

ISBS 2018 Auckland Conference

SPRINZ Sport and Exercise Biomechanics Teaching Archive Programme

Tuesday 11th September, 16:10-16:20

Professor Duane Knudson, Dr Anna Lorimer, Professor Patria Hume and Kelly Sheerin



Host

The host of the archive is the *J.E. Lindsay Carter Kinanthropometry Clinic and Archive* (JELCKCA) at the Auckland University of Technology. The director of the Archive is Professor Patria Hume (AUT SPRINZ) and archive web master is Dr Anna Lorimer (Bond University and AUT SPRINZ).

Initiation of this project was a result of planning and hosting the 36th Annual Conference of the International Society of Biomechanics in Sports (ISBS) in Auckland, New Zealand September 10-14, 2018.

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Sport and Exercise Biomechanics Teaching Archive



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- Initiation of this project was a result of planning and hosting the 36th Annual Conference of the International Society of Biomechanics in Sports (ISBS) in Auckland, New Zealand September 10-14, 2018

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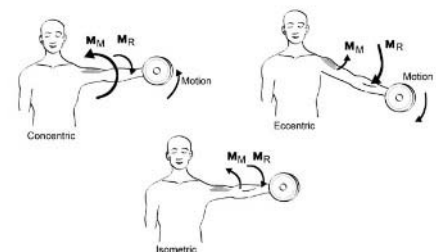
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Muscle Actions

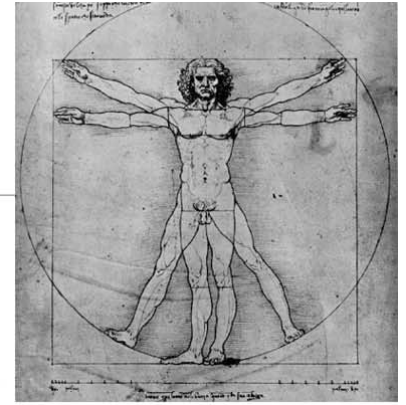
- **Muscle Action**—neuromuscular activation of muscle contributing to movement or stabilization
 - **Isometric**: Moment of force of muscle or muscle group (**active** and **passive** components) is equal to the moment of the resistance—negligible joint motion
 - **Concentric**: Muscle moment is larger than the moment of the resistance—whole muscle shortens
 - **Eccentric**: Muscle moment is less than the moment of the resistance—whole muscle actively lengthens, essentially acting as a brake



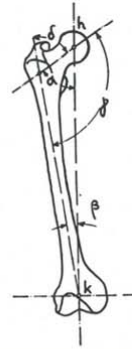
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Knudson (2003)

Anatomy and its Limitations



- **Anatomy**—Study of the **structure** of the human body
- **Anthropometrics**—study of dimensions/properties of body



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Decreasing Peak Force-Pro prospective ↓ in Injuries



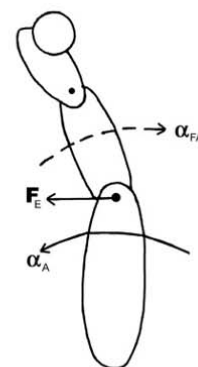
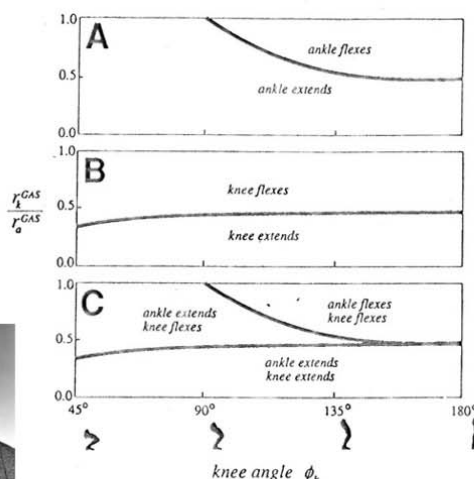
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Hume & Potts (1999); Quarrie et al (2007)

Multi-Segment Transfers & Passive Dynamics

Functional Anatomy should be used with **EXTREME** caution in multi-segment movements

- *Muscles have acceleration actions on all segments of a linked segment system—joint forces transfer force/energy between segments (**passive dynamics**)
- *Bi-articular muscles can create actions opposite of torque created
- *Muscle actions best described as **synergies**
- *Muscle action is task/goal dependent



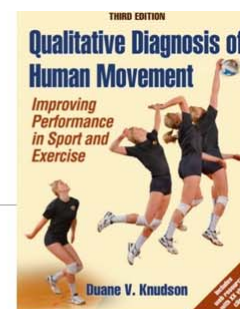
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Zajac & Gordon (1989)

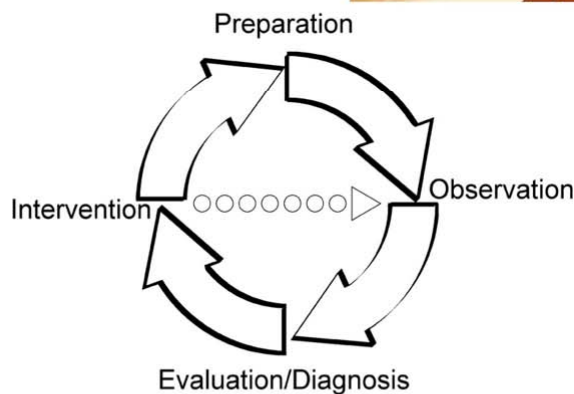
Knudson (2003)

Qualitative Movement Diagnosis Model

- Four Task Model of QMD
 - Integrate knowledge from all subdisciplines of kinesiology, however biomechanics is most important in technique-centric activities
 - More holistic than superficial error detection-correction
 - Avoids “Paralysis by Analysis”



Watch the ball, bend your knees, that'll be \$20 please!



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Knudson & Morrison (2002)