MUSCLE CONTRIBUTION TO VARUS KNEE GAIT

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WHAT IS VARUS?

Mr. Webster says:

“a deformity in which an anatomical part is turned inward toward the midline of the body to an abnormal degree”
WHAT IS VARUS?

Normal
Bowleggedness (Vargus)
Knock Knees (Valgus)
WHY DO WE CARE?

- Varus gait often leads to OA and painful gait
- 26.9 million adults in the US have OA
- Estimated cost of hip and knee replacement $7.9 billion (1997)
- Few clinical interventions slow the progression of OA
MODEL

- 10 Segments
- 54 Muscles
- 23 DOF

Added varus DOF to knee
PROCESS

Sensory Organs → EMGs → Musculotendon Dynamics → Lengths, Velocities → (Musculoskeletal Geometry)^{-1} → Musculoskeletal Geometry → Forces → Moments → Accelerations → Velocities, Angles → Multi-Joint Dynamics → Observed Movement

Neural Command

Inverse Dynamics/Static Optimization

Gait Data
RESULTS

Force (N)

Activation

- 0 Degrees Varus
- 5 Degrees Varus
- 10 Degrees Varus
RESULTS

<table>
<thead>
<tr>
<th>Muscle Group</th>
<th>Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip Flexors</td>
<td>Decreased</td>
</tr>
<tr>
<td>Hip Extensors</td>
<td>Increased</td>
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<tr>
<td>Hip Adductors</td>
<td>Decreased</td>
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<td>Increased</td>
</tr>
<tr>
<td>Dorsi Flexors</td>
<td>Decreased</td>
</tr>
<tr>
<td>Plantar Flexors</td>
<td>Increased</td>
</tr>
</tbody>
</table>
DISCUSSION

- Tibia & femur medial overlap
- Based on normal gait data
FUTURE

- With varus knee gait
- Strengthening different muscles
QUESTIONS
REFERENCES


