Identifying technical problems and Prevention of Sports Injuries

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Most Common Sports Injuries

- Shin Splints
- Ankle Sprains
- Hamstring Strain
- Dislocated Shoulder
- Groin Pull
- ACL Tear
- Tennis Elbow

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Common Sports Injuries

- **Shoulder Injuries**
  - Rotator cuff tendonitis and partial tears
  - Ant. & Post. Band of IGHL
  - ACJ, SCJ and C-C ligament
  - SLAP Lesion

- **Elbow Injuries**
  - Lateral epicondylitis
  - Medial Epicondylitis

- **Back and Hip Injuries**
  - Facet Joint arthritis
  - Sacroiliac joint pain
  - Hip girdle muscle pain
  - Hamstring tendonitis

- **Wrist**
  - Ligament Sprains
  - TFCC

- **Knee**
  - Patellar tendonitis
  - Meniscus
  - Ligament- ACL, PCL, MCL, LCL
  - Cartilage defects

- **Ankle**
  - Ligament Sprains
  - Strains, tear
  - Fractures

- **Head**
  - Concussions
  - Hematoma
  - Skull Fracture
Injury
Injury Mechanism
Skeletal Muscle Injuries

Acute Strain:
- Results from overstretching a passive muscle or dynamically overloading an active muscle.
  - Mild: minimal structural disruption and rapid return to normal function.
  - Moderate: partial tear in the muscle tissue, pain and some loss of function.
  - Severe: complete or near-complete tissue disruption and functional loss as well as marked haemorrhage and swelling.

Types of Muscle Tears

For Information, Visit: www.epainassist.com

Grade 1  Grade 2  Grade 3
Injury Mechanism

- Motion
- Contact
- Impulse
- Stress
- Injury
Injury Mechanism
Injury Mechanism
No Quick fix Solutions in sports

- No quick solutions
- Neural automisation
- Use and disuse principle
- Ensuring Right mechanics for beginners
Pattern of Muscle activation in Archer for 36 shots
Pattern of Muscle activation in Archer for 36 shots
Shooter with thoracic outlet syndrome – muscle atrophy (possible nerve impingement)
Forward Diagonal Lunge
Forward Diagonal Lunge

F = 155.76 N
Forward Diagonal Lunge

$F = 724.51\ \text{N}$
EMG – SHOULDER PAIN IN BUTTERFLY STROKE SWIMMER

Purpose:
Muscle activity in swimmer – while executing simulated stroke mechanics at different isometric angles.

Methodology
• Eight electrodes placed - right and left
  – Biceps Brachii,
  – Anterior deltoid
  – Pectoralis major
  – Infra spinatus
EMG – shoulder pain in a swimmer (butterfly stroke)
EMG – Swimmer – with DELant pain

EMG at Pull (Isometric at 80°)

<table>
<thead>
<tr>
<th></th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biceps Brachii</td>
<td>30.3</td>
<td>19.3</td>
</tr>
<tr>
<td>Anterior Deltoid</td>
<td>1.0</td>
<td>28.6</td>
</tr>
<tr>
<td>Pectoralis Major</td>
<td>25.5</td>
<td>6.1</td>
</tr>
<tr>
<td>Infraspinatus</td>
<td>43.2</td>
<td>46.0</td>
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EMG – Swimmer – with DELant pain

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EMG—following vastus lateralis tear and rehabilitation

Muscle activation in Half squat (Back)

![Graph showing muscle activation in half squat with data for different loads and muscle groups.]

**Mean volt (µm)**

<table>
<thead>
<tr>
<th></th>
<th>L_VMO</th>
<th>L_VLQ</th>
<th>REC FEMORIS</th>
<th>R_VMO</th>
<th>R_VLQ</th>
<th>REC FEMORIS</th>
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<tr>
<td>70 KG</td>
<td>259</td>
<td>286</td>
<td>280</td>
<td>330</td>
<td>317</td>
<td>335</td>
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<tr>
<td>90 KG</td>
<td>221</td>
<td>182</td>
<td>363</td>
<td>395</td>
<td>353</td>
<td>411</td>
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EMG – FOLLOWING VASTUS LATERALIS TEAR AND REHABILITATION

CLEAN & JERK

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<tr>
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<th>L_VMO</th>
<th>L_VLO</th>
<th>L_REC</th>
<th>R_VMO</th>
<th>R_VLO</th>
<th>R_REC</th>
<th>L_BIC</th>
<th>R_BIC</th>
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<tbody>
<tr>
<td>JERK 60 Kg</td>
<td>92</td>
<td>224</td>
<td>285</td>
<td>85</td>
<td>261</td>
<td>335</td>
<td>76</td>
<td>102</td>
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<tr>
<td>JERK 80 Kg</td>
<td>103</td>
<td>208</td>
<td>310</td>
<td>93</td>
<td>265</td>
<td>342</td>
<td>127</td>
<td>157</td>
</tr>
<tr>
<td>JERK 90 Kg</td>
<td>100</td>
<td>176</td>
<td>332</td>
<td>124</td>
<td>282</td>
<td>360</td>
<td>195</td>
<td>224</td>
</tr>
</tbody>
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Clean and Jerk

SET UP
DIP/DRIVE
SPLIT/LUNGE
RECOVERY
Badminton Player - shoulder injury

BACKGROUND:

- Right shoulder surgery – 5 months ago
- Bankart shoulder arthroscopy (repair), resection, and debridement done.
- Under going rehab at ISN.
Badminton Player - shoulder injury

Isometric Voluntary contractions

<table>
<thead>
<tr>
<th></th>
<th>Max, uV</th>
<th>Mean, UV</th>
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</thead>
<tbody>
<tr>
<td>Levator Scapulae</td>
<td>16.5</td>
<td>14.7</td>
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<tr>
<td>Lower Trapezius</td>
<td>270</td>
<td>228</td>
</tr>
<tr>
<td>Upper Trapezius</td>
<td>107</td>
<td>92.4</td>
</tr>
<tr>
<td>Posterior Deltoid</td>
<td>287</td>
<td>265</td>
</tr>
<tr>
<td>Infra spinatus</td>
<td>94.6</td>
<td>85</td>
</tr>
<tr>
<td>Serratus Anterior</td>
<td>48.8</td>
<td>43.1</td>
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Dynamic swing movements with shuttle badminton racquet

Dummy action – back swing and forward swing without shuttle
Dynamic swing movements with shuttle badminton racquet

Back swing and forward swing with shuttle
Dynamic swing movements with shuttle badminton racquet
Dynamic swing movements with shuttle badminton racquet

Dummy action – back swing and forward swing without shuttle
Upper extremity structure in men/women
Women Upper – shoulder Internal rotation
Women Upper – Force application away from pivot joint
Women Lower extremity structure
Beginners and equipments

- Novice performer
- Teaching the technique
- Selecting the drills for training
Foot rolling – Drag flicker
PC FLICKER- FRONT
PC FLICKER- FRONT
PC FLICKER- FRONT
PC FLICKER- SIDE
**Main issue:**
During the mid stance phase (weight bearing), the orientation of tibial is lateral and away from the middle of ankle joint line. In case of right and left leg the deviation is 12 - 13 degrees and 9-10 degrees respectively to through the middle of patella.

**Main issue:**
During the mid-stance phase (weight bearing), the heel does have a contact with the ground. Though the body moves forward and ahead of heel line – the heel is still in contact with the ground – thus hyper extending the knee joint which pull the patella medially upwards.
Swimmer – Hyper extension of knee

**Main issue:**
Knee flexed during take off – reduces linear speed of the swimmer during take off
The rotatory force generated by leg tends to drop the body almost at vertical line – reducing the speed

**Main issue:**
Knee flexion angle less at take off – hence needs to generate vertical force
CG raised up
Hyper extension of knee – leading to ecc contraction of hamstrings which inhibits knee to flex
Imbalances and injury
Drag effect - performance
Case – Low back pain

- During the left leg mid stance the left shoulder is dropped.
- The left foot is planted straight almost in line with the hip joint whereas the right leg is planted diagonally and almost crosses the groin line.
- During the push phase - toe off – the toes pivot medially creating an internal rotation of the hip joint in the left leg.
AMPUTEE – RUNNING MECHANICS
Lever type encountered:

LEVER TYPE - 1st order lever

EA = Effort put in retractors, protractors and stabilizer of scapulo-thoracic joint.
RA = Length & Weight of the top tube, frame, body weight (pilot + stoker), tail swing forces
Rhomboid Muscle:

- rhomboids, are **rhombus**-shaped muscles associated with the **scapula** and are chiefly responsible for its retraction. There are two rhomboid muscles:
  - **Rhomboid major muscle**
  - **Rhomboid minor muscle**
Heavier the stoker –

The CG & proportion of weight distribution across the cycle varies.

The angle of initial force & peak force application varies.
CONCLUSION

• A comprehensive approach - which accounts for the events leading to the injury situation (playing situation, player and opponent behaviour), as well as to include a description of whole body and joint biomechanics at the time of injury are essential for effective mechanics analysis.
• Basic understanding of the internal and external risk factors as well as the inciting event (the injury mechanism).
• Early Technique correction and specific training programmes would significantly reduce the incidence of injuries.
• Coaches are the one who should realize the technical issues – but unfortunately they do not have enough sports science support.