‘the link between movement and pathology’

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Research interests

- teaching 'skills'
- evidence translation
- movement and pathology link
- Service evaluation
- student supervision
'the link between movement + pathology' – tendons

prevalence → treatment → mechanisms

Claire Emerson,
Elsevier Young Researcher Prize Winner, IFOMT 2008


Saira Chaudhury
Doctoral candidate, with Hazel Screen
‘the link between movement + pathology’ - measurement

- New human performance lab (£400k of equipment)
- Capacity to measure
  - Fitness eg sub-maximal VO2 max
  - Biomechanics eg gait of children with cerebral palsy
- Part of ARC £2.5 million bid (shortlisted 6/21)
  - Integral to MSK CAU strategy
‘the link between movement + pathology’ - shoulders


- **ARC fellowship application in review**


- **ARC project application in review ~£150k**


- **PPEF funding ~£40k**
- **ARC submission prepared ~£150k**
Development of the Kinetic Medial Rotation Test (KMRT)
a dynamic clinical test for shoulder movement categorisation

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Prof RC Woledge, Dr MC Morrissey, Mr JB King, Dr A Shortland, Mr T Christopher
## Do we need another test?

<table>
<thead>
<tr>
<th>Traditional paradigms</th>
<th>Rationale of test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active or passive joint movement</td>
<td>range of movement</td>
</tr>
<tr>
<td>Pain score during given manoeuvre</td>
<td>nociogenic status</td>
</tr>
<tr>
<td>Static resisted contraction testing</td>
<td>force generation properties</td>
</tr>
<tr>
<td>Accessory joint glide assessment</td>
<td>describe the joint play</td>
</tr>
<tr>
<td>Patient specific functional tests</td>
<td>describe the functional capacity</td>
</tr>
</tbody>
</table>
The KMRT - Normal

NORMAL
65 degrees of medial rotation at 90 degrees abduction in the scapular plane without significant GH or ST anterior translation.
IMPINGEMENT

excessive translation at the ST articulation (>7mm, usually anterior-inferior) before 65 degrees of medial rotation
The KMRT - Instability

INSTABILITY

excessive anterior translation (>4mm) at the GH articulation before 65 degrees of medial rotation.
Questions to answer

1. Does the KMRT distinguish between pathological groups?
   - Sensitivity, specificity

2. Does the KMRT reflect biomechanical properties of the GHJ?
   - Laxity studies
   - Kinematics

3. Are we measuring true bone movement?
   - Soft tissue thickness changes
   - Bone surface contact changes
   - Palpation accuracy issues
   - And UL motion analysis inaccuracy errors
Method

- **KMRT** grading
- **Diagnose** with ‘baskets’ of orthopaedic tests
  (Ludewig 2000, Lukasiewicz 1999, Ure 1993)
- Apply **kinematic** mathematical model
  - Segmental ROM
  - Translation at each articulation
- Measure shoulder laxity and stiffness - **biomechanics**
- N = 18 normal subjects, N = 18 patients
KMRT measurement method

- Used throughout the rest of the studies
Laxity / stiffness testing

- Arm support
- Elbow fixation
- Force applicator and ring transducer
- Potentiometers
Kinetic Medial Rotation Test Score

KMRT Grade

Patient sample

Shoulder
- Asymptomatic
- Symptomatic

Instability  ⏳  Impingement
Typical movement patterns

Scapula range of movement (degrees)

Scapula translation (mm)

- Total data set
- Movement one
- Return form movement one
‘ScapuloHumeral Rhythm’
$(r = -0.64, p < 0.001)$
Scapula: anterior-inferior glenoid
Biomechanics and KMRT grading
Summary
Why so irregular!

Long-standing pathology?

Adaptation?

Paradigm needs adapted for instability?
Thank You

● Funders
  ● BLT Special Trustees: Dylan Morrissey
  ● Wellcome Trust: Will Driver
  ● Nuffield Foundation: Kathryn Kumar
  ● KCL Studentship: Bev Greensitt

● Hosts of this great weekend
  ● Kinetic Control
  ● MACP

● Audience
  ● Still here late on the Saturday!