Premier League Growth Study

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Premier League

- Corporation of 20 member clubs operating England’s top professional football league
- Strategically invests in Academy system and player development
- Oversees Academy audits, CPD, and competition
Issues of concern

- Competition has made clubs increasingly reliant on foreign payers
- £530 million paid to foreign clubs in 2015 summer transfer window (63% of total spending)
- Limited opportunity for home-grown players to play first team football

Percentage of foreign born players

* CIES Football Observatory (2013) Demographic Study of European Football
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Elite Player Performance Plan (EPPP)

- Long-term strategy to increase number and quality of home-grown players
- Improve coaching provision; implement system of effective measurement and quality assurance
- Collective platform for clubs to share ideas/concerns

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Academy concerns

1. Limited understanding of growth and maturation & how to assess & monitor it
2. Assessments, training & competition based upon chronological age groups – blanket approach
3. Selection bias towards males who are advanced in age and/or maturation
Premier League Growth Study: Aims

1. Establish a systematic and shared set of procedures for the measurement of growth & maturation

2. Educate practitioners on growth, maturation & measurement

3. Adapt existing database (PMA) to capture and present growth and maturation information

4. Help clubs develop strategies to account for individual differences in growth & maturation
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Scientific Advisory Group

- Professor Robert Malina, University of Texas
- Professor Adam Baxter-Jones, University of Saskatchewan
- Professor Joey Eisenmann, Michigan State University
- Dr Manuel Coelho e Silva, University of Coimbra
- Dr Thomas Dompier, Datalys Center for Sports
- Dr Lauren Sherar, University of Loughborough
- Dr Amanda Johnson, Aspire Academy
- Dr Marije Elferink-Gemser, Rijksuniversiteit
- Dr Roel Vaeyen, Club Brugge K & Ghent University

Process of development

Evaluation of Current Practice
- What do clubs do?
- What are our aims/constraints?
- What is “best practice”?

Education / Teaching of Best Practice
- Club buy in
- Staff training
- Learning resources (MoP, Online Media)

Adaptation of PMA
- Integrated database to collect, analyze, and present data on player growth and maturity
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What information does the PMA generate?

Auxology
- Growth status & rate (plotted), Relative Age
- Maturity status and timing (Khamis-Roche, Mirwald)
- Predicted stature with 50-90% confidence intervals
- Sensitive time-points for training (PHV, PWV)

Fitness
- Age specific standards
- Maturity specific standards
- Developmental trajectories for fitness

Programme overview
- Relative age by maturity timing matrix
- Groupings of athletes by maturity status

Maturation measures: Maturity Offset

- Uses age, height, seated height & weight to predict age from & age at Peak Height Velocity

- Mean age PHV 13.8 years in males (+- 1 or .5 years for early, late)

- Adjustable in PMA for age associated error

Stratton & Oliver (2013) In Strength and Conditioning for Young Athletes: Science and Application
Limitations of MO method


Maturation measures: Khamis-Roche

- Uses age, height, weight, biological mid-parent height to predicted adult height (PAH) (+2.2cm median error)

- Percentage of predicted adult height (%PAH) as index of maturation status

- Timing expressed as age/sex specific Z-scores (0 = on-time)
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Player A
- 13.5 years
- Curr. 165cm
- Pred. 185cm
- 89% adult ht.
- Circa PHV
- Z Score = -0.2
- On time

Player B
- 13.5 years
- Curr. 165cm
- Pred. 170cm
- 97% adult ht.
- Post PHV
- Z Score = 2.2
- Early

PLGS Targets

Phase 1 (2013-2014)
- Measurement procedures & guidelines
- Educate and train practitioners
- PMA Adaption
- PLGS Rollout

Phase 2 (2014-present)
- Age & maturity specific standards
- Developmental trajectories
- Bio-Banding competitions
How are clubs using the data

1. Talent identification & evaluation
2. Training design and evaluation
3. Bio-banding competition

1. Talent identification
   - Young athletes defined as talented in terms of athletic aptitude and success within age groups
   - Success and aptitude can be masked or enhanced by individuals differences in RAE and growth and maturation
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Age at PHV in Japanese Football Players *

Chuman et al., (2014) *

Maturation and footballers

- Footballers on-time or advanced in maturation; heavier than norm; born early in the year (Q1 - 50%, Q4 - 10%)

- Selection bias emerges at puberty; increases with age & competitive level

- Defenders & forwards more advanced in maturity, taller & heavier
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Maturity timing and performance

- Males advanced in age and/or maturation perform better on tests of ....
  - Explosive power (CMJ, VSJ, SLJ)
  - Anaerobic power
  - Isometric strength
  - Sprinting (30 m run)
  - Agility (shuttle run, sprint with slalom)
  - Endurance


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Maturity timing and in-game performance

Social management of maturation

- Early maturing males identified earlier, treated preferentially *
  
  i. Greater confidence
  ii. More playing time/star roles e.g., forward, captain
  iii. Greater rewards & recognition
  iv. More encouragement & instruction
  v. Earlier & better access to coaching, sports science support

*Bloom (1985) The development of talent

Questions for consideration

- Are selection strategies favouring players on attributes not fully realized until after puberty counterproductive?

- Do early maturing boys play to their strengths at the neglect of their technical development?

- Are talented yet younger and/or late maturing boys being overlooked or excluded too early?
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Bio-banding and recruitment

- Brighton and Hove Albion and West Bromwich Albion using ‘4th quarter trials days’ to overcome the relative age effect
- ‘Juvenile’ developmental squads for younger and later maturing players
- Educating scouts on the impact of growth and maturation
Bio-banding and evaluation / selection

- PMA allows academies to generate age- & maturity-specific standards for fitness testing
- Developmental trajectories will better reflect athletes’ true aptitude & development

Developmental trajectories and RAE

The underdog hypotheses *

- Younger/late maturing athletes hold the most potential as adults
- Physical disadvantages necessitate superior technical / psychological skills
- More time in stage optimised for learning and development
- More potential for future physical growth


Maturity Timing & Upper body strength

Figure 4. Average arm pull (ARP) distance curves for early, average and late maturing boys.
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Maturity Timing & Power

Figure 3. Average vertical jump (VTJ) distance curves for early, average and late maturing boys.

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Maturity Timing and Speed

Figure 7. Average shuttle run (SHR) distance curves for early, average and late maturing boys.
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Underdog effect in Academy rugby

- Later maturing players...
  - Report higher levels of Grit (perseverance / effort)
  - Possess more adaptive self regulation skills (reflection, planning, questioning / seeking support)


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Growth potential: A Case Study in Tennis
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Bio-banding: Training

- Matching the athletes training program/stimulus to their maturational status and skill set

- Optimize training effects and improve safety for the athlete*


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Bio-banding: Training

- Players grouped by biological maturation for training purposes; often around key phases (e.g., pre, circa, post PHV, post PWV)

- Technical proficiency & psychological resilience/maturity considered in individual case scenarios *

* DePledge (2015) Application of growth and maturation at Southampton FC
Bio-banding: The clumsy child phase

- Growth spurt requires athlete to adjust to rapid changes in limb length, fitness & mechanics *

- Sessions on controlled movement, reactions/co-ordination, running & landing mechanics, sport specific skills for youth circa PHV *


Bio-banding: Overuse injuries

- Growth spurt a risk factor for overuse / epiphyseal injuries (Osgood-Schlatter’s, Sever’s disease) *

- Reduction in training load circa-PHV resulting in marked reductions in overuse injuries in Premier League Academies

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**Bio-banding: Competition**

- Premier League hosted world’s first bio-banded competition in football (Southampton, Norwich, Stoke, Reading)

- Players aged between 11 to 14 years between 85-90% predicted adult height


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**Testing a bio-banded competition in EPL**

- Coaches and players completed a post-tournament questionnaire

- Late and early maturing players (N=16) participated in post-tournament focus groups

- GPS & match performance data collected
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Testing a bio-banded competition in EPL (cont.)

• Coaches & players rated experience as overwhelmingly positive

• "In this type of match they don't go into a game worried about other players being too big, too quick and too physical for them to compete with, but know that the challenge will be something that is manageable. This will also assist us with talent identification, retaining late developing players for longer periods."

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Testing a bio-banded competition in EPL (cont.)

• Early maturers (playing up) reported working harder, had to rely more on technical than physical attributes, adapt to a faster game, and rely more on teammates

• Late maturers (playing down) reported greater composure, more opportunity to demonstrate technical skills, leadership opportunities
Early maturers playing up

“It’s definitely made me move the ball quicker than I would and I don’t use my strength as an advantage as much as I do with my own age group” (EM1, P4)

“You learn a lot more playing like this than you would normally playing with your age group” (EM2, P4)

“It made me more confident, playing with older boys, and getting used to the pace. Made me quicker on the ball.” (EM1, P3)

Late maturers playing down

“in a normal game you might only be able to do a bit of magic twice, but in here, every time you get the ball there is a chance that you can do it” (LM1, P3)

“You’re also more composed on the ball...there’s not a massive 6’ 5” player running up ...you know that it’s somebody your size, you can push off as well as keep the ball” (LM1, P4)

“I feel like it’s given us more chance to stay at the club... Finally, people have been realising that small players are good for the academies” (LM1, P1)
Bio-banding: The future

- Examine ‘in game’ differences between early & late maturing males (GPS, match analysis)
- Competitions different maturity bands (e.g., 90-95%, 95-100%)
- Bio-banding tournaments in other sports (tennis, rugby, gymnastics)

PLGS: Take home messages

- Clubs and NGBs can develop systems of measurement to account for individual differences in growth and maturation and RAE in young athletes
- These systems show promise in relation to informing talent identification and optimise development an enhance safety
- Further research is undoubtedly required to determine the effectiveness of bio-banding strategies on player development and safety