

Long term development in Swimming



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There is an increasing interest in the longitudinal development of athletes in all sports. Long Term Athlete Development (LTAD) has become a popular notion with many western sports policy makers and National Sport Organisations.

The average age of the Australian swimmers in Beijing (2008) was 23 years with none of our men's team

below the age of 20 years. This reflects the trend towards older and more mature athletes staying in competitive swimming. Another interesting fact from the Beijing Games was that the Gold Medallists in Swimming had an average age of 22.2 years – 23.9 (Men); 20.4 (Women).

Therefore, coaches, parents, administrators and athletes need to have a long-term view for our sport.

- **Older and mature elite swimmers are competing longer at the highest level.**

This long-term outlook is confirmed in many articles and texts. Many of these mention the **Ten-Year Rule** that suggests “that world – class expertise in every domain (violin, math, chess and so on) requires roughly a decade of committed practice. Indeed, scientific research has identified that it takes at least **10 years, or 10,000 hours** for talented athletes to achieve sporting excellence. For athlete and coach, this translates into slightly more than three hours of training or competition daily for 10 years. There are **no short cuts!** (Talent Code; pages 51 - 53).

Countries such as Canada, the UK and Ireland have had their direct government funding predicated on each sporting organisation having LTAD models for respective sports. Swimming Canada and many Canadian Sporting Organisations have adopted much of the work generated by Dr. Istvan Balyi (University of British Columbia). Istvan Balyi's model and many of his training suggestions are based around the physiological growth of the athlete as measured by changes in height. Establishing Peak Height Velocity (PHV) i.e., the maximum growth rate in stature known commonly as adolescent growth spurt is central to the Balyi modelling. His model reconciles athletic development with natural development.

“From early childhood to maturation, people go through several stages of development which include pre-puberty, puberty, post-puberty and maturation. For each development stage there is a corresponding phase of athletic training.” (Bompa)

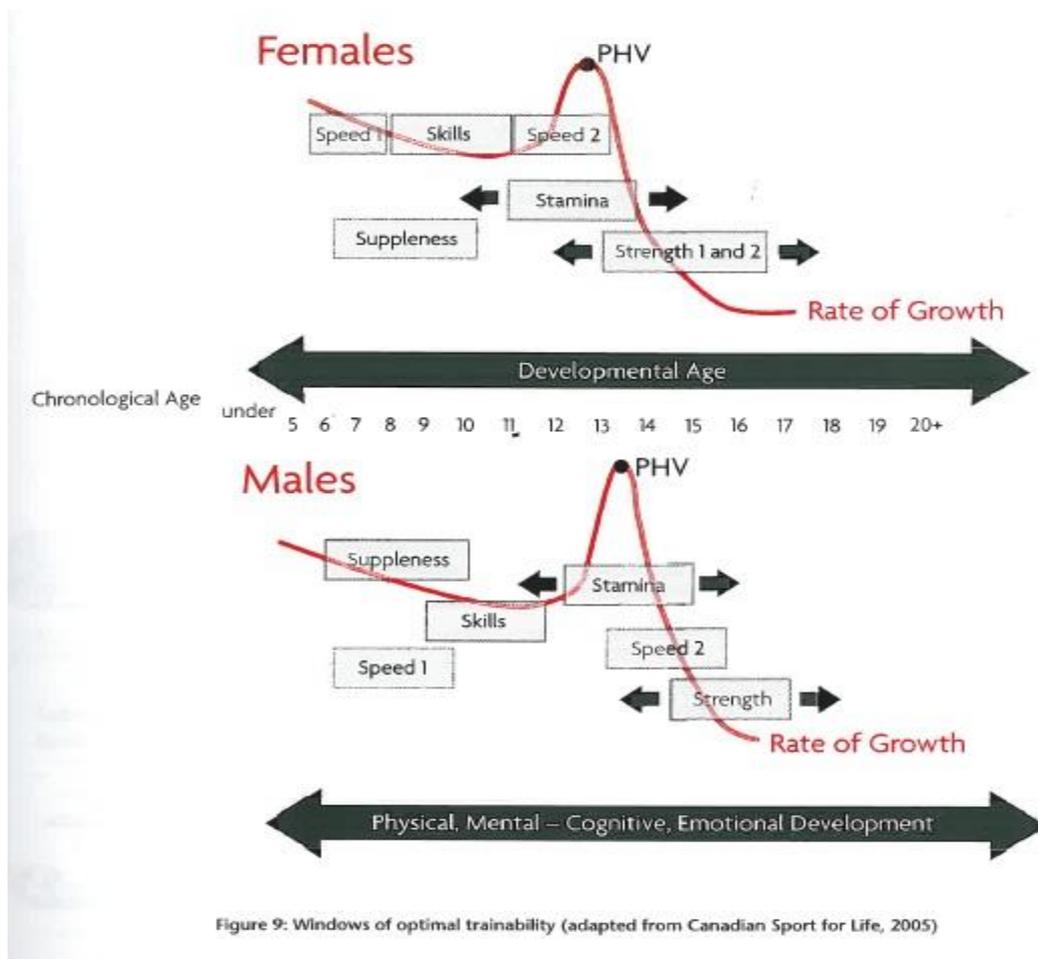
The LTAD approach has been influenced by analysis of the empirically tested athlete development models from former East Bloc Countries which brings both negative and positive implications. Regular and perhaps excessive measurements by coaches and/or scientists would be unwise in our Australian setting. However, to assist the coach's observation skills a simple height measurement may be taken at the beginning and the end of each season as a worthwhile guide when fostering younger athletes. The coach's eye needs to recognise whether an athlete is an early or late developer then appropriately apply the principles of training to best grow that talent. The findings from the research done by Balyi and others can help in development of Long-Term training plans for swimmers to fulfil their potential.

LTAD focuses on the general framework of athlete development with reference to growth maturation, highlighting where windows of improved trainability occur in an athlete's development. For example, physiological capacities, such as aerobic endurance, develop quite rapidly during the pre-pubertal stage of growth; therefore, a critical period of development aerobic engine can be predominately undertaken prior puberty. The fact that former World Record holders Tracey Wickham (AUS) and Janet Evans (USA) set their world marks in the 800 freestyle at 15 years of age lends credence to this training predisposition for our younger female distance swimmers. Bill Sweetenham's article “Break Point Volume” (2003) reinforces the above and specifies:

“Long-term development programs build slowly and steadily toward Break Point Volume that is achieved sometime between 13 and 15 years of age. This may amount to 2000-2500km of training annually, over 42-46 weeks and include about 400 training sessions. I have always believed that the

ideal progression was to achieve Break Point Volume at age 13 (girls) and 14 (boys), but with flexibility and consideration given to the influence of school, individual maturation rate, and training history.”

Istvan Balyi’s research highlights when these “windows of optimal trainability” exist where the maximum return on training for an athlete can be achieved. However, he is also saying: “All systems are Always Trainable!” But some stages are more sensitive to improvement or adaptation when done at the appropriate time. These windows of optimal trainability are shown on the following diagrams from Balyi’s text:



(Reproduced with permission)

When examining the above diagrams coaches must be clear in their understanding that Peak Height Velocity (rate of growth) is not confused with Peak Height at maturity. When swimmers reach full height at maturity there is then zero growth rate. Whereas, “PHV is the maximum rate of growth in stature during growth spurt.” - Coaching the Young Developing Performer page 91. From the information correlated by Balyi, the following training phases are suggested:

- **Active Start** – learn to swim; physical literacy in an aquatic environment including breath control; buoyancy; floating and gliding; kicking; arm propulsion; coordination; connection or feel for the water plus some basic water safety activities. Chronological ages 0 – 6.
- **FUNDamentals** – Stage 1 of training for females 5 years to 8 years; males 6 years to 9 years where the fundamental movement skills are developed. During this stage activities should be structured and fun. Learning all the strokes and start building technique would be paramount at this level.

- **Learn to Train** – Chronological ages: Female 8 to 11 years; Male 9 to 12 years; In this pre-growth spurt period focus on repetition of skills towards mastery in stroke mechanics plus learning and moving towards mastery of racing skills: starts; turns and finishes is best done in this stage.
- **Train to Train** – Building the Engine for Performance; Chronological ages: Female 11 to 14; Male 12 to 15; During the training to train stage, there should be an emphasis on aerobic conditioning combined with speed work and developing anaerobic capacity. In this period there can be greater individualisation of fitness and technical training and learning correct weight lifting techniques could begin. The focus should still be on training rather than competition.
- **Train to compete** - Optimising the engine! Chronological ages: Female 14 to 16 years; Male 15 to 18 years. During the training to compete stage there should be continued emphasis on physical conditioning with more training building the race pace work and the anaerobic system. At this stage swimmers are developing individual strengths and event selection would be fostered. Training should continue to develop strength, core body strength and maintain flexibility. In competition target both National Open and Age Meets to gain experience and confidence at domestic level whilst striving to gain national team representation and international experience.
- **Compete to Win** – Sustain podium success at the international level for up to two or more Olympiads.
- **Active for Life** – Healthy Life Long Physical Activity.
 - *The approximate age associated with each developmental stage should be seen as rough guidelines and not precise, rigid rules. Ian Stafford page 10.*

This is the link <https://www.swimming.ca/ltad> to Swimming Canada's Long Term Athlete Development Strategy for interested coaches, parents and club administrators.

The other interesting aspect from Balyi's work is the acceptance that individuals have unique and differing growth patterns. Our training environs need to cater for early and late developers. Many Australians would generally think about swimming as a sport producing early developing athletes with names from the modern era including Yolane Kukla and Emily Seebohm. Our greatest Olympian Ian Thorpe started his international career at a young age. They are the Performer "A's" in the following diagram. However, Australian Swimming has had examples in recent times of successful athletes who could be categorized as late developers: Brenton Rickard, Chris Fydler and Matt Welsh to name a few. They are the Performer "B's" in the next diagram:

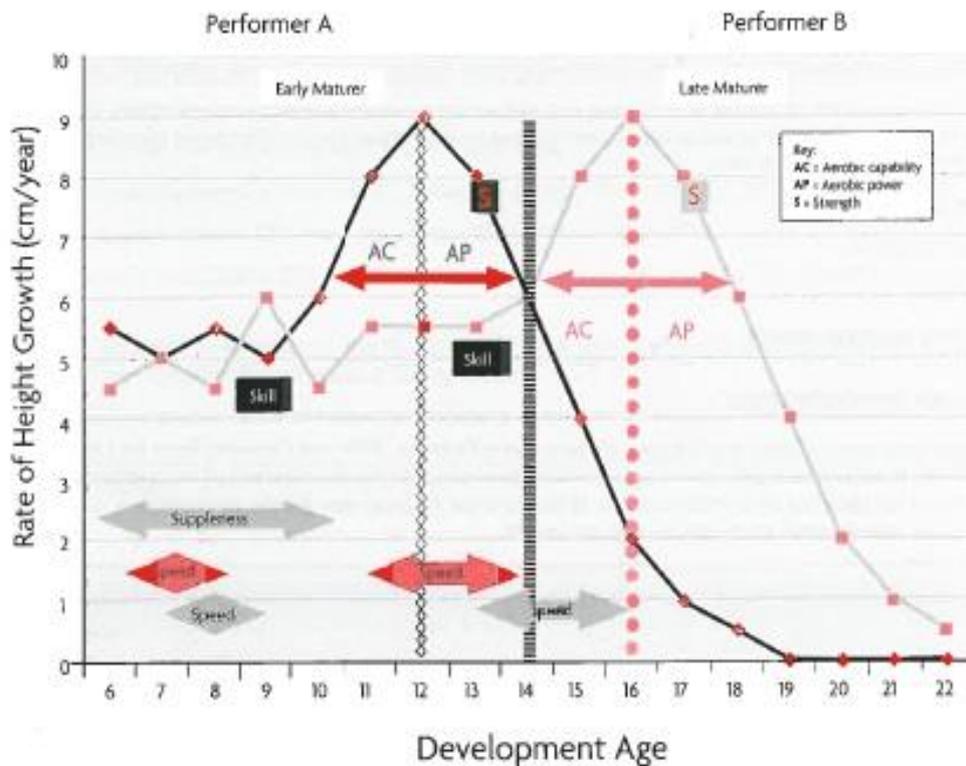


Figure 16: Readiness and training priorities, aerobic capability, aerobic power and strength (Balyi and Way, 2005)

(Reproduced with permission)

Optimising Long-Term Training:

1. Early maturing athletes experience early success due to physical growth advantages.
 2. Early success does not predict later success.
 3. Late maturing athletes often catch up and exceed the performance of early maturing athletes.
 4. Keep success in perspective.
 5. Develop sets to monitor individual progress.
- **Coach needs to identify an athlete's stage of maturation – Early or Late maturing athletes will influence the type of training which is most effective.**

Therefore, it is paramount in all swimming programs to develop good technique and skills in the younger age groups whilst fostering these young participants to stay with the sport until they achieve their potential. Awareness from the above diagram and examples of elite athletes who have had international success without super age group achievement may assist some coaches to keep the Next Generation of “Gems” involved – retention.

- **Technique and skills development in pre-puberty swimmers including late developers should be emphasised until they are ready for high levels of training.**

When looking at Istvan Balyi's phases or labels for training, I was impressed by the simplicity and practicality of his terminology for our training environments. However, the similarity with earlier models struck me as well. Orjan Madsen and Kurt Wilke have a model which fits closely to the stages listed above. These German sports scientists and coaches illustrated and describe their observations in their text – “Coaching the Young Swimmer” Pelham Books Ltd. 1986. Australia's own swimming academic, Dr Ralph Richards has devoted a chapter on Long Term Swimmer Development in his text – “Coaching

Swimming – An Introductory Manual.” 1996. They are all describing the same pathway from junior squad member through to senior swimmer then onto international competitor. The descriptions from Balyi, Richards, Sweetenham, Madsen and Wilke have much in common.

From “Swimming Coaching - An Introductory Manual” 1996 by Ralph J. Richards the main aspects of the Australian Long Term plan have been scanned into this paper for your perusal:

In my role as Australian National Youth Coach, it is my intention to bring more attention and awareness of these swimming development models, so coaches, administrators and parents can make more informed choices when fostering current and future Australian athletes.

References and further readings:

Books

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Bompa, T.O. Periodization: Theory and Methodology of Training . Human Kinetics, 1999

Coyle, Daniel. The Talent Code. Bantam Books, 2009.

Stafford, Ian. Coaching for Long Athlete Development: To Improve Participation and Performance in Sport. Coachwise, 2010.

Sweetenham, Bill & Atkinson, John. Championship Swim Training. Human Kinetics, 2003

Tihanyi, J.. Long Term Planning for Young Performers: An Overview of the influences of Growth, Maturation and Development. Sudbury, Laurentian University, 1990

Touretski,G.; “Long Term Swimming Planning.” Presented 1994 at the ASCTA Convention.

Wilke, Kurt & Madsen, Orjan. Coaching the Young Swimmer. Pelham Books Ltd, 1993

Note - books available for loan from National Sport Information Centre -

<http://www.ausport.gov.au/information/nsic>

Web Documents

Swimming Canada Long Term Athlete Development - <https://www.swimming.ca/ltad>

Gordon, Richard; A Shorter Guide to Long Term Athlete Development (LTAD)

<http://www.sportcentric.com/vsite/vfile/page/fileurl/0,11040,5157-184732-201954-124688-0-file,00.pdf>

Richards, Dr Ralph., Swimmer Development Model

https://assets.clubsonline.com.au/.../swimmer_development_model.pdf

Sokolovas, Genadyus., Analysis of USA Swimming ‘a All Time Top 100 Times (Not a Champion at Age Group Level? Don’t despair)

http://www.coachesinfo.com/index.php?option=com_docman&task=doc_download&gid=191&Itemid

MULTI-YEAR AGE-GROUP SWIMMER DEVELOPMENT MODEL

Age	8 ± 1 year		10 ± 2 years		Girls 12 / Boys 13 ± 1 year		14 ± 2 years	
Training Period	2 years		2 years		2 - 3 years		3 - 5 years	
Training Time Per Week	Pool	Land	Pool	Land	Pool	Land	Pool	Land
	2-4 Sessions 40 min - 1 hr	1-2 Sessions 15-25 min	3-5 Sessions 1 - 1 1/4 hr	2 Sessions 20-30 min	4-6 Sessions 1 1/4 - 1 1/2 hr	2-3 Sessions 30-45 min	6-10 Sessions 1 1/2 - 2 hr	2-3 Sessions 45 min - 1 hr
Volume / Session	0.75 - 2 Km.		2 - 3.5 Km.		3.5 - 6 Km.*		4 - 8 Km.*	
Yearly Training Volume (Pool)	24 - 30 Weeks 75 - 250 Km.		30 - 36 Weeks 250 - 500 Km.		36 - 44 Weeks 500 - 1000 Kms.		40 - 46 Weeks 1000 - 2500 Kms.	
Training Objectives	<ul style="list-style-type: none"> * Technique all strokes * Racing Skills starts, turns, pace * Aerobic Endurance * Sculling Drills * Speed at 25-50m * Simple Training Sets and Games 	<ul style="list-style-type: none"> * Flexibility * General Body Strength * Movement Co-ordination * Group Activities 	<ul style="list-style-type: none"> * Technique * Racing Skills * Aerobic Endurance * Speed (< 50m) & Acceleration * Greater mix of Training Methods 	<ul style="list-style-type: none"> * Increase Strength to Body Weight Ratio * Even Development of all muscle groups * Flexibility * Improve 'core' body strength 	<ul style="list-style-type: none"> * Technique * Increased Volume * Racing Skills * Speed (< 50m) & Acceleration * Introduce some Intense Interval Training 	<ul style="list-style-type: none"> * Musculo-Skeletal Assessment * Body Weight Exercises & Simple Gym Equipment * Flexibility & Body Strength 	<ul style="list-style-type: none"> * Increase Volume and Intensity of Training * Integrated Training Model * Begin to Specialise * Perfect Technique & Skills 	<ul style="list-style-type: none"> * Periodise Strength Program * Transfer Power into Swimming Performance * Cross Training Activities * Maintain Flexibility
Motor Learning Objectives	<ol style="list-style-type: none"> 1. Develop a feel for the water, the ability to make corrections in movement patterns. 2. Learn the technical skills of all four strokes. 3. Develop general body co-ordination and strength. 4. Learn good habits for maintaining and improving natural flexibility. 5. Learn to maintain correct technique on longer (submaximal) swims. 6. Learn to maintain correct technique on short sprints. 		<ol style="list-style-type: none"> 1. Improve stroke technique and learn race skills (such as turns, starts, pacing, and acceleration). 2. Consolidate stroke development. 3. Improve conditioning components of endurance and speed while maintaining stroke technique. 4. Develop simple race strategy and tactics. 		<ol style="list-style-type: none"> 1. Maintain efficient technique as body proportions change. 2. Accommodate increases in muscle strength to improve swimming efficiency. 3. Retain diversity of performance goals (compete in various stroke events and distances). 4. Improve both steady pace and sprint performance using ideal stroke technique (all strokes). 		<ol style="list-style-type: none"> 1. Adapt to diverse training methods. 2. Refine stroke technique during all speeds & intensity of swimming. 3. Apply strength and power to swimming performance. 4. Specialise in strokes and competition distances. 5. Retain range of motion and muscular co-ordination at all swimming speeds. 6. Refine race skills (starts & turns, tactics, pace, etc.). 7. Learn to taper for peak performance. 	

[* During some developmental stages the 'average' girl may be capable of handling a greater volume of training than the 'average' boy, due to an advanced rate of maturation.]

	[age 8 ± 1 year]	[age 10 ± 2 years]	[age 12 / 13 ± 1 year]	[age 14 ± 2 years]
Knowledge & Attitudes	<ol style="list-style-type: none"> 1. Enjoyment of pool and land based activities. 2. Learn to function as an individual within a group activity. 3. Become familiar with rules and competitive situations. 4. Learn about stroke technique and training methods. 	<ol style="list-style-type: none"> 1. Enjoyment of pool and land based activities. 2. Become part of the club, team, squad culture. 3. Develop habits which support an active, healthy lifestyle. 4. Begin to function with less direct supervision and make positive decisions regarding training compliance. 	<ol style="list-style-type: none"> 1. Enjoyment of swimming activities and desire for personal improvement. 2. Broader knowledge of training methods and the resulting performance outcomes. 3. Improved personal management skills (balancing training, school and social objectives). 4. Develop self-discipline and increasing commitment to swimming. 	<ol style="list-style-type: none"> 1. Enjoyment of the process (i.e. goal setting) and product (i.e. attainment of results) of sports participation. 2. Understanding and practicing performance management skills (such as good nutrition, recovery techniques, mental skills, etc.). 3. Independence (i.e. working with a coach and support personnel, but taking responsibility for self). 4. Improved personal skills (including education & vocational objectives).
Competition Objectives	Have fun and learn to participate without anxiety or distraction. Personal improvement (in both performance and skill) and enjoyment should be recognised and reinforced.	Club level competitions leading up to State competitions (i.e. school or age-group). Skill development, improvement, and number of events swum are the most important goals.	Club and State level competition (age group). Performance goals should be evaluated regularly, as they apply to both training and competition. Each race opportunity is used as a learning experience.	State and National (age-group) performance goals. Competition in 'open' events as ability improves. Selection of events begins to focus on stroke and distance. Race strategies and mental skills are perfected.

This model has been endorsed by the Australian Swimming Coaches and Teachers Association as a guideline for training program development. It's recognised that some swimmers will be capable of training at the 'top end' of the suggested range. Coaches should always be mindful of their duty of care to provide a training program that is both challenging and within the capability of each swimmer to absorb.



Footnotes from my coaching background:

When I first started part-time coaching at Wondall State School Swimming Club in the summer of 1979 -1980, I was privileged to teach to swim a young girl named Samantha Riley. She suffered from asthma and as a consequence her parents wanted her involved in swimming for its health benefits. Samantha was in the local summer swimming club as a good competitor but certainly not as the strongest in her age group. Samantha established good skills and great technique from the ages 6 – 11 years.

When I moved up to Townsville to pursue a career as a full time coach, Samantha moved into the Chandler program with the highly successful Coach Laurie Lawrence. Whilst with the Lawrence Swim Club, Samantha attended National Age without achieving outstanding success. Post the 1988 Olympics Laurie Lawrence moved his coaching set up from Brisbane to the Gold Coast. As a result Samantha Riley moved into Scott Volk's squad based at the Valley Pool in the centre of Brisbane. It was here that her extraordinary swimming talents began to flourish with the help of Scott's coaching.

Samantha Riley became an Olympic medallist and dual Gold World medallist in 100 and 200 breaststroke, Rome 1994. Samantha as World Champion displays the characteristics of the late maturing athlete – which in her case was influenced by childhood health complaints. Samantha Riley is one of those “gems” who coaches need to foster in their squads so they can achieve their full potential. The first of the following photos is of a young Samantha Riley. It was taken when she was competing for the Wondall Heights Swimming Club – approximately 11 years (1983). The second image was taken in 1994 when Samantha Riley was competing for Queensland at Open Trials.



World Champion - Rome 1994 100 & 200 Breaststroke

The second example I wish to share is from my more recent coaching experience of Brenton Rickard who like Samantha became World Champion (2009 Rome) and an Olympic medallist (2008 Beijing) after steady improvement during his age group career. Brenton came to Brothers' Swim Club (St. Joseph's Nudgee College) as a ten year old in 1994. When he arrived in Brisbane from Cairns, Brenton had already been a State medallist in the 100 Breaststroke and 200 IM as a 10 year old showing signs of being a good junior swimmer.

Brenton failed to maintain medal winning performances at State level through the years 11 – 14. Stronger and bigger lads were gaining the podium positions. Brenton's third State medal came some five years later at 15 years with a bronze medal in the 100 Breaststroke. Brenton was a late developing athlete who through his early years at High School played other sports including water polo, rugby and basketball along with swimming in the summer months. This multisport background has contributed to Brenton's athletic coordination and space sensory skills. He then started in our gym program at 14 years of age with our dry land coach Gerard Alexander, who focused on teaching correct lifting

techniques (including Olympic lifts) plus core stability work using Swiss and Medicine balls. This initial dry land emphasis continued for two to three years in the weights room.

By the age of 16 years Brenton started to win medals at National Age level. The following photo of Brenton was taken in his final year of High School at the age of sixteen and a half – it is obvious from this shot that his main growth spurt was still to come. He raced at the Olympics (2008) weighing over 90 kilos.



This is a photo of Brenton Rickard (2000) at age 16.5 years showing little development in stature for a year 12 student. Within two years of this picture Brenton made his first Open Australian Team – Moscow; Short Course World Championships (2002). Brenton is the first swimmer to the left side of the coach.

Brenton's accelerated growth in stature seemed to occur immediately post high school between the ages of 17 years to 19 years. This then started his long and successful international career. A breakthrough event, where Brenton Rickard first stepped up onto the international stage was at the 2006 Melbourne Commonwealth Games. Winning four medals at that competition made this a watershed meet. Brenton then attained great success at the 2007 FINA World Swimming Championships where he won Bronze in the 100m Breaststroke, Silver in the 200m Breaststroke and Gold in the 4 x 100m, Medley Relay.

He achieved further success at the 2008 Beijing Olympic Games winning Silver in the 200m Breaststroke and Silver in the 4 x 100m Medley Relay, and came a creditable 5th in the 100m Breaststroke to become the first Australian breaststroker to go under the sixty second barrier.

At the 2009 FINA World Swimming Championships Rickard won Gold in the 100m Breaststroke and broke the World Record by an impressive 0.33 seconds to swim a time of 58.58 seconds. After the race Rickard said:



“When I touched the wall I felt like I had done a really good race but to see that I got to the wall first was another thing again. To finally have that shiny gold one around my neck after so many silvers and bronzes it’s pretty satisfying.”

As his coach for sixteen years (1994 – 2009), it was a privilege to work with such a wonderful person/athlete and to share his journey to the top of the podium in the Roman summer of 2009.

These two athletes show us that the pathway to elite success is not always linear. As coaches we must be aware that athletes are individuals and the one size fits all approach may not be successful in the long term.

- ***It is our job to realise these differences and then apply training strategies to foster their individual talents.***



World Champion - Rome; 100 Breaststroke in World Record time; 58.58 - August 2009.

Wednesday, 22 June 2011