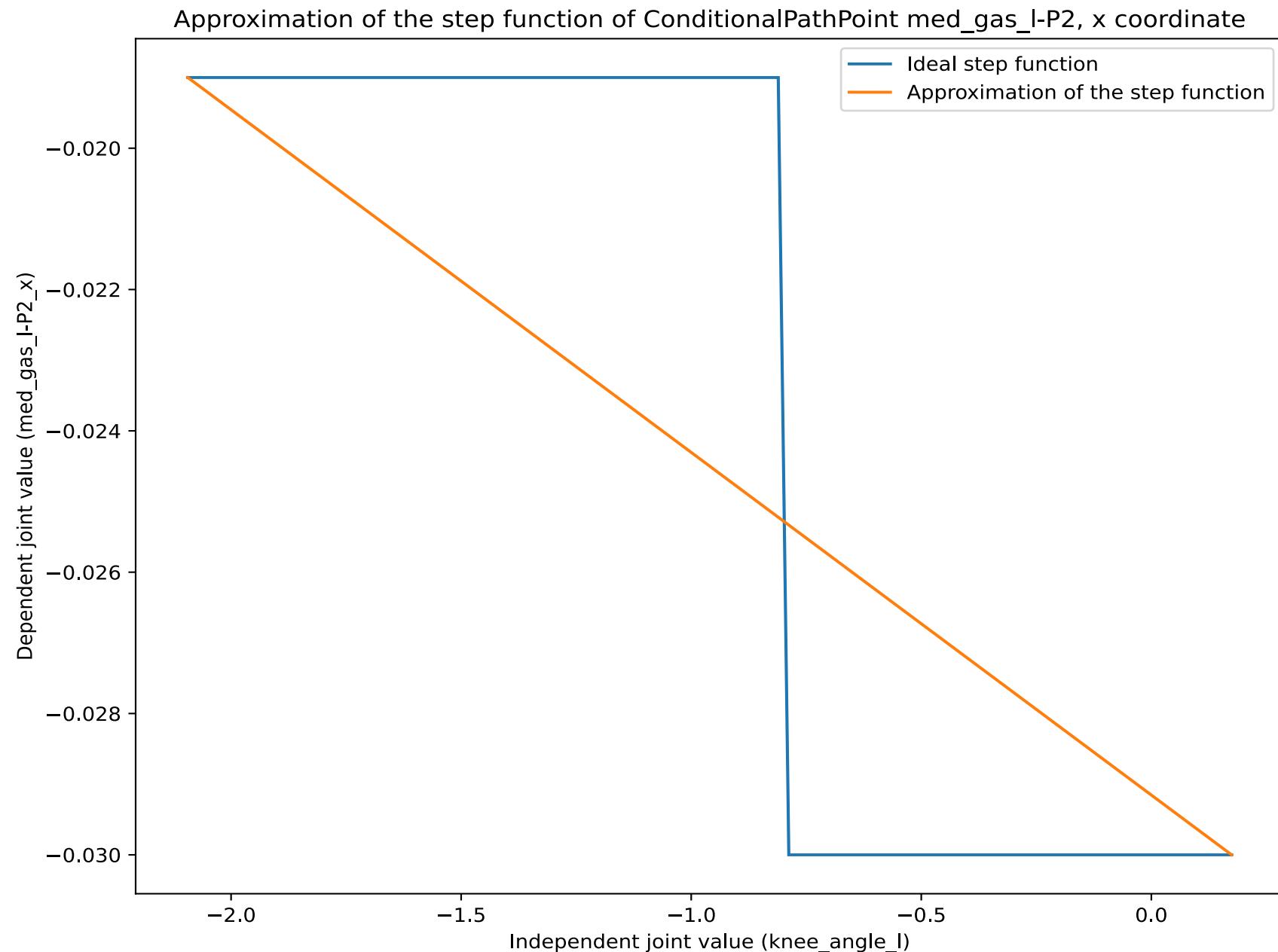
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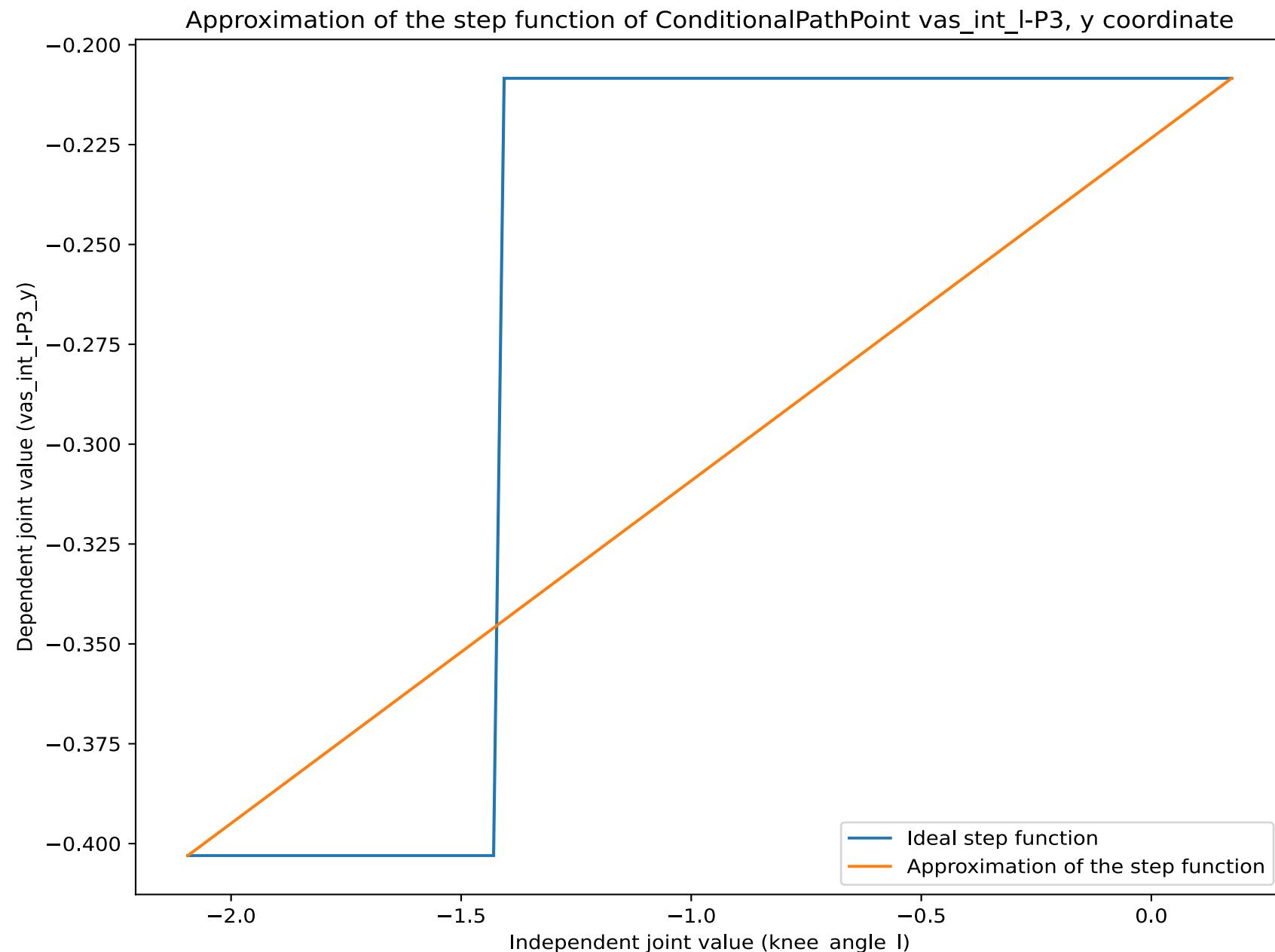
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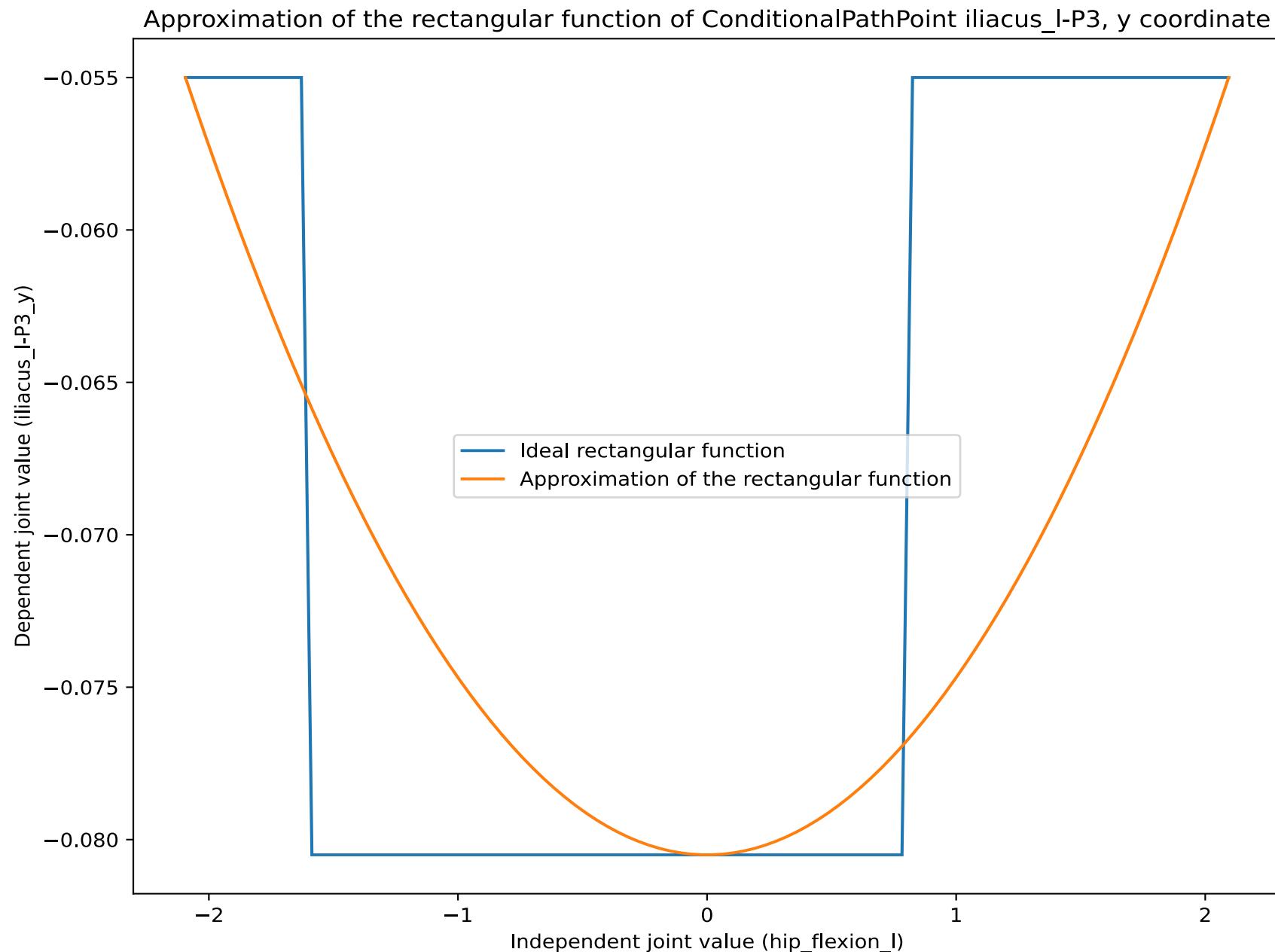
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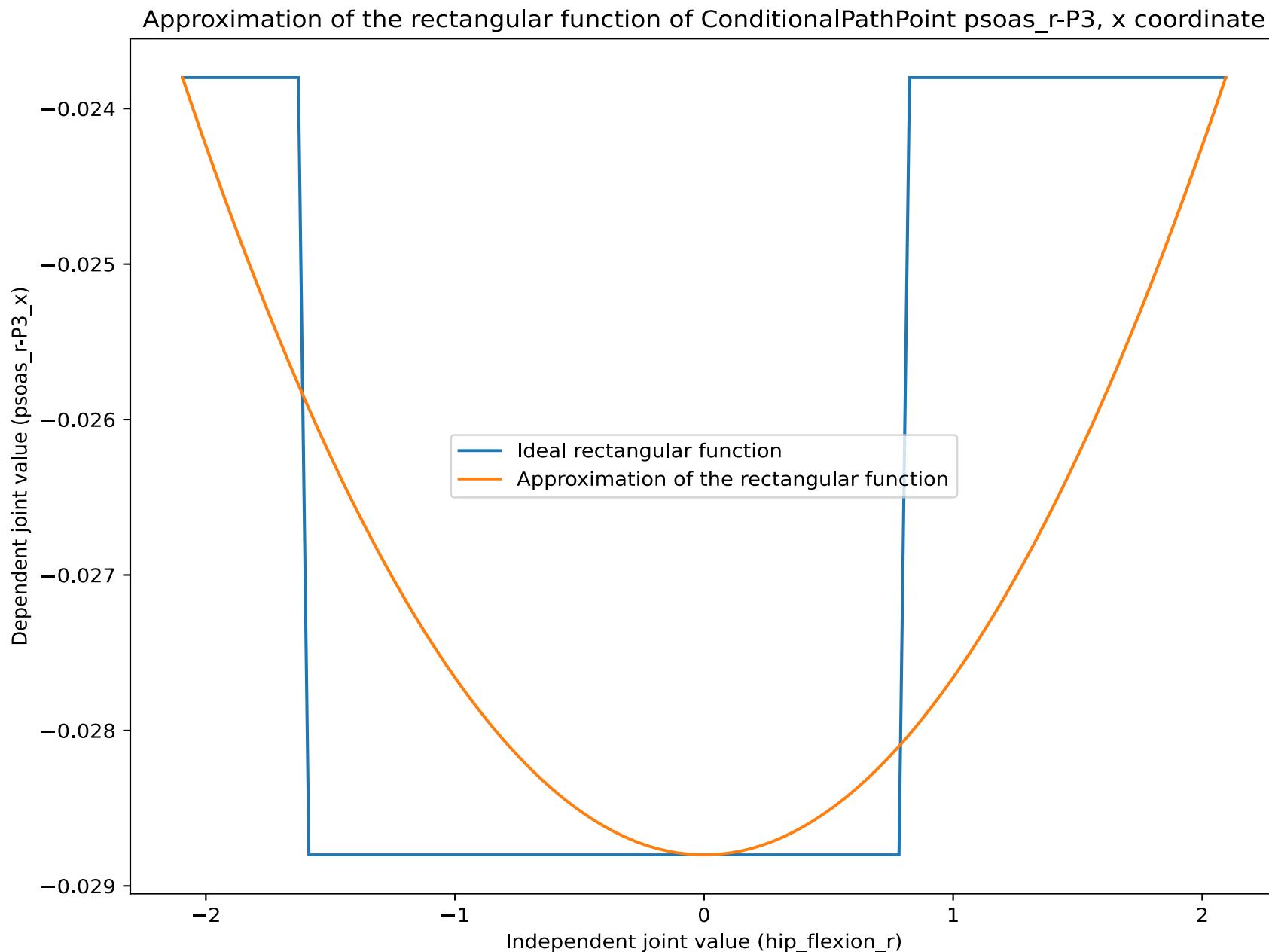
Approximation of conditional path points



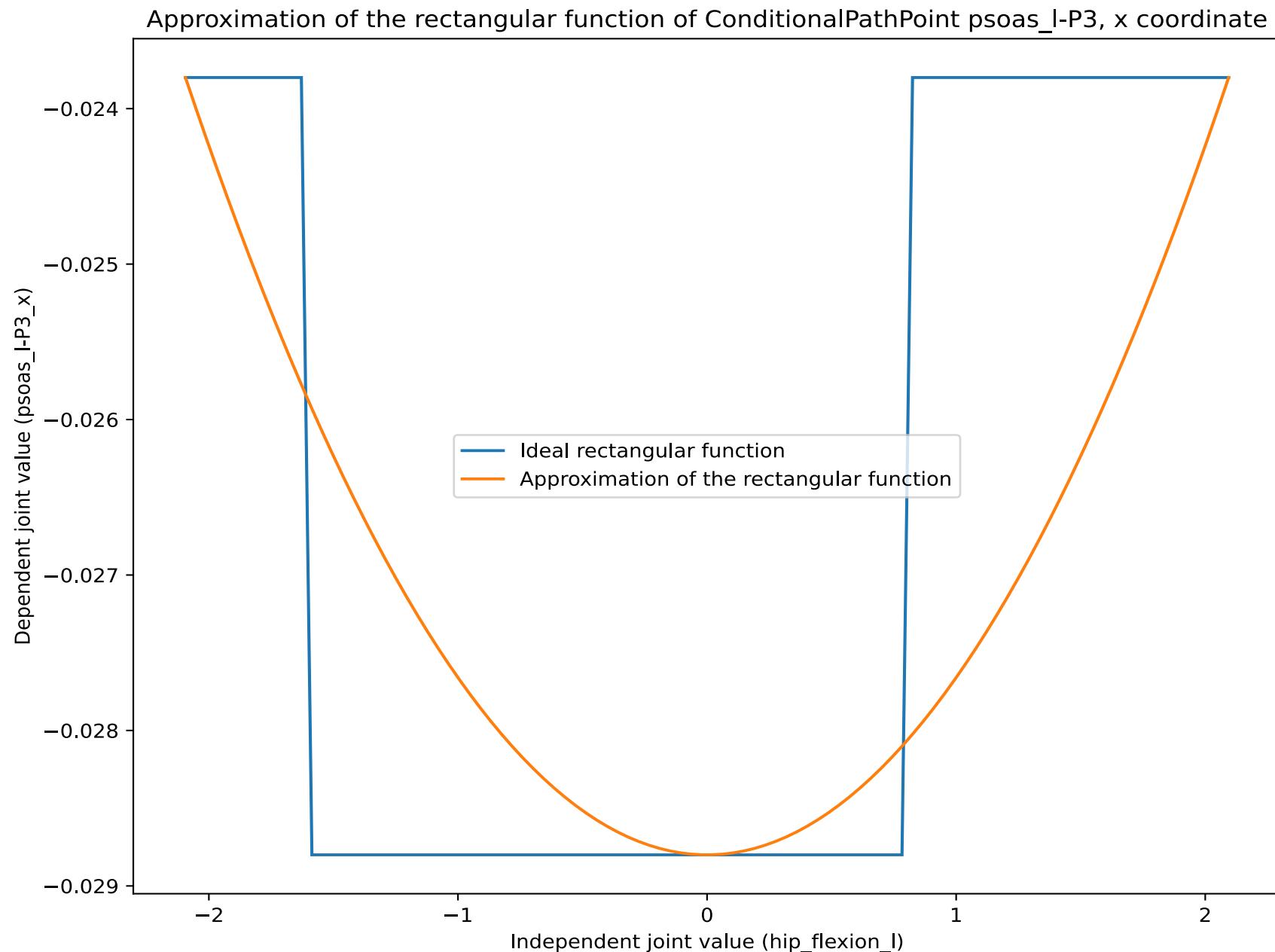
Approximation of conditional path points



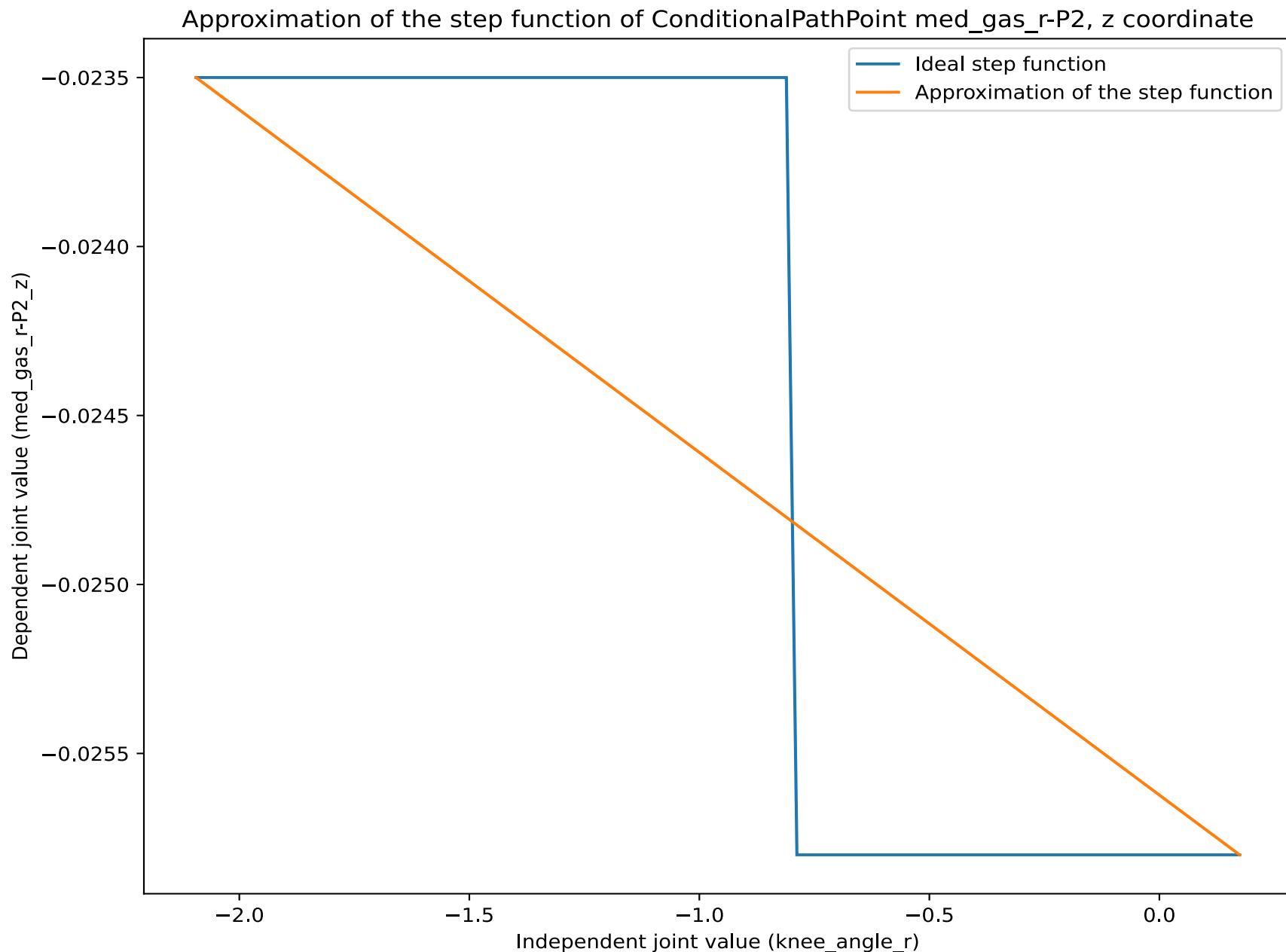
Approximation of conditional path points



Approximation of conditional path points



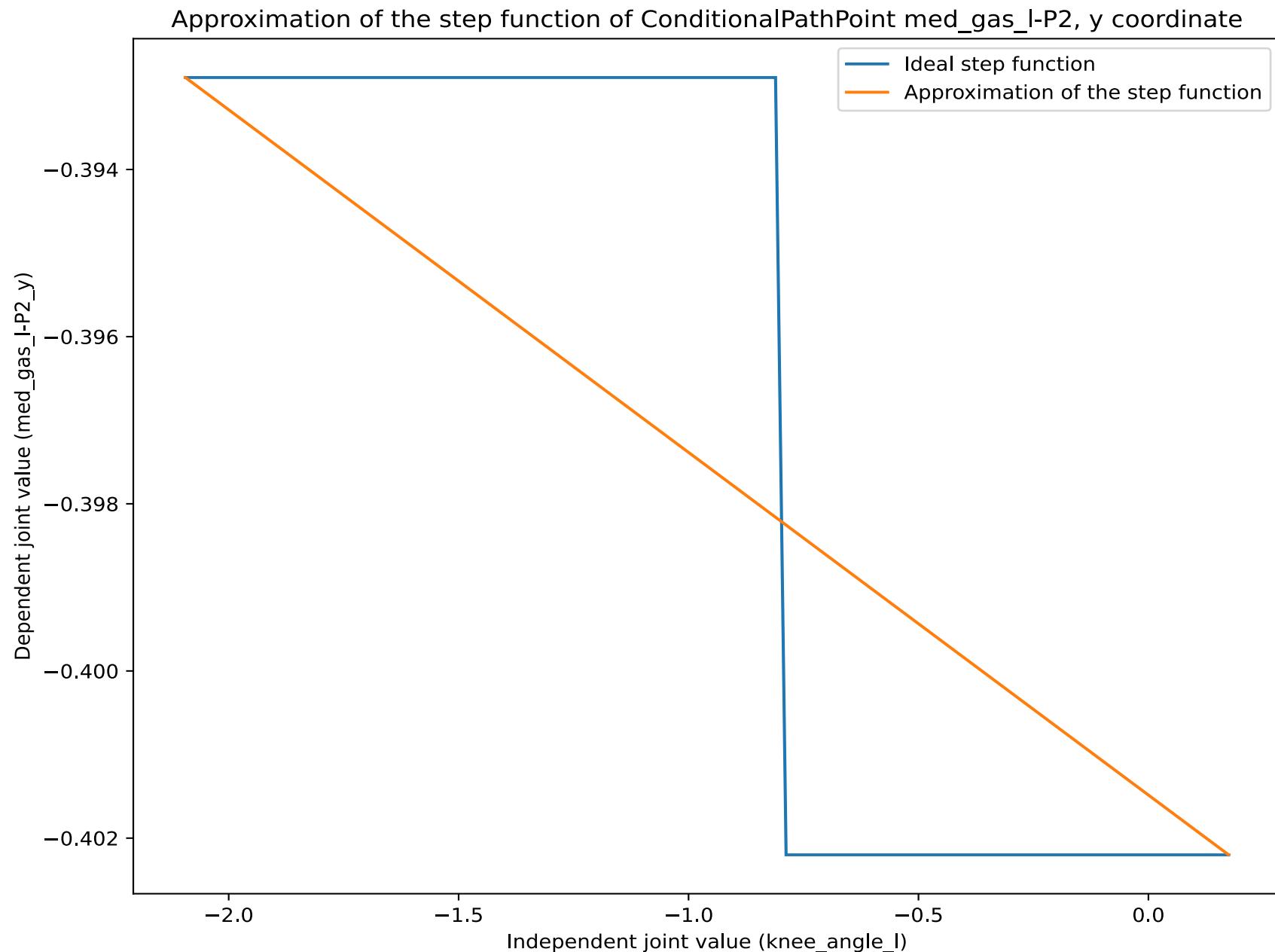
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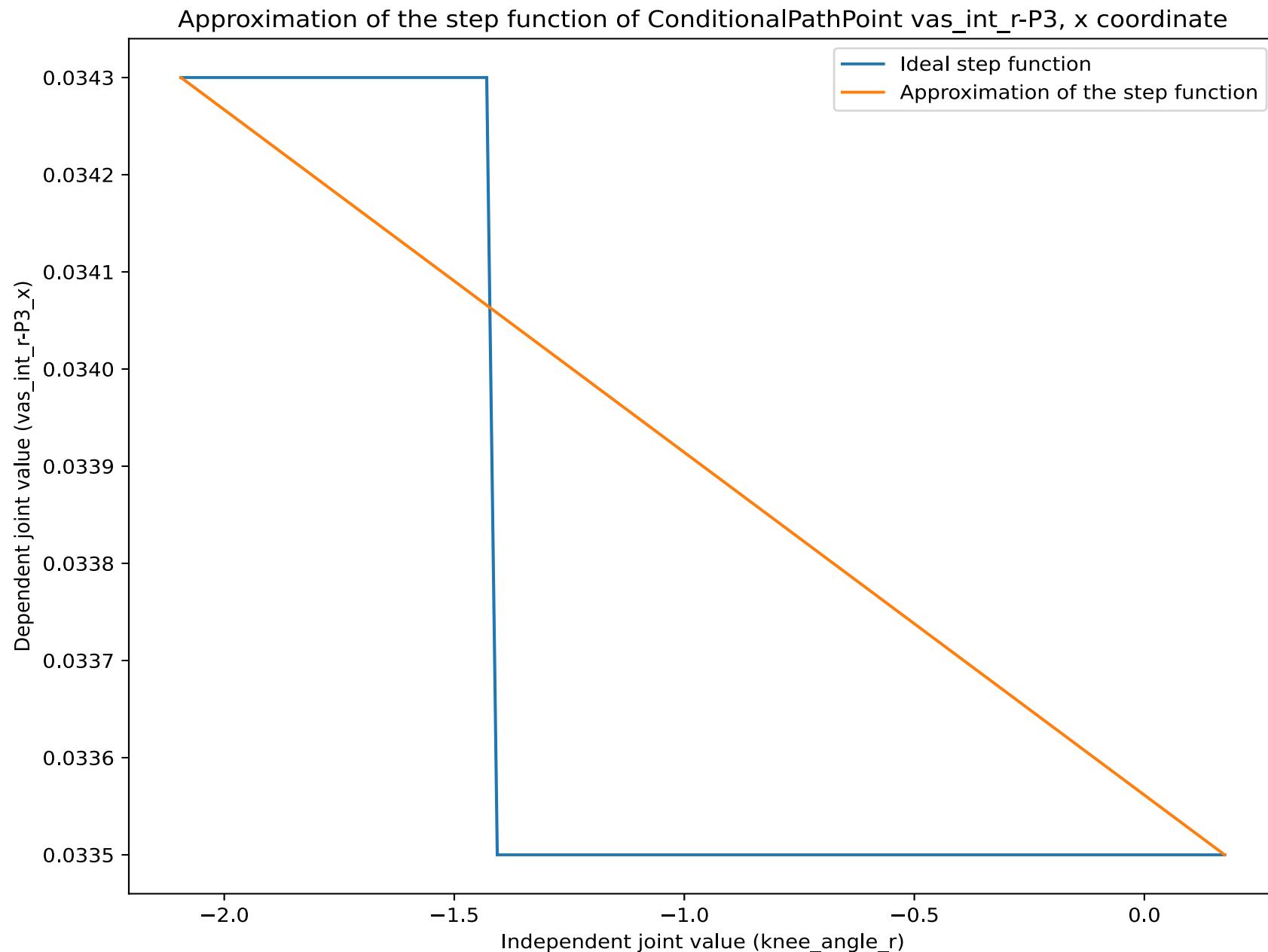
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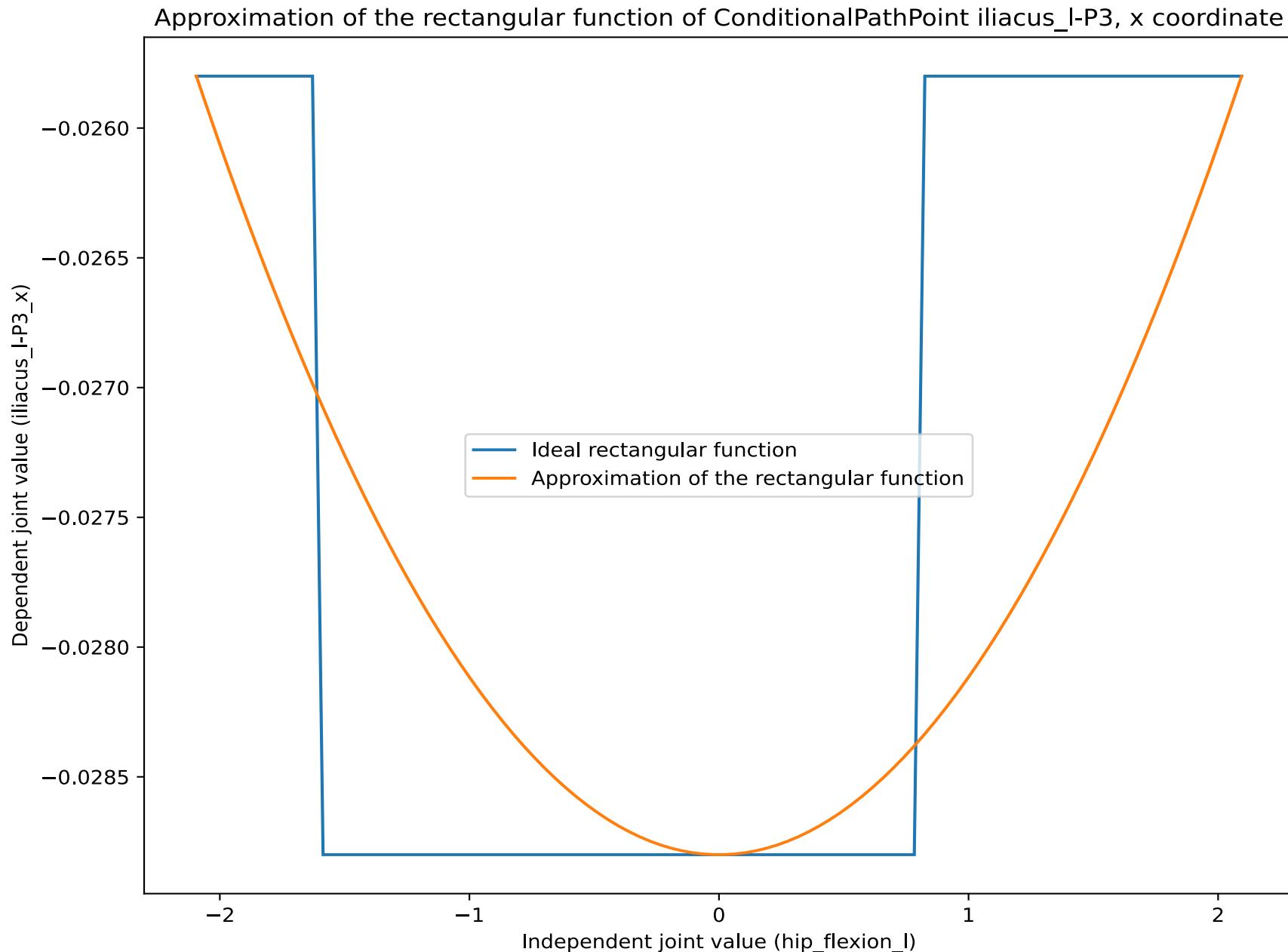
Approximation of conditional path points



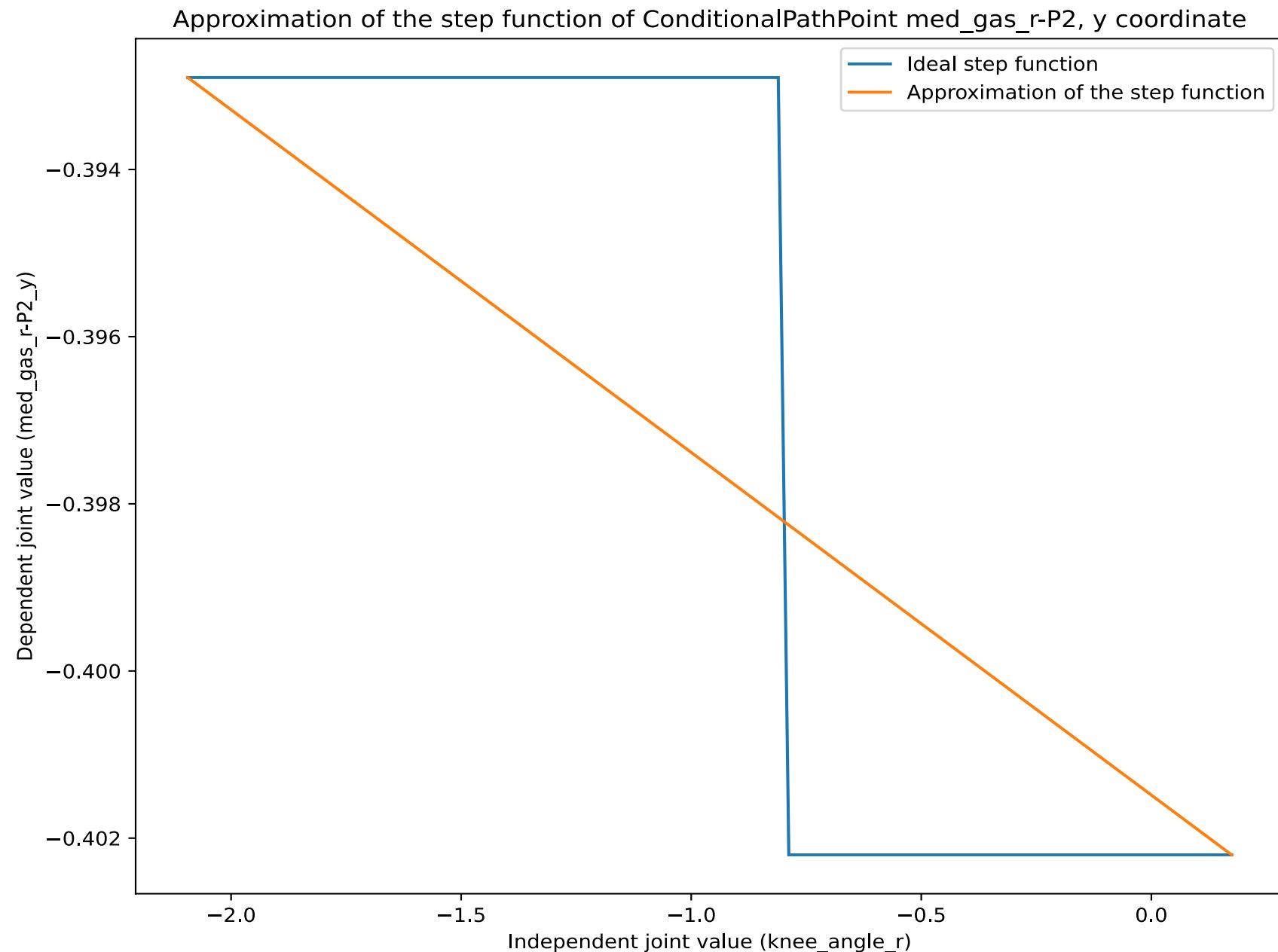
Approximation of conditional path points



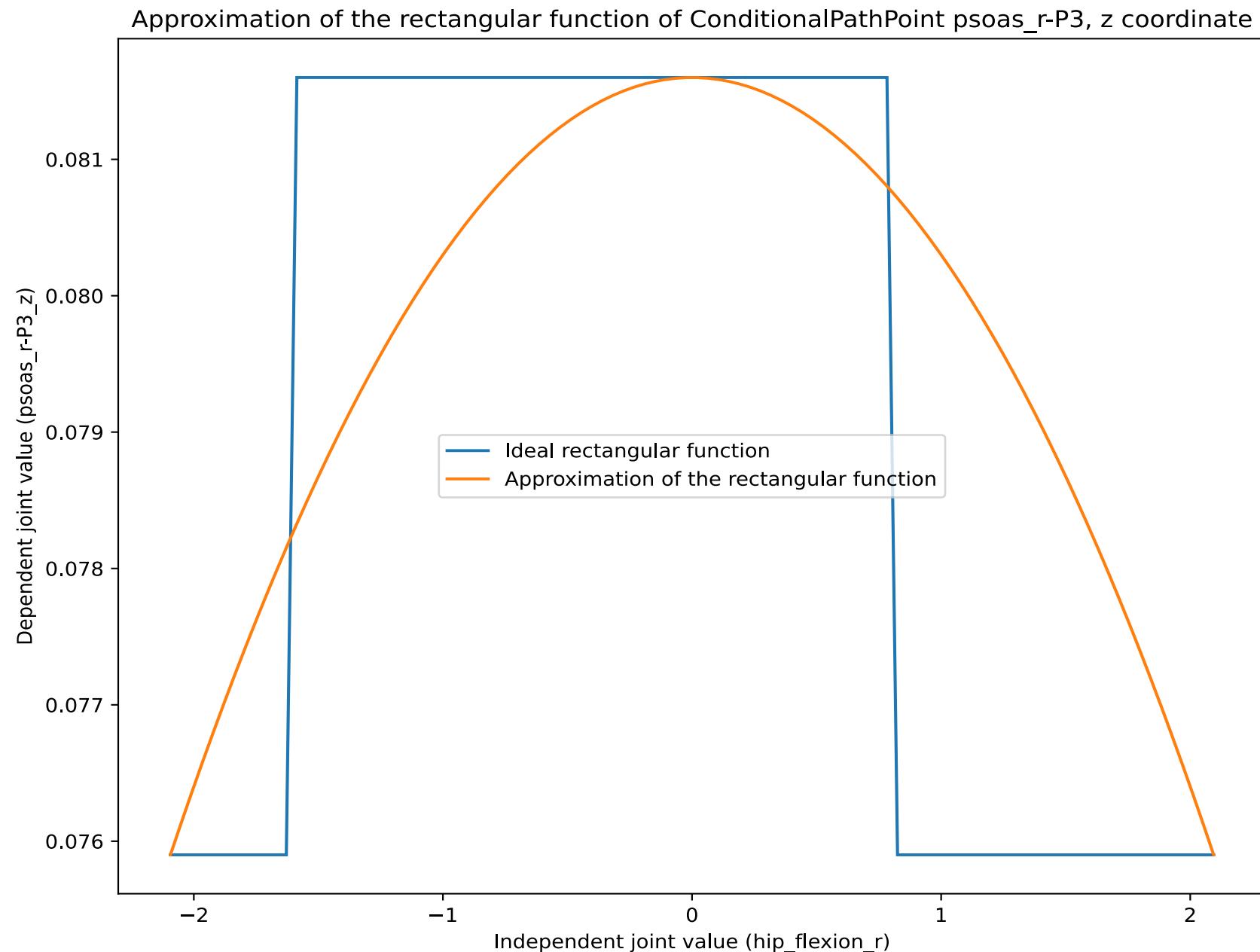
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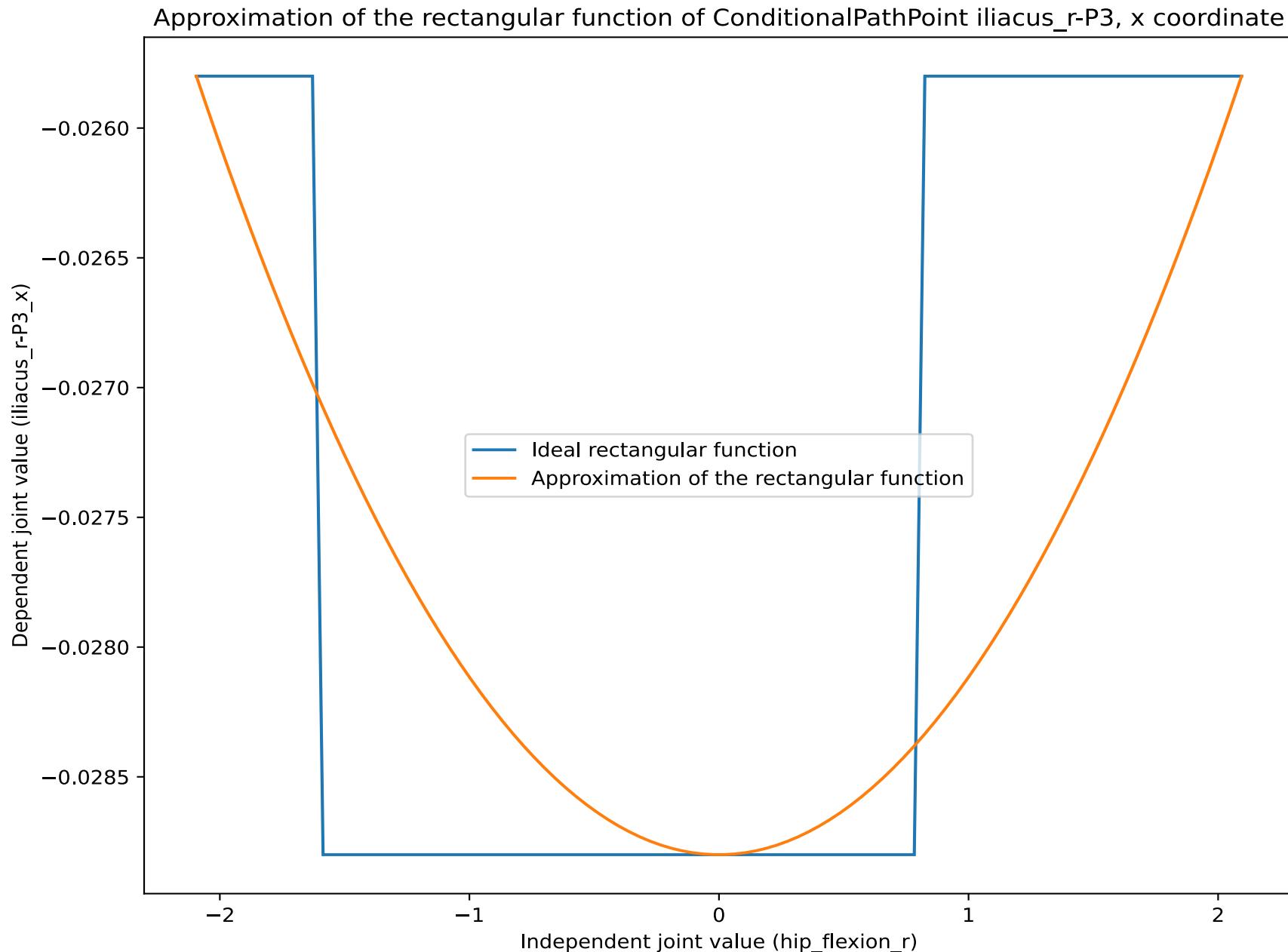
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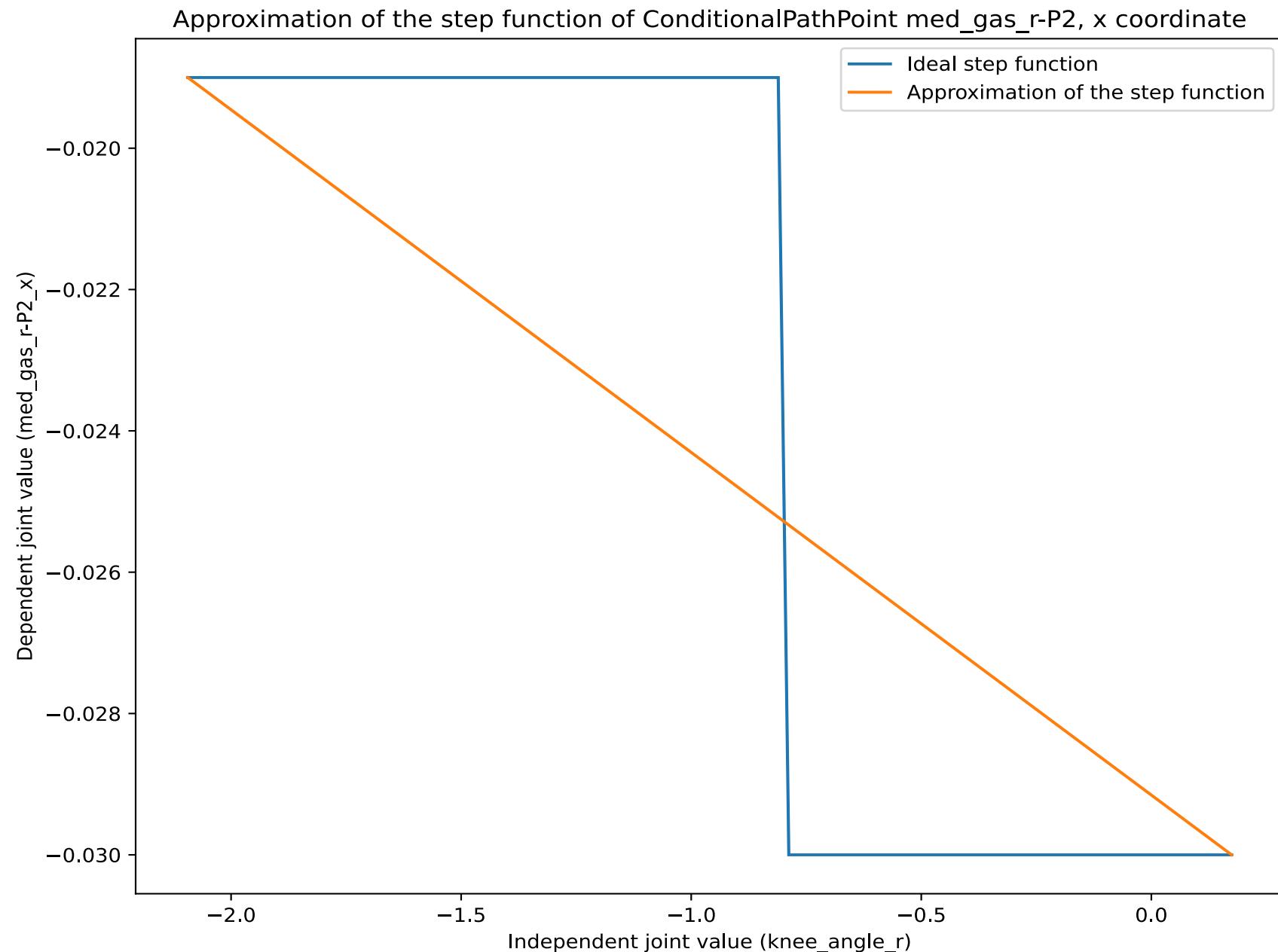
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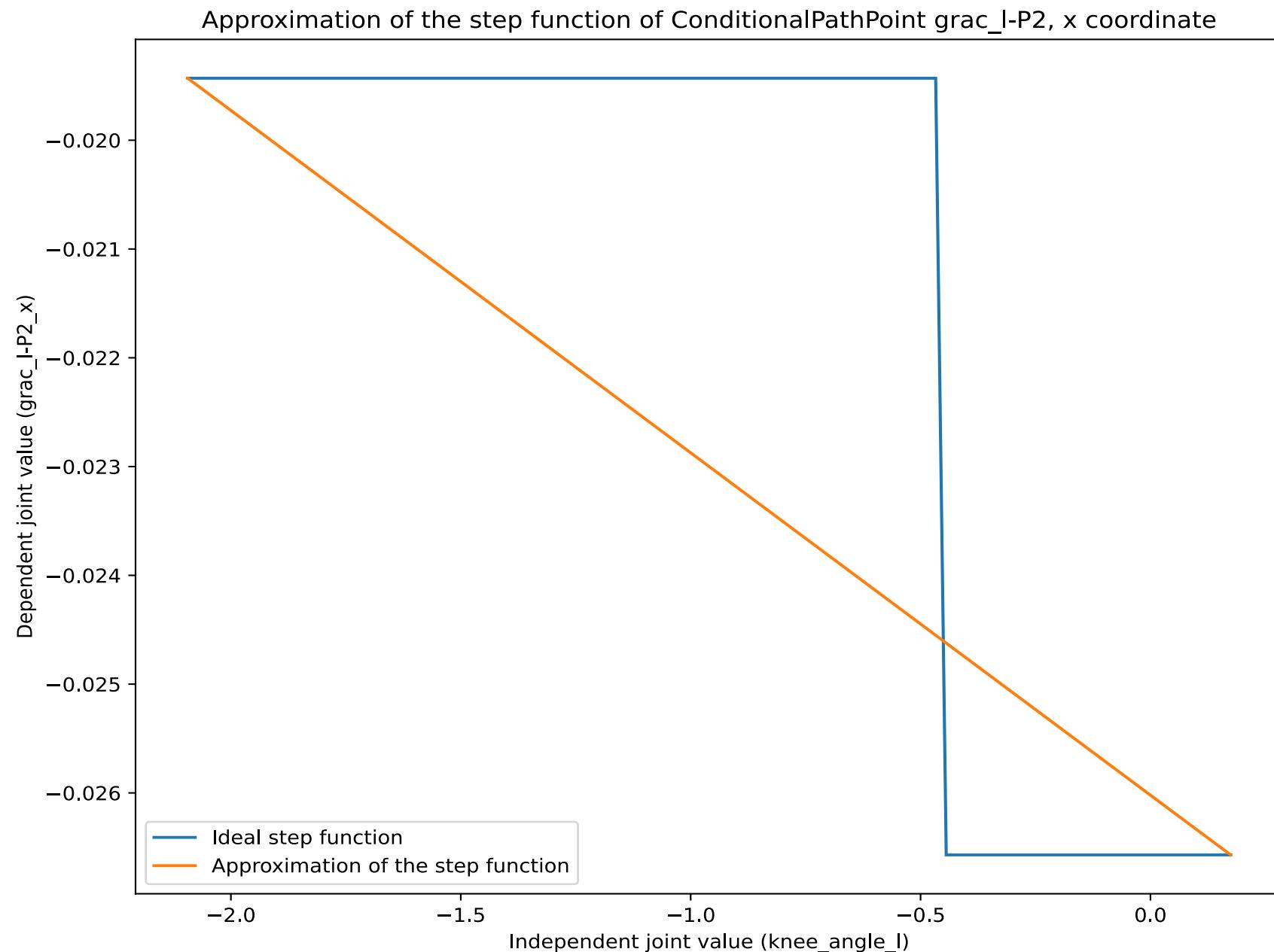
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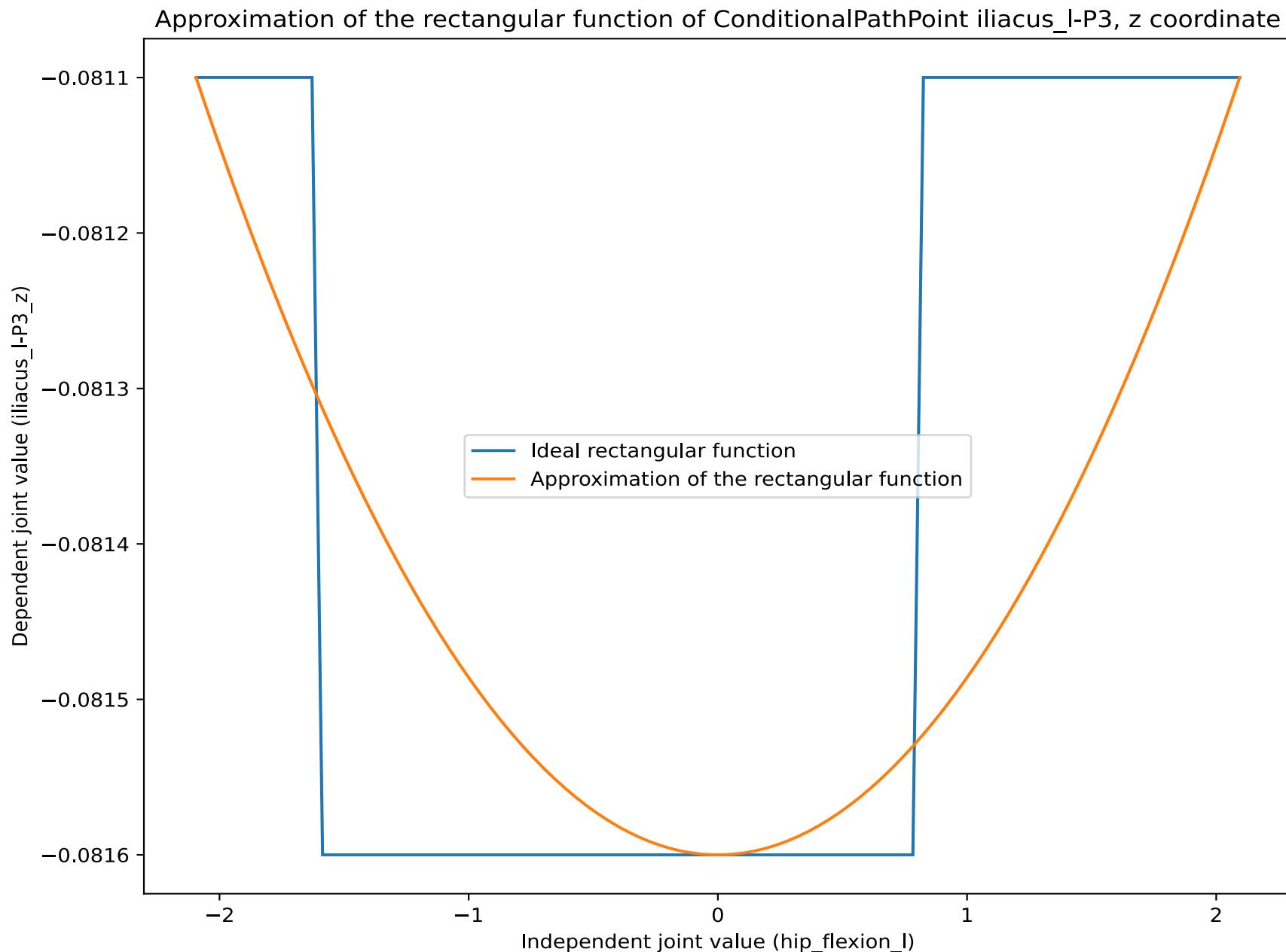
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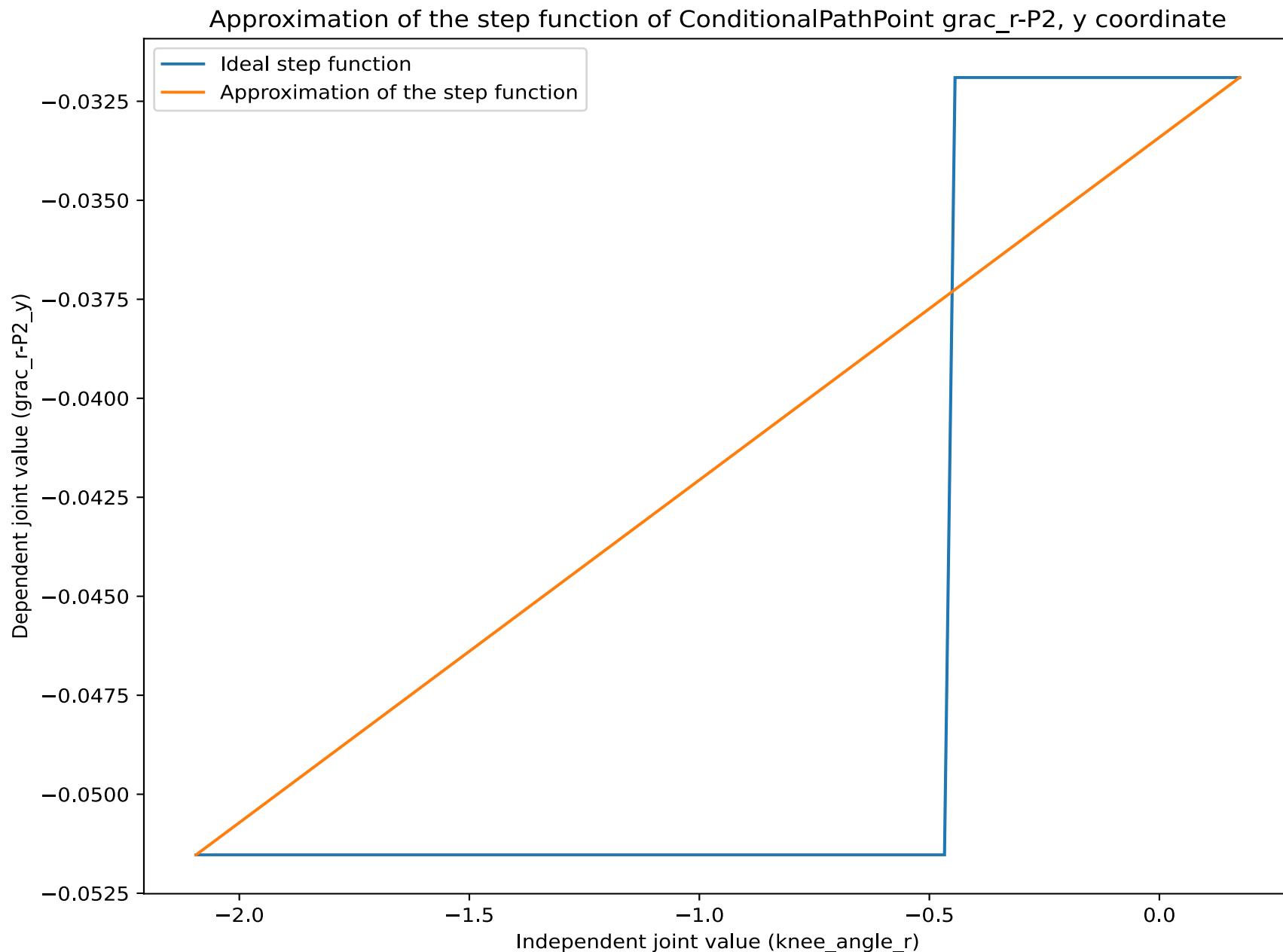
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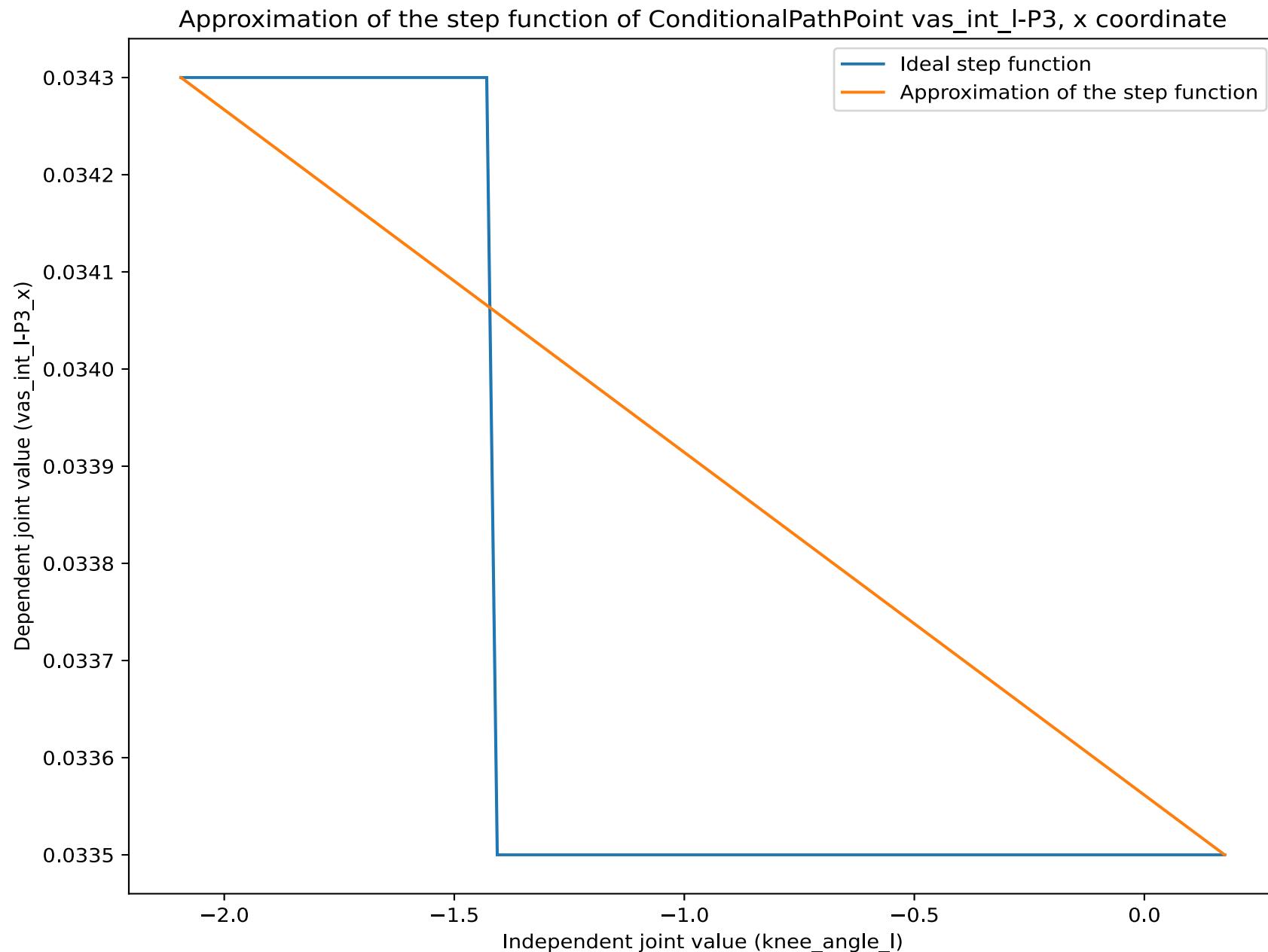
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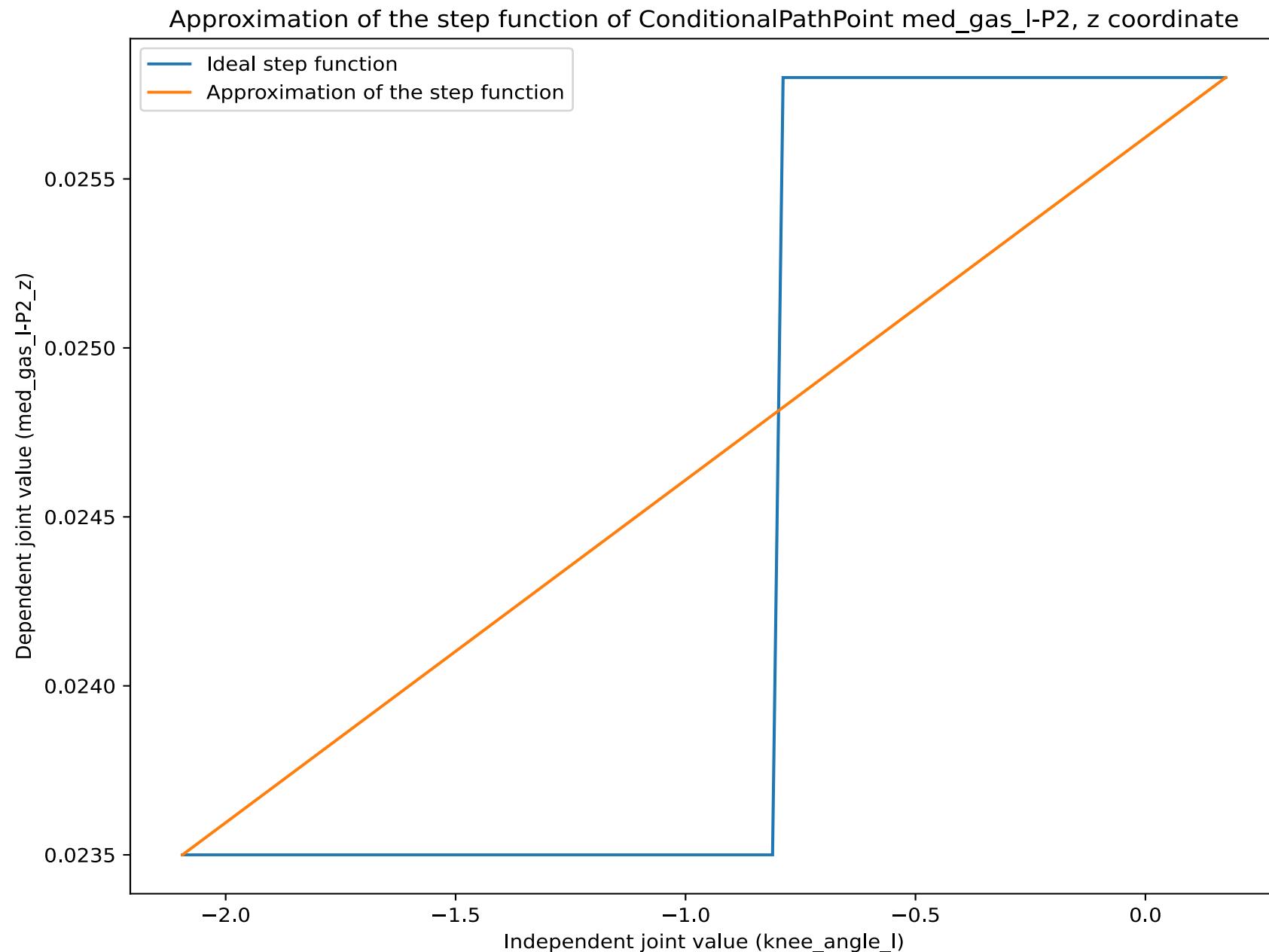
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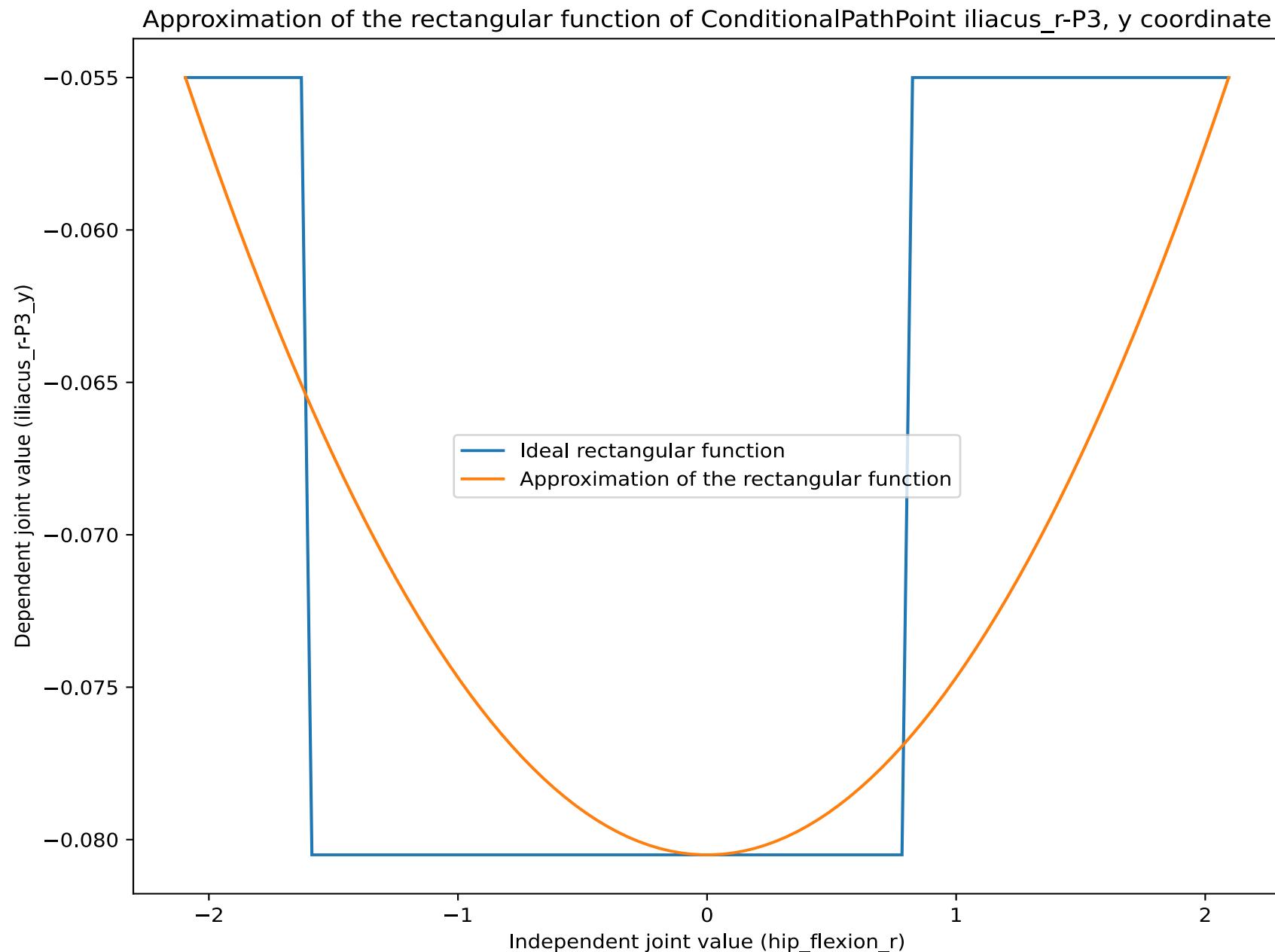
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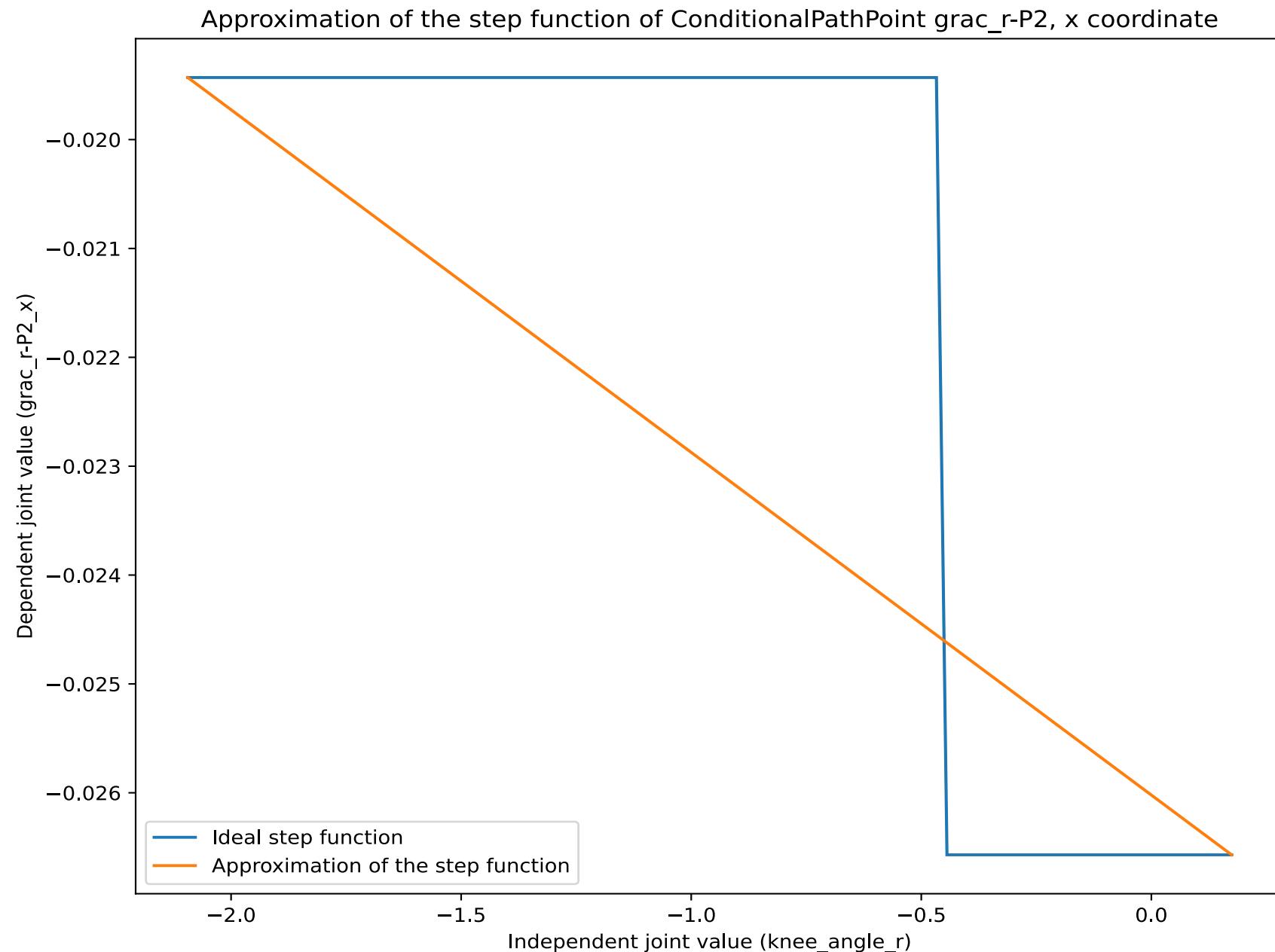
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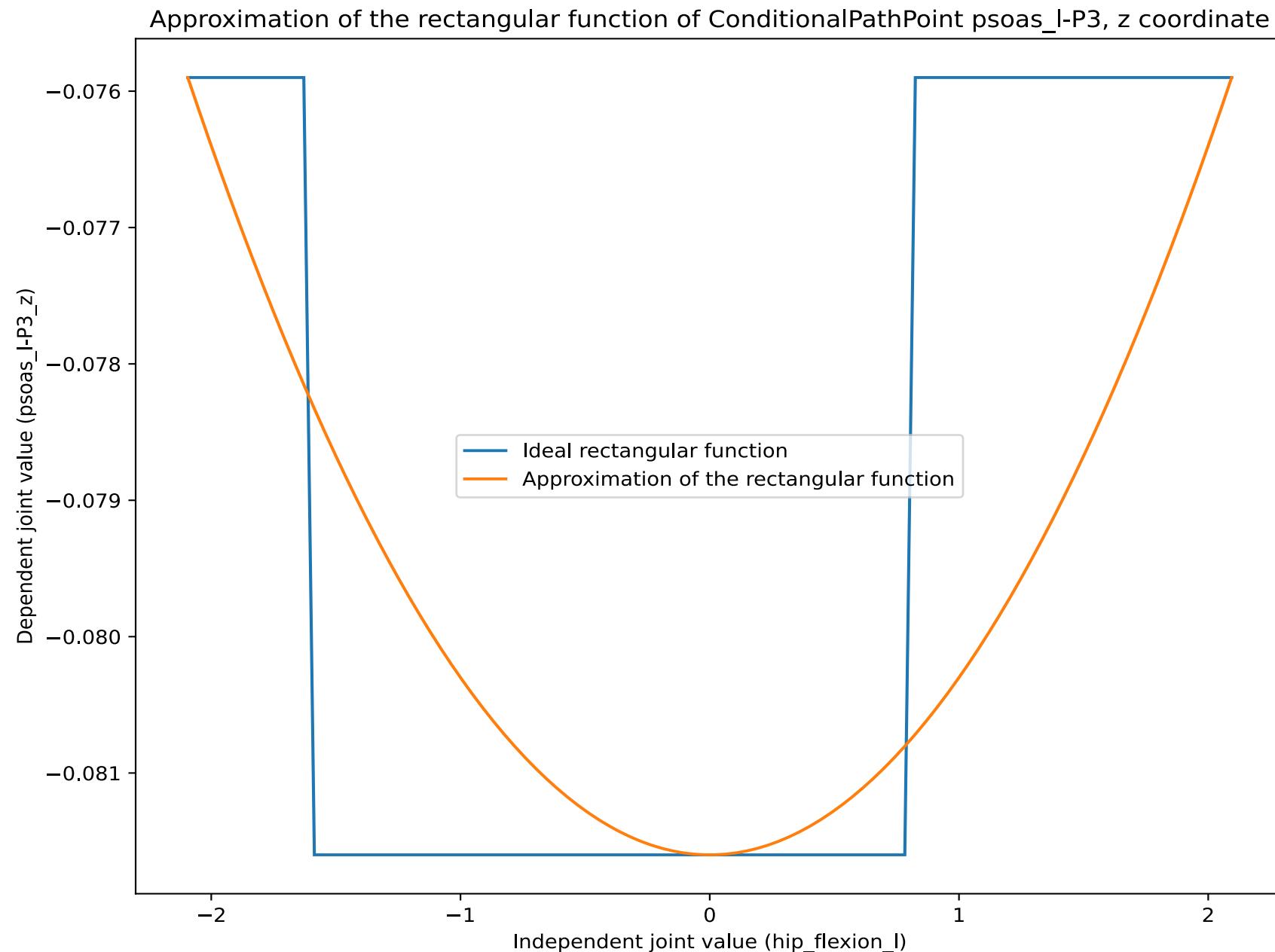
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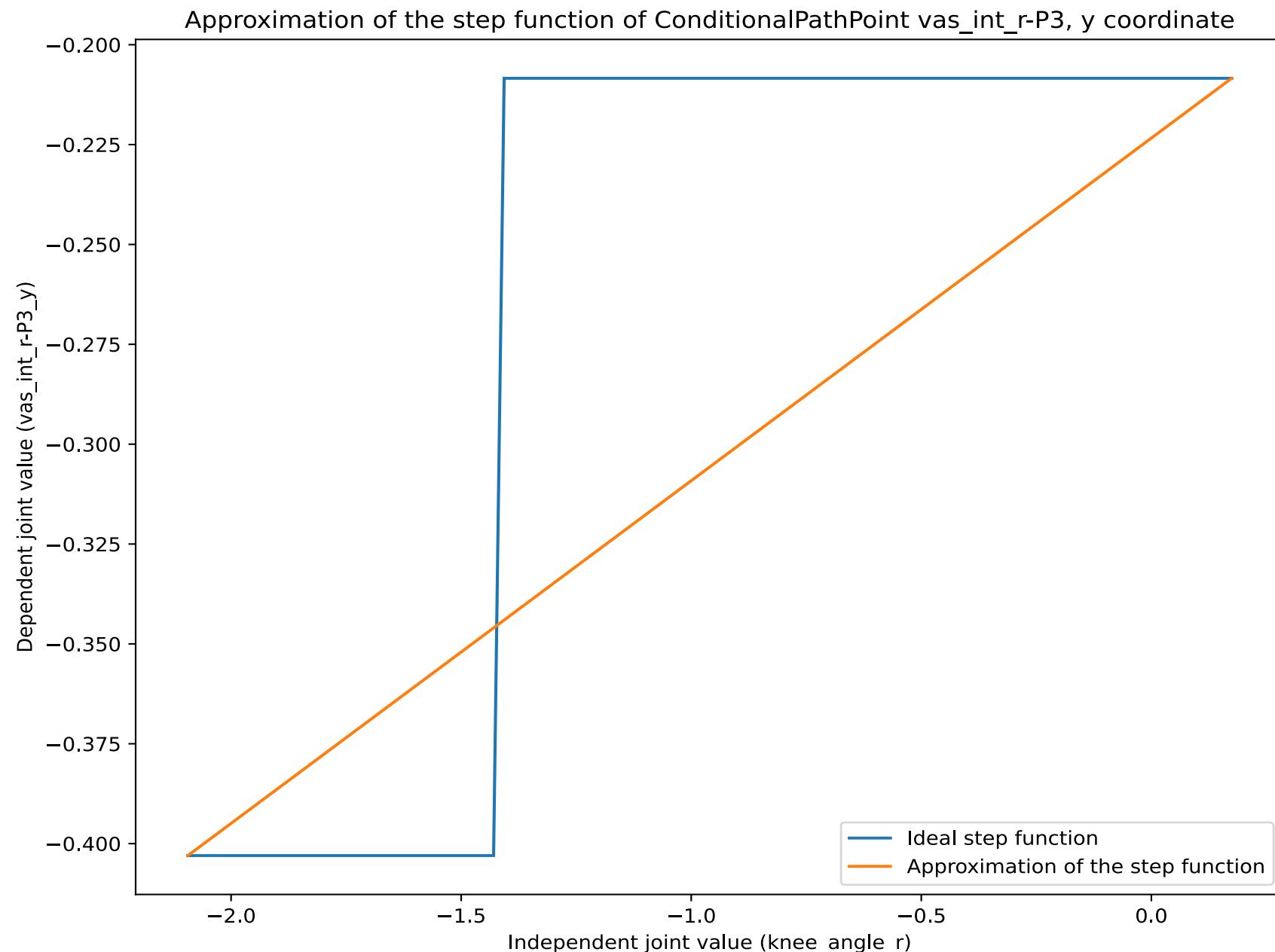
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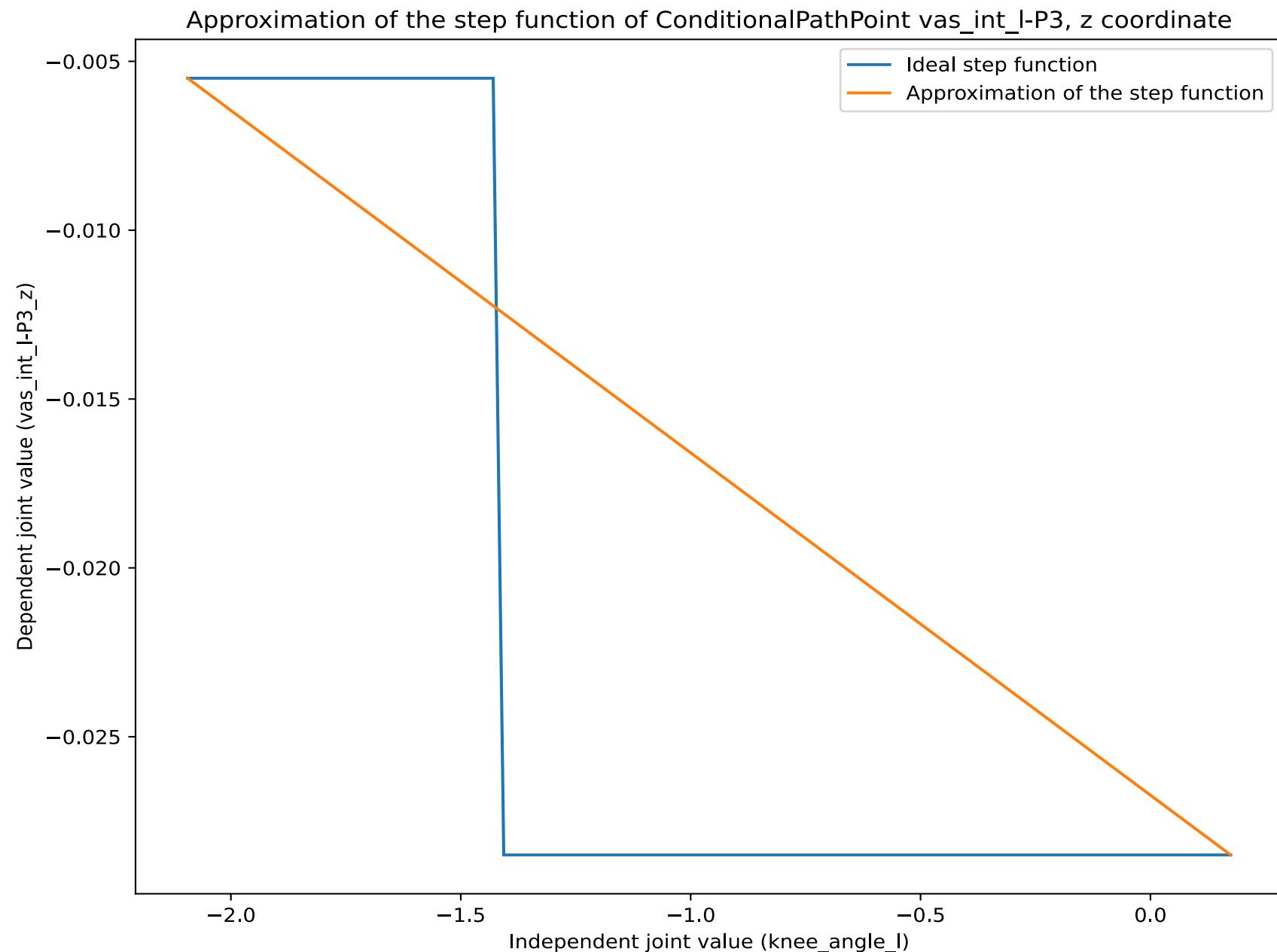
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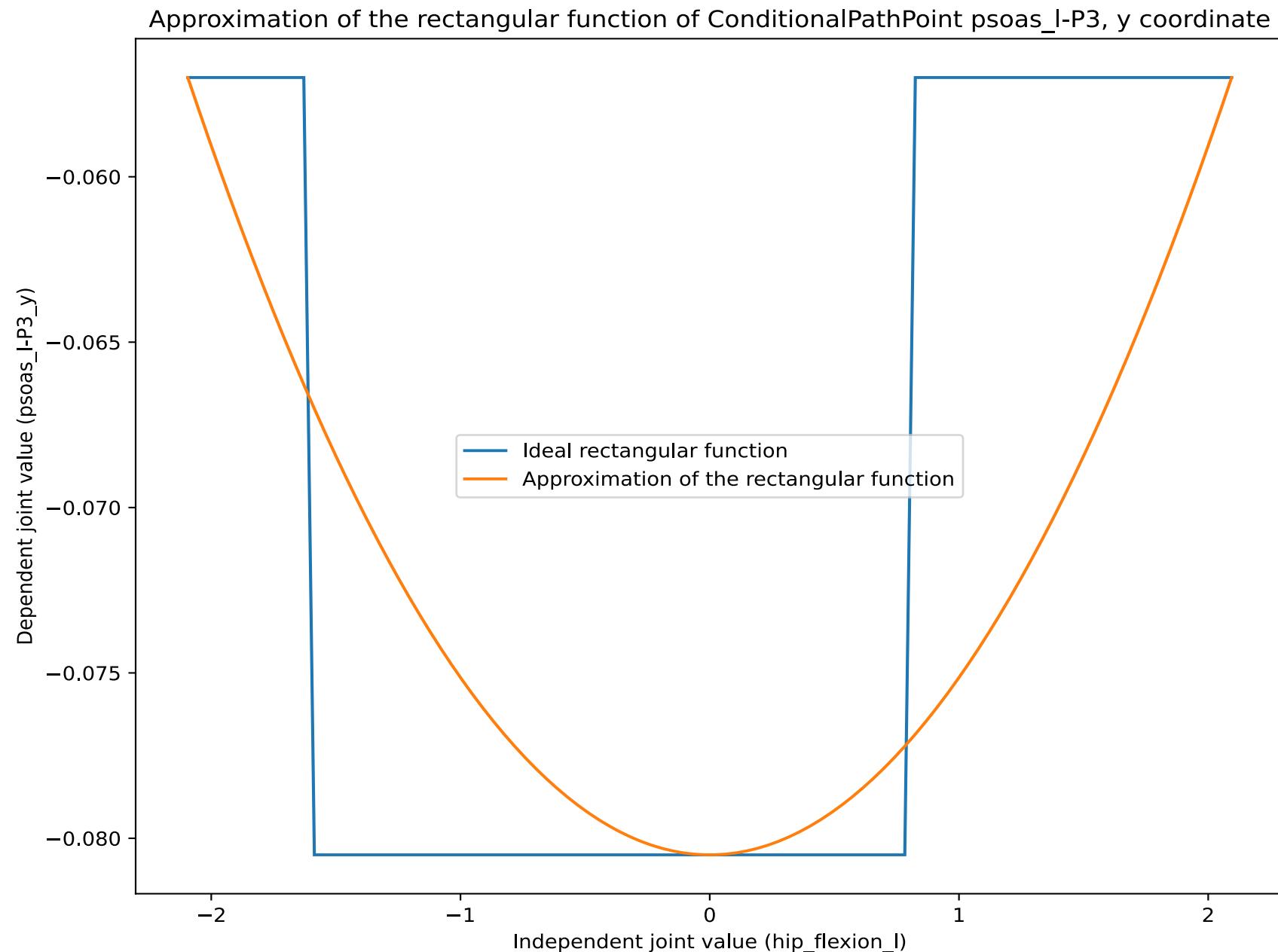
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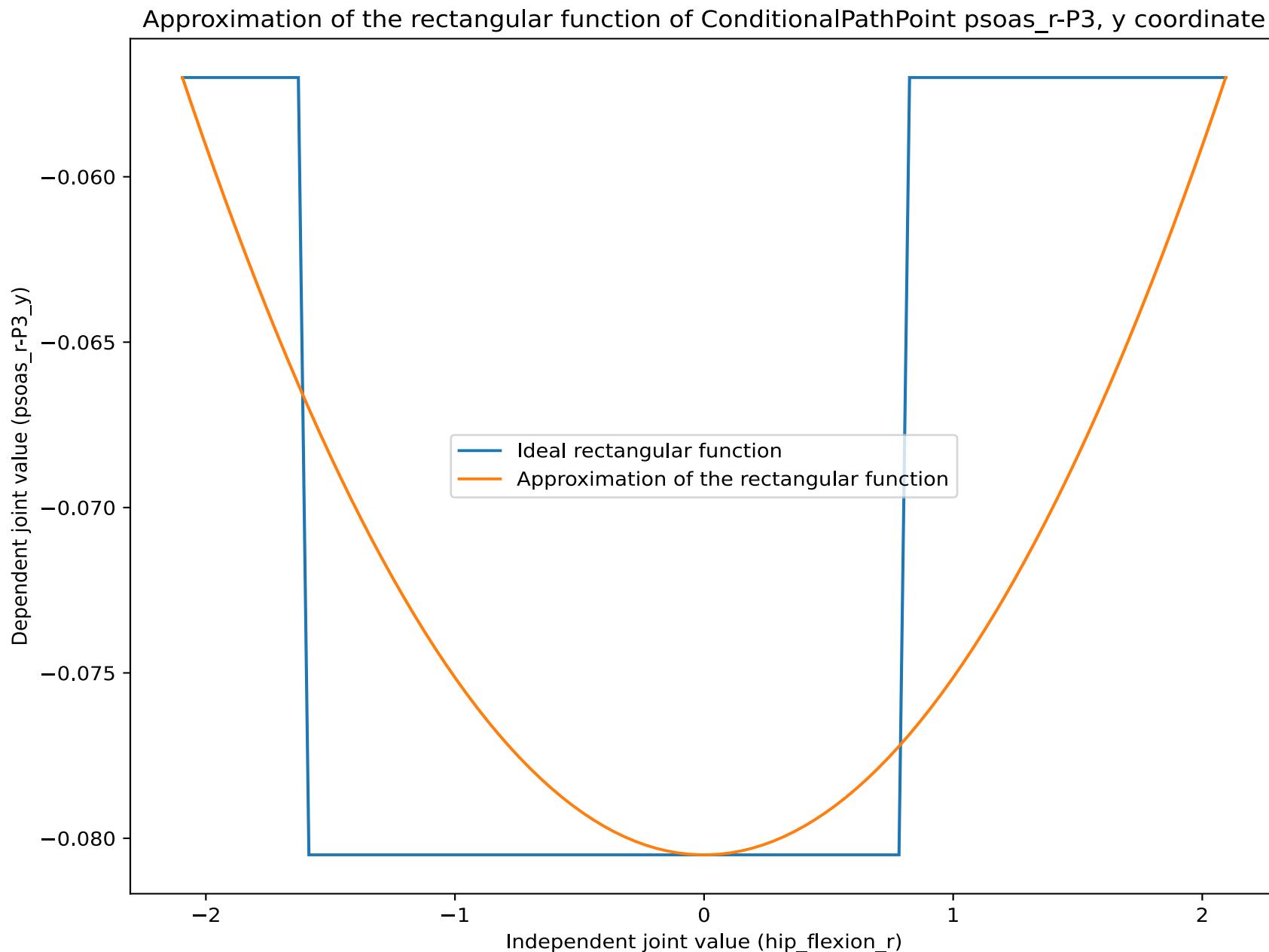
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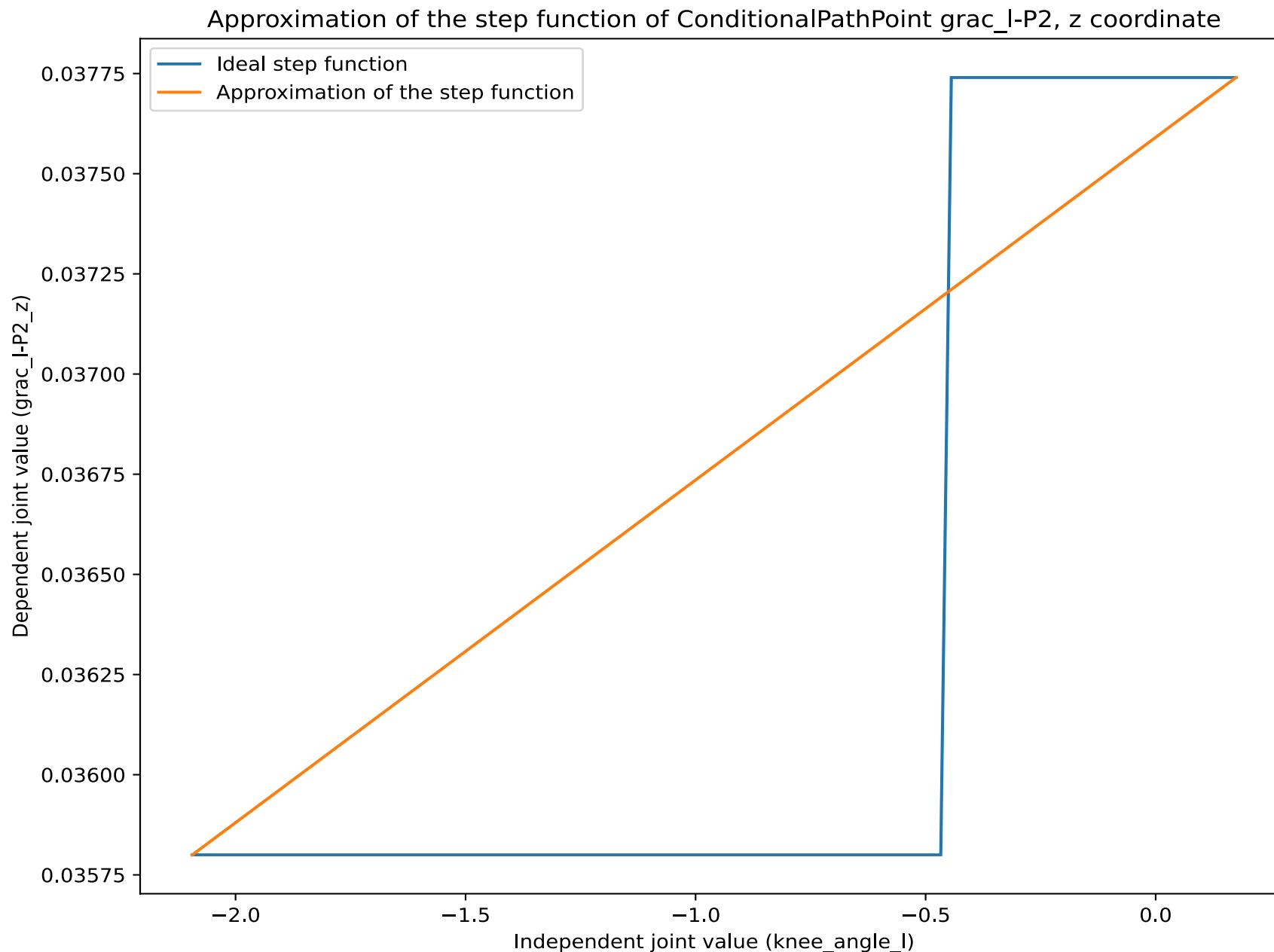
Approximation of conditional path points



Approximation of conditional path points



Approximation of conditional path points



Step 2: Muscle Kinematics Validation

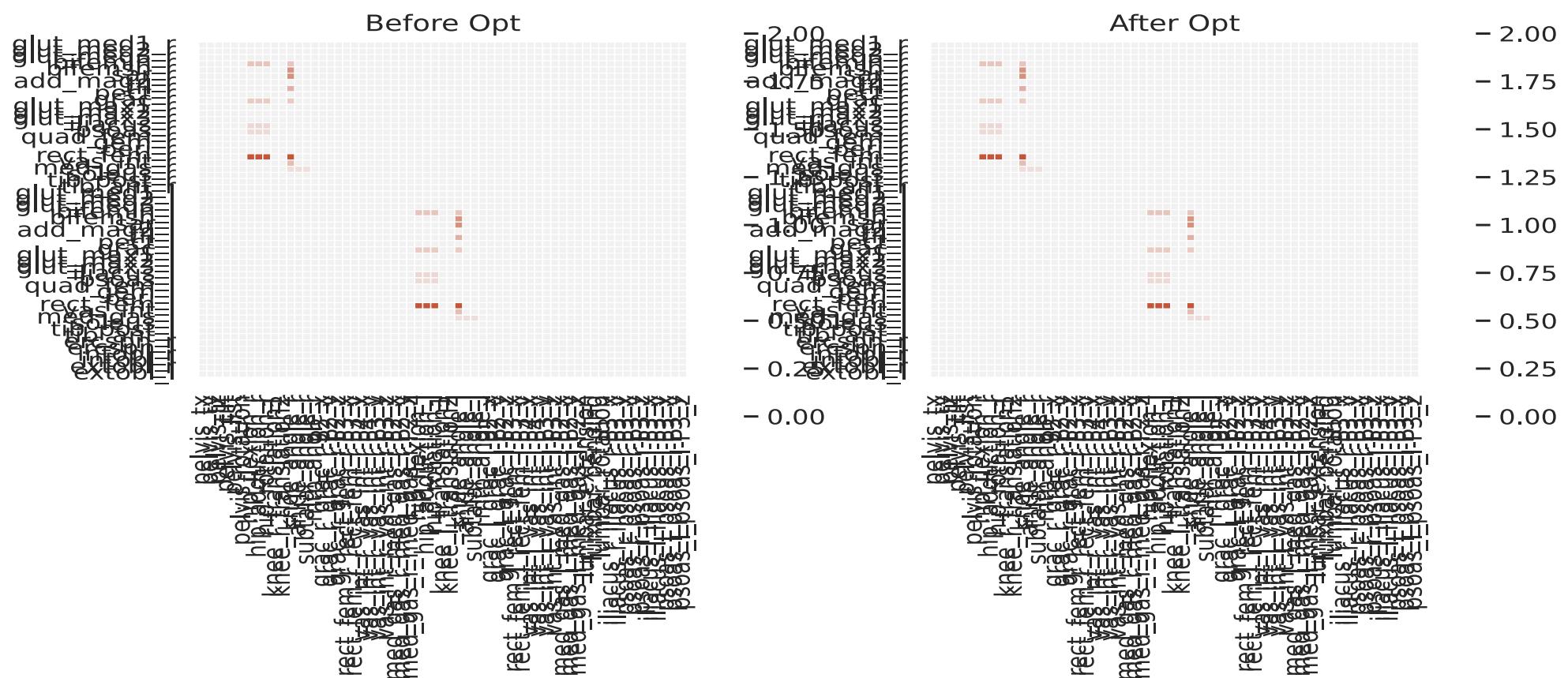
Moment arm of each muscle at each joint are compared between Osim and converted MJC model. A overall heatmap is included to indicate the overall moment arm errors before and after optimization. Then detail moment arm curves are plotted for comparison. For the muscles that wrap over multiple joints, moment arms with respect to one joint maybe affected by several other joints. In this case, several mesh points were checked of these affecting joints, when plotting moment arms at one joint. This is why there are multiple lines (with different grey levels) plotted for one muscle on one joint.

How to interpret the plot:

Global title indicate the muscle and joints that affecting the moment arms in the plots. X axis indicate the joint that moment arms were extracted. Grey level of the lines indicate the mesh postures of other relevant joints (in the global title, but not the x axis)

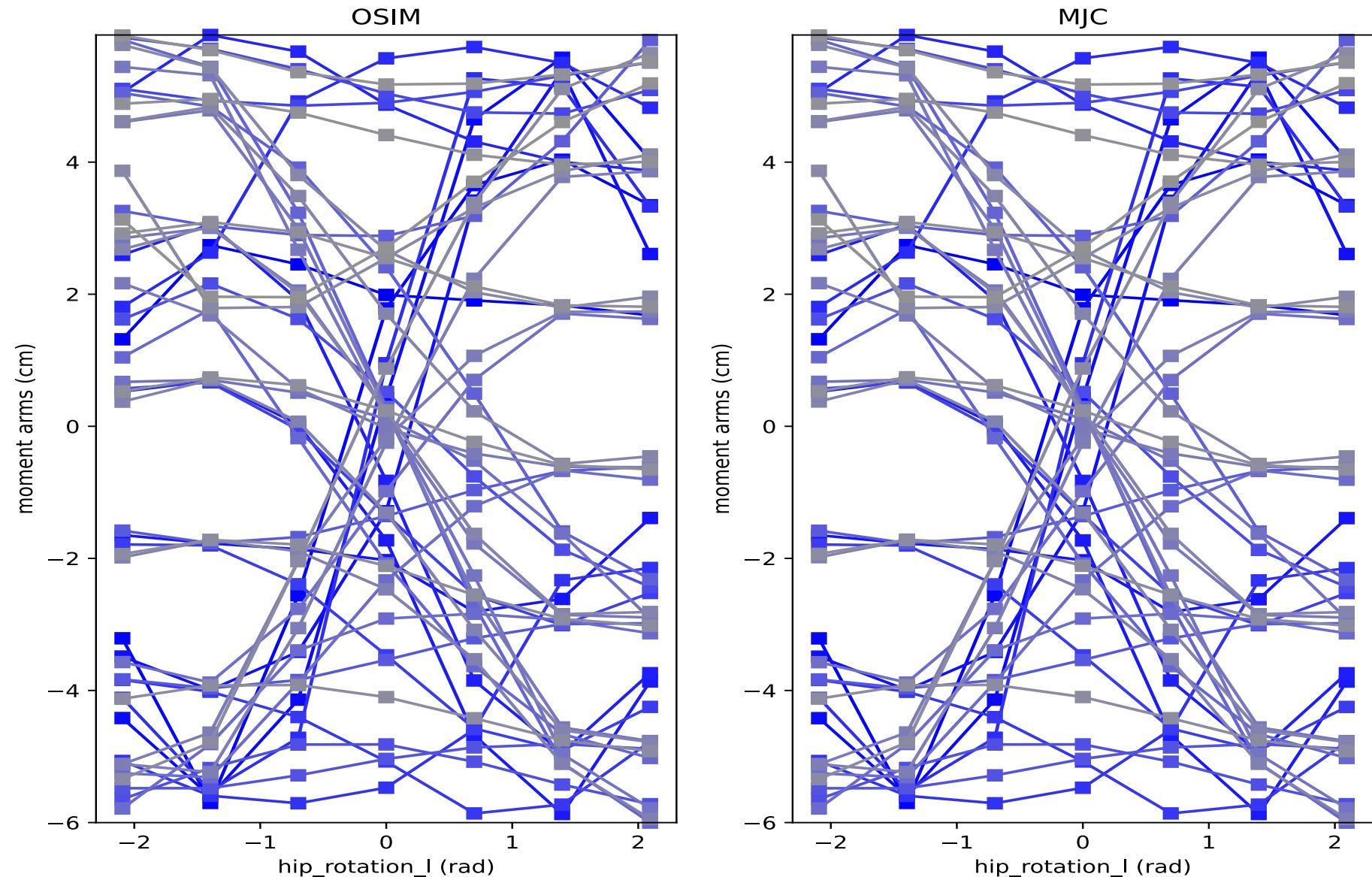
Overall comparison of muscle moment arms before/after optimization

Moment arm comparison of all muscles (cm)



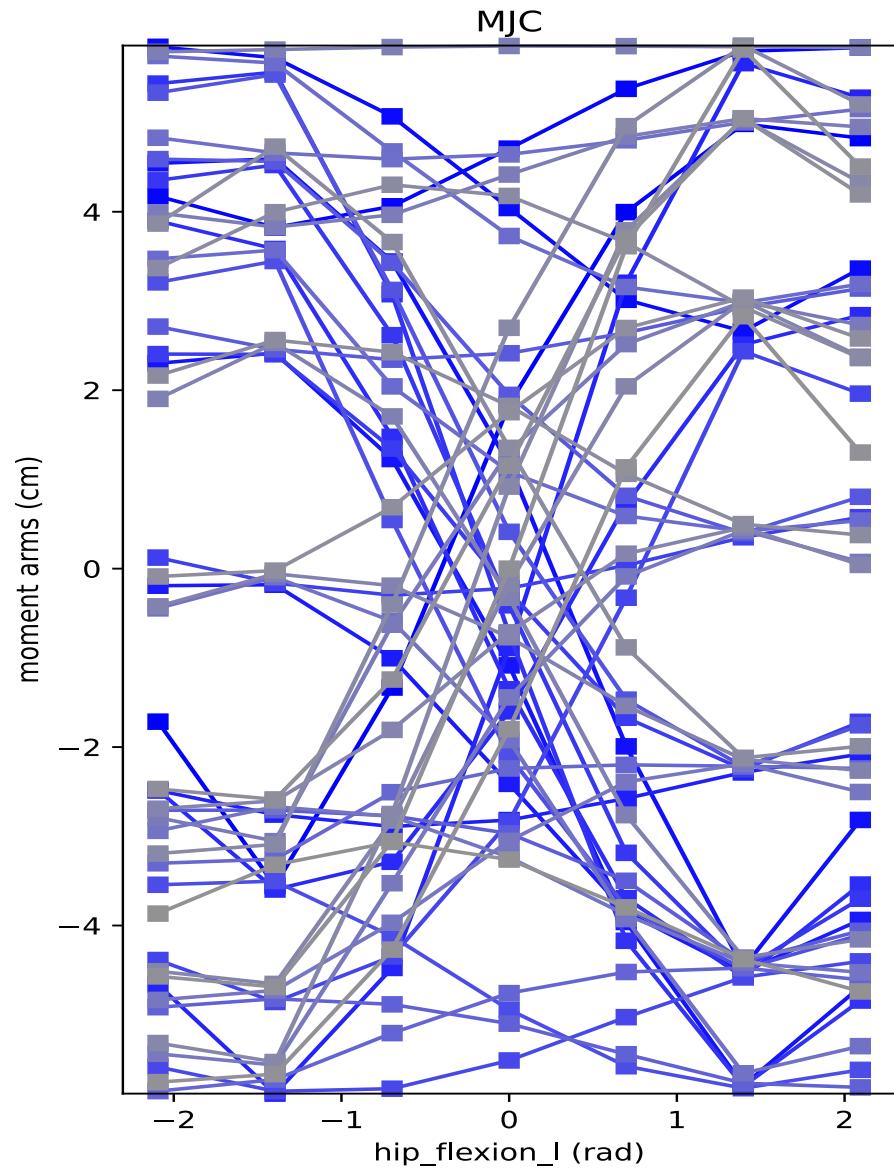
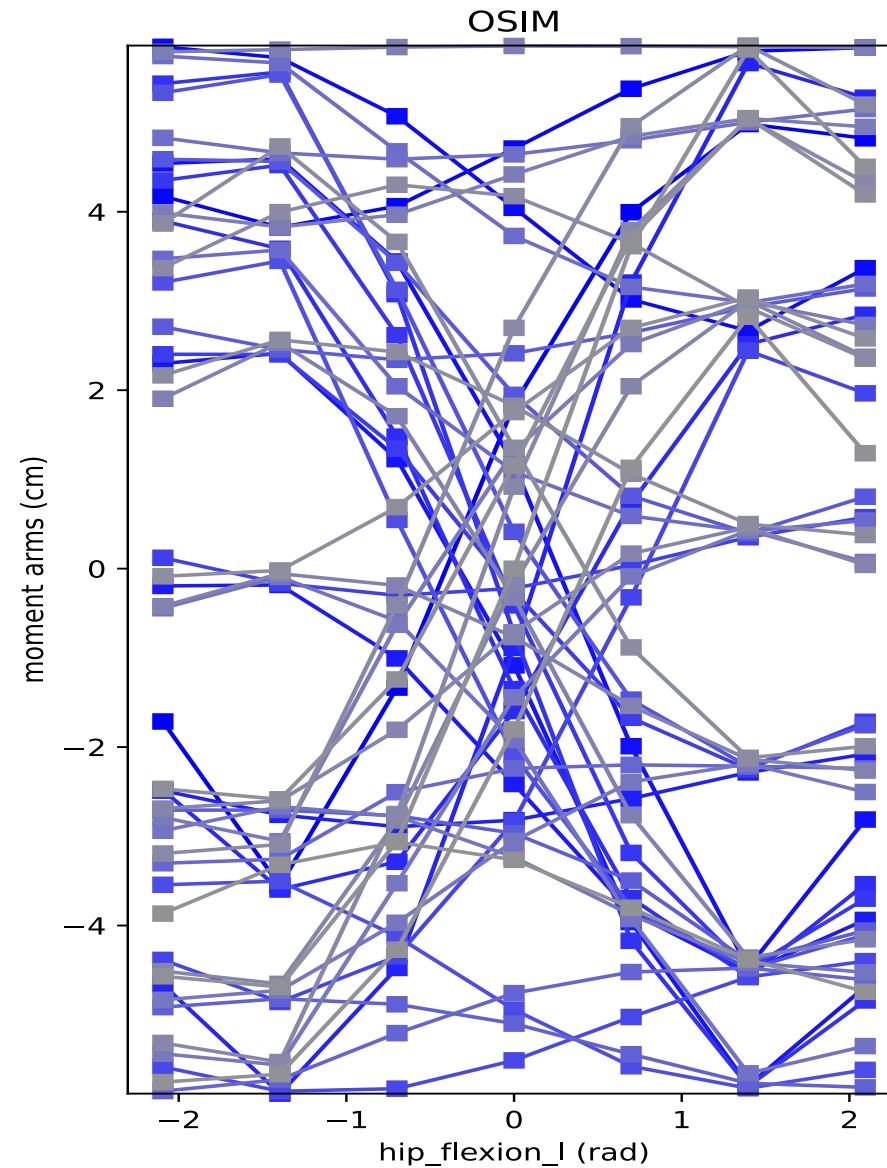
Muscle specific moment arm comparison with Osim model after optimization

glut_max1_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



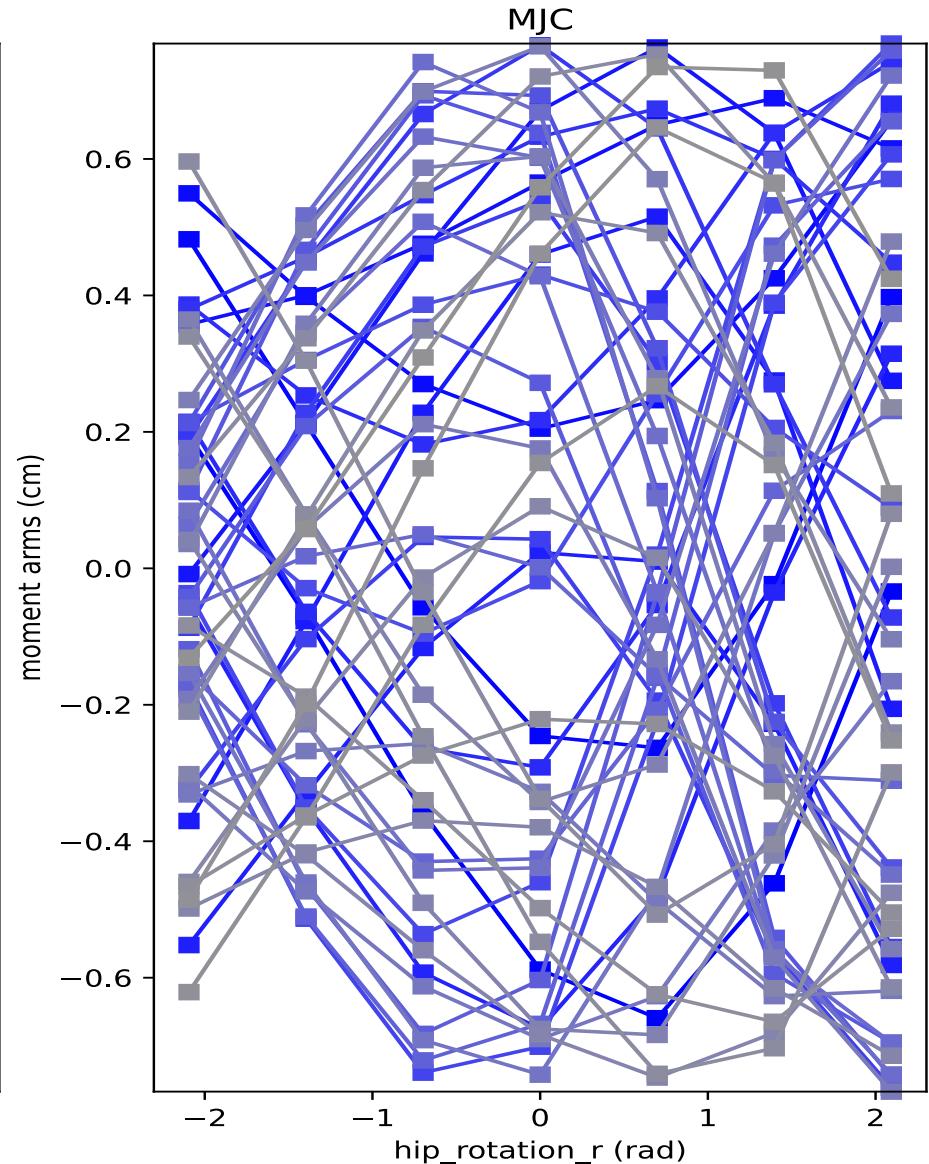
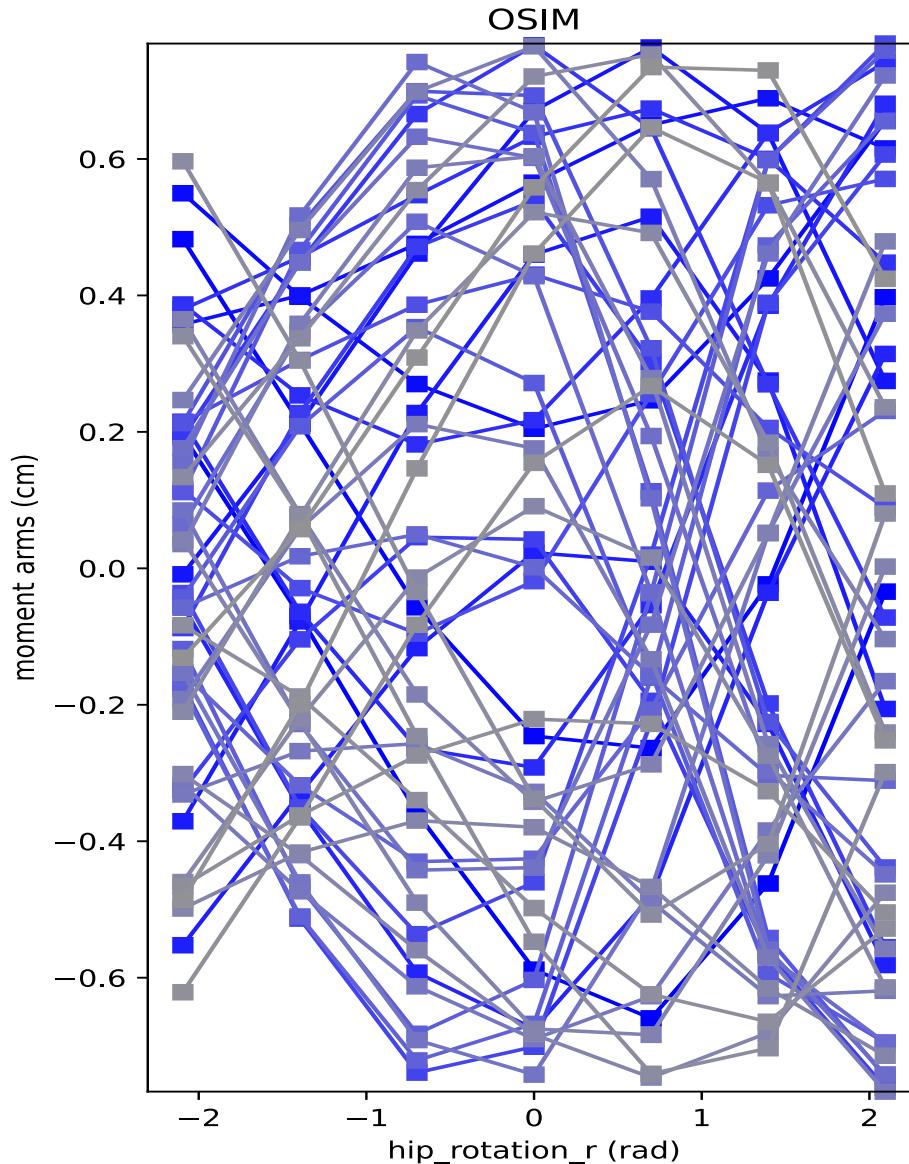
Muscle specific moment arm comparison with Osim model after optimization

glut_med2_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



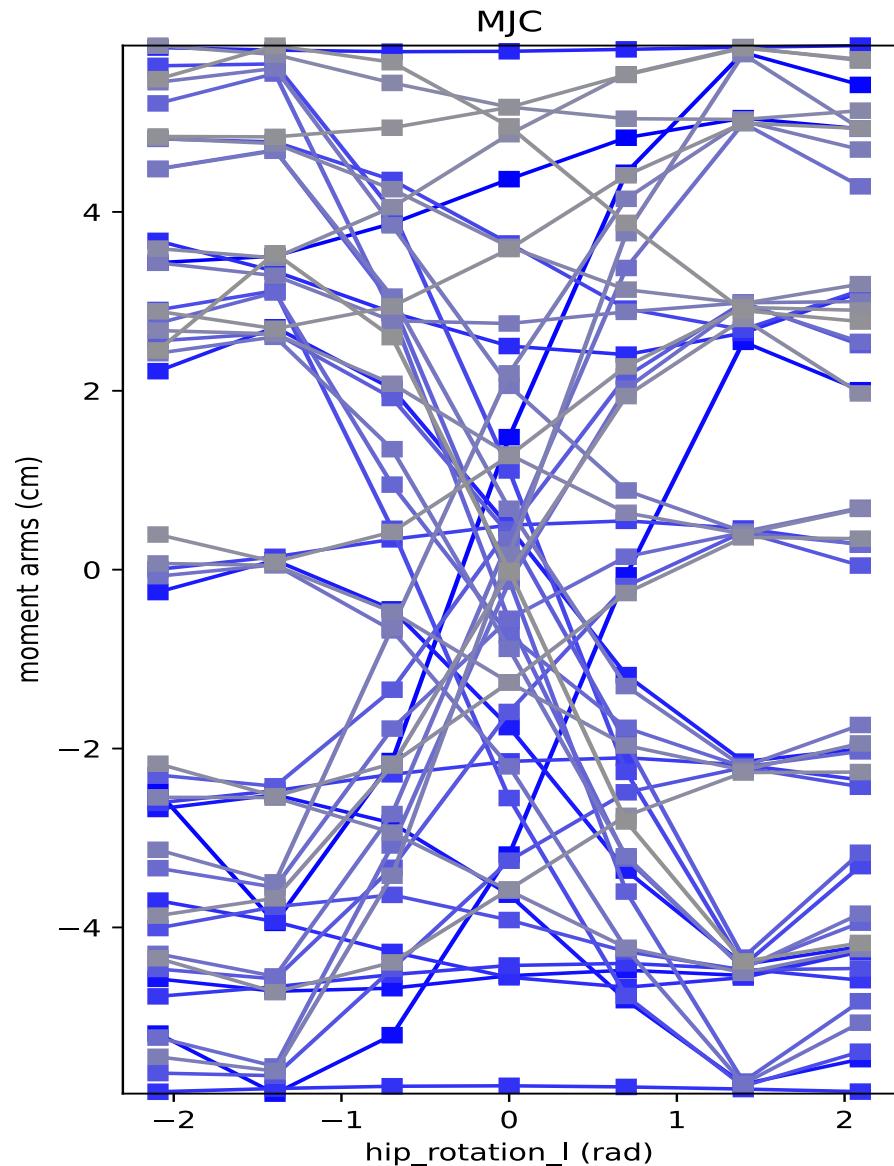
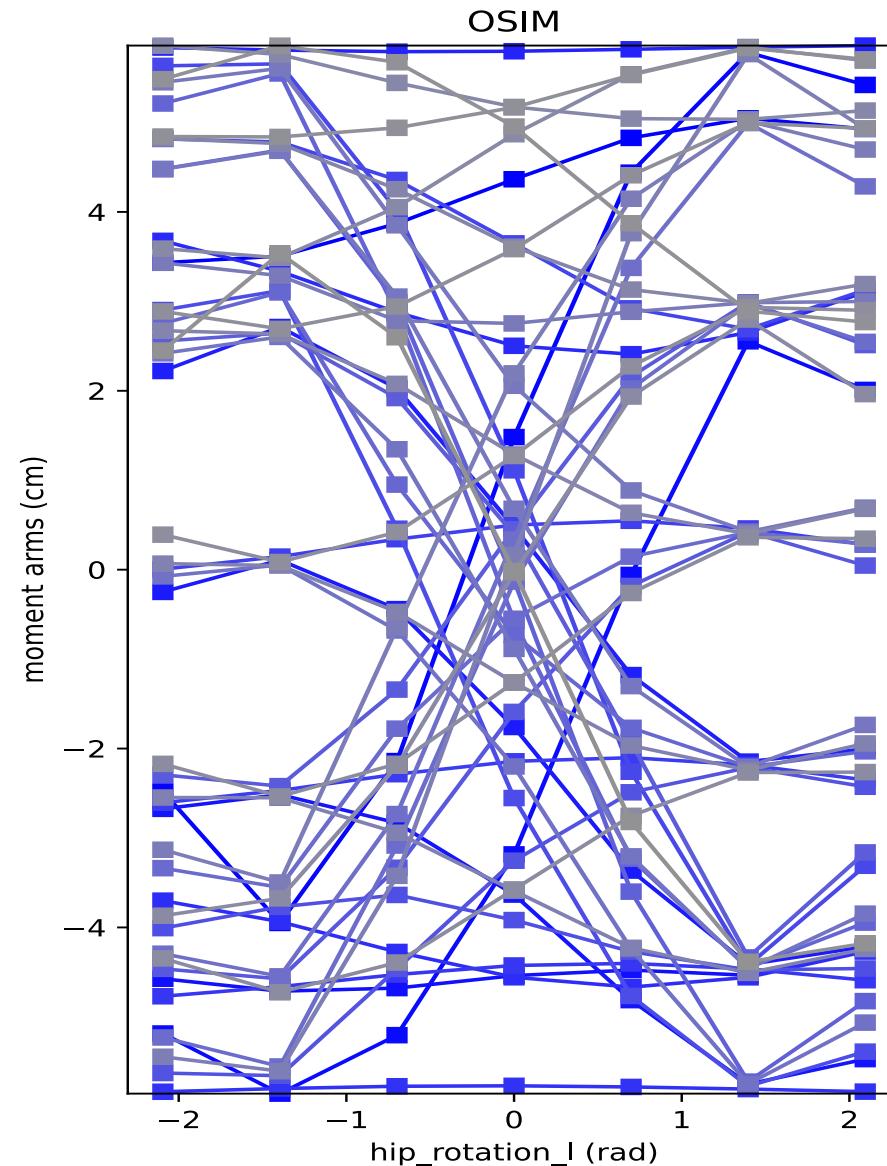
Muscle specific moment arm comparison with Osim model after optimization

add_mag2_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



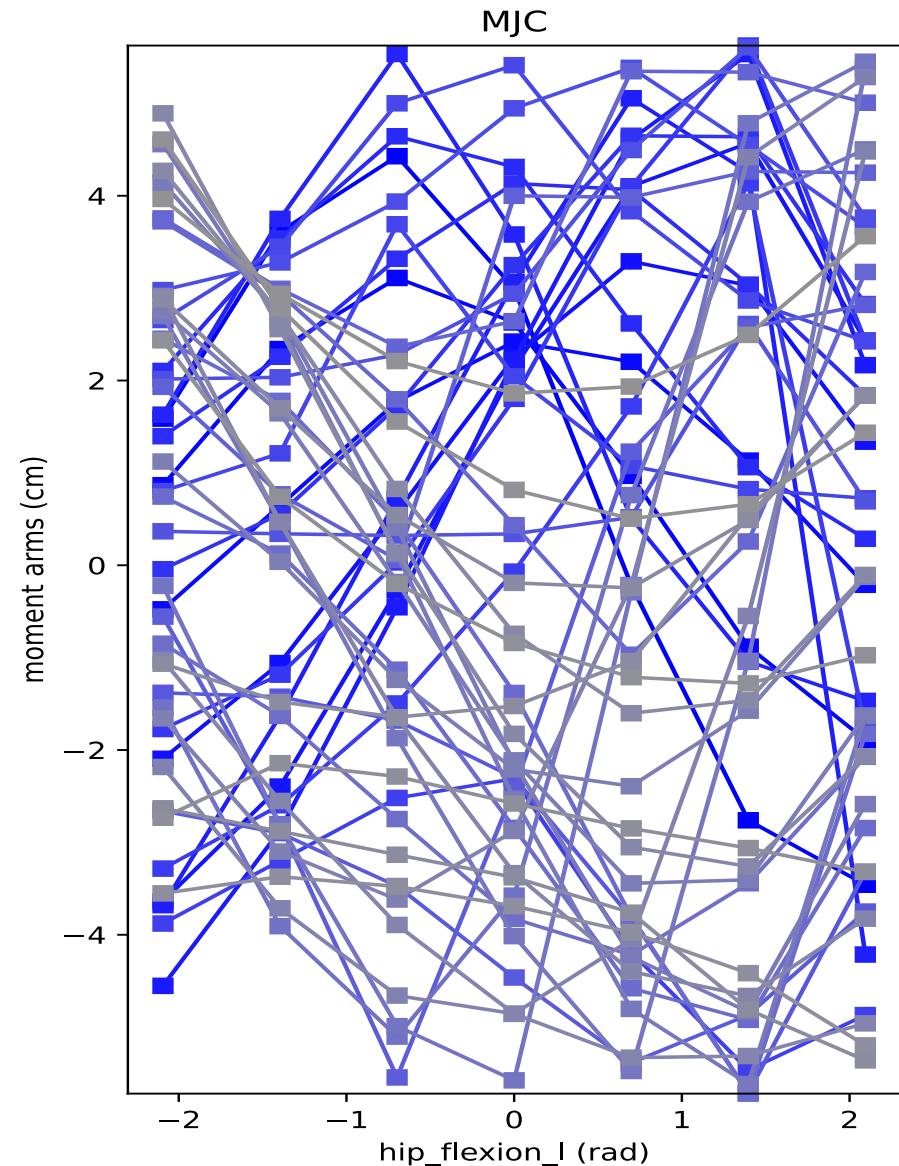
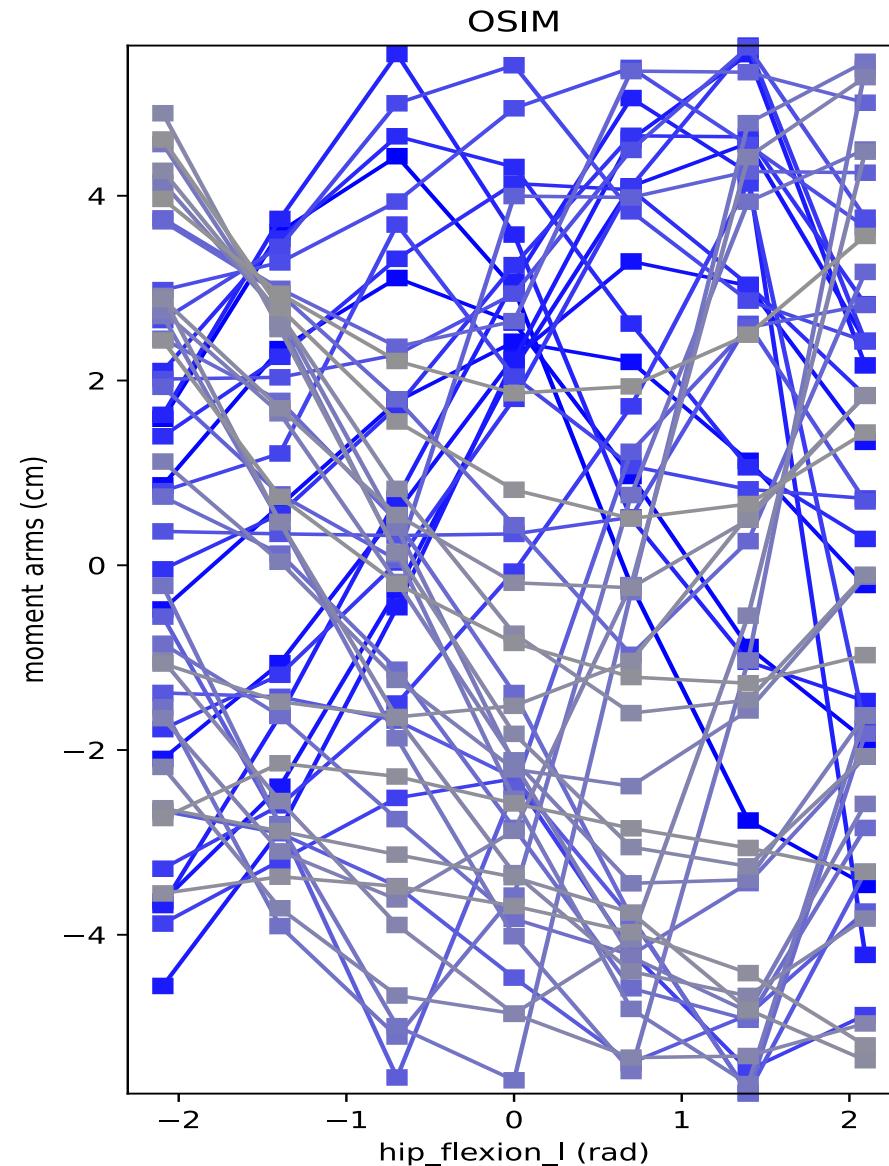
Muscle specific moment arm comparison with Osim model after optimization

glut_med2_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



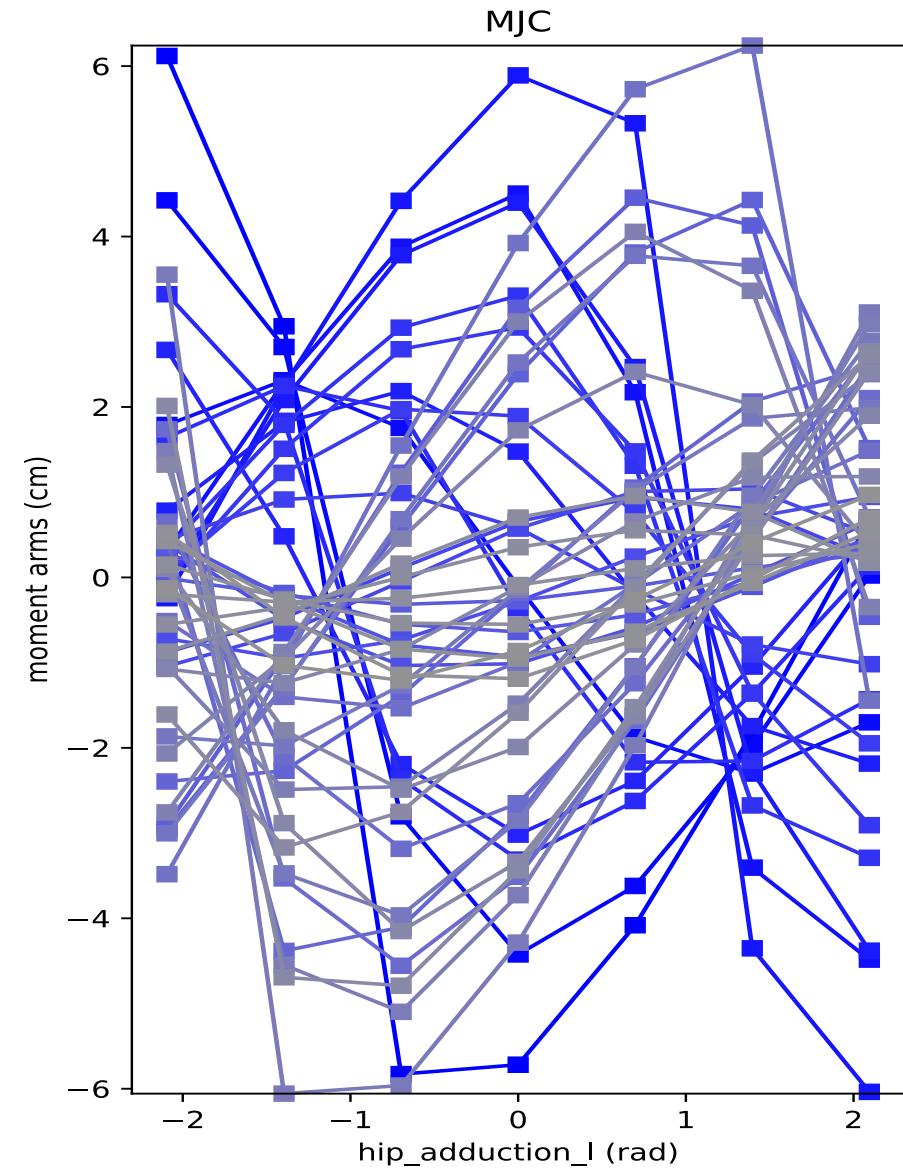
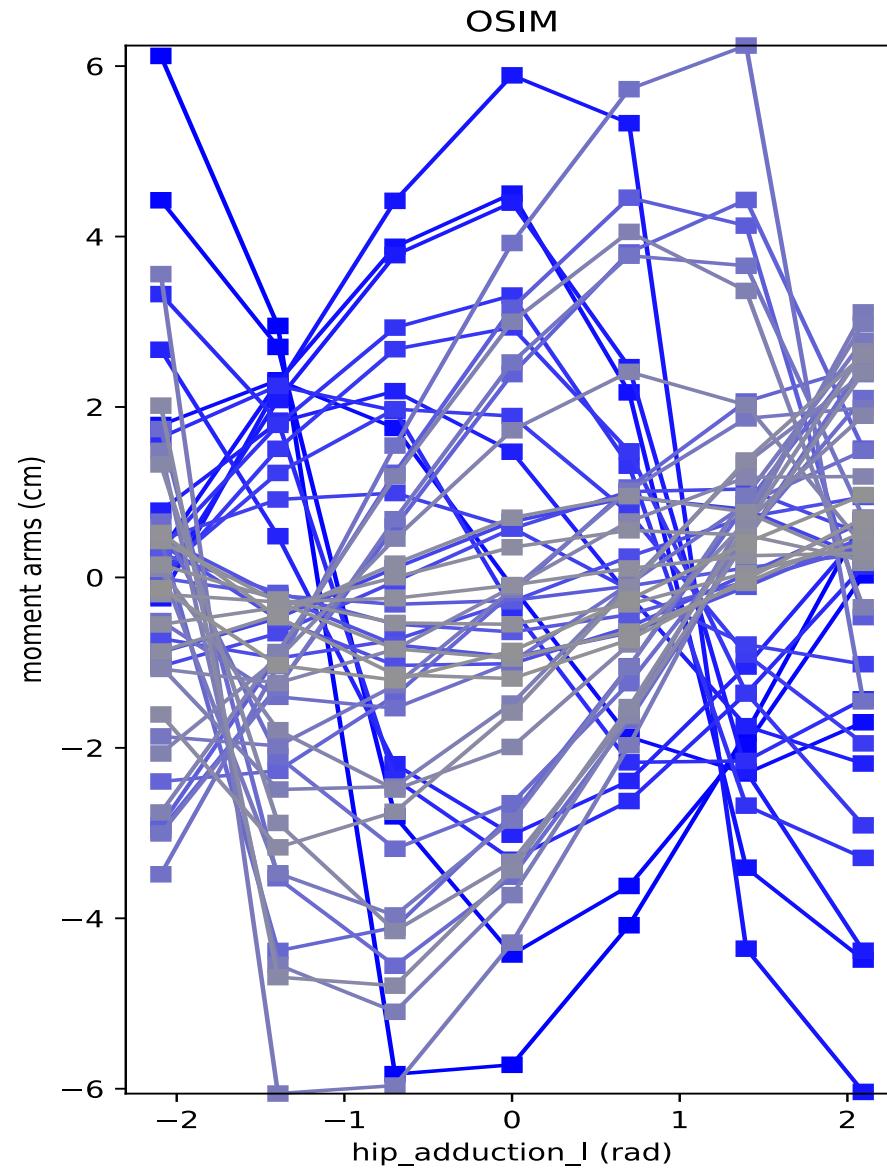
Muscle specific moment arm comparison with Osim model after optimization

quad_fem_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



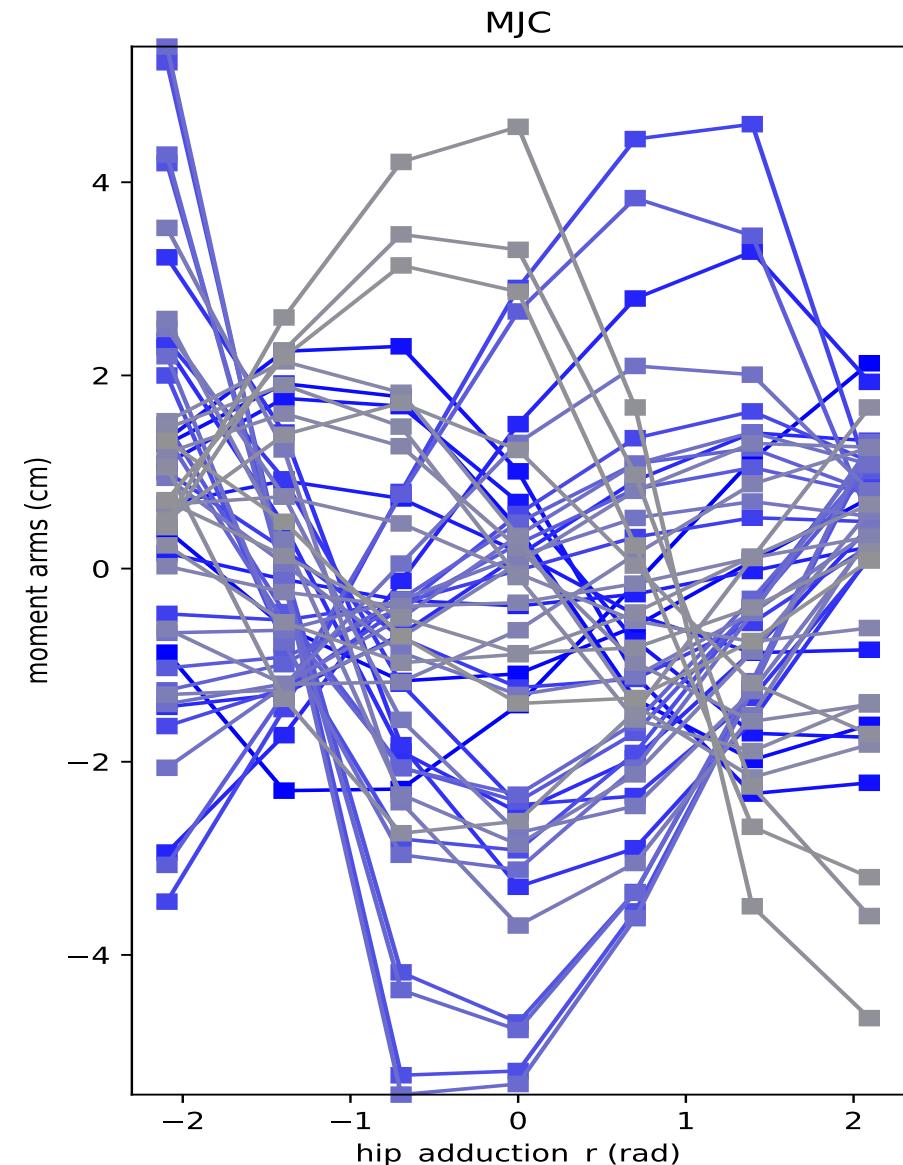
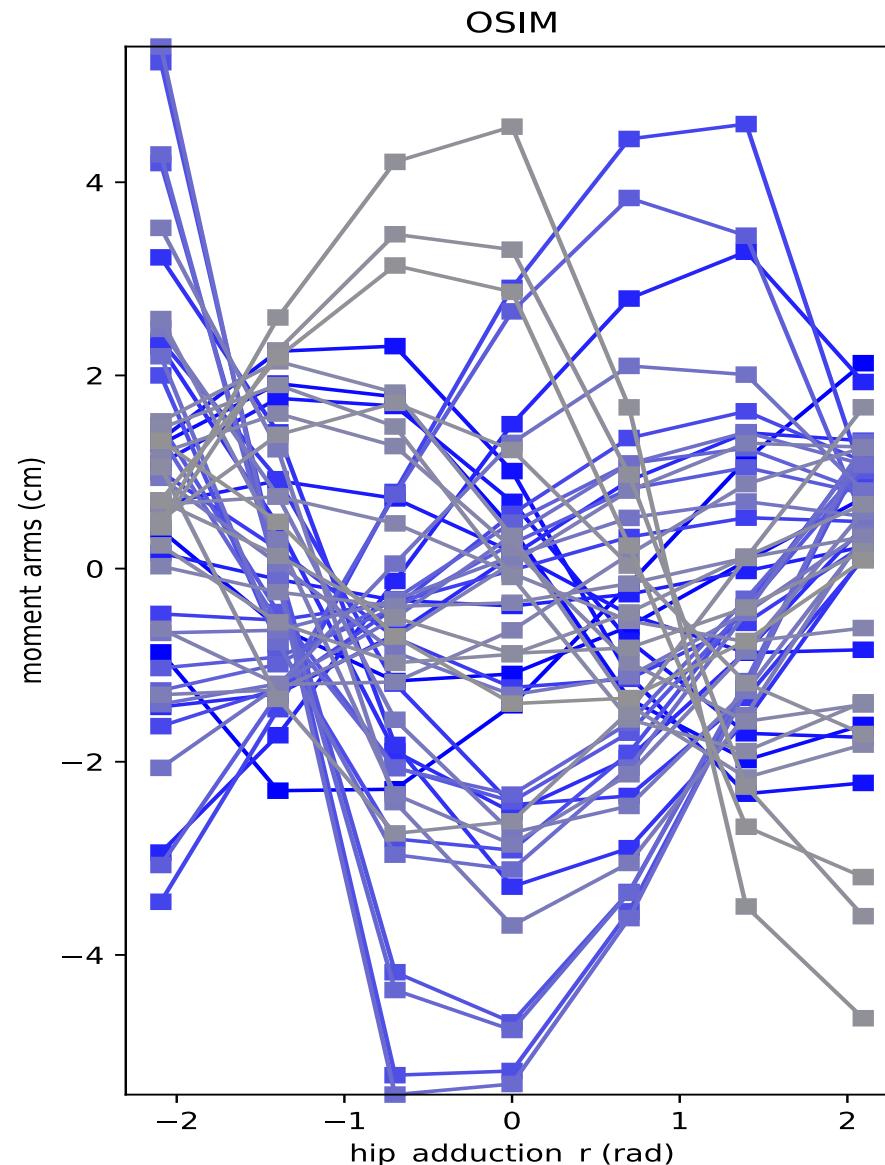
Muscle specific moment arm comparison with Osim model after optimization

glut_max1_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



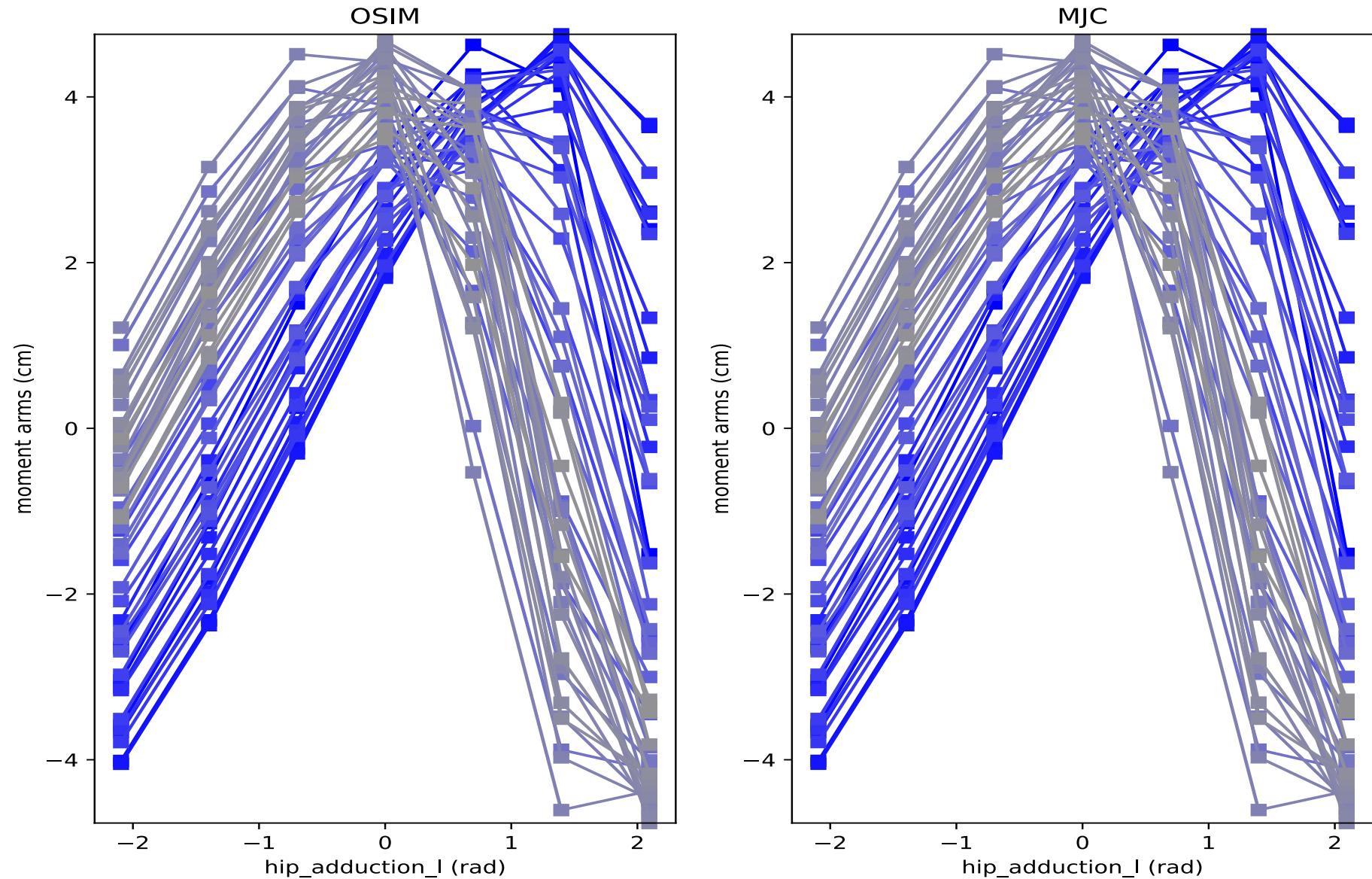
Muscle specific moment arm comparison with Osim model after optimization

glut_med1_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



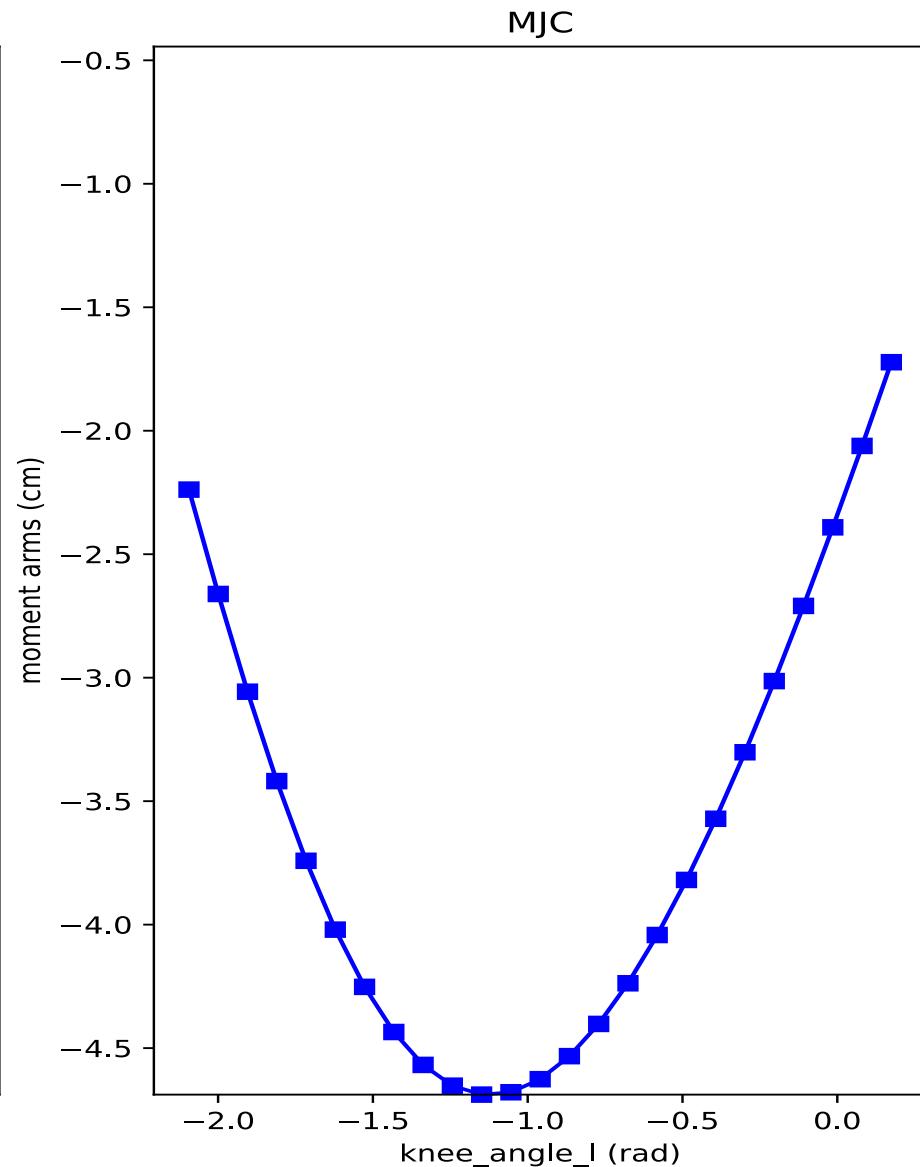
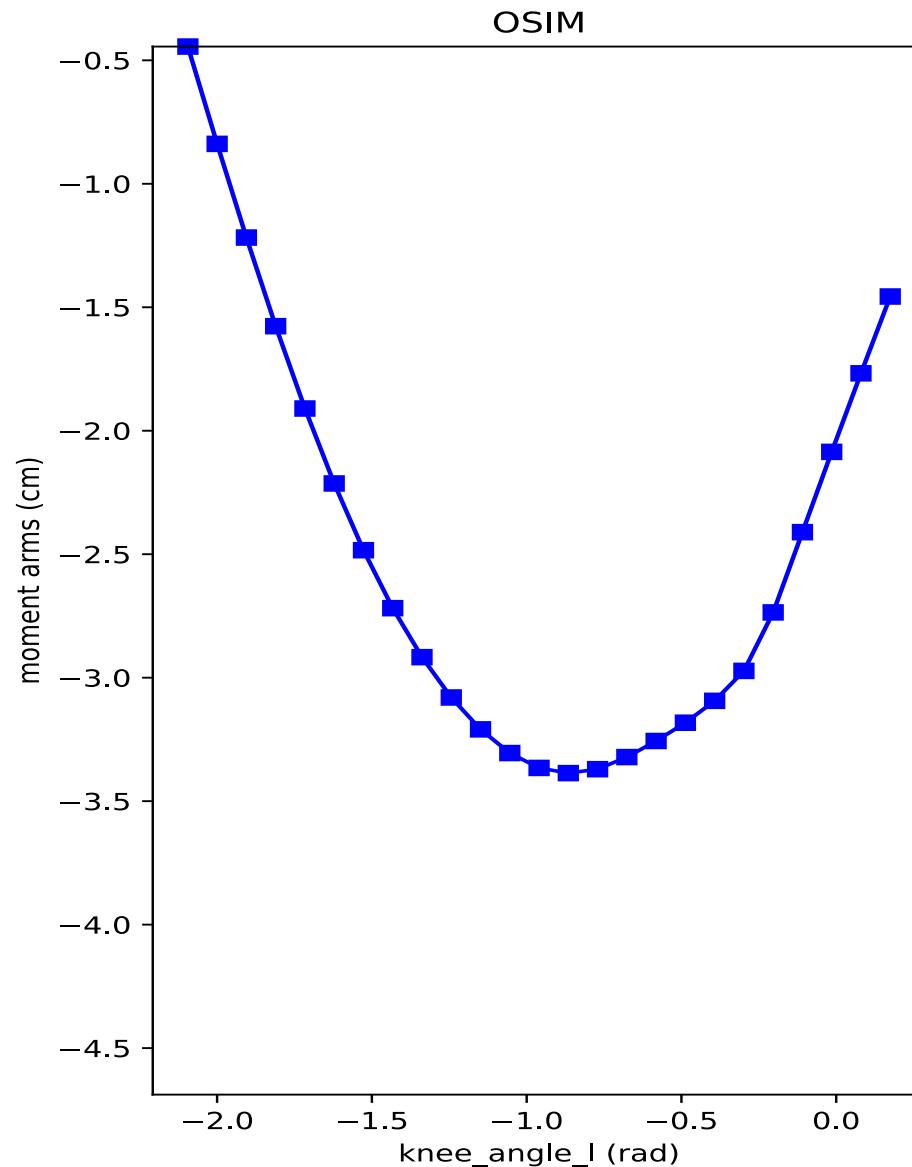
Muscle specific moment arm comparison with Osim model after optimization

pect_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



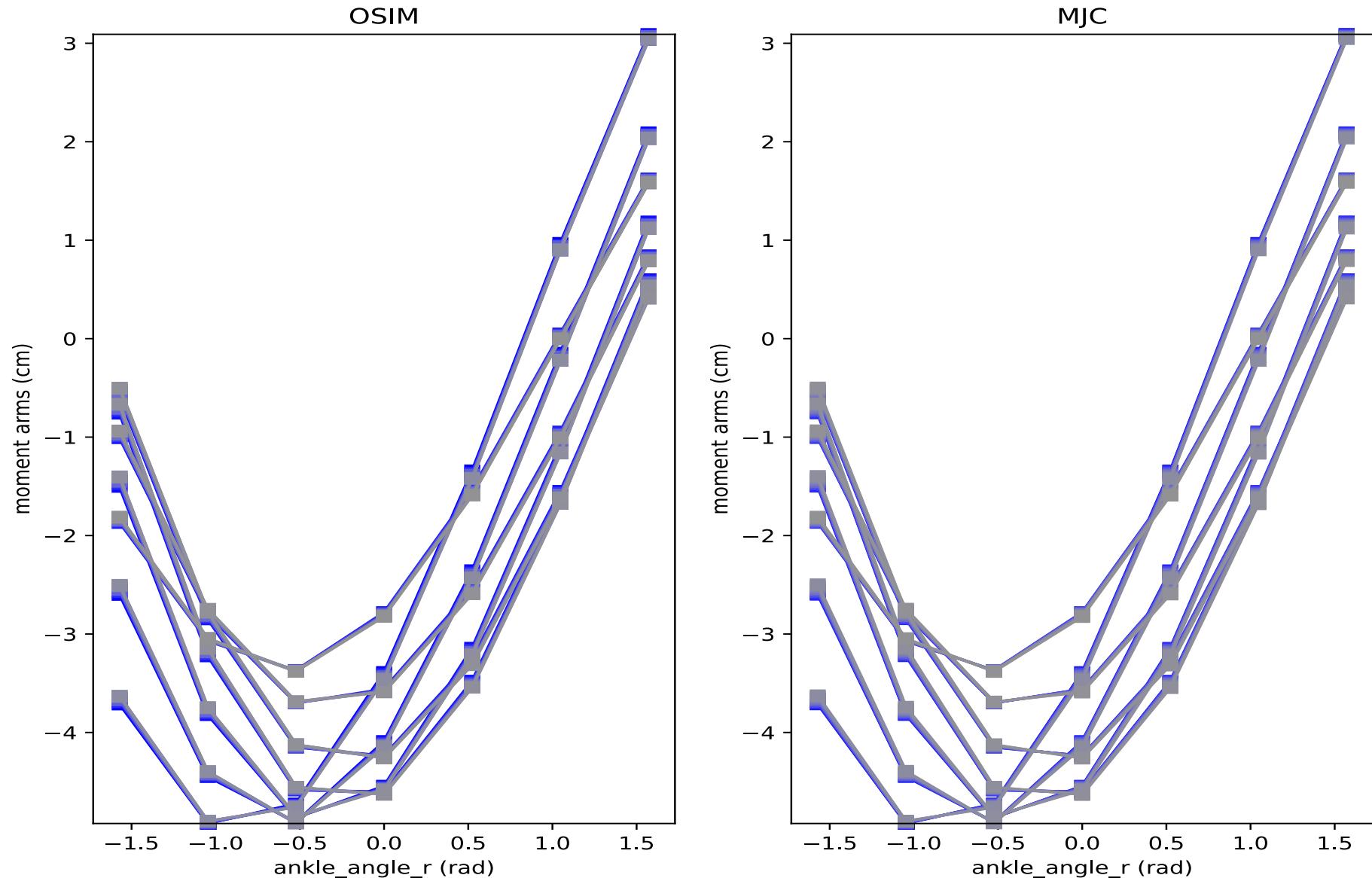
Muscle specific moment arm comparison with Osim model after optimization

bifemsh_I - knee_angle_I



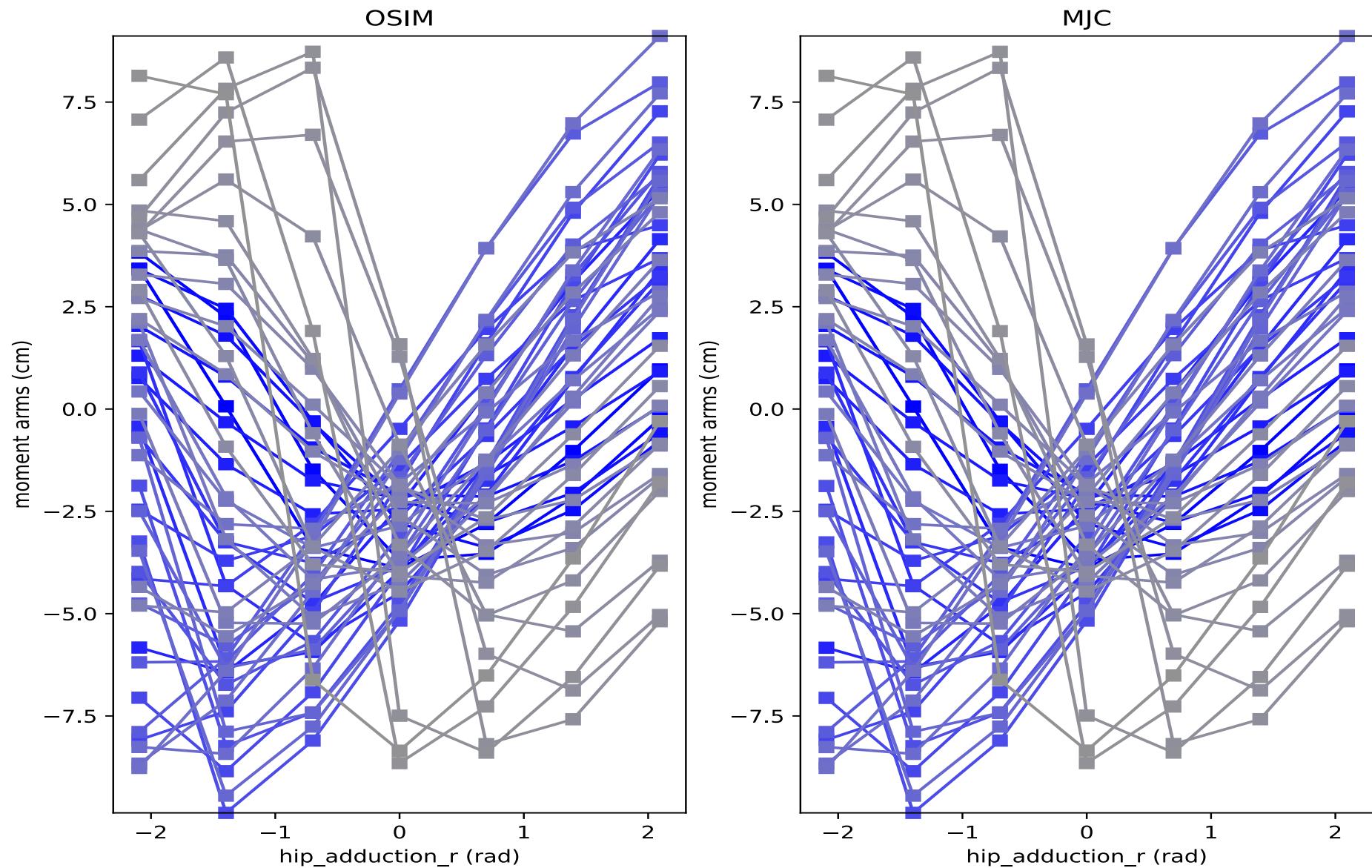
Muscle specific moment arm comparison with Osim model after optimization

med_gas_r - ankle_angle_r - knee_angle_r - subtalar_angle_r



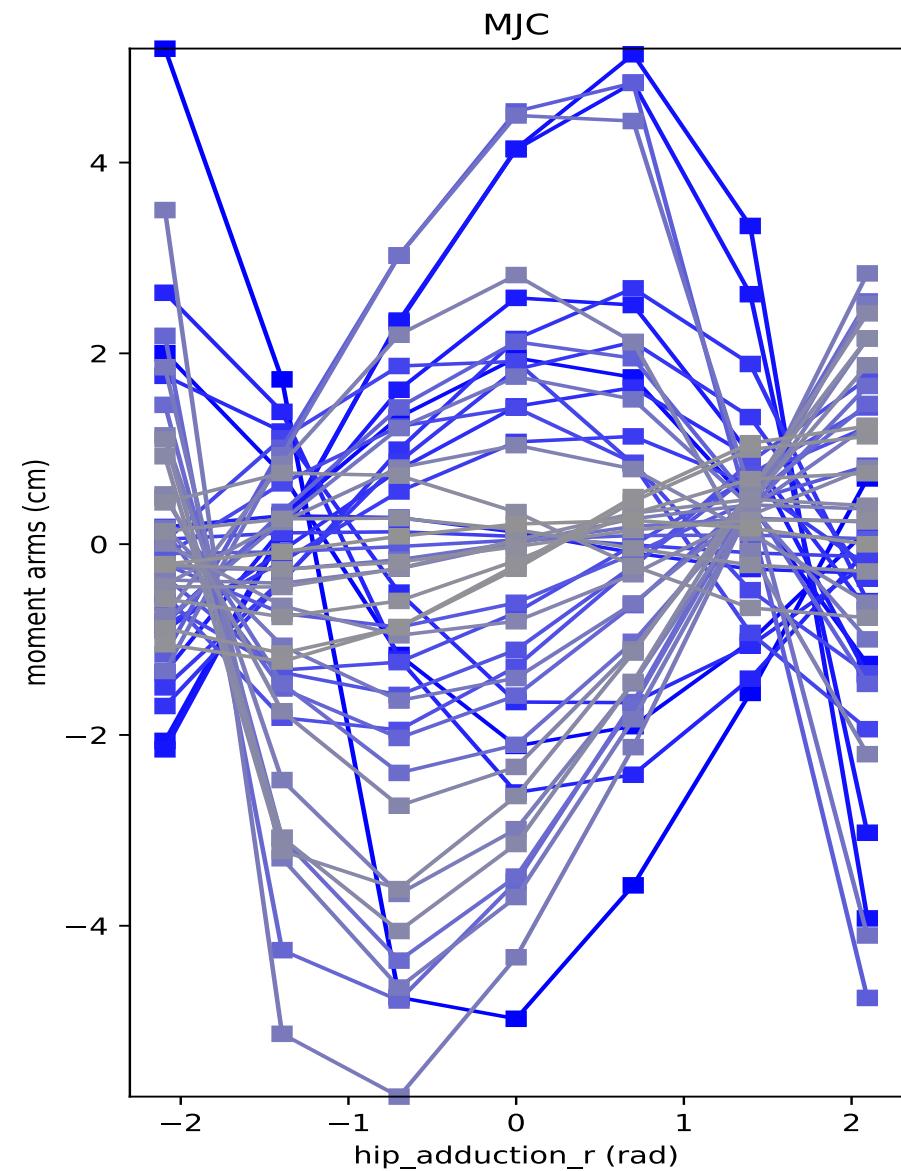
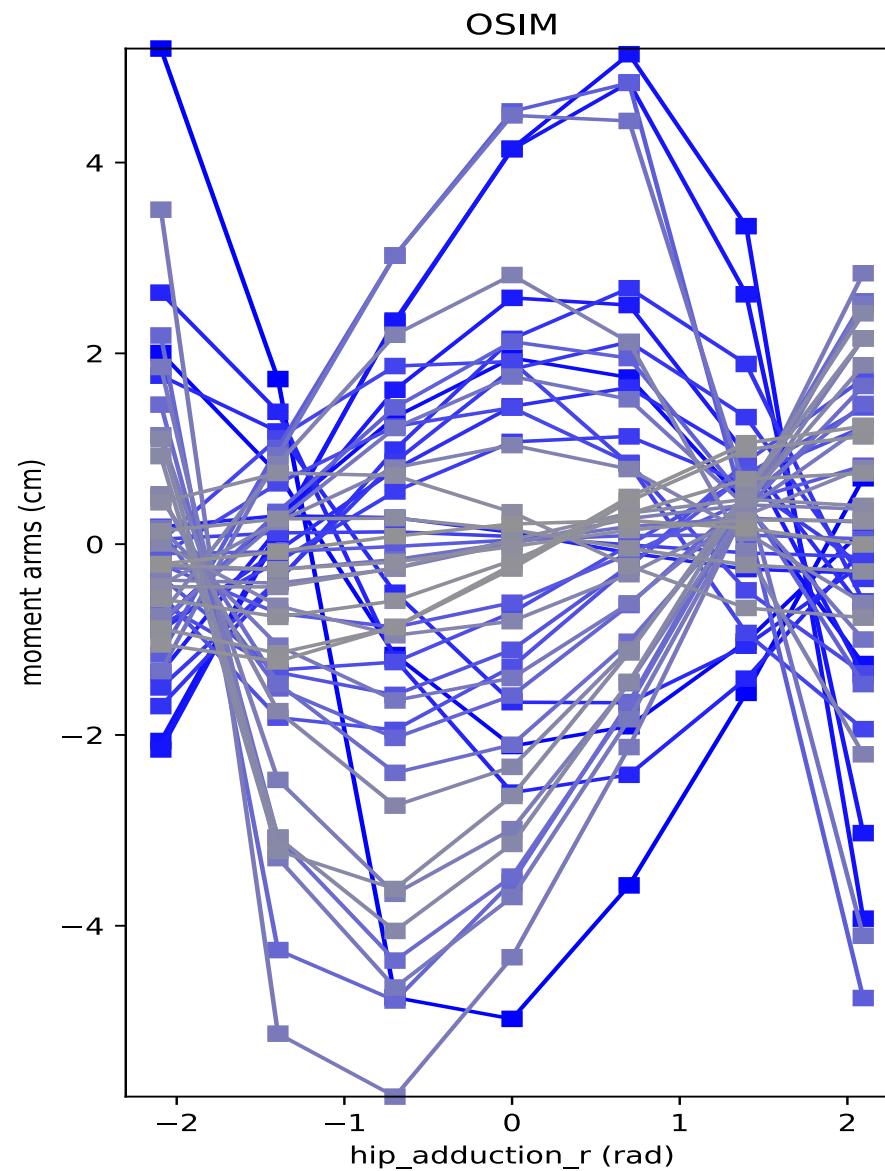
Muscle specific moment arm comparison with Osim model after optimization

tfl_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



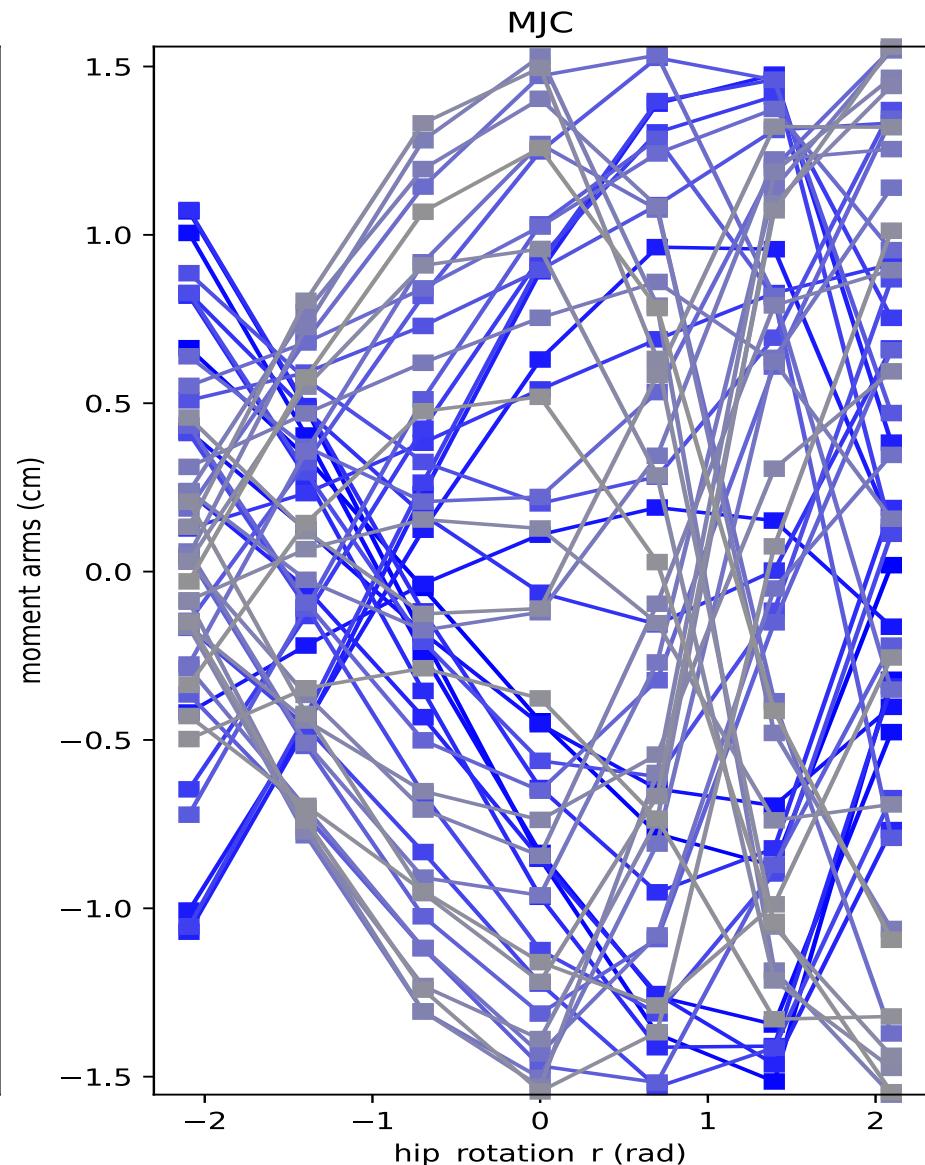
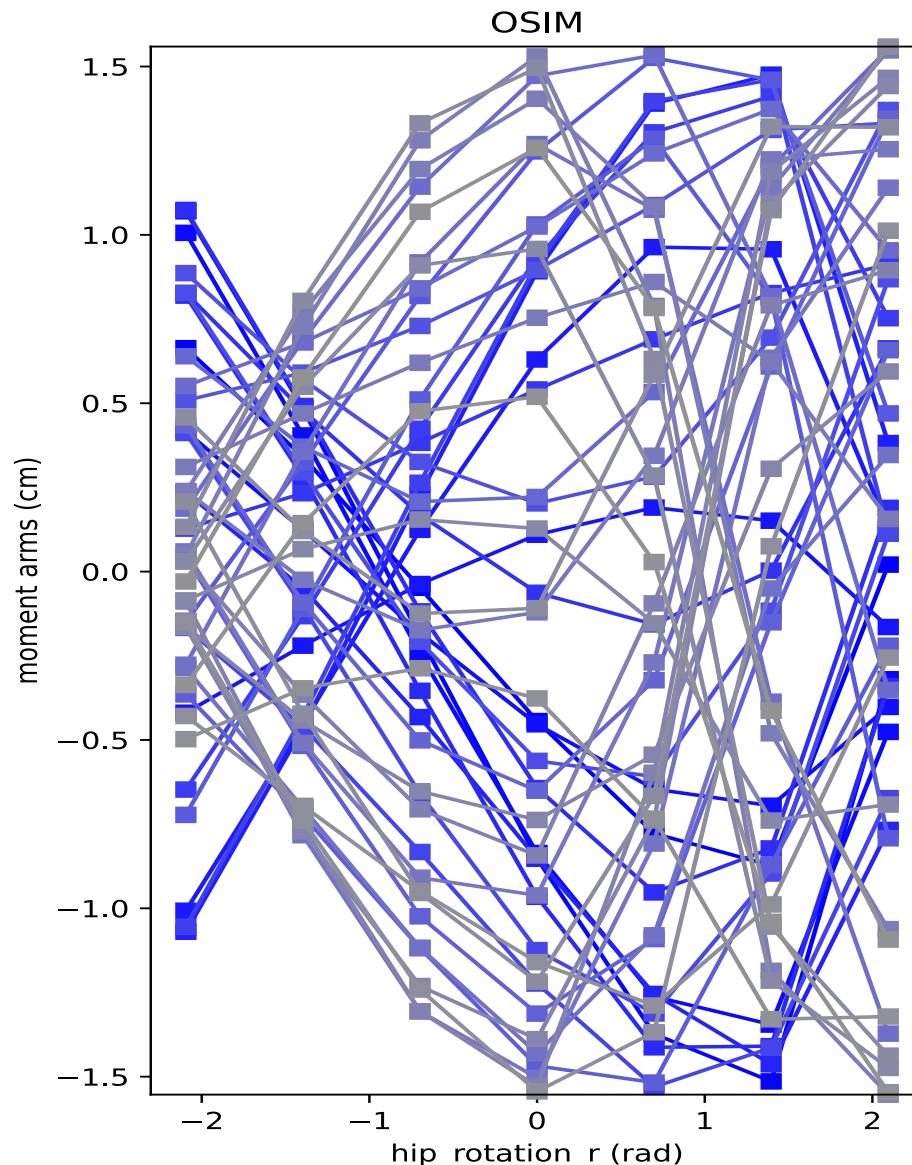
Muscle specific moment arm comparison with Osim model after optimization

glut_med3_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



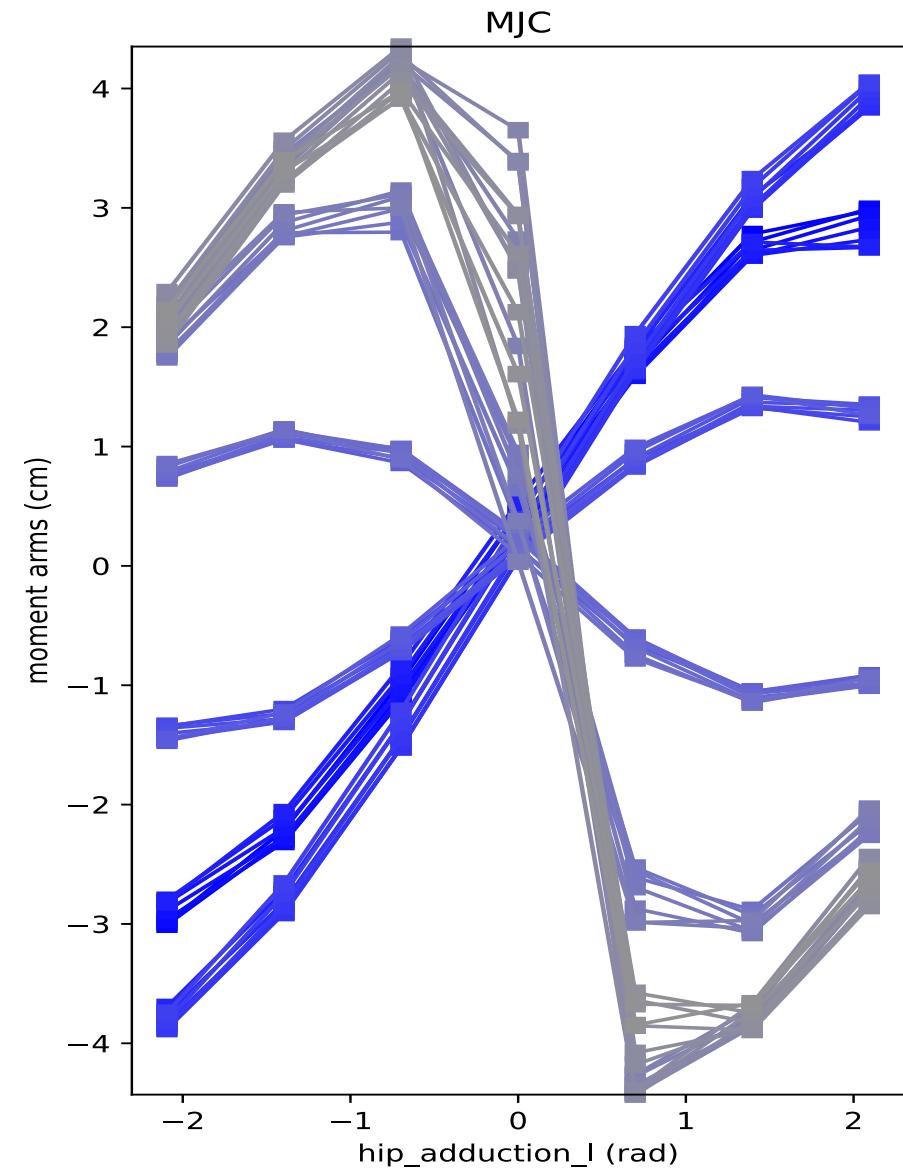
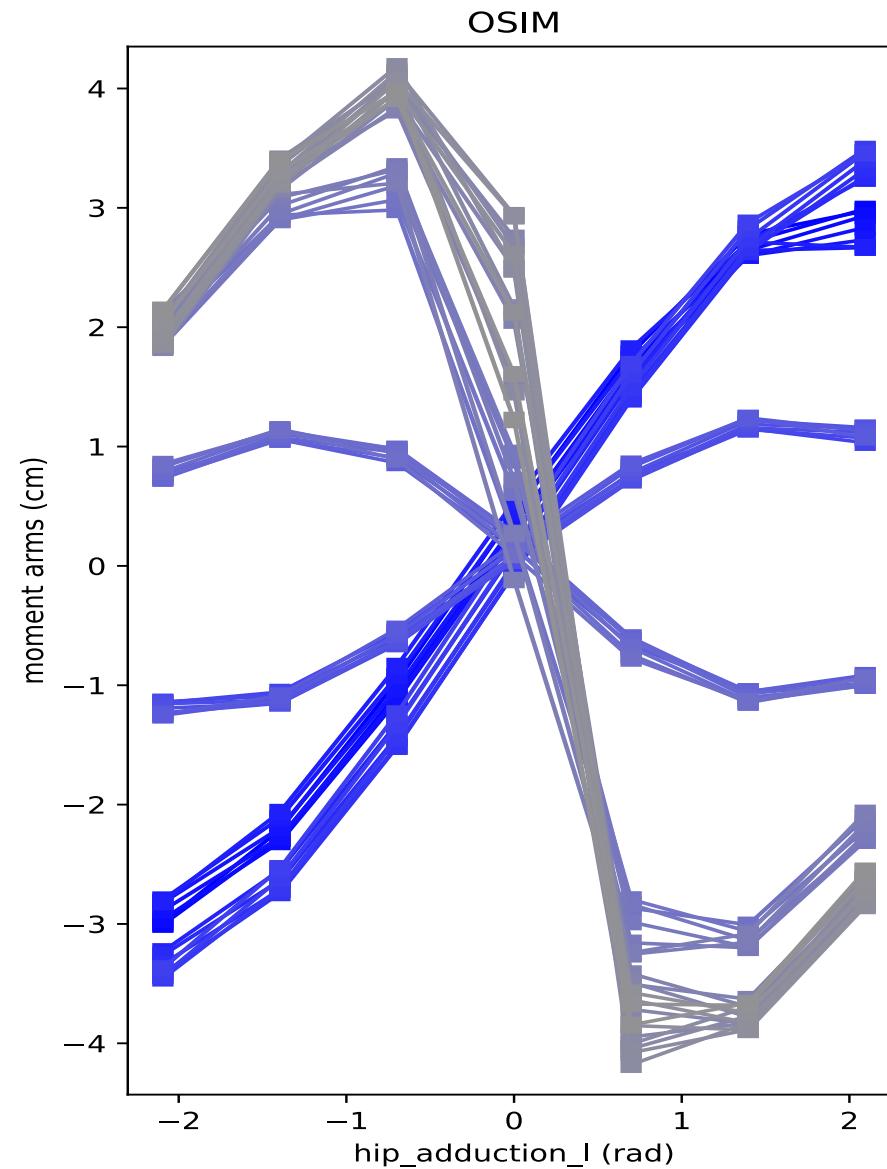
Muscle specific moment arm comparison with Osim model after optimization

pect_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



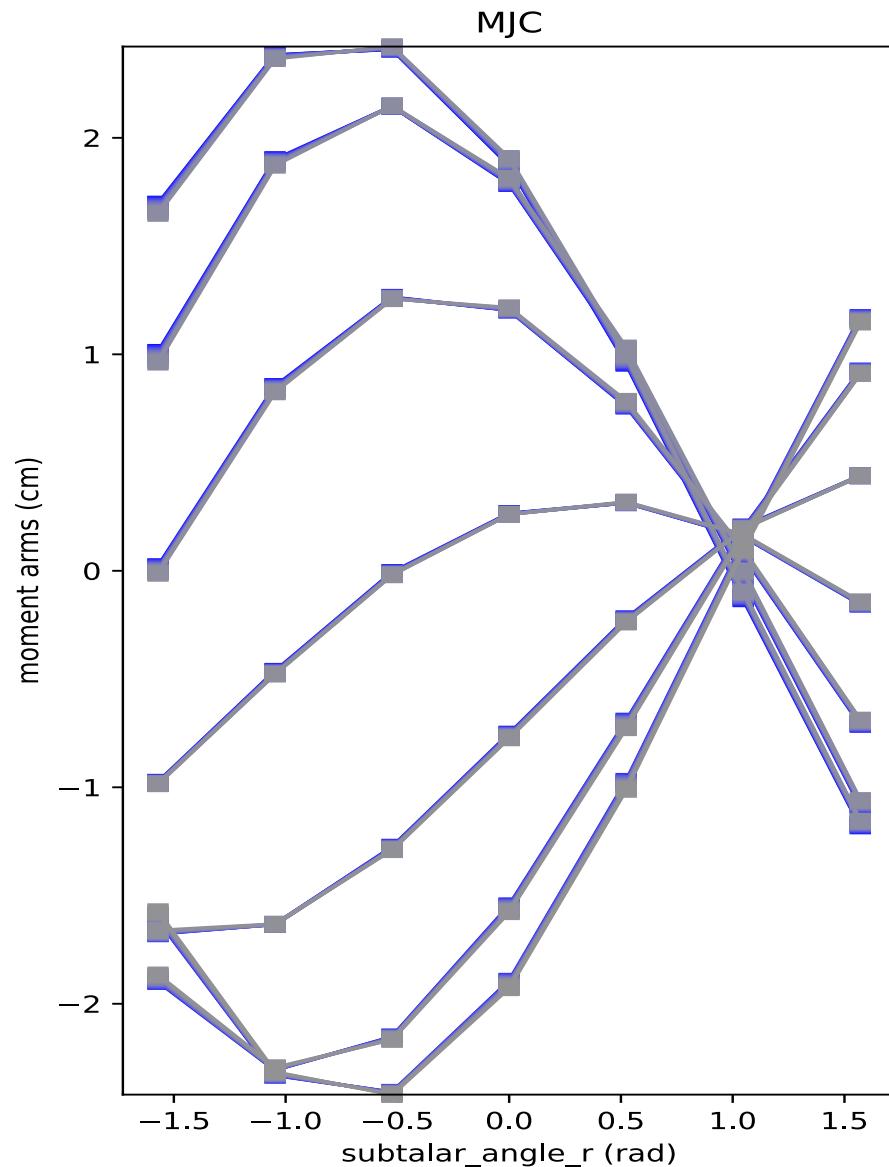
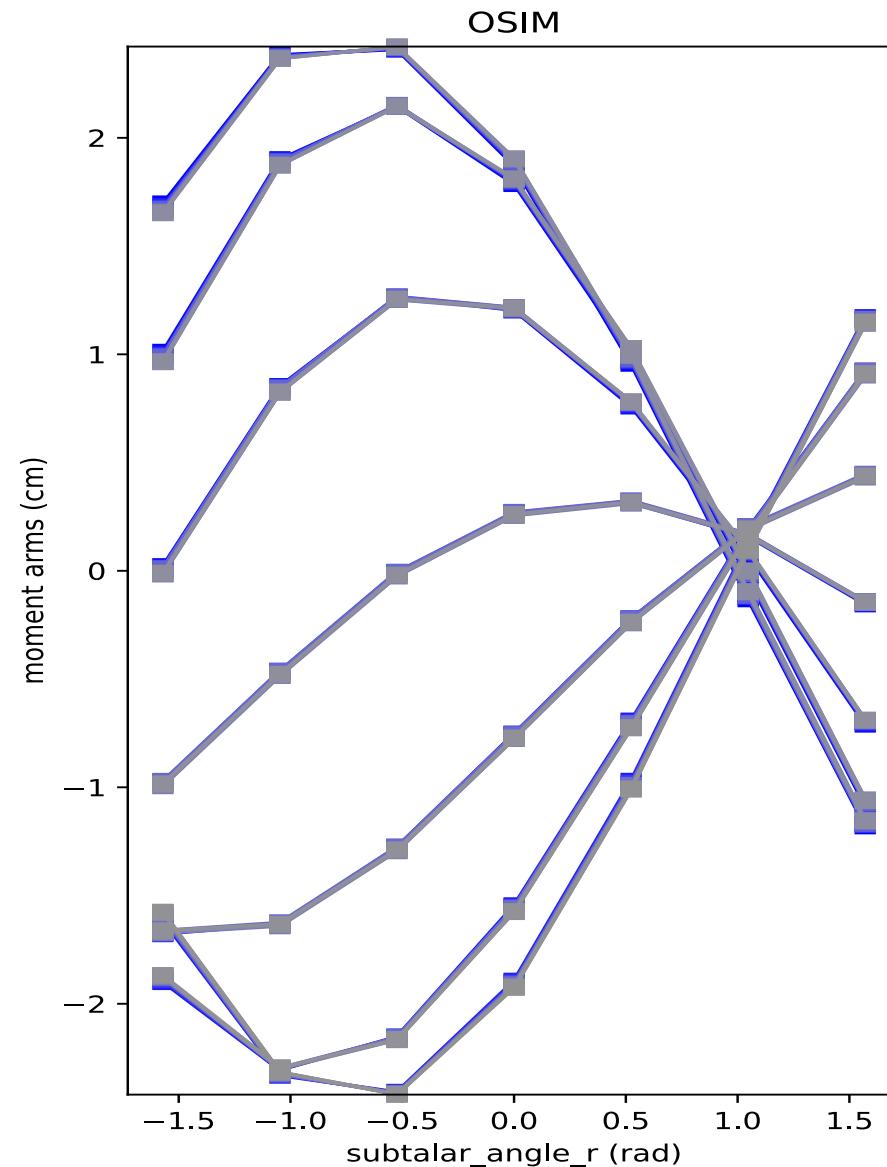
Muscle specific moment arm comparison with Osim model after optimization

psoas_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



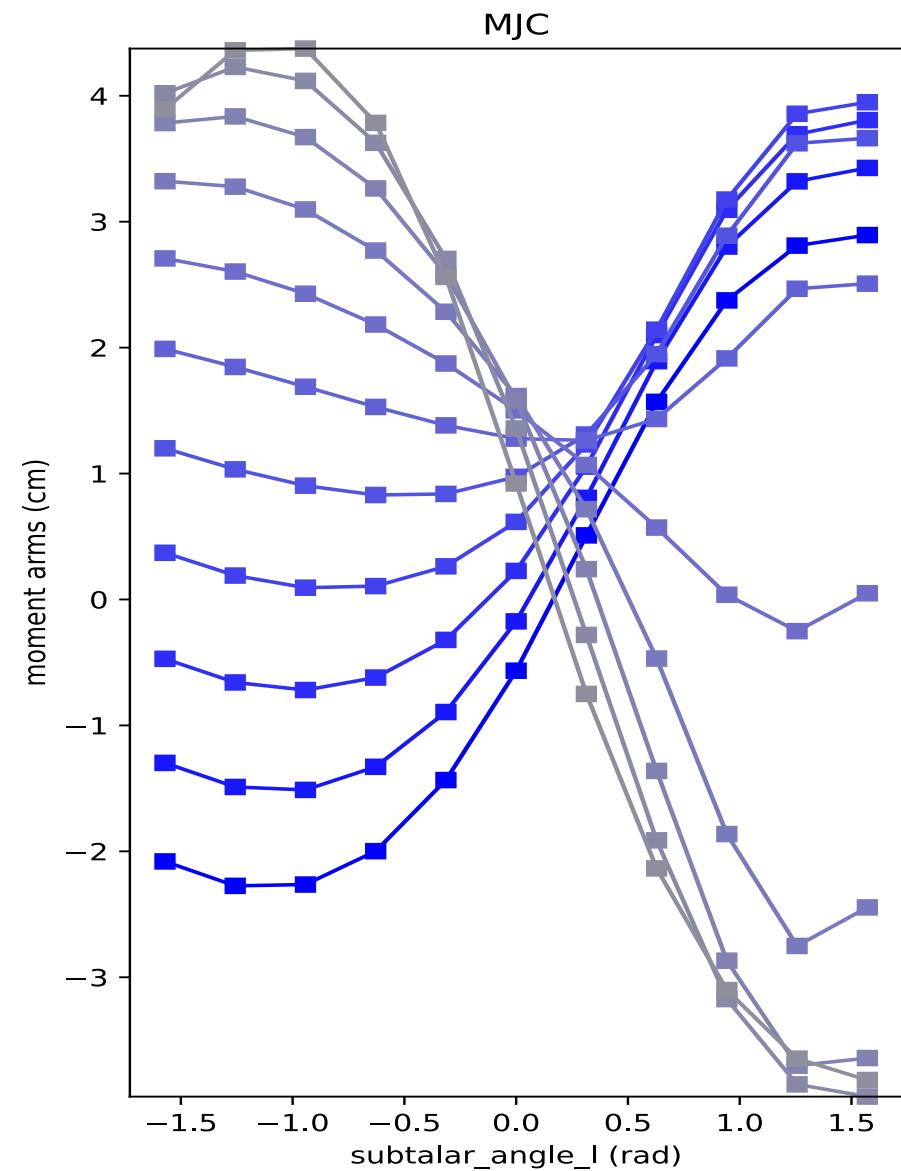
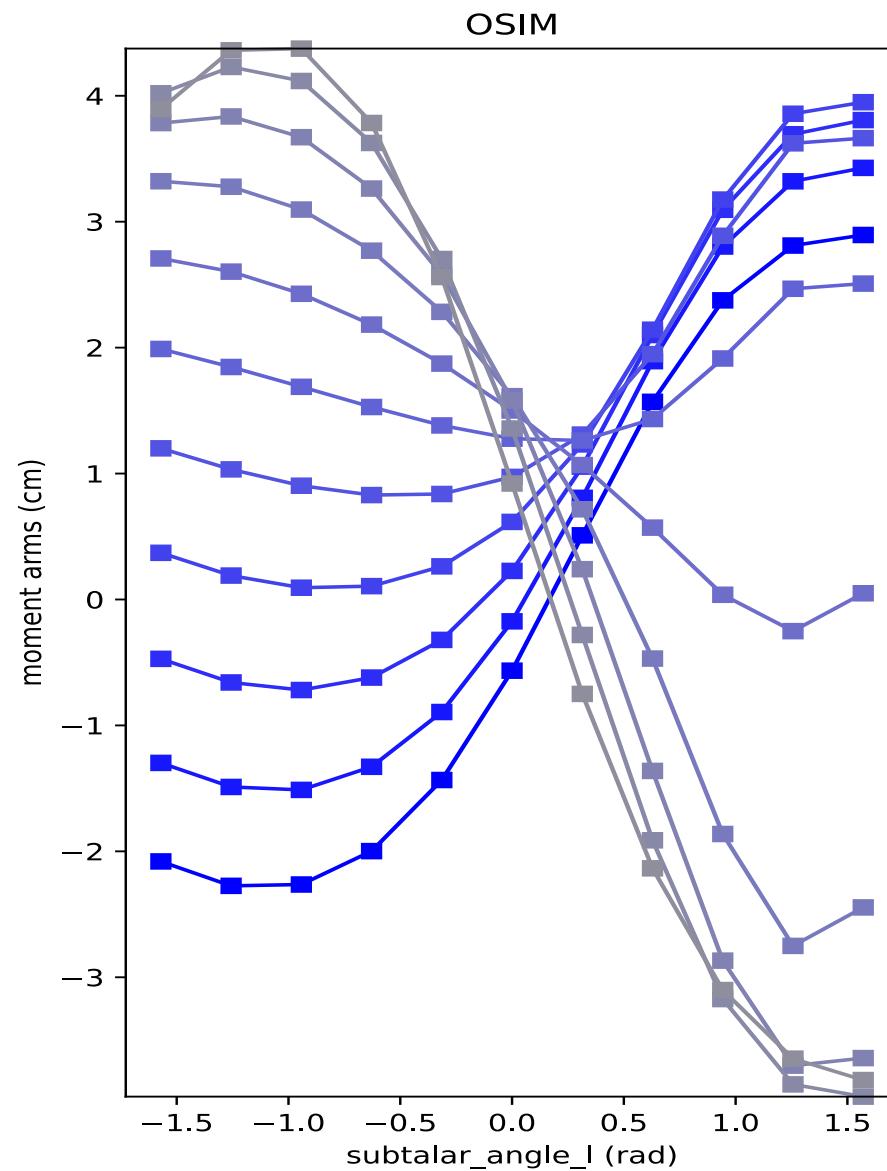
Muscle specific moment arm comparison with Osim model after optimization

med_gas_r - ankle_angle_r - knee_angle_r - subtalar_angle_r



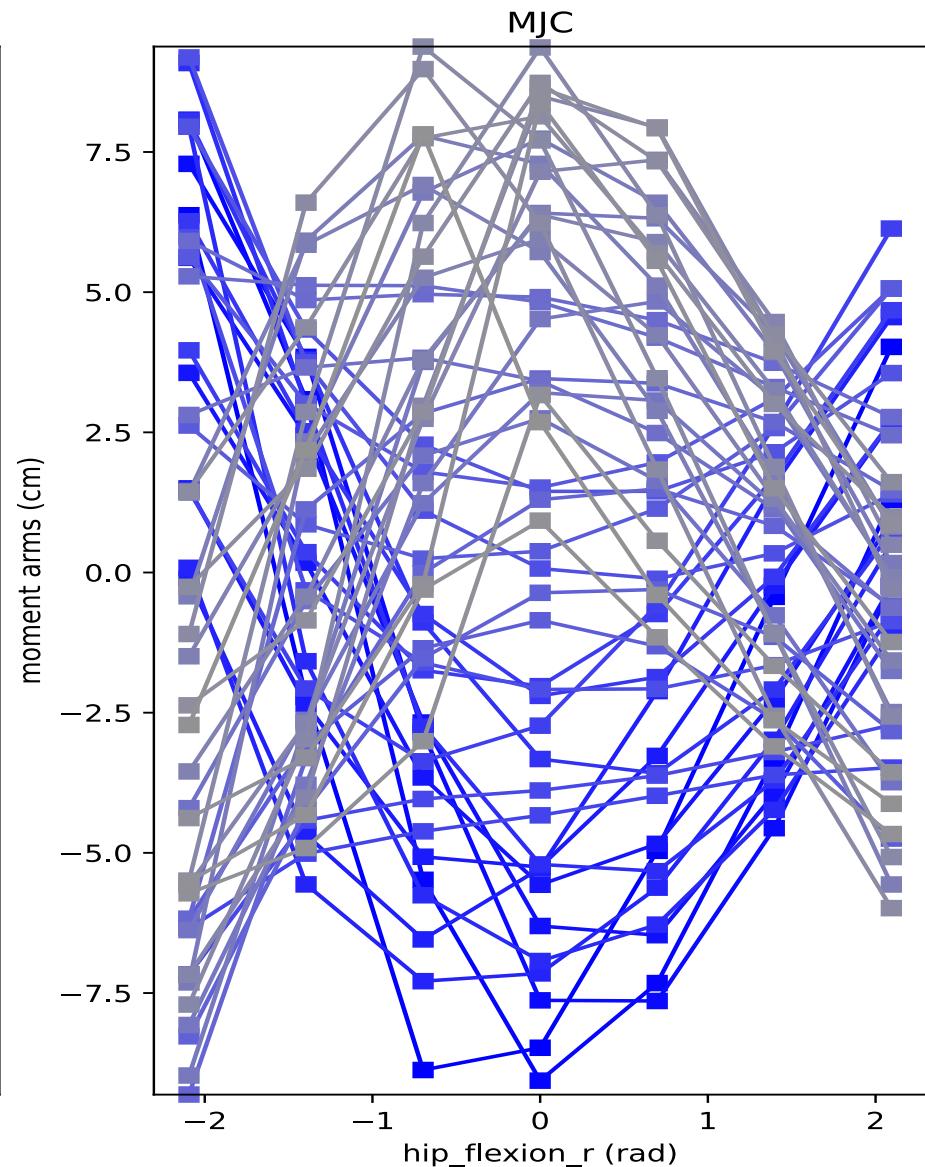
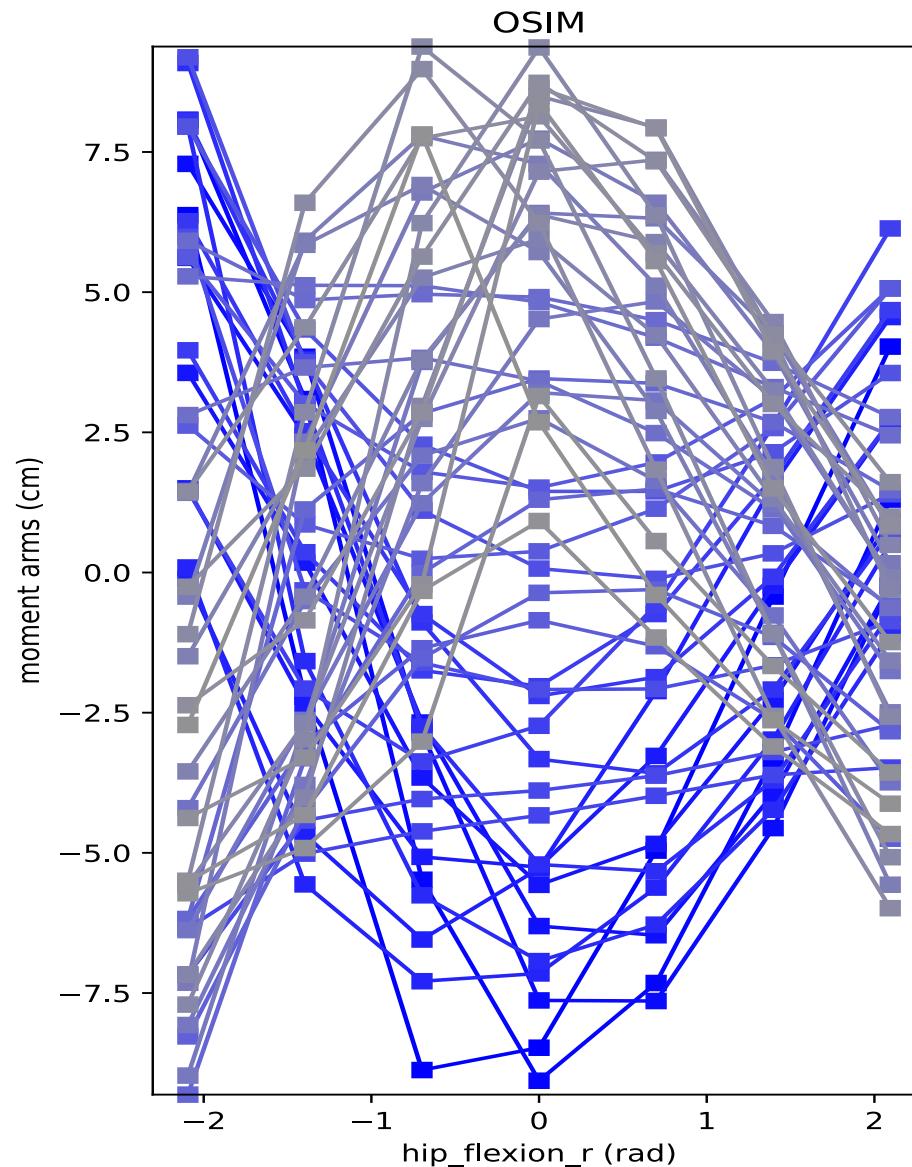
Muscle specific moment arm comparison with Osim model after optimization

tib_ant_I - ankle_angle_I - subtalar_angle_I



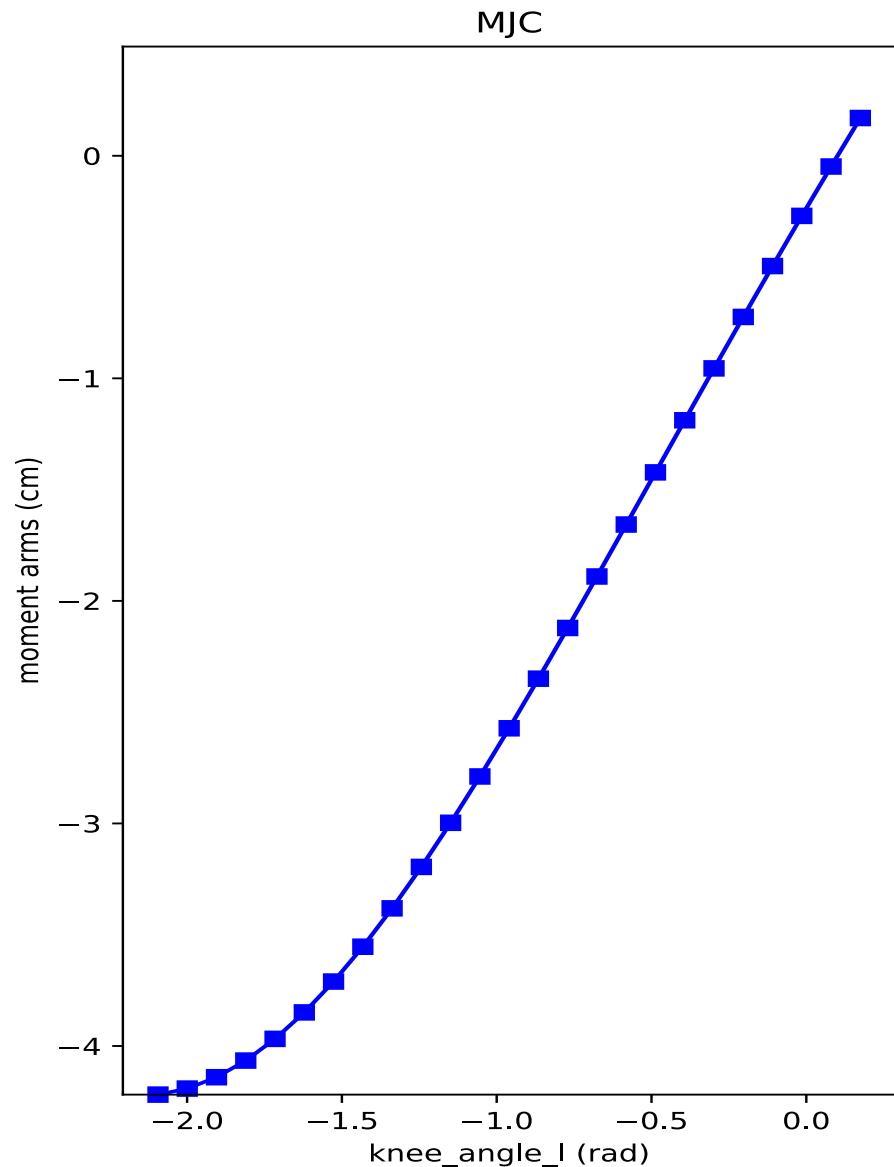
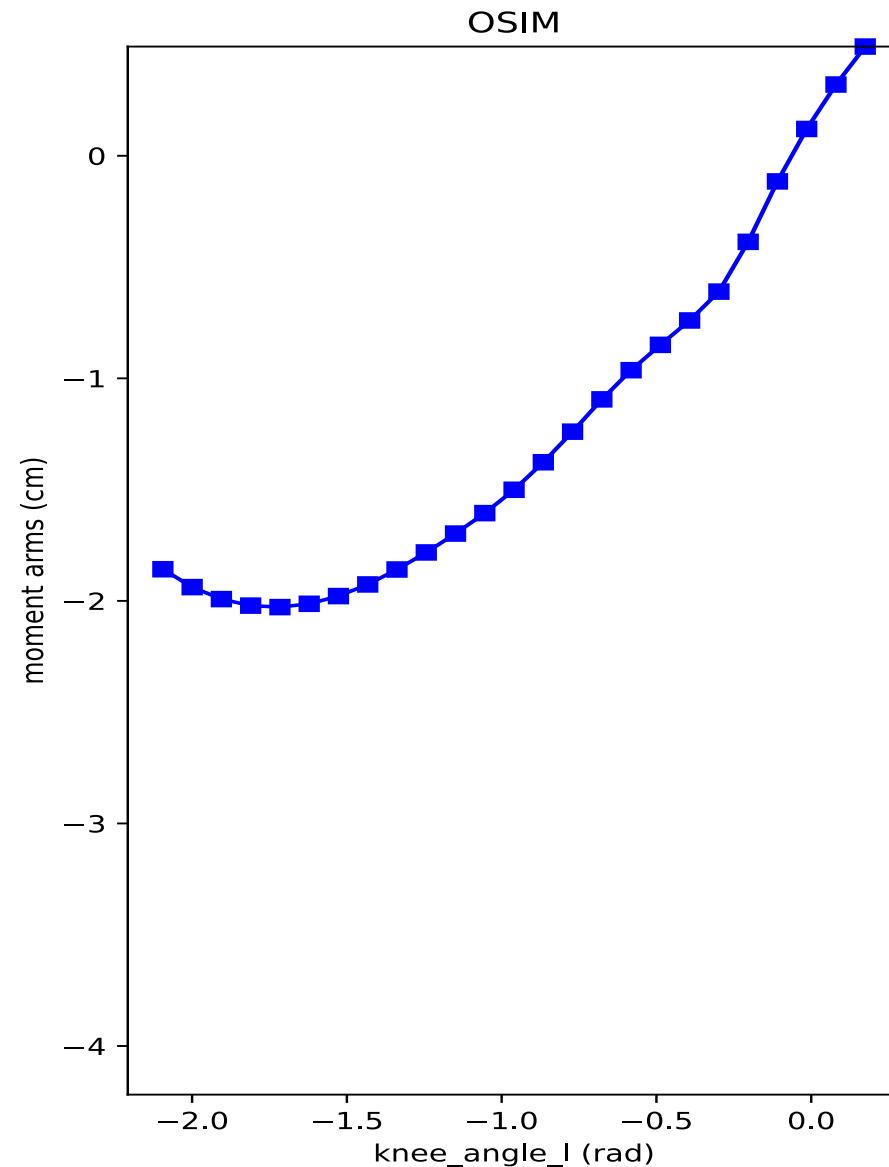
Muscle specific moment arm comparison with Osim model after optimization

tfl_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



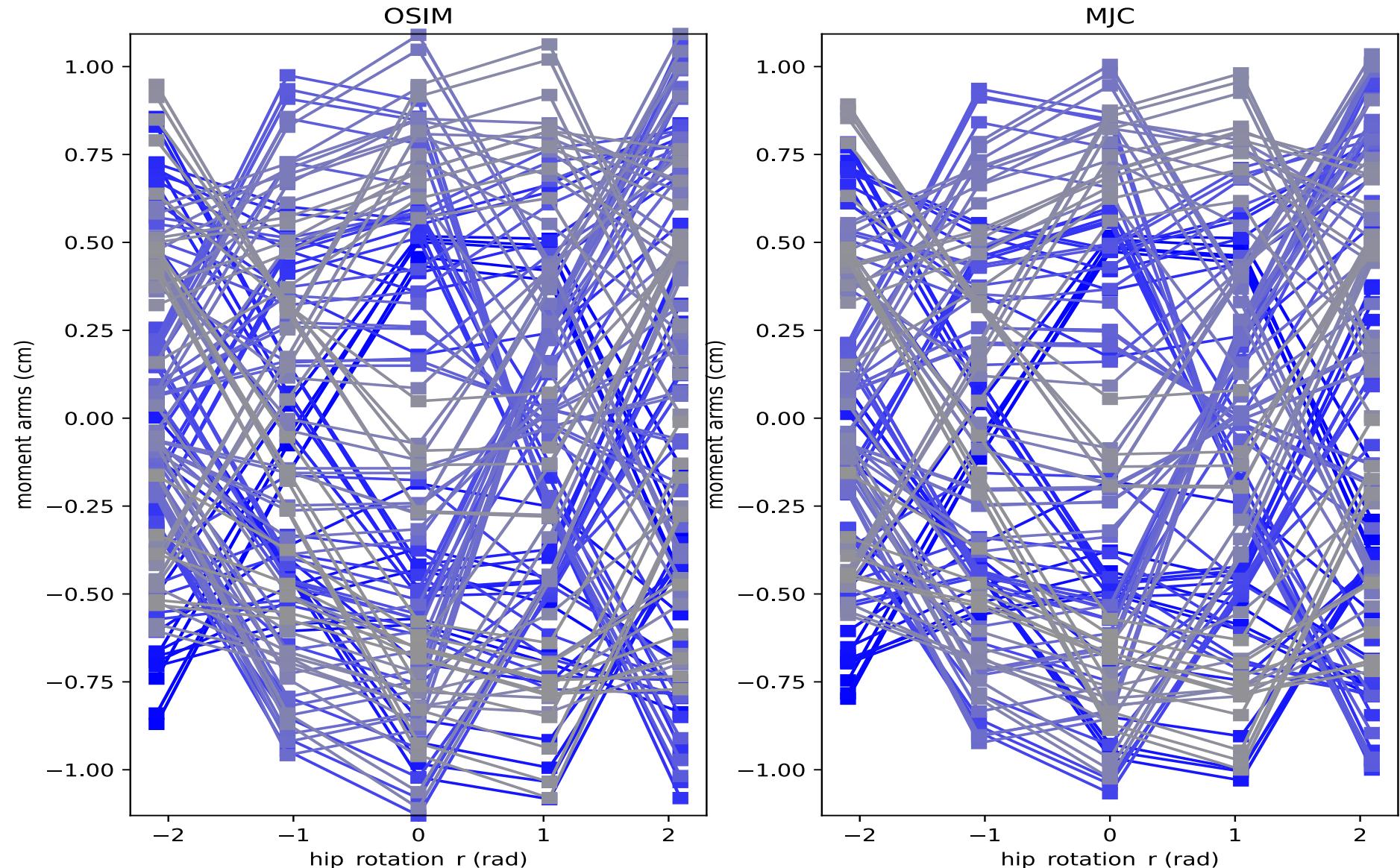
Muscle specific moment arm comparison with Osim model after optimization

sar_I - knee_angle_I



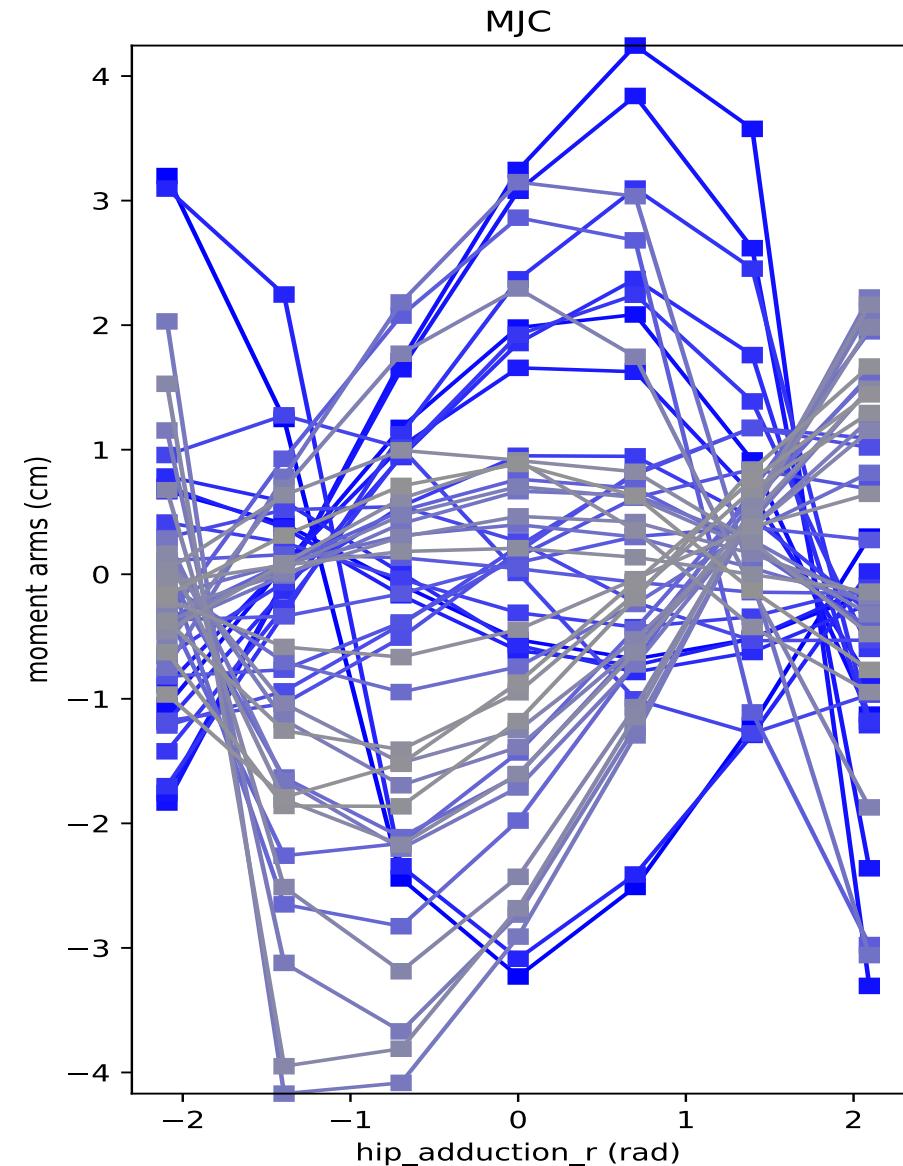
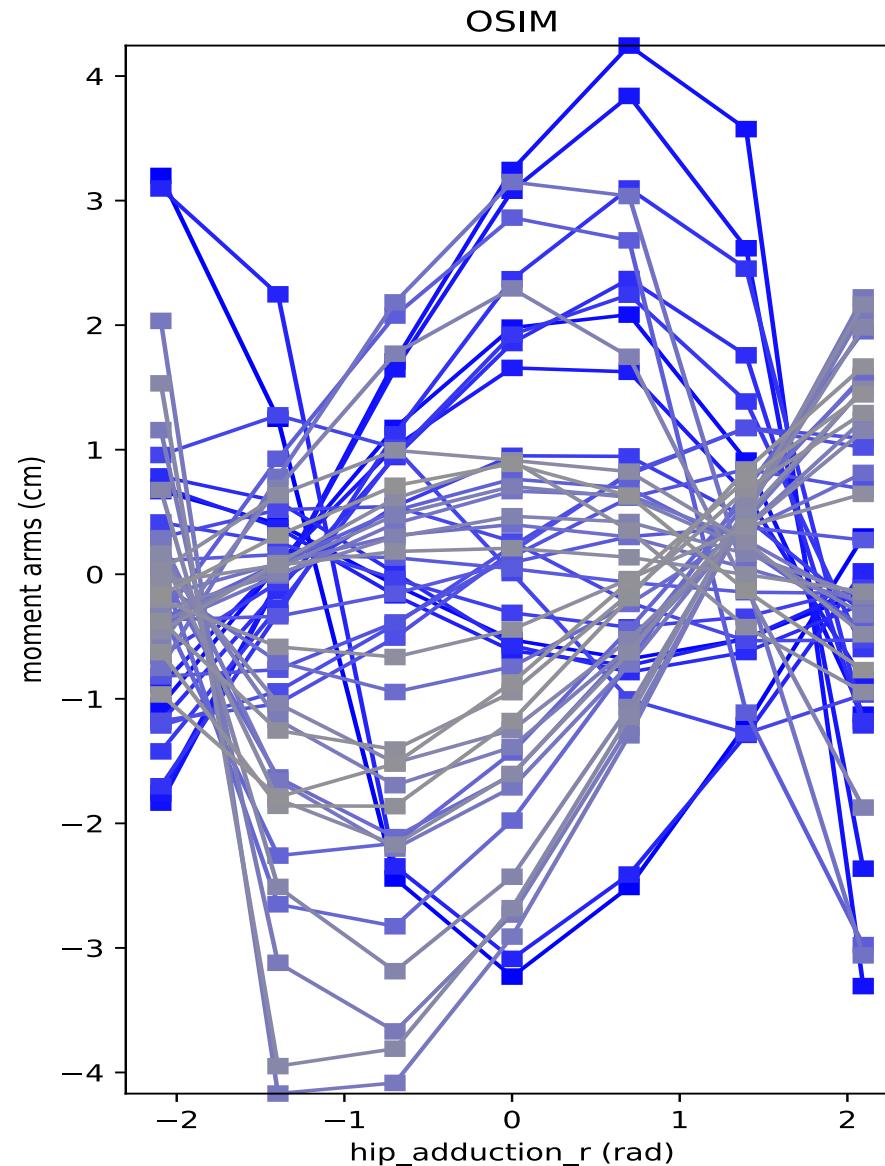
Muscle specific moment arm comparison with Osim model after optimization

grac_r - hip_adduction_r - hip_flexion_r - hip_rotation_r - knee_angle_r

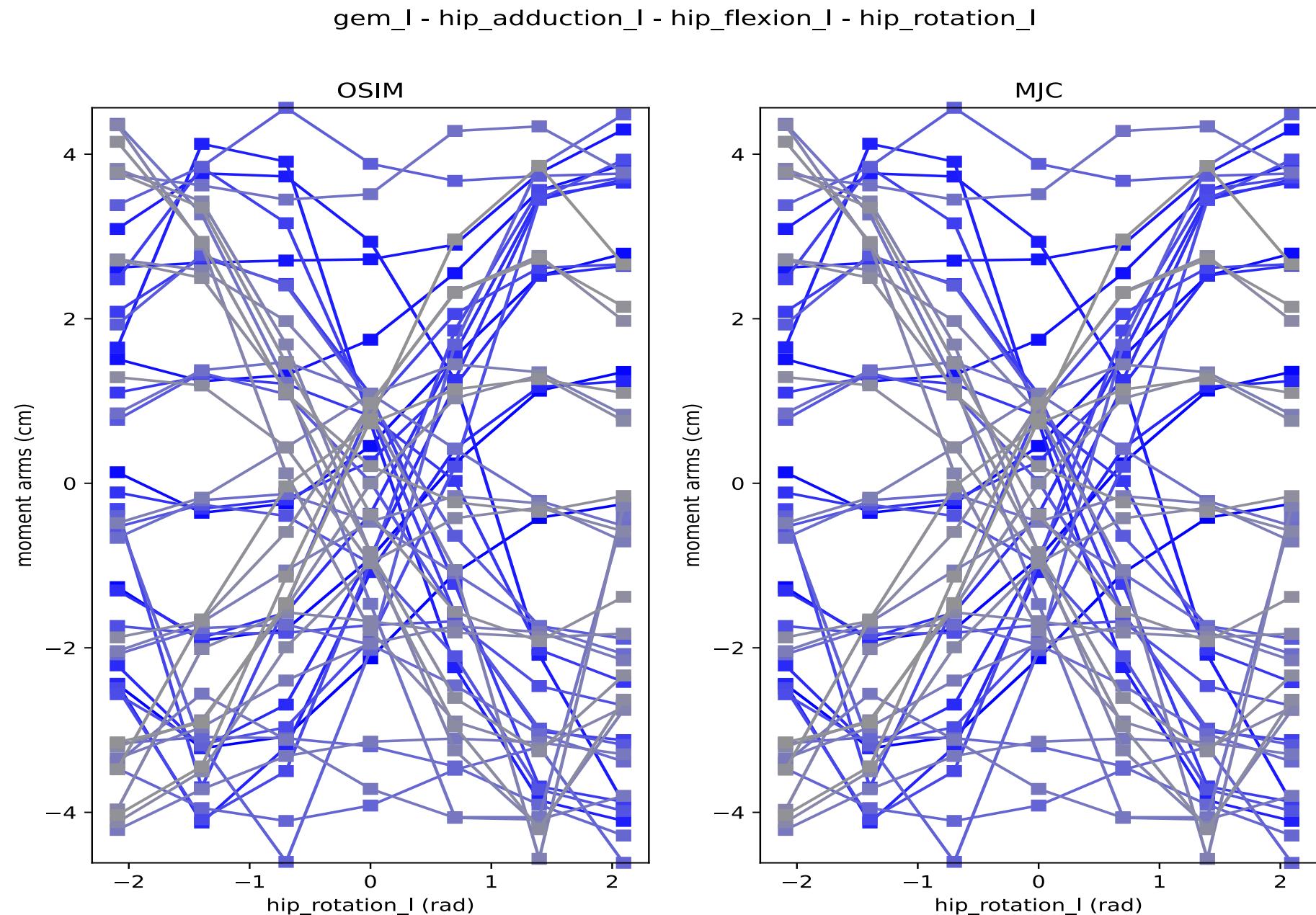


Muscle specific moment arm comparison with Osim model after optimization

peri_r - hip_adduction_r - hip_flexion_r - hip_rotation_r

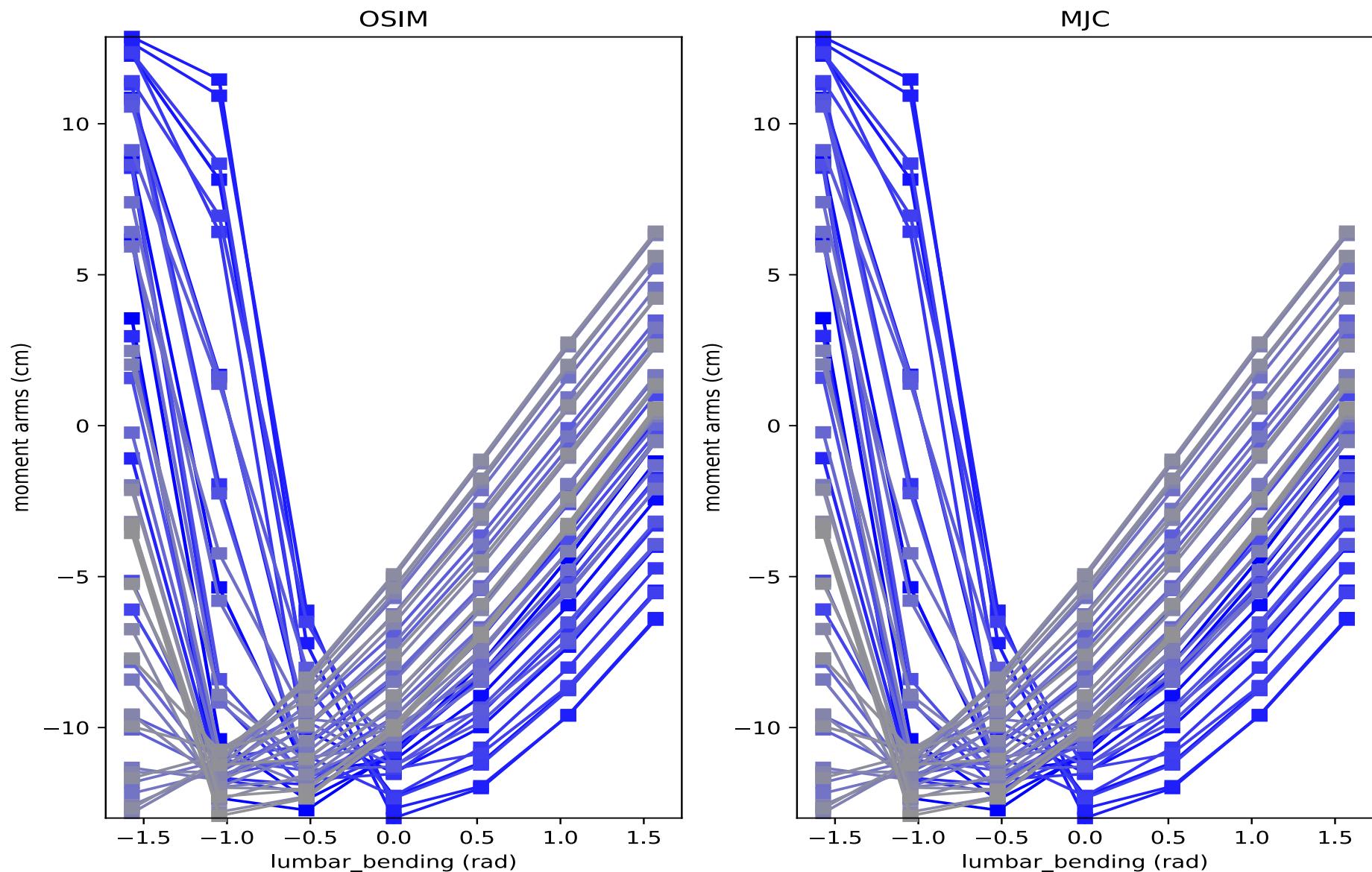


Muscle specific moment arm comparison with Osim model after optimization



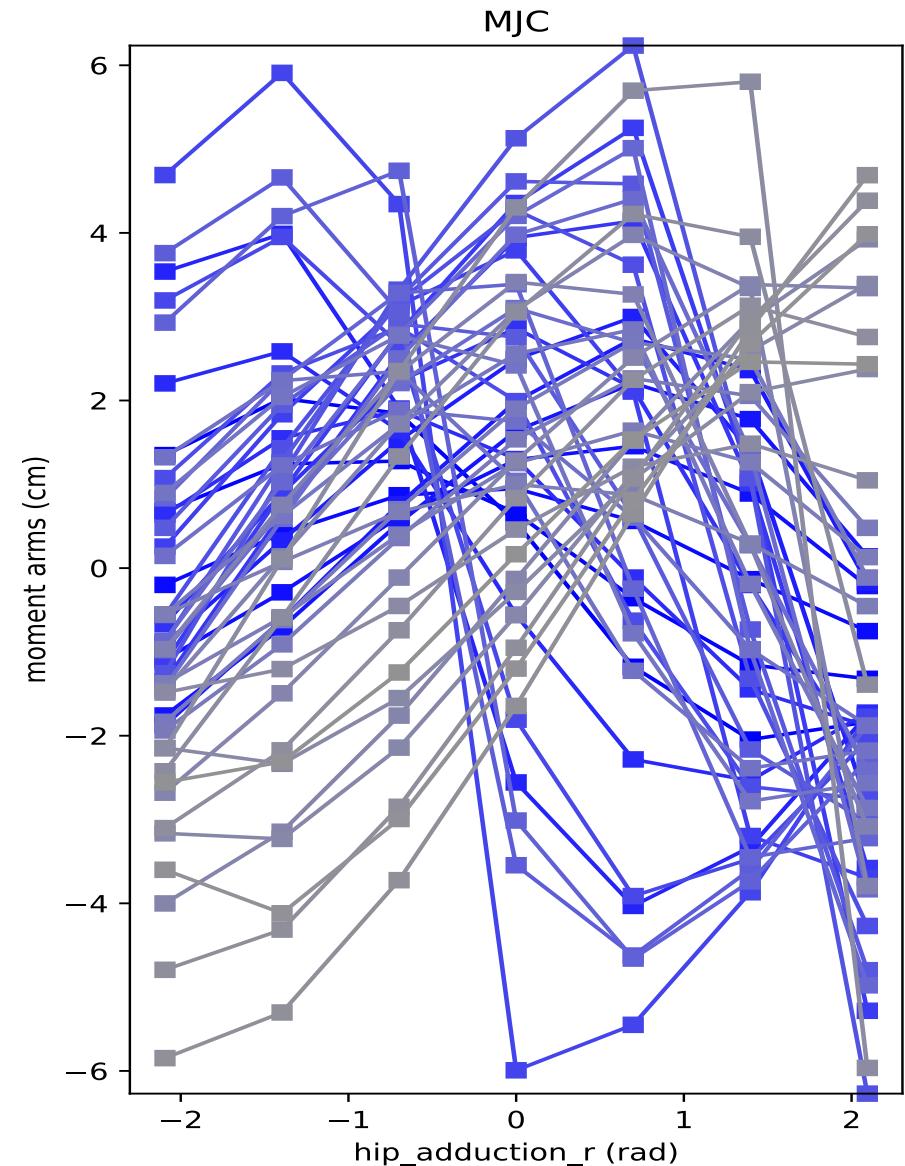
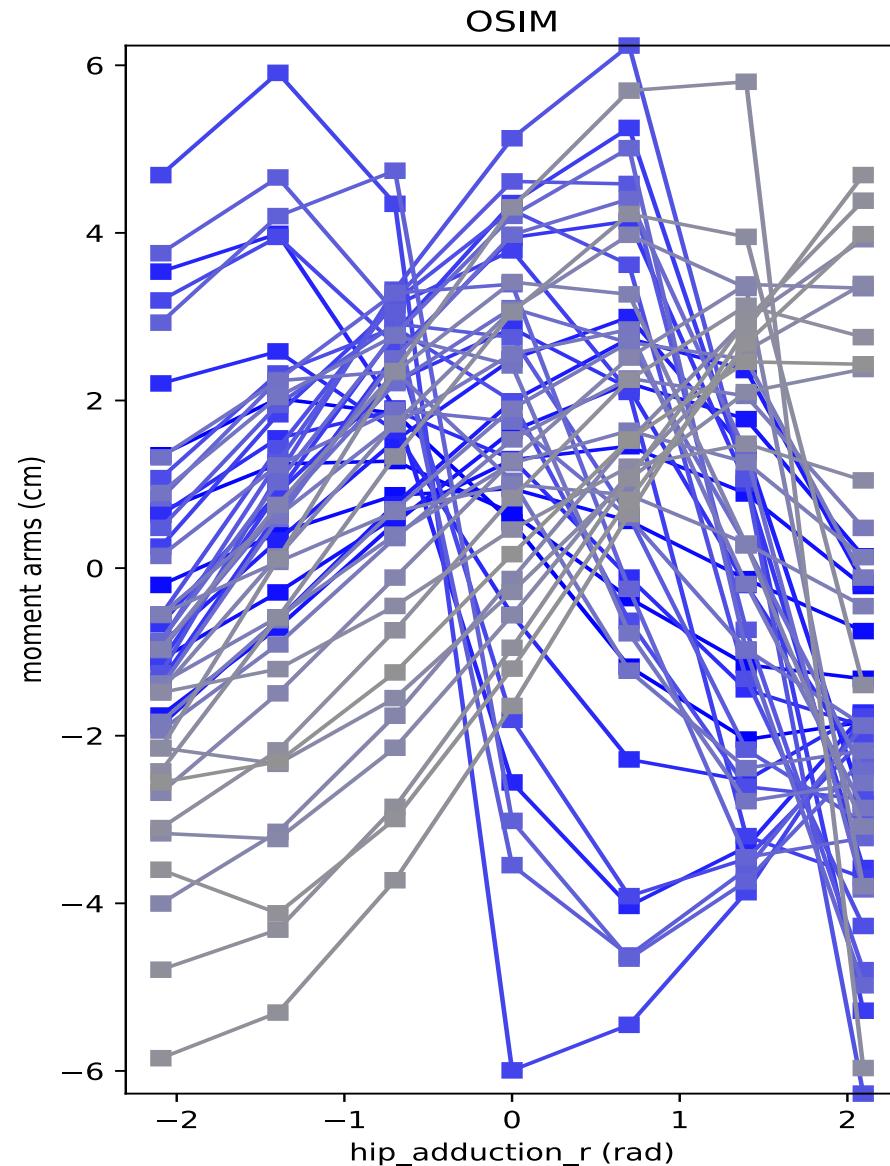
Muscle specific moment arm comparison with Osim model after optimization

intobl_I - lumbar_bending - lumbar_extension - lumbar_rotation



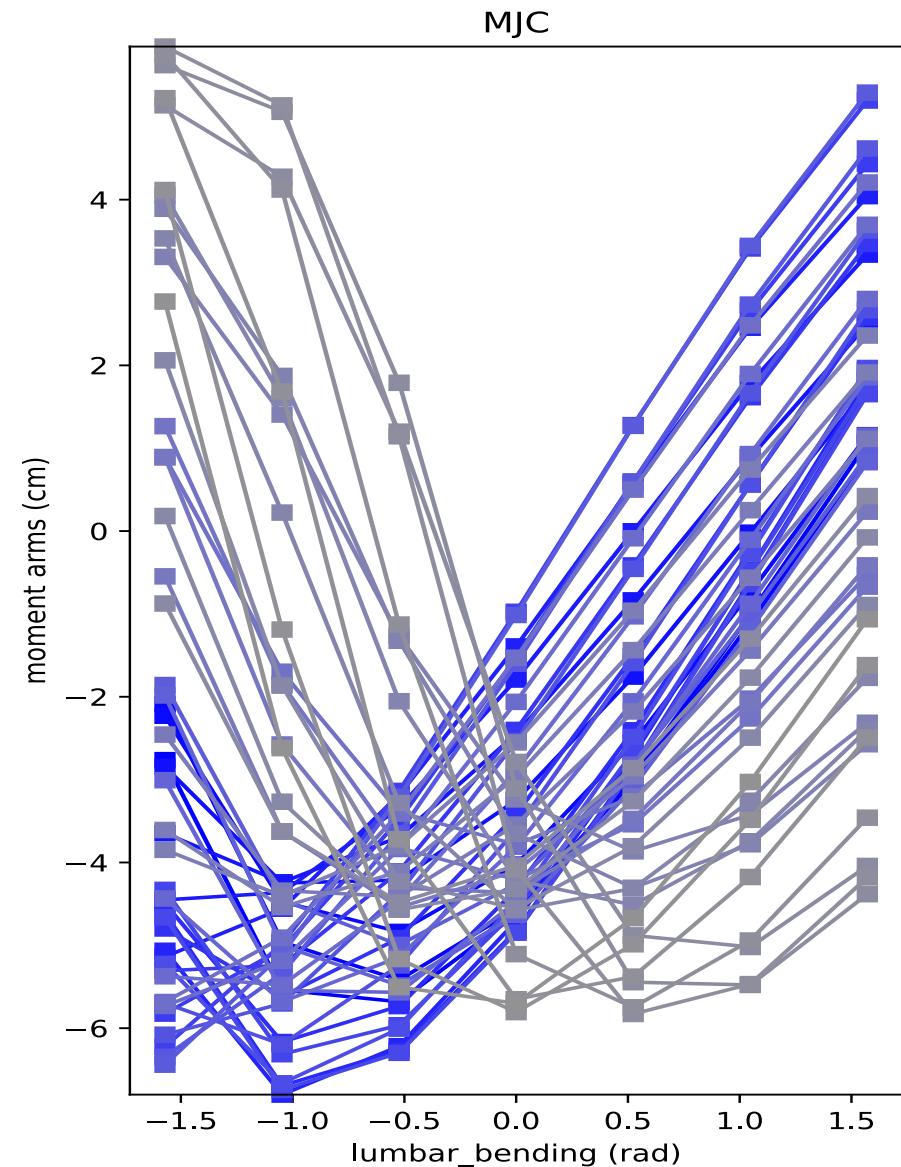
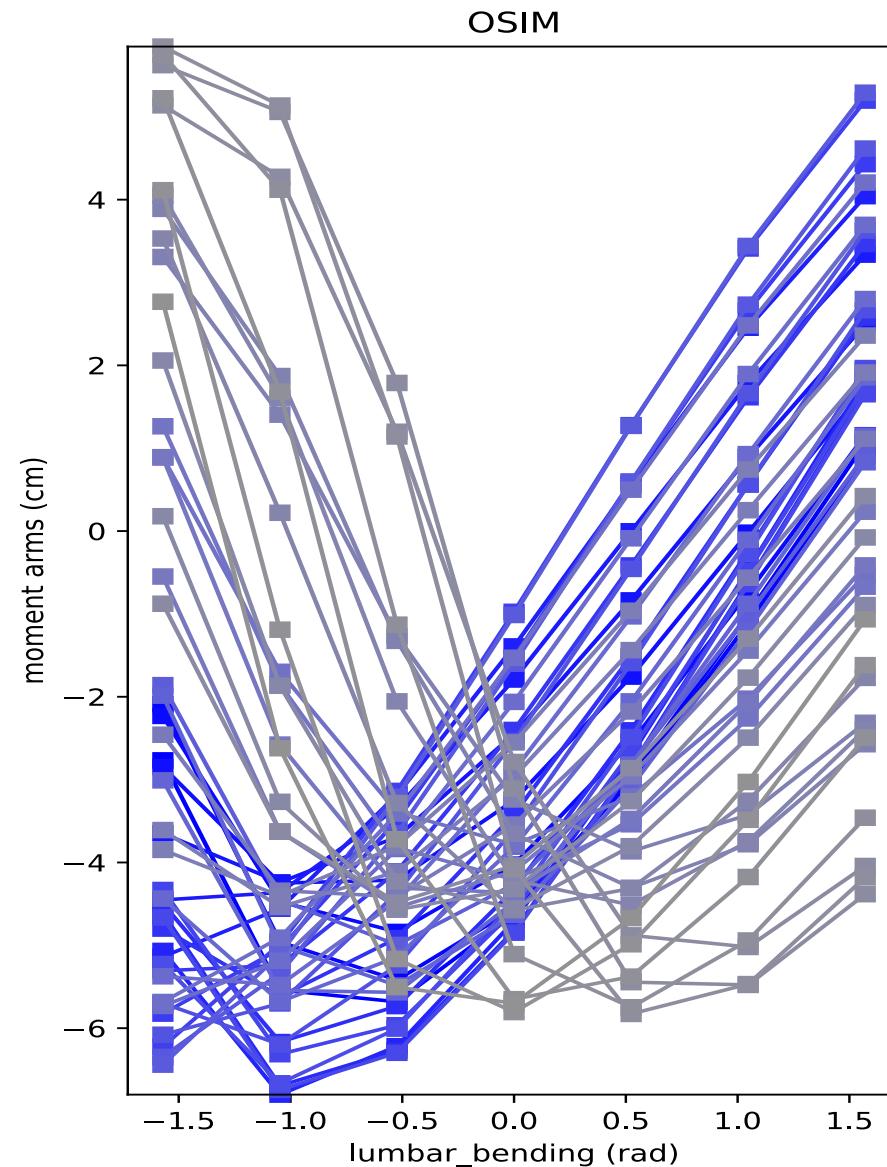
Muscle specific moment arm comparison with Osim model after optimization

quad_fem_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



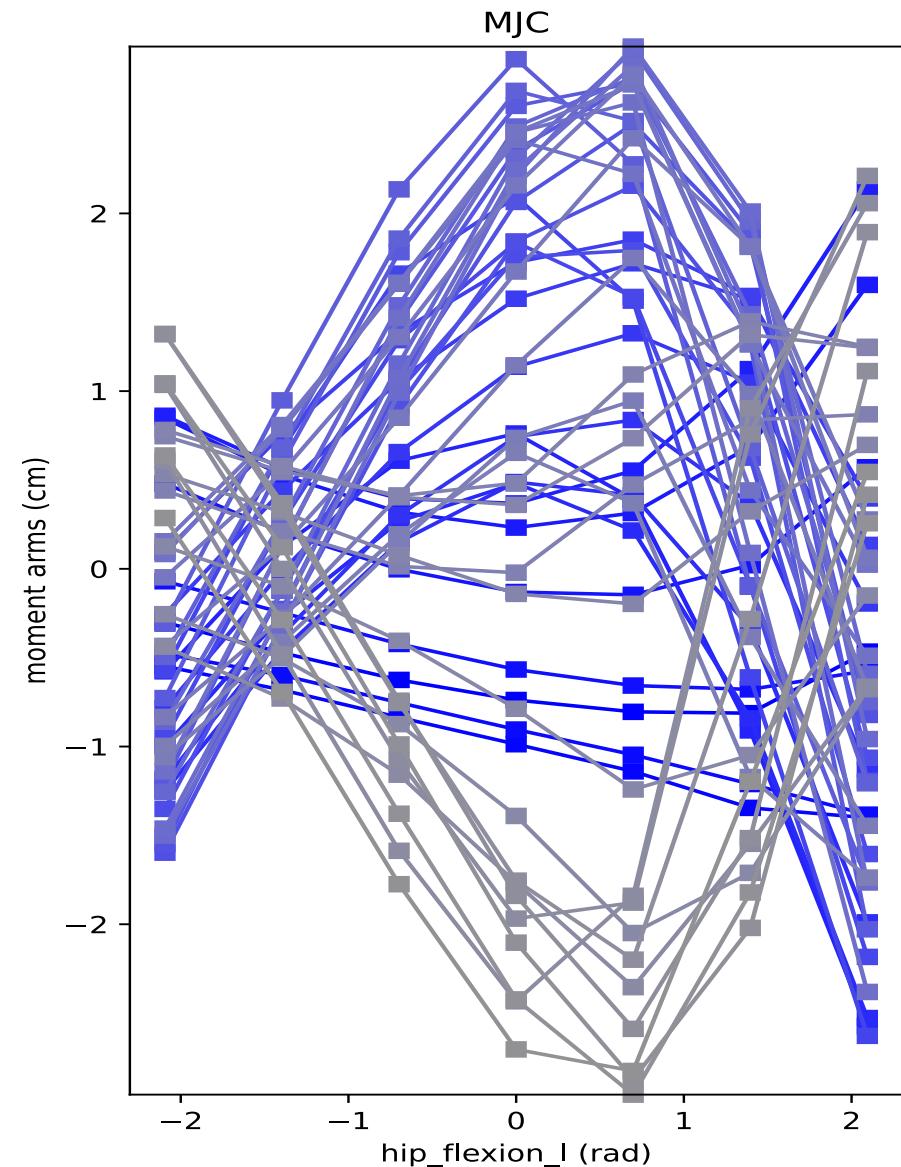
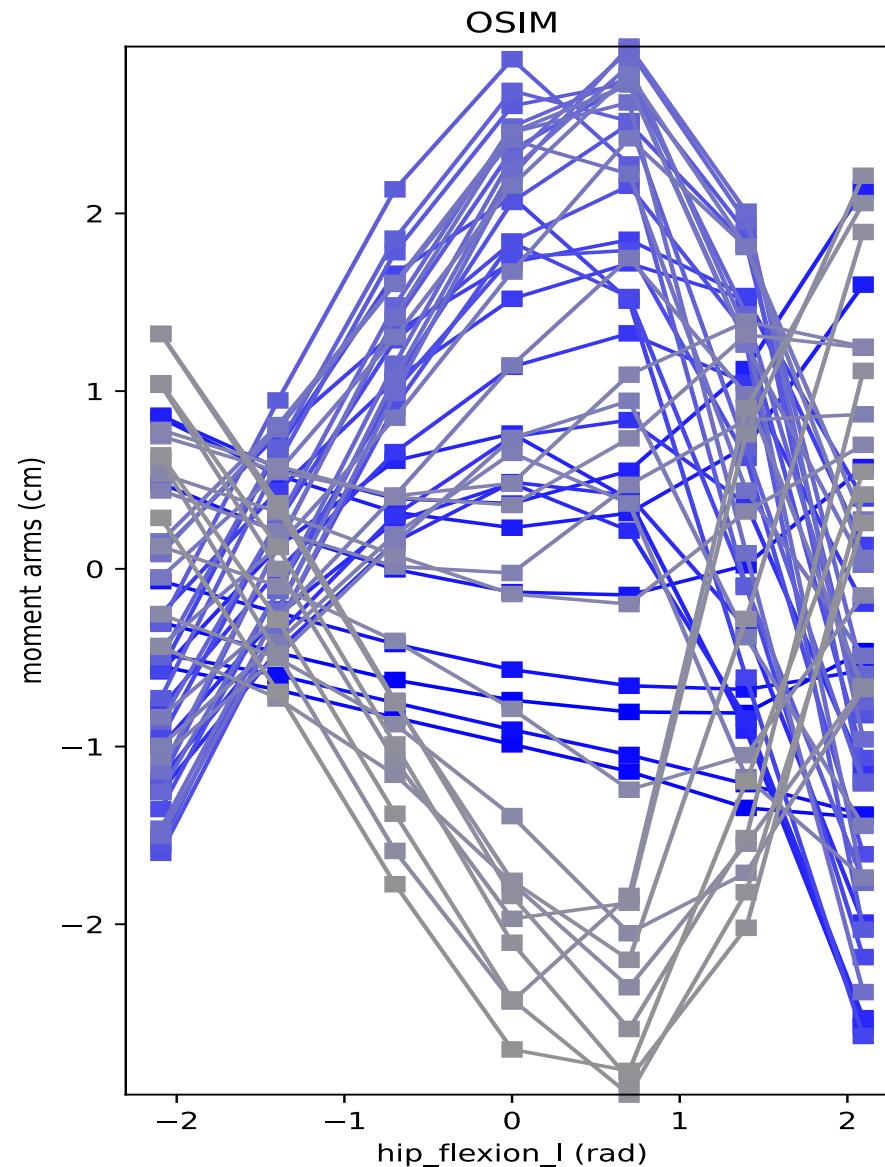
Muscle specific moment arm comparison with Osim model after optimization

ercspn_I - lumbar_bending - lumbar_extension - lumbar_rotation



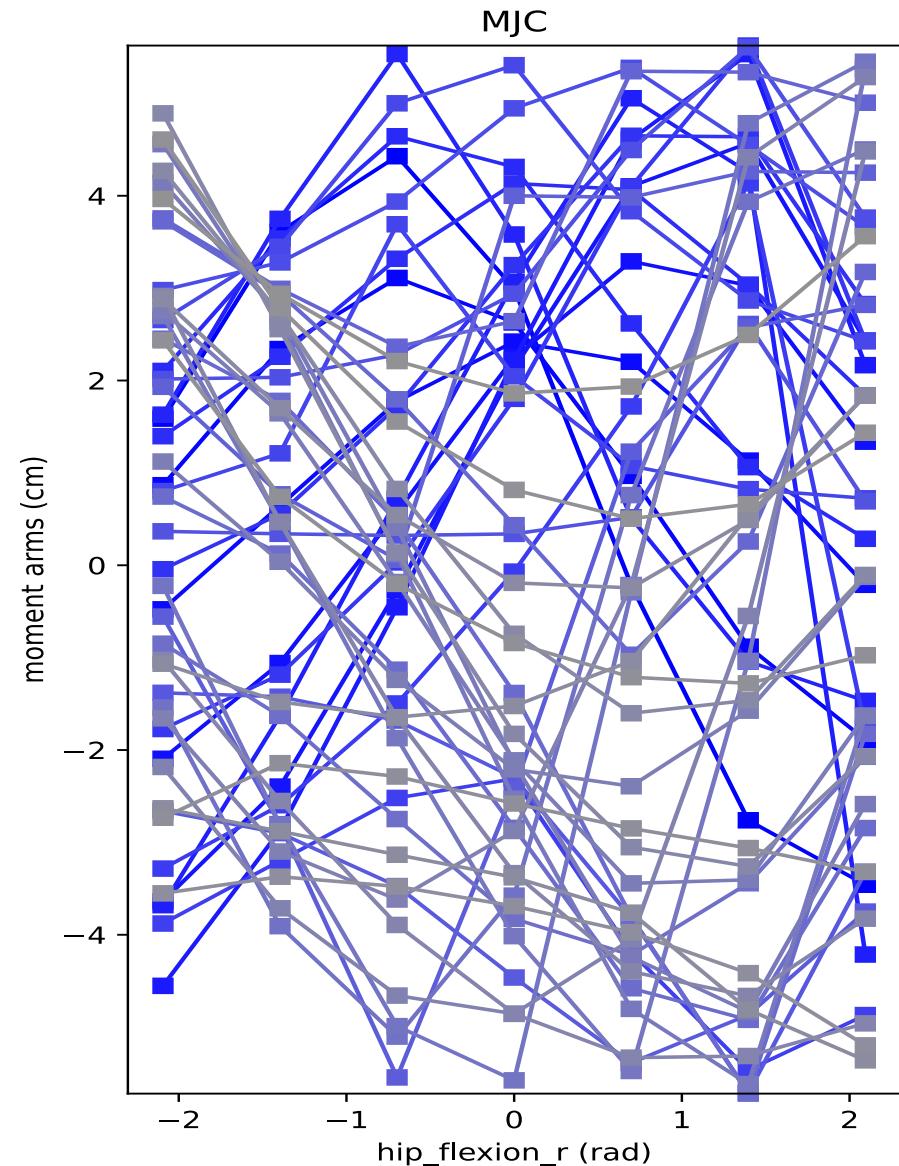
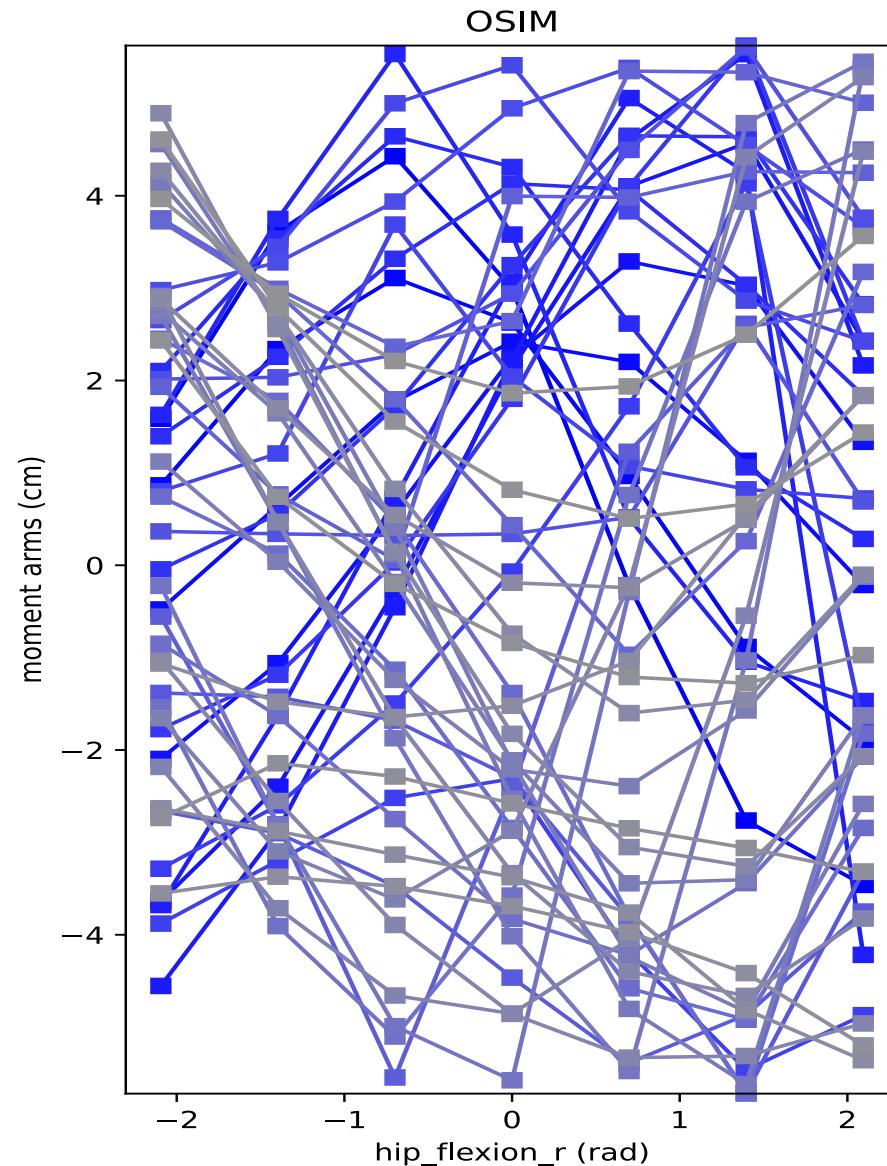
Muscle specific moment arm comparison with Osim model after optimization

pect_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



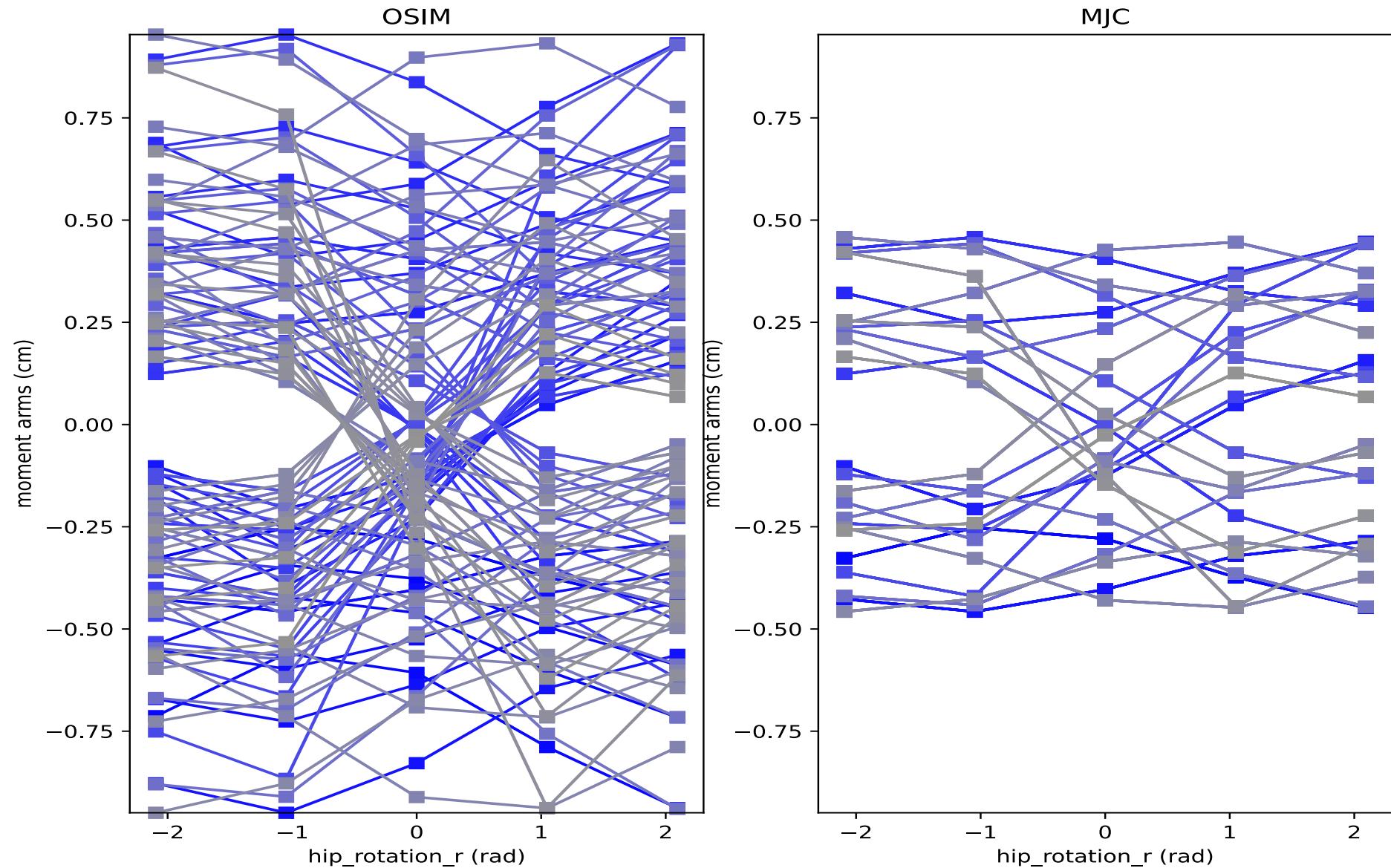
Muscle specific moment arm comparison with Osim model after optimization

quad_fem_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



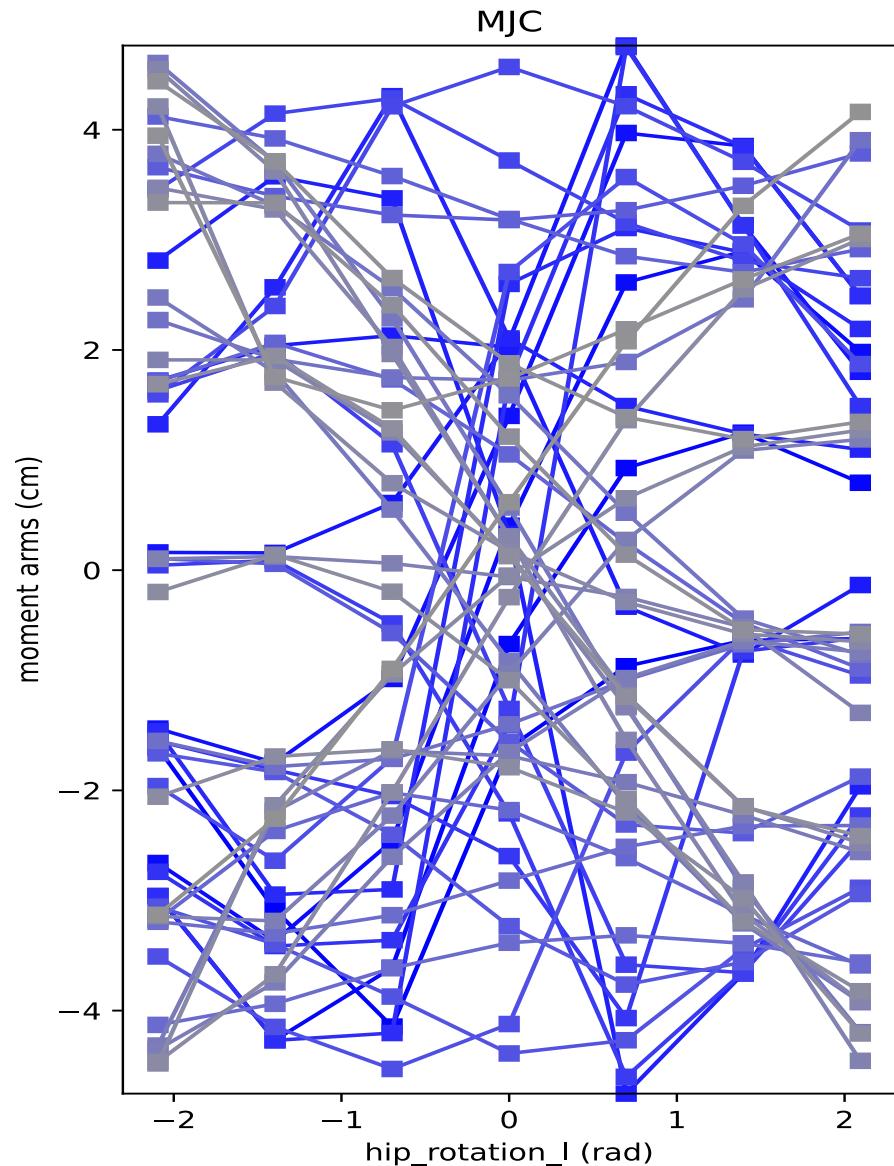
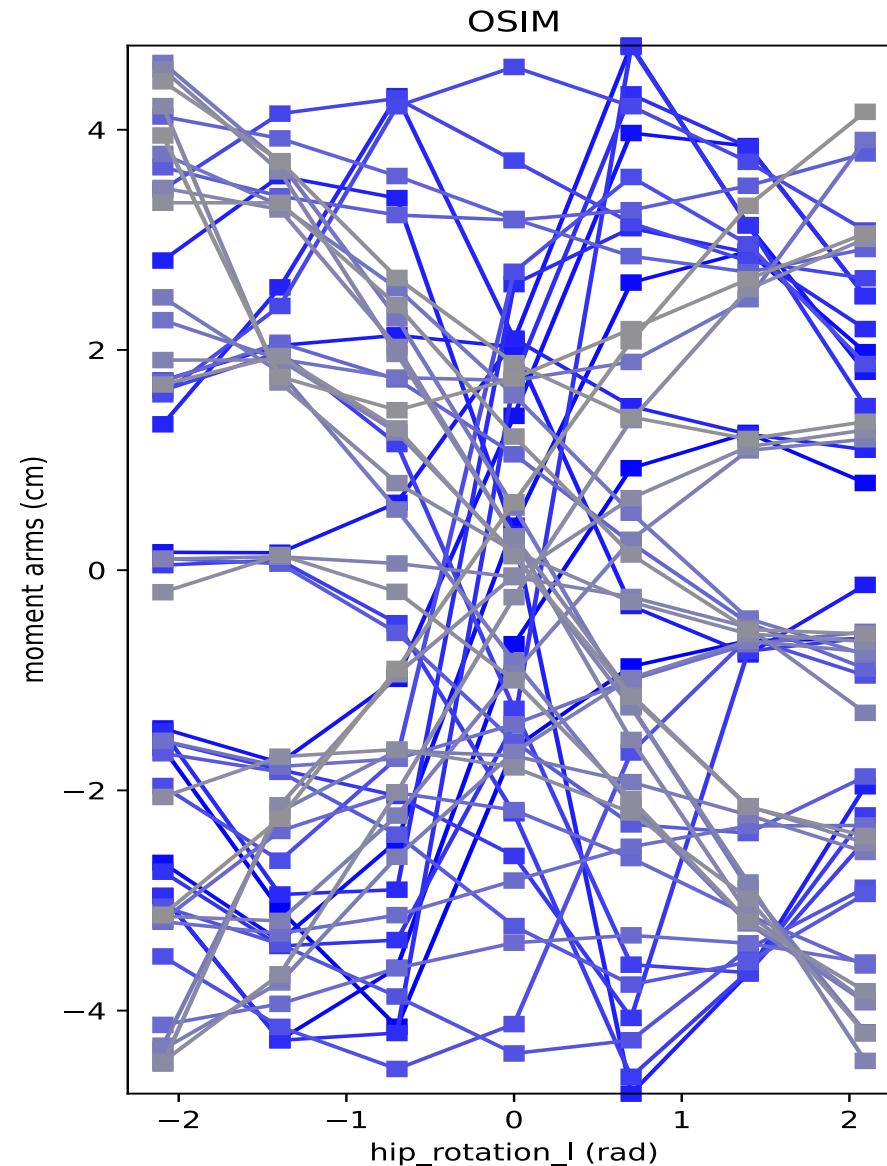
Muscle specific moment arm comparison with Osim model after optimization

rect_fem_r - hip_adduction_r - hip_flexion_r - hip_rotation_r - knee_angle_r



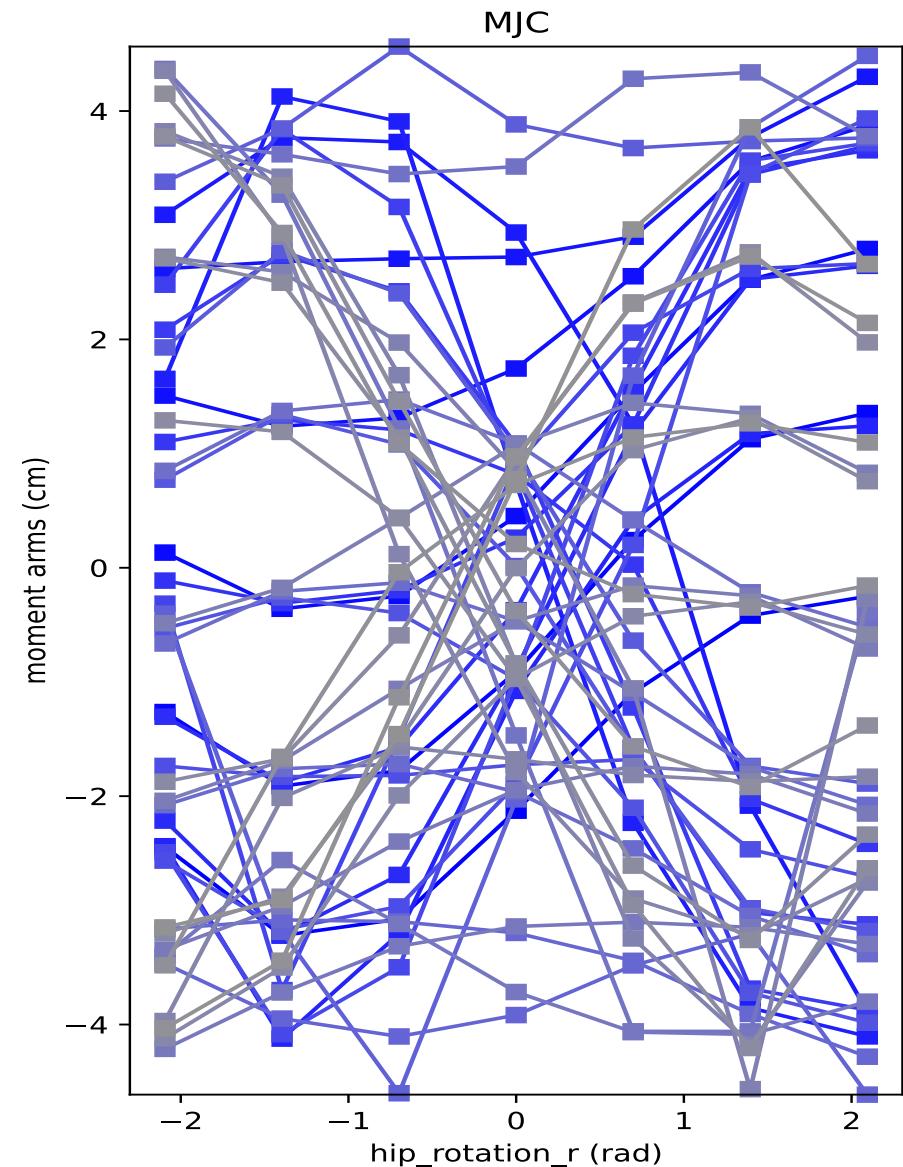
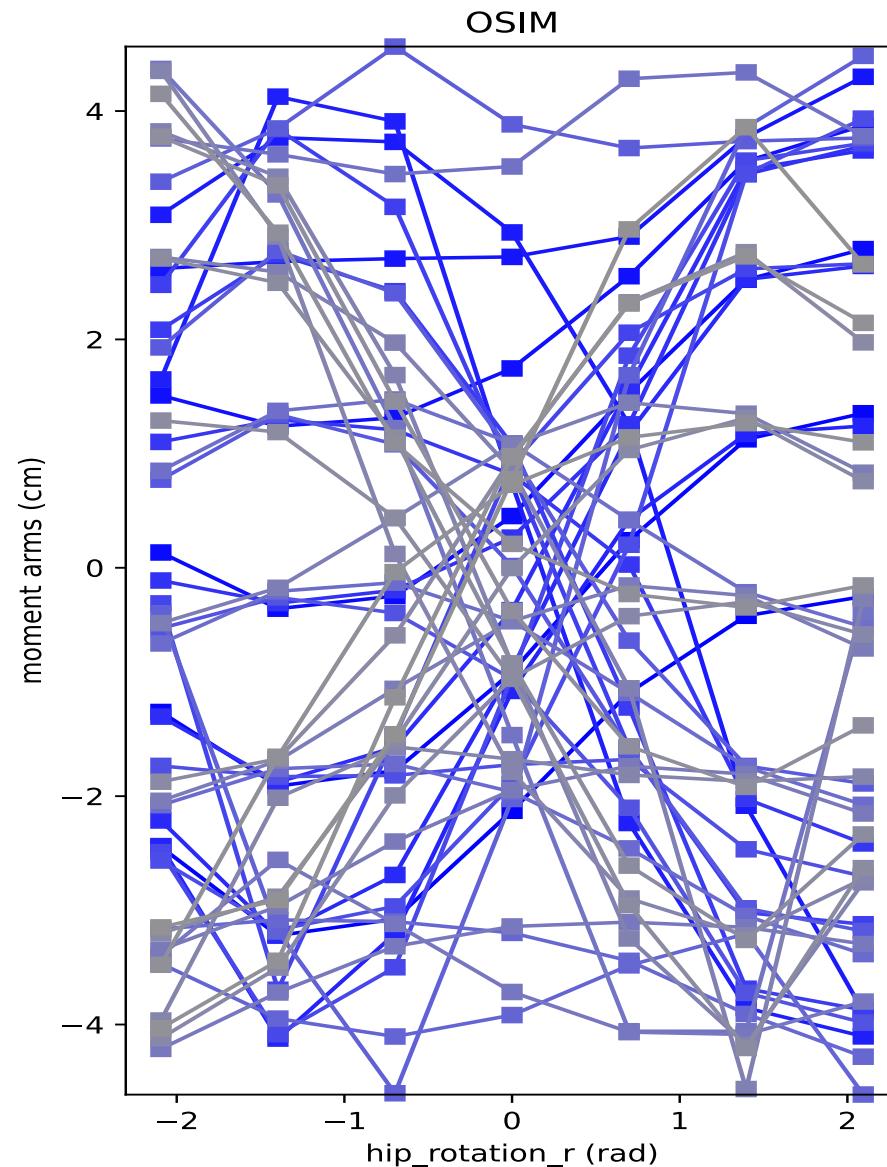
Muscle specific moment arm comparison with Osim model after optimization

glut_max2_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



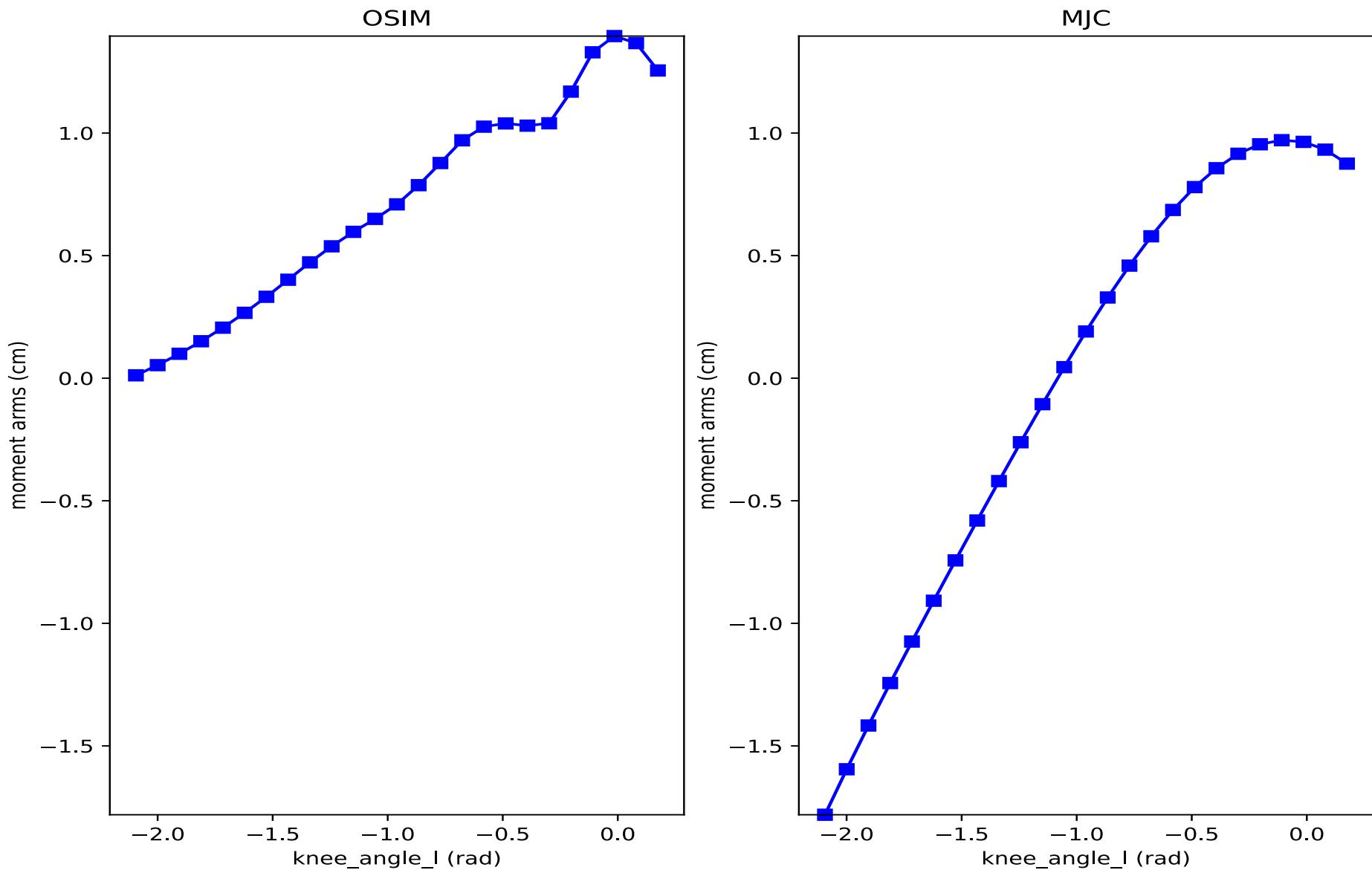
Muscle specific moment arm comparison with Osim model after optimization

gem_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



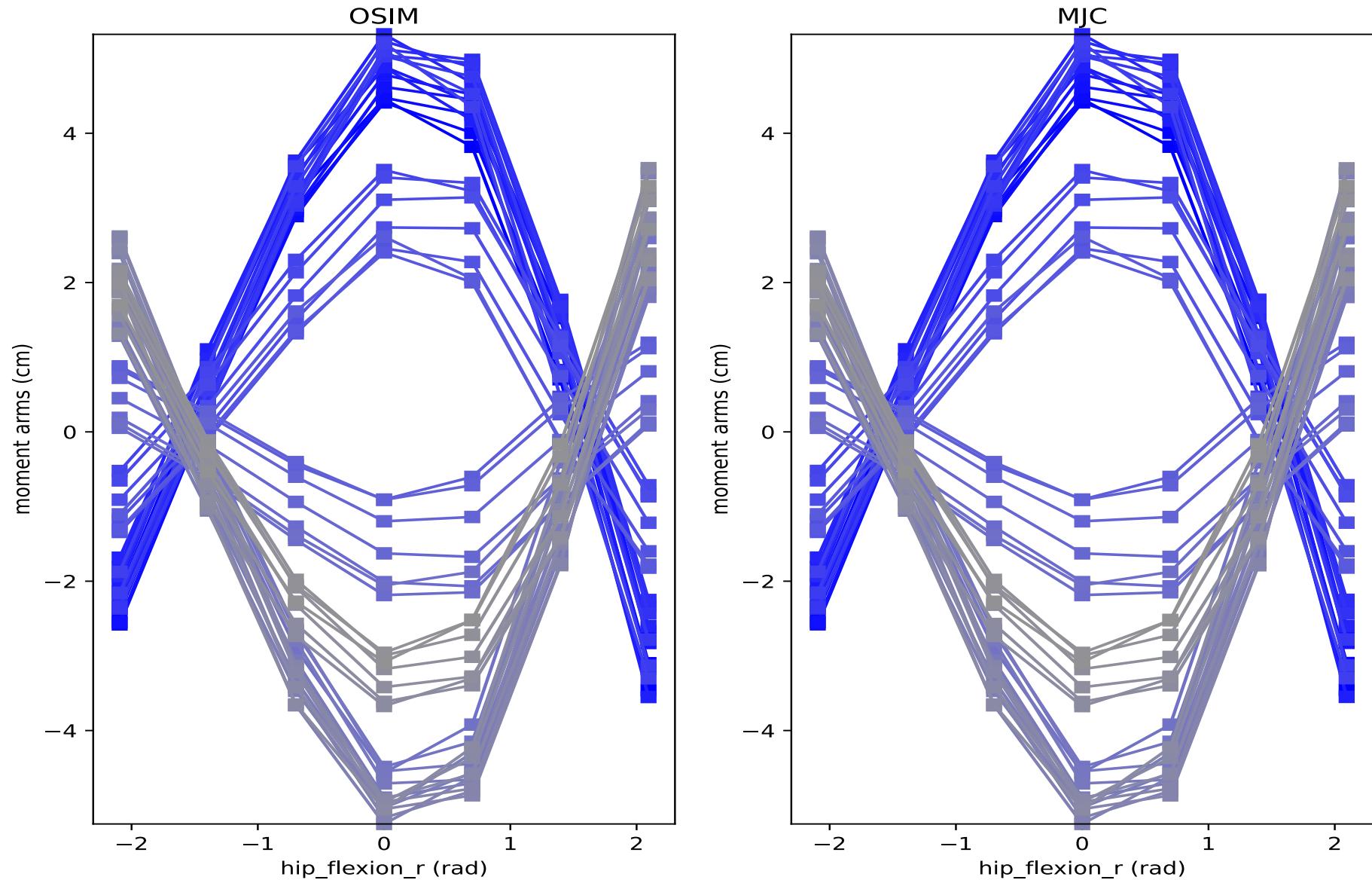
Muscle specific moment arm comparison with Osim model after optimization

tfl_I - knee_angle_I



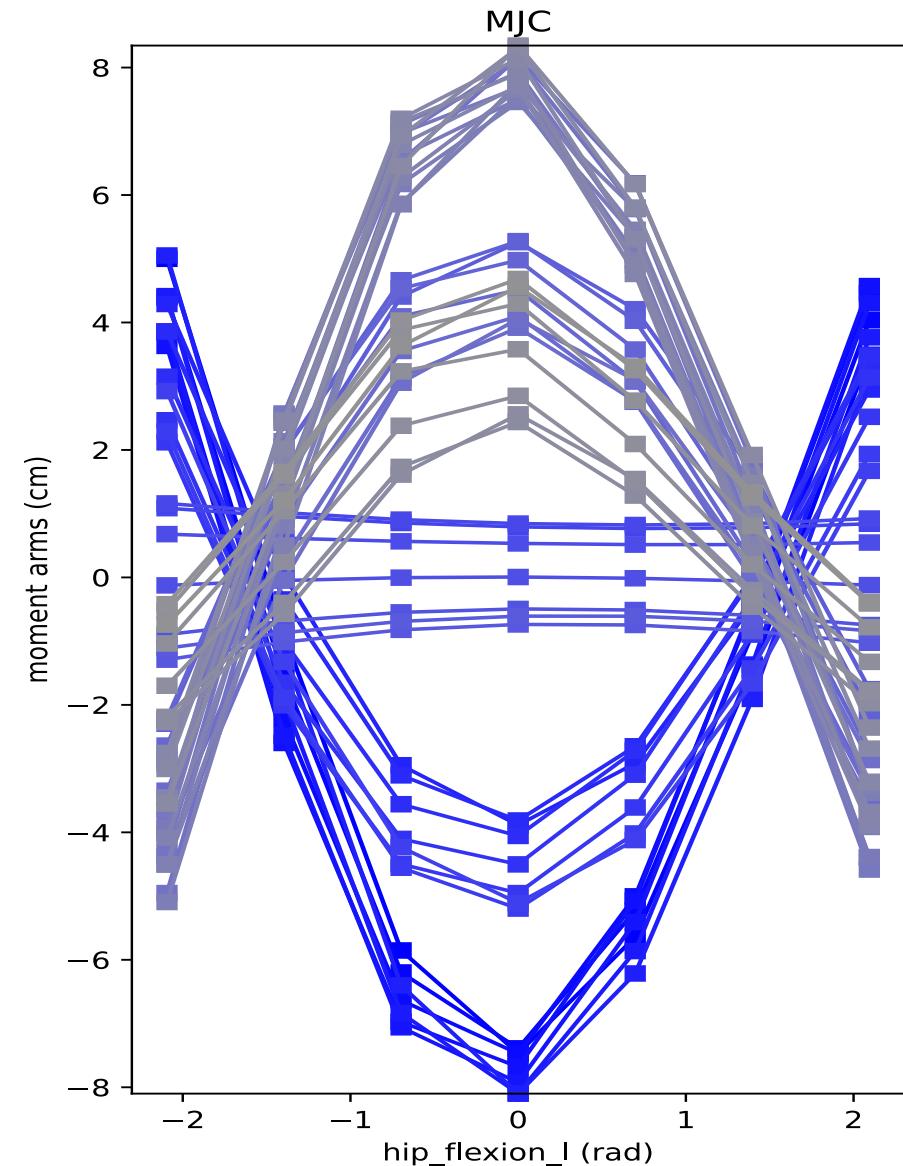
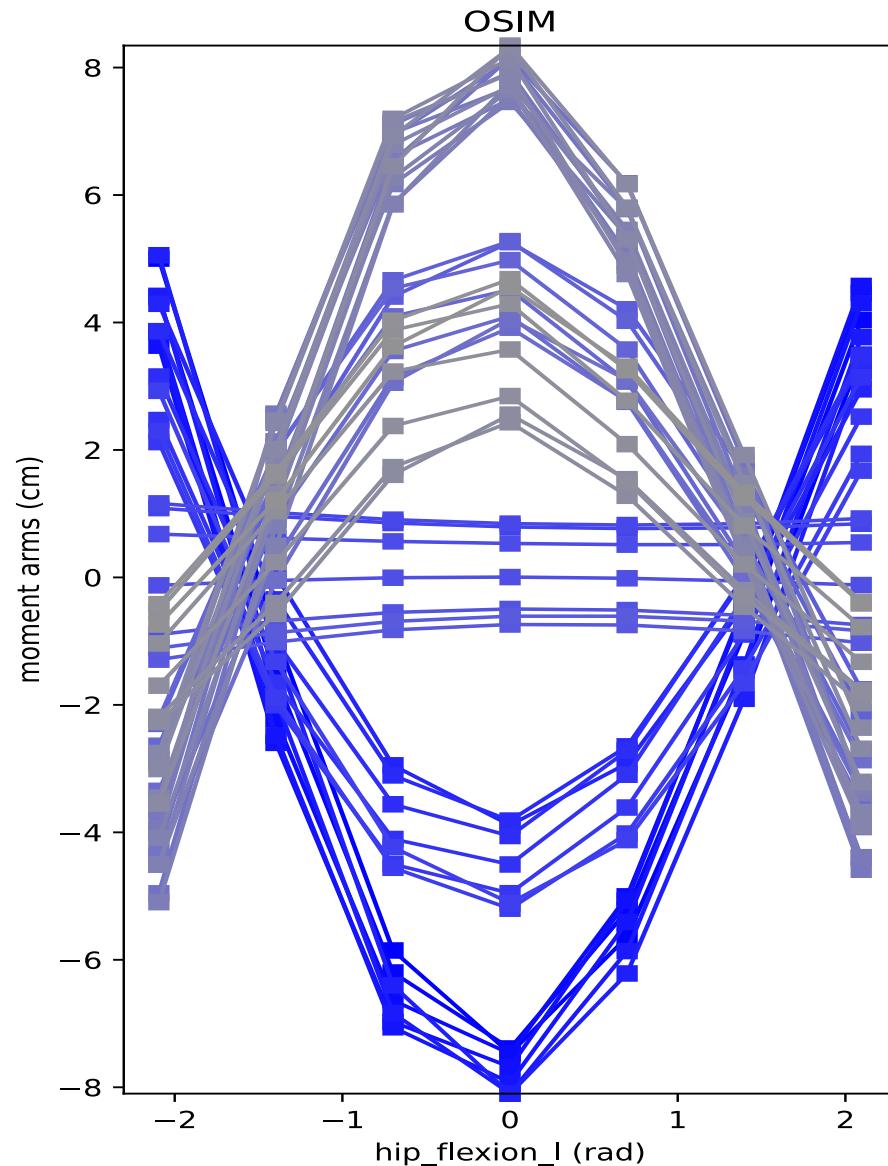
Muscle specific moment arm comparison with Osim model after optimization

add_mag2_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



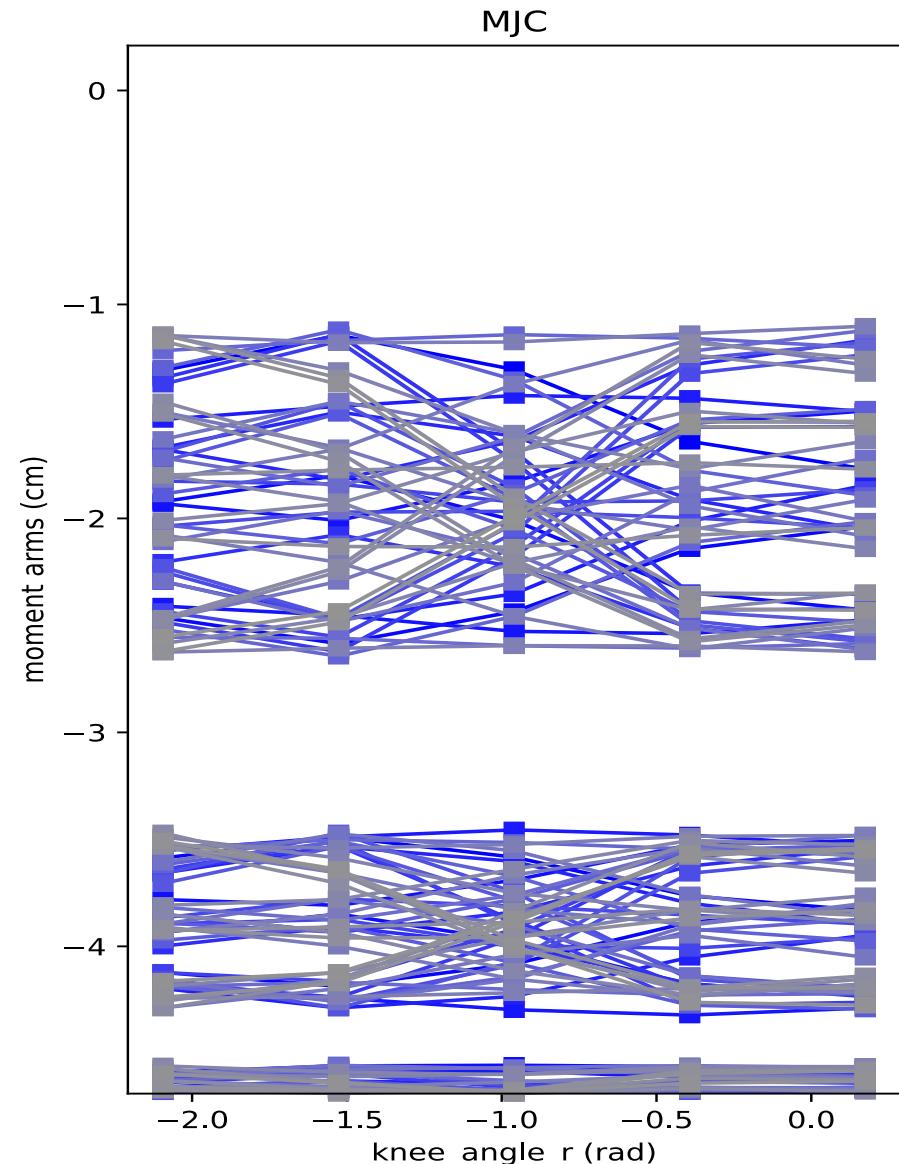
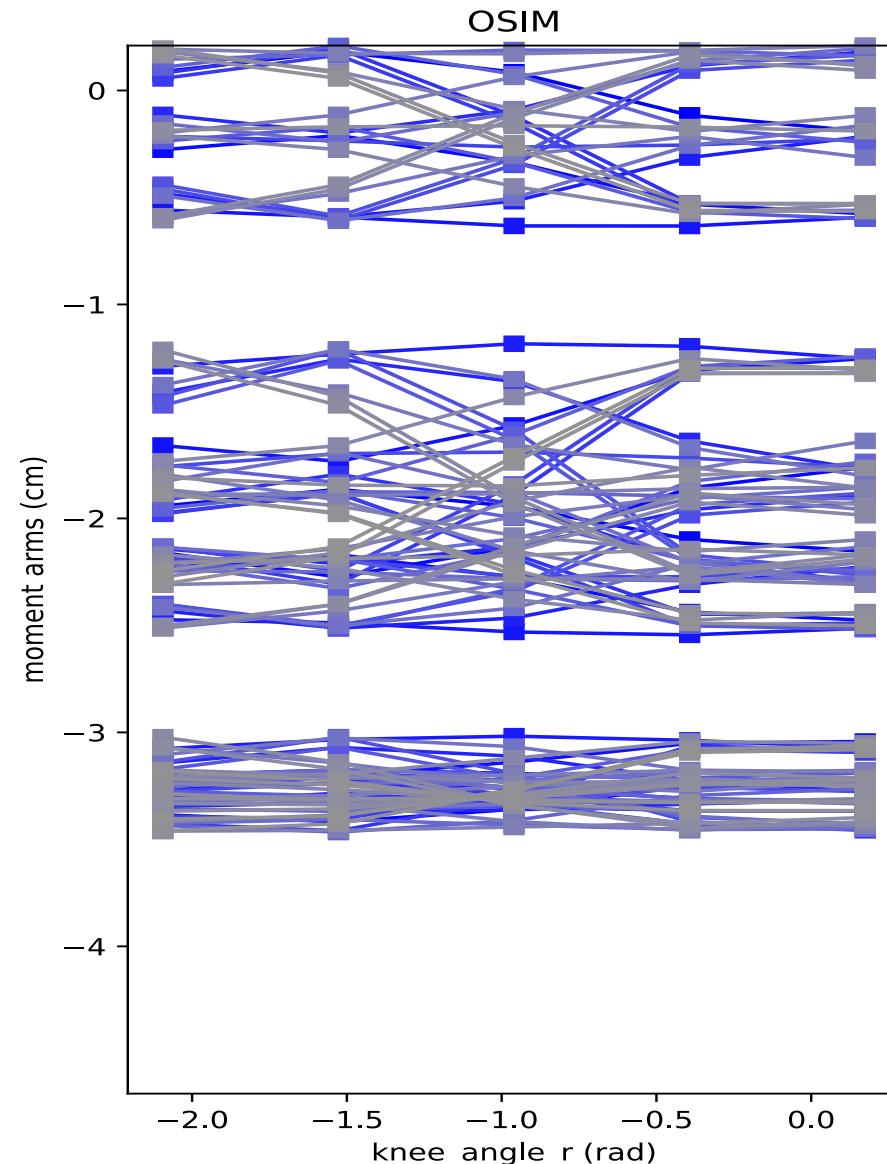
Muscle specific moment arm comparison with Osim model after optimization

sar_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



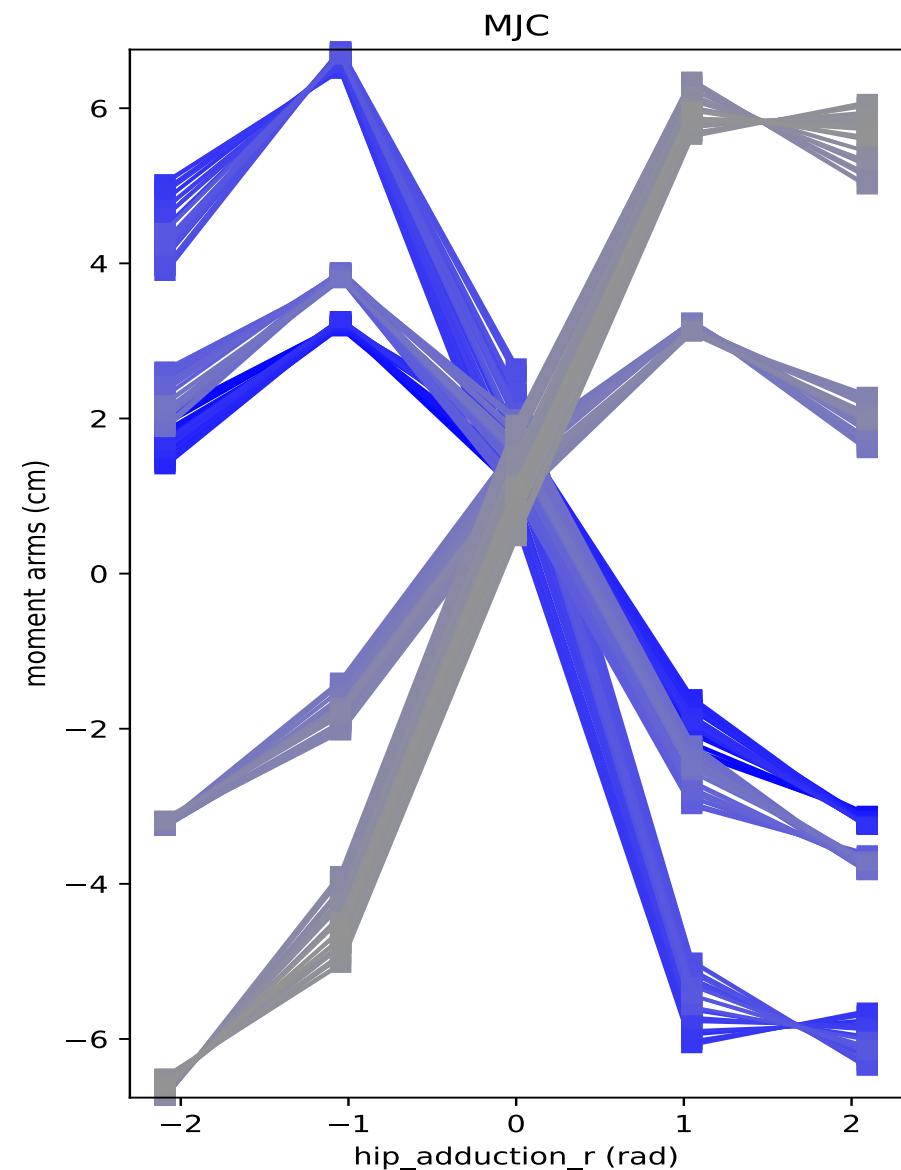
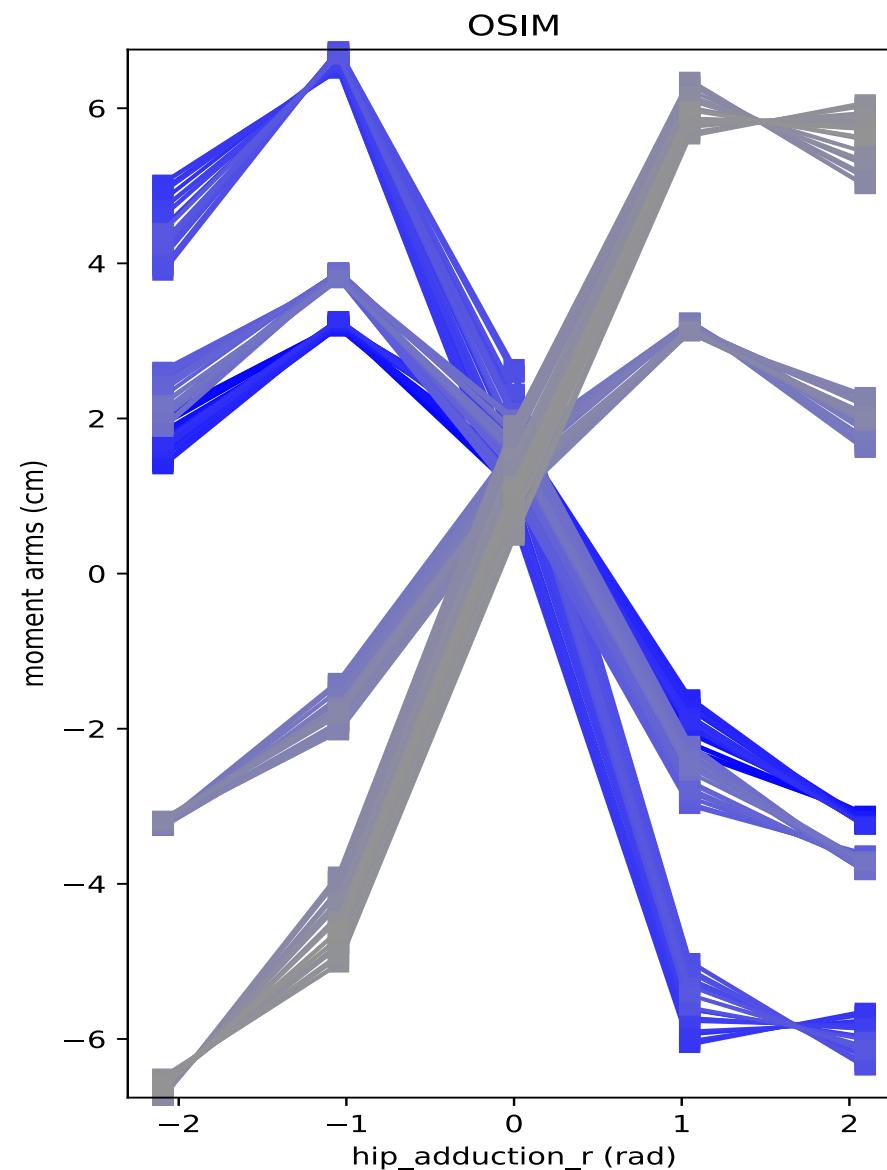
Muscle specific moment arm comparison with Osim model after optimization

bifemlh_r - hip_adduction_r - hip_flexion_r - hip_rotation_r - knee_angle_r



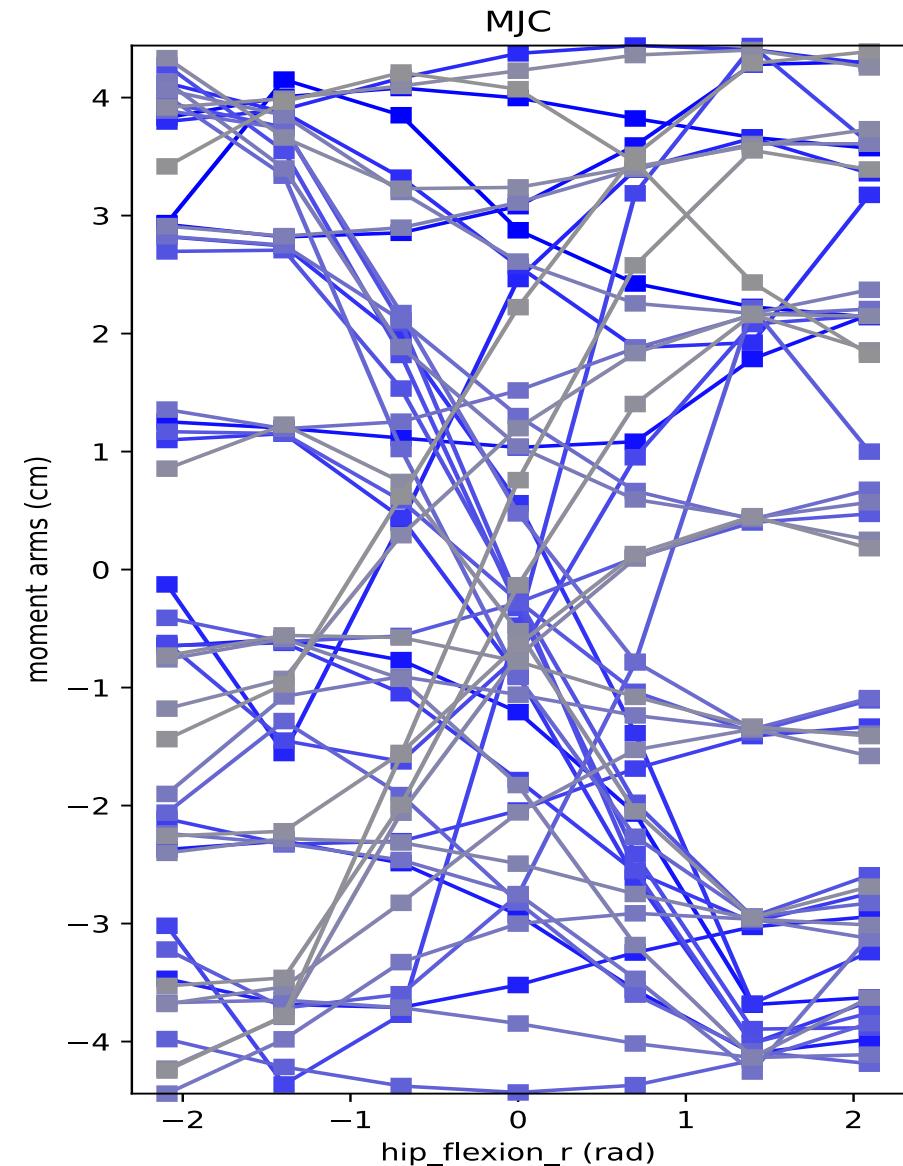
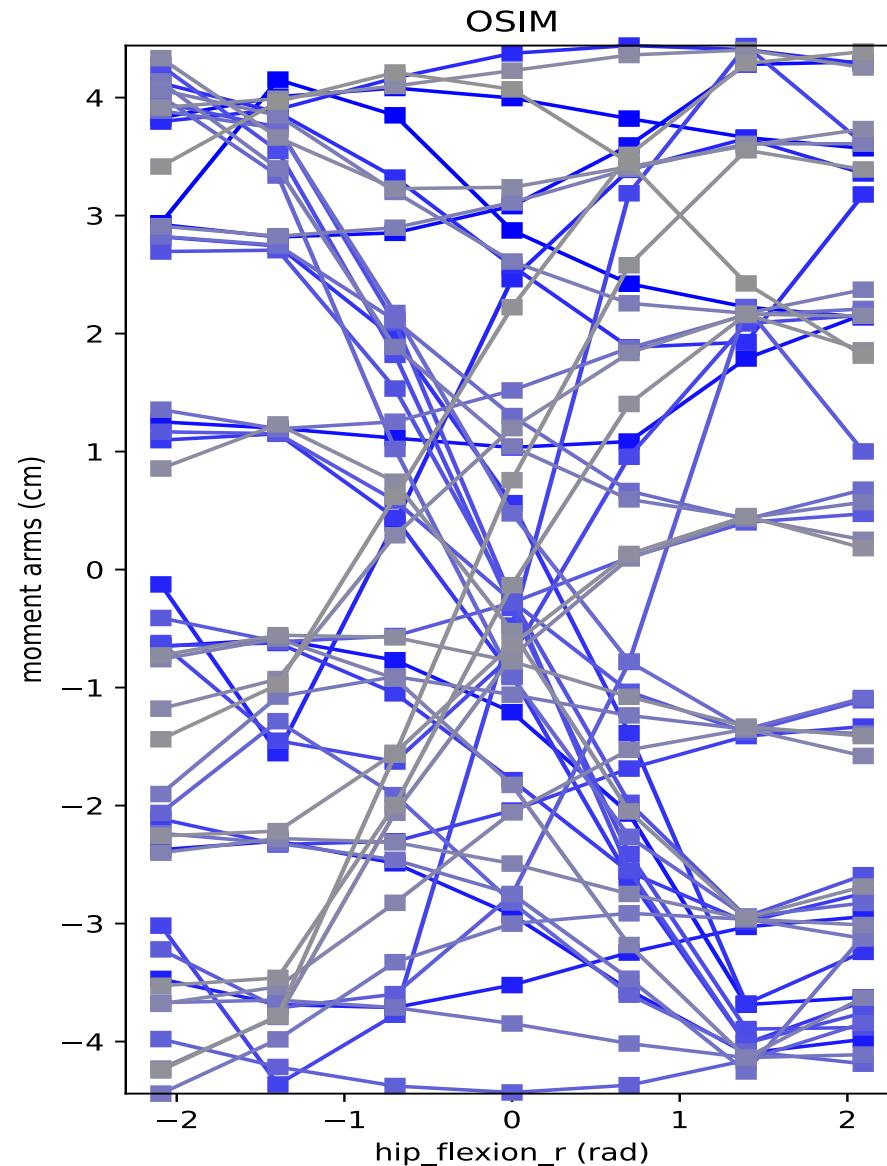
Muscle specific moment arm comparison with Osim model after optimization

bifemlh_r - hip_adduction_r - hip_flexion_r - hip_rotation_r - knee_angle_r



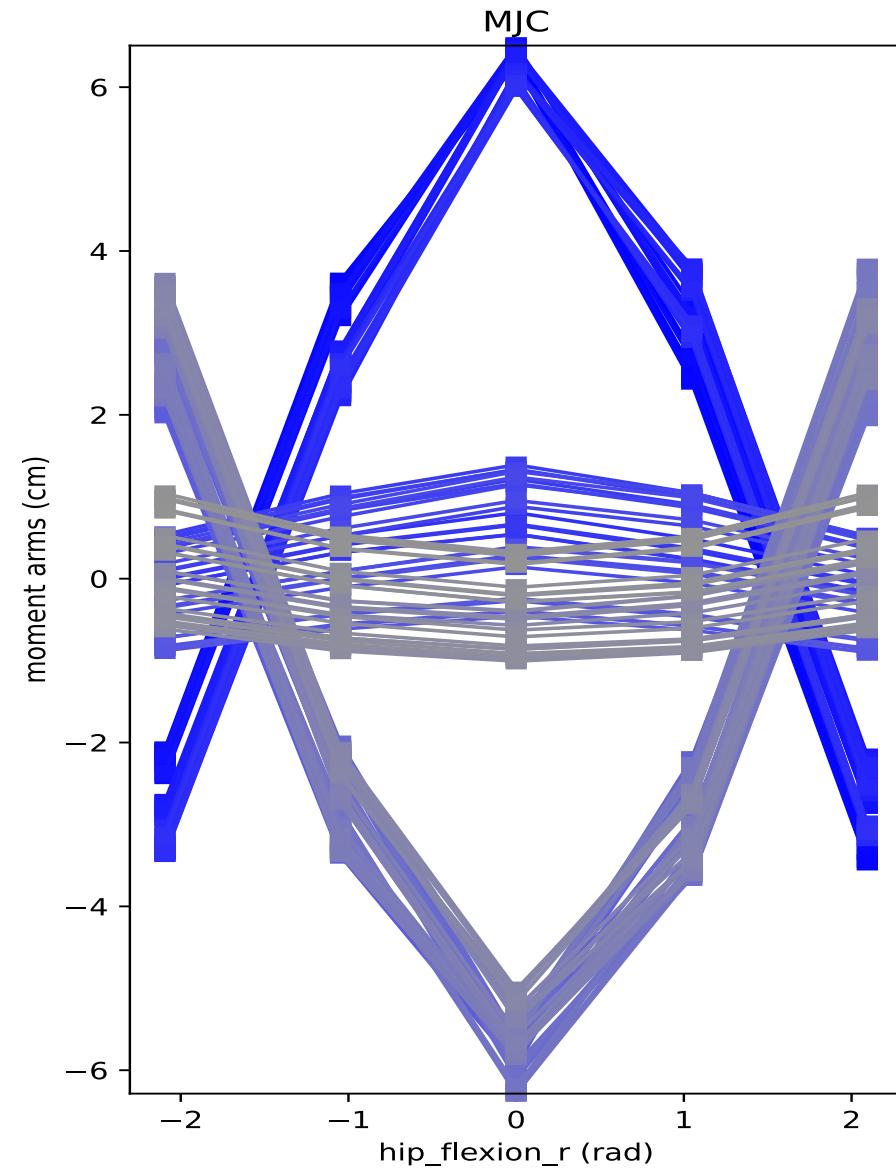
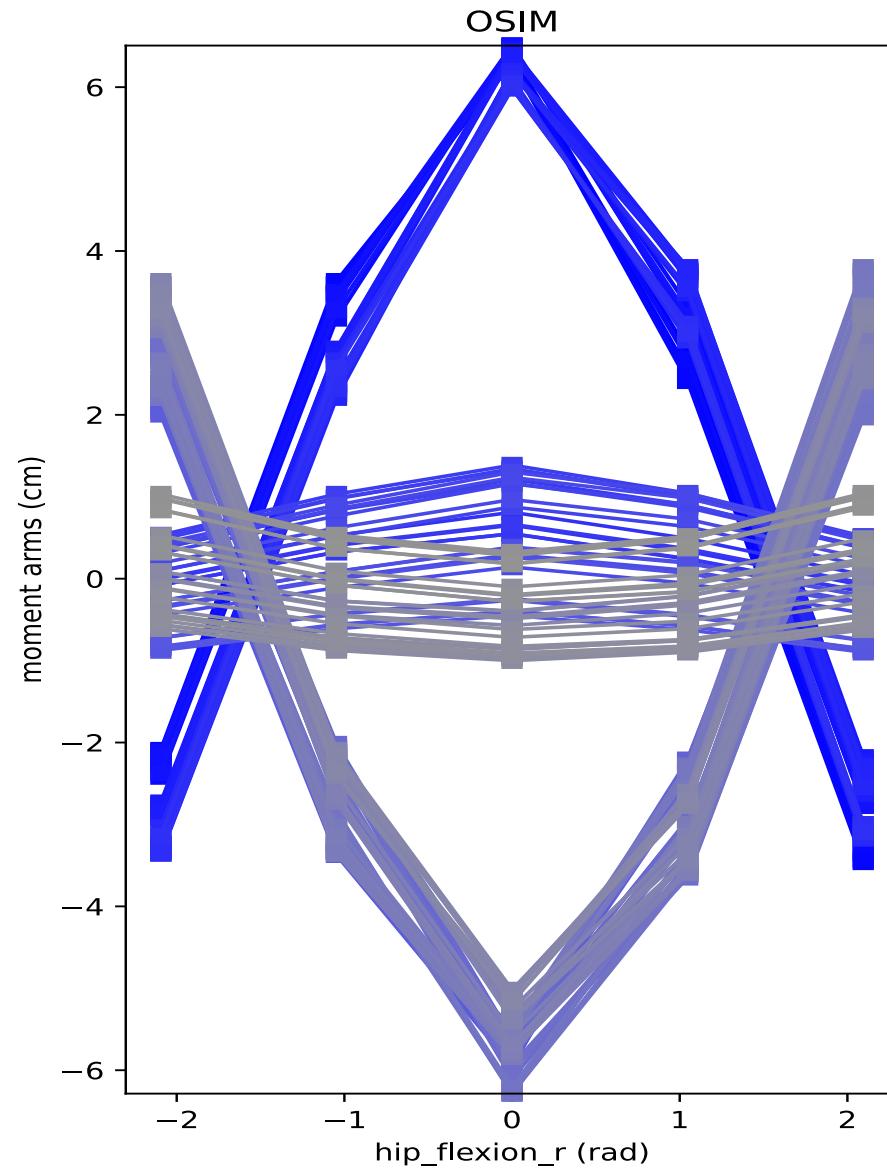
Muscle specific moment arm comparison with Osim model after optimization

peri_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



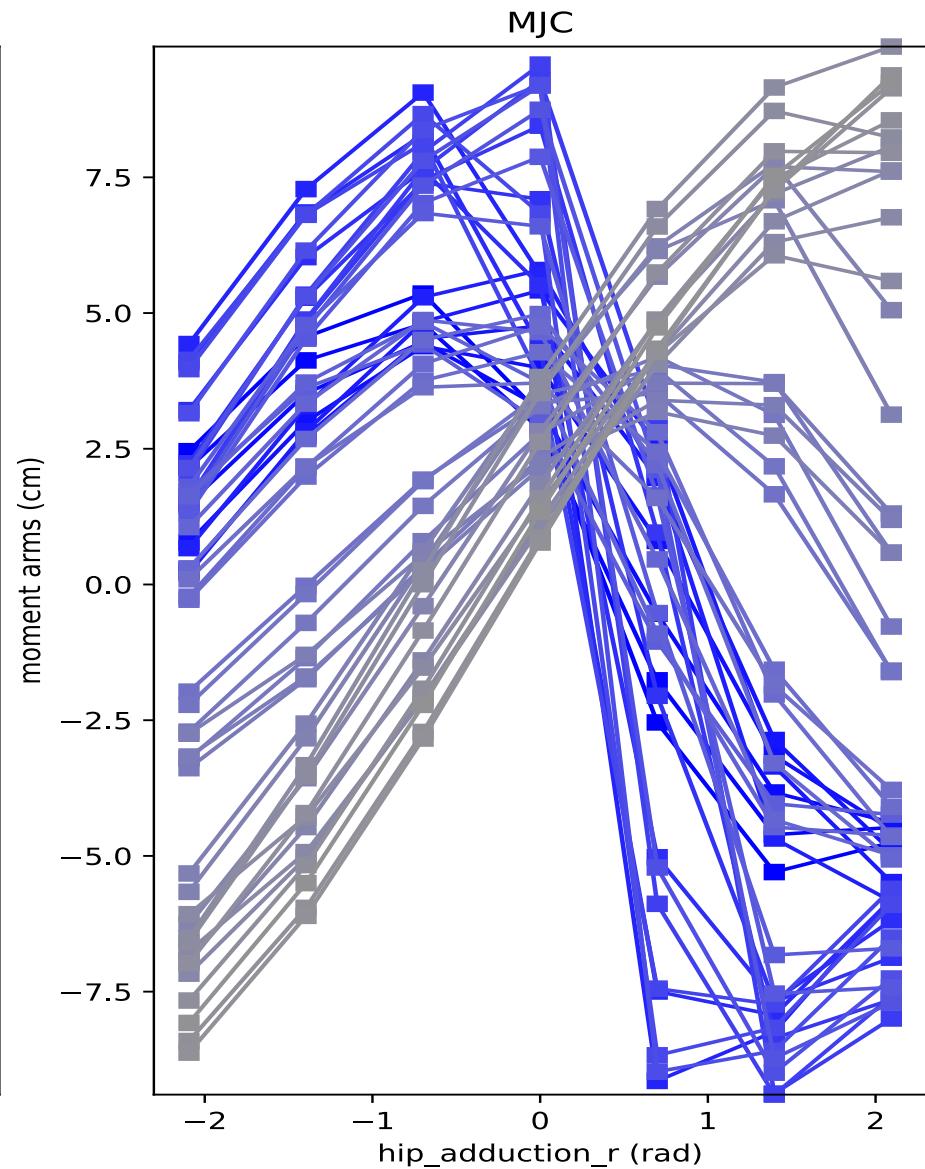
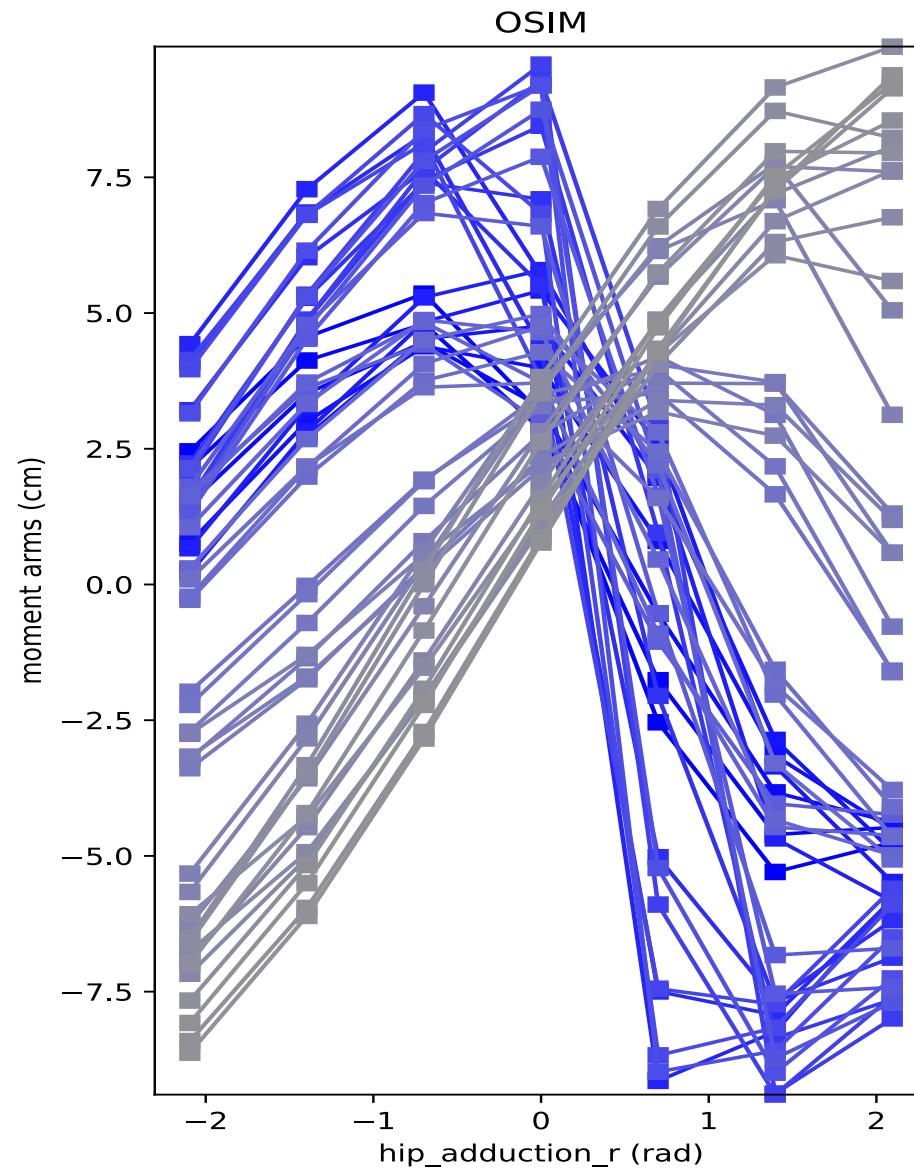
Muscle specific moment arm comparison with Osim model after optimization

bifemlh_r - hip_adduction_r - hip_flexion_r - hip_rotation_r - knee_angle_r



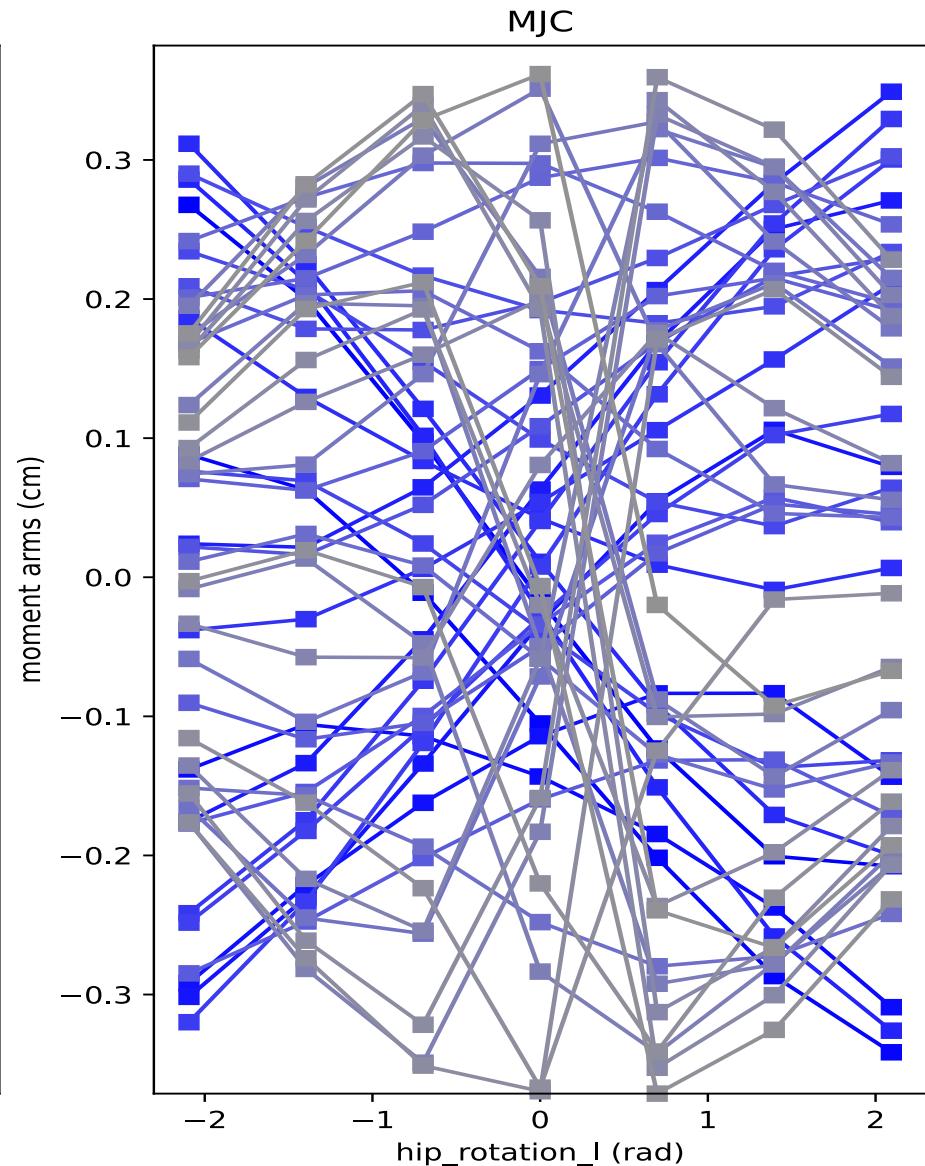
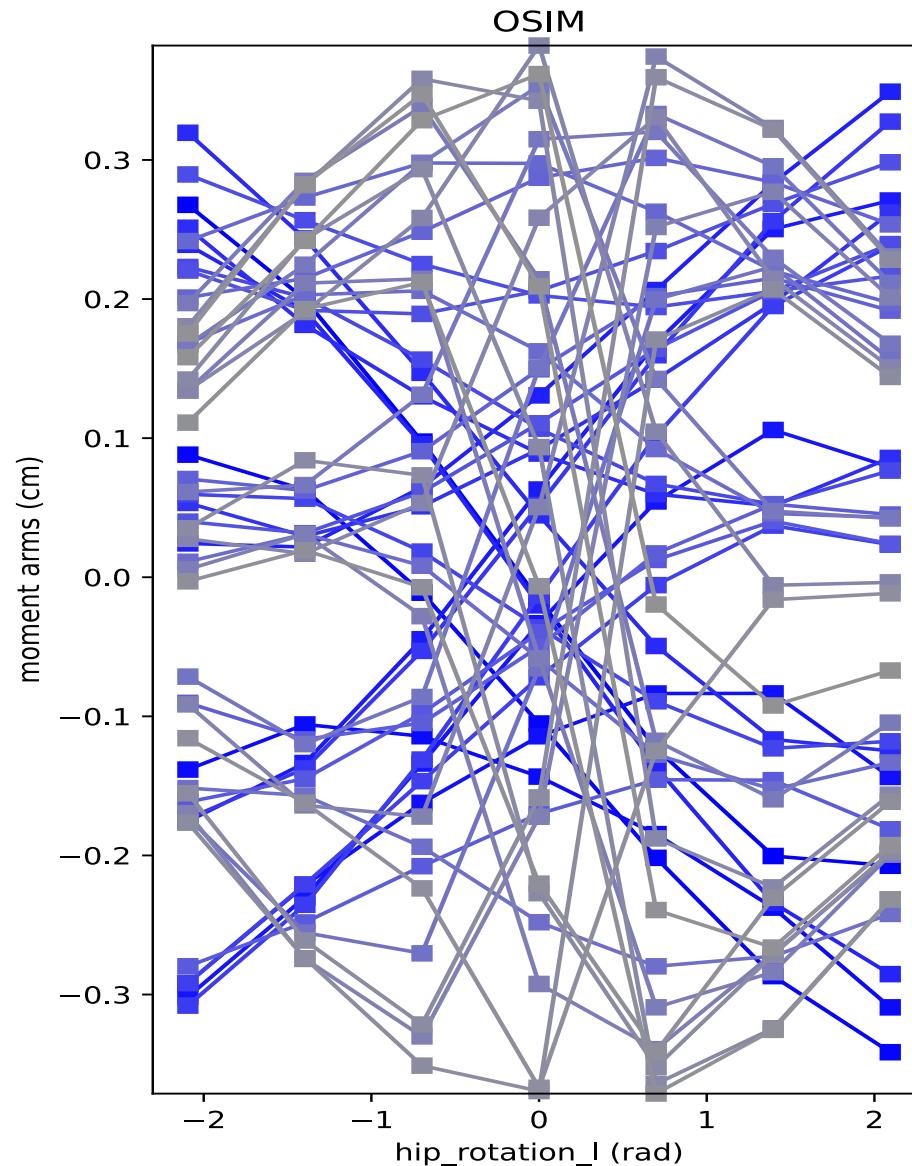
Muscle specific moment arm comparison with Osim model after optimization

glut_max3_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



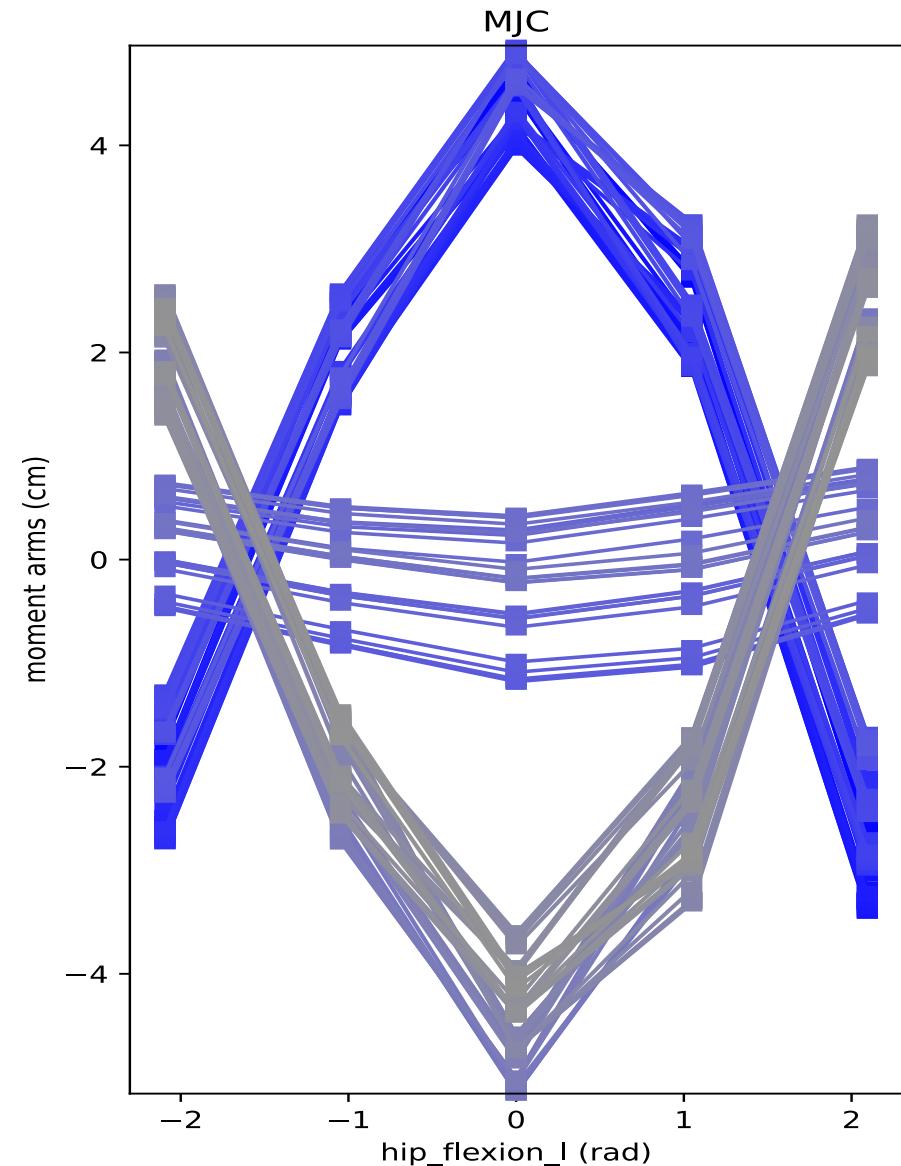
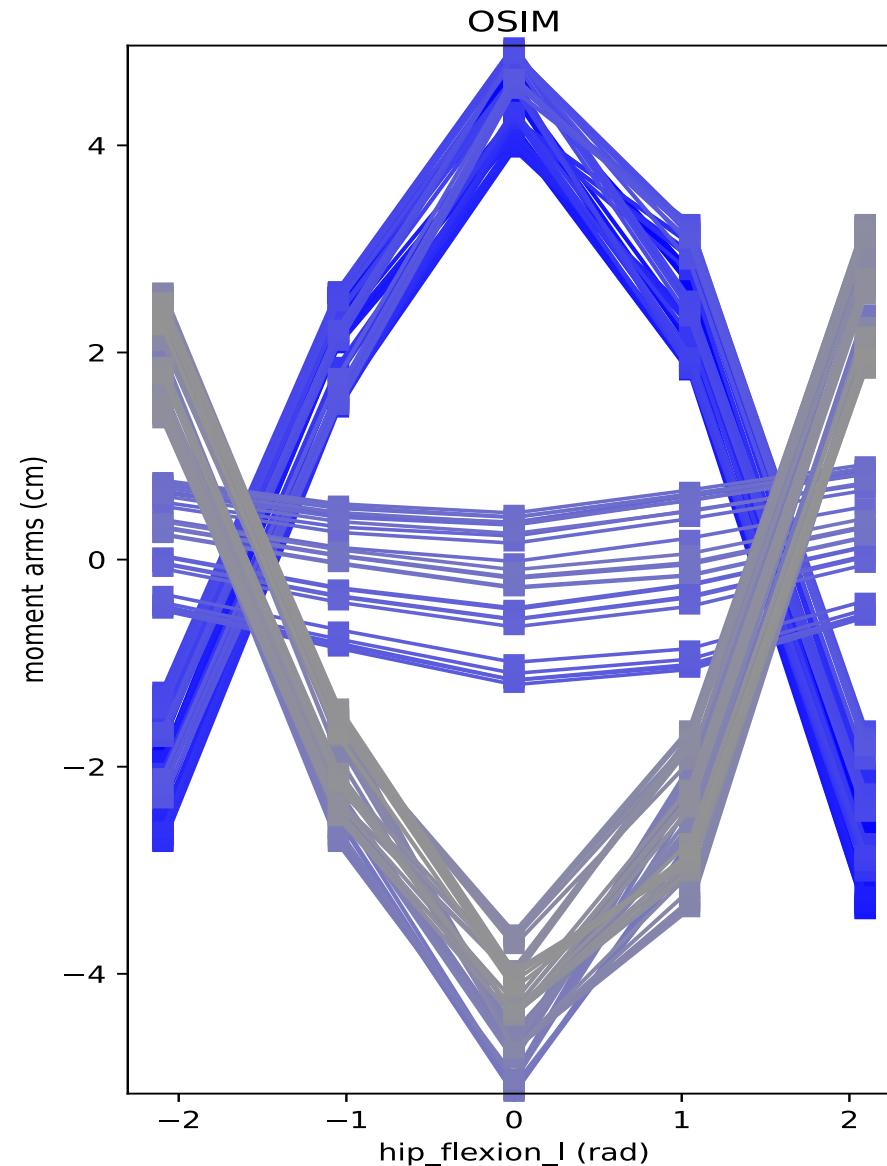
Muscle specific moment arm comparison with Osim model after optimization

psoas_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



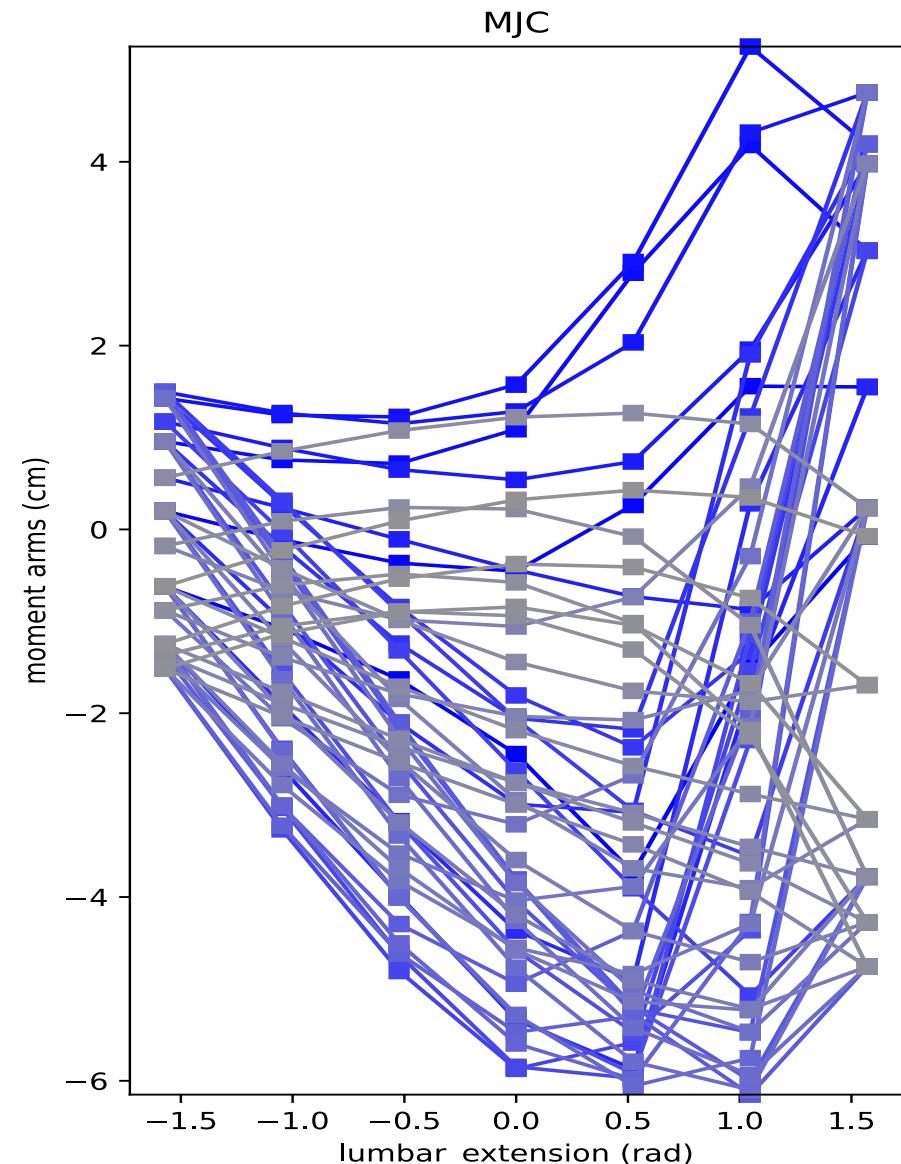
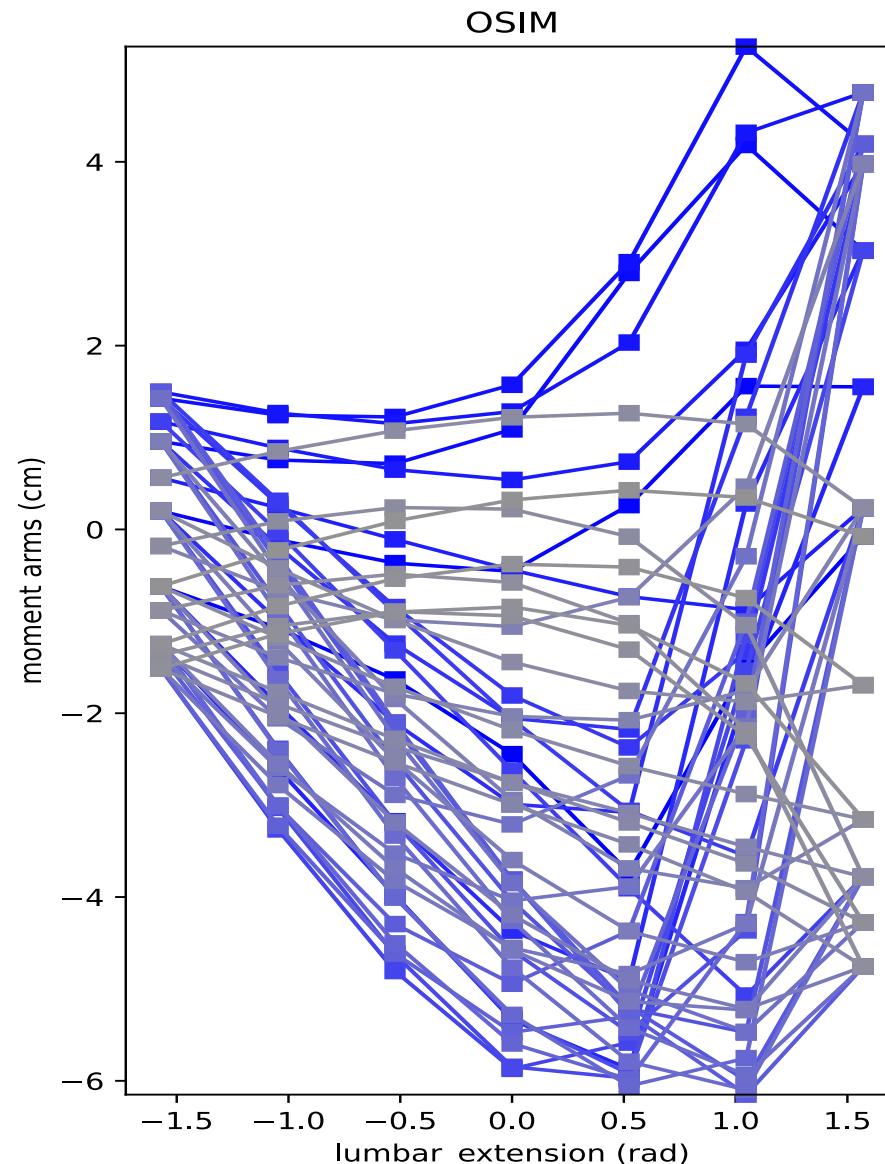
Muscle specific moment arm comparison with Osim model after optimization

grac_I - hip_adduction_I - hip_flexion_I - hip_rotation_I - knee_angle_I



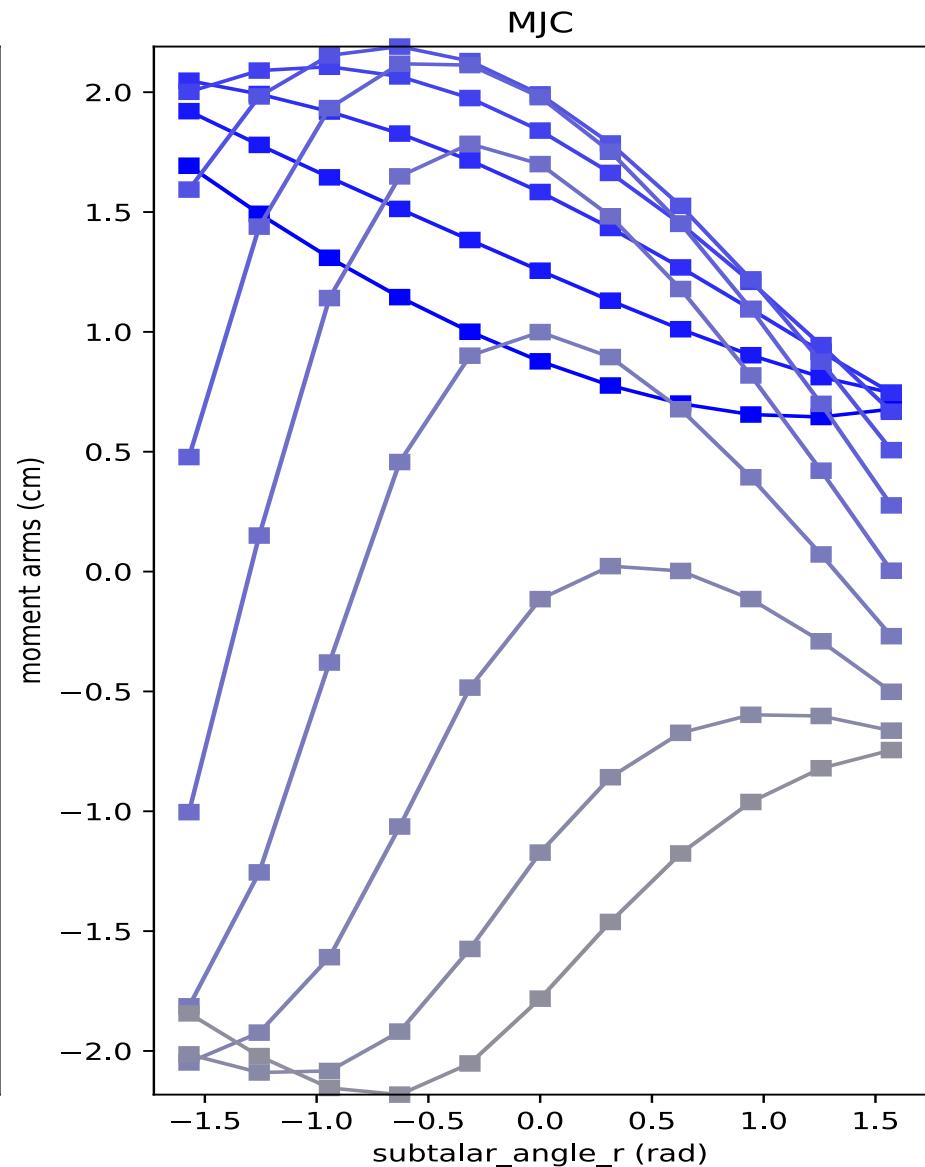
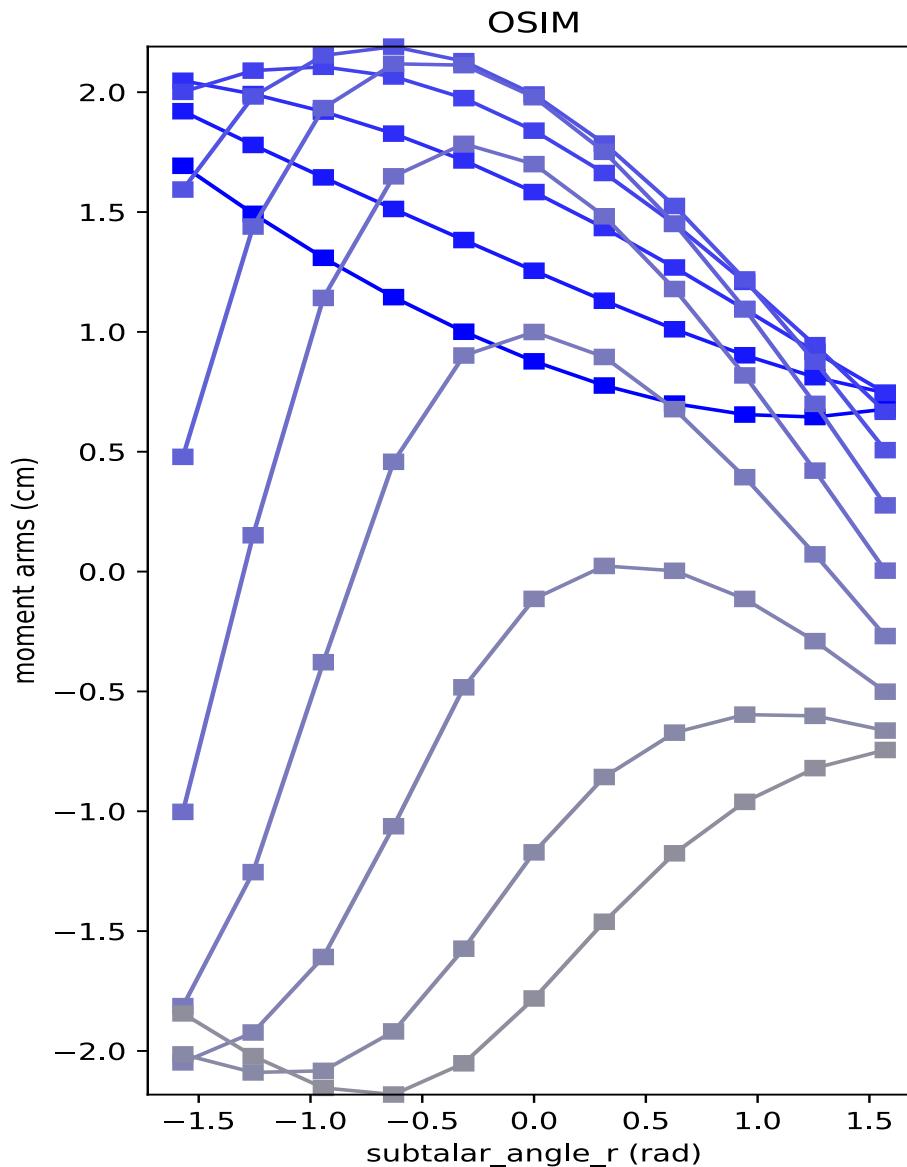
Muscle specific moment arm comparison with Osim model after optimization

intobl_r - lumbar_bending - lumbar_extension - lumbar_rotation



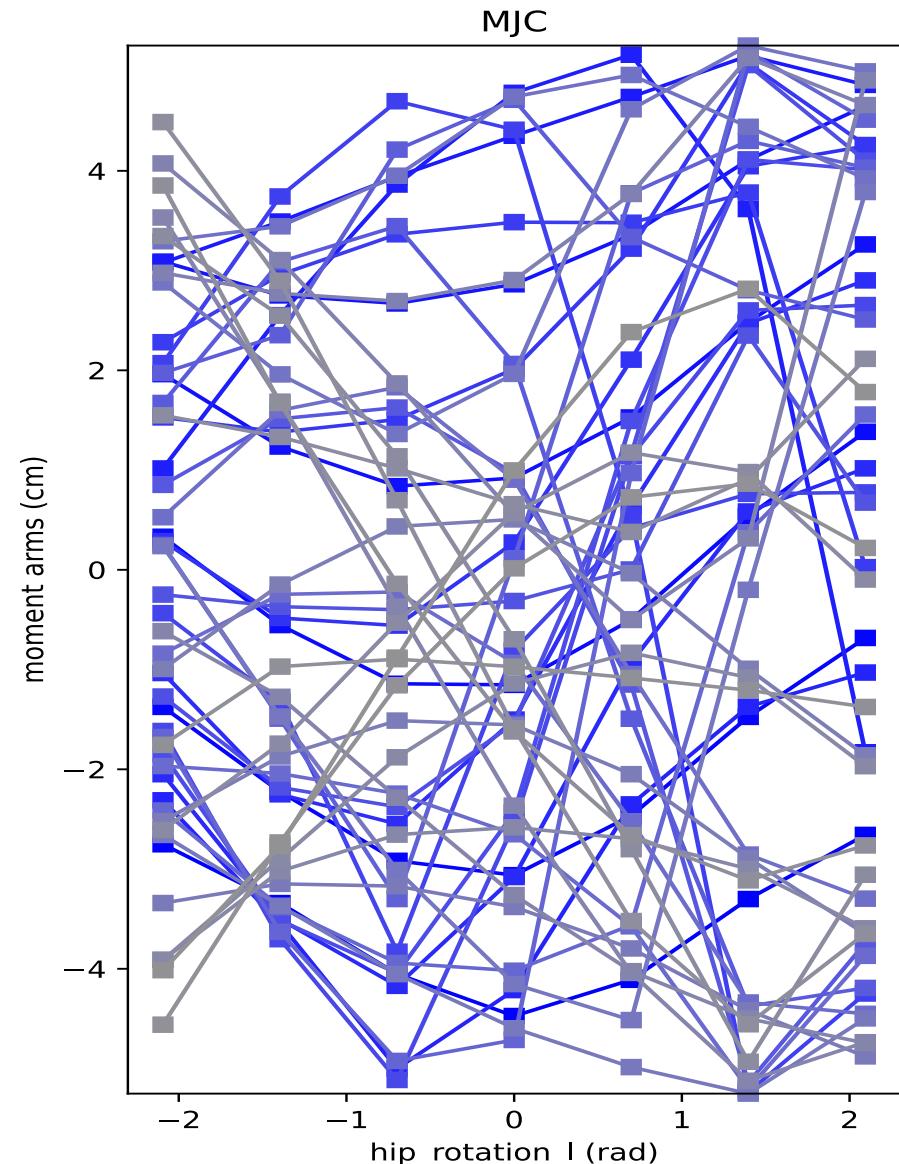
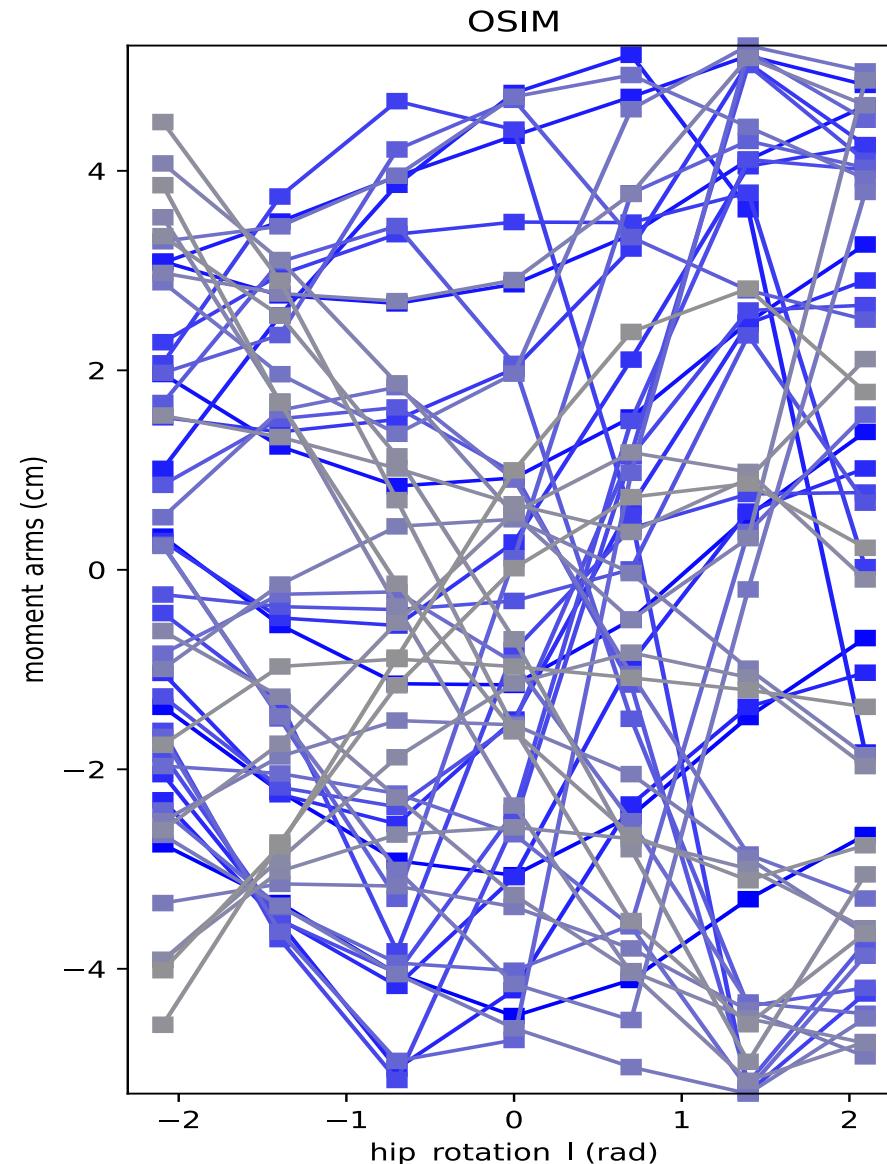
Muscle specific moment arm comparison with Osim model after optimization

tib_post_r - ankle_angle_r - subtalar_angle_r



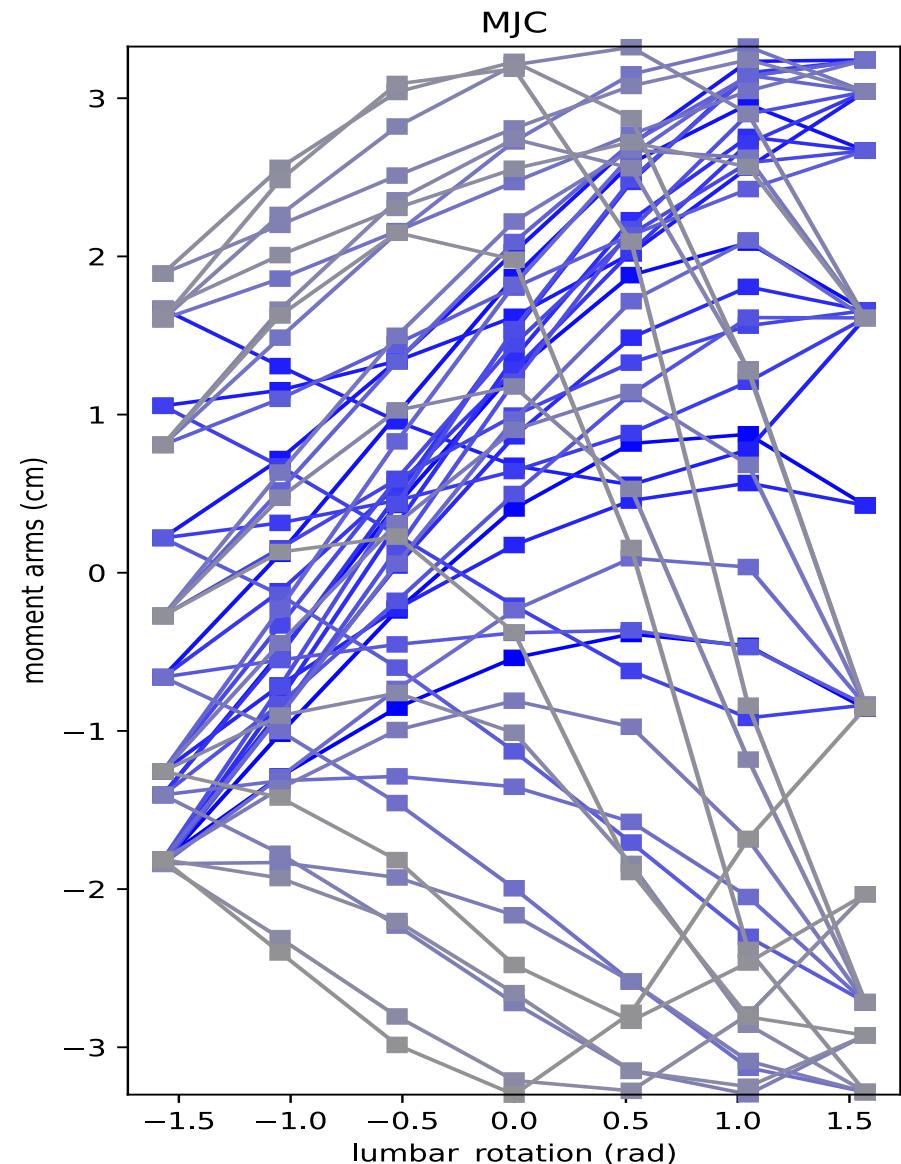
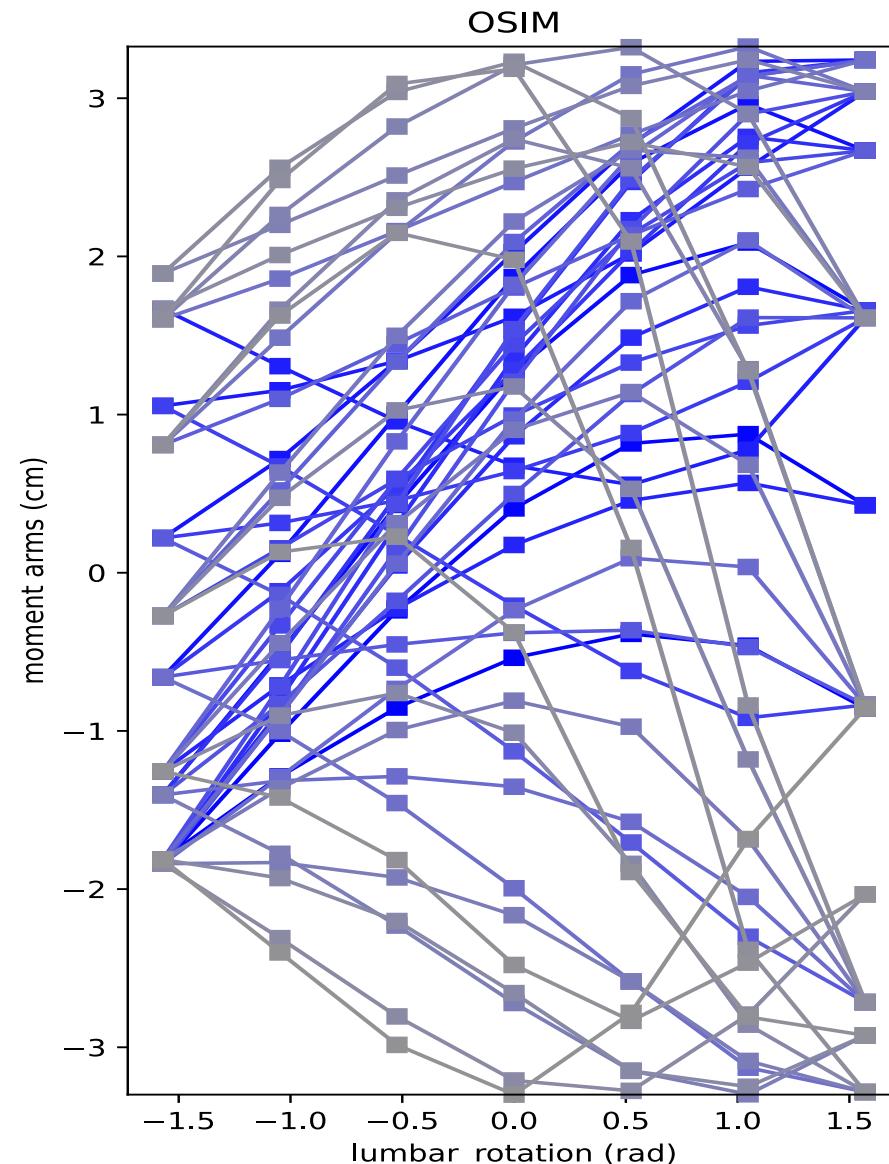
Muscle specific moment arm comparison with Osim model after optimization

quad_fem_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



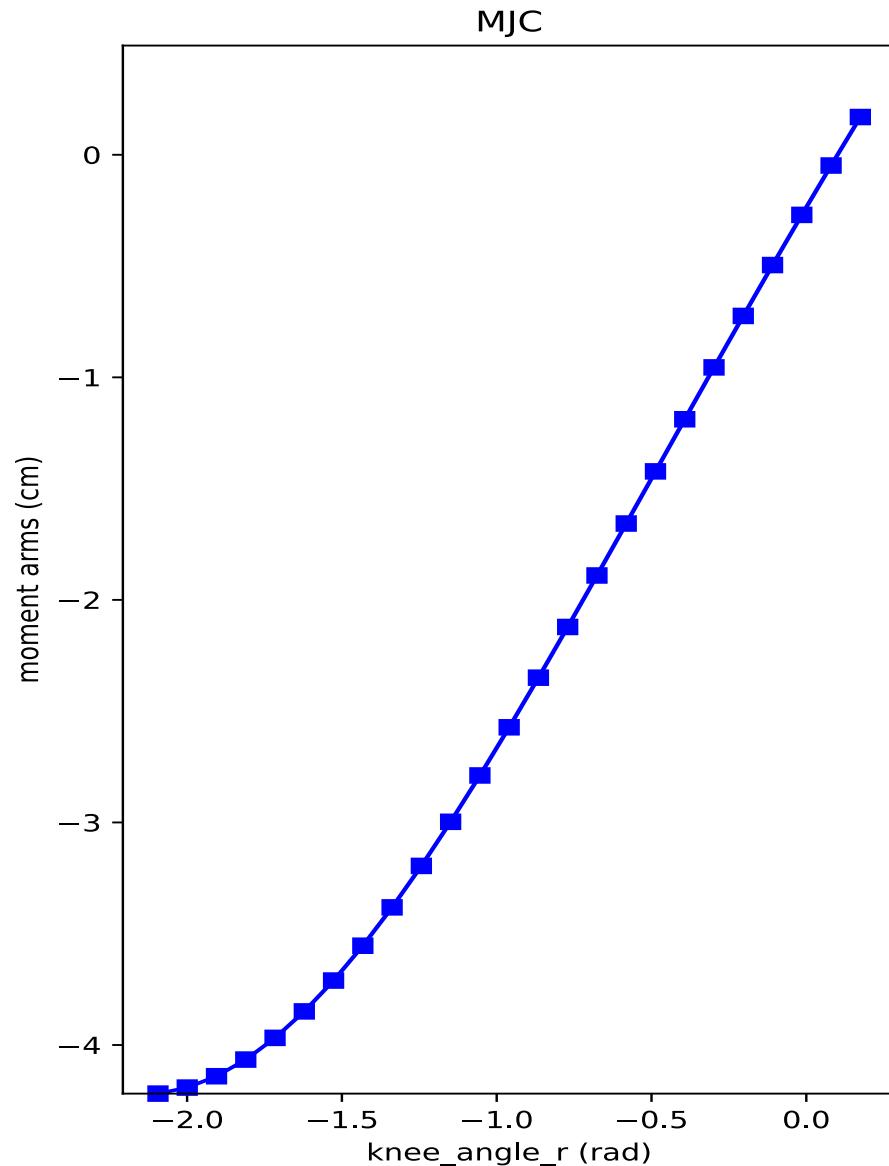
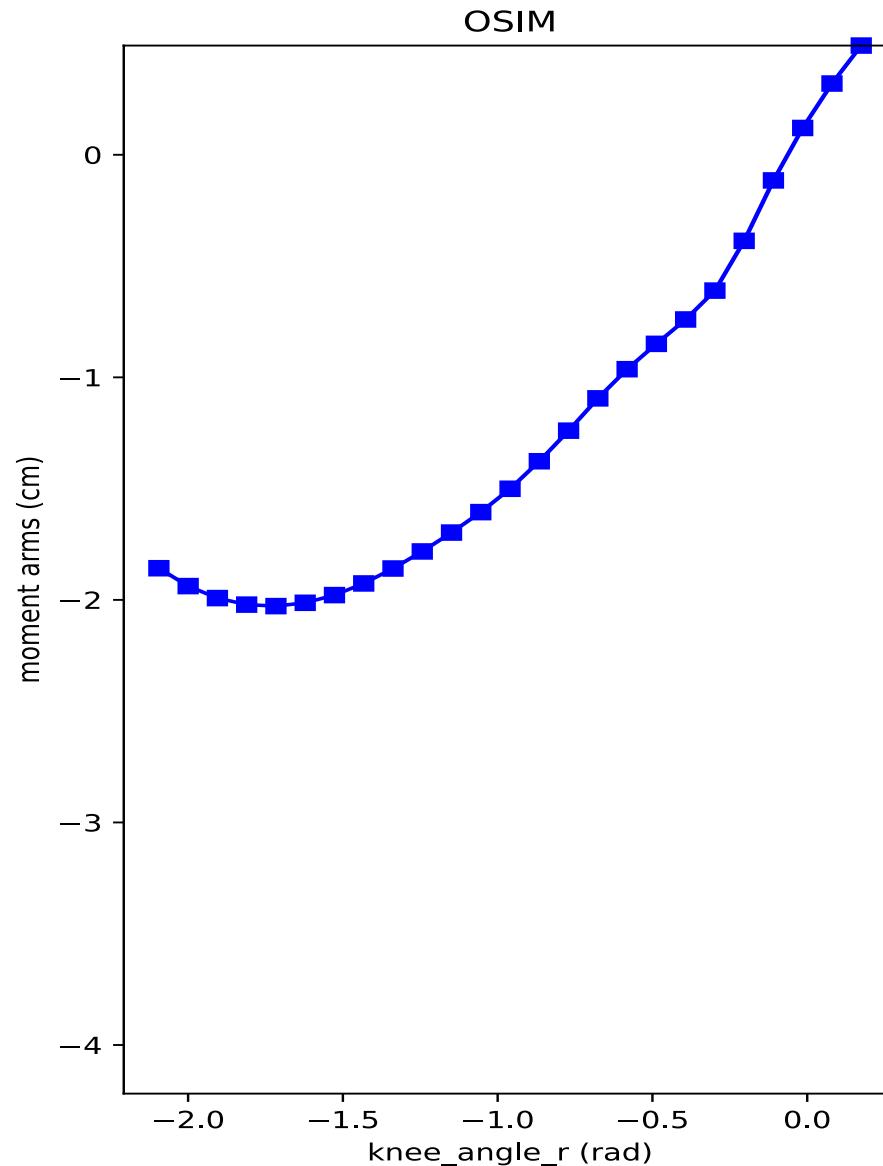
Muscle specific moment arm comparison with Osim model after optimization

ercspn_r - lumbar_bending - lumbar_extension - lumbar_rotation



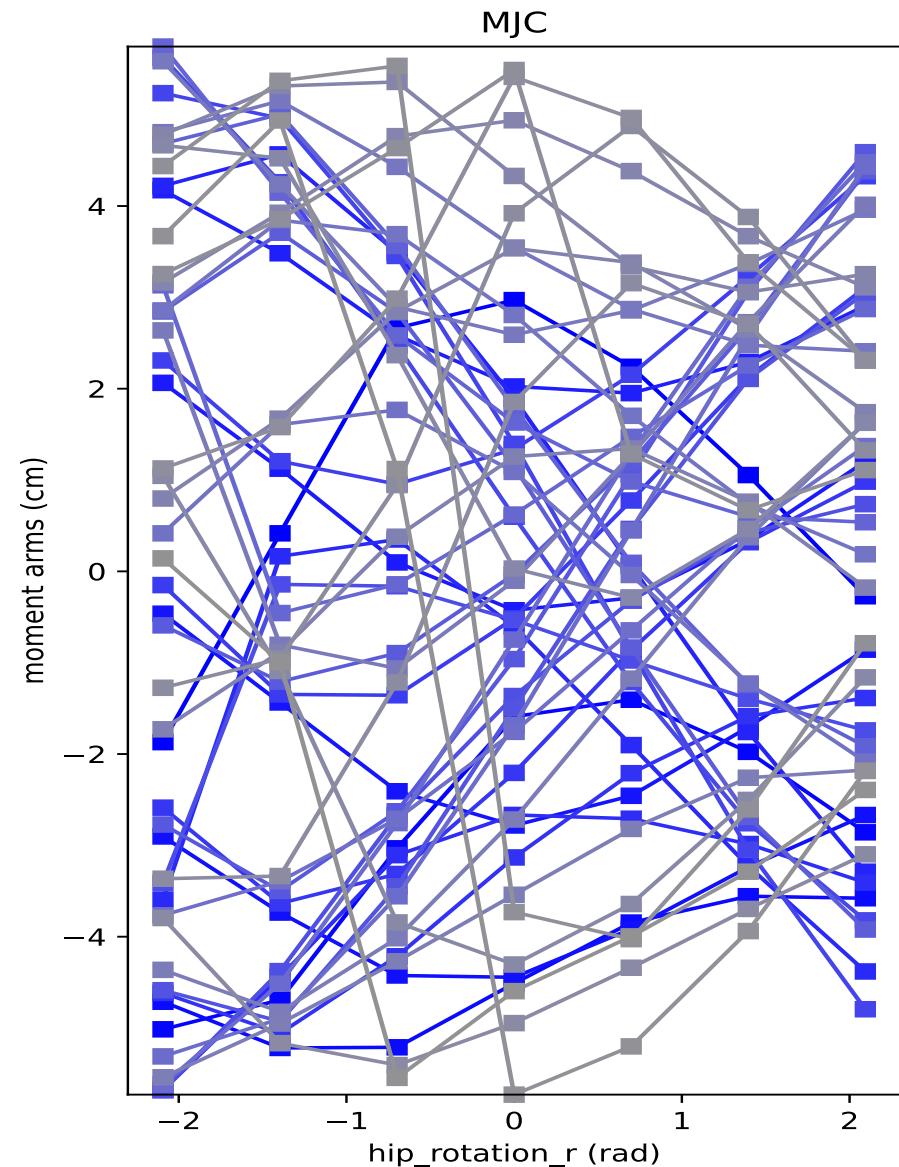
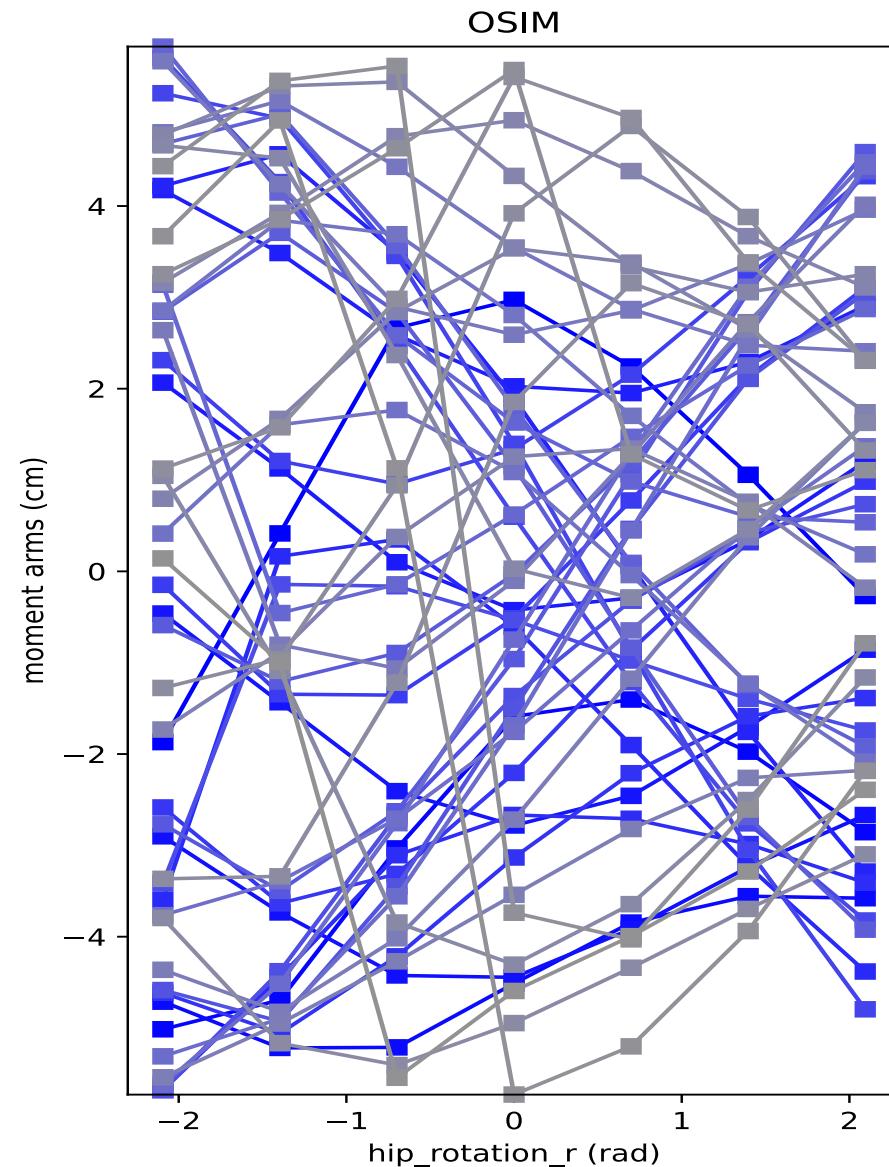
Muscle specific moment arm comparison with Osim model after optimization

sar_r - knee_angle_r



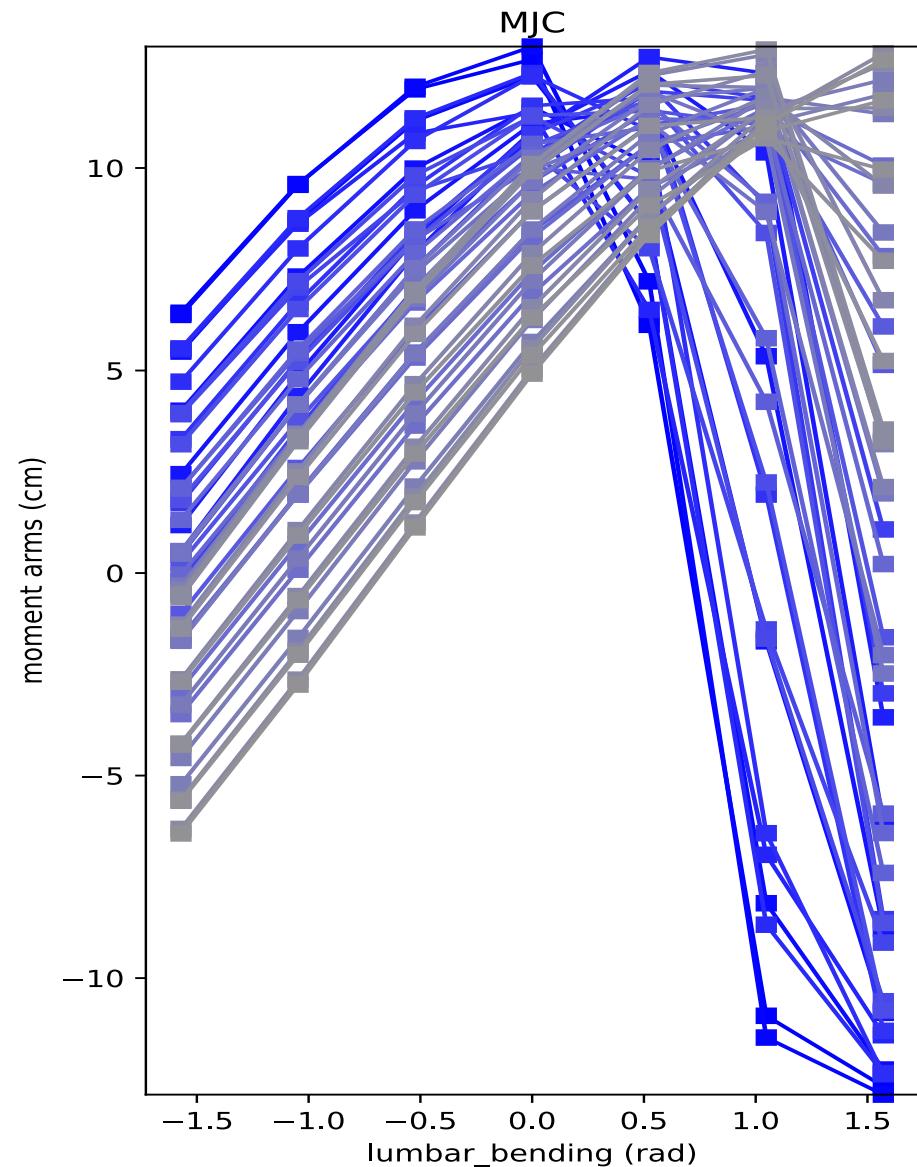
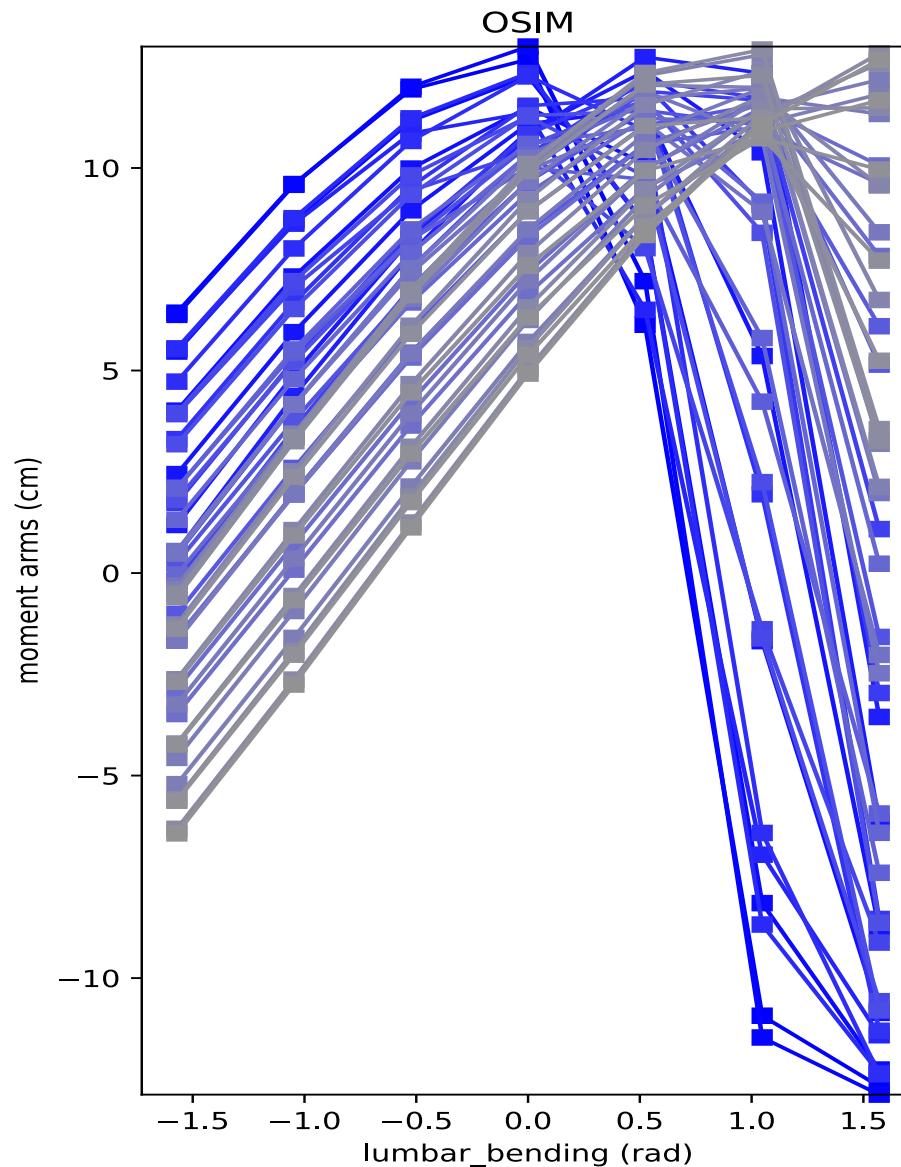
Muscle specific moment arm comparison with Osim model after optimization

tfl_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



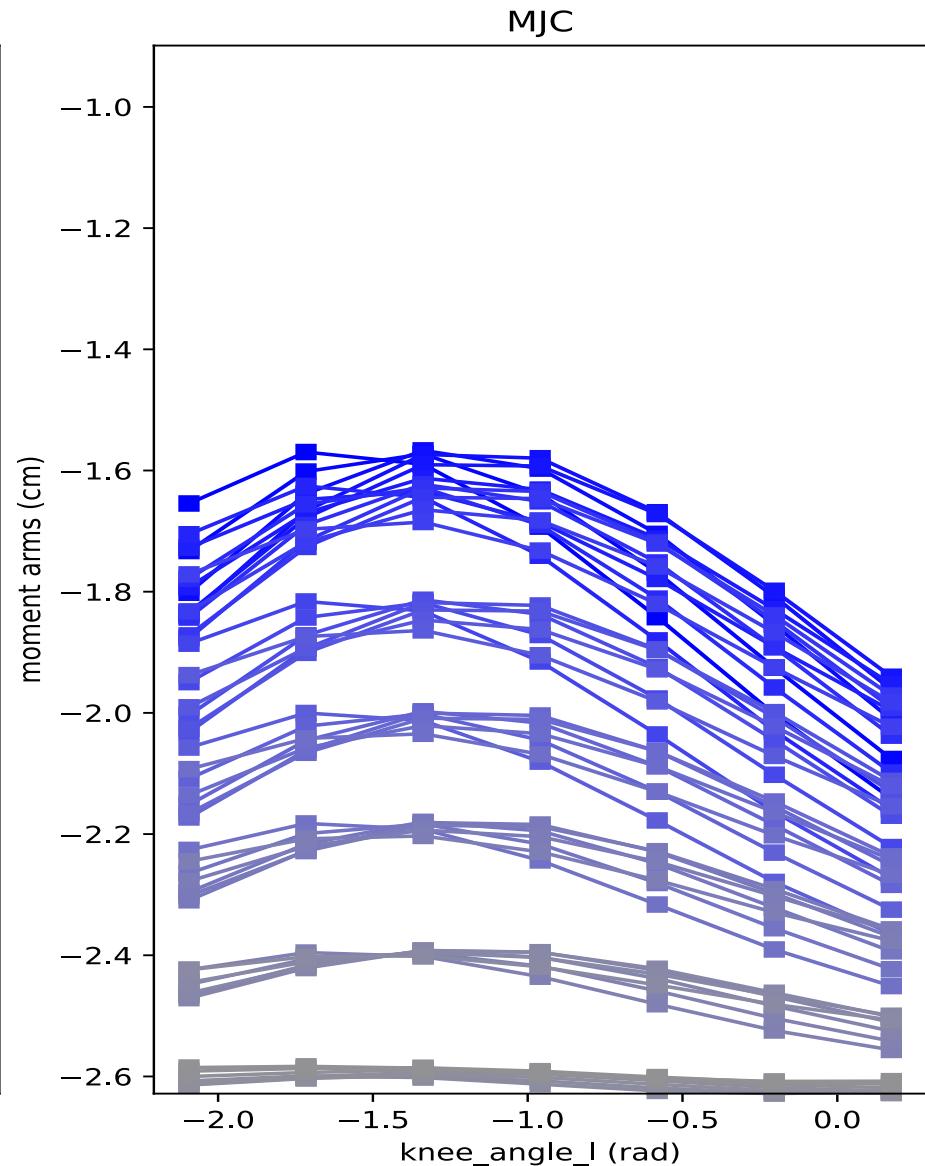
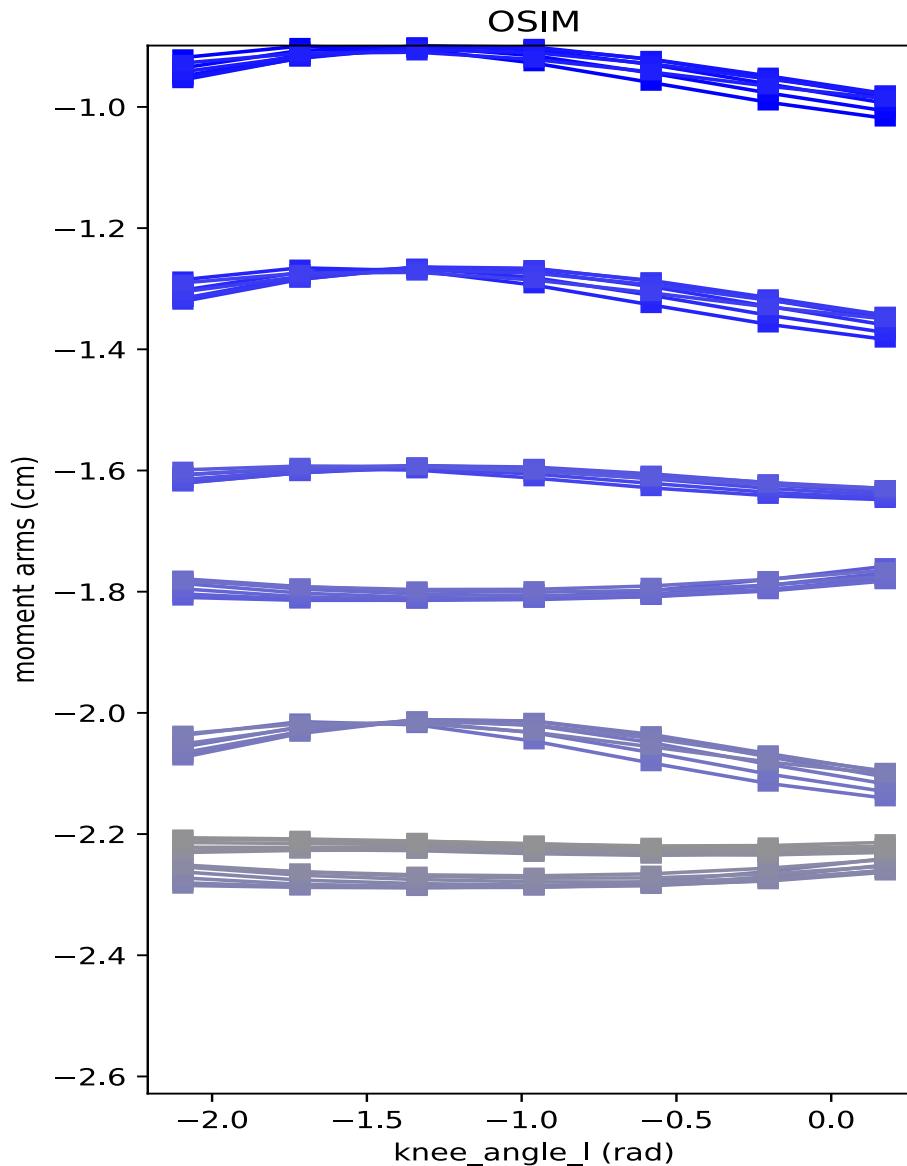
Muscle specific moment arm comparison with Osim model after optimization

intobl_r - lumbar_bending - lumbar_extension - lumbar_rotation



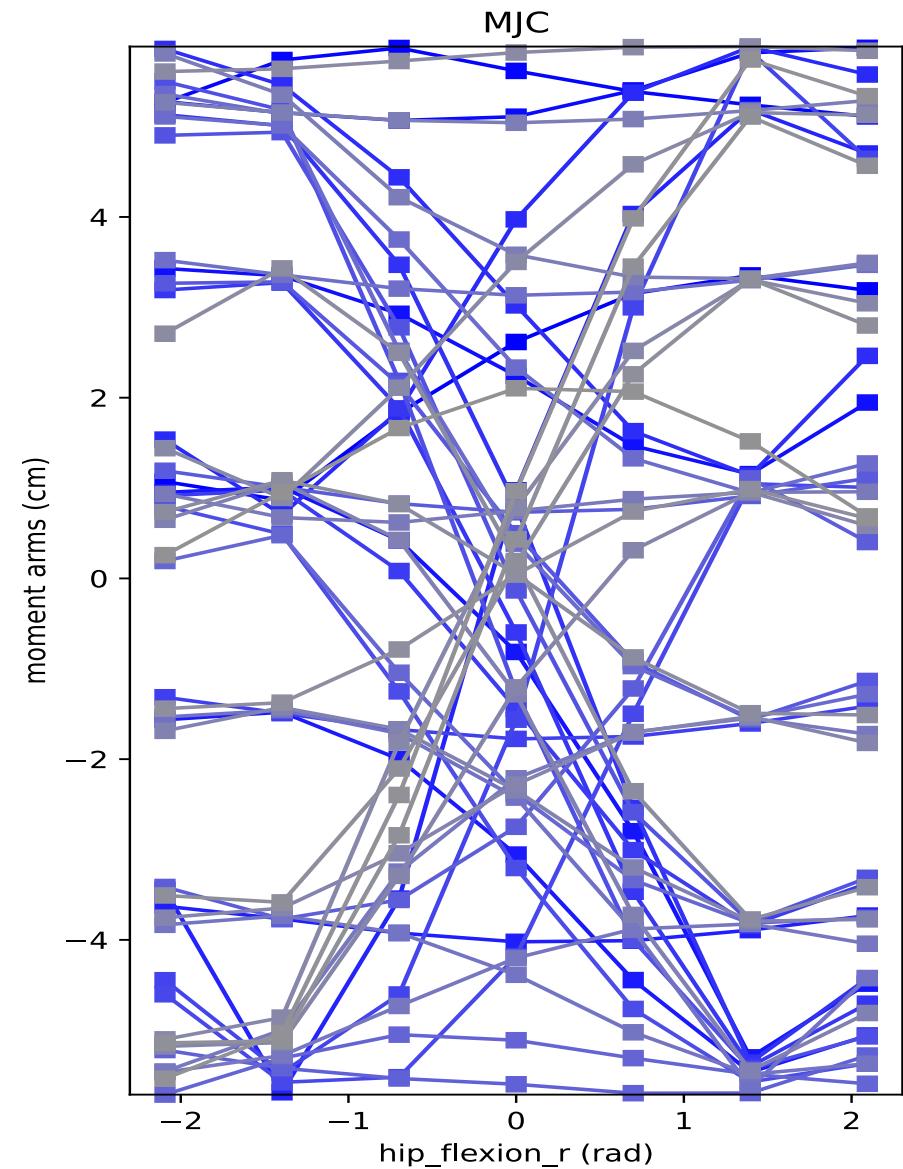
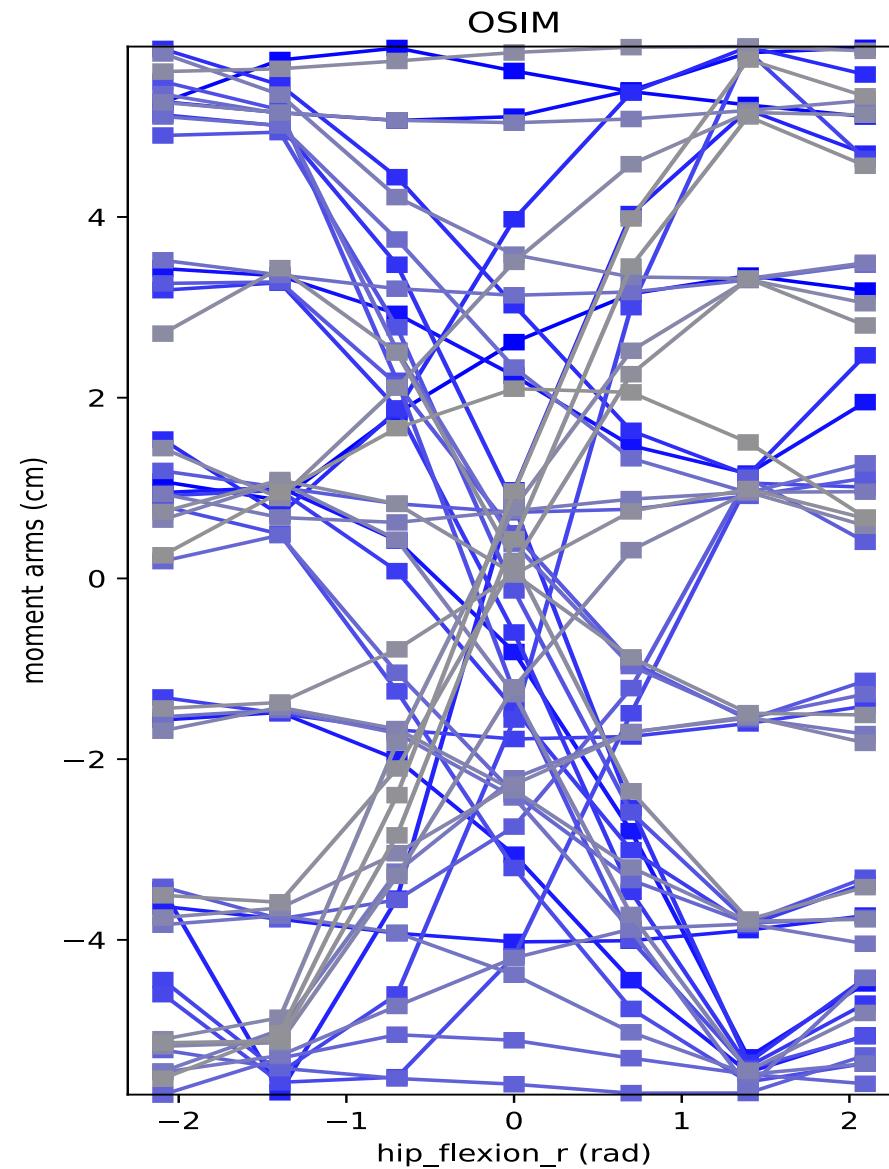
Muscle specific moment arm comparison with Osim model after optimization

med_gas_I - ankle_angle_I - knee_angle_I - subtalar_angle_I



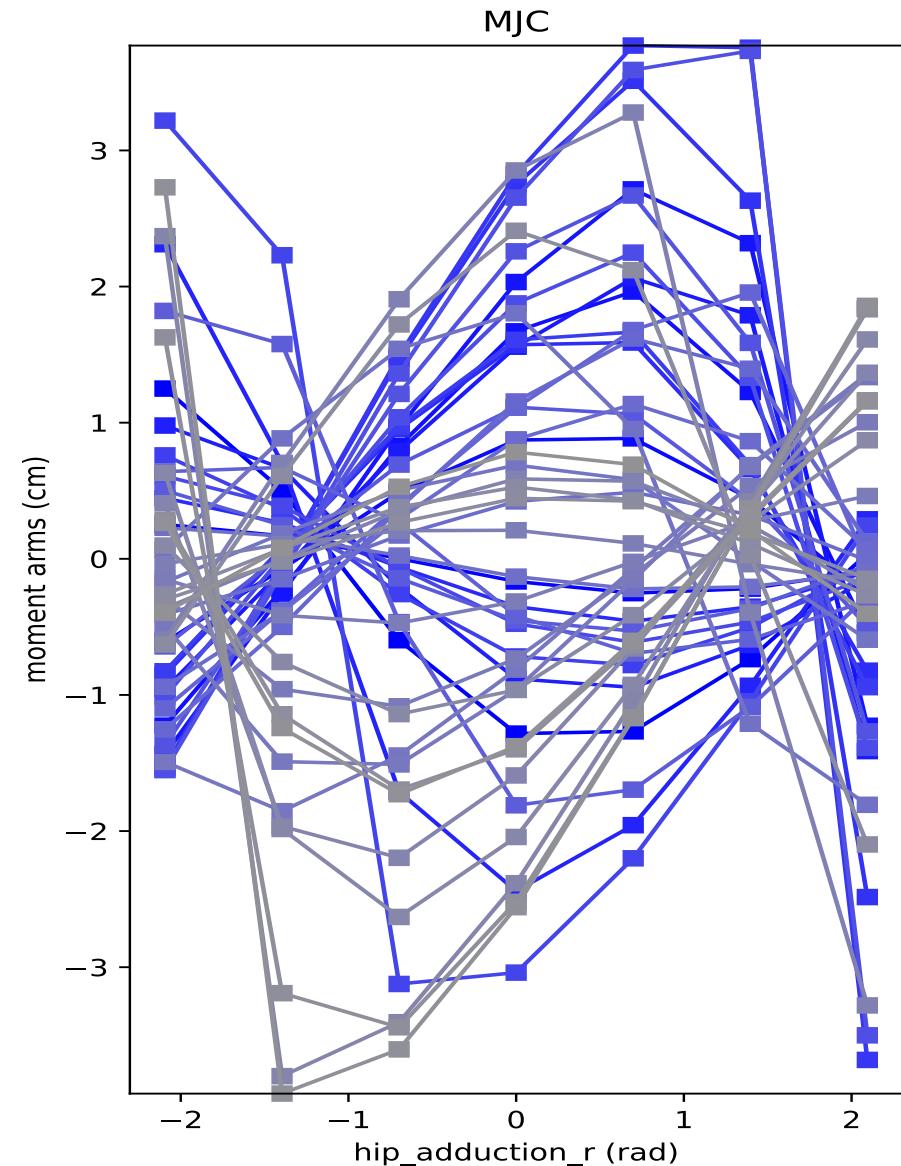
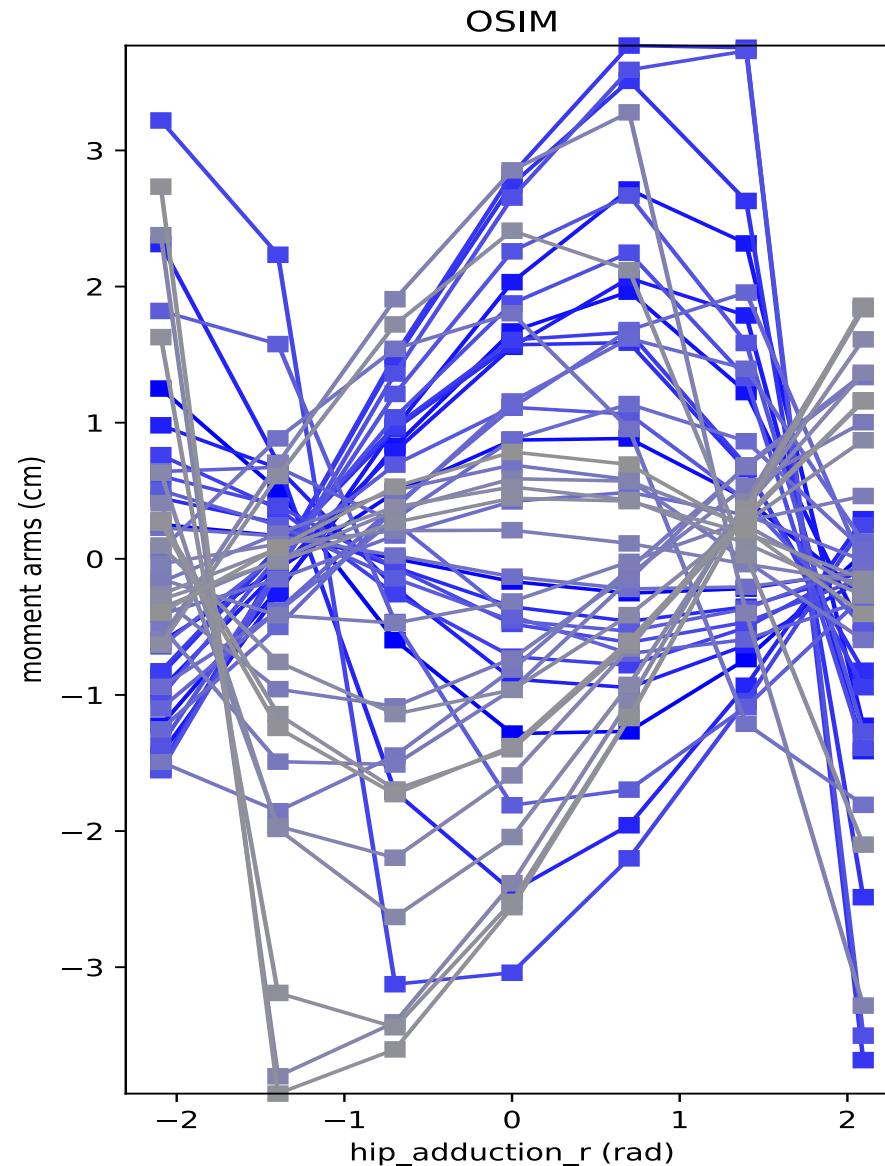
Muscle specific moment arm comparison with Osim model after optimization

glut_med3_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



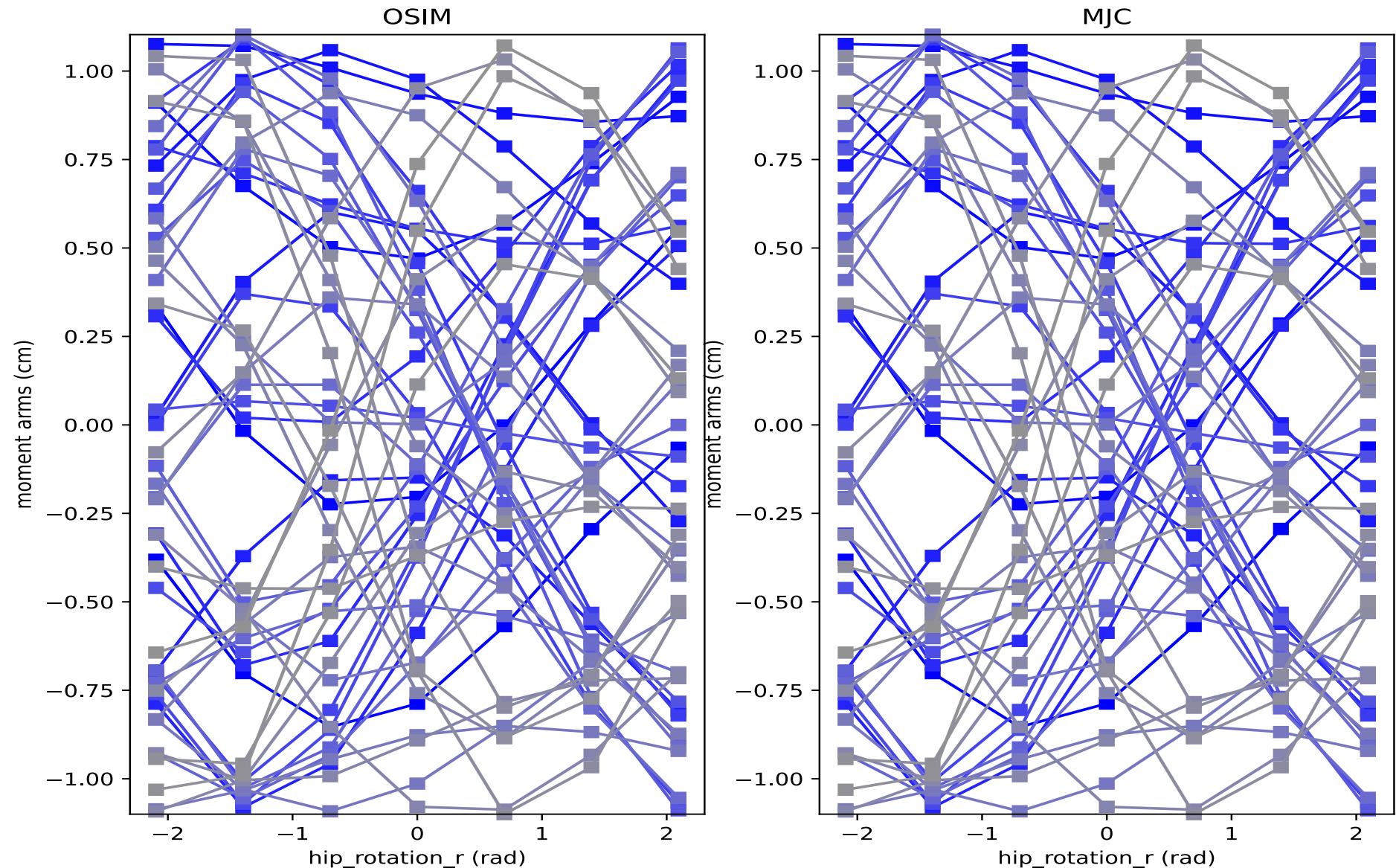
Muscle specific moment arm comparison with Osim model after optimization

gem_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



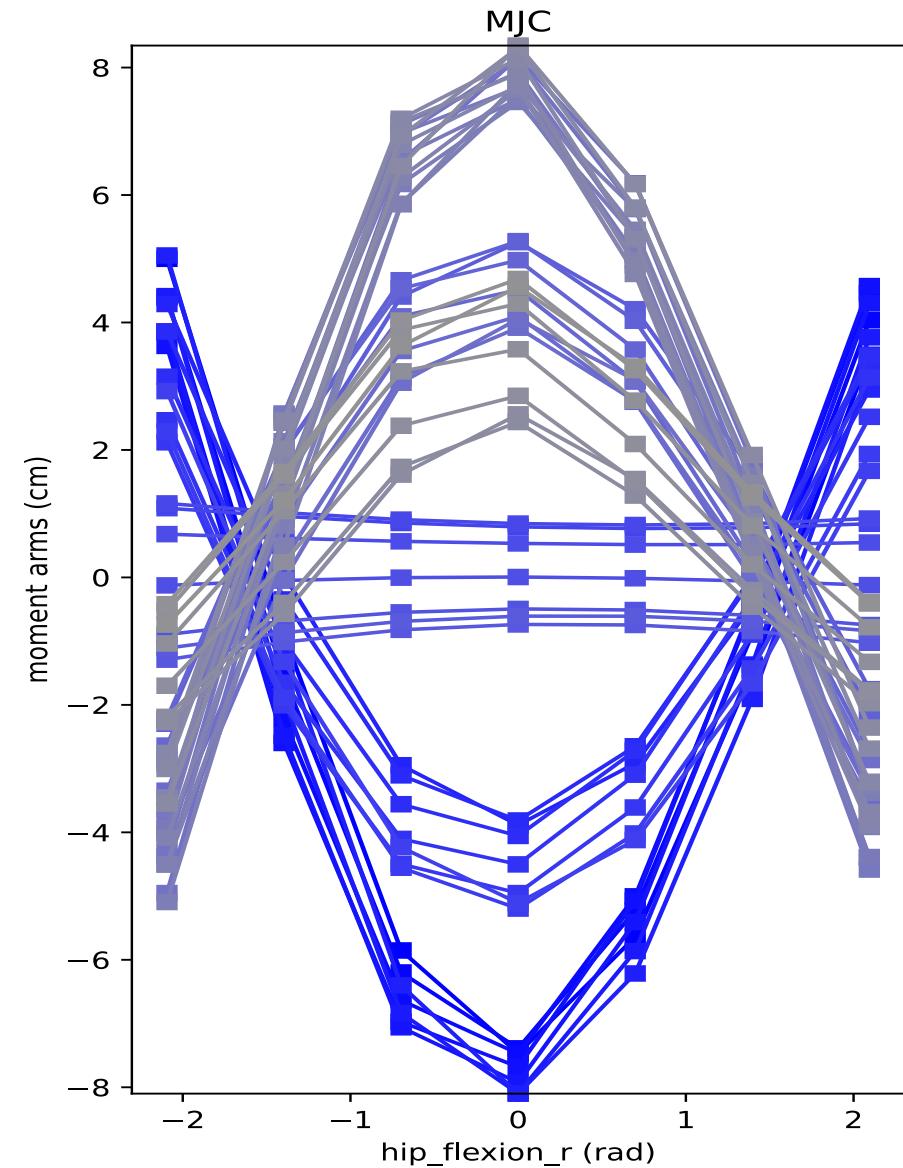
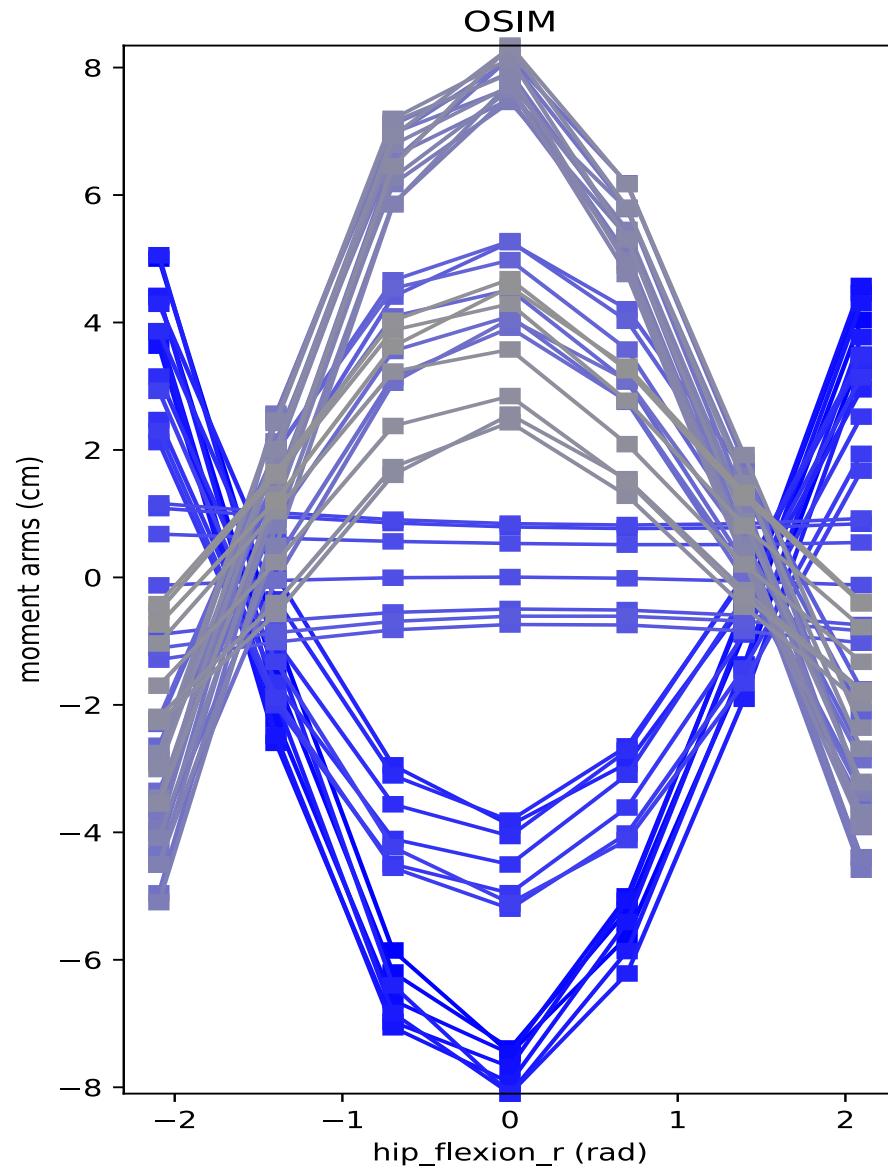
Muscle specific moment arm comparison with Osim model after optimization

sar_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



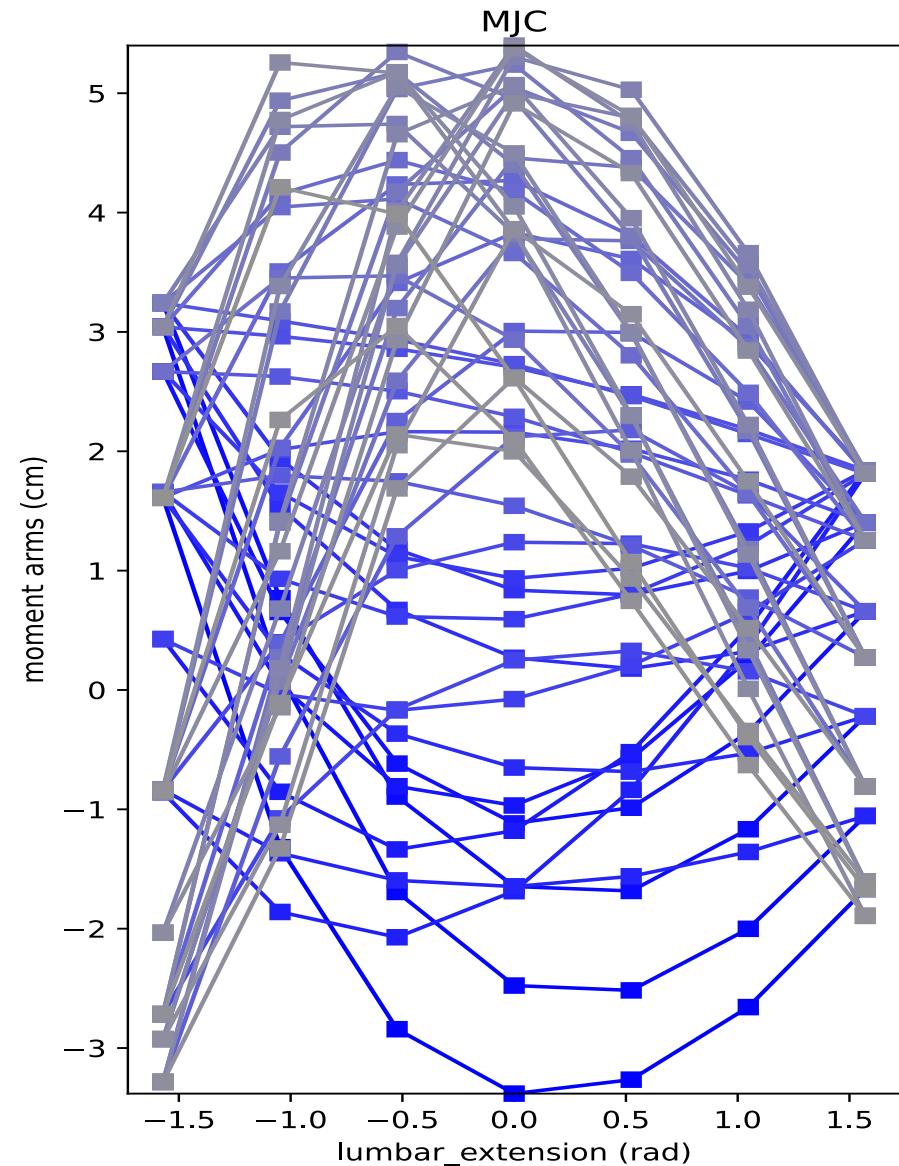
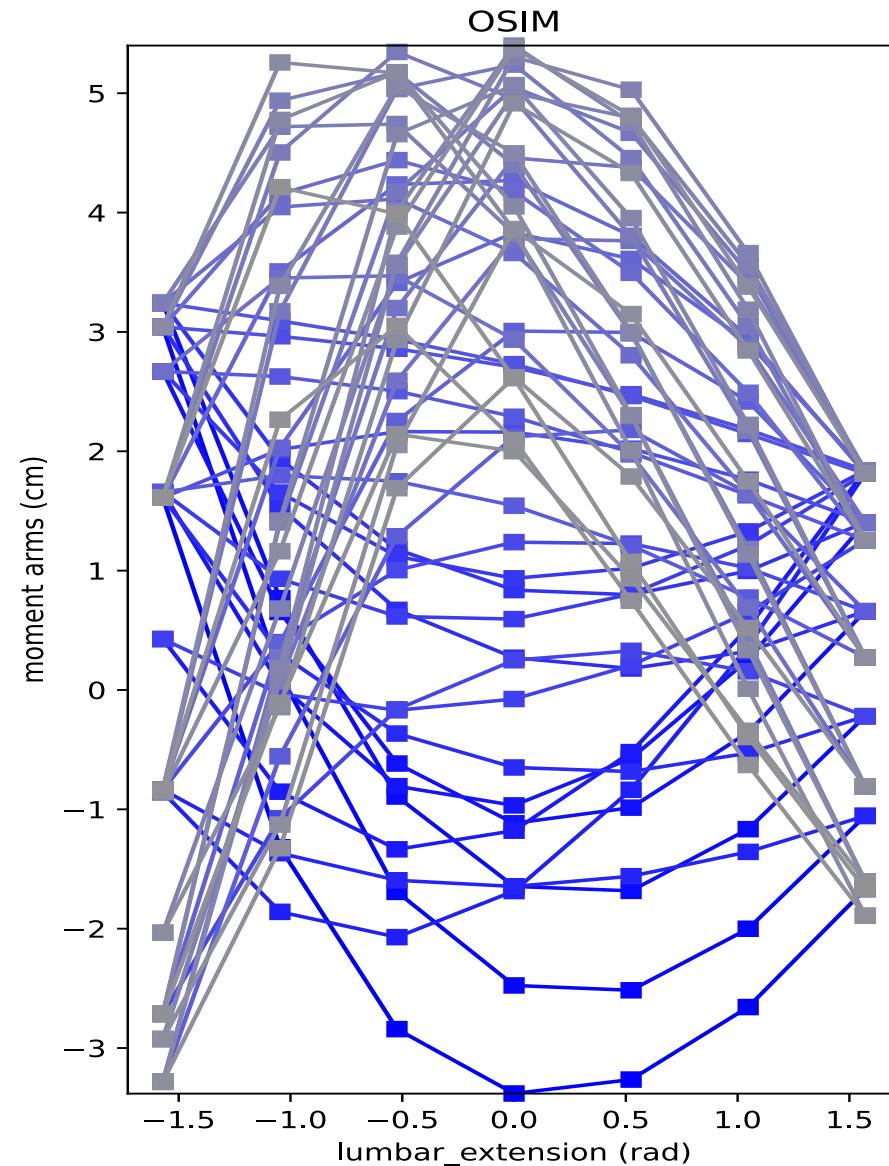
Muscle specific moment arm comparison with Osim model after optimization

sar_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



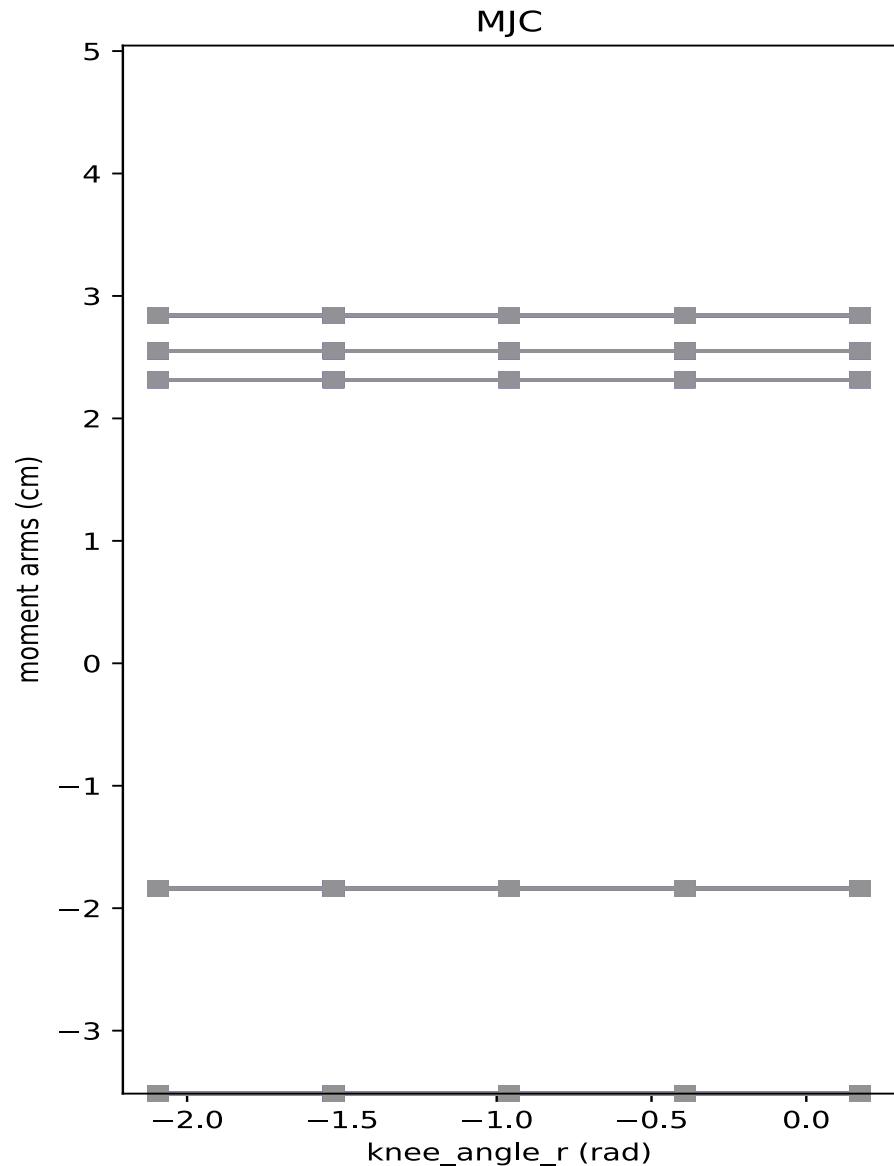
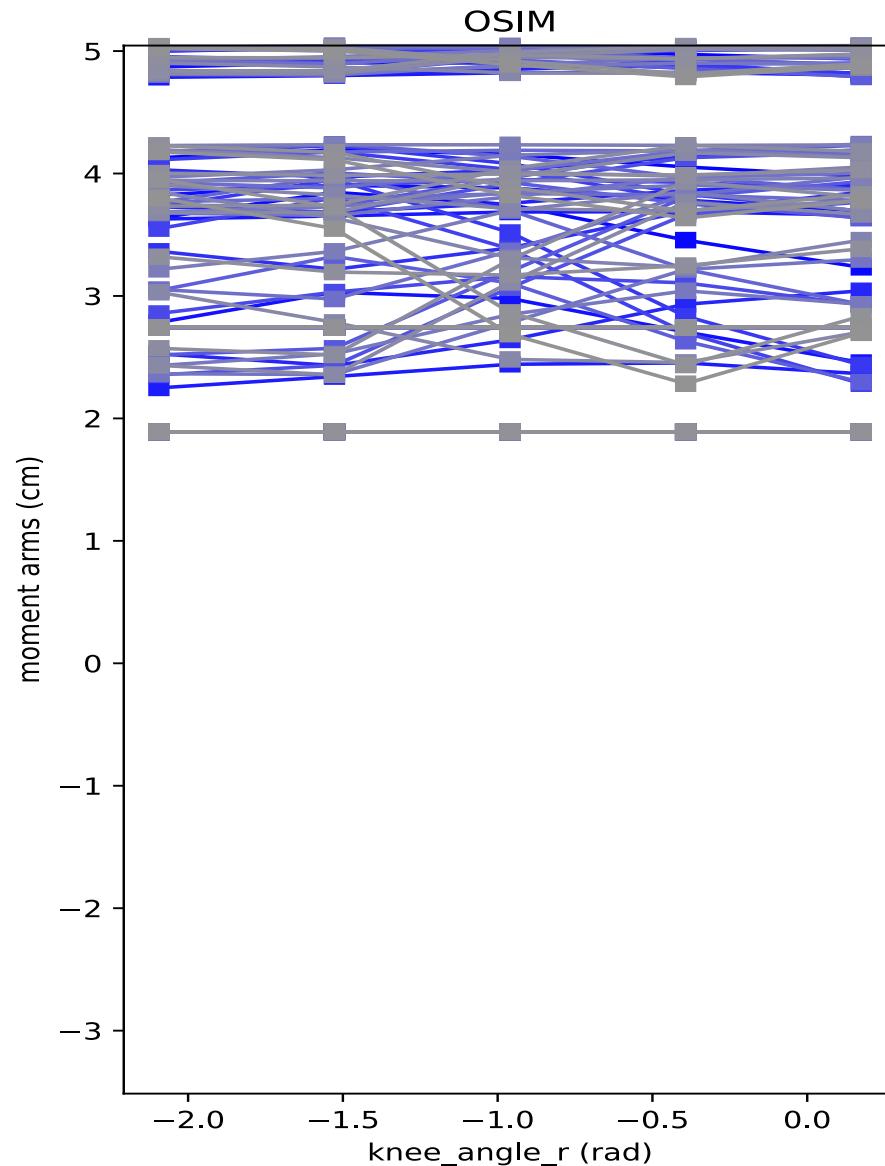
Muscle specific moment arm comparison with Osim model after optimization

ercspn_I - lumbar_bending - lumbar_extension - lumbar_rotation



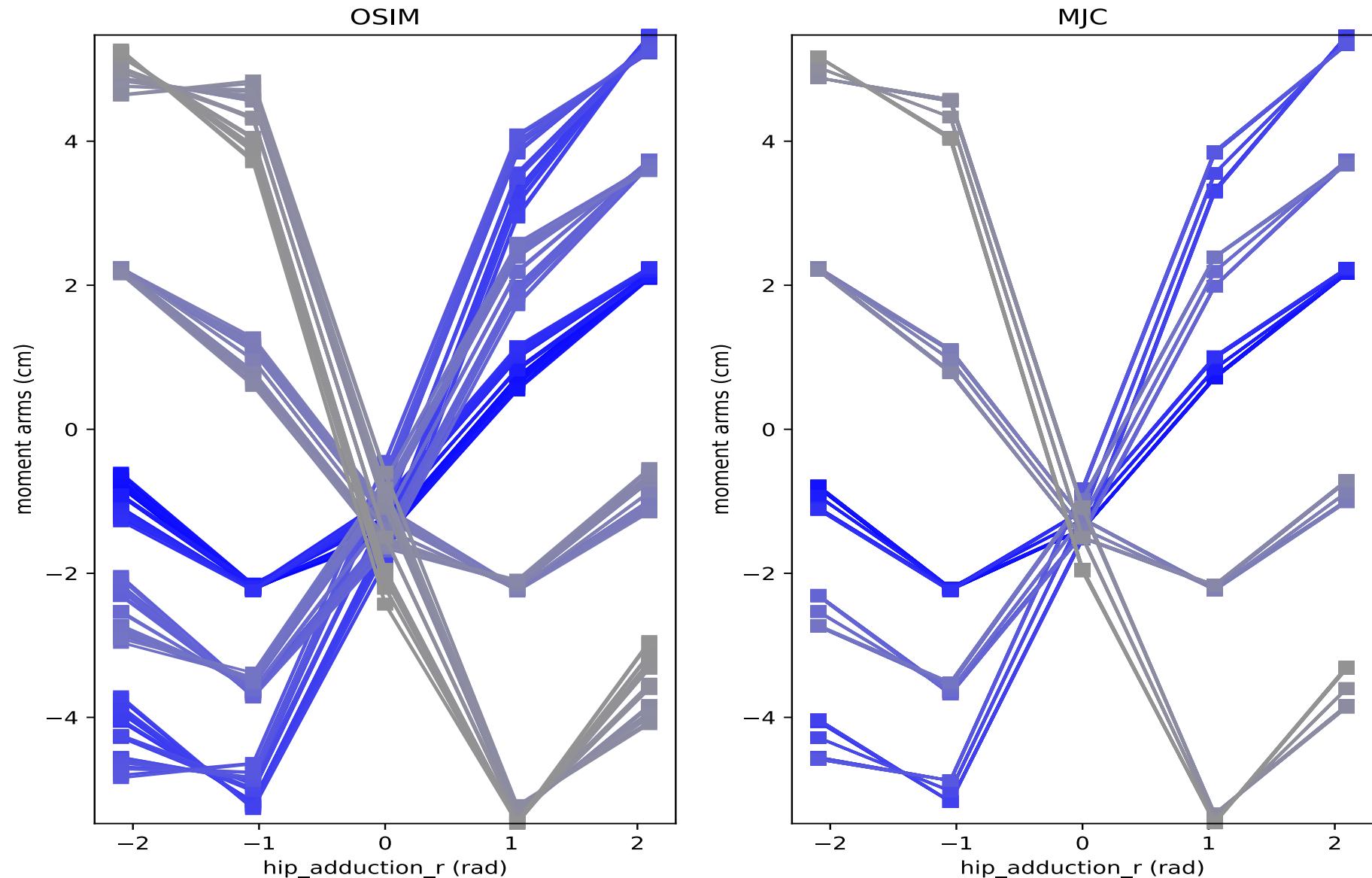
Muscle specific moment arm comparison with Osim model after optimization

rect_fem_r - hip_adduction_r - hip_flexion_r - hip_rotation_r - knee_angle_r



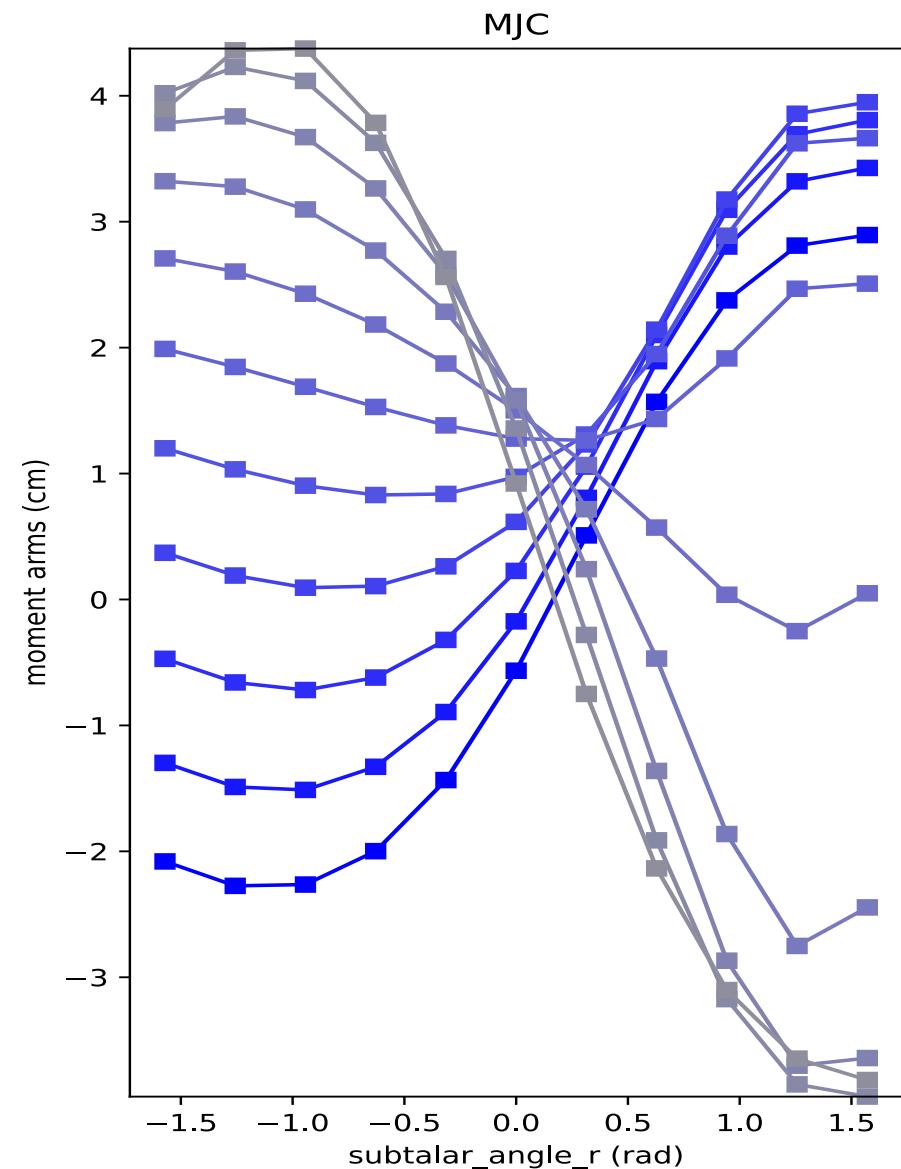
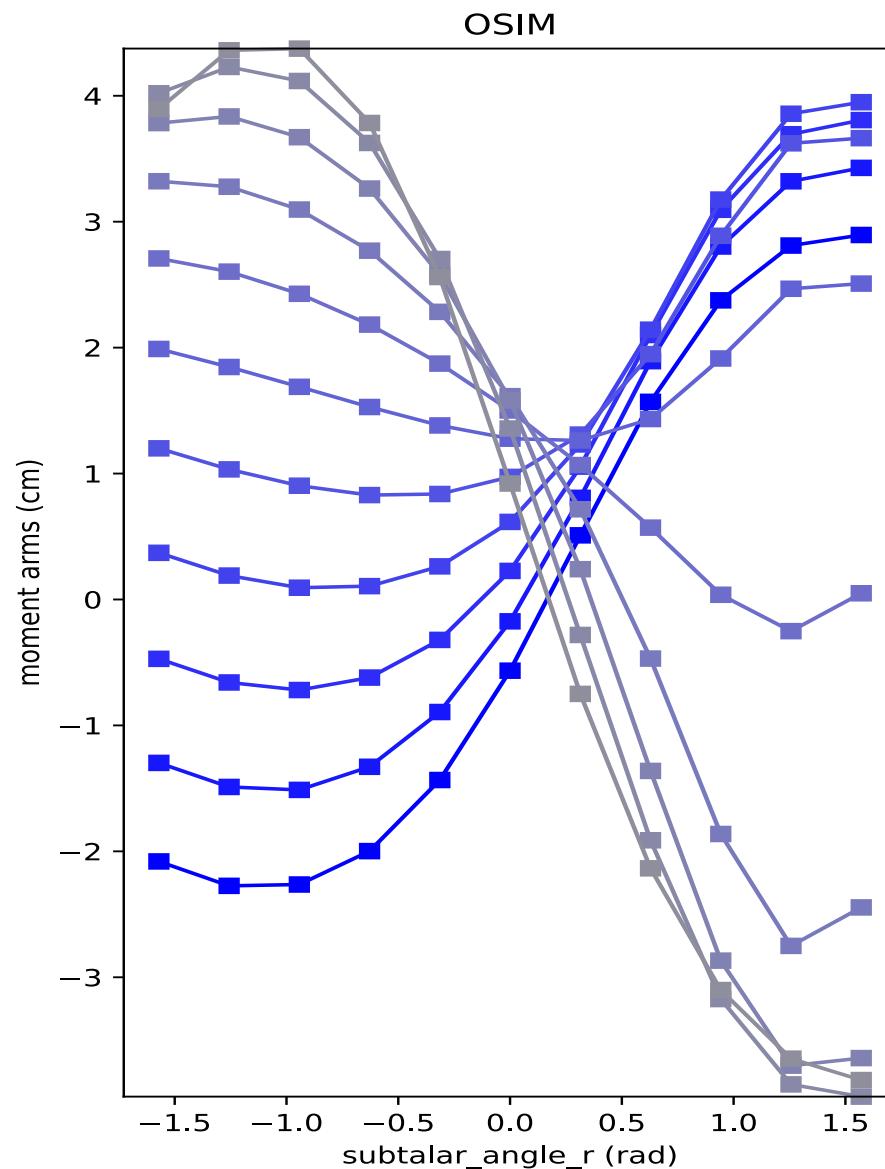
Muscle specific moment arm comparison with Osim model after optimization

rect_fem_r - hip_adduction_r - hip_flexion_r - hip_rotation_r - knee_angle_r



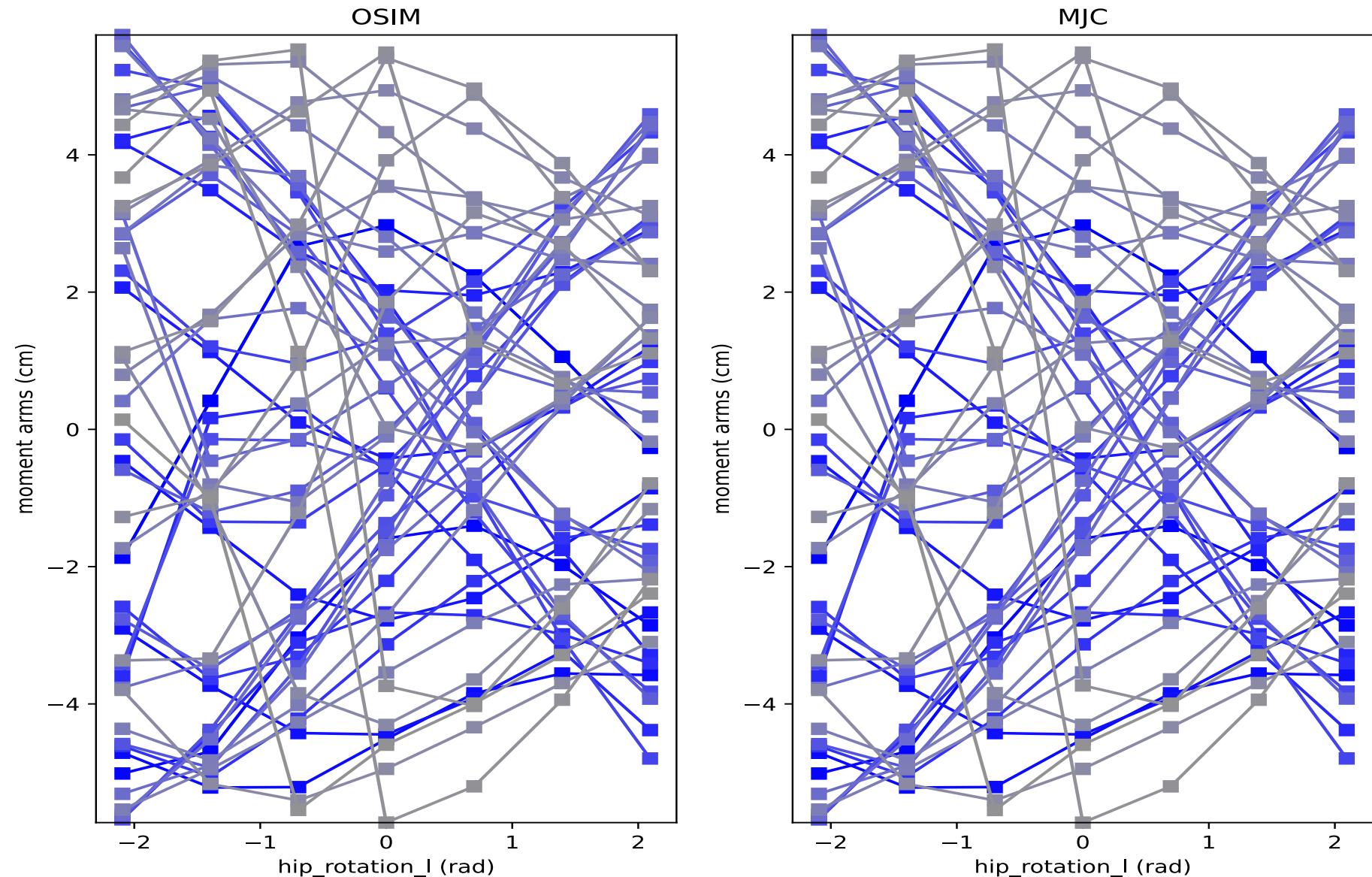
Muscle specific moment arm comparison with Osim model after optimization

tib_ant_r - ankle_angle_r - subtalar_angle_r



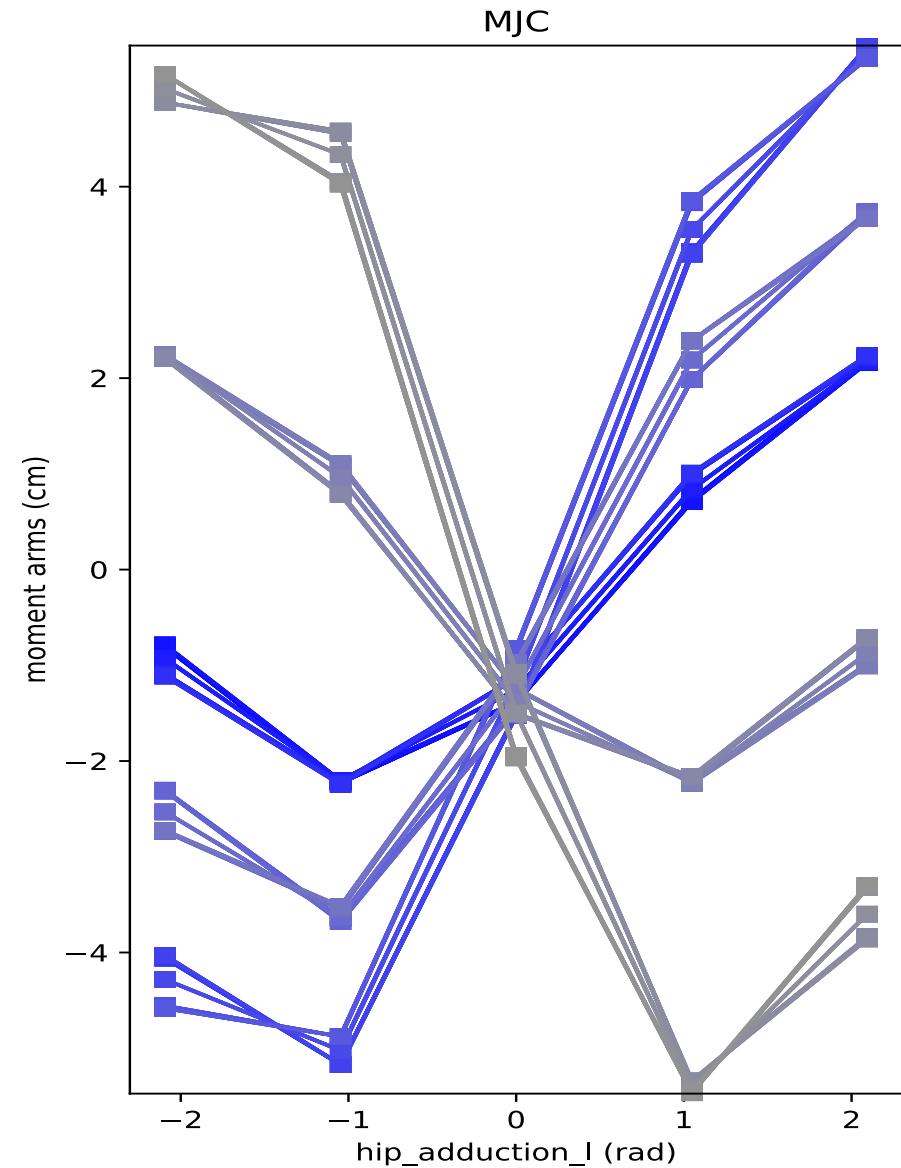
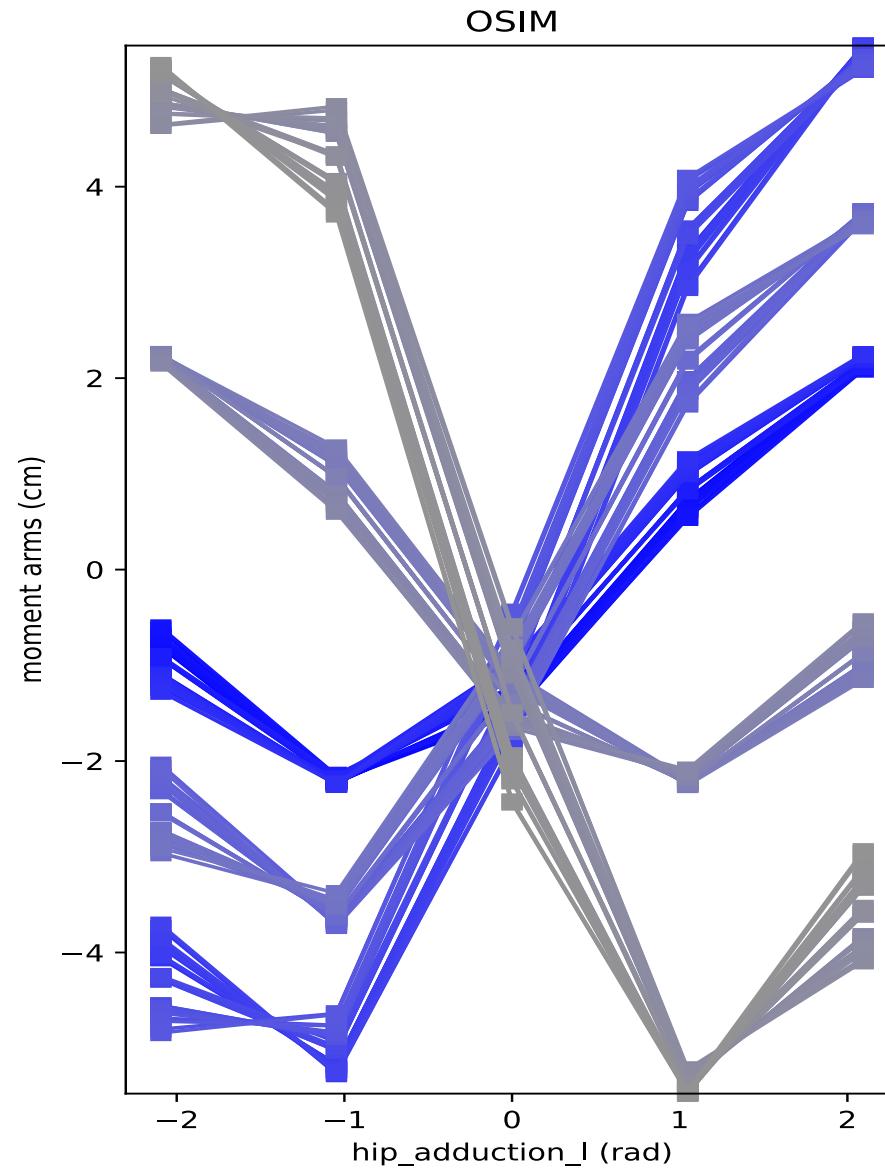
Muscle specific moment arm comparison with Osim model after optimization

`tfl_I - hip_adduction_I - hip_flexion_I - hip_rotation_I`



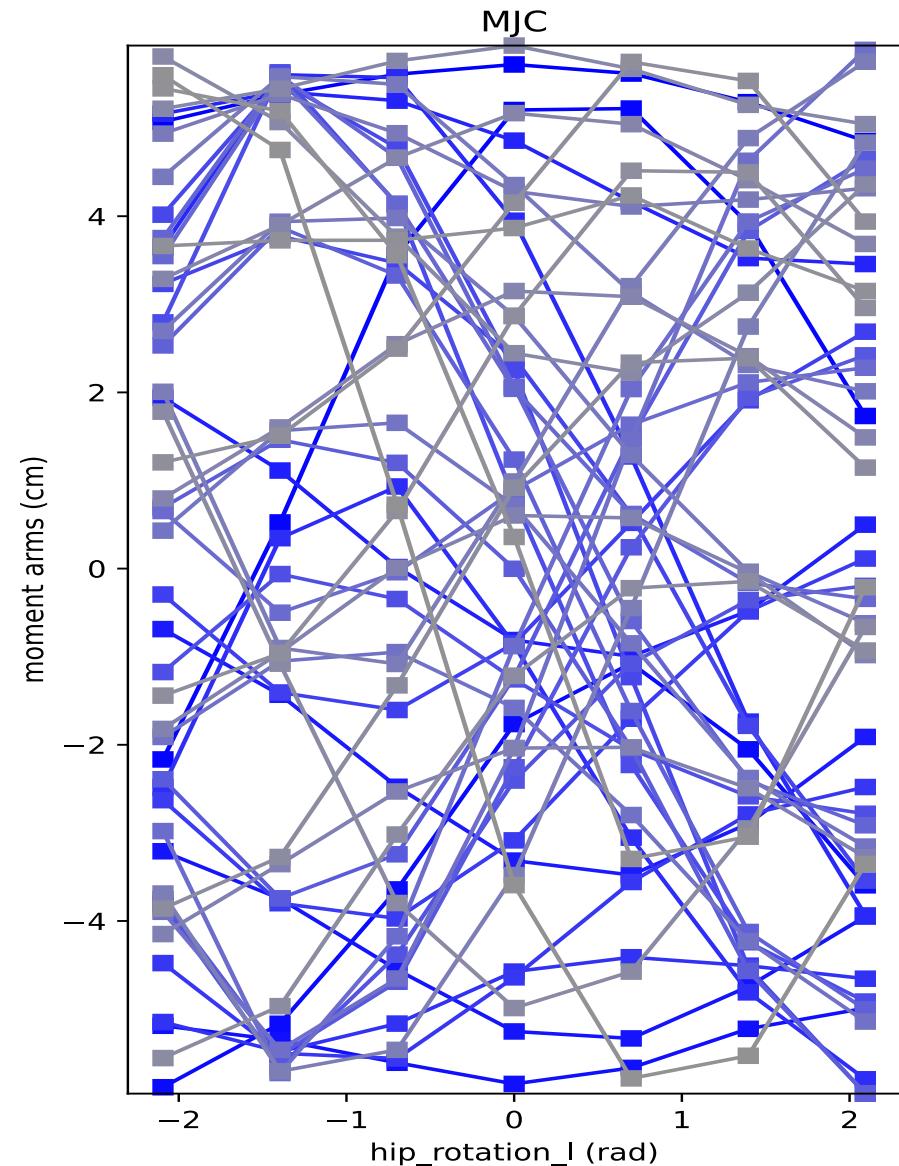
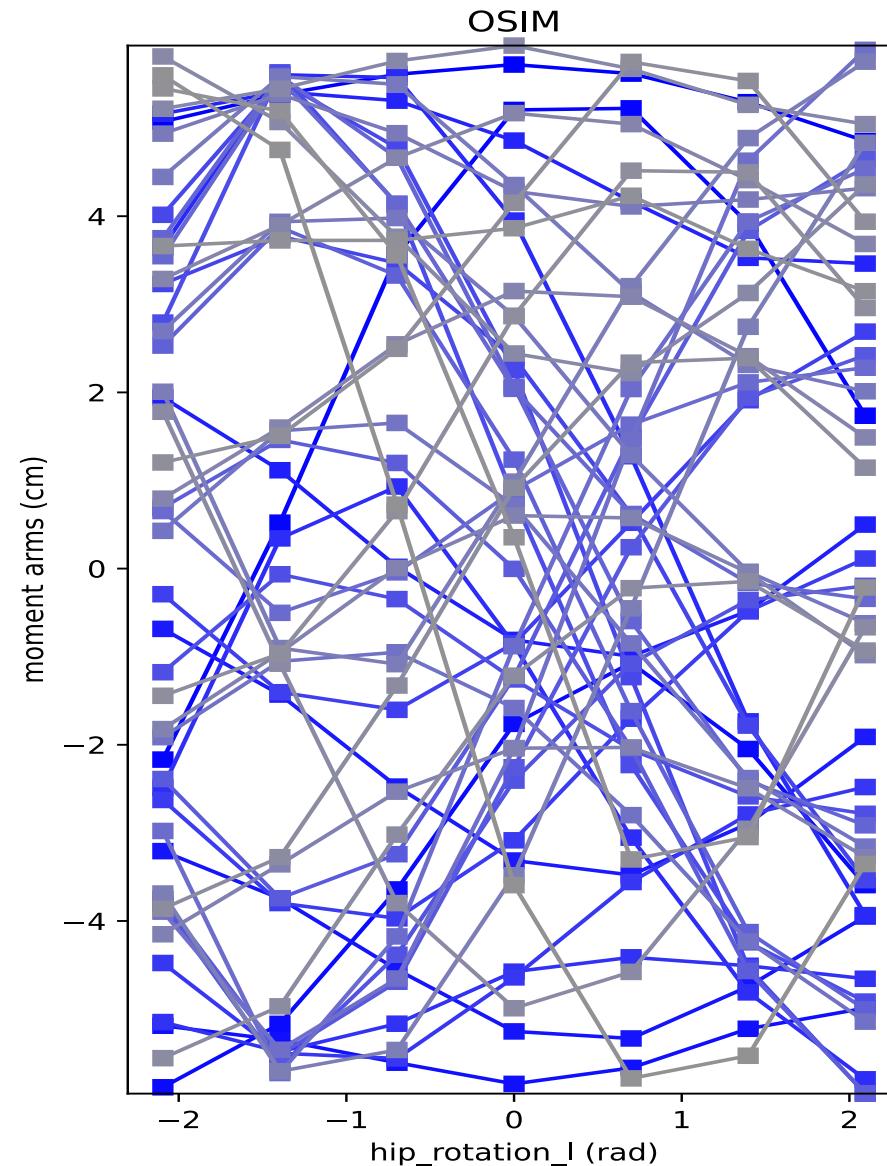
Muscle specific moment arm comparison with Osim model after optimization

rect_fem_I - hip_adduction_I - hip_flexion_I - hip_rotation_I - knee_angle_I



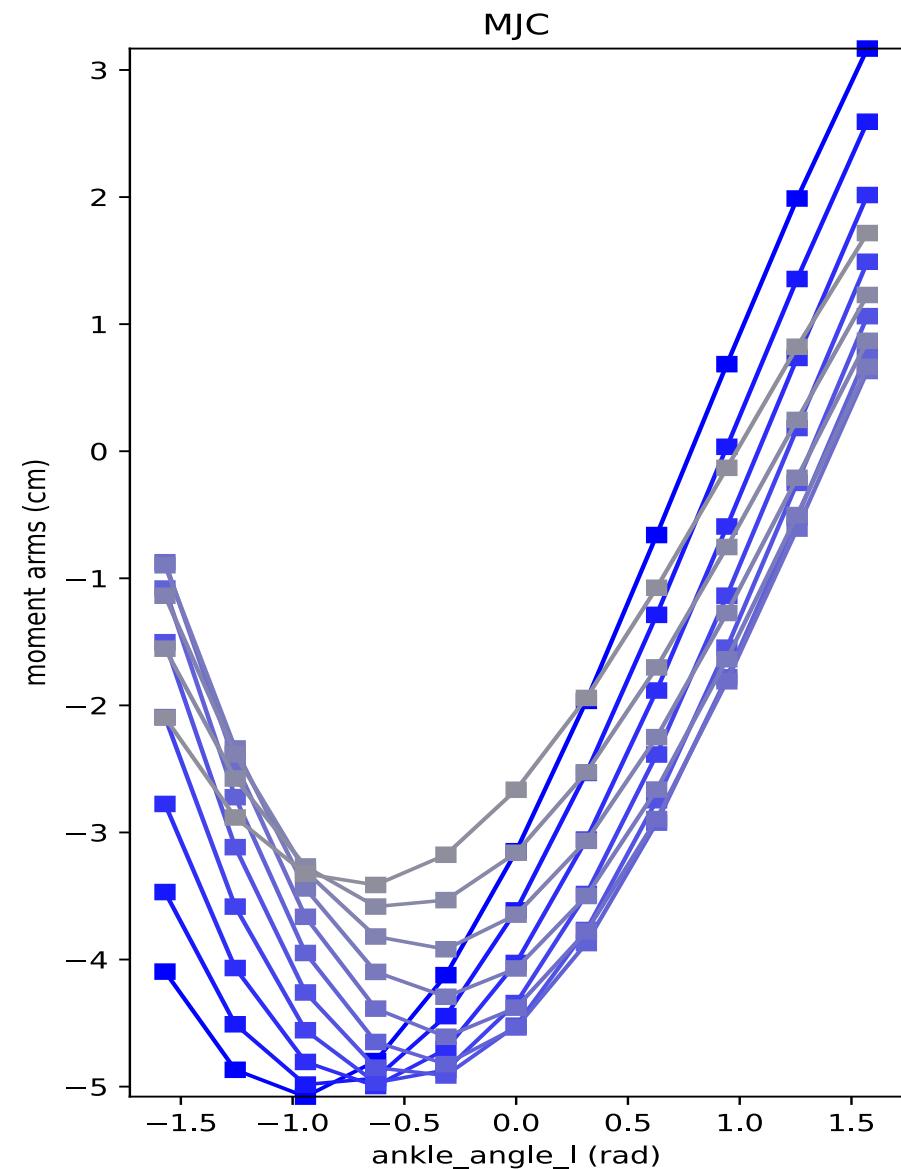
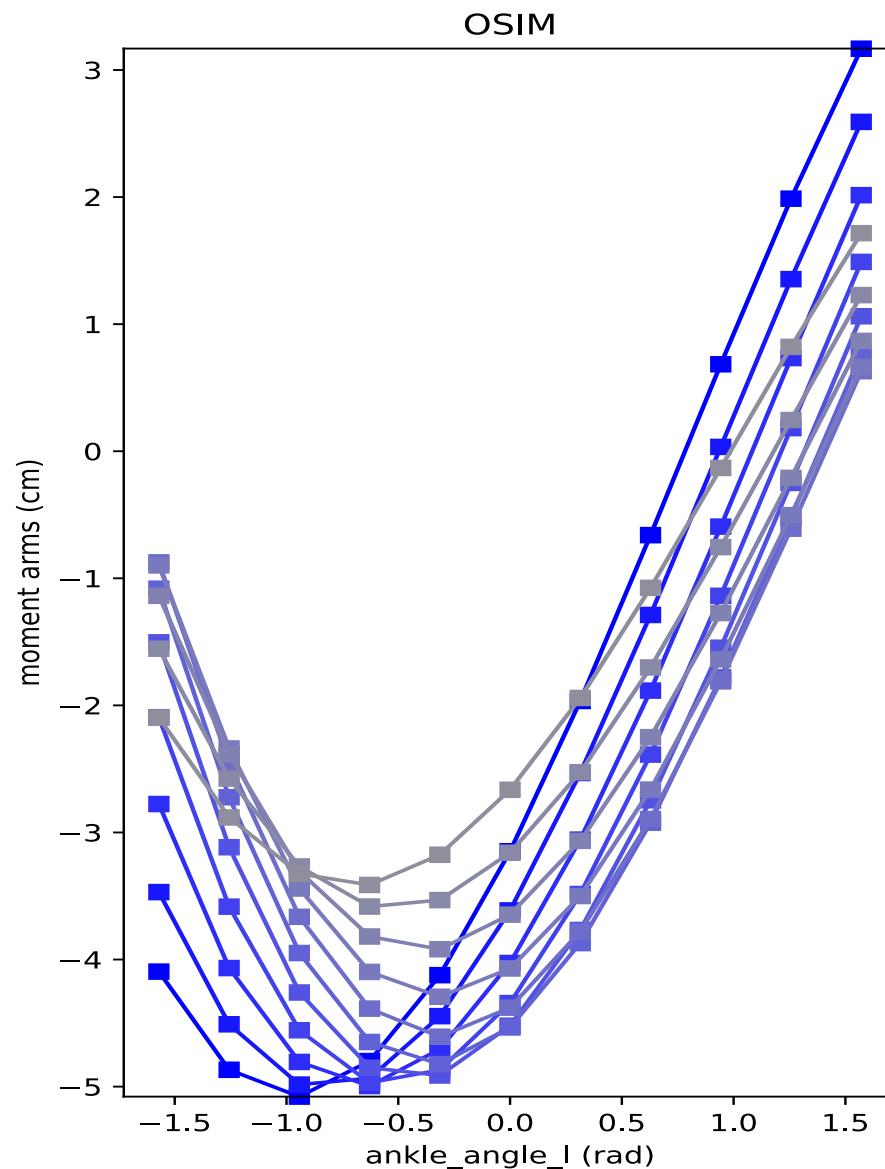
Muscle specific moment arm comparison with Osim model after optimization

glut_med1_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



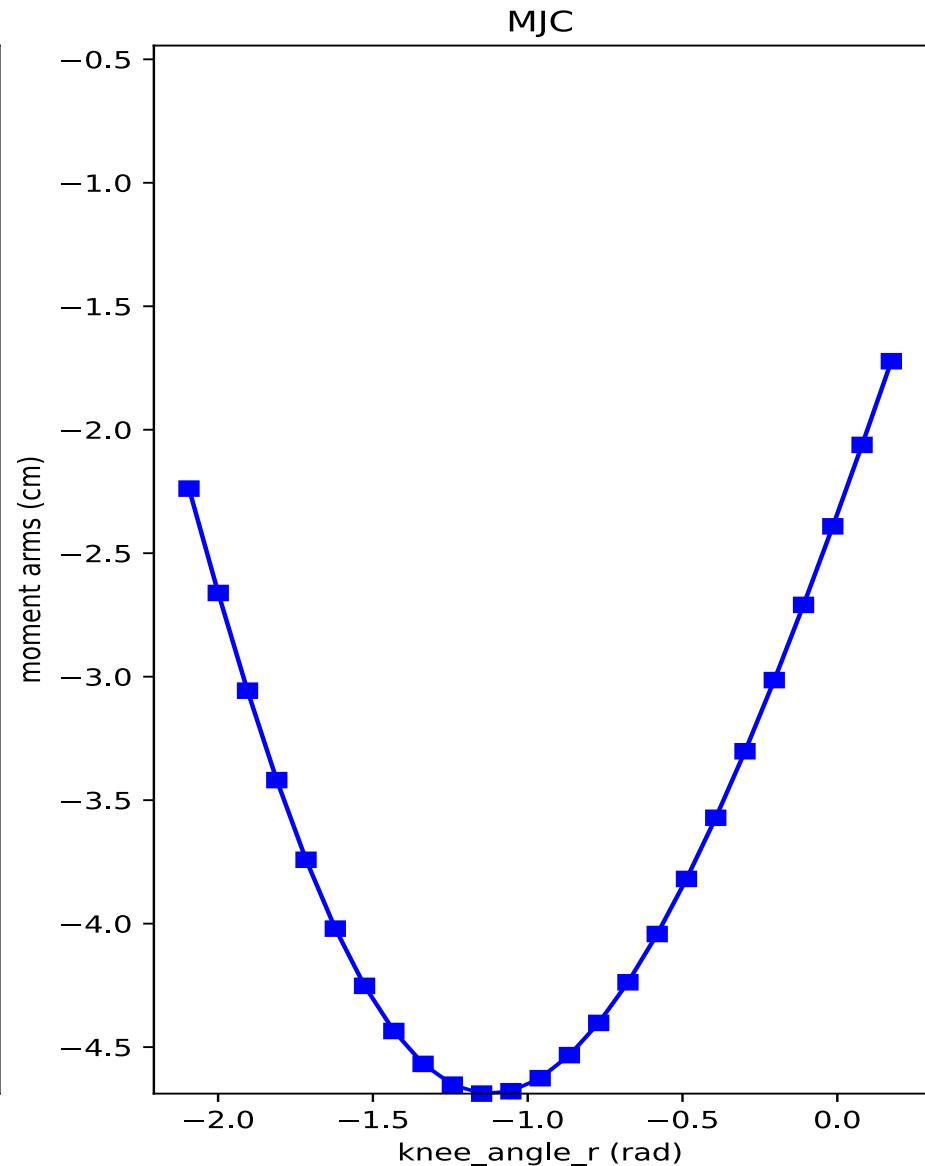
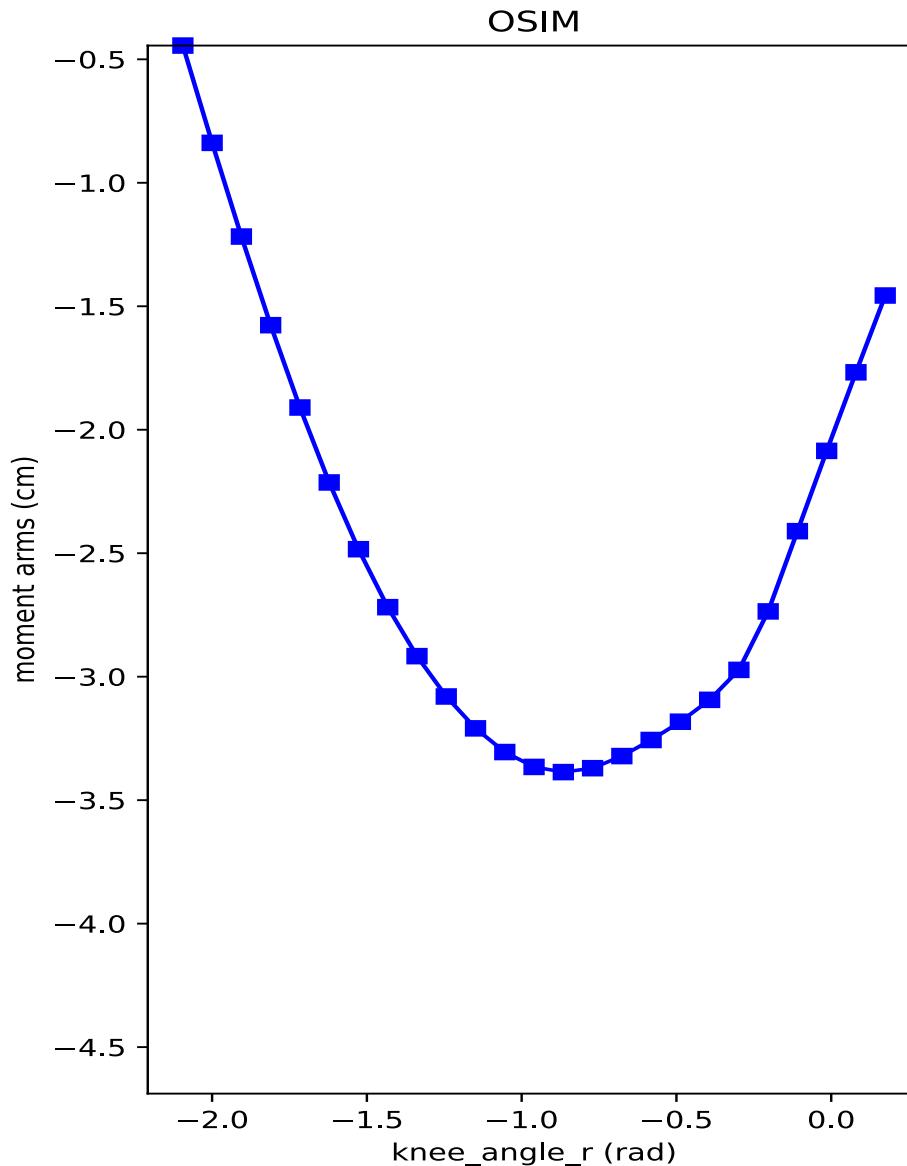
Muscle specific moment arm comparison with Osim model after optimization

soleus_I - ankle_angle_I - subtalar_angle_I



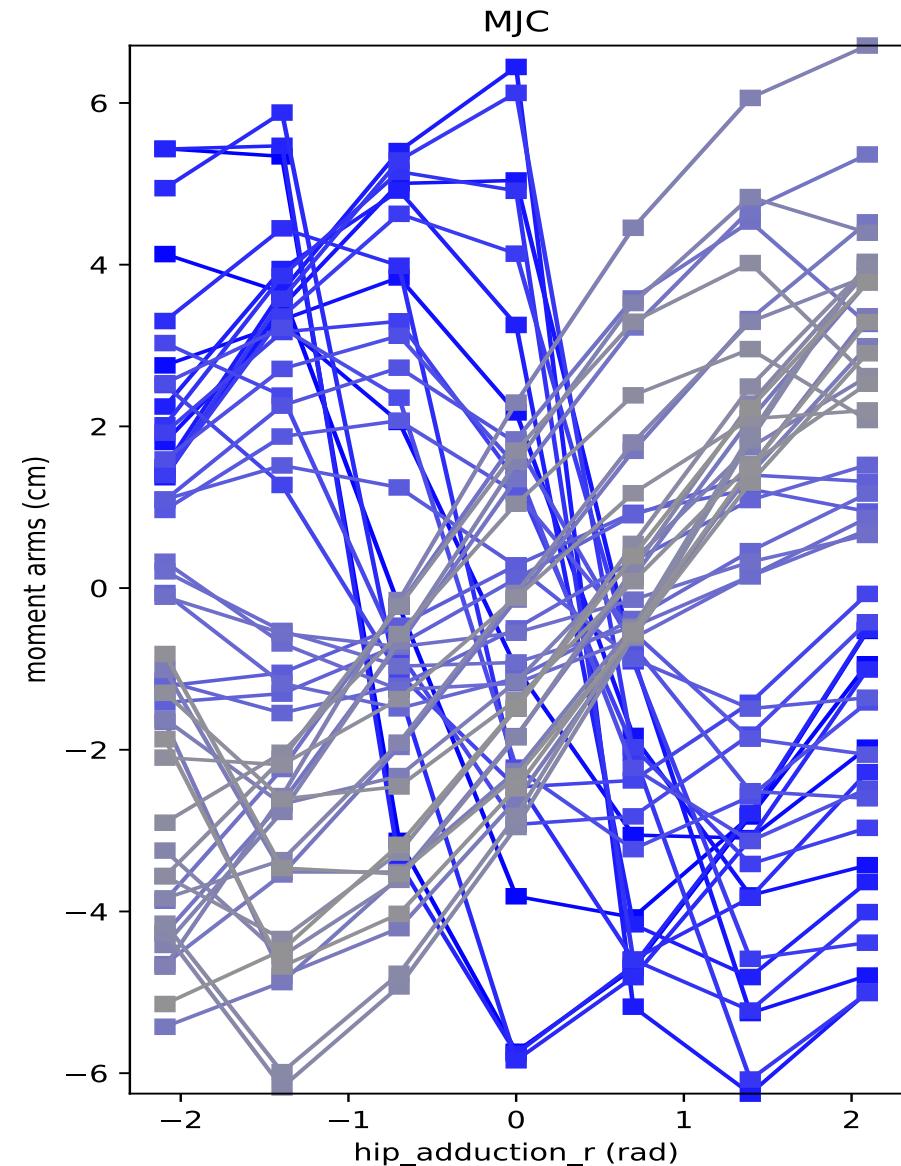
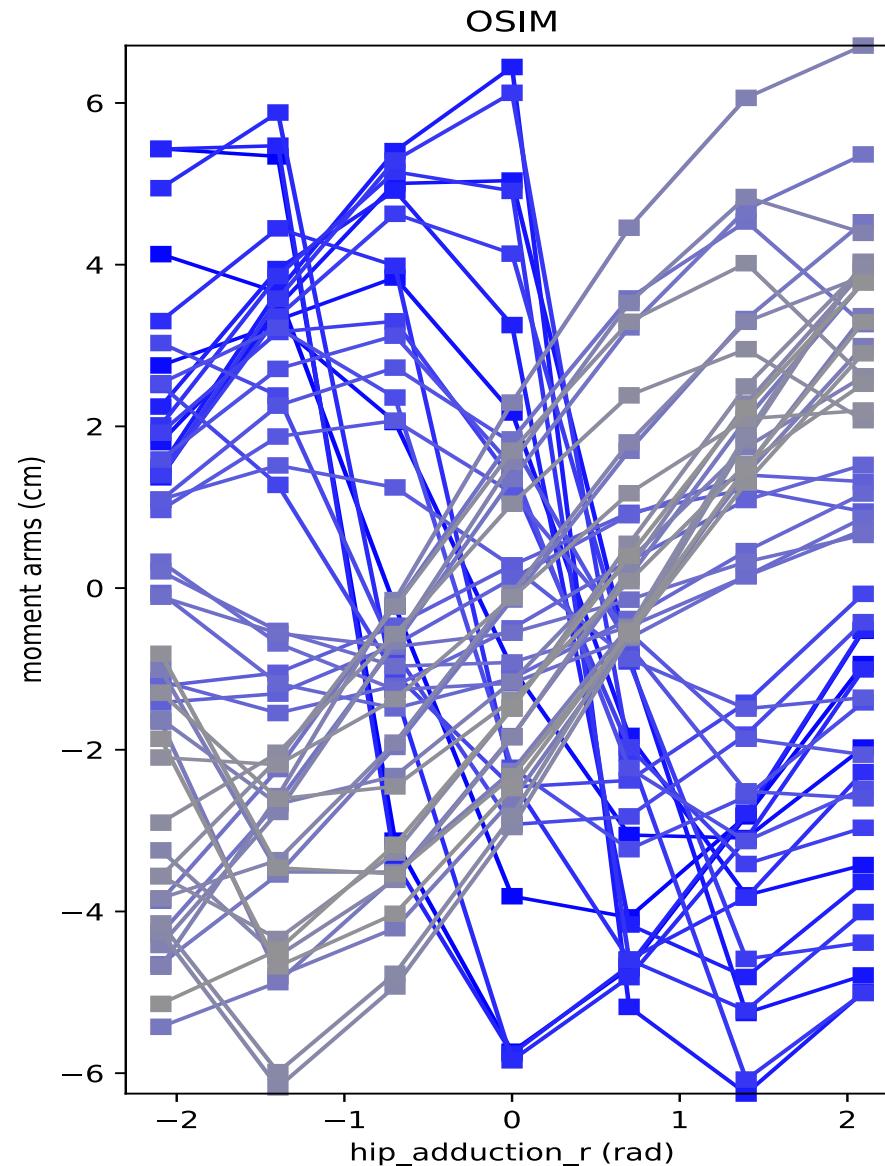
Muscle specific moment arm comparison with Osim model after optimization

bifemsh_r - knee_angle_r



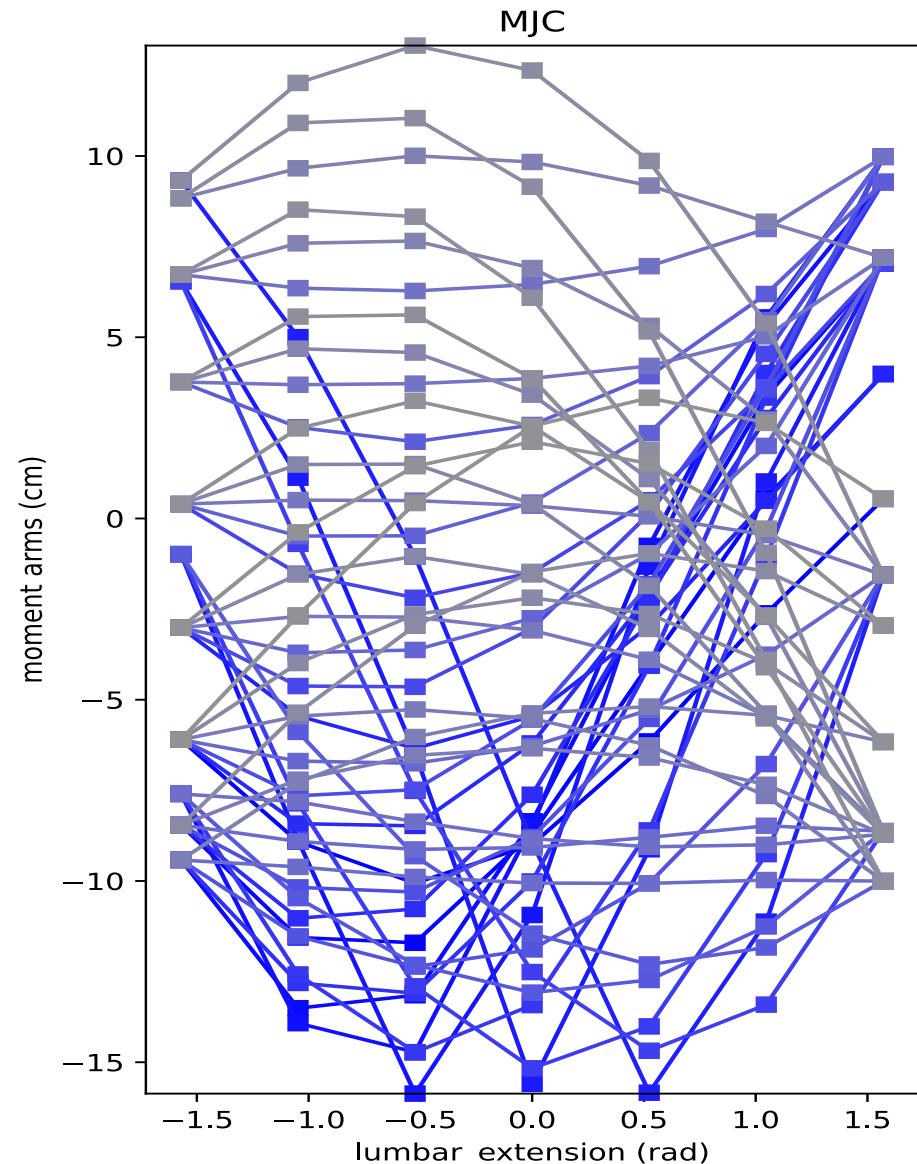
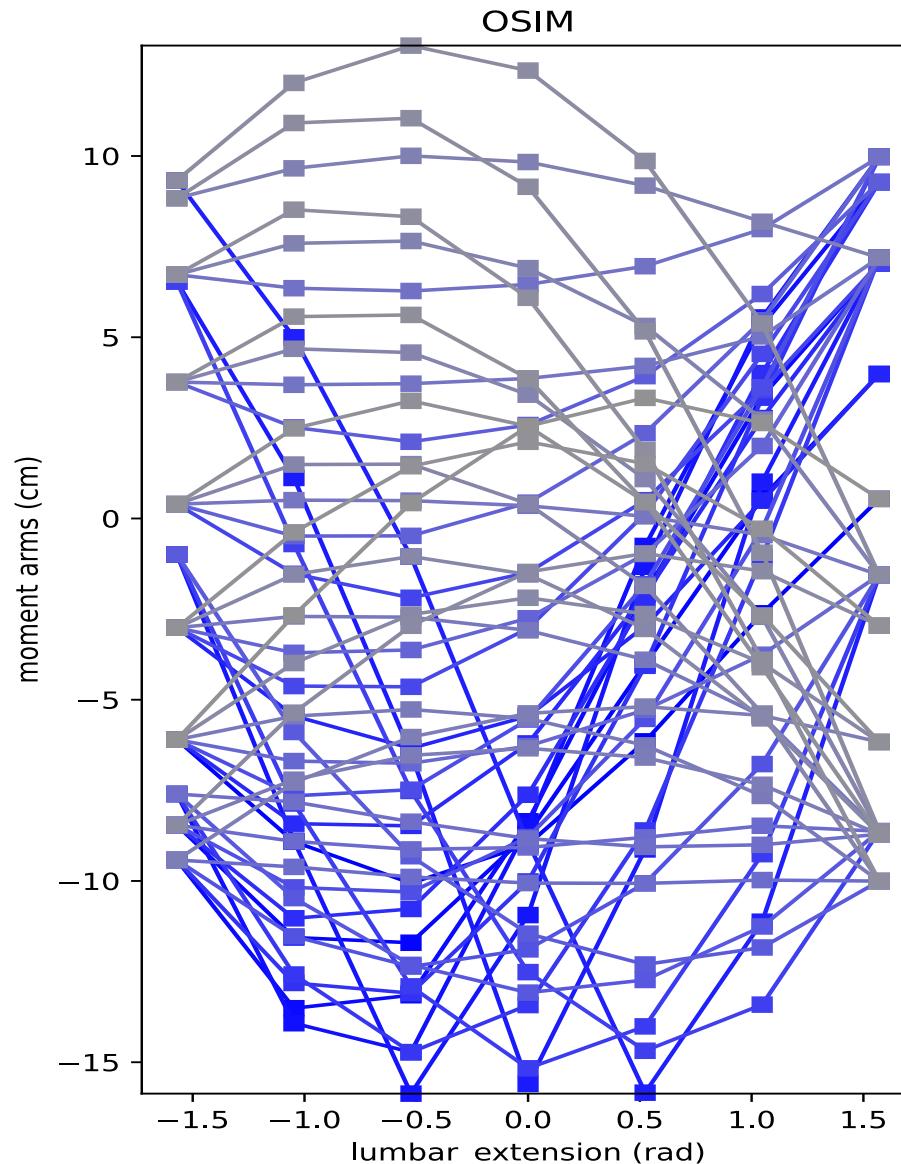
Muscle specific moment arm comparison with Osim model after optimization

glut_max2_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



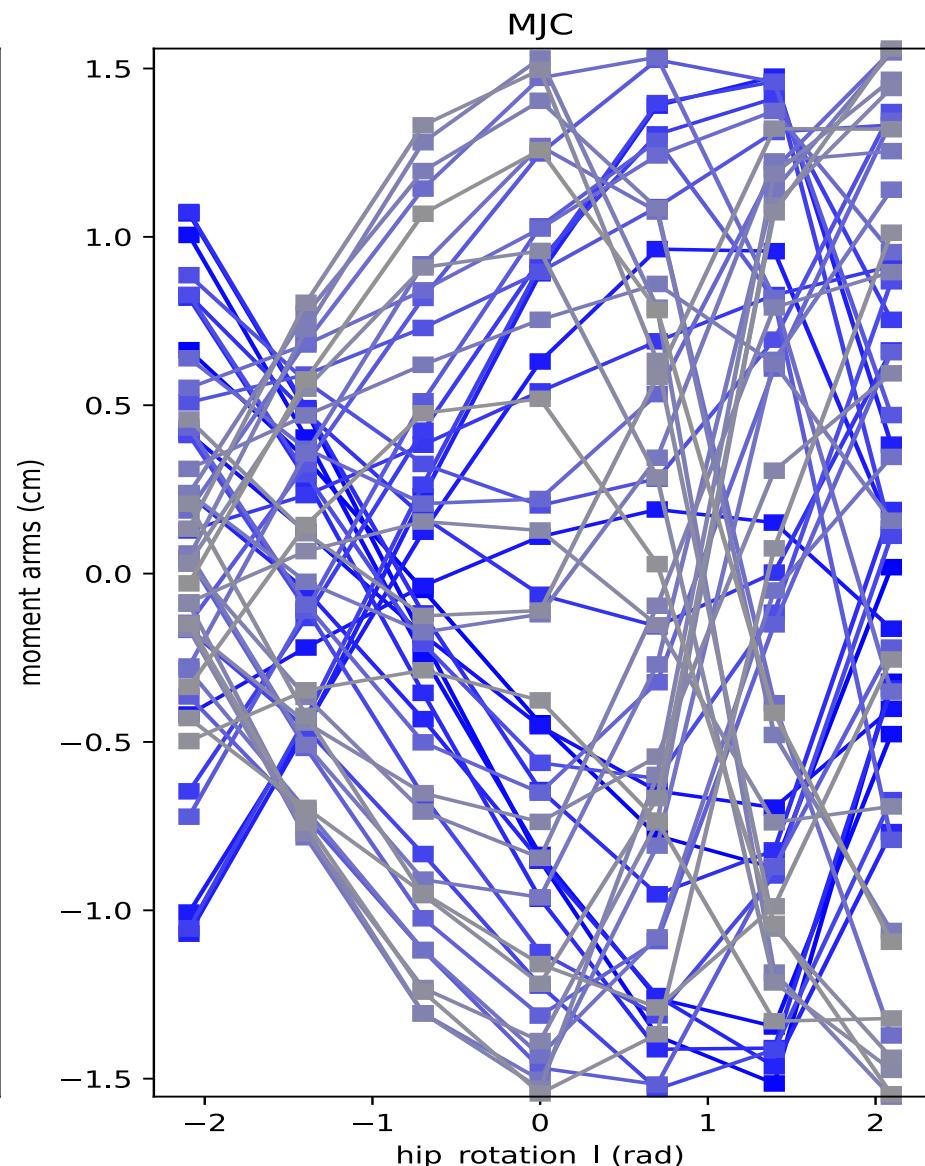
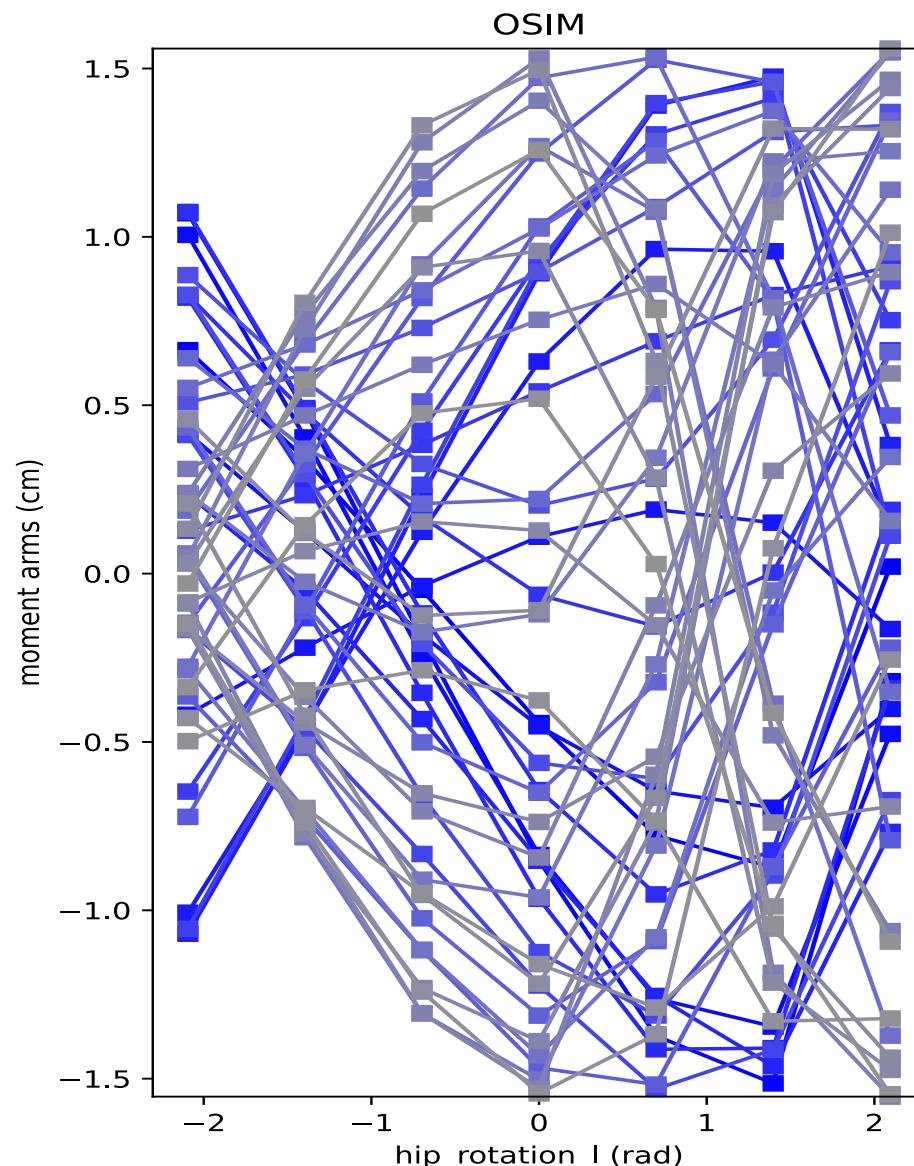
Muscle specific moment arm comparison with Osim model after optimization

extobl_r - lumbar_bending - lumbar_extension - lumbar_rotation



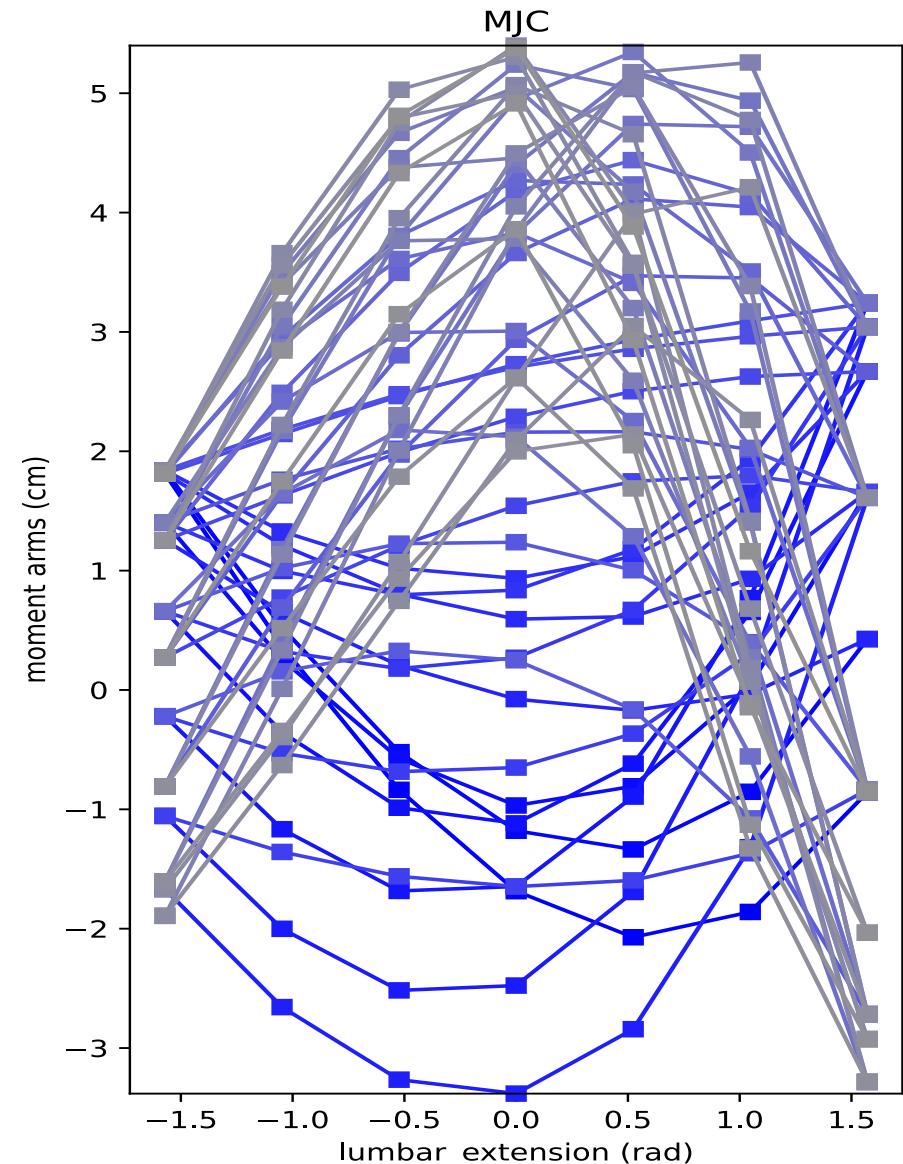
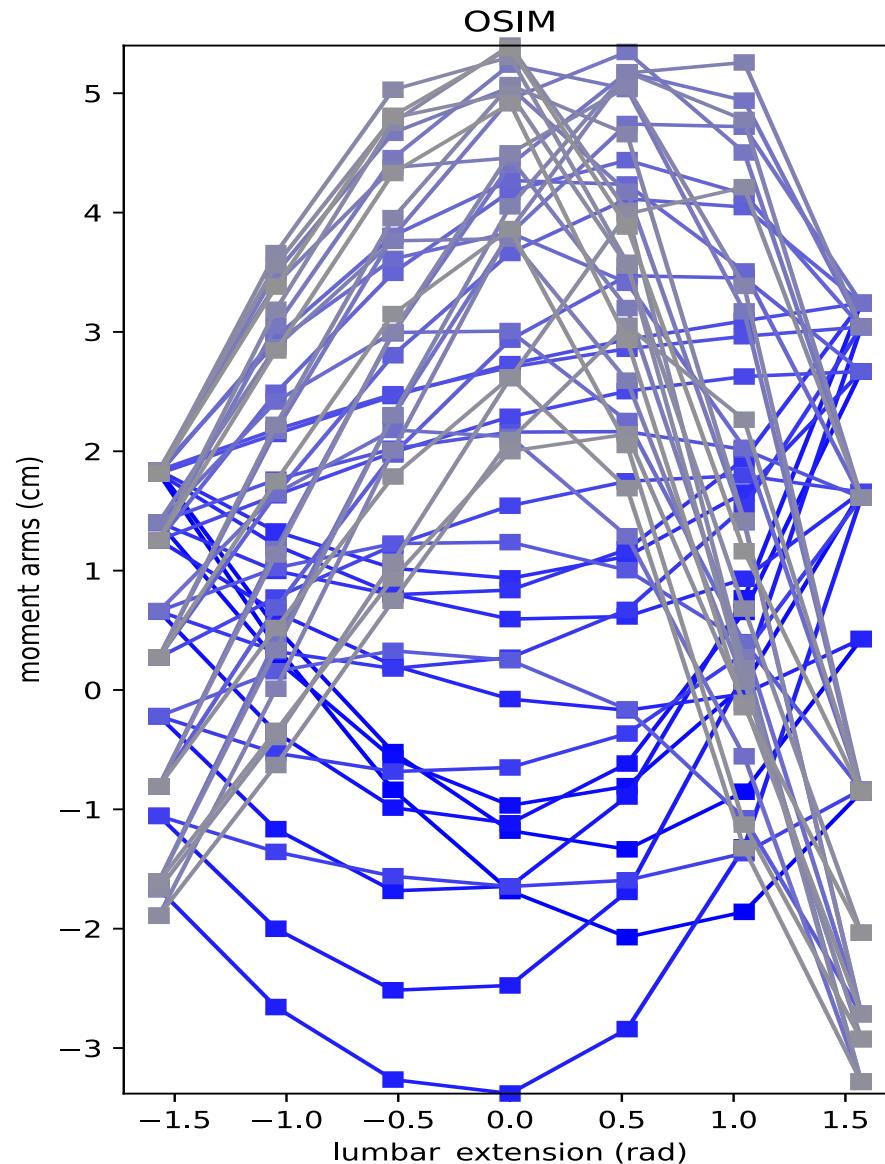
Muscle specific moment arm comparison with Osim model after optimization

pect_I - hip_adduction_I - hip_flexion_I - hip_rotation_I

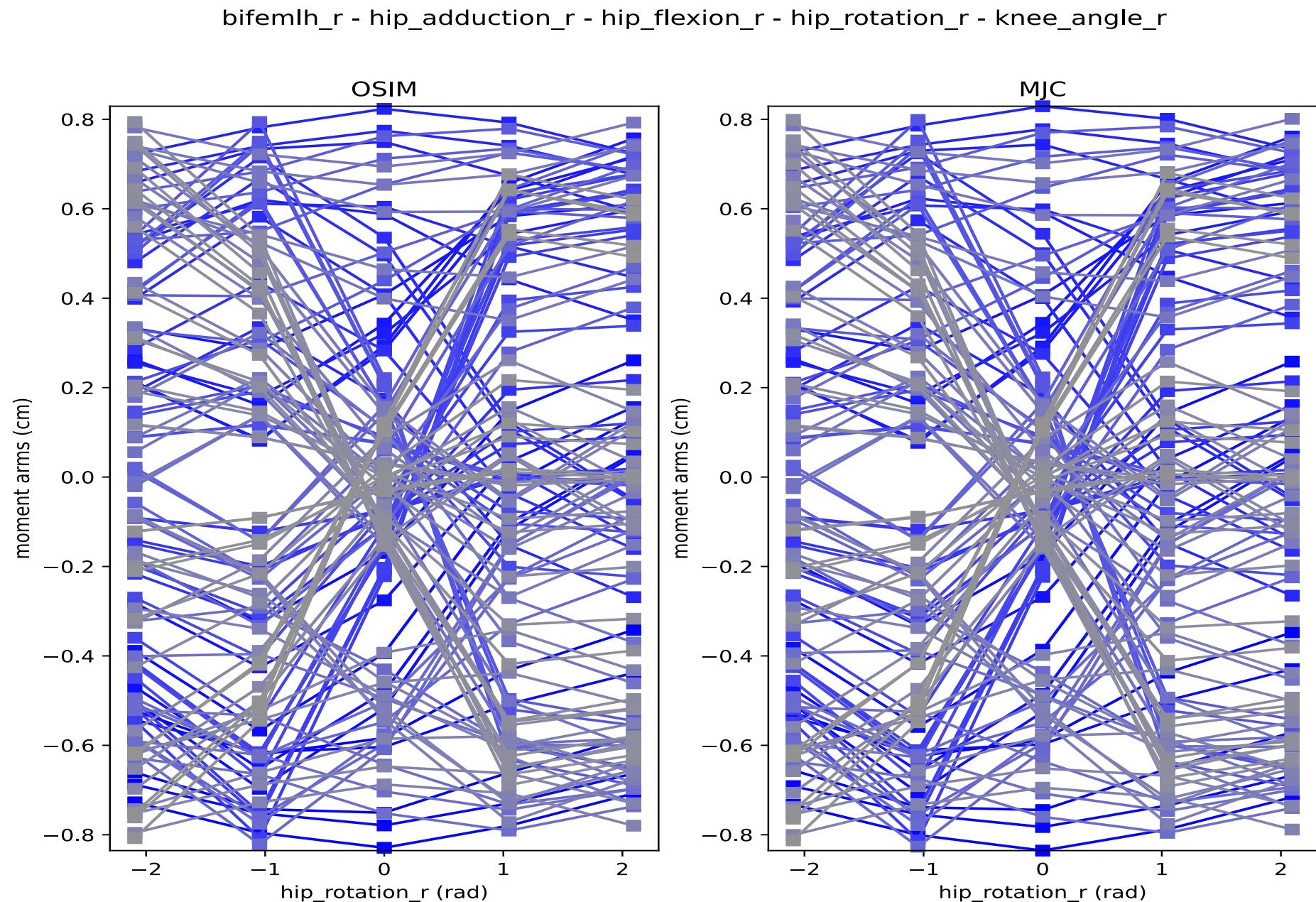


Muscle specific moment arm comparison with Osim model after optimization

ercspn_r - lumbar_bending - lumbar_extension - lumbar_rotation

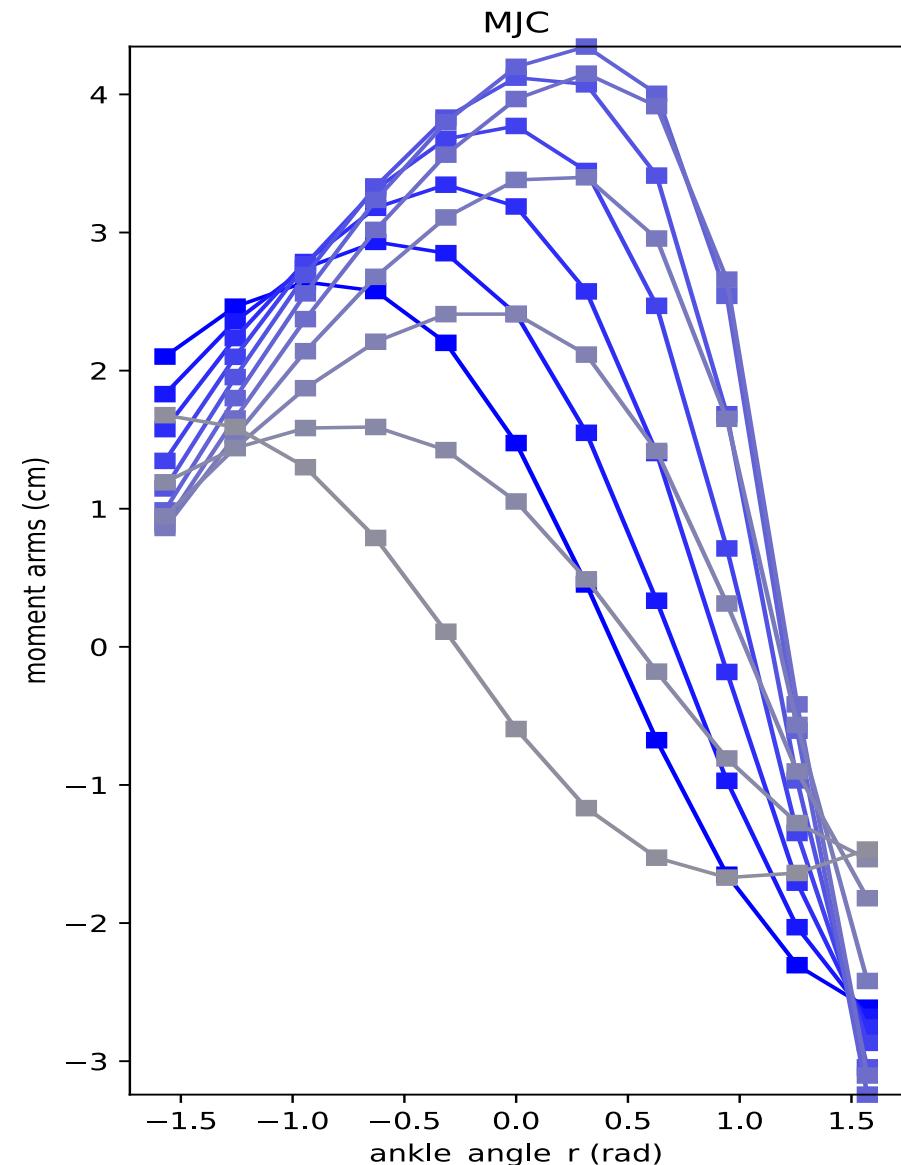
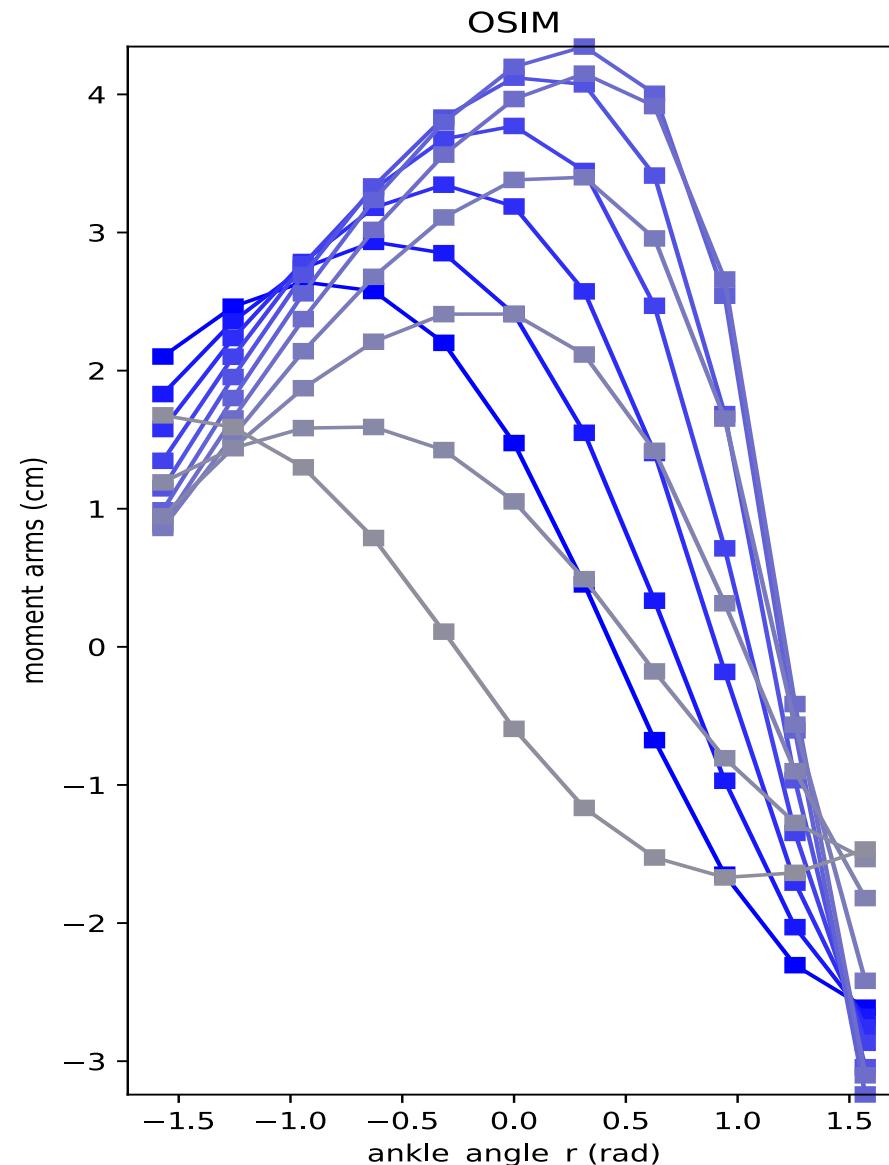


Muscle specific moment arm comparison with Osim model after optimization

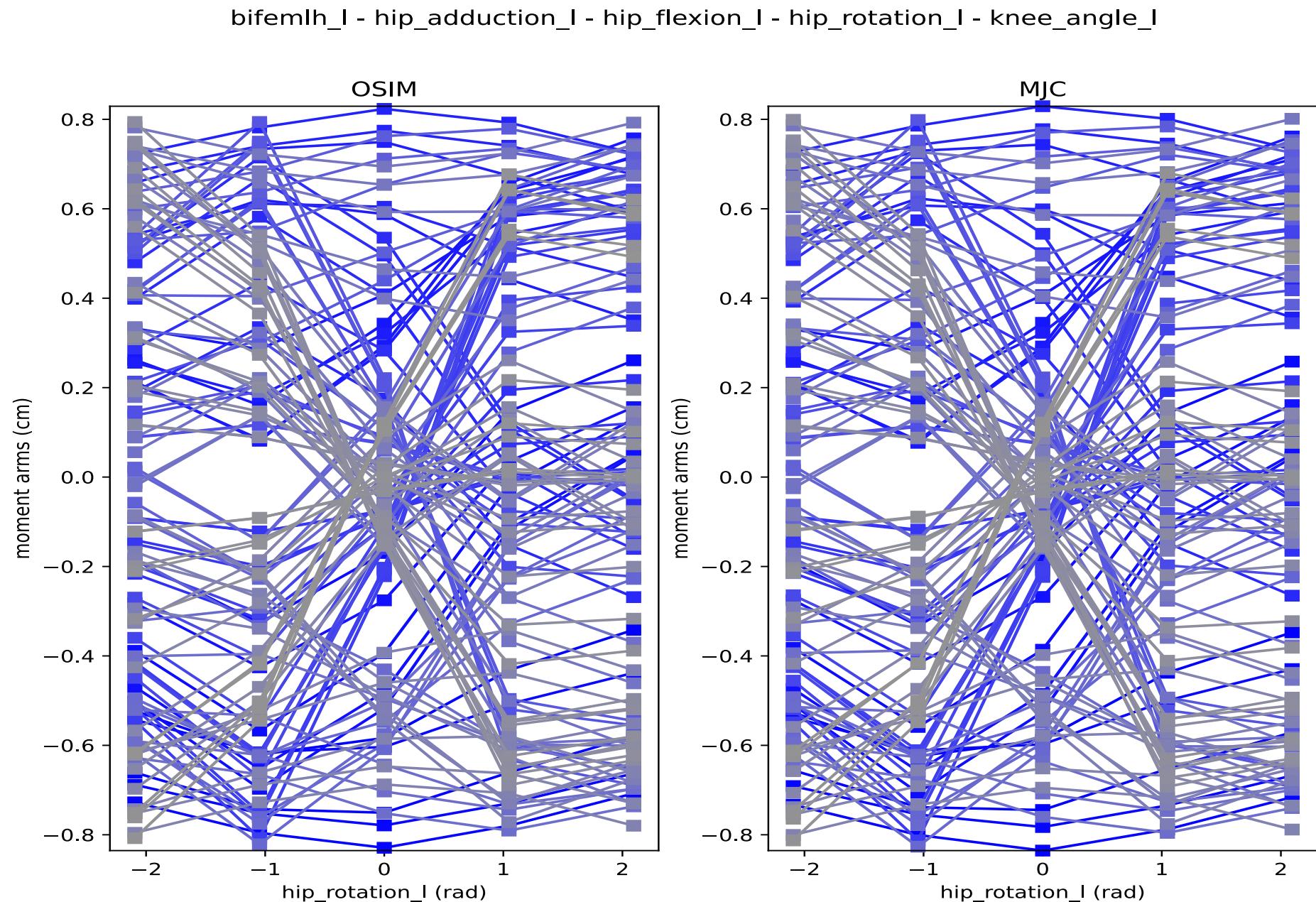


Muscle specific moment arm comparison with Osim model after optimization

tib_ant_r - ankle_angle_r - subtalar_angle_r

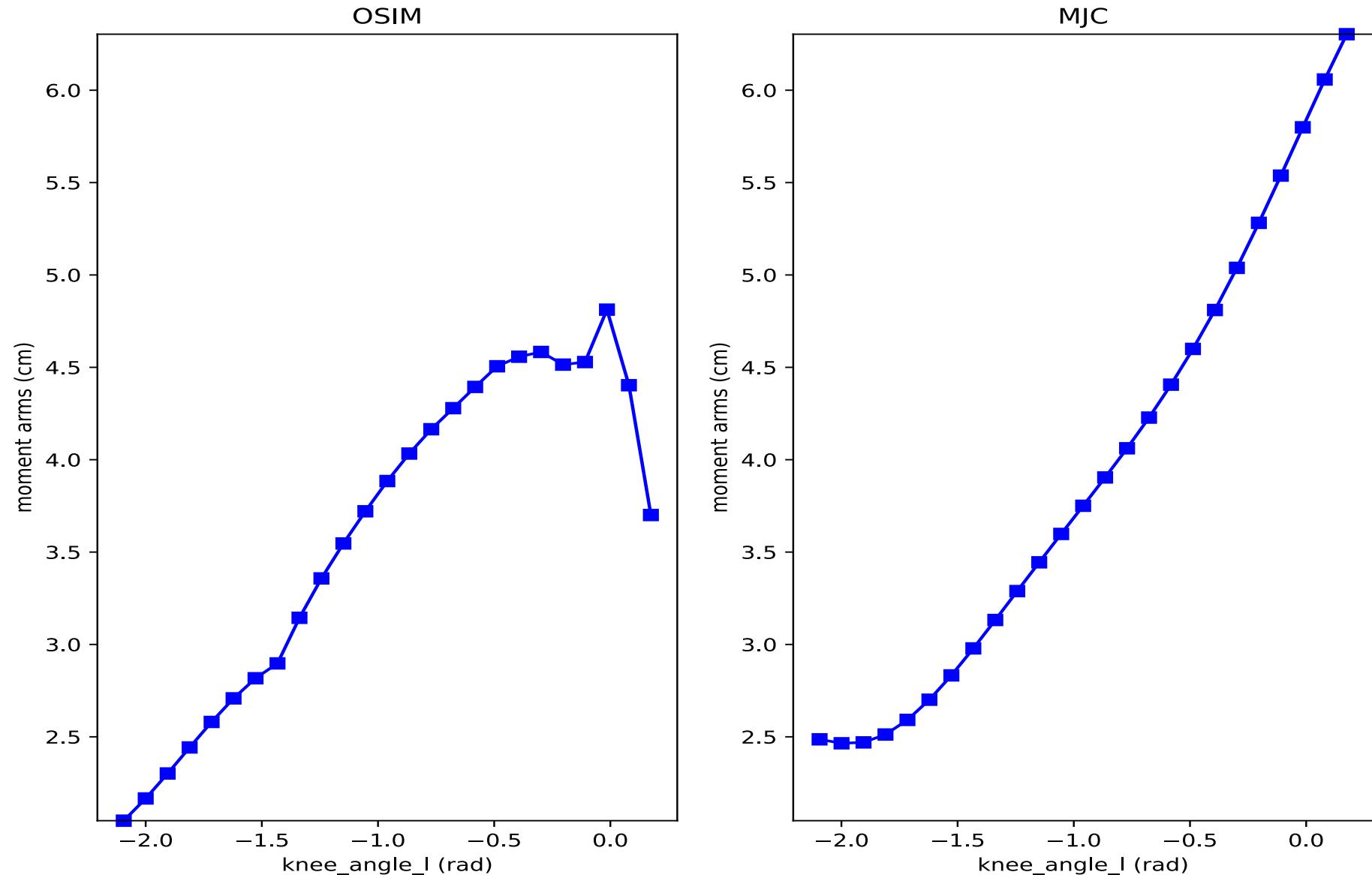


Muscle specific moment arm comparison with Osim model after optimization



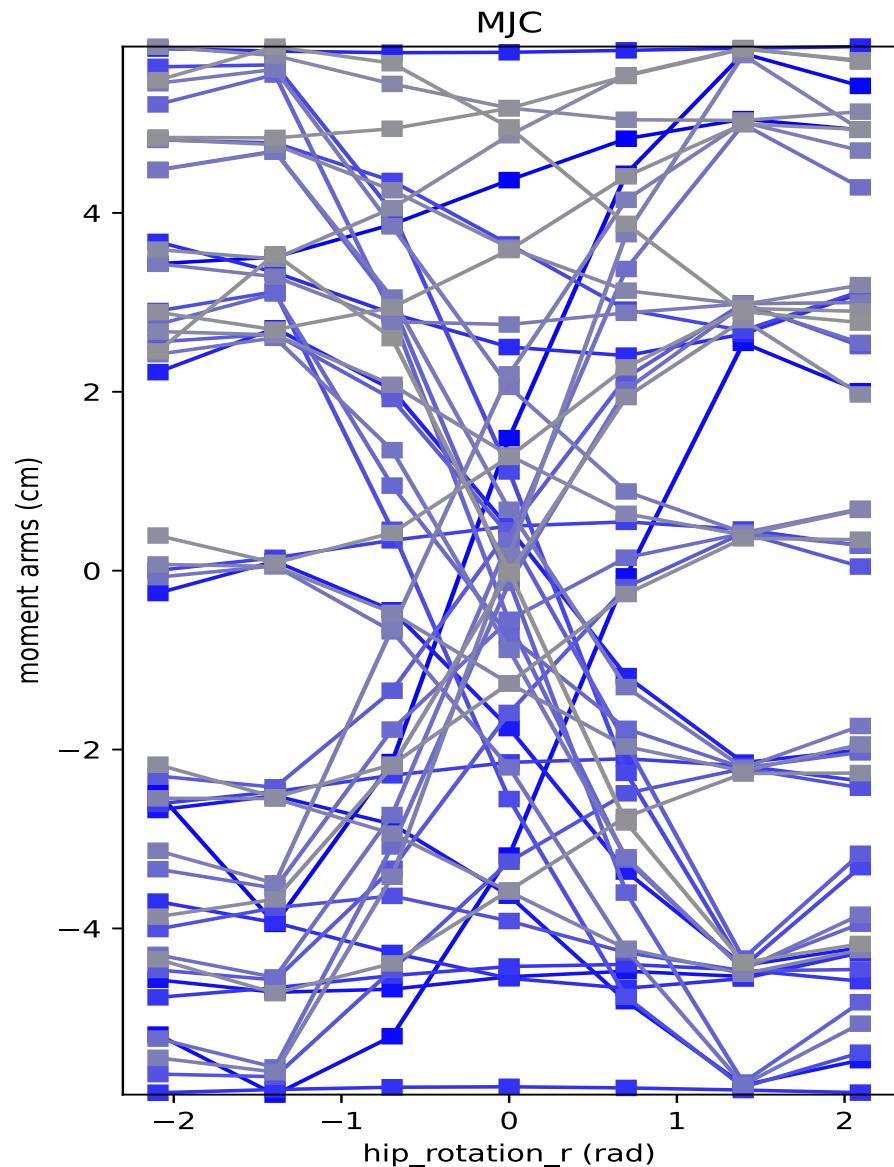
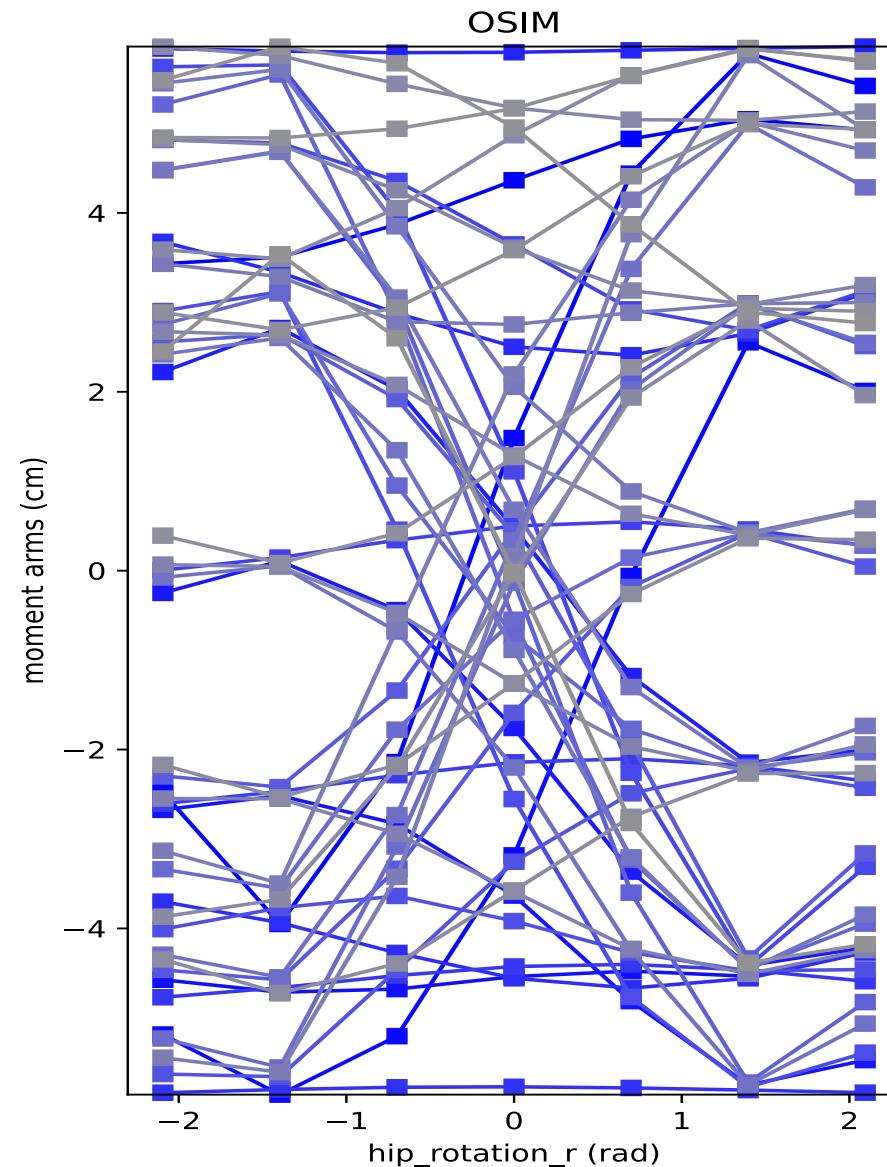
Muscle specific moment arm comparison with Osim model after optimization

vas_int_I - knee_angle_I



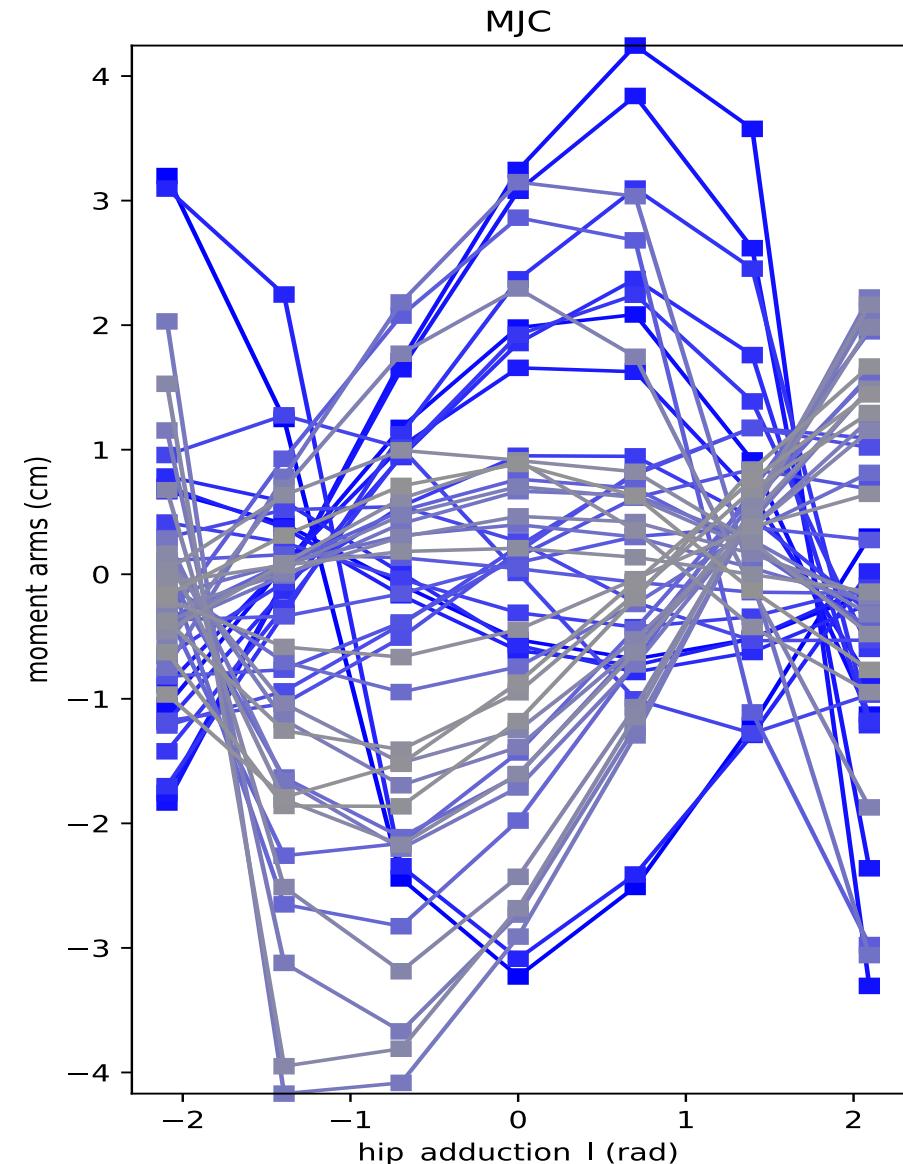
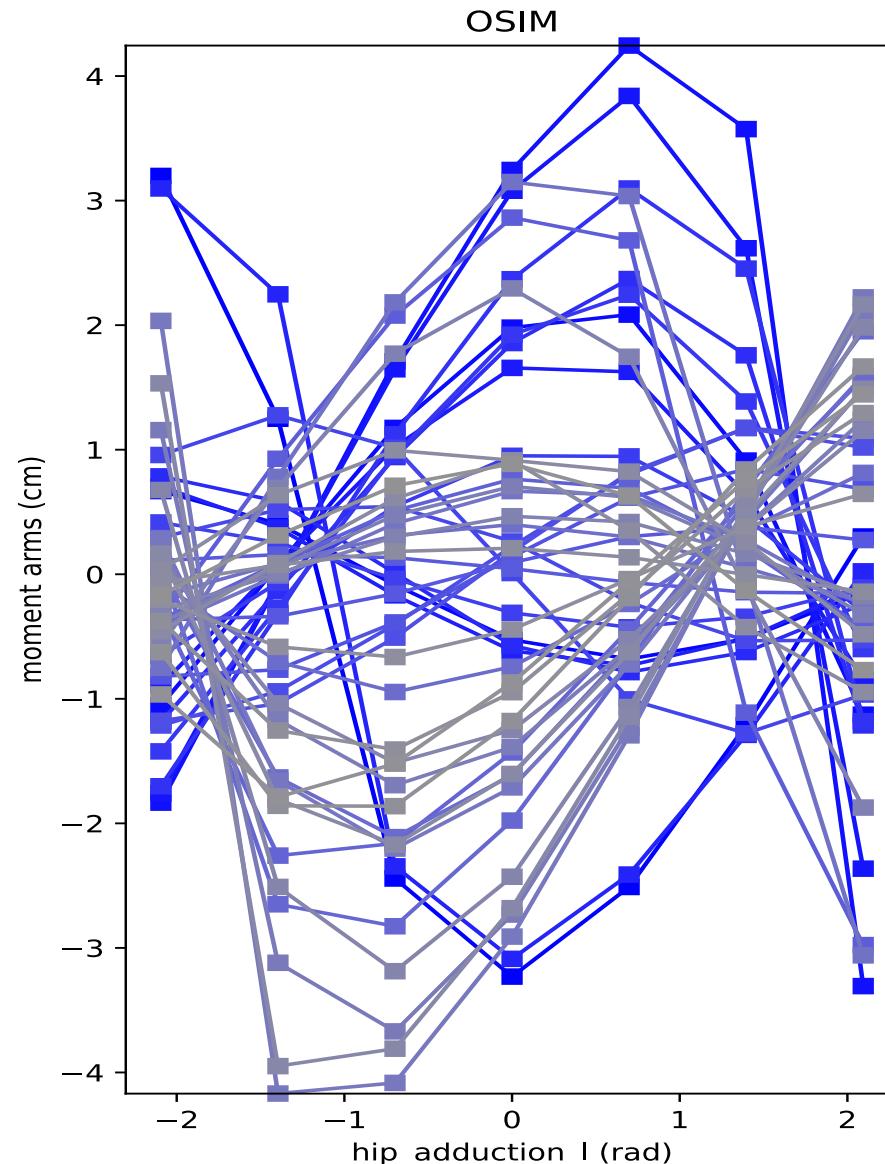
Muscle specific moment arm comparison with Osim model after optimization

glut_med2_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



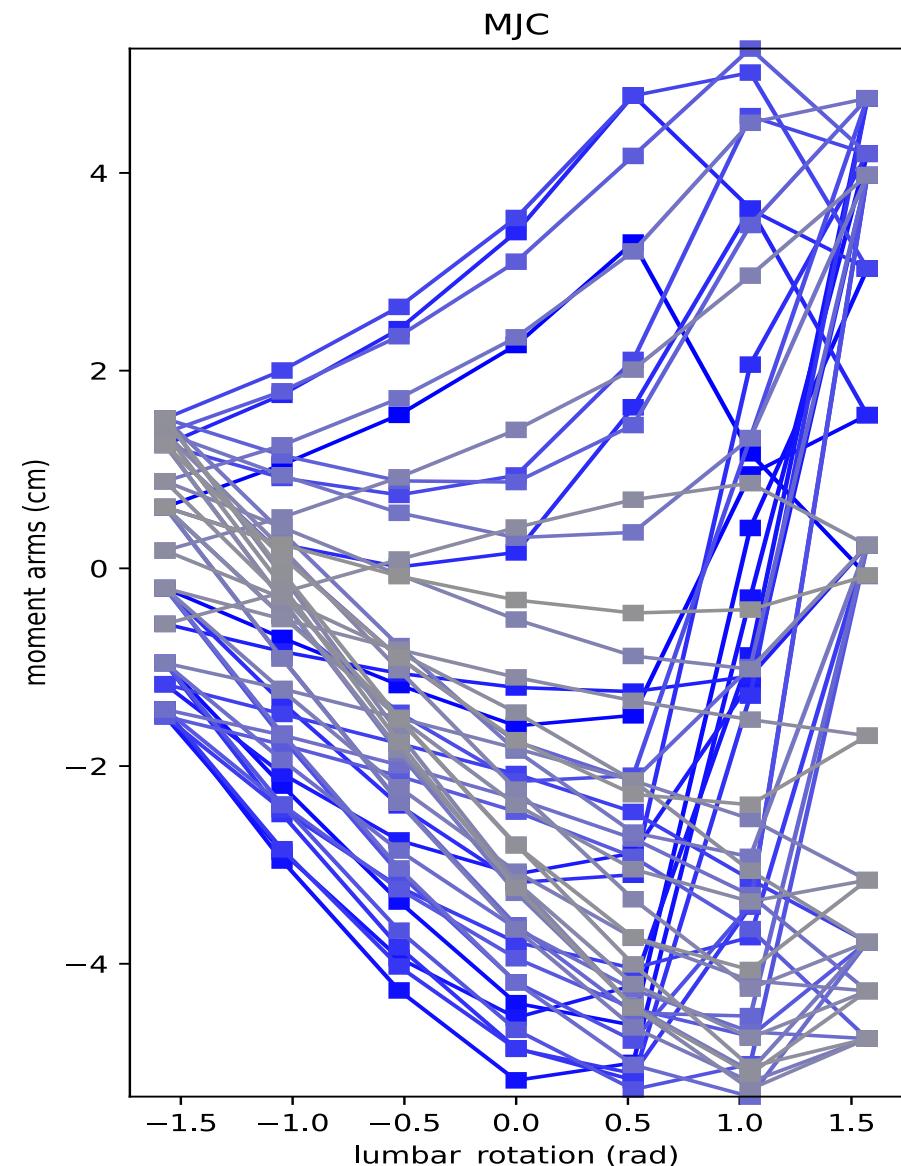
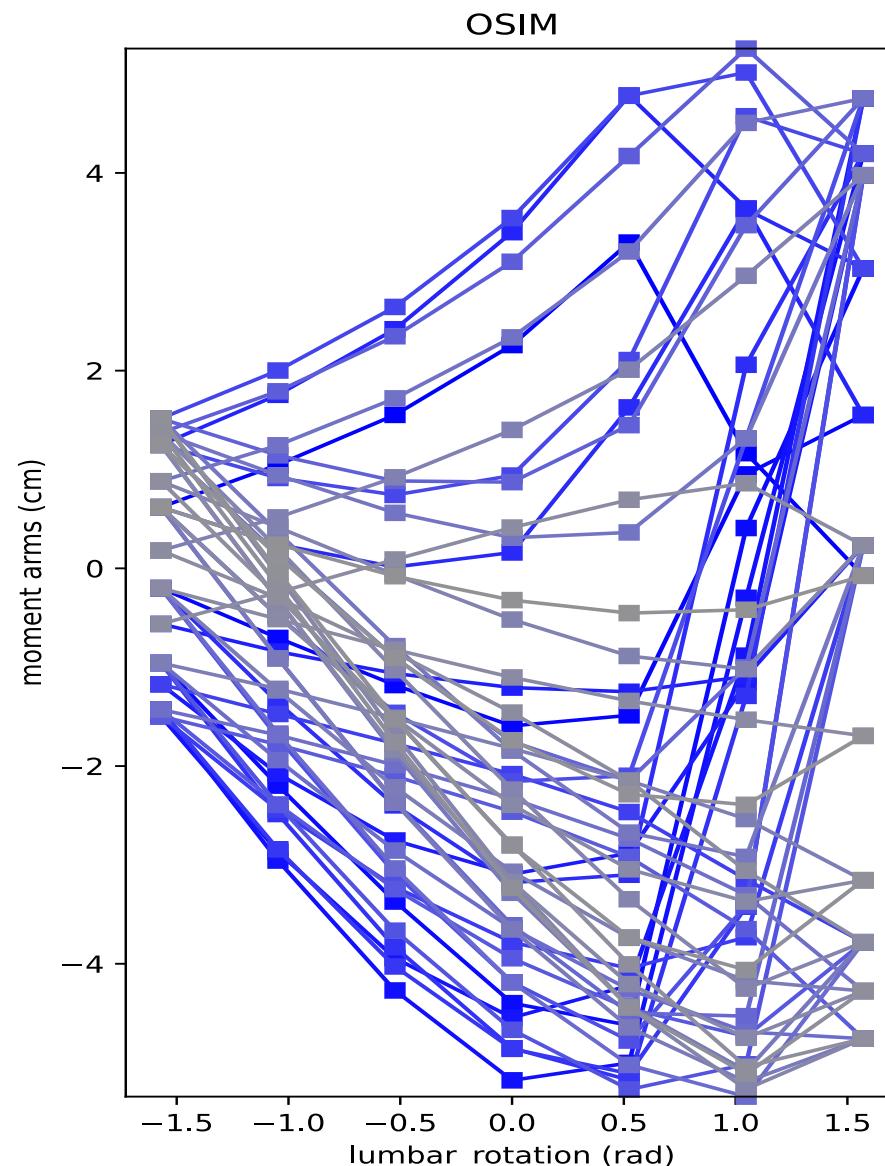
Muscle specific moment arm comparison with Osim model after optimization

peri_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



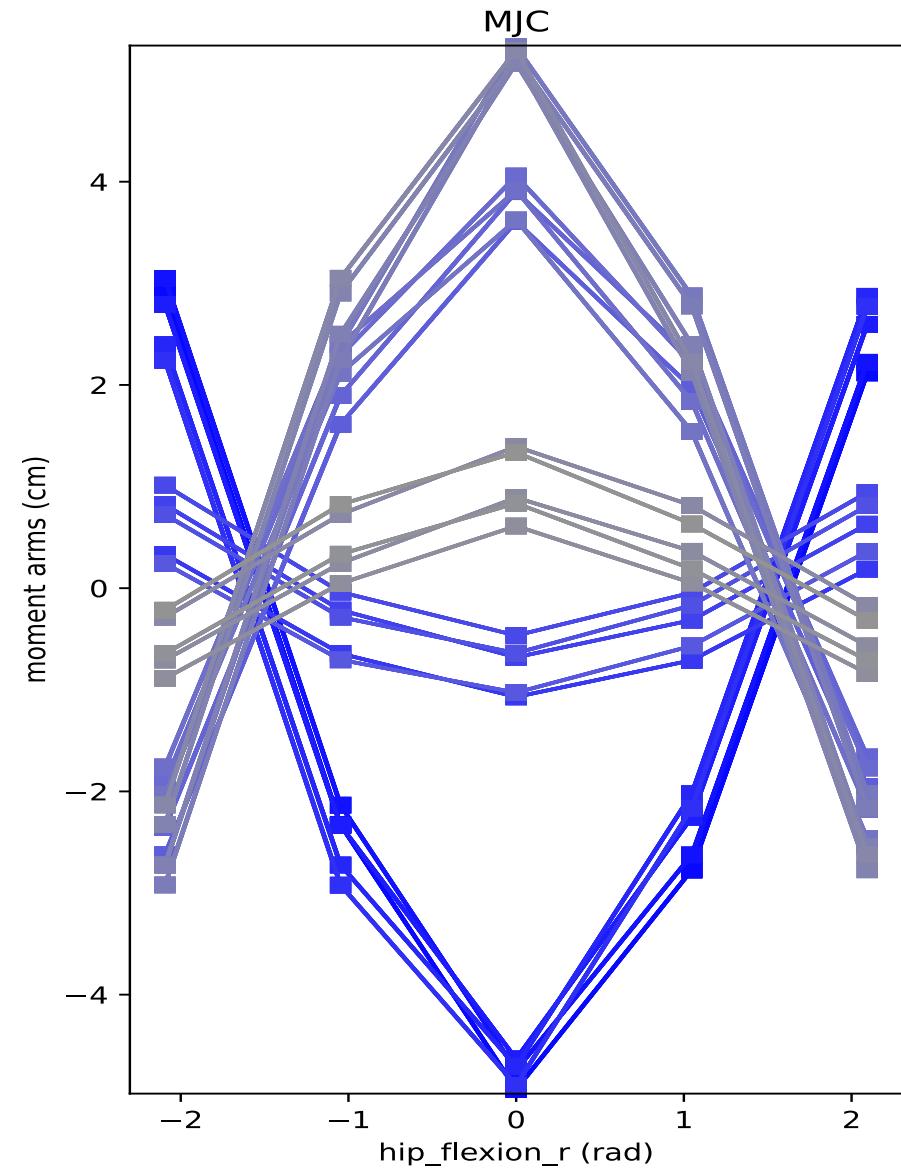
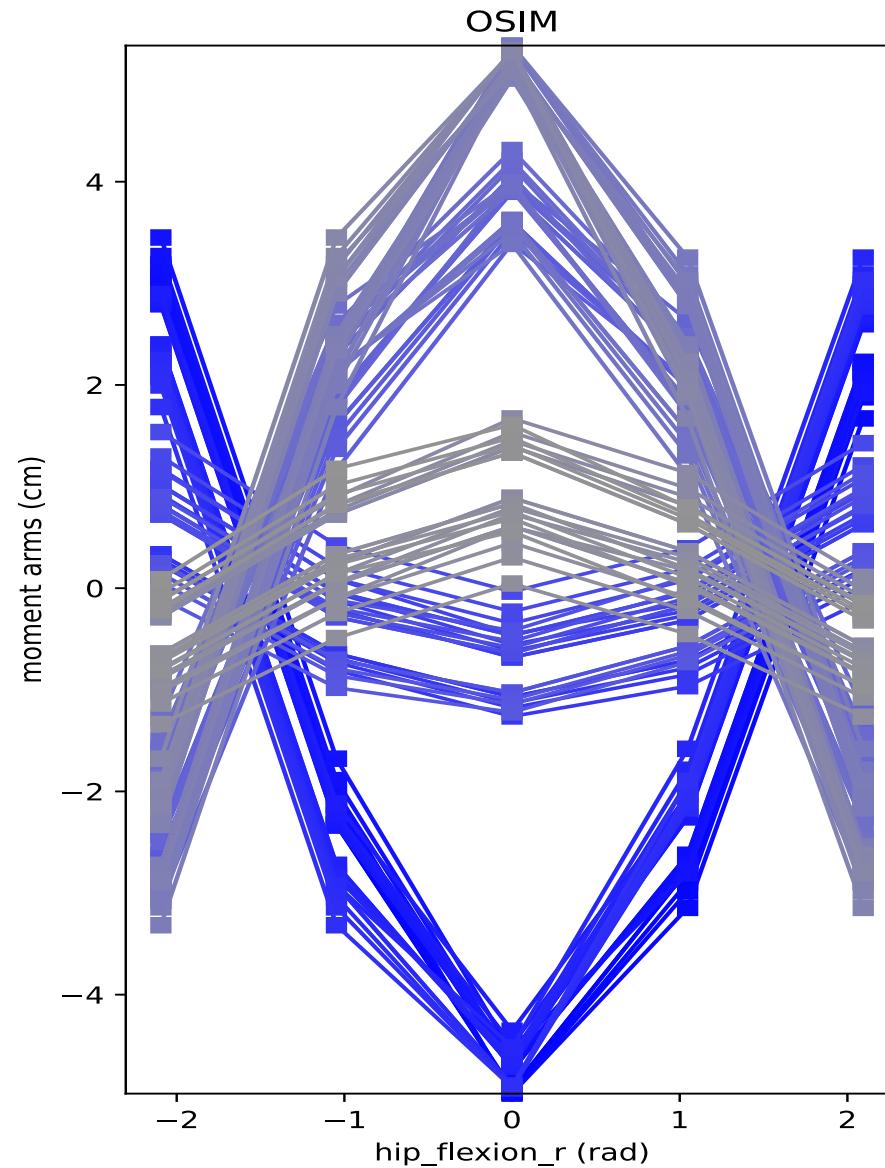
Muscle specific moment arm comparison with Osim model after optimization

intobl_r - lumbar_bending - lumbar_extension - lumbar_rotation

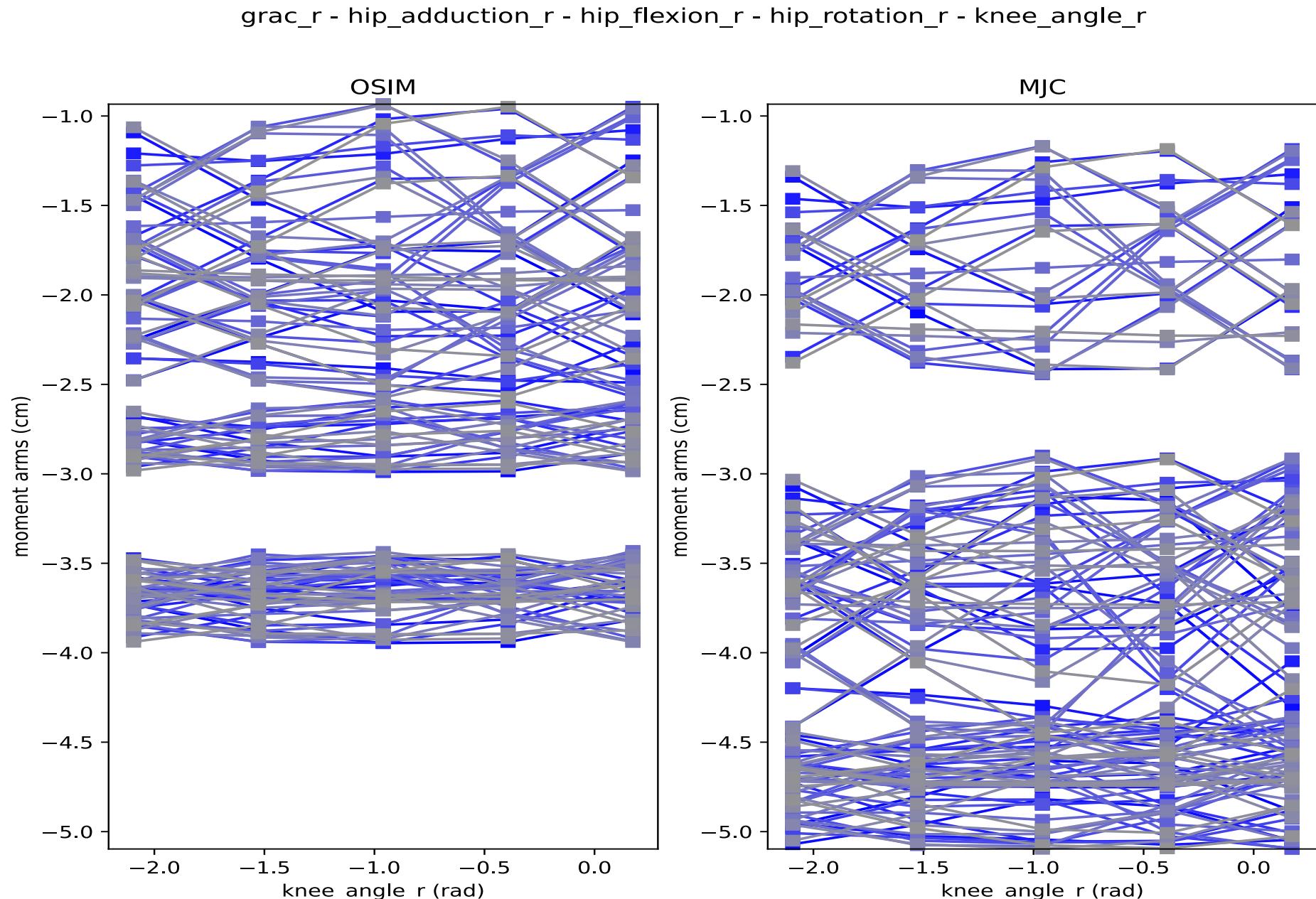


Muscle specific moment arm comparison with Osim model after optimization

rect_fem_r - hip_adduction_r - hip_flexion_r - hip_rotation_r - knee_angle_r

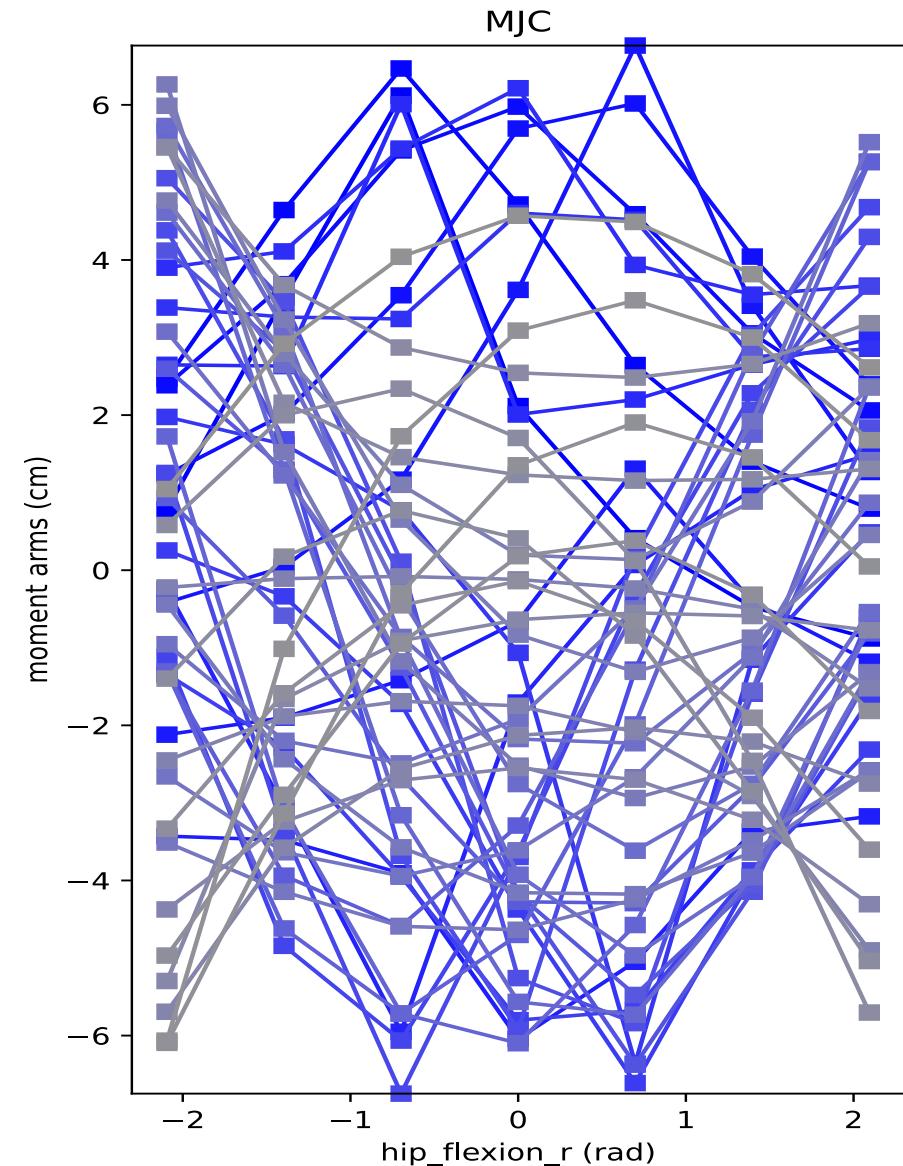
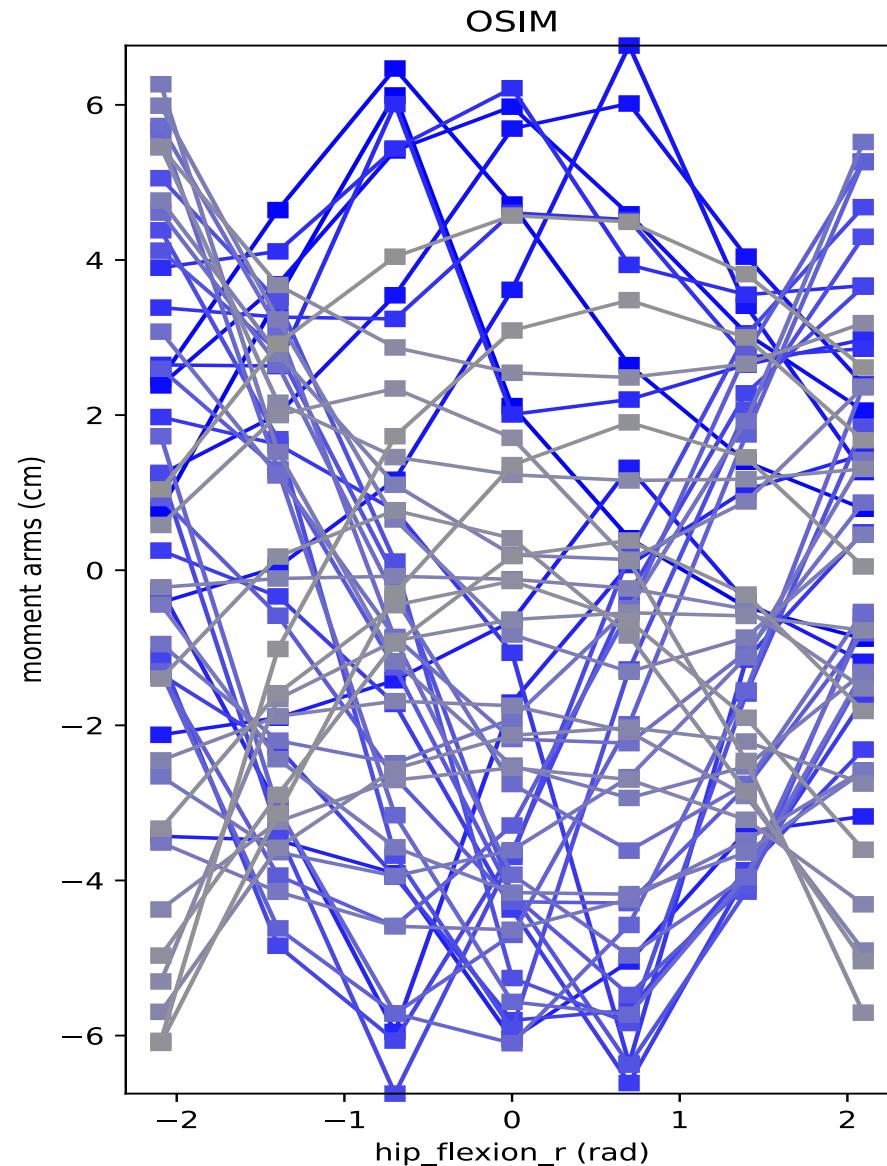


Muscle specific moment arm comparison with Osim model after optimization



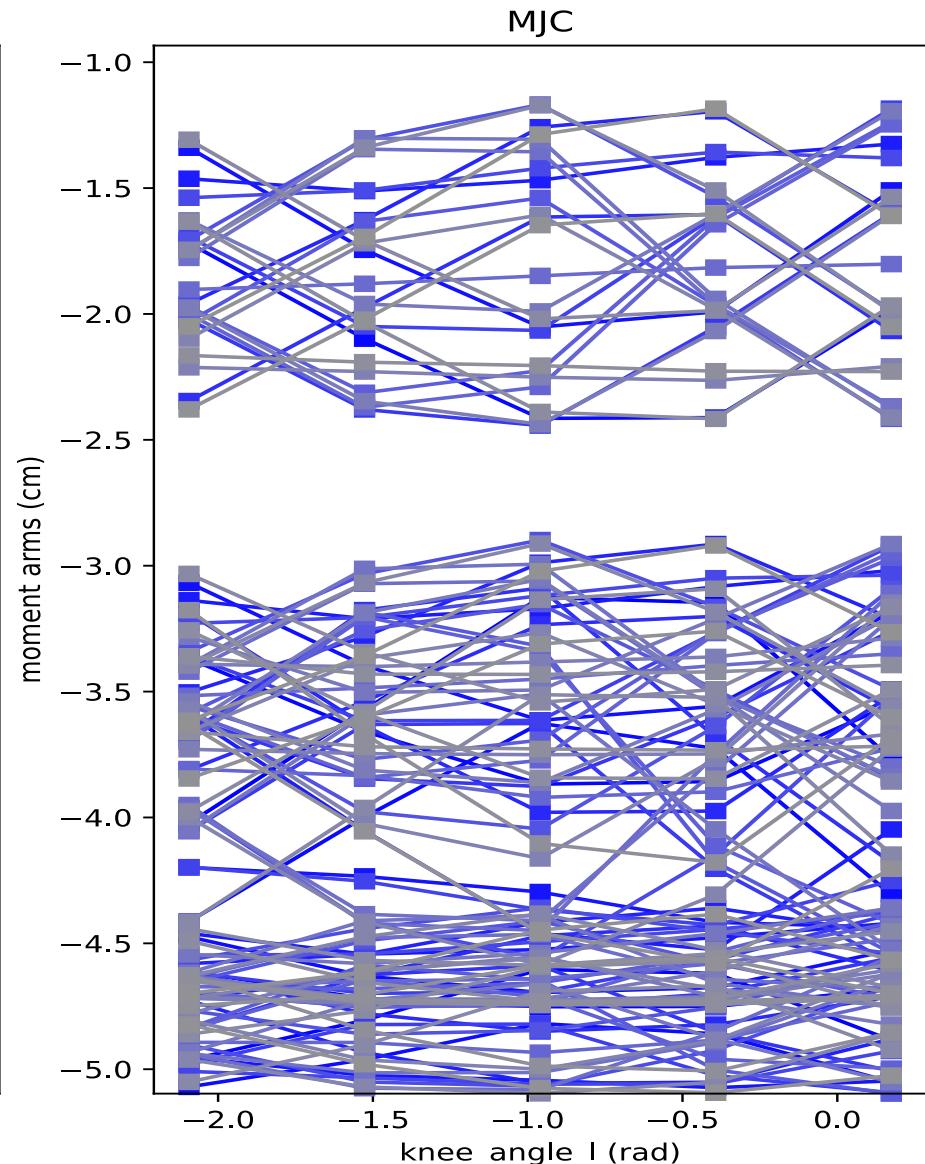
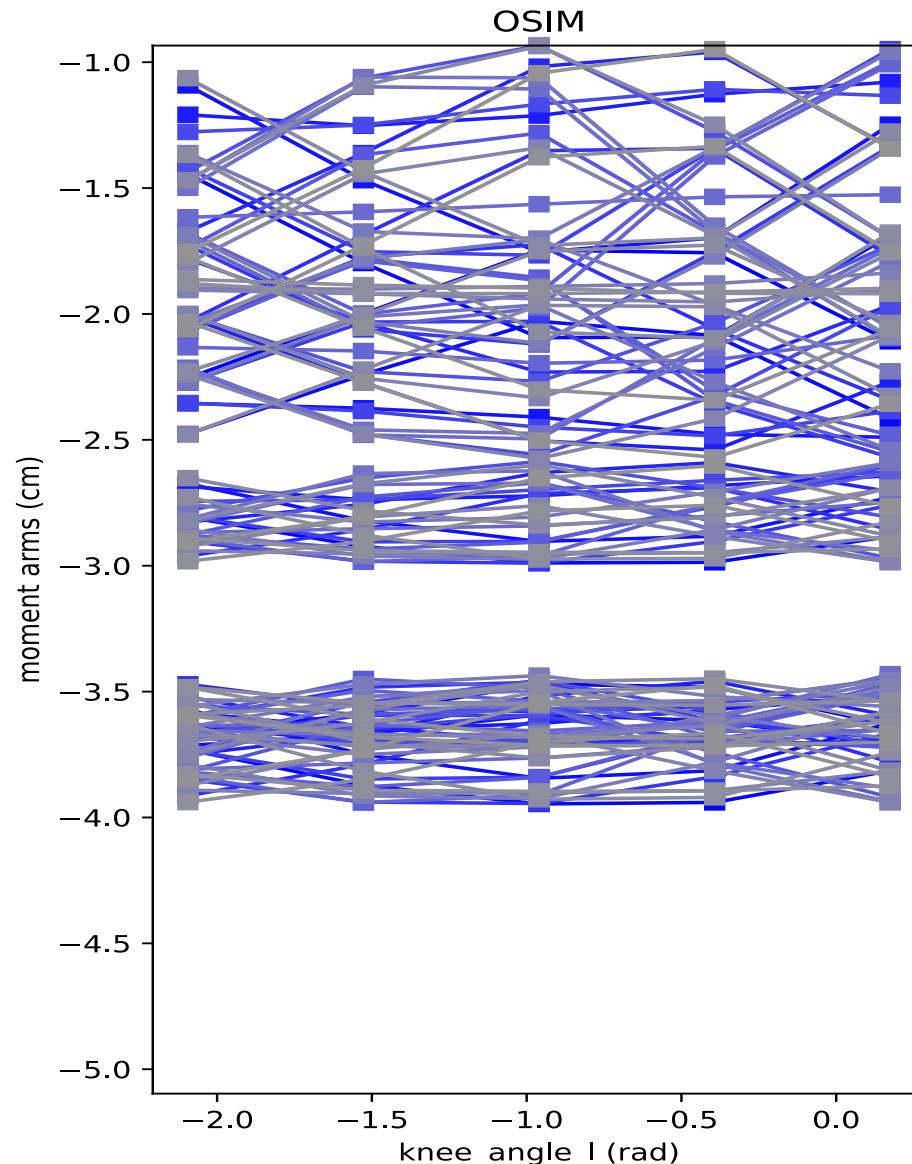
Muscle specific moment arm comparison with Osim model after optimization

glut_max2_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



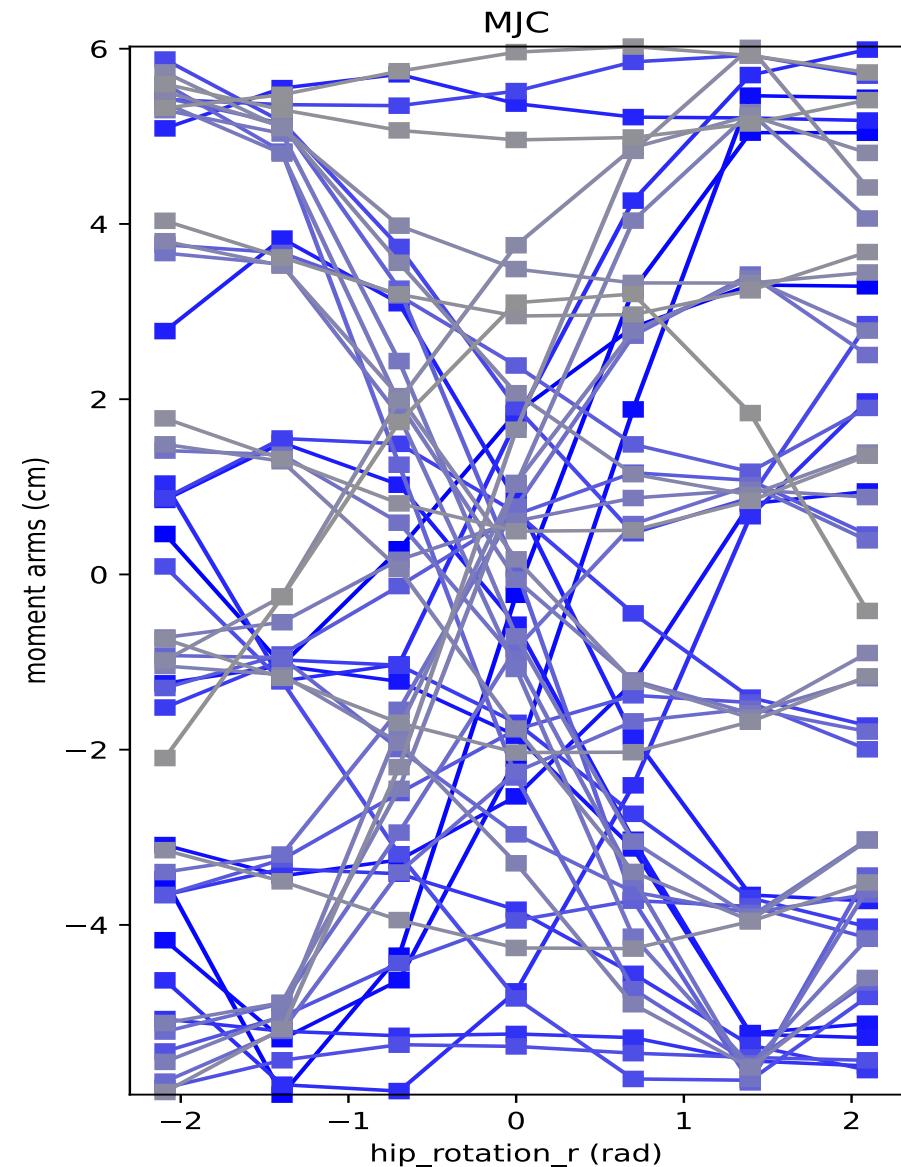
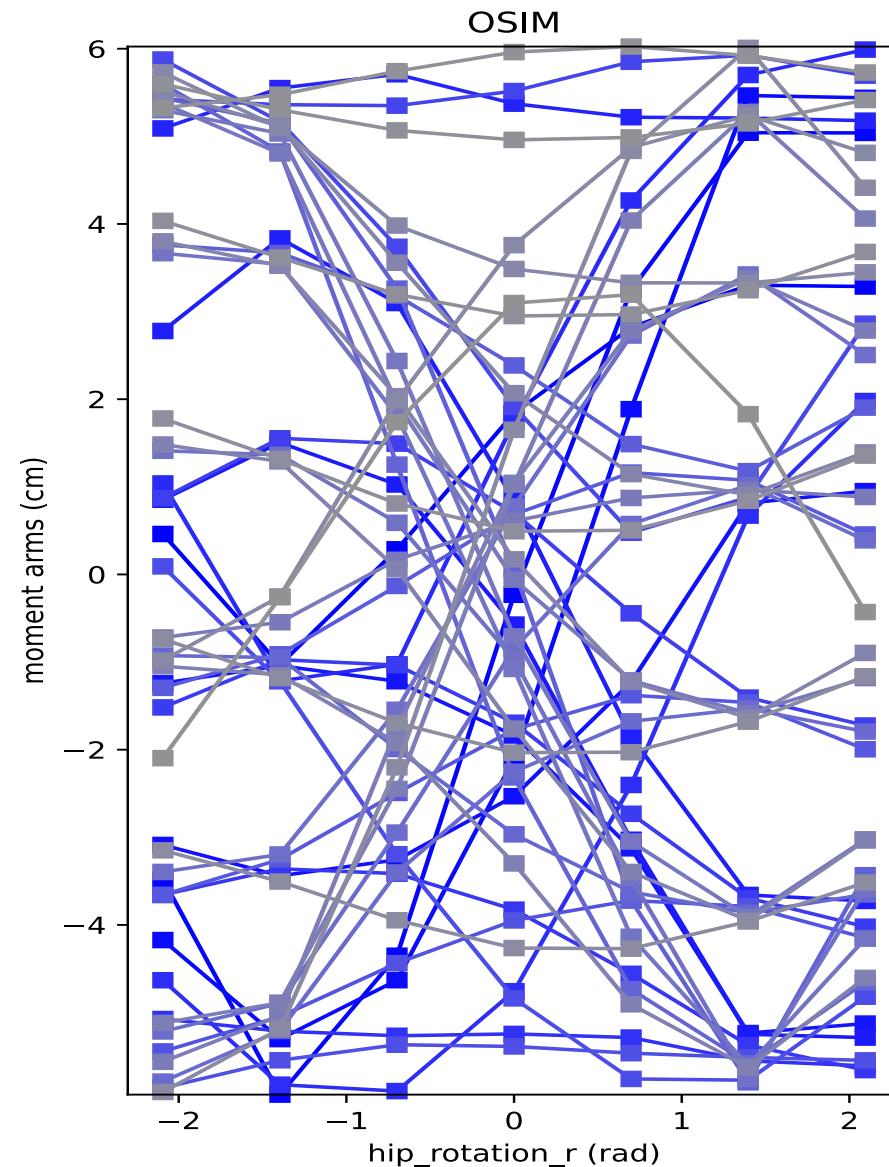
Muscle specific moment arm comparison with Osim model after optimization

grac_I - hip_adduction_I - hip_flexion_I - hip_rotation_I - knee_angle_I



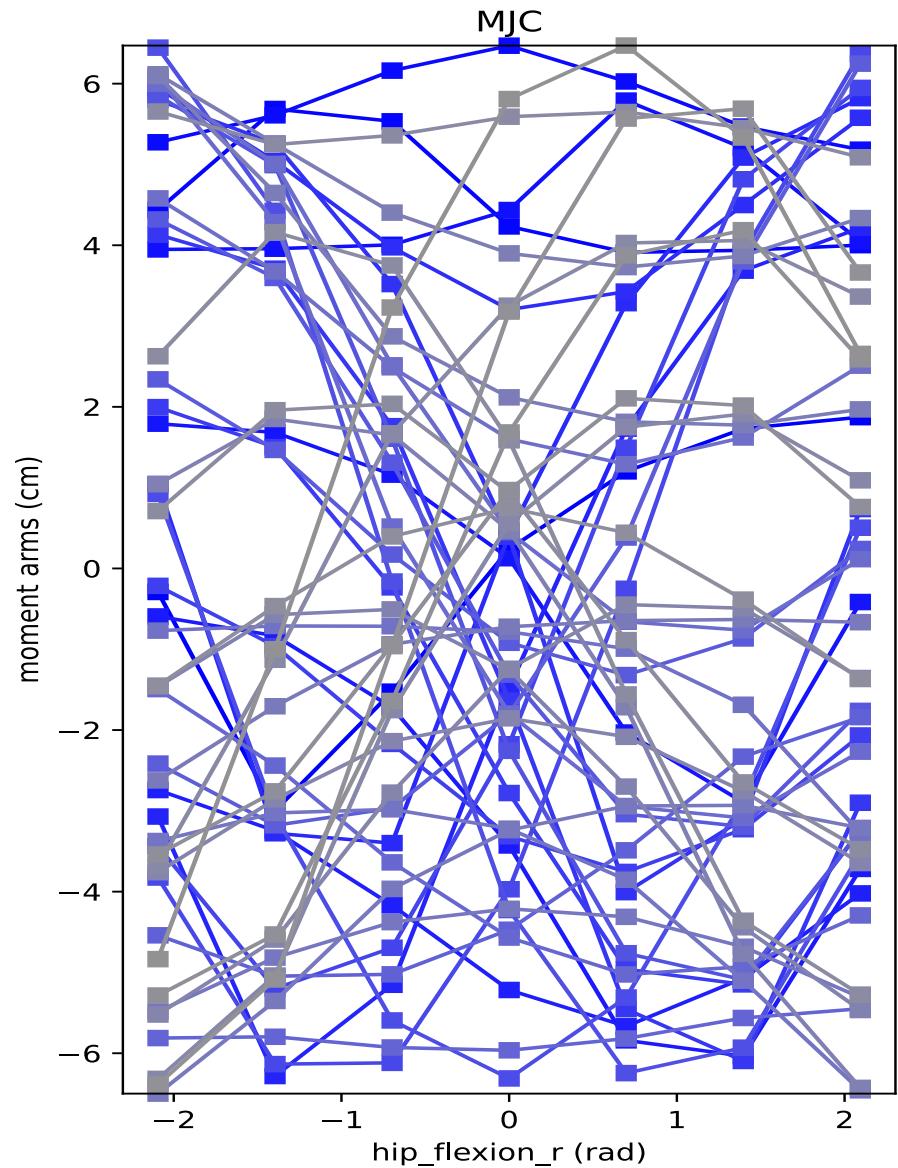
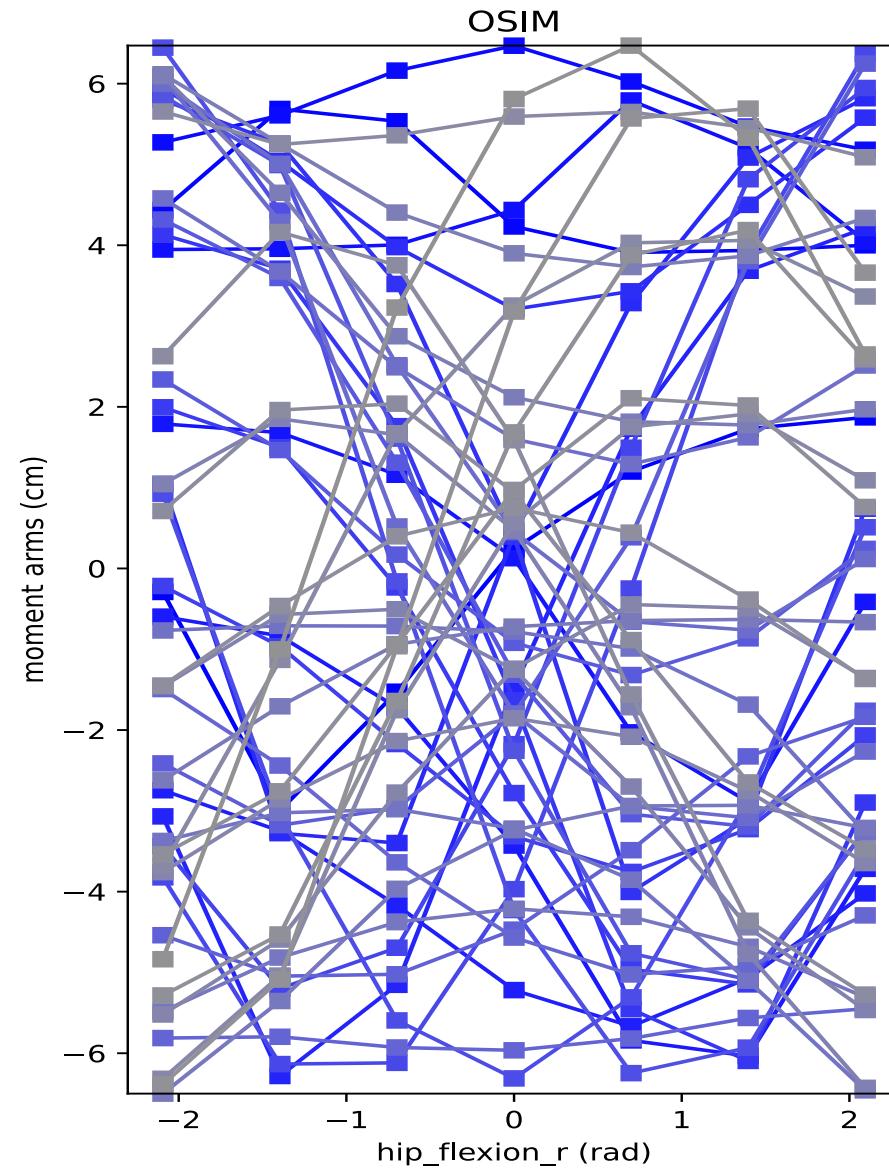
Muscle specific moment arm comparison with Osim model after optimization

glut_med3_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



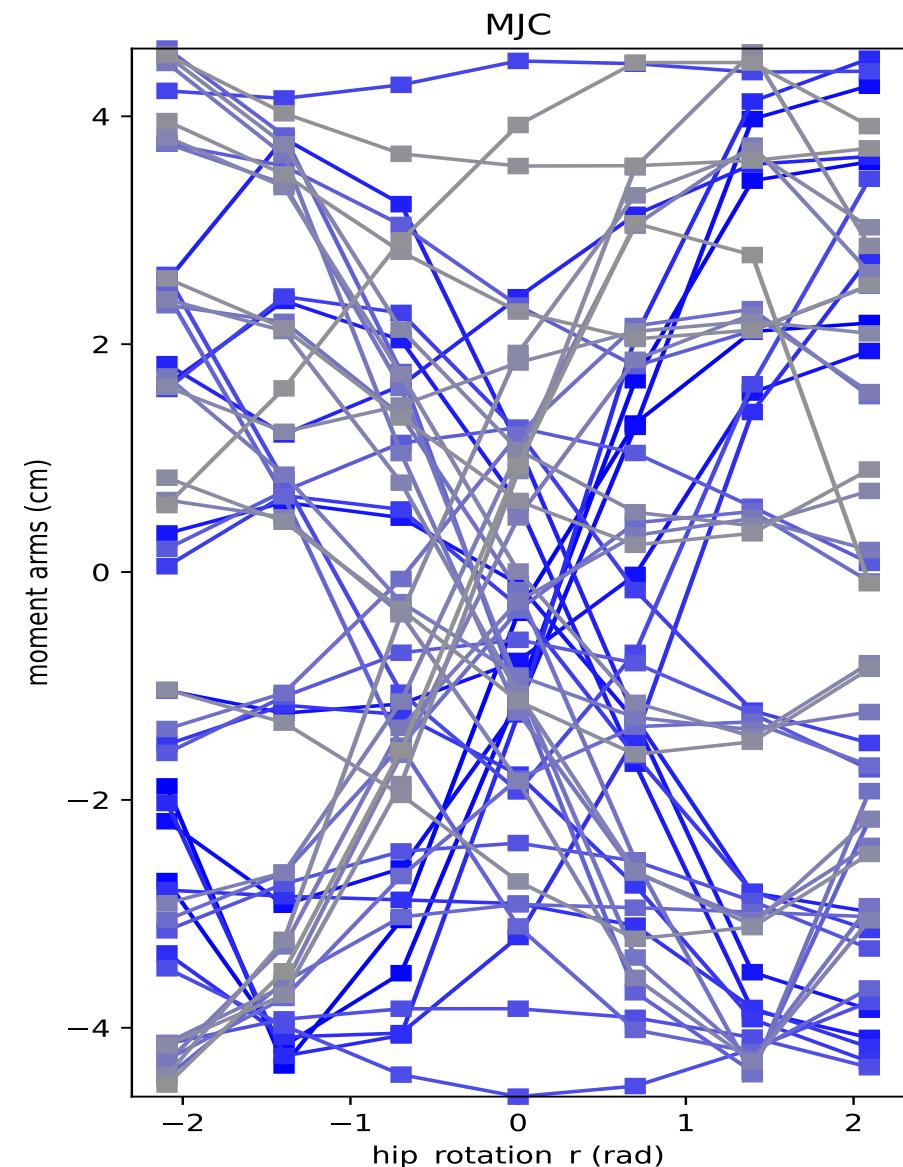
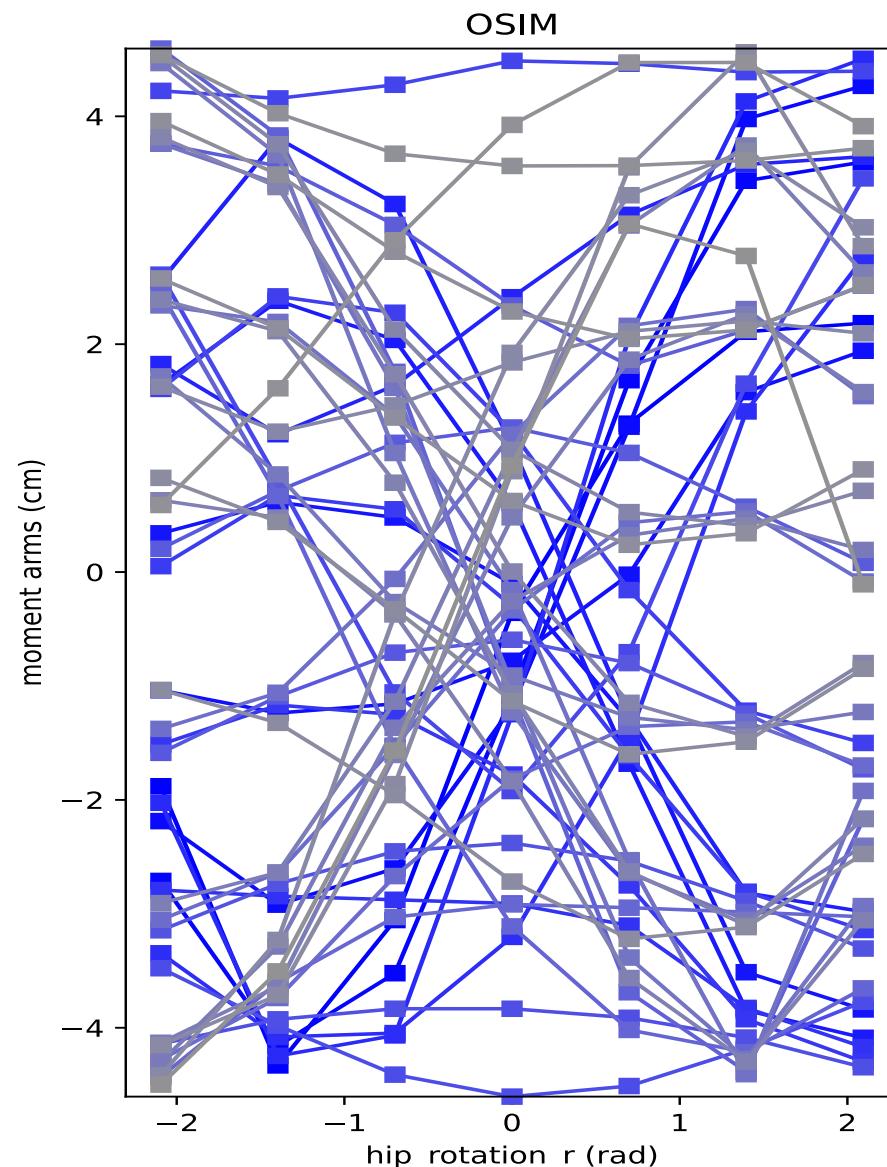
Muscle specific moment arm comparison with Osim model after optimization

glut_max1_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



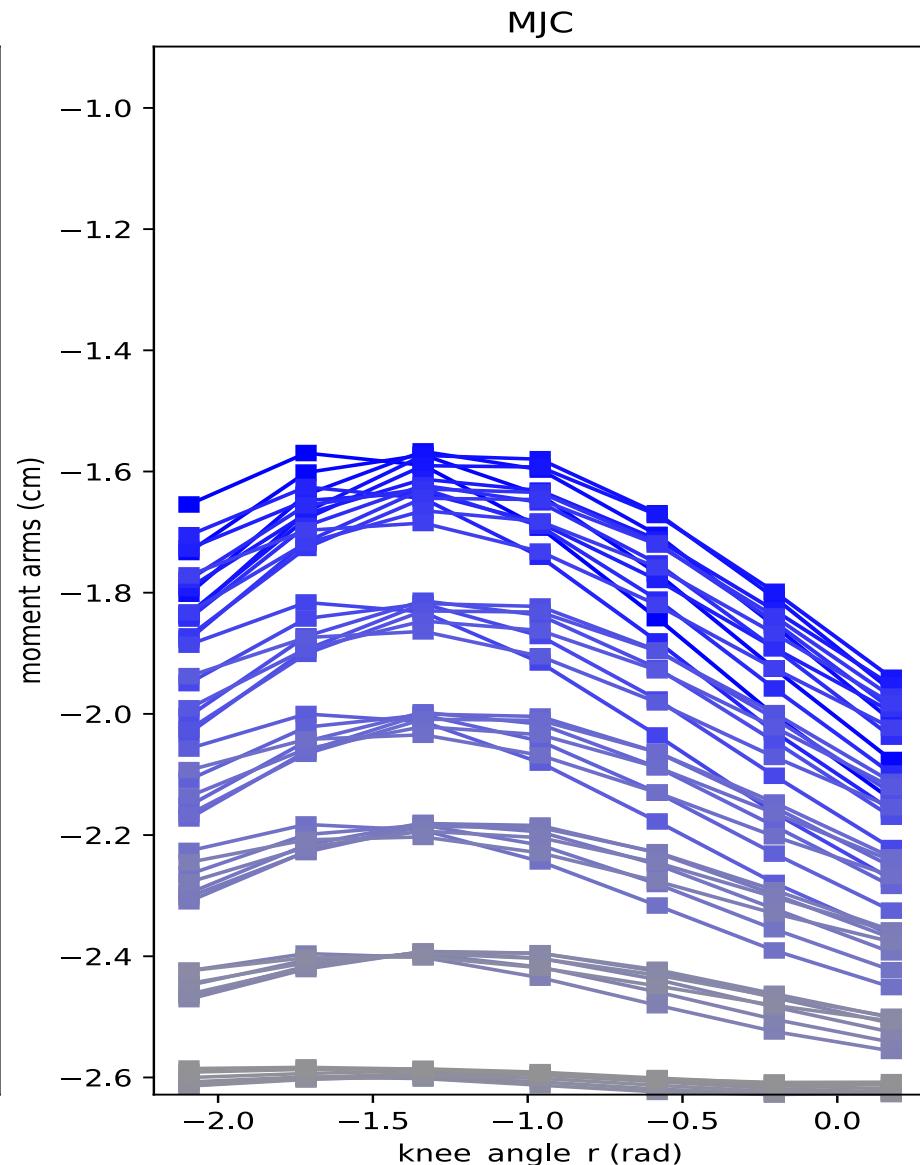
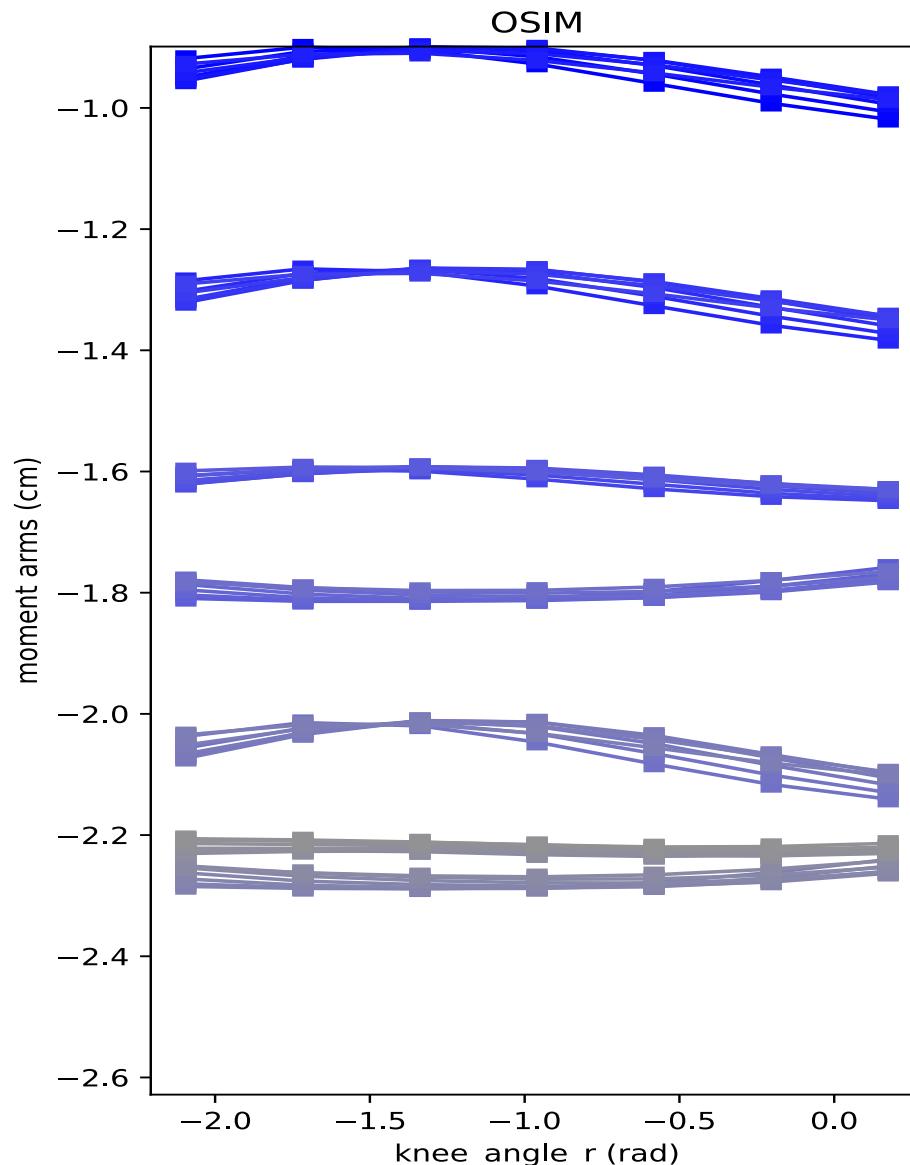
Muscle specific moment arm comparison with Osim model after optimization

peri_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



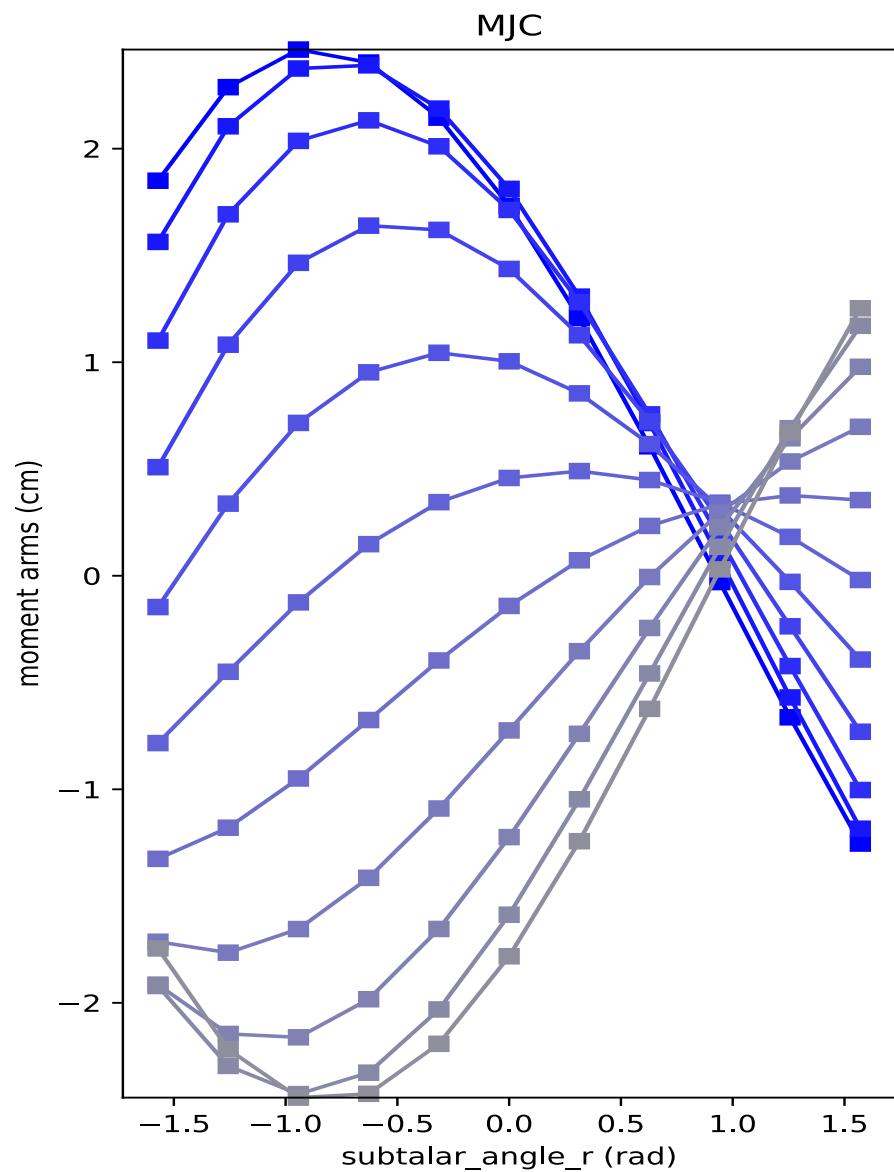
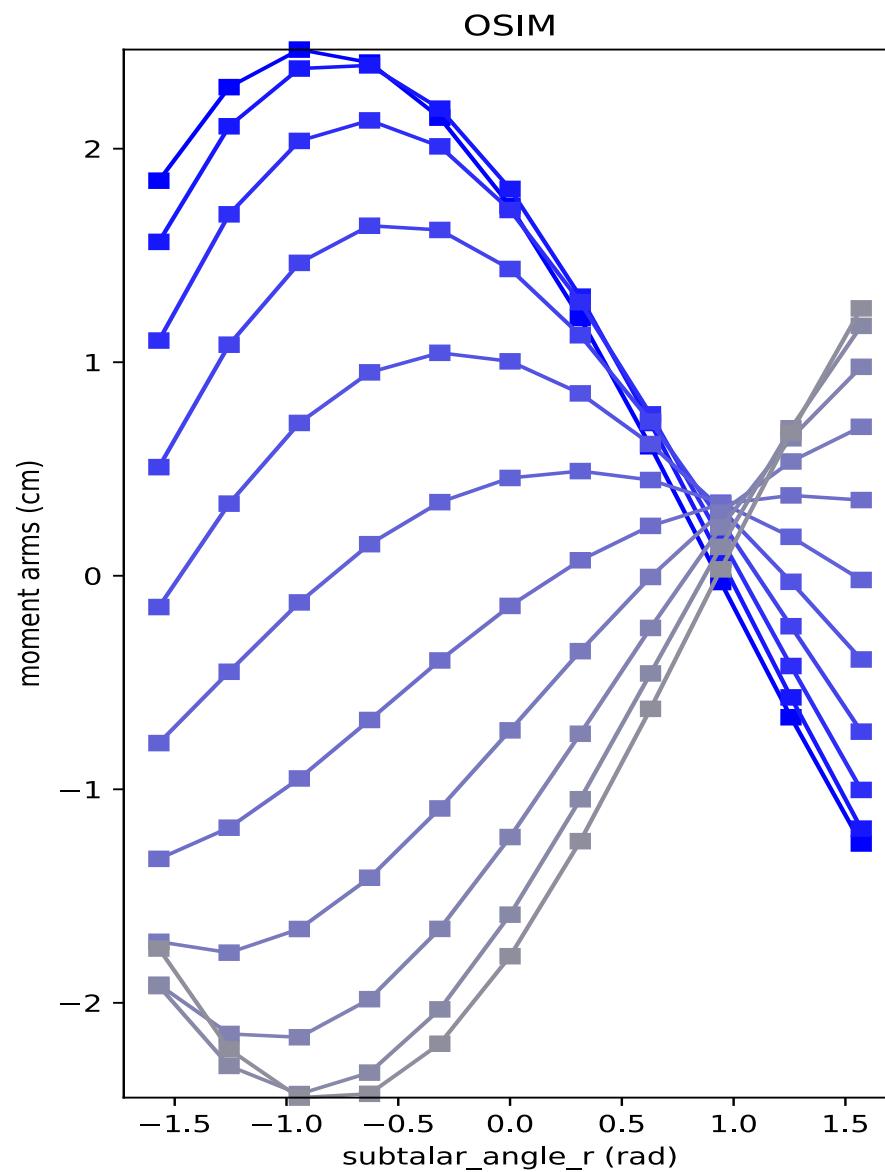
Muscle specific moment arm comparison with Osim model after optimization

med_gas_r - ankle_angle_r - knee_angle_r - subtalar_angle_r



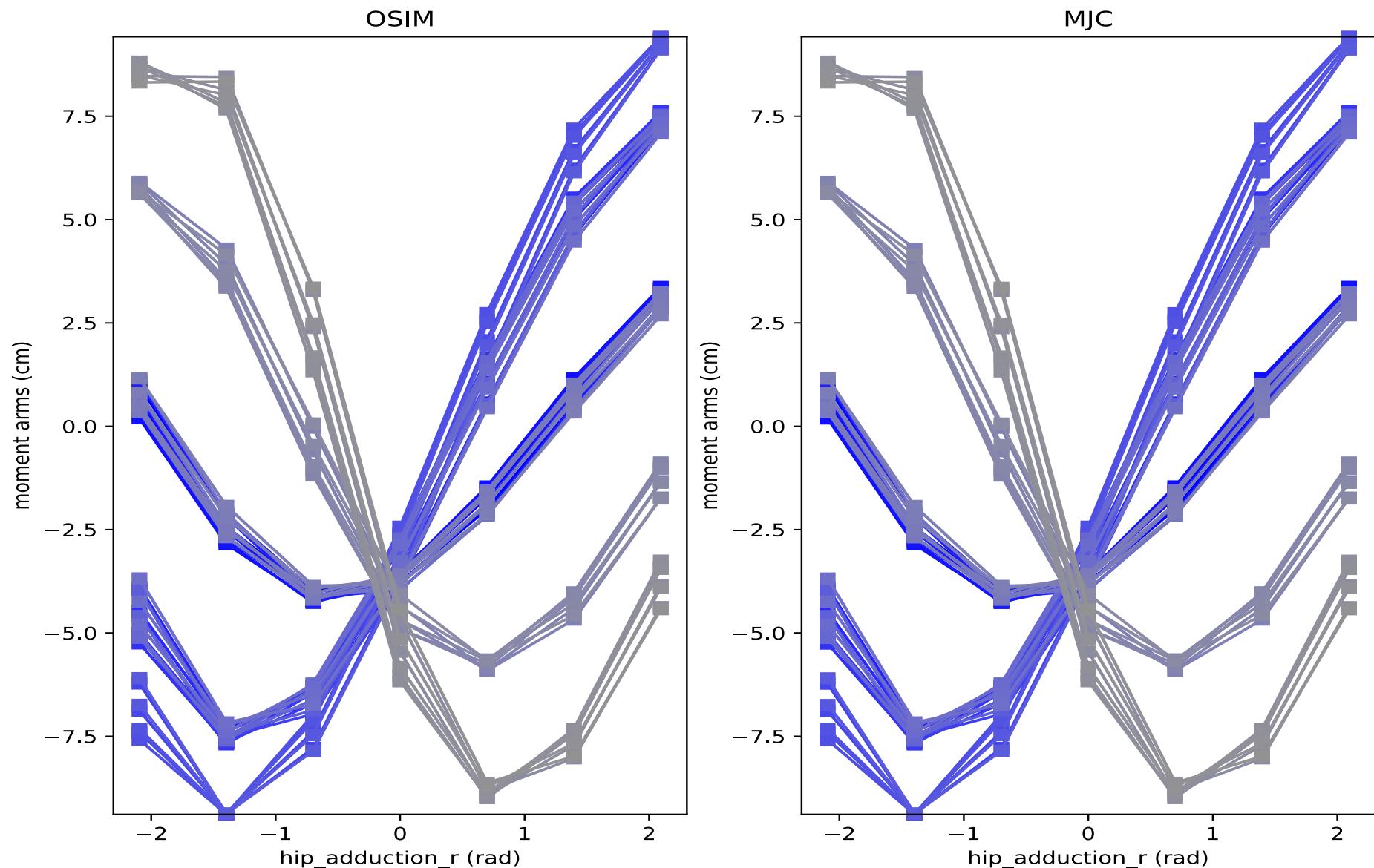
Muscle specific moment arm comparison with Osim model after optimization

soleus_r - ankle_angle_r - subtalar_angle_r



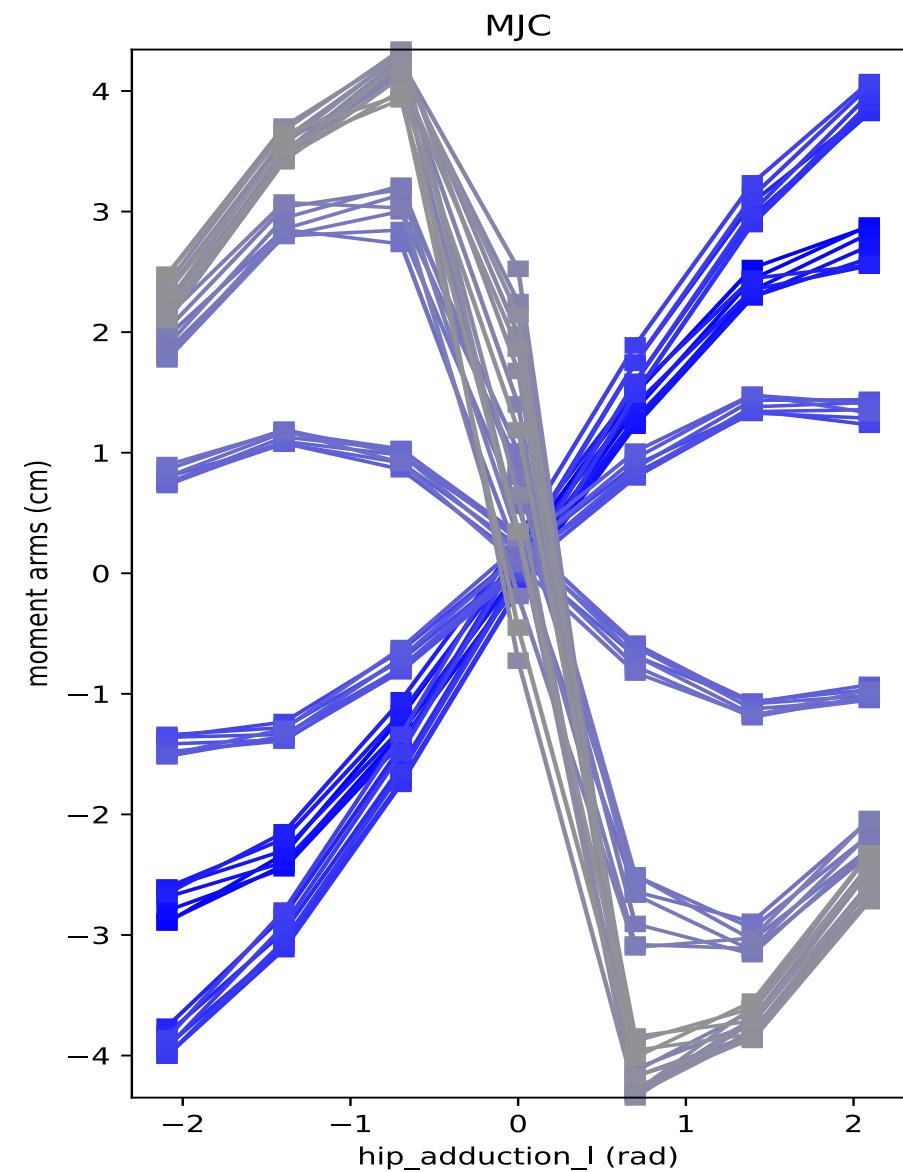
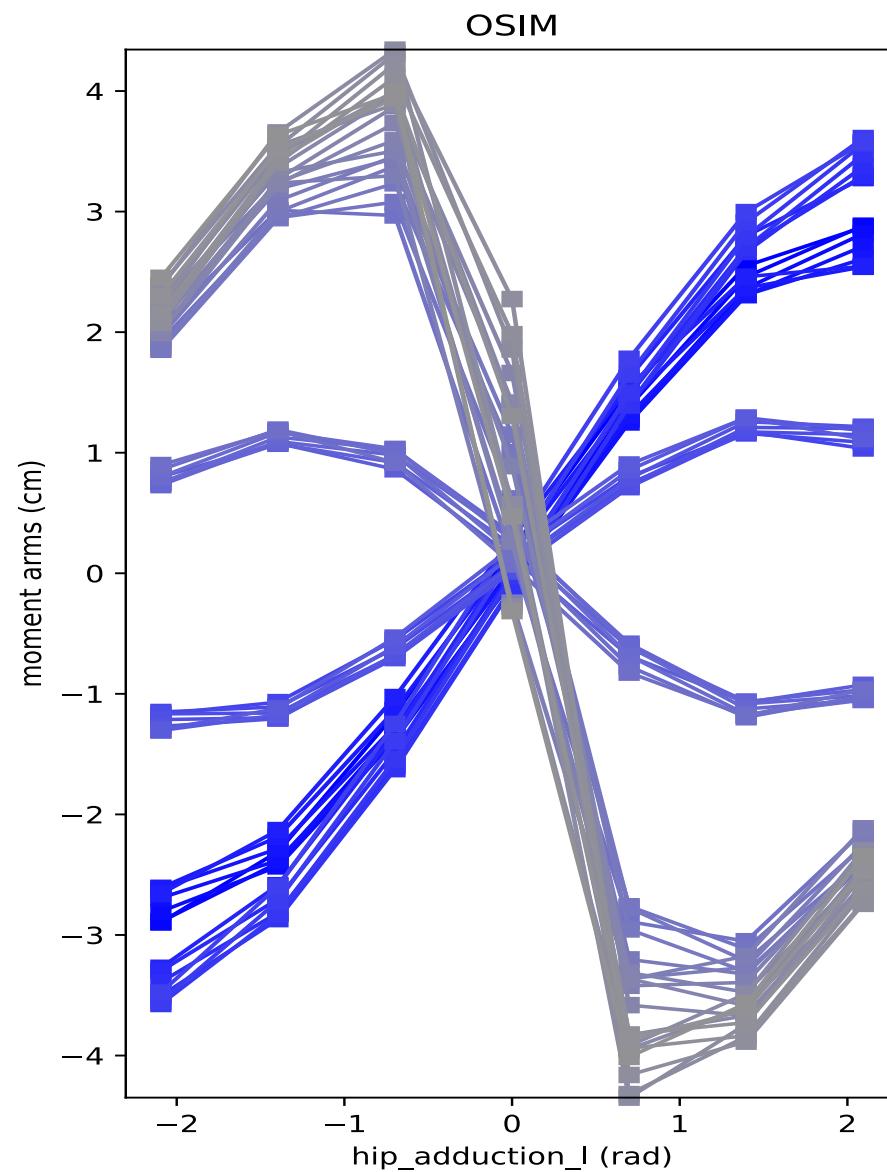
Muscle specific moment arm comparison with Osim model after optimization

sar_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



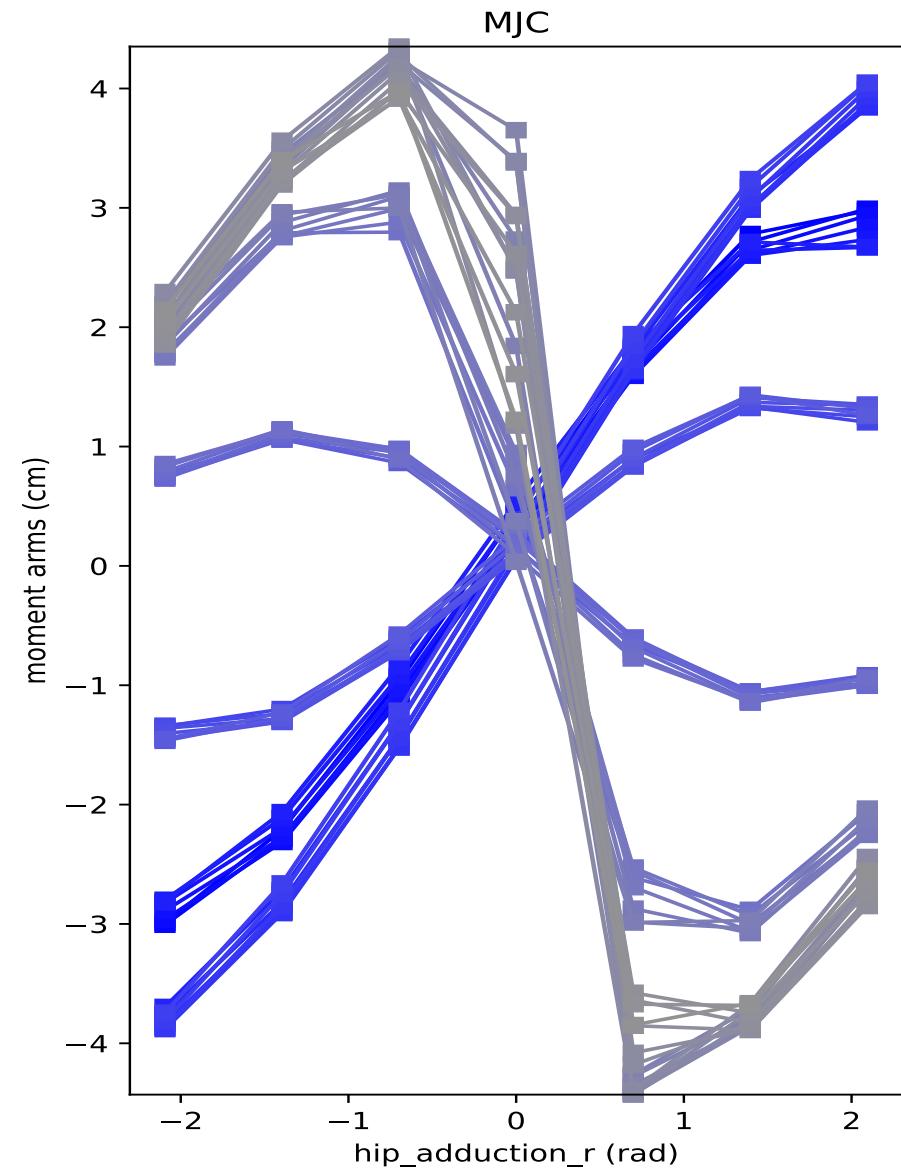
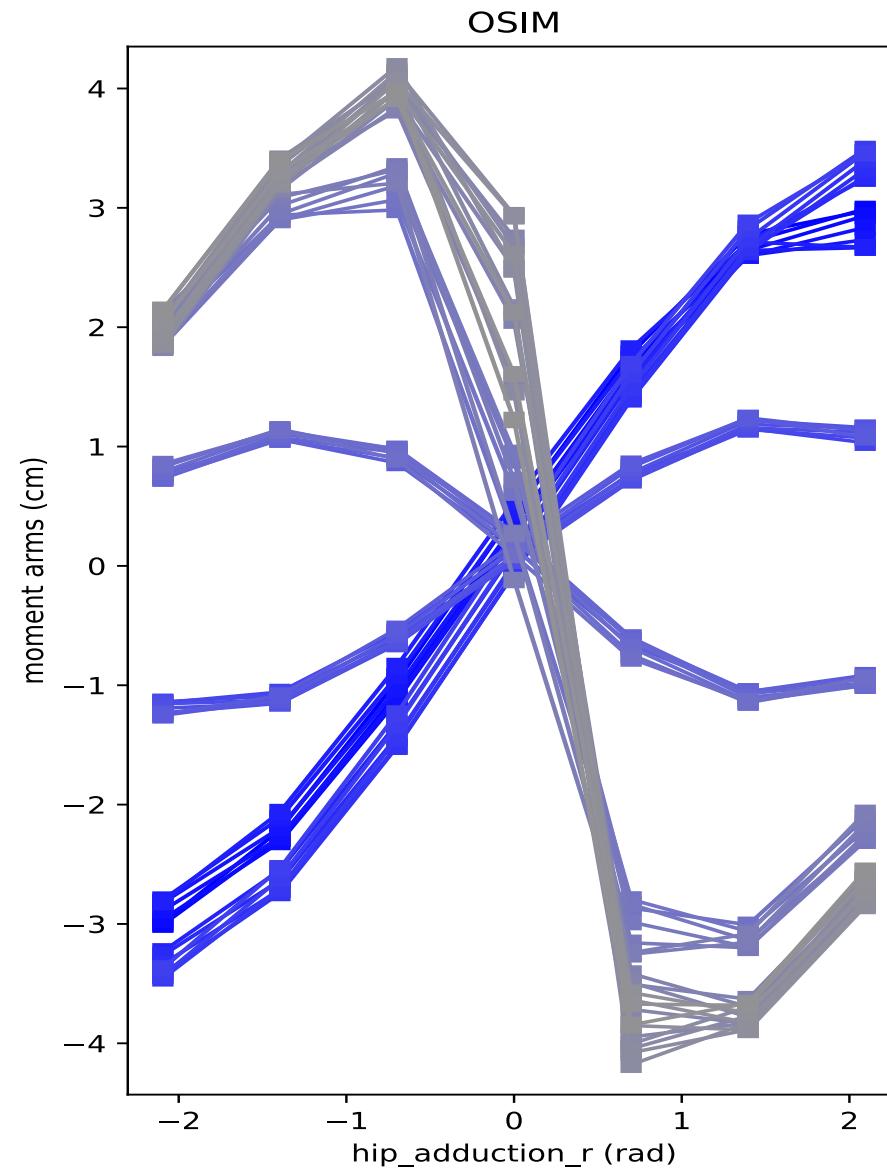
Muscle specific moment arm comparison with Osim model after optimization

iliacus_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



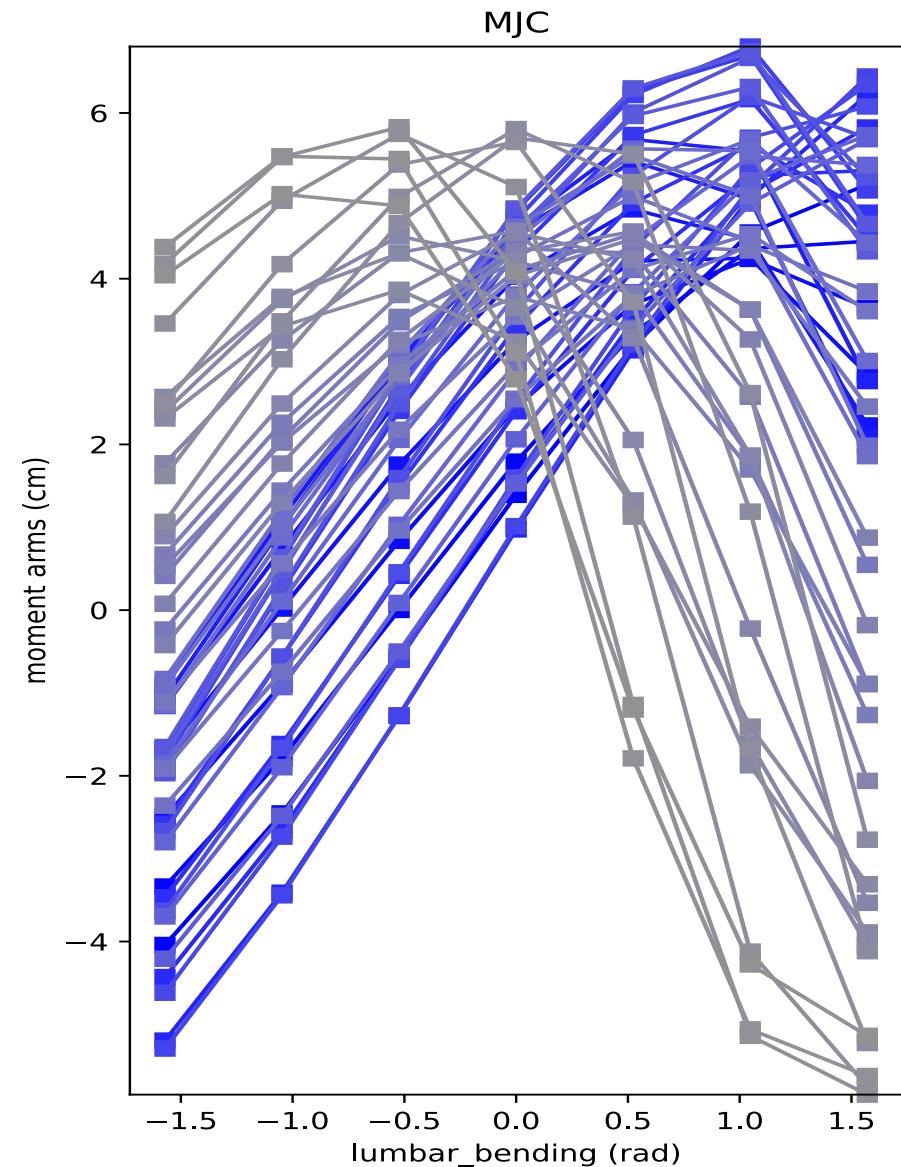
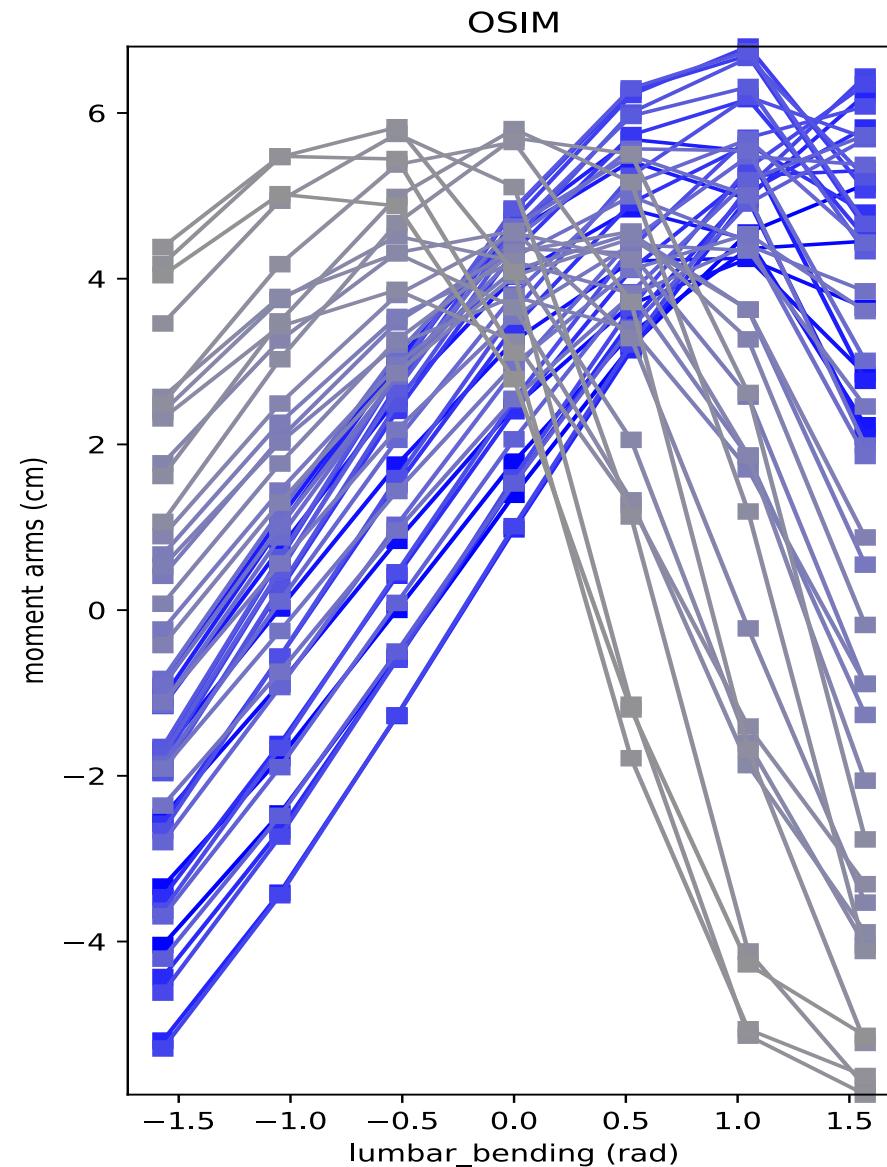
Muscle specific moment arm comparison with Osim model after optimization

psoas_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



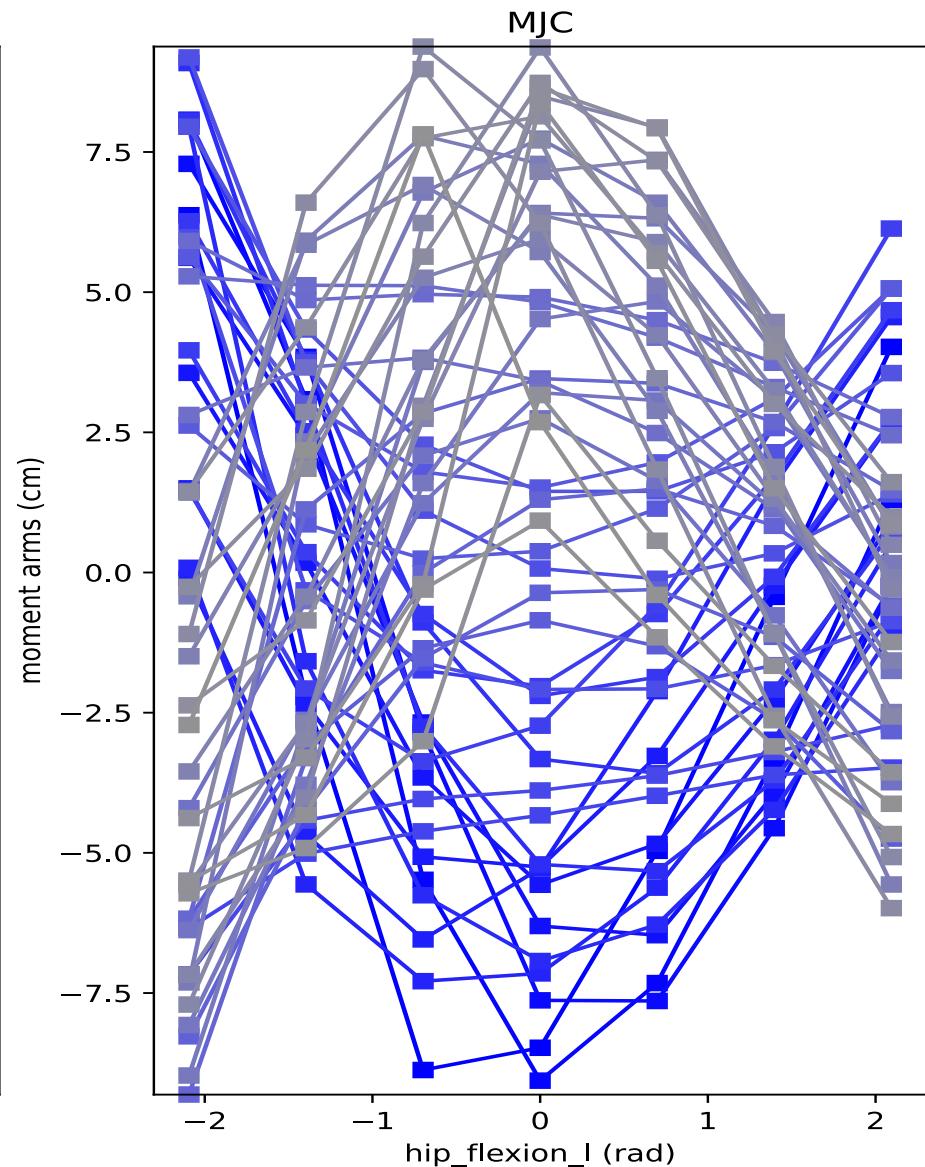
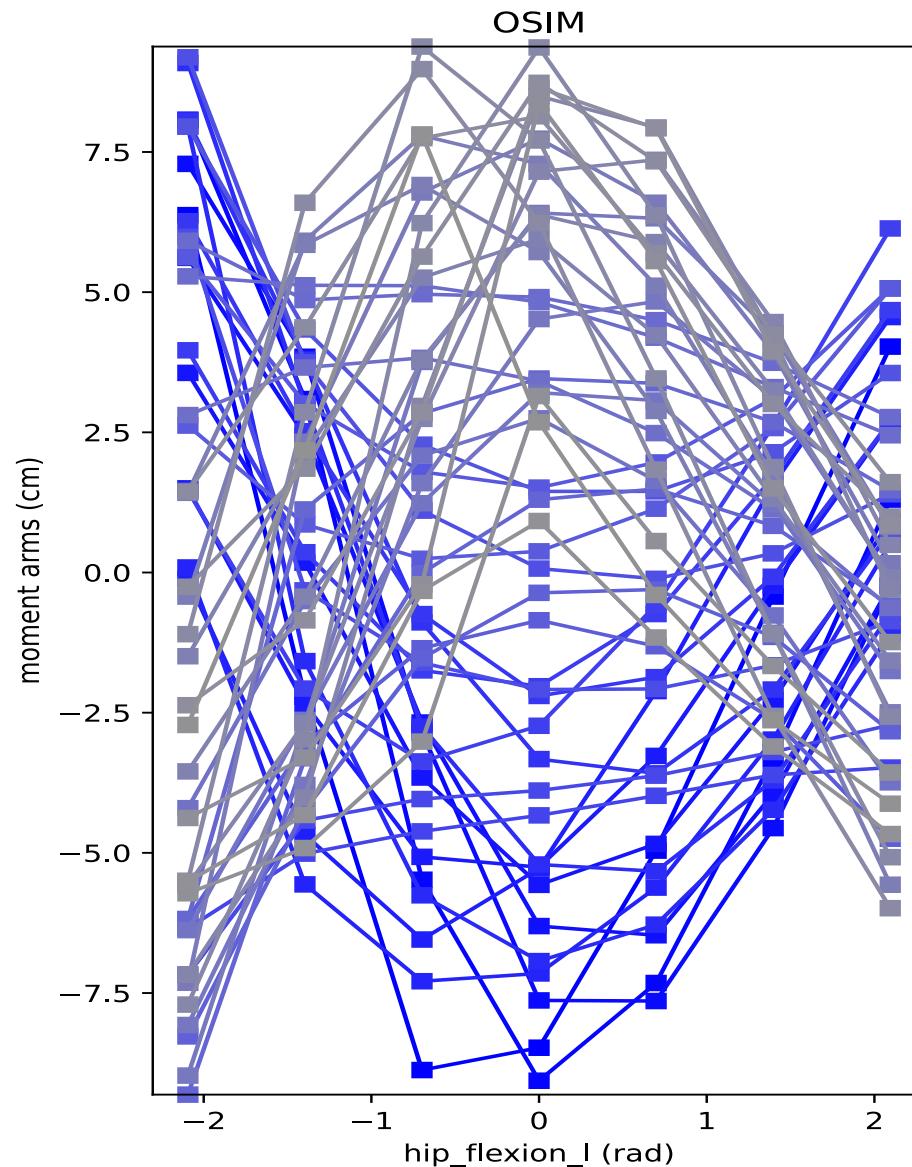
Muscle specific moment arm comparison with Osim model after optimization

ercspn_r - lumbar_bending - lumbar_extension - lumbar_rotation



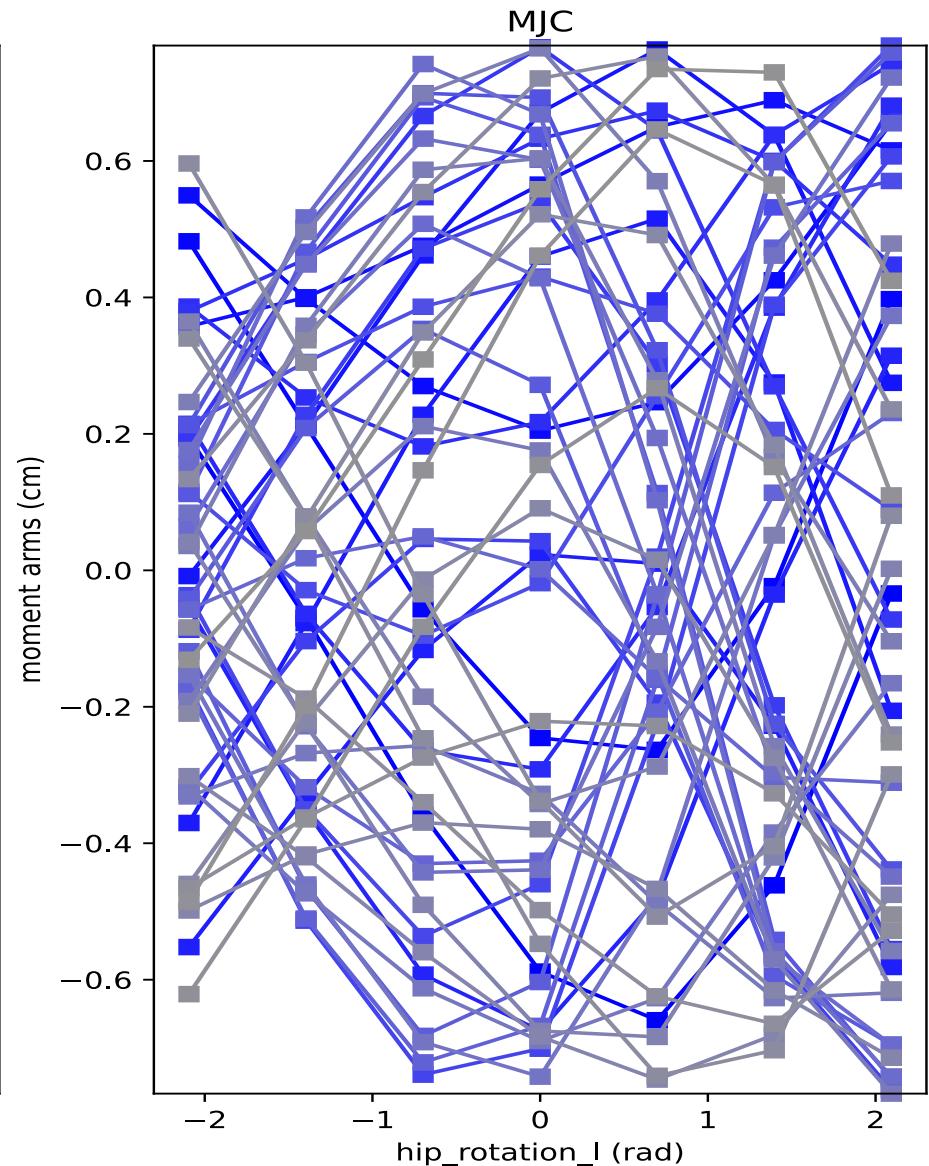
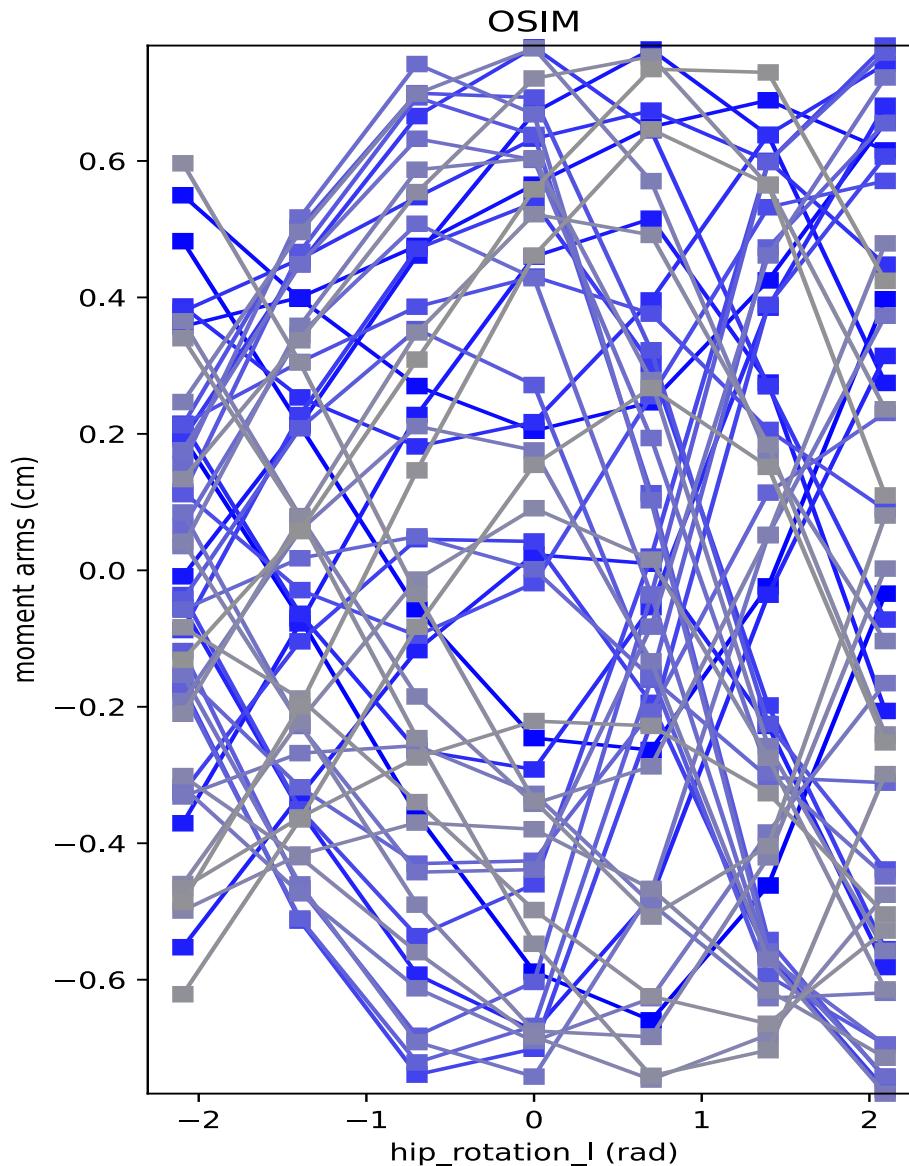
Muscle specific moment arm comparison with Osim model after optimization

`tfl_I - hip_adduction_I - hip_flexion_I - hip_rotation_I`



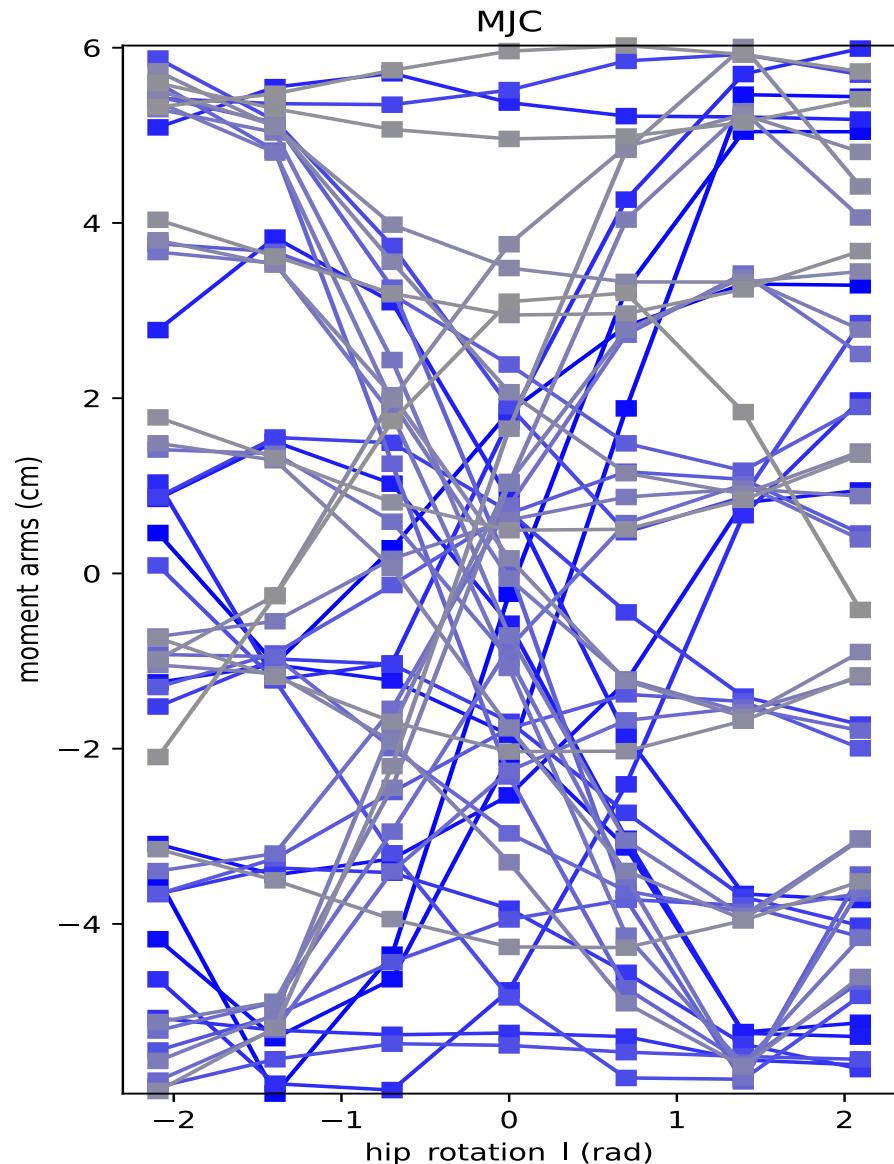
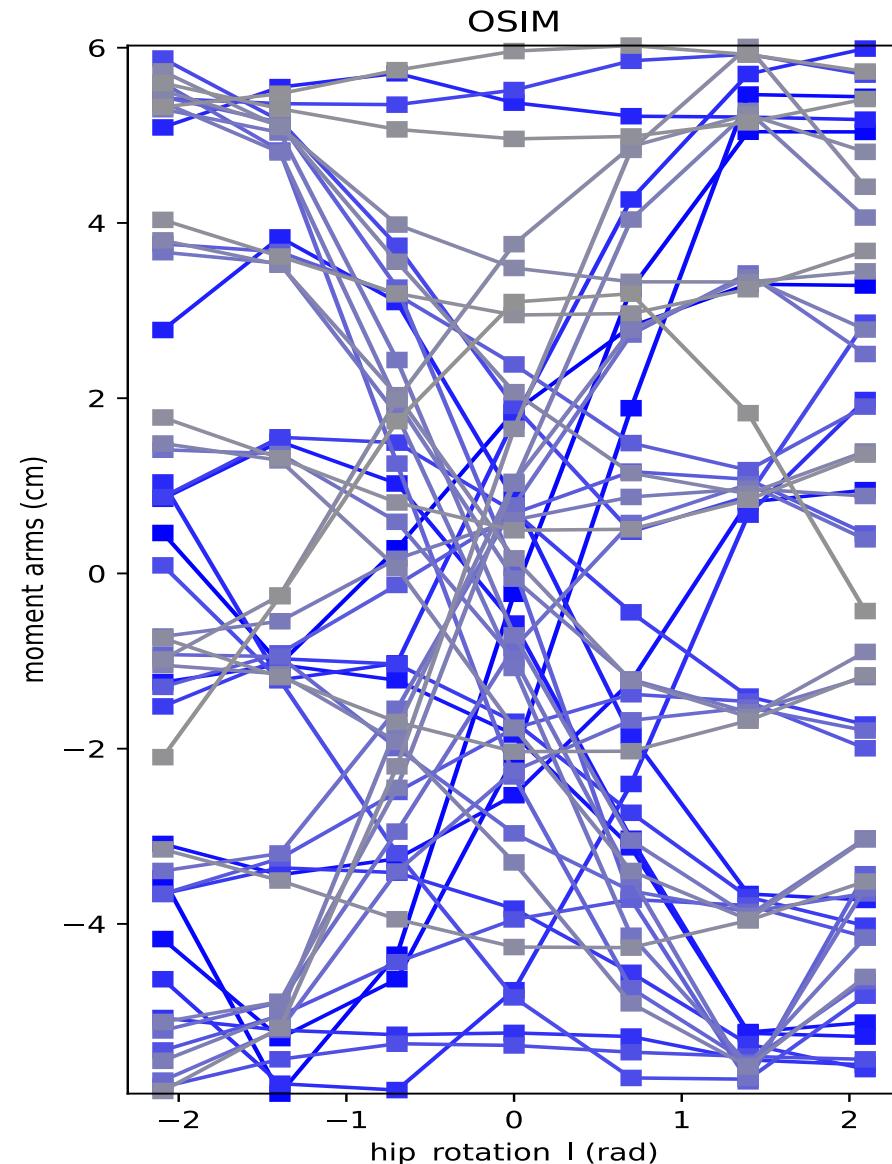
Muscle specific moment arm comparison with Osim model after optimization

add_mag2_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



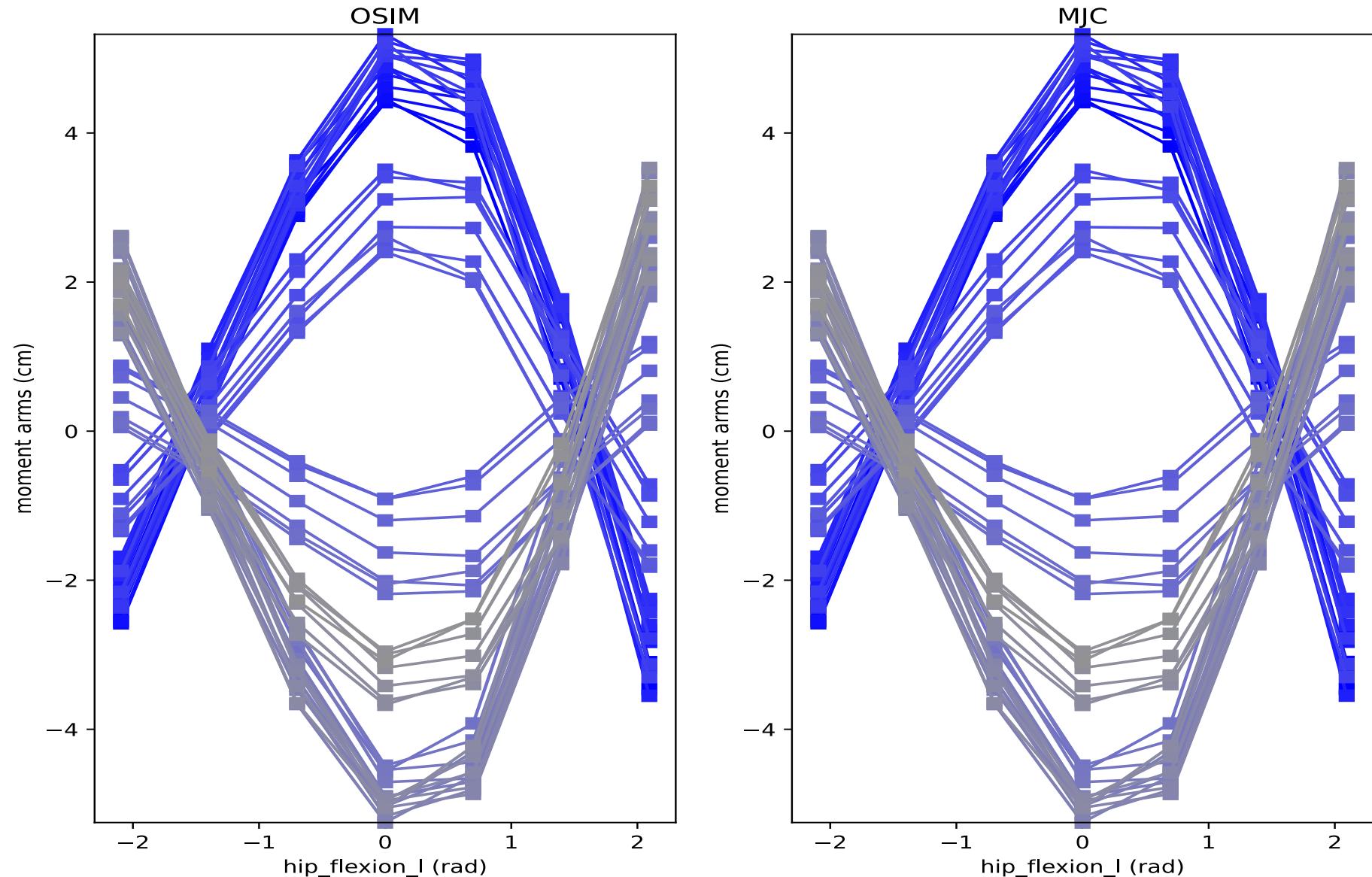
Muscle specific moment arm comparison with Osim model after optimization

glut_med3_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



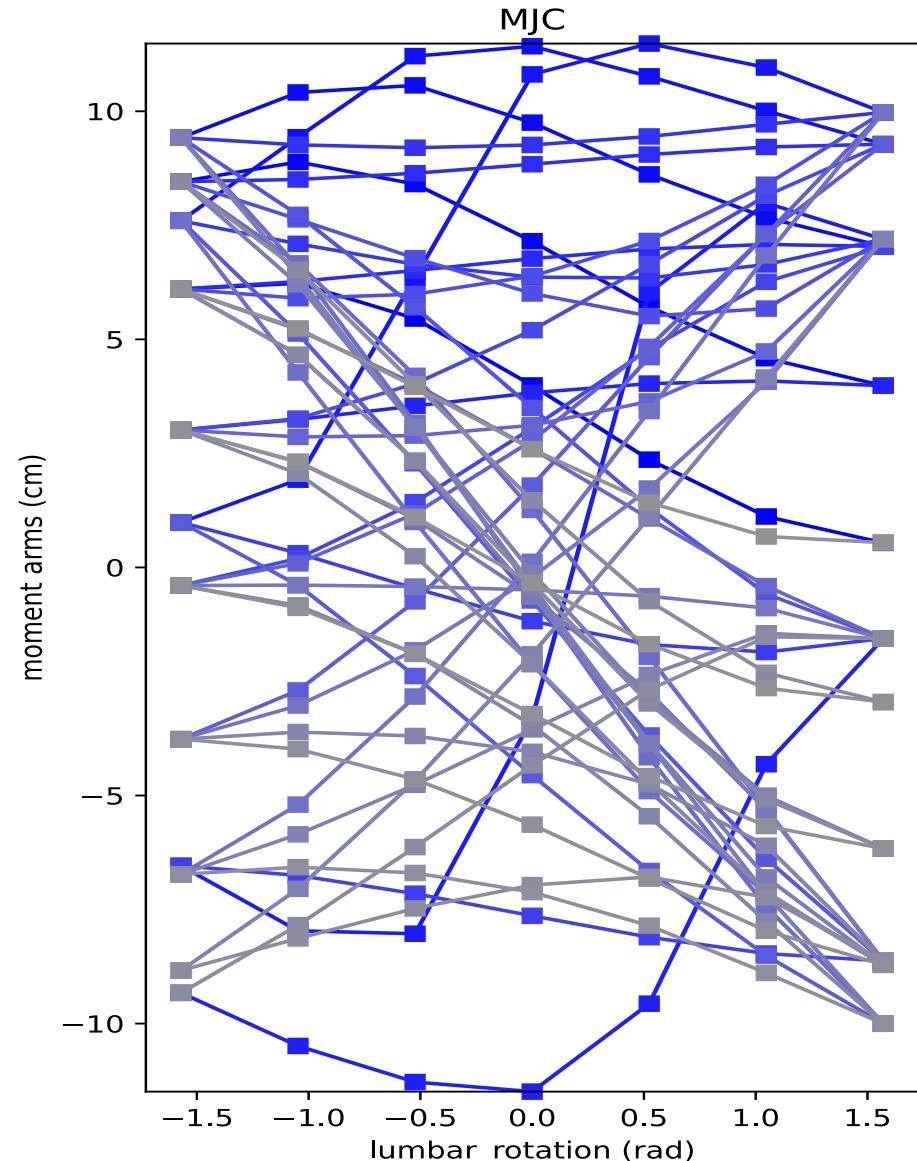
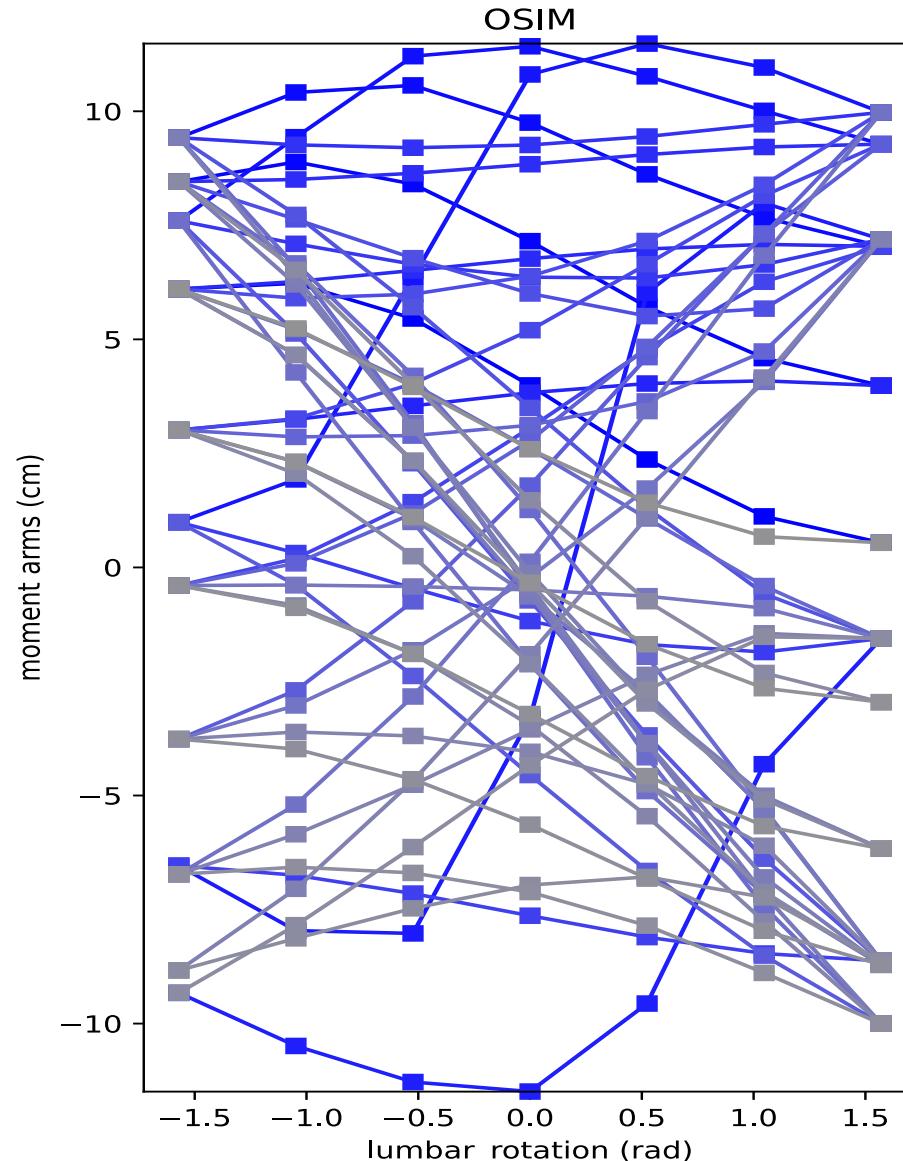
Muscle specific moment arm comparison with Osim model after optimization

add_mag2_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



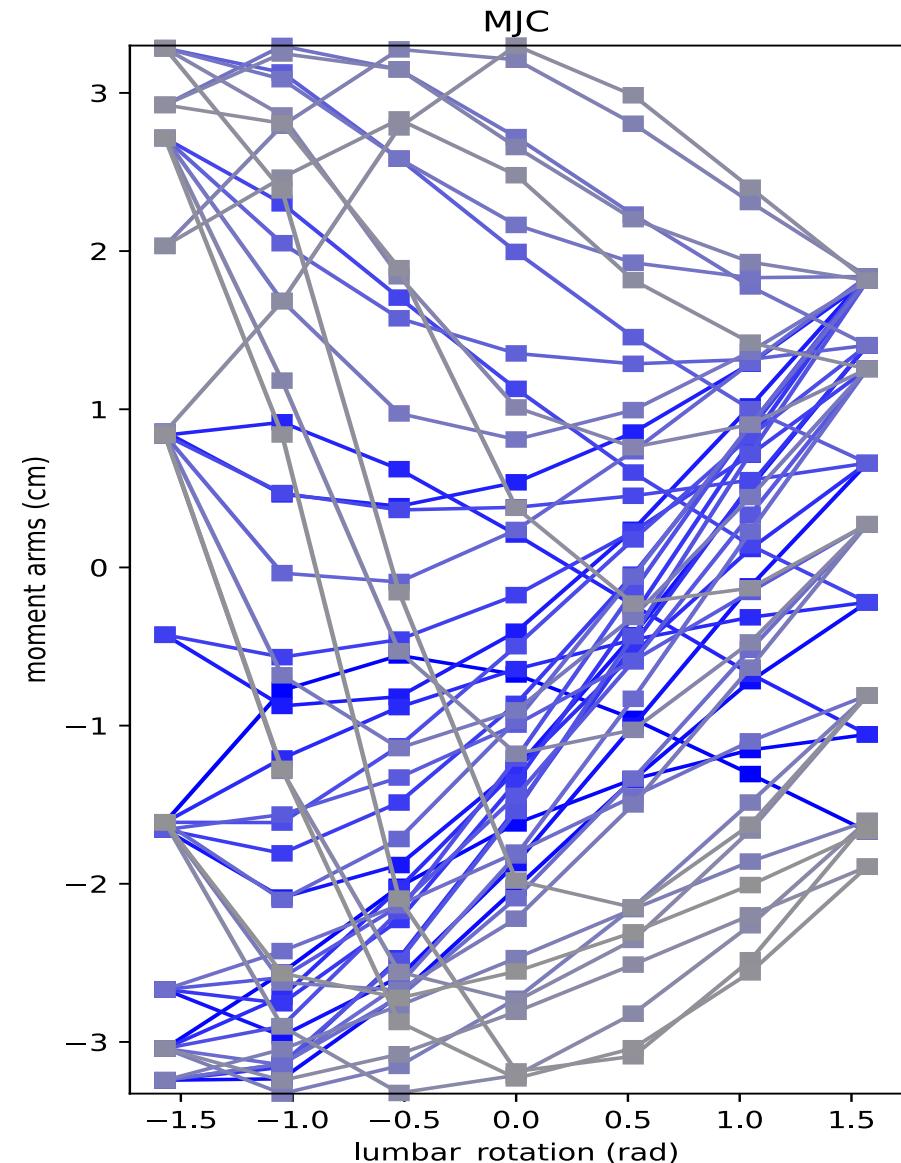
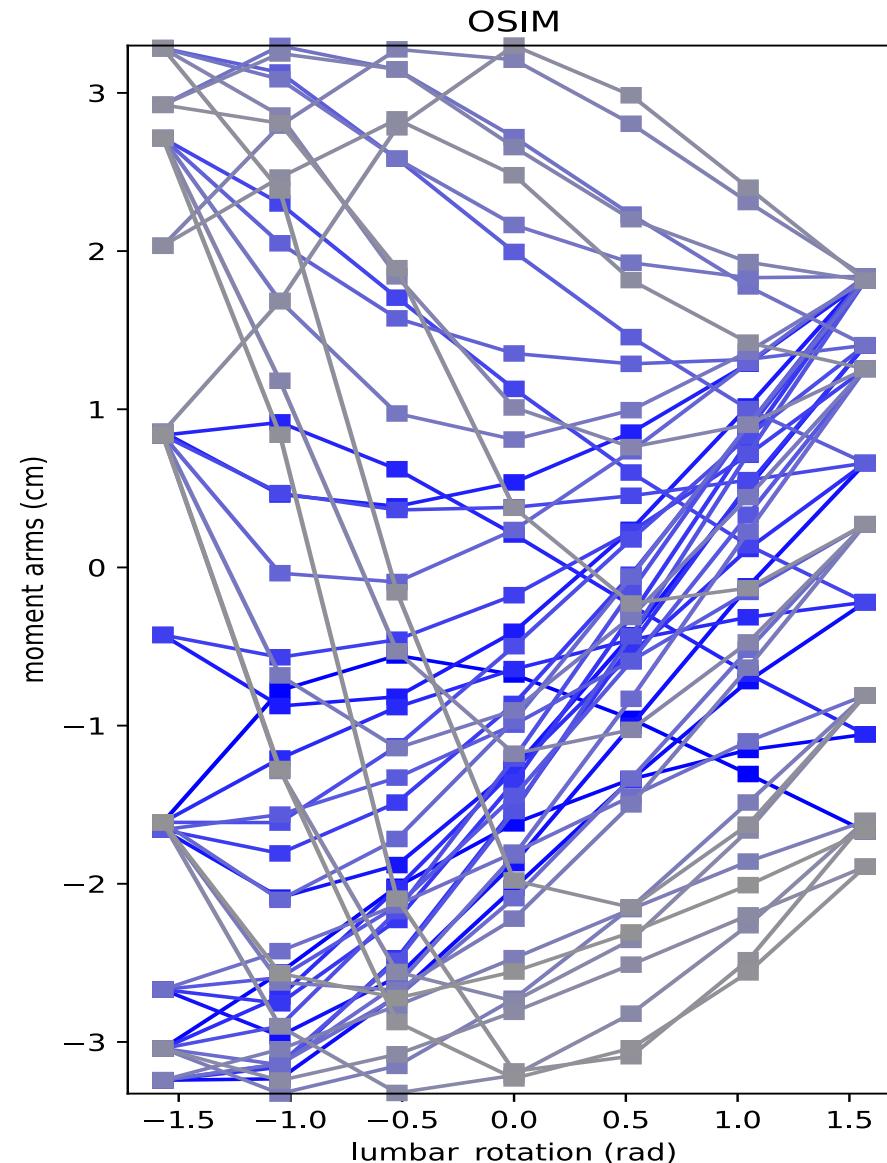
Muscle specific moment arm comparison with Osim model after optimization

extobl_r - lumbar_bending - lumbar_extension - lumbar_rotation



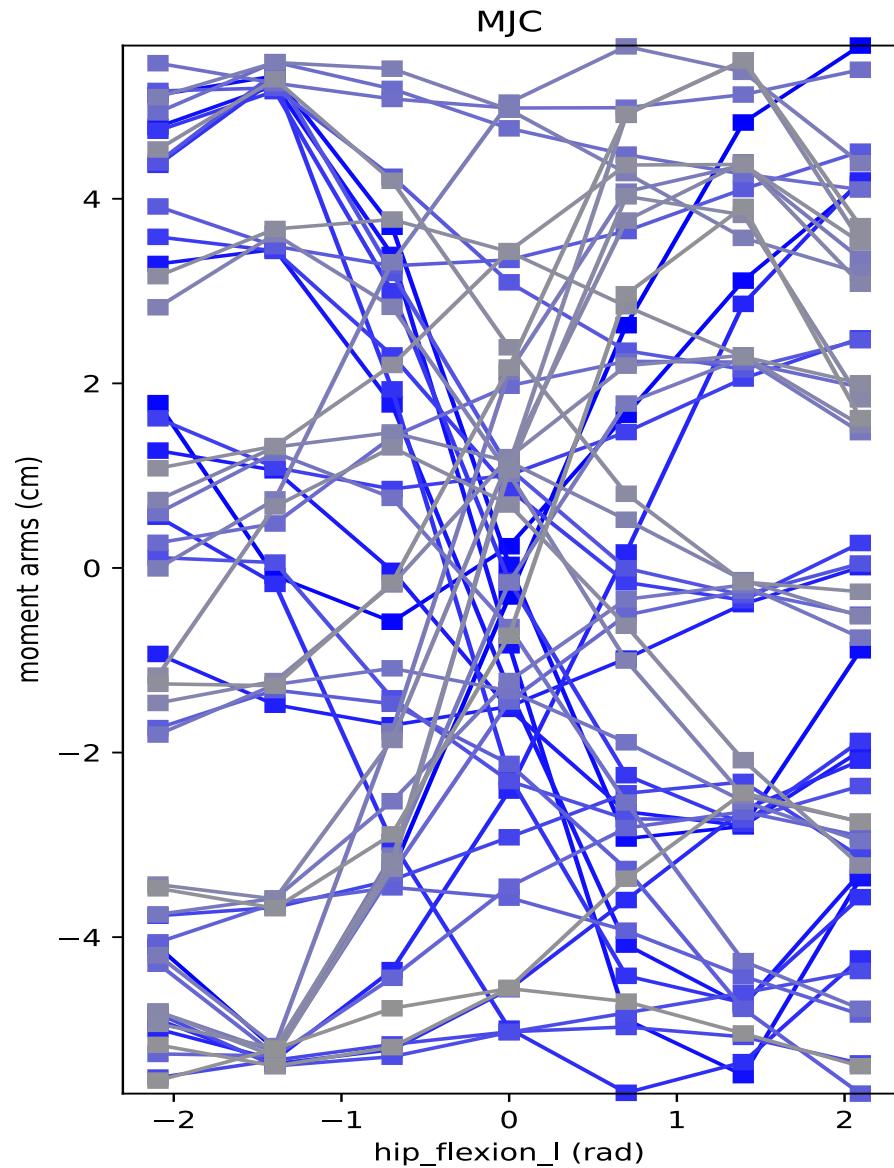
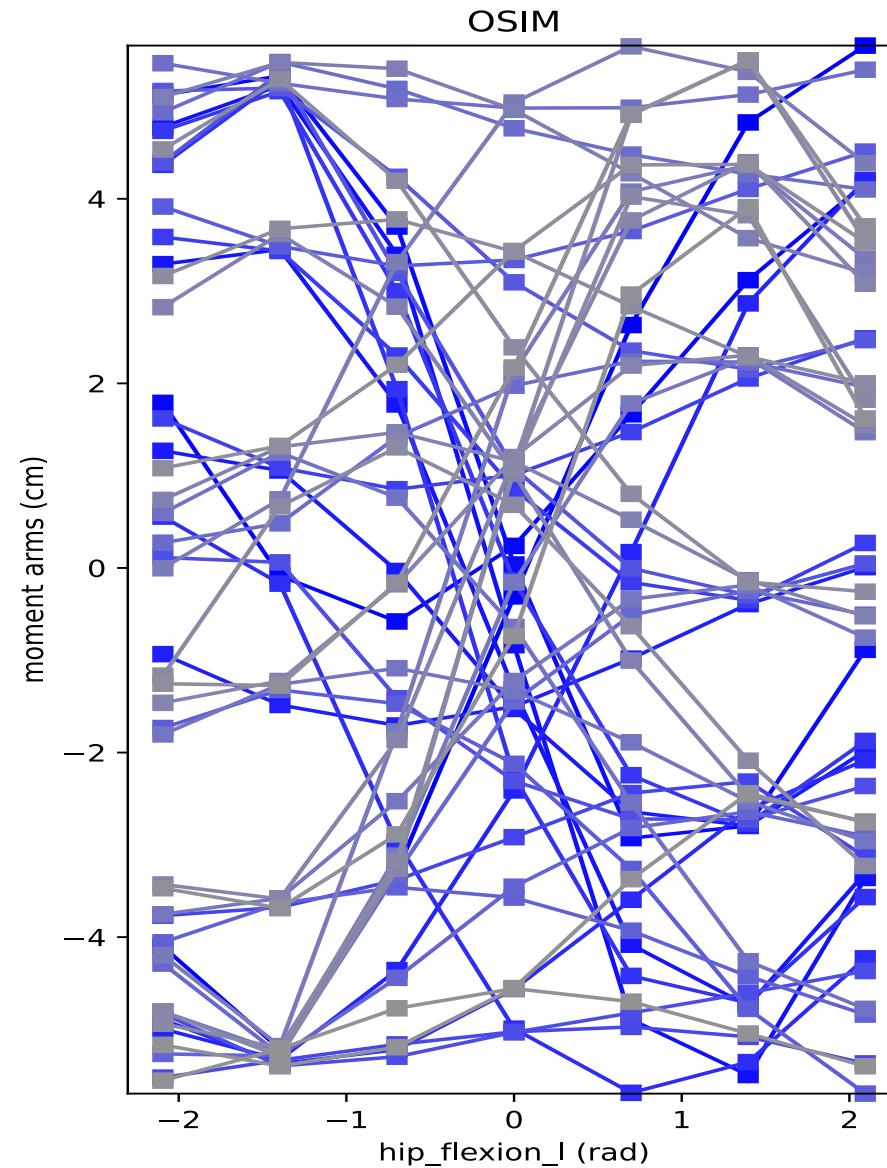
Muscle specific moment arm comparison with Osim model after optimization

ercspn_I - lumbar_bending - lumbar_extension - lumbar_rotation



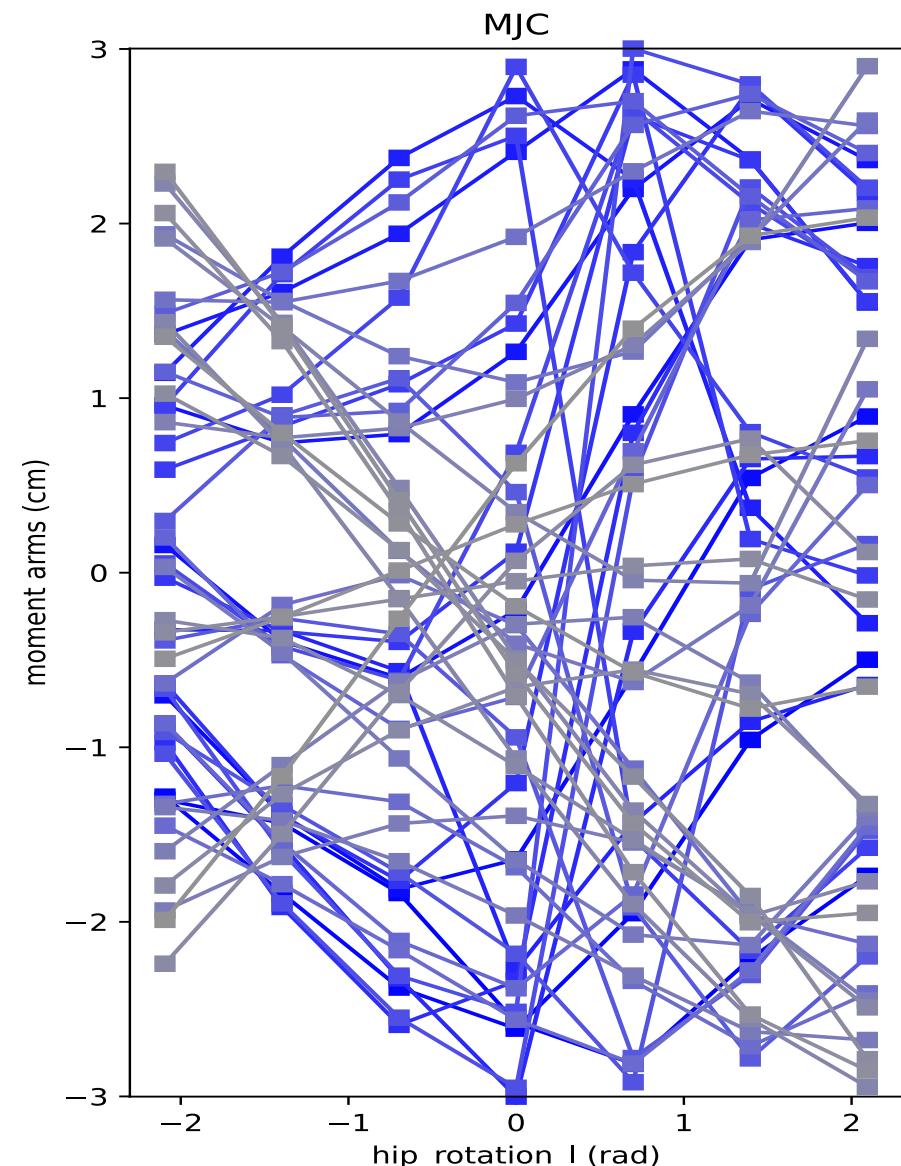
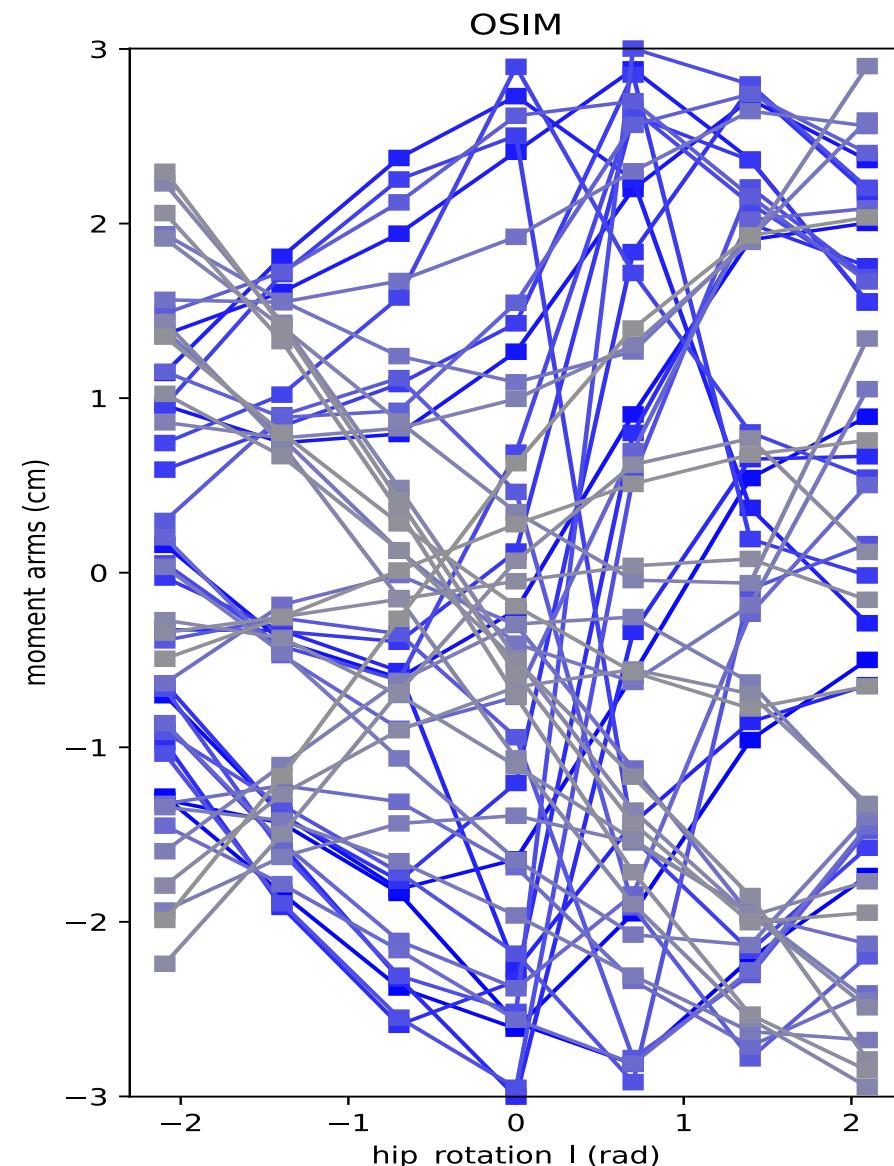
Muscle specific moment arm comparison with Osim model after optimization

glut_med1_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



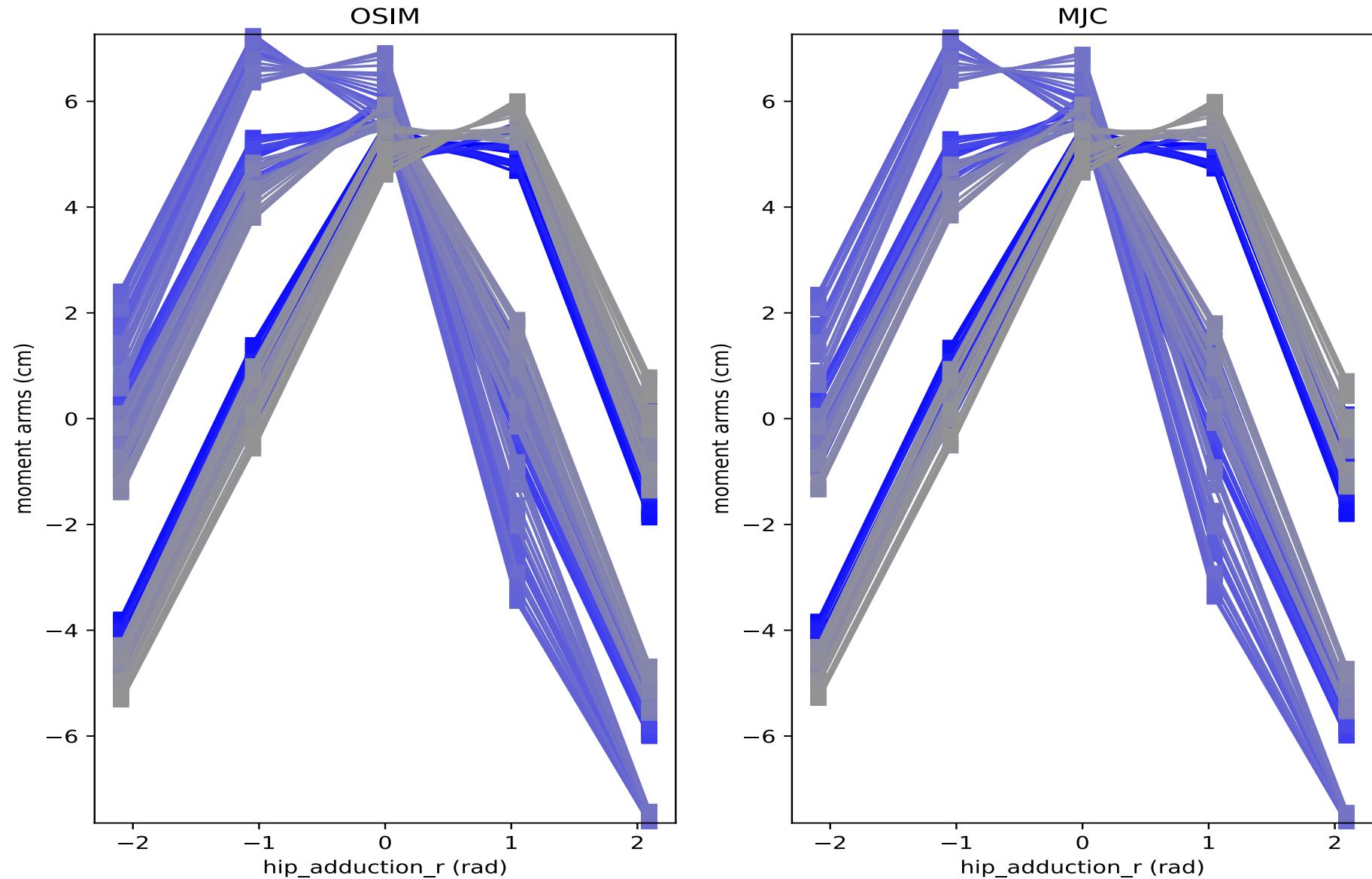
Muscle specific moment arm comparison with Osim model after optimization

glut_max3_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



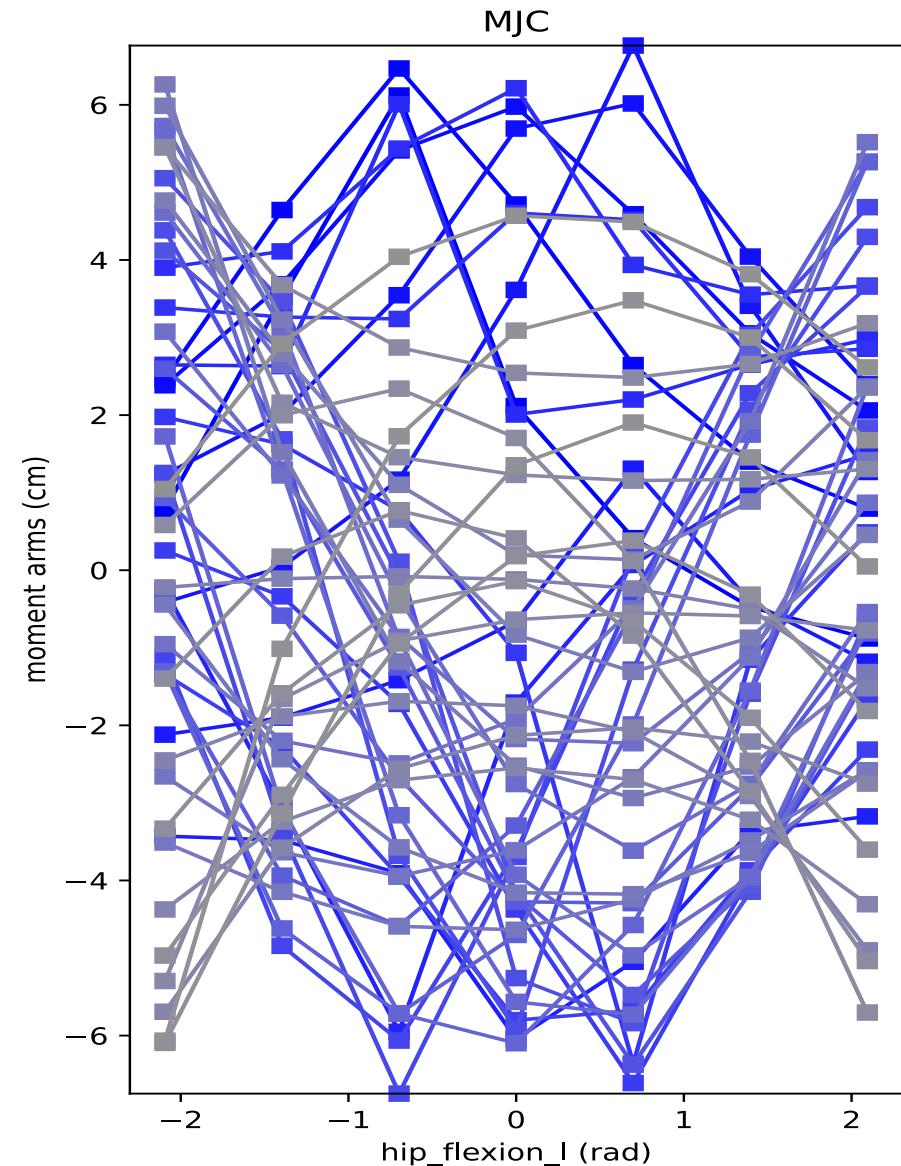
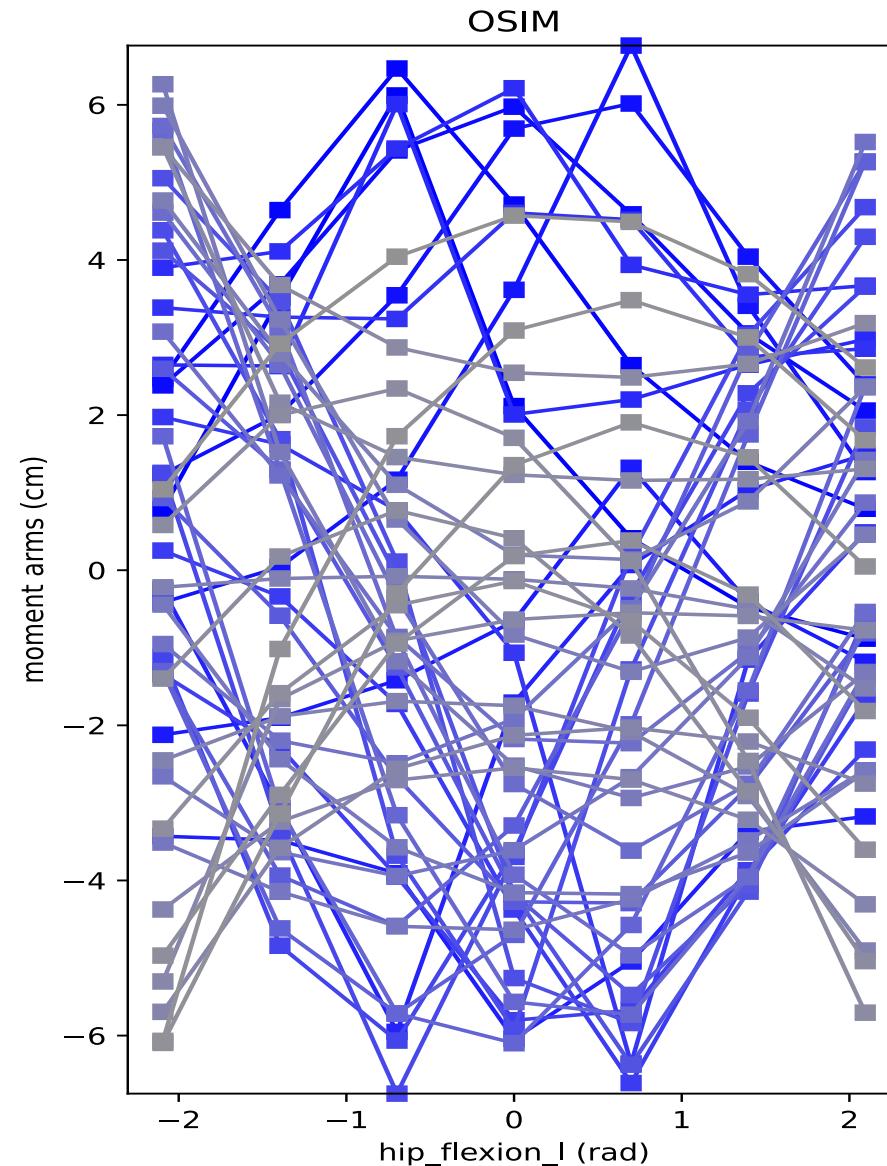
Muscle specific moment arm comparison with Osim model after optimization

grac_r - hip_adduction_r - hip_flexion_r - hip_rotation_r - knee_angle_r



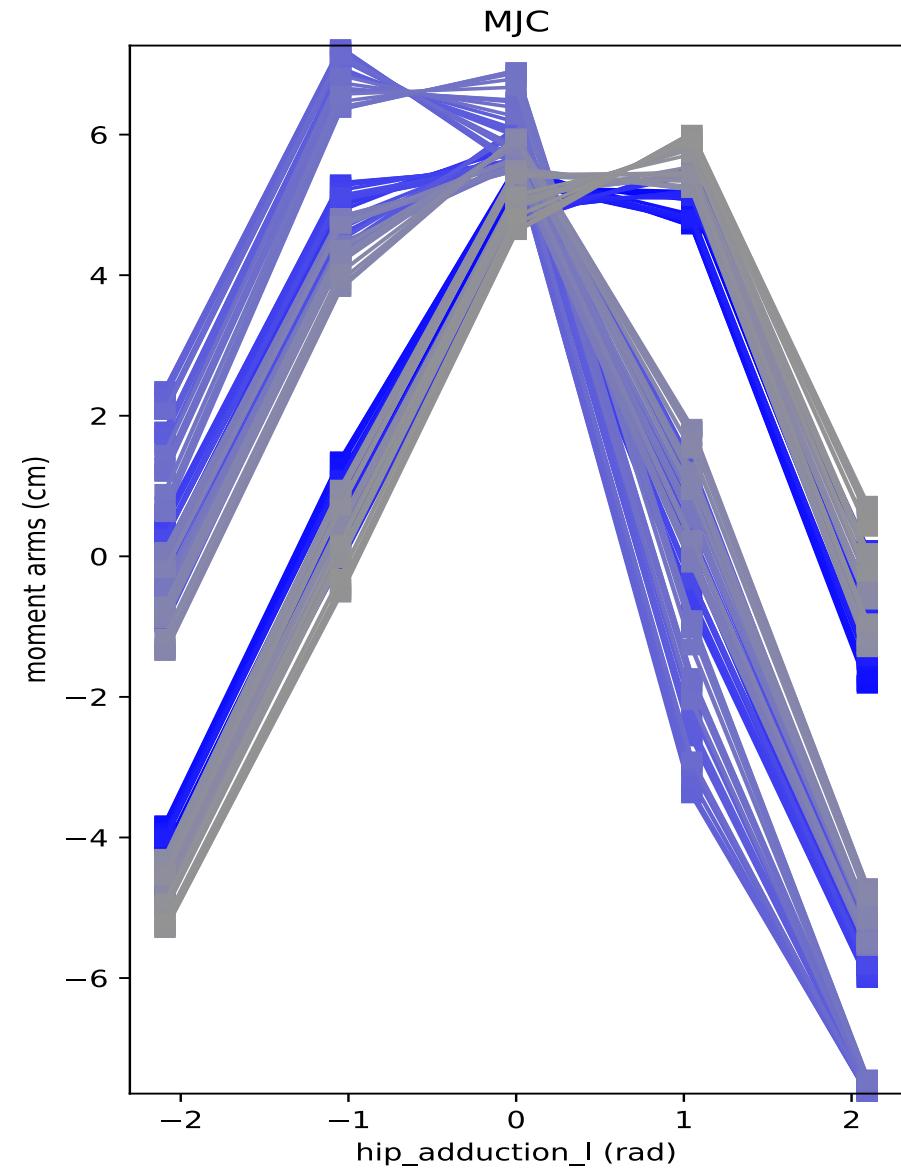
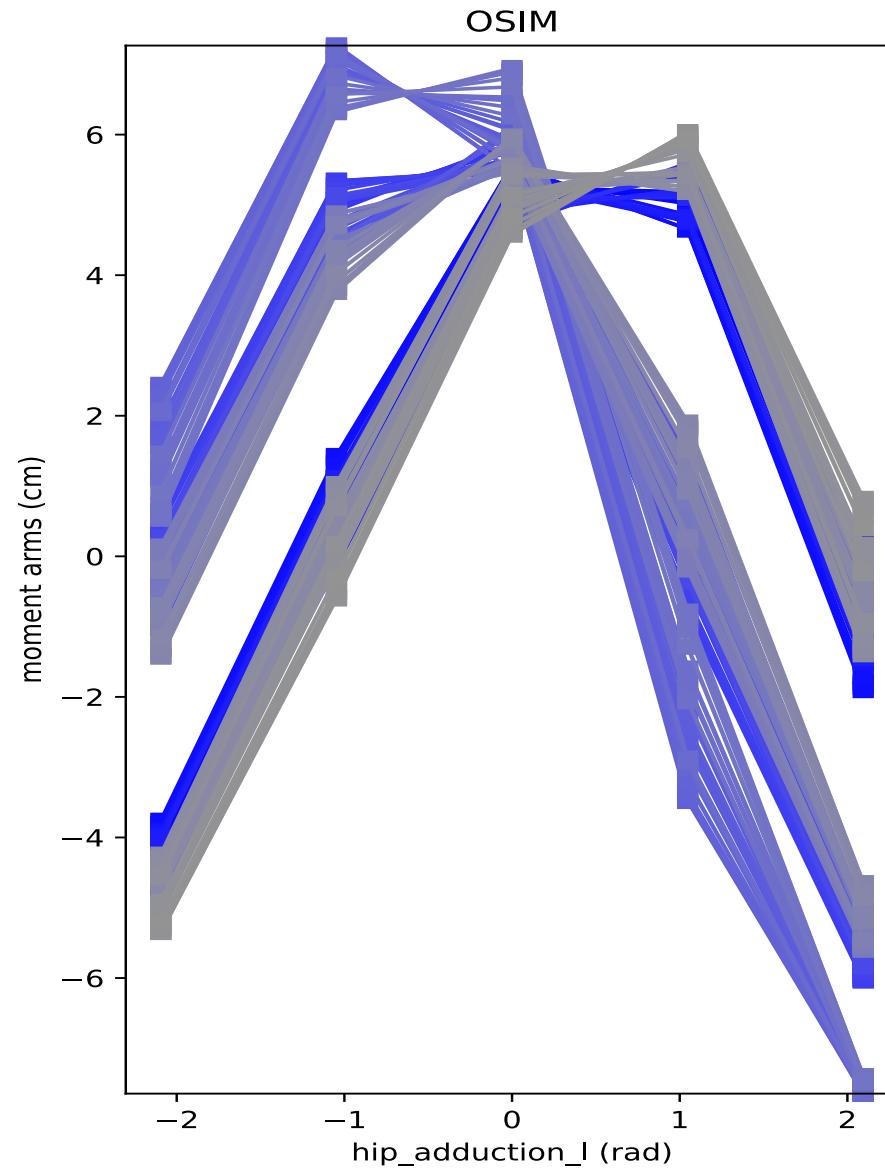
Muscle specific moment arm comparison with Osim model after optimization

glut_max2_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



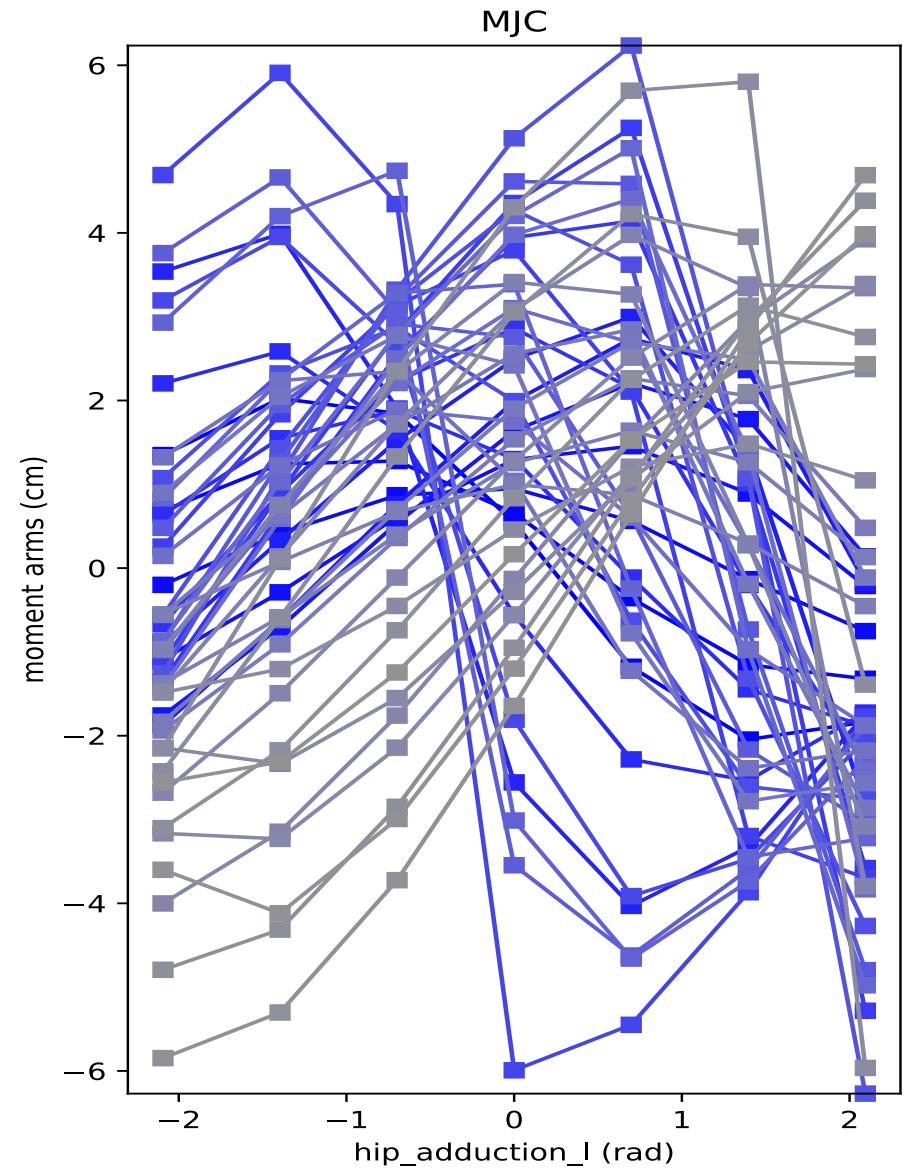
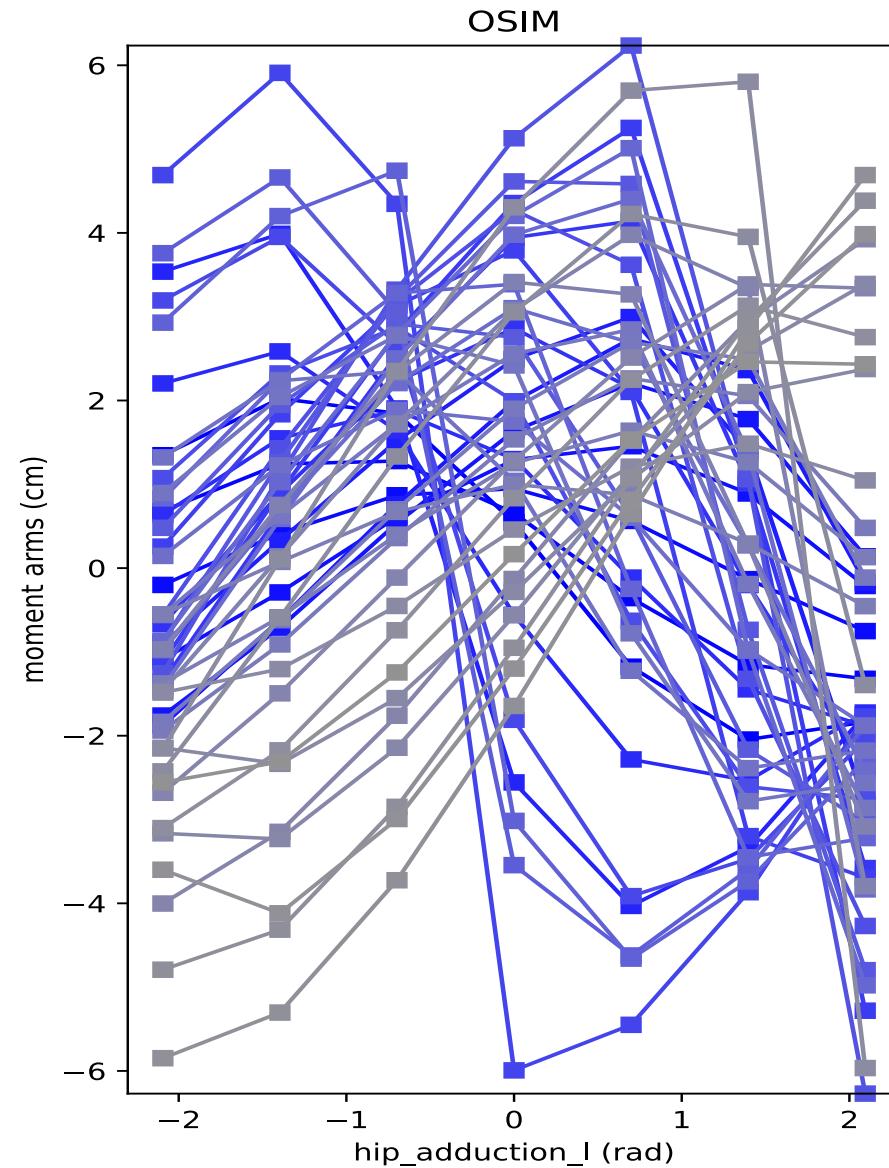
Muscle specific moment arm comparison with Osim model after optimization

grac_I - hip_adduction_I - hip_flexion_I - hip_rotation_I - knee_angle_I



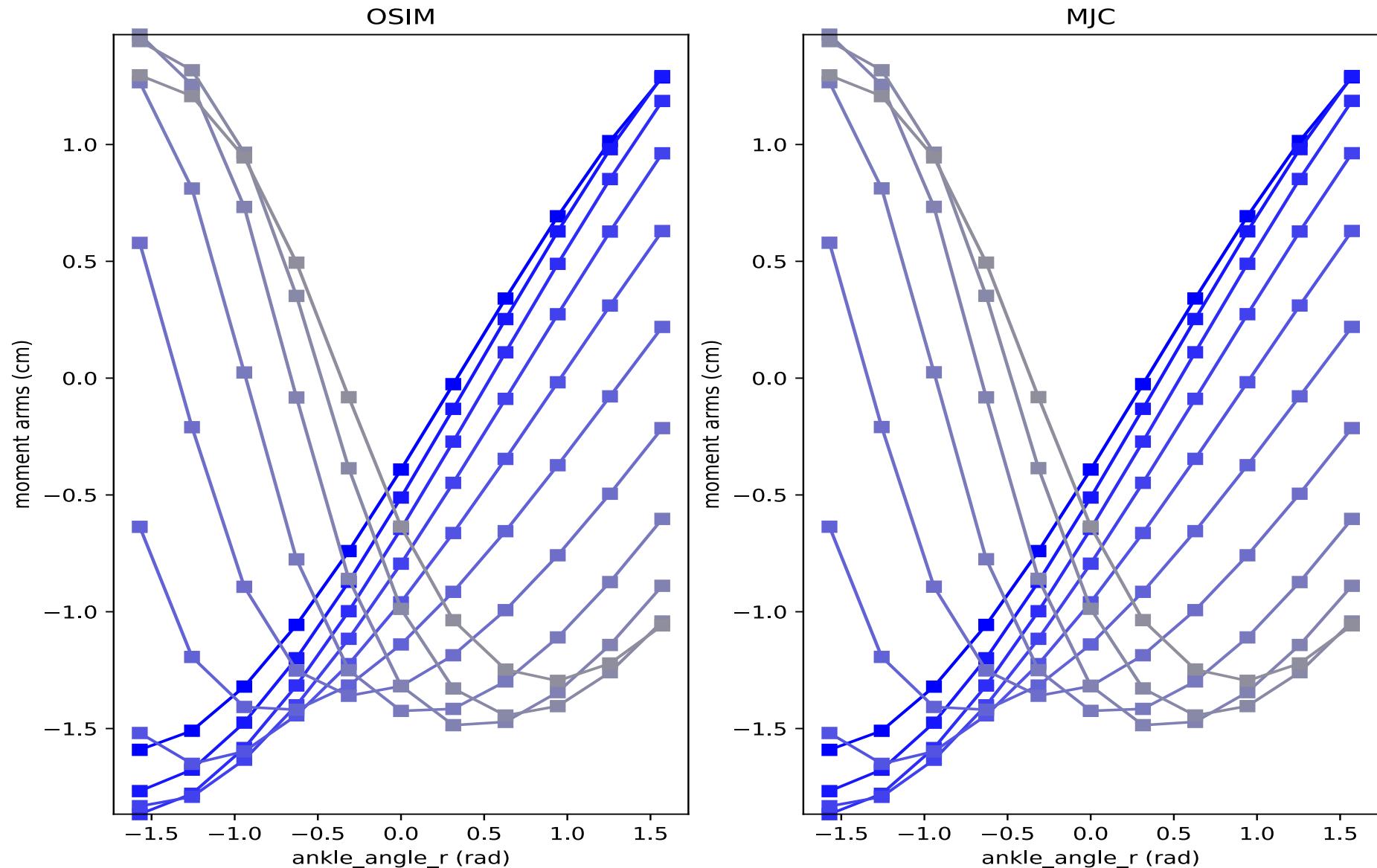
Muscle specific moment arm comparison with Osim model after optimization

quad_fem_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



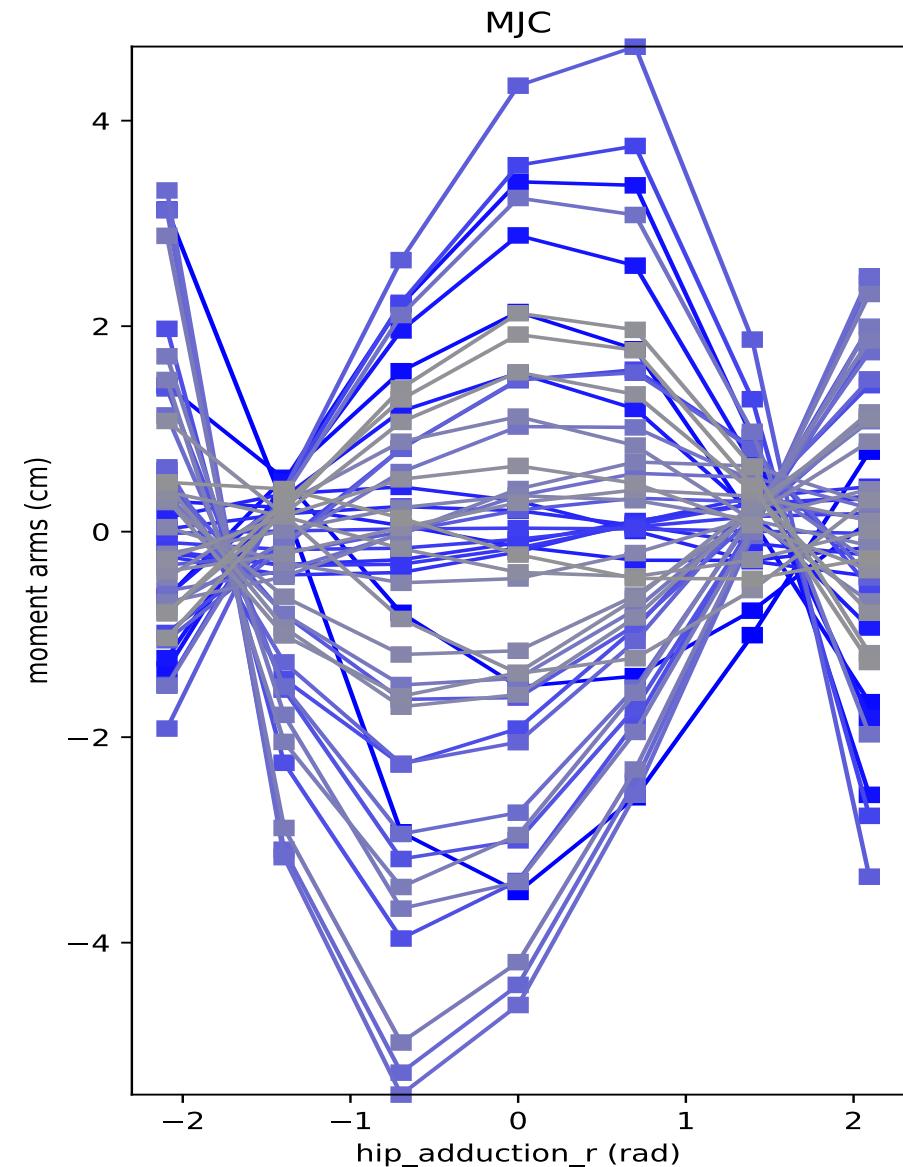
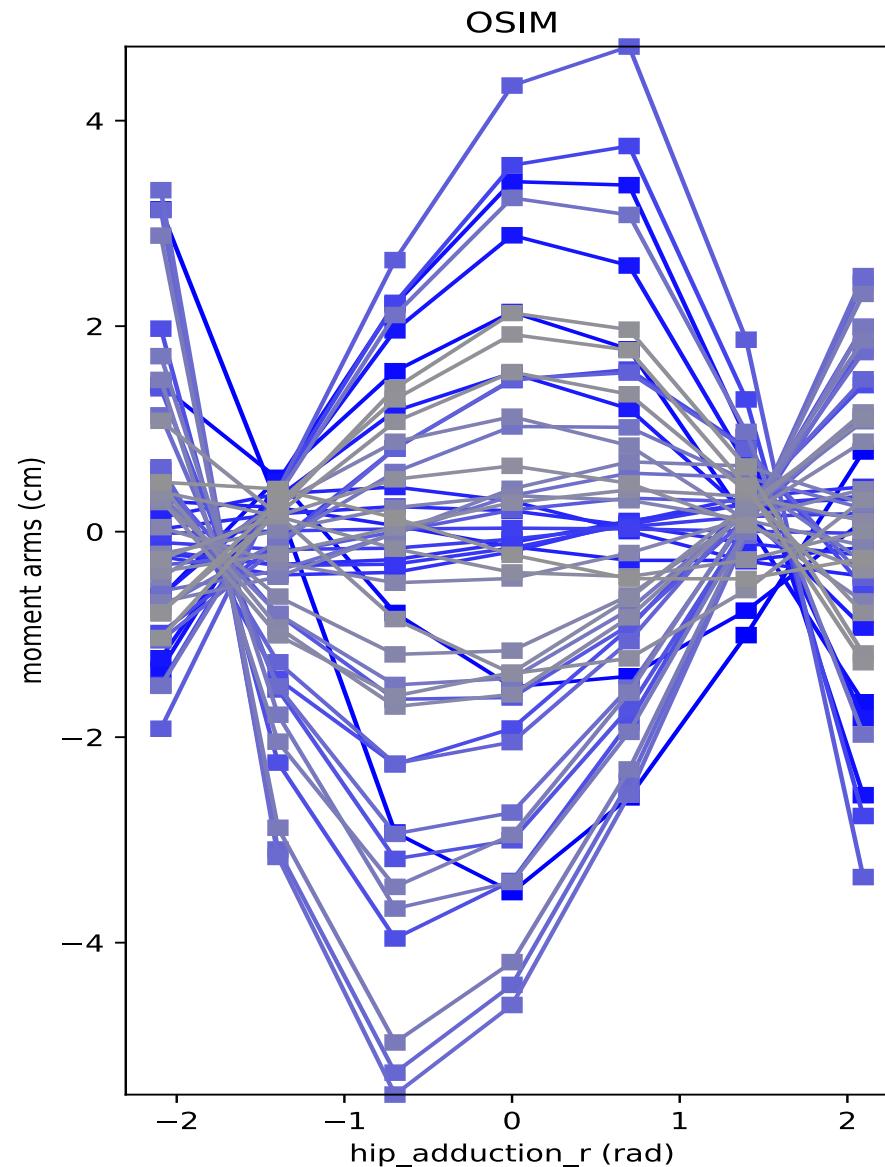
Muscle specific moment arm comparison with Osim model after optimization

tib_post_r - ankle_angle_r - subtalar_angle_r



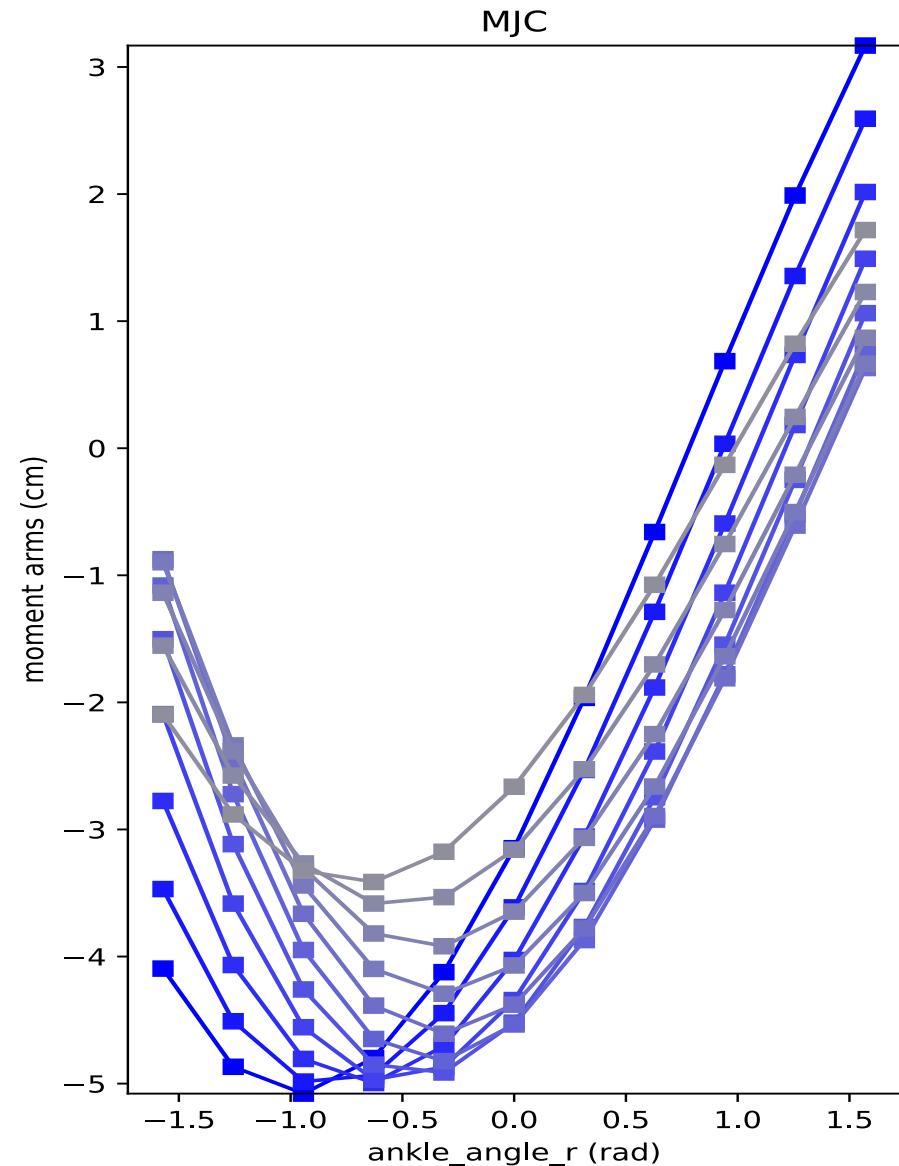
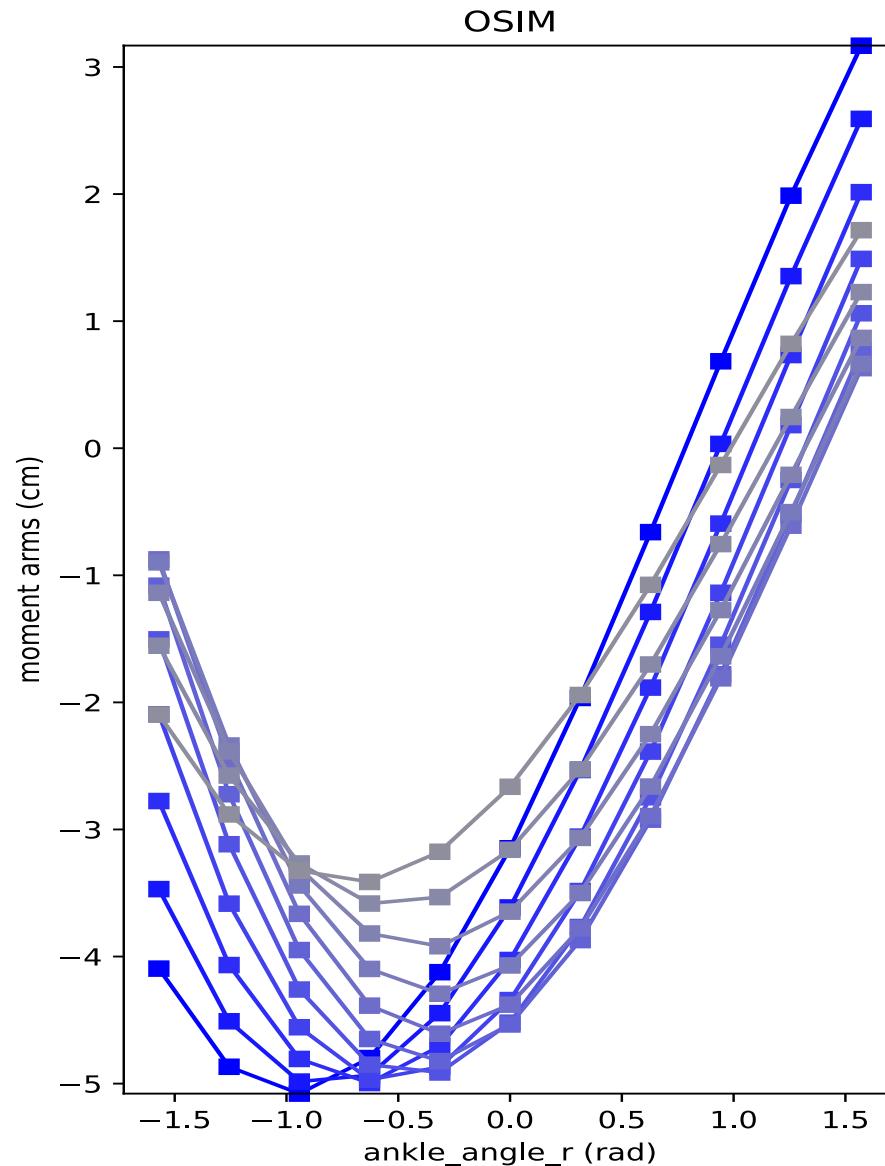
Muscle specific moment arm comparison with Osim model after optimization

glut_med2_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



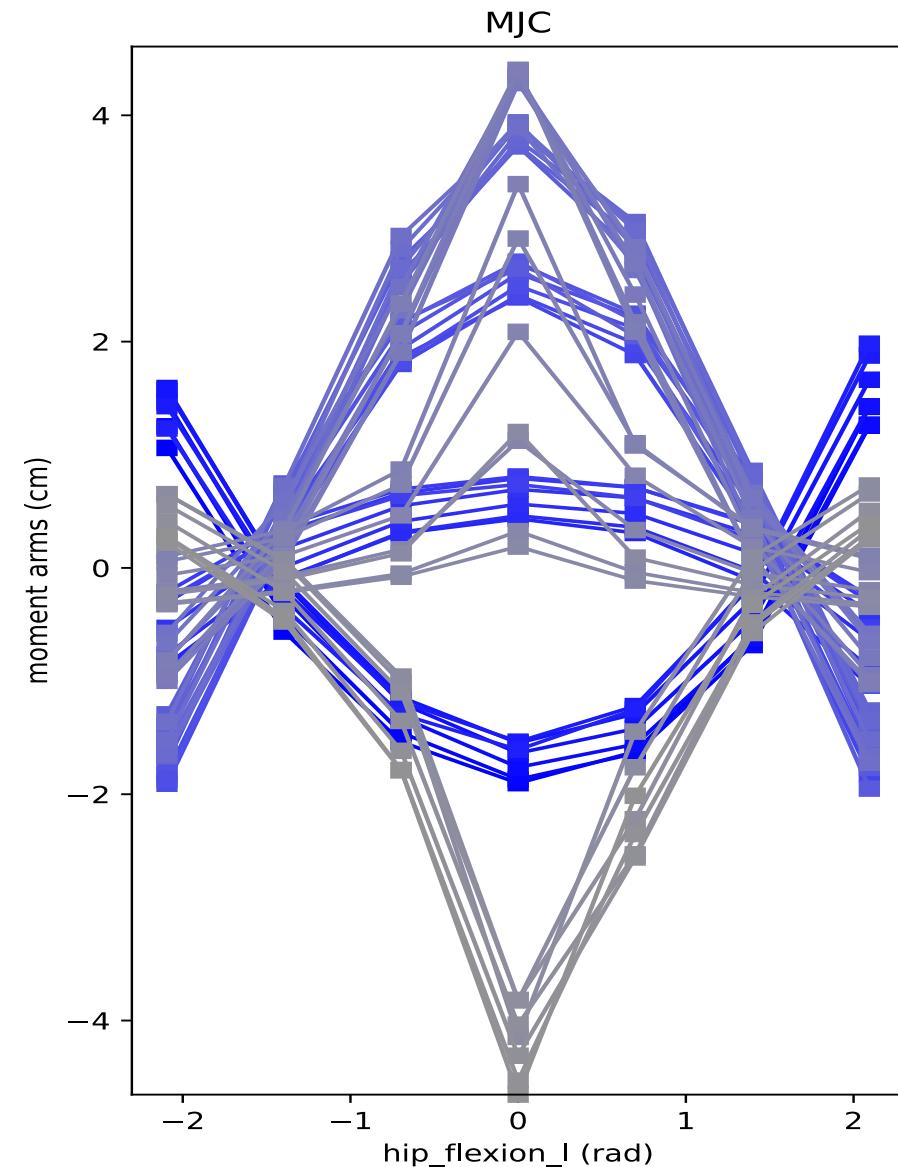
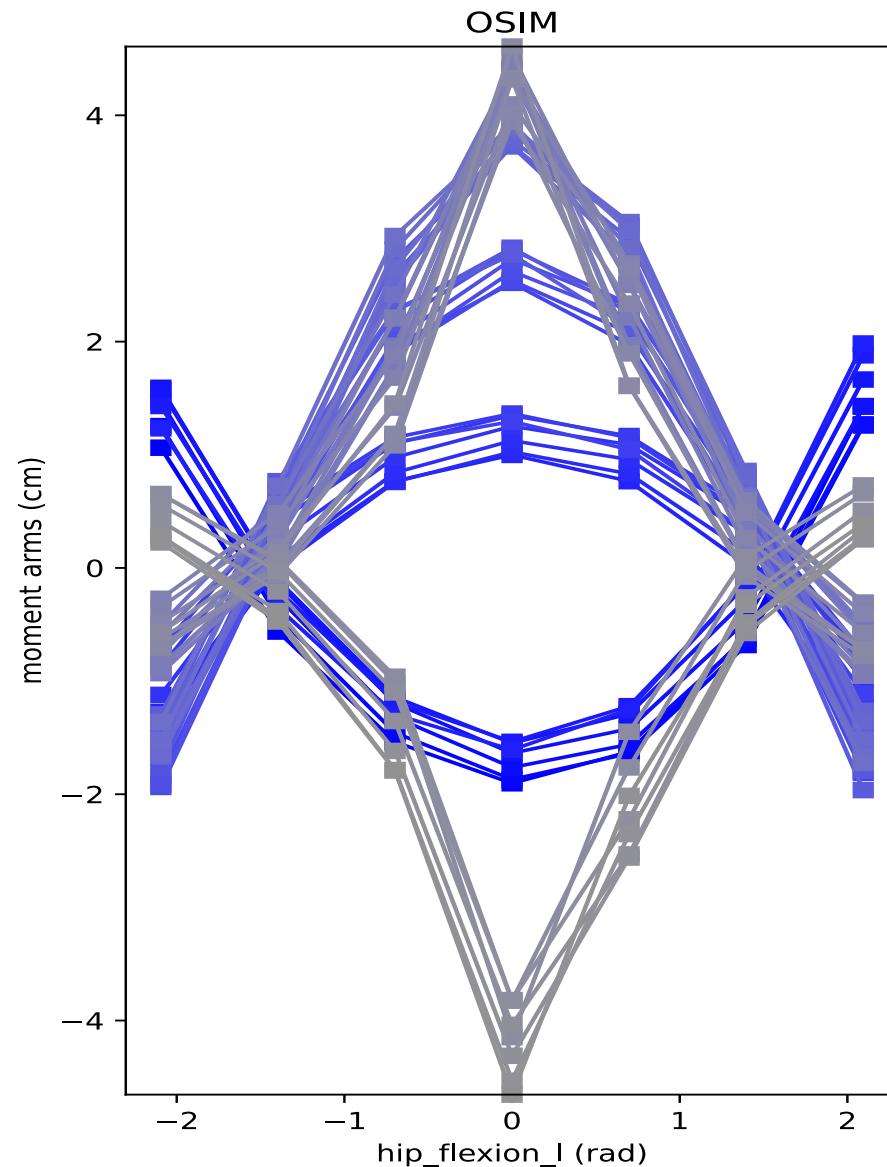
Muscle specific moment arm comparison with Osim model after optimization

soleus_r - ankle_angle_r - subtalar_angle_r



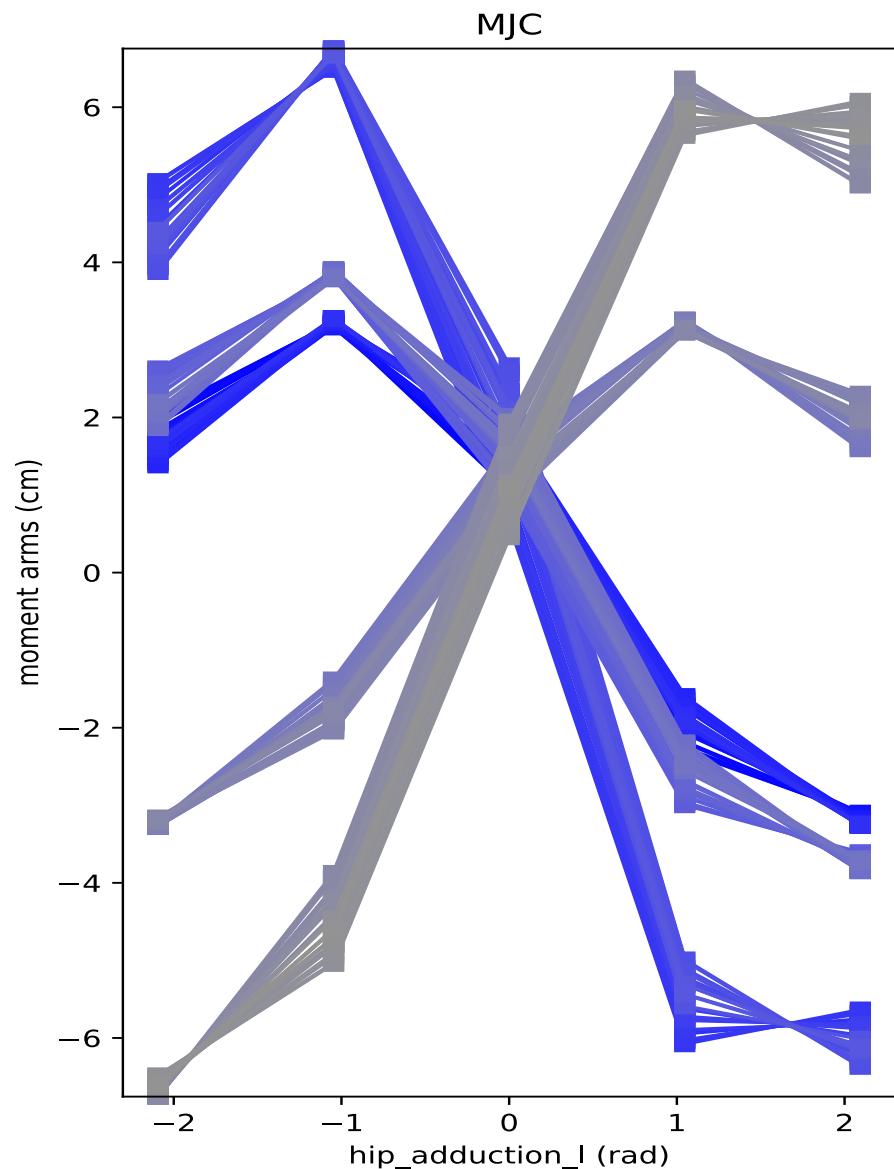
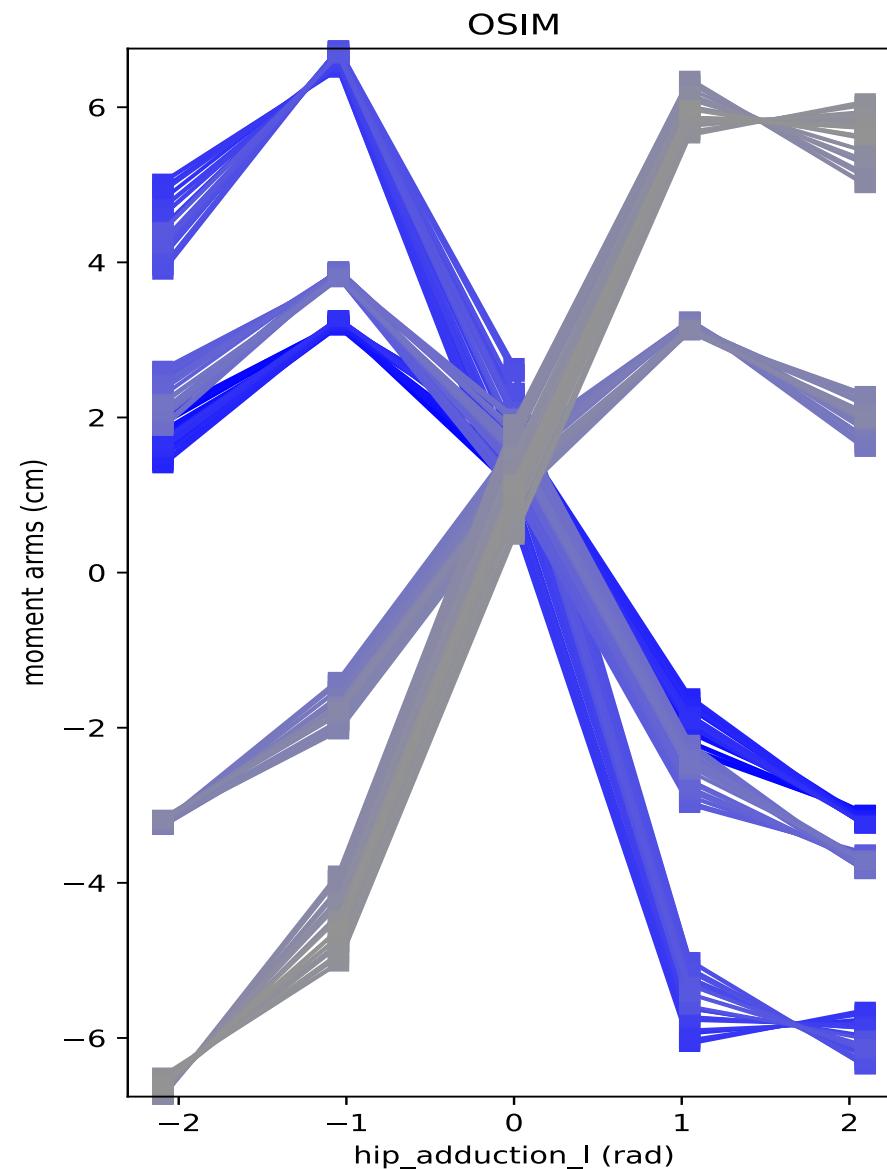
Muscle specific moment arm comparison with Osim model after optimization

psoas_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



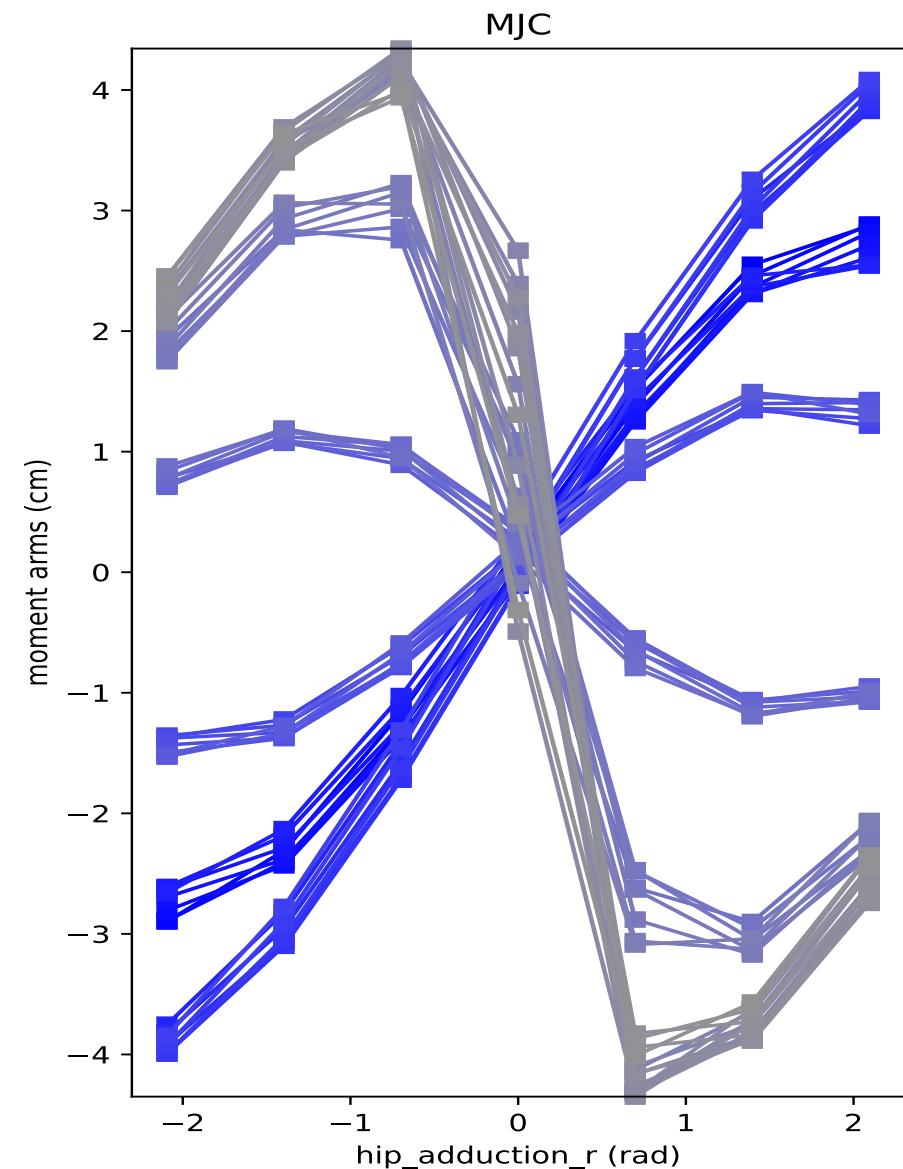
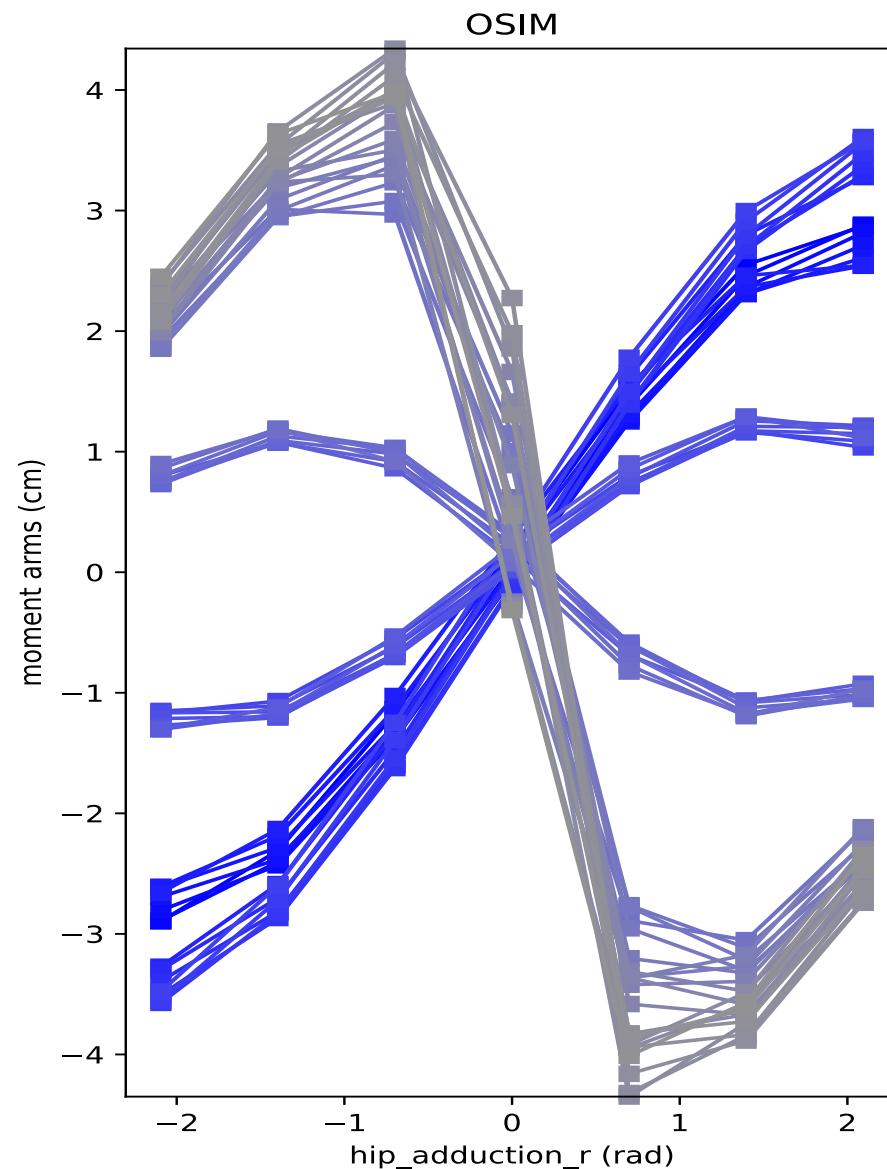
Muscle specific moment arm comparison with Osim model after optimization

bifemlh_I - hip_adduction_I - hip_flexion_I - hip_rotation_I - knee_angle_I



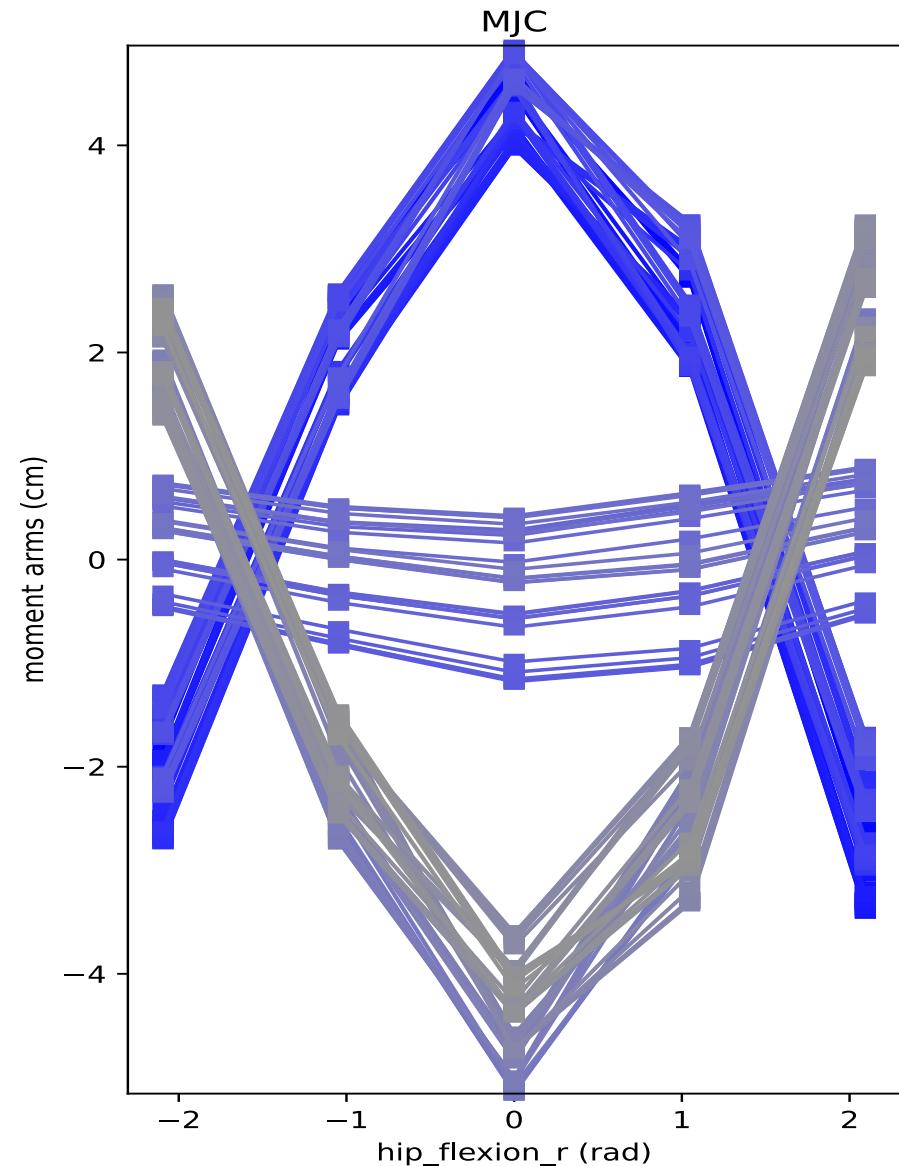
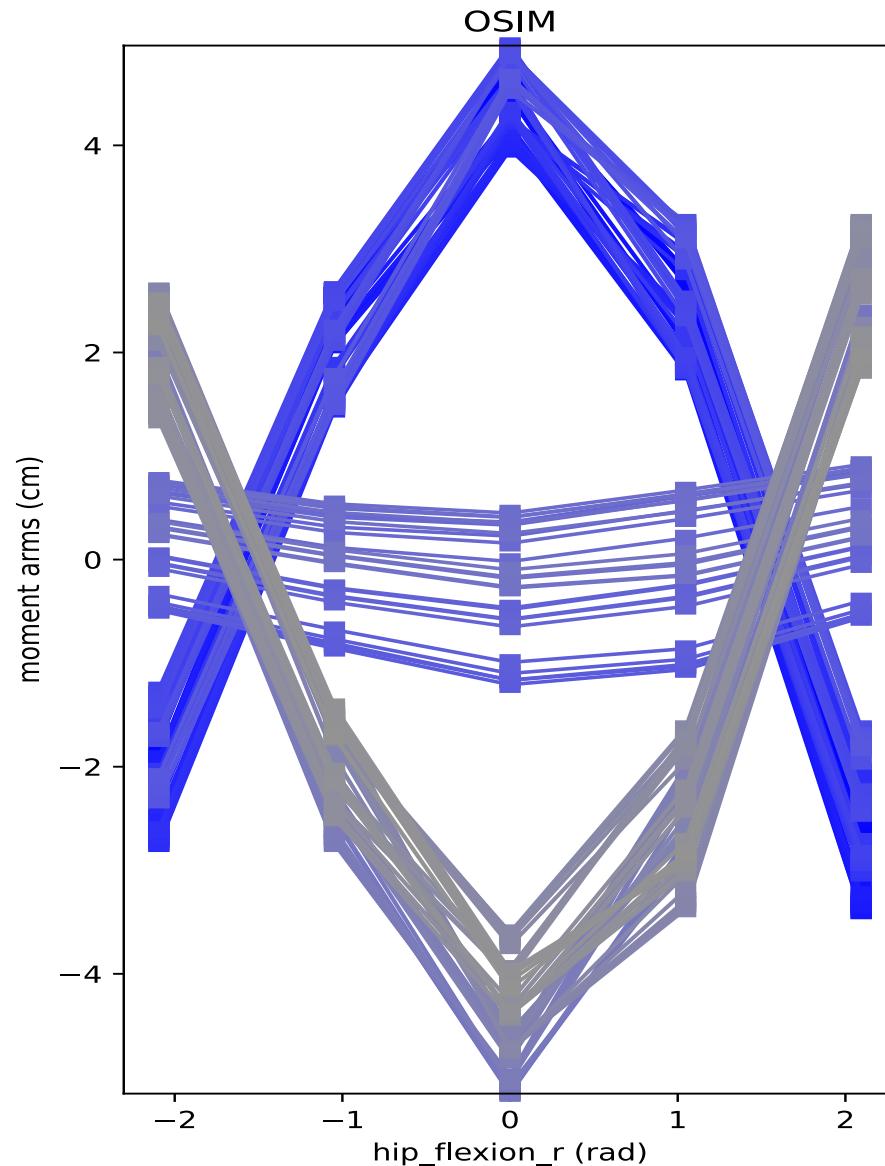
Muscle specific moment arm comparison with Osim model after optimization

iliacus_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



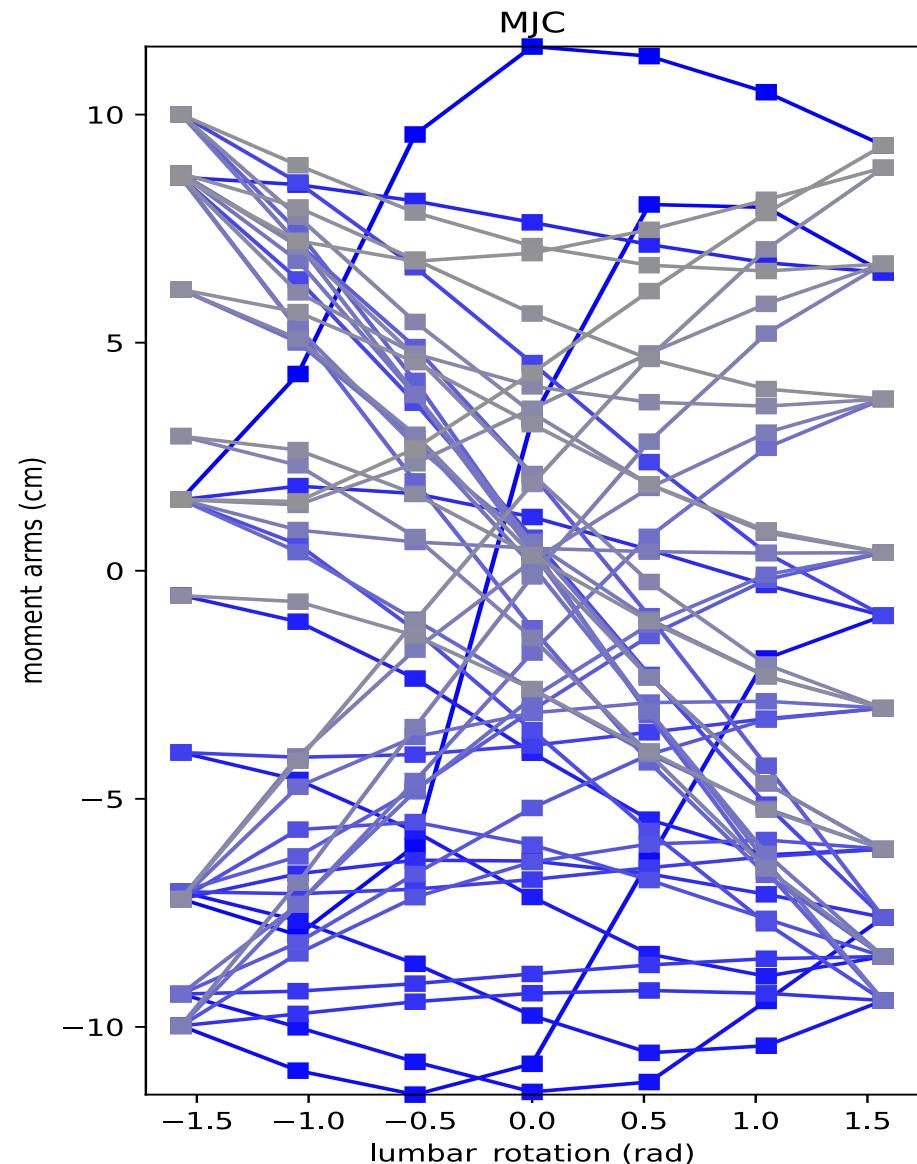
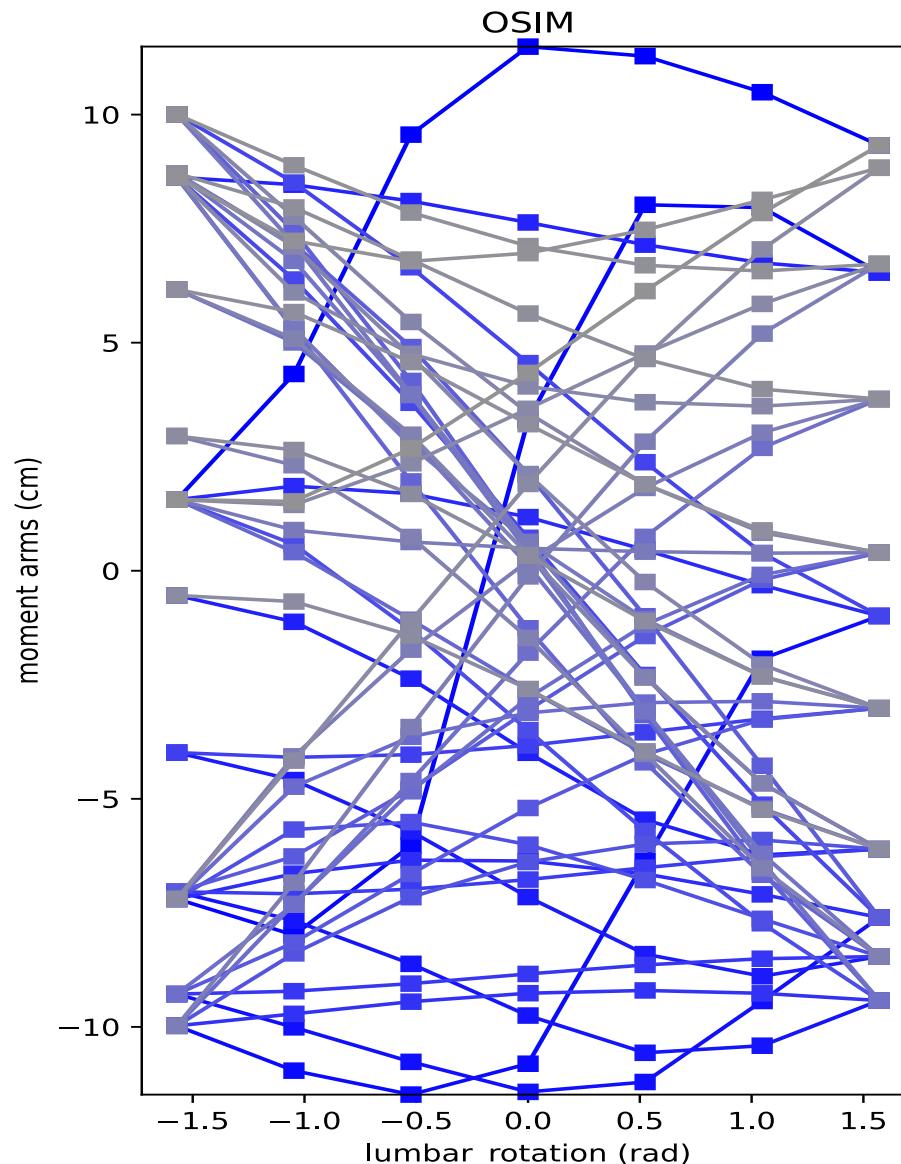
Muscle specific moment arm comparison with Osim model after optimization

grac_r - hip_adduction_r - hip_flexion_r - hip_rotation_r - knee_angle_r



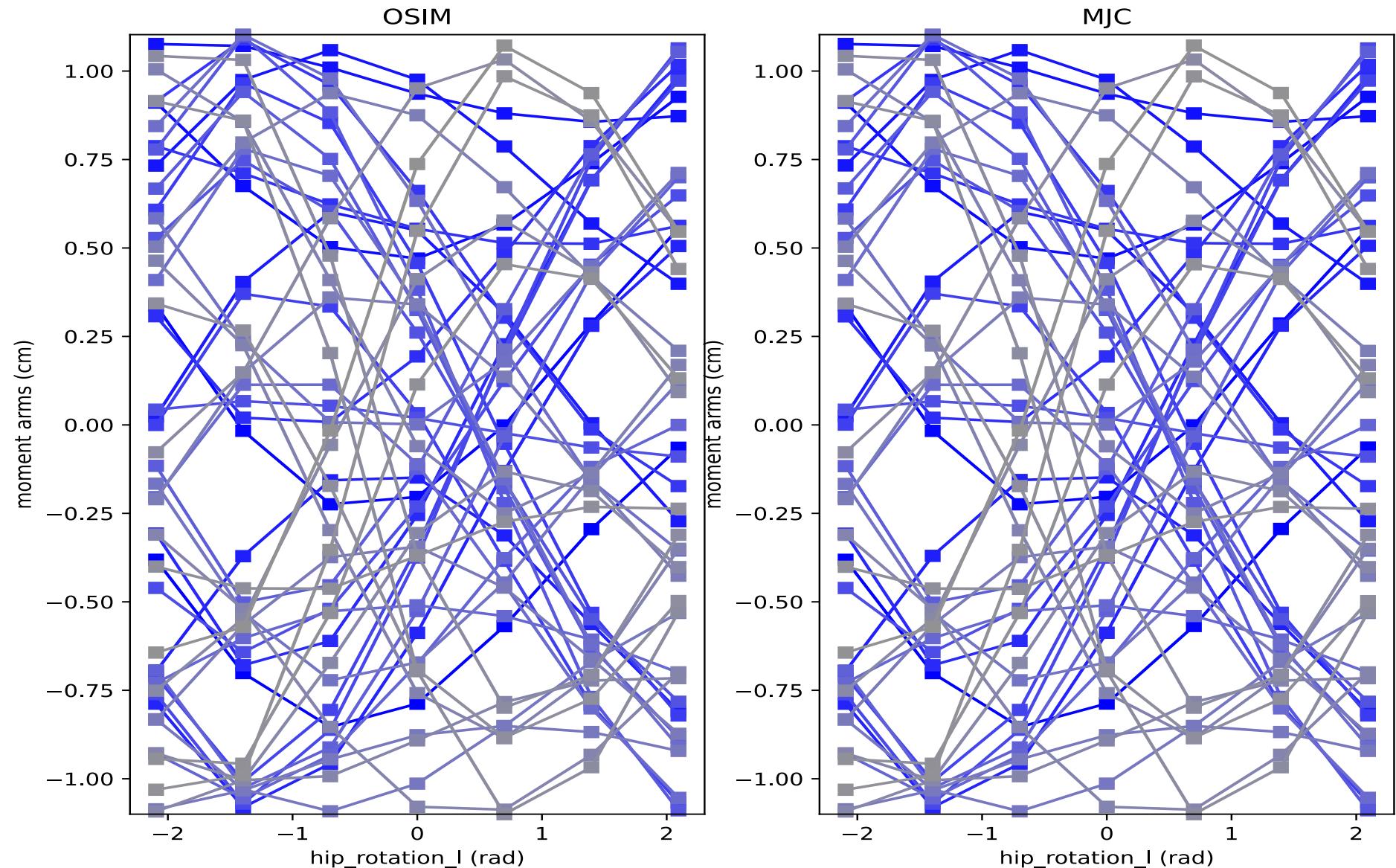
Muscle specific moment arm comparison with Osim model after optimization

extobl_I - lumbar_bending - lumbar_extension - lumbar_rotation



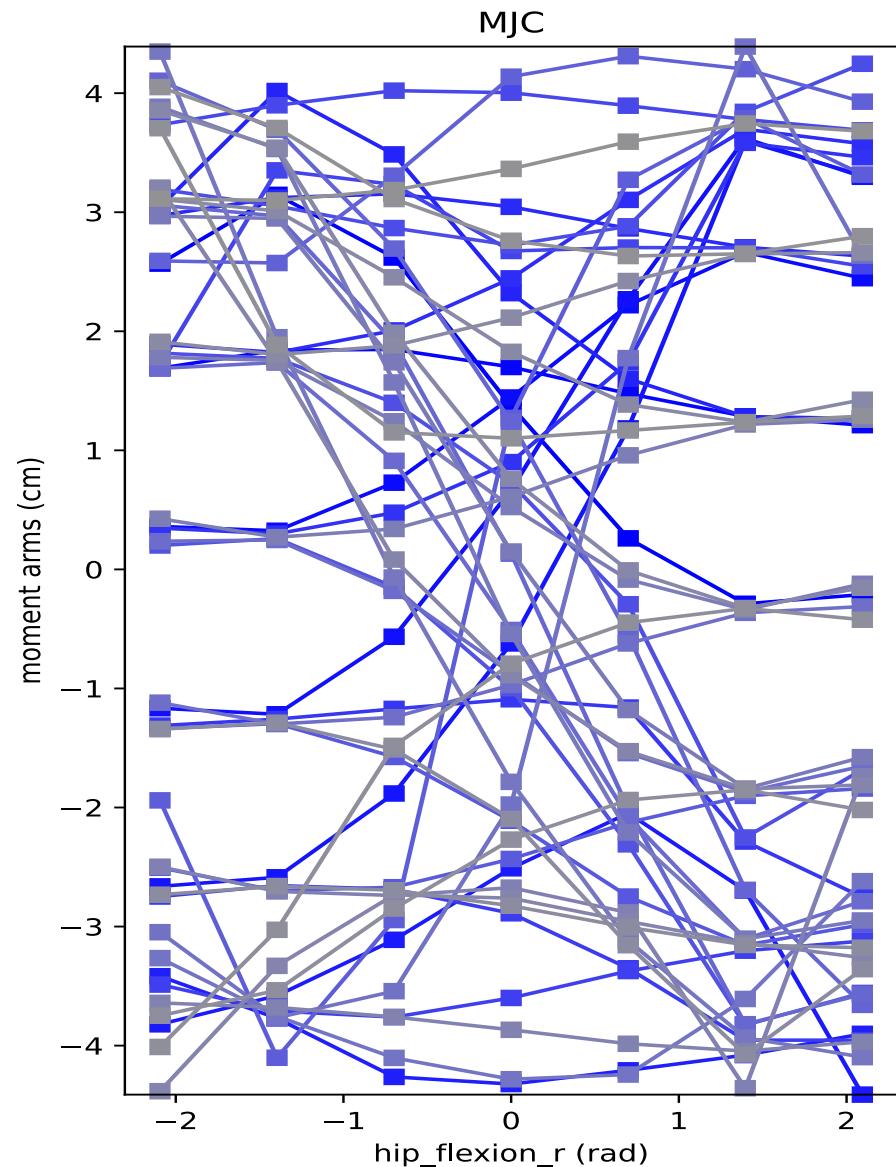
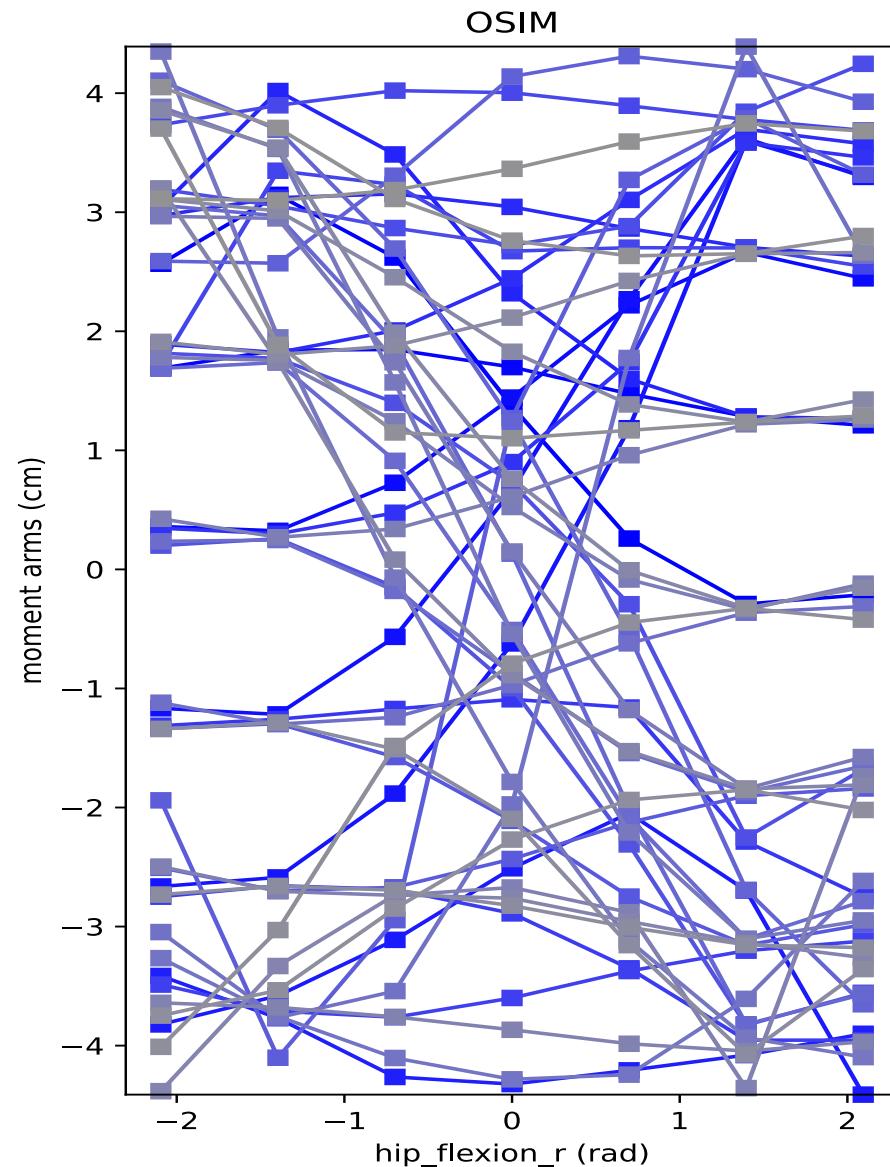
Muscle specific moment arm comparison with Osim model after optimization

sar_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



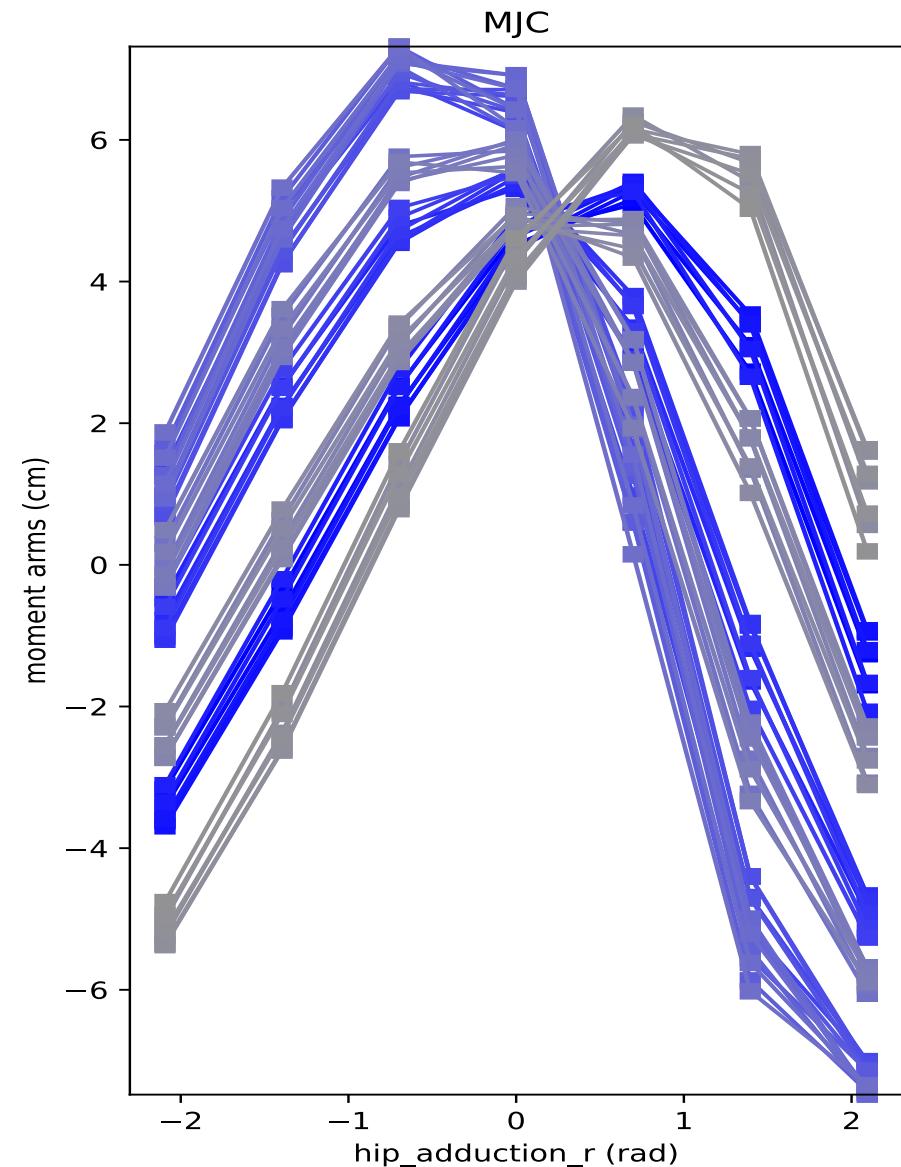
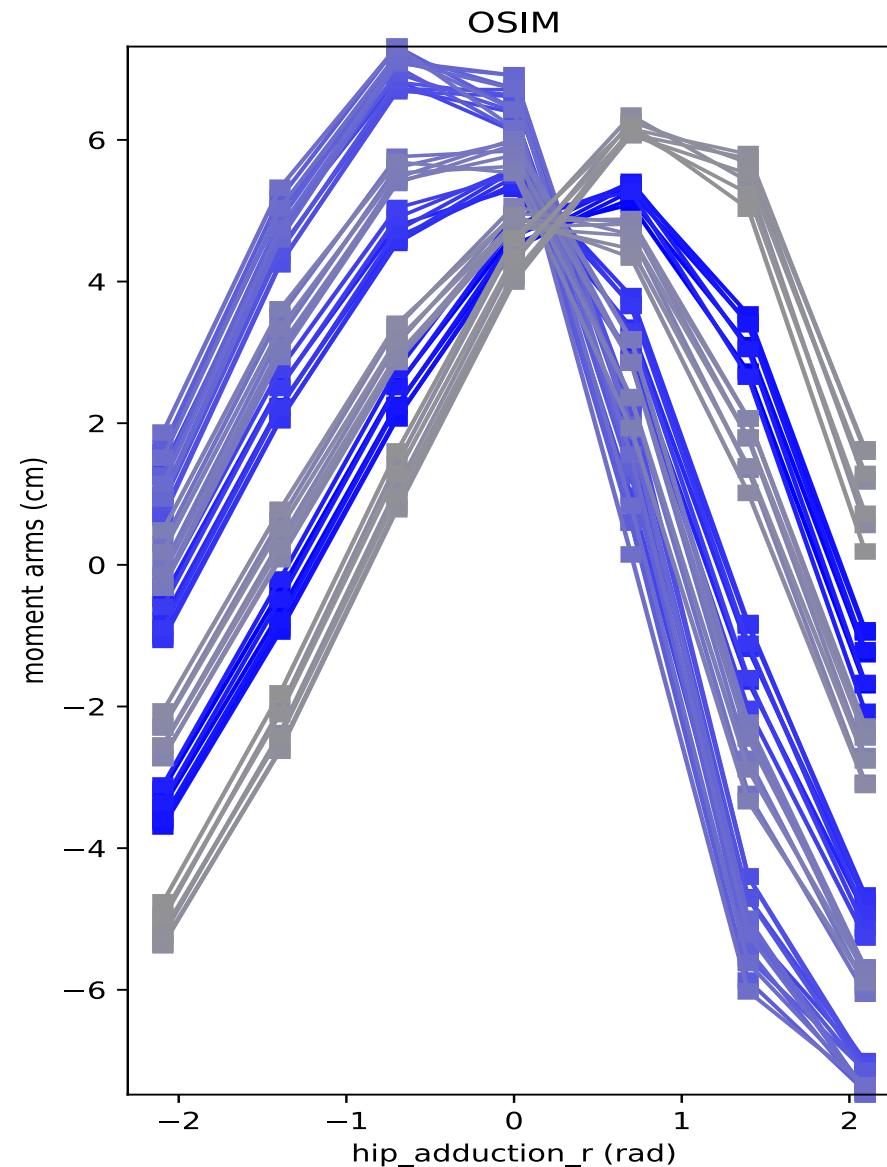
Muscle specific moment arm comparison with Osim model after optimization

gem_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



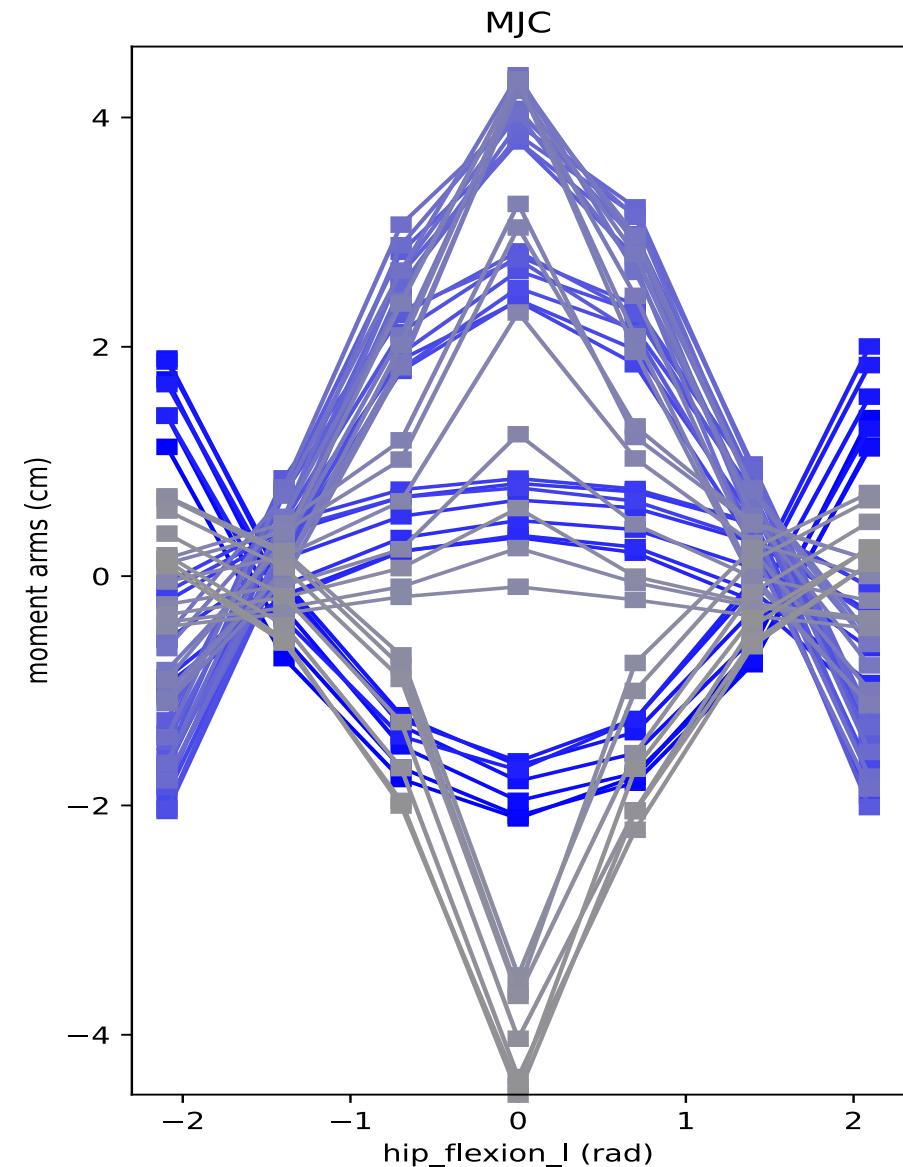
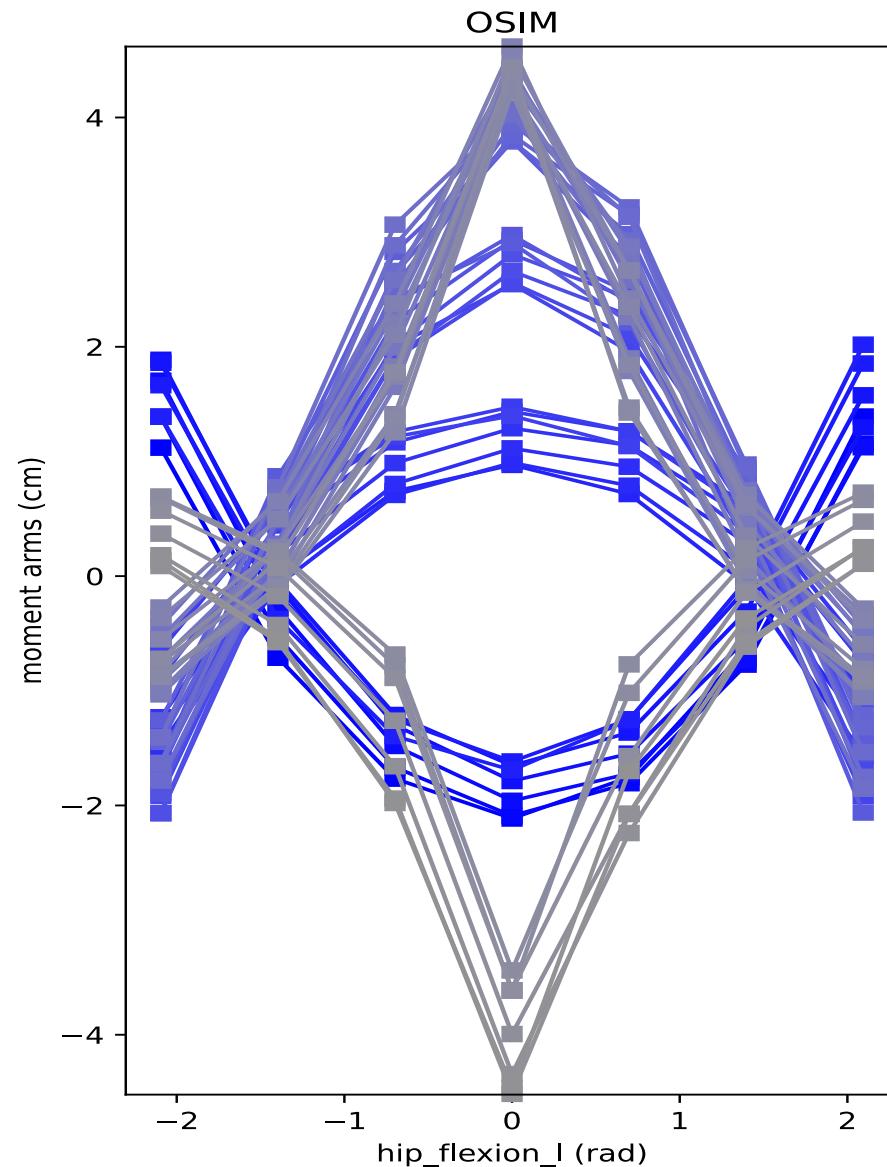
Muscle specific moment arm comparison with Osim model after optimization

add_mag2_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



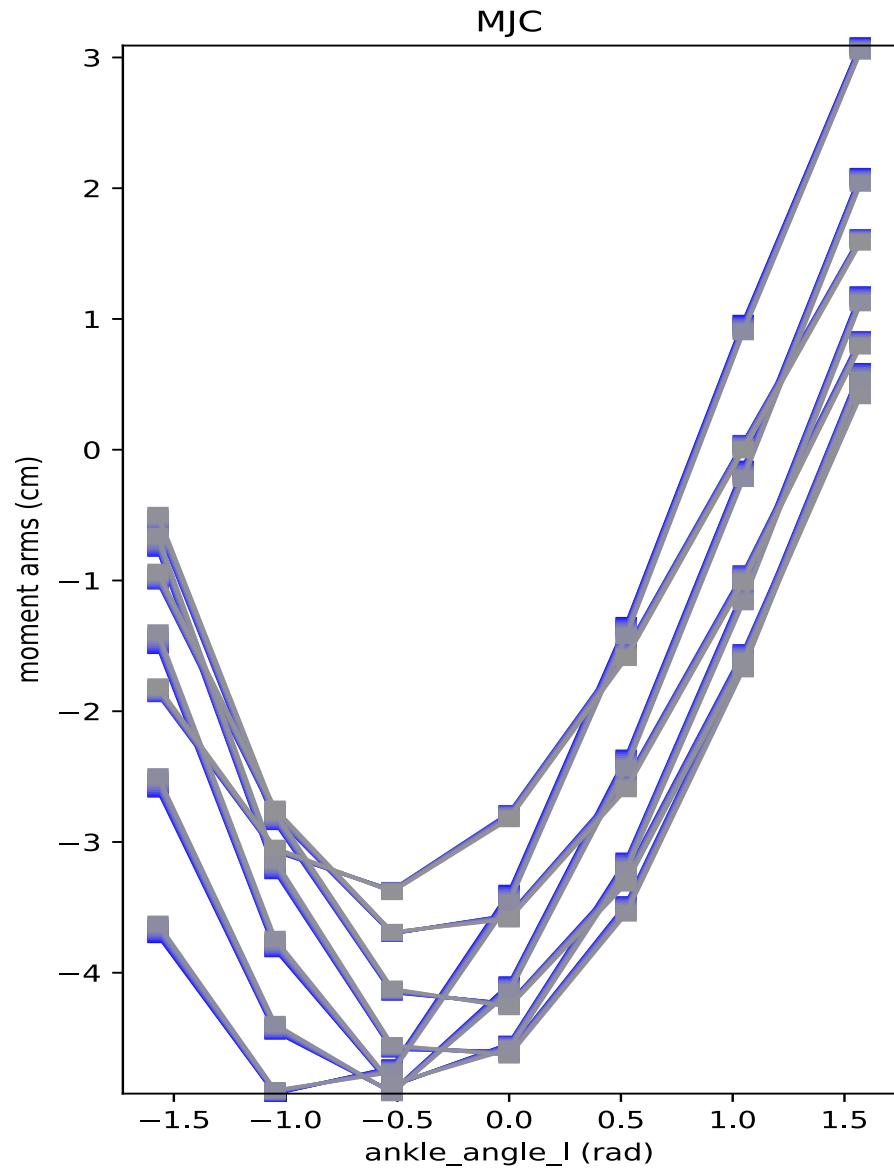
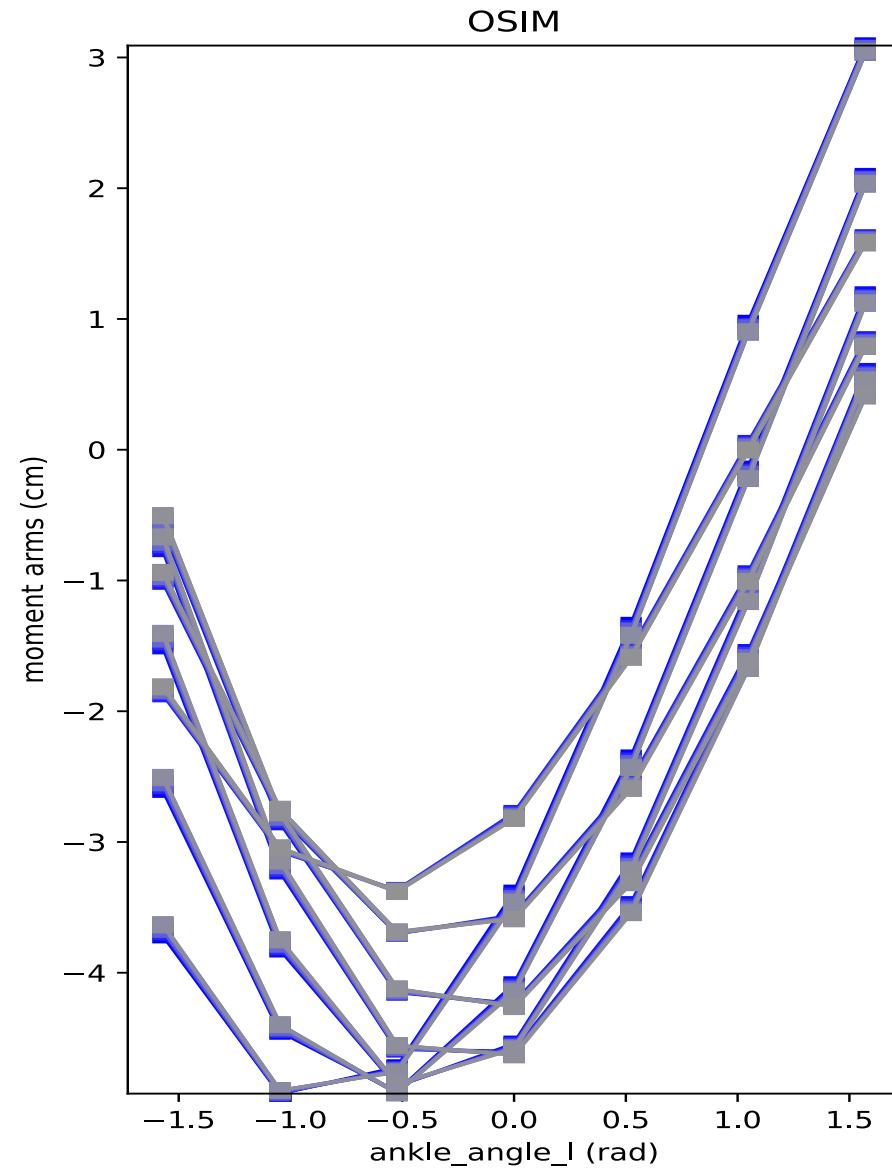
Muscle specific moment arm comparison with Osim model after optimization

iliacus_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



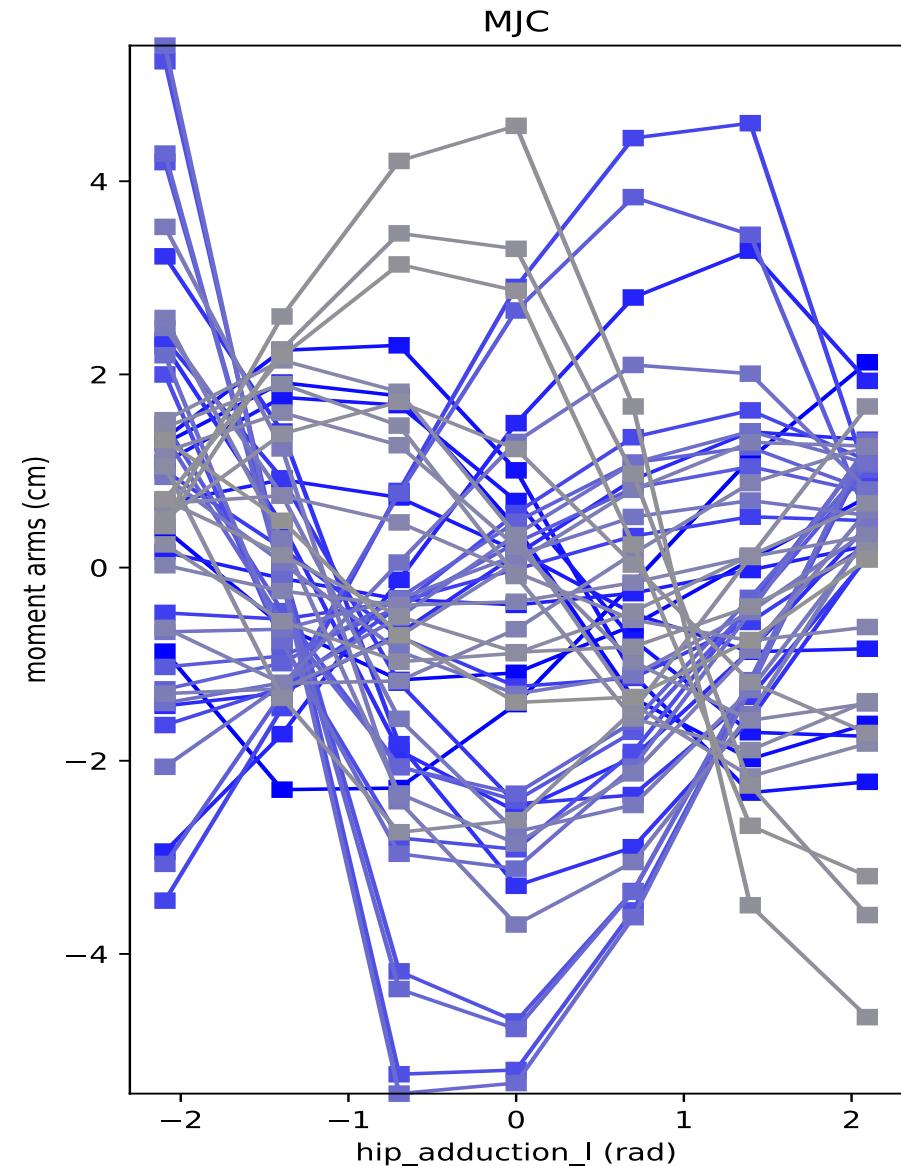
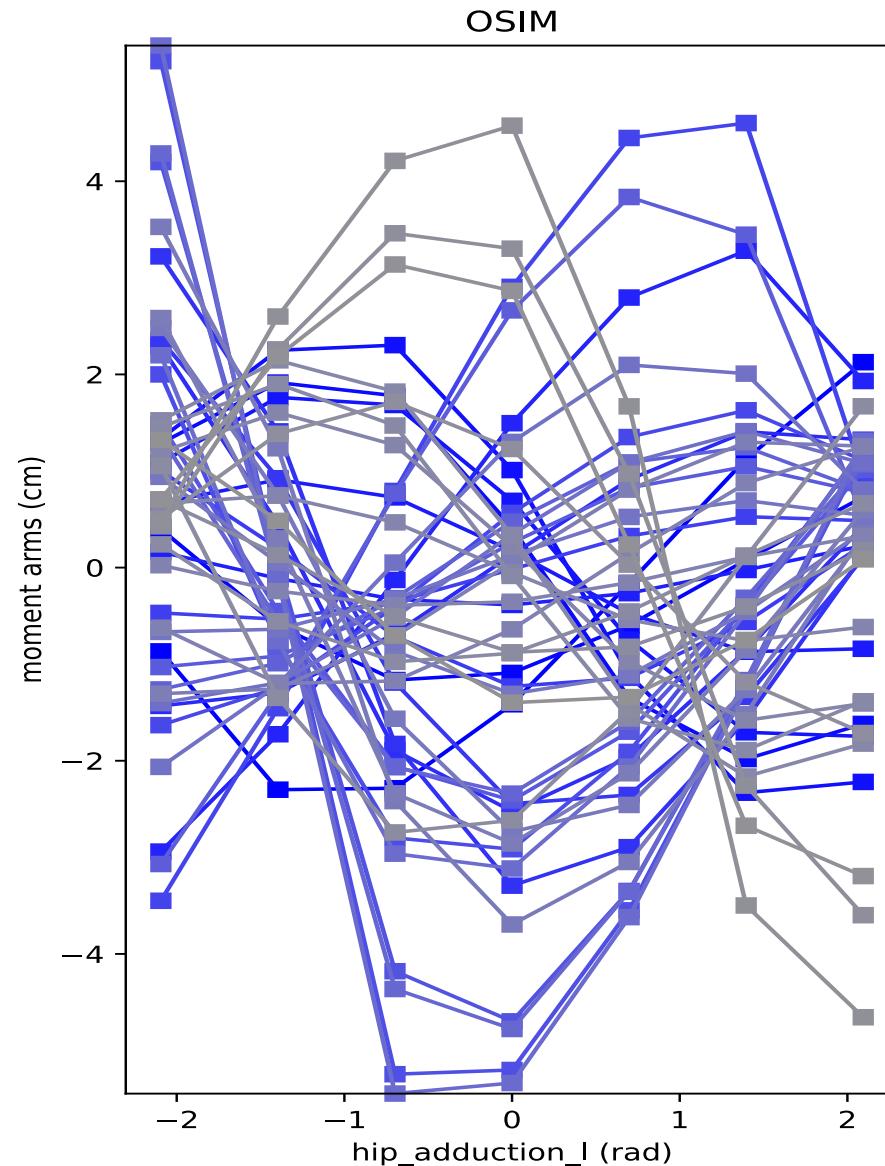
Muscle specific moment arm comparison with Osim model after optimization

med_gas_I - ankle_angle_I - knee_angle_I - subtalar_angle_I



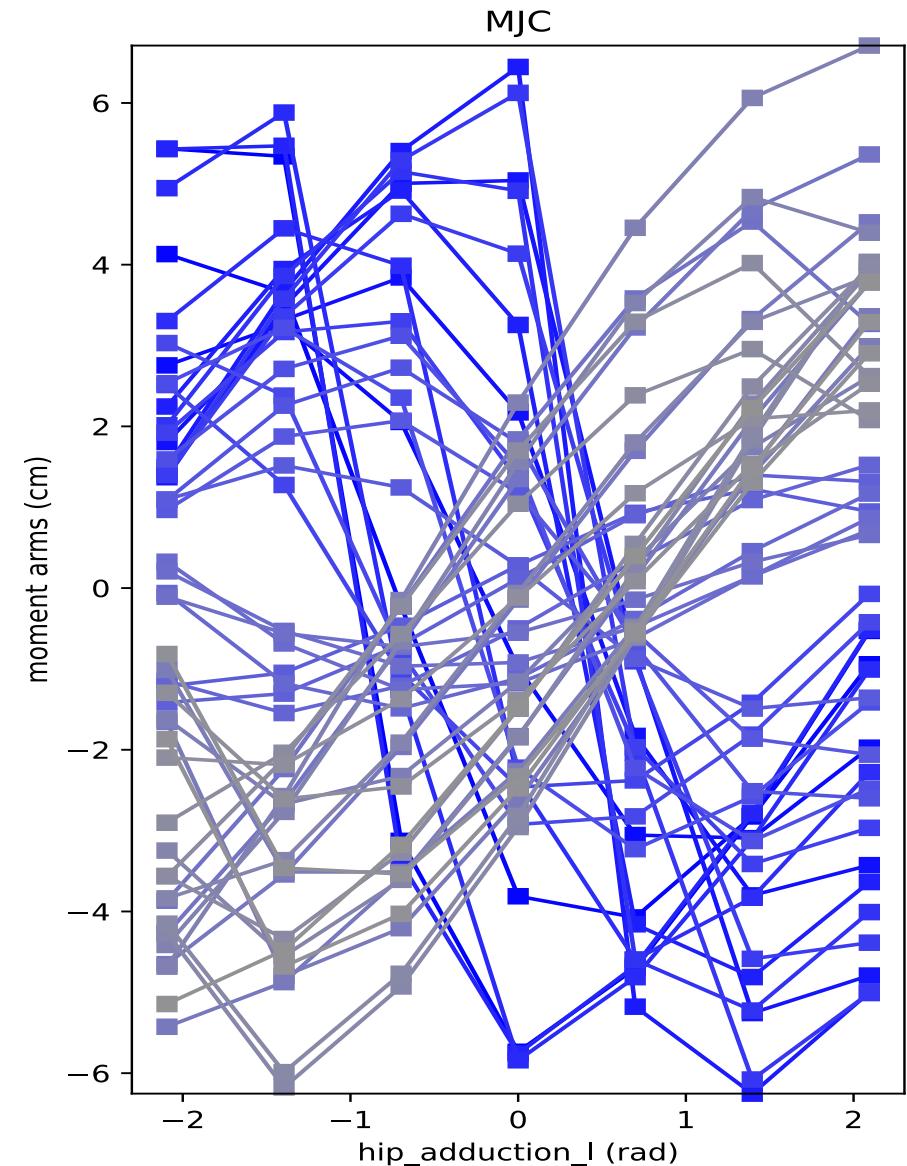
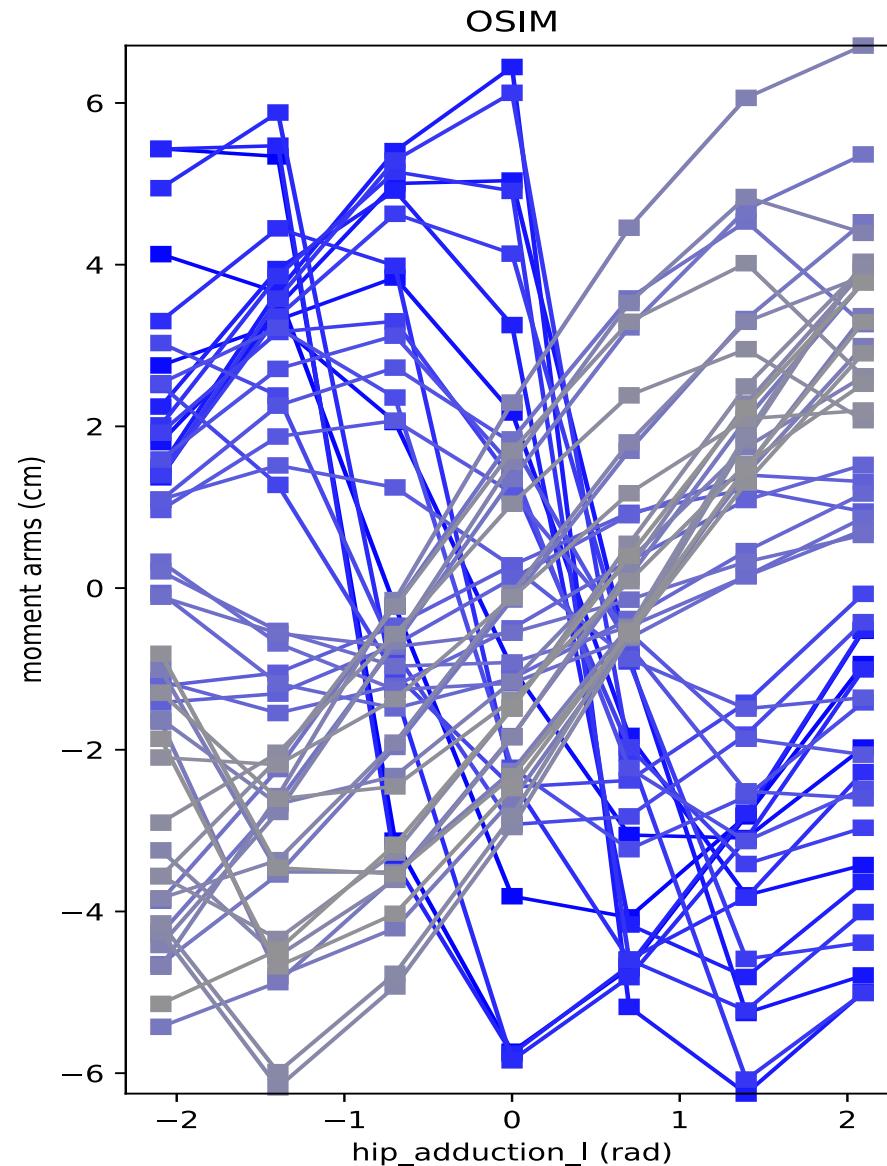
Muscle specific moment arm comparison with Osim model after optimization

glut_med1_I - hip_adduction_I - hip_flexion_I - hip_rotation_I

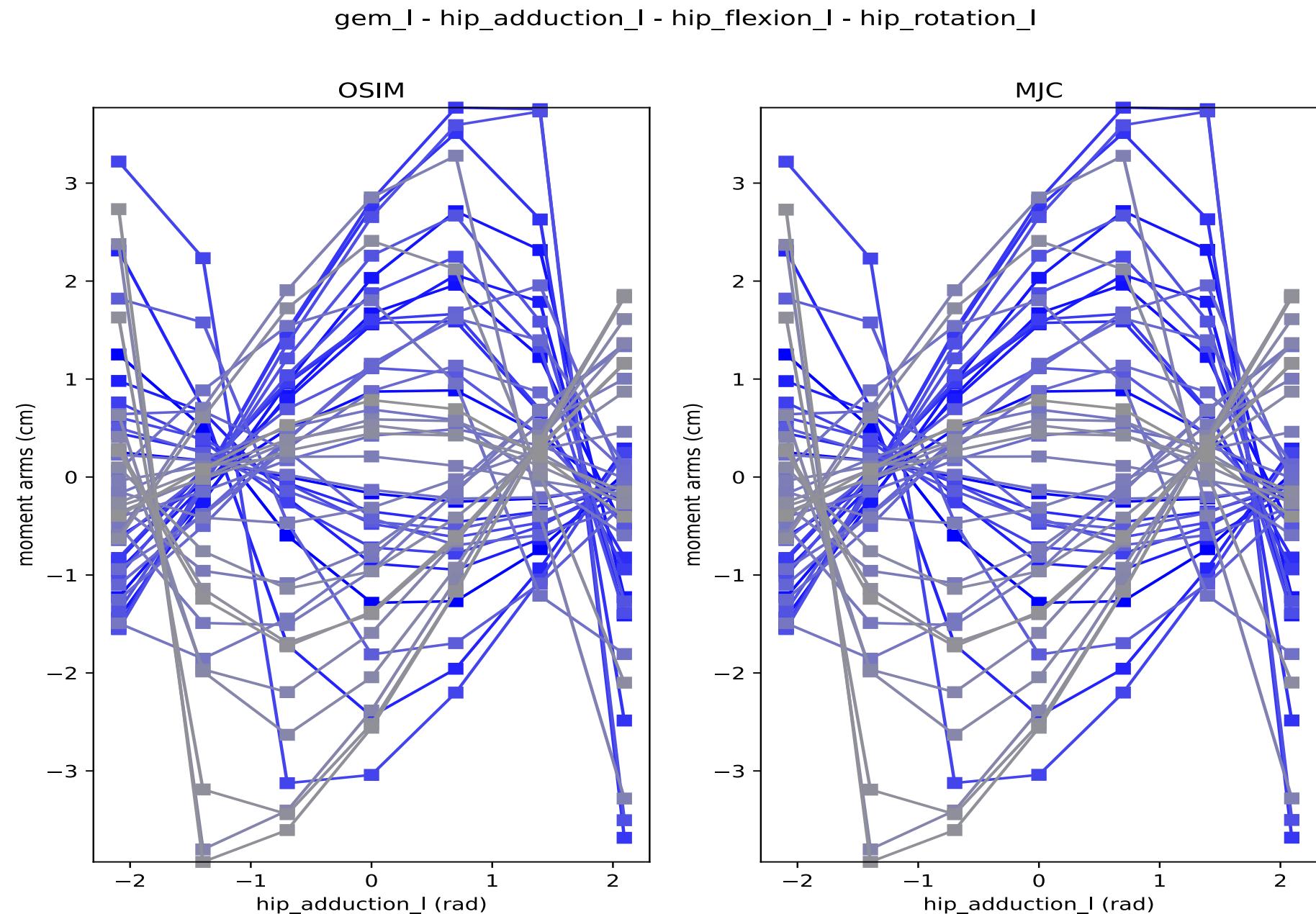


Muscle specific moment arm comparison with Osim model after optimization

glut_max2_I - hip_adduction_I - hip_flexion_I - hip_rotation_I

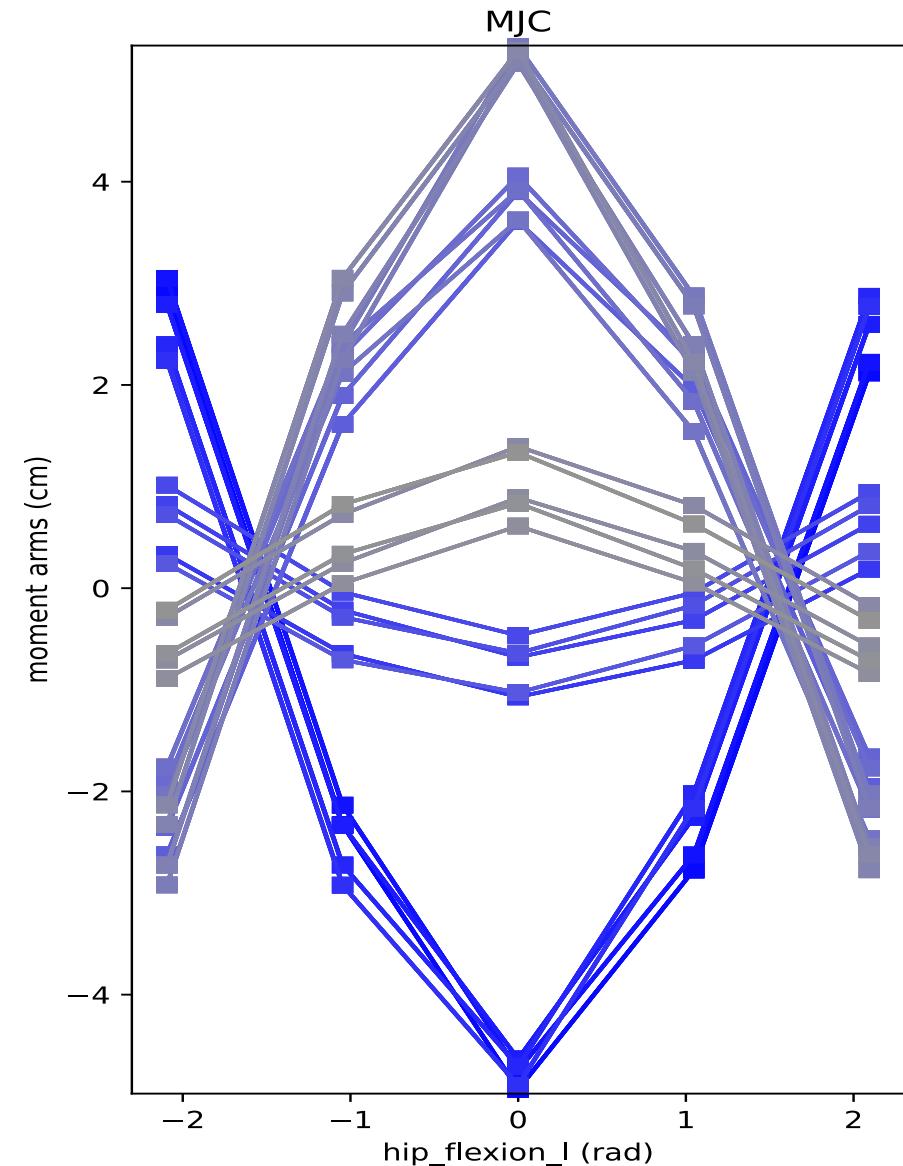
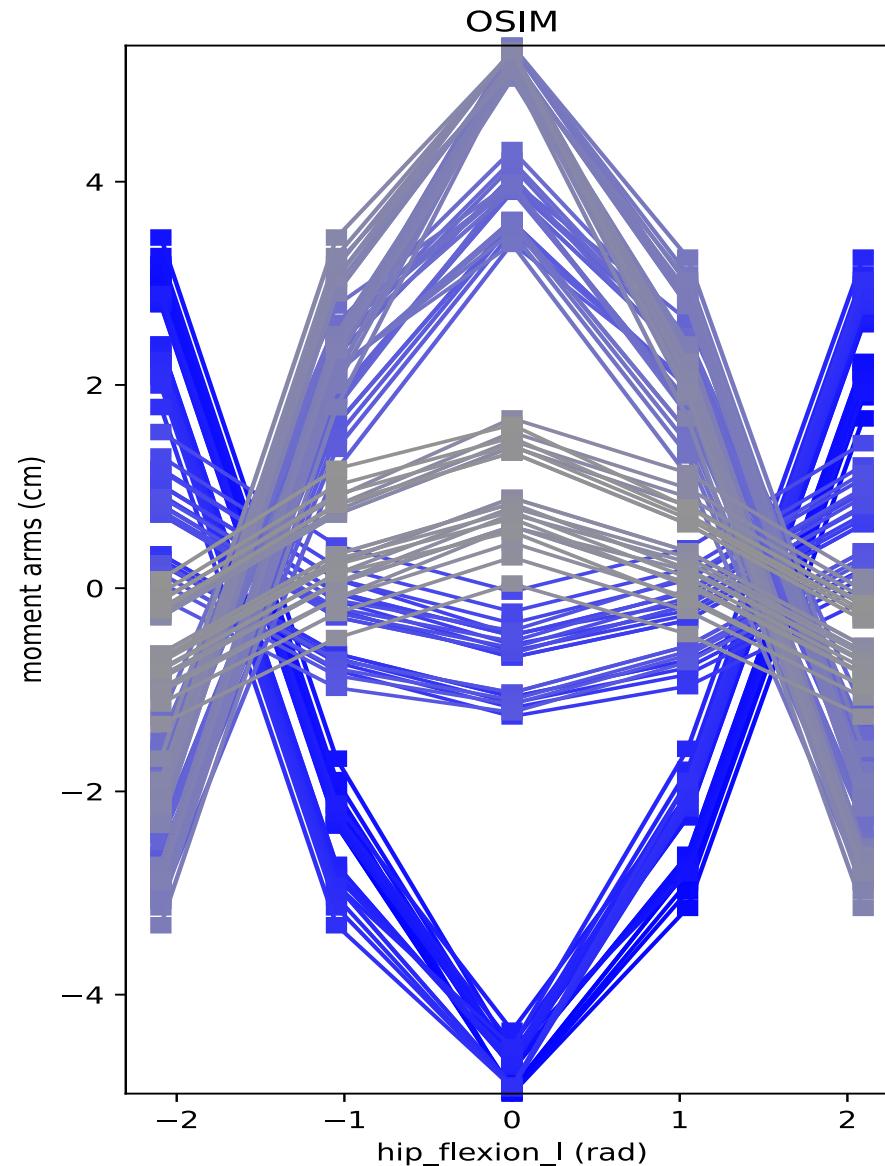


Muscle specific moment arm comparison with Osim model after optimization



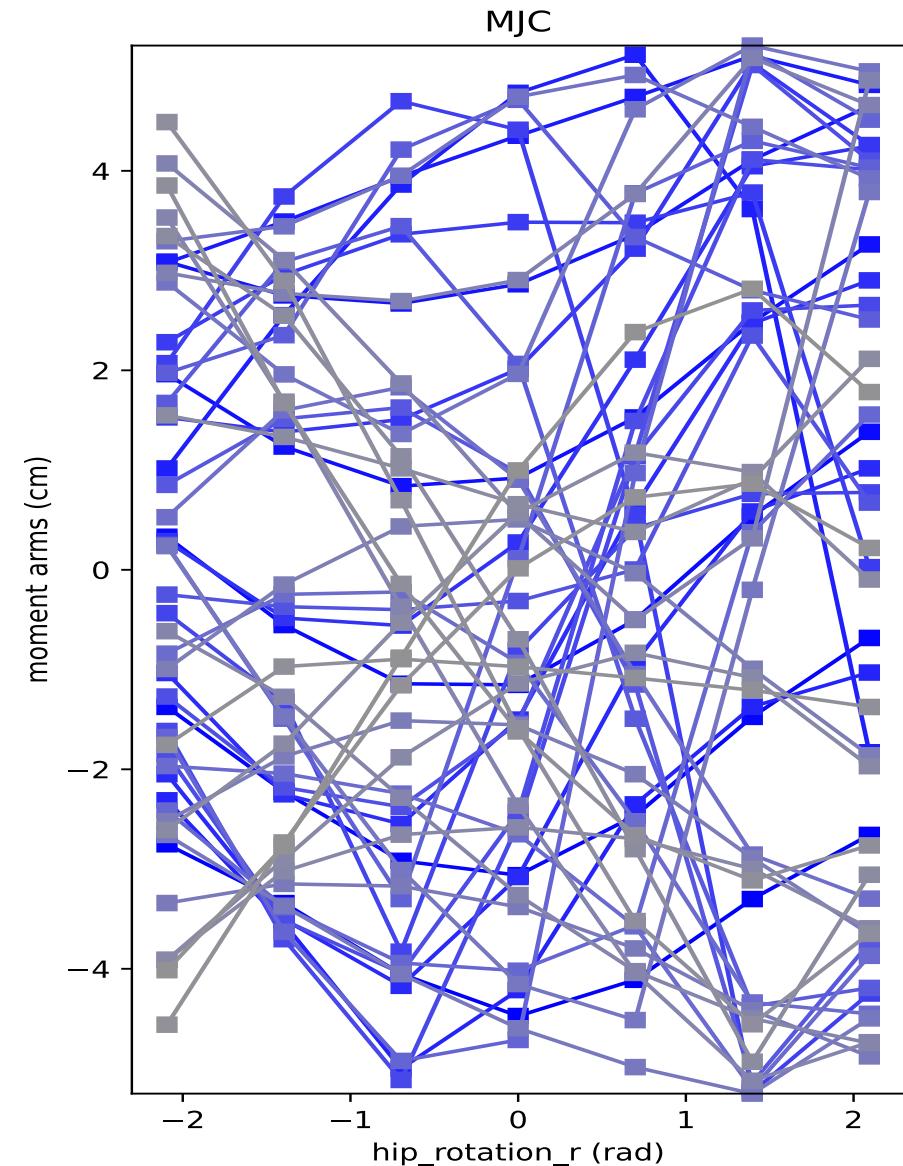
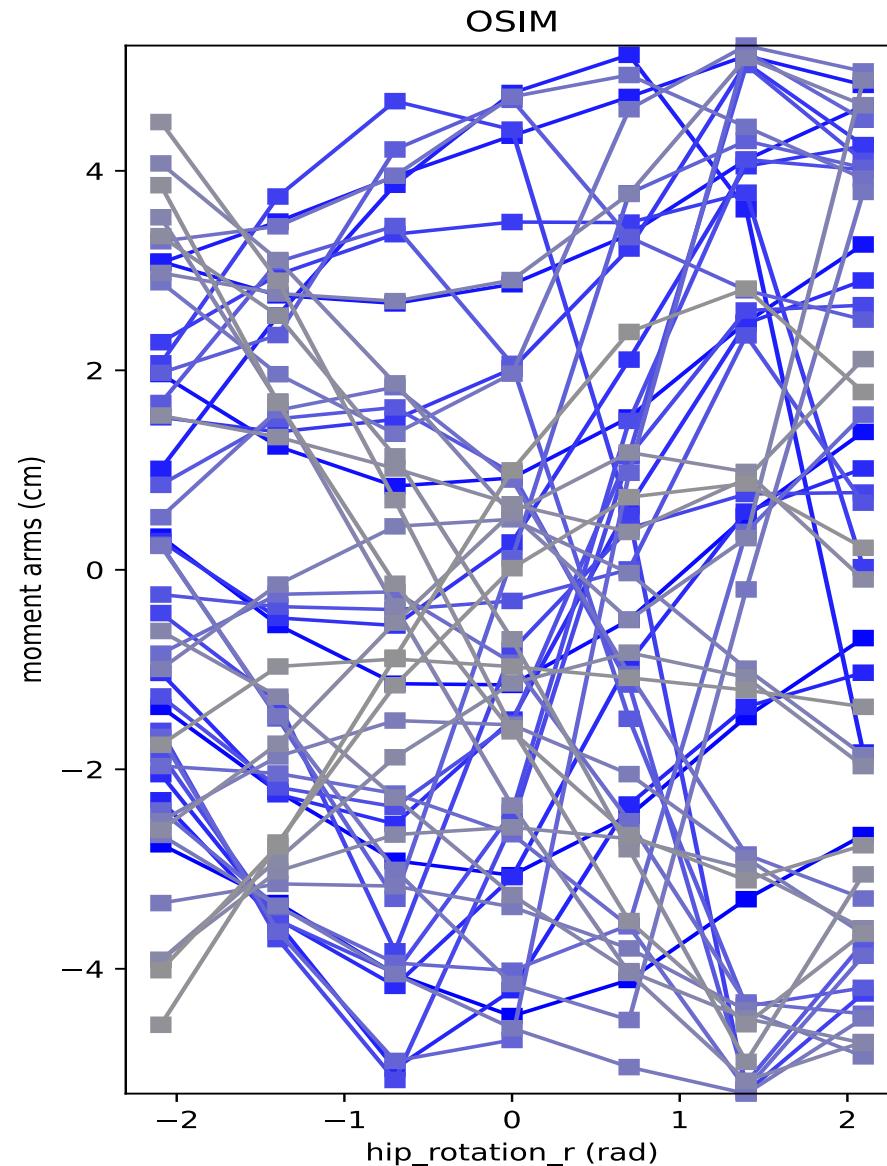
Muscle specific moment arm comparison with Osim model after optimization

rect_fem_I - hip_adduction_I - hip_flexion_I - hip_rotation_I - knee_angle_I



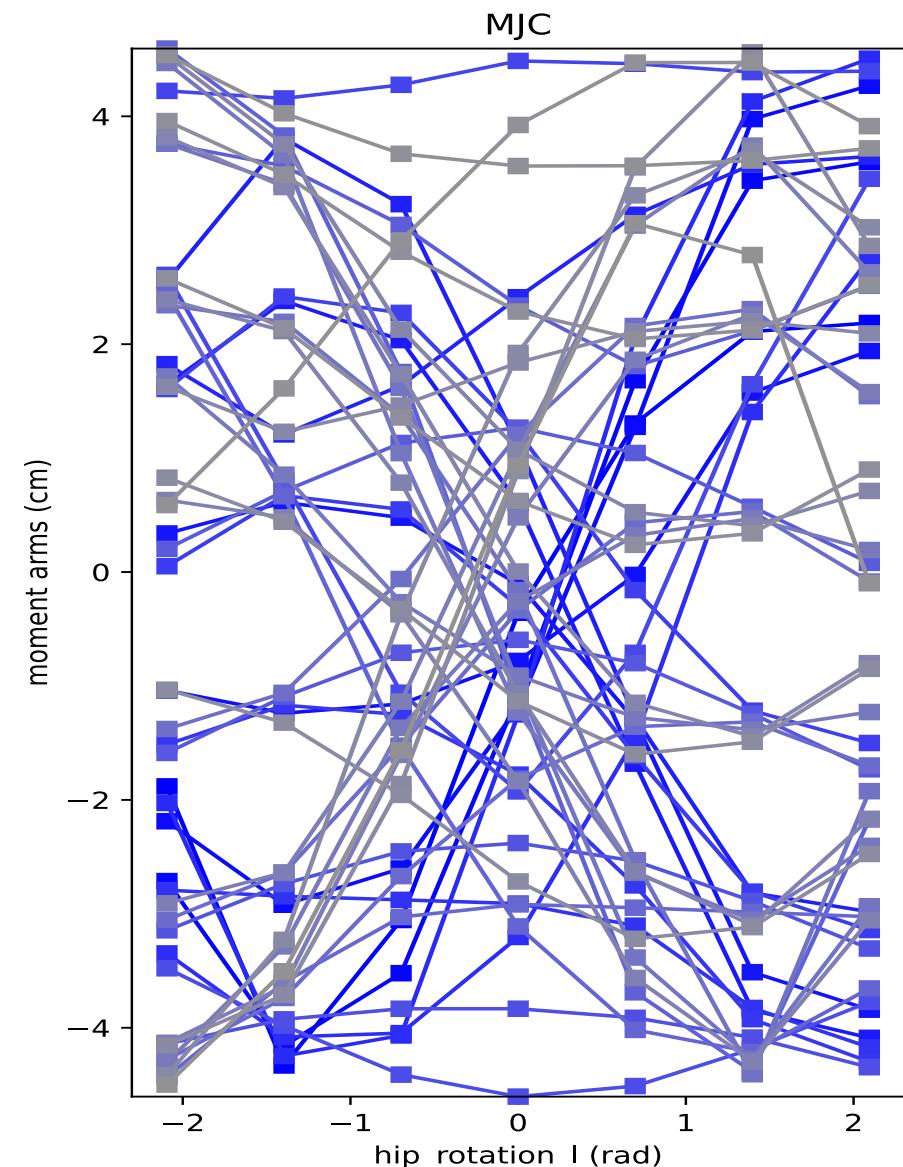
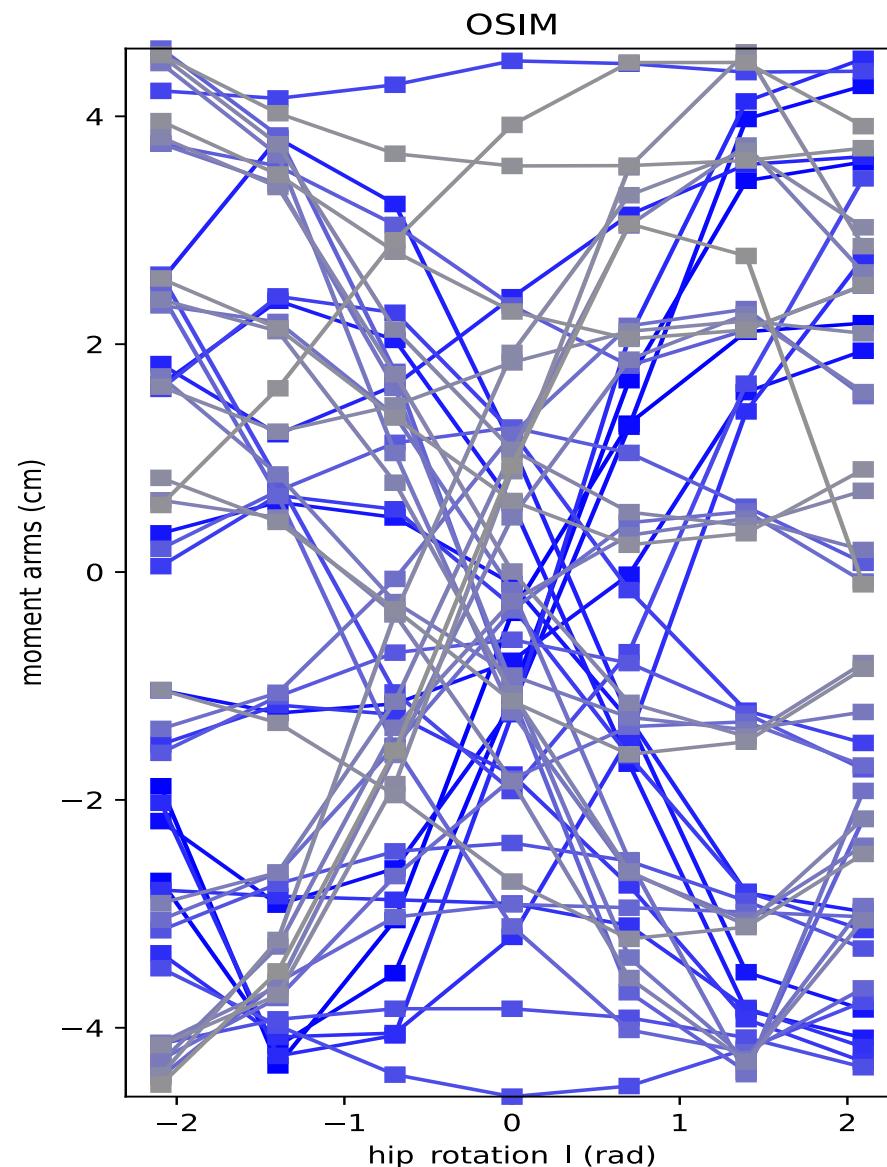
Muscle specific moment arm comparison with Osim model after optimization

quad_fem_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



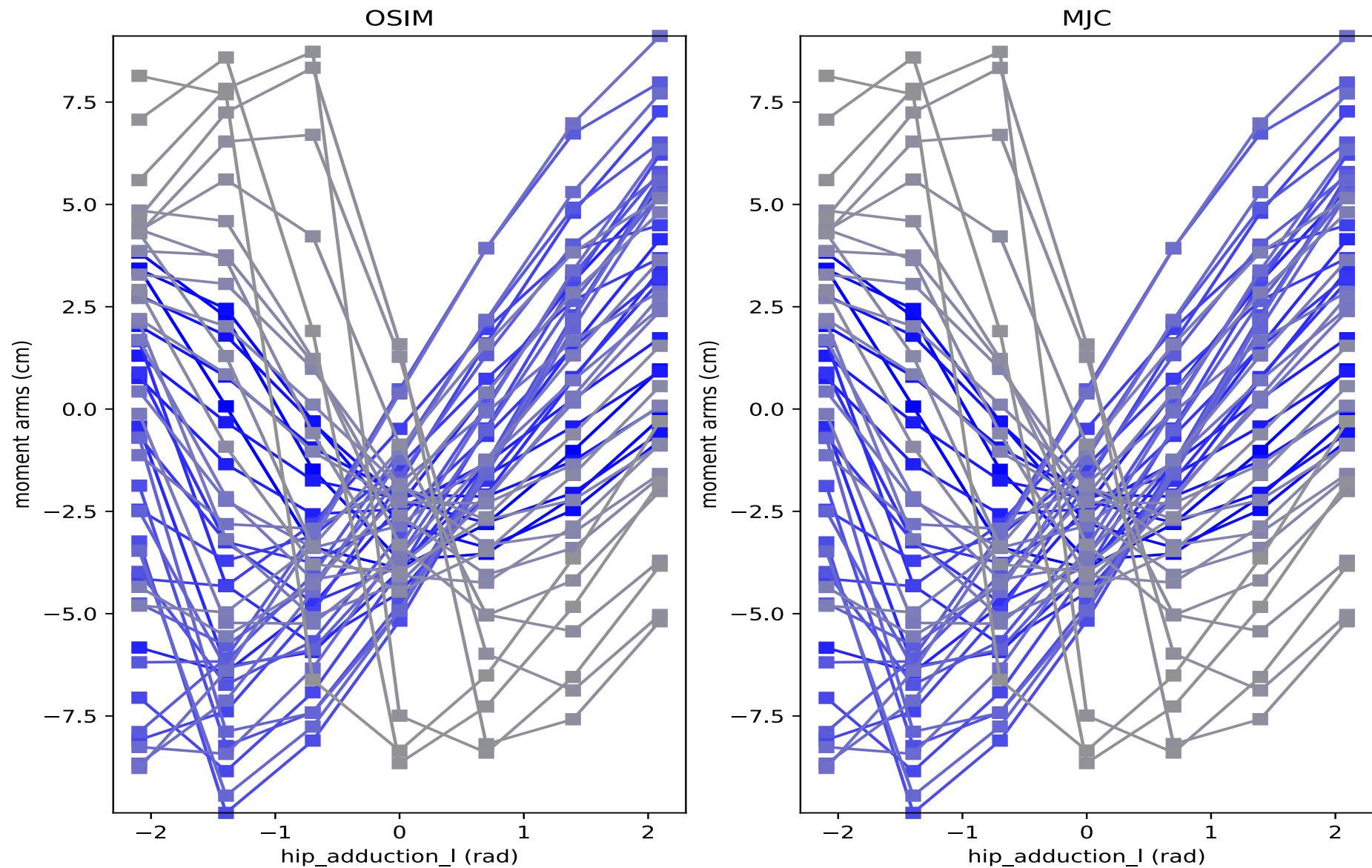
Muscle specific moment arm comparison with Osim model after optimization

peri_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



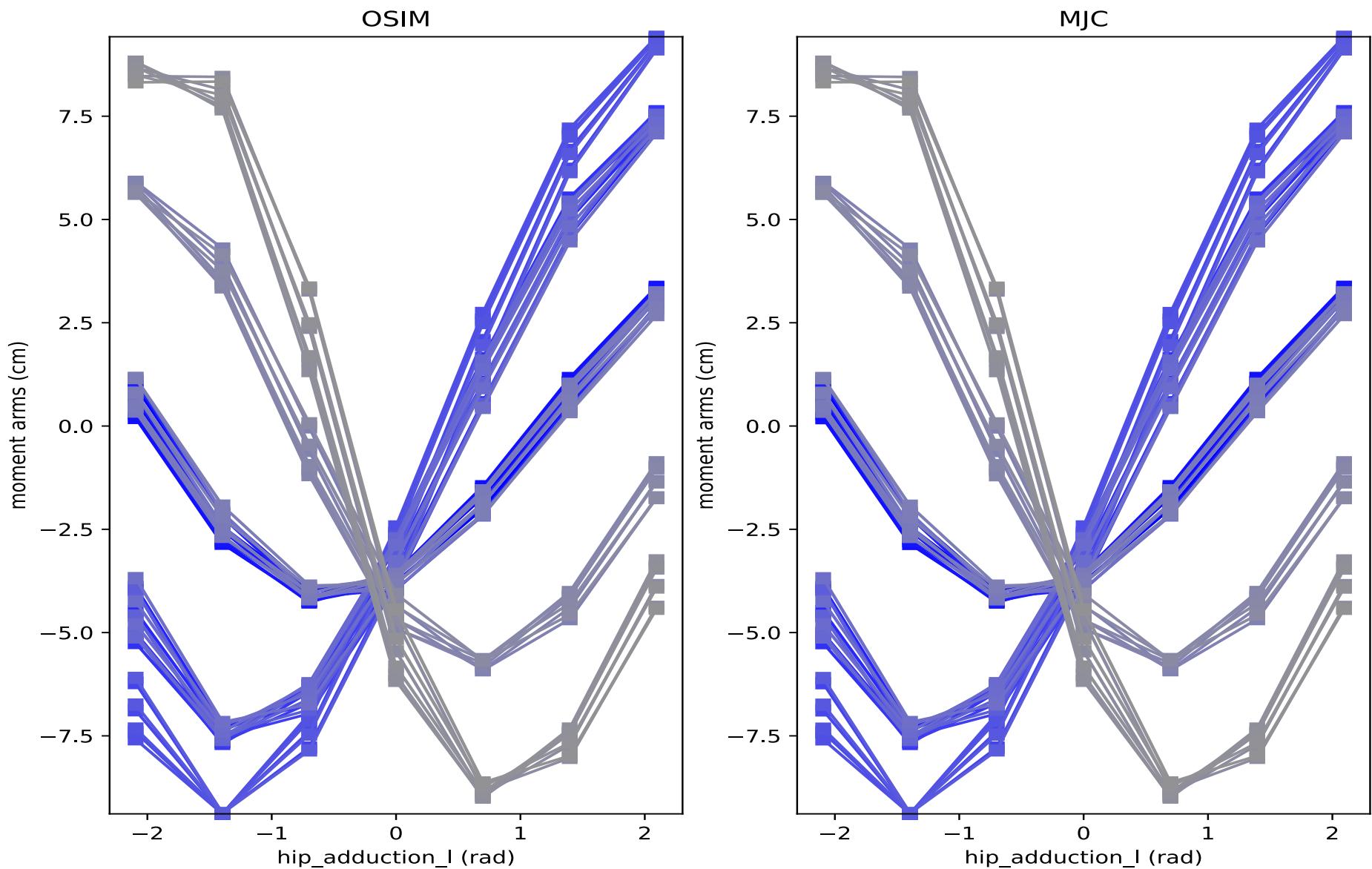
Muscle specific moment arm comparison with Osim model after optimization

tfl_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



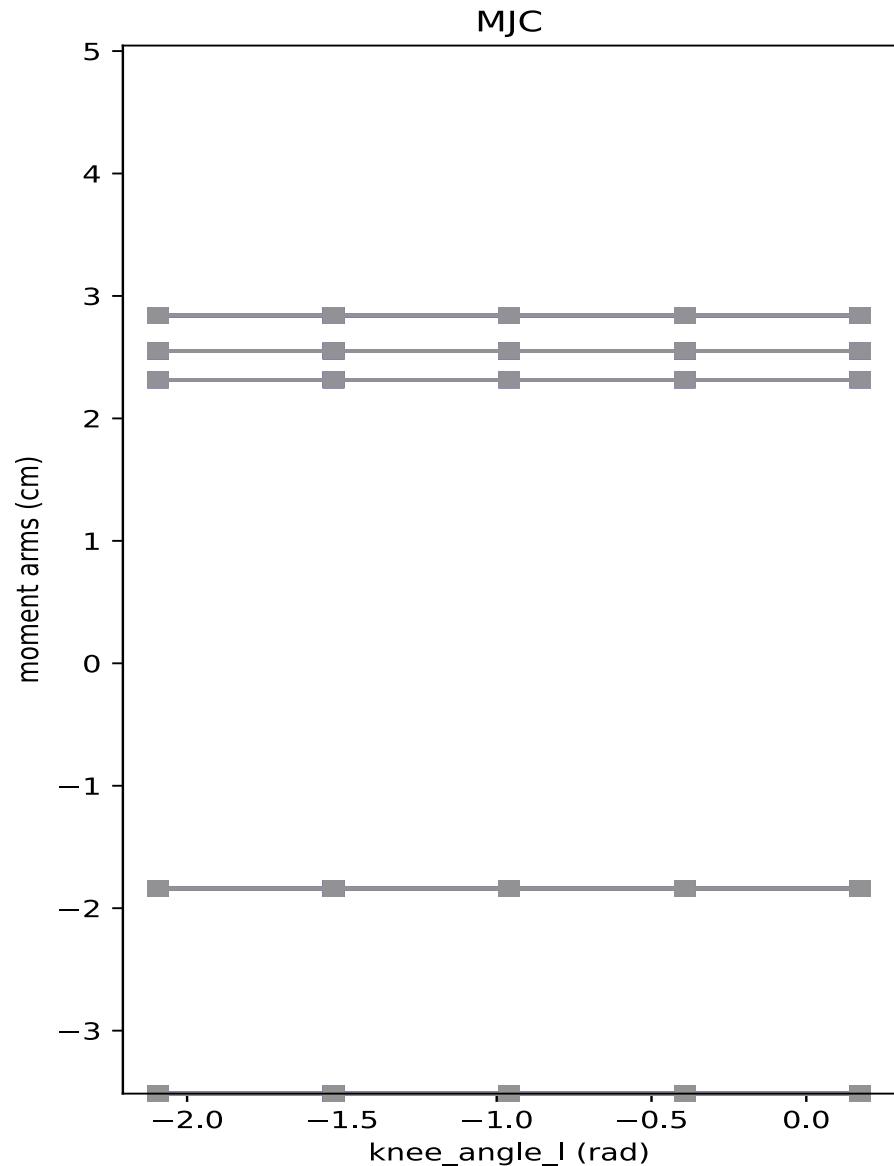
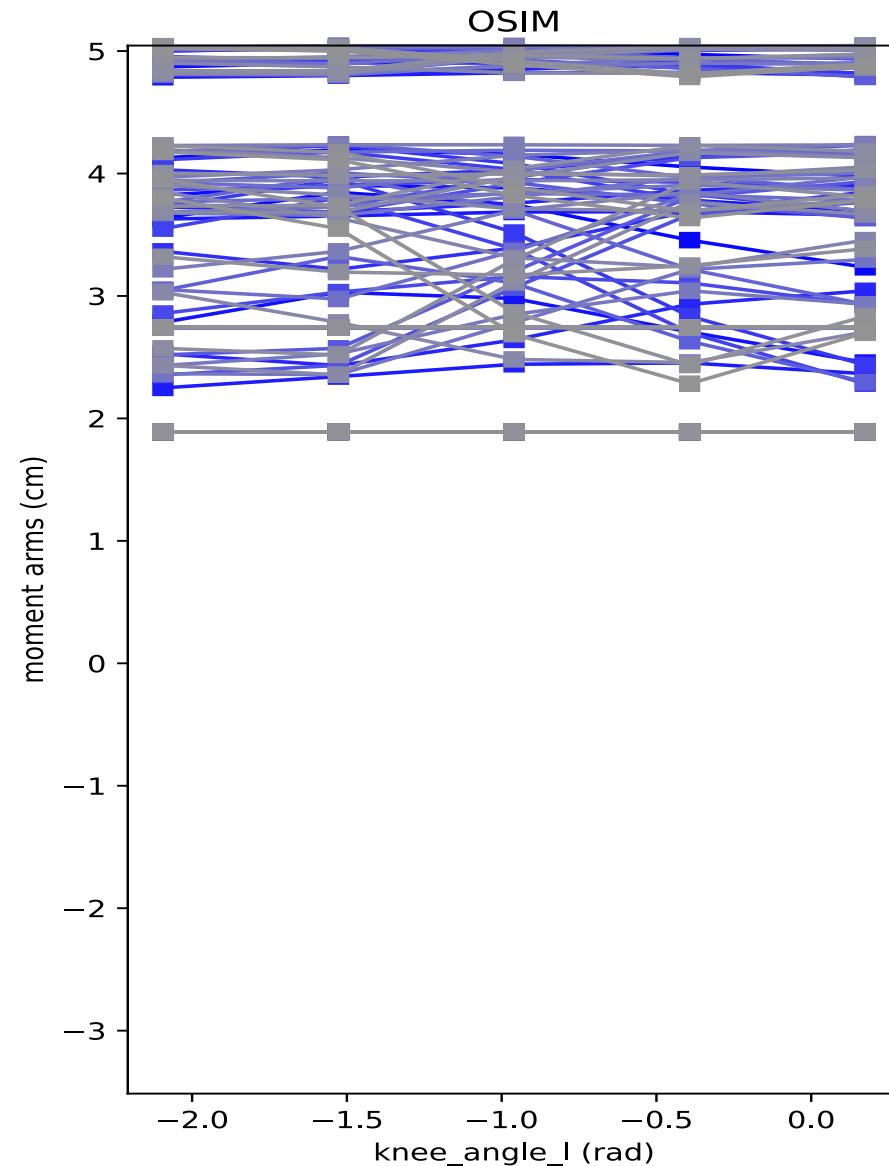
Muscle specific moment arm comparison with Osim model after optimization

sar_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



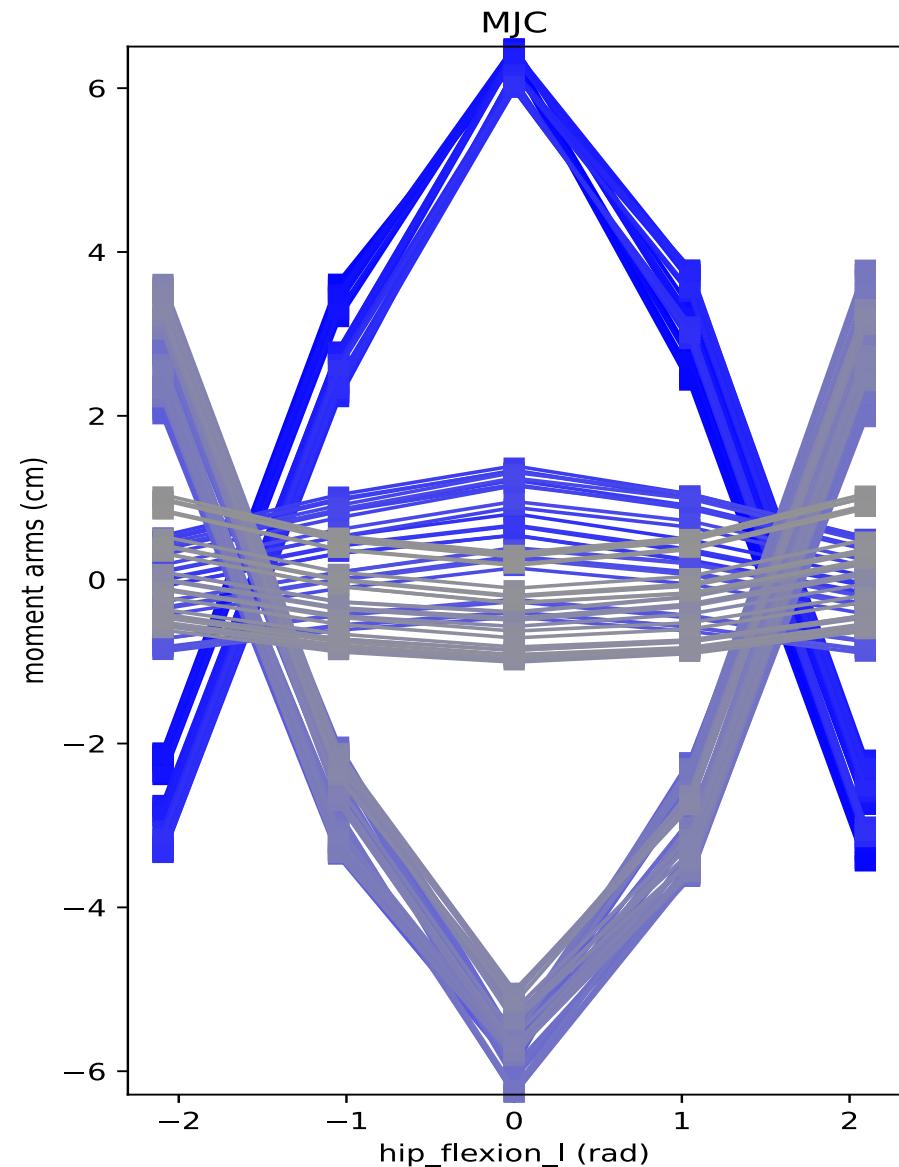
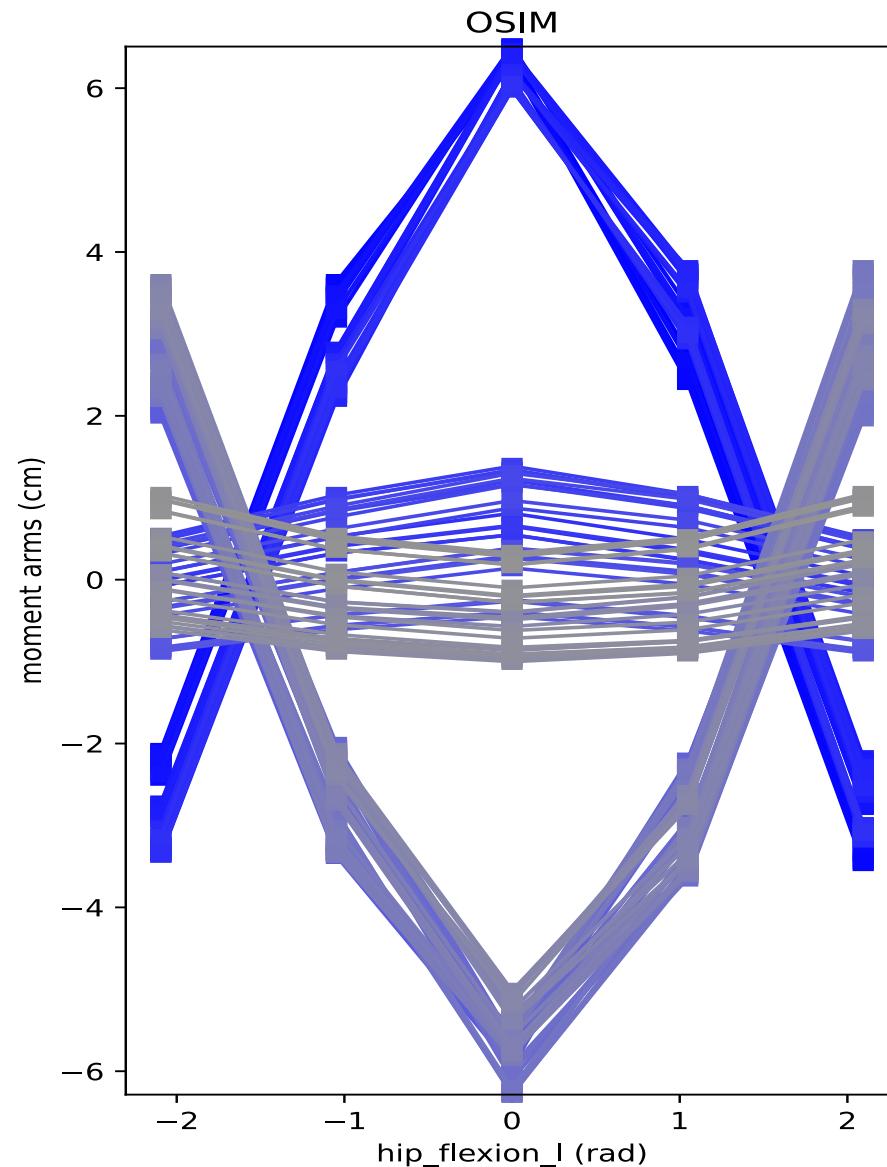
Muscle specific moment arm comparison with Osim model after optimization

rect_fem_I - hip_adduction_I - hip_flexion_I - hip_rotation_I - knee_angle_I



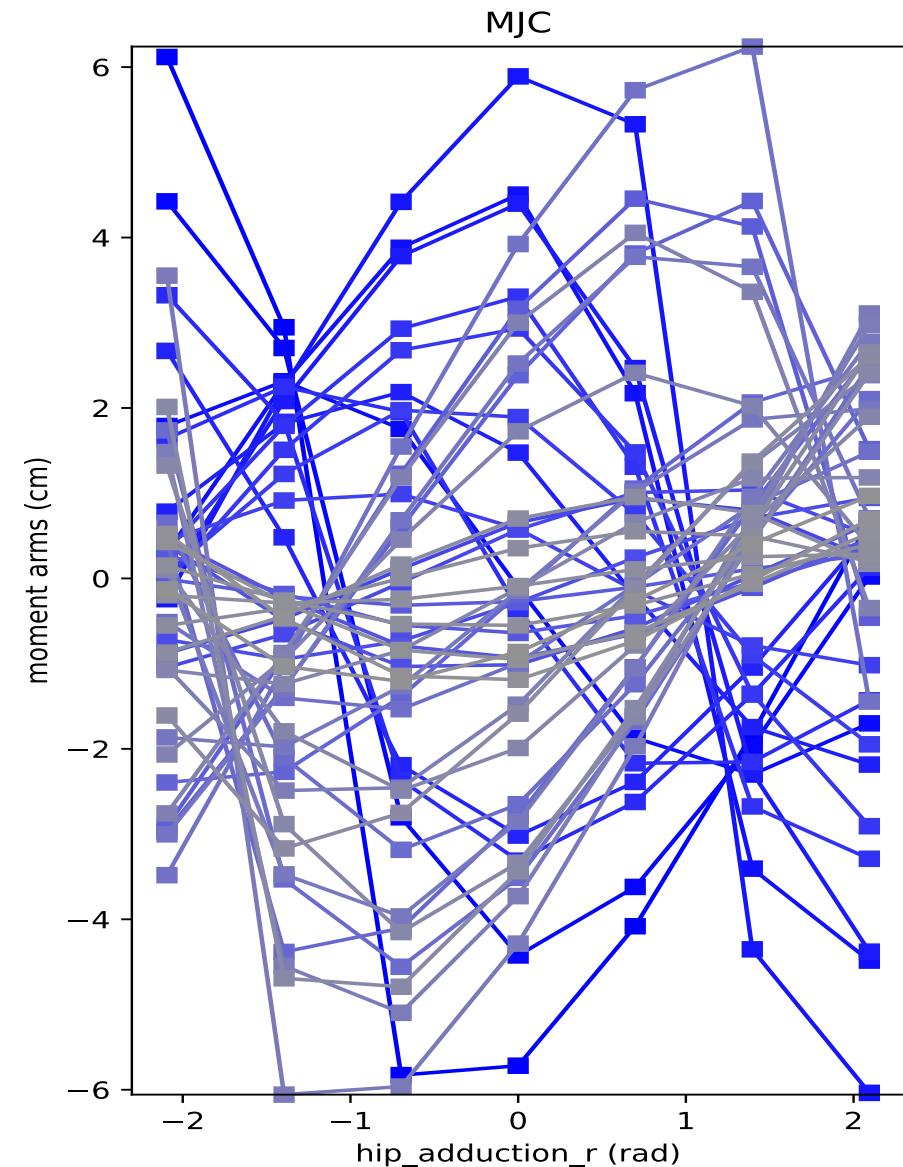
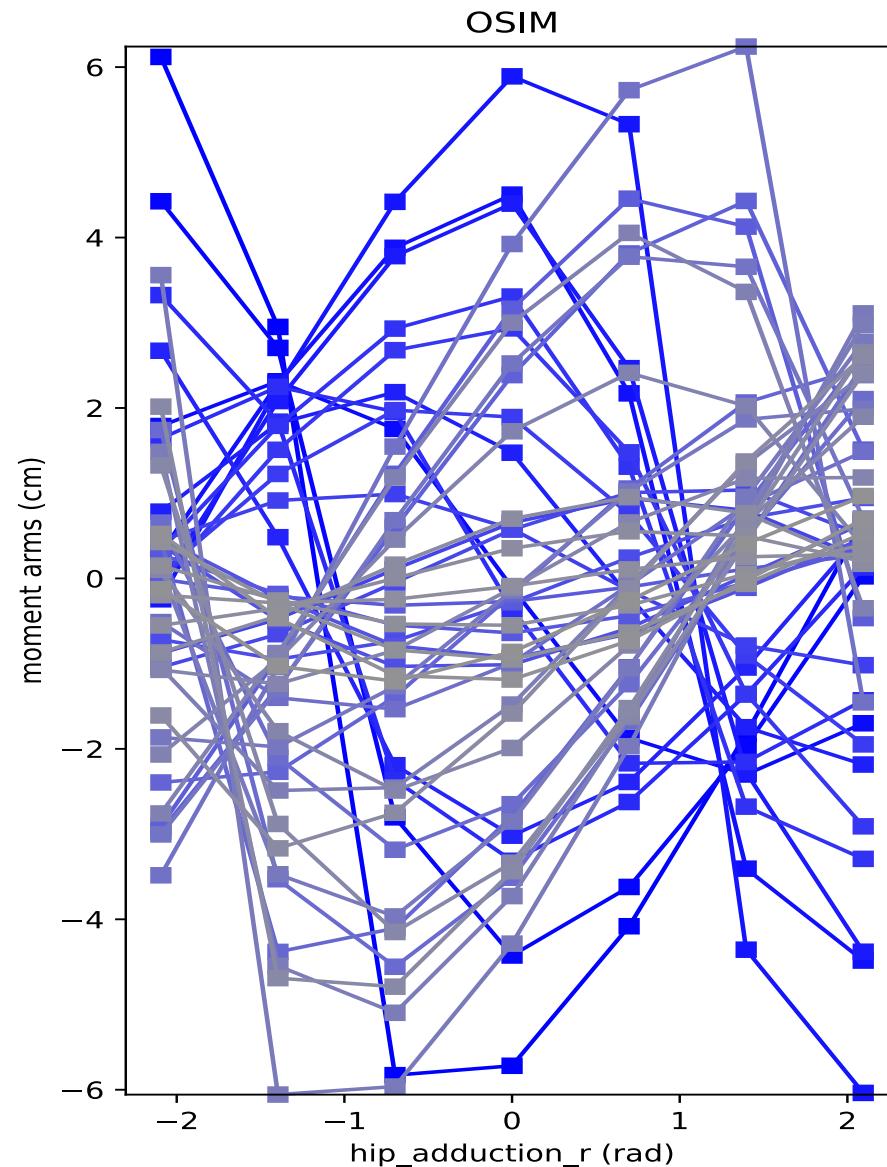
Muscle specific moment arm comparison with Osim model after optimization

bifemlh_I - hip_adduction_I - hip_flexion_I - hip_rotation_I - knee_angle_I



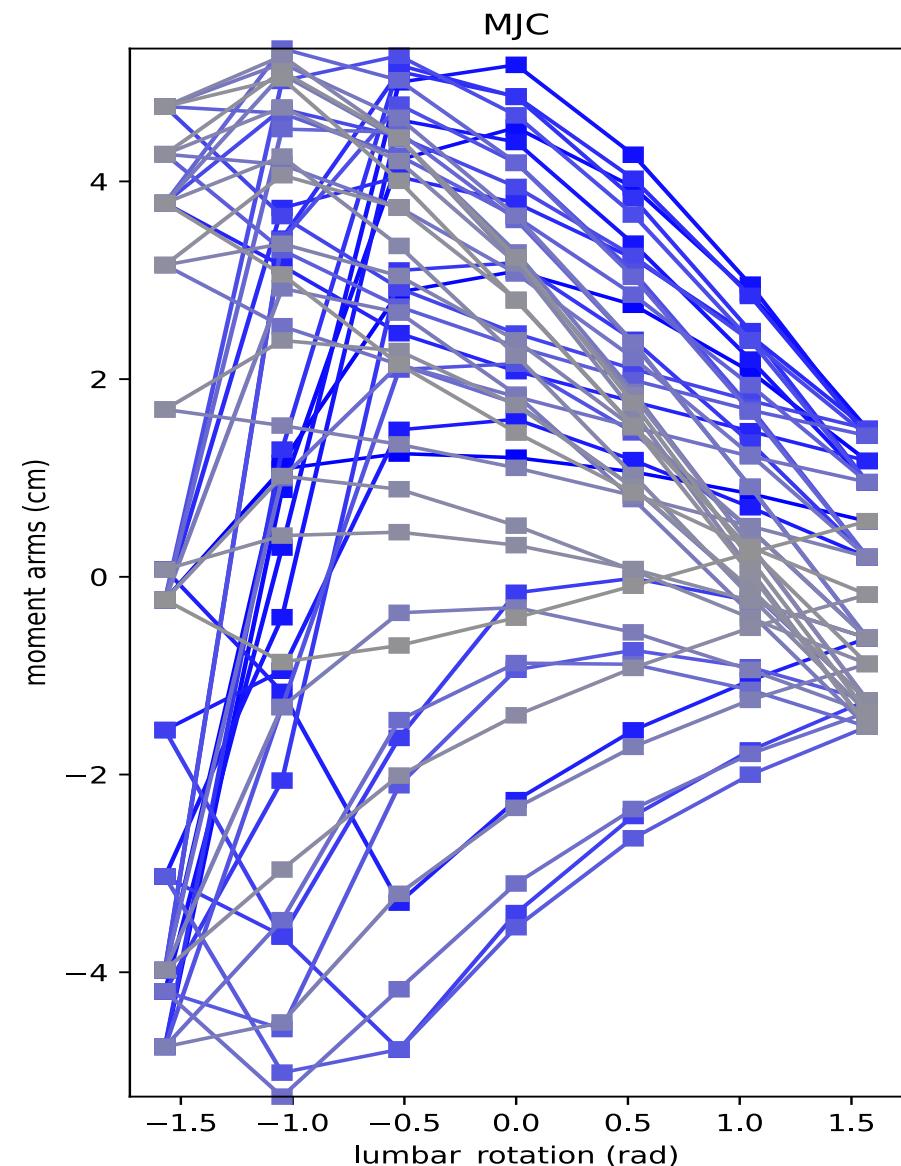
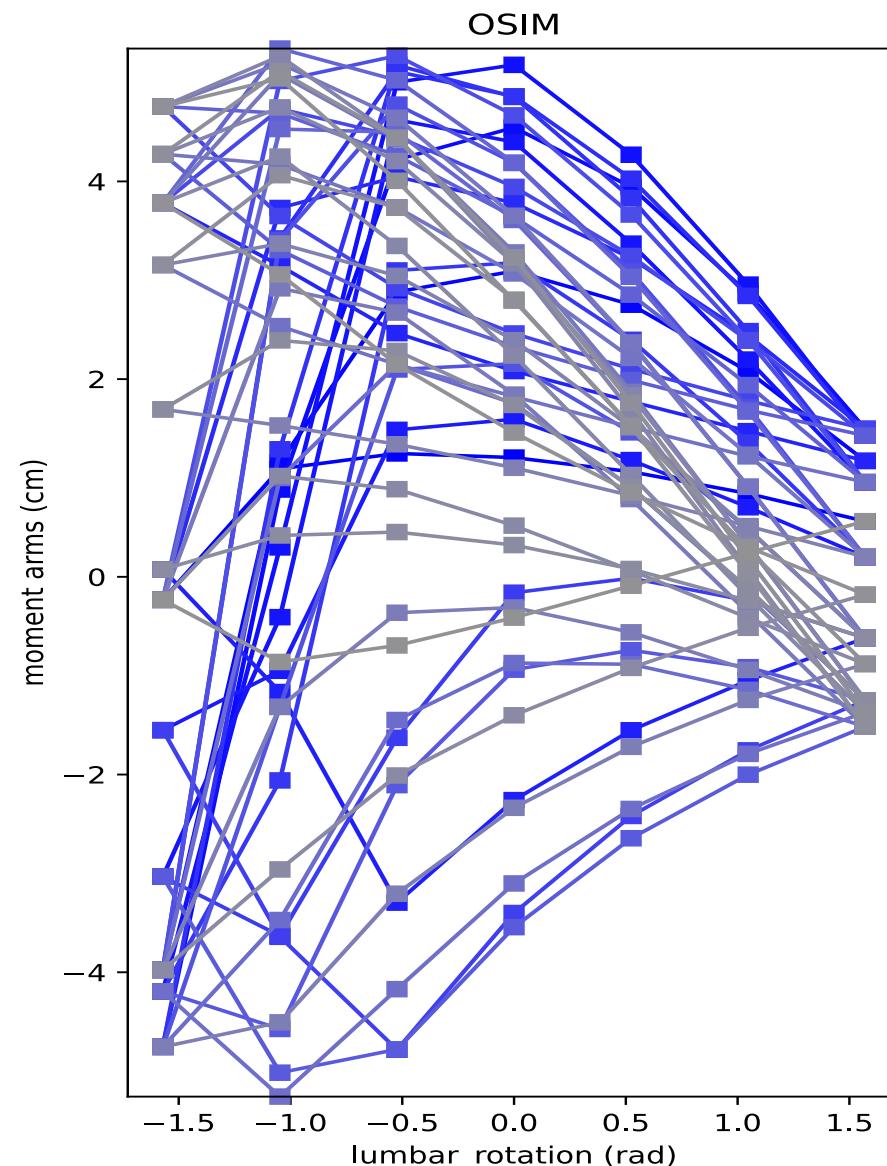
Muscle specific moment arm comparison with Osim model after optimization

glut_max1_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



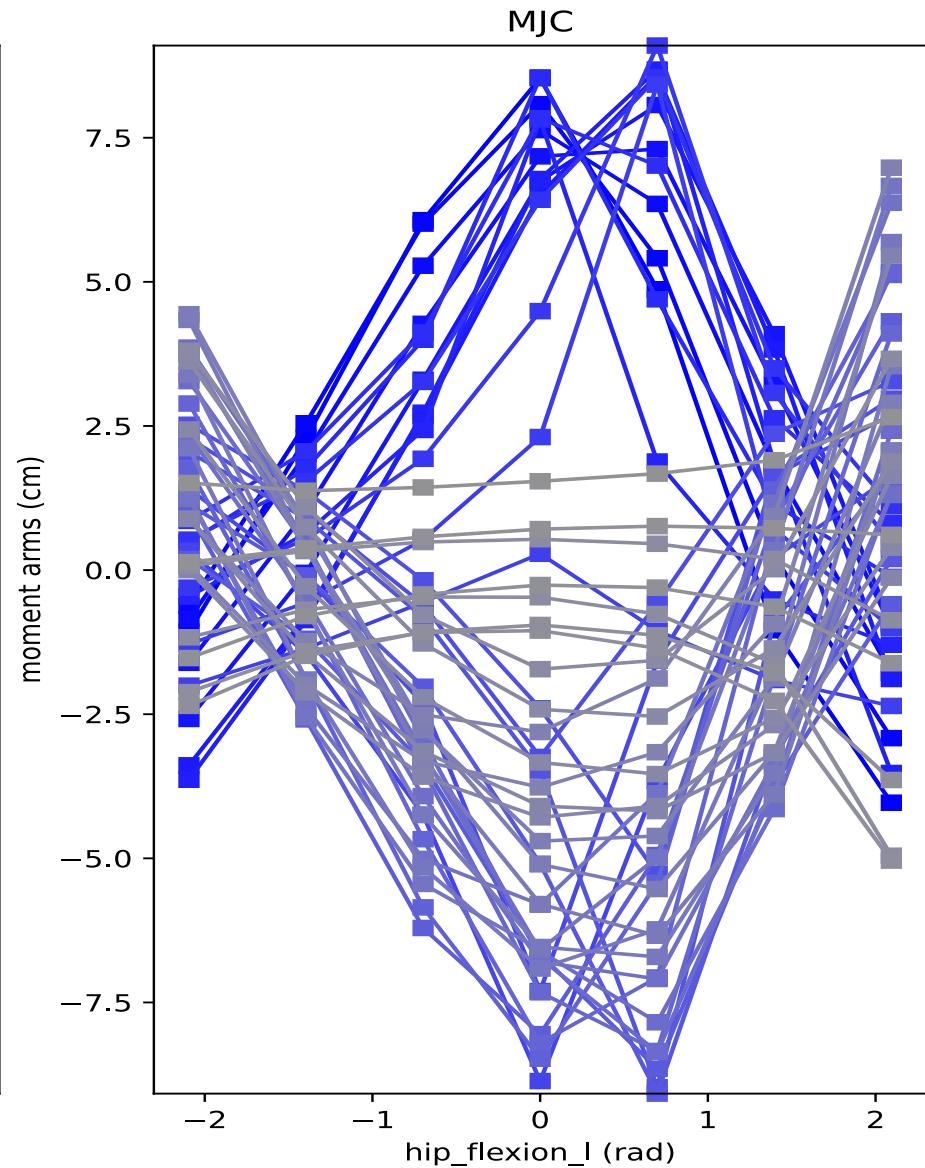
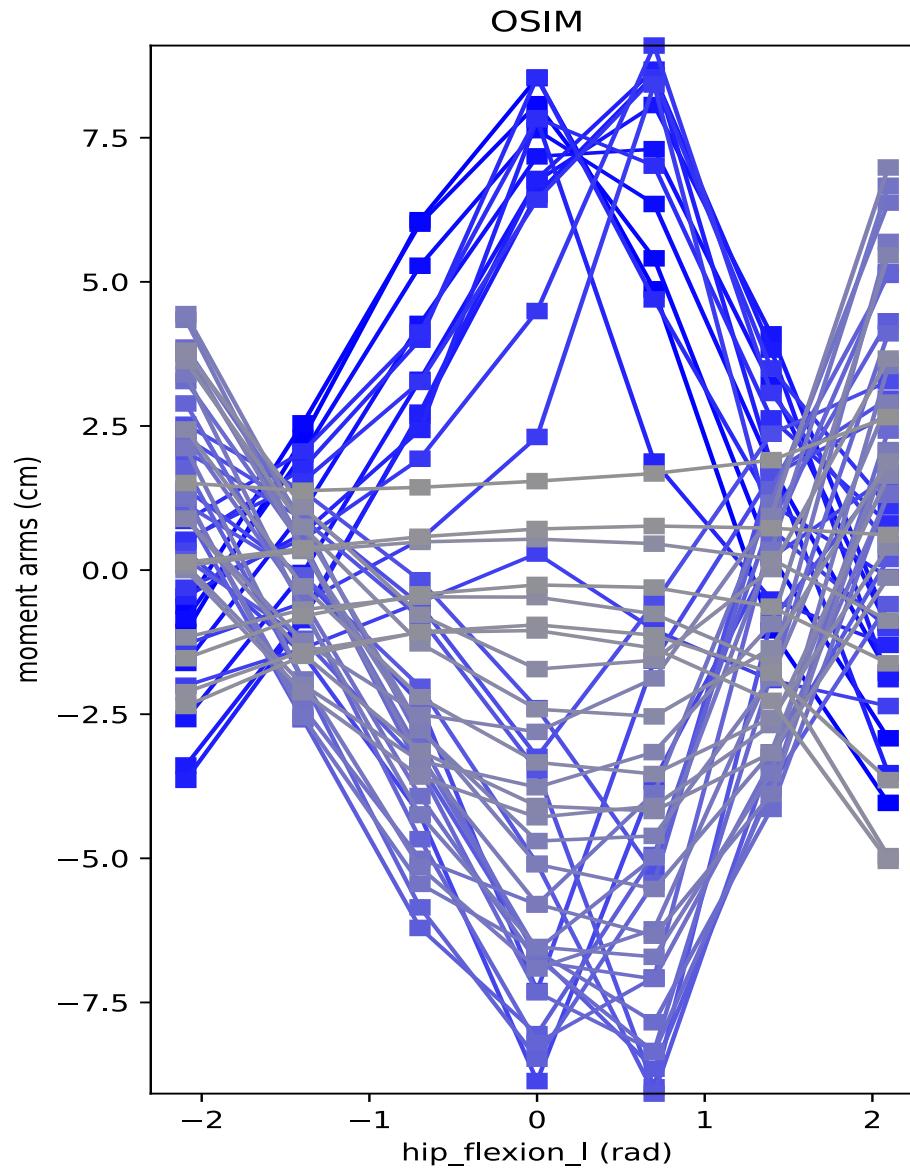
Muscle specific moment arm comparison with Osim model after optimization

intobl_I - lumbar_bending - lumbar_extension - lumbar_rotation



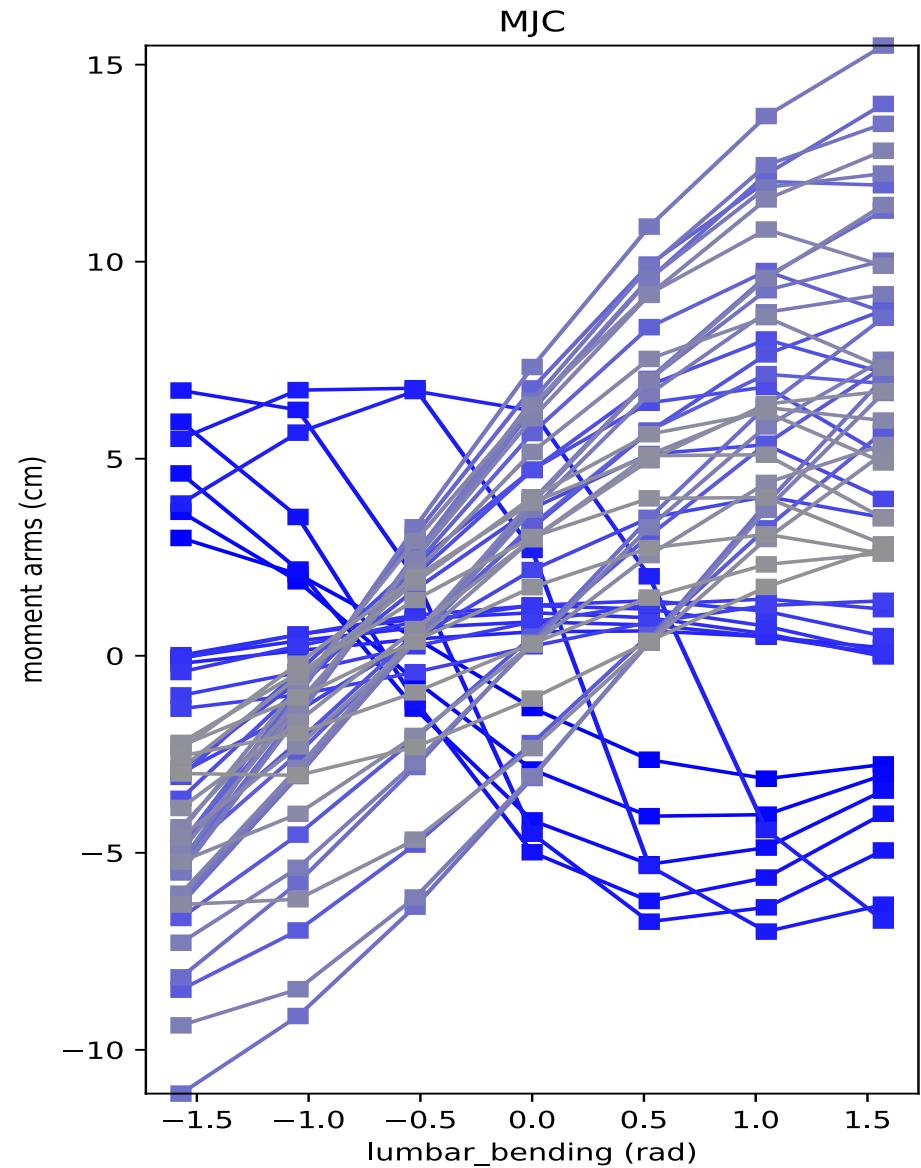
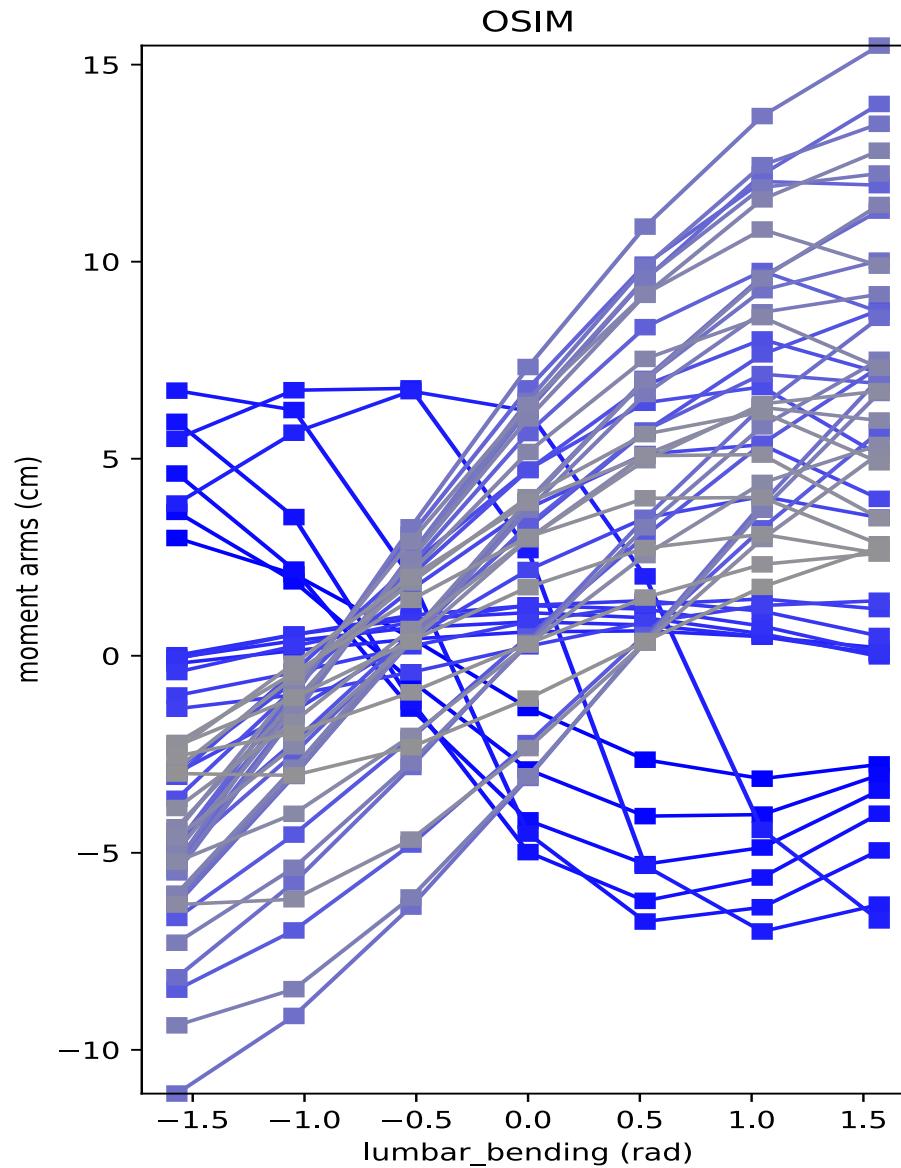
Muscle specific moment arm comparison with Osim model after optimization

glut_max3_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



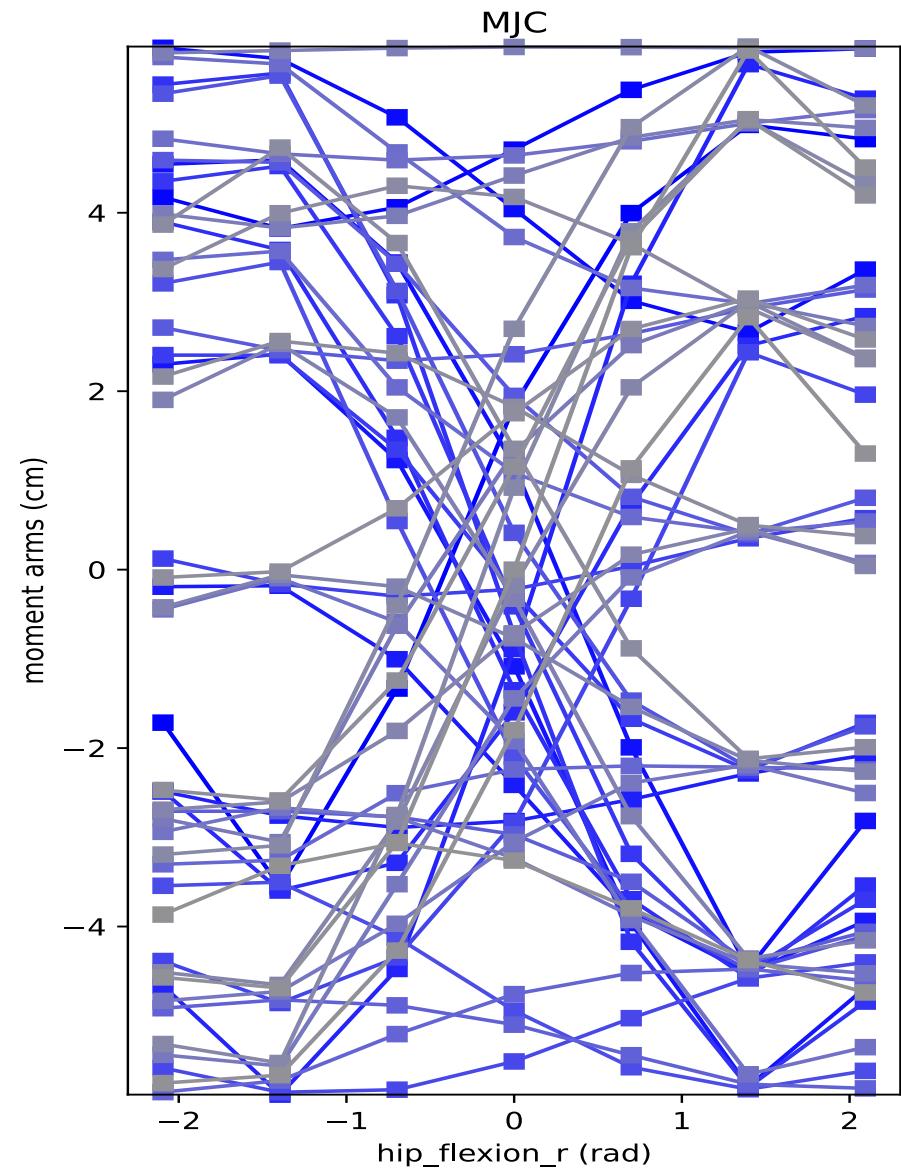
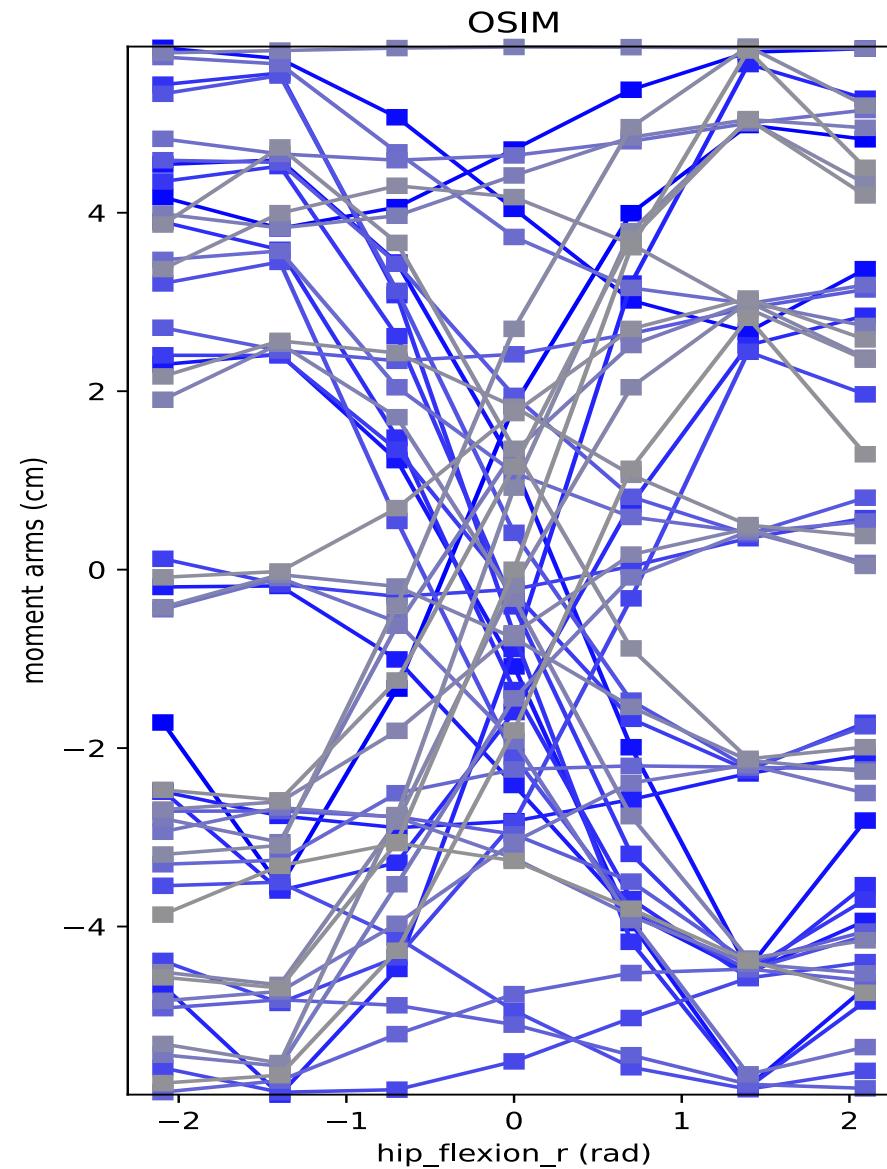
Muscle specific moment arm comparison with Osim model after optimization

extobl_r - lumbar_bending - lumbar_extension - lumbar_rotation



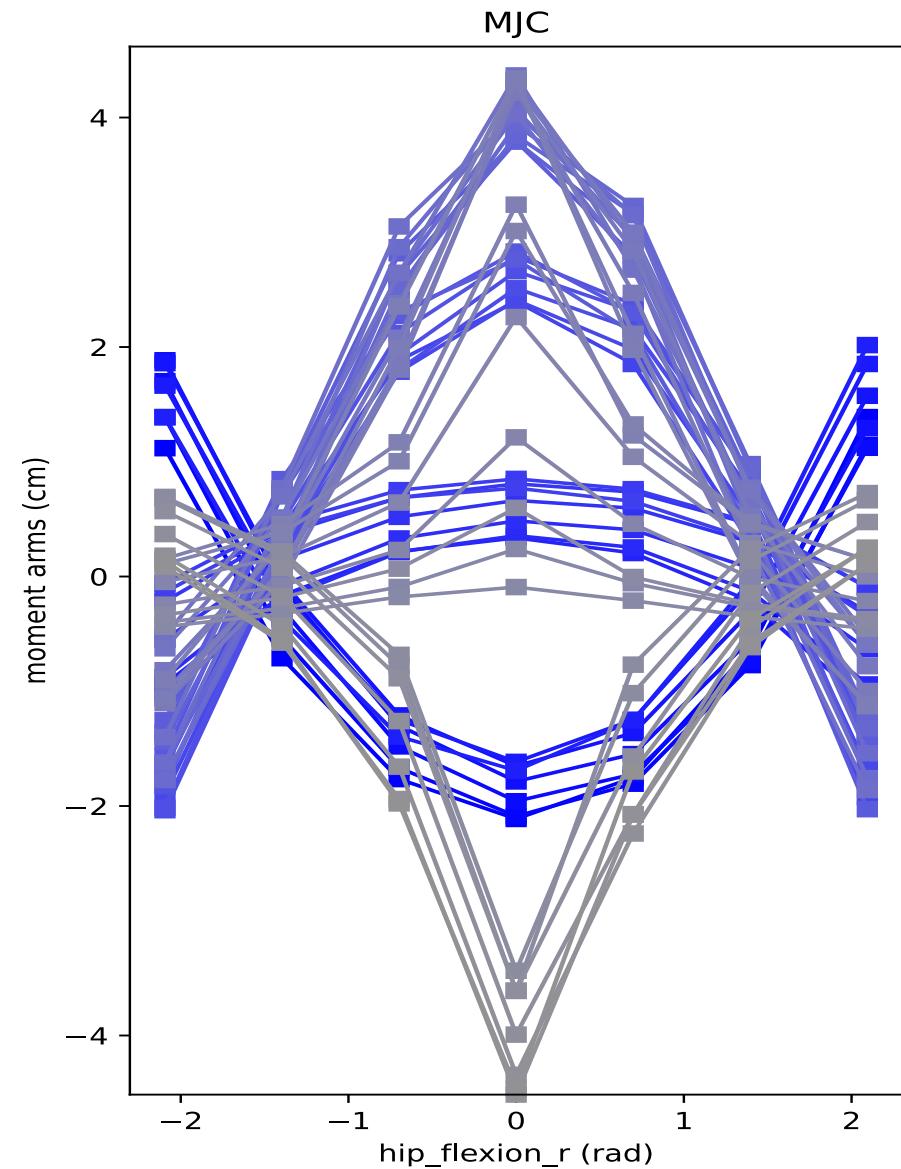
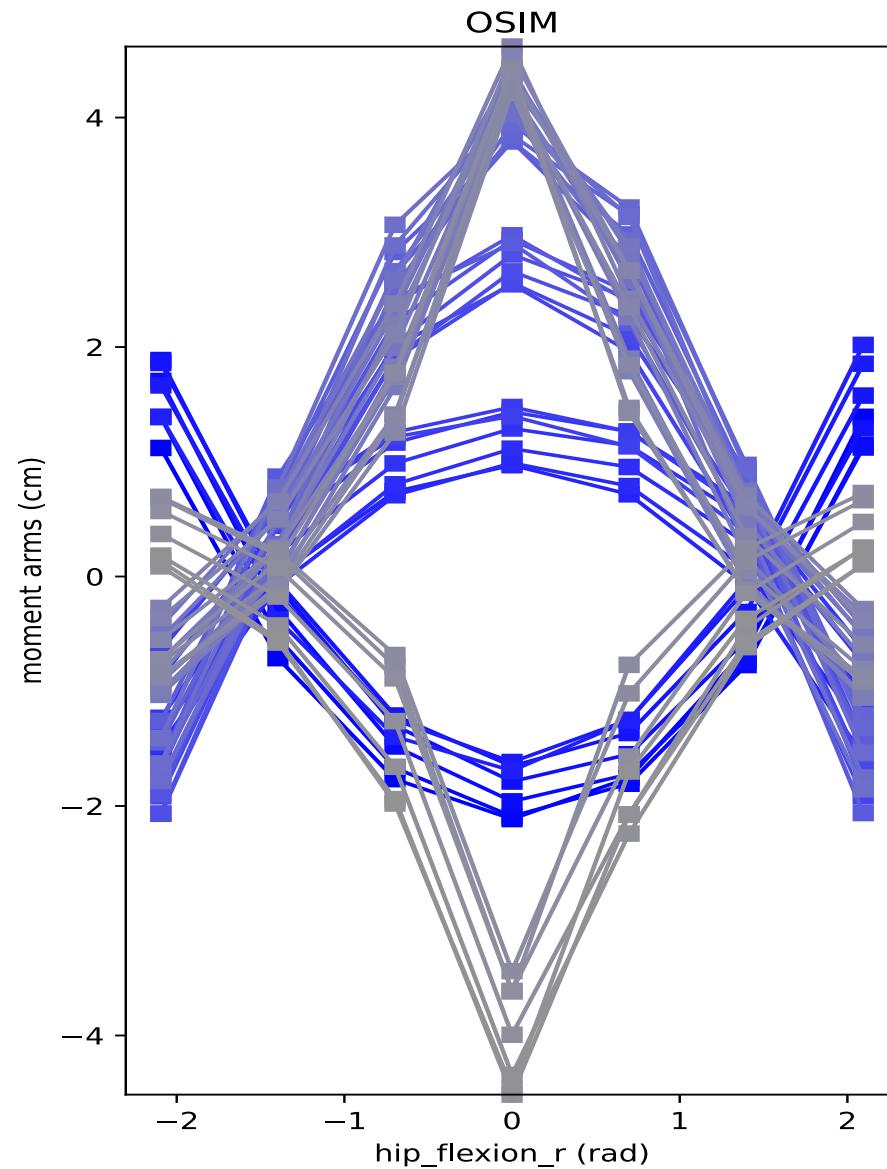
Muscle specific moment arm comparison with Osim model after optimization

glut_med2_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



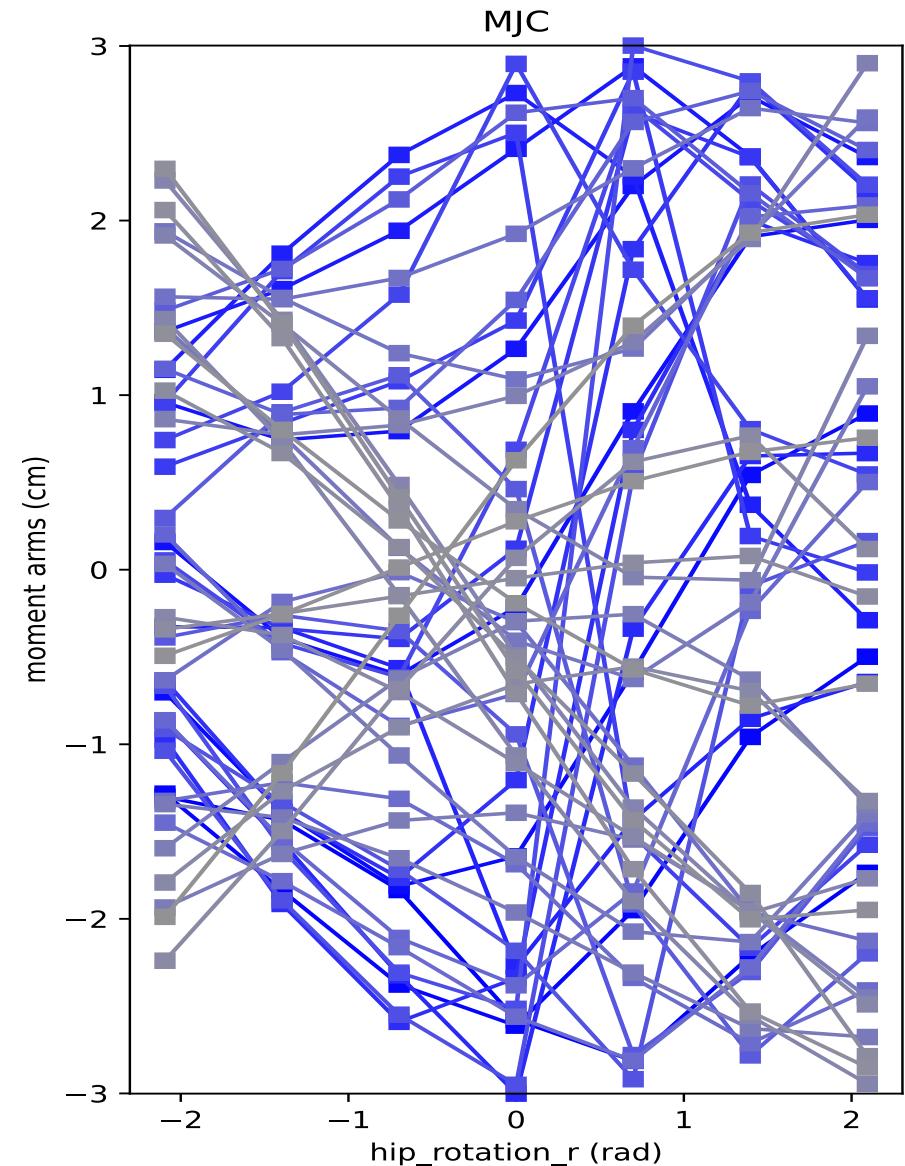
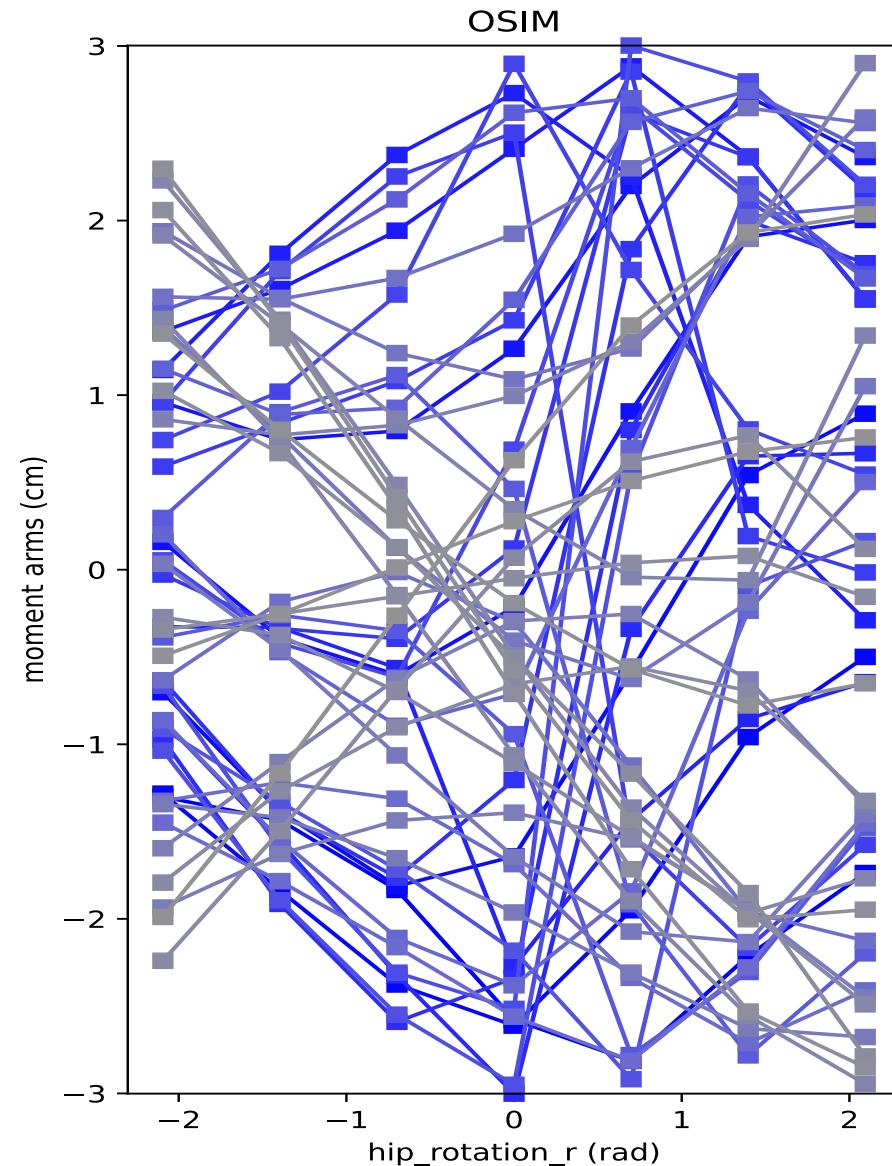
Muscle specific moment arm comparison with Osim model after optimization

iliacus_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



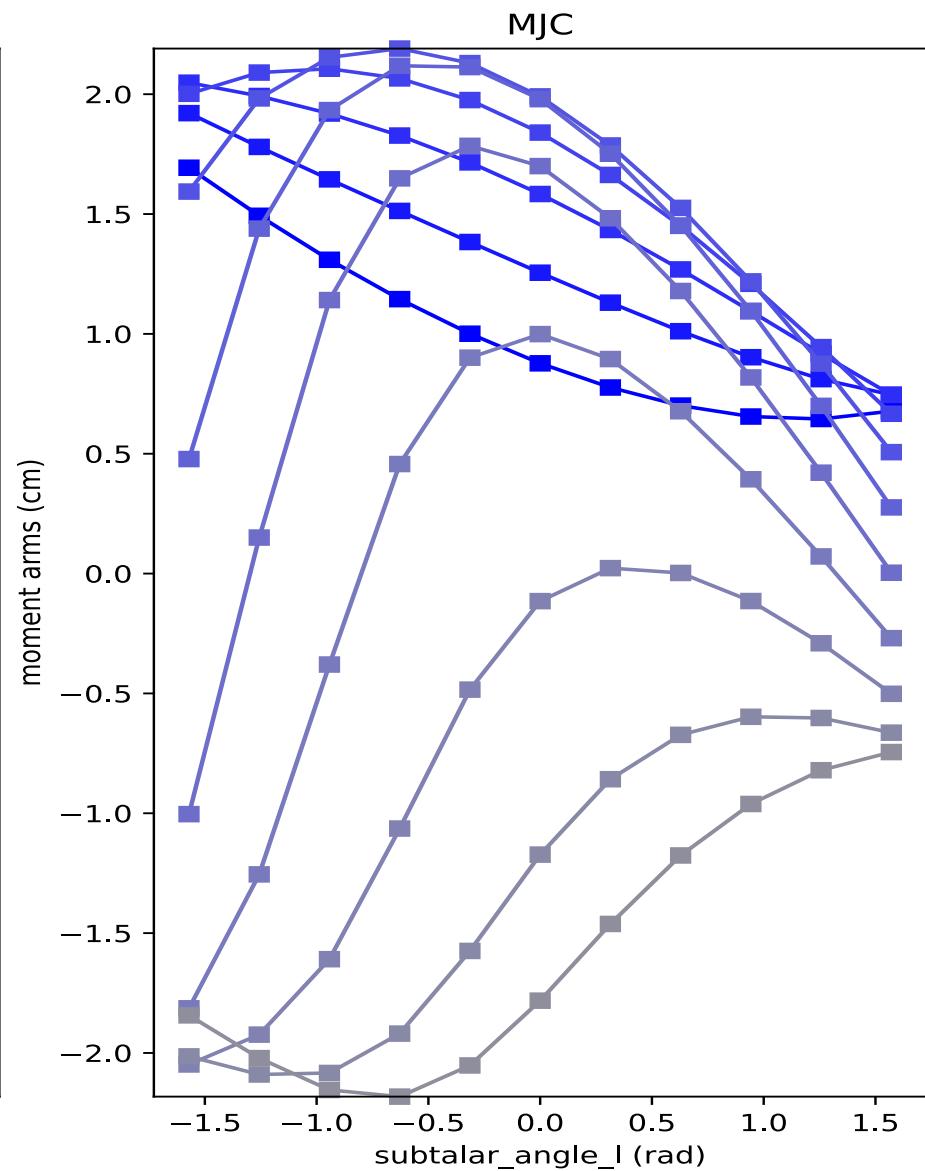
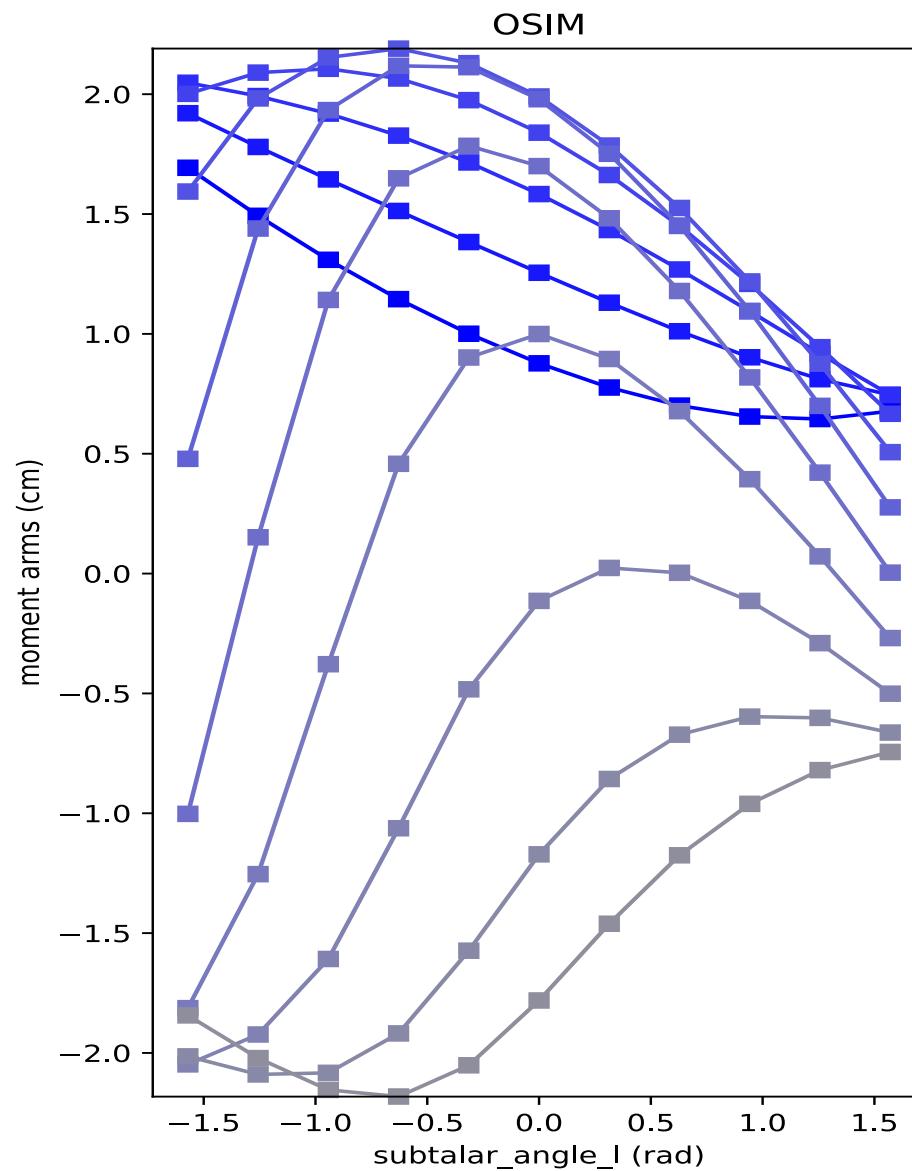
Muscle specific moment arm comparison with Osim model after optimization

glut_max3_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



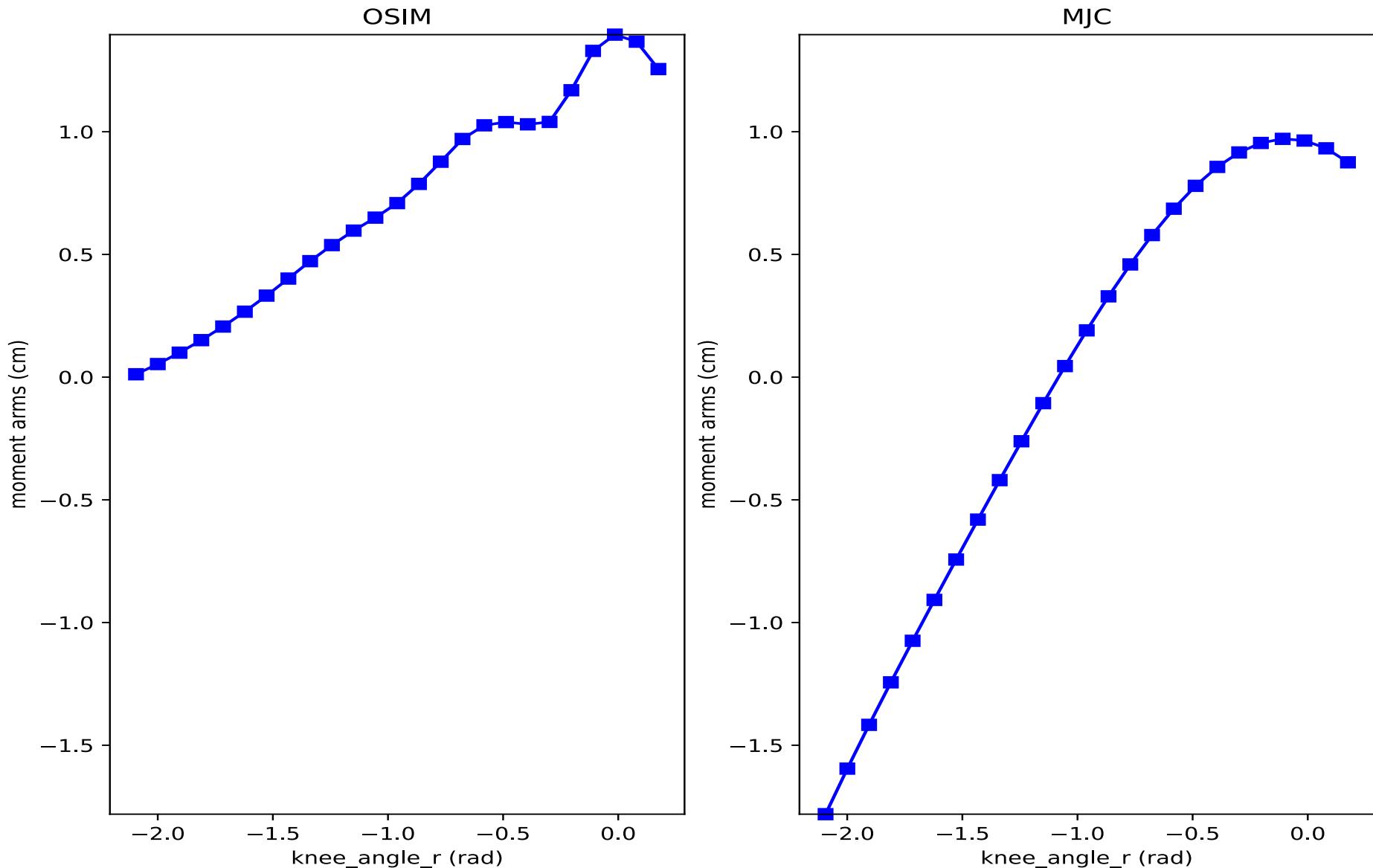
Muscle specific moment arm comparison with Osim model after optimization

tib_post_I - ankle_angle_I - subtalar_angle_I



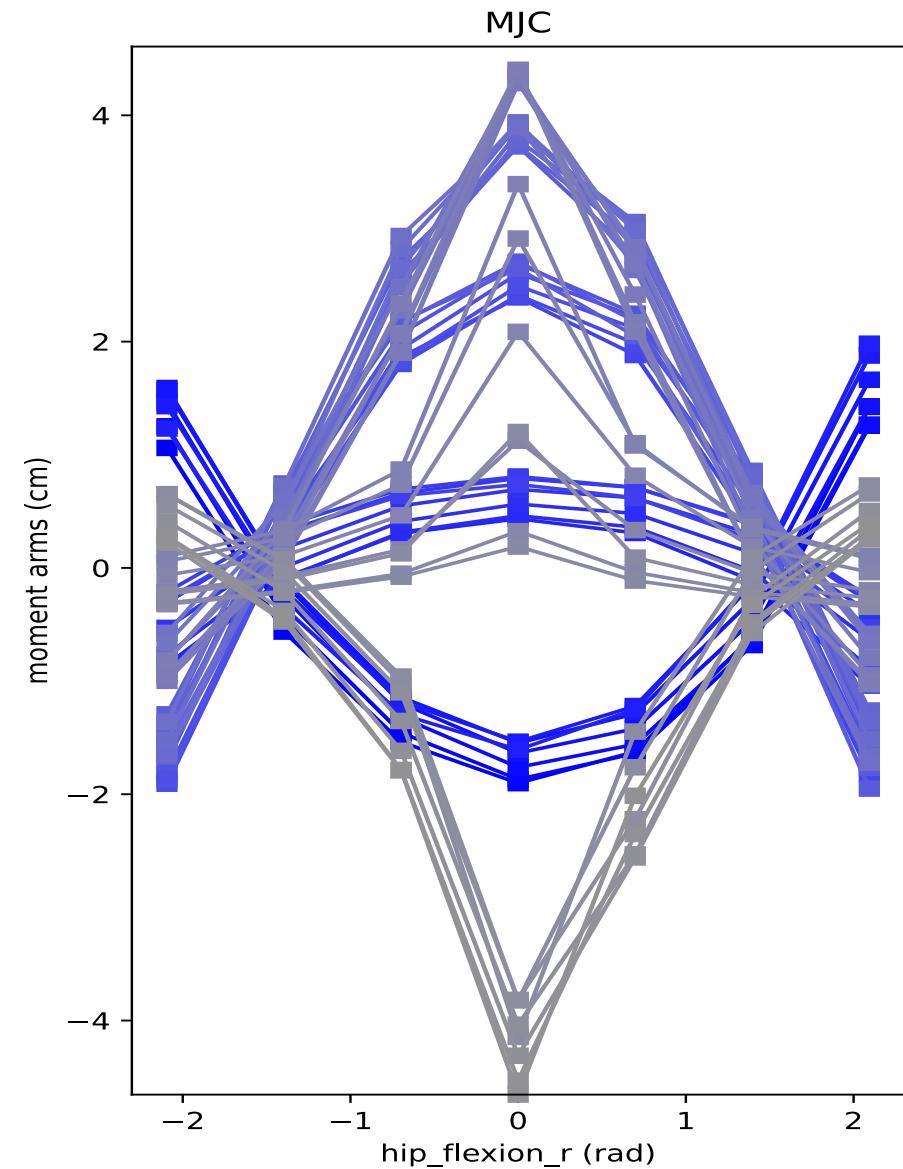
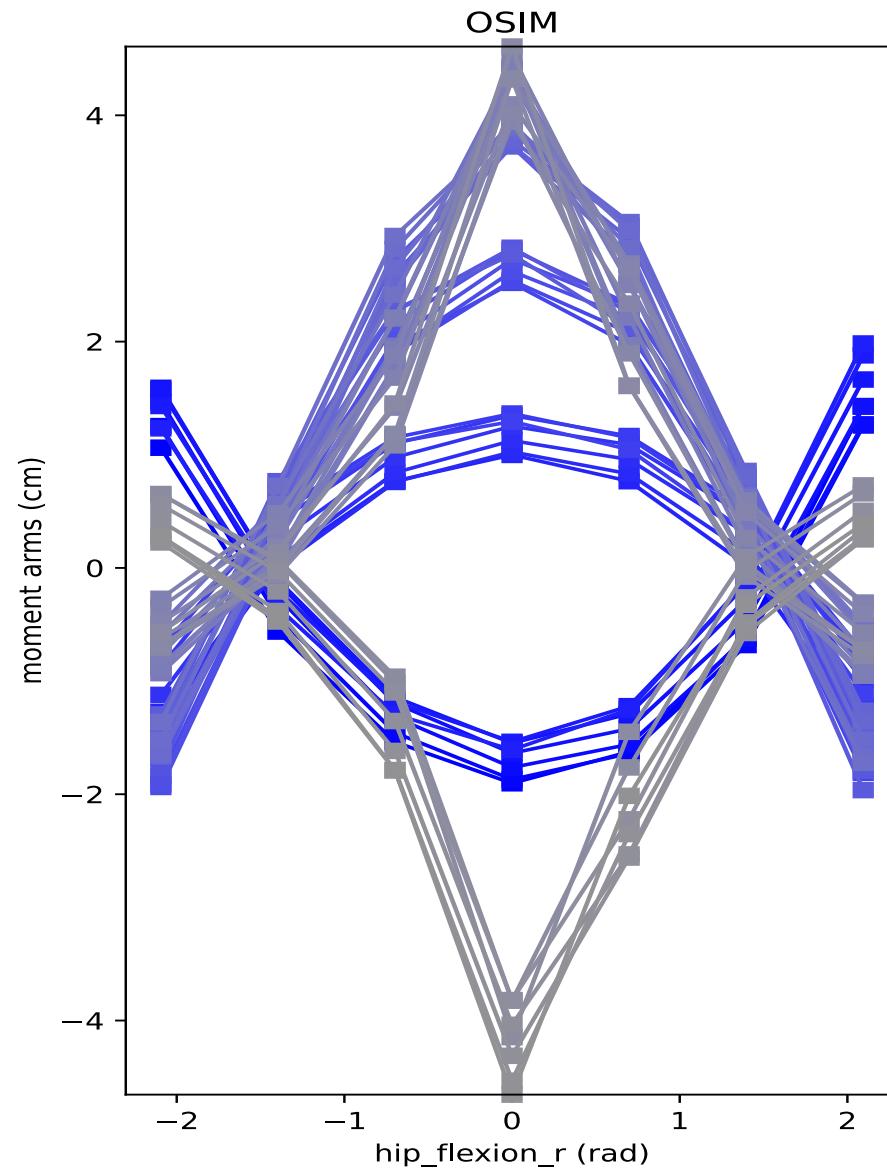
Muscle specific moment arm comparison with Osim model after optimization

tfl_r - knee_angle_r



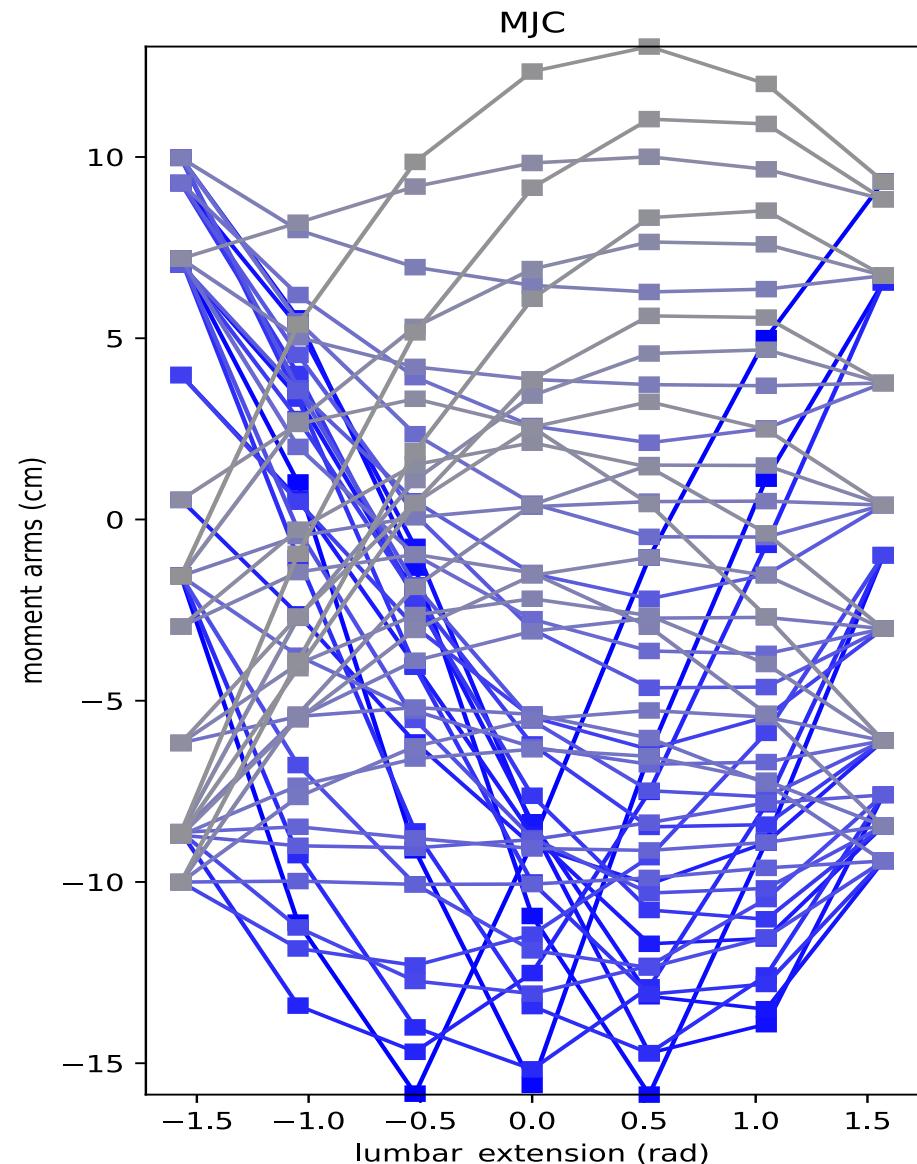
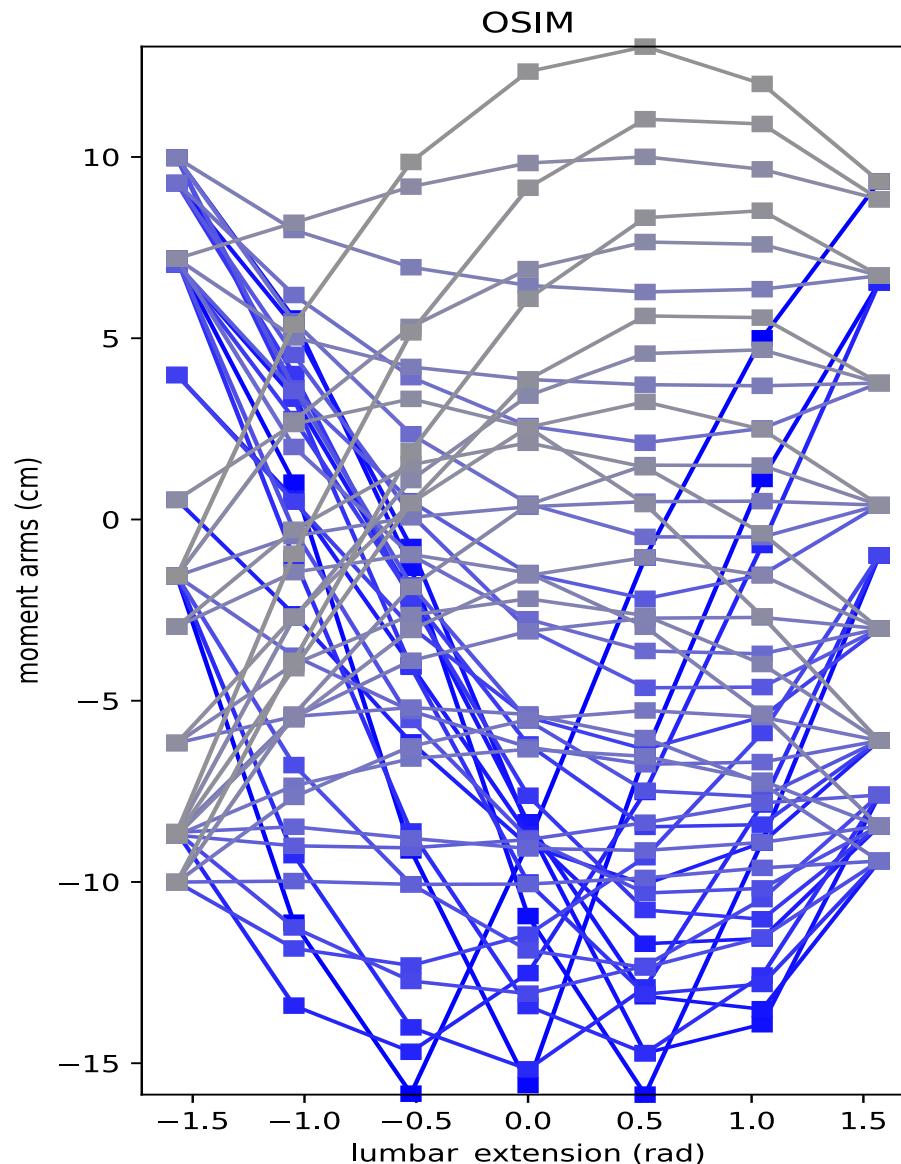
Muscle specific moment arm comparison with Osim model after optimization

psoas_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



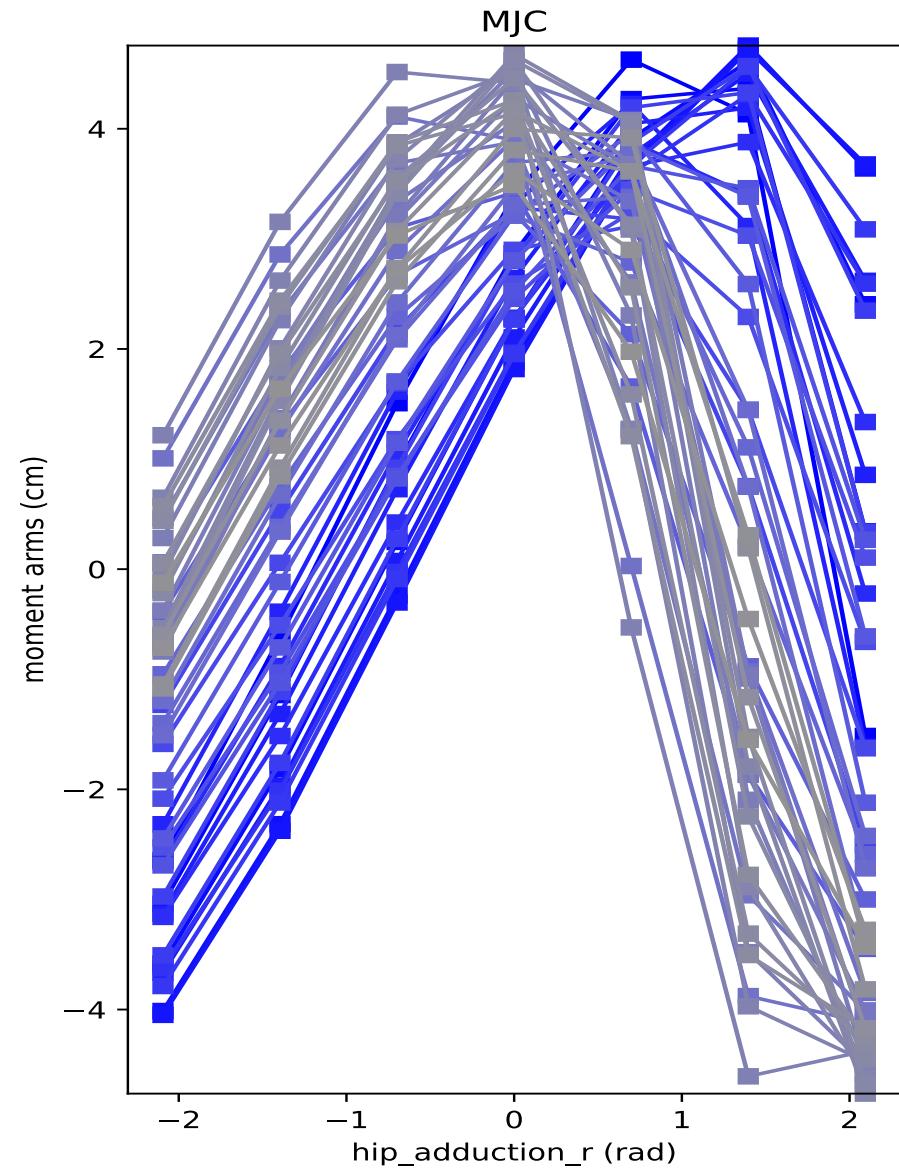
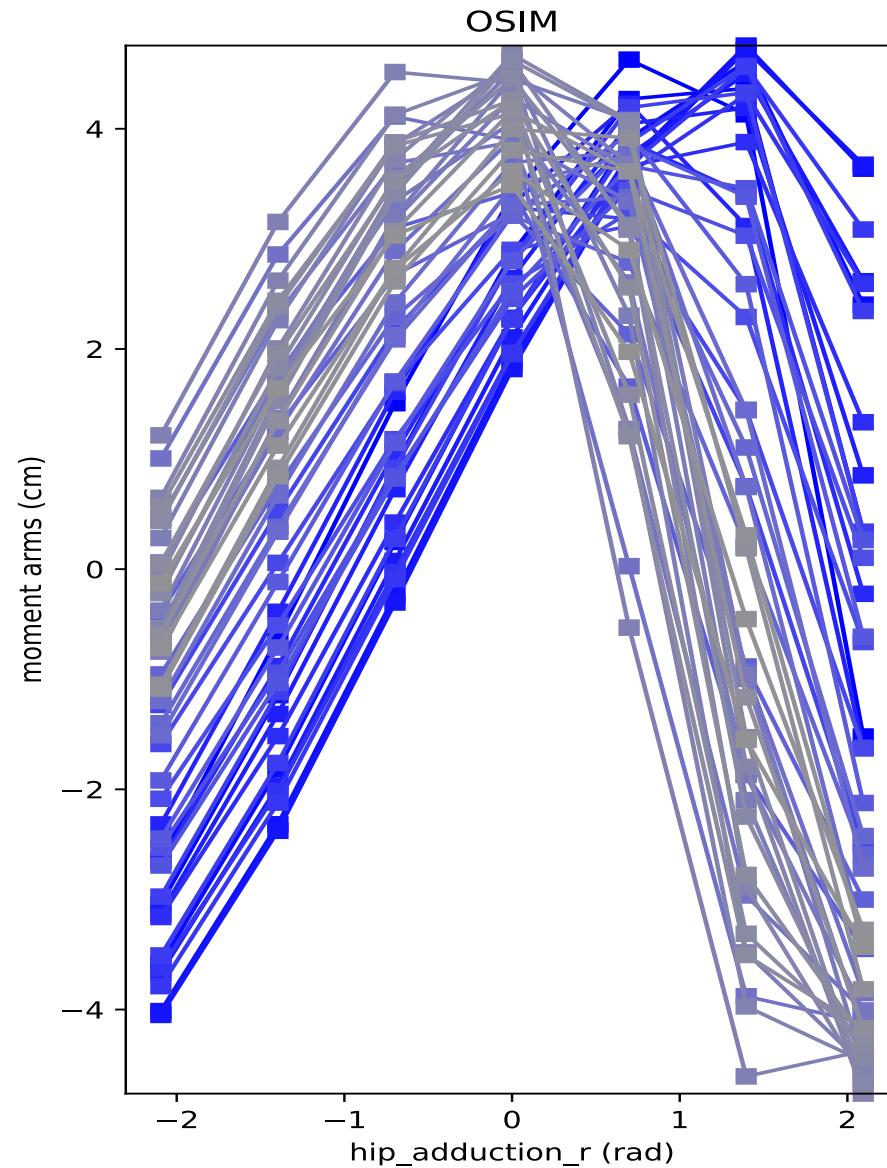
Muscle specific moment arm comparison with Osim model after optimization

extobl_I - lumbar_bending - lumbar_extension - lumbar_rotation

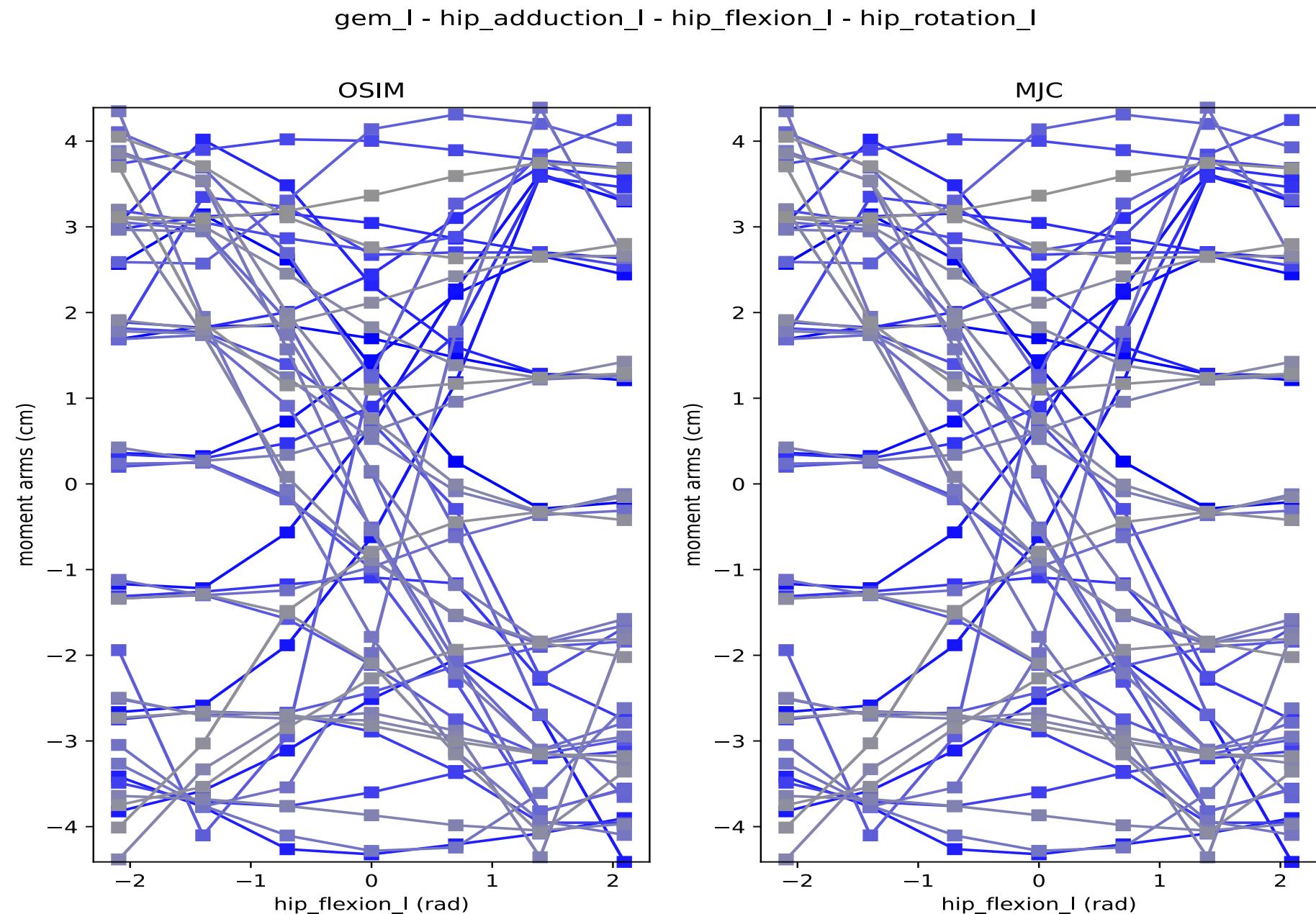


Muscle specific moment arm comparison with Osim model after optimization

pect_r - hip_adduction_r - hip_flexion_r - hip_rotation_r

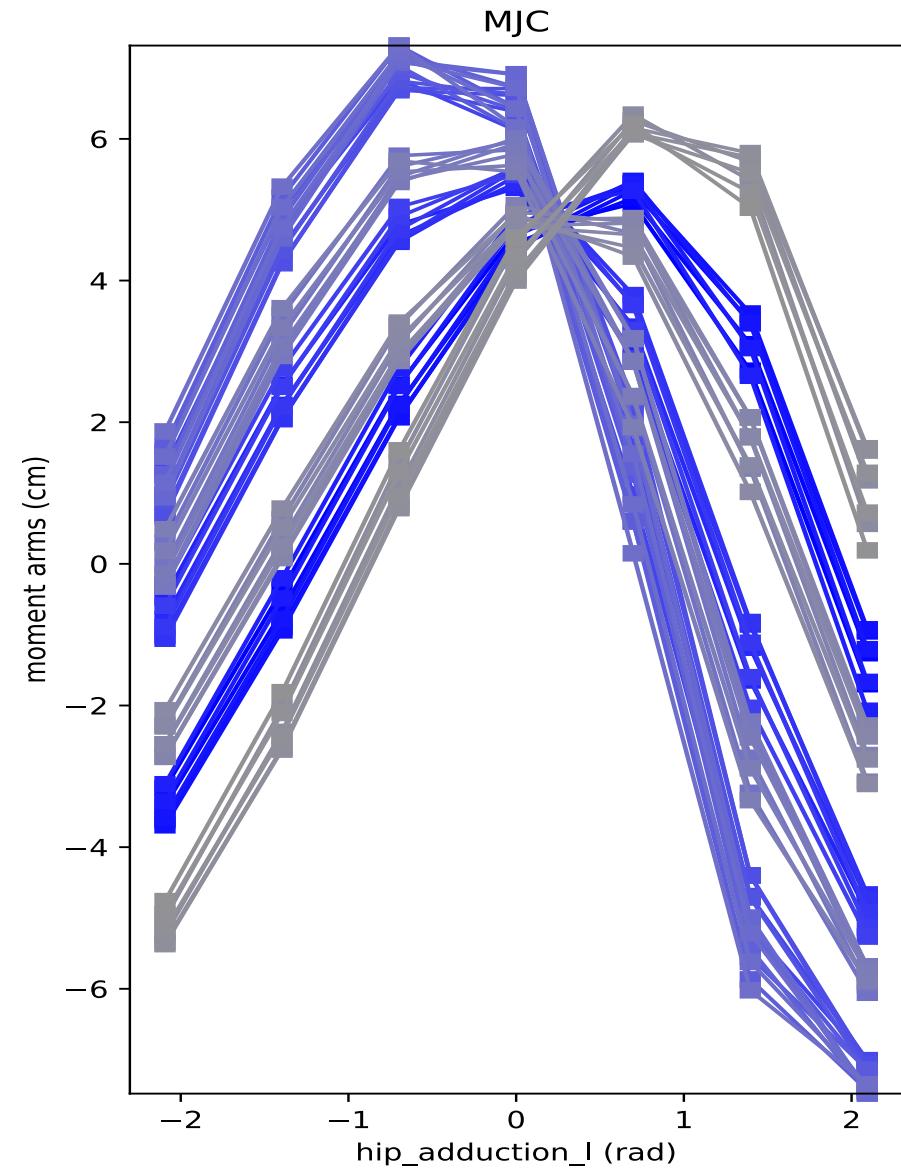
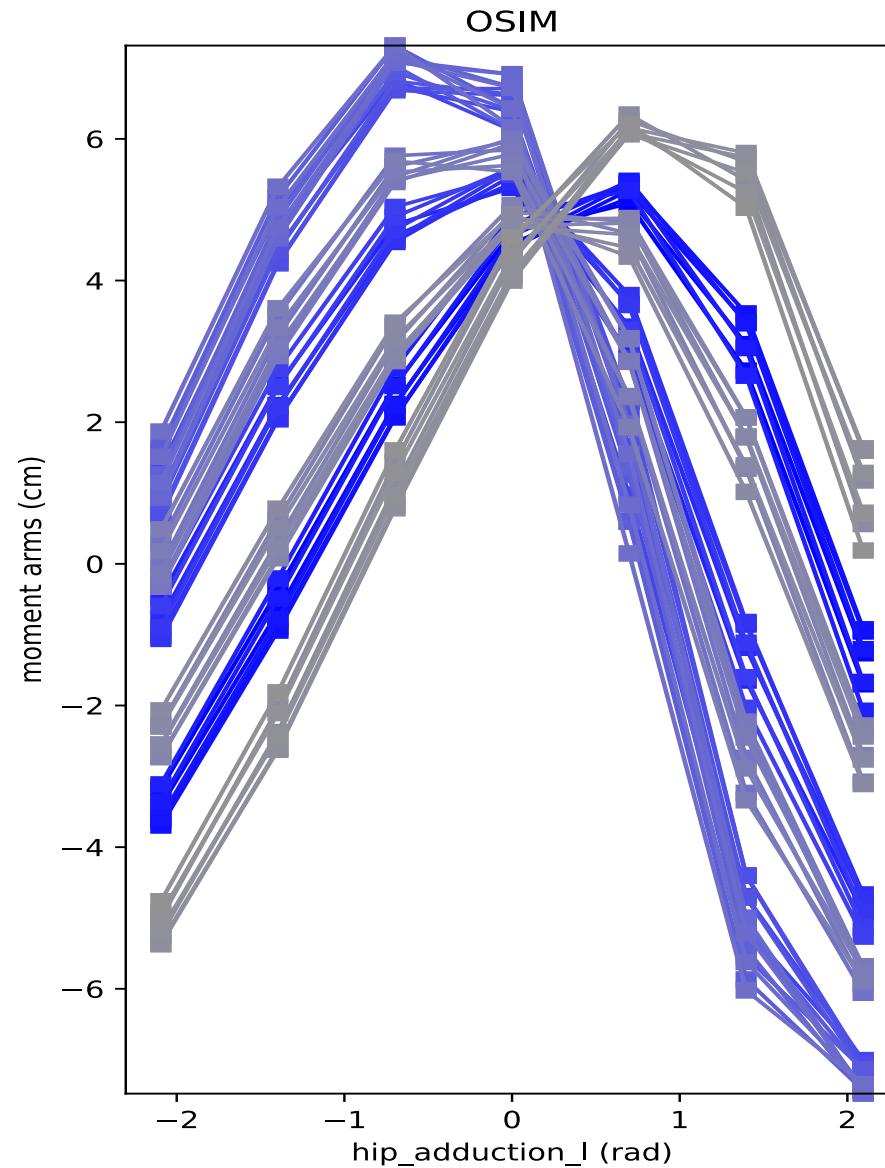


Muscle specific moment arm comparison with Osim model after optimization



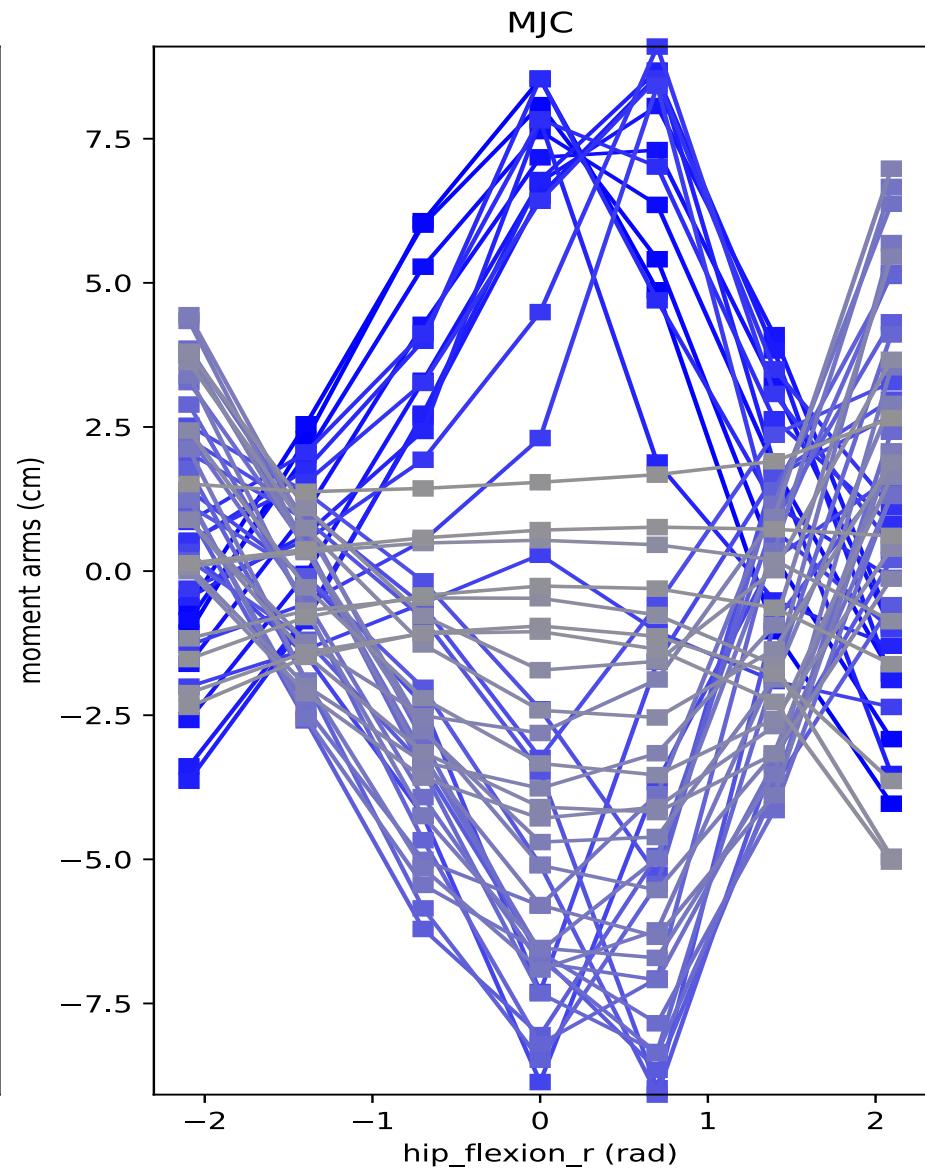
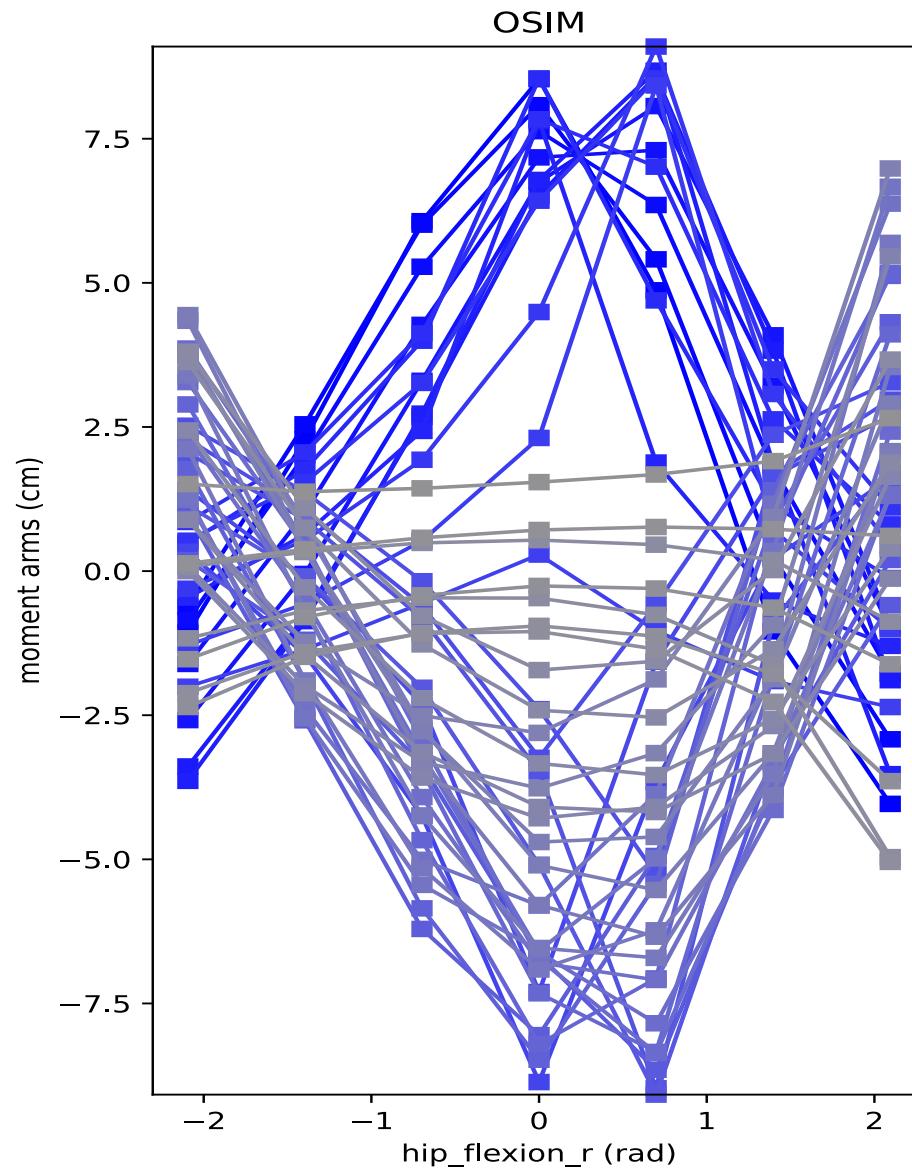
Muscle specific moment arm comparison with Osim model after optimization

add_mag2_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



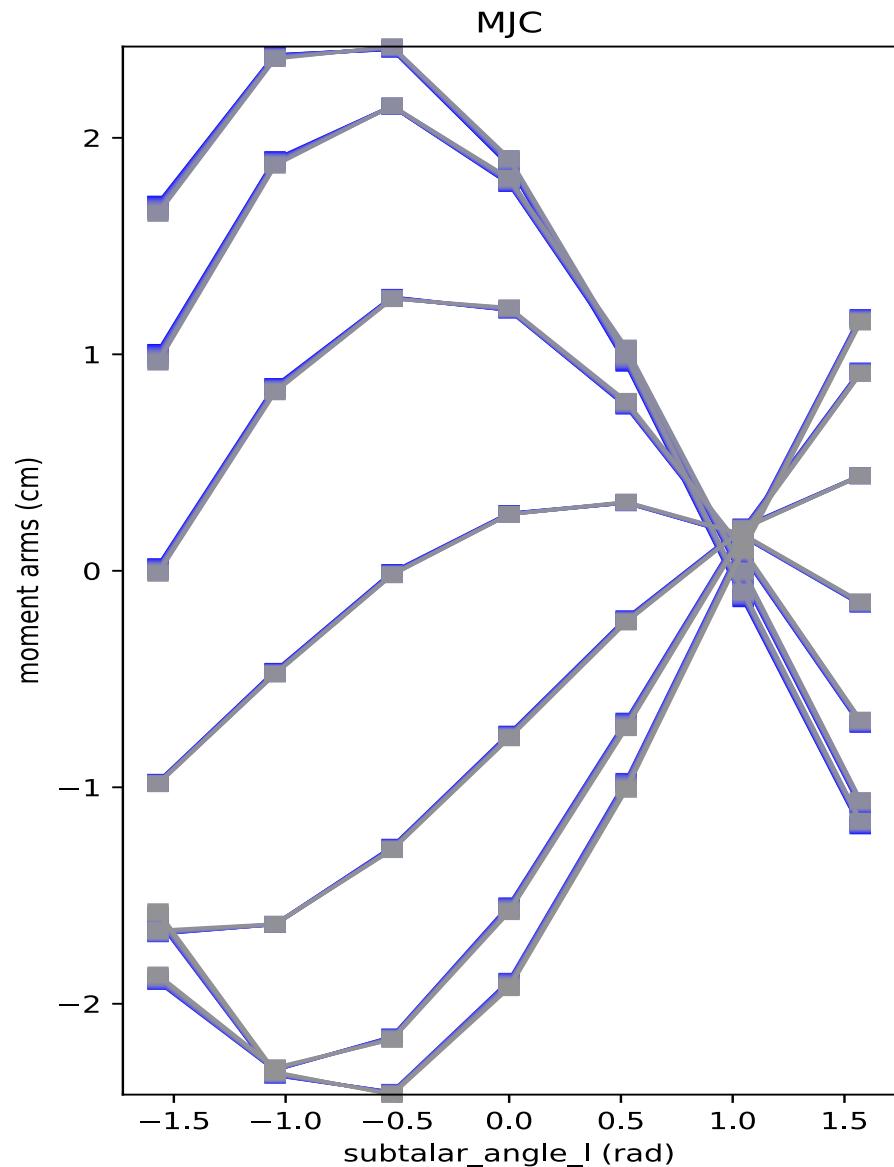
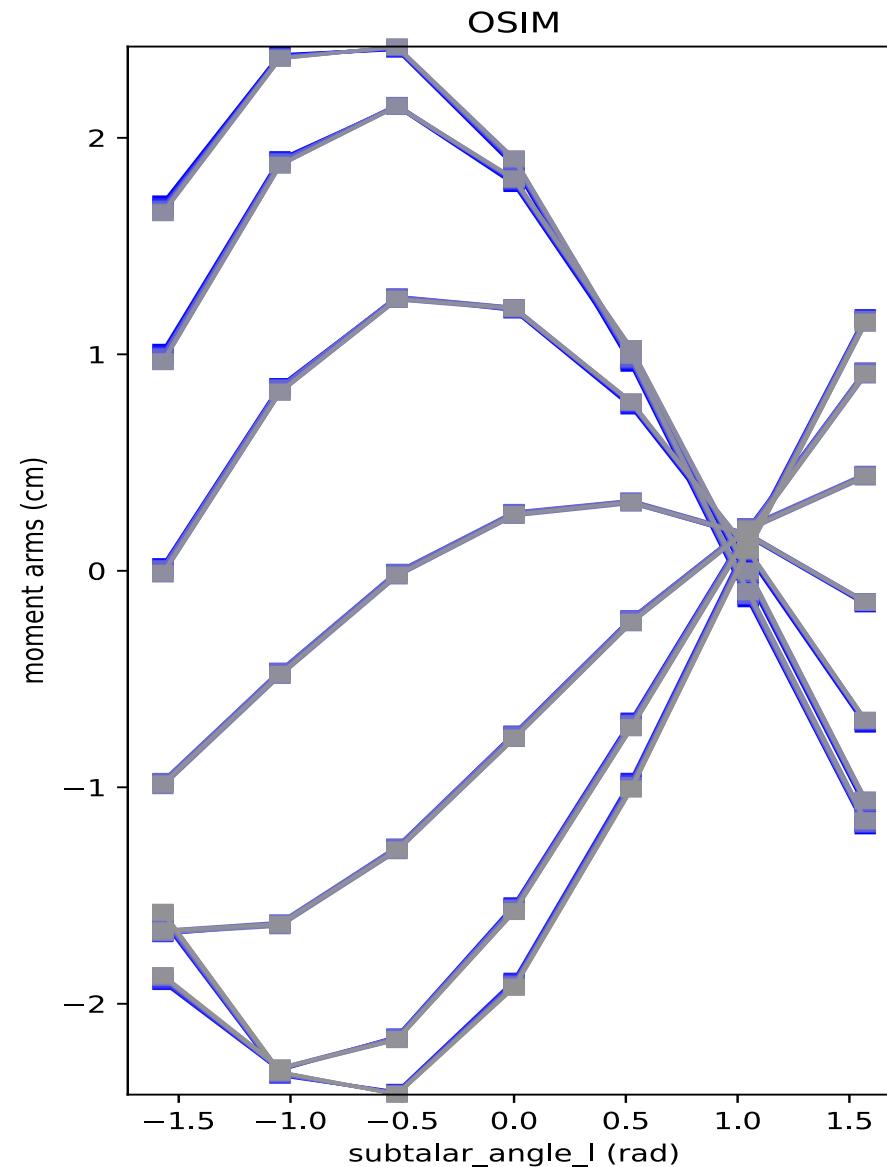
Muscle specific moment arm comparison with Osim model after optimization

glut_max3_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



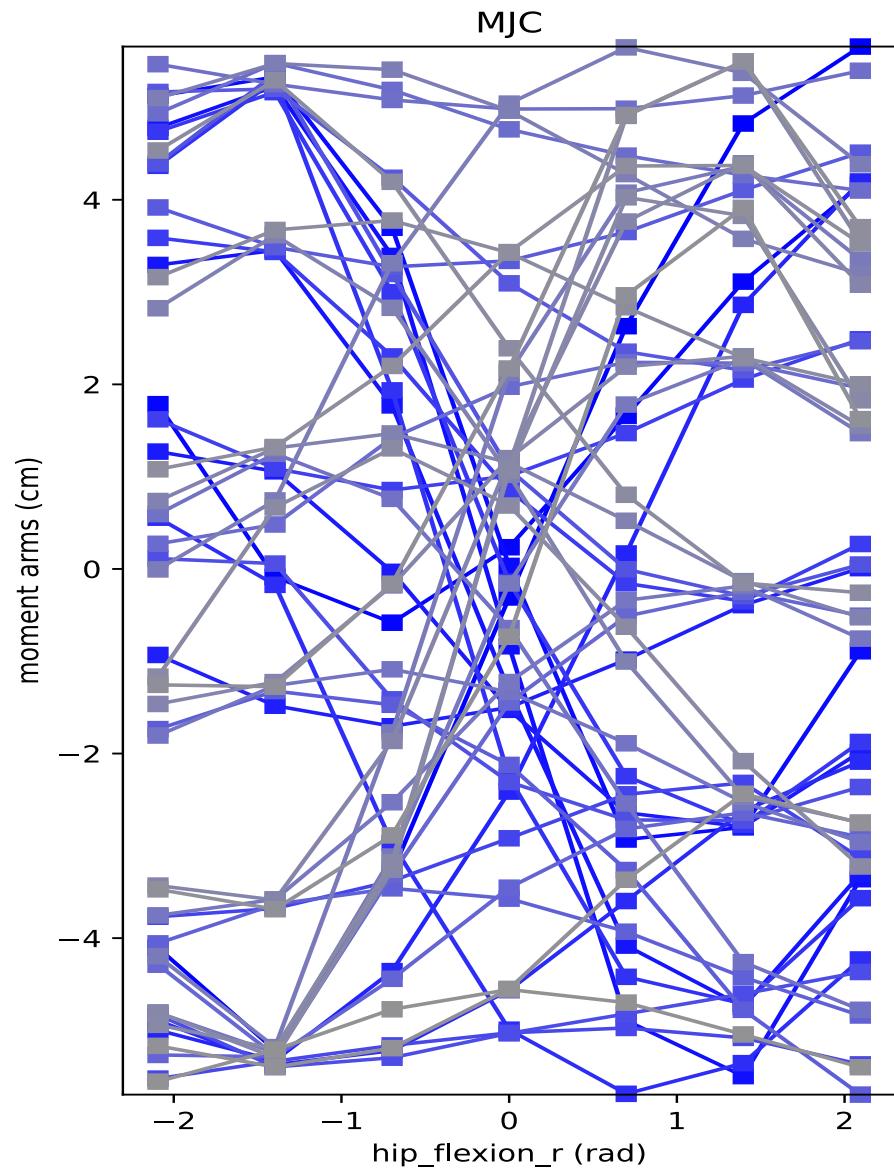
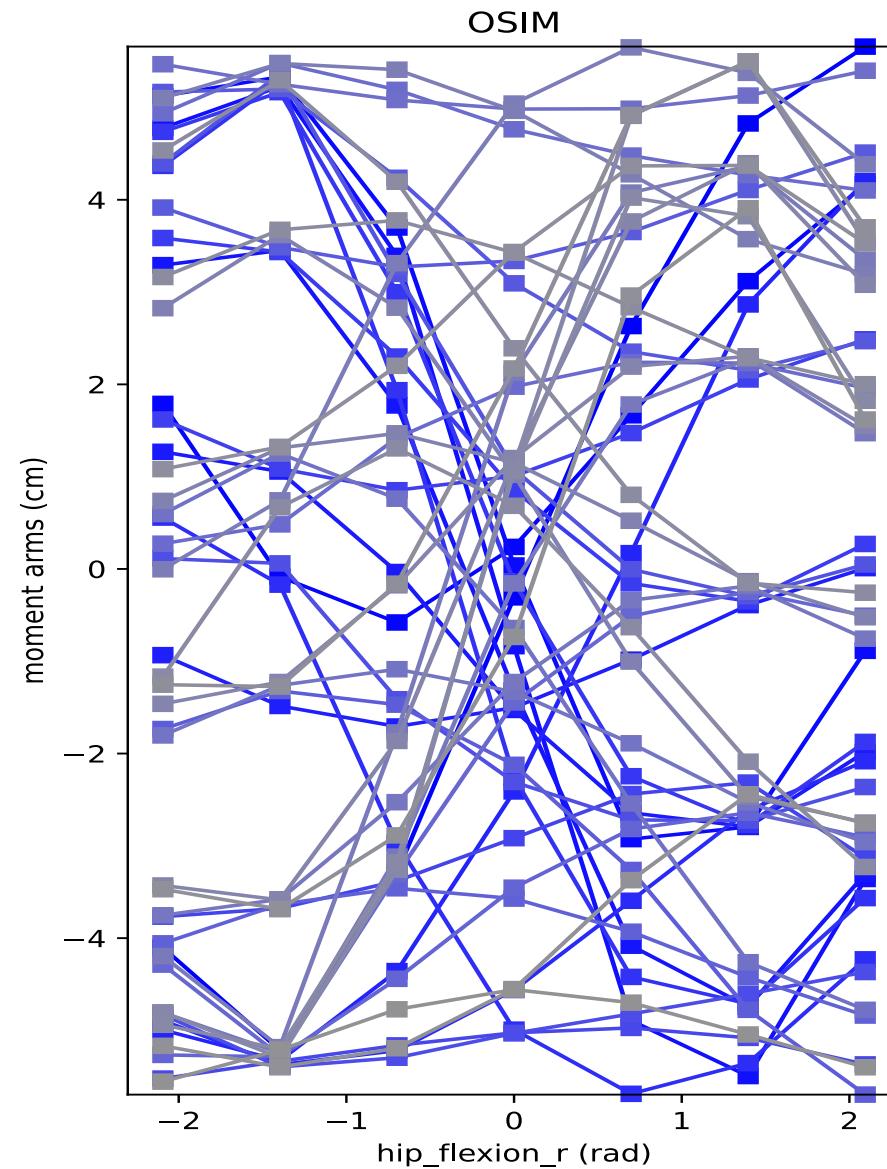
Muscle specific moment arm comparison with Osim model after optimization

med_gas_I - ankle_angle_I - knee_angle_I - subtalar_angle_I



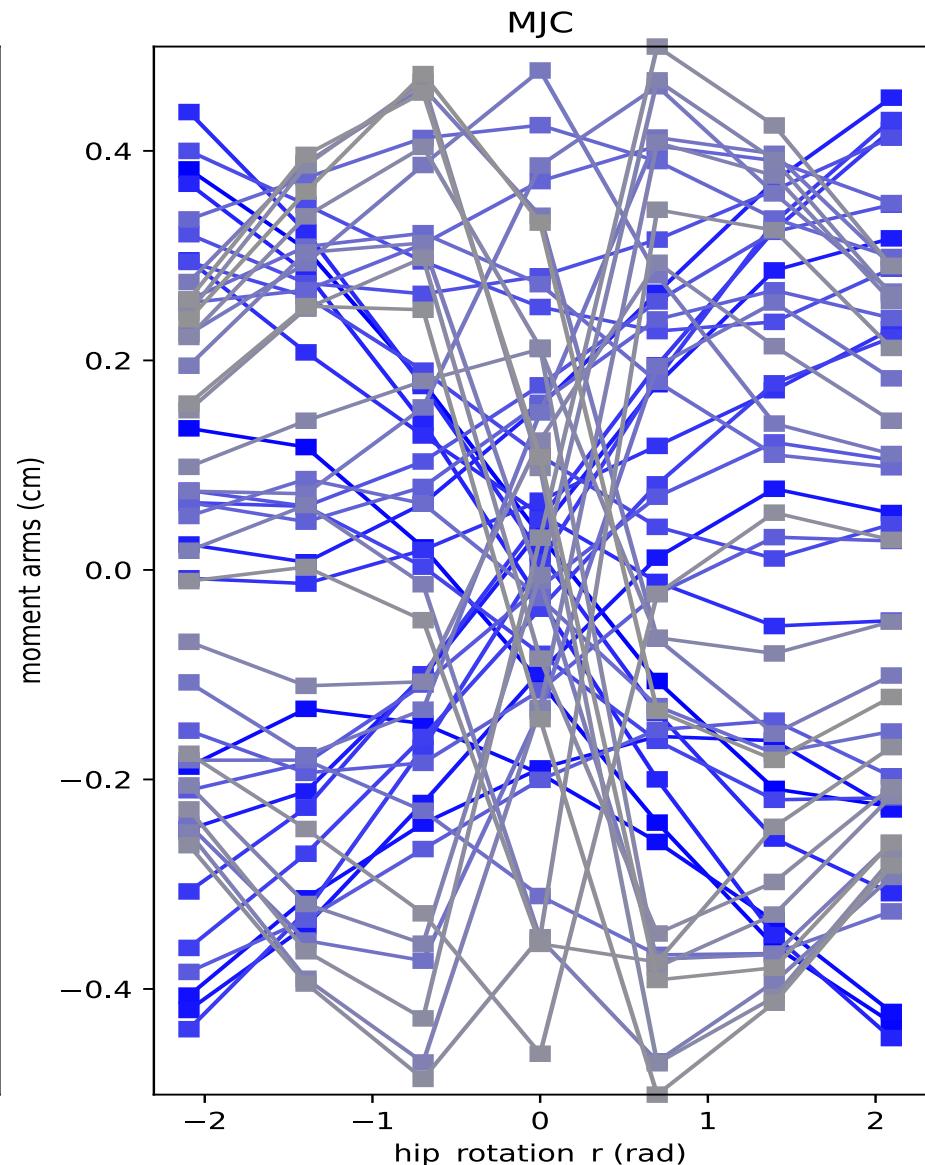
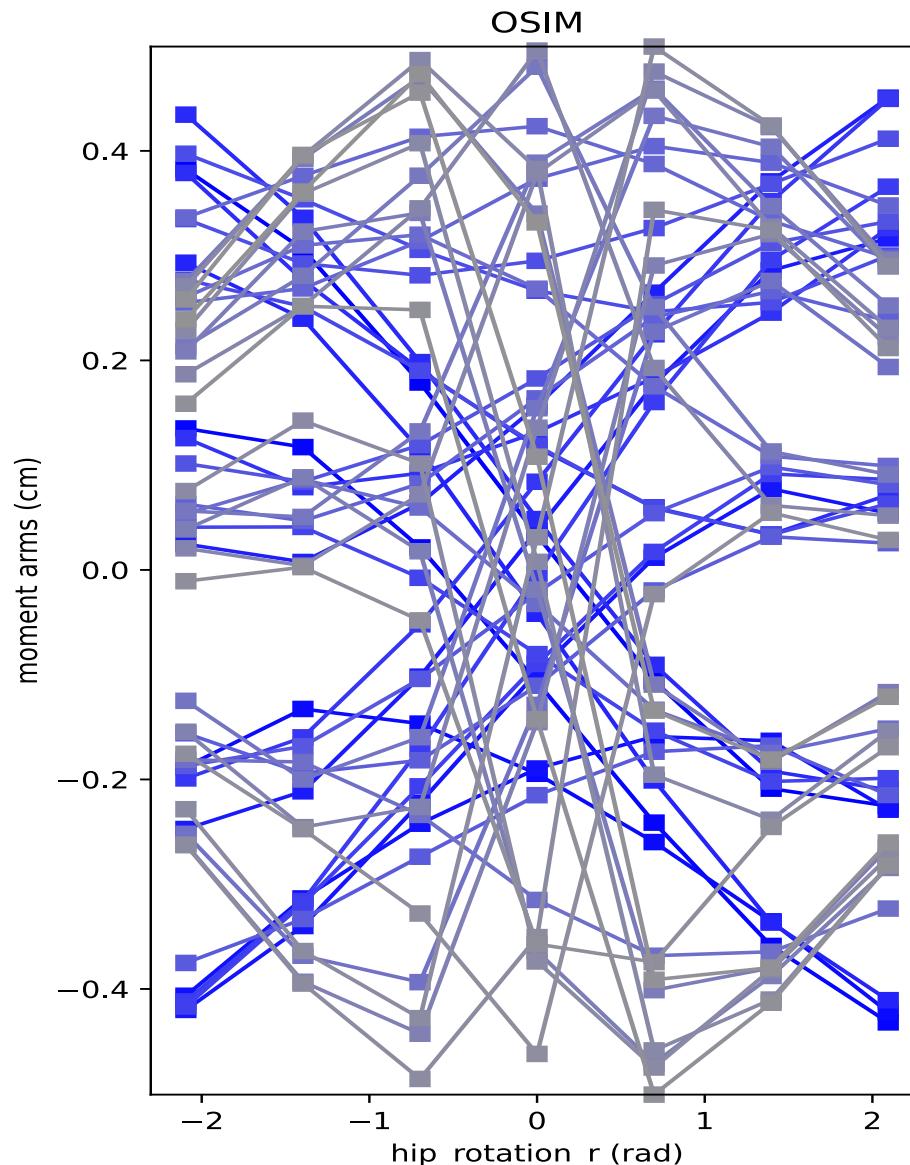
Muscle specific moment arm comparison with Osim model after optimization

glut_med1_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



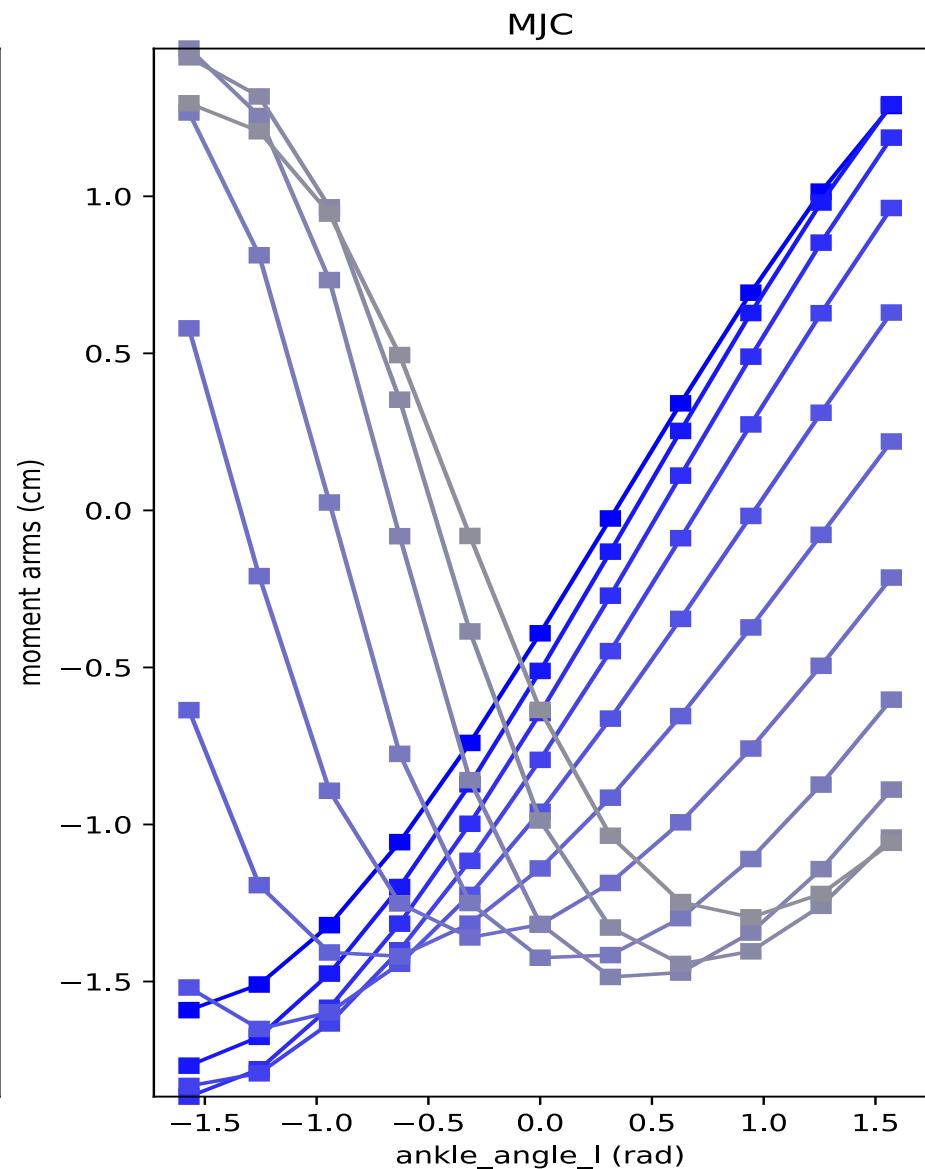
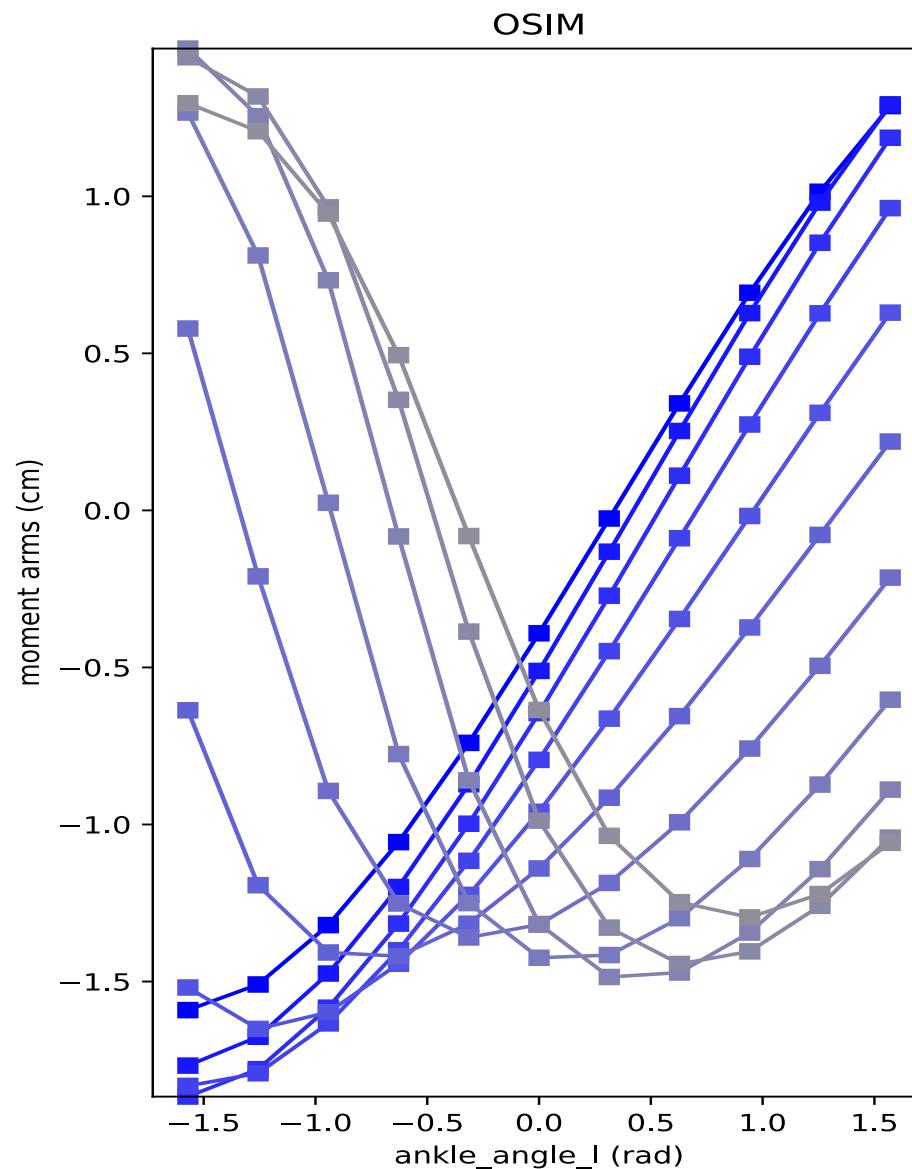
Muscle specific moment arm comparison with Osim model after optimization

iliacus_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



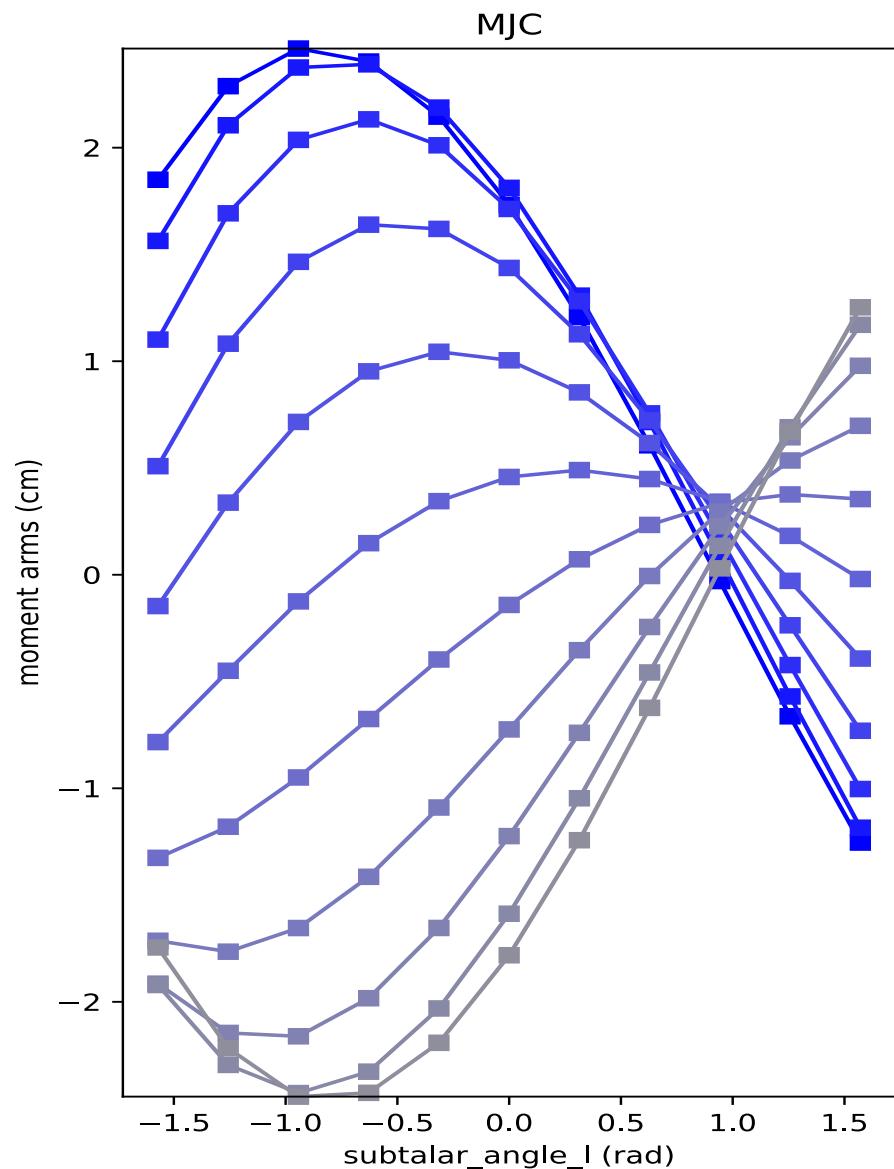
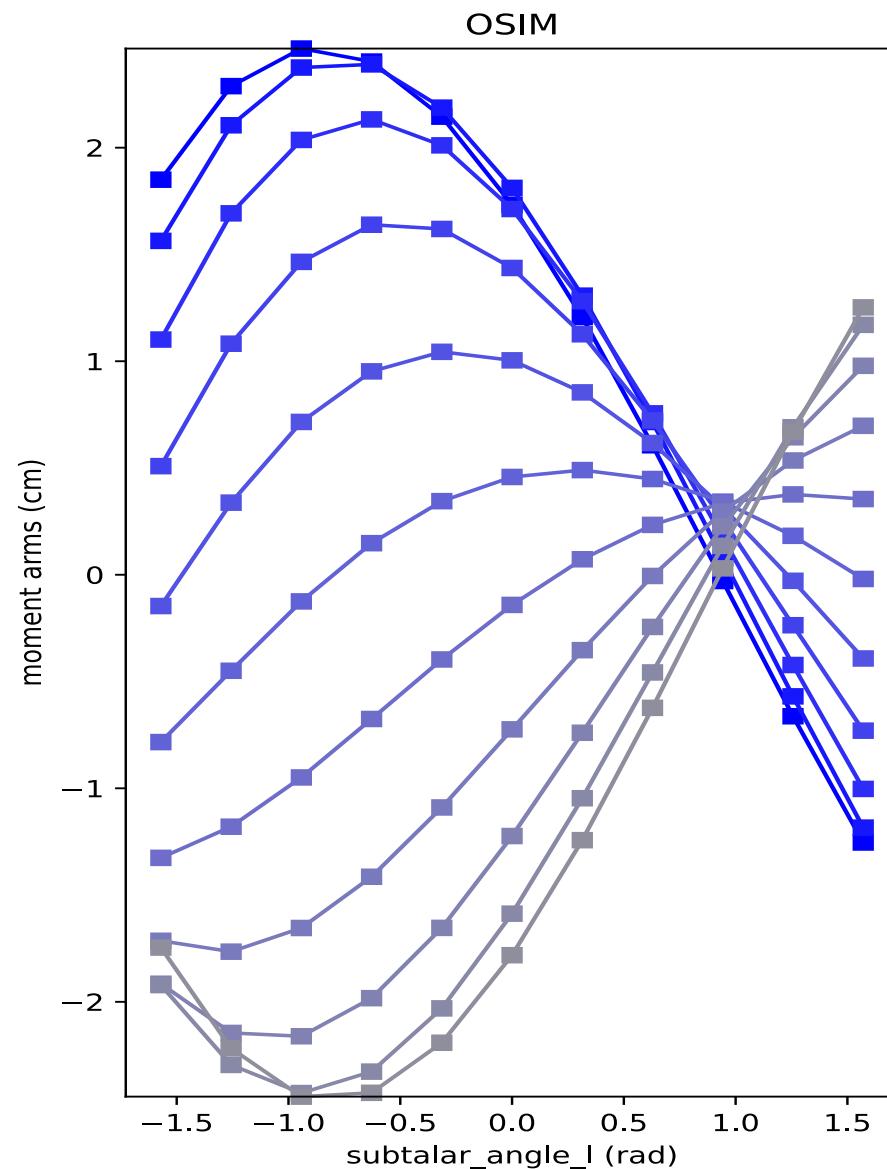
Muscle specific moment arm comparison with Osim model after optimization

tib_post_I - ankle_angle_I - subtalar_angle_I



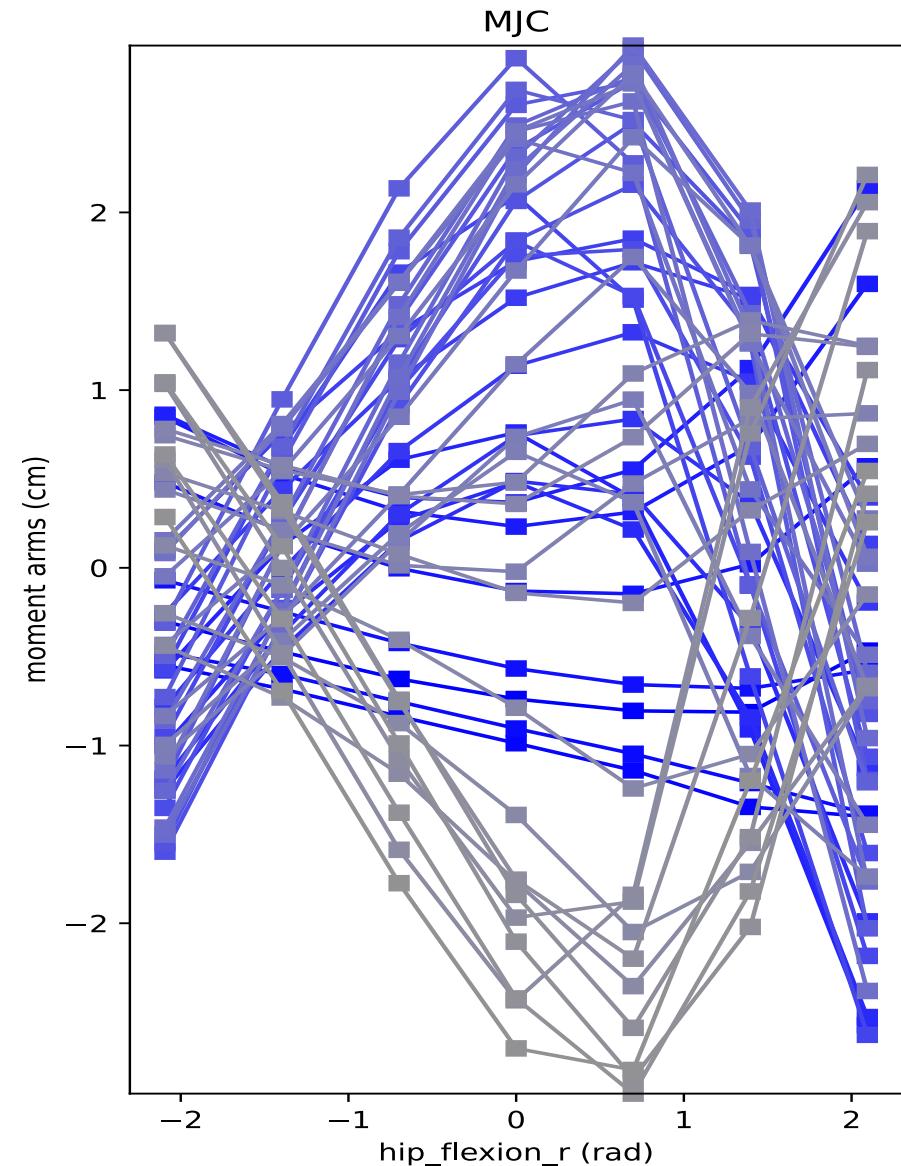
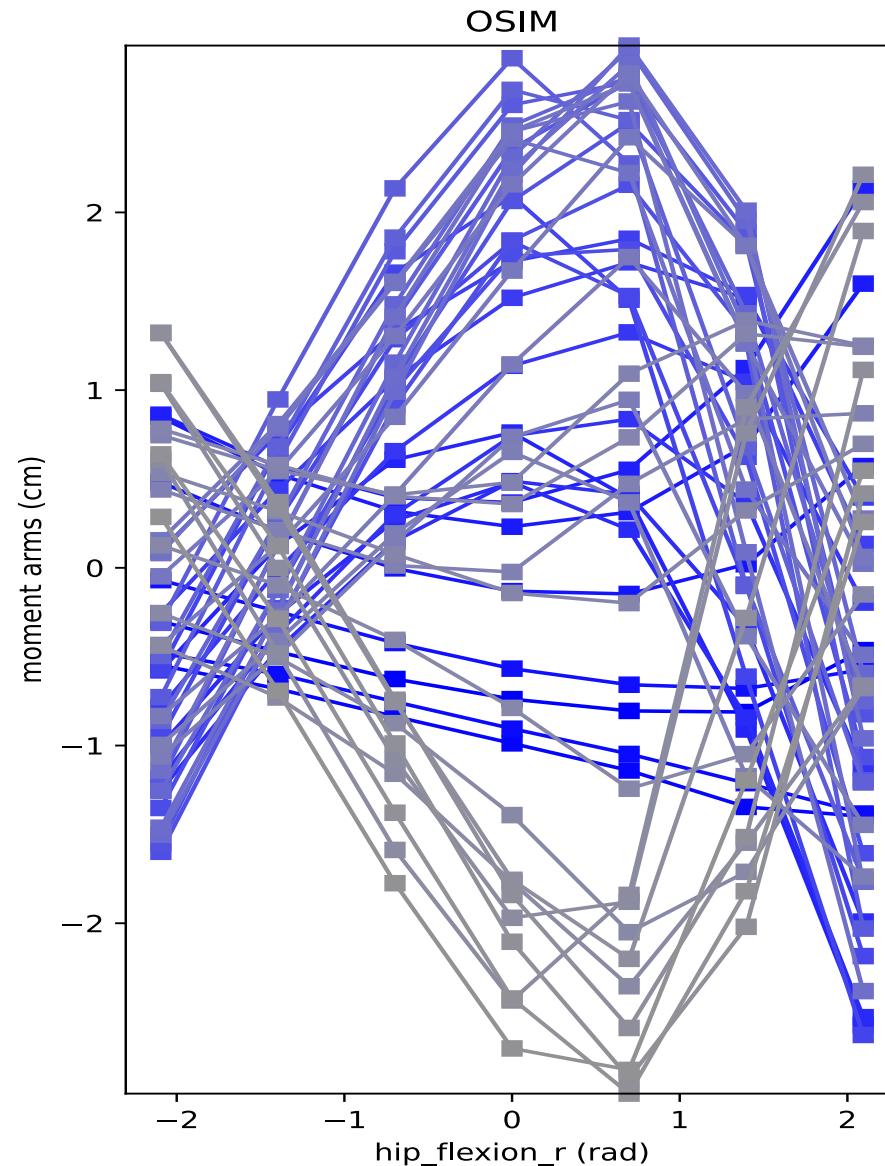
Muscle specific moment arm comparison with Osim model after optimization

soleus_I - ankle_angle_I - subtalar_angle_I



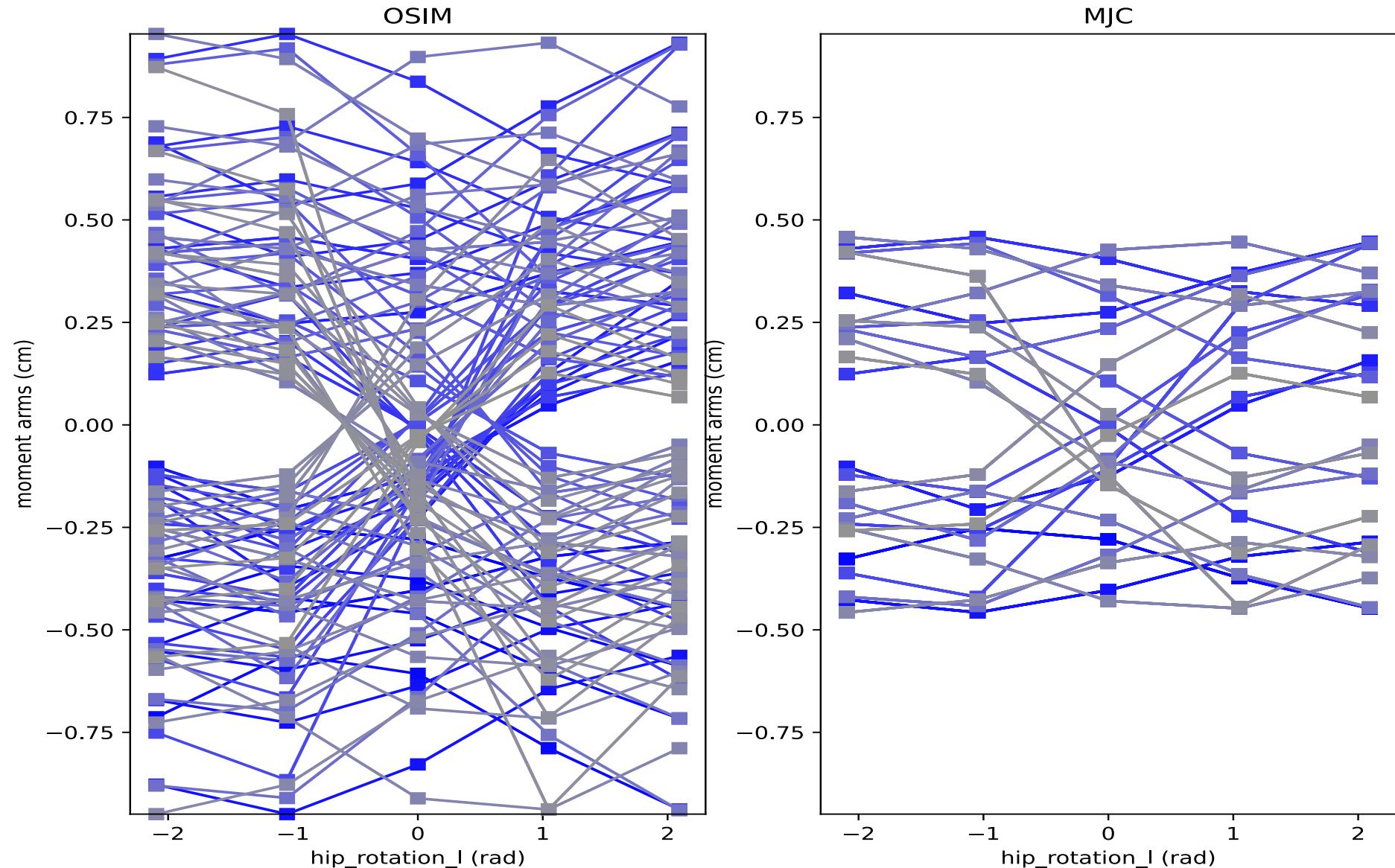
Muscle specific moment arm comparison with Osim model after optimization

pect_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



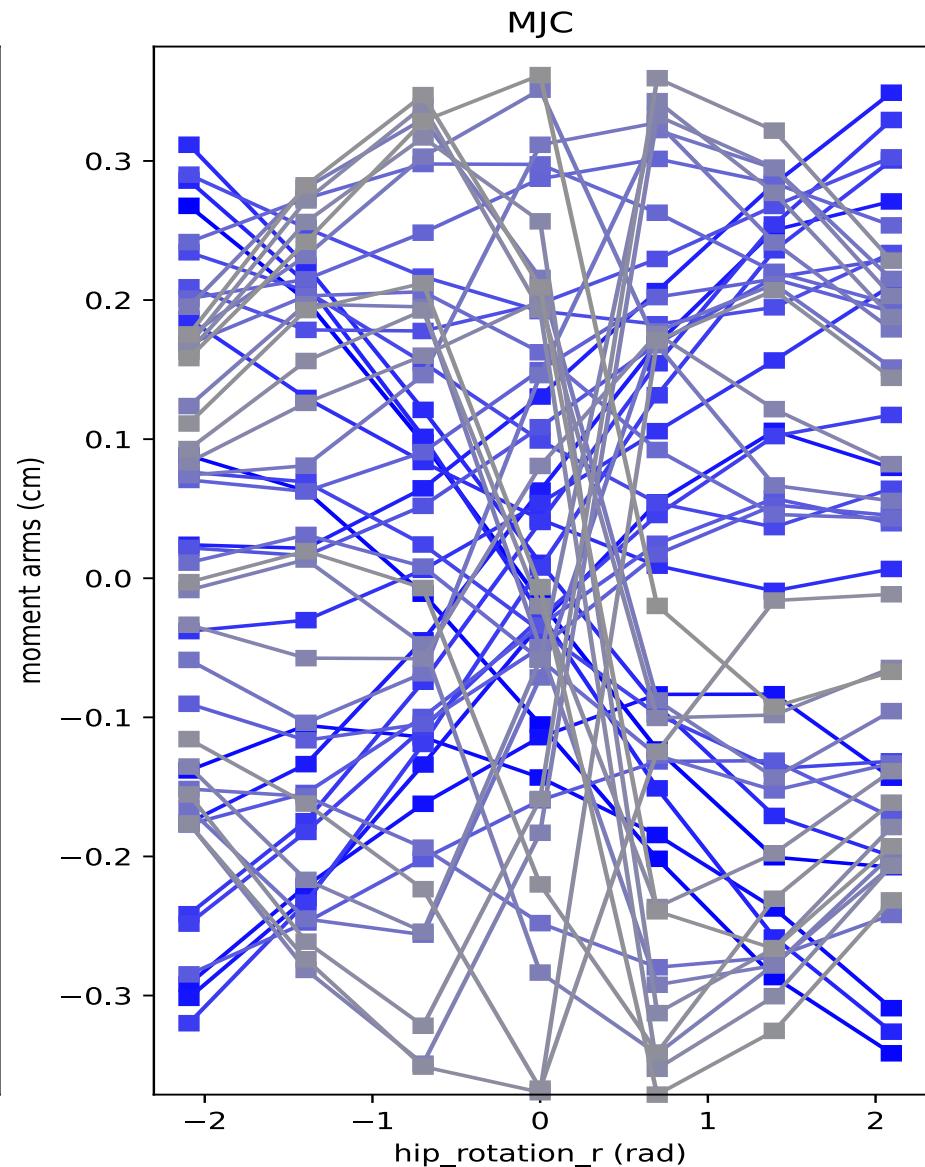
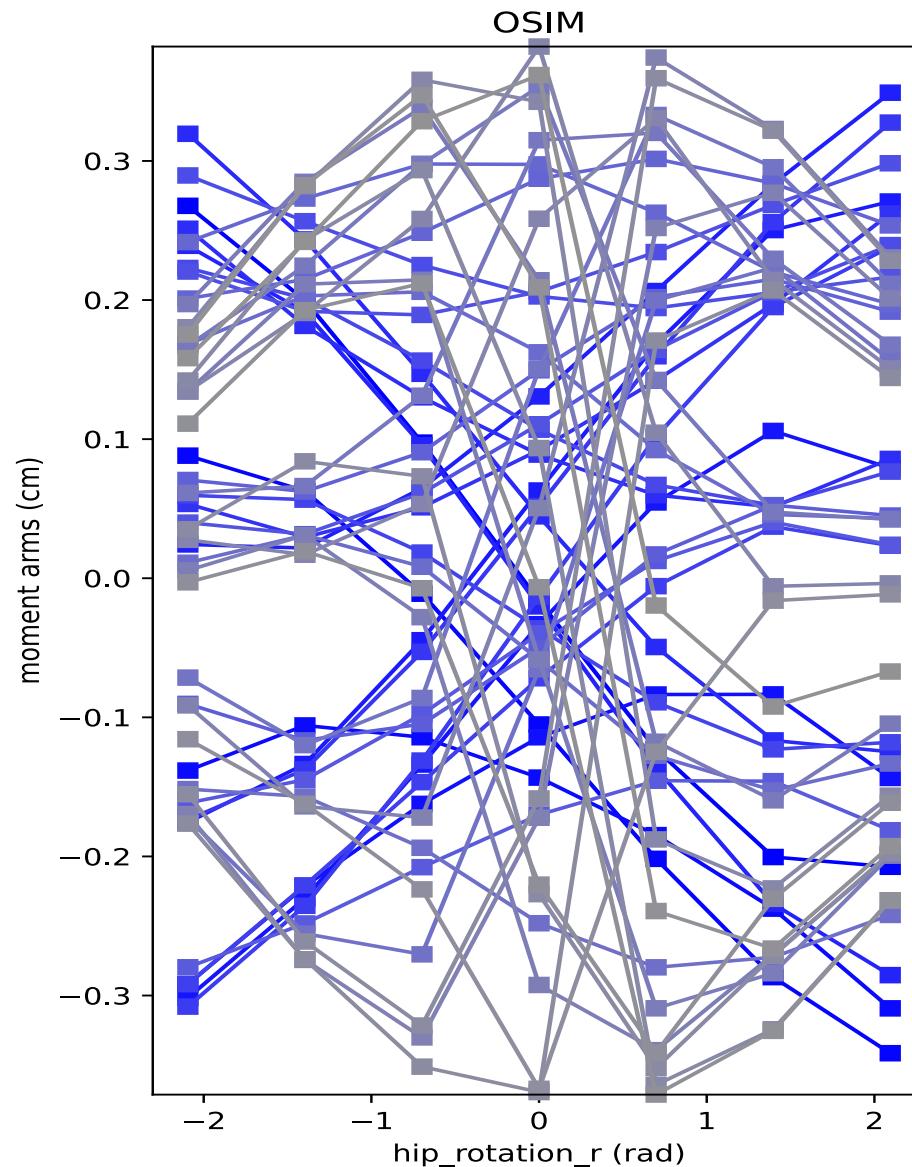
Muscle specific moment arm comparison with Osim model after optimization

rect_fem_I - hip_adduction_I - hip_flexion_I - hip_rotation_I - knee_angle_I



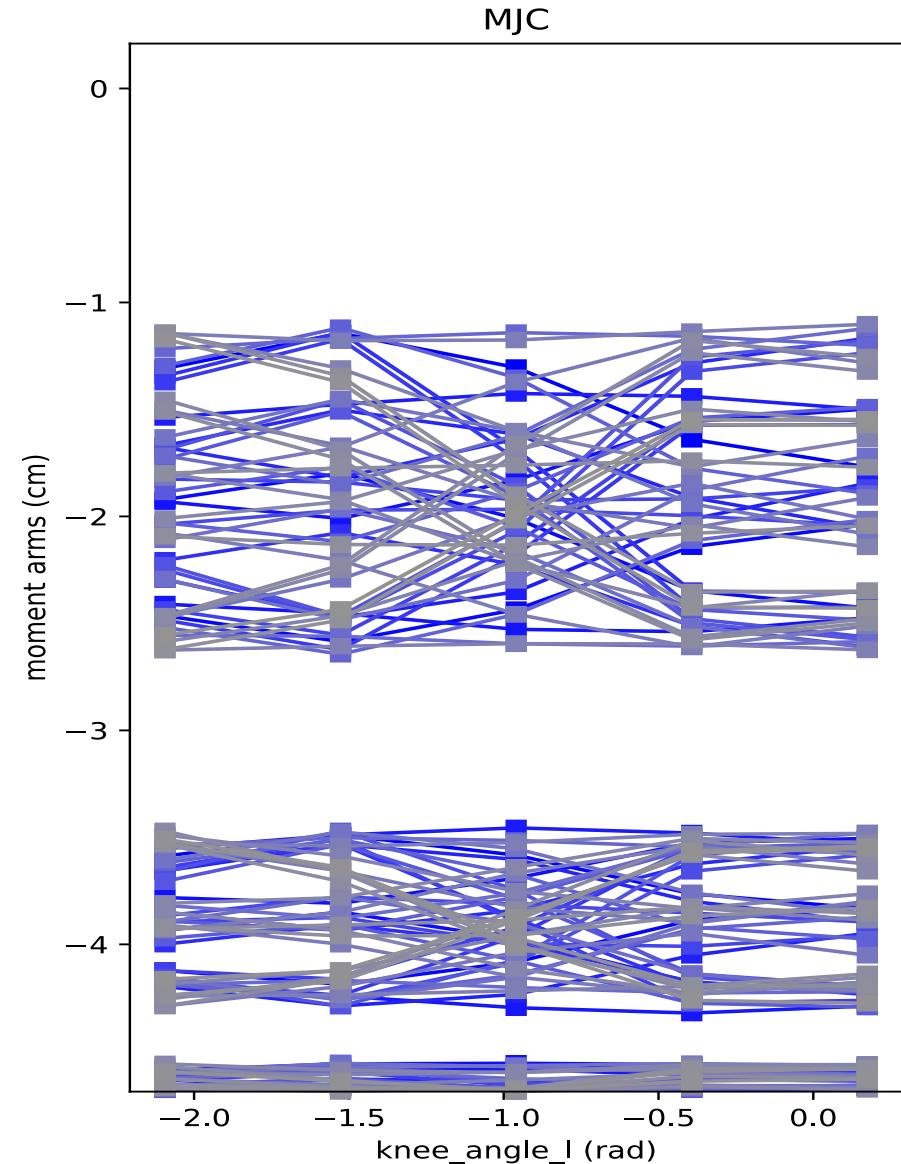
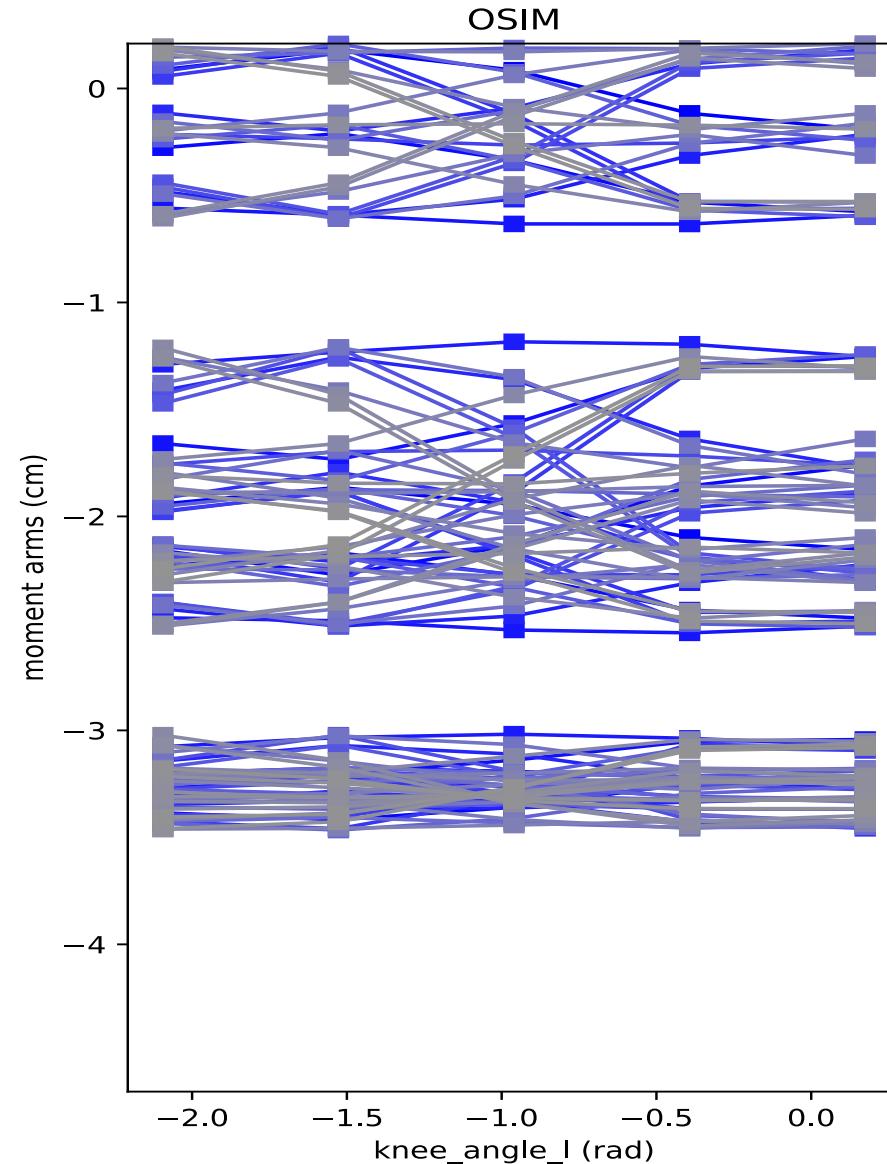
Muscle specific moment arm comparison with Osim model after optimization

psoas_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



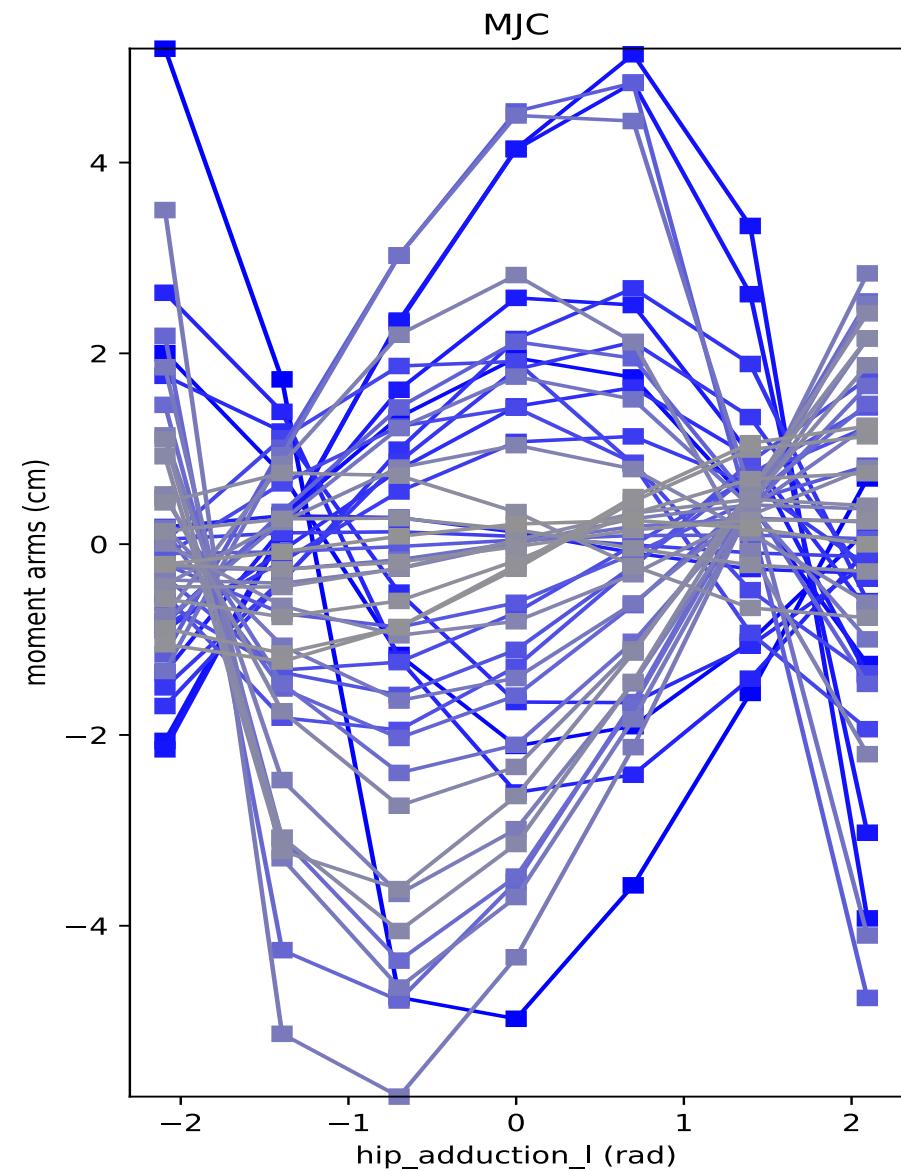
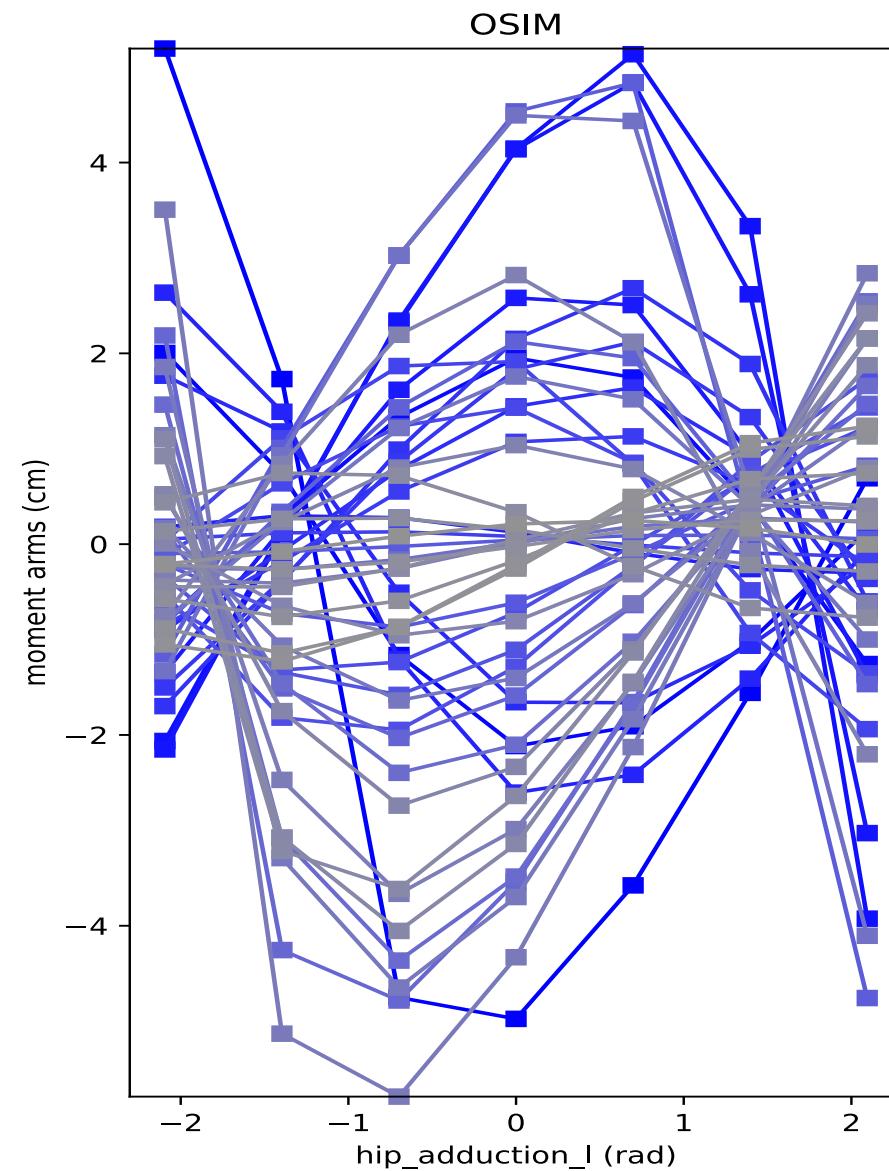
Muscle specific moment arm comparison with Osim model after optimization

bifemlh_I - hip_adduction_I - hip_flexion_I - hip_rotation_I - knee_angle_I



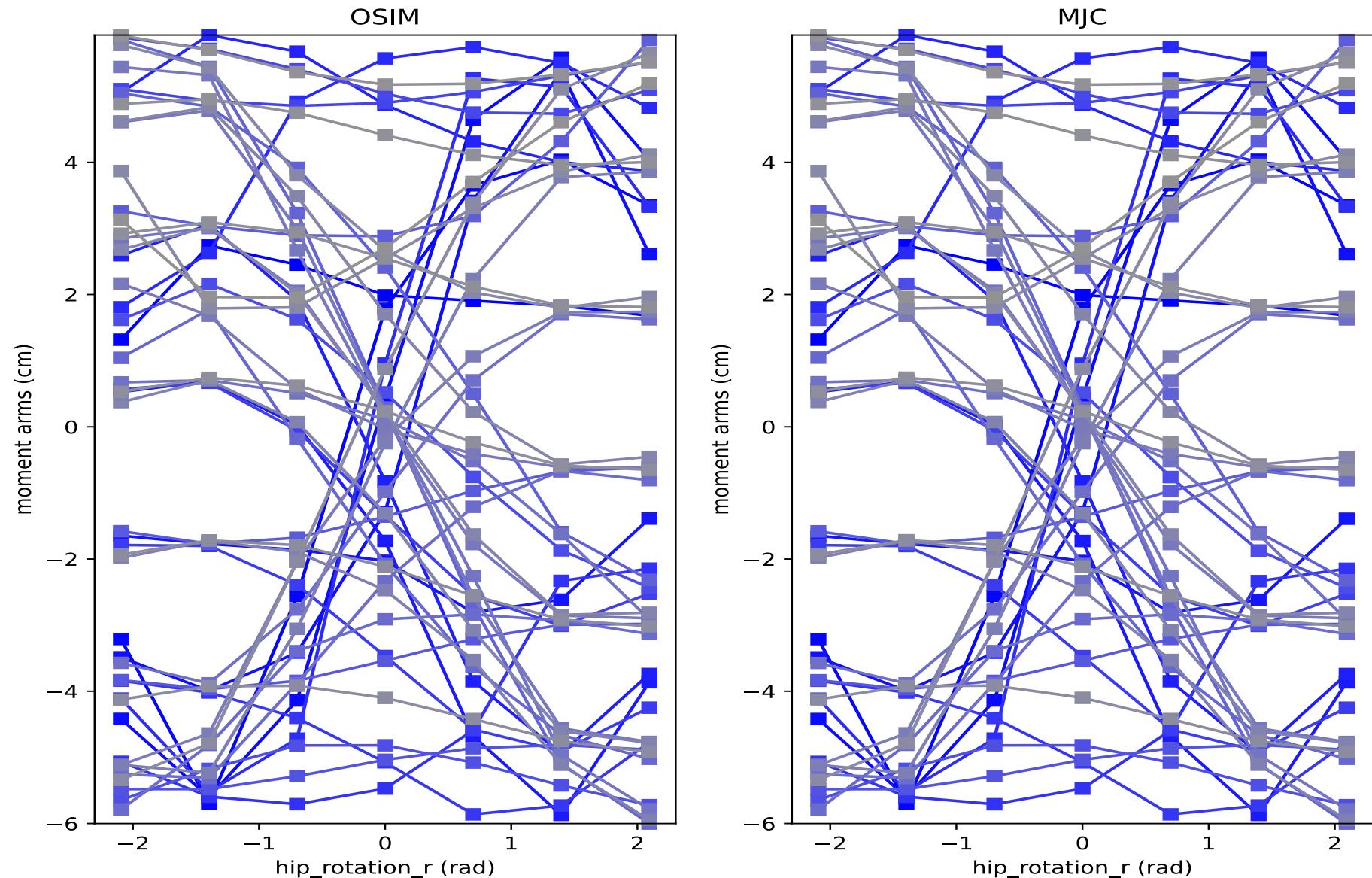
Muscle specific moment arm comparison with Osim model after optimization

glut_med3_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



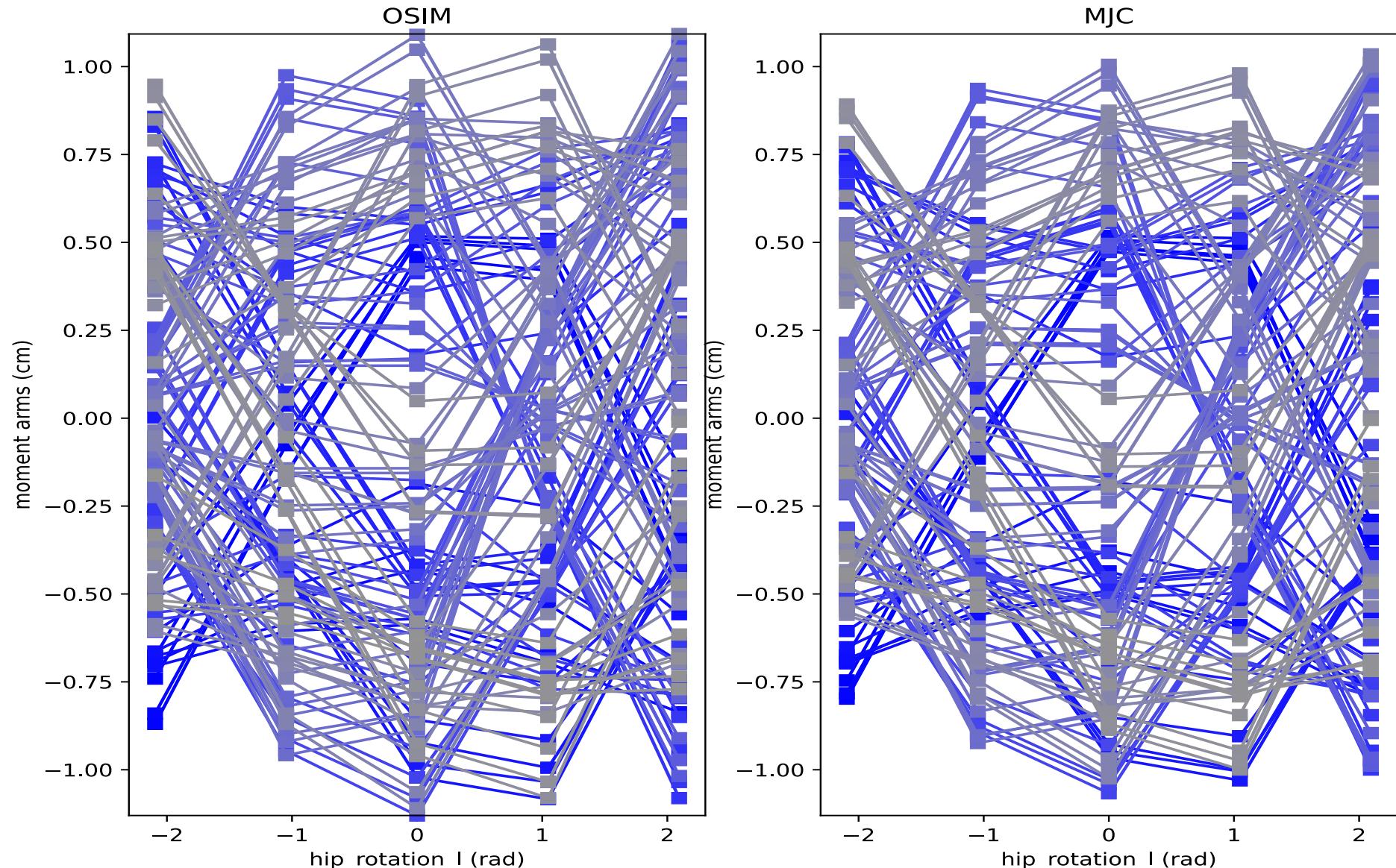
Muscle specific moment arm comparison with Osim model after optimization

glut_max1_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



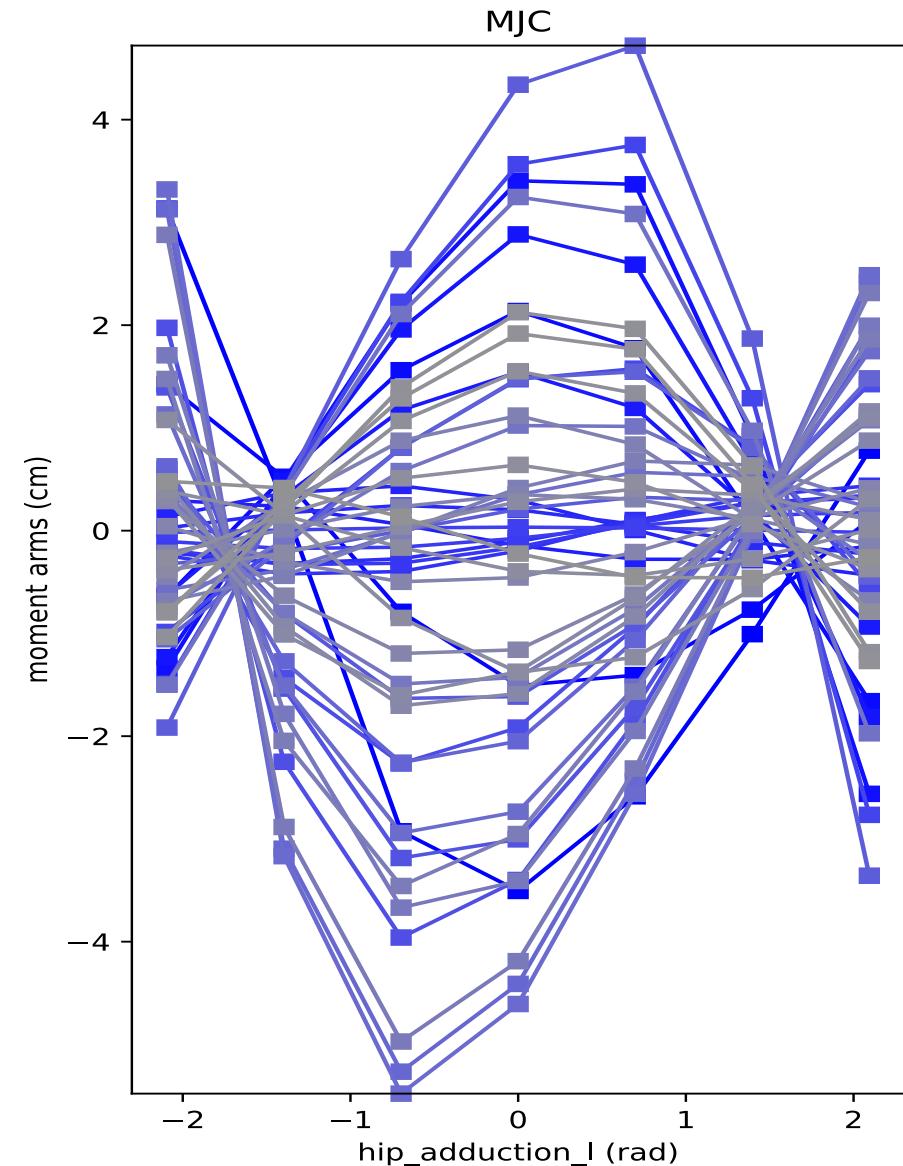
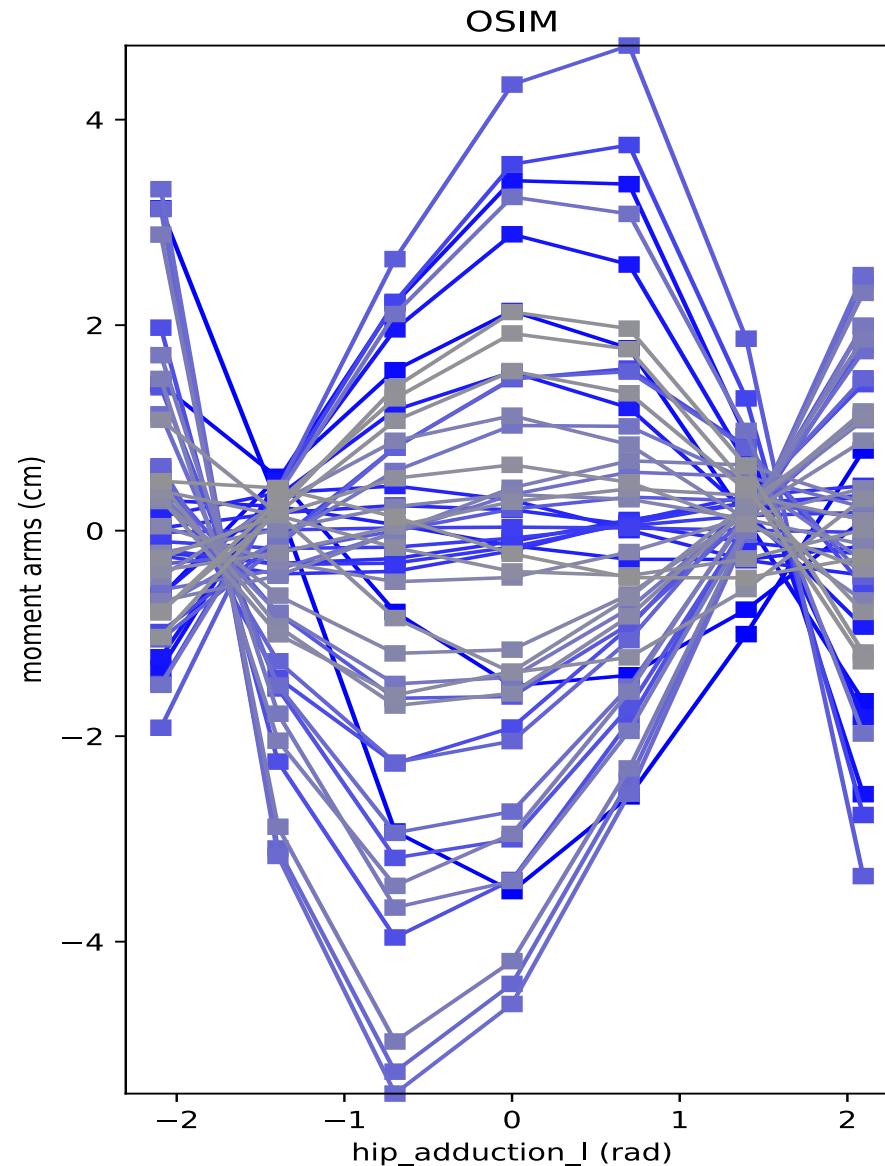
Muscle specific moment arm comparison with Osim model after optimization

grac_I - hip_adduction_I - hip_flexion_I - hip_rotation_I - knee_angle_I



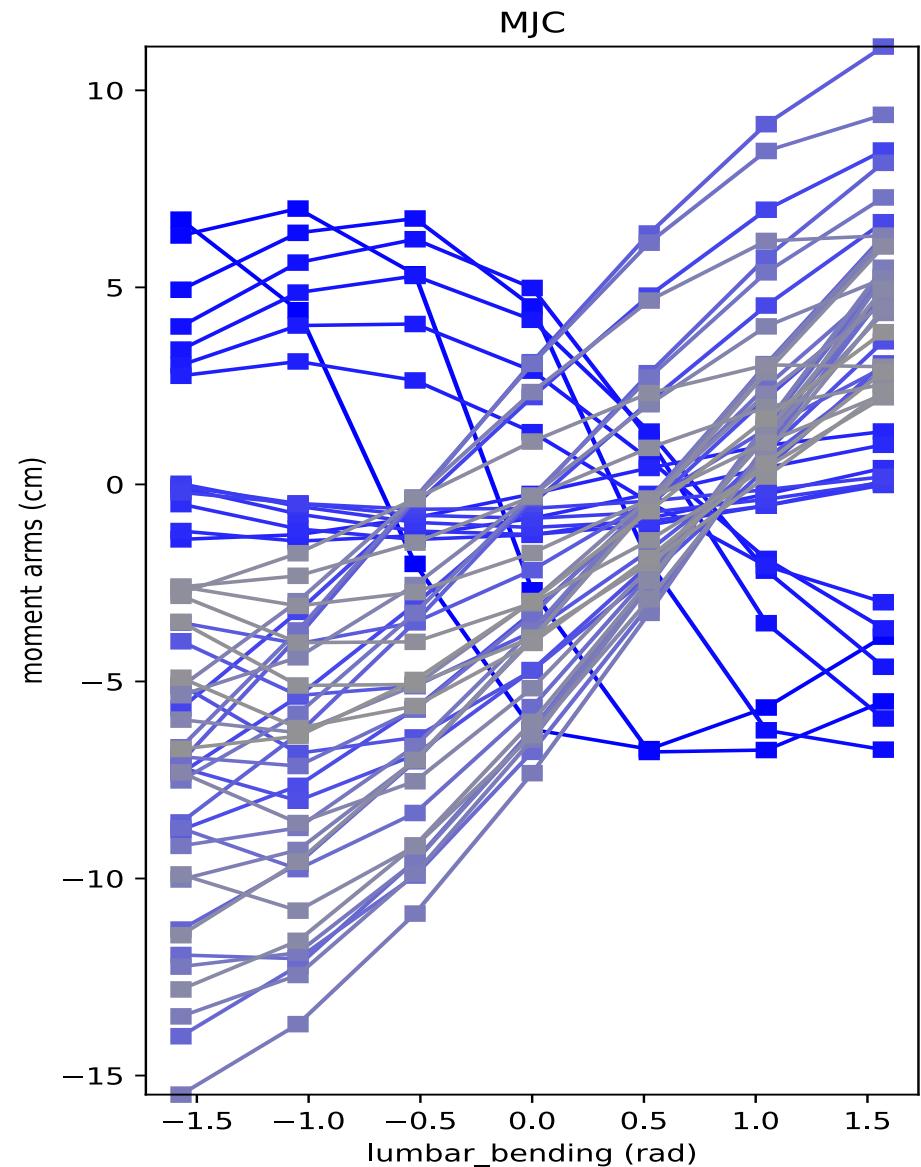
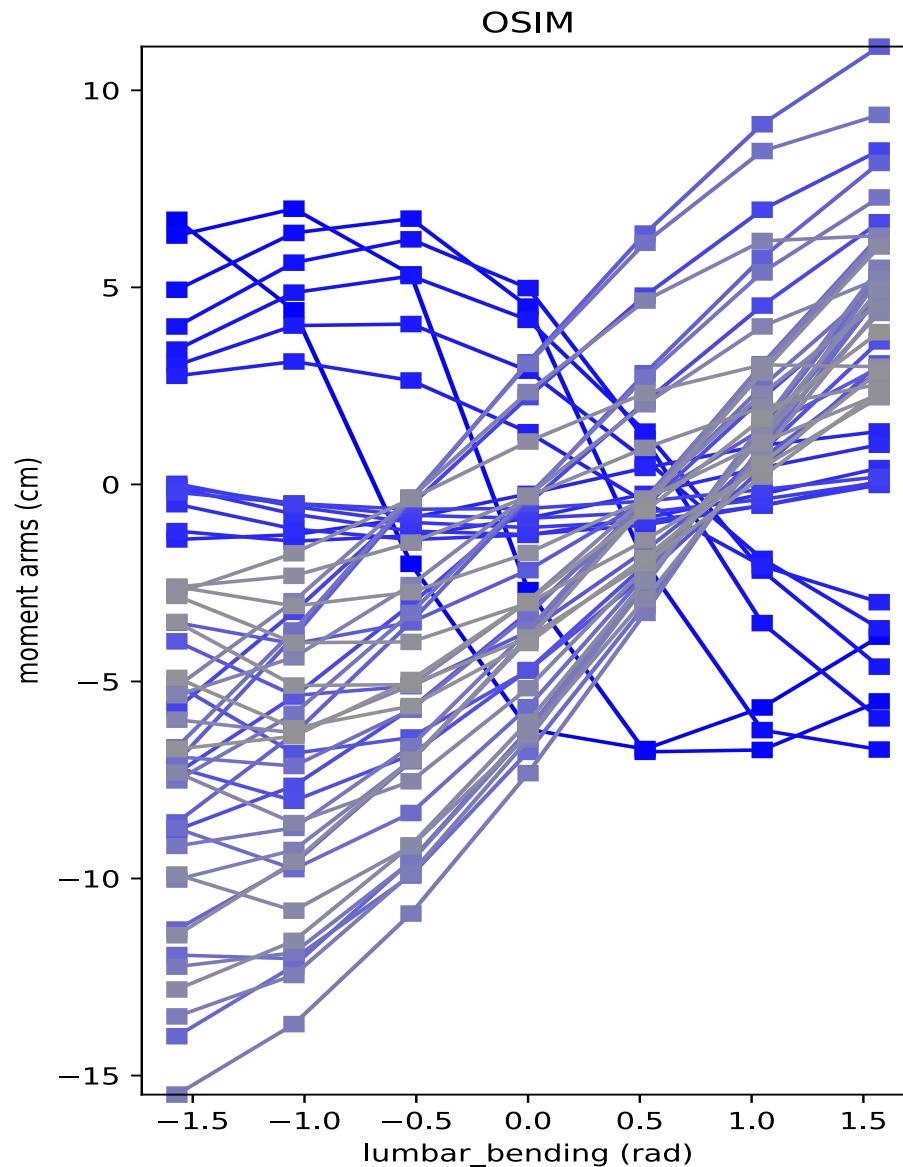
Muscle specific moment arm comparison with Osim model after optimization

glut_med2_I - hip_adduction_I - hip_flexion_I - hip_rotation_I

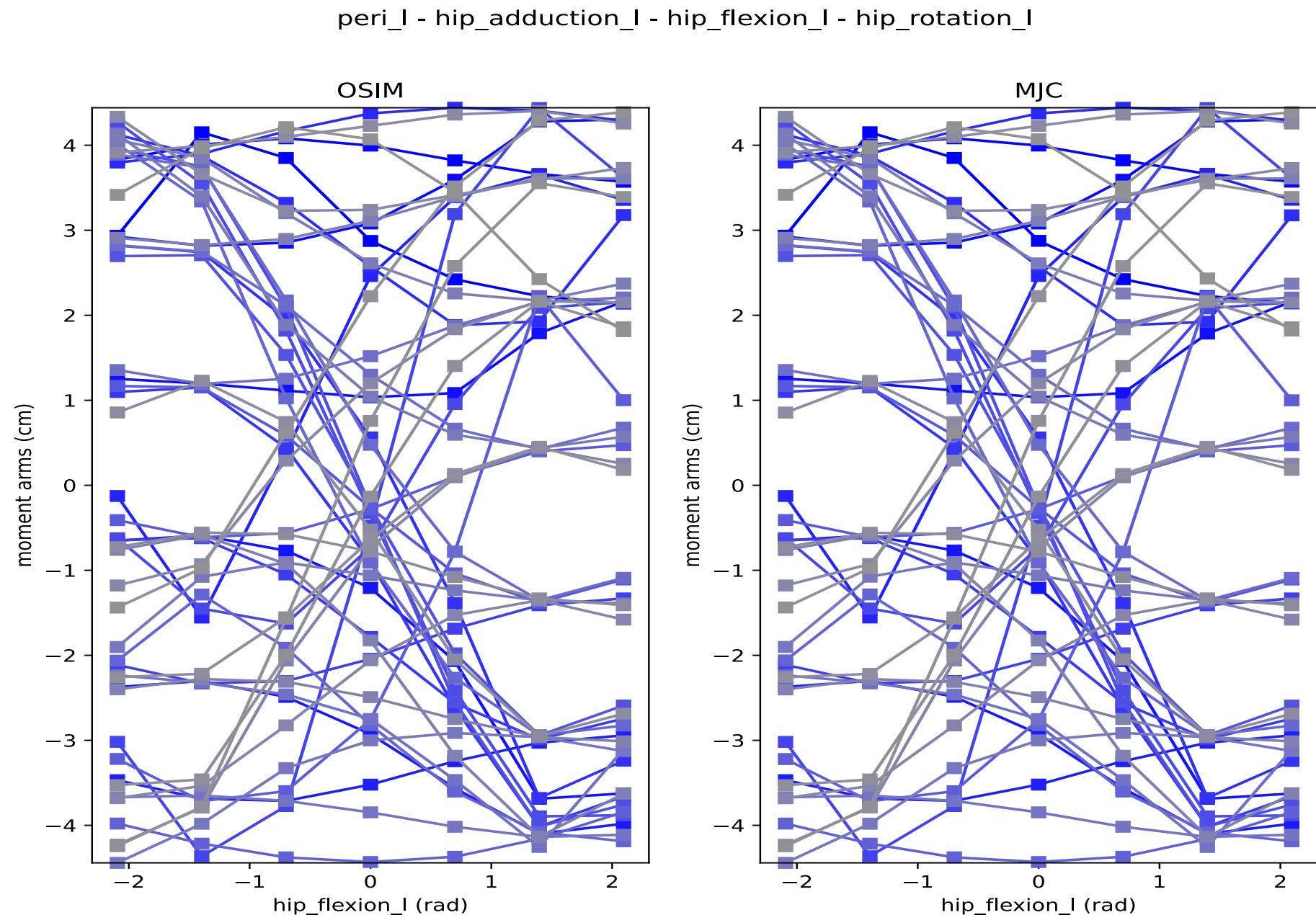


Muscle specific moment arm comparison with Osim model after optimization

extobl_I - lumbar_bending - lumbar_extension - lumbar_rotation

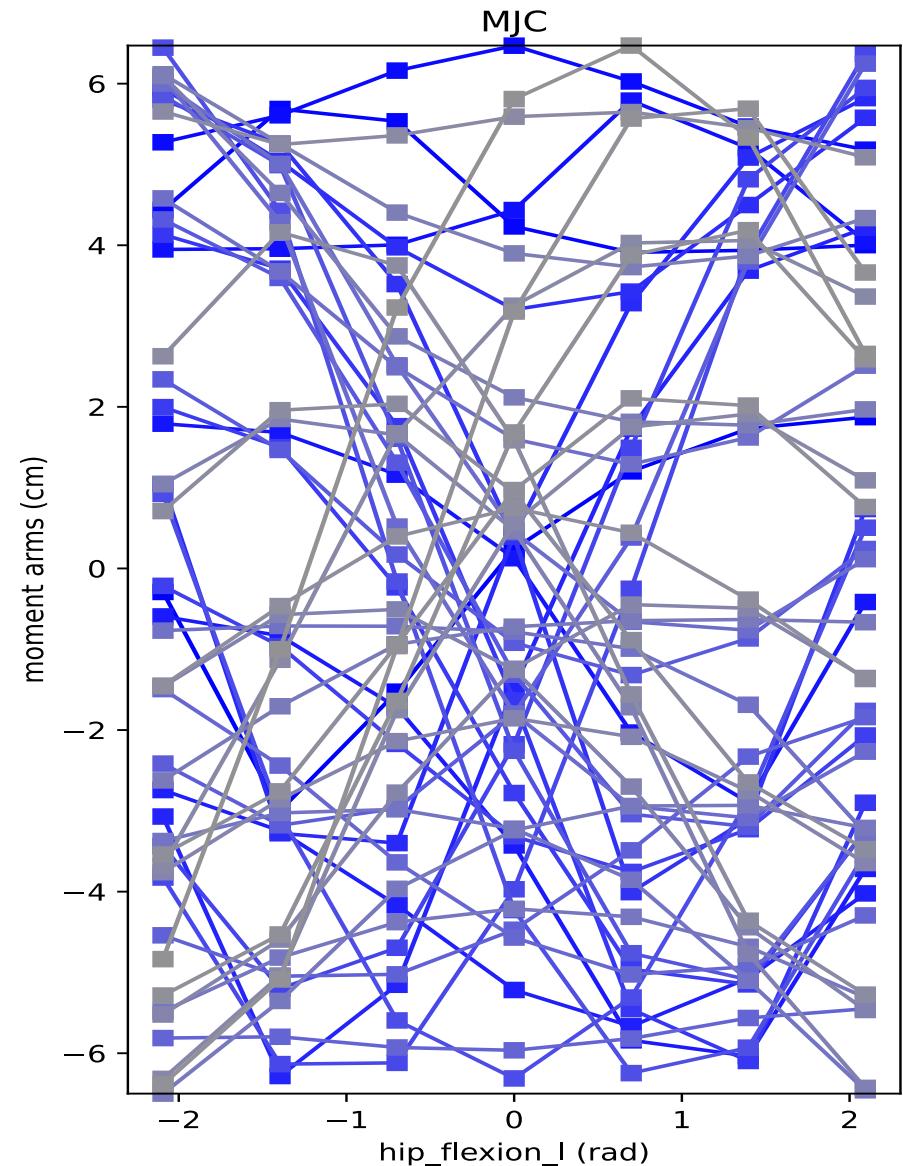
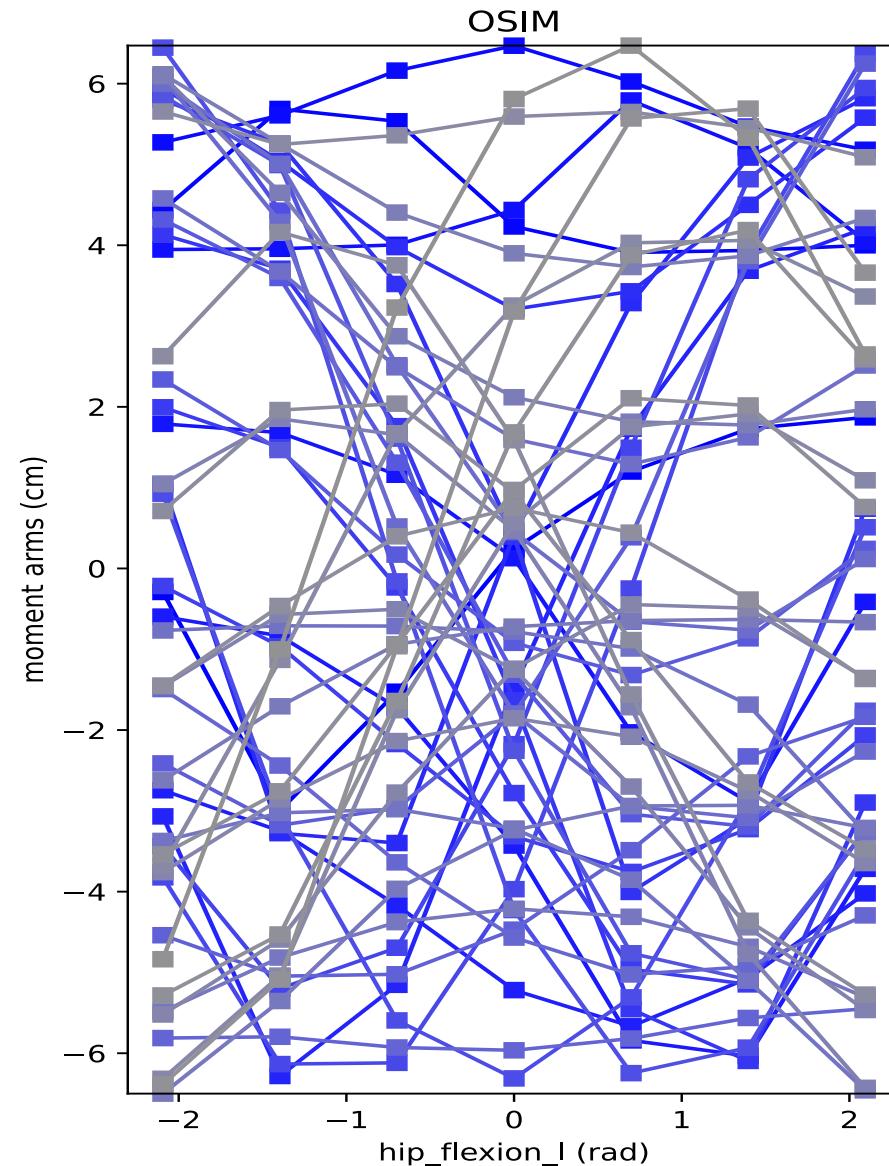


Muscle specific moment arm comparison with Osim model after optimization



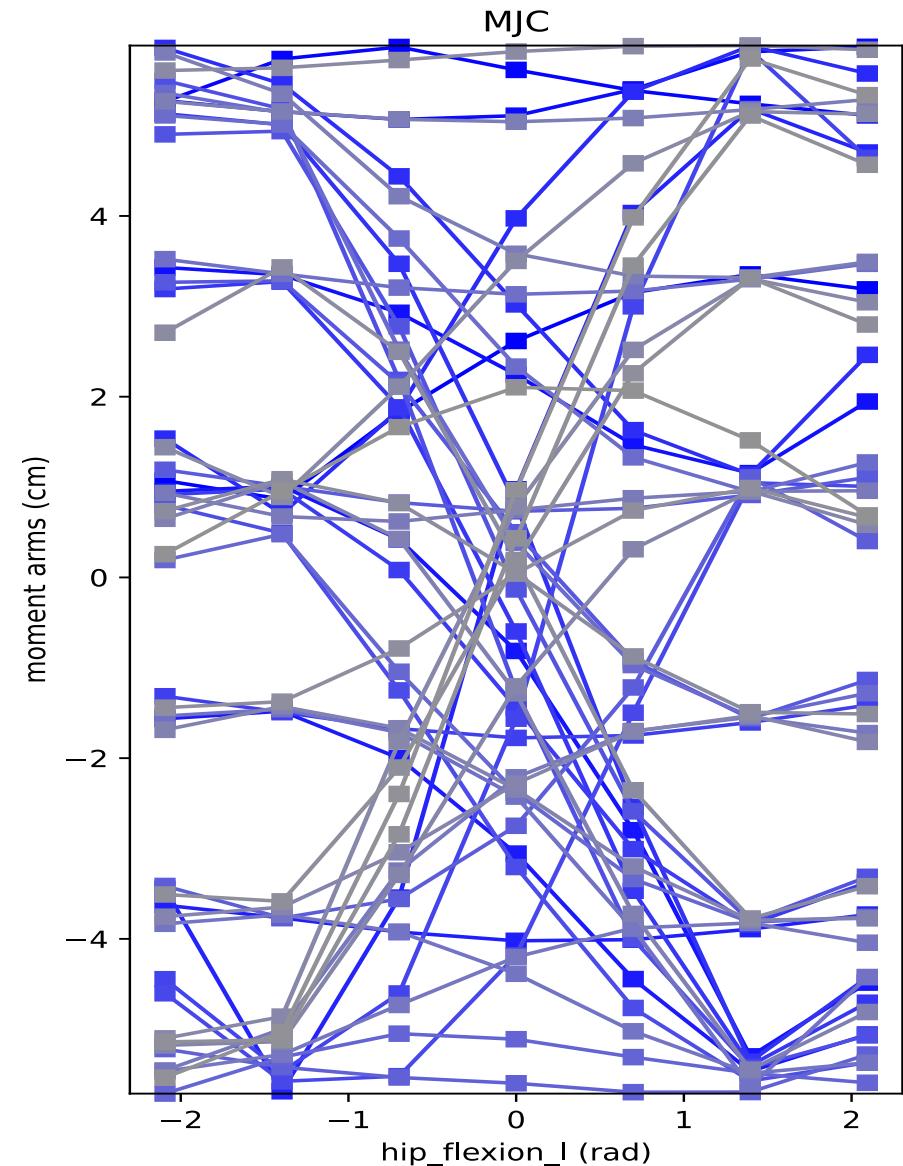
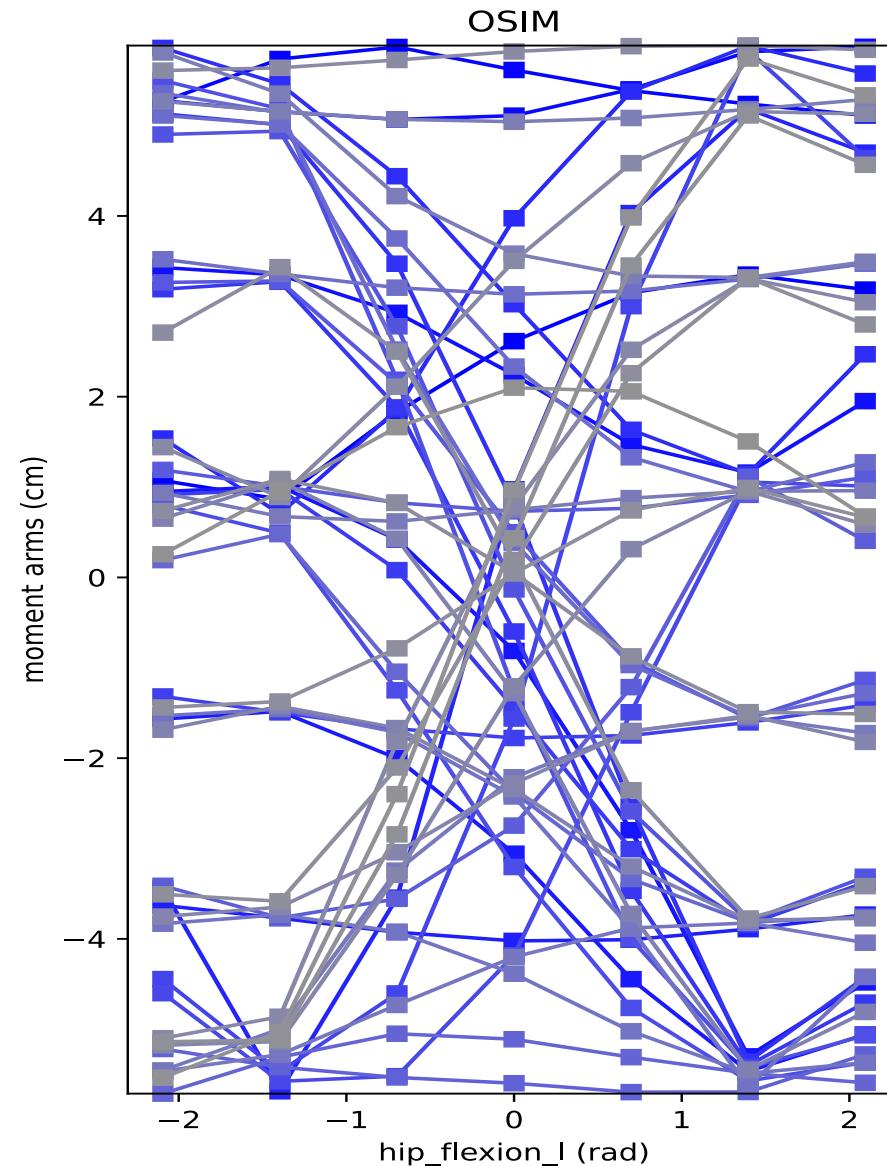
Muscle specific moment arm comparison with Osim model after optimization

glut_max1_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



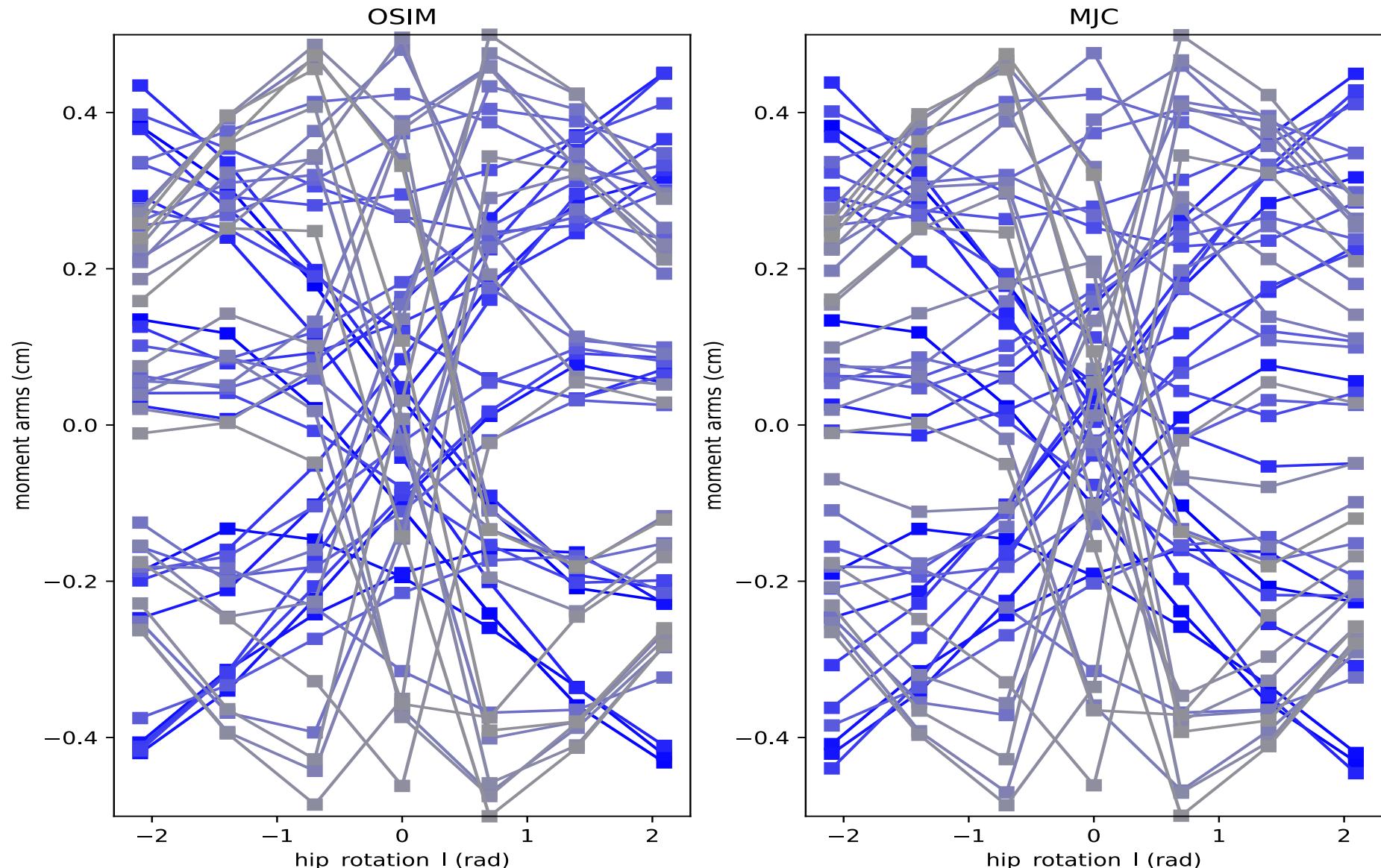
Muscle specific moment arm comparison with Osim model after optimization

glut_med3_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



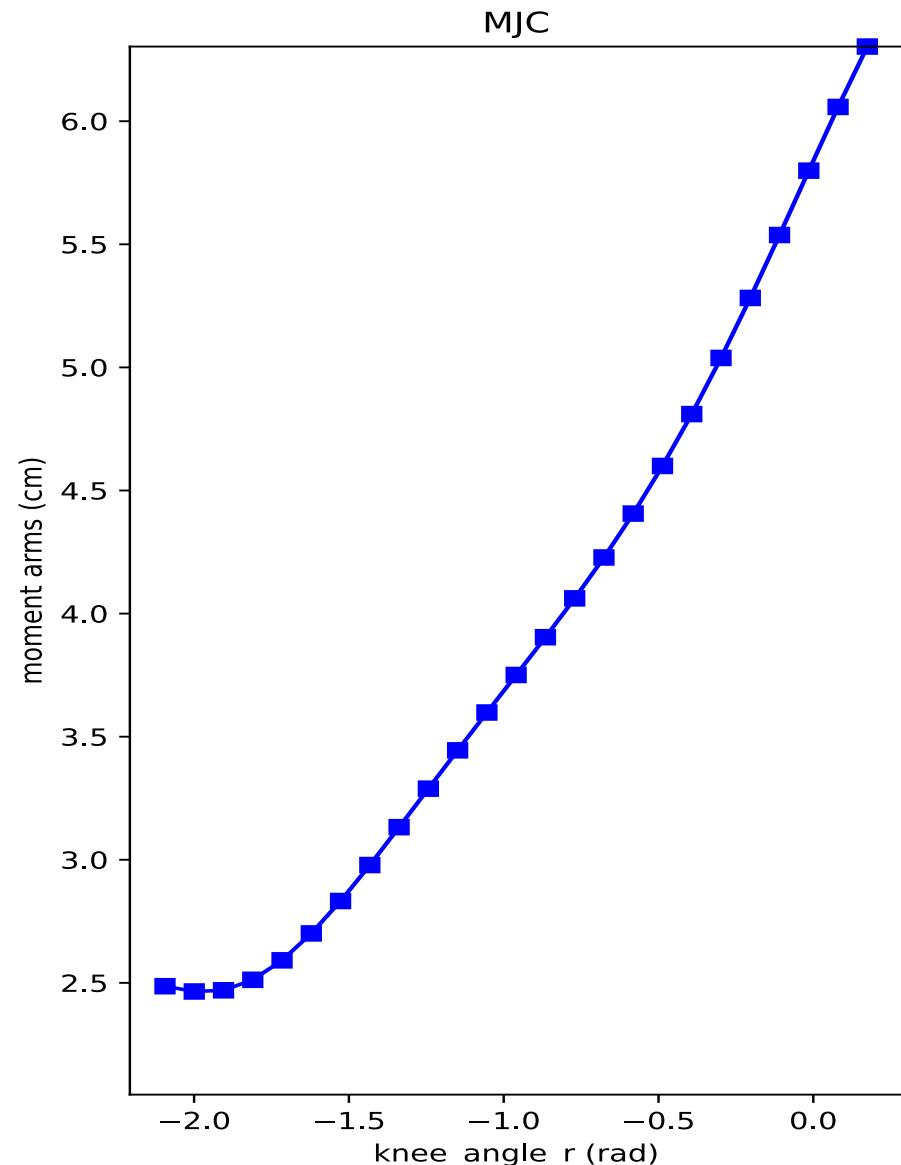
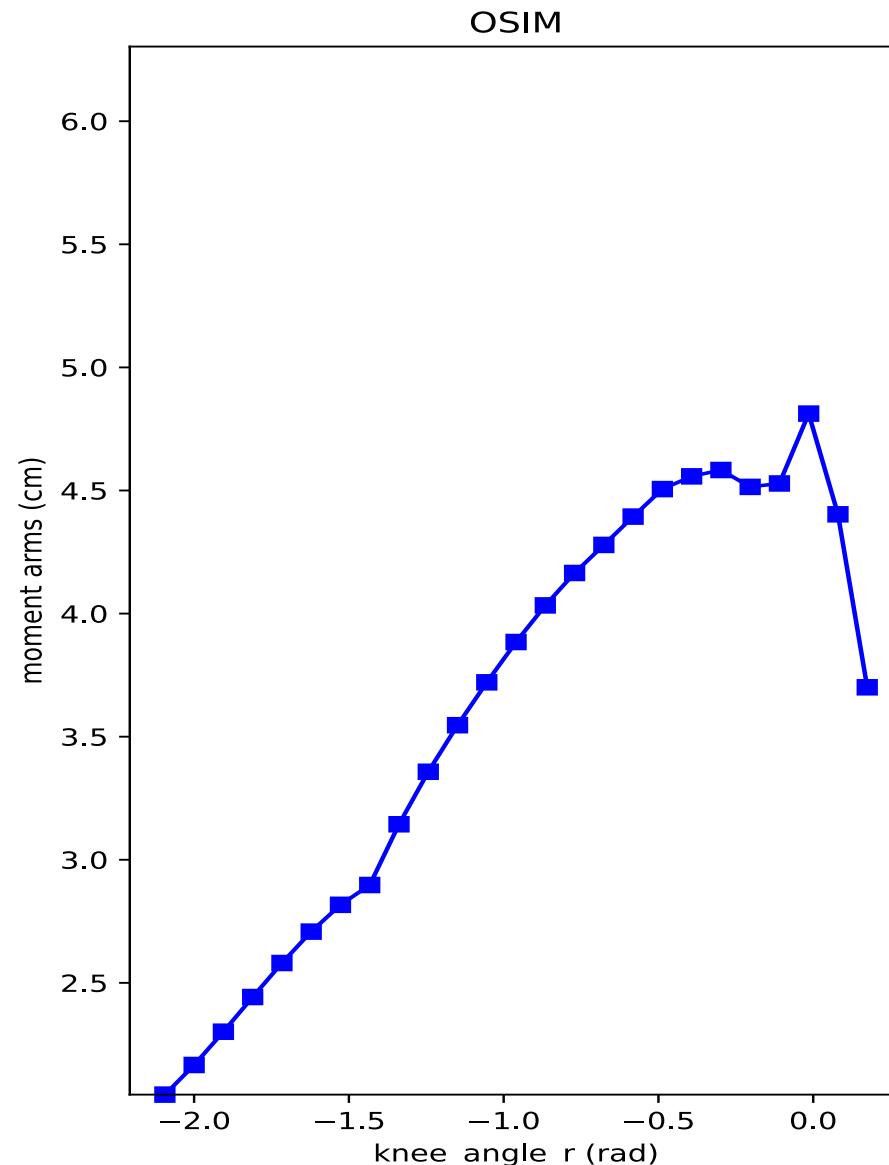
Muscle specific moment arm comparison with Osim model after optimization

iliacus_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



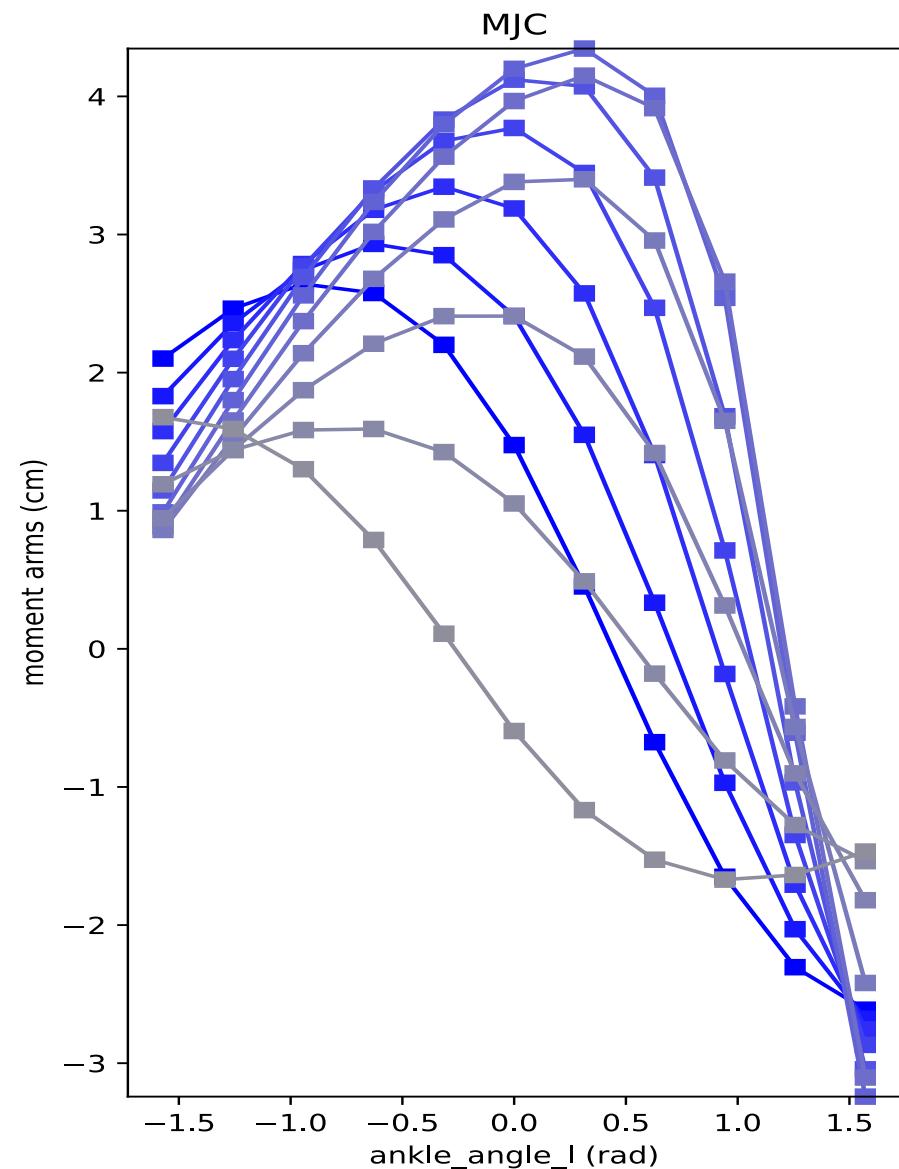
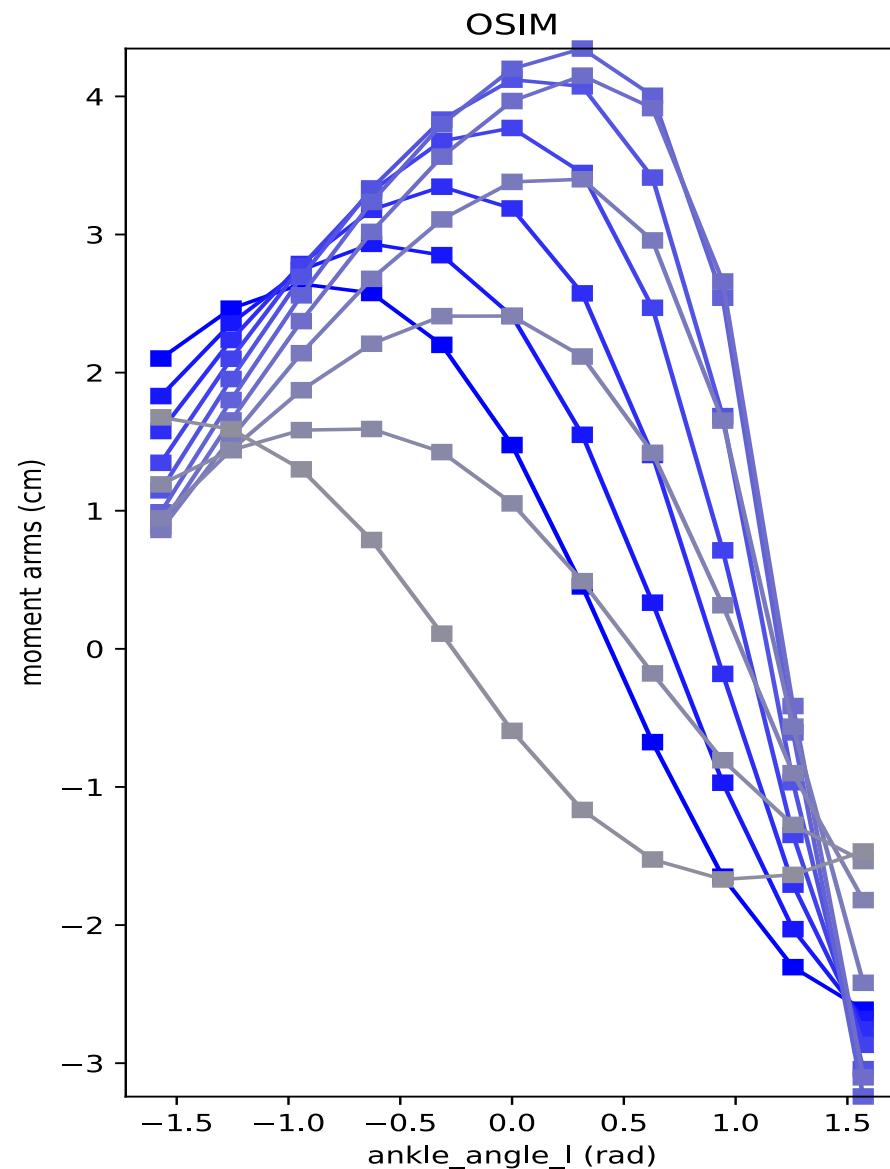
Muscle specific moment arm comparison with Osim model after optimization

vas_int_r - knee_angle_r



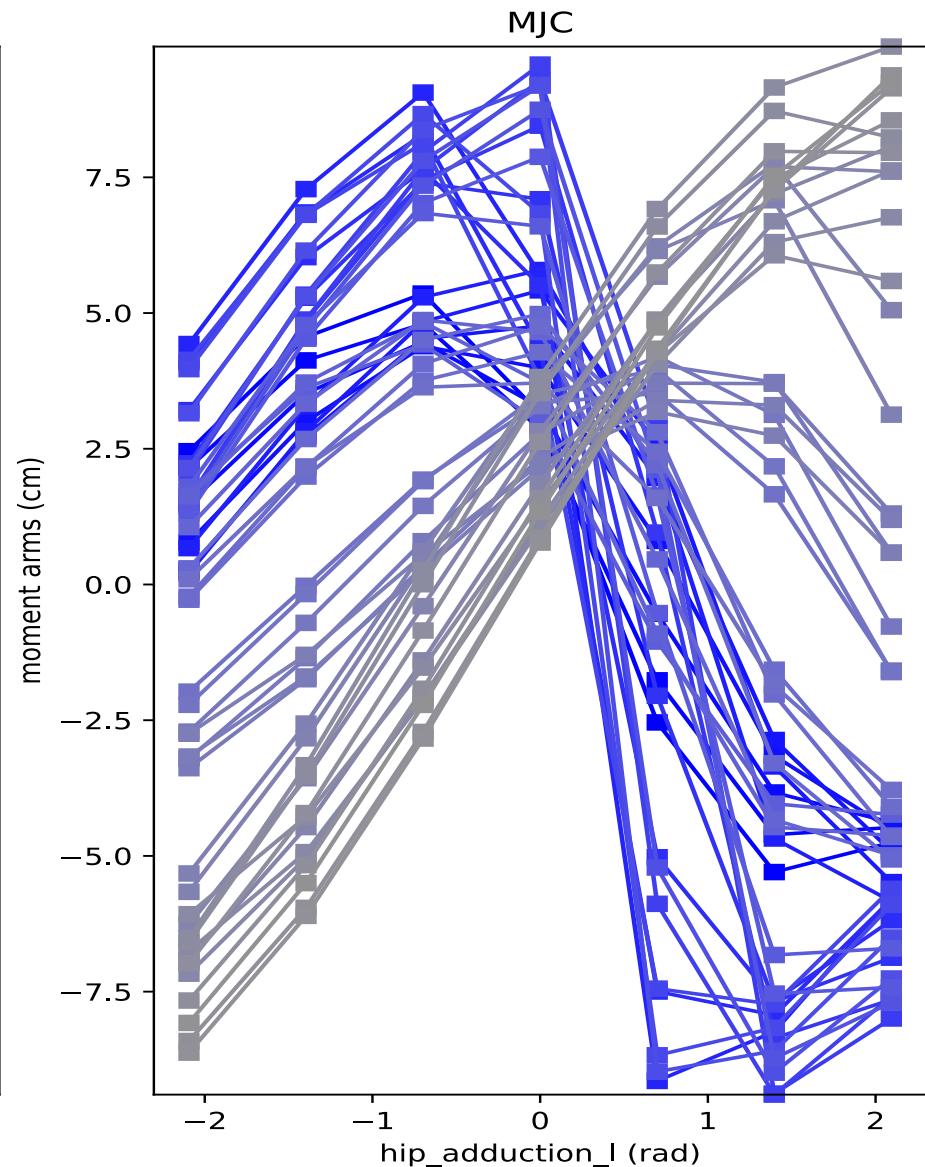
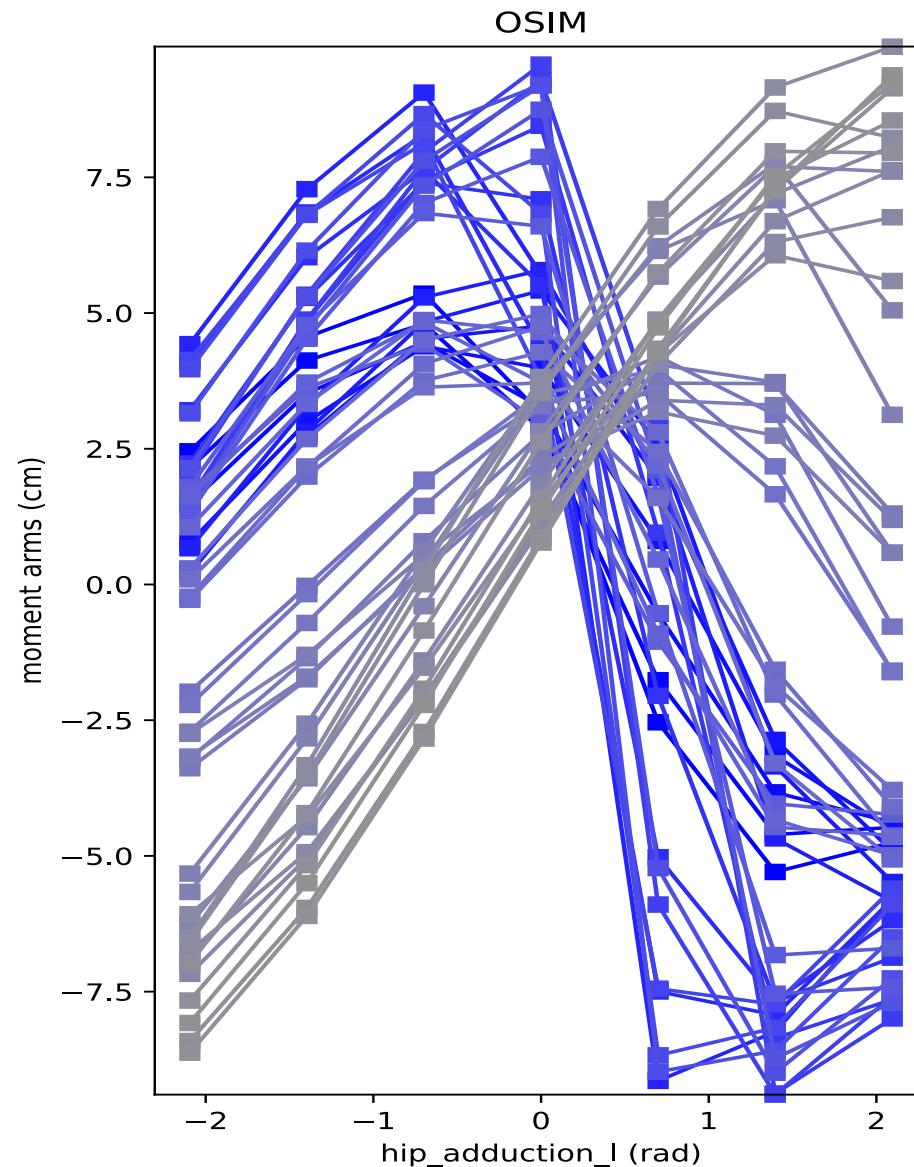
Muscle specific moment arm comparison with Osim model after optimization

tib_ant_I - ankle_angle_I - subtalar_angle_I



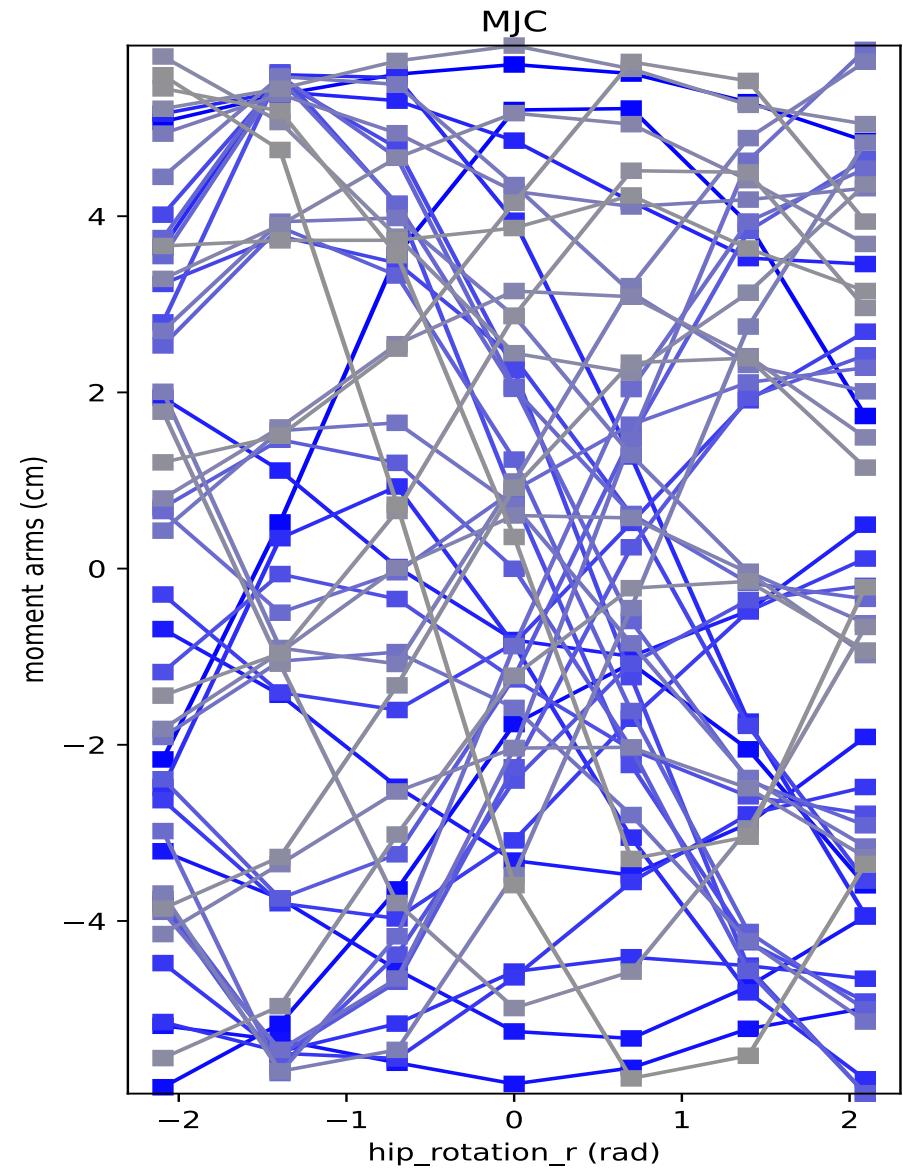
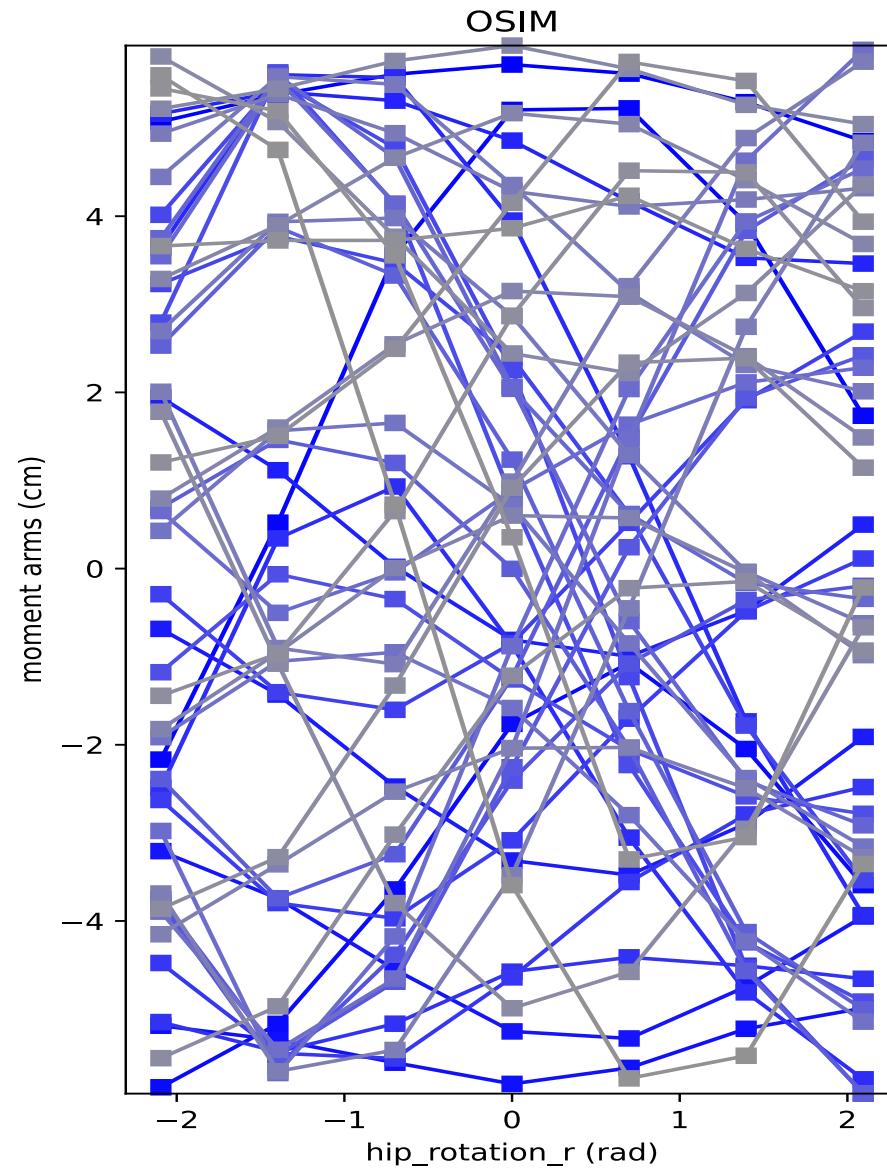
Muscle specific moment arm comparison with Osim model after optimization

glut_max3_I - hip_adduction_I - hip_flexion_I - hip_rotation_I



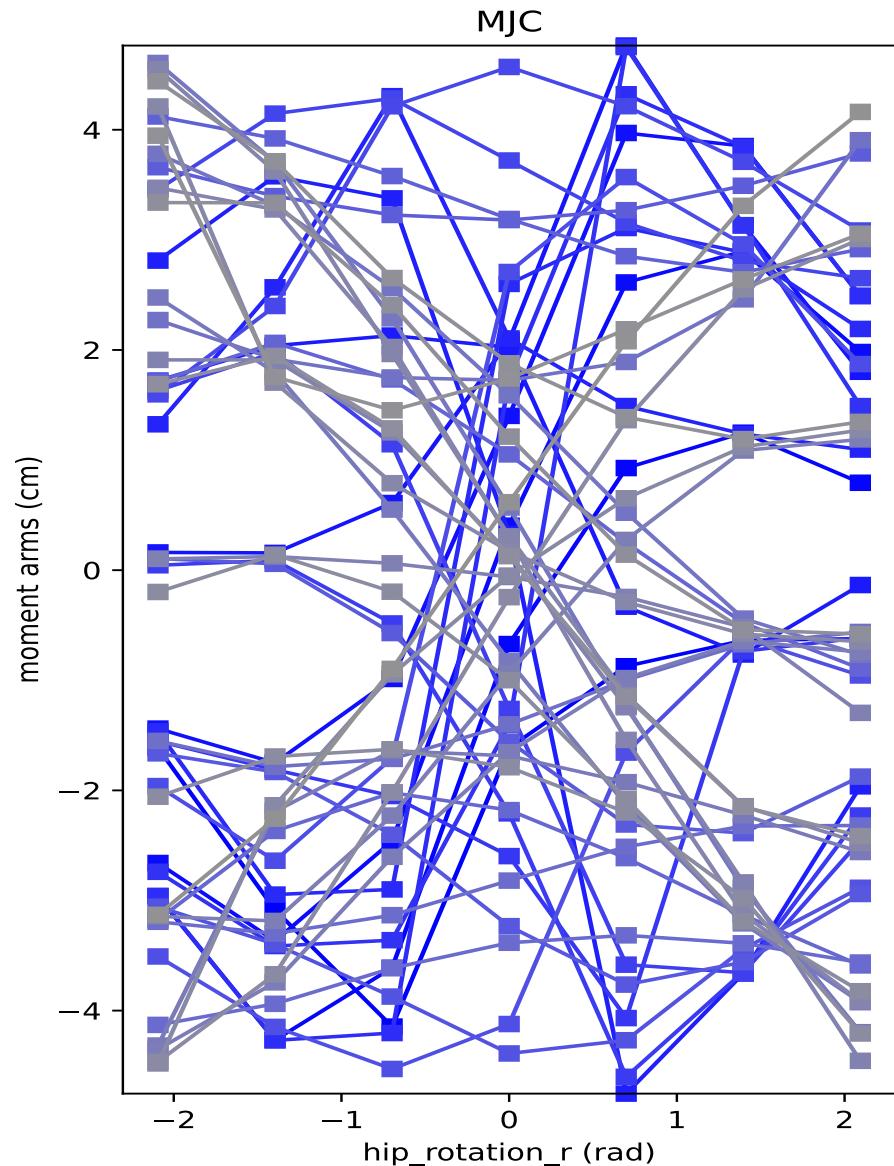
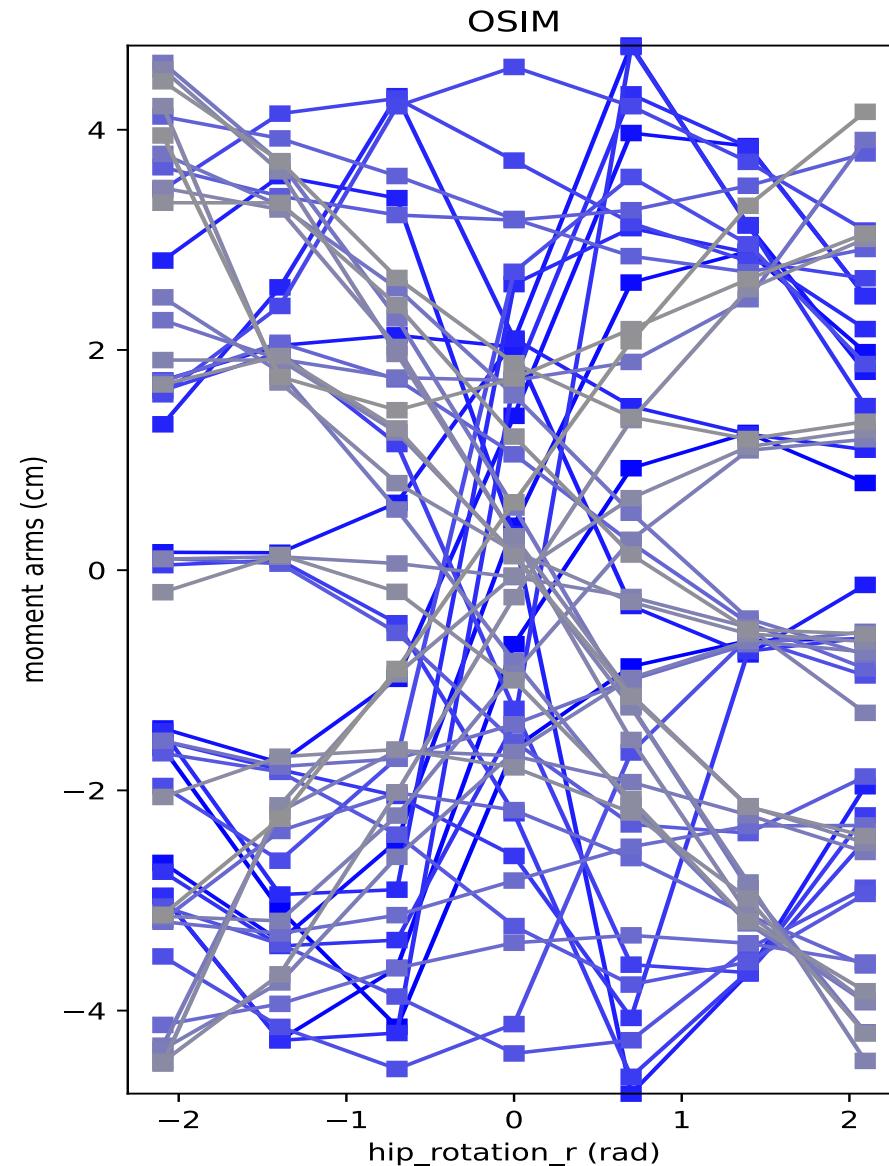
Muscle specific moment arm comparison with Osim model after optimization

glut_med1_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



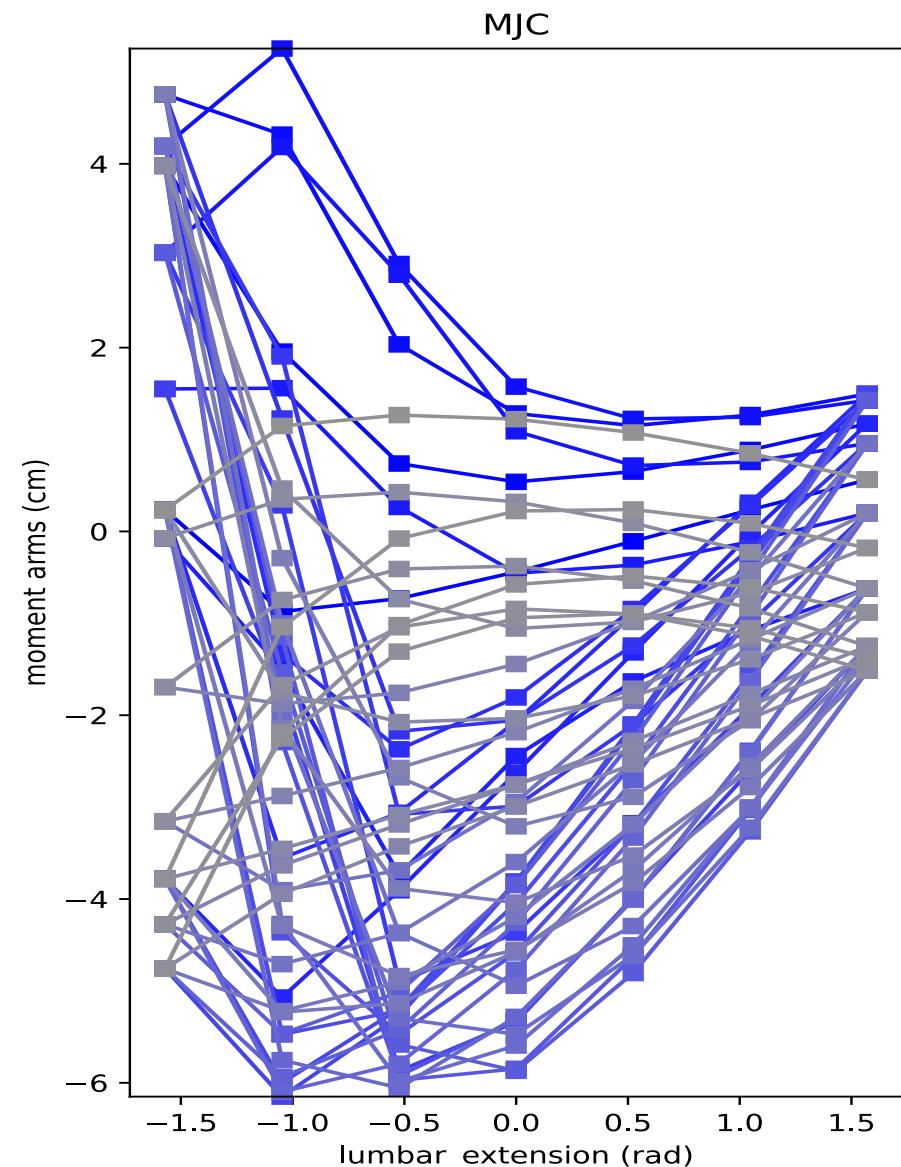
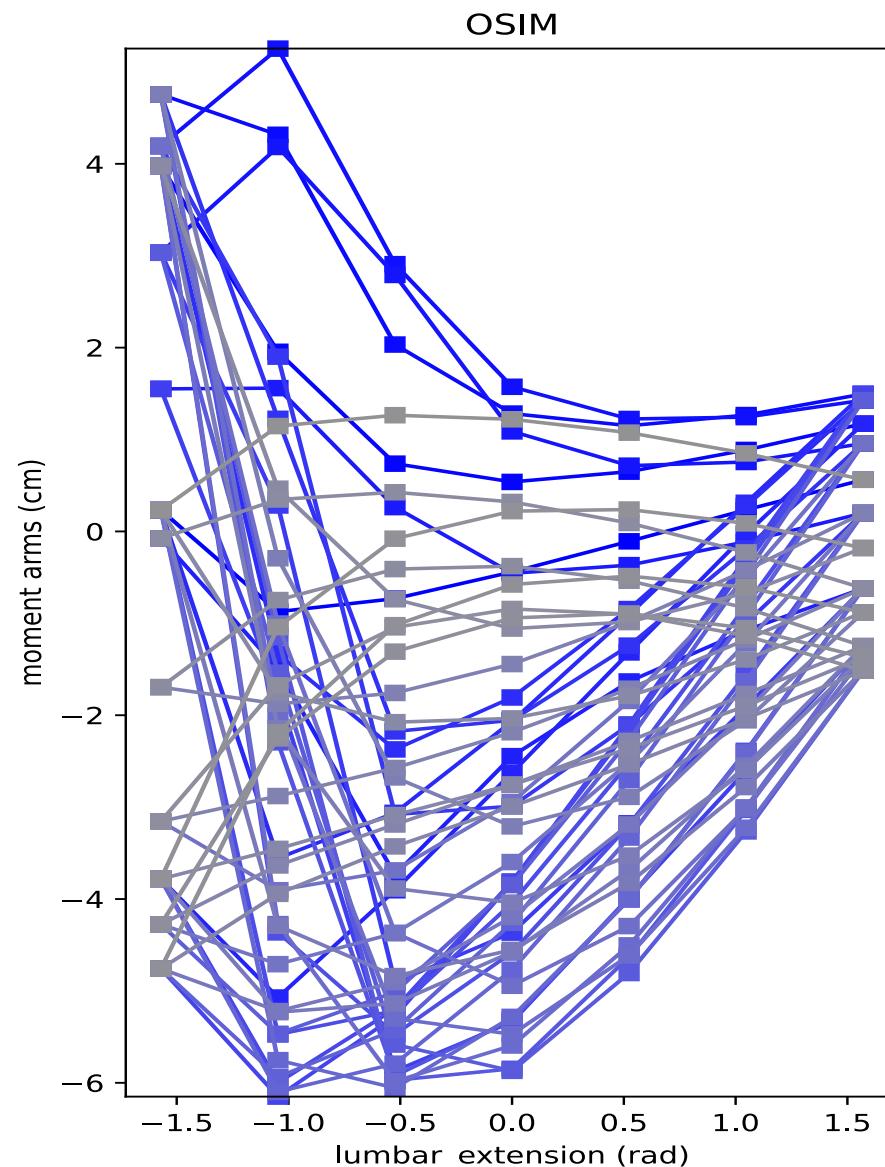
Muscle specific moment arm comparison with Osim model after optimization

glut_max2_r - hip_adduction_r - hip_flexion_r - hip_rotation_r



Muscle specific moment arm comparison with Osim model after optimization

intobl_I - lumbar_bending - lumbar_extension - lumbar_rotation



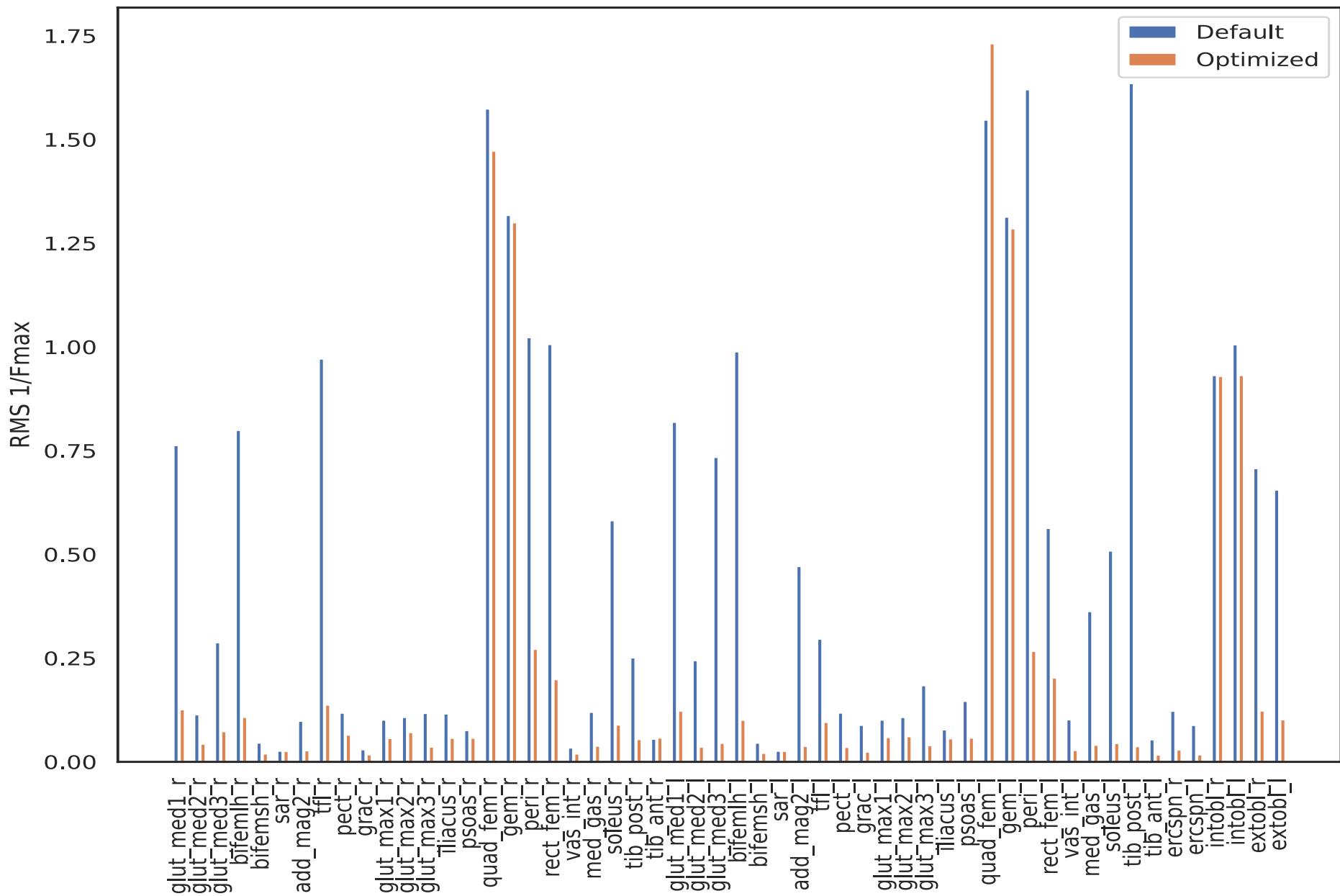
Step 3: Muscle Kinetic Validation

Muscle force-length property are compared between Osim and Mjc models. This force-length property only depends on muscle-fiber-tendon unit lengths. We made it isolated with the moment arm, so that the change in moment arms will not affect the muscle force properties. The muscle-fiber-tendon unit lengths were roughly even extracted (from shorest to longest) with all possible body postures. A bar plot of the froce errors of all muscle before and after optimization is included. Then the detail force-length curve comparsion plot of each muscle is included.

How to interpret the plot:

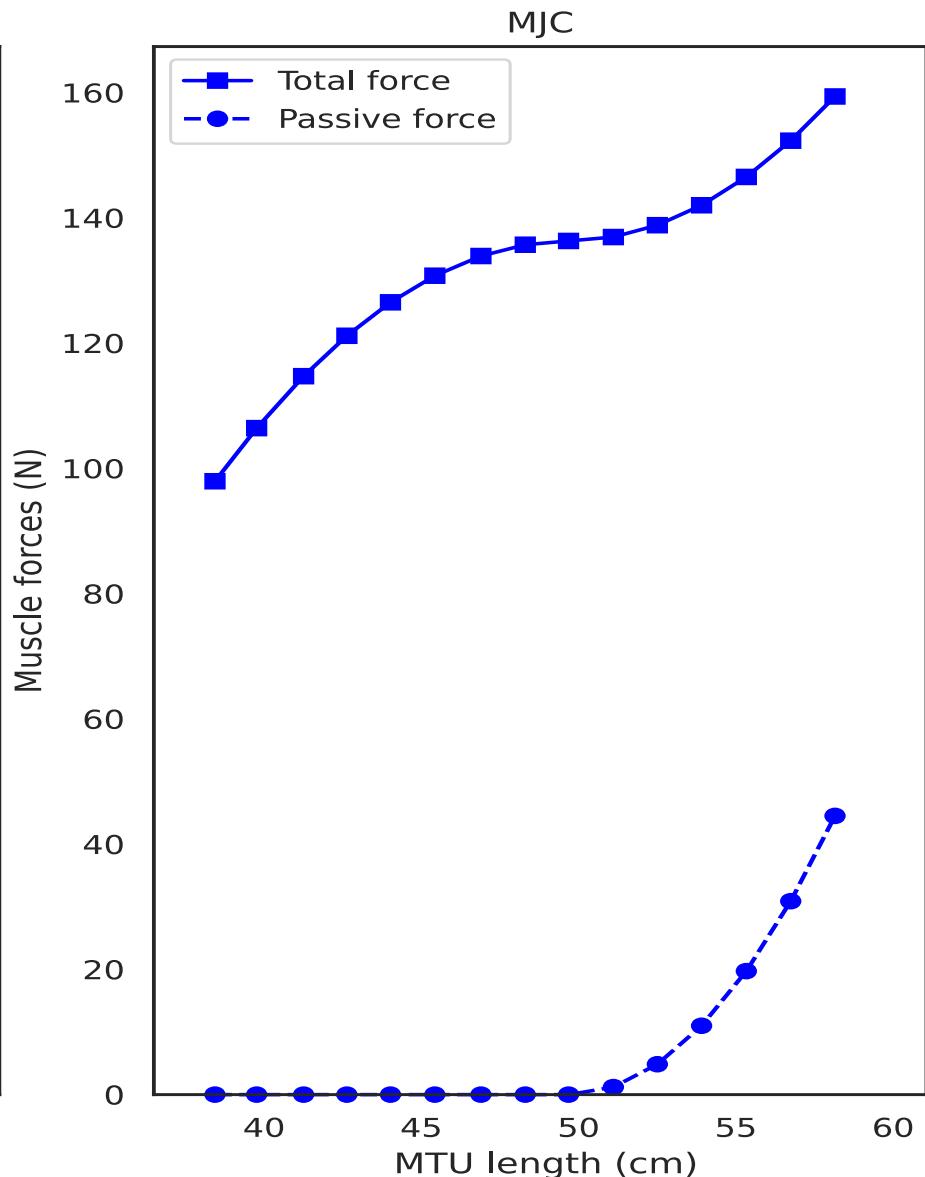
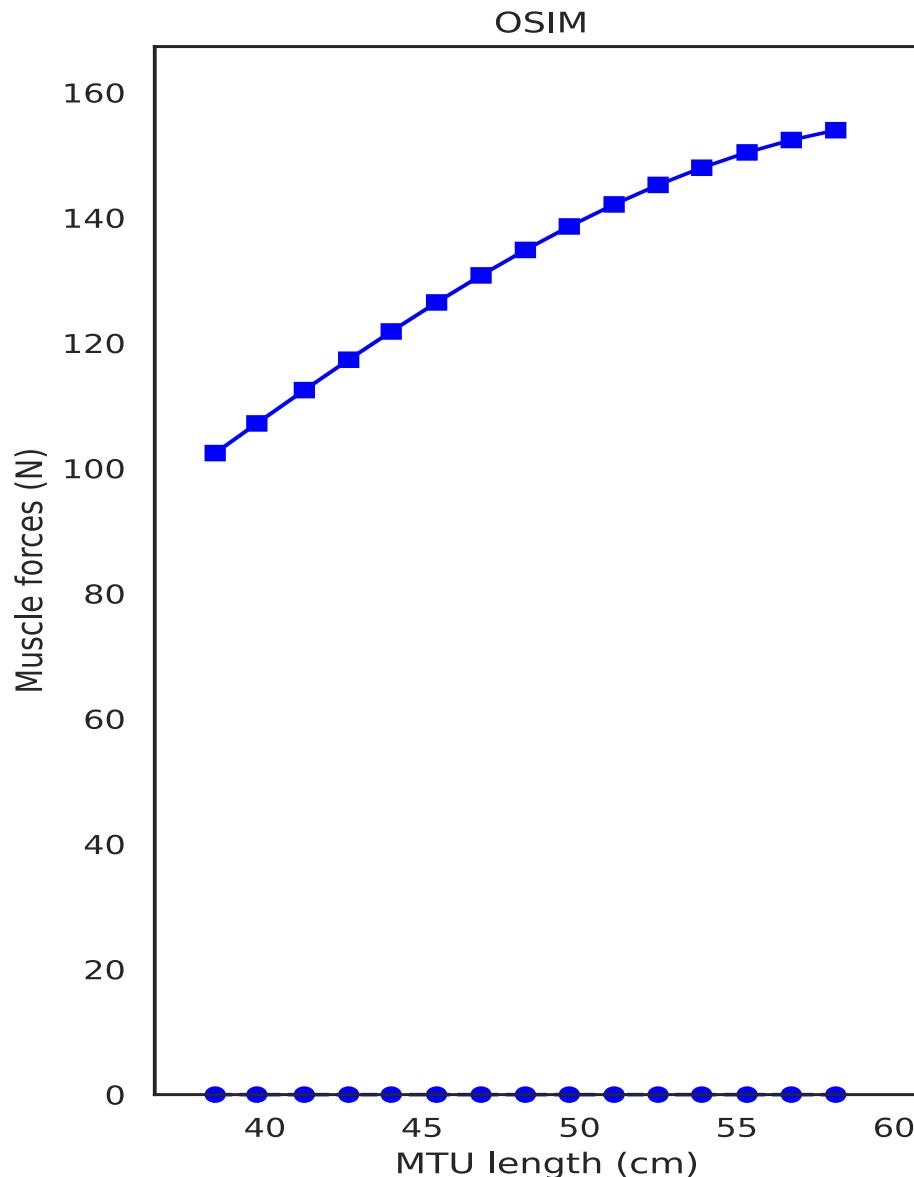
Global title indicate the muscle name. X axis indicate the muscle-fiber-tendon unit length. Y axis is the muscle force (unnormalized)

Overall comparison of muscle force-length relationship before/after optimization

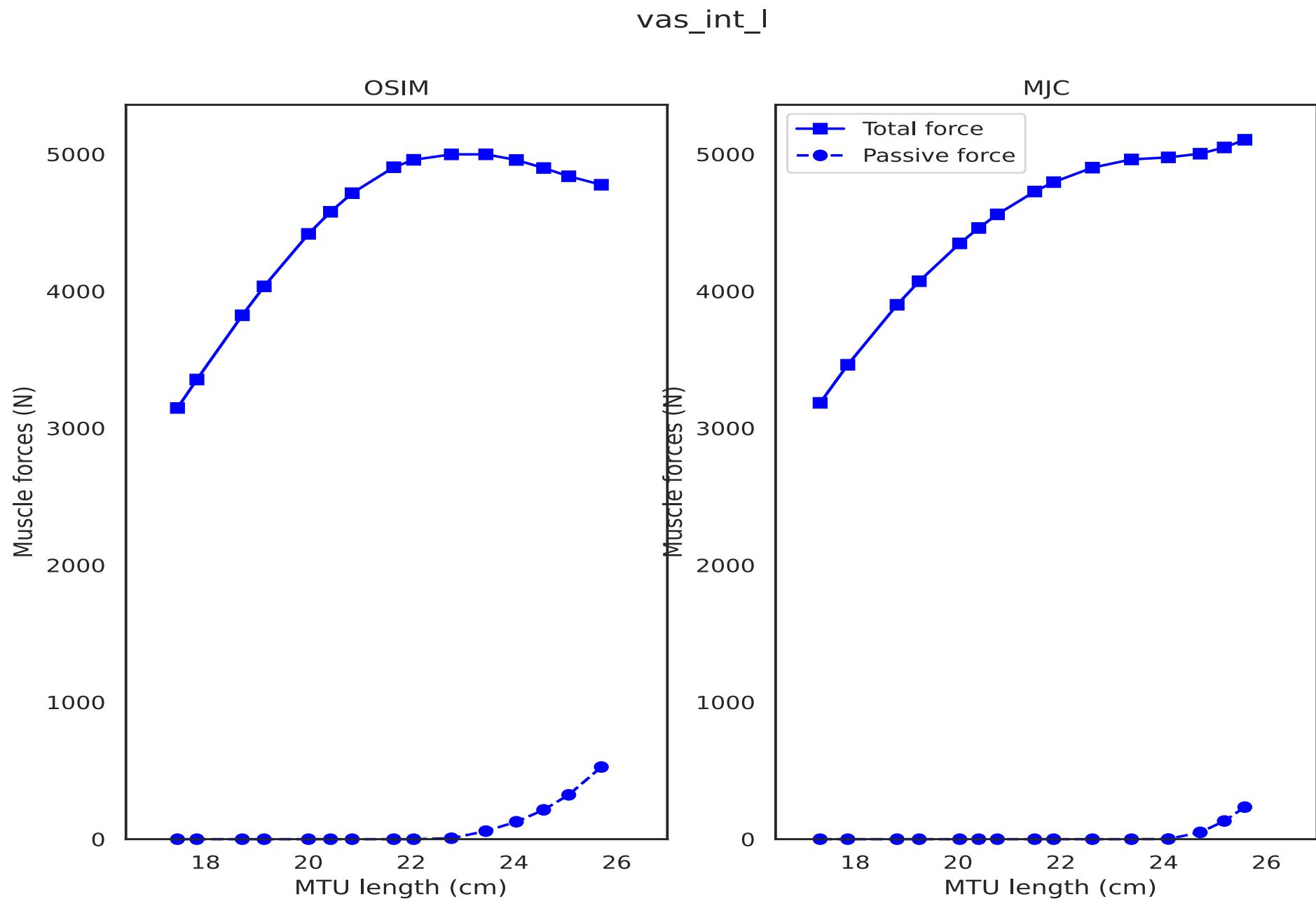


Muscle specific force comparison before/after optimization

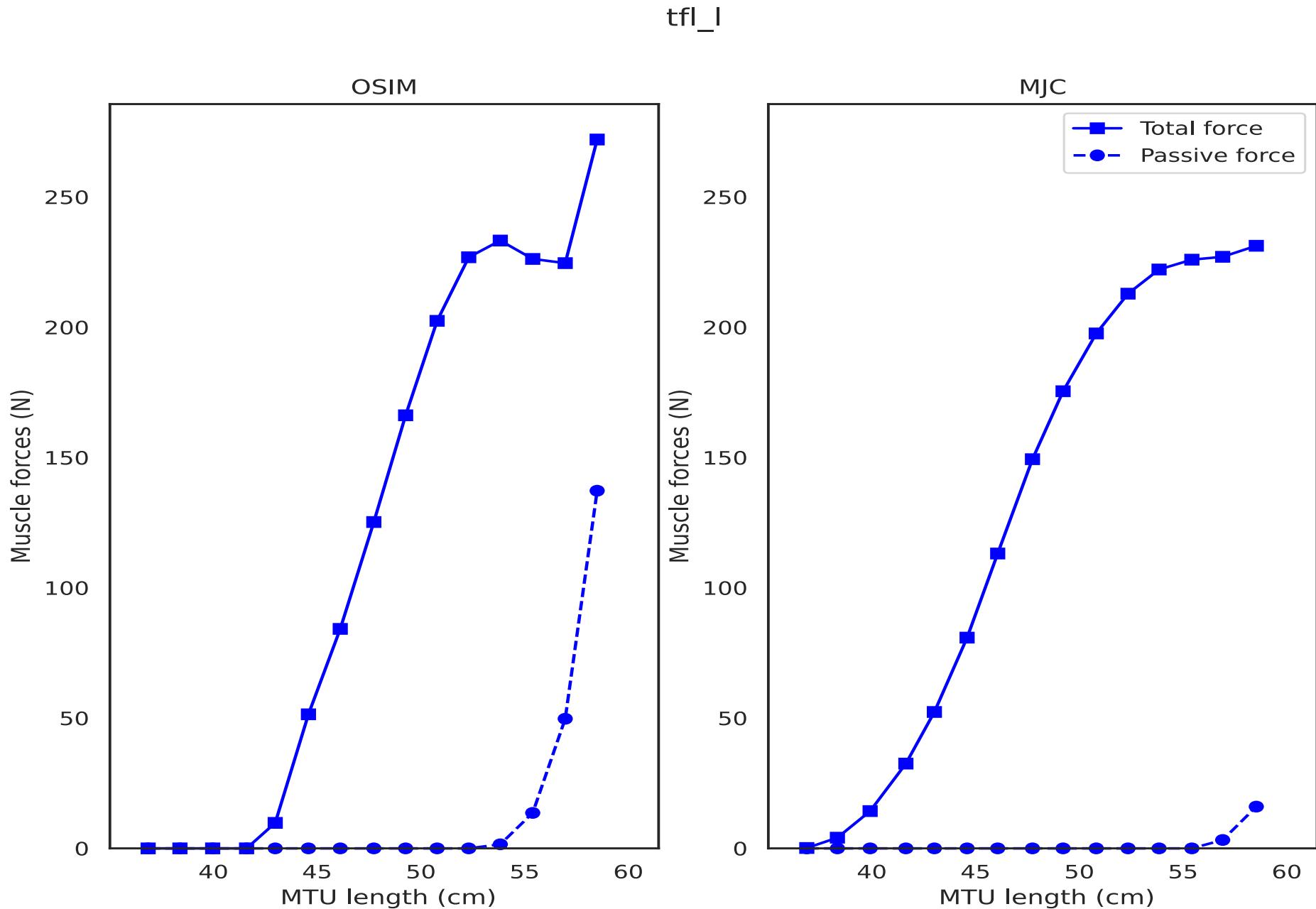
sar_I



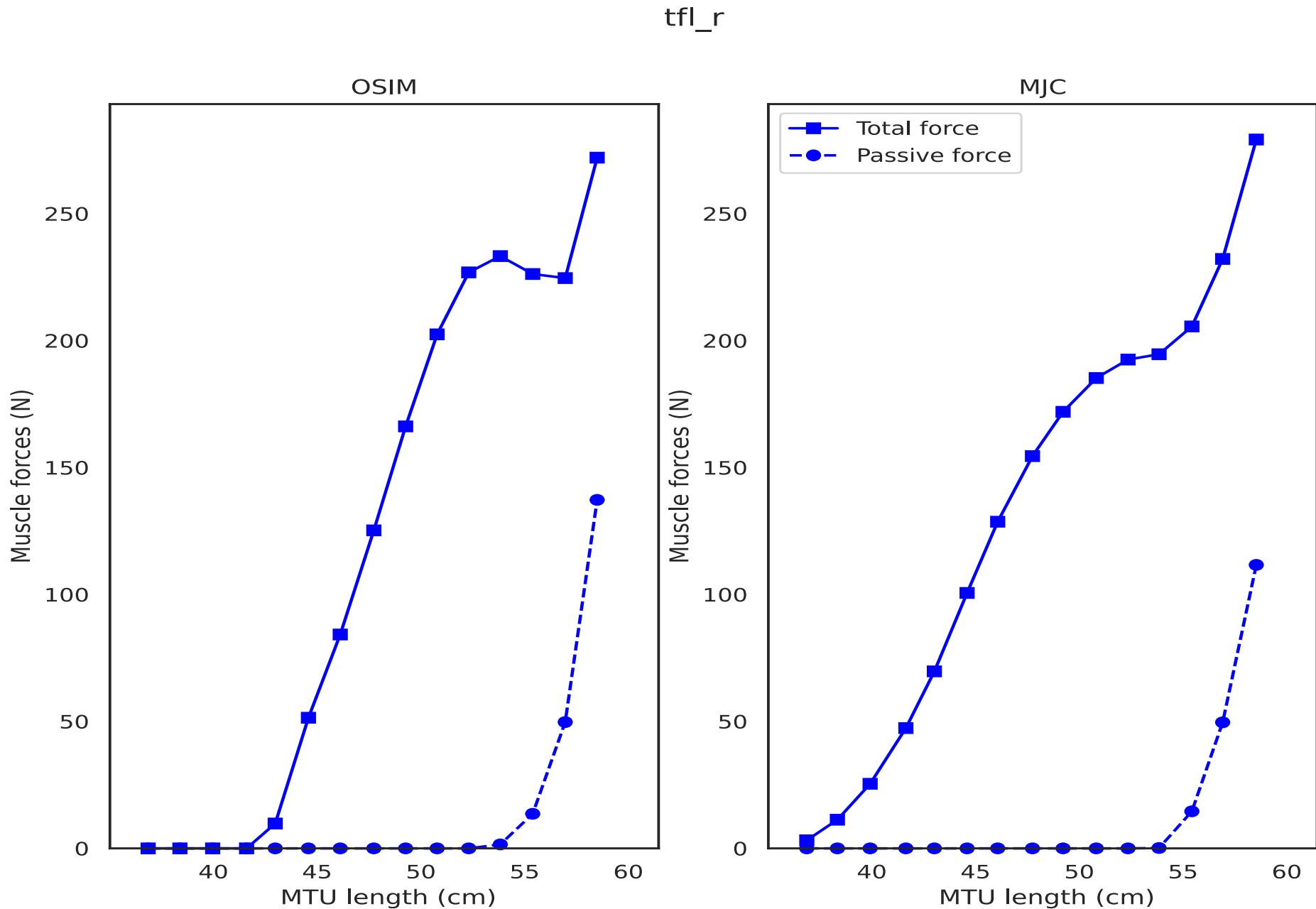
Muscle specific force comparison before/after optimization



Muscle specific force comparison before/after optimization

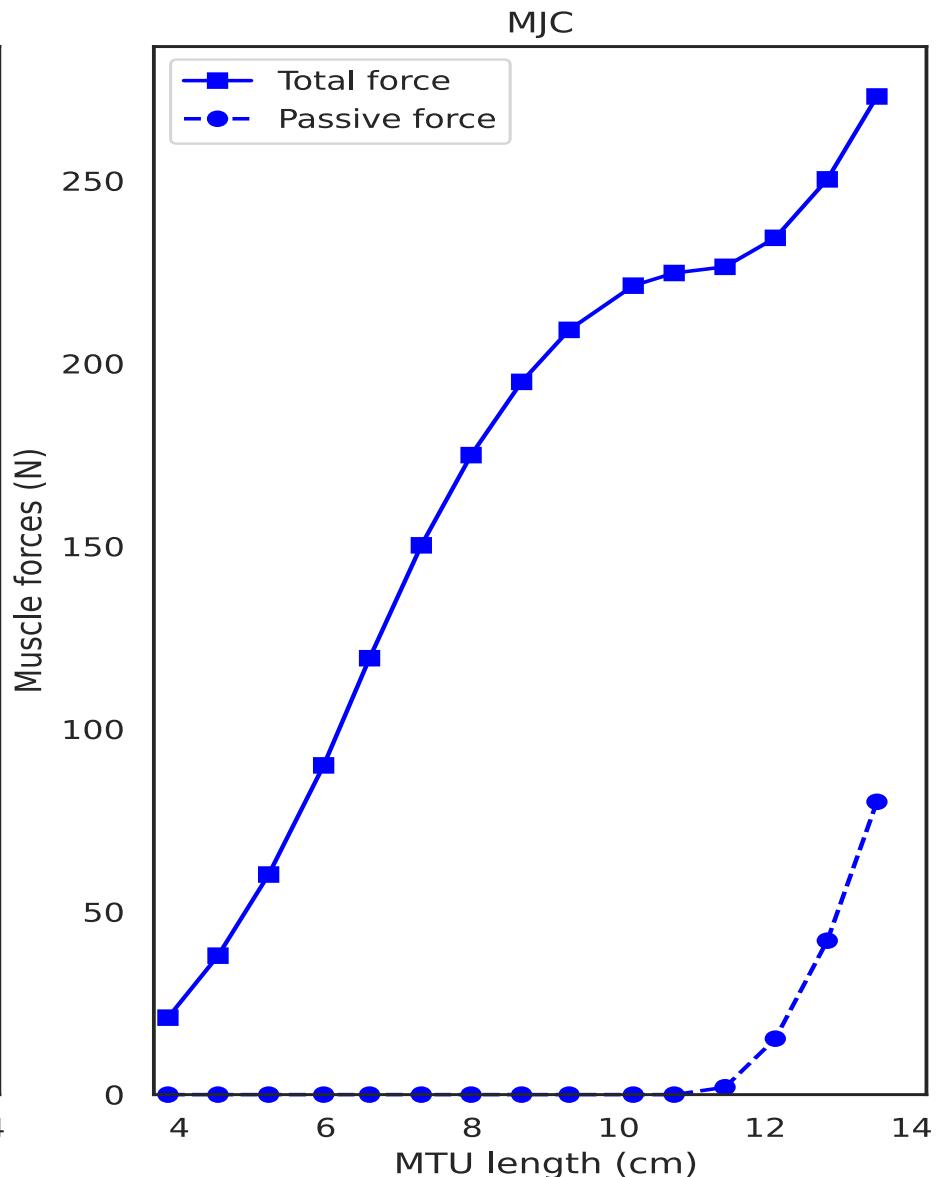
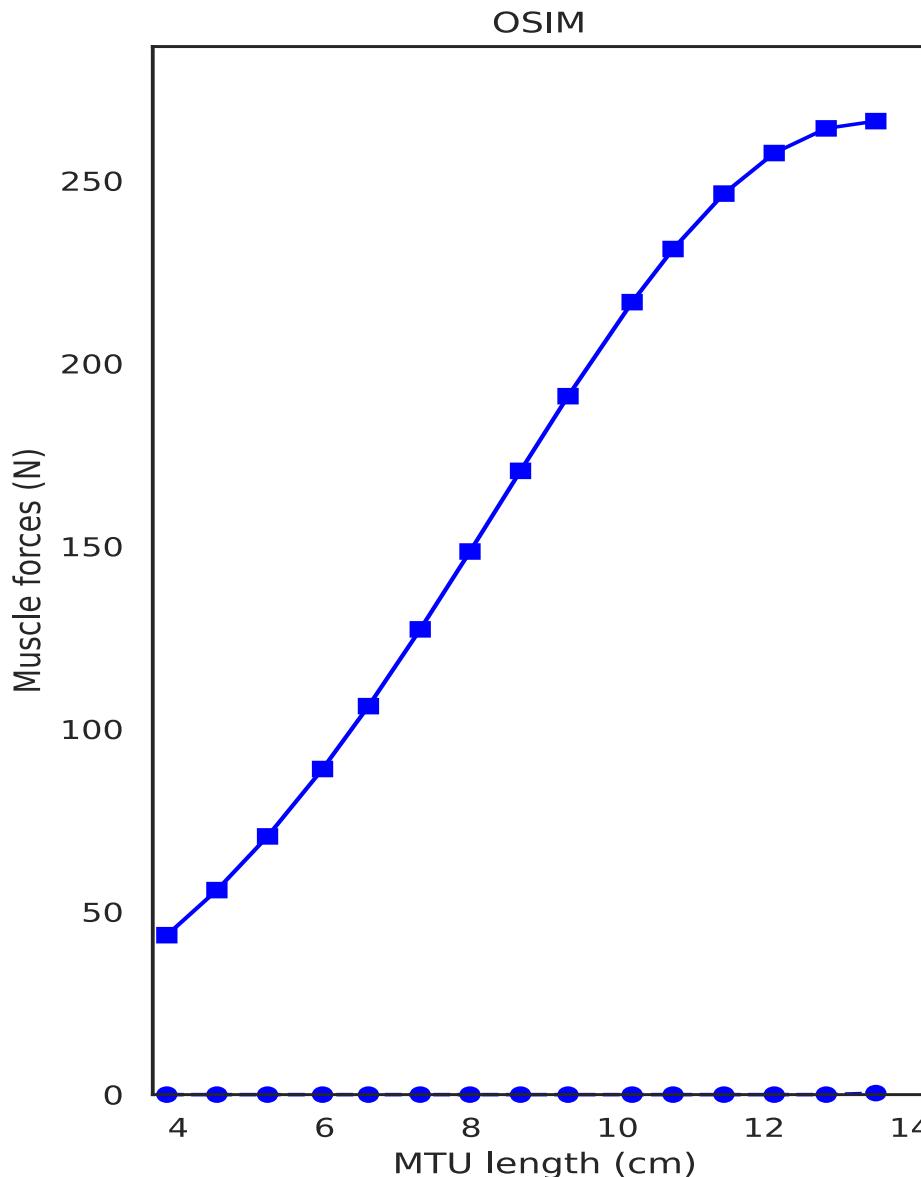


Muscle specific force comparison before/after optimization

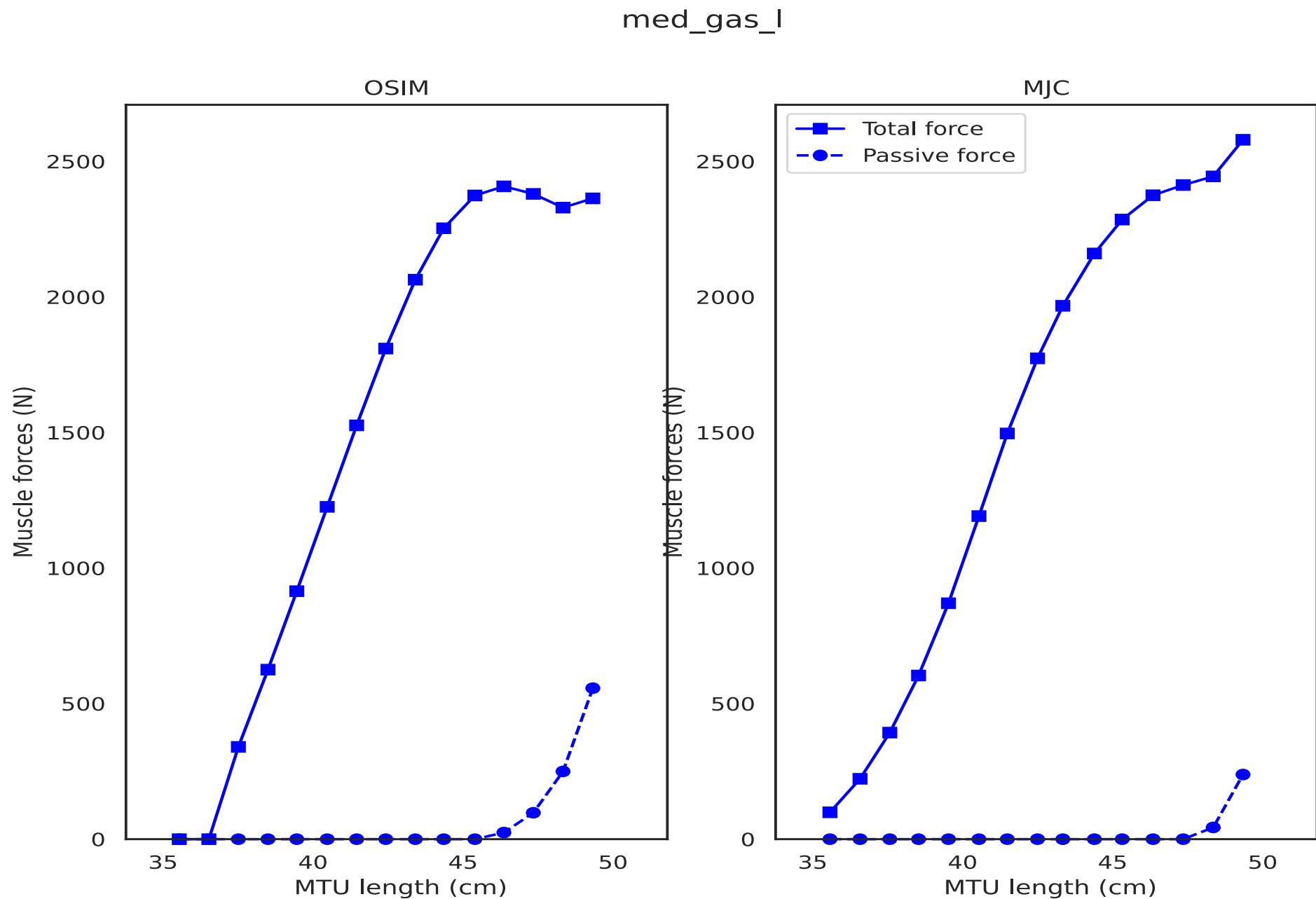


Muscle specific force comparison before/after optimization

pect_r

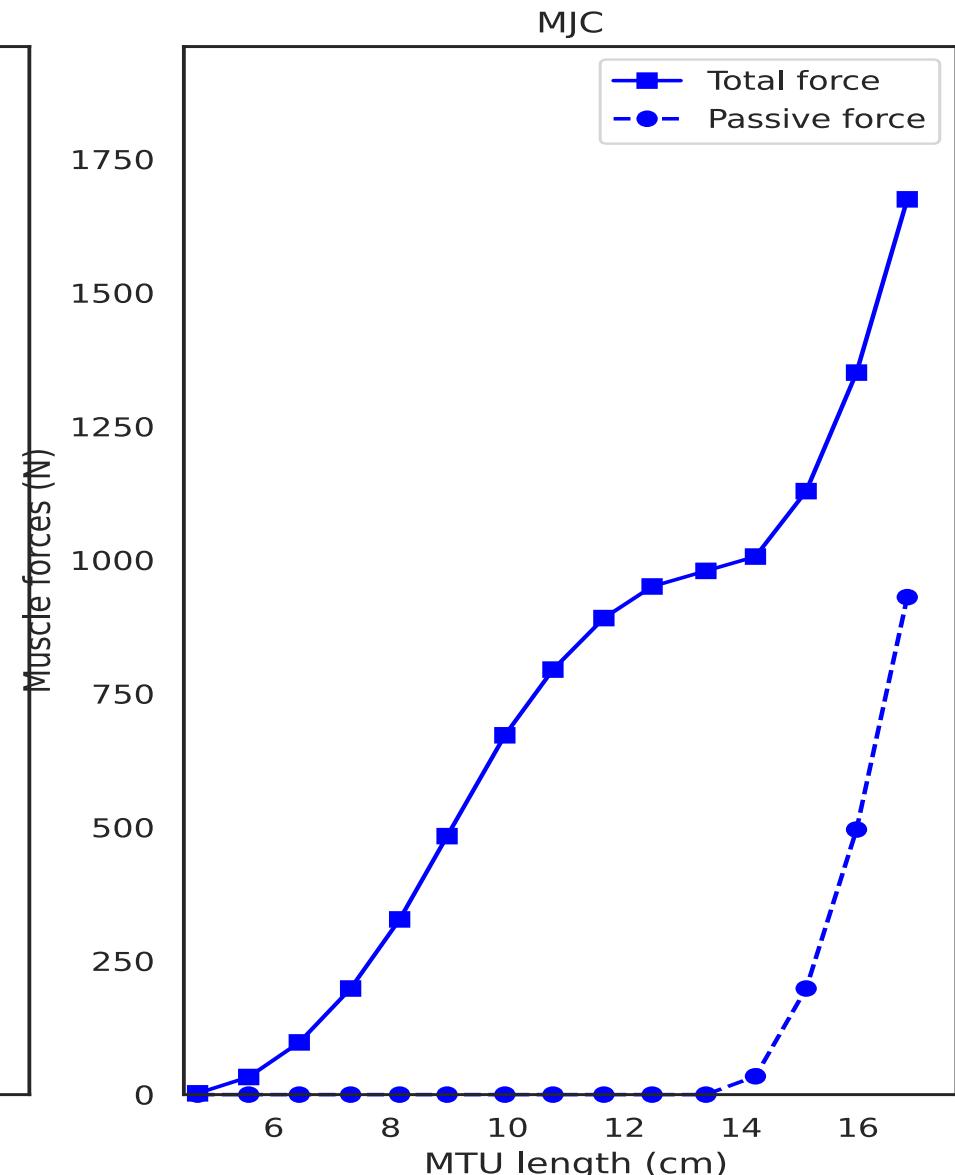
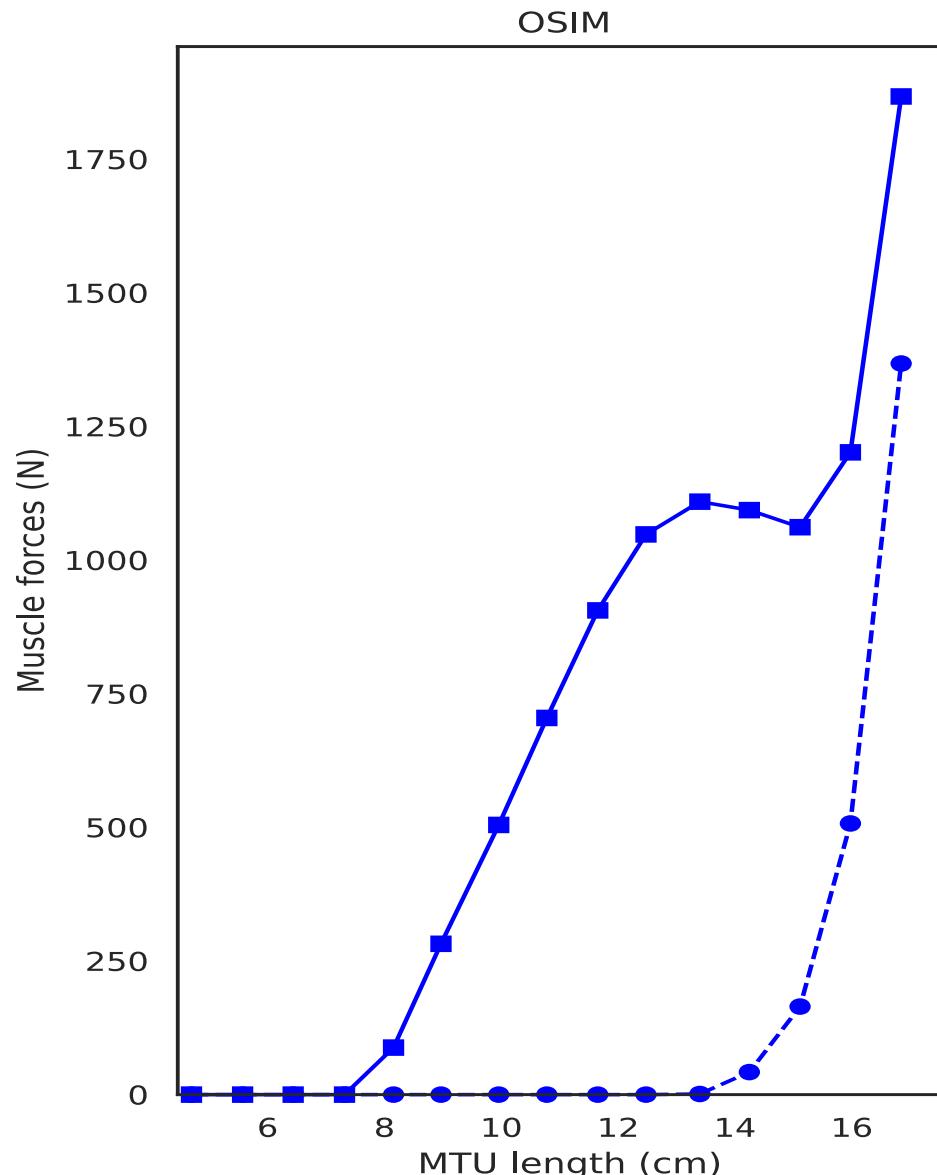


Muscle specific force comparison before/after optimization



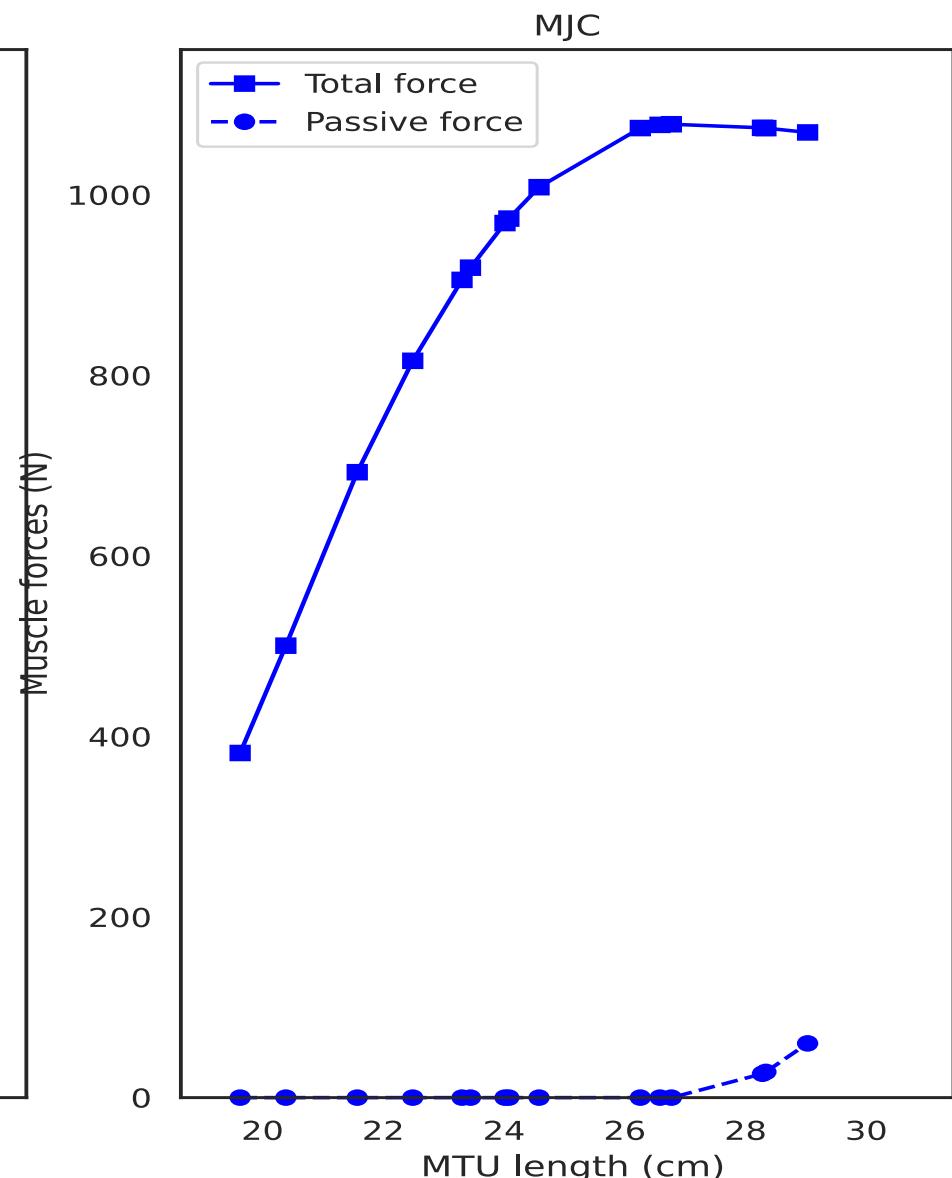
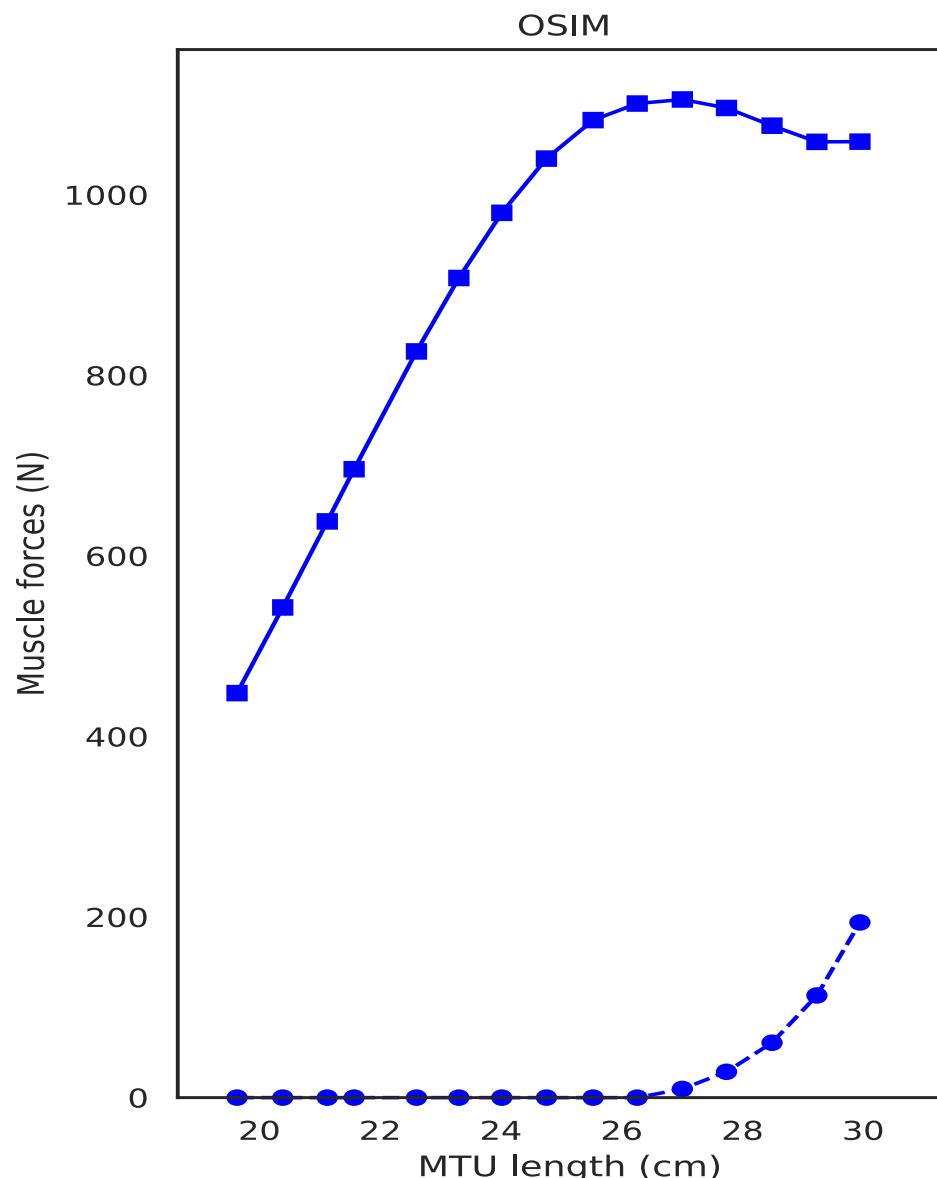
Muscle specific force comparison before/after optimization

glut_med1_I



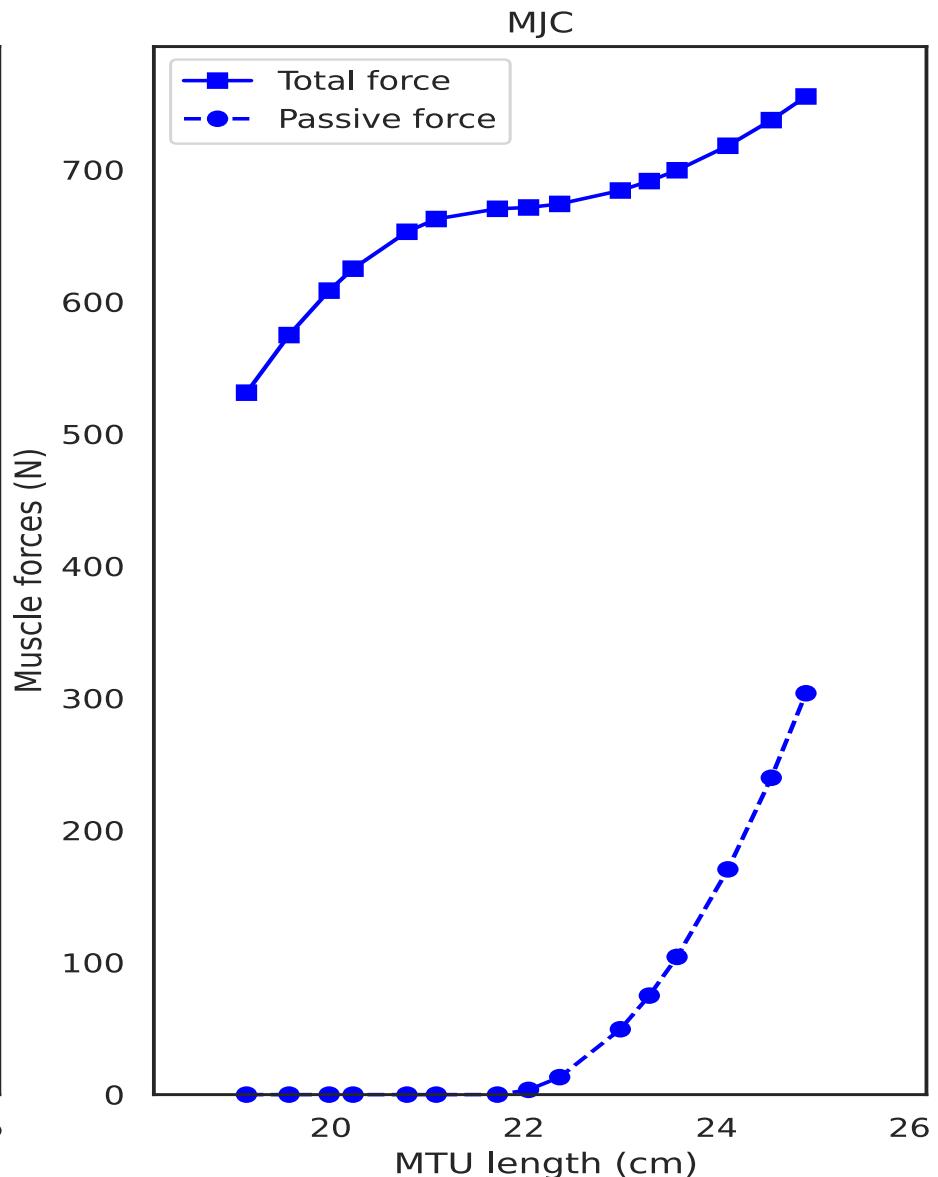
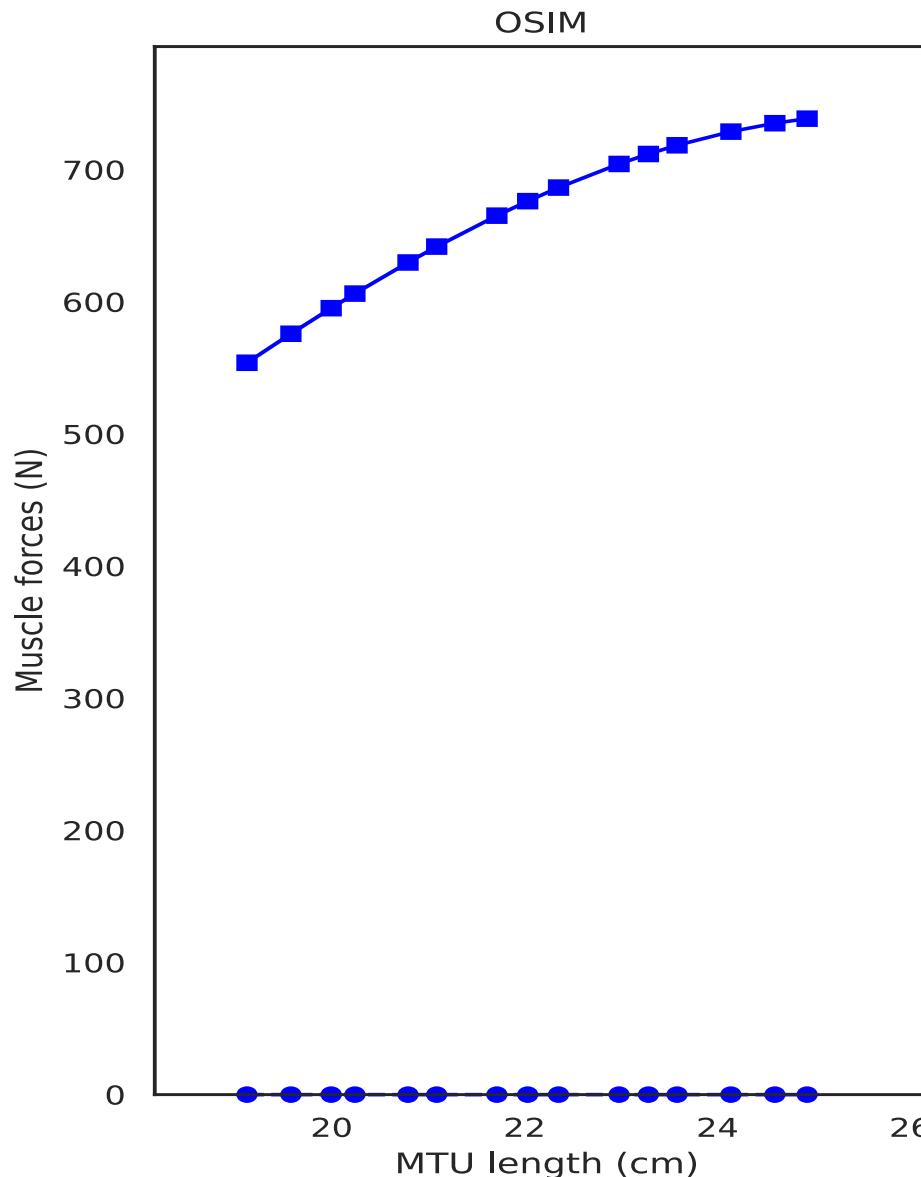
Muscle specific force comparison before/after optimization

psoas_r

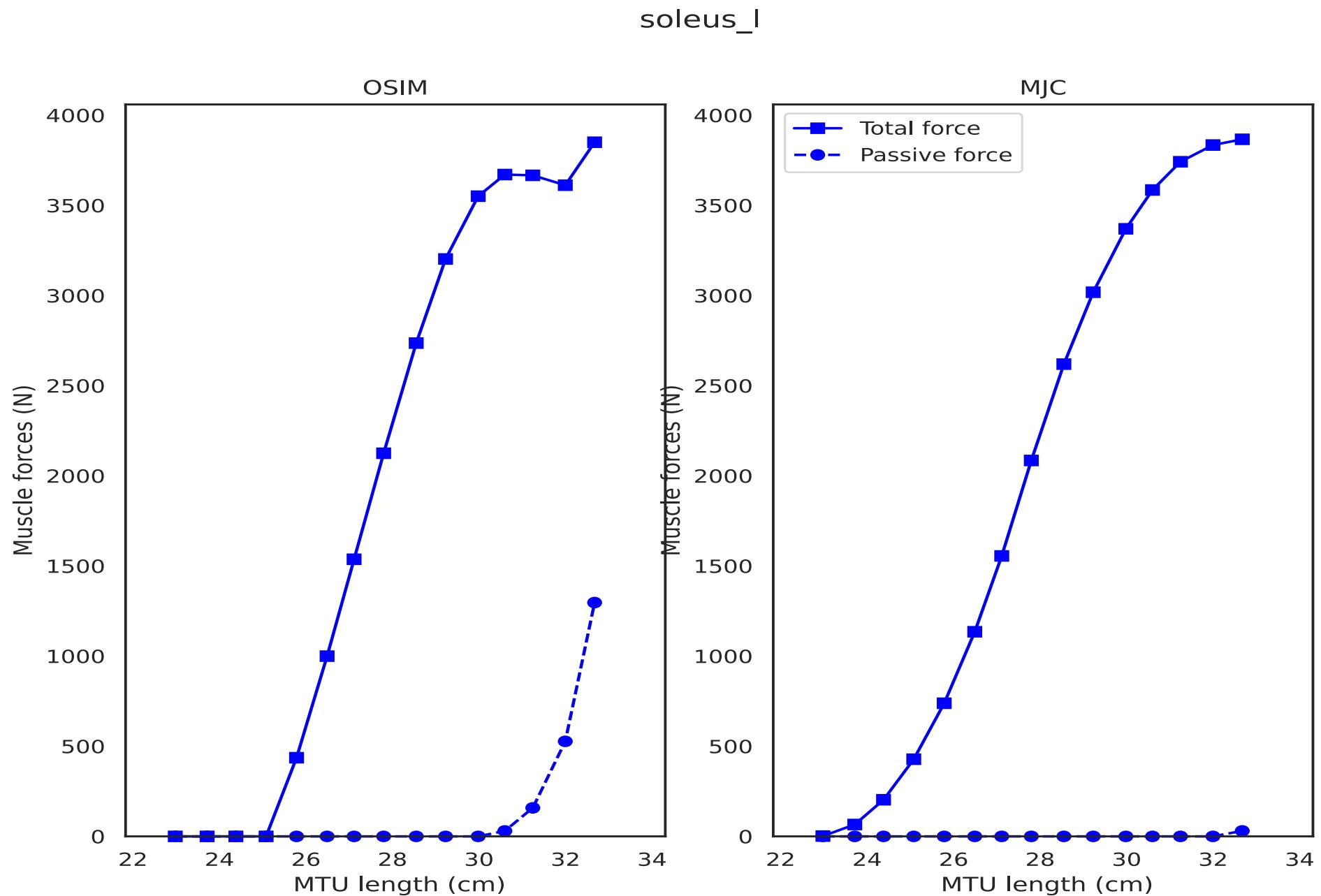


Muscle specific force comparison before/after optimization

bifemsh_r

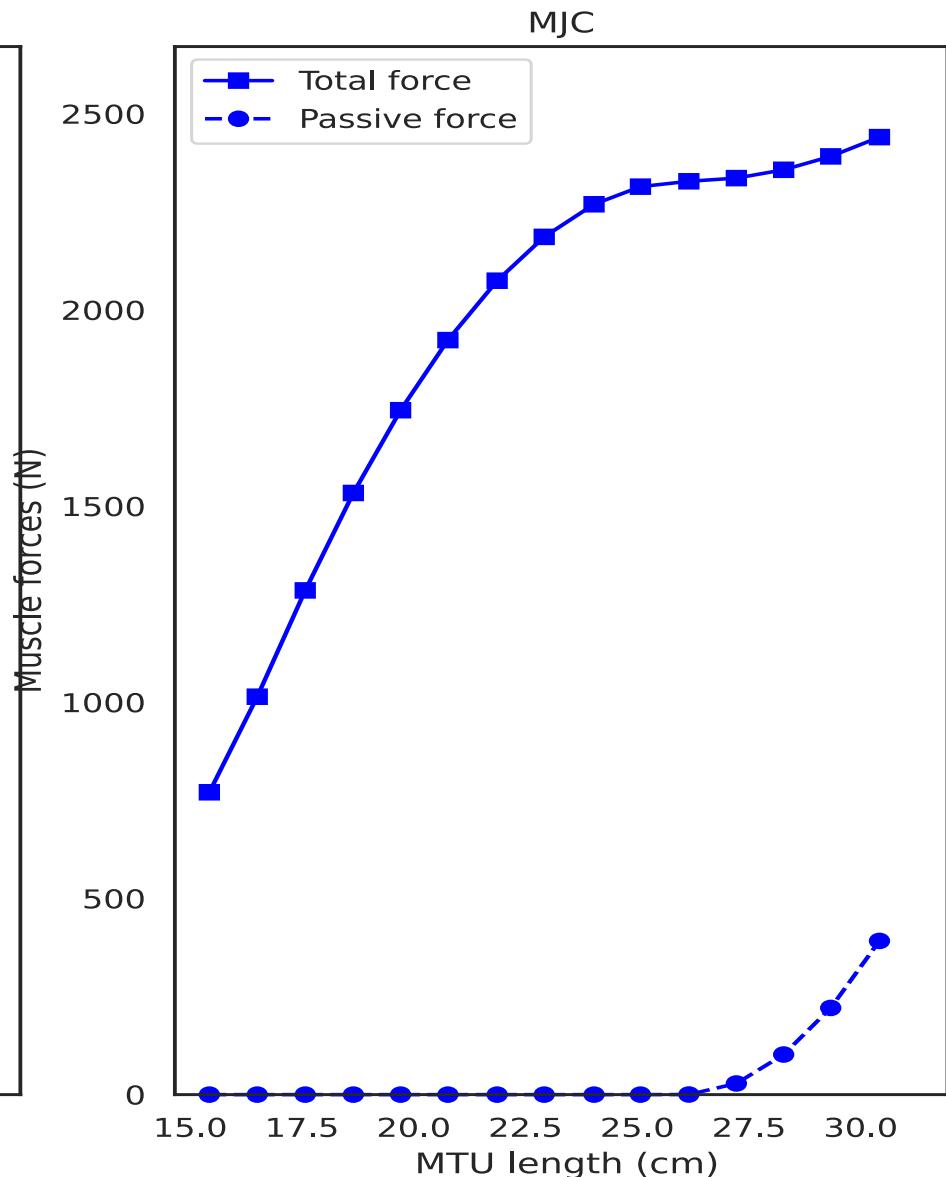
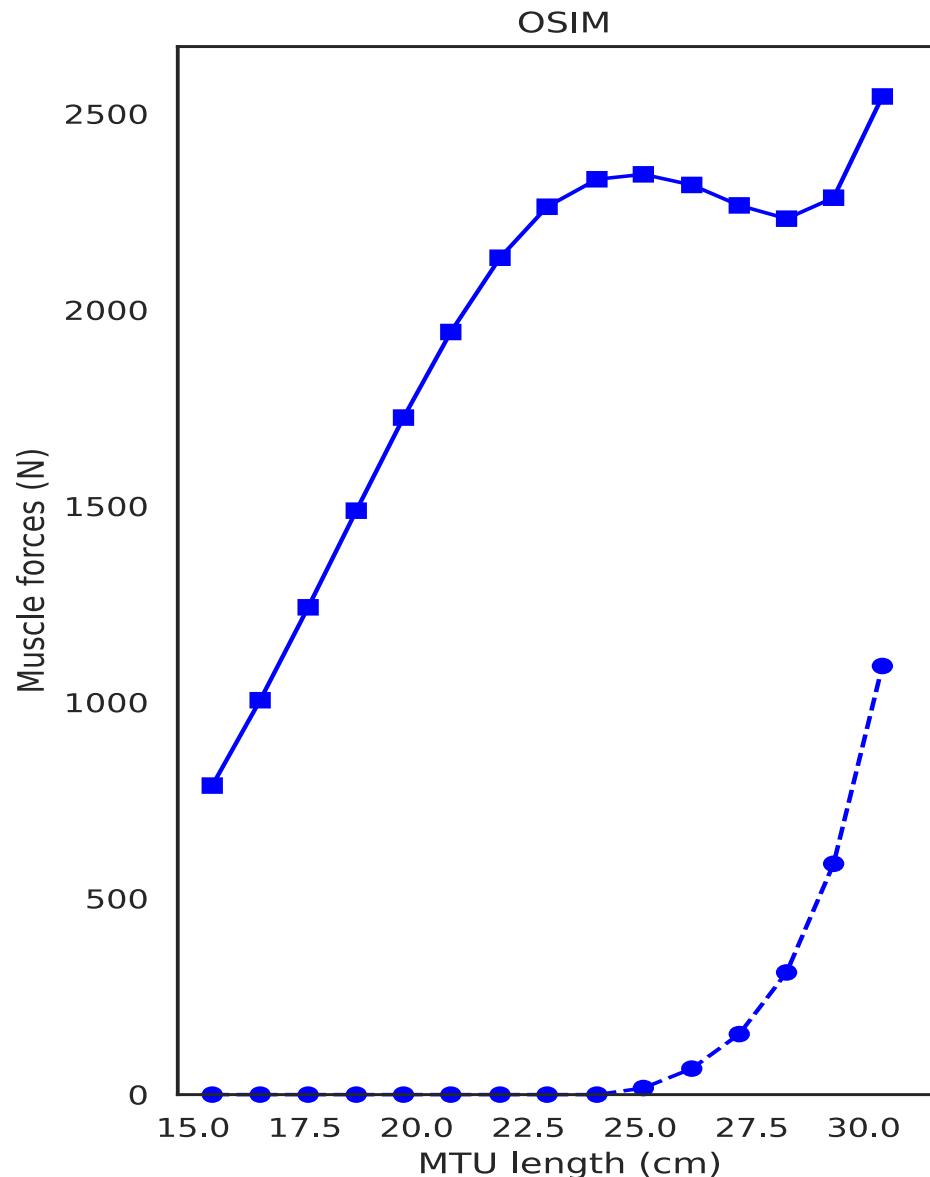


Muscle specific force comparison before/after optimization

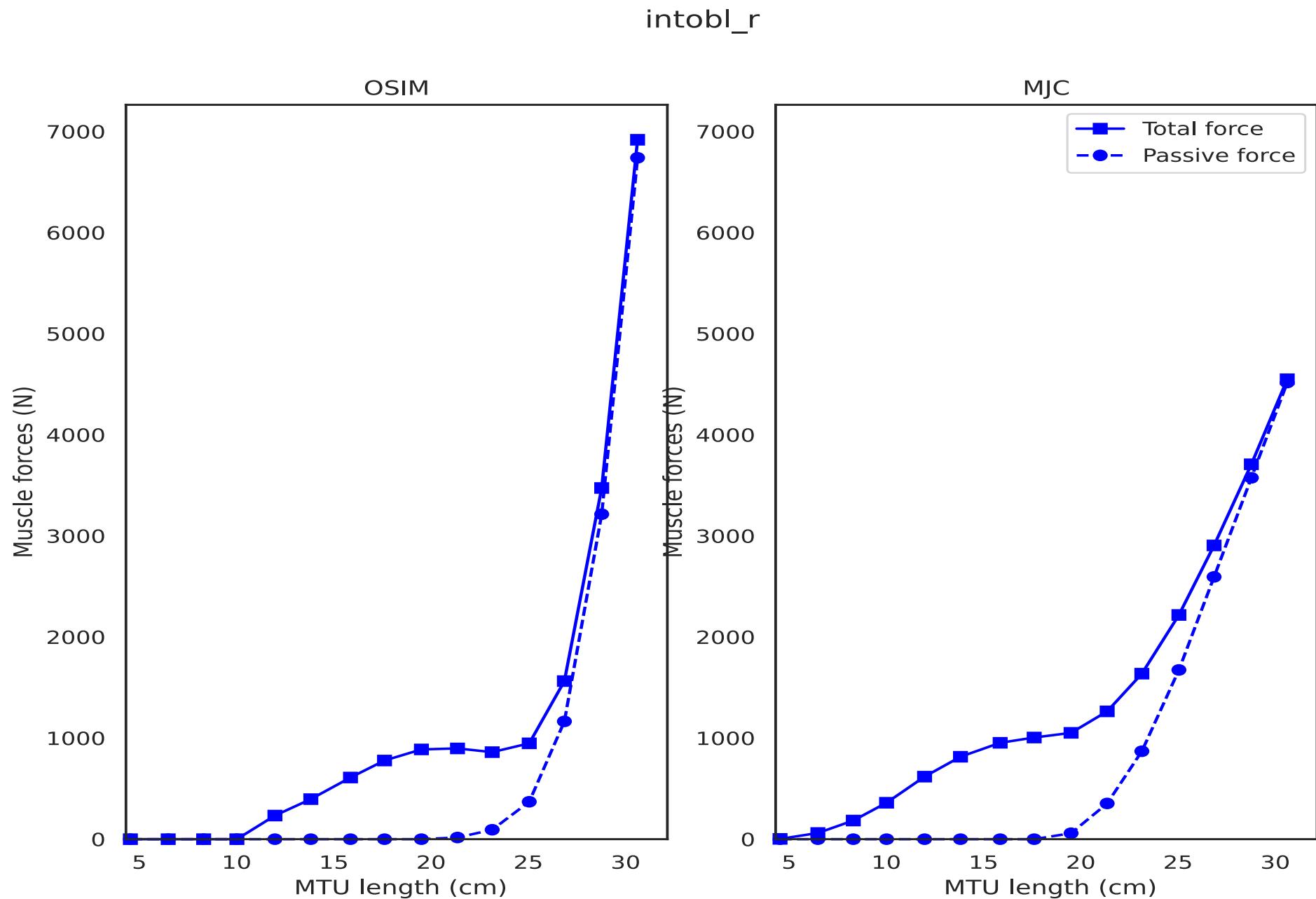


Muscle specific force comparison before/after optimization

add_mag2_r

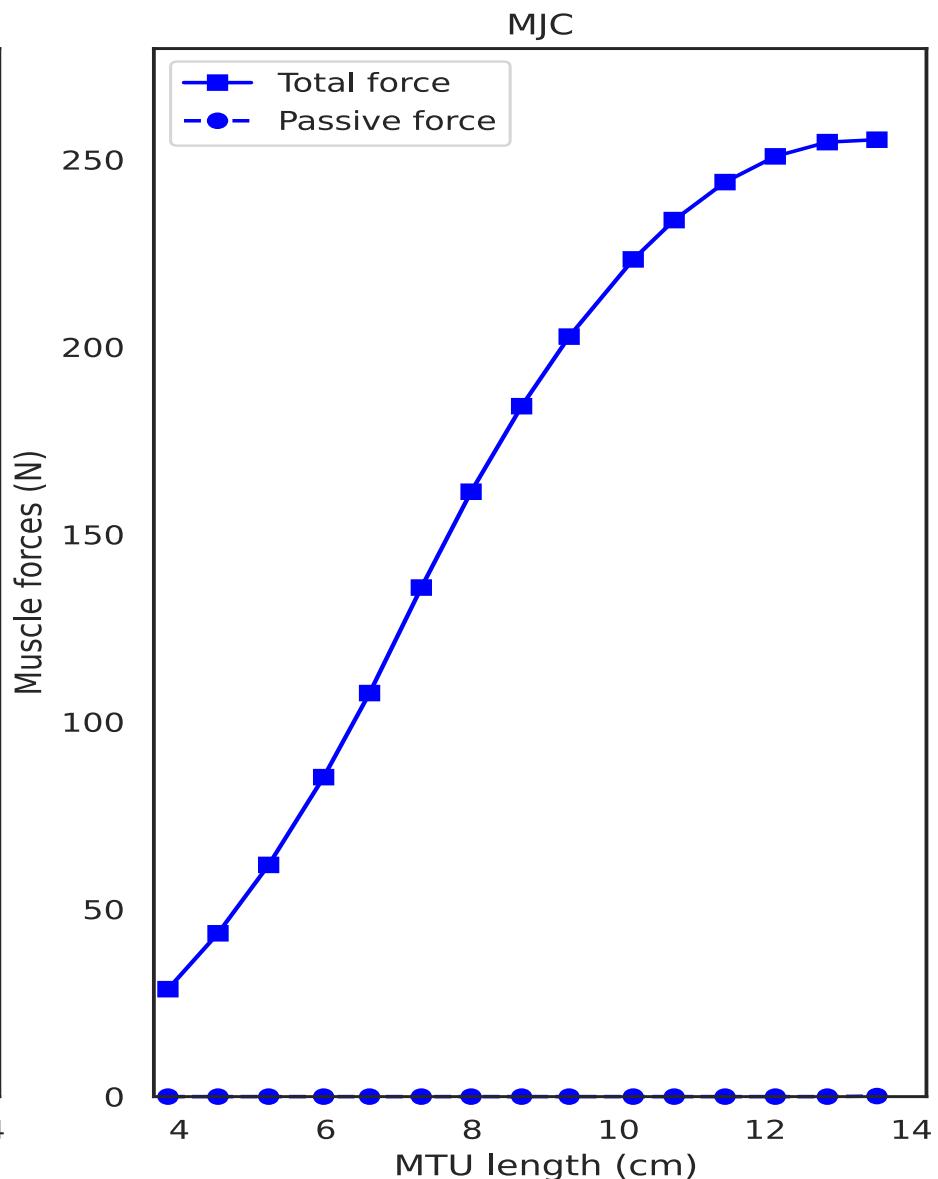
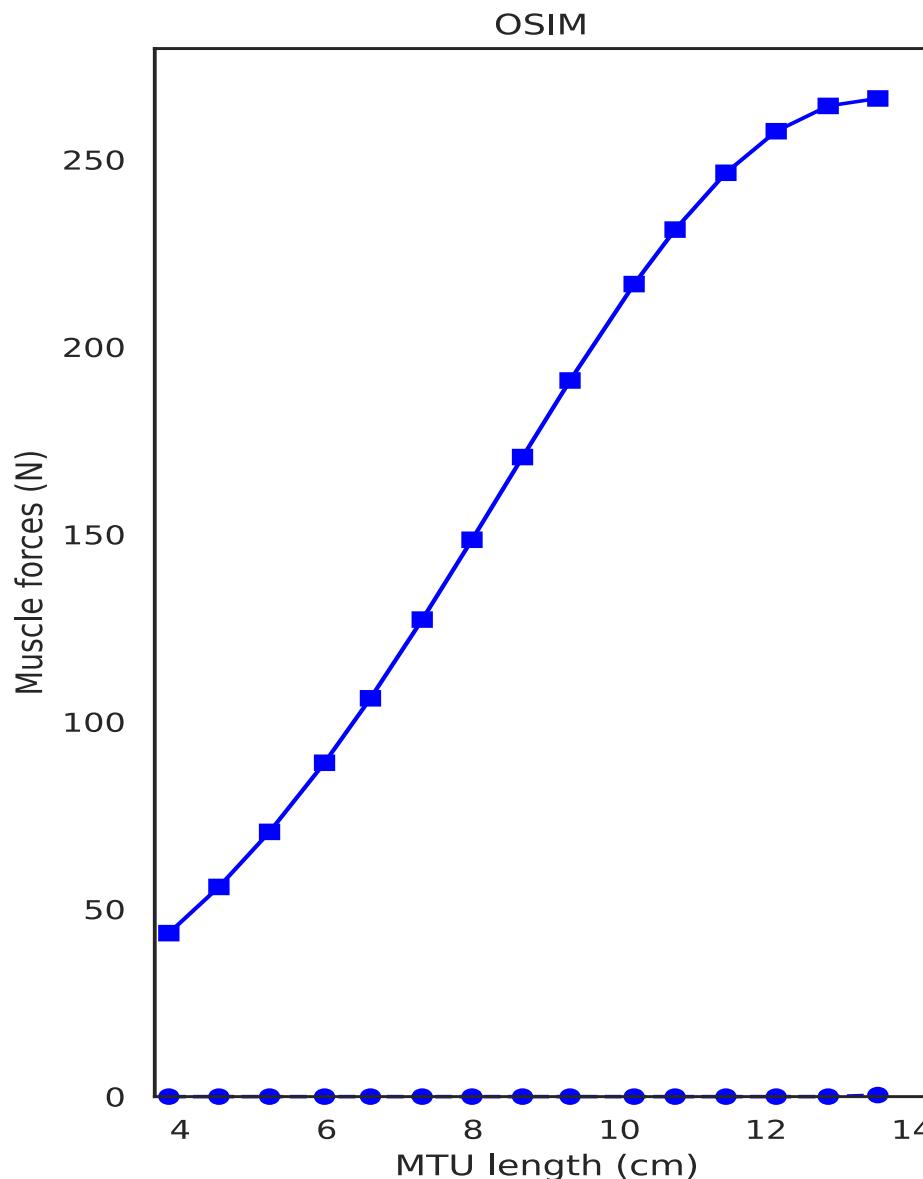


Muscle specific force comparison before/after optimization

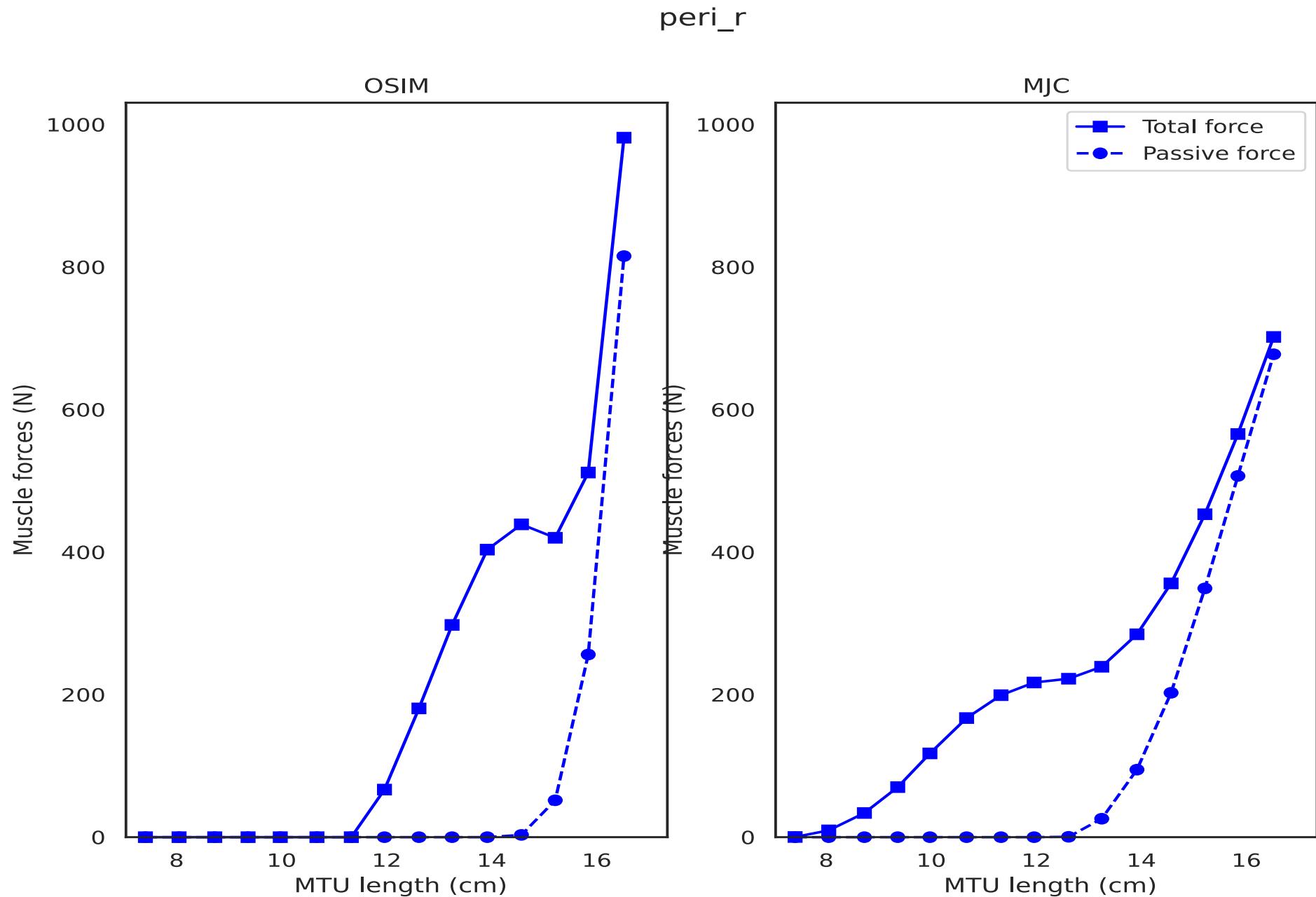


Muscle specific force comparison before/after optimization

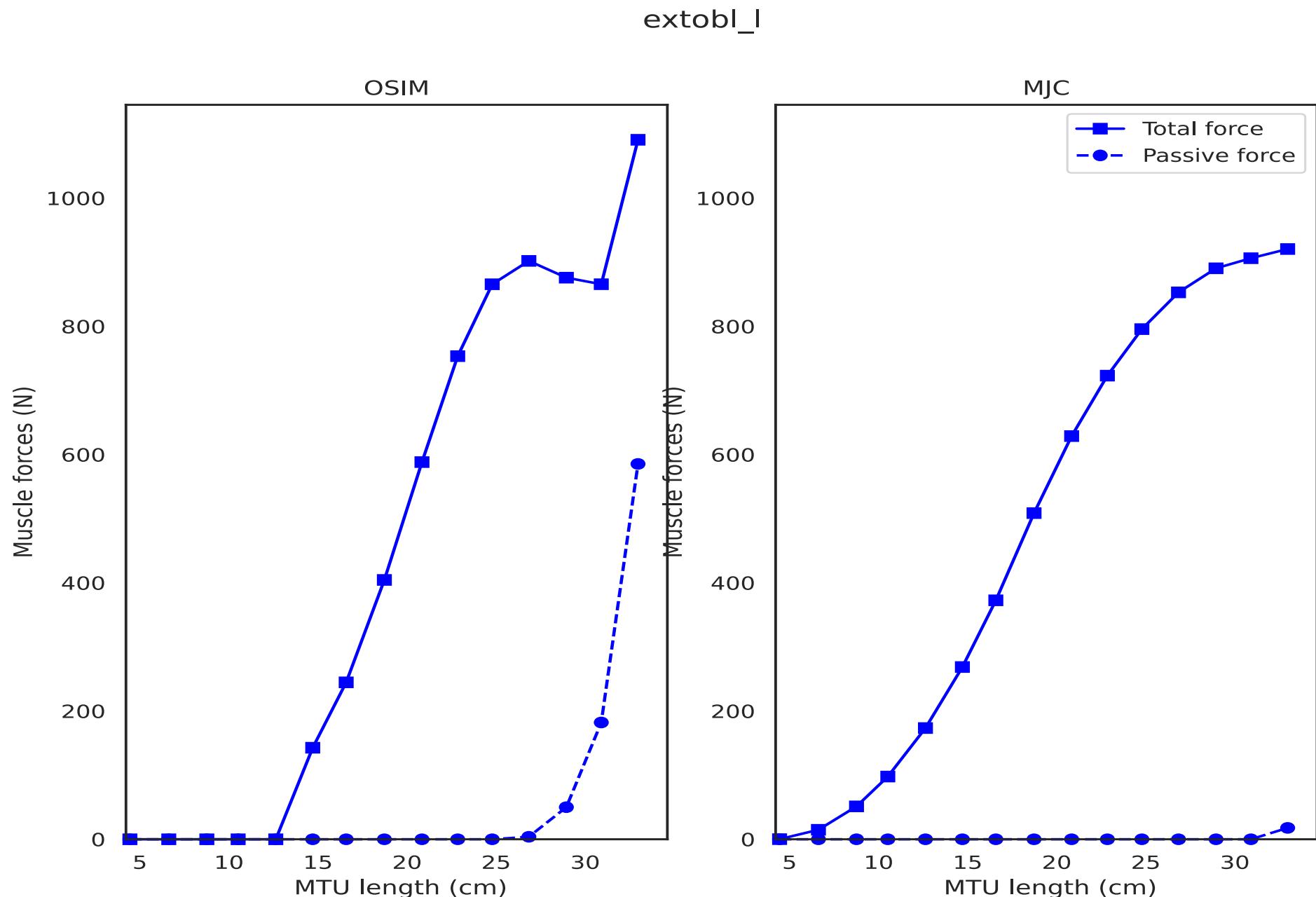
pect_I



Muscle specific force comparison before/after optimization

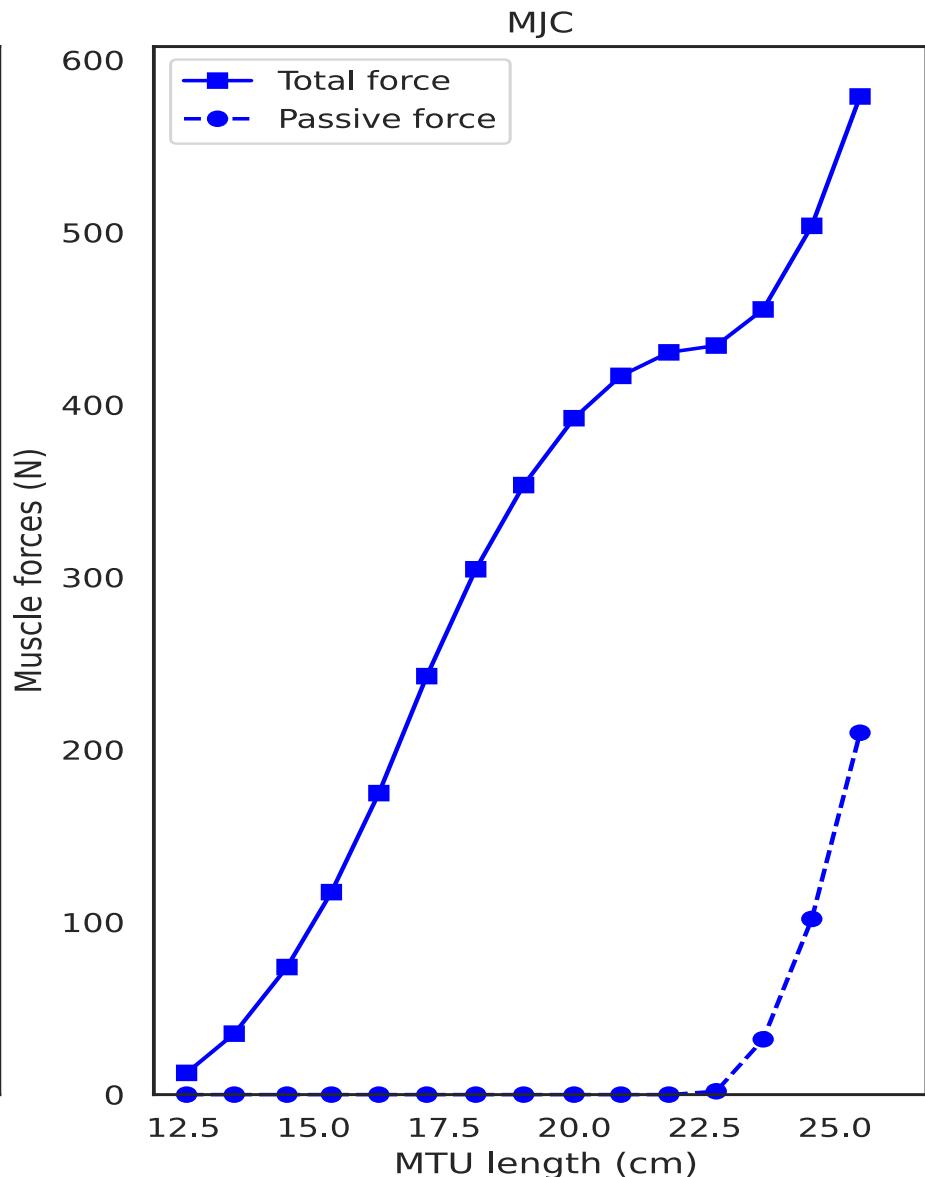
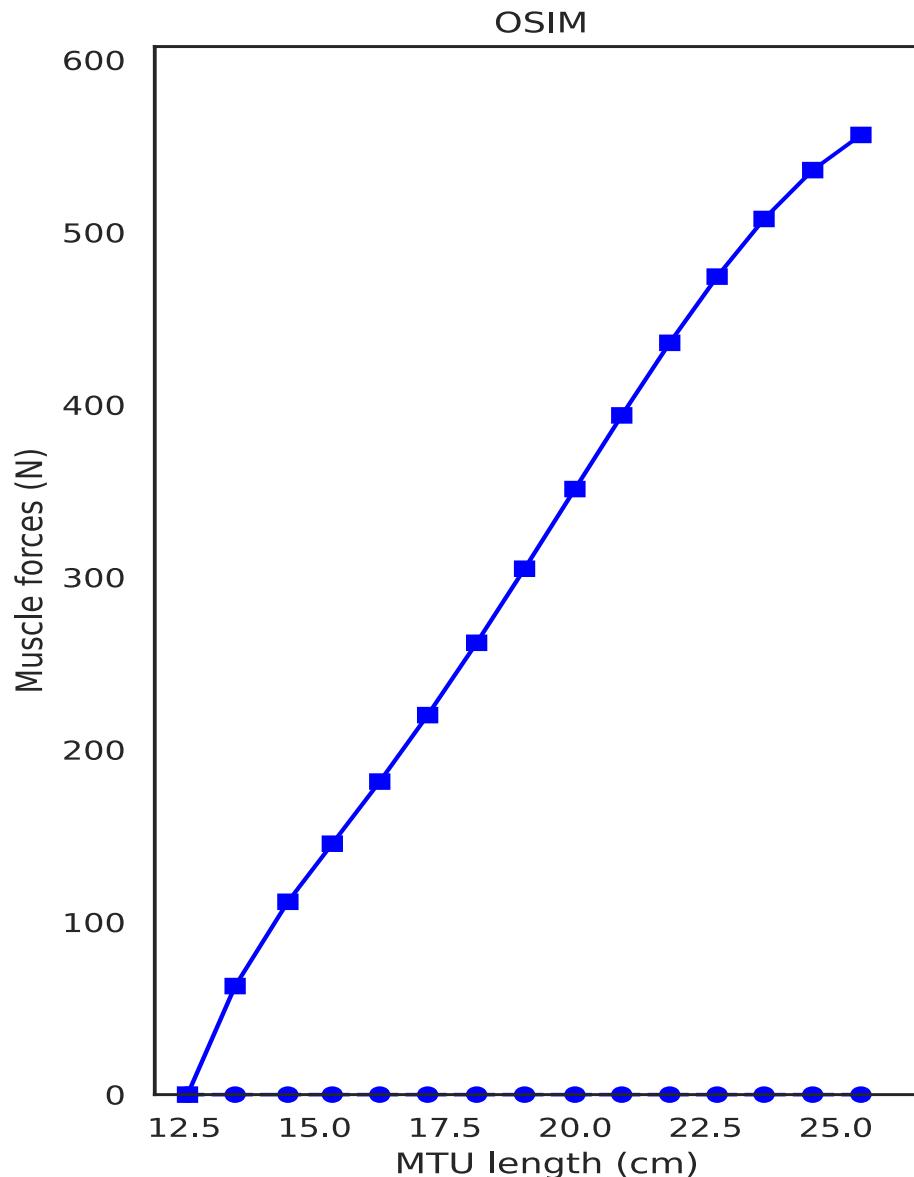


Muscle specific force comparison before/after optimization

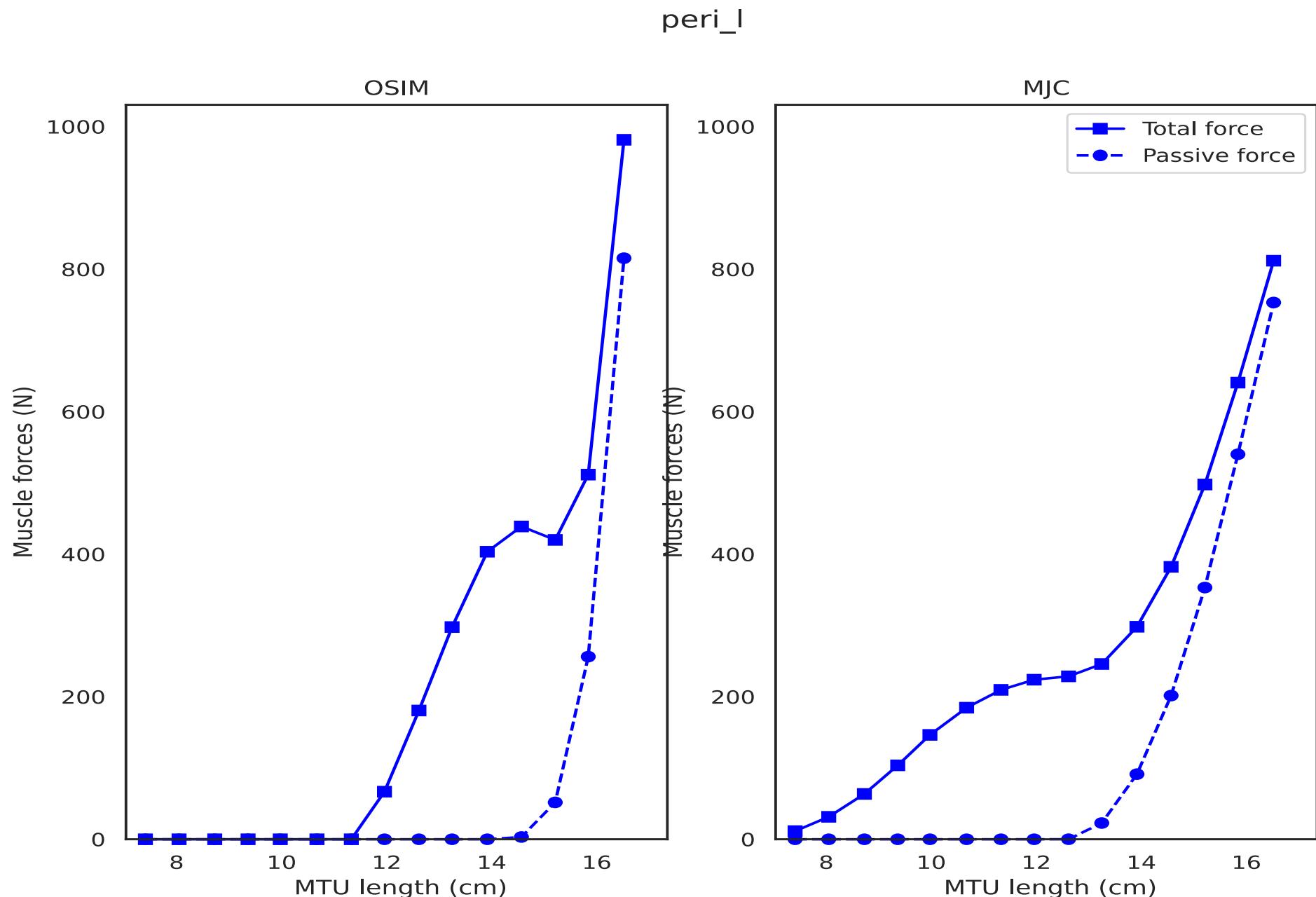


Muscle specific force comparison before/after optimization

glut_max1_r

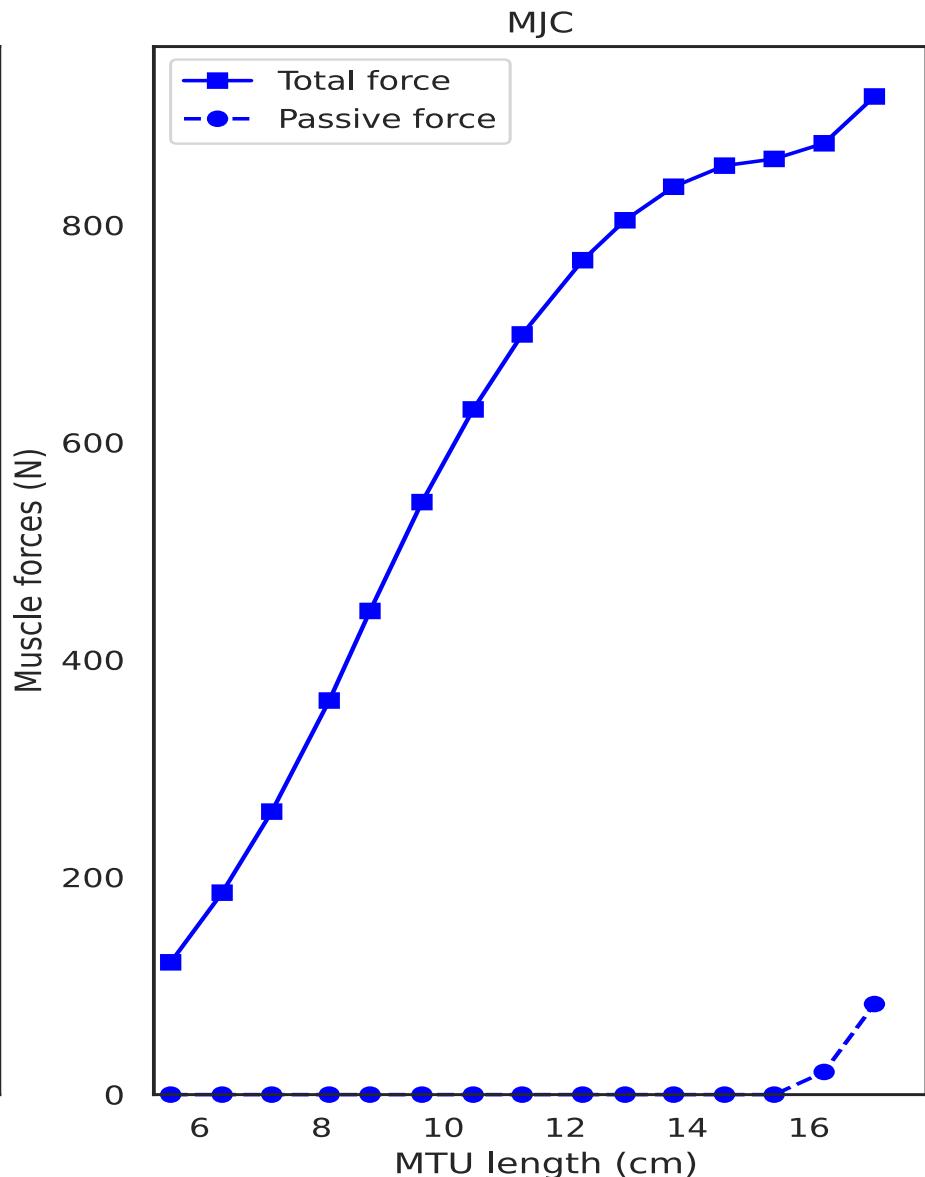
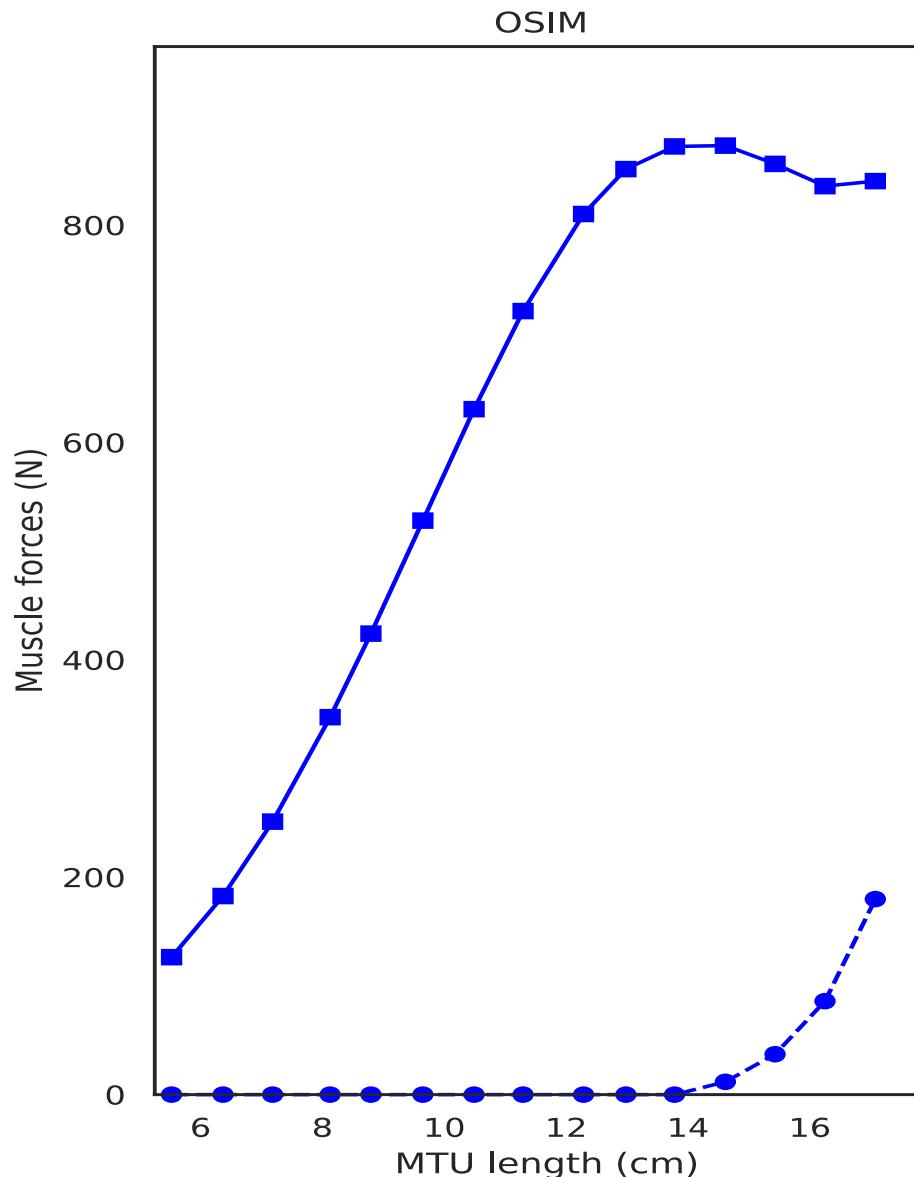


Muscle specific force comparison before/after optimization



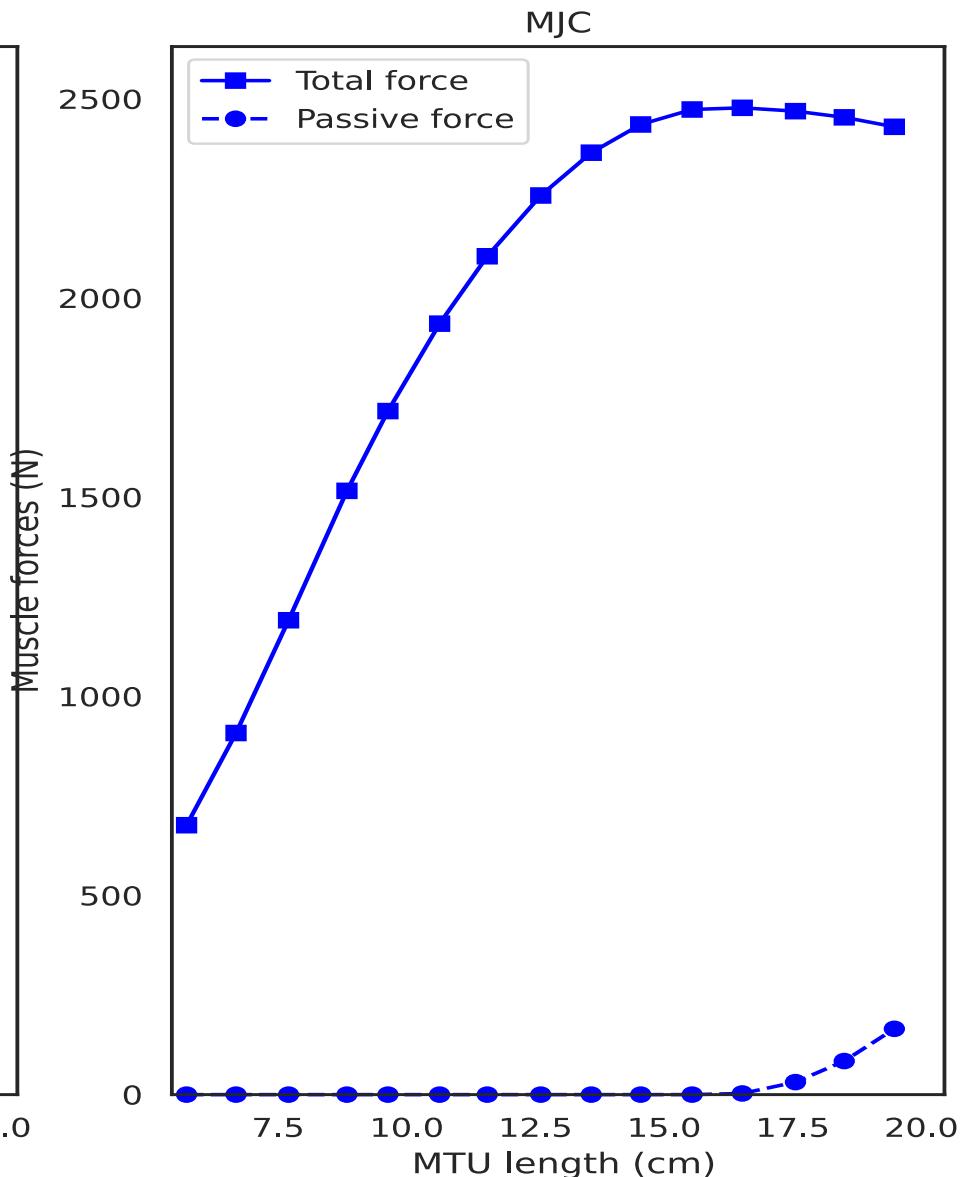
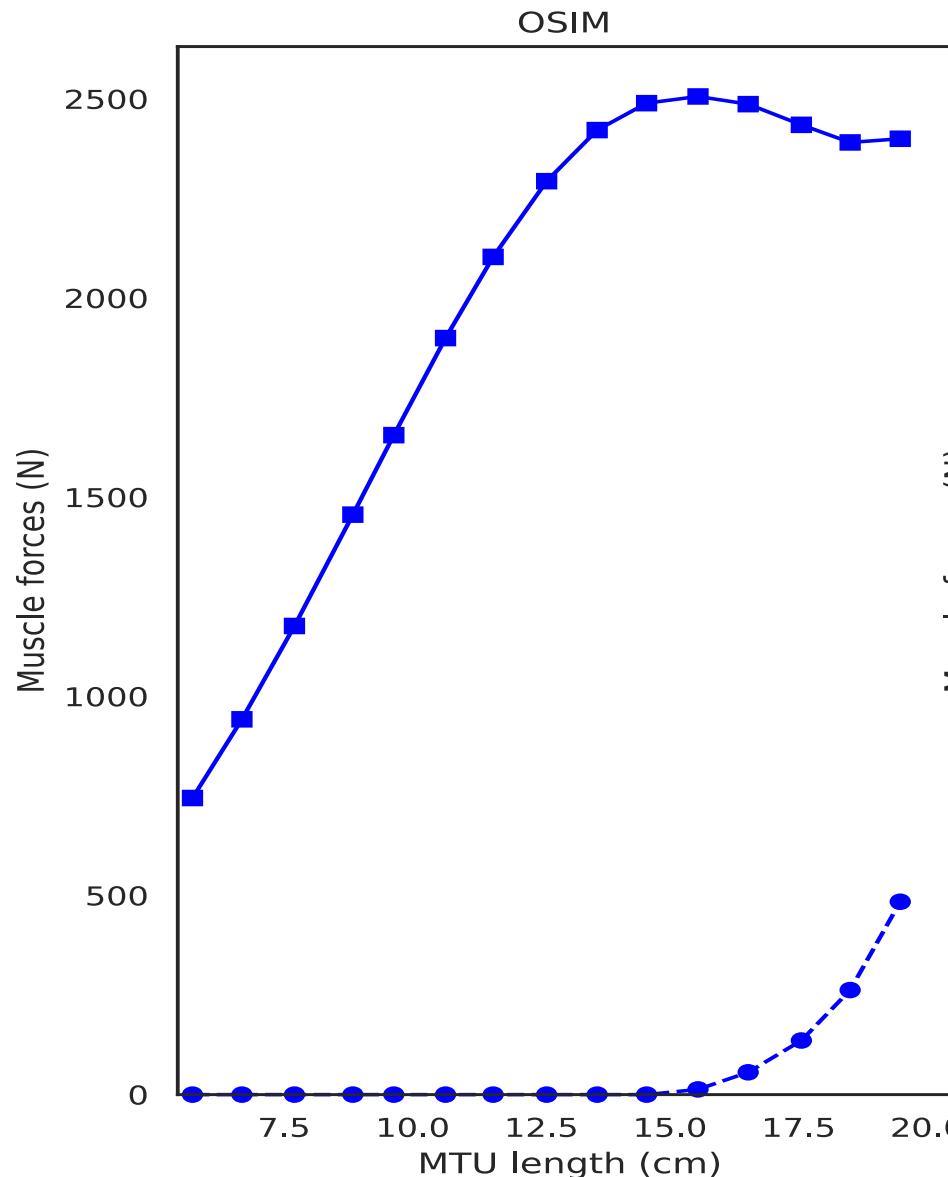
Muscle specific force comparison before/after optimization

glut_med2_I

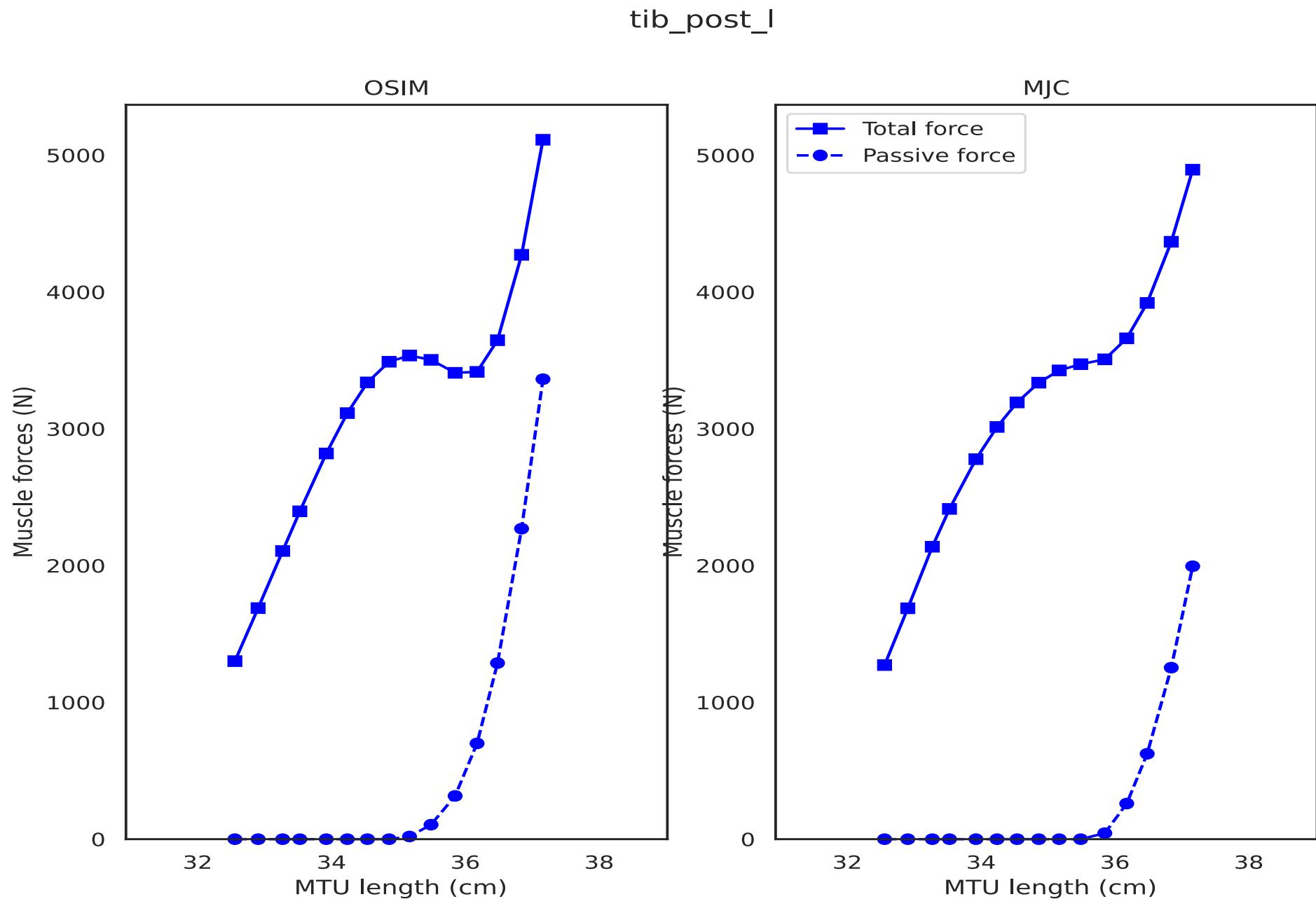


Muscle specific force comparison before/after optimization

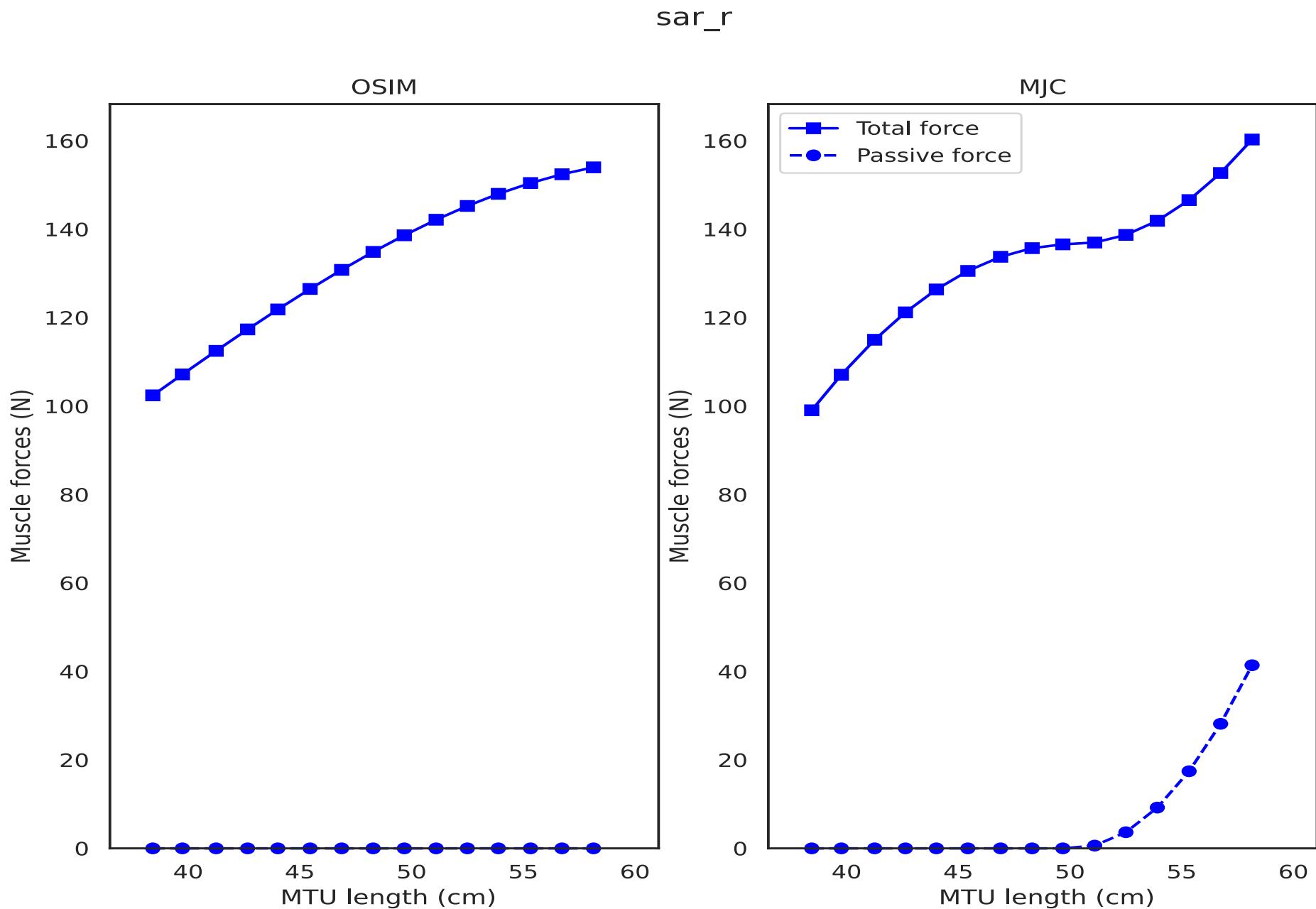
ercspn_I



Muscle specific force comparison before/after optimization

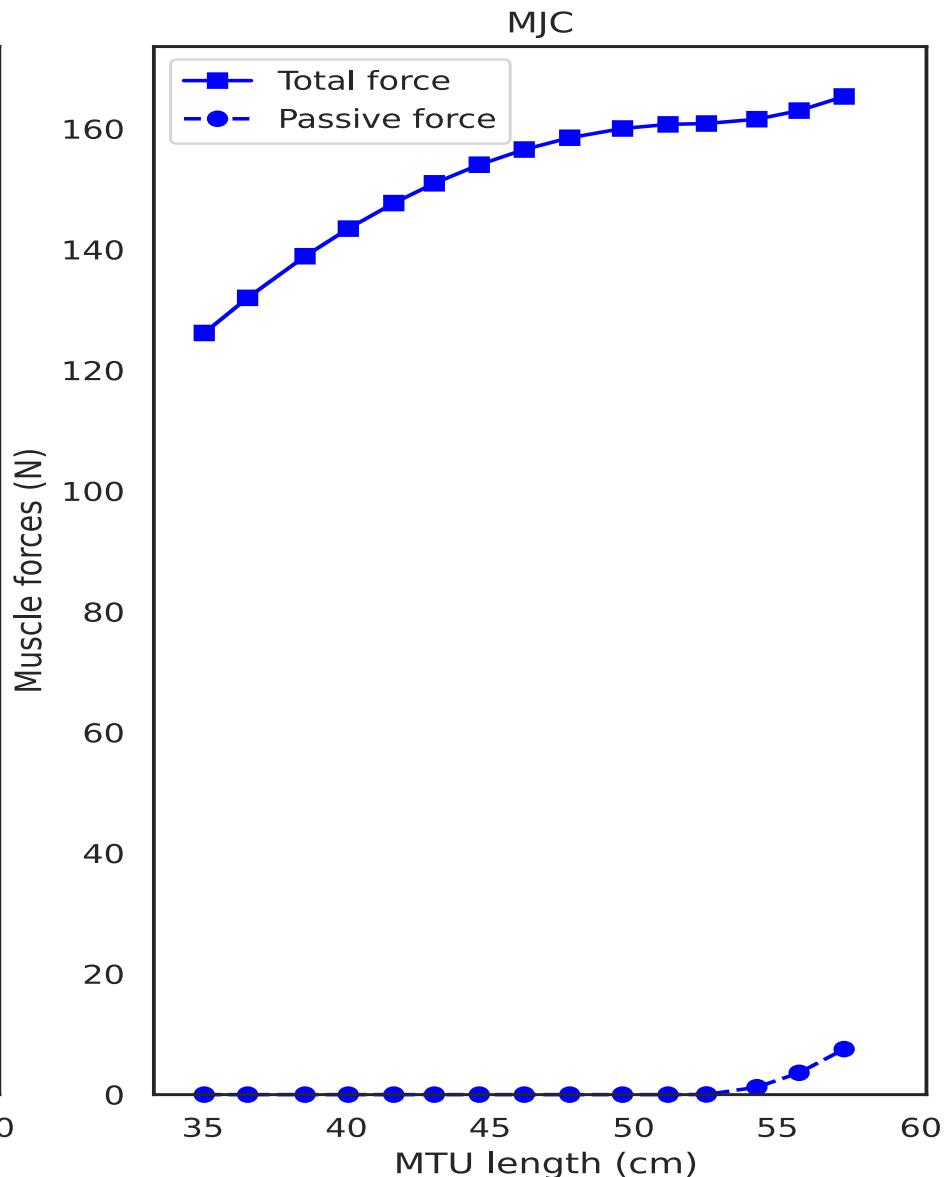
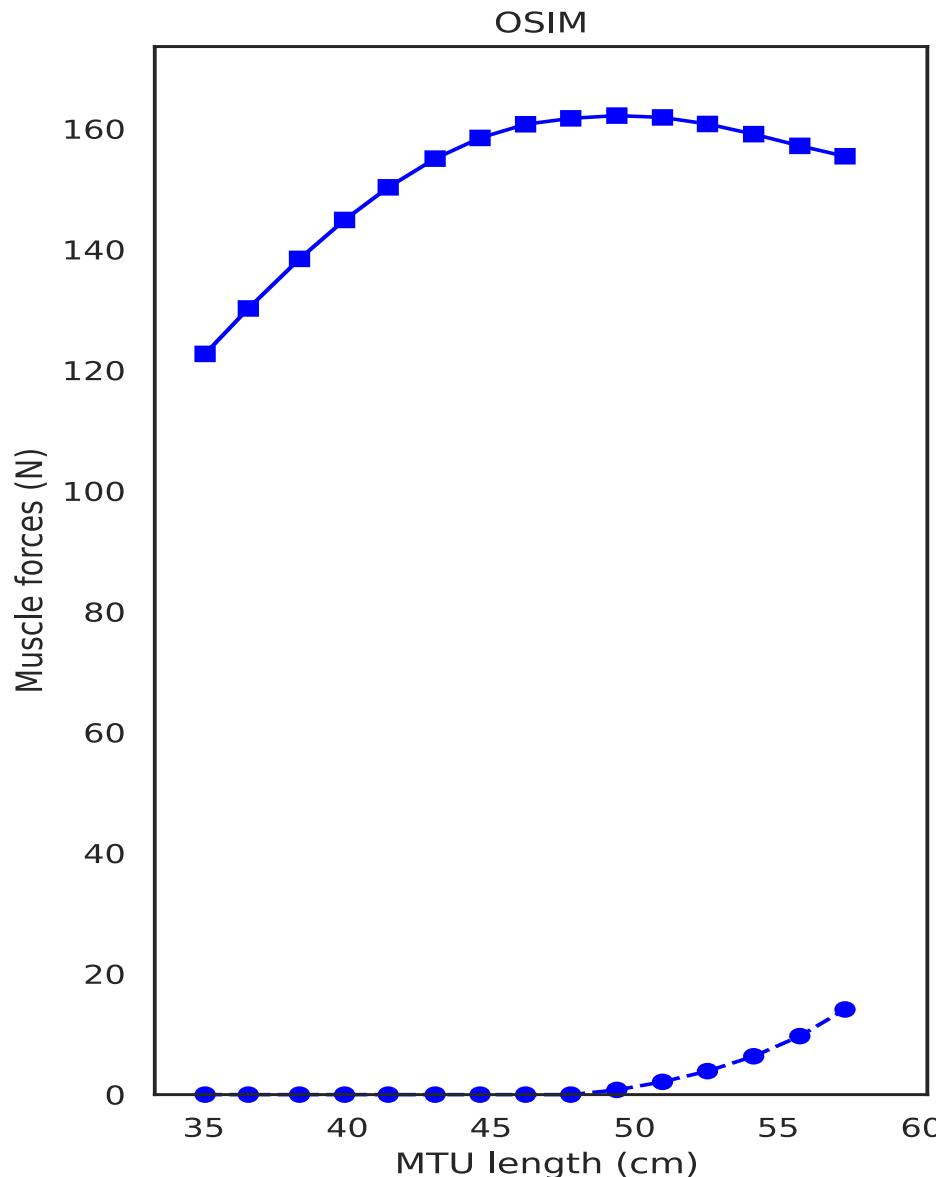


Muscle specific force comparison before/after optimization



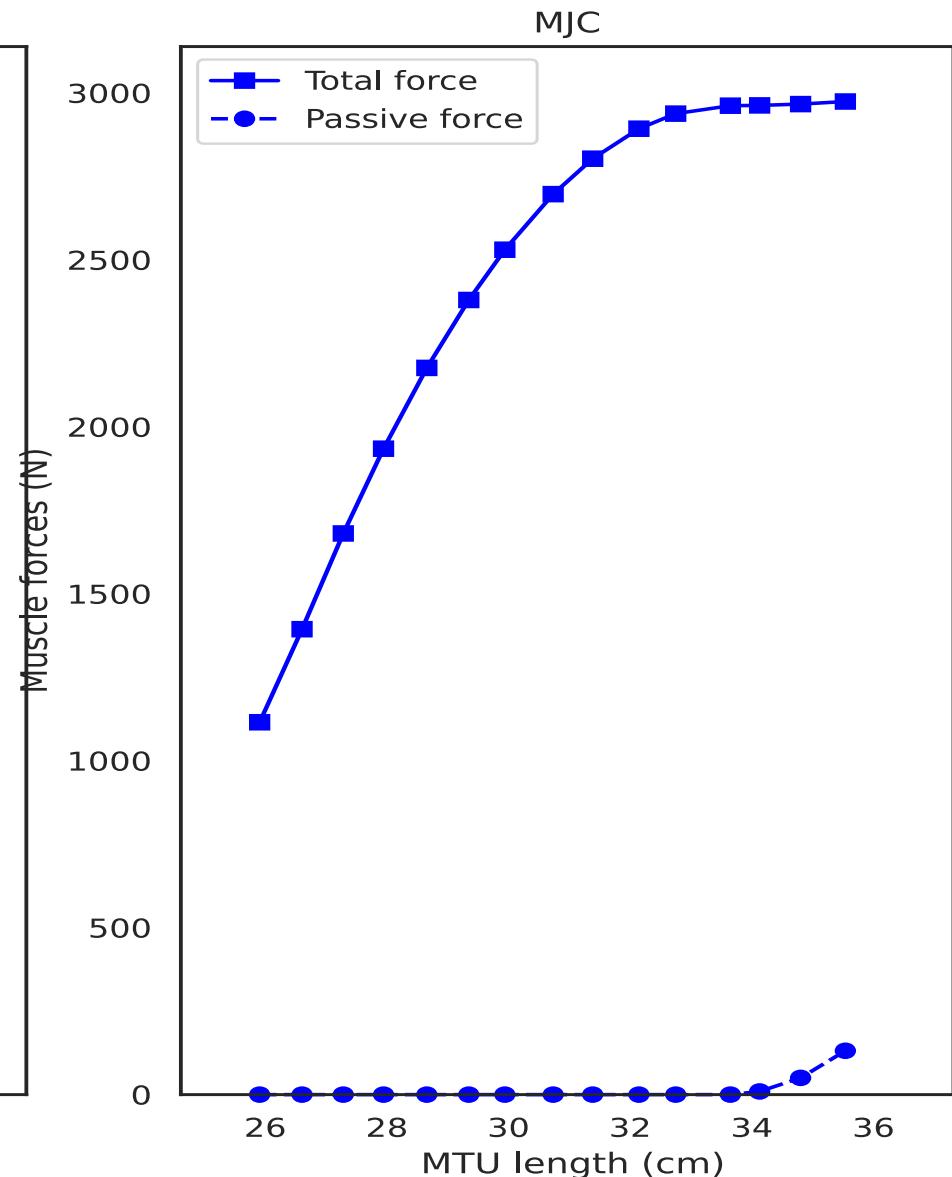
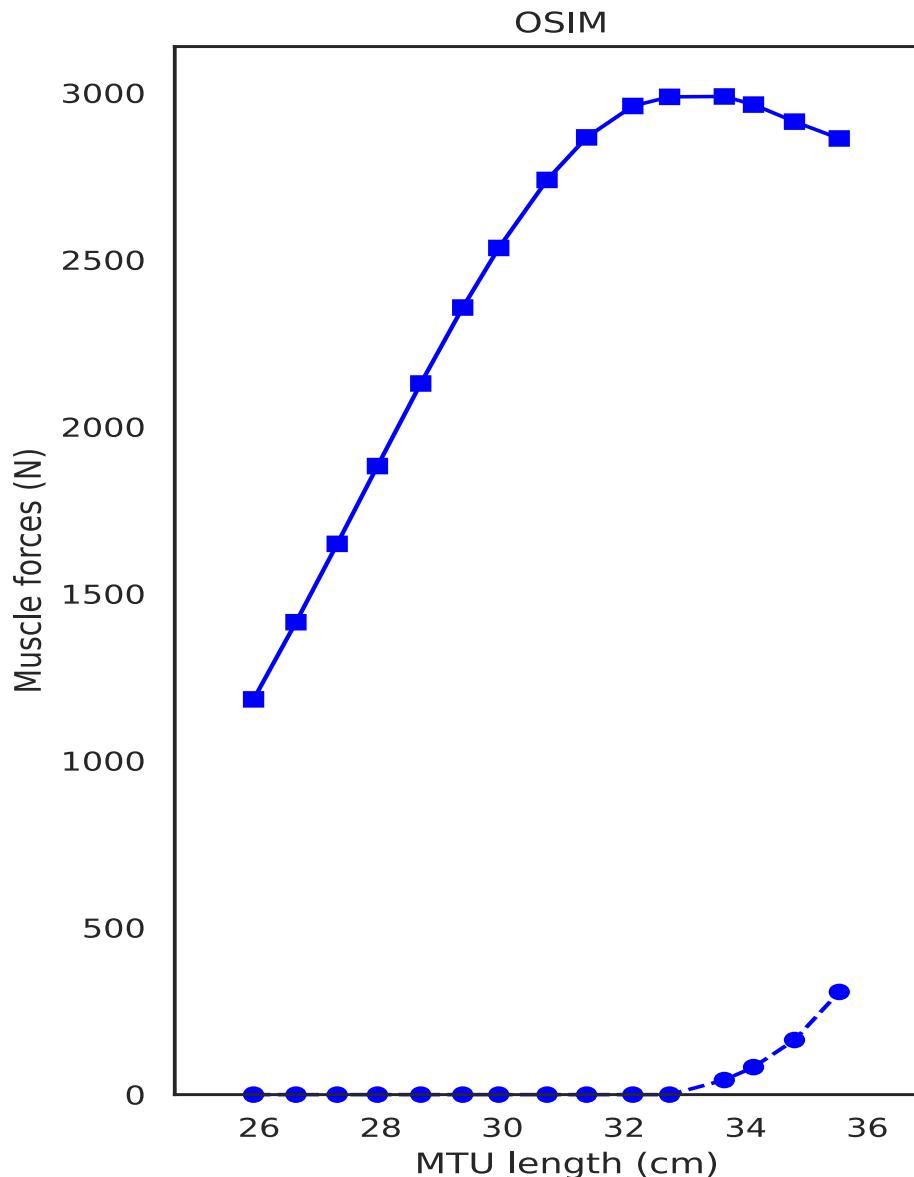
Muscle specific force comparison before/after optimization

grac_l



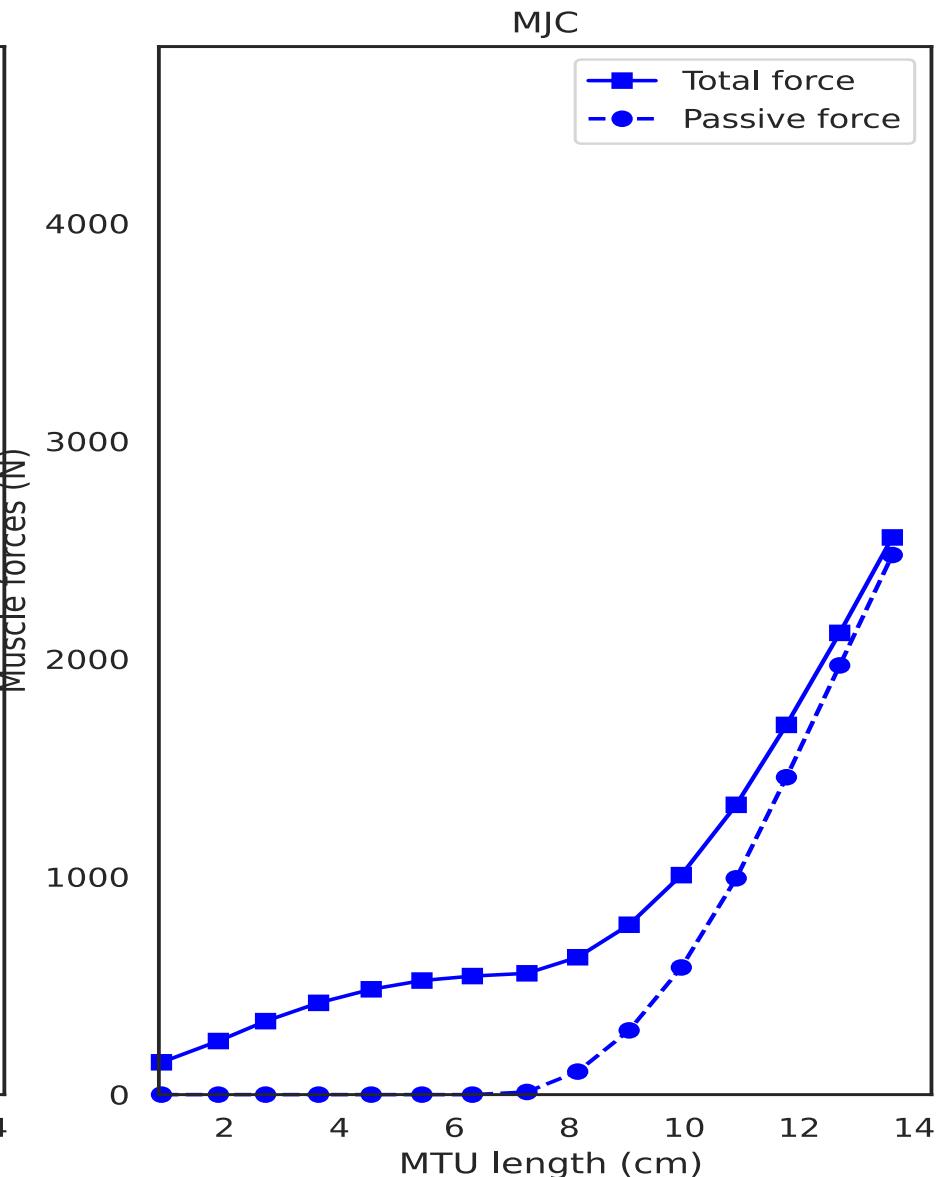
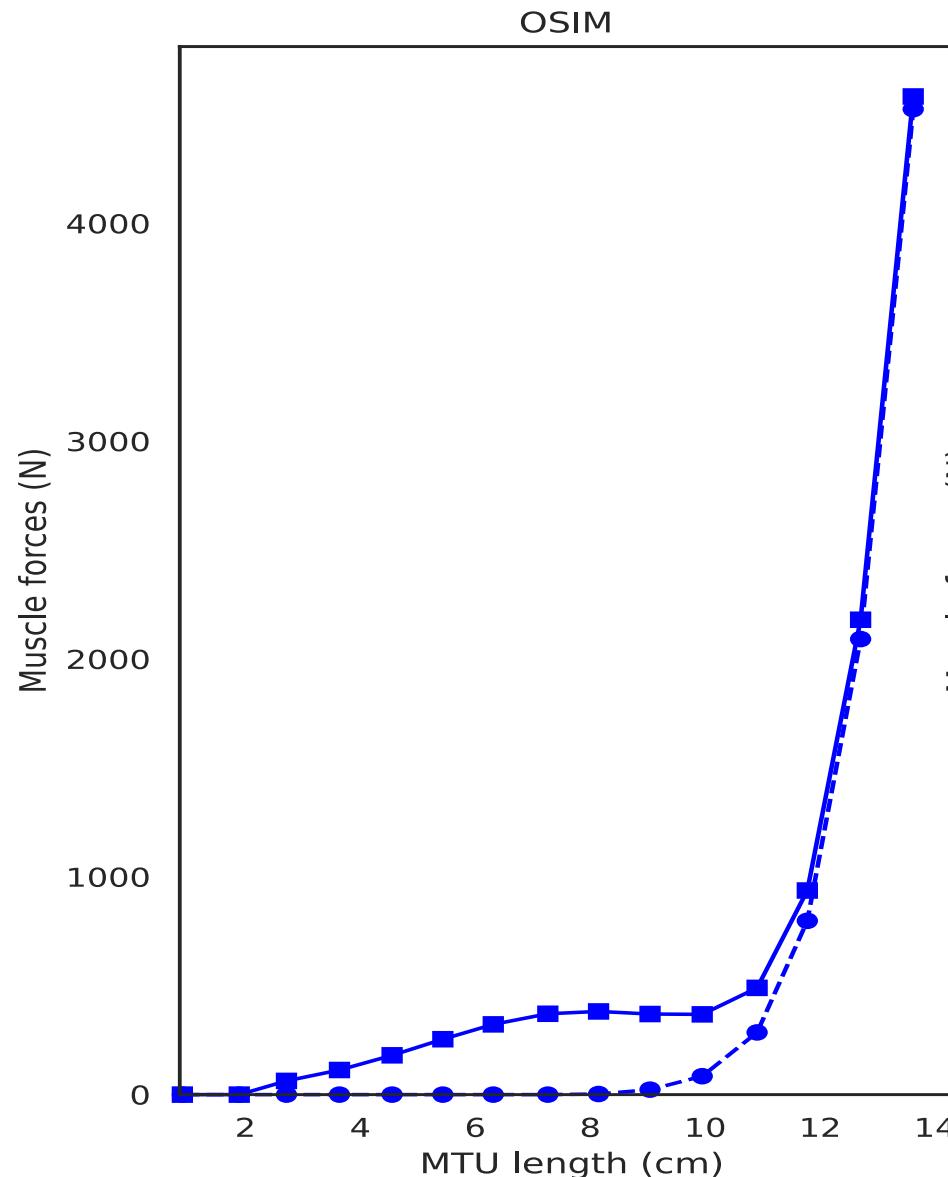
Muscle specific force comparison before/after optimization

tib_ant_I



Muscle specific force comparison before/after optimization

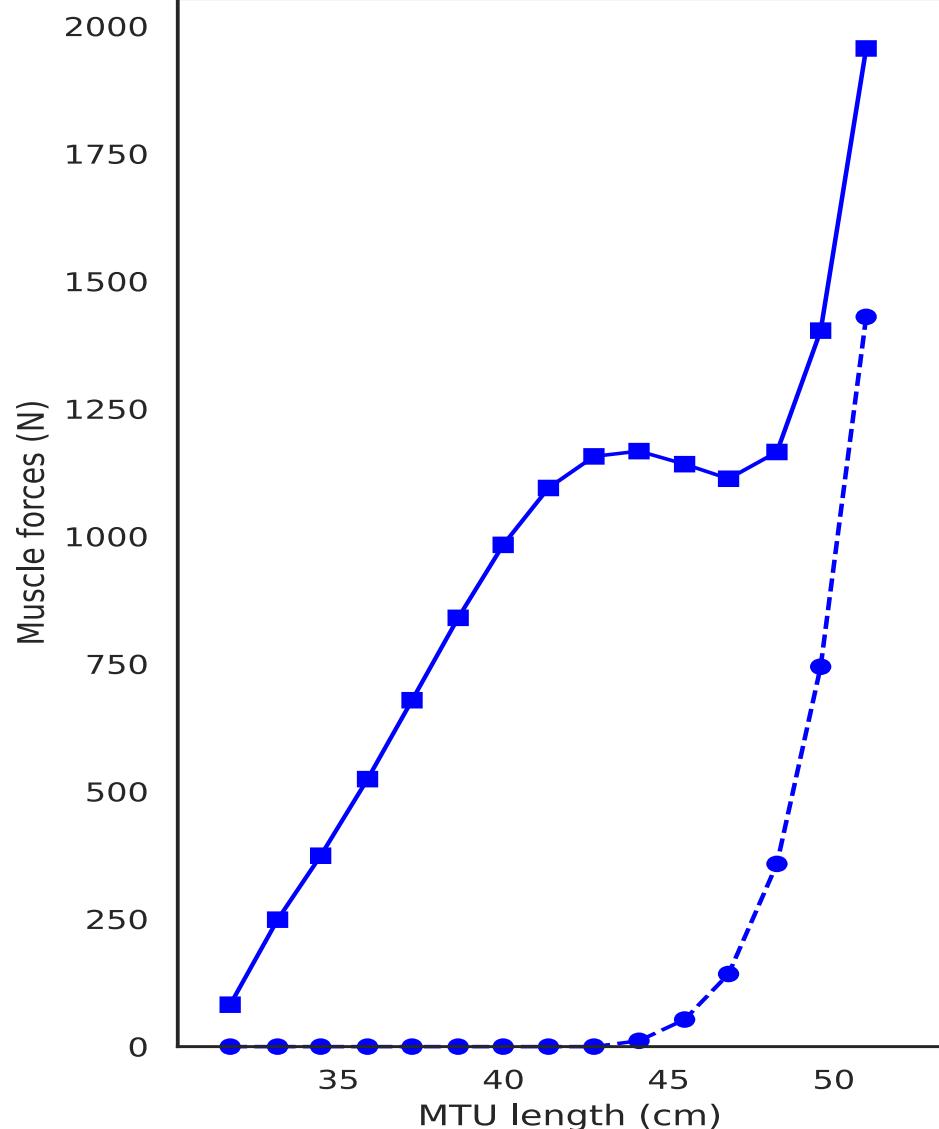
quad_fem_I



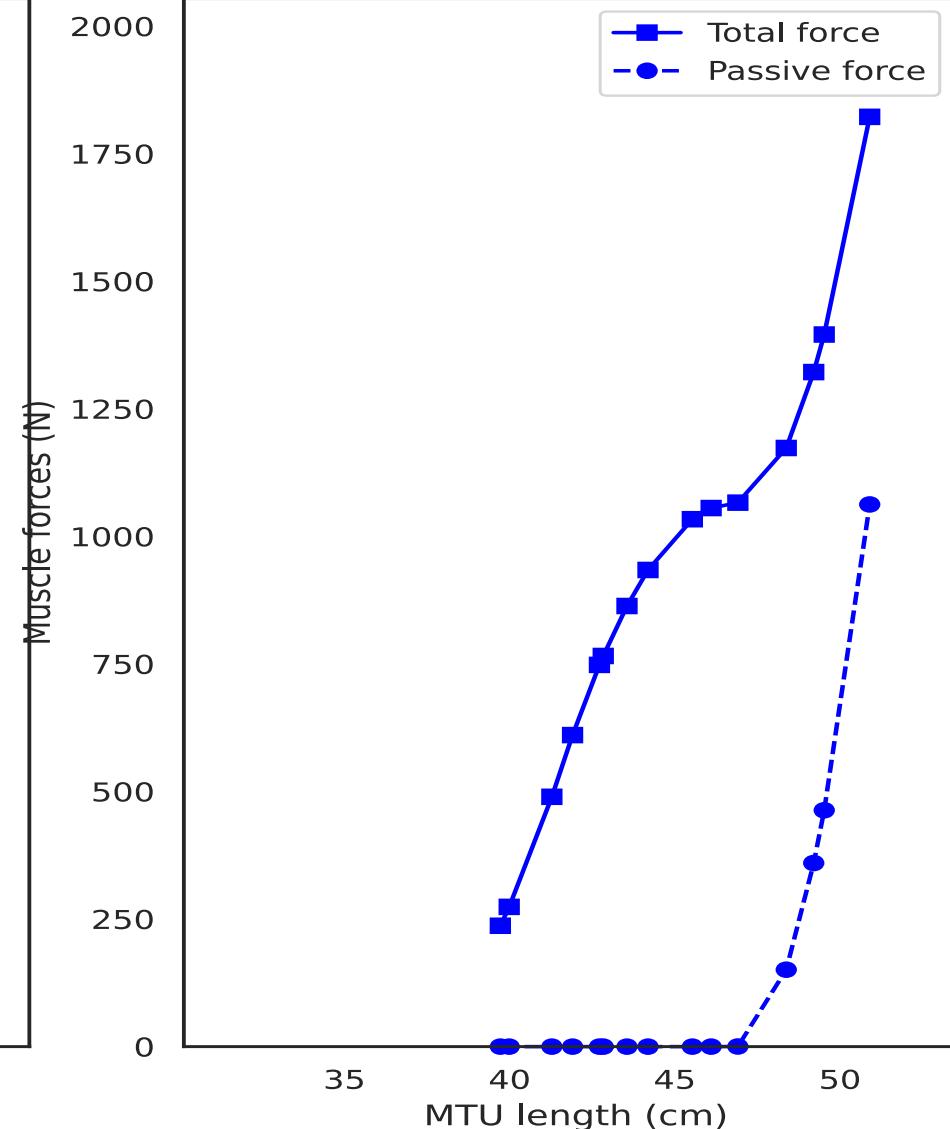
Muscle specific force comparison before/after optimization

rect_fem_r

OSIM

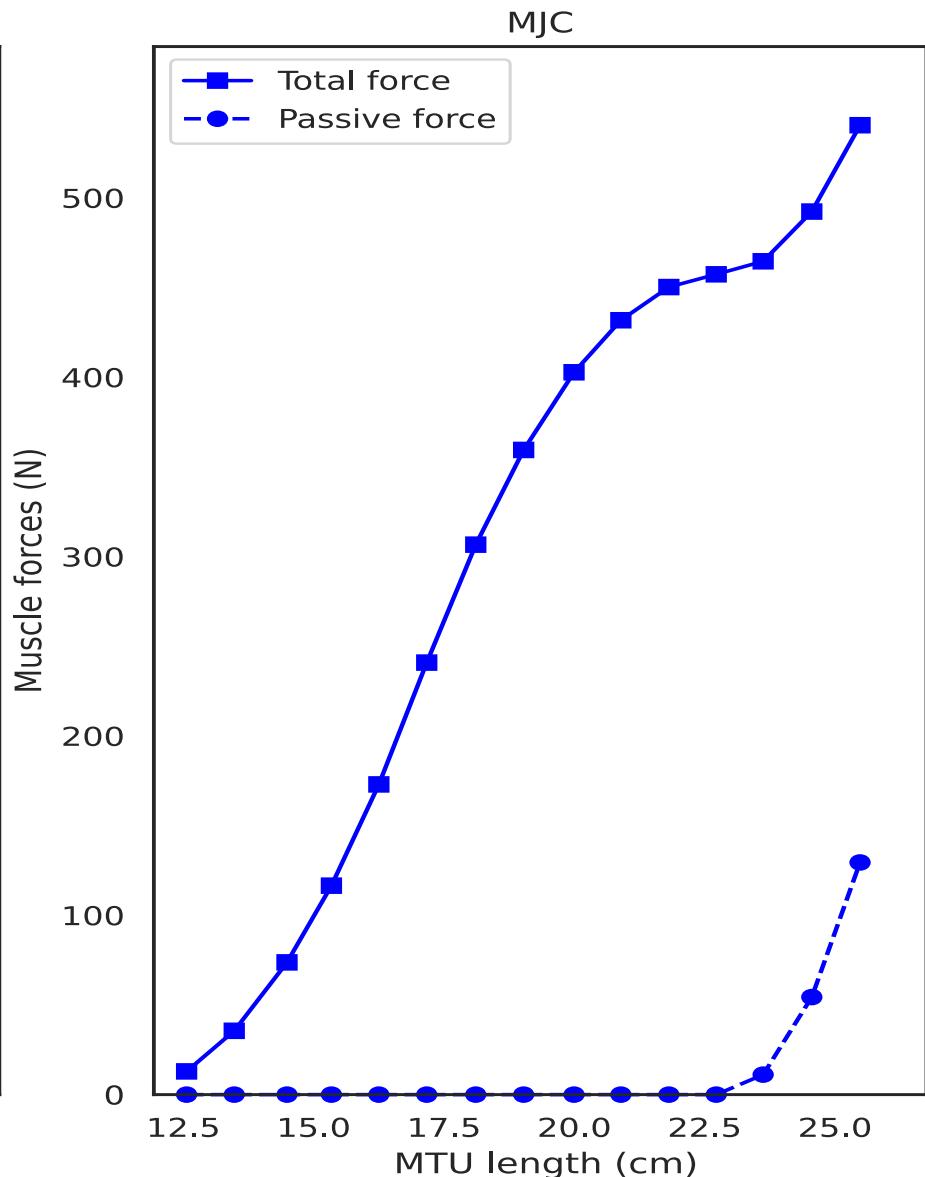
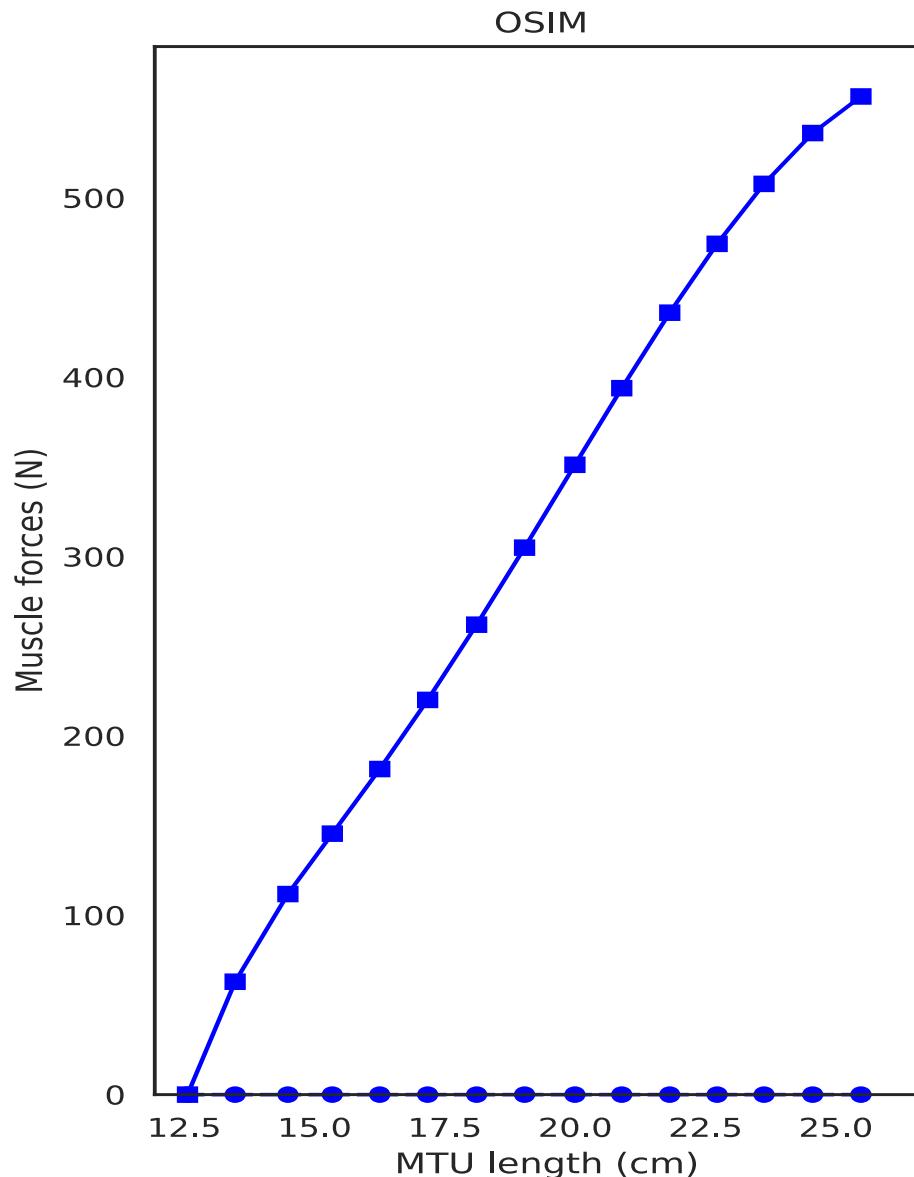


MJC



Muscle specific force comparison before/after optimization

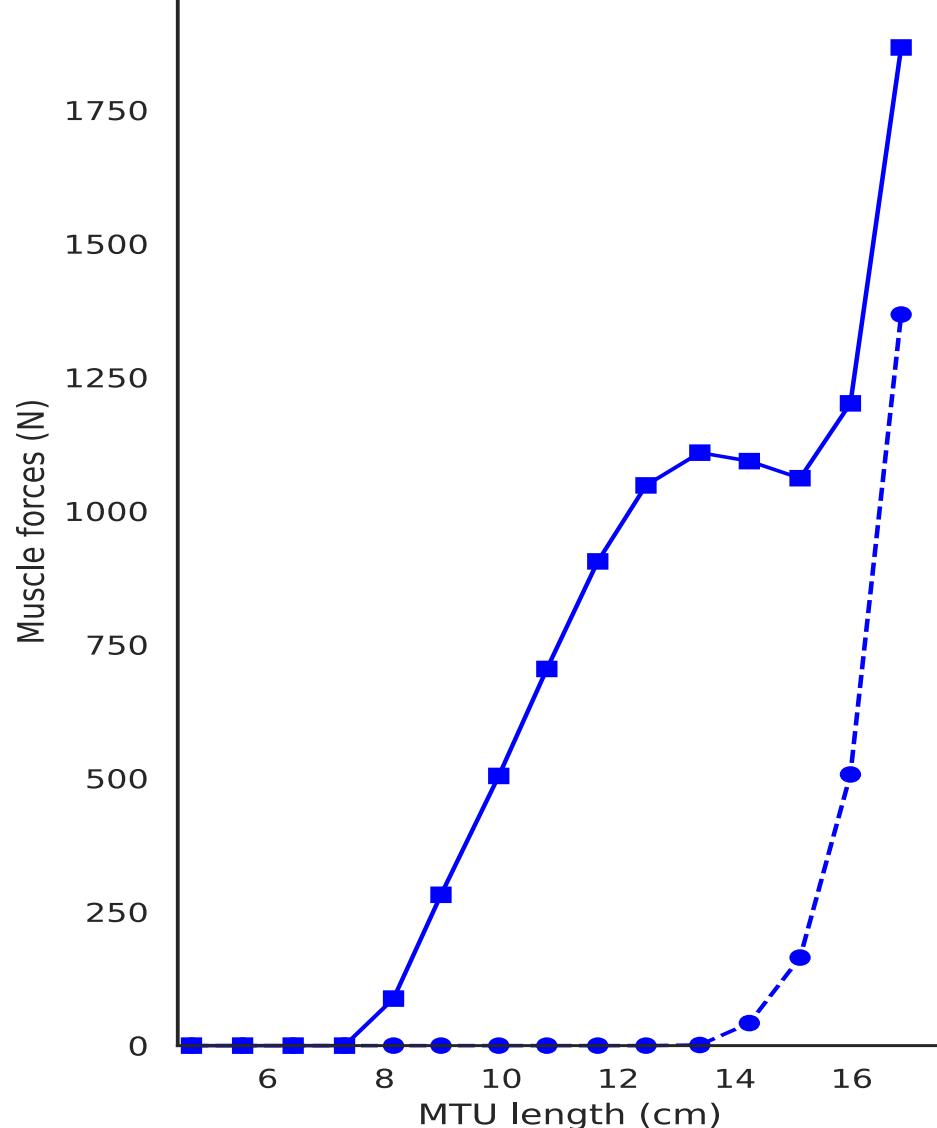
glut_max1_I



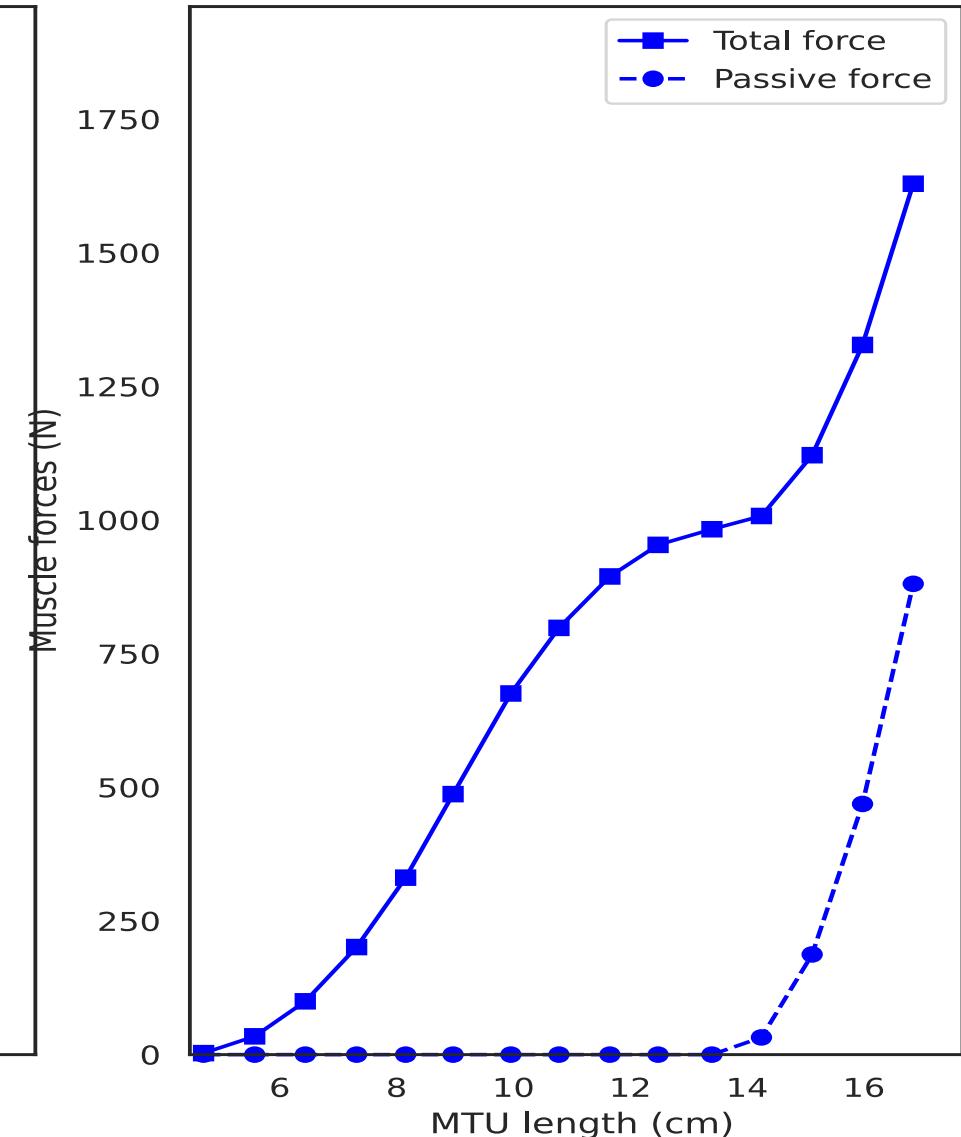
Muscle specific force comparison before/after optimization

glut_med1_r

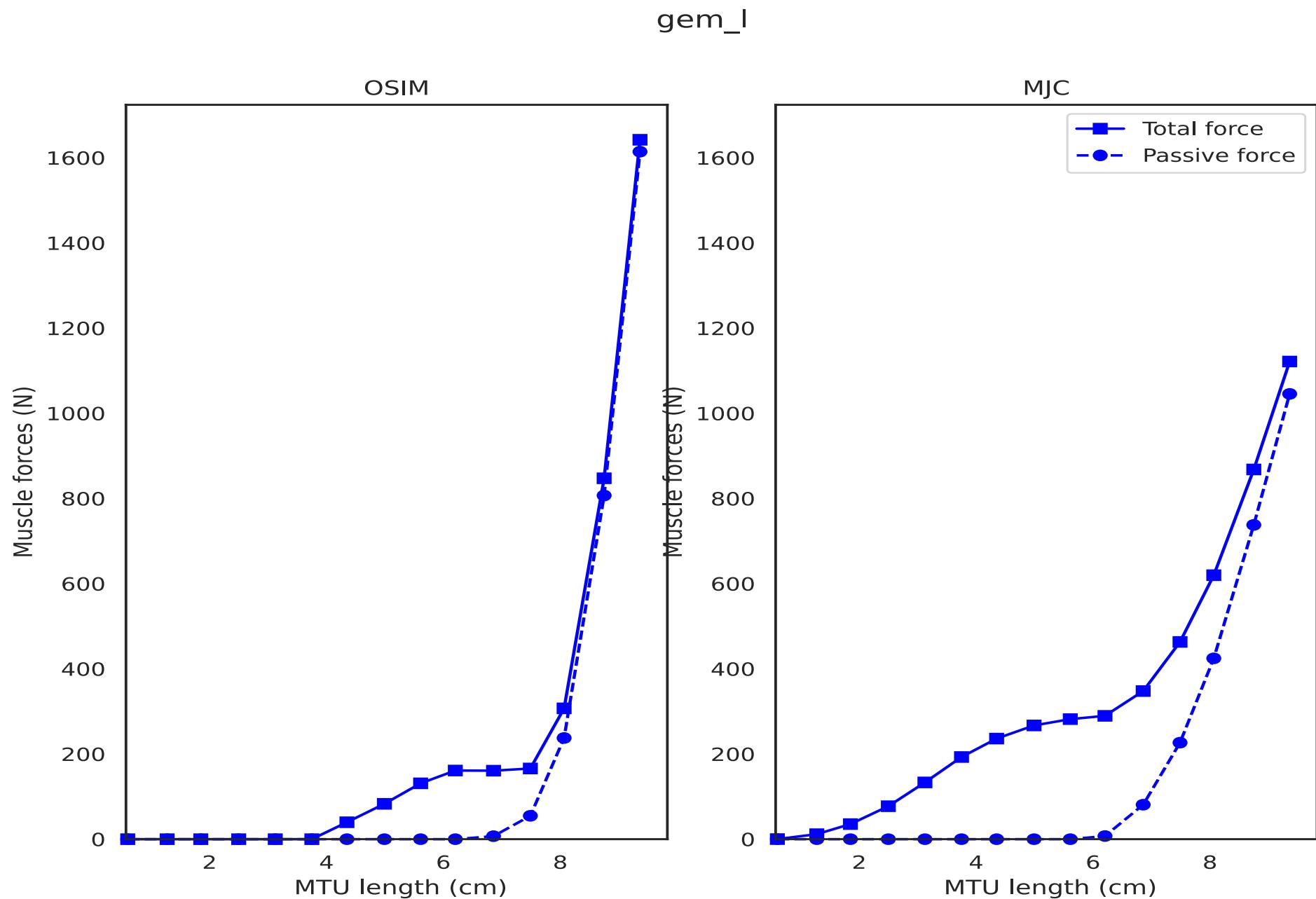
OSIM



MJC

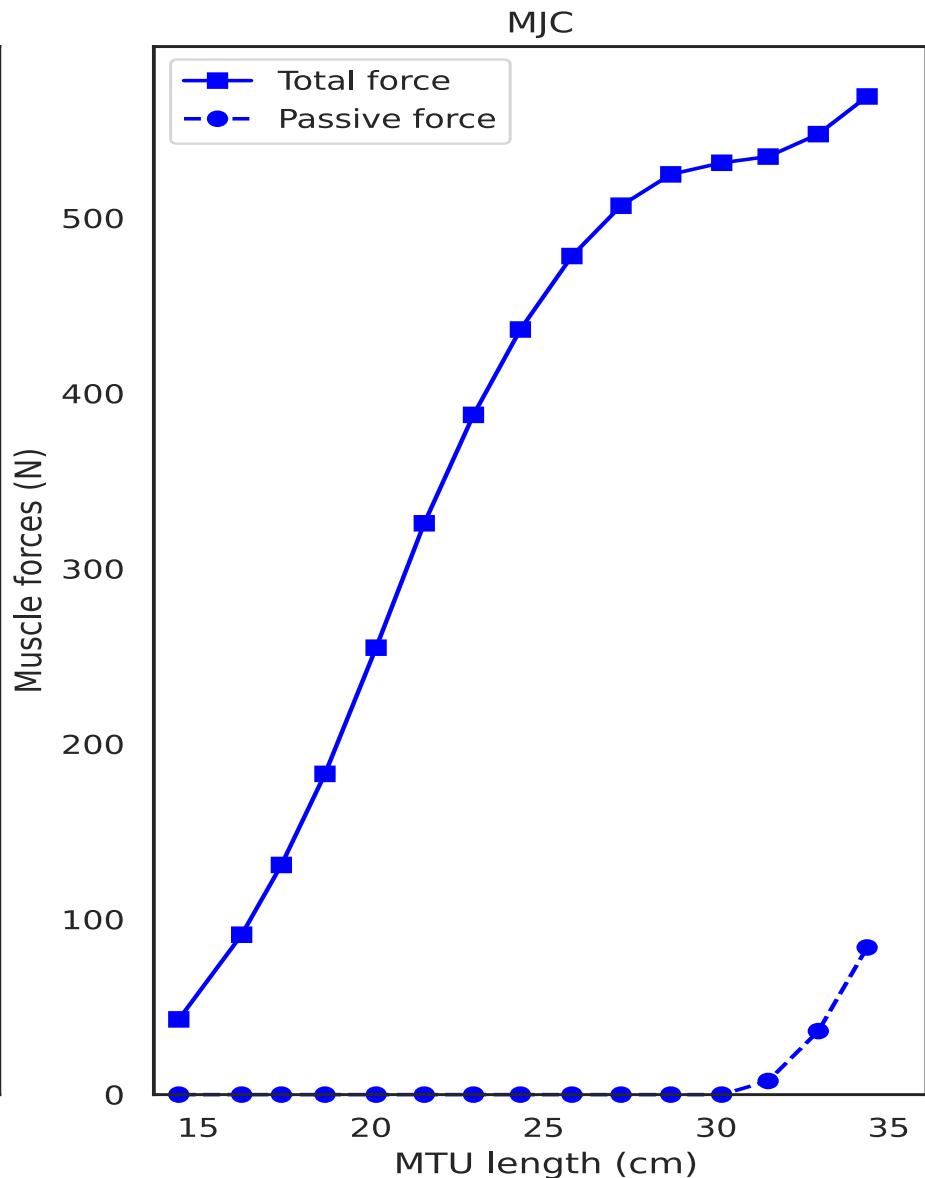
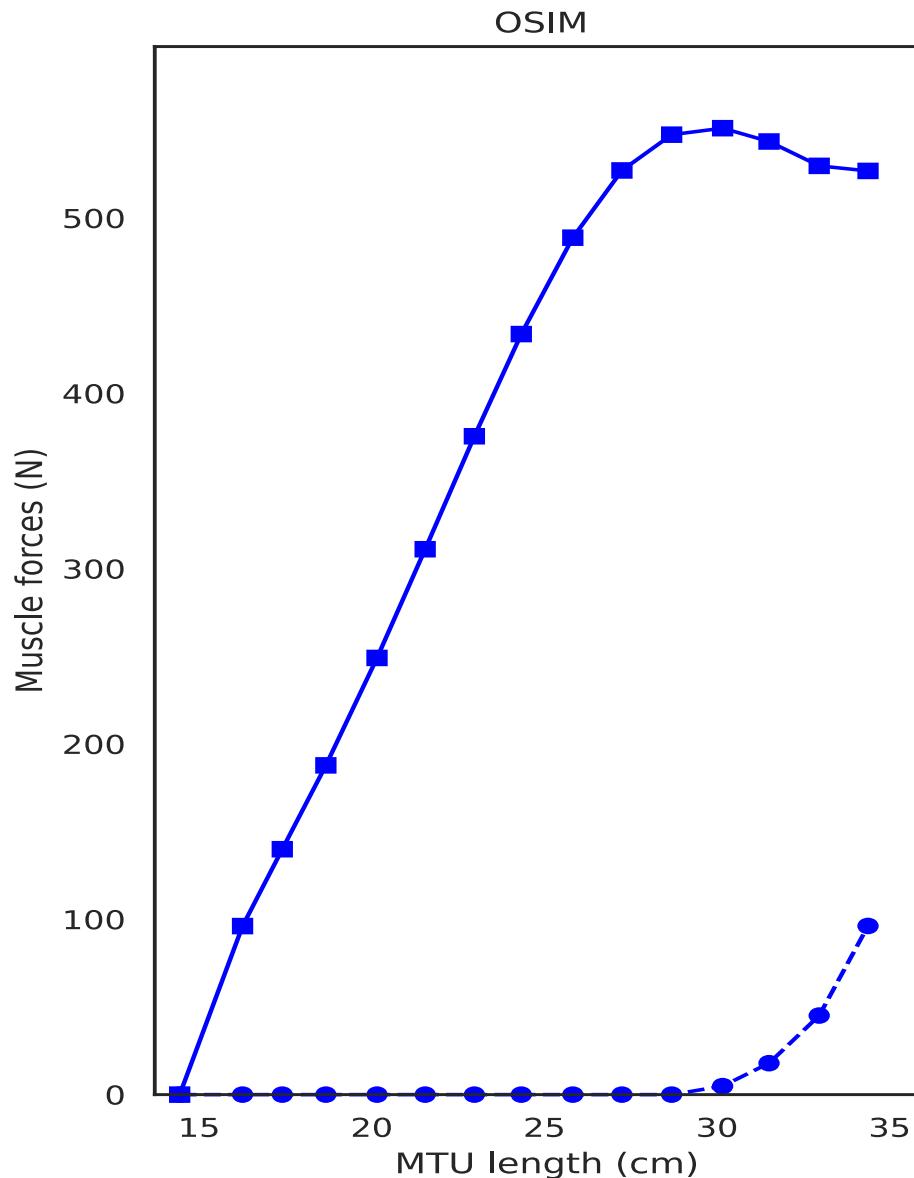


Muscle specific force comparison before/after optimization



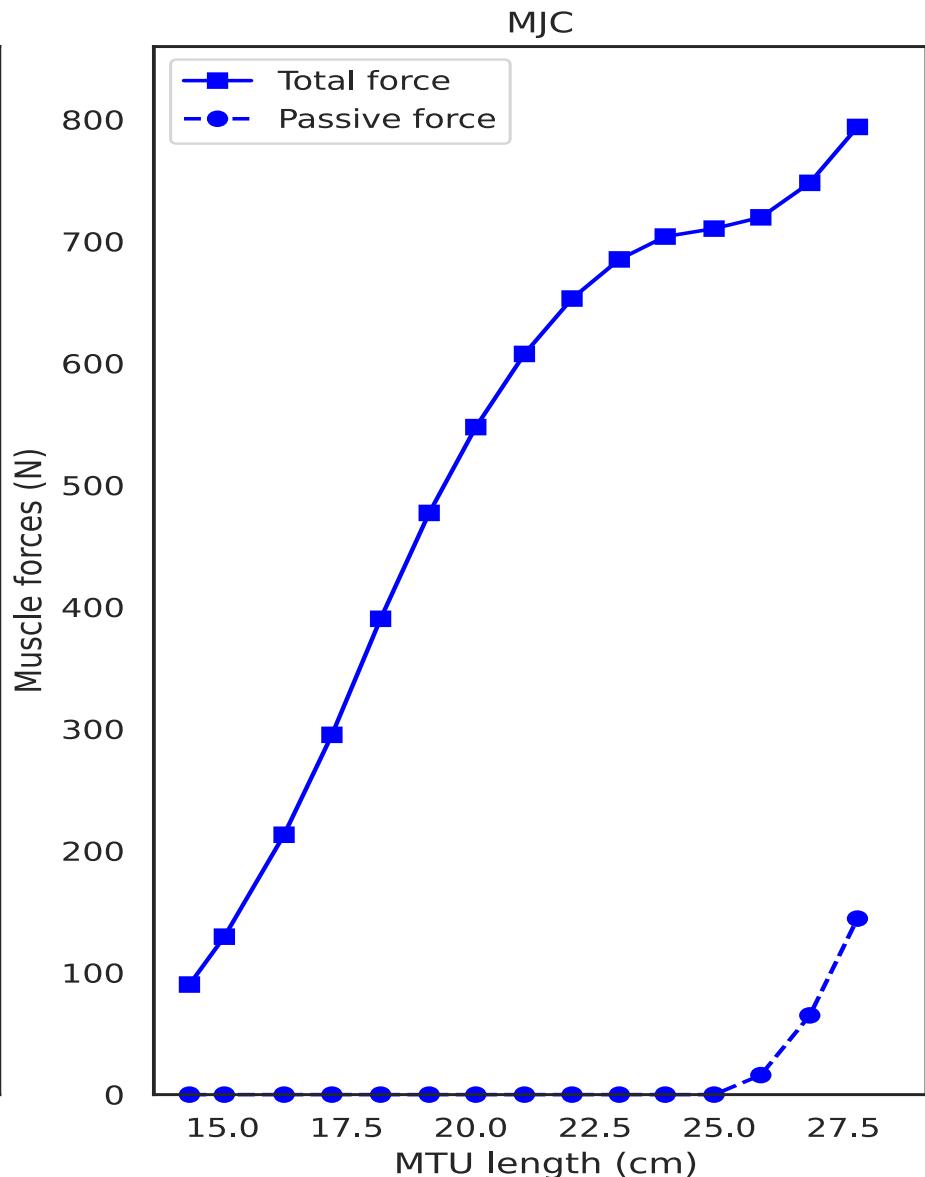
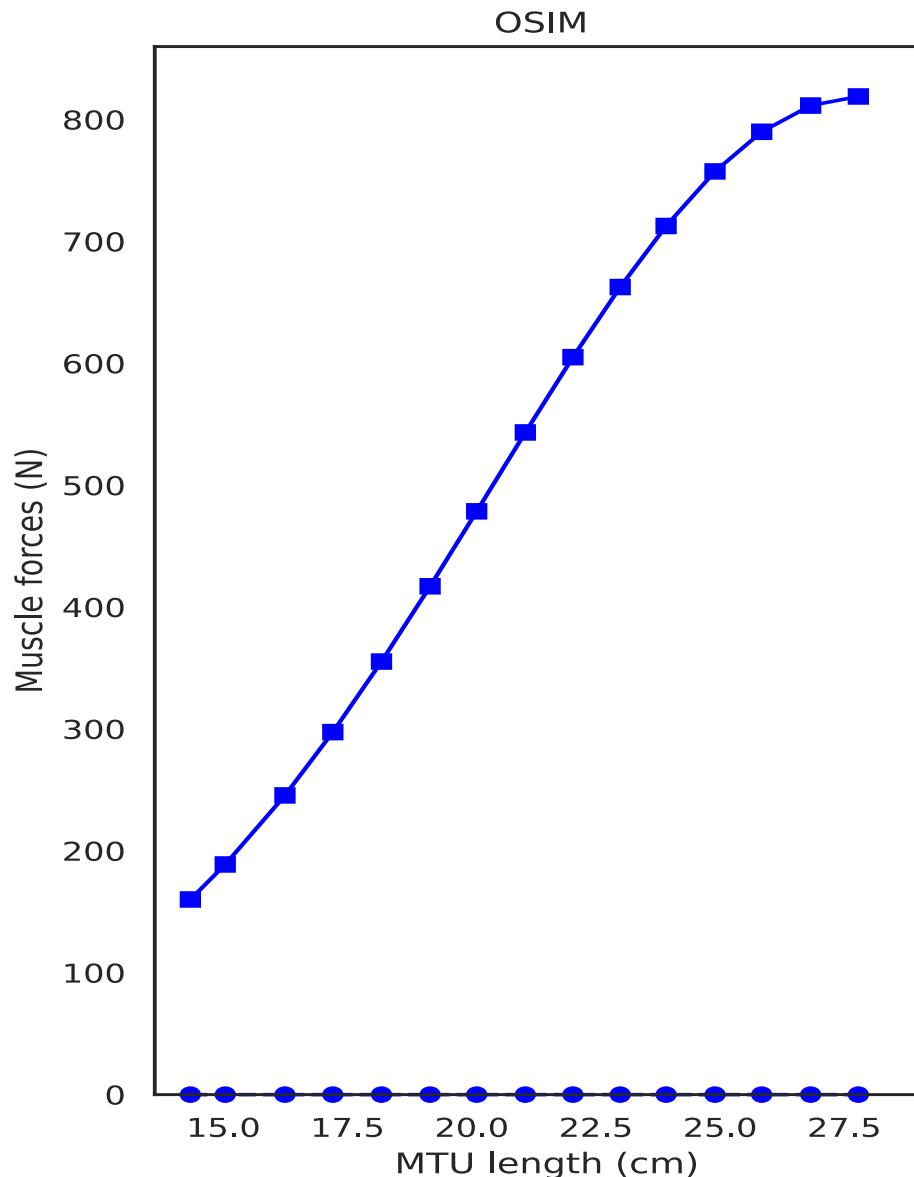
Muscle specific force comparison before/after optimization

glut_max3_r

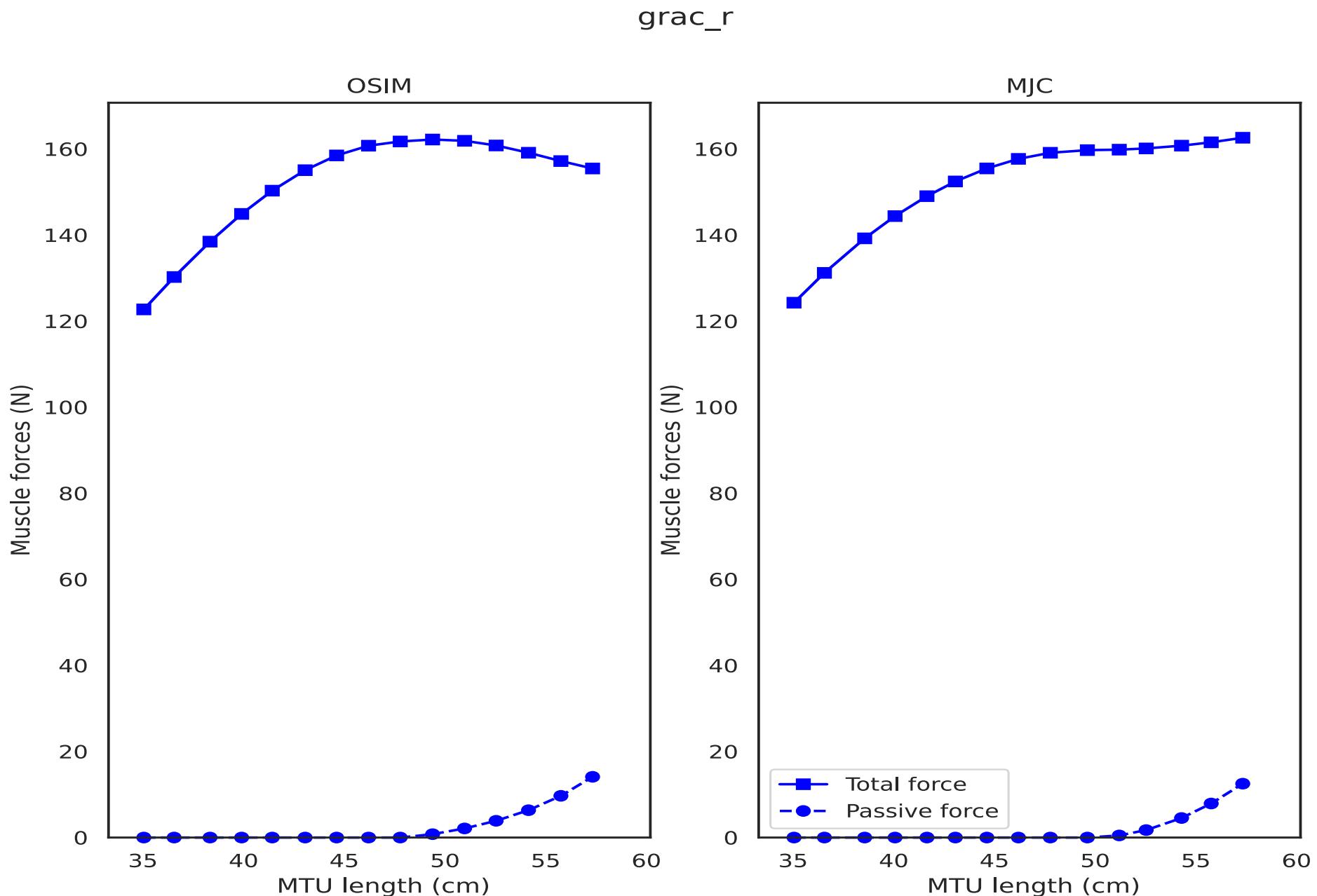


Muscle specific force comparison before/after optimization

glut_max2_I

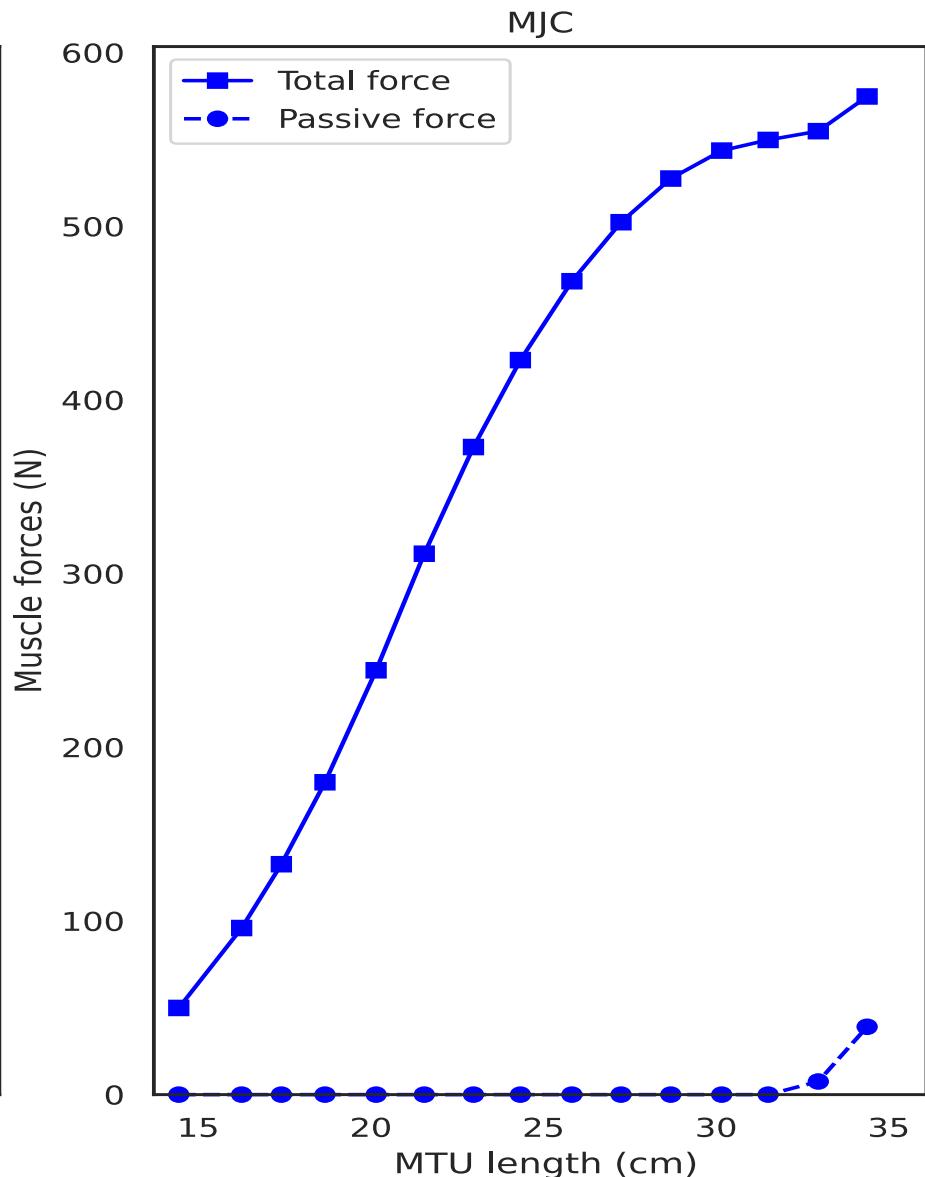
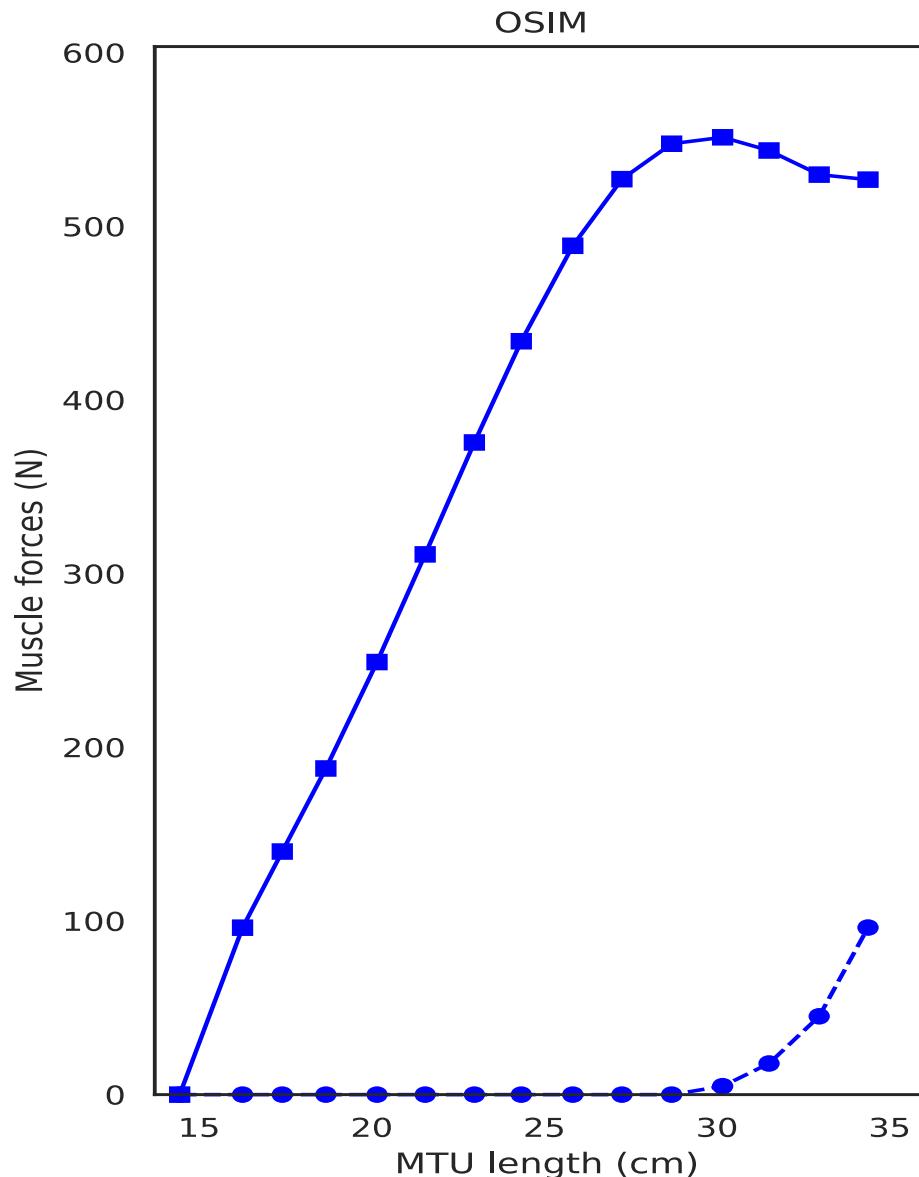


Muscle specific force comparison before/after optimization



Muscle specific force comparison before/after optimization

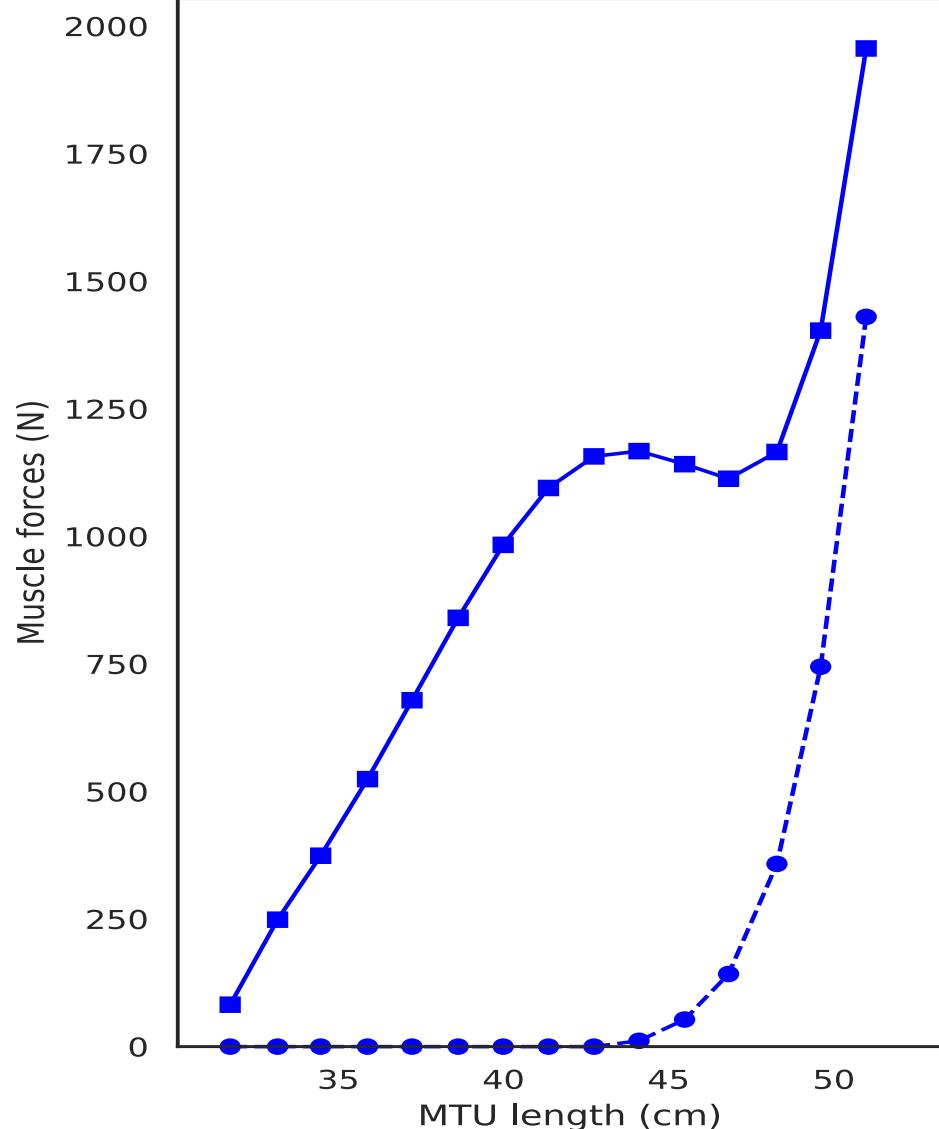
glut_max3_I



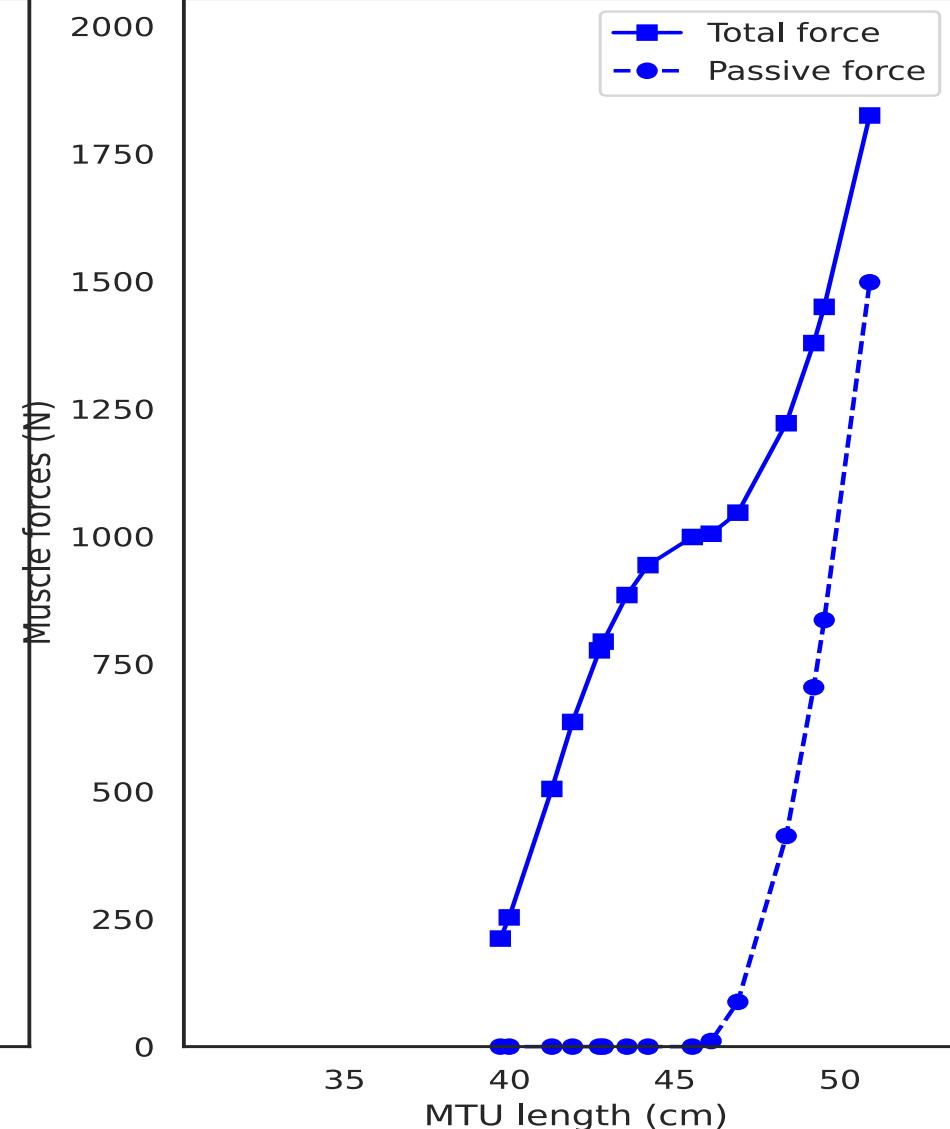
Muscle specific force comparison before/after optimization

rect_fem_I

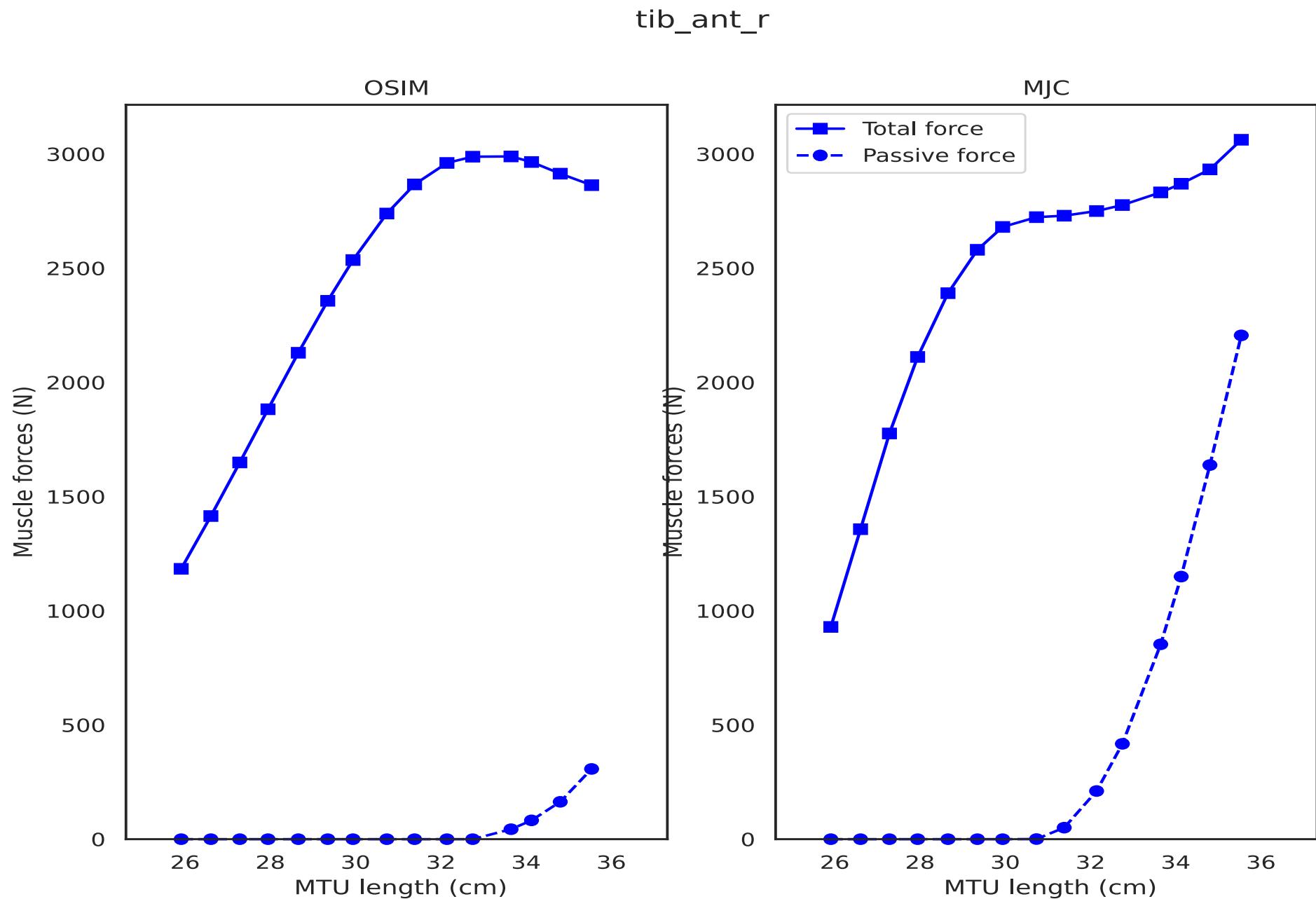
OSIM



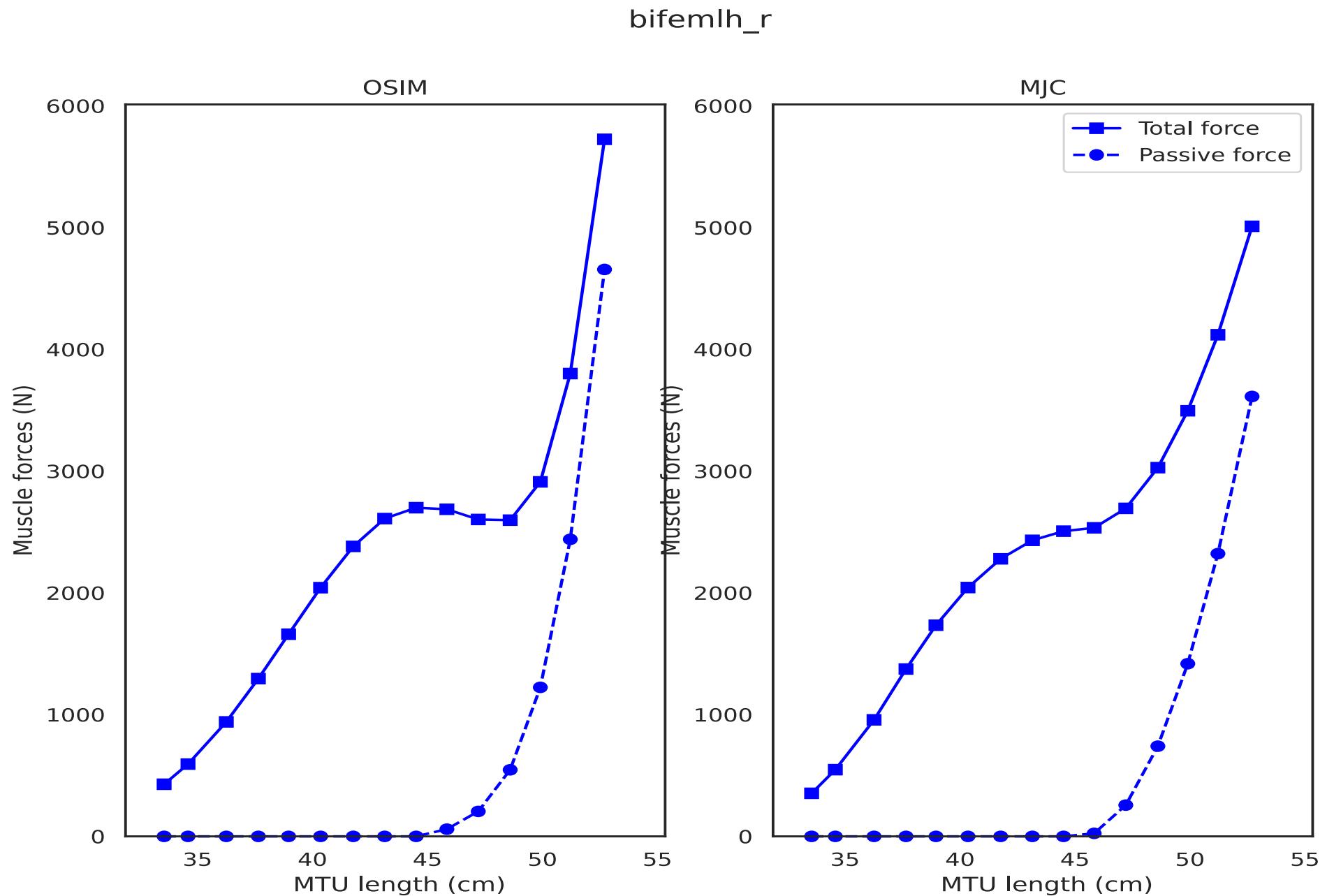
MJC



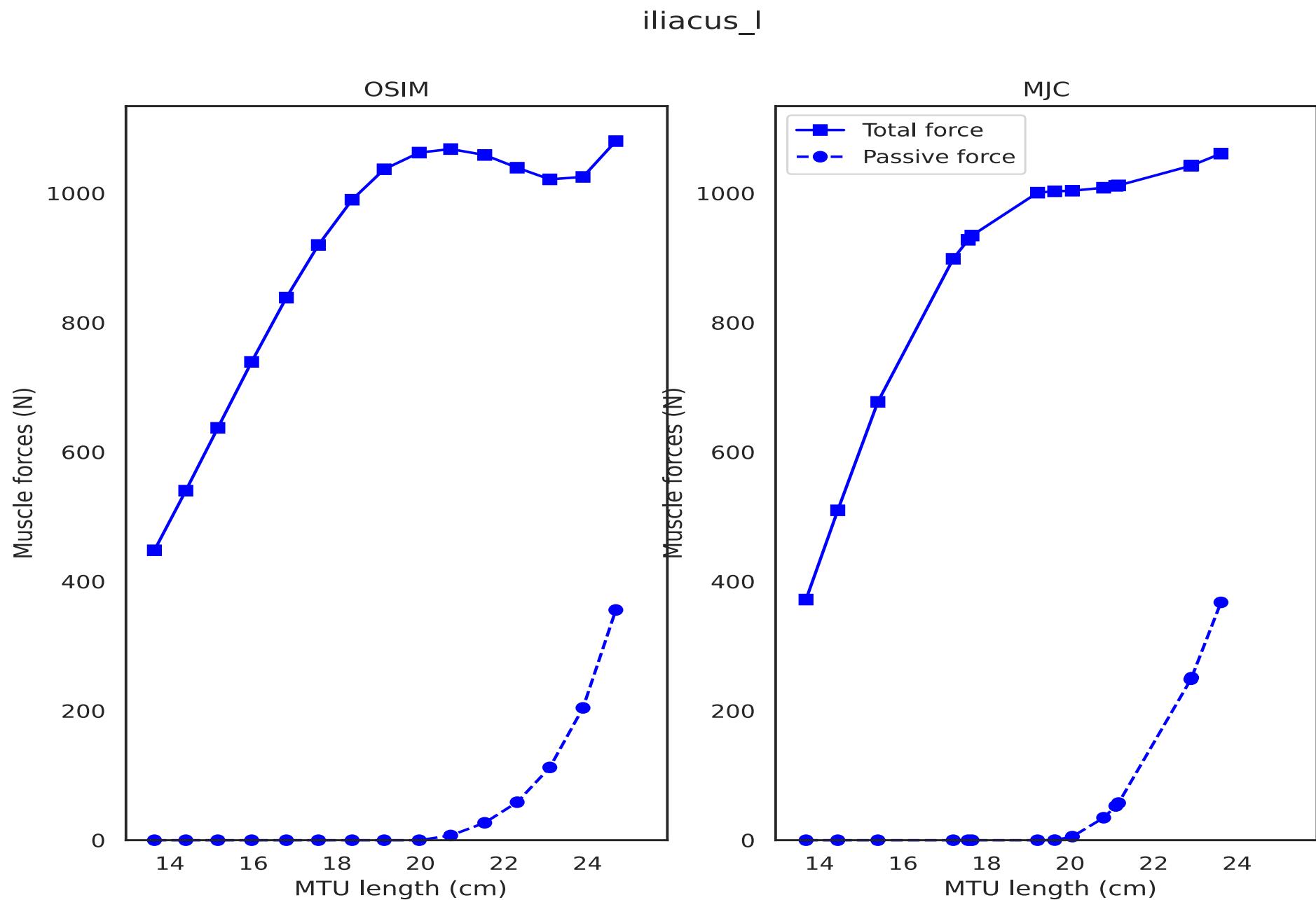
Muscle specific force comparison before/after optimization



Muscle specific force comparison before/after optimization

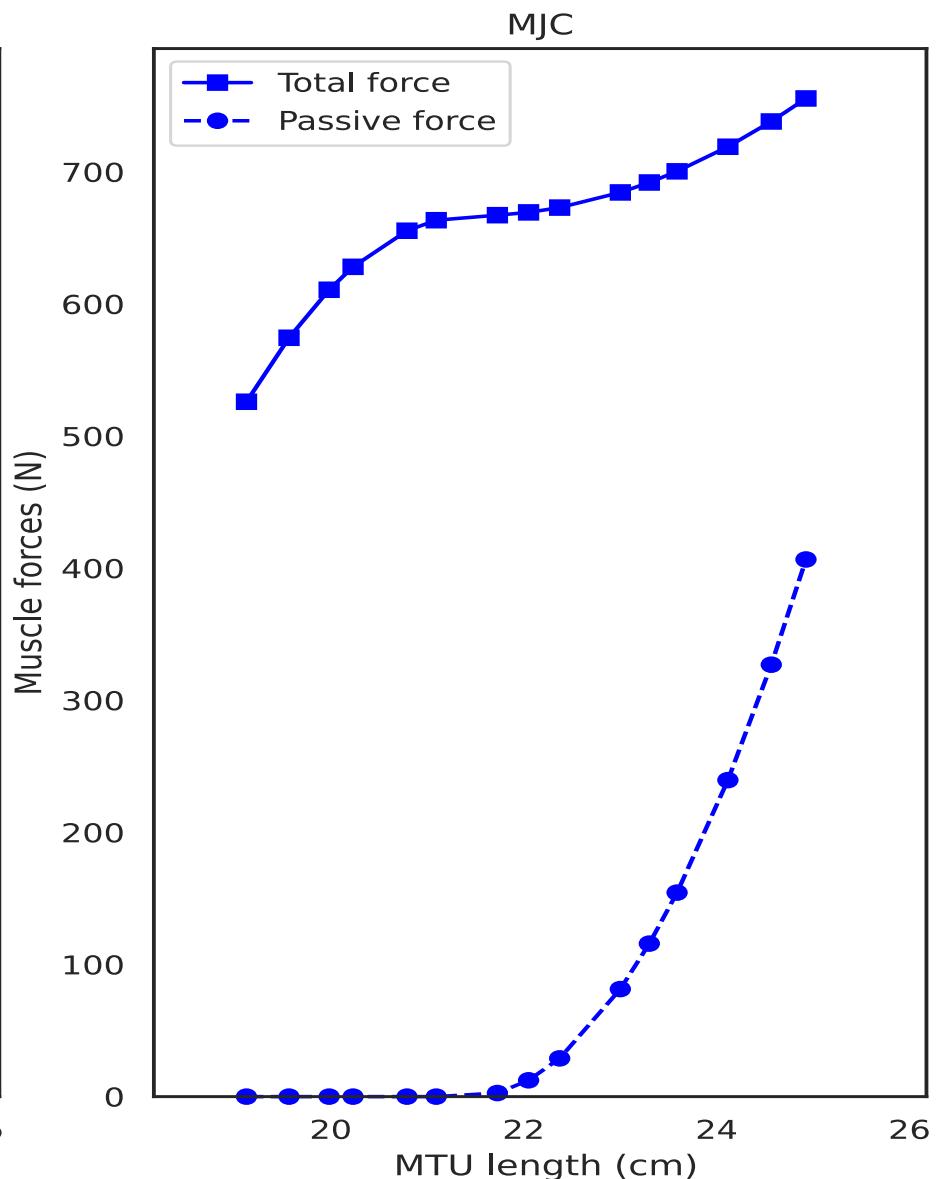
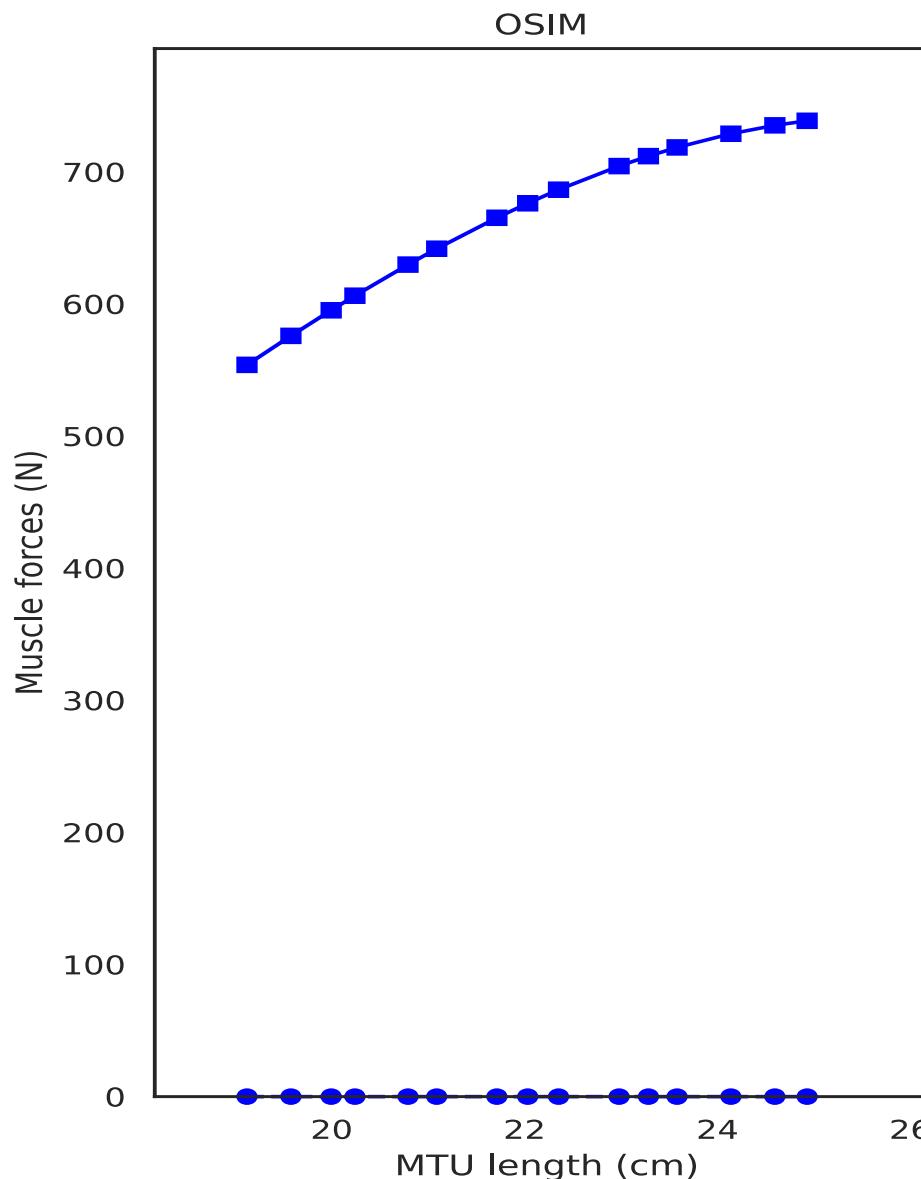


Muscle specific force comparison before/after optimization

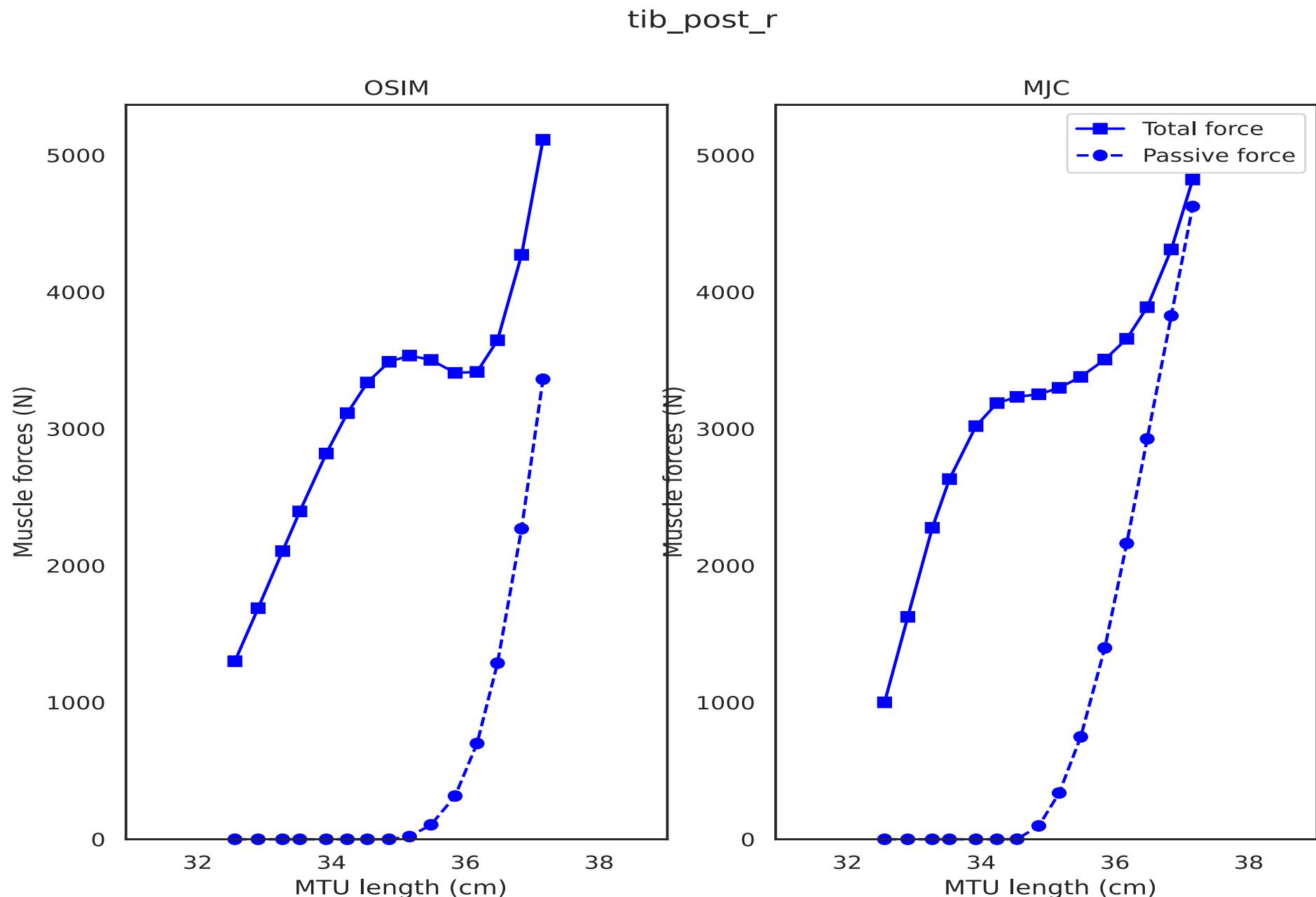


Muscle specific force comparison before/after optimization

bifemsh_I

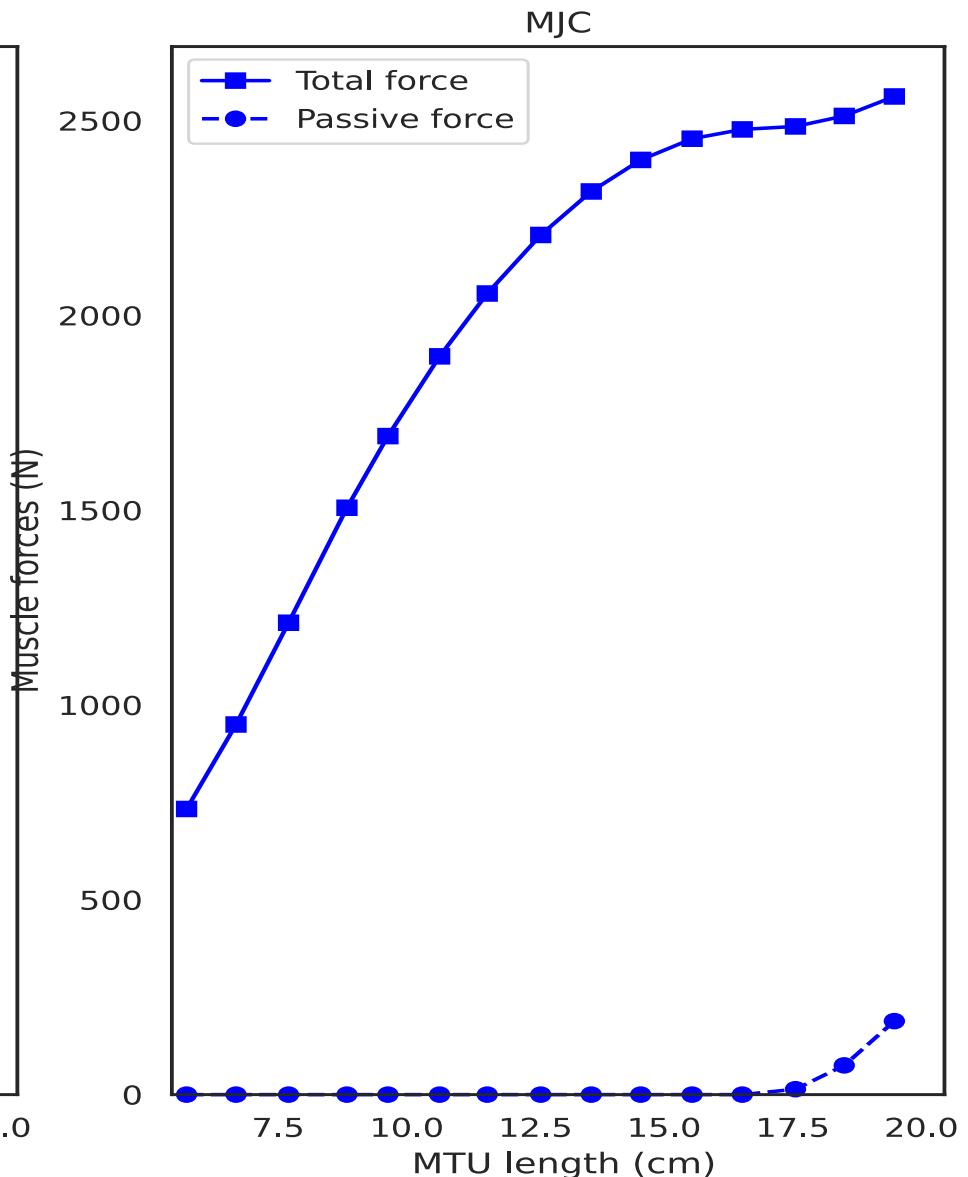
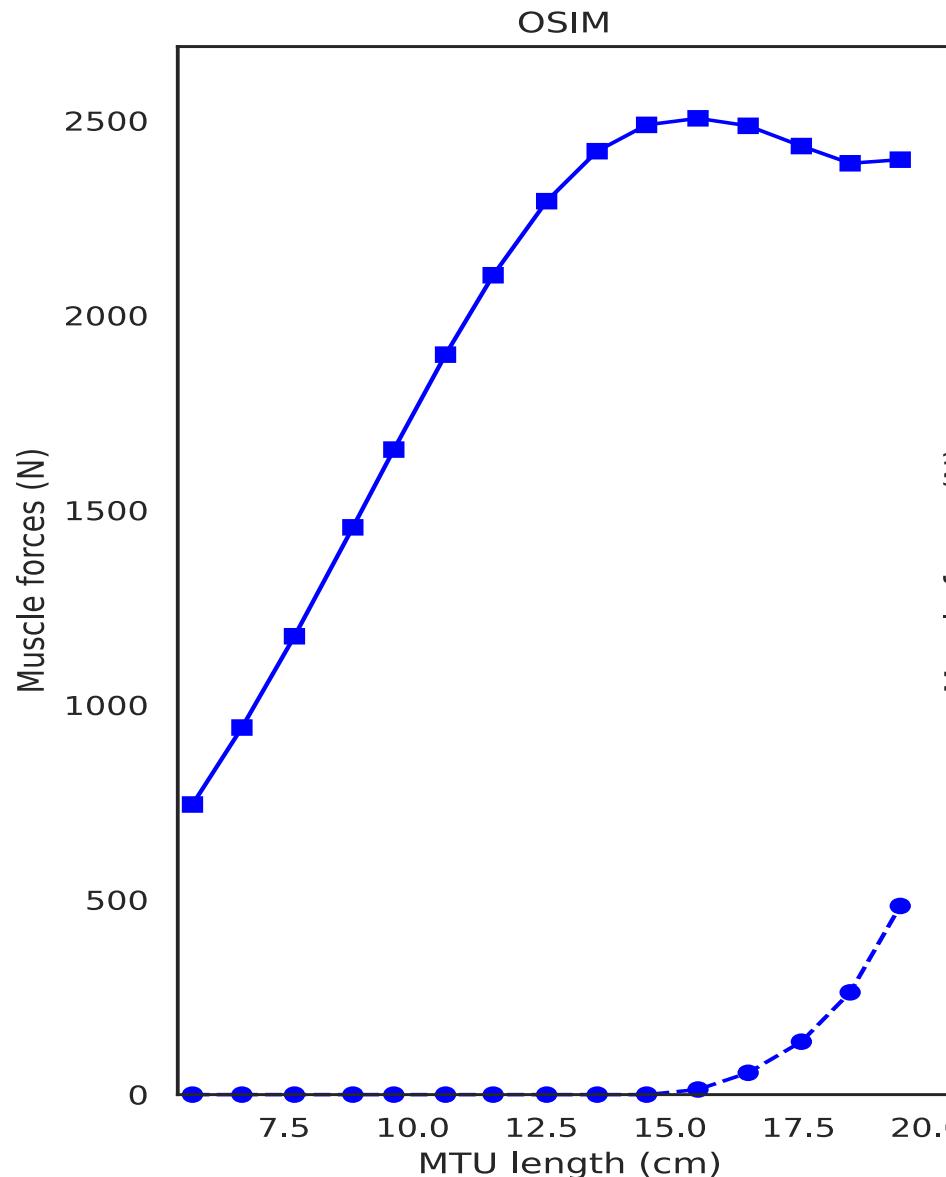


Muscle specific force comparison before/after optimization



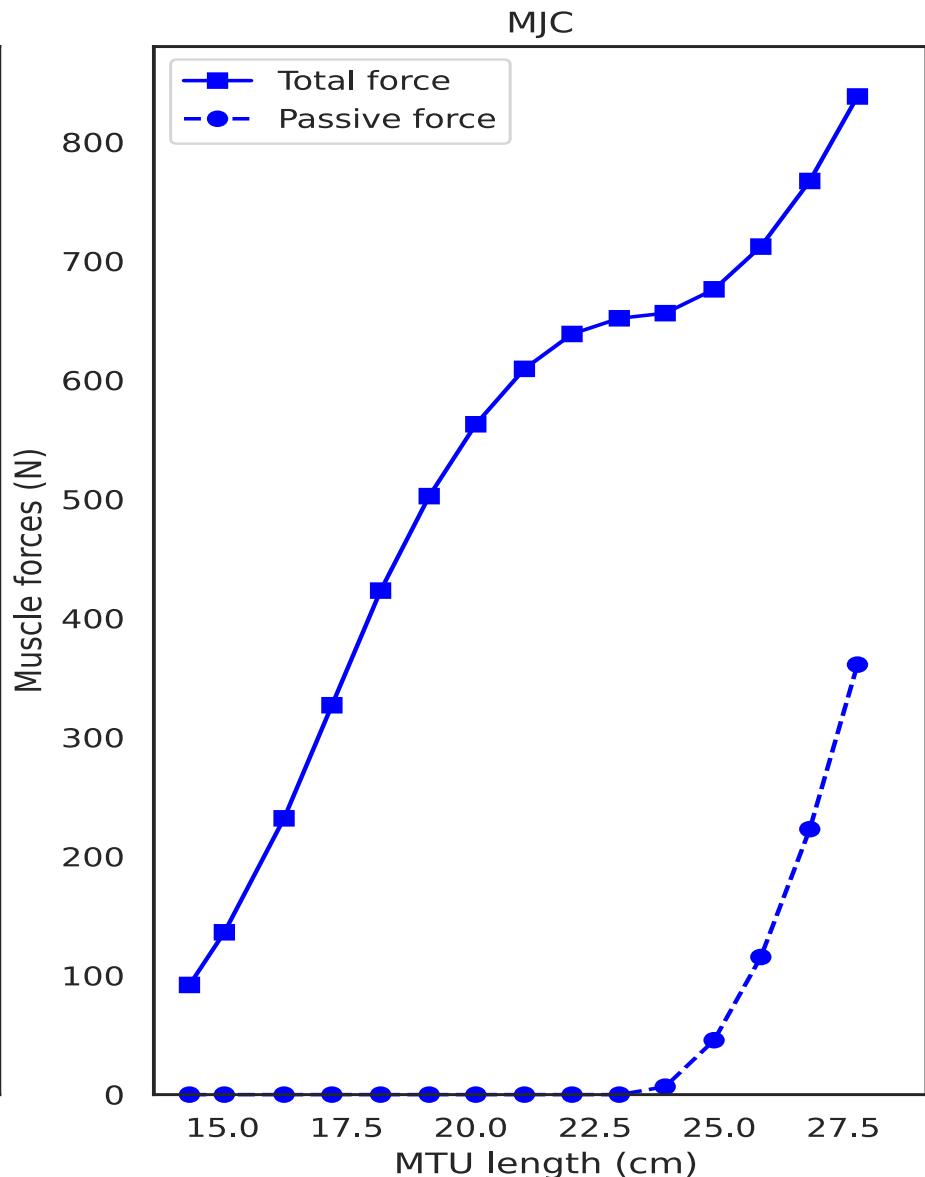
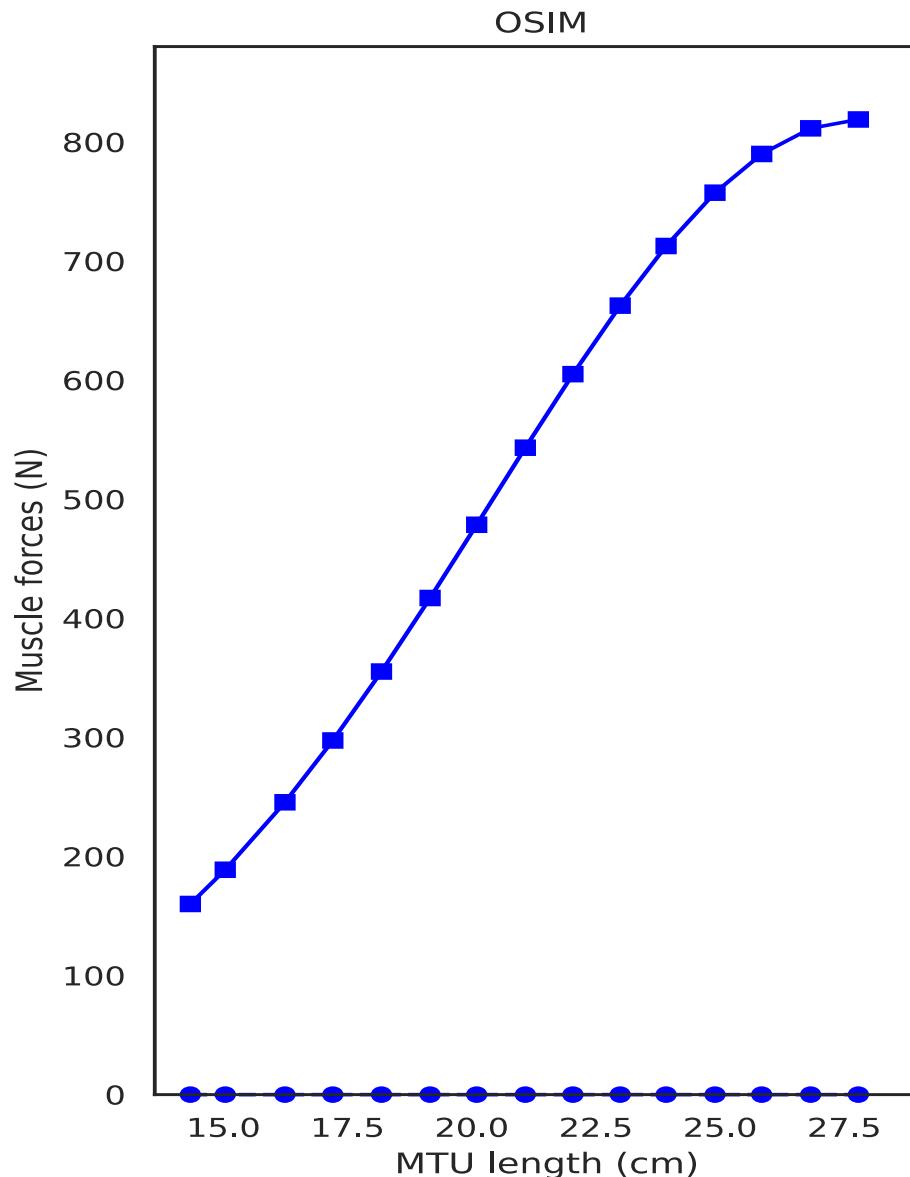
Muscle specific force comparison before/after optimization

ercspn_r

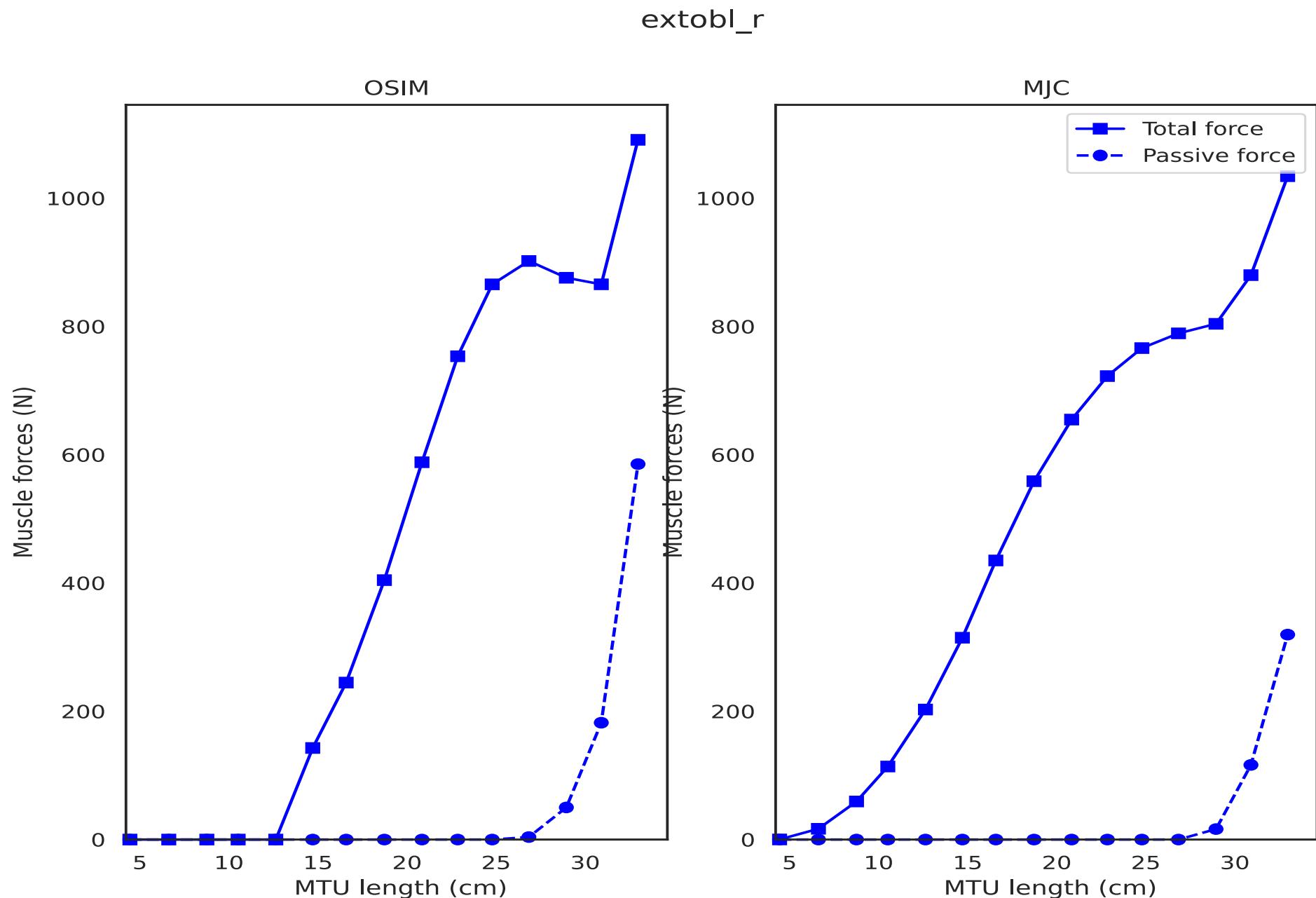


Muscle specific force comparison before/after optimization

glut_max2_r

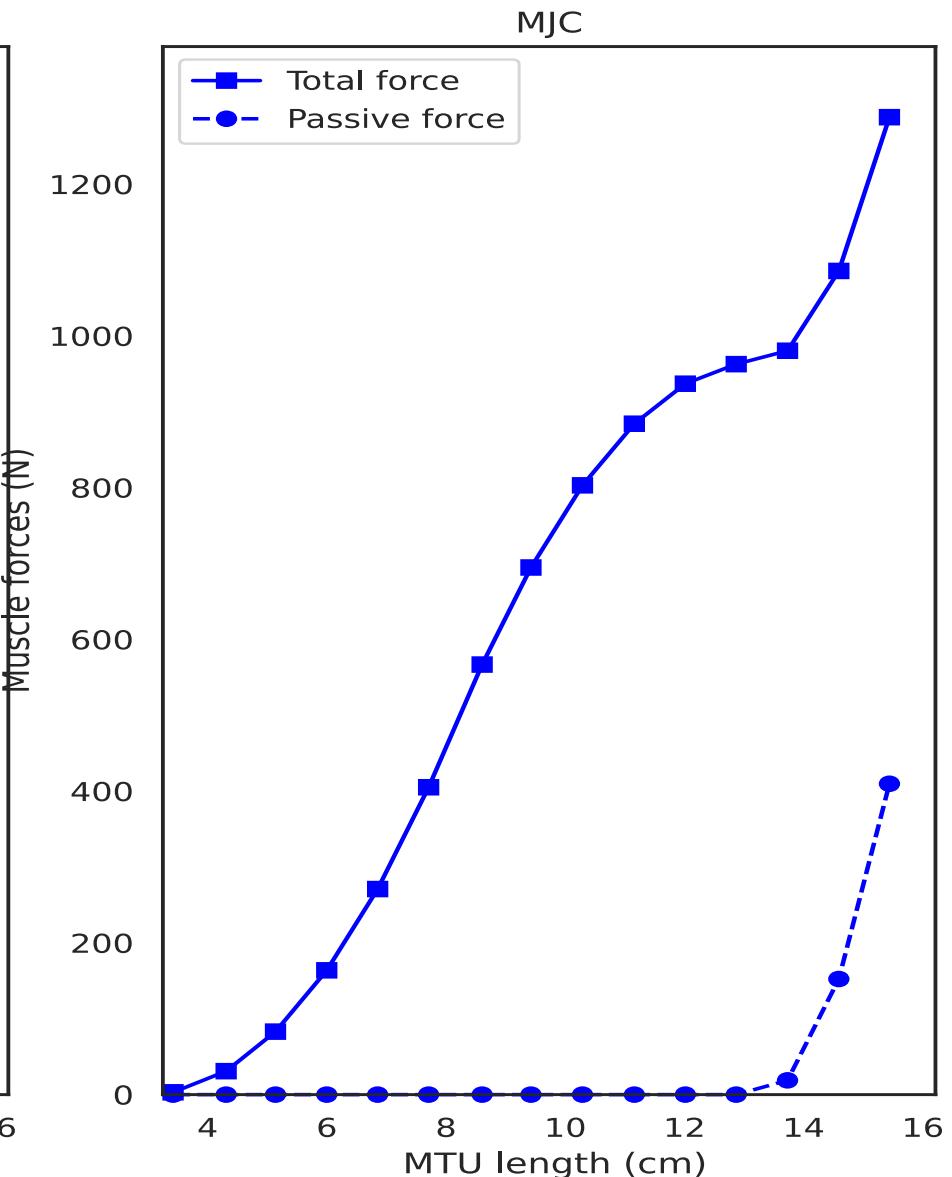
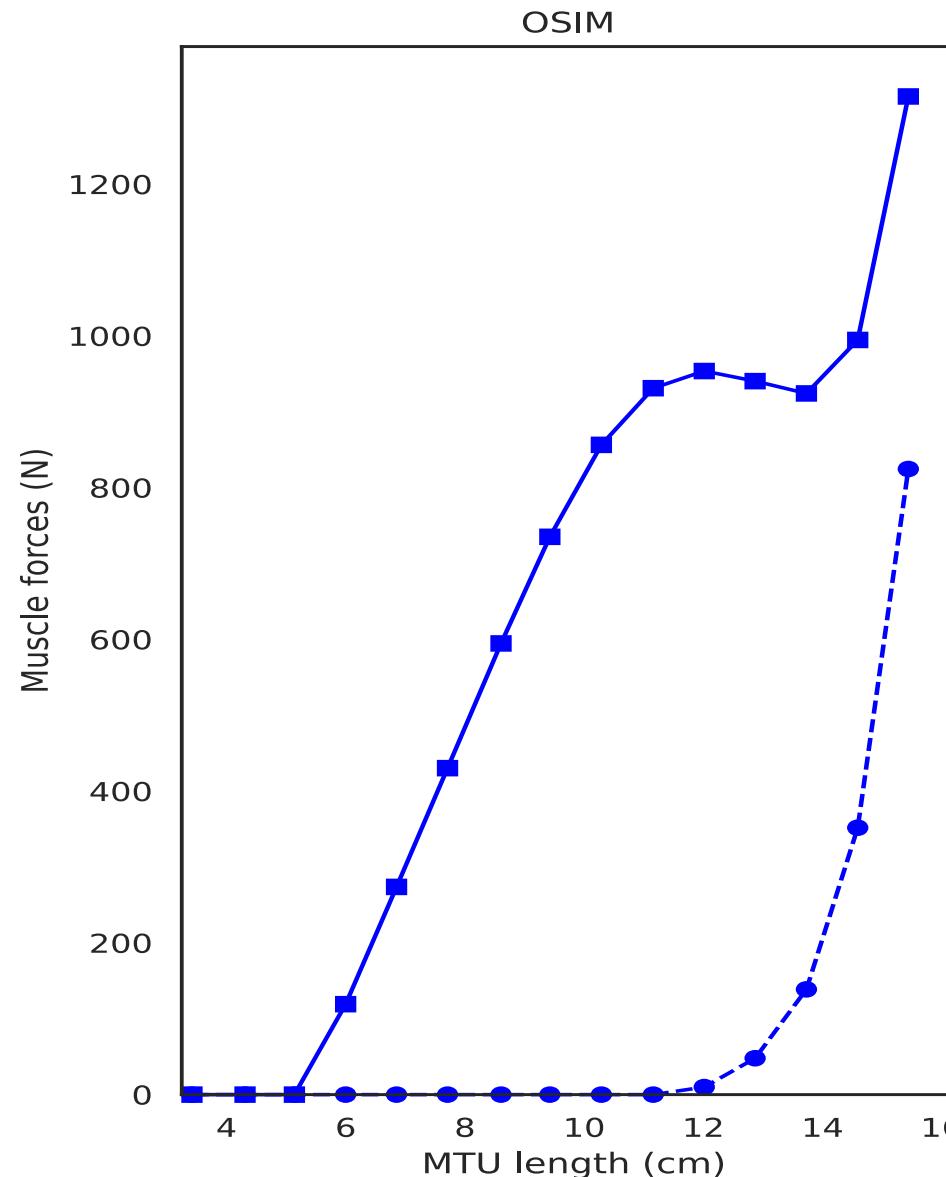


Muscle specific force comparison before/after optimization

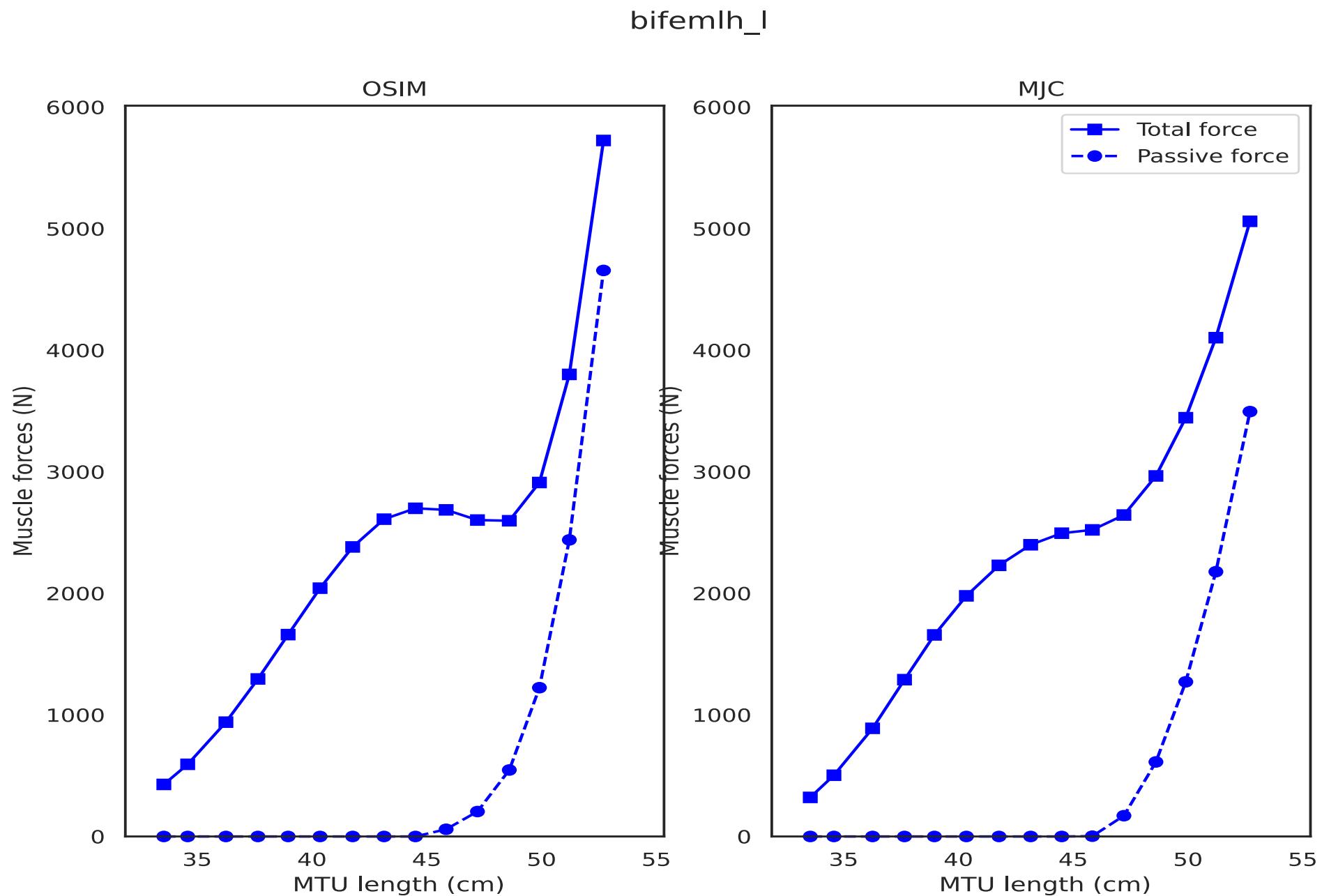


Muscle specific force comparison before/after optimization

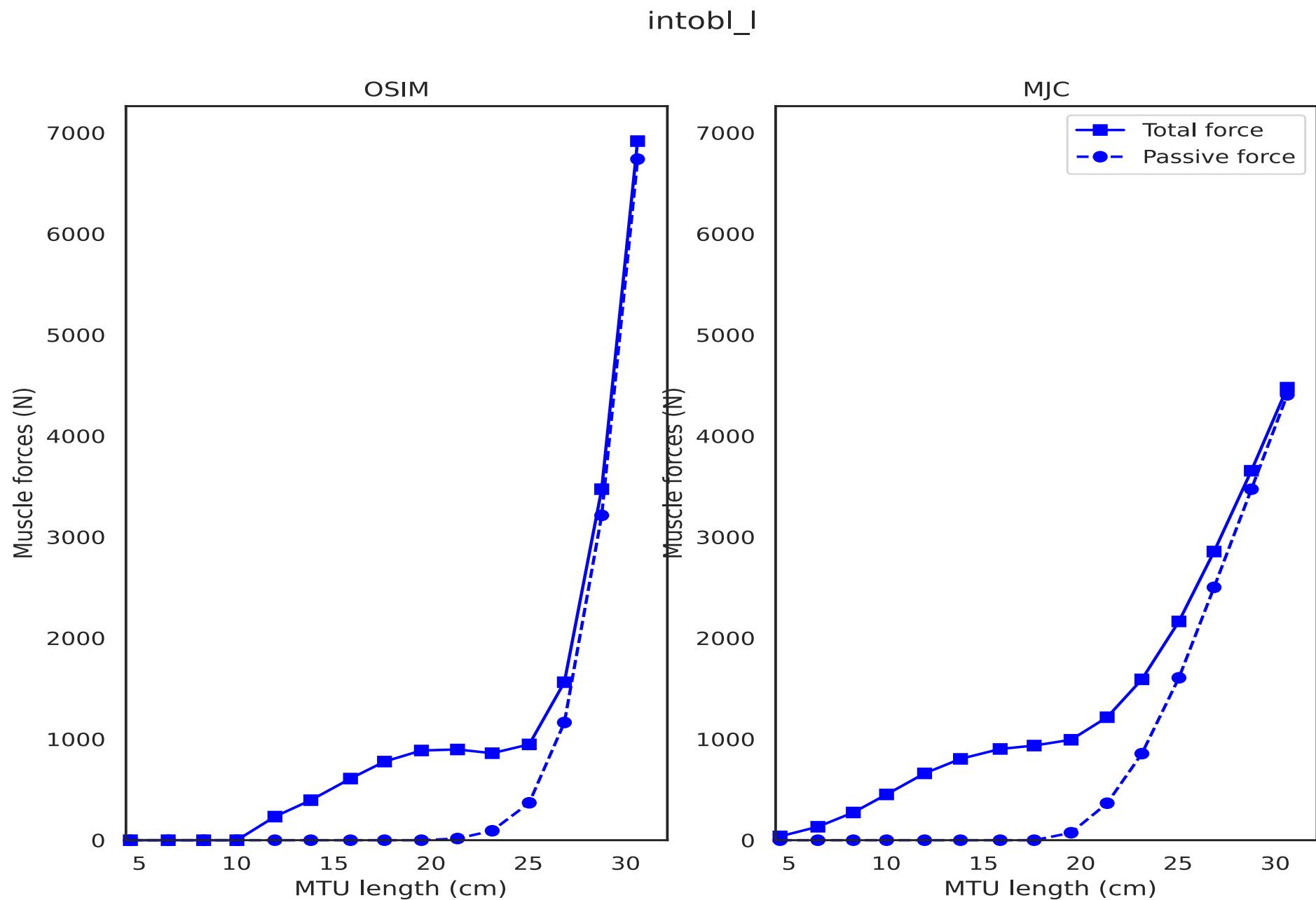
glut_med3_I



Muscle specific force comparison before/after optimization

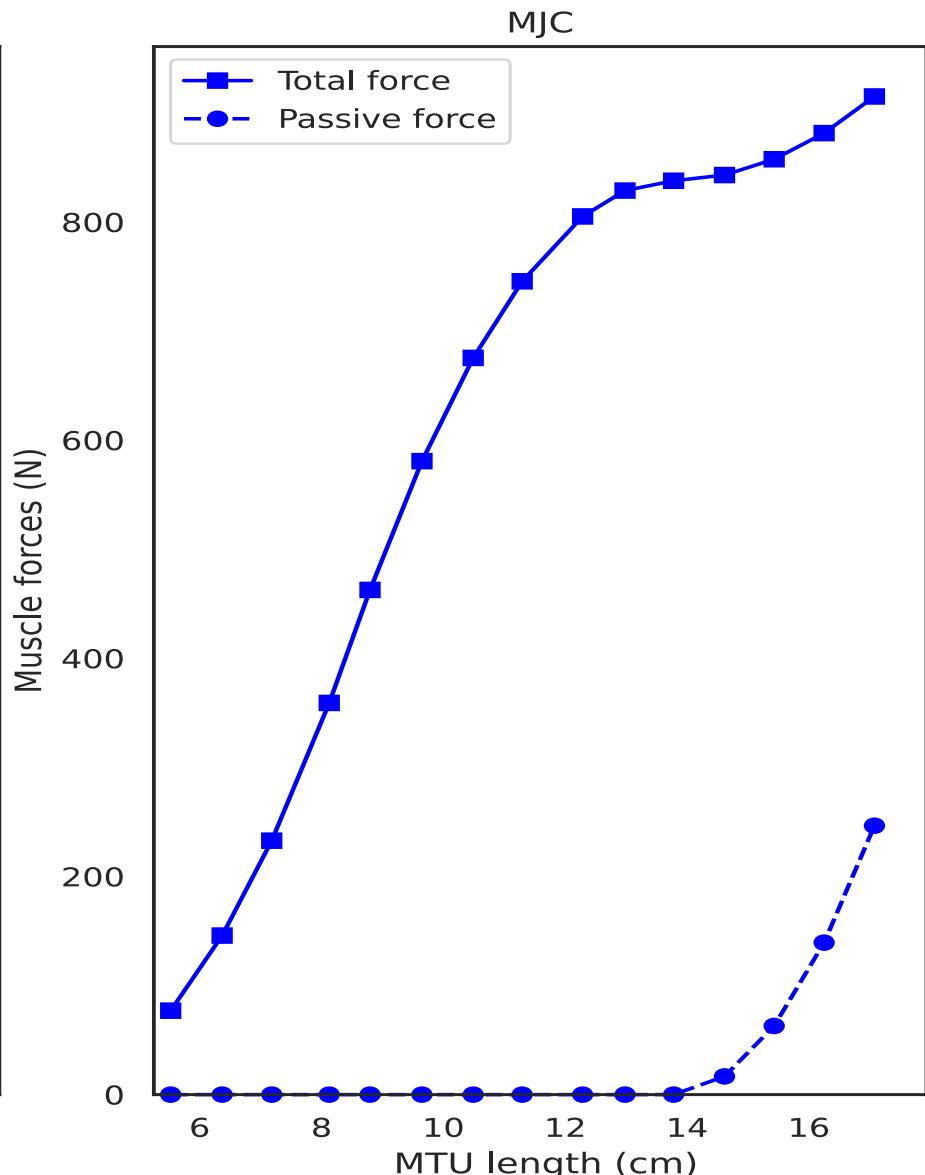
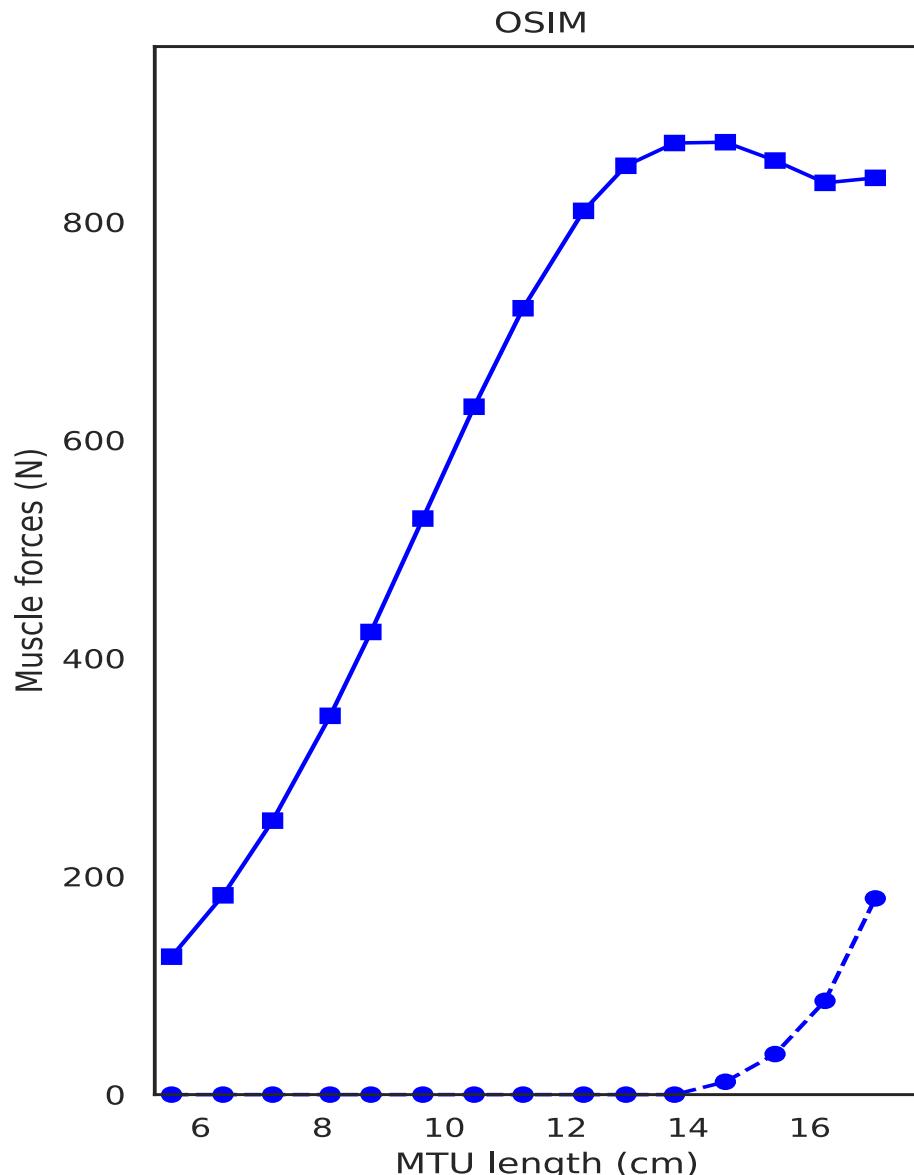


Muscle specific force comparison before/after optimization

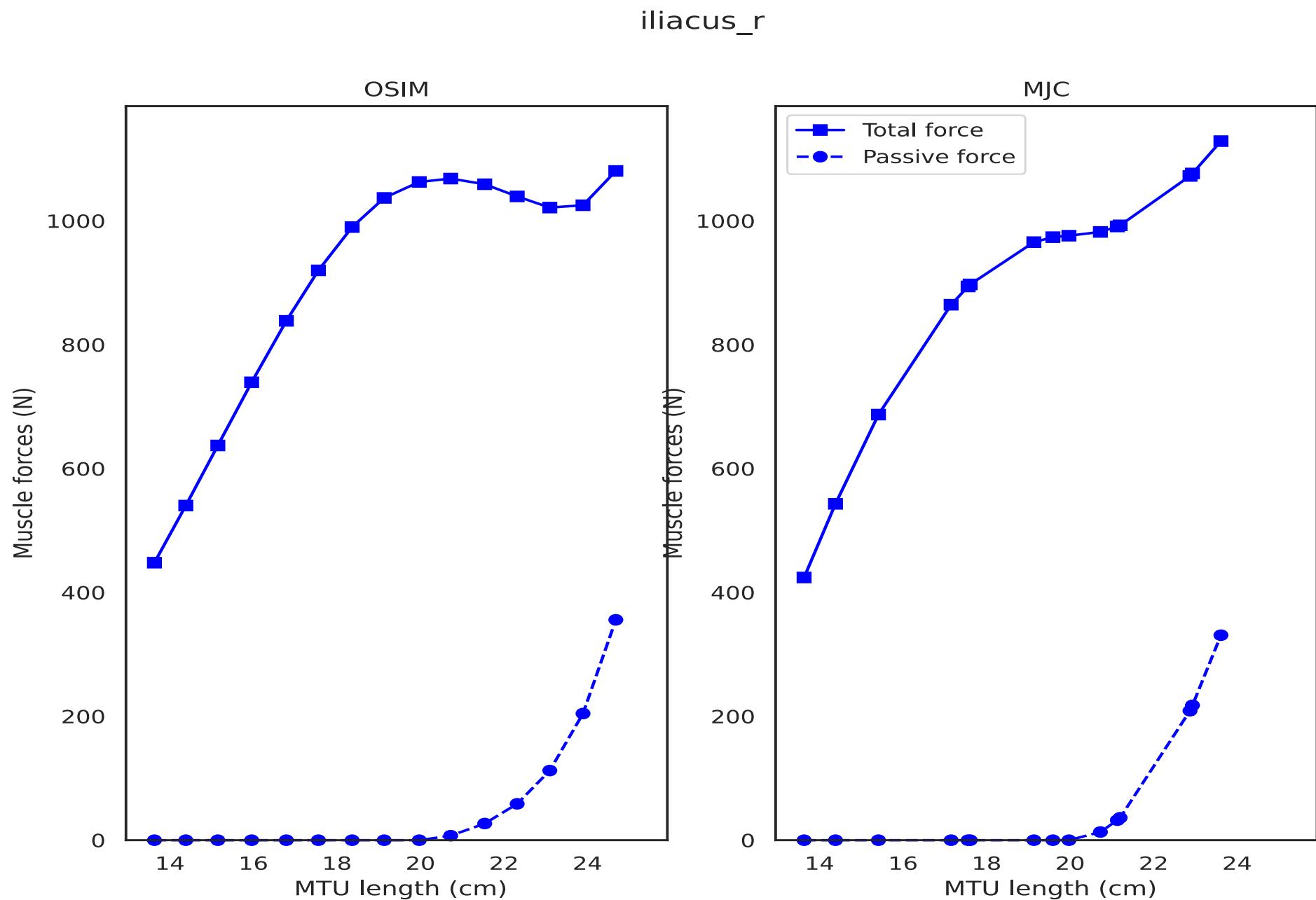


Muscle specific force comparison before/after optimization

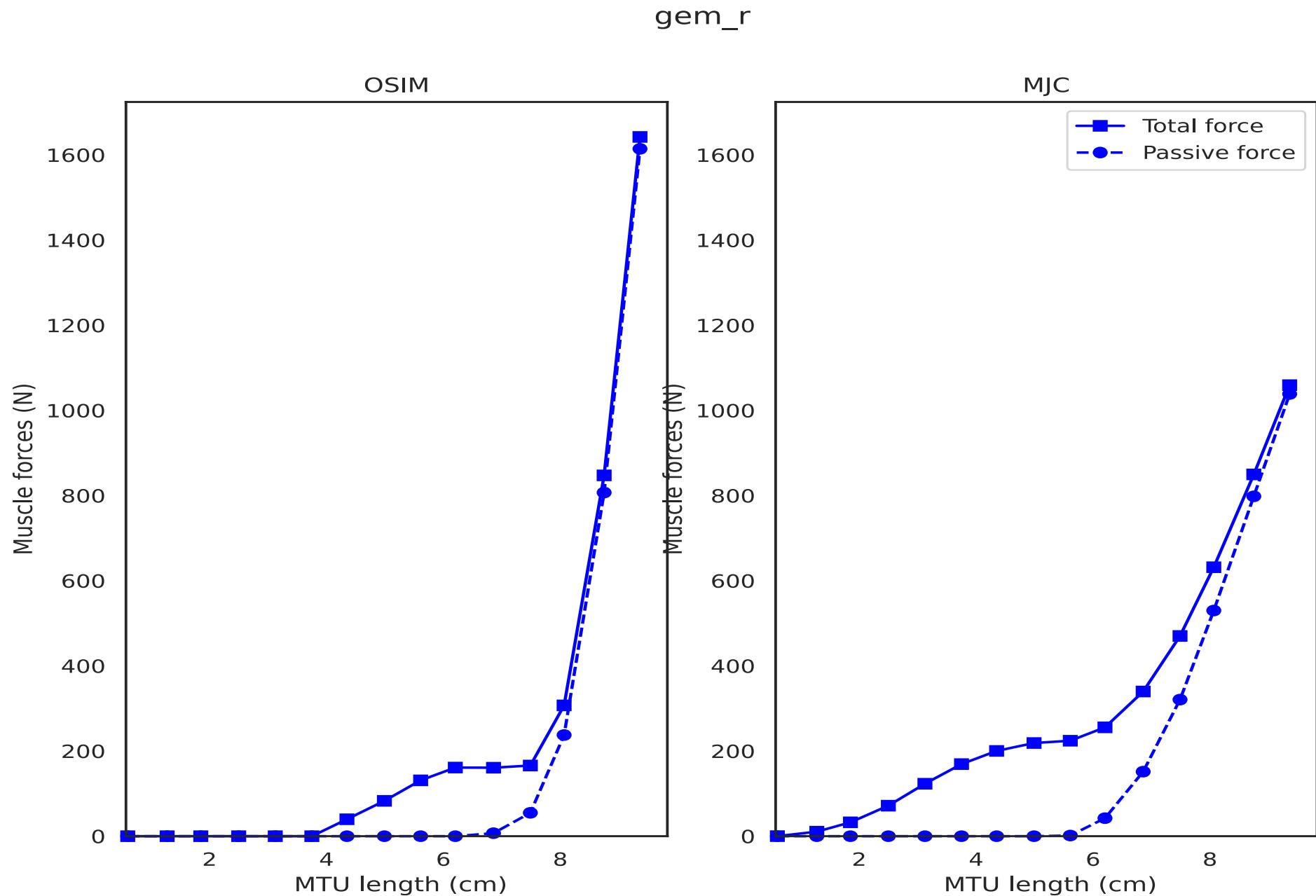
glut_med2_r



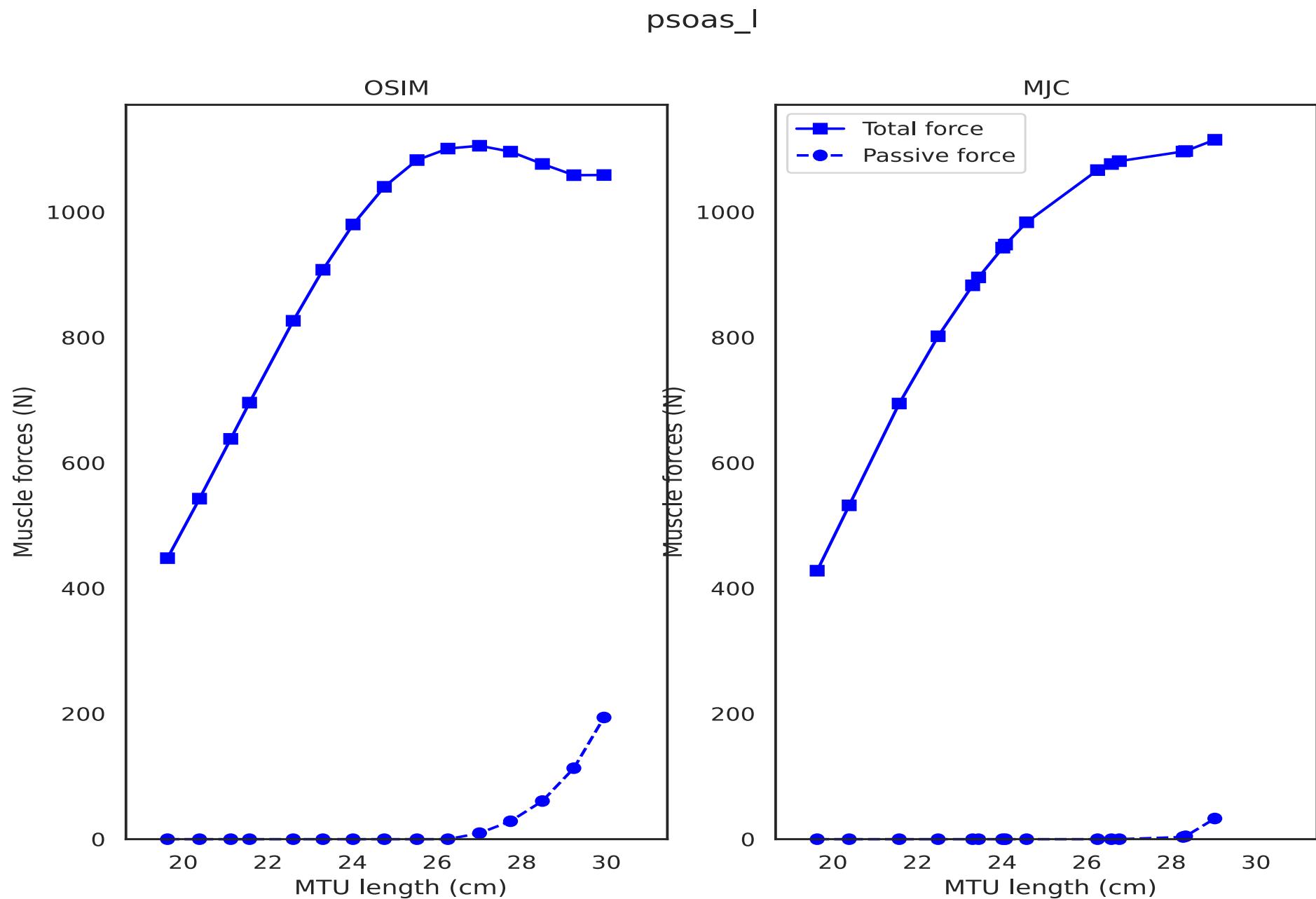
Muscle specific force comparison before/after optimization



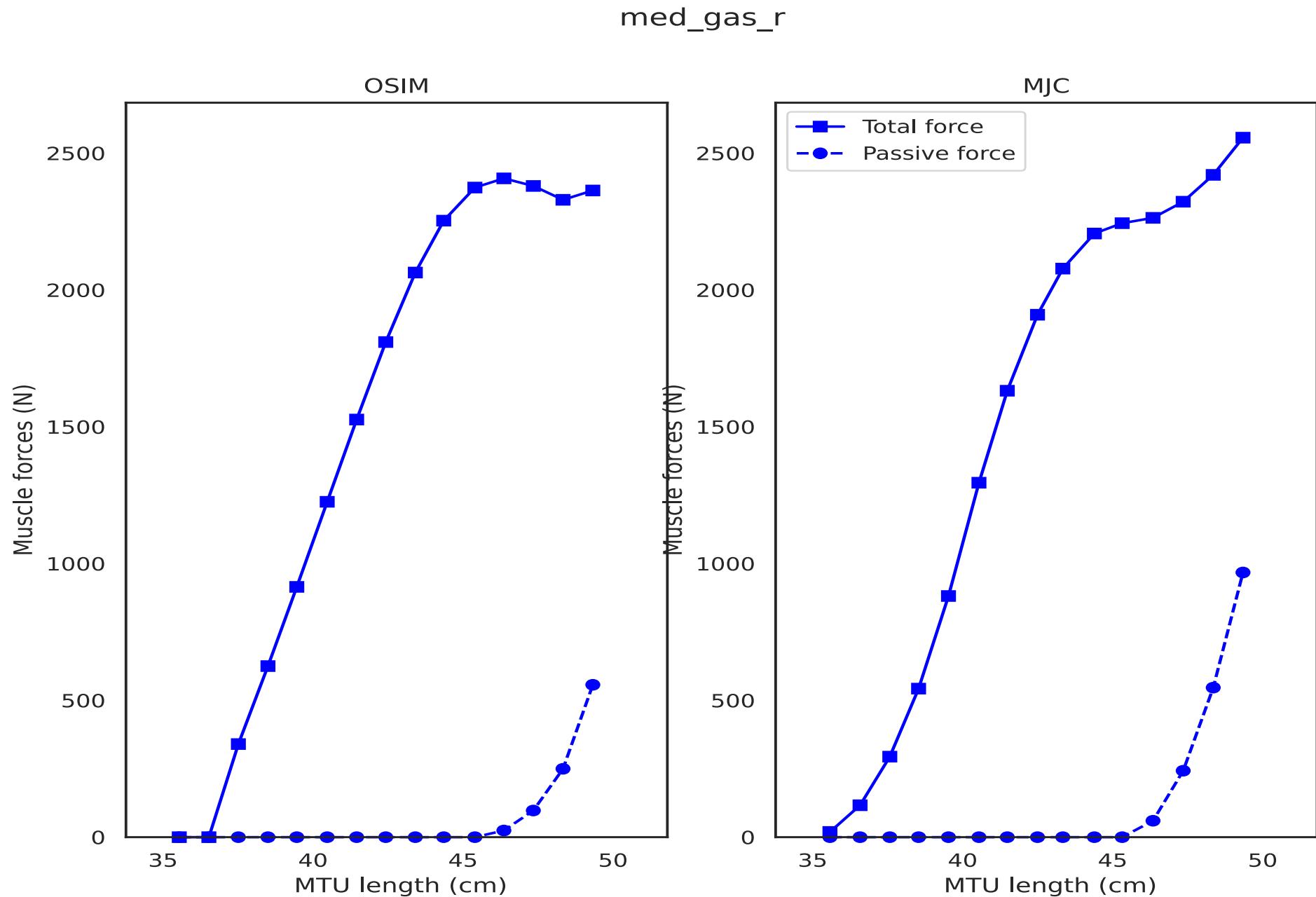
Muscle specific force comparison before/after optimization



Muscle specific force comparison before/after optimization

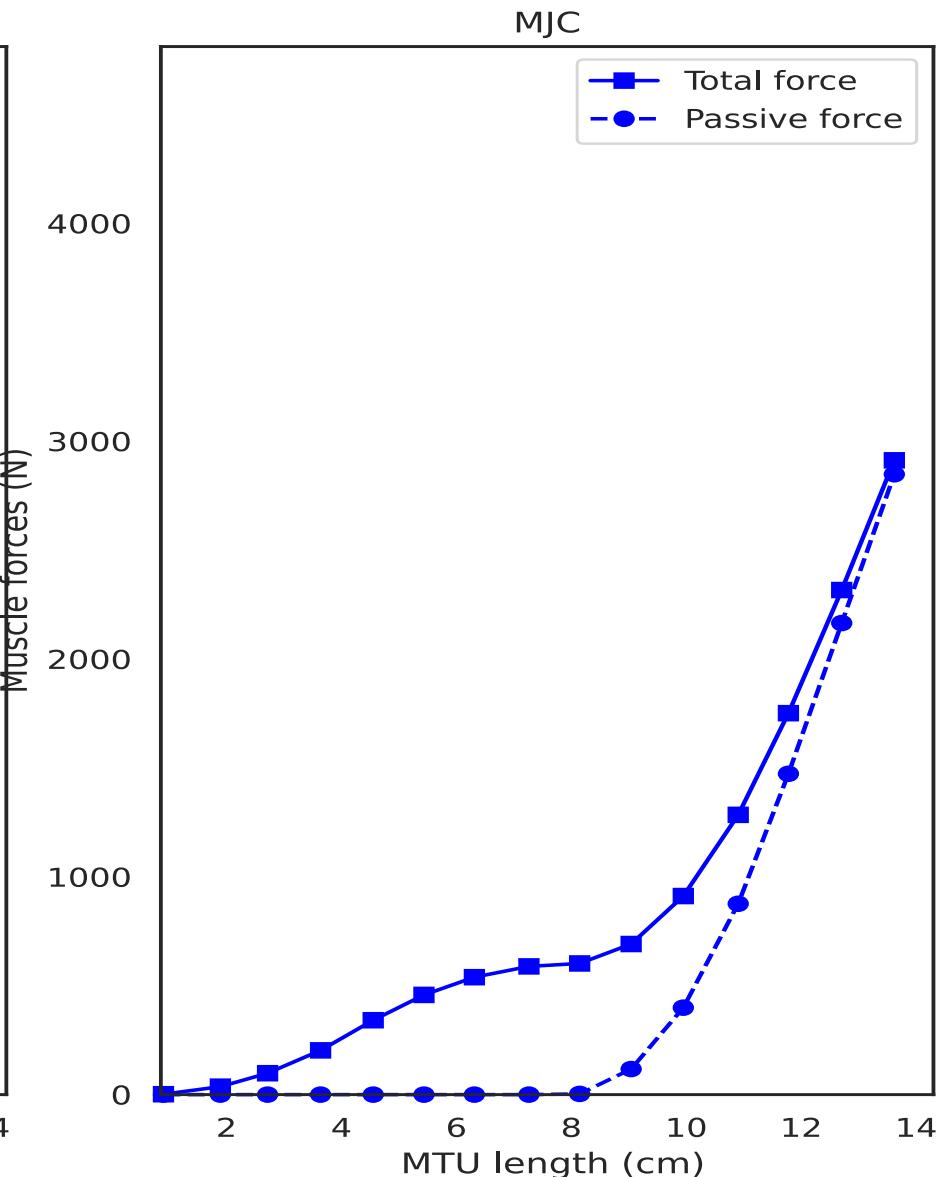
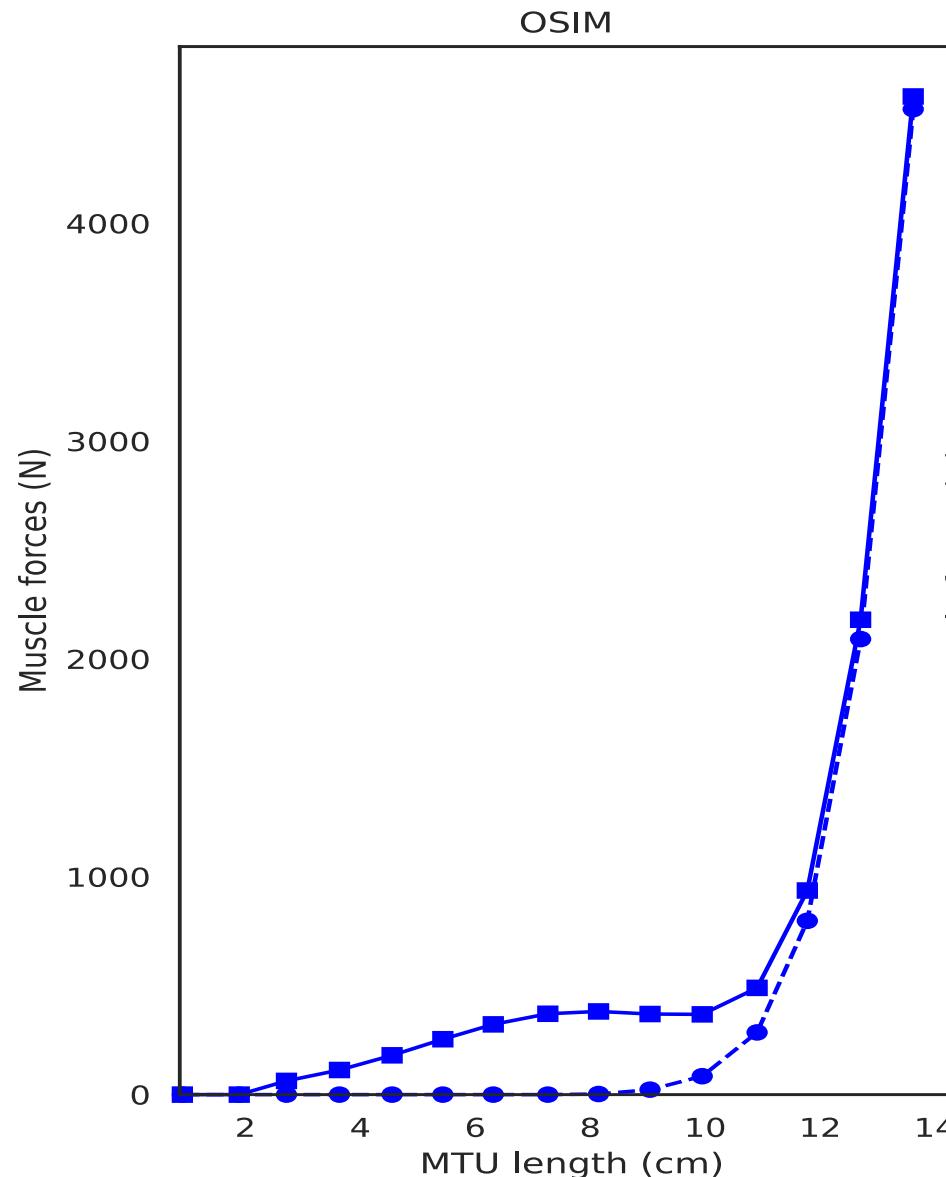


Muscle specific force comparison before/after optimization

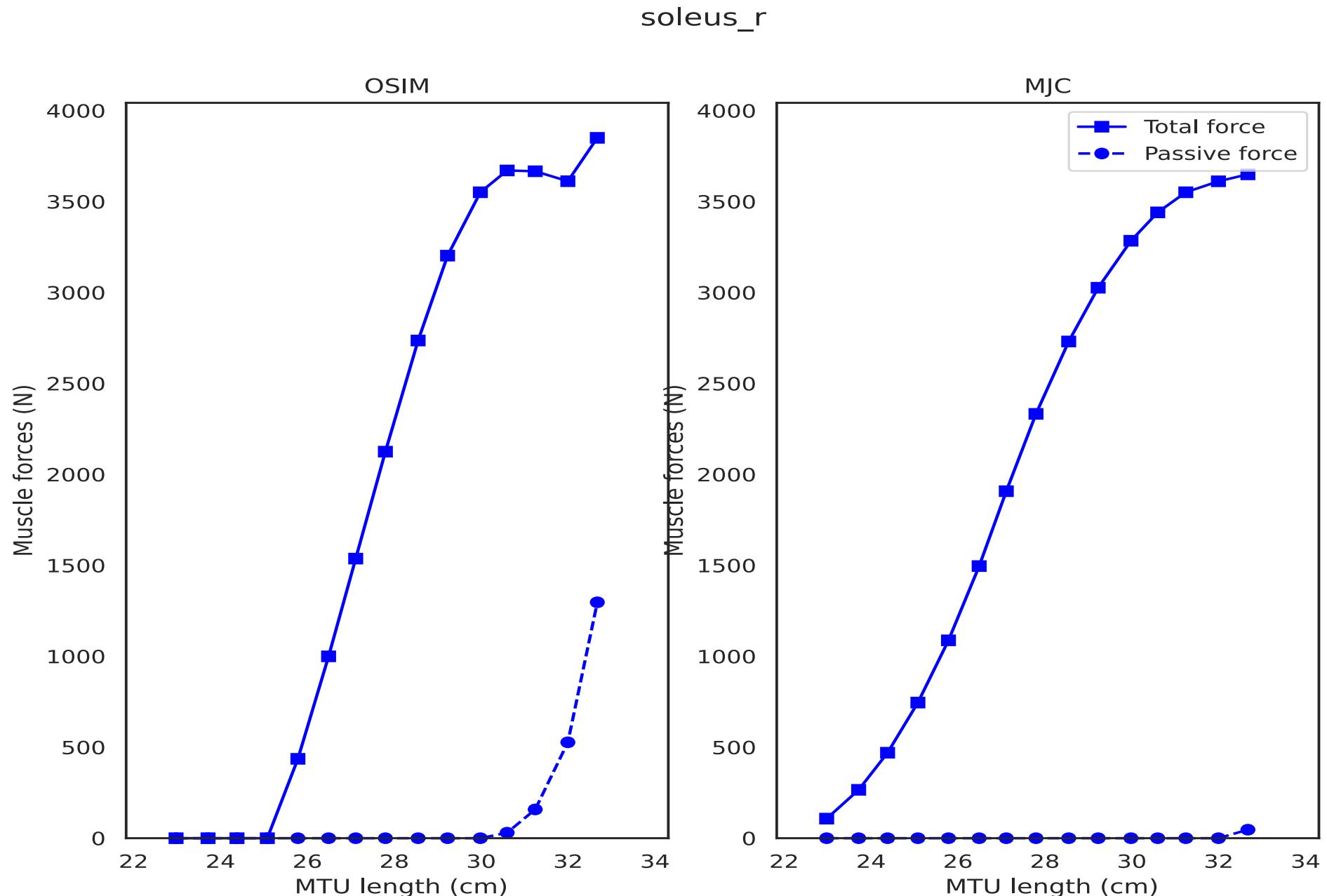


Muscle specific force comparison before/after optimization

quad_fem_r

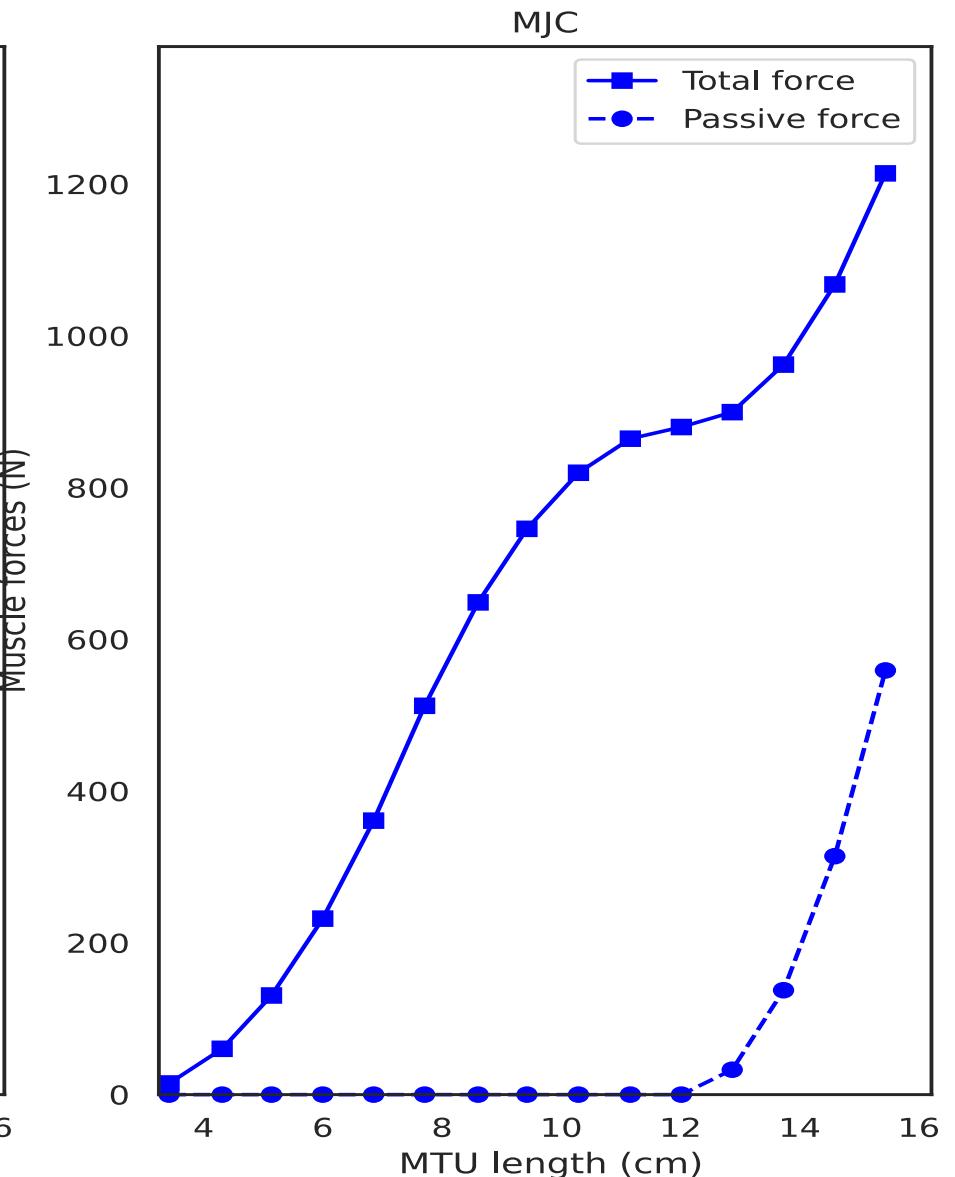
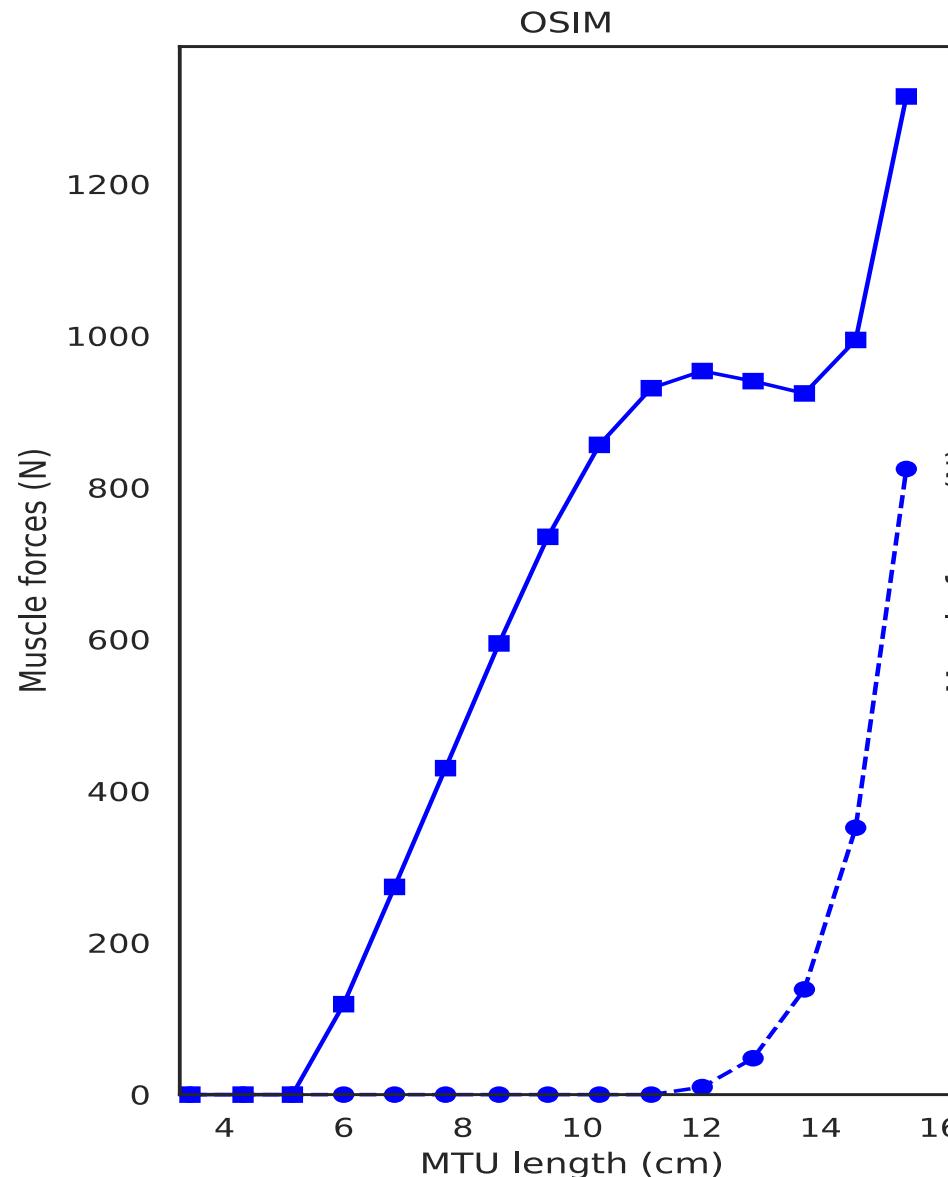


Muscle specific force comparison before/after optimization



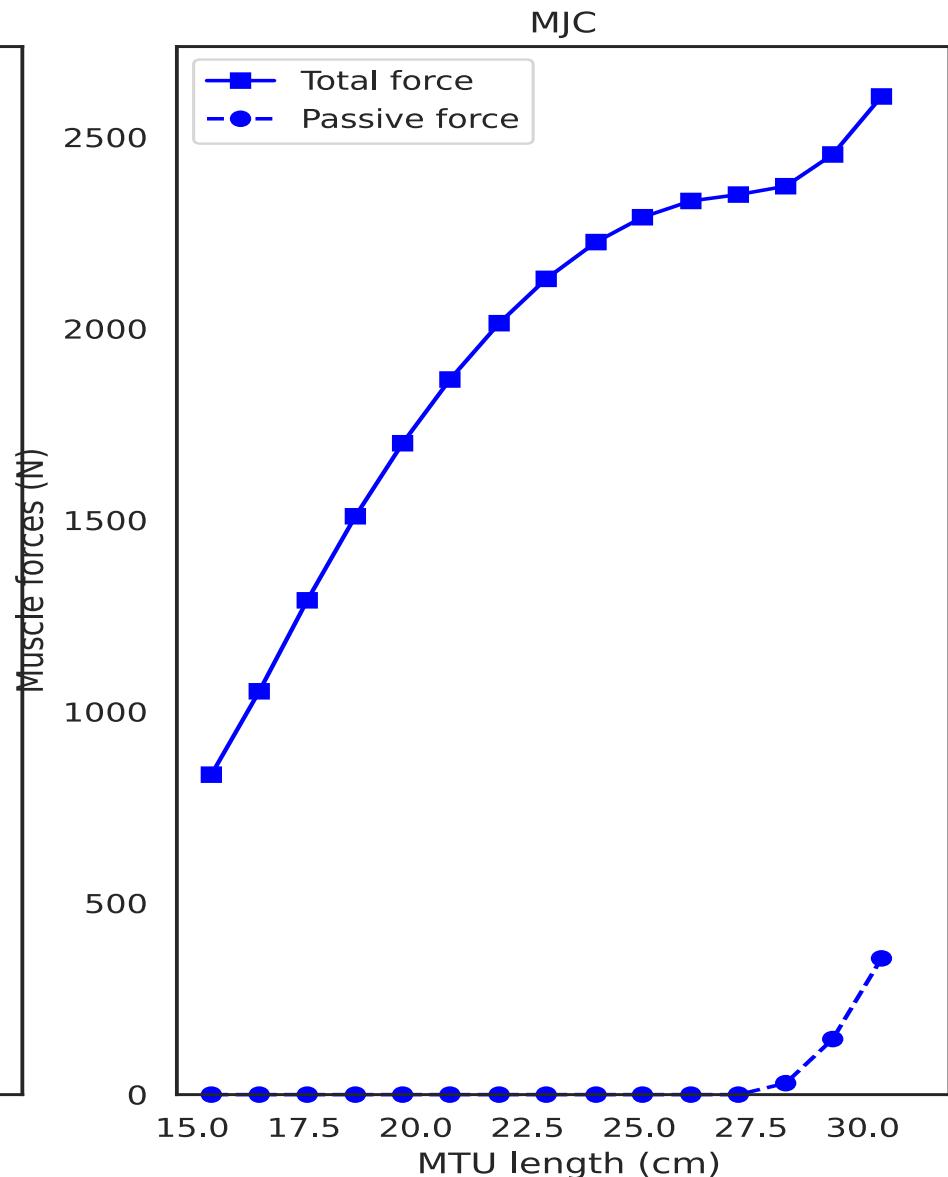
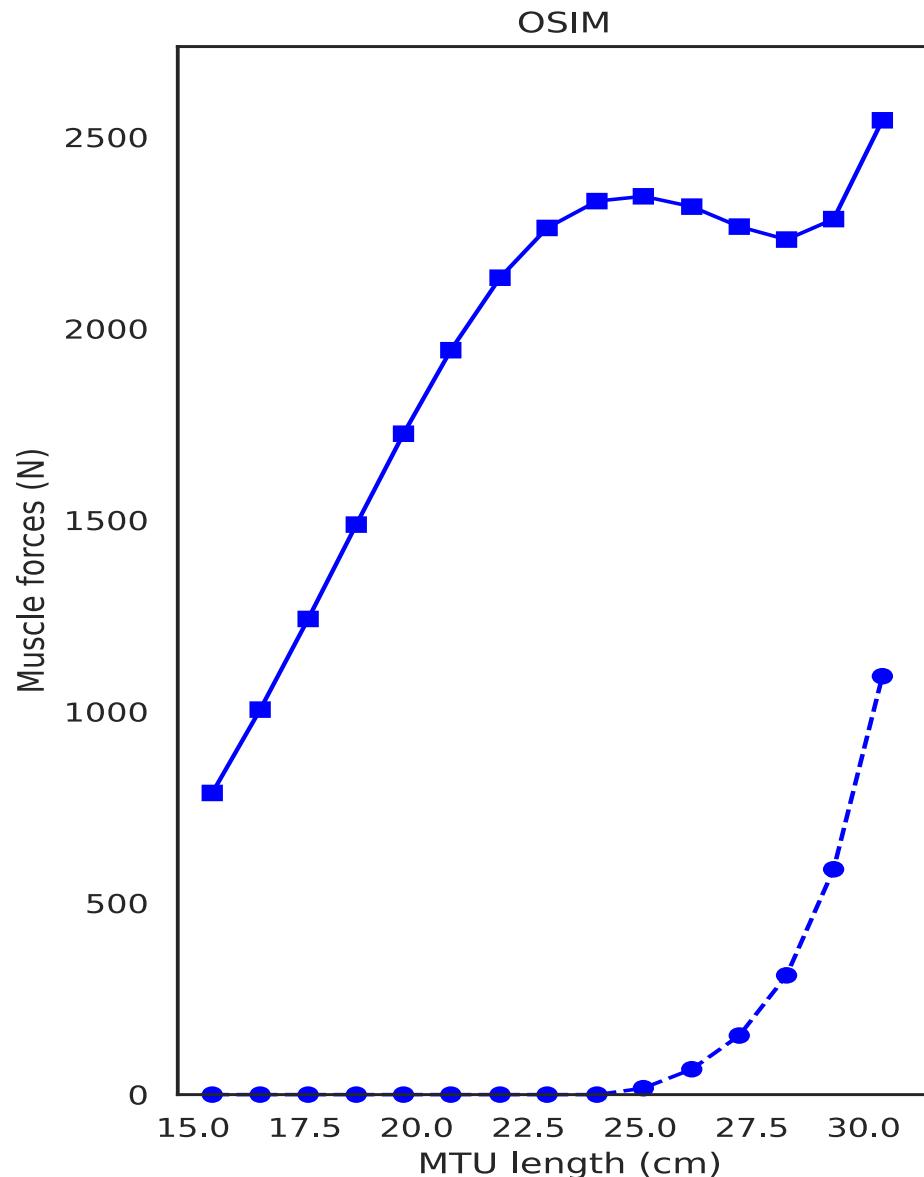
Muscle specific force comparison before/after optimization

glut_med3_r



Muscle specific force comparison before/after optimization

add_mag2_I



Muscle specific force comparison before/after optimization

