Oct 17th, 3:45 PM - 4:15 PM

The relative age effect in youth and elite sport: Did 20 years of research make any difference?

Werner Helsen
*Katholieke Universiteit Leuven*, werner.helsen@kuleuven.be

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RELATIVE AGE EFFECTS: AN INTERNATIONAL CONFERENCE
The relative age effect in youth and elite sport: what can we learn after 20 years of research?
Prof. Werner Helsen
October 17th, York University, Canada

1. Introduction
2. Questions for the audience?
3. Answers to the audience!
4. Relative Age Effect (RAE): what is it anyway?
5. What about the Late Maturity Effect
6. Underlying mechanisms
7. Solutions

A gymnast from North-Korea with 3 different birth dates

A player with 4 different birth dates

Anderlecht one of our top and most successful teams!
What about the Relative Age Effect?

Introduction

Questions for the audience?

Answers to the audience!

Relative Age Effect (RAE): what is it anyway?

What about the Late Maturity Effect

Underlying mechanisms

Solutions

Is football skill determined by the month of birth?

Please use your cards to 'vote': YELLOW = YES & Red = No
2. Is the month of birth decisive to play for an U21 team?

3. Is the month of birth decisive to make a successful transition from youth to professional football?

4. Is there any link between month of birth and the chances to play for the national teams?

5. Is there any association between month of birth and salaries in professional football?

Journal of Sports Economics
http://jse.sagepub.com

Selection Bias and Peer Effects in Team Sports: The Effect of Age Grouping on Earnings of German Soccer Players
John Ashworth and Bruno Heyndels
DOI: 10.1177/1527002506287695

The online version of this article can be found at:
http://jse.sagepub.com/cgi/content/abstract/8/4/355
6. Are early maturers more skilled than late maturers?

7. Does the federation/club want to lose late maturers for football?

8. Is the identification of ‘talent’ affected by the maturity status of a player?

9. Is the impact of the RAE nowadays greater than 20 years ago?
1. Introduction

2. Questions for the audience?

3. Answers to the audience!

4. Relative Age Effect (RAE): what is it anyway?

5. What about the Late Maturity Effect

6. Underlying mechanisms

7. Solutions

---

### Definition of the Relative Age Effect (RAE)*

According to Barnsley et al. (1992), relative age refers to the difference in ages between children in the same age category resulting from their different birth dates throughout the “sport” year. In soccer, children with August birth dates possess almost a one-year relative age advantage over children born in July of the following year. Conversely, children with November birth dates are delayed roughly by a year. Relative age: physical > cognitive > coordination > technical skills > experience > maturation

Relative Age Effect (RAE)

*‘Relative age’ or ‘Relative age effect’ don’t exist as mesh term! Web search revealed 143 publications.

---

### Table: Relative Age Effect (RAE)

<table>
<thead>
<tr>
<th>Age (in years)</th>
<th>Age (in months)</th>
<th>Relative age difference (in %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>60</td>
<td>20.0</td>
</tr>
<tr>
<td>6</td>
<td>72</td>
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<td>7</td>
<td>84</td>
<td>14.3</td>
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<td>8</td>
<td>96</td>
<td>12.5</td>
</tr>
<tr>
<td>9</td>
<td>108</td>
<td>11.1</td>
</tr>
<tr>
<td>10</td>
<td>120</td>
<td>Equal chances?</td>
</tr>
<tr>
<td>11</td>
<td>132</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>144</td>
<td>8.3</td>
</tr>
<tr>
<td>13</td>
<td>156</td>
<td>7.7</td>
</tr>
<tr>
<td>14</td>
<td>168</td>
<td>7.1</td>
</tr>
<tr>
<td>15</td>
<td>180</td>
<td>6.7</td>
</tr>
<tr>
<td>16</td>
<td>192</td>
<td>6.3</td>
</tr>
</tbody>
</table>

---

### Quite consistent across many different sports

- Thomson et al 1991
- Abernethy ea 2005
- Baxter-Jones 1995
- Dudink 1994
- Stanaway & Hines 1995
- Daniel & Janssen 1987
- Abernethy ea 2005
- Daniel & Raspaud 2009
- Steingröver 2016
- Strong 2017 JSSM
- Cottrell 2017 JSSM
- Wattie & Baker 2013 Psychologist
- Wattie 2008 JSS

1. Is football skill determined by the month of birth?

**NO!**

Don Ballon: 100 best players!

2. Is the month of birth decisive to play for any U21 team?

**YES!**

<table>
<thead>
<tr>
<th>Country</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Czech Republic</td>
<td>9</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>23</td>
</tr>
<tr>
<td>Denmark</td>
<td>11</td>
<td>6</td>
<td>6</td>
<td>0</td>
<td>23</td>
</tr>
<tr>
<td>England</td>
<td>7</td>
<td>8</td>
<td>4</td>
<td>4</td>
<td>23</td>
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<td>7</td>
<td>5</td>
<td>4</td>
<td>23</td>
</tr>
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<td>Macedonia</td>
<td>14</td>
<td>1</td>
<td>6</td>
<td>2</td>
<td>23</td>
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<td>6</td>
<td>10</td>
<td>5</td>
<td>2</td>
<td>23</td>
</tr>
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<td>Portugal</td>
<td>6</td>
<td>7</td>
<td>5</td>
<td>5</td>
<td>23</td>
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<td>7</td>
<td>4</td>
<td>6</td>
<td>23</td>
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<tr>
<td>Slovakia</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>7</td>
<td>23</td>
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<td>Spain</td>
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<td>23</td>
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<td>4</td>
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<tr>
<td></td>
<td>99</td>
<td>76</td>
<td>55</td>
<td>46</td>
<td>276</td>
</tr>
<tr>
<td></td>
<td>35,9</td>
<td>27,5</td>
<td>19,9</td>
<td>16,7</td>
<td></td>
</tr>
</tbody>
</table>
3. Is the month of birth decisive to make a successful transition from youth to professional football?

The Influence of Relative Age on Success and Dropout in Male Soccer Players

WEINER F. HELENS, JANET L. STARKEL, & JAN VAN WINCHEL

ABSTRACT
The consistent asymmetry in the birth-date distribution of senior professional soccer players has led us to investigate whether similar asymmetries emerge throughout youth categories in soccer. Birth dates were considered for professional players, national youth teams, youth players transferred to top teams, and regular youth league players. Rohmagorov

Jan-Mar Apr-Jun Jul-Sep Okt-Dec

Series 1 147 88 81 60

Series 2 182 94 84 59

Series 3 200 101 90 64

Series 4 217 111 101 76

Series 5 234 124 115 90

3. Is the month of birth decisive to make a successful transition from youth to professional football?

The relative age effect in youth soccer across Europe

WEINER F. HELENS, JAN VAN WINCHEL, & A. MARK WILLIAMS

Department of Kinesiology, Kiel University, Kiel, Germany and Research Institute for Sport and Exercise Sciences, Liverpool John Moores University, Liverpool, UK

(Accepted 24 July 2006)

Abstract
The present asymmetry in the birth-date distributions of youth soccer players across European countries (1279 age-matched player comparisons) was analyzed for birth dates of players registered to a national youth team and national winning soccer teams. The present research was based on data from the European Working Group of Children’s Soccer and the Belgian Soccer Association. Relevant facts were used to determine the relative age effect. The relative age effect was determined for national teams and national winning teams. The results showed that the relative age effect was significant in both groups. The relative age effect was also significant for the national youth teams. The results are consistent with the findings of other studies. The relative age effect is a powerful predictor of success in soccer. The present study provides evidence for the relative age effect in youth soccer across Europe. The relative age effect is a powerful predictor of success in soccer. The present study provides evidence for the relative age effect in youth soccer across Europe.

3. Is the month of birth decisive to make a successful transition from youth to professional football?

YES!

Table 3: Birth-date distributions among youth players, all of whom were transferred to a national team in 2000

<table>
<thead>
<tr>
<th>Birth-date months</th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November</th>
<th>December</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age groups</td>
<td>6-10 years</td>
<td>11-15 years</td>
<td>16-20 years</td>
<td>21+ years</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jan-Mar</td>
<td>114</td>
<td>79</td>
<td>84</td>
<td>60</td>
<td>70</td>
<td>50</td>
<td>40</td>
<td>30</td>
<td>20</td>
<td>15</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>Feb-Mar</td>
<td>122</td>
<td>85</td>
<td>88</td>
<td>62</td>
<td>72</td>
<td>55</td>
<td>45</td>
<td>35</td>
<td>25</td>
<td>20</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>Mar-Apr</td>
<td>130</td>
<td>94</td>
<td>98</td>
<td>72</td>
<td>84</td>
<td>65</td>
<td>55</td>
<td>45</td>
<td>35</td>
<td>30</td>
<td>25</td>
<td>20</td>
</tr>
<tr>
<td>Apr-May</td>
<td>140</td>
<td>101</td>
<td>101</td>
<td>75</td>
<td>91</td>
<td>73</td>
<td>63</td>
<td>55</td>
<td>45</td>
<td>40</td>
<td>35</td>
<td>30</td>
</tr>
<tr>
<td>May-Jun</td>
<td>150</td>
<td>110</td>
<td>110</td>
<td>84</td>
<td>100</td>
<td>85</td>
<td>76</td>
<td>67</td>
<td>57</td>
<td>50</td>
<td>45</td>
<td>40</td>
</tr>
<tr>
<td>Jun-Jul</td>
<td>160</td>
<td>120</td>
<td>120</td>
<td>95</td>
<td>105</td>
<td>91</td>
<td>82</td>
<td>75</td>
<td>65</td>
<td>60</td>
<td>55</td>
<td>50</td>
</tr>
<tr>
<td>Jul-Aug</td>
<td>170</td>
<td>130</td>
<td>130</td>
<td>100</td>
<td>110</td>
<td>96</td>
<td>87</td>
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<td>Aug-Sep</td>
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<td>97</td>
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<td>85</td>
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<td>70</td>
</tr>
<tr>
<td>Sep-Oct</td>
<td>190</td>
<td>150</td>
<td>150</td>
<td>120</td>
<td>130</td>
<td>116</td>
<td>107</td>
<td>100</td>
<td>95</td>
<td>90</td>
<td>85</td>
<td>80</td>
</tr>
<tr>
<td>Oct-Nov</td>
<td>200</td>
<td>160</td>
<td>160</td>
<td>130</td>
<td>140</td>
<td>126</td>
<td>117</td>
<td>110</td>
<td>105</td>
<td>100</td>
<td>95</td>
<td>90</td>
</tr>
<tr>
<td>Nov-Dec</td>
<td>210</td>
<td>170</td>
<td>170</td>
<td>140</td>
<td>150</td>
<td>136</td>
<td>127</td>
<td>120</td>
<td>115</td>
<td>110</td>
<td>105</td>
<td>100</td>
</tr>
</tbody>
</table>

Percentage of national team players:
- Jan-Mar: 39.1%
- Feb-Mar: 23.4%
- Mar-Apr: 21.5%
- Apr-May: 15.9%
4. Is there any link between month of birth and the chances to play for the national teams? **YES!**

![Bar graph showing month of birth for Belgium's national team players U15-U16-U17-U18-U21-A team (2015-16) N=134.]

- 1: 40.3%
- 2: 29.9%
- 3: 20.1%
- 4: 9.7%
- 5: 5.1%
- 6: 3.8%
- 7: 2.3%
- 8: 1.5%
- 9: 0.7%
- 10: 0.5%
- 11: 0.3%
- 12: 0.2%

**Dropout?** **YES!**

5. Is there any association between month of birth and salaries in professional football? **YES, but!**

![Bar graph showing average/median earnings (in millions of euros) of soccer players by month of birth.]

Players born late at the end of the selection year (cut-off date August 1st) earn systematically more!

6. Are early matures more skilled than late matures? **NO!**

![Image showing early and late matures playing football.]

**Early matures:**
- Physical advantage
  - Strength, power, speed
  - More important for 'winning'
  - Infiltration, shooting, heading

**Late matures:**
- Develop more creativity & decision making
  - Positional, tactical
  - Technically more skilled (more harmonic)
  - Need to be strong mentally
  - Need to avoid physical challenges

7. Does the federation/club want to loose late matures for football? **NO!**
7. Does the federation/club want to loose the late maturers for football?

<table>
<thead>
<tr>
<th>Inhabitants</th>
<th>Licensed players</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>80,600,000</td>
<td>6,800,000</td>
<td>8.5%</td>
</tr>
<tr>
<td>16,800,000</td>
<td>1,200,000</td>
<td>7.1%</td>
</tr>
<tr>
<td>11,000,000</td>
<td>420,000</td>
<td>3.8%</td>
</tr>
</tbody>
</table>

7. Does the club want to loose the late maturers for football?

In 2 years: from 8 mill € → 40 mill €

8. Is the identification of ‘talent’ affected by the maturity status of a player?

YES!
High performer versus high potential

Talent Identification in Football

- Mostly based on **HIGH PERFORMERS**
- Instead of **HIGH POTENTIALS**
- For immediate competitive needs
- Advantage of *relative* OLDER player
  - More powerful, physically stronger
  - He can make a difference physically!
- More hours of practice
- Advantage of *more* MATURE player
  - More powerful, physically stronger
  - He can make a difference physically!

Youth coaches want to **WIN** the GAME, but the club loses **TALENT**!

---

9. Is the impact of the RAE nowadays bigger than 20 years ago?

European professional teams 2000 versus 2010

- **YES!**
- **NEW CUT-OFF DATE!**

---

9. Is the impact of the RAE nowadays bigger than 20 years ago?

The relative age effect in European professional soccer: Did ten years of research make any difference?

Werner F. Helsen¹, Joseph Baker², Stijn Michiels³, Joerg Schorer⁴, Jan Van Winckel⁵ & A. Mark Williams⁶

¹Department of Biomedical Kinetics, Karlstad University, Sweden, ²Kinesiology and Health Science, York University, Toronto, Ontario, Canada. ³Institute for Sport Science, Westfälische Wilhelms-University Münster, Münster, Germany, and ⁴Centre for Sports Medicine and Human Performance, School of Sport and Education, Brand University, Uniblinds, Middlesbrough UK. ⁵PH, UK.

(Accepted 14 August 2012)

---

<table>
<thead>
<tr>
<th>Country</th>
<th>'home' players 2000</th>
<th>Foreign players 2000</th>
<th>Total 2000</th>
<th>% foreigners</th>
</tr>
</thead>
<tbody>
<tr>
<td>England</td>
<td>314</td>
<td>230</td>
<td>544</td>
<td>59.3%</td>
</tr>
<tr>
<td>Portugal</td>
<td>242</td>
<td>189</td>
<td>431</td>
<td>44.0%</td>
</tr>
<tr>
<td>Germany</td>
<td>293</td>
<td>282</td>
<td>575</td>
<td>42.7%</td>
</tr>
<tr>
<td>Belgium</td>
<td>270</td>
<td>201</td>
<td>471</td>
<td>38.9%</td>
</tr>
<tr>
<td>Italy</td>
<td>322</td>
<td>320</td>
<td>642</td>
<td>35.1%</td>
</tr>
<tr>
<td>Netherlands</td>
<td>270</td>
<td>201</td>
<td>471</td>
<td>38.9%</td>
</tr>
<tr>
<td>Spain</td>
<td>319</td>
<td>315</td>
<td>634</td>
<td>34.4%</td>
</tr>
<tr>
<td>France</td>
<td>340</td>
<td>321</td>
<td>661</td>
<td>28.1%</td>
</tr>
<tr>
<td>Denmark</td>
<td>276</td>
<td>209</td>
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<td>13.5%</td>
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<td>442</td>
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<tr>
<td>Total</td>
<td>3111</td>
<td>2636</td>
<td>5747</td>
<td>33.5%</td>
</tr>
</tbody>
</table>

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*SCAPPIS, Kelowna, October 19th, 2013*
The new ‘cut-off date’ of January even increased the RAE!

**Effect of a Change in Selection Year on Success in Male Soccer Players**

**Abstract** Since 1997 and following the guidelines of the International Football Federation, the Belgian soccer federations have used January 1st as the start of the selection year. Previously, August 1st was the start. This shift prompted an investigation of changes in birth-date distributions throughout youth categories for 1996-1997 compared to the 1995-1996 competition ones. Birth dates were evaluated for qualified youth league players. The frequencies were compared to those expected for baby boomers, Generation X, and Millennials. The results showed a significant increase in the number of players born January 1st or later. Despite these differences between observed and expected birth-date distributions, regression analyses examined the relationship between month of birth and number of participants both before and after the August to January shift.

**UEFA F4F workshops 2017-18: The RAE across associations (MEN = 3757 players)**

**The RAE in the World Cup (MEN = 736 players)**

9. Is the impact of the RAE nowadays bigger than 20 years ago?

**Italian elite youth players championship 2016-17**

**Effect size**

<table>
<thead>
<tr>
<th>Year</th>
<th>Series 1</th>
<th>Series 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1966-67</td>
<td>1414</td>
<td>37,6</td>
</tr>
<tr>
<td>1976-77</td>
<td>1062</td>
<td>28,3</td>
</tr>
<tr>
<td>1986-87</td>
<td>791</td>
<td>21,1</td>
</tr>
<tr>
<td>1996-97</td>
<td>490</td>
<td>13%</td>
</tr>
</tbody>
</table>

**Similar for Women!**
1. Introduction

2. Questions for the audience?

3. Answers to the audience!

4. Relative Age Effect (RAE): what is it anyway?

5. What about the Late Maturity Effect

6. Underlying mechanisms

7. Solutions

---

**Differences in age and maturation!**

*High Ability Studies, 2016*

http://dx.doi.org/10.1080/13598130.2016.1242563

**Relative age effects in a cognitive task: A case study of youth chess**

Werner F. Helsen*, Joseph Baker*, Joerg Schorer*, Christina Staingrover*, Nick Wattle* and Janet L. Starke*

*Department of Kinesiology, Movement Control and Neuromuscular Research Group, R.E. Lecuyer, Belgium;* *School of Kinesiology and Health Science, York University, Toronto, Canada; Department of Sport and Movement Science, University of Oldenburg, Oldenburg, Germany; Faculty of Health Sciences, University of Ontario Institute of Technology, Oshawa, Canada; *Department of Kinesiology, McMaster University, Hamilton, Canada*

---

**Biological (or skeletal) maturity**

- *Early mature players*: biologically speaking far more mature (difference up to 2 years with average mature players)
- *Average mature players*: biological and calendar age are the same
- *Late mature players*: biologically speaking less mature (difference up to 2 years with average mature players)
- How big is the impact of the Late Maturity Effect?

---

**Biological maturity**

Unequal battle between early and late mature/born players

- If 31/12 + very late mature (- 2y)
- If 01/01 + very early mature (+ 2y)
Mirwald et al. (2002) use reference data from the population. But youth players from 8 to 15 years are heavier than non-players. Therefore, the method of Till et al. (2014) is more football specific as it allows to use the data of the sample of youth players.

Using a dynamic excel sheet with pivot tables and reference values:

<table>
<thead>
<tr>
<th>Date of birth</th>
<th>Date</th>
<th>Age</th>
<th>Height</th>
<th>Height (bench)</th>
<th>Height seated</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Youth teams & U14 detection days (N=307)

1. Introduction
2. Questions for the audience?
3. Answers to the audience!
4. Relative Age Effect (RAE): what is it anyway?
5. What about the Late Maturity Effect
6. Underlying mechanisms
7. Solutions
Solutions

1. Awareness to provide equal chances to all children
2. Talent detection & selection process (what are the 'key' attributes?)
3. Organisation of youth sport by federation (and clubs)
   - Age range (average age in the middle of the 2-year age band)
   - Quota system (wild cards for late born/maturers in the elite schools)
   - Show the month of birth
   - Organisation per 6 months rather than 12 months
   - Training by biological age, rather than chronological age
   - Classification on biological age (Future teams of only late maturers)
   - Rotating cut-off dates
4. Technical changes to decrease physical impact (field hockey, futsal, table tennis, volleyball) & competitive character (American football) in younger age categories
5. Change in mentality: 'Learning isn’t everything, it’s the only thing'
6. T E A M work makes the dream W O R K

Show the month of birth!

January 1st
December 31st

AS it IS
U10 age group (2 teams per birth year)

TO BE
U10 First half
U10 Second half
U10 age group (2 teams for each semester)

Future teams!

- Since 2008
  - U16 F tournaments (Denmark, Sweden, Czech Republic, Belgium)
    - Minimum of 50% playing time for each player
    - Great experience and challenge for the players against other "future" players
    - International level
    - Maximum development chances in powerful learning environment

Future teams!
“As many as possible, for as long as possible, in the best environment possible”

As many as possible, for as long as possible, in the best environment possible.

Development

1. How do you create the best environment possible for both Player A and Player B?

2. How do you motivate Player A to continue for as long as possible?

Rotating cut-off dates!
Preview of the 21-month grouping system season X

<table>
<thead>
<tr>
<th>Grouping System</th>
<th>U10</th>
<th>U12</th>
<th>U14</th>
<th>U16</th>
</tr>
</thead>
<tbody>
<tr>
<td>U10</td>
<td>Apr (10)</td>
<td>Jul (10)</td>
<td>Oct (10)</td>
<td>Jan (10)</td>
</tr>
<tr>
<td>U12</td>
<td>Jun (10)</td>
<td>Aug (10)</td>
<td>Nov (10)</td>
<td>Feb (10)</td>
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<td>U14</td>
<td>Sep (10)</td>
<td>Dec (10)</td>
<td>Jan (10)</td>
<td>Apr (10)</td>
</tr>
<tr>
<td>U16</td>
<td>Mar (10)</td>
<td>Jun (10)</td>
<td>Sep (10)</td>
<td>Dec (10)</td>
</tr>
</tbody>
</table>

1. Most Advantaged
2. Most Disadvantaged

TEAM work makes the dream WORK

Club

Federation

Player

You Win

You Win

You Win

Take home message!
The RAE and the LME still have a clear impact on:
- Talent detection & selection
- Transition from youth to senior teams
- National teams
- Drop-out
- Injuries
- Salaries
- Post-career opportunities

RAEs represent a persistent, unfair and unacceptable inequality in elite youth and professional football we all need to be aware of and take our responsibility for!

Schorer et al. (2013) Plos One
Thank You

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