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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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**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

*Slide by D. Knudson for educational use only*  Knudson (2003)

https://commons.nmu.edu/isbs/vol36/iss1/278
Anatomy and its Limitations

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

Decreasing Peak Force-Prospective ↓ in Injuries

*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

![Image of a diagram showing muscle actions and forces]

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 that superficial error detection-correction
  - Avoids “Paralysis by Analysis”

![Image of a qualitative movement diagnosis model]

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

![Additional image with a comic strip related to sports]

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**Slide by D. Knudson for educational use only**

Zaiac & Gordon (1989)  
Knudson (2003)

Knudson & Morrison (2002)