Athletic Groin Pain: A Biomechanical Diagnosis

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Introduction

Chronic groin pain is prevalent in football
(Werner et al. 2009; Hawkins et al. 1999)

Rapid change-of-direction/cutting associated with groin injury
(Holmich et al. 2014)

~723 cutting actions per game
(Bloomfield et al. 2007)
Traditional groin pain assessment:

Lack of Sports Specificity
No studies have examined the biomechanics of change of direction cutting in groin pain patients.
Movement patterns in groin patients are likely to exhibit inter-individual variability, due to:

- Source and severity of the pathology
- Training history
- Neuromuscular capacity
- Anthropometrics
Apply statistical clustering procedures to identify distinctive features in the cutting mechanics of groin pain patients
Methods

382 field sport athletes diagnosed with AGP

- 3 trials
- Symptomatic side examined
- Vicon motion capture
Statistical Methods

- Hierarchical cluster on kinematic data
- Independent measures ANOVA
- $P < 0.05$
## Results

3 distinct subgroups were created:
- C1 (40% of participants)
- C2 (45%)
- C3 (15%)

<table>
<thead>
<tr>
<th>Movement Plane</th>
<th>Variable</th>
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<tbody>
<tr>
<td>Sagital</td>
<td>Hip flexion</td>
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<tr>
<td></td>
<td>Knee flexion</td>
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<tr>
<td></td>
<td>Trunk flexion</td>
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<tr>
<td>Transverse</td>
<td>Pelvis external rotation</td>
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<tr>
<td></td>
<td>Trunk external rotation</td>
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<tr>
<td></td>
<td>Hip internal rotation</td>
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<tr>
<td>Frontal</td>
<td>Ipsilateral trunk side flexion</td>
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<td>Contralateral pelvis drop</td>
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<td>Hip abduction angle</td>
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</tbody>
</table>
Results

Cluster 1 (40%)

- Trunk external rotation
- Hip internal rotation
- Hip flexion

Cluster 2 (45%)

- Trunk side flexion
- Hip abduction

Cluster 3 (15%)

- Trunk side flexion
- Hip abduction
- Trunk forward flexion

Trunk external rotation
Hip internal rotation
Hip flexion
Discussion

Cluster 1

- Hip internal rotation, hip flexion
  - associated with an increase in pubic symphyseal motion (Birmingham et al. 2012)
  - associated with femeroacetabular impingement particularly in the presence of abnormal hip morphology

- Trunk external rotation
  - Likely to have an effect on the hip and groin region

Trunk Vs. Hip: $r = 0.74$, $p < 0.01$
Cluster 2

**Hip abduction and trunk side flexion**

- Dynamic hip abduction controlled by eccentric action of the adductors

- Greater hip abduction angles appear to be exacerbated by increased trunk side flexion

Hip Vs. Trunk: $r = 0.70$, $p < 0.01$
Cluster 3

- Trunk flexion, as well as
- Hip abduction and trunk side flexion

Due to a reduced posterior chain utilisation/capacity?

![Graph showing Hip Moment (N.m/kg)]
Conclusion

• 3 distinct movement patterns identified – biomechanical diagnoses

• 3D assessment provides additional information to tailor rehabilitation – **Groin Rehab Workshop, Pickwick Suite, 2.30pm**

• Poor trunk control effects hip and groin mechanics in dynamic movements

• Clustering analysis warranted
Future Work

Clinical relevance of the clusters

• prospective study in at risk groups (e.g. elite football players)
• rehabilitation RCT

Clustering with kinematic data only

• our classifications could potentially be identified in typical sports medicine practises with 2D cameras
• possible to accurately cluster groin patients based on two dimensional video?
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