



THE YOUTH PHYSICAL DEVELOPMENT MODEL: A New Approach to Long – Term Athletic Development

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Youth Physical Development Model

- Alternative to previous LTAD models which have lacked clear supporting evidence
- Encompasses athletic development from early childhood (2 years of age) up to adulthood (21+ years of age)
- Comprehensive approach to the development of females and males respectively
- Overview of physical development, whilst identifying when and why the training of each fitness component should be undertaken

YOUTH PHYSICAL DEVELOPMENT (YPD) MODEL FOR FEMALES

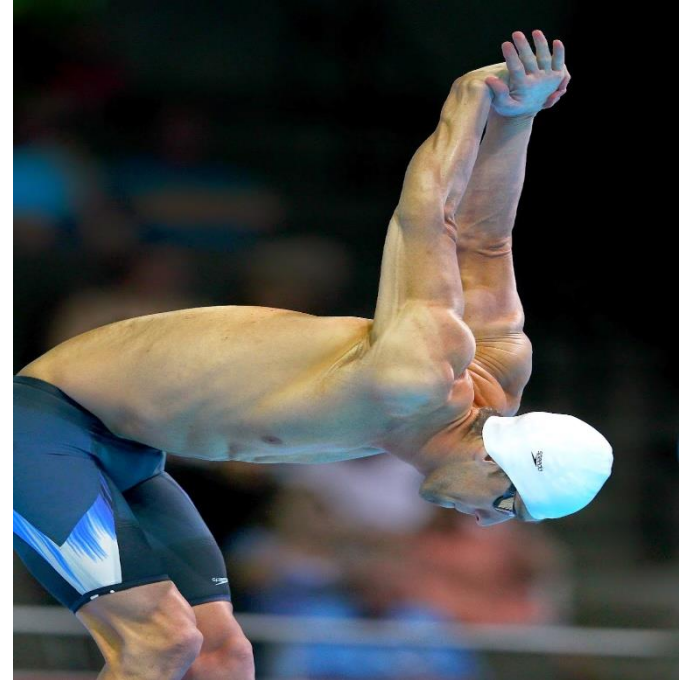
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Key Fitness Components

- Fundamental Movement Skills (FMS)
- Sport – Specific Movement Skills (SSS)
- Strength
- Hypertrophy
- Power
- Speed
- Agility
- Mobility
- Endurance and Metabolic Conditioning (MC)



FMS and SSS

- FMS development is essential to ensure mastery of correct movement patterns
- Will facilitate performance of more complex SSS at a later stage
- FMS should be the focus of physical development programmes from early childhood to foster gross motor skills
- Onset of puberty, adolescents can then be introduced to more SSS

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Strength

- Despite previous concerns, now widely accepted that children can participate in strength training
- YPD model suggests that the development of muscular strength should be a priority at all stages of development for males and females
- Research shows close associations between muscular strength and all other fitness components
- Improved performance and reduce injury risk
- Strength training is 'integral' not additional to overall programme

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Hypertrophy

- **Emphasis on hypertrophy:**

growth and increase in size of the muscle cells

- Females 12 years+
- Males 14 years+

- **Resistance training:**

- Pre adolescence:

Strength

- Post adolescence:

Interspersed Strength / Hypertrophy



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Power

- Ability to exert a maximal force in as short a time as possible
- Essential for sporting success
- Key period for power development is at onset of adolescence (continues throughout adulthood) due to maturational influences
- Although emphasised after onset of puberty, YPD model suggests some training focus should be given to developing power during the pre pubertal phase

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Speed

- Speed development influenced by maturation
- Trainable during adolescence and childhood

Prepubescent Children:

- focus on plyometrics, technical competency, sprint work

Adolescents:

- focus on strength training, plyometrics and sprint training



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Agility

- Ability to explosively start, decelerate, change direction and accelerate again whilst maintaining body control and minimising loss of speed
- Lack of research to identify appropriate time frames to develop agility – specific training
- YPD model makes inferences to:
 - **change of direction speed** (*technique, straight sprinting speed, lower limb strength and anthropometry*)
 - **cognitive function** (*perceptual and decision making processes*)

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Mobility

- At no stage is mobility ***the main emphasis*** of a training programme
- Mobility development and maintenance essential in all programmes to ensure athlete's are able to achieve ROM for their sports
- Middle childhood (ages 5 – 11 years) most important timeframe to **develop** flexibility and mobility
- Adolescents and adults must **maintain** required levels



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CHRONOLOGICAL AGE (YEARS)	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21+		
AGE PERIODS	EARLY CHILDHOOD			MIDDLE CHILDHOOD							ADOLESCENCE							ADULTHOOD				
GROWTH RATE	RAPID GROWTH			↔			STEADY GROWTH				↔			ADOLESCENT SPURT			↔			DECLINE IN GROWTH RATE		
MATURATIONAL STATUS	YEARS PRE-PHV										←		PHV		→		YEARS POST-PHV					
TRAINING ADAPTATION	PREDOMINANTLY NEURAL (AGE-RELATED)										↔		COMBINATION OF NEURAL AND HORMONAL (MATURITY-RELATED)									
PHYSICAL QUALITIES	FMS			FMS			FMS			FMS												
	SSS			SSS			SSS			SSS												
	Mobility			Mobility							Mobility											
	Agility			Agility				Agility			Agility											
	Speed			Speed				Speed			Speed											
	Power			Power				Power			Power											
	Strength			Strength				Strength			Strength											
	Hypertrophy										Hypertrophy		Hypertrophy					Hypertrophy				
	Endurance & MC			Endurance & MC							Endurance & MC			Endurance & MC								
TRAINING STRUCTURE	UNSTRUCTURED			LOW STRUCTURE					MODERATE STRUCTURE			HIGH STRUCTURE			VERY HIGH STRUCTURE							

Endurance and Metabolic Conditioning

- YPD model proposes to focus on this component as the child approaches adulthood
- At no stage is it seen as the main focus of an individual's training
- Rationale based upon assumption that an athlete will be exposed to skill training and regular competition
- Remarkable levels of endurance not required in all sports (events) and endurance remains trainable in adulthood

YOUTH PHYSICAL DEVELOPMENT (YPD) MODEL FOR FEMALES

CHRONOLOGICAL AGE (YEARS)	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21+
AGE PERIODS	EARLY CHILDHOOD			MIDDLE CHILDHOOD					ADOLESCENCE										ADULTHOOD	
GROWTH RATE	RAPID GROWTH			↔ STEADY GROWTH					↔ ADOLESCENT SPURT					↔ DECLINE IN GROWTH RATE						
MATURATIONAL STATUS	← YEARS PRE-PHV							PHV			→ YEARS POST-PHV									
TRAINING ADAPTATION	PREDOMINANTLY NEURAL (AGE-RELATED)								↔ COMBINATION OF NEURAL AND HORMONAL (MATURITY-RELATED)											
PHYSICAL QUALITIES	FMS		FMS			FMS		FMS												
	SSS		SSS			SSS		SSS												
	Mobility		Mobility					Mobility												
	Agility		Agility			Agility					Agility									
	Speed		Speed			Speed					Speed									
	Power		Power			Power					Power									
	Strength		Strength			Strength					Strength									
	Hypertrophy				Hypertrophy		Hypertrophy							Hypertrophy						
	Endurance & MC		Endurance & MC					Endurance & MC					Endurance & MC							
TRAINING STRUCTURE	UNSTRUCTURED			LOW STRUCTURE					MODERATE STRUCTURE			HIGH STRUCTURE			VERY HIGH STRUCTURE					

YOUTH PHYSICAL DEVELOPMENT (YPD) MODEL FOR MALES

CHRONOLOGICAL AGE (YEARS)	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21+	
AGE PERIODS	EARLY CHILDHOOD			MIDDLE CHILDHOOD							ADOLESCENCE							ADULTHOOD			
GROWTH RATE	RAPID GROWTH			↔			STEADY GROWTH				↔			ADOLESCENT SPURT			↔			DECLINE IN GROWTH RATE	
MATURATIONAL STATUS	YEARS PRE-PHV										←		PHV		→		YEARS POST-PHV				
TRAINING ADAPTATION	PREDOMINANTLY NEURAL (AGE-RELATED)										↔			COMBINATION OF NEURAL AND HORMONAL (MATURITY-RELATED)							
PHYSICAL QUALITIES	FMS			FMS			FMS			FMS											
	SSS			SSS			SSS			SSS											
	Mobility			Mobility							Mobility										
	Agility			Agility				Agility			Agility										
	Speed			Speed				Speed			Speed										
	Power			Power				Power			Power										
	Strength			Strength				Strength			Strength										
	Hypertrophy										Hypertrophy		Hypertrophy				Hypertrophy				
	Endurance & MC			Endurance & MC							Endurance & MC			Endurance & MC							
TRAINING STRUCTURE	UNSTRUCTURED			LOW STRUCTURE				MODERATE STRUCTURE			HIGH STRUCTURE			VERY HIGH STRUCTURE							

Individualising Long Term Athletic Development Programmes

YPD model must be manipulated to address:

- Sex Differences
- Timing and Rate of Maturation
- Training History



Sex Differences

Prepubertal: boys and girls follow similar rates of development in growth and maturation and subsequent progression in all fitness components.

Focus upon: **FMS, strength, speed and agility**

Adolescent Spurt: clear maturational differences apparent for nearly all fitness components. Males making bigger improvements in all except flexibility.

AS: Girls, 2 years earlier than Boys (about 10 vs 12 years of age)

PHV: Girls, 2 years earlier than Boys (about 12 vs 14 years of age)

Females undergo sex – specific physiological processes, all associated with non contact anterior cruciate ligament injury – should undertake:

- Plyometrics
- Core Strengthening
- Strength Training
- Balance and Perturbation Training

Early Versus Late Maturing Athletes

- Highly individual timing of maturation – flexibility with age ranges
- Early maturing athletes – components shifted to the left, more advanced training at an earlier age
- Late maturing athletes – components shifted to the right, later exposure to advanced training when physiologically ready to cope with increased training stimulus
- Must accurately monitor through childhood to establish ‘biological’ age

YOUTH PHYSICAL DEVELOPMENT (YPD) MODEL FOR FEMALES

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GROWTH RATE	RAPID GROWTH			↔ STEADY GROWTH ↔					ADOLESCENT SPURT					↔ DECLINE IN GROWTH RATE						
MATURATIONAL STATUS	← YEARS PRE-PHV ←							PHV			→ YEARS POST-PHV →									
TRAINING ADAPTATION	PREDOMINANTLY NEURAL (AGE-RELATED)								↔ COMBINATION OF NEURAL AND HORMONAL (MATURITY-RELATED)											
PHYSICAL QUALITIES	FMS		FMS			FMS		FMS												
	SSS		SSS			SSS		SSS												
	Mobility		Mobility					Mobility												
	Agility		Agility			Agility					Agility									
	Speed		Speed			Speed					Speed									
	Power		Power			Power					Power									
	Strength		Strength			Strength					Strength									
	Hypertrophy				Hypertrophy		Hypertrophy								Hypertrophy					
	Endurance & MC		Endurance & MC					Endurance & MC					Endurance & MC							
TRAINING STRUCTURE	UNSTRUCTURED			LOW STRUCTURE					MODERATE STRUCTURE			HIGH STRUCTURE			VERY HIGH STRUCTURE					

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	Mobility			Mobility							Mobility											
	Agility			Agility				Agility			Agility											
	Speed			Speed				Speed			Speed											
	Power			Power				Power			Power											
	Strength			Strength				Strength			Strength											
	Hypertrophy										Hypertrophy		Hypertrophy					Hypertrophy				
	Endurance & MC			Endurance & MC							Endurance & MC			Endurance & MC								
TRAINING STRUCTURE	UNSTRUCTURED			LOW STRUCTURE					MODERATE STRUCTURE			HIGH STRUCTURE				VERY HIGH STRUCTURE						

Initial Training Status

- Training age is a critical consideration irrespective of chronological and biological age
- Defined as the number of years that an athlete has been participating in formalised training
- Athlete approaching adulthood with little exposure to early phases of YPD model should commence with FMS and muscular strength
- Conversely an early maturing athlete displaying exceptional strength, power whilst maintaining technical proficiency can work above their 'predicted' capability level on more advanced components

Key Messages

- Progression is an ‘individual’ process – avoid comparing swimmers with their peers ...
- Allow coaches to direct and explain the need for flexibility within squad structures to meet the needs of athletes of differing sexes, ‘biological’ ages and ‘training’ ages. Some swimmers may be prescribed different training programmes within the same squad – individualisation is the key!
- Dryland activities are critical to the success of young swimmers (pre and post pool, land training) – needs to start earlier and be ‘integral’ to the overall programme.

Any Questions?

