Title	LTAD and Windows of Trainability in Young Athletes
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Audience	Athletes, Parents & Coaches
Background	This document is based upon the author's personal opinion and is not a scientific study. Hopefully it stimulates some debate and internal reflection amongst readers.

What is LTAD?

LTAD stands for Long Term Athlete Development. It is a development model created by Dr Istvan Balyi that can be applied to most, if not all sports. It has been adopted by UK Athletics and forms the basis of many of their coaching courses, accreditation schemes and long term strategies.

The model's primary aim is to produce greater numbers of elite performers but it also provides a platform for coaches and athletes of all abilities to fulfil their potential and stay involved in sport for as long as possible.

There are several different development models available for consideration and all of them are fairly interesting to explore. LTAD uses biology (human development) as its foundation whereas others will focus on Psychological (e.g. Jean Cote's DMSP model) or Social perspectives.

How is LTAD applied in practice?

Balyi recognised one of the theories covered in a previous blog regarding the 10,000 Hours Rule. He recognised that it is important that athletes stay in a sport for a significant length of time if they are to develop elite level skills. Therefore, they need to stay motivated and injury free whilst still developing essential skills and techniques.

To achieve this he defined a series of training stages:

Active Start – From birth to 6 years old. Here you develop essential basic movement skills such as walking, running and jumping.

FUNdamentals – Up to the age of 9 for boys and 8 for girls. Where you gain more agility, balance and coordination through having fun in sport.

Learning to Train – Up to 12 for boys and 11 for girls. Where you learn the attributes that are needed to become more serious about sport (mental development and maturity) and develop interests in specific sports.

Training to Train – Up to 16 years in boys and 15 for girls. This is a major biological development stage where you can start to develop advanced skills, strength, speed and endurance for specific sports (See Windows of Trainability below).

Training to Compete – Late teens and early 20's. Where you develop advanced skills and focus a significant amount of time to 1 or 2 sports.

Training to Win – Builds on all of the above and is the stage where you develop advanced strategic and tactical skills and develop plans that maximise the chances of winning.

Active for Life – Is the stage where you still train but for a much reduced time per week. It is also the stage where you seek a different type of participation in sport such as coaching or administration.

The next stage of adopting LTAD is to recognise that all athletes mature and develop at different stages. Athletes of the same age can vary dramatically in terms of height, weight, emotional maturity, strength, speed and endurance. Therefore to treat them all the same is likely to lead to a mismatch and a diluting of development success.

Coaches therefore consider Training Age and Developmental Age when grouping and training athletes. Training age is the number of years that they have been doing the sport and Developmental Age is their physical and emotional development in comparison to their peers.

So far, so good? This is all common sense stuff, now comes the exciting part!

Balyi identified something called **Windows of Trainability**. He established that at different stages of growth there was an opportunity to significantly improve Speed, Endurance, Agility and Strength and that these stages differed between girls and boys of different heights.

By measuring Peak Height Velocity (PHV) which is known to most people as the growth spurt you can then calculate when to apply specific training (see my previous Blog on Deliberate Practice) to maximise results and sustain the impact.

Example 1: if you wait approximately 12 months after a teenage boy's growth has peaked then the window of trainability for Strength opens and the athletes should pay particular attention to strength & conditioning training. However, in girls the window is likely to open much sooner and he recommends that you only wait 4 weeks after PHV has been reached.

Example 2: Between the ages of 6 and 8 girls have a great opportunity to develop speed window 1 which is essentially their reaction time and sprint start. However for boys this occurs between 7 and 9 years old.

How to spot a Window of Trainability

Before the growth spurt occurs there are a number of windows of trainability. These are illustrated below.

Growth becomes especially important when it comes to strength training. Doing too much strength & conditioning (S&C) training too early may result in long lasting injury and a shortening of the athletes career. Not doing enough S&C or leaving it too late, will reduce performance potential and may also affect the athlete's ability to correctly perform a technique. For example, a lack of strength in a jump athlete will reduce their runway speed and their ability to explode on takeoff. This will reduce their time in the air, which reduces the height or length jumped.

Athletes should measure their height every few weeks from the age of 10 or 11. They should do this by standing up against a wall and recording the results, but I would also recommend doing it seated against the wall too. This will show what part of the body is growing, is it an athlete's legs or their upper body. Significant changes in height will not only allow you to identify when to apply training but it may also explain sudden loss of performance, lack of coordination, aches and pains or changes to eating patterns.

The Windows of Trainability

A search on the internet will provide you with quite a complex illustration to show all of these windows but I have simplified them and removed some of the detail that isn't essential for this introductory document.

	BOYS	**Under 9**	**9 - 11**	**11 - 13**	**13 - 15**	**15 - 17**	**Adult**
	Growth Spurt (GS or PHV)				14 - 16		
Window of Trainability	**Flexibility**					Test & Monitor after GS	
	Strength					12m+ after GS	
	Skill Development		9 - 12				
	Speed One (<5 sec)	7 - 9					
	Speed Two (5-20 sec)				13 - 16		
	Endurance*	Focus on movement efficiency			14 - 16 Peak VO2 Max		

	GIRLS	**Under 9**	**9 - 11**	**11 - 13**	**13 - 15**	**15 - 17**	**Adult**
	Growth Spurt (GS or PHV)			12 - 15			
Window of Trainability	**Flexibility**					Test & Monitor after GS	
	Strength			Immediately after GS			
	Skill Development	8 - 11					
	Speed One (<5 sec)	6 - 8					
	Speed Two (5-20 sec)			11 - 13			
	Endurance*	Movement Efficiency		12 - 15 VO2 Max			

* It is recommended that endurance athletes are grouped by performance maturation and not age groups.

As always, don't embark upon a lengthy training strategy without seeking the advice of a qualified coach that knows the athlete concerned.

Further Reading

A good web summary: http://www.brianmac.co.uk/ltad.htm
In depth analysis of the various models by Sports Coach UK Download Link
LTAD Summaries for parents and athletes Download Link
LTAD Training Stages Download Link
More detail from Athletics Ireland and Balyi Download Link