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A Game Plan for Growth: How Football is leading the Way in the Consideration of Biological Maturation in Young Male Athletes

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As the 2018 World Cup draws to an end, football's governing bodies turn an eye to the future and, for many, the task of rebuilding. An important step in this process is the identification and development of talented young footballers. Which players hold the greatest potential for success as adults, which clubs are they with, and how do we optimise their development? (Tucker and Collins 2012)

A significant challenge for those tasked with identifying talented young footballers is that children and youth can vary considerably in the timing and rate at which they mature physically/biologically (Malina et al. 2015). Players of the same age have been shown to vary in maturity status by as much as five to six years in biological age (Johnson 2015). Players born just after the cut-off dates for their year groups can also be up to a year older chronologically than those born at the end of the year; a concept known as 'relative-age effect' (Votteler and Honer 2014). Differences in biological maturity status and relative-age have been shown to independently impact player selection and performance in youth football (Johnson et al. 2017; Towlson et al. 2017). By virtue of their older age, players born at the start of the selection year are more likely to be represented in academy football (Votteler and Honer 2014). This effect likely arises through age related differences in experience and development and can be observed from early childhood and is maintained through adolescence (Helsen et al. 1998). Boys who mature early are also more likely to be selected into academy football (Figueiredo et al. 2009). However, this maturity bias emerges from 11 years, coinciding with the physical and athletic gains that accompany puberty (i.e., greater size, strength, speed, & power) (Meylan et al. 2010), and increases with age and competitive level. A recent study of Aspire Sports Academy (Qatar) and Manchester United players found between 60% and 74% of the under-16 and under-17 players to be early maturing (Johnson et al. 2017).

Recognising that academy selection policies favour more physically mature players, Sir Alex Ferguson (former Manchester United Manager) remarked that '*the biggest risk was that we had erred in our assessment of a particular boy and could have used his spot to work with a more talented youngster. We had to wait a little longer to see the potential in some boys, because not everyone's physique develops at the same rate*' (Ferguson 2015, p. 260). Awareness of individual differences in maturity status and timing can inform player selection and development. As a youth, Jesse Lingard (Manchester United & England) was considered talented, yet struggled physically, due to being a late developer. Academy coach, Tony Whelan noted concerns outside the club that Lingard "*was so small and delicate, he might not be able to cope with the training*" (Bartram 2018). Realising his exceptional technical and psychological aptitude, however, Jesse was retained and played down a year against physically matched peers. "*Even when he went full-time he was still playing with the under-16s. There was a big gap between him and the older boys, so in some of the games he didn't play, simply because he wouldn't have been able to get around the field and cope with the physical demands.*" (Bartram 2018)

Although late maturing players often struggle to compete as youths, they may hold the greatest potential for success as adults. Coined the 'underdog hypotheses (Gibbs et al. 2012; Krogman 1959), this theory holds that late developers must possess or develop superior psychological or technical/tactical skills if they are to be competitive. These abilities, though often masked through childhood and adolescence, emerge in adulthood when maturity associated variation in size and athleticism is reduced. Evidence from Swiss (Zuber et al. 2016) and English (Cumming and Bunce, 2015) players reveals that later maturing players do indeed possess superior technical, tactical and psychological skill sets. Despite these advantages, however, these players are still less likely to be represented or transition

successfully through their developmental programs (Cumming and Bunce, 2015; Zuber et al. 2016).

So what are football's governing bodies and professional clubs doing to solve these problems? The answer is, quite a lot. World cup semi-finalists Belgium are already reaping the benefits of their 'Juvenile' program; a parallel national junior squad designed to retain talented, yet later maturing, players within the talent pool. Erik Abrams, former national youth coach and architect of the program, cites Kevin De Bruyne, Thibaut Courtois, and Dries Mertens as Belgian players who have benefitted from this system; having had the opportunity to compete and train, and to be evaluated in more developmentally appropriate contexts (Bate 2016).

As part of their Elite Player Performance Plan, the Premier League in England has implemented a league wide initiative; educating academy staff on the processes of growth and maturation and creating a system that enables clubs to better assess, monitor and interpret differences in player development (Lansley 2016). This system allows clubs to identify players advanced or delayed in maturation, pinpoint important stages of development (e.g., pubertal growth spurt), and account for maturity when evaluating player fitness (Ryan et al. 2018). It also permits clubs to periodically group players by maturity status for training or competition; a process referred to as bio-banding (Cumming et al. 2017). Although in its infancy, evidence suggests that bio-banding, as an adjunct to age group competition, can benefit both early and late maturing boys (Cumming et al., 2018; Reeves et al. 2018). Competing against older and physically matched players, early developers cannot rely on their physicality and must adopt more technical/tactical styles of play. Conversely, late developers have more opportunity to use and demonstrate their physical and technical skills and adopt positions of leadership. Early and late developers also agree that bio-banding encourages a more technical/tactical and less physical style of play; an observation

substantiated in a recent study conducted by Exeter City (Thomas et al. 2017). Interest in bio-banding is growing with bio-banded games being recently trialled in Australia, Scotland, Poland, and the United States.

Exploring the role that coaches and scouts play in the relative age effect, PSV Eindhoven evaluated the impact of age-ordered shirts (i.e., shirts where the numbers corresponded to the relative age of the players) to counter the selection bias toward relatively older players (Mann and van Ginneken, 2017). The results of the study demonstrated that visual cues identifying differences in relative-age can help coaches overcome this bias when evaluating match performance. In a similar vein, a number of British clubs have experimented with 'fourth quarter' trialist days, restricted to players born in the last 3 months of the selection year.

Football has initiated a renaissance in the study and consideration of growth and maturation in young athletes and the integration of these observations into developmental programs. The national governing bodies, academy managers, coaches and practitioners responsible for spearheading this change should be commended for their innovation and willingness to translate research into practice and policy. Other sports, for whom growth and maturation is a concern, should look to football for inspiration and as an example of good practice. Through education and the systematic assessment, monitoring and management of growth and maturation, all sports can better identify and develop the superstars of tomorrow.

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