BI 199 APWT Discussion 9

I. Announcements  Update on poster outline feedback!

II. Lower Back & Hip Exercise Anatomy
A. Back extension
B. Lower back & hip anatomy
C. Russian dead lift vs. good morning?

III. Advantages of Dumbbells

IV. Abdominal Exercise Anatomy (Review)

V. Exercise Classification Systems
Isometric, isotonic, DAR, isokinetic

VI. Group Overview of Presentations
Back Extension

Lower back
Hip
Back of thigh

Beginners beyond here?

Erector spinae
Gluteal group
Hamstring group

Alignment?
Russian/Straight Leg (Knee) Dead Lift (RDL)

**NB**: Best bent or soft knee!
Use Dumbbells to:
1. Start w/↓ weight
2. ↑ control, cf: COG
3. ↑ balance
4. ↑ small incremental resistance

NB: Want curved or tip up!
Dumbbells enable independent, unilateral, multi-planar, resistance exercise, more akin to daily life movements!
Good morning?

Always soft knees!
Lower Back Muscles

- Levator costae
- Iliocostalis
- Deep
  - L
- Spinalis
- Erector spinae

Higher view cf:

- Latissimus dorsi
- Superficial
  - R
- Fascia over Erector spinae
- External & Internal Obliques
Deep Upper Back Muscles, Thorax/Chest

- Spinous process of 4th thoracic vertebra
- Rotator m.
- Longissimus m. tendon
- Levator costae m.
**Sit up or Curl up**

1. Feet *unanchored*
2. Chin to chest (gently)
3. Trunk up to only 35-45°, otherwise activate iliopsoas
4. To keep feet down, activate hamstrings so inhibit quadriceps, thus ↑ abdominal activation!

- Hands @ side to ↓ resistance.
- Hands overhead to ↑ resistance!
External oblique

Internal oblique

Rectus abdominis

R Lower Abdomen
Discussion

+ Q?
Table 3.1  Characteristics of Weight Training Exercises and Systems

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Isometric</th>
<th>Isotonic</th>
<th>Isokinetic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Contraction/ Synonym</td>
<td>Static</td>
<td>Dynamic</td>
<td>Dynamic&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Relative Expense</td>
<td>None or low</td>
<td>Low&lt;sup&gt;b&lt;/sup&gt; to high&lt;sup&gt;c&lt;/sup&gt;</td>
<td>High</td>
</tr>
<tr>
<td>Maintenance</td>
<td>None or low</td>
<td>Low&lt;sup&gt;b&lt;/sup&gt; to moderate&lt;sup&gt;c&lt;/sup&gt;</td>
<td>Moderate to high</td>
</tr>
<tr>
<td>Portability</td>
<td>Not required</td>
<td>Easy&lt;sup&gt;b&lt;/sup&gt; to difficult&lt;sup&gt;c&lt;/sup&gt;</td>
<td>Moderate to difficult</td>
</tr>
<tr>
<td>Concentric loading</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Eccentric loading</td>
<td>No</td>
<td>Yes</td>
<td>No&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>Accommodation</td>
<td>No</td>
<td>No&lt;sup&gt;b&lt;/sup&gt;/Yes&lt;sup&gt;c&lt;/sup&gt;</td>
<td>Yes</td>
</tr>
<tr>
<td>Intramuscular tension</td>
<td>Low to high?</td>
<td>Moderate&lt;sup&gt;b&lt;/sup&gt; to high&lt;sup&gt;c&lt;/sup&gt;</td>
<td>Moderate to high</td>
</tr>
<tr>
<td>Potential for delayed muscle soreness</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Potential for rehabilitation</td>
<td>Limited</td>
<td>Moderate to high</td>
<td>High</td>
</tr>
</tbody>
</table>

<sup>a</sup>Since the velocity on isokinetic devices may be set to zero, static contractions are also possible.

<sup>b</sup>For free-weight barbells, dumbbells, and most other constant load devices.

<sup>c</sup>For isotonic dynamic accommodating resistance (DAR) devices.

<sup>d</sup>New isokinetic devices by Chattecx (Kincom) and Loredan (Lido) have built-in options for constant velocity eccentric loading. These are exceptions to typical isokinetic machines.
Isometric Squat Works Very Limited Range, But Can Help with Sticking Points

NB: ≈ 5-10° around set <, → limited functionality!
Functional isometrics at an early age!
Isotonic Barbells & Dumbbells
Most CWT Machines & WT Equipment Isotonic
Force x Force Arm = Weight x Weight Arm

\[ F \times FA = W \times WA \]

\[ F = \frac{W \times WA}{FA} \]

\[ F = \frac{10 \text{ lb.} \times 8''}{3''} \]

\[ F = 26.67 \text{ lb.} \]
Isokinetic Omni-tron: Concentric-Concentric

Velocity = C

NB: Relatively constant!
Can these also evolve into Isometric?

Yes, if you handle more weight than you can overcome or set \( \vec{v} = 0! \)
Dynamic Accommodating Resistance (DAR)

**NB:** Nautilus machine from 1980s!

Odd-shaped Cam
Simplified Cam System

A. Start

WA

AXIS

1d

W = 100 lb.

W = 100 lb.

F_A = W x WA = 100 x 1d = 100d

B. Finish

WA

AXIS

\frac{1}{2}d

10

20

30

40

50

60

70

80

90

100

F_B = W x WA = 100 x \frac{1}{2}d = 50d
Group Overview of Presentations