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Growth and maturity in swimming

A story of two swimmers

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11 March 2018

Swim England Swimming

How to survive the talent development pathway

Meet the characters

Marjorie Majority

Talented!!!

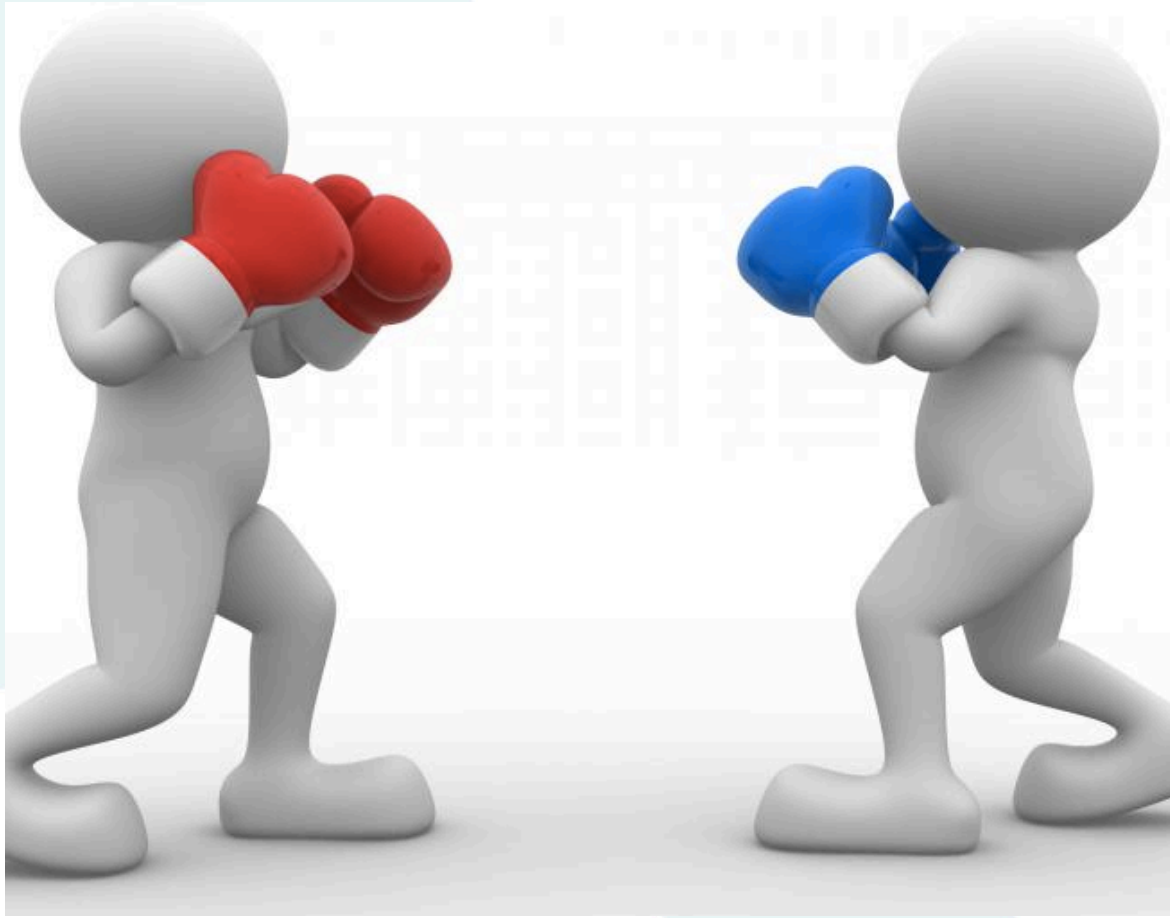
Winner at national championships

Dorothy Different

Talented

Narrowly missed selection for national championships

The battle



The difference

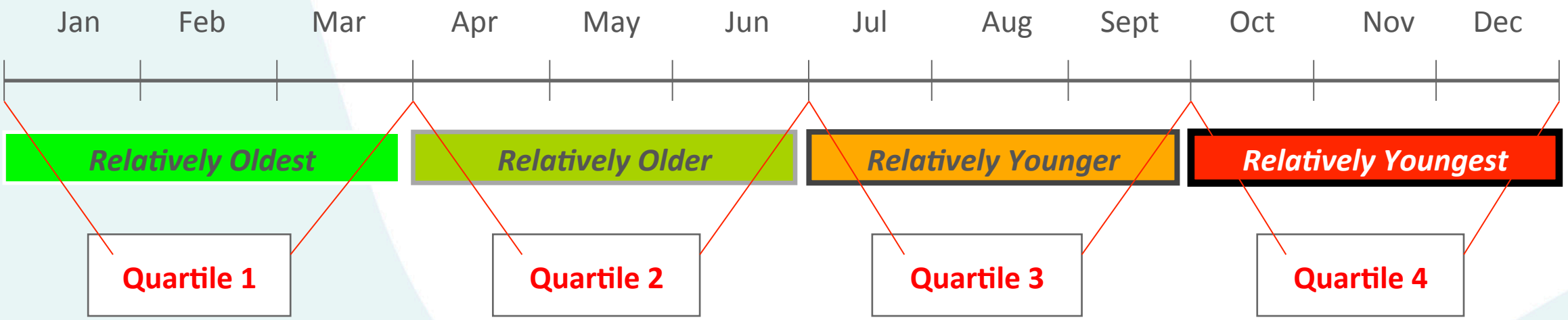
Relative Age Effect

The luck of your birthday

What is relative age effect?

Relative Age =

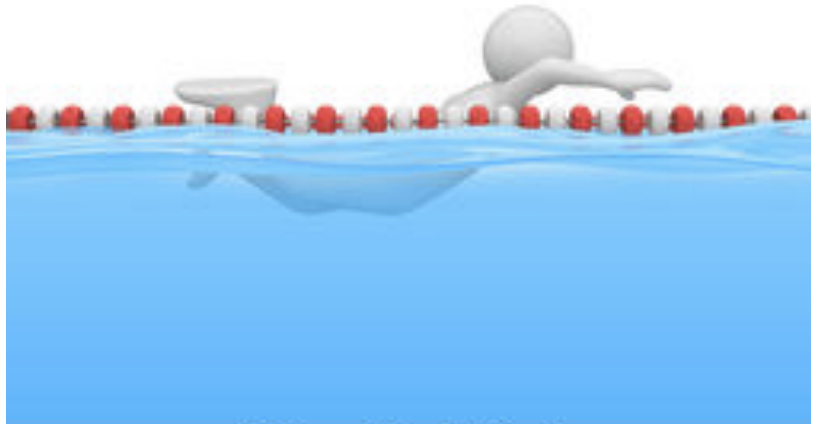
Potential differences in an age within an annual cohort.



Annual-age grouping policy

At 12 years old…. 8 months makes a big difference..

Marjorie Majority



Born in January

Dorothy Different

Born in August

Research

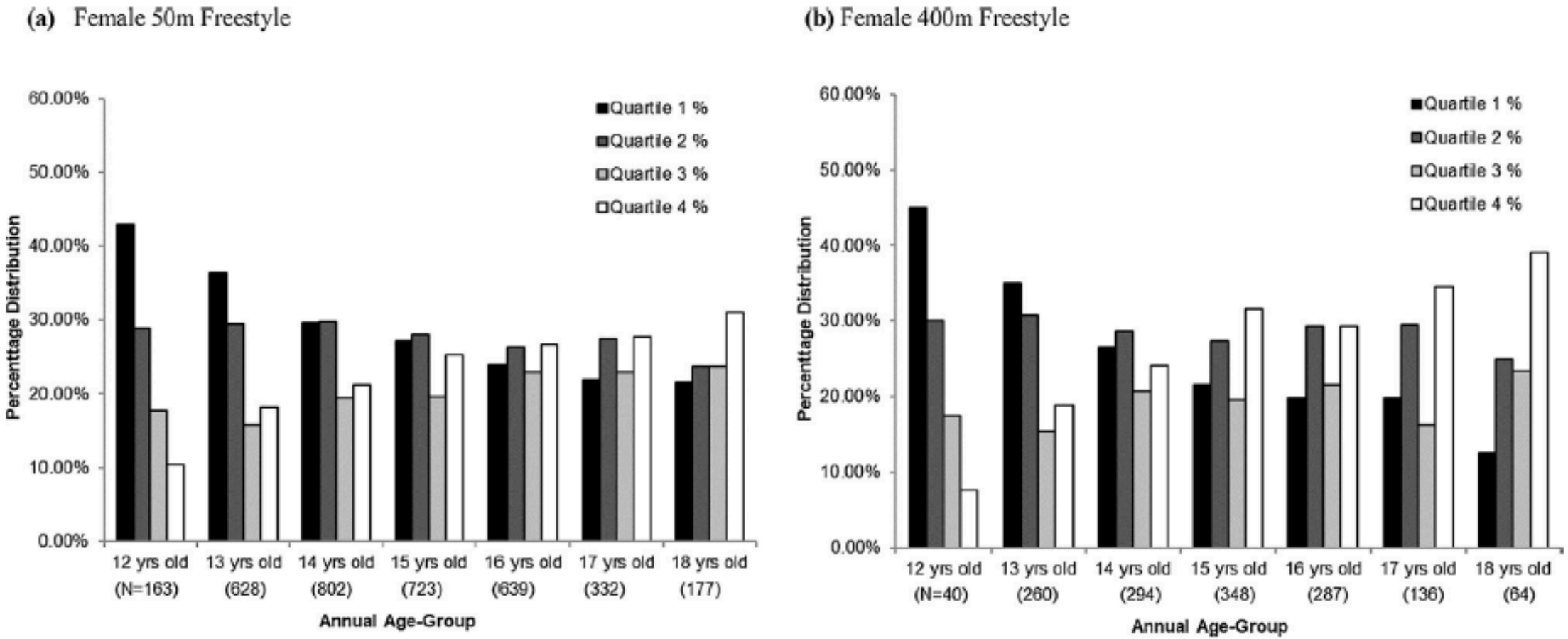


Fig. 1. (a & b) A graphical summary of female participants competing in the 50 m (a) & 400 m (b) Freestyle at the National Swimming Championships (2000–2014 inclusive) according to annual age group and quartile.

Cobley et al., (2018) JSAMS (Epub ahead of print)

Messages received at this stage matter

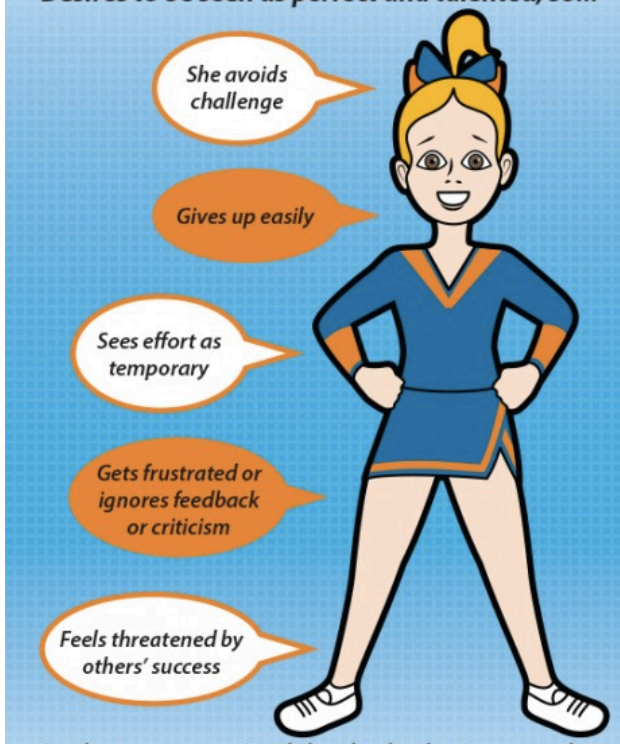
Marjorie Majority

Dorothy Different

Fixed Mindset

Believes talent is inborn

Desires to be seen as perfect and talented, so...



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.

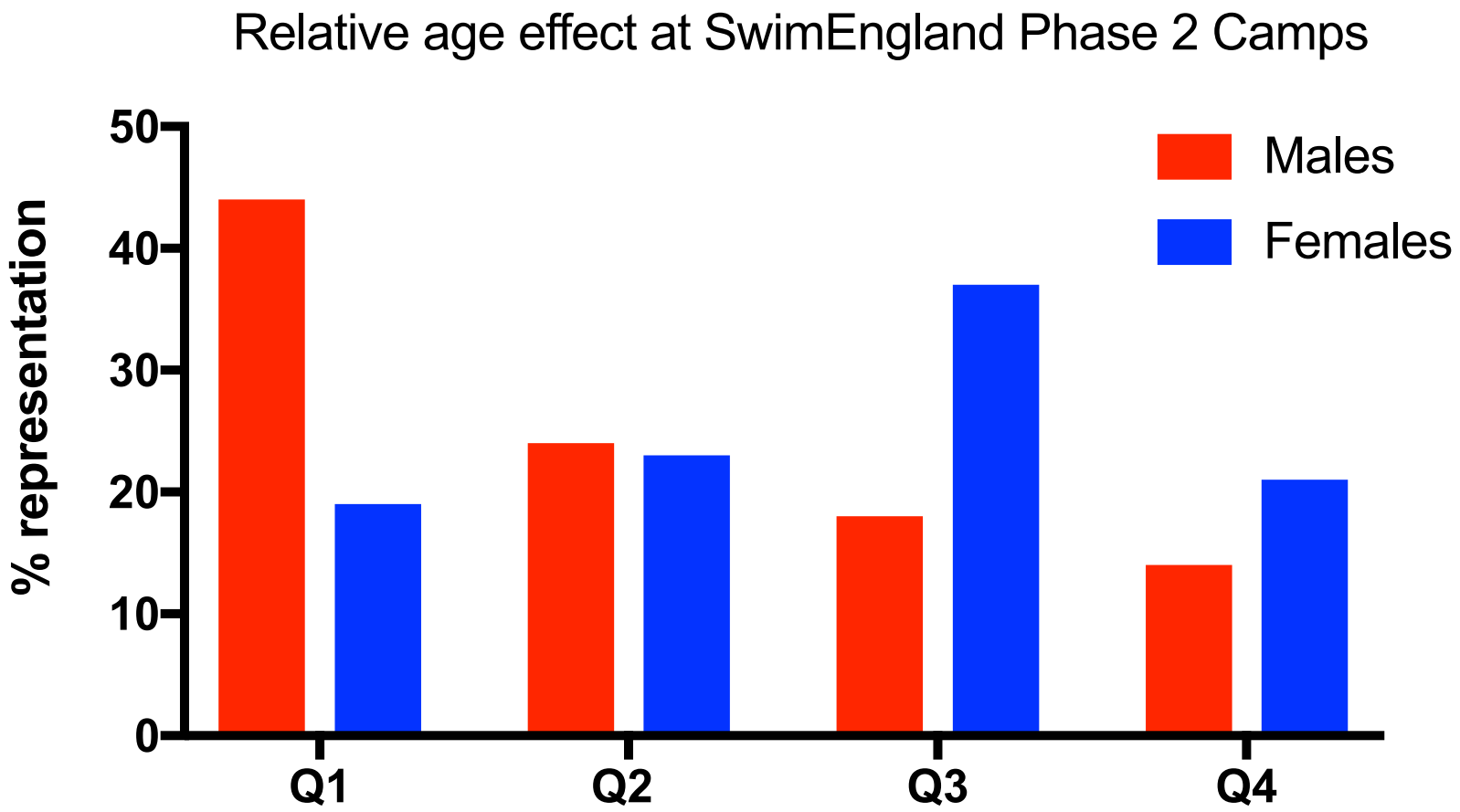
Growth Mindset

Believes ability can be developed

Ultimate desire is to learn and improve, so...

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



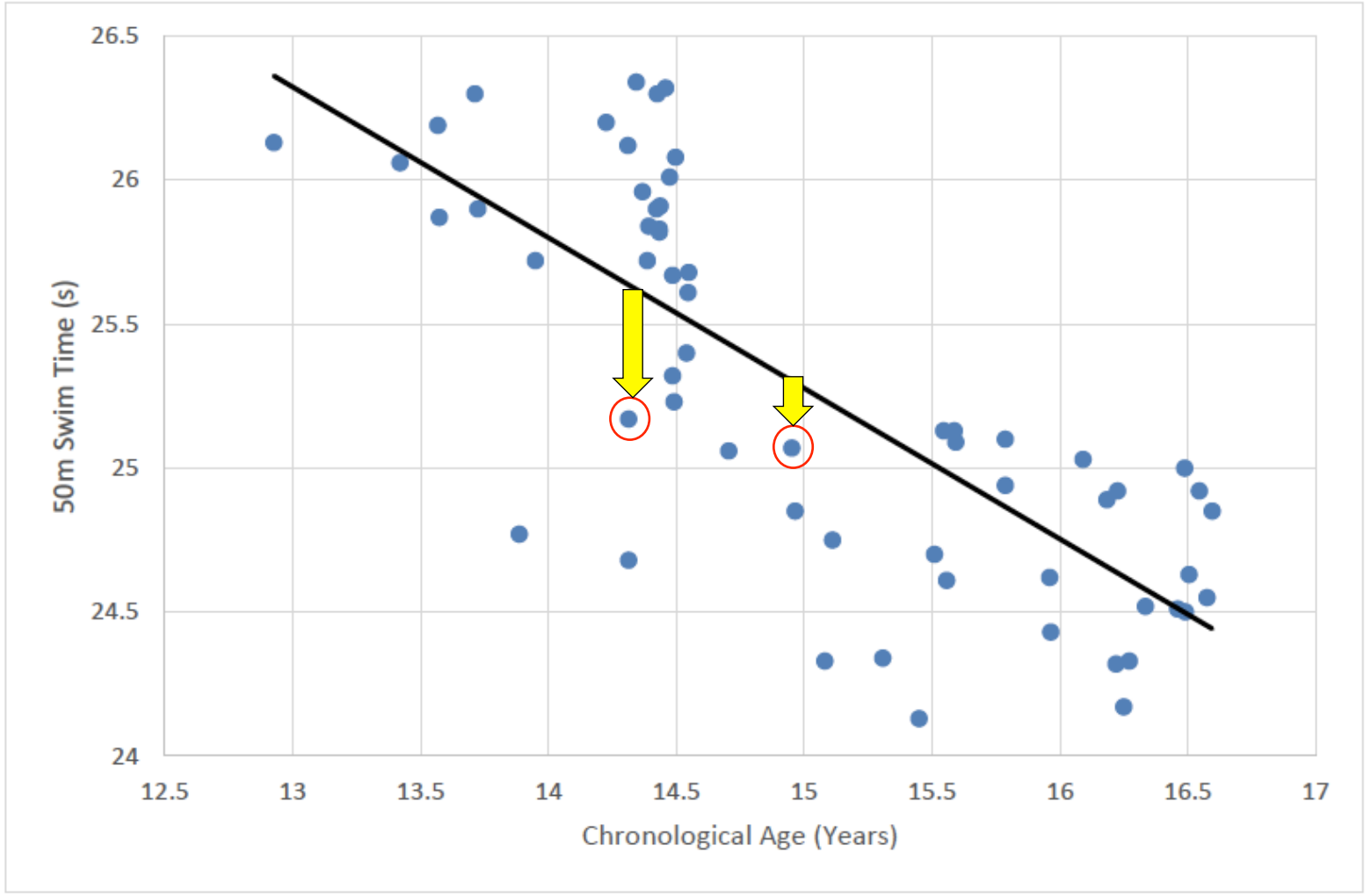
At 15-16 years old, RAE is no longer evident for females, but is still evident for male swimmers

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

Figure 1. 50m Male Swim Performance vs Chronological Age



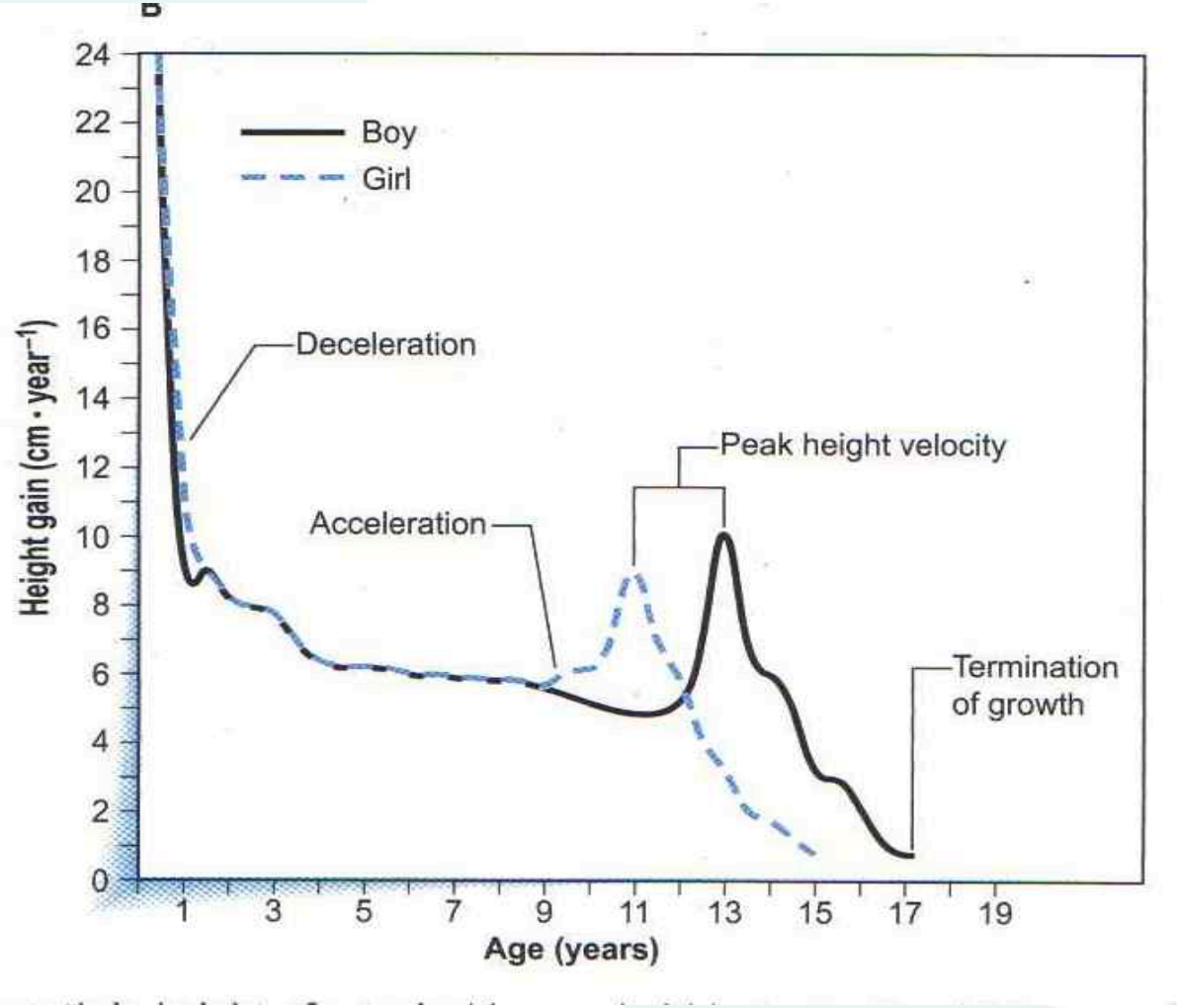
Till, (2017)
Enhancing the Evaluation and Interpretation of Swim Performance within Youth Swimmers

Maturity Effects

Timing of the growth spurt

Growth Curves

Growth in Height and Velocity Curves (Malina et al., 2004)

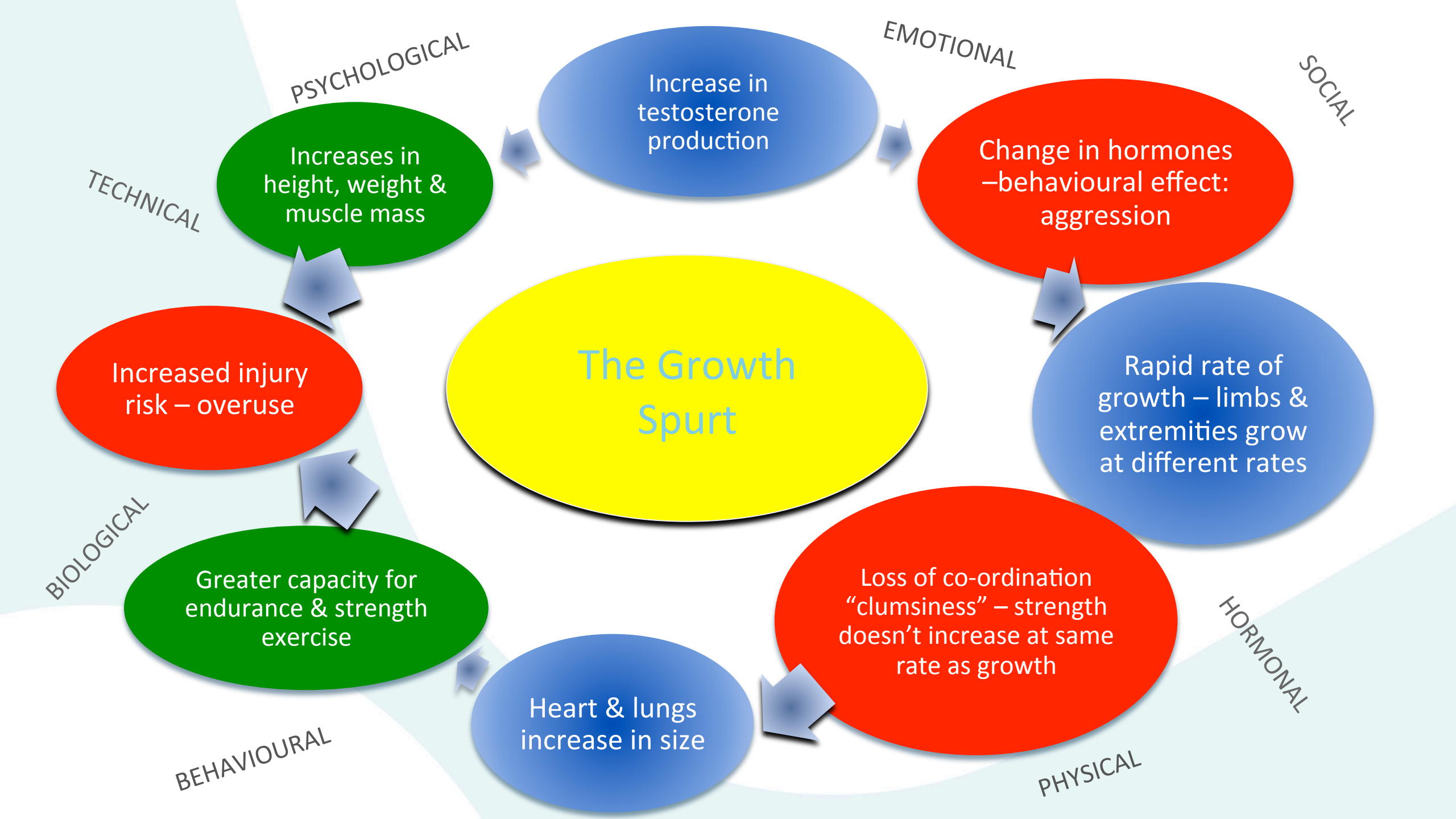


PHV usually occurs at

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
Increase in testosterone production
Change in hormones –behavioural effect: aggression
Rapid rate of growth – limbs & extremities grow at different rates
Loss of co-ordination "clumsiness" – strength doesn't increase at same rate as growth
Heart & lungs increase in size
Greater capacity for endurance & strength exercise
Increased injury risk – overuse
Increases in height, weight & muscle mass
PSYCHOLOGICAL
EMOTIONAL
SOCIAL
HORMONAL
PHYSICAL
BEHAVIOURAL
BIOLOGICAL
TECHNICAL

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

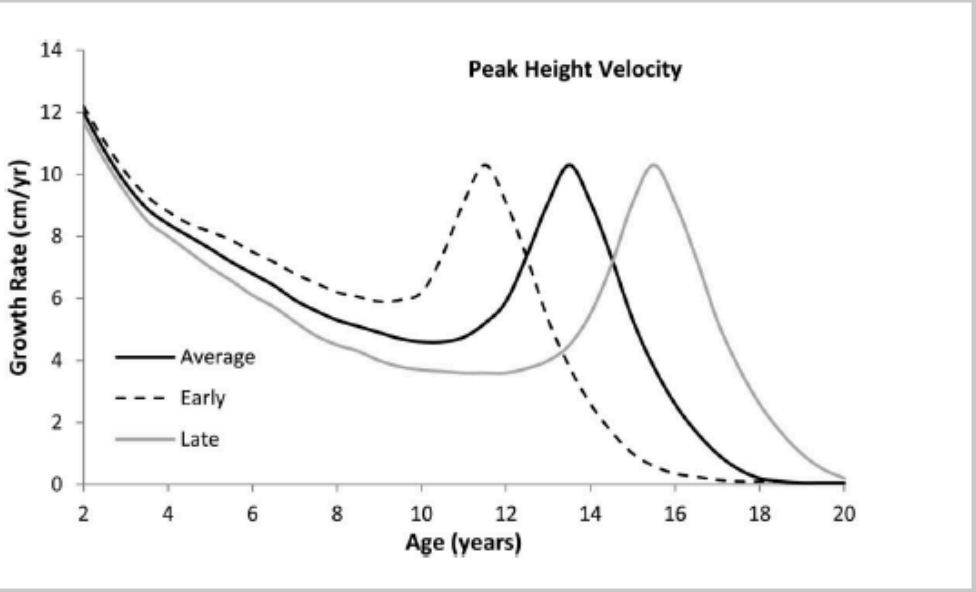


Figure 3. Change in growth rates (centimeter per year) with chronological age (years) for early-, average-, and late-maturing individuals based on theoretical data (adapted from Stratton and Oliver (57)). Adaptations are themselves works protected by copyright. So in order to publish this adaptation, authorization must be obtained both from the owner of the copyright in the original work and from the owner of copyright in the translation or adaptation.

Lloyd et al., 2014, JSCR

Variation in maturation

FOREWARNED, FOREARMED; TO BE PREPARED IS HALF THE VICTORY.

Miguel De Cervantes
Spanish Novelist
1547 - 1616

QUOTEHD.COM

Determining Maturity

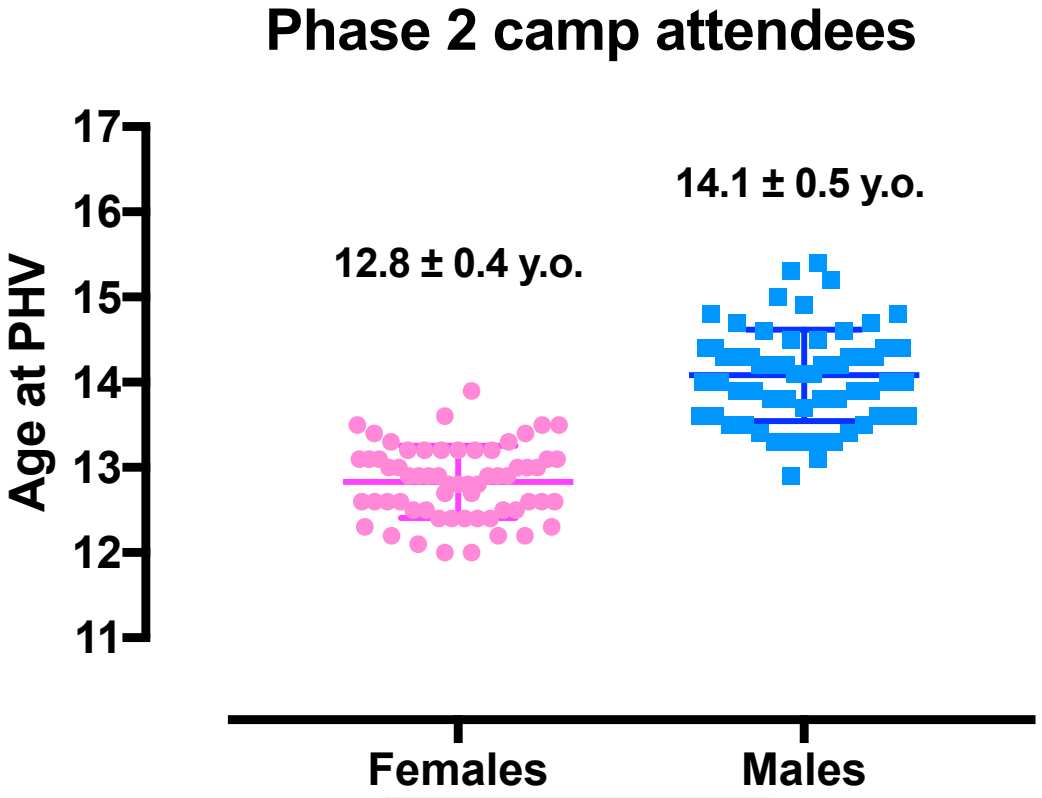
Age at PHV – Mirwald (2002)

$$\begin{aligned}\text{Maturity offset} = {} & -29.769 + 0.0003007 \\ & \times \text{leg length and sitting height interaction} - 0.01177 \\ & \times \text{age and leg length interaction} + 0.01639 \\ & \times \text{age and sitting height interaction} + 0.445 \\ & \times \text{leg by height ratio}\end{aligned} \tag{1}$$

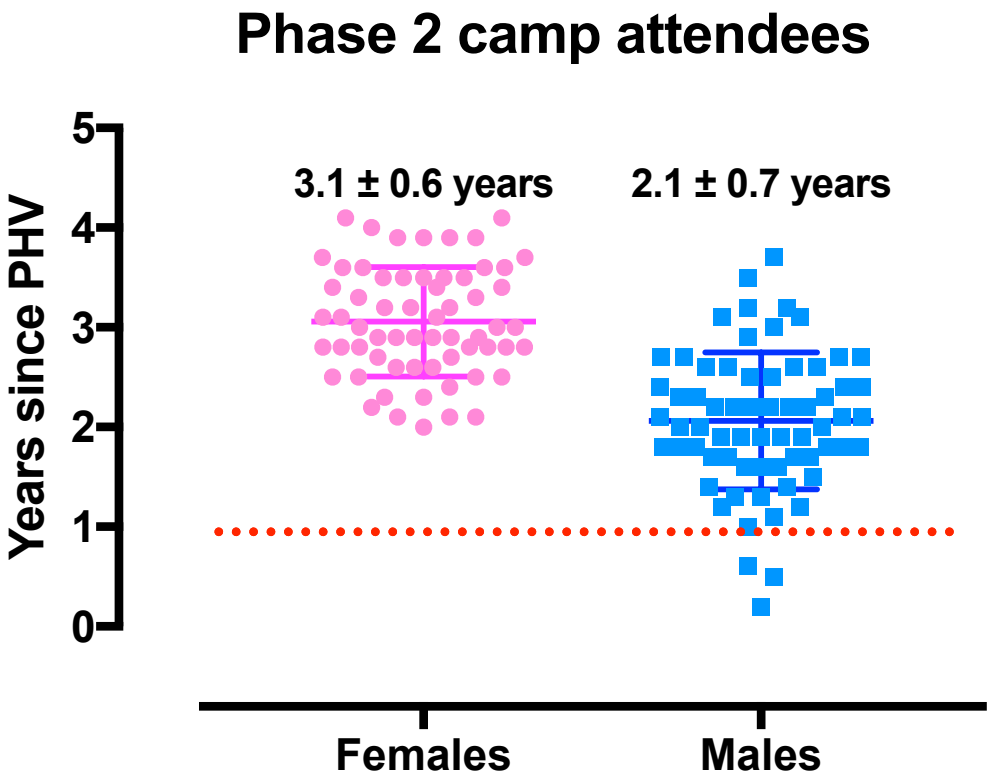
$$\begin{aligned}\text{Maturity offset} = {} & -16.364 + 0.0002309 \\ & \times \text{leg length and sitting height interaction} \\ & + 0.006277 \times \text{age and sitting height interaction} \\ & + 0.179 \times \text{leg by height ratio} + 0.0009428 \\ & \times \text{age and weight interaction.}\end{aligned} \tag{2}$$

Peak height prediction – Khamis & Roche (1994)

Our data… Peak Height Velocity

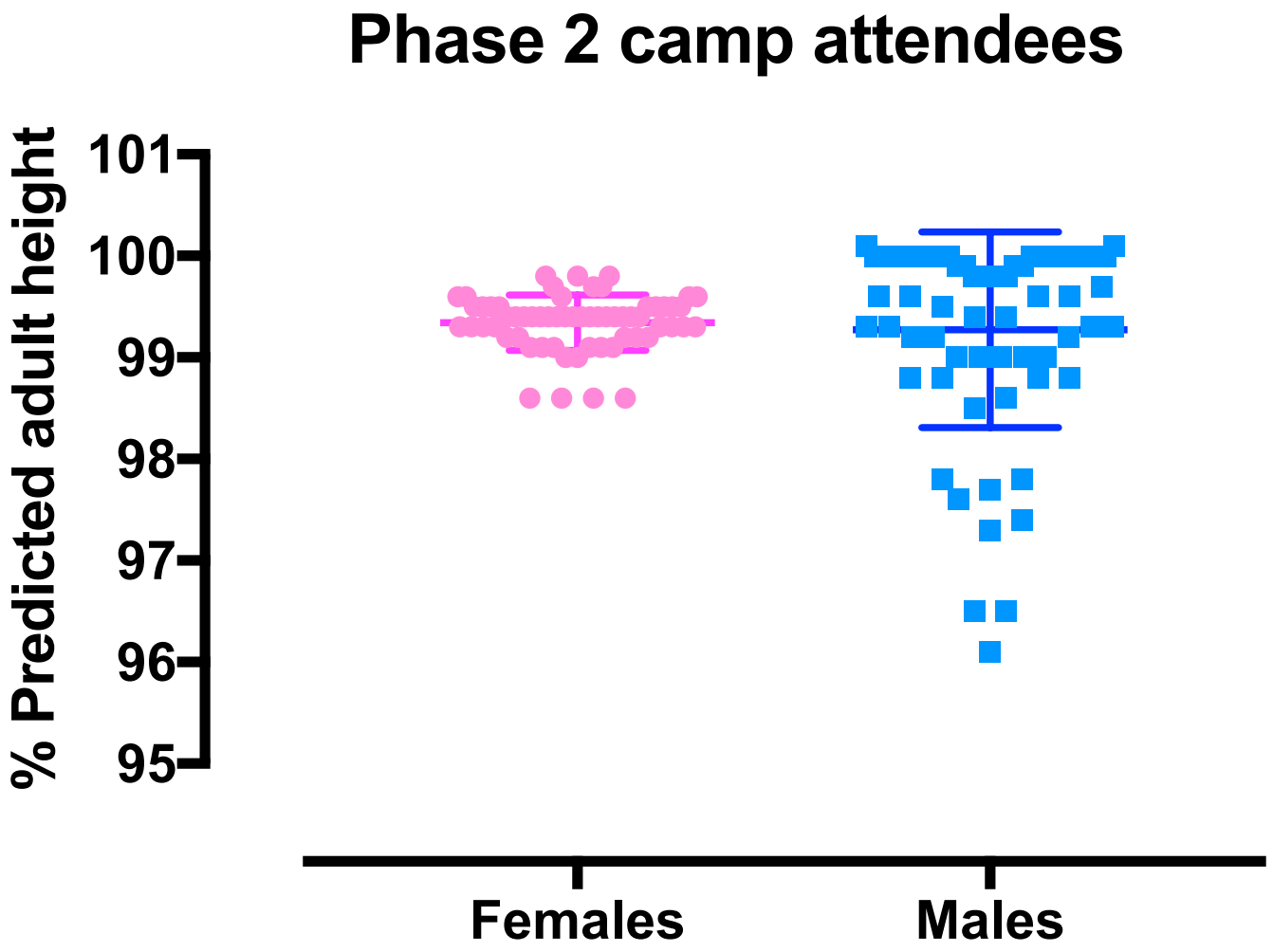


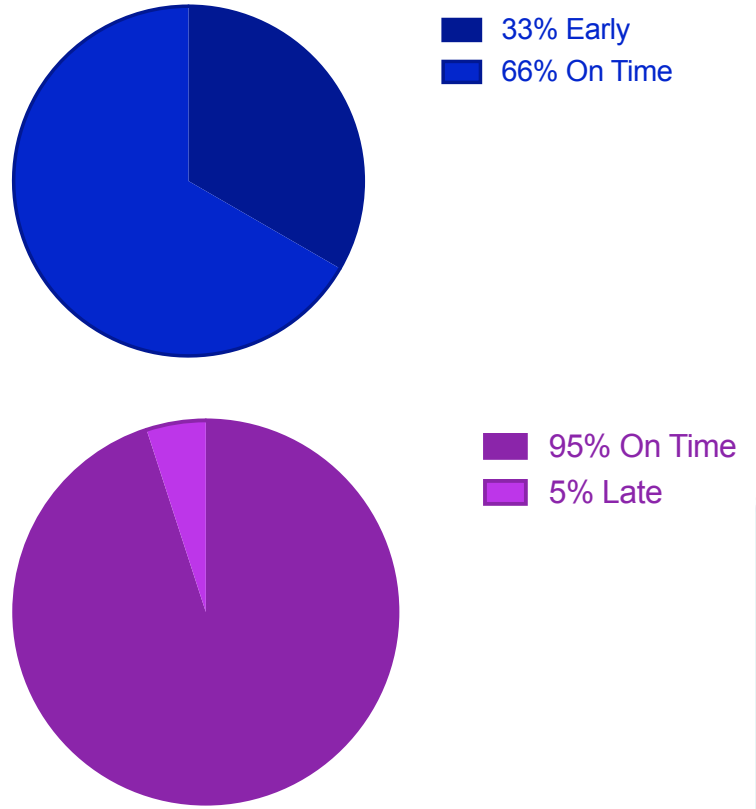
Ranges: 12.0 to 13.9 12.9 to 15.3



Ranges: 2.0 to 4.1 0.2 to 3.5

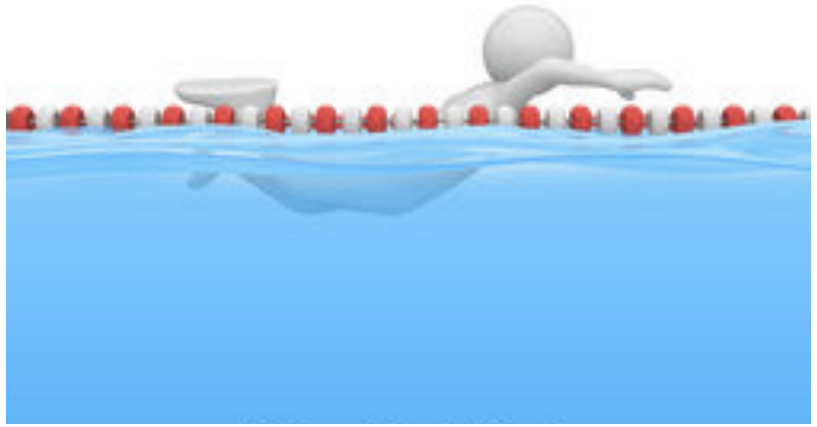
Our Data… Predicted adult height





At 13 years old…. How does this affect our girls?

Marjorie Majority



Early maturer

Dorothy Different

Late maturer

Marjorie’s coach

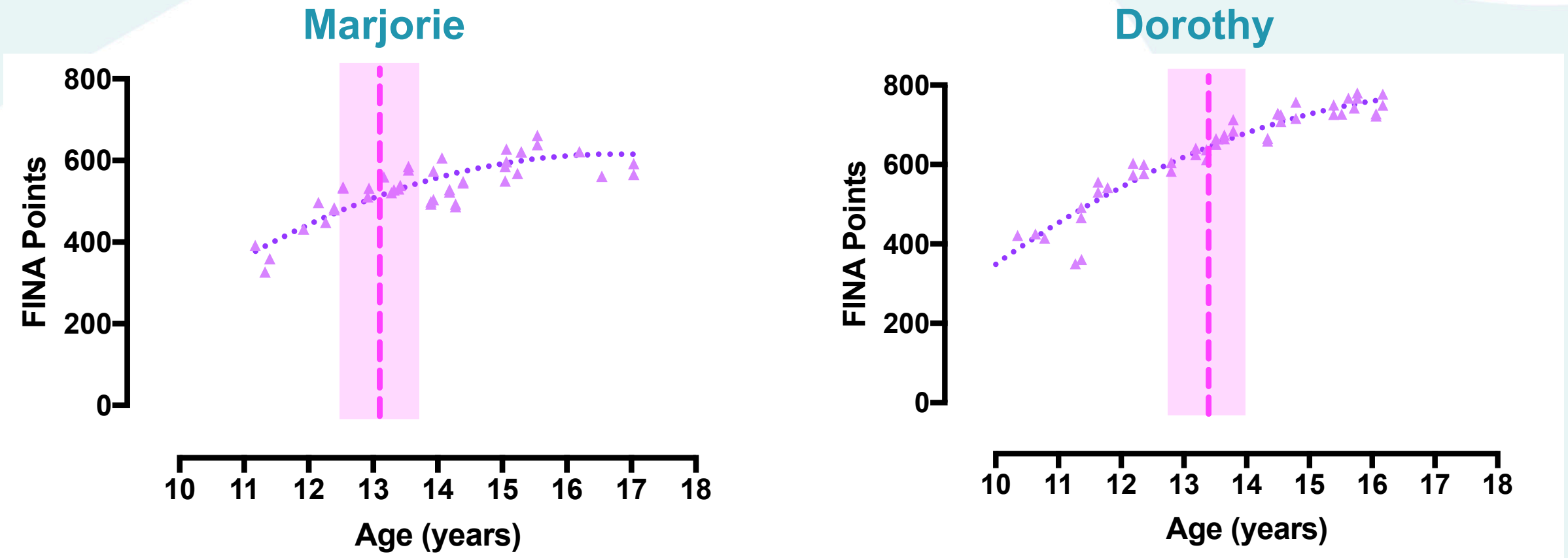
- Is very impressed by her progress
- Doesn’t have any girls who can compete with her, so challenges her to swim with the boys

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.

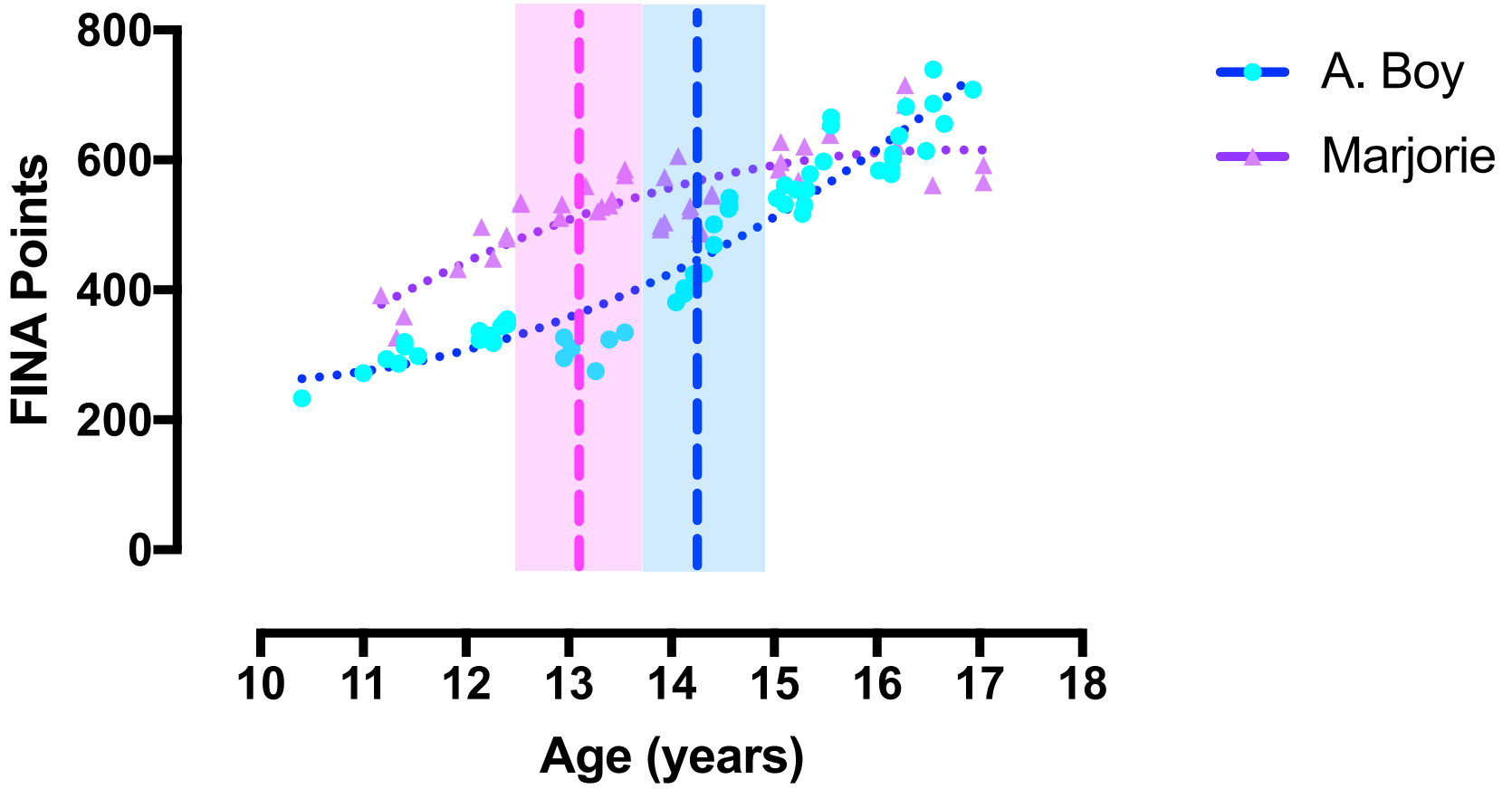
So what happened?

Marjorie stagnates, Dorothy thrives



Critical differences in approach

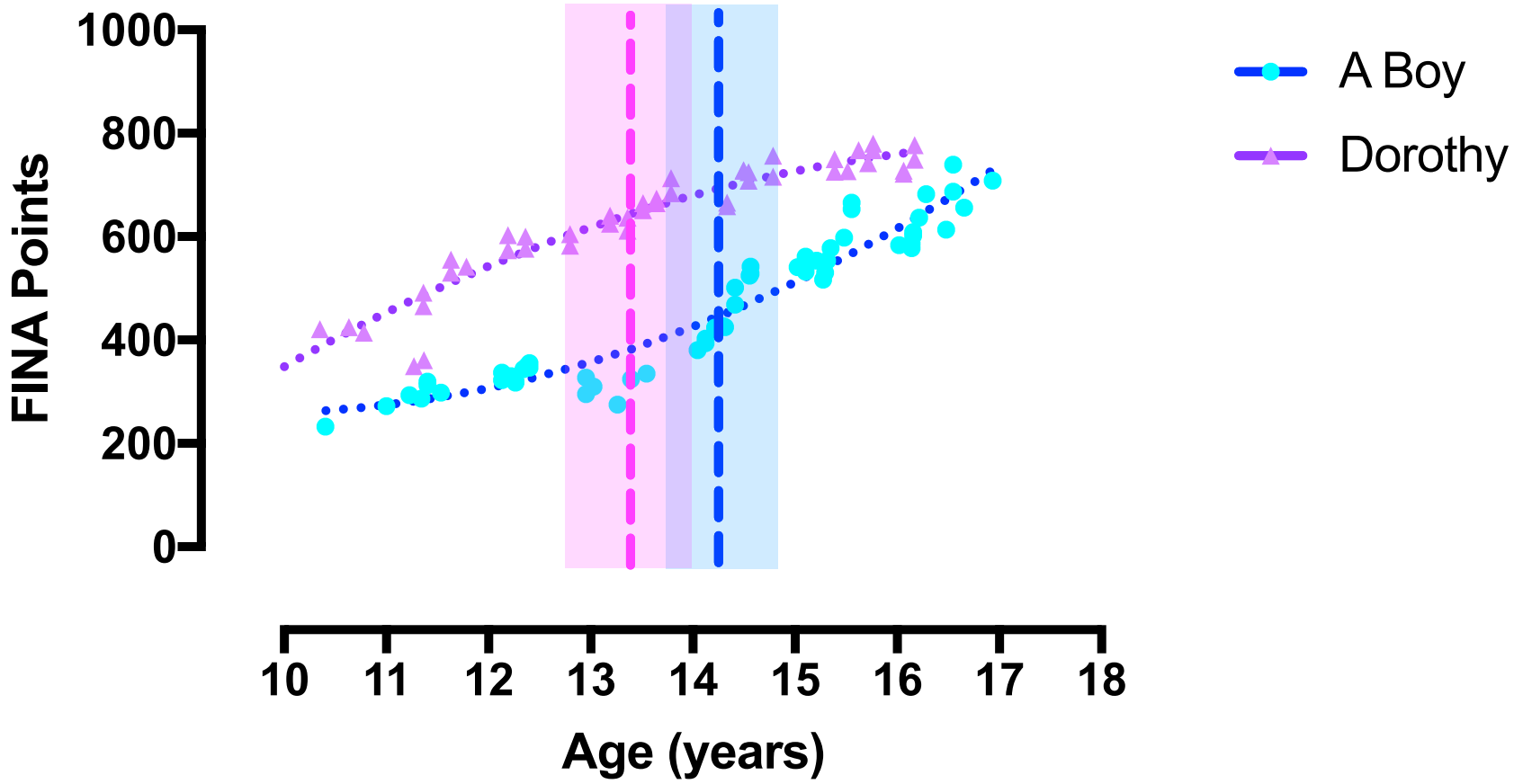
- Marjorie is out performing boys of the same age at 12 & 13
- Boys progress massively during growth spurt
- With matched training Marjorie stagnates and becomes frustrated



Stagnation, frustration and overtraining

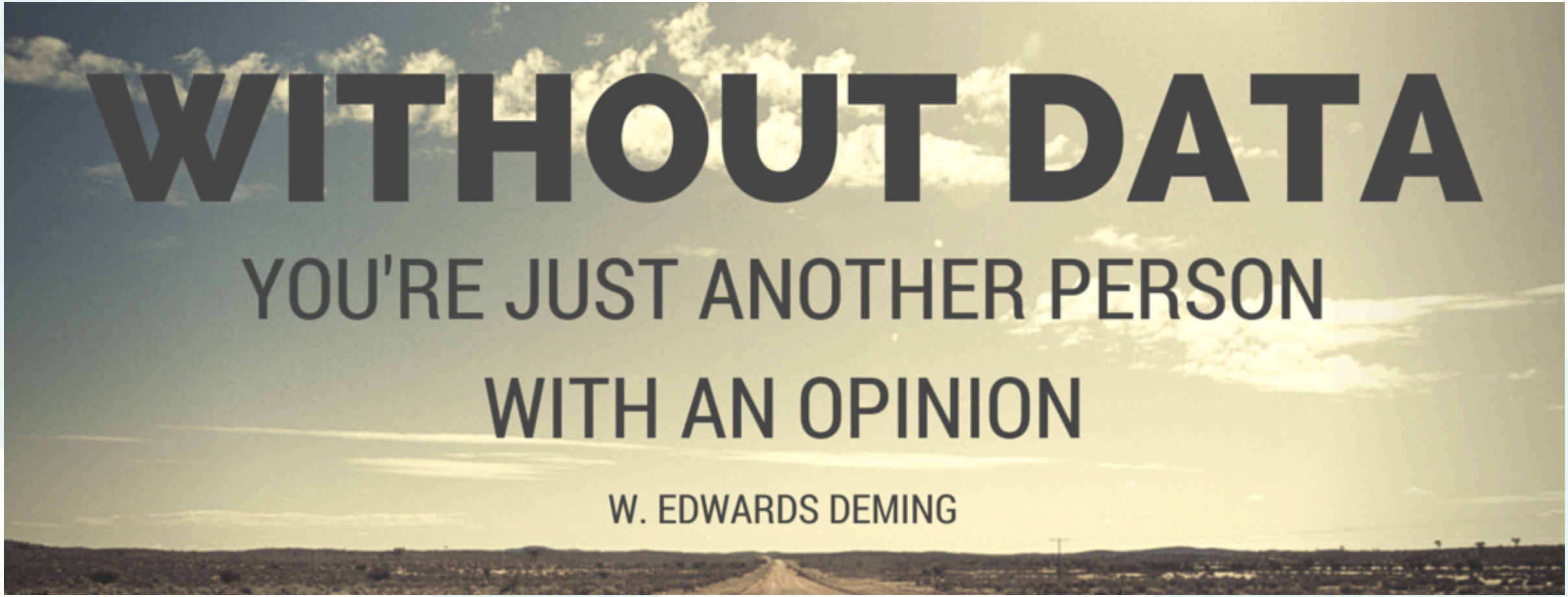
Critical differences in approach

- Dorothy performs age appropriate training throughout
- Trains independently of boys
- Makes consistent progress, and eventually overtakes her age matched, early maturing peers

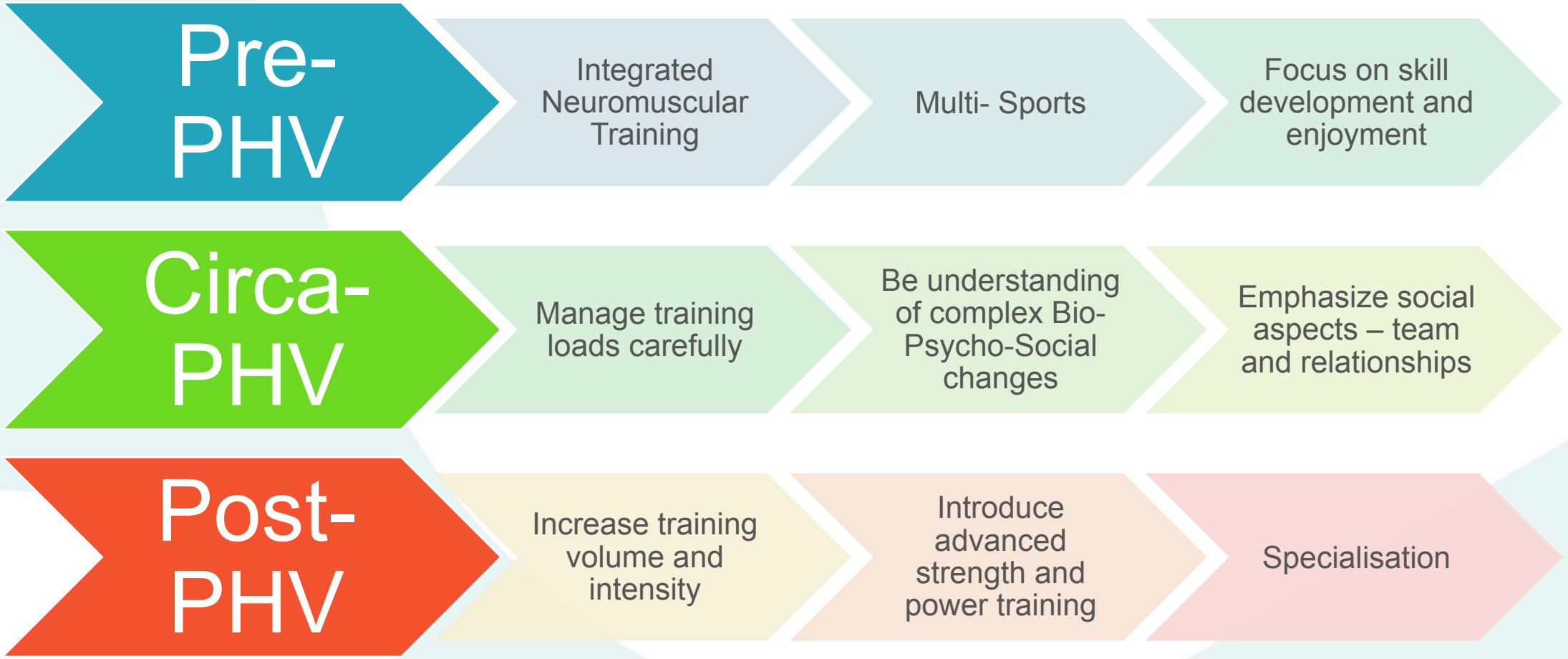


Fulfillment and attainment

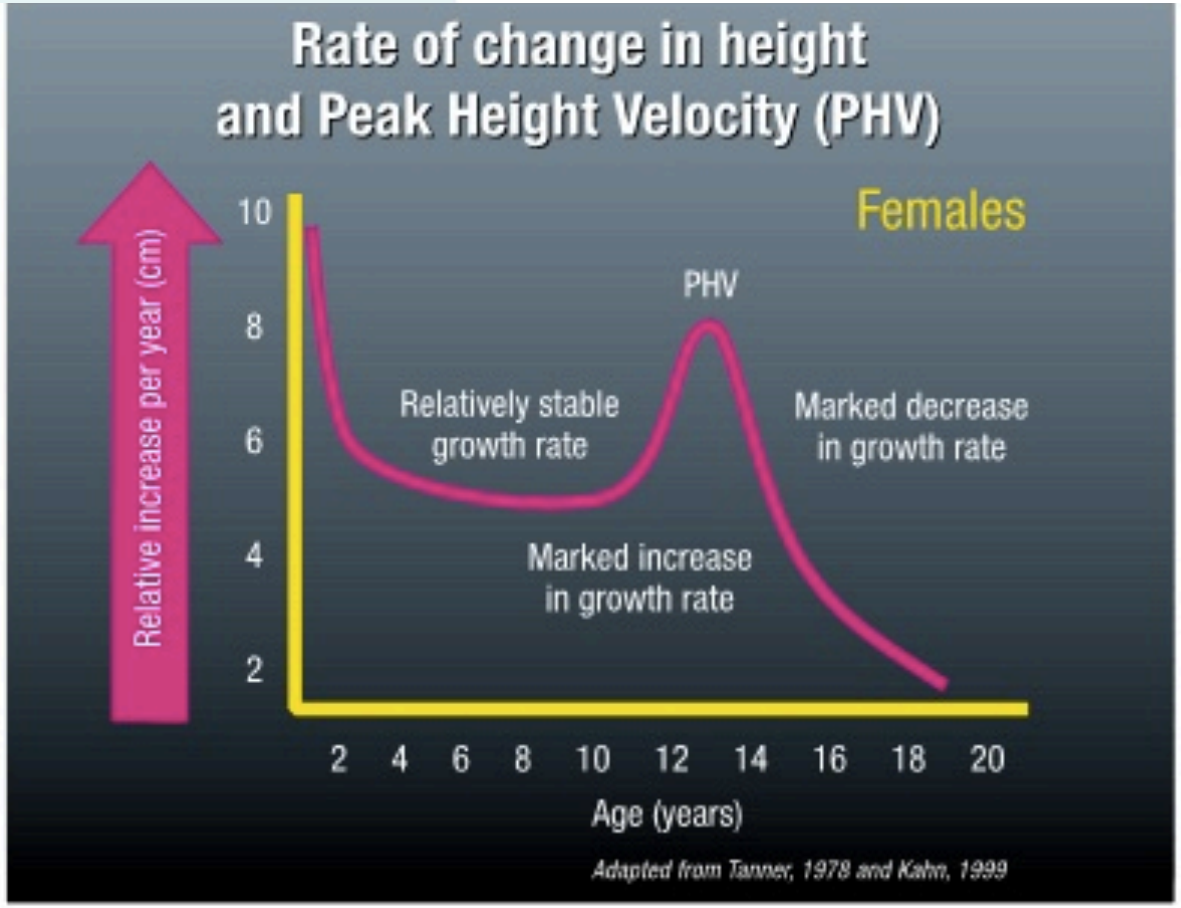
Measure, don’t guess

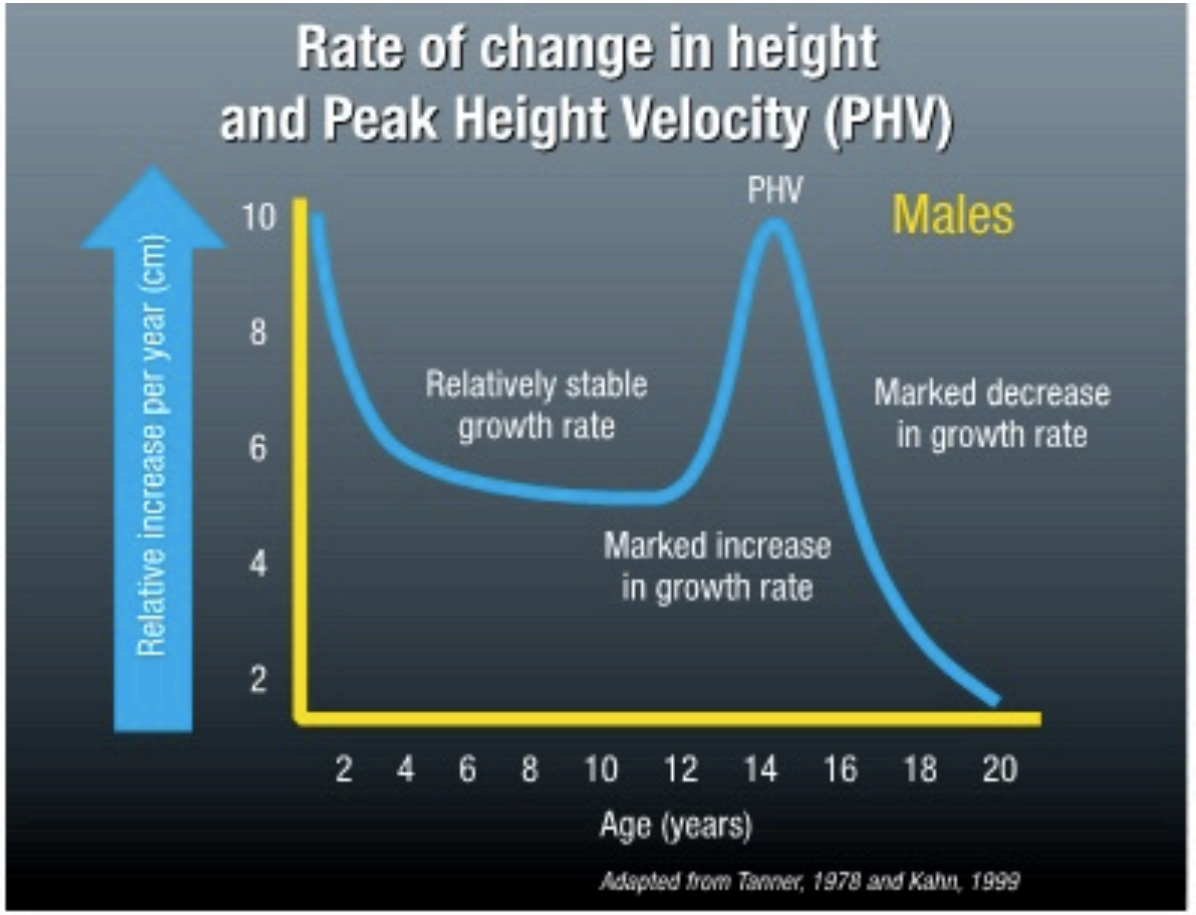


(St)age appropriate training



Boys and girls are different, don't treat them the same.





Swim England Swimming

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