Gagné’s Differentiated Model of Giftedness and Talent (DMGT)

• **Giftedness** is defined as “the possession and use of *untrained and spontaneously expressed natural abilities* (called aptitudes or gifts), in at least one ability domain, to a degree that places an individual at least amongst the top 10% of age peers”

• **Talent** is defined as “the superior mastery of *systematically developed abilities* (or skills) and knowledge in at least one field of human activity to a degree that places an individual at least amongst the top 10% of age peers who are or have been active in that field or fields”

• Where giftedness is the beginning of the learning process, talent is the result of it.
Talented Individuals

• High Energy
• Creativity
• Imagination
• Less “Linear”

• Equally applicable in Art, Music, Football

Talent ID: A Long History

The notion that we can identify talented individuals in a given domain is not new. Despite ongoing attempts, science and practice have still not found a means to accurately identify talented individuals, whether it be in a specific sport or another domain.

‘No empirical support for the traditional approach to talent ID in sport’ (Vaeyens et al., 2009)

International level athletes, 50% more time in total sport involvement than national level athletes = only discriminating factor

Wide range of talent ID programmes in existence
Multidimensional Model of Talent

Physical predictors
- Height
- Weight
- Body size
- Bone diameter
- Muscle girth
- Somatotype
- Growth
- Body fat

Sociological predictors
- Parental support
- Socio-economic background
- Education
- Coach-child interaction
- Hours in practice
- Cultural background

POTENTIAL PREDICTORS OF TALENT IN SOCCER

Psychological predictors
- Perceptual-cognitive skills
  - Attention
  - Anticipation
  - Decision making
  - Game intelligence
  - Creative thinking
  - Motor/technical skills
- Personality
  - Self-confidence
  - Anxiety control
  - Motivation
  - Concentration

Physiological predictors
- Aerobic capacity
- Anaerobic endurance
- Anaerobic power
Talent identification

• Evidence based forecast of expert from novice or sub-elite level
  1. Establish clear strategy/objective for programme
  2. Orchestrate quality talent development environment
  3. Undertake evidence-based identification phase

Gulbin (2008)
Time course of TID

Talent selection
Sub-elite

Talent detection
Elite

Mastery

Gulbin (2008)
The Australian Institute of Sport
The Talent Search Programme

- Determine
  - Requirements of different sports
  - Type of athlete suited to competition
- Test in schools (ages 14-15) for a match (1995, 5yr to Sydney). Top 2% taken

<table>
<thead>
<tr>
<th>Height</th>
<th>Sitting Height</th>
<th>Body Mass</th>
<th>Arm Span</th>
</tr>
</thead>
<tbody>
<tr>
<td>40m Sprint</td>
<td>Vertical Jump</td>
<td>Seated B’Ball Throw</td>
<td>MSFT</td>
</tr>
</tbody>
</table>

- Sport Specific Lab Testing (Top 10% Taken to Talent Development)

eTID:
The Talent Search Programme

- Women’s soccer (Hoare and Warr, 2000)
- 12 month talent development programme
- 2 players to State League

<table>
<thead>
<tr>
<th>TEST</th>
<th>TRIALLISTS ($n = 59$)</th>
<th>SELECTED PLAYERS ($n = 13$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertical jump (cm)</td>
<td>Mean ± SD</td>
<td>Mean ± SD</td>
</tr>
<tr>
<td>5 m sprint (s)</td>
<td>1.23 ± 0.09</td>
<td>1.18 ± 0.06</td>
</tr>
<tr>
<td>10 m sprint (s)</td>
<td>2.08 ± 0.18</td>
<td>2.01 ± 0.08</td>
</tr>
<tr>
<td>20 m sprint (s)</td>
<td>3.63 ± 0.23</td>
<td>3.47 ± 0.14</td>
</tr>
<tr>
<td>Agility 505 (s)</td>
<td>2.75 ± 0.15</td>
<td>2.64 ± 0.09</td>
</tr>
<tr>
<td>MSFT score (level + shuttle)</td>
<td>7 ± 0 ± 1.9</td>
<td>7 ± 9 ± 1.3</td>
</tr>
<tr>
<td>Predicted VO$_{2\text{max}}$ (ml.kg$^{-1}$min$^{-1}$)</td>
<td>36.3 ± 6.4</td>
<td>39.4 ± 4.3</td>
</tr>
<tr>
<td>Height (m)</td>
<td>1.63 ± 0.06</td>
<td>1.64 ± 0.03</td>
</tr>
<tr>
<td>Body mass (kg)</td>
<td>54.5 ± 7.4</td>
<td>55.3 ± 6.67</td>
</tr>
<tr>
<td>Age (years)</td>
<td></td>
<td>15.4 ± 1.06</td>
</tr>
</tbody>
</table>
The Australian Institute of Sport

The Talent Search Programme

- Women’s soccer
  - (Hoare and Warr, 2000)
- Recommendations:
  - Minimum 12 month commitment
  - Develop goalkeeper test
  - Develop game sense test
    - lacking in many good athletes
  - True assessment takes 2-3 months
    - don’t underestimate late developers
  - Keep team together for more than 1 year
Physiological Testing and Talent in Young Footballers in the UK

• Work between Coventry University and Coerver Coaching
• Players (n = 120, aged 11-17) assessed 3 X year on a range of field based fitness tests
• Used by coaches to gauge progress compared to norms
• Data from initial phase of testing presented here with some suggestion for future analysis of talent ID information.
Physiological Testing and Talent in Young Footballers in the UK

- Hand Grip Strength
- Counter Movement Jump (CMJ)
- Height, Mass
- Body Fatness (using SKF)
- Sprint Speed (5, 10, 30m)
- Agility (T-Test)
- Lateral Balance
- Anterior-Posterior Balance
- Pre, Mid, End Season
Physical Testing of Talented Individuals

- Multiple correlations between fitness test variables
- 30m Sprint single best predictor of agility performance (P=.0001, Adj R^2 = .531)

- CMJ Height vs Agility T-test
  - r = .35, P = .002

- Agility vs 30m Speed
  - r = .74, P = .001

- Agility vs 5m Speed
  - r = .6, P = .001
Comparison to the Norm

Grip strength and sprint scores in excess of 60th Percentile for age.

Agility T-Test scores equivalent to elite players of same age.

CMJ scores equivalent to published data on elite Portuguese and American players.

If in doubt take the heaviest

- A number of talent ID programmes have focused on what is measurable
- Consistently Body mass and/or height have been related to success in football

![Graphs showing relationship between 30m Speed and Body Mass, as well as Grip Strength and Body Mass.](image)
If in doubt take the heaviest and/or tallest

FIFA U17 World Cup (2005)

<table>
<thead>
<tr>
<th>Av Squad Height</th>
<th>Av Squad Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Italy 1.82m</td>
<td>Brazil 74.2kg</td>
</tr>
<tr>
<td>2. Brazil 1.8m</td>
<td>Uruguay 74.9kg</td>
</tr>
<tr>
<td>3. Turkey 1.79m</td>
<td>Holland 72.4kg</td>
</tr>
<tr>
<td>4. Holland 1.75m</td>
<td>Peru 72.2kg</td>
</tr>
<tr>
<td>5. Ivory Coast 1.75m</td>
<td>Turkey 72.3kg</td>
</tr>
<tr>
<td>6. Mexico 1.74m</td>
<td>Mexico 70.1kg</td>
</tr>
</tbody>
</table>

Mexico won the tournament. But 95% (19/20) born in first 6 months, 0 players in last 3 months

Brazil 70% in the first 6 months, 5% (1 player in last 3 months)

Reliance on height and mass in performance assessment can be erroneous and results in distortion due to age, we simply associate better performance due to being older
Is the relative age effect (RAE) a problem?

The relative age effect (RAE) in sport, first noted among elite level ice hockey players in the USA. Findings demonstrated that for major junior leagues and the NHL, player birth dates decreased in frequency from January through December.

The RAE is strikingly evident in activities that are competitive and where performance is highly correlated with age and maturity.

It was theorized that the RAE arose from the consequences of grouping young boys for entry into organized sport, thereby producing a one-year age range for the participants.

As size, speed, and coordination are highly correlated with age, older players within the age-group will, on average, show superior performance.
Is the relative age effect (RAE) a problem?

RAE Effects in our Coerver data (11-14 year olds)

- **Grip Strength (Kg)**
  - Jan: 19
  - July: 18.5
  - Dec: 18

- **30m Sprint Speed**
  - Jan: 1.2
  - July: 1.18
  - Dec: 1.16

- **CMJ Height (cm)**
  - Jan: 29.5
  - July: 29
  - Dec: 28.5
Could age independent locomotor performance be used for talent identification in footballers?

Unidimensional approach used in many studies may be counter productive resulting in maturity being mistaken for ability.

Principal Component Analysis might provide a better way to use fitness testing for talent ID performance.

Sixty male footballers, aged between 11 and 17 years old (mean ± SD=13.8±1.3 years), coached by Coerver Coaching UK, undertook the following:

<table>
<thead>
<tr>
<th>Lateral Balance</th>
<th>Anterior/Posterior Balance</th>
<th>Agility T-Test</th>
<th>Tricep and Calf SKF</th>
<th>Vertical Jump</th>
</tr>
</thead>
<tbody>
<tr>
<td>30m Sprint</td>
<td>Height</td>
<td>Mass</td>
<td>Max Forearm Girth</td>
<td>Handgrip Strength</td>
</tr>
</tbody>
</table>
Could age independent locomotor performance be used for talent identification in footballers?

Principal component analysis (PCA) used to ‘group’ variables and reduce the number of variables to avoid multicollinearity in the data sets.

When absolute data was taken most variables correlated with each other in this age group, but also all correlated with age.

When age residuals were taken and used with PCA

Figure 1: Sprint significantly correlated with grip strength ($r = -0.737$). Stronger = faster.

Figure 2: Sprint significantly correlated with anthropometrics ($r = -0.783$). Taller = faster.

Figure 3: No significant correlation between sprint and agility ($r = .006$).
Could age independent locomotor performance be used for talent identification in footballers?

Good agility performance requires rapid direction changes, therefore involving high acceleration rates.

Although absolute acceleration and sprint speed correlate with each other, they are also correlated with anthropometrics (Vanhooydonck et al. 2006).

Using age residuals we found that sprint performance was significantly correlated with anthropometrics PC2, but not agility performance.

Usage of age residuals and PCA may prove a useful tool in analyses within the talent ID process.

Some differences in player performance may be due to rate of development (biological age). Thus age residuals need to be used within Talent ID over a prolonged time period.

10,000 Hour Rule

Nothing new here, well established in multiple domains from chess to music to sport.

Soloist: 10,000 hours practice
- 3 hrs a day
- 7 days a week
- 10 years
Age 13
- 3-4 hours a day

Professional player threshold
- 8 hours a day

Clear from the literature that to attain this performers have to engage in ‘deliberate practice’ focused on skill acquisition.

The 10-year rule

Age

# activities

Hours per week

Non-experts activities
Experts activities
Non-experts hours per week
Experts hours per week

Figure 2. Comparison of expert and non-expert participation in other activities and training hours per week by chronological age.

Predicted development of the interval endurance capacity, assessed as interval shuttle run test (ISRT) score, of talented youth field hockey players in the age band 12-19 years.
So, are we overlooking skill acquisition and deliberate practice in favour of fitness test type measures?

Work by Robbie Wilson at the University of Queensland would suggest so.

Used PCA to examine range of variables related to football ‘talent/expertise’ in a range of populations.
Consistent patterns of findings from PCA analysis on the contributing factors to football performance

With University players, English Championship players and National team in Europe

### Passing Accuracy

**http://www.youtube.com/watch?v=amaCZ9E7pxA&NR=1**

<table>
<thead>
<tr>
<th>Player</th>
<th>20m Passing Accuracy (Pts)</th>
<th>20m Passing Asymmetry (Pts)</th>
<th>35m Pass Accuracy (Pts)</th>
<th>35m Passing Asymmetry (Pts)</th>
<th>20m Shooting Accuracy (Pts)</th>
<th>20m Shooting Asymmetry (Pts)</th>
<th>Wall-Pass (Pts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X1</td>
<td>5.57</td>
<td>0.71</td>
<td>6.32</td>
<td>8.07</td>
<td>4.32</td>
<td>0.21</td>
<td>8.50</td>
</tr>
<tr>
<td>X2</td>
<td>6.32</td>
<td>0.64</td>
<td>7.07</td>
<td>5.29</td>
<td>5.64</td>
<td>1.00</td>
<td>18.50</td>
</tr>
<tr>
<td>X3</td>
<td>6.75</td>
<td>1.50</td>
<td>5.75</td>
<td>3.50</td>
<td>6.75</td>
<td>2.07</td>
<td>18.75</td>
</tr>
<tr>
<td>X4</td>
<td>7.14</td>
<td>0.00</td>
<td>7.93</td>
<td>4.57</td>
<td>5.61</td>
<td>3.79</td>
<td>15.25</td>
</tr>
<tr>
<td>X5</td>
<td>6.25</td>
<td>2.36</td>
<td>7.75</td>
<td>2.79</td>
<td>4.57</td>
<td>1.71</td>
<td>12.00</td>
</tr>
<tr>
<td>X6</td>
<td>7.11</td>
<td>0.64</td>
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<td>5.00</td>
<td>6.18</td>
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<td>6.36</td>
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<td>X8</td>
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<td>5.61</td>
<td>5.21</td>
<td>2.79</td>
<td>1.00</td>
<td>8.25</td>
</tr>
<tr>
<td>X9</td>
<td>4.25</td>
<td>0.64</td>
<td>1.79</td>
<td>3.00</td>
<td>3.82</td>
<td>0.36</td>
<td>0.00</td>
</tr>
<tr>
<td>X10</td>
<td>6.50</td>
<td>2.00</td>
<td>6.75</td>
<td>4.50</td>
<td>3.86</td>
<td>0.57</td>
<td>12.25</td>
</tr>
<tr>
<td>X11</td>
<td>6.36</td>
<td>1.71</td>
<td>5.86</td>
<td>0.29</td>
<td>5.75</td>
<td>2.21</td>
<td>10.00</td>
</tr>
<tr>
<td>X12</td>
<td>6.39</td>
<td>0.79</td>
<td>6.11</td>
<td>0.79</td>
<td>3.36</td>
<td>0.29</td>
<td>15.50</td>
</tr>
<tr>
<td>X13</td>
<td>5.86</td>
<td>1.86</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>X14</td>
<td>5.61</td>
<td>3.79</td>
<td>5.54</td>
<td>4.64</td>
<td>4.54</td>
<td>0.07</td>
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<tr>
<td>X15</td>
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<td>4.79</td>
<td>5.57</td>
<td>4.04</td>
<td>1.07</td>
<td>11.50</td>
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<td>0.64</td>
<td>7.18</td>
<td>1.50</td>
<td>4.54</td>
<td>2.07</td>
<td>12.75</td>
</tr>
<tr>
<td>Average</td>
<td>6.00</td>
<td>1.33</td>
<td>6.10</td>
<td>3.79</td>
<td>4.75</td>
<td>1.09</td>
<td>11.80</td>
</tr>
</tbody>
</table>

### Rebound Test

**http://www.youtube.com/watch?v=L0l5jsFKNM&NR=1**
Consistent patterns of findings from PCA analysis on the contributing factors to football performance

PCA revealed that the single predictor of Football expertise is Football specific skill.
Suggestion that when focusing on talent ID for football the most important variable that impacts of match performance was skill.

Talent ID: Is Motor Skill the Key Factor?

Data from Wilson et al has suggested that motor skill performance specific to football is the most important indicator of football performance.

Also suggested focus on athletic ability within talent ID may not be as important as skill related assessment.

Athletic ability = more easily trained than high level motor skills?

PCA provides an effective way to manage variety of performance and testing data gathered during typical football related testing that can be used to predict expertise whilst controlling for RAE.

Data still lacking in relation to longitudinal studies and tracking of young performers into the professional game.
Thank You

Any Questions?

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