



THE UNIVERSITY OF  
WESTERN AUSTRALIA

FACULTY OF LIFE AND PHYSICAL SCIENCES

# Functional screening test associated with altered trunk and pelvis kinematics and low back injury incidence in adolescent fast bowlers

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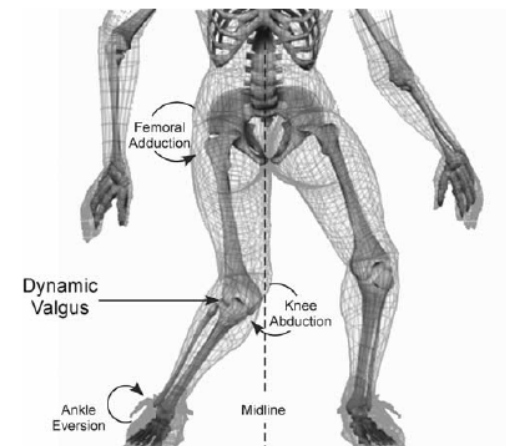
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ACHIEVE INTERNATIONAL EXCELLENCE

## BACKGROUND

- Functional movement assessment
- Dysfunctional hip mechanics associated with lower limb injury *Powers, 2010*
- Lumbo-pelvic-hip complex
- “... dynamic trunk stability cannot exist without pelvis stability” *Powers, 2010*
- Low back injury?



*From Hewett et al., 2005*



## BACKGROUND

- Cricket Australia physiotherapy screening protocol includes the single-leg decline squat (SLDS) to assess control of the lumbo-pelvic-hip complex
- Adolescent fast bowlers prone to low back injury – 55% of bowling injuries affect the low back; lumbar stress fractures in up to 54% *Stretch, 2005; Hardcastle et al., 1992*
- Questions:
  - Is dysfunctional motion on the SLDS associated with low back injury risk?
  - Is there a relationship between lower limb kinematics during the SLDS and kinematics of the lower limb and trunk during bowling?



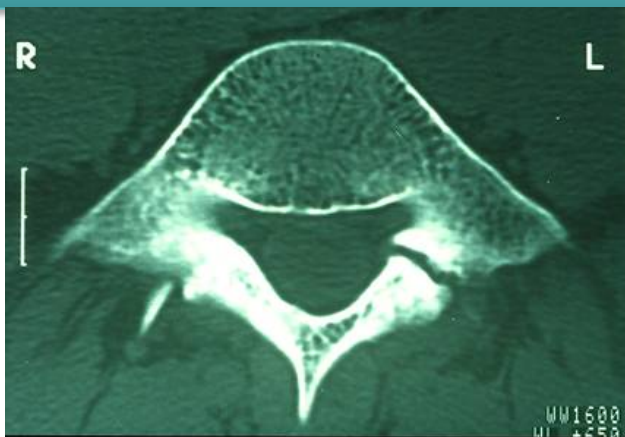
*From Young et al., 2005*



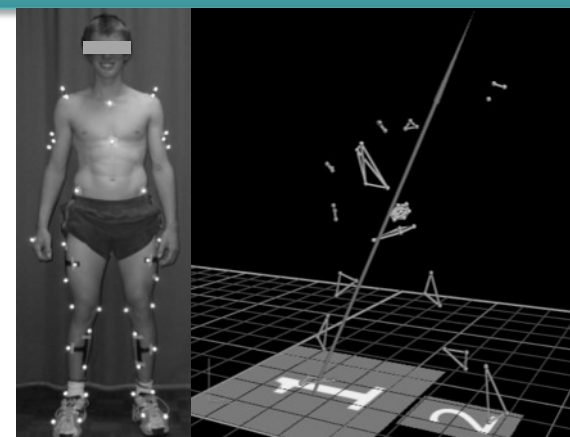
## STUDY AIMS

### SINGLE-LEG DECLINE SQUAT (SLDS)

#### 1. LOW BACK INJURY

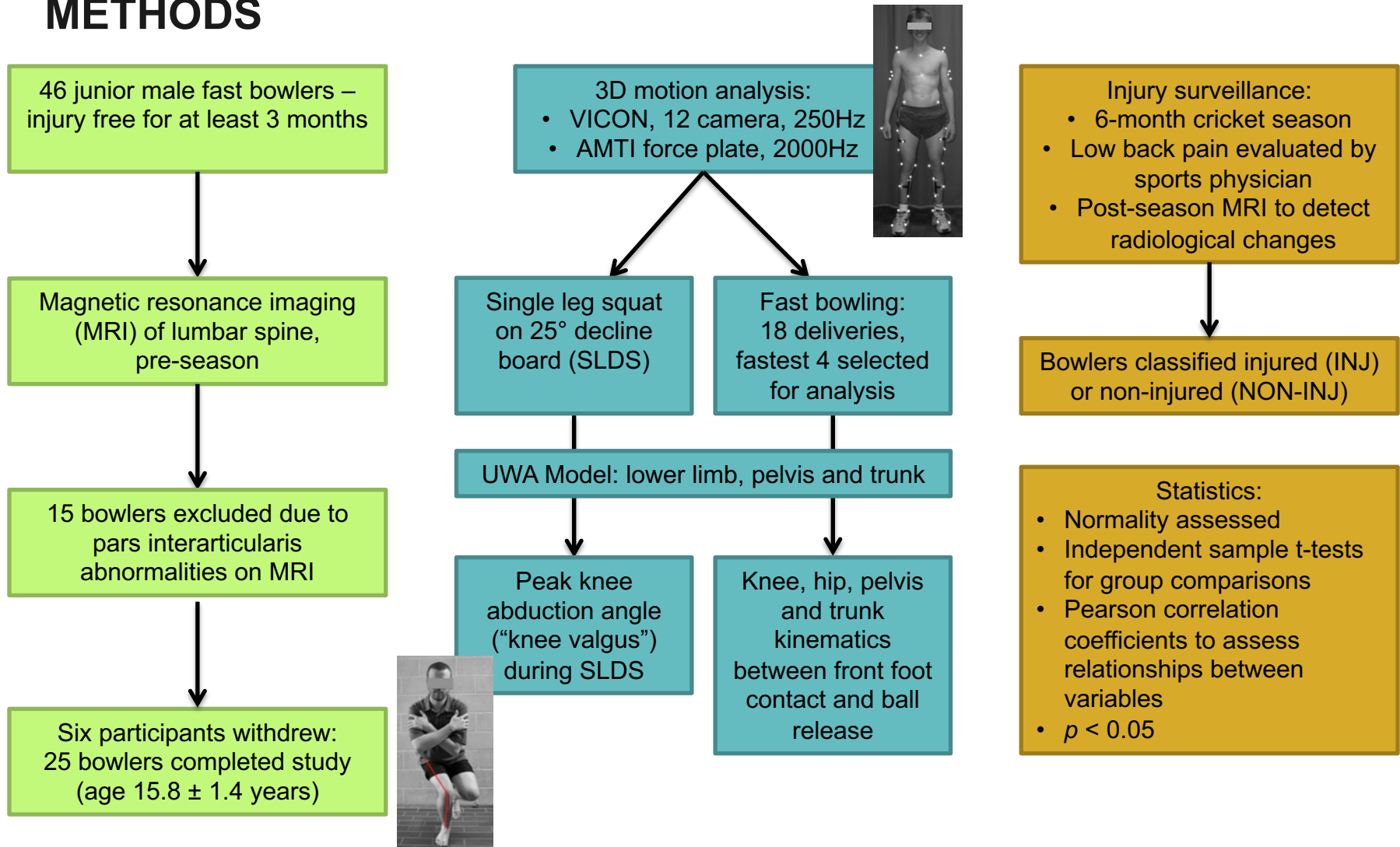


#### 2. BOWLING KINEMATICS





## METHODS

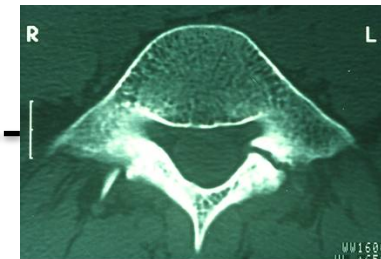


## RESULTS

### 1. LOW BACK INJURY

➤ 12 injured bowlers:

- 6 soft tissue injuries
- 3 symptomatic bone stress injuries
- 3 bone stress injuries on post-season MRI



Descriptive data for injured (INJ) and non-injured (NON-INJ) bowlers

	<i>n</i>	Age (years)	Height (cm)	Mass (kg)	Bowling speed (m.s <sup>-1</sup> )	Peak knee valgus angle on SLDS (°)
INJ	12	15.5 ± 1.4	175.9 ± 9.0	67.0 ± 10.0	29.5 ± 3.1	9.1 ± 4.2*
NON-INJ	13	16.0 ± 1.2	180.7 ± 5.8	71.5 ± 9.1	29.3 ± 2.4	5.5 ± 3.3

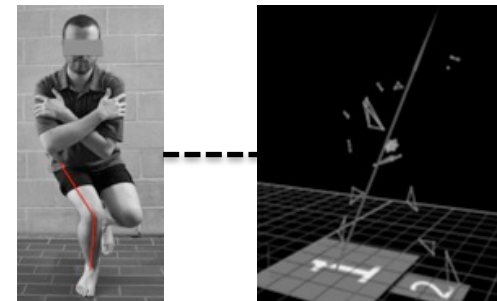
\* significantly different from NON-INJ,  $p < 0.05$

Cohen's *d* effect size: 1.4 (large)



## RESULTS

### 2. BOWLING KINEMATICS



Correlation between peak knee valgus angle during SLDS and lower limb and trunk kinematics during bowling

		Peak knee valgus angle during SLDS	
		<i>r</i>	<i>p</i>
	→ Peak knee valgus angle	0.644	<0.01
Bowling kinematics	→ Peak hip adduction angle	0.448	0.025
	→ Pelvis rotation range of motion	0.426	0.034
	→ Thorax lateral flexion range of motion	0.401	0.047

## DISCUSSION



- Poor control of lumbo-pelvic-hip complex on SLDS affects the segments above and below the pelvis
- Increased frontal plane motion of hip and knee
- Compensatory frontal plane motion of trunk
- Pelvis rotation and trunk lateral flexion → torsional stresses on the lumbar spine



## PRACTICAL IMPLICATIONS

- Two-dimensional assessment of dynamic knee valgus during single leg squat is reliable and valid, compared with 3D

*Munro et al., 2011; McLean et al., 2005*

- Coaching interventions focusing on technique should consider bowler's capacity to maintain pelvic stability





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# THANK YOU



Funding was provided by Cricket Australia

