Enhancing opportunities for high-level sporting performance: influence of 'Relative Age'
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This report was written by Dr. John G. Morris and Dr. Mary E. Nevill of the Institute of Youth Sport (IYS), School of Sport and Exercise Sciences, Loughborough University, Leicestershire, LE11 3TU.
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Enhancing opportunities for high-level sporting performance: influence of ‘Relative Age’

Executive Summary

The Context:

There are a wide variety of factors, such as socio-economic status, sex and family background, that can and do influence selection and progression in elite sport. One factor that does seem to influence high-level performance is termed the ‘relative age’ effect.

The Relative Age Effect:

The relative age effect describes the observation that greater numbers of performers born early in a selection year are over-represented in junior and senior elite squads compared with what might be expected based on national birth rates. It would appear that the relative age effect, certainly in some sports, crucially influences the opportunities to achieve high-level sporting performance.

Relative Age In Sport - The Evidence:

The first studies to investigate the relative age effect were carried out in Baseball and Ice Hockey. This research clearly demonstrated a skewed distribution (and hence a relative age effect) among elite young and adult players, such that a greater proportion of players were born in the first quarter of a selection year with decreasing numbers thereafter. Based on a number of studies conducted in the early-to-mid 1990s, the relative age effect was strongly evident among junior and senior football (soccer) players. Published research has also demonstrated a relative age effect among elite junior and senior tennis players. Further research presented in this document will show that the relative age effect is as strong as ever in football, and can also be seen in senior cricket and rugby union players. It is also evident in junior and senior track and field athletes (see figure below) and in young (11-14 years) and senior swimmers.

Sources: http://www.esaa.net; Whittingham & Matthews (Eds.) British Athletics Statistical Review 1999-2005
However, recent rule changes in swimming (such that the eligibility of swimmers to take part in events is based on their ‘age on date’ of the competition) may explain why the effect was not seen in youth (14-18 years) swimmers. Interestingly, the relative age effect does not appear to be as evident among female sports performers, except in track and field athletics and tennis, or in a weight-classified sport such as judo.

Possible Causes of the ‘Relative Age Effect’:

Despite the belief that differences in physical maturity explain the relative age effect very little evidence exists to support such an assertion. It has been argued that the underlying cause of the relative age effect is actually an amalgamation of physical, cognitive, emotional, biological and sociological factors.

What to do about the ‘Relative Age Effect’ - Possible Solutions:

A number of suggestions have been made with respect to minimising the effect of relative age. These include:

- Rotating Cut-Off Dates
  It has been suggested that selection years should be based on a period such as 9 months such that each year different individuals in a particular group will be age-advantaged.

- Reduced Age Ranges
  Age group squads based on smaller age bands (6 months rather than 12 or 24) might alleviate some of the effects of relative age.

- Establish ‘Current’ and ‘Potential’ Squads
  The creation of 2 squads in a selection group rather than just one is another suggested means of reducing the impact of relative age.

- Winning is not Everything!
  An adjustment of the “winning is everything” focus often evident in junior sport among performers, coaches, parents and others is probably necessary.

- Age on Date of Competition
  Certainly in sports where performers compete as an individual, eligibility should probably be based on ‘age on date of competition’. Therefore during a year different performers will be age-advantaged at different periods during a year.

- Altered Competition Structures
  A move away from a single national competition at one time of year to a series of important competitions spread throughout a year, where eligibility for participation is dependent on age on date of competition.

Key Question:

Can anything be done to minimise the relative age effect and so enhance the opportunities for ALL talented young performers to progress to be high level sporting performers as adults?
The Context

There are a wide variety of factors that can and do influence selection and progression in elite sport. The first step on the journey to high-level performance is participation, and it is well known that this is influenced by factors such as socio-economic status and sex; with participation rates being greater among individuals in 'professional' occupations, and among males (Rowe et al., 2004). In addition, while there is some variation between sports, it has been shown that children from lower socio-economic backgrounds are less likely to reach high levels of sporting achievement. The family background of potential high-level performers is also very important: families influence the entry of children into sport, provide practical, financial and emotional support, and it has been observed that children from ‘one-parent’ families are less likely to progress into high-level sport (Kay, 2000). In addition, the structure of the families in which children and young people live and grow is diverse and undergoing change over time (The Lever Faberge Family Report 2004). This diversity of, and continual change in, family structure may create further problems for the progression of young performers to elite sport. In addition, the elasticity of family structure may mean that any solutions to this issue can only ever be temporary. These important factors, and many others, may form the basis for future discussions by the ‘Sportsnation’ Panel.

One factor that does seem to influence high-level performance and which it might be possible to positively influence is termed the ‘relative age’ effect. The relative age effect describes the observation that greater numbers of performers born early in a selection year are over-represented in junior and senior elite squads compared with what might be expected based on national birth rates. While the research evidence needs to be carefully interrogated it would appear that the relative age effect, certainly in some sports, crucially influences the opportunities for high-level sporting performance. This will be the first topic for discussion by the ‘Sportsnation’ Panel.

Relative Age - Introduction:

In England the school system is organized in 12-month age bands such that all children and young people born between the 1st September in a particular year and the 31st of August of the following year are educated together. By the end of “Year 8” all children will be 13. However, within a particular year group some individuals will have just turned 13 (those born in August) while others will be almost 14 (those born in September). Therefore, there is almost a year’s difference in age and in potential growth and maturation and cognitive development. In adults 12 months of growth is unlikely to be significant, whereas in children and young people the changes that occur in such a period can be huge.

As well as forming the basis for placing students in school year groups the 12-month age bands also form the basis for school sports team selection and then perhaps selection to regional and national teams. It should be noted that not all selection periods are 12-months in duration (some are longer), and also that not all start in September (for example the international football year runs from January 1st to December 31st).

In general the distribution of births, namely the numbers of children born in a particular month in England, is relatively uniform throughout the months of the year.

Relative Age - The educational evidence:

In 1964 Jinks published a research paper describing how the academic performance of students’ on an arithmetic test completed as part of their 11+ was influenced by their birth date. Among the 586 students placed in an ‘A’ stream as a result of the test, 39% were born in September-December, 35% in January-March and only 26% in May-August. It was also noted that the gap between streamed pupils...
does not remain stable; in fact it seems to widen. While the reasons for this widening of differences in performance are not clear the effect of perceived success or failure on the attitude of the student, and indeed on the attitude of the teacher could be important. Jinks (1964) noted that while there was little doubt regarding the reality of the relative age effect, agreed solutions to minimize or negate its impact were not available. Since these early observations by Jinks (1964) a number of other research studies have confirmed that month of birth influences scholastic achievements.

Thompson (1971), in his analysis of 1,136 boys who entered a comprehensive school in Coventry during 1955-64 and remained at the school for 5 years, found that of the boys gaining 5 or more ‘O-level’ passes a greater proportion were born in the autumn term (September-December) than in the summer term (May-August): 34% vs. 23% respectively. Similarly, only 26% of boys born in the autumn term failed to gain any ‘O-level’ passes compared with 40% born in the summer term. In addition, Thompson (1971) also found that the proportion of students in top and bottom streams in the school in their fourth year was also skewed: autumn born students were more likely to be in the top stream and summer born students in the bottom stream.

Based on pilot Key Stage Maths and Science Standard Assessment Tests (SATs) Giles (1993) found that autumn born pupils (September-December) averaged half a level higher than students born in the summer (May-August). Giles (1993) suggested that sometimes the ‘slow learner’ may just be among the youngest in their peer group and may need an alternative form of encouragement and support to that being presently offered. However, by the time students reach degree level the effect of relative age may not be negative. Russell and Startup (1986) investigated the effect of month of birth upon degree classification in 295,700 students who undertook 3-year degrees between 1972-1982. While they did find that a disproportionate number of students who were ‘older’ upon entry to University actually graduated, the relatively youngest in a year group were the ones who left with a better degree classification. A possible explanation for the findings is that the relatively age disadvantaged summer born students are those that have managed to overcome their disadvantage, and therefore relatively may be among the most academically able and successful in their year group at University.

In summary, there is evidence in the literature that the academic performance of students is influenced by the month of birth and that this influence extends ultimately to the grades obtained at public examinations. While this effect may persist at University level in terms of the numbers of autumn born students who graduate, in terms of performance (i.e. degree classification) it is summer born students who do best.

### Relative Age - What is the evidence to suggest it exists in sport?

A number of published research studies have investigated the relative age effect in sport (Boucher and Mutimer, 1994, [Ice Hockey]; Brewer et al., 1995 [Football]; Dudink, 1994 [Football]; Edgar and O’Donoghue, 2005 [Tennis]; Musch and Hay, 1999 [Football]; Thompson et al., 1991 [Baseball]). The results and findings from these studies have been summarised in the figures in the following pages and in Appendix 1.

In addition, for the purposes of this report, further original data collection was undertaken (by the Institute of Youth Sport, Loughborough University) to investigate whether the relative age effect was evident in sports such as athletics, cricket, gymnastics, swimming and rugby union. This information has also been included in the analysis presented in the following pages and in Appendix 1.
Enhancing opportunities for high-level sporting performance: influence of ‘Relative Age’

Evidence of a RELATIVE AGE EFFECT? Yes

Source: Thompson et al., 1991
Enhancing opportunities for high-level sporting performance: influence of ‘Relative Age’

**Males**

**NHL Ice Hockey Players (male) 1988 / 1989**  
- Q1 Jan-Mar: 34%  
- Q2 Apr-Jun: 31%  
- Q3 Jul-Sep: 20%  
- Q4 Oct-Dec: 15%

*Source: Boucher & Mutimer, 1994*

**Junior Ice Hockey Players (male) 1988 / 1989**  
- Q1 Jan-Mar: 37%  
- Q2 Apr-Jun: 28%  
- Q3 Jul-Sep: 23%  
- Q4 Oct-Dec: 12%

*Source: Boucher & Mutimer, 1994*

Evidence of a RELATIVE AGE EFFECT? **Yes**
Enhancing opportunities for high-level sporting performance: influence of ‘Relative Age’

Athletics

### Males

#### U15 Finalists English Schools Athletics (male) 2002
- **n=133**
- **Q1 Sep-Nov: 55%**
- **Q2 Dec-Feb: 23%**
- **Q3 Mar-May: 14%**
- **Q4 Jun-Aug: 8%**

*Evidence of a RELATIVE AGE EFFECT? Yes*

Sources: [http://www.esaa.net](http://www.esaa.net); Whittingham & Matthews (Eds.) British Athletics Statistical Review 1999-2005

#### U17 Finalists English Schools Athletics (male) 2002
- **n=172**
- **Q1 Sep-Nov: 38%**
- **Q2 Dec-Feb: 32%**
- **Q3 Mar-May: 17%**
- **Q4 Jun-Aug: 13%**

*Evidence of a RELATIVE AGE EFFECT? Yes*

Sources: [http://www.esaa.net](http://www.esaa.net); Whittingham & Matthews (Eds.) British Athletics Statistical Review 1999-2005

#### U20 Finalists English Schools Athletics (male) 2002
- **n=130**
- **Q1 Sep-Nov: 45%**
- **Q2 Dec-Feb: 28%**
- **Q3 Mar-May: 17%**
- **Q4 Jun-Aug: 9%**

*Evidence of a RELATIVE AGE EFFECT? Yes*

Sources: [http://www.esaa.net](http://www.esaa.net); Whittingham & Matthews (Eds.) British Athletics Statistical Review 1999-2005
Enhancing opportunities for high-level sporting performance: influence of ‘Relative Age’

Senior Athletes Ranked in Top 20 in their (ESAA) Event (male) 2002

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<th>Q3</th>
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<td>Mar-May</td>
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<td>Jun-Aug</td>
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Evidence of a RELATIVE AGE EFFECT? **Yes**

Source: Whittingham & Matthews (Eds.) British Athletics Statistical Review 2002

Senior Athletes Ranked in Top 20 in their Event (male) 2002

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<td>Jun-Aug</td>
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Evidence of a RELATIVE AGE EFFECT? **Yes**

Source: Whittingham & Matthews (Eds.) British Athletics Statistical Review 2002

**Males**
Enhancing opportunities for high-level sporting performance: influence of ‘Relative Age’

**FA School Footballers (male) 6 year period**
- n=103
- Evidence of a RELATIVE AGE EFFECT? Yes

**English Academy Footballers (male) 2002 / 2004**
- n=1765
- Evidence of a RELATIVE AGE EFFECT? Yes

**English Professional Footballers (male) 1991 / 1992**
- n=2777
- Evidence of a RELATIVE AGE EFFECT? Yes

**Premiership Footballers (male) 2006 / 2007**
- n=348
- Evidence of a RELATIVE AGE EFFECT? Yes

*Source: Brewer et al., 1995*
*Source: M. Hulse, The Football Association Medical and Exercise Science Department*
*Source: Dudink, 1994*
*Source: Premiership Clubs Websites*
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First Class County Cricketers (male) 2006
n=276

Premiership Rugby Union Players (male) 2006 / 2007
n=299

Evidence of a RELATIVE AGE EFFECT? Yes

Source: First Class Clubs Websites
Source: Premiership Clubs Websites

Cricket
Rugby Union
Males
Enhancing opportunities for high-level sporting performance: influence of ‘Relative Age’

**Judo**

**Males**

**Elite Judo Players (Cadet)**
12-16 yrs (male) 2003-2006
n=367

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<td>23%</td>
<td>20%</td>
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Evidence of a RELATIVE AGE EFFECT? Yes

Source: John Bramall, British Judo Association

**Elite Judo Players (Juniors)**
16-20 yrs (male) 2003-2006
n=93

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Evidence of a RELATIVE AGE EFFECT? No

Source: John Bramall, British Judo Association

**Elite Judo Players (Seniors)**
(male) 2003-2006
n=172

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<td>23%</td>
<td>25%</td>
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Evidence of a RELATIVE AGE EFFECT? No

Source: John Bramall, British Judo Association
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Swimming

**Males**

ASA Age Championship Swimmers (11-14 yrs) (male) 2004
n=186

Q1 Aug-Oct: 39%
Q2 Nov-Jan: 28%
Q3 Feb-Apr: 22%
Q4 May-Jul: 11%

Source: Amateur Swimming Association

Evidence of a RELATIVE AGE EFFECT? Yes

ASA Youth Championship Swimmers (15-18 yrs) (male) 2004
n=119

Q1 Aug-Oct: 18%
Q2 Nov-Jan: 26%
Q3 Feb-Apr: 23%
Q4 May-Jul: 33%

Source: Amateur Swimming Association

Evidence of a RELATIVE AGE EFFECT? No

Senior International Swimmers (male) 1986-2004
n=96

Q1 Jan-Mar: 30%
Q2 Apr-Jun: 35%
Q3 Jul-Sep: 14%
Q4 Oct-Dec: 21%

Source: Amateur Swimming Association

Evidence of a RELATIVE AGE EFFECT? Yes
Enhancing opportunities for high-level sporting performance: influence of ‘Relative Age’

**Males**

**Tennis**

---

**Elite Junior Tennis Players (male) 2003**

- Q1: Jan-Mar 33%
- Q2: Apr-Jun 30%
- Q3: Jul-Sep 22%
- Q4: Oct-Dec 15%

*Evidence of a RELATIVE AGE EFFECT? Yes*

*n=237*

Source: Edgar and O'Donoghue, 2005

---

**Elite Senior Tennis Players (male) 2002/2003**

- Q1: Jan-Mar 29%
- Q2: Apr-Jun 29%
- Q3: Jul-Sep 25%
- Q4: Oct-Dec 17%

*Evidence of a RELATIVE AGE EFFECT? Yes*

*n=237*

Source: Edgar and O'Donoghue, 2005
Enhancing opportunities for high-level sporting performance: influence of ‘Relative Age’

**Athletics**

**Females**

**U15 Finalists English Schools Athletics (female)**

- Year: 2002
- Participants: 110

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<th>December-February</th>
<th>March-May</th>
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<td>33%</td>
<td>25%</td>
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Evidence of a RELATIVE AGE EFFECT? **No**

Sources: http://www.esaa.net; Whittingham & Matthews (Eds.) British Athletics Statistical Review 1999-2005

**U17 Finalists English Schools Athletics (female)**

- Year: 2002
- Participants: 156

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<th>December-February</th>
<th>March-May</th>
<th>June-August</th>
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<td>28%</td>
<td>24%</td>
<td>21%</td>
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</table>

Evidence of a RELATIVE AGE EFFECT? **No**

Sources: http://www.esaa.net; Whittingham & Matthews (Eds.) British Athletics Statistical Review 1999-2005

**U20 Finalists English Schools Athletics (female)**

- Year: 2002
- Participants: 133

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<tr>
<th>Quarter</th>
<th>September-November</th>
<th>December-February</th>
<th>March-May</th>
<th>June-August</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>37%</td>
<td>28%</td>
<td>23%</td>
<td>13%</td>
</tr>
</tbody>
</table>

Evidence of a RELATIVE AGE EFFECT? **Yes**

Sources: http://www.esaa.net; Whittingham & Matthews (Eds.) British Athletics Statistical Review 1999-2005
Enhancing opportunities for high-level sporting performance: influence of ‘Relative Age’

Senior Athletes Ranked in Top 20 in their (ESAA) Event (female) 2002
n=380

Q1 Sep-Nov 31% 30%
Q2 Dec-Feb 20% 20%
Q3 Mar-May 20%
Q4 Jun-Aug 20%

Evidence of a RELATIVE AGE EFFECT? Yes

Source: Whittingham & Matthews (Eds.) British Athletics Statistical Review 2002

Females

Senior Athletes Ranked in Top 20 in their Event (female) 2002
n=320

Q1 Sep-Nov 31% 30%
Q2 Dec-Feb 20% 20%
Q3 Mar-May 20%
Q4 Jun-Aug 20%

Evidence of a RELATIVE AGE EFFECT? Yes

Source: Whittingham & Matthews (Eds.) British Athletics Statistical Review 2002
Enhancing opportunities for high-level sporting performance: influence of ‘Relative Age’

**Football**

**English International Footballers (U15-U21) (female)**
2002 / 2004
n=113

Q1 Jan-Mar 26%
Q2 Apr-Jun 27%
Q3 Jul-Sep 26%
Q4 Oct-Dec 27%

Evidence of a RELATIVE AGE EFFECT? **No**

Source: D. Scott, The Football Association Medical and Exercise Science Department

**English Premiership Footballers (female)**
2004 / 2005
n=1537

Q1 Sep-Nov 26%
Q2 Apr-Jun 22%
Q3 Jul-Sep 26%
Q4 Oct-Dec 26%

Evidence of a RELATIVE AGE EFFECT? **No**

Source: D. Scott, The Football Association Medical and Exercise Science Department

**Gymnastics**

**Females**

**Elite Gymnasts (Female)**
2004
n=177

Q1 Jan-Mar 25%
Q2 Apr-Jun 29%
Q3 Jul-Sep 26%
Q4 Oct-Dec 20%

Evidence of a RELATIVE AGE EFFECT? **No**

Source: J. Prescott, British Gymnastics
Enhancing opportunities for high-level sporting performance: influence of ‘Relative Age’

**Females**

**Judo**

**Elite Judo Players (Cadet)**
12-16 yrs (female) 2003-2006
n=281

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Jan-Mar</th>
<th>Apr-Jun</th>
<th>Jul-Sep</th>
<th>Oct-Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>26%</td>
<td>30%</td>
<td>23%</td>
<td>21%</td>
<td></td>
</tr>
</tbody>
</table>

Evidence of a RELATIVE AGE EFFECT? **No**

Source: John Bramall, British Judo Association

**Elite Judo Players (Juniors)**
16-20 yrs (female) 2003-2006
n=96

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Jan-Mar</th>
<th>Apr-Jun</th>
<th>Jul-Sep</th>
<th>Oct-Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>26%</td>
<td>24%</td>
<td>17%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Evidence of a RELATIVE AGE EFFECT? **No**

Source: John Bramall, British Judo Association

**Elite Judo Players (Seniors)**
(female) 2003-2006
n=143

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Jan-Mar</th>
<th>Apr-Jun</th>
<th>Jul-Sep</th>
<th>Oct-Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>30%</td>
<td>25%</td>
<td>21%</td>
<td>24%</td>
<td></td>
</tr>
</tbody>
</table>

Evidence of a RELATIVE AGE EFFECT? **No**

Source: John Bramall, British Judo Association
Enhancing opportunities for high-level sporting performance: influence of 'Relative Age'

**Females**

**ASA Age Championship Swimmers (11-13 yrs) (female) 2004**
- Q1: 45%
- Q2: 26%
- Q3: 16%
- Q4: 13%

**Evidence of a RELATIVE AGE EFFECT? Yes**

**ASA Youth Championship Swimmers (14-17 yrs) (female) 2004**
- Q1: 26%
- Q2: 27%
- Q3: 27%
- Q4: 20%

**Evidence of a RELATIVE AGE EFFECT? No**

**Senior International Swimmers (female) 1986-2004**
- Q1: 31%
- Q2: 27%
- Q3: 16%
- Q4: 24%

**Evidence of a RELATIVE AGE EFFECT? No**

*Source: Amateur Swimming Association*
Enhancing opportunities for high-level sporting performance: influence of ‘Relative Age’

**Females**

**Tennis**

**Evidence of a RELATIVE AGE EFFECT?**

*Yes*

**Elite Junior Tennis Players (female) 2003**

- Q1: Jan-Mar - 31%
- Q2: Apr-Jun - 25%
- Q3: Jul-Sep - 28%
- Q4: Oct-Dec - 17%

*Source: Edgar and O’Donoghue, 2005*

**Elite Senior Tennis Players (female) 2002/2003**

- Q1: Jan-Mar - 33%
- Q2: Apr-Jun - 28%
- Q3: Jul-Sep - 22%
- Q4: Oct-Dec - 17%

*Source: Edgar and O’Donoghue, 2005*
Summary of the research presented in the figures above which has investigated the “Relative Age Effect” in sport; ✓ = a relative age effect was found in the population group studied; X = no relative age effect was found in the population group studied.

<table>
<thead>
<tr>
<th>Sport</th>
<th>Sex</th>
<th>Age</th>
<th>Evidence of a Relative Age Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Athletics</td>
<td>Male</td>
<td>Junior</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>Senior</td>
<td>✓ ✓</td>
</tr>
<tr>
<td>Baseball</td>
<td>Male</td>
<td>Senior</td>
<td>✓ ✓</td>
</tr>
<tr>
<td>Cricket</td>
<td>Male</td>
<td>Senior</td>
<td>✓</td>
</tr>
<tr>
<td>Football</td>
<td>Male</td>
<td>Junior</td>
<td>✓ ✓</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>Senior</td>
<td>✓ ✓</td>
</tr>
<tr>
<td>Ice Hockey</td>
<td>Male</td>
<td>Junior</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>Senior</td>
<td>✓</td>
</tr>
<tr>
<td>Judo</td>
<td>Male</td>
<td>Junior</td>
<td>✓ ✗</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>Senior</td>
<td>✗</td>
</tr>
<tr>
<td>Rugby Union</td>
<td>Male</td>
<td>Senior</td>
<td>✓</td>
</tr>
<tr>
<td>Swimming</td>
<td>Male</td>
<td>Junior</td>
<td>✓ ✗</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>Senior</td>
<td>✓</td>
</tr>
<tr>
<td>Tennis</td>
<td>Male</td>
<td>Junior</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>Senior</td>
<td>✓</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sport</th>
<th>Sex</th>
<th>Age</th>
<th>Evidence of a Relative Age Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Athletics</td>
<td>Female</td>
<td>Junior</td>
<td>X X ✓</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>Senior</td>
<td>✓ ✓</td>
</tr>
<tr>
<td>Football</td>
<td>Female</td>
<td>Junior</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>Senior</td>
<td>X</td>
</tr>
<tr>
<td>Gymnastics</td>
<td>Female</td>
<td>Elite</td>
<td>X</td>
</tr>
<tr>
<td>Judo</td>
<td>Female</td>
<td>Junior</td>
<td>X X X</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>Senior</td>
<td>X</td>
</tr>
<tr>
<td>Swimming</td>
<td>Female</td>
<td>Junior</td>
<td>✓ X</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>Senior</td>
<td>X</td>
</tr>
<tr>
<td>Tennis</td>
<td>Female</td>
<td>Junior</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>Senior</td>
<td>✓</td>
</tr>
</tbody>
</table>
Relative Age - What is the evidence to suggest it exists in sport? (continued)

The figures and table above clearly demonstrate that the relative age effect exists in a number of different sports. It is also clear that the relative age effect is more prevalent among males than females. Interestingly, only in a weight classified sport such as Judo did the relative age effect not seem to be strong in males. The analysis also demonstrates that in many sports (for example athletics, baseball, cricket, football, ice hockey, rugby union and tennis) the relative age effect persists into adulthood such that senior players with a date of birth early in a selection year are present in far greater numbers in professional and senior leagues and competitions, and ranking lists, than would be expected based on national birth rates.

The voluntary nature of sports participation compared with the compulsory attendance required in education may explain the persistence of the relative age effect into adulthood but not so obviously in education. In other words while children must persist in education and hence may achieve success at a later date, they may choose to drop out of a sport, and therefore be lost to that sport, if they are not selected and deemed to be ‘unsuccessful’ at a young age. However, while the existence of a relative age effect is evident in many sports the exact mechanisms through which it favours the older individuals remains to be elucidated.

What is the cause of the relative age effect in sport?

A large amount of research evidence demonstrates the existence of a relative age effect. However, little of the research conclusively shows why this effect exists. There appear to be a number of possible reasons. It has been suggested that the relative age effect occurs because, on the average, children and young people with birth dates early in a selection period are those who are most likely to be more mature and therefore stronger and faster and have more developed motor and co-ordination skills. As a result during selection trials they are the performers most likely to catch the eye especially against age-disadvantaged peers. To compound the problem it can be argued that talent selection procedures in many sports focus largely on physiological superiority. Relatively younger individuals with equivalent or better technical, tactical and psychological skills (which at the adult level may be the critical factors) may be overlooked as a result. In addition, as Thompson and colleagues (1991) note once an age-advantaged performer has been ‘selected’ they are likely to be provided with better coaching and higher levels of competition. While the skills and self-confidence of the age-advantaged performer develops, their age-disadvantaged peer may experience lack of opportunity, discouragement and possibly disillusionment, perhaps eventually leading to dropout.

It should be noted that the research into the relative age effect typically limits its analysis to ‘chronological’ age. That is the actual age of the individual. However, individuals will develop and mature (increase their functional ability to the point where they can successfully procreate and rear offspring [Cameron, 2002]) at differing rates. Differences in maturation, which are particularly evident during puberty, mean that two young people can have exactly the same chronological age but, because they are experiencing puberty at different times, have very different ‘biological’ ages. Because maturation affects physical function it obviously can have major impacts (both positive and negative) on sports performance. Therefore, biological age / maturation is also a key issue to be considered in talent identification and development procedures.

[Discussion continued on page 23]
Relative Age - A hypothetical example of the possible effect of relative age:

Let us consider the effects of relative age in a simple theoretical way. In order to emphasise the potential impact of even 11 months worth of growth let us consider an 'average' boy born on the 1st September 1990 (‘Boy 1’), and an identical boy born 11 months later (‘Boy 2’). [Let us also recognise that there is no such thing as an average boy. However, we can measure the height and weight of large numbers of children (thousands) and from this calculate growth curves, which give a reasonable indication of the pattern of height or weight change that could be expected in a child or young person at a certain age]. From the figure below we can see that the 11 months difference in chronological age results in substantial differences in height and weight on the 1st September 2004. However, when the boys reach adulthood there will be no differences in height and weight because they are identical. However, if their physical characteristics in year 9 influenced selection to a team (as is suggested in our theoretical example described graphically in the figure below) it is possible that Boy 2 would be deprived of chances given to Boy 1 simply because he was born in August rather than 11 months earlier in September.

---

**Relative Age**

- Boy 2 is identical to Boy 1 except for being 11 months younger.
- The calculations are based on the British Growth Reference 1990 (revised Sept 1996) assuming the Boy 1 (or 2) is on the 50th centile.

---

<table>
<thead>
<tr>
<th>Relative Age</th>
<th>Entry to Year 9 Secondary School 1st September 2004</th>
<th>Selected for School Football Team?</th>
<th>Selected for Professional Club Academy Team?</th>
<th>Adult Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boy 1 1st September 1990</td>
<td>14 years 0 month</td>
<td>Age: 14 yrs</td>
<td>Height: 172.4 cm</td>
<td>Weight: 49.2 kg</td>
</tr>
<tr>
<td>Boy 2 1st August 1991</td>
<td>13 years 1 month</td>
<td>Age: 13 yrs 1 month</td>
<td>Height: 155.4 cm</td>
<td>Weight: 43.4 kg</td>
</tr>
</tbody>
</table>

**Difference between boys at time indicated.**

| Difference between boys at time indicated | 11 months | 7.0 cm | 5.7 kg | "Good player but too small" | 0 cm | 0 kg |

Enhancing opportunities for high-level sporting performance: influence of ‘Relative Age’
Boucher and Mutimer (1994) argue that while other authors offer a variety of reasons for the relative age effect the underlying cause is actually an amalgamation of physical, cognitive, emotional, biological and sociological factors. Also, despite the belief that differences in physical maturity explain the relative age effect very few people have provided evidence to support such an assertion.

A number of issues relating to the relative age effect need to be clarified: Why does the relative age effect appear more evident in some sports than others? Are issues such as the type of sport and the size of the competition field (i.e. the number of individuals who participate in the sport at particular representative levels) confounding factors? The point at which sports start selecting for higher level performance squads is also likely to be a factor. The sex of the competitors may well be important with the relative age effect seemingly less evident in females involved in elite sport.

What to do about the ‘Relative Age Effect’ - Possible Solutions:

A number of suggestions have been made with respect to minimising the effect of relative age:

• **Rotating Cut-Off Dates**: It has been suggested that selection years should be based on a period such as 9 months such that each year different individuals in a particular group will be age-advantaged. However, such a system would be very demanding to administer and is perhaps an unrealistic option in most sports.

• **Reduced Age Ranges**: Age group squads based on smaller age bands (6 months rather than 12 or 24) might alleviate some of the effects of relative age.

• **Establish ‘Current’ and ‘Potential’ Squads**: The creation of 2 squads in a selection group rather than just one is another suggested means of reducing the impact of relative age; one squad is deliberately selected on potential rather than current ability and probably includes younger performers who are technically proficient but physically immature.

• **Winning is not Everything!**: An adjustment of the “winning is everything focus” often evident in junior sport among performers, coaches, parents and others is probably necessary. What is the purpose of junior elite sport: to win at junior level or to produce performers capable of winning at senior level? These two aims may not always be compatible. That is not to say young people should not learn how to compete and be exposed to competition. However, in the young, an over emphasis on competition, competitive superiority, and the development of an ethos of winning at all costs, which replace the opportunity to train, to develop technique and improve skill may not create the most appropriate environment in which to mould the young sports performers of today into the senior champions of tomorrow.

• **Age on Date of Competition**: Certainly in sports where performers compete as an individual, eligibility should probably be based on ‘age on date of competition’. Therefore during a year different performers will be age-advantaged at different periods during a year. A similar approach could be used in team sports although the fact that teams are reliant on interaction between individuals for success might make this difficult to implement.

• **Altered Competition Structures**: a move away from a single national competition at one time of year to a series of important...
Enhancing opportunities for high-level sporting performance: influence of ‘Relative Age’

competitions spread throughout a year, where eligibility for participation is dependent on age on date of competition. Both individual and team sports could take this approach.

The influence of other factors on sporting opportunity:

It was noted at the beginning of this document that a wide variety of factors can and do influence selection and progression in elite sport. Clearly the relative age effect is one such factor. However, it is not the only factor which may influence the opportunities for high-level sporting performance. Collins (2004) has argued that while factors such as physical location and environment are important many individuals excluded from sport are poor (in terms of income). Recently it has been estimated that the development of an elite sports performer from child to adult will cost £250,000 over a 14 year period (Mike Turner, personal communication). Clearly, such expenditure can only be afforded by certain individuals.

Interestingly it has also been shown that young sportsmen and sportswomen who achieve high levels of performance are more likely to be from families drawn from the wealthier socio-economic classes (Yang et al., 1996). It has also been shown that a child’s participation is heavily dependent on the ability of their family to accommodate the activity patterns required by the sport (Kay, 2000).

Simple factors such as geography can also play a part in opportunity: poor access to facilities, such as a 50 m swimming pool, and poor access to coaches and high quality clubs are often a key impediment to the development of young performers.

Therefore it seems that a number of factors can and do influence the opportunities for high-level sporting performance. It is also obvious that the greater the number of barriers encountered by a young performer the more difficult it will be for them to progress to senior international level.

Acknowledgements:

A number of individuals and organisations have helped in the preparation of this report: Matt Sedgwick; Natalie Dunman; Mike Peyrebrune, Chelsea Warr and The Amateur Swimming Association; Jo Prescott and British Gymnastics; Elizabeth Broomhead and the All England Netball Association Ltd.; Dawn Scott, Mark Hulse and The Football Association Medical and Exercise Science Department; John Bramall and the British Judo Association;

References:


Enhancing opportunities for high-level sporting performance: influence of ‘Relative Age’


### Appendix 1: Summary of the research which has investigated the “Relative Age Effect” in Sport

<table>
<thead>
<tr>
<th>Sport</th>
<th>Study authors</th>
<th>Sex</th>
<th>Subjects</th>
<th>Subject Characteristics</th>
<th>Percentage of performers found in each quarter of the selection year</th>
<th>Selection Year Start Date</th>
<th>Evidence Of Relative Age Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseball</td>
<td>Thompson et al. 1991</td>
<td>M</td>
<td>Adults</td>
<td>1985: 682 major league baseballers</td>
<td>29 % 27 % 23 % 21 %</td>
<td>1st August</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>M Adults</td>
<td>1990: 837 major league baseballers</td>
<td>29 % 25 % 23 % 22 %</td>
<td>1st August</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ice Hockey</td>
<td>Boucher &amp; Mutimer 1994</td>
<td>M</td>
<td>Junior Players (8-17 years)</td>
<td>1988-89 season: 951 players</td>
<td>37 % 28 % 23 % 12 %</td>
<td>1st January</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>M Adults</td>
<td>1988-89 season: 884 NHL players</td>
<td>34 % 31 % 20 % 15 %</td>
<td>1st January</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Athletics</td>
<td>Morris et al., (IYS) 2006 unpublished</td>
<td>M</td>
<td>Adult</td>
<td>2002: 400 athletes UK Top 20 in event</td>
<td>32 % 24 % 23 % 21 %</td>
<td>1st September</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>M Adult</td>
<td>2002: 340 athletes UK Top 20 in schools event</td>
<td>34 % 24 % 21 % 20 %</td>
<td>1st September</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M U20</td>
<td>2002: 130 English Schools Finalists</td>
<td>45 % 28 % 17 % 9 %</td>
<td>1st September</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M U17</td>
<td>2002: 172 English Schools Finalists</td>
<td>38 % 32 % 17 % 13 %</td>
<td>1st September</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M U15</td>
<td>2002: 133 English Schools Finalists</td>
<td>55 % 23 % 14 % 8 %</td>
<td>1st September</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cricket</td>
<td>Morris et al., (IYS) 2006 unpublished</td>
<td>M</td>
<td>Senior</td>
<td>2006: 276 English First Class players</td>
<td>34 % 22% 26% 18%</td>
<td>1st September</td>
<td>Yes</td>
</tr>
<tr>
<td>Field Hockey</td>
<td>Leslie et al., (IYS) 2006 unpublished</td>
<td>M</td>
<td>Senior</td>
<td>1993-95 &amp; 2004: 21 international players</td>
<td>19 % 24% 48% 10%</td>
<td>1st January</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>M Junior</td>
<td>1993-95: 48 international players</td>
<td>40 % 19% 35% 6%</td>
<td>1st January</td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Appendix 1 (continued): Summary of the research which has investigated the “Relative Age Effect” in Sport

<table>
<thead>
<tr>
<th>Sport</th>
<th>Study authors</th>
<th>Sex</th>
<th>Sex</th>
<th>Subjects</th>
<th>Percentage of performers found in each quarter of the selection year</th>
<th>Selection Year Start Date</th>
<th>Evidence Of Relative Age Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Judo</td>
<td>Morris et al. (IYS) 2006 unpublished</td>
<td>M</td>
<td>Senior</td>
<td>2003-06: 172 Elite Senior Internationals</td>
<td>Q 1: 26 %  Q 2: 26 %  Q 3: 23 %  Q 4: 25 %</td>
<td>1st January</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M</td>
<td>16-20</td>
<td>2003-06: 93 Elite Players</td>
<td>Q 1: 32 %  Q 2: 20 %  Q 3: 29 %  Q 4: 18 %</td>
<td>1st January</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M</td>
<td>12-16</td>
<td>2003-06: 367 Elite Players</td>
<td>Q 1: 30 %  Q 2: 27 %  Q 3: 23 %  Q 4: 20 %</td>
<td>1st January</td>
<td>Yes</td>
</tr>
<tr>
<td>Rugby Union</td>
<td>Morris et al., (IYS) 2006 unpublished</td>
<td>M</td>
<td>Senior</td>
<td>2006/2007: 299 Premiership players</td>
<td>Q 1: 30 %  Q 2: 27 %  Q 3: 25 %  Q 4: 18 %</td>
<td>1st September</td>
<td>Yes</td>
</tr>
<tr>
<td>Swimming</td>
<td>Dunman et al., (IYS) 2004 unpublished</td>
<td>M</td>
<td>Adult</td>
<td>1986-2004: 96 Senior Internationals</td>
<td>Q 1: 30 %  Q 2: 35 %  Q 3: 14 %  Q 4: 21 %</td>
<td>1st January</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M</td>
<td>15-18</td>
<td>2004: 119 ASA Youth Championship</td>
<td>Q 1: 18 %  Q 2: 26 %  Q 3: 23 %  Q 4: 33 %</td>
<td>1st August ‘Age on Date’</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M</td>
<td>11-14</td>
<td>2004: 186 ASA Age Championship</td>
<td>Q 1: 39 %  Q 2: 28 %  Q 3: 22 %  Q 4: 11 %</td>
<td>1st August ‘Age on Date’</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M</td>
<td>Junior</td>
<td>2003: 237 Elite Junior Men</td>
<td>Q 1: 33 %  Q 2: 30 %  Q 3: 22 %  Q 4: 15 %</td>
<td>1st January</td>
<td>Yes</td>
</tr>
<tr>
<td>Football</td>
<td>Dudink, 1994</td>
<td>M</td>
<td>Adults</td>
<td>621 Dutch Professional Football Players</td>
<td>Q 1: 31 %  Q 2: 28 %  Q 3: 25 %  Q 4: 17 %</td>
<td>1st August</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M</td>
<td>Adults</td>
<td>1991-92: 2777 English Professional Footballers</td>
<td>Q 1: 37 %  Q 2: 25 %  Q 3: 20 %  Q 4: 19 %</td>
<td>1st September</td>
<td>Yes</td>
</tr>
<tr>
<td>Football</td>
<td>Brewer et al., 1995</td>
<td>M</td>
<td>Adults</td>
<td>16 Swedish Senior International Players</td>
<td>Q 1: 50 %  Q 2: 19 %  Q 3: 19 %  Q 4: 13 %</td>
<td>Not given</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M</td>
<td>Junior</td>
<td>59 Swedish U17 International Players</td>
<td>Q 1: 58 %  Q 2: 20 %  Q 3: 20 %  Q 4: 2 %</td>
<td>Not given</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M</td>
<td>Junior</td>
<td>103 FA School Players</td>
<td>Q 1: 67 %  Q 2: 21 %  Q 3: 10 %  Q 4: 2 %</td>
<td>1st September</td>
<td>Yes</td>
</tr>
</tbody>
</table>
### Appendix 1 (continued): Summary of the research which has investigated the “Relative Age Effect” in Sport

<table>
<thead>
<tr>
<th>Sport</th>
<th>Study authors</th>
<th>Sex</th>
<th>Subjects</th>
<th>Subject Characteristics</th>
<th>Percentage of performers found in each quarter of the selection year</th>
<th>Selection Year Start Date</th>
<th>Evidence Of Relative Age Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Football</td>
<td>Musch &amp; Hay</td>
<td>M</td>
<td>Adults</td>
<td>1995-96: 355 German Professional Footballers</td>
<td>~32 % ~25 % ~22 % ~23 %</td>
<td>1st August</td>
<td>Yes</td>
</tr>
<tr>
<td>Football</td>
<td>M</td>
<td></td>
<td>Adults</td>
<td>1995-96: 486 Brazilian Professional Footballers</td>
<td>~30 % ~27 % ~25 % ~19 %</td>
<td>1st August</td>
<td>Yes</td>
</tr>
<tr>
<td>Football</td>
<td>M</td>
<td></td>
<td>Adults</td>
<td>1995-96: 360 Japanese Professional Footballers</td>
<td>~37 % ~30 % ~17 % ~18 %</td>
<td>1st April</td>
<td>Yes</td>
</tr>
<tr>
<td>Football</td>
<td>M</td>
<td></td>
<td>Adults</td>
<td>1988-89: 207 Australian Professional Footballers</td>
<td>~31 % ~27 % ~25 % ~18 %</td>
<td>1st January</td>
<td>Yes</td>
</tr>
<tr>
<td>Football</td>
<td>M</td>
<td></td>
<td>Adults</td>
<td>1995-96: 61 Australian Professional Footballers</td>
<td>~38 % ~22 % ~20 % ~22 %</td>
<td>1st August</td>
<td>Uncertain Weak</td>
</tr>
<tr>
<td>Football</td>
<td>Hulse et al., (IYS) 2005 unpublished</td>
<td>M</td>
<td>Adults</td>
<td>2004-05: 277 Premiership Footballers</td>
<td>35 % 27 % 21 % 16 %</td>
<td>1st September</td>
<td>Yes</td>
</tr>
<tr>
<td>Football</td>
<td>M</td>
<td>Junior (8-18)</td>
<td>2002-04: 1765 English Academy Footballers</td>
<td>48 % 25 % 16 % 11 %</td>
<td>1st September</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Football</td>
<td>Hulse et al., (IYS) 2006 unpublished</td>
<td>M</td>
<td>Adults</td>
<td>2006-07: 348 Premiership Footballers</td>
<td>32 % 25 % 24 % 20 %</td>
<td>1st September</td>
<td>Yes</td>
</tr>
<tr>
<td>Athletics</td>
<td>Morris et al., (IYS) 2006 unpublished</td>
<td>F</td>
<td>Adult</td>
<td>2002: 380 athletes UK Top 20 in event</td>
<td>30 % 32 % 19 % 20 %</td>
<td>1st September</td>
<td>Yes</td>
</tr>
<tr>
<td>Athletics</td>
<td>F</td>
<td></td>
<td>Adult</td>
<td>2002: 320 athletes UK Top 20 in schools event</td>
<td>31 % 30 % 20 % 20 %</td>
<td>1st September</td>
<td>No</td>
</tr>
<tr>
<td>Athletics</td>
<td>F</td>
<td>U20</td>
<td></td>
<td>2002: 133 English Schools Finalists</td>
<td>37 % 28 % 23 % 13 %</td>
<td>1st September</td>
<td>Yes</td>
</tr>
<tr>
<td>Athletics</td>
<td>F</td>
<td>U17</td>
<td></td>
<td>2002: 156 English Schools Finalists</td>
<td>28 % 28 % 24 % 21 %</td>
<td>1st September</td>
<td>No</td>
</tr>
<tr>
<td>Athletics</td>
<td>F</td>
<td>U15</td>
<td></td>
<td>2002: 110 English Schools Finalists</td>
<td>33 % 25 % 20 % 22 %</td>
<td>1st September</td>
<td>No</td>
</tr>
</tbody>
</table>
## Appendix 1 (continued): Summary of the research which has investigated the “Relative Age Effect” in Sport

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<th>Selection Year Start Date</th>
<th>Evidence Of Relative Age Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Football</td>
<td>Scott et al., (IYS) 2004 unpublished</td>
<td>F</td>
<td>Adults</td>
<td>2004-05: 1537 Premiership Footballers</td>
<td>Q 1: 26 % Q 2: 22 % Q 3: 26 % Q 4: 26 %</td>
<td>1st September</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Junior (U15-U21)</td>
<td>2002-04: 113 English International Footballers</td>
<td>Q 1: 21 % Q 2: 27 % Q 3: 26 % Q 4: 27 %</td>
<td>1st January</td>
<td>No</td>
</tr>
<tr>
<td>Gymnastics</td>
<td>Morris et al., (IYS) 2004 unpublished</td>
<td>F</td>
<td>Elite Female Gymnasts</td>
<td>2004: 177</td>
<td>Q 1: 21 % Q 2: 22 % Q 3: 25 % Q 4: 32 %</td>
<td>1st January</td>
<td>No Or Inverse?</td>
</tr>
<tr>
<td>Judo</td>
<td>Morris et al., (IYS) 2006 unpublished</td>
<td>F</td>
<td>Senior</td>
<td>2003-06: 143 Elite Senior Internationals</td>
<td>Q 1: 30 % Q 2: 25 % Q 3: 21 % Q 4: 24 %</td>
<td>1st January</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>16-20</td>
<td>2003-06: 96 Elite Players</td>
<td>Q 1: 26 % Q 2: 24 % Q 3: 17 % Q 4: 33 %</td>
<td>1st January</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>12-16</td>
<td>2003-06: 281 Elite Players</td>
<td>Q 1: 26 % Q 2: 30 % Q 3: 23 % Q 4: 21 %</td>
<td>1st January</td>
<td>No</td>
</tr>
<tr>
<td>Swimming</td>
<td>Dunman et al., (IYS) 2004 unpublished</td>
<td>F</td>
<td>Senior</td>
<td>1986-2004: 95 Senior Internationals</td>
<td>Q 1: 31 % Q 2: 27 % Q 3: 16 % Q 4: 24 %</td>
<td>1st January</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>14-17</td>
<td>2004: 111 ASA Youth Championship</td>
<td>Q 1: 26 % Q 2: 27 % Q 3: 27 % Q 4: 20 %</td>
<td>1st August 'Age on Date'</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>11-13</td>
<td>2004: 145 ASA Age Championship</td>
<td>Q 1: 45 % Q 2: 26 % Q 3: 16 % Q 4: 13 %</td>
<td>1st August 'Age on Date'</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Junior</td>
<td>2003: 239 Elite Junior Women</td>
<td>Q 1: 31 % Q 2: 25 % Q 3: 28 % Q 4: 17 %</td>
<td>1st January</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Enhancing opportunities for high-level sporting performance: influence of ‘Relative Age’

1. Number of 11-15 year olds in the UK population:

4. Research suggests that often birth date distributions are not even in sport.
   Let us assume that the distribution of births for this hypothetical gifted and talented cohort resembles that seen in the research literature. Therefore, the distribution of performers by birth date might be:
   - males: Q1-35%; Q2-25%; Q3-25%; Q4-15%
   - females: Q1-30%; Q2-25%; Q3-25%; Q4-20%

Appendix 2
HYPOTHETICAL IMPACT OF THE RELATIVE AGE EFFECT IN SPORT:

1.) 11-15 yr olds in UK population 2005
   - males: 1,998,000
   - females: 1,897,000

2.) distribution of population by birth date - assuming an even distribution
   - Q1: 49,950
   - Q2: 49,950
   - Q3: 49,950
   - Q4: 49,950

3.) distribution of birth dates in a gifted and talented cohort (Top 10%) - assuming an even distribution
   - Q2: 49,950
   - Q3: 49,950
   - Q4: 49,950

4.) in sport birth distributions are often uneven - fewer performers with birth dates in Q4
   - Q1: 69,930
   - Q2: 49,950
   - Q3: 49,950
   - Q4: 29,970

5. HYPOTHETICAL IMPACT OF THE RELATIVE AGE EFFECT IN SPORT:
   Therefore, this hypothetical example suggests that potentially 20,000 boys and 10,000 girls might not be selected on the basis of their age / birth date.