Motor Learning Best Practices: From Theory to Practice

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Today’s Presentation

- Overview of motor learning principles related to skill complexity
- Building appropriate progression
  - Equipment modifications
  - Manipulating environmental conditions
  - Adjusting practice
- quickstart tennis
Adults Games for Children?

- Regulation Games are not always age-appropriate
- Must often adapt and modify regulation game
- Practice teachers and students always think that means breaking things apart (that can be problematic if artificial breaks are made)
- What are other ways to modify, simplify, etc. for the younger learner?
Consider Tennis

Poulton’s Skill Continuum

CLOSED  OPEN

SELF-PACED  EXTERNALLY PACED

FIXED ENVIRONMENT  CHANGING ENVIRONMENT
OPEN SKILL

 CHARACTERISTICS

• SPATIAL AND TEMPORAL CONTROL
• LOW PREDICTABILITY
• MOVING ENVIRONMENT
• SKILL LEVEL OF PERFORMER
• DEGREE OF MOVEMENT
### Gentile’s Taxonomy
Movement Dimensions (Columns)

<table>
<thead>
<tr>
<th>Movement</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Stability; No Object Manipulation</td>
<td>Body Stability; Object Manipulation</td>
</tr>
<tr>
<td>Body Transport; No Object Manipulation</td>
<td>Body Transport; Object Manipulation</td>
</tr>
<tr>
<td>Stable Environment; No Inter-trial Variability (ITV)</td>
<td>![Image]</td>
</tr>
<tr>
<td>Stable Environment; ITV</td>
<td>![Image]</td>
</tr>
<tr>
<td>Moving Environment; No ITV</td>
<td>![Image]</td>
</tr>
<tr>
<td>Moving Environment; ITV</td>
<td>![Image]</td>
</tr>
</tbody>
</table>
## Gentile’s Taxonomy

<table>
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<tr>
<th>Environment/ITV</th>
<th>Body Stability; No Object Manipulation</th>
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<th>Body Transport; No Object Manipulation</th>
<th>Body Transport; Object Manipulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable Environment; No ITV</td>
<td>1 Free Throw</td>
<td>2 Penalty shot in field hockey to same location each attempt</td>
<td>3 Running Long Jump</td>
<td>4 “Happy Gilmore” on driving range to no target</td>
</tr>
<tr>
<td>Stable Environment; ITV</td>
<td>5 Softball Pitcher</td>
<td>6 <strong>Tennis Serve - Expert</strong></td>
<td>7 High Jump</td>
<td>8 Pole Vault</td>
</tr>
<tr>
<td>Moving Environment; No ITV</td>
<td>9 Riding on an escalator</td>
<td>10 Hitting a baseball from a pitching machine at 1 speed/location</td>
<td>11 Running on a treadmill at variable speeds</td>
<td>12 <strong>Hitting ground strokes from a tennis machine while one the move</strong></td>
</tr>
<tr>
<td>Moving Environment, ITV</td>
<td>13 Catcher guarding the plate and tagging out a baserunner</td>
<td>14 <strong>Tennis Serve - Novice</strong></td>
<td>15 Running a cross country race</td>
<td>16 <strong>Return of Serve Groundstrokes</strong></td>
</tr>
</tbody>
</table>
Accuracy and Movement

Fitts Law

Speed Accuracy Trade-off

3 Factors Influence Movement Accuracy

Distance

Target Size

Movement Speed
Distance

Reciprocal Tapping Task

Increased distance = increase movement time
Smaller Targets = Increased Movement Time or Decreased Accuracy
Improving Accuracy in Tennis

**Decrease Distance**
- Move closer to net
- Choke down on racquet
- Short handle racquet or paddle

**Increase Target size**
- Larger Ball
- Larger racquet face
- Increase the boundaries
Improving Accuracy in Sport

**Slow Speed to Increase Accuracy**
Sports that Require both Accuracy and Speed

- How do we teach these?
TEACHER FACILITATION OF SKILL

- DESIGNING APPROPRIATE SKILL PRACTICE
Variations: Tennis Groundstrokes

- Environmental Dimension
  - Moving Environment
    - Unpredictable
  - Inter-trial Variability
  - Position of object in space
    - Quite variable
- Movement Dimension
  - Body Transport: Yes
  - Object Manipulation: Yes
Other Characteristics of the Tennis

- Fast paced
- A lot of space to cover
- Lots of movement
- Must keep ball within boundaries on other side
- Lower net in middle of court
- Other?
Equipment Modifications

- Smaller Racquets
- Larger Balls
- Less compression in balls
- Smaller court
- Lower net
Tennis Serve

Objective

- To get ball into required court area with sufficient velocity to gain some advantage
- Thus, serve presents an accuracy/speed problem for the learner and the facilitator
  - Since speed and accuracy trade off, and both are important, must emphasize both
Analyzing and Enhancing Performance