Dynamics

The branch of mechanics concerned with the motion of bodies under the action of forces.

Warning!!

- Beware of conformational bias
- Utilize deep study of new trends and reports
- Sample diverse practitioners and projects
- Realize some of the classics and old guys weren’t that far off
- Beware of marketing and internet gurus
- Be careful with inferences
Motor Learning and Biomechanics

Motor learning is a change, resulting from practice or a novel experience, in the capability for responding. It often involves improving the smoothness and accuracy of movements.

Biomechanics is the movement science field that applies the laws of mechanics and physics to human performance, in order to gain a greater understanding of performance in movement events through modeling, simulation and measurement.

They are not one and the same!

Factors Influencing Distance: The 10,000 foot view!

- Release Velocity; cost/benefit factors
- Angle of Release; how is it obtained?
- Height of Release; a synchronized result

Games Theory- a study of strategic decision making.
Strategies

- Leverage variables to gain distance
- Lever and Axes systems
- Timing systems, alarm theory
- Momentum
- Speeds
- Support Phases
- Flight Phases
- Pathways of implement and athlete

Virus Detection Paradigm

- Build spectral patterns that allow for identification of most pressing or worst virus.
- Search for “Trigger Viruses”.
- Let go of myopic searches and see things in a more fractal, geometric manner.
- Keep “Cause and Effect” analysis at the forefront.

Tensegrity Factors, an Overlooked Phenomena in Technical Change

Tensegrity = tension + integrity

Integrates compression floating in a balanced sea of tension
Motion Analysis: What to Watch and Cue

- Inter-athlete study
  - gender, training age, cultures, evolutions
- Intra-athlete study
  - far throws, poor throws, weather issues, evolution
- Event History and Evolutions
  - film, studies, interviews, reports and texts

Bandwidth of Styles: Shot Put

Discus Bandwidth
Kinematics and Kinetics of the Throws

- Path of the implement: linear undulations and orbitals
- Discus:
Longitudinal, Shoulder and Hip Axes

• At various stages and support phases of the throw
• In relation to rotational factors
• 3 dimensional analysis critical

Head Positions

• Deviations in the frontal, sagittal and transverse planes

Free Arm Movement Paths and Timing
Throwing Arm Movements

- Shoulder
- Elbow
- Hand

Javelin

Hip, Knee and Ankle Factors

- Angles, ranges, congruency
- Pathways of movement
- Timing
- Support phase and flight phase factors
Longitudinal Foot Axis

- In double support phases
- In single support phases
- In flight phases

Elastic Energy Advantages

Spatial and Temporal Dynamics

Table 3: Duration of the single (S) and the double (D) support phases in the 1st, 2nd, 3rd and 4th turns (in seconds)

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<th>S3</th>
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Figure 3: The duration of each turn (% of percentage of the total duration of the turn). The colors indicate different phases.
Temporal Dynamics-Discus

Optimum Temporal Rhythm
- Unwind ≥ 0.6 sec
- 0.45 sec S Single support on the back ≤ 0.55 sec
- 0.08 sec S Flight ≤ 0.12 sec
- 0.17 sec S Single support in the middle ≤ 0.22 sec
- 0.15 sec Delivery ≤ 0.17 sec

Preparation Phase or Windup

- Balance
- Rhythm and Timing
- Replication of program disc drives
- Elastic strength promotion
- Conservation of momentum
- Conservation of acceleration
Positive Movement Phase

- Free side dynamics
- Throwing side dynamics
- Support leg dynamics
- Flight phase dynamics
- Free leg or swing leg dynamics
- Foot positions and dynamics

Support Phase/Flight Phase

Delivery Phase Dynamics

Distance between the release point and toes of the front leg in horizontal direction (Finnish male throwers 2004-2012)