Happy birthday?

Nick Wattie and Joseph Baker on relative age and its influence on human development

While relating one’s birthdate with health and development may sound like astrology, researchers in a range of fields (e.g. education, medicine, sport) have consistently demonstrated that this seemingly innocuous characteristic affects a host of developmental outcomes. One mechanism of this effect is ‘relative age’, more specifically, one’s age relative to peers in the same cohort.

This brief summary attempts to give an overview of the diverse, numerous and nuanced influences that relative age has on human health and development.

How do age grouping policies affect development?
Can birthdate be used to predict who’s going to succeed in school and/or sport?
How would you solve relative age effects?

Casting your mind back, to your school days. Were you one of the oldest in your year, relatively speaking? And did you ever imagine that this had much of an influence on your life? Relative age ultimately stems from how we’ve chosen to group youth into cohorts (grades or year) in school and to determine their eligibility for sports teams. For example, in England a child’s age by 31 August is used to determine which school year they should be in for the upcoming academic session. If a child is five years old on or before 31 August, they are eligible to be in Year 1 of England’s school structure. A child born on 30 August will be approximately 12 months younger than a peer born on 1 September of the previous calendar year. However, for the breiest period, these two children will both be five years of age and they are therefore placed within the same school year. The same process is used to group youth on sports teams. Relative-age effects describe the consequences of relative-age difference within cohorts such as school years and sports teams.

Academic and athletic outcomes

The domain with the longest history of examining relative-age effects is education (e.g. Jinks, 1964), where the bulk of the evidence indicates that relatively older pupils are more likely to attain higher grades than their relatively younger peers. This effect has been reported across a range of subjects (Donofrio, 1977; Massey et al., 1996), among males and females, and within both the primary and secondary stages of education (Bell & Daniels, 1990; Sharp et al., 1994). In a recent study from our research team (Cobley et al., 2009b) we observed that the top 20 per cent of achievers across all subjects (based on a composite attainment score from their grades from all subjects) were approximately four and a half times more likely to be relatively older rather than relatively younger. Importantly, this relationship is not limited to the UK; the influence of relative age on academic proficiency has been reported around the world. Data from the Trends in International Mathematics and Science Study (TIMSS), from 19 OECD countries (www.oecd.org), demonstrated a 4–12 percentile lower score for the relatively youngest among 4th grade children (approximately nine years of age) and a 2–9 percentile decrease for relatively younger 8th grade children (approximately 13 years of age).

Given the relationship between relative age and academic achievement, it should come as no surprise that relatively older and younger youth have qualitatively different experiences in school, particularly with regard to ability streaming (grouping children in hierarchies of academic proficiency). Indeed, during secondary education, relatively older pupils are more likely to be in the top ability streams and identified as ‘gifted and talented’ (Cobley et al., 2009b; Thompson, 1971). One study even reported that relatively older children were up to 11 per cent more likely to occupy leadership roles in secondary school (Dhuey & Lipscomb, 2008).

The flip side of this coin shows that relatively younger children are more likely to be placed in lower-ability streams (Thompson, 1971) and identified as having ‘special educational needs’ in England (Bookbinder, 1967; Wilson, 2000) and the United States (Martin et al., 2004; Wallingford & Prout, 2000). Relatively younger pupils are also overrepresented among those identified as learning disabled (Maddux, 1980). More relatively younger pupils than relatively older pupils (approximately 60 per cent vs. 40 per

resources

Relative age in sports performance noted that 40 per cent of elite Canadian professional ice hockey players were born in the first three months of the hockey selection year (January to December) compared to less than 10 per cent born in the last three months (Barnsley et al., 1985). Over the intervening two and half decades, similar effects have been reported in sports ranging from team activities like soccer, handball and volleyball to individual sports like swimming and tennis (see Cobley et al., 2009a, for a review).

The effect is presumably driven by the sophisticated and highly competitive talent identification and development systems used by many sports. Increasing attention speed, power, and physical size. As a result, because these variables are often determined by chronological age rather than innate potential, coaches and trainers confuse maturation for innate talent (see Baker et al., 2010; Wattie et al., 2008).

Researchers have also investigated a range of behavioural, psychosocial and health outcomes associated with education-based relative age. Research suggests that relatively younger pupils have lower levels of self-esteem (Fenzel, 1992; Thompson et al., 2004), although ambiguous results have also been reported for motivational and engagement outcomes (Martin, 2009). In a nationally representative sample of 5- to 15-year-olds from the UK, relatively younger pupils were at greater risk of psychiatric disorders than relatively older pupils (Goodman et al., 2003). As an indication of the scale of this issue, the authors suggest that if the prevalence of psychiatric disorders were equal across different relative ages then there would be approximately 60,000 fewer cases of child psychiatric disorder in the UK. Similarly, researchers in the United States (Schneider & Eisenberg, 2006) observed that relatively younger youth were approximately 50 per cent more likely to be diagnosed with attention-deficit/hyperactivity disorder (ADHD), particularly with regard to how ADHD-related symptoms were perceived by children’s teachers (Elder, 2010). A recent large-scale Canadian study confirmed that relatively younger youth are also more likely to be prescribed medication to treat ADHD (Morrow et al., 2012). If these findings were not enough to convey the potential seriousness of some relative-age effects, Thompson and colleagues (1999) observed an overrepresentation of the relatively young among individuals under 20 years of age who had committed suicide.

The devil is in the details
While the trends and outcomes described above have serious implications for youth development, it is important to describe
some of the nuances of the relative-age effect since they offer insights into the mechanisms of these effects and may even illuminate how they can be moderated or eliminated. Interestingly, the socio-economic literature has noted some unexpected attainment trends when examining relative-age effects, suggesting that simple mean trends may obfuscate the complexity of these effects. In an investigation of secondary school mathematics exam results, Allen (2008) observed that relatively older pupils had higher average attainment in maths. However, relatively younger pupils were more likely than their relatively older counterparts to score above the 90th percentile. Therefore, mean attainment statistics, which indicated conventional school relative effects (relatively older = higher attainment; relatively younger = lower attainment), may not reveal important subtleties. This study adds to a growing body of evidence suggesting that in some circumstances there is the potential for relatively younger youths to have some advantages over their older peers. Allen (2008) suggests that relative age may influence social identity (e.g. cool crowd, nerd, etc.), which in turn may exert an influence on academic achievement trends. More generally, however, the results reported by Allen also reiterate the importance of remembering that advantages for relatively older youths are probabilistic and not deterministic.

There is another point to make about relative-age trends in academic achievement, namely the relationship between academic ability streaming and academic achievement. Perhaps most interesting is the fact that two countries, Denmark and Finland, demonstrated no relative-age effects for academic achievement (Bedard & Dhuey, 2006). The authors highlight one particular educational feature within these countries that may explain the lack of effects: specifically, policies regarding ability streaming (the streaming, selection or organisation of youth into different hierarchies of proficiency). The authors note that these countries also had a lack of, or in the case of Denmark a complete prohibition on, ability streaming until late adolescence (16 years of age). This is in stark contrast to countries like England and the United States which ability stream from the early primary years of education. Indeed, relative age seems to predominantly influence academic achievement in environments where ability streaming is common practice. Whether or not Allen and Barnsley (1993) should have titled their paper ‘Streams and tears’ rather than ‘Streams and tiers’, their admonition of ability streaming was poignant nonetheless: ‘Observing the relative age effect late in schooling, then makes it easy – too easy, facile really – to simply conclude that strong streaming in school systems produces dead weight loss’ (p.658).

Another insight from the socioeconomic literature concerns the intersection between relative age and socio-economic status. Specifically, the observation that high socio-economic status parents were more likely to delay their child’s entry to school if they were to be relatively younger members of their cohort, thereby making them relatively older when entered into school (Bedard & Dhuey, 2006). If true, and replicated, relatively younger youth may be more likely to be disadvantaged by both their relative age and their socio-economic status. However, research has not comprehensively considered the intersection of social class and ethnicity with relative age, providing an intriguing avenue for future research.

The last point we would like to make regarding relative-age effects in education concerns the subjective nature of some relative-age effects. Earlier, it was mentioned that relatively younger youth were more likely to be referred for counselling/behavioural problems (Drabman et al., 1987), despite the fact that their scores on standardised tests of behavioural problems were equivalent to those of relatively older youth. This suggests the possibility of a far more insidious aetiology based on perceptions, rather than objective differences in behaviour. There may be a need to consider whether the resultant developmental outcomes so consistently linked with ability streaming and relative age could be described as pathologising...
individuals' normal reactions/behaviours to their developmental environment. In the case of the findings reported by Drabman and colleagues (1987), there may also be a need to consider whether or not some outcomes may be pathologised without foundation or meaningful cause. More research is needed to explore the role of subjective perceptions on the disproportionate diagnosis of other conditions, such as ADHD, according to relative age.

Long-term effects
Even though the majority of research has focused on youth samples, evidence suggests that relative-age differences may have lasting impacts later in life. Relatively younger youth are also underrepresented (by 7–12 per cent) among those who take pre-university entrance tests (e.g. the SAT) in North American during the last year of secondary school (Bedard & Dhuey, 2006). Consistent with this line of evidence, researchers who examined applications to medical school in the United States found that a greater proportion of applicants were relatively older (Abel et al., 2008). Interestingly, researchers examining cognitive academic achievement and indices of healthy social life of students at one Italian University found that relatively younger, not older, students attained higher grades (Billari & Pellizzari, 2008). There were also concomitant indications that relatively younger students had less active social lives, perhaps an indication that they had more time to focus on educational attainment and/or that these students had developed poorer social skills. The trend for less active social lives among relatively younger students could also be a corollary of the social identity hypothesis described by Allen (2008; see above).

Similarly, results from sport suggest that relative-age differences occurring early in development have long-term implications, affecting one's likelihood of becoming a professional/elite athlete (e.g. Wattie et al., 2007). One's relative age status also predicts salary in professional soccer (Ashworth & Heyndels, 2007) and career length in professional handball (Schorer et al., 2009), although, interestingly, it is the relatively younger athlete who seems advantaged in these outcomes. Furthermore, Baker and Logan (2007) found that relatively younger ice hockey players were more sought after in the National Hockey League’s professional sports draft. It is possible that relatively younger athletes who are able to continue in a system that may be biased towards their relatively older counterparts may end up developing superior skills (e.g. through competing against larger, more capable opponents during key stages of development), although this hypothesis has not been explored empirically. These seemingly counterintuitive results highlight the complexity of these effects and how they relate to human health and development. The fact that the processes related to these counterintuitive results are largely not understood highlights the need for future research.

Conclusions
Collectively, the trends discussed here emphasise the subtle influence that birth date has on human development. Clearly not all relatively older youth experience the advantages described above, just as not all relatively younger youth are disadvantaged and discriminated against. What is clear is that relative age has the potential to influence a variety of different developmental outcomes, affecting the quality of an individuals’ experience in sport and education, two of our most cherished and ubiquitous social structures. Greater attention to these effects and the social policies underpinning them would help to ensure a level playing field for all.

Nick Wattie
is in the School of Kinesiology and Health Science, York University, Toronto
wattien@yorku.ca

Joseph Baker
is in the School of Kinesiology and Health Science, York University, Toronto
bakerj@yorku.ca