Growth and maturity in swimming
A story of two swimmers

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How to survive the talent development pathway
Meet the characters

Marjorie Majority

Talented!!!
Winner at national championships

Dorothy Different

Talented
Narrowly missed selection for national championships
The battle

The difference
Relative Age Effect
The luck of your birthday
What is relative age effect?

Relative Age = Potential differences in an age within an annual cohort.
At 12 years old…. 8 months makes a big difference..

Marjorie Majority
Born in January

Dorothy Different
Born in August
Fig. 1. (a & b) A graphical summary of female participants competing in the 50 m (a) & 400 m (b) Freestyle at the National Swimming Championships (2000–2014 inclusive) according to annual age group and quartile.

Cobley et al., (2018) JSAMS (Epub ahead of print)
Messages received at this stage matter

Marjorie Majority

Fixed Mindset
Believes talent is inborn

- Desires to be seen as perfect and talented, so...
  - She avoids challenge
  - Gives up easily
  - Sees effort as temporary
  - Gets frustrated or ignores feedback or criticism
  - Feels threatened by others’ success

Leads to a very emotional cheerleader that is constantly trying to regulate herself and the way others view her. This creates a rigid and difficult athlete that is limiting her potential.

Dorothy Different

Growth Mindset
Believes ability can be developed

- Ultimate desire is to learn and improve, so...
  - She embraces challenge
  - Pushes through setbacks
  - Believe her effort is most important
  - Uses feedback and criticism as a way to improve
  - Is inspired by and learns from others’ success

Leads to a hard working cheerleader that is constantly looking to better herself. This creates a calmer, more open-minded athlete that is coachable and can reach her fullest potential.
Our data... Phase 2 camps

Relative age effect at SwimEngland Phase 2 Camps

At 15-16 years old, RAE is no longer evident for females, but is still evident for male swimmers
What does this mean for us?

- Should we have representative selection younger than 15?
- Can we be more scientific in our selection and correct for RAE?
- What messages are we sending around early selection?
Age correction for selection

Till, (2017)
Enhancing the Evaluation and Interpretation of Swim Performance within Youth Swimmers
Maturity Effects

Timing of the growth spurt
PHV usually occurs at
11.3 – 12.2 years in girls
13.3 – 14.4 years in boys.

BUT this varies considerably in the general adolescence population. For example, PHV for British boys could occur anywhere between 12.0 and 15.8 years.
The Growth Spurt

**Physical:**
- Increases in height, weight, and muscle mass
- Increased injury risk - overuse
- Greater capacity for endurance and strength exercise
- Heart & lungs increase in size
- Rapid rate of growth - limbs & extremities grow at different rates
- Loss of co-ordination "clumsiness" - strength doesn’t increase at same rate as growth

**Hormonal:**
- Change in hormones - behavioural effect: aggression
- Increase in testosterone production

**Psychological:**
- Major changes in psychosocial behavior, especially in males
Variation in maturation

“Growth and maturation are non-linear phenomena which vary greatly between individuals in terms of both timing and tempo.”

Robert M. Malina

Lloyd et al., 2014, JSCR
Variation in maturation
FOREWARNED, FORARMED; TO BE PREPARED IS HALF THE VICTORY.
Determining Maturity

Age at PHV – Mirwald (2002)

\[
\text{Maturity offset} = -29.769 + 0.0003007 \times \text{leg length and sitting height interaction} - 0.01177 \times \text{age and leg length interaction} + 0.01639 \times \text{age and sitting height interaction} + 0.445 \times \text{leg by height ratio}\]

(1)

Peak height prediction – Khamis & Roche (1994)

\[
\text{Maturity offset} = -16.364 + 0.0002309 \times \text{leg length and sitting height interaction} + 0.006277 \times \text{age and sitting height interaction} + 0.179 \times \text{leg by height ratio} + 0.0009428 \times \text{age and weight interaction}.
\]

(2)
Our data... Peak Height Velocity

Phase 2 camp attendees

Age at PHV

Ranges: 12.0 to 13.9  12.9 to 15.3

Years since PHV

Ranges: 2.0 to 4.1  0.2 to 3.5
Our Data… Predicted adult height

Phase 2 camp attendees

- Females
- Males

% Predicted adult height

- 95%
- 96%
- 97%
- 98%
- 99%
- 100%
- 101%

- 33% Early
- 66% On Time
- 95% On Time
- 5% Late
At 13 years old…. How does this affect our girls?

Marjorie Majority

Early maturer

Dorothy Different

Late maturer
Marjorie’s coach

• Is very impressed by her progress
• Doesn’t have any girls who can compete with her, so challenges her to swim with the boys
Dorothy’s coach

• Has done some maturity measurements
• Knows Dorothy is a slightly late maturer, but that she will ultimately be taller than average
• Encourages “integrated neuromuscular training”
• Encourages Dorothy to play different sports
• Ensures that enjoyment is maintained.
So what happened?
Marjorie stagnates, Dorothy thrives

Marjorie

Dorothy
Critical differences in approach

- Marjorie is outperforming boys of the same age at 12 & 13
- Boys progress massively during growth spurt
- With matched training Marjorie stagnates and becomes frustrated
Stagnation, frustration and overtraining
Critical differences in approach

- Dorothy performs age-appropriate training throughout.
- Trains independently of boys.
- Makes consistent progress, and eventually overtakes her age-matched, early maturing peers.
Fulfillment and attainment
Measure, don’t guess

WITHOUT DATA
YOU’RE JUST ANOTHER PERSON
WITH AN OPINION

W. EDWARDS DEMING
(St)age appropriate training

Pre-PHV
- Integrated Neuromuscular Training
- Multi-Sports
- Focus on skill development and enjoyment

Circa-PHV
- Manage training loads carefully
- Be understanding of complex Bio-Psycho-Social changes
- Emphasize social aspects – team and relationships

Post-PHV
- Increase training volume and intensity
- Introduce advanced strength and power training
- Specialisation
Boys and girls are different, don’t treat them the same.
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