Expertise in Sport: Human Adaptations to Practice and Instruction

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Aims

• Outline relationship between practice and human achievement

• Summarise adaptations that arise as a result of engagement in practice

• Consider implications for talent search and development
Practice History Profiles of Elite Performers
Ericsson et al. (1993) Psych Review

Accumulated Practice Hours

Years of Age
20-30 Hours Per Week
10 Years of Practice
6000-11000 Hours
Non-Coach Led Practice Activity (13-16 years)

Deliberate Play

Ford et al. (2008) High Ability Studies
Non-Coach Led Practice Activity (6-12 years)

- Professional
- Released
- Recreational

Ford et al. (2008) JSEP
Time-Motion Analysis of Practice

Percentage of time in varying soccer-specific training activities for U16s
Practice History of English Academy Soccer Player

• 9-10 years
• 800 hours per year
• 16 hours per week
  - team practice = 4 hrs
  - individual practice = 5 hrs
  - deliberate play = 7 hrs

• 7500 hours
Adaptations to Practice: Plasticity and Adaptability
Key Findings on Perceptual-Cognitive Expertise

• Ability to pick-up advance visual cues
900 ms before ball racket contact (BRC)

600 ms before BRC

300 ms before BRC

At BRC

After BRC

Farrow et al. (2003)

Research Institute for Sport & Exercise Sciences

FACULTY OF SCIENCE
Huys et al. (in press) Perception and Psychophysics, JMB

Williams et al. (in press) HMS
Key Findings on Perceptual-Cognitive Expertise

- Ability to pick-up advance visual cues
- Superior pattern recognition skills
Williams et al. (2006) Perception
Key Findings on Perceptual-Cognitive Expertise

- Ability to pick-up advance visual cues
- Superior pattern recognition skills
- More effective visual search strategies
Key Findings on Perceptual-Cognitive Expertise

- Ability to pick-up postural anticipation cues
- Superior pattern recognition skills
- More efficient visual search behaviour
- More refined event probabilities/expectations
Ward & Williams (2003) JSEP
Key Findings on Perceptual-Cognitive Expertise

- Ability to pick-up postural anticipation cues
- Superior pattern recognition skills
- More efficient visual search behaviour
- More refined event probabilities/expectations
- Enhanced tactical decision-making
Vaeyens et al. (2007a,b) JMB, JSEP
McPherson (2003)
Implications for Talent Search and Development
Implications for Talent Search

- Expertise multi-faceted – difficult to define, particularly in team sports
- No real ‘gene’ or measurable performance indicator that will predict success at early age
- Human system adapts to training
- Motivation and sustained commitment – heritable differences may present limits on achievement
Implications for Talent Development

- Retain and recruit as many athletes as possible
- Motivation, commitment and enjoyment key
- Practice opportunities need to be appropriate and abundant
- Provide appropriate systems and support networks
What is ‘appropriate’ practice?

- Circularity of coaching doctrine - intuition, tradition and emulation
- Coaching practice often informed by ‘myths’
- Practice must be based on empirical evidence
An Example From Hockey
Anticipation Performance on Laboratory- and Field-Based Tests Pre and Post Training

**Laboratory-Based Test**

<table>
<thead>
<tr>
<th></th>
<th>PRE</th>
<th>POST</th>
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<tbody>
<tr>
<td>Placebo</td>
<td>800</td>
<td>700</td>
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<tr>
<td>Control</td>
<td>850</td>
<td>750</td>
</tr>
<tr>
<td>Training</td>
<td>900</td>
<td>800</td>
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</tbody>
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**Field-Based Test**

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<thead>
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<th>PRE</th>
<th>POST</th>
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<tbody>
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<tr>
<td>Control</td>
<td>700</td>
<td>600</td>
</tr>
<tr>
<td>Training</td>
<td>800</td>
<td>700</td>
</tr>
</tbody>
</table>
An Example From Tennis
Delivery of Training

Explicit instruction

Hips closed =
Down the line
Got it!

Problem focused training

= ?
Ah-hah!!!
Key Information Sources

- Experts focus upon
  - Hip position and rotation
  - Shoulder position and rotation
  - Racket orientation and position

Proximal to distal cues
Measuring Effectiveness

**Off-court**
- Video
- Response timer
- 4 response mats
- 2 start mats
- Projector
- Life size screen
- Eye tracking system
- Magnetic head tracking system

**On-court**
Acquisition Trials

Decision time (ms)

Explicit-rules
Guided discovery
Discovery learning

Perceptual cognitive training session
Pre, Post and Anxiety

![Bar chart showing decision time (ms) for Explicit, Guided Discovery, Discovery, and Control groups. The x-axis represents the different conditions, and the y-axis represents decision time in milliseconds. The chart includes red bars for Pretest, blue bars for Posttest, and yellow bars for Anxiety.]
Pre, Post and Anxiety

Decision Time (ms)

Explicit  Guided Discovery  Discovery  Control

-100 0 100 200 300 400 500 600

Pretest  Posttest  Anxiety

Explicit: Pretest, Guided Discovery: Pretest, Discovery: Pretest, Control: Pretest

Guided Discovery: Pretest, Guided Discovery: Posttest, Discovery: Posttest, Control: Posttest

Discovery: Pretest, Guided Discovery: Pretest, Discovery: Posttest, Control: Posttest

Control: Pretest, Guided Discovery: Pretest, Discovery: Pretest, Control: Pretest

-100 0 100 200 300 400 500 600

Explicit  Guided Discovery  Discovery  Control

-100 0 100 200 300 400 500 600

Pretest  Posttest  Anxiety

Explicit: Pretest, Guided Discovery: Pretest, Discovery: Pretest, Control: Pretest

Guided Discovery: Pretest, Guided Discovery: Posttest, Discovery: Posttest, Control: Posttest

Discovery: Pretest, Guided Discovery: Pretest, Discovery: Posttest, Control: Posttest

Control: Pretest, Guided Discovery: Pretest, Discovery: Pretest, Control: Pretest

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Discovery: Pretest, Guided Discovery: Pretest, Discovery: Posttest, Control: Posttest

Control: Pretest, Guided Discovery: Pretest, Discovery: Pretest, Control: Pretest
What is an ‘appropriate’ system or support network?

- Specialisation vs. diversification
- Play vs. practice
- Biological maturity vs. latent talent
Seasonal Birth Date Bias in Elite Soccer

6078 Premier League Academy Players (9-16 years)
## Seasonal Birth Date Bias in Elite Soccer

<table>
<thead>
<tr>
<th>Country</th>
<th>Months 1-3</th>
<th>Months 9-12</th>
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<tbody>
<tr>
<td>England</td>
<td>50.0</td>
<td>17.1</td>
</tr>
<tr>
<td>France</td>
<td>43.9</td>
<td>14.6</td>
</tr>
<tr>
<td>Germany</td>
<td>50.5</td>
<td>3.8</td>
</tr>
<tr>
<td>Italy</td>
<td>46.8</td>
<td>3.9</td>
</tr>
<tr>
<td>Netherlands</td>
<td>36.8</td>
<td>15.8</td>
</tr>
<tr>
<td>Spain</td>
<td>47.2</td>
<td>2.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>45.9%</strong></td>
<td><strong>9.0%</strong></td>
</tr>
</tbody>
</table>

National youth teams U15, U16, U17, U18 - Helsen et al. (2005), JSS
What is an ‘appropriate’ system or support network?

- Specialisation vs. diversification
- Play vs. practice
- Biological maturity vs. latent talent
- Talent search vs. talent development
Conclusions

• No ‘genes’ that differentiate elite from near elite athletes – no holy grail!

“Expertise arises as a result of specific adaptations to the constraints of the performance environment”


• Motivation and persistence key

• No short cuts – practice, practice, practice!

• Focus on effective models and systems of talent development