Developing Efficient Competitive Swimming Skills

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Advanced Learn-to-Swim Levels

The initial focus of aquatic instruction must always be safety and learning to enjoy water activities. Aquatic instruction then progresses through various stages where interested participants gain confidence and independence of movement in the water. Skill in performing the basic swimming strokes, usually backstroke and freestyle, begins to emerge. The swimmer then acquires greater diversity in movement skill by mastering breaststroke and butterfly. An accomplished swimmer usually emerges from this learning progression between the ages of 8 and 11 years of age.

During the 'advanced' stages of this learn-to-swim progression the departure point from a purely learning activity to a performance-based activity is reached. The defining element of training programs, as compared to learning programs, is a matter of how much massed-practice is provided at the current stage of skill development. The question of 'how much' swimming can and should be done at each stage of development is central to optimal long-term swimmer development. Learning new skills and consolidating these skills into established motor patterns requires repeated practice. During a lesson plan of 30 – 45 – or 60 minutes, how much swimming (i.e. volume of work) should the teacher/coach reasonably expect to accomplish? Lesson plans are usually divided into a limited number of key tasks; these may include such skills as body position drills, kicking only, arms only, whole stroke swimming, starts and turns, and purely 'fun' activities. At the beginning stages of skill development the total lesson may only contain a limited volume of 'work'. In this context work is defined by the physiological requirements of energy production that produces movement and stimulates physiological adaptation. Work is generally quantified in terms of the number of metres swum. At more advanced levels of skill development the volume of work may include 800—1600m (or more) of swimming during a single session. For the 8-10 year-old swimmer this represents a significant training load and begins to blend into more complex systems of performance development.

Identifying Talented Swimmers

Because coaching is a results-driven occupation there is great incentive for the coach to seek out those athletes with the greatest potential to succeed. However, this does not mean that talent identification factors should be the sole criteria when decisions are made regarding the time and effort a coach 'invests' in a swimmer. Many swimmers with average physical abilities achieve remarkable results because of their great desire and dedication to succeed. In some respects their 'talent' as an athlete lies in their exceptional will to succeed, dedication to training, and mental toughness in race situations. Sometimes this

is enough to make up for any shortfall in natural ability. It's also true that many physically talented swimmers fail to achieve their potential because of insufficient commitment, bad luck, or missed opportunities.

Much of what we consider to be 'talent' is the degree to which each swimmer possesses certain physical, physiological, or mental attributes that may contribute to performance. Some of the physical characteristics of the swimmer are controlled by genetic profile. That is, they are beyond anything the coach may do in the training program. For example, mature anatomical characteristics (commonly referred to as somatotype) are not easily altered. Therefore, many talent identification models focus on profiling somatotypes that contribute to optimal force/drag components of swimming. Studies on elite swimmers have been used to identify common physical characteristics, as compared to their less successful peers. The general premise is that a swimmer's somatotype influences the horizontal components of lift and drag and thereby affects the potential to generate optimal propulsion and to minimise resistance forces. The typical profile of a mature elite swimmer features these general characteristics:

- greater than average height,
- wide shoulder girdle and narrow hip width (note: 'wide' and 'narrow' are relative terms, the respective ratio will determine if the relationship is favourable),
- relatively long arms in relation to one's height,
- relatively long legs in relation to trunk length,
- relatively large hands and feet.

There are also some variations reported in research literature specific to stroke specialty. For example, male breaststrokers tend to be slightly heavier in their body build with large feet relative to their height. Freestylers and backstrokers (both sexes) tend to be the tallest and have the longest legs in relation to their body size. However, the overall differences between elite swimmers having different stroke specialities are usually less than the differences between elite and non-elite swimmers.

Body composition is also a component of somatotype and serves as a descriptive characteristic of elite swimmers. As a rule, elite swimmers tend to have lean body types. That is, the percentage of body mass that is fat tissue is relatively low when compared to age/sex peers who are not elite swimmers. The amount of body fat is one factor that, to a large degree, can be controlled through good nutrition practices and adequate aerobic training loads. Body composition often becomes a significant performance factor during puberty because proportional changes affect drag characteristics and strength/body-mass ratio.

Muscularity of most swimmers would be described as 'lean muscled'. Both quantitative and qualitative characteristics of muscle development are subject to change as a result of the type and amount of exercise performed. Swimmers

tend to retain a lean muscular appearance without developing excessive muscle bulk because of the specific strength training programs undertaken. The body shape of elite swimmers is typically narrow in terms of chest depth (for mature female swimmers this means relatively small breast size is an advantage). The torso typically tapers to a narrow waist and hips, a 'V-shape' as viewed from the front.

The physiological characteristics that are advantageous in swimming are more susceptible to change as a result of the type and volume of training. Talent identification tests seek to select individuals possessing desirable characteristics (i.e. finding individuals at the extremes on the physiological spectrum). It's often an advantage to factor-out training status, because a highly trained athlete of 'lesser' talent will usually test higher than a truly talented athlete having minimal training background. For example, great explosive-power in muscular capacity is a desirable trait for sprint swimmers. A non-swimming test such as vertical jump performance can be used to roughly measure this trait. However, there is also a good case for using only swim-specific testing because of the overriding importance of swimming efficiency. Therefore, a simple test to estimate endurance capacity might be a long swim where one's ability to evenly pace the swim (i.e. swim with even splits) is just as important as the overall time. Although talent identification testing may be crude, it gives some insight into who is a likely candidate for certain types of events.

Other factors are related to one's neuro-muscular control, these are much harder to measure but are no less important than physical features. Experienced coaches can easily recognise that some swimmers have a better 'feel' for the water than other swimmers. A swimmer's ability to sense pressure on the propulsive surfaces of the hands and feet provides a great advantage in terms of applying optimal stroke technique. Talented swimmers are the ones who quickly make adjustments in their movement patterns to maximise applied force. Swimming is a sport that relies upon tactile sense more than sight or sound. Therefore, the quality of one's tactile and movement sense affects one's ability to maintain favourable body position. The talented swimmer will possess a great sense of balance and body awareness in the water.

In recent years international coach Bill Sweetenham has advocated the use of 'recovery ability' as a measure of physiological talent. Both sprint and endurance athletes will have a certain ability to absorb and adapt to physical activity to a point where they can repeat the activity with minimum reduction in performance. This is one's ability to recover. It's possible to structure specific sprint or endurance test sets to get an indication of a swimmer's potential to recover after specific energy demands.

Last, but by no means least, some characteristics shared by elite swimmers are associated with one's psychological make-up. Like the technical aspects of performance, these characteristics are sometimes hard to assess by traditional methods (i.e. standard tests). Research has not clearly identified if specific traits are common to elite swimmers. However, there are general traits worth considering when putting together a talent profile. Most successful swimmers have a well-balanced sense of 'self'. That is, they have a healthy self-concept and belief in their own ability. They are usually someone who displays great determination and concentration when given a task to complete.

It's been said that the best form of talent identification is mass participation. The best way to identify talent is to have large numbers of young children exposed to quality learn-to-swim programs and then to keep them progressing in the sport during their developmental years. This recognises that talented athletes will mature at different rates and some will be 'found' as 12 or 13 year-olds and others will be 'discovered' as 15 or 16 year-olds. Much of the success attributed to identifying talented swimmers relies on the 'educated-eye' of the Coach. However, the educated-eye must act in consort with scientific principles and good judgement regarding talent development. A coach's understanding of how swimmers develop and progress during their sporting lifetime is the cornerstone of talent development.

Phases of Swimmer Development

When a swimmer completes a 'skills based' course of lean-to-swim lessons he/she has the basic technical skill to swim competitively. Development as a swimming athlete depends upon consolidating and refining those skills and expanding training and competition opportunities. We might view a swimmer's career progress in terms of three phases of development.

First, the swimmer must learn to train; this is called the 'training phase'. This phase will last several years and will take the swimmer through the pubertal growth spurt and biological maturation. Competition is also an important part of the swimmer's overall development, but training progressions are the key element at this stage of a swimmer's career. Many talented swimmers do not distinguish themselves in competition during this phase because they may be late maturing. The ideal training background includes developing a good work ethic, positive attitude, love of the sport, and determination to succeed.

Second, the swimmer goes through a phase where competitive results begin to identify those individuals having the potential to rise to elite level. This does not mean that a swimmer who is not winning age-group medals will never reach the top of the sport. However, the likelihood that well preformed age-group swimmers will advance to senior swimming is established during this phase.

Third, the final phase of a swimmer's career is the 'performance phase'. Only a small percentage of competitive swimmers advance to this phase of mature sporting development. Most swimmers remain at the second phase throughout their competitive career, even those who advance through age-group ranks and compete in open events. As competitive swimmers they realise all the benefits (i.e. social, skill development, and fitness) from sport without progressing to the final stage of elite development.

Three Phases of Swimmer Development – Training Outcomes

Components:	1. TRAINING PHASE	2. COMPETITION PHASE	3. PERFORMANCE PHASE
Overall Training Objective	Learning the Basic Training Fundamentals	Progressive Buildup (volume then intensity)	Systematic High Level Training
Associated Stage of Physical Maturity	Prepubescent and Early Puberty	Pubescent and Post-Pubescent	Physically Mature Athlete
Movement Skill Development	Refine Fundamental Movement Skills	Master All Skills At Race Pace/Pressure	Optimal Skill App-lication at All Times
Technical Model	Acquire Basic Skills in all Four Strokes	Advanced Skill Level in all Four Strokes	Maintain General Skills and Specialise
Knowledge	"How To" Swim Strokes, Starts, Turns	Race Tactics & Pacing Strategies	Performance Analysis Strengths & Weakness
Sportsmanship	Respect for Team-mates and Coaches	Respect for other Com-petitors & Officials	Interaction with Sport (media, public, etc.)
Personal Interactions	Work with Coach and Team-mates	Support Club & Team Goals	Demonstrate Leadership
Nutrition	Understand Principles of Good Nutrition	Use Best Practice and Monitor Eating Habits	Maintain Body Weight and Health
Aerobic Conditioning	Acquire Training Back-Ground	Increase Volume and Intensity of Training	Maintain Aerobic Fitness
Anaerobic Conditioning	Maintain Stroke Tech-nique during Sprints	Increase Volume of Intense Training	Increase Quality of Intense Training
Muscular Strength	Core Body Strength and Muscle Control	Increase Strength -- Balanced Development	Develop Specific Strength & Power
Flexibility and Range of Movement	Learn Swim Technique with Range of Motion	Maintain/Increase Joint Flexibility & Stability	Maintain all Elements of Muscle/Joint Action
Recovery and Regeneration	Understand the Role of Recovery	Apply a Variety of Recovery Methods	Develop Individual Recovery Routine
Emotional & Psycho-logical Development	Enjoy Swimming Experiences	Control Mental State during Competition	Develop Mental Skills to Meet any Situation
Medical Control (monitoring)	Check Growth, Posture & Body Structure	Apply Injury Prevention Strategies	Monitor Health Status & Use Rehab Techniques

[adapted from "A Plan Behind the Dream", Vern Gambetta, ASCTA Journal, Vol. 15, No. 1]

Most parents have several basic concerns regarding their child's involvement in a swimming training program. What is the focus of the training program – fitness, skill, or competition? How do training commitments change with age and performance? How many sessions are appropriate each week and what is the content of those sessions (i.e. volume and intensity)? What is an appropriate competition program? Whilst there is no single 'right' or 'wrong' answer to each question, there are a number of supporting recommendations that should be taken into account. ASI's Multi-Year Age-Group Swimmer Development Model*

* Coaching Swimming: An Introductory Manual © 1996 and Swimming Essentials: A Swimming Coach's Guidebook © 2003.

has been in the mainstream of coach education for over a decade. The model addresses various training parameters to encourage a progressive approach to planning long-term swimmer development. Training guidelines are defined in terms of volume, content, and achievable outcomes.

Four basic periods of age-group swimmer development are identified based upon a number of important considerations (e.g. biological maturity, progressive skill development, emotional and social maturity, etc.). The specific age of any swimmer within a defined period should not be taken as absolute because slightly older or younger swimmers may fit the model. For example, a late maturing 12 year-old girl might best fit into the training plans developed for a group of mostly 10-11 year-olds. Conversely, a 12 year-old girl who has completed her growth spurt and passed the age of menarche may be capable of meeting the training expectations of a more advanced training period. Mastery of the majority of skills identified at each level is necessary before more advanced or complex training programs commence. To achieve all (or nearly all) of the objectives identified for each training period may take two or more years of progressive training (i.e. progressive in this sense means an increase in training stimuli from one training cycle to the next). The model helps the coach plan, on a large scale, how training should progress. Squad organisation and the application of specific training methods will reflect appropriate objectives at each level of maturation.

Three important concepts should be incorporated into the coach's planning. First, different training periods should have different emphasis in terms of training components and developmental objectives. Second, it's of paramount importance that both mastery and retention of lower level skills and fitness components are carried forward to the next training period. Swimmers must be able to maintain basic skills and fitness components, or quickly re-acquire these after a period of reduced training. Third, training plans should be progressive (i.e. advancing in a logical manner) in their application.

Summary of Key Points

SKILL DEVELOPMENT

- Good Technique = High Efficiency.
- It's important to know the difference between Technique and Style.
- Complex skills should be broken down into simplified components.
- Skills develop from 'Learning' to 'Performance with Speed' to 'Performance with Speed while Under Pressure'.
- The current level of physical preparation impacts on skill acquisition.
- Motor development and the complexity of a skill will affect learning and the retention of learnt skills.

PSYCHOLOGICAL DEVELOPMENT

- ♦ Maintaining motivation requires developing psychological skills within the context of the swimmer's rationale for participation.
- ♦ Age-group swimmers are not 'little senior swimmers' and senior swimmers are not 'bigger age-group swimmers'.
- ♦ Success encourages high self-esteem.
- ♦ Positive reinforcement instills a sense of success.
- ♦ The transition from age-group to senior swimming is psychological as well as physiological.
- ♦ Psychological skills should improve with training and practice if applied in a positive environment.
- ♦ The emotional state of children is unpredictable and can change quickly.

PHYSICAL DEVELOPMENT

- ∇ Success prior to the age of 12 is closely related to biological development / success at the senior elite level is the result of many factors.
- ∇ Late or average-age maturing children tend to stay in the sport longer.
- ∇ Sporting preparation that coincides with developmental stages will result in better long-term improvements.
- ∇ Prior to the age of 12 the energy system that is developing most rapidly is the 'Aerobic System'.
- ∇ Aerobic endurance developed prior-to and immediately-following puberty may be the single most important component of success throughout the career of an athlete.
- ∇ Energy systems must be developed concurrently using appropriate loading and recovery methods.
- ∇ Positive experience motivates the acquisition of higher physical capabilities.

<u>'Break Point Volume' Concept (as an extension of the ASI Model)</u>

An extension of the Multi-Year Age-Group Swimmer Development Model has been proposed by Bill Sweetenham. His concept is referred to as 'Break Point Volume' (BPV). It suggests that an optimum volume of training, performed at optimum skill level, and achieved through participation in a maximum number of training sessions at controlled intensities; provides the ideal preparation for future success. The BPV concept implies that during the maturation years increased volume of training can be absorbed more easily by the athlete, provided the intensity is controlled within certain limits. Senior swimmers are more likely to absorb complex training programs if their swimming career contains appropriate amounts of 'background training'. The key ages appear to be 13 to 15 years (± 1 year) for boys and slightly earlier for girls. According to the BPV concept these five factors are critical to the structure of a training program.

- Before and through maturation the quantity of training under aerobic workloads is more important than the quantity of 'high intensity' workloads.

(Note: it's recognised that all types of training are required in a balanced program)

- After maturation the proportion of training performed at a high percentage of maximum becomes more important to the overall success of the training program.
- Recovery is always a major concern in the design of training programs.
- Quality technique and application of skills are vitally important at all training intensities.
- Before and through maturation the frequency of training stimuli is important. There should be continuity in the number of sessions swum during any phase of the season.

The general observation made by Sweetenham is that an annual training volume of 2000-2500 km should be achieved over a 42-46 week training season by the time a swimmer reaches his/her physical maturation. This peak training volume equates to about 6 km per session in a training plan that averages 8-9 sessions per week. Following maturation the swimmer's yearly training volume will remain about the same for the next few years, although the composition of training components will change. This concept of training fits within the upper range of values suggested in the Multi-Year Age-Group Swimmer Development Model (i.e. 14 year-old swimmers $\pm$ 2 years, training between 1000-2500 km annually). Sweetenham's recommendation assumes that all prior levels of fitness and skill attainment have been satisfied in the build-up to break point volume.

Coaching Junior Squads (Within a Development Model)

Prior to puberty the paramount objectives of any program should be to instill a love of the sport, teach quality technique, and develop all-around skill. Junior training programs must be well thought-out and have goals that include high-level skill development and appropriate emphasis on physiological conditioning. Questions regarding volume and intensity of training and the importance of competitions during the childhood years involve complex issues that require careful attention. Both over-exposure and under-exposure to these variables may detract from achieving one's full potential. Age-group competitive swimming must always be seen as a means to an end, not an end to itself. Finding the 'right' answers is a difficult matter.

The composition of major Australian Swimming Teams (i.e. Olympics, World Championships, Commonwealth Games, Pan-Pac Championships) in recent years has reflected the trend toward older, mature competitors, staying in the sport. This highlights the need for swim teachers and coaches of junior squads to be aware of their role during the early stages of development and the transition that takes place when physical maturity and a growing interest in performance swimming emerges. Peak performance at international level is the result of many

things; including early skill development (physical, technical and psychological skills), maturity, and the optimum development of physiological capacities.

Prior to commencing ‘training’ there may be several years of consolidation of basic aquatic movement skills. Training is an ill-defined term during a swimmer's early years of development because the acquisition and refinement of swimming skill (i.e. learning) also relies on repetition, as does physical conditioning. Thus, both factors are closely linked. Training involves regular participation in a program that has at least three broad-based performance objectives. The first and foremost objective will always be the continued acquisition and refinement of movement skills beyond the point required for aquatic safety. The second is improvement in a number of physical capacities that will allow faster swimming speed and greater endurance. The third objective is to provide a positive experience for every swimmer. If all three objectives are achieved, then the swimmer is more likely to remain involved. The achievement of all three objectives means that a child will be able to swim further, faster, and more skillfully.

Coaches working with junior squads should have an overall understanding of what can be realistically achieved. Then it’s necessary to implement appropriate participation strategies to meet those objectives. Research has highlighted the fact that young children place great value upon ‘learning skills’ and ‘active participation’ (i.e. the element of 'doing') much more than external rewards they might earn. The top five factors identified by children as influencing their continued participation in sport are:

1. Learning new skills and improving existing skills.
2. Using their skills to improve performance.
3. Having an enjoyable experience with the coach/instructor.
4. Testing their ability by competing with their peers.
5. Being with friends and social interaction.

If we accept that skill development is essential, then the coach must have a good working knowledge of correct swimming mechanics and how to teach correct techniques. This also means that a coach who works with young swimmers must have communication skills appropriate to the age and experience of those swimmers. The greatest mistake made by novice coaches is to translate the techniques and expectations of elite athletes too literally. Young swimmers are less likely to need the inspirational motivation speech, the high-powered technical analysis, or the complex training program that we (as coaches) apply to our senior elite swimmers. Techniques for coaching juniors must be kept simple, but within the realm of technical accuracy and professionalism.

Coaches of junior swimmers must also have a clear vision of what the end product of their labour should be. Don't attempt to create a world record holder or Olympic champion from a child, but try to create the best possible environment

so that the child may develop into a future champion (if he/she has the talent and desire). Training intensity and rigid training discipline may create a fast swimming 10 or 11 year-old; but the development of technical skill, physical capacities, and positive attitudes will provide the underpinning for the highest levels of sporting achievement. Teaching young swimmers good work habits and responsibility for their training outcomes is an important part of any background preparation. Performing turns in accordance with swimming rules, streamlining off the wall, controlling stroke (and breathing pattern) during all swims, maintaining predetermined pace and technical form, are all skills that must be taught and reinforced daily. The overall environment in which training is conducted should be positive, competitive (yes, children like to compete with each other during training) and full of feedback from the coach.

The coach of junior swimmers should understand how growth and maturation impact upon performance. Often the performance improvements that are attributed to the training program are primarily the result of growth and physical maturity. Although basic coaching qualification courses attempt to provide this core knowledge, there is never enough time during a course to explore these concepts in depth. Practical application of basic training principles should give the coach a better 'feel' for how the diverse elements of a training program are brought together.

Training programs for junior swimmers should be simple in their approach to physiological development. Young swimmers need to progressively improve their aerobic capacity while maintaining natural speed. A balanced training approach will take into account the physical preparation for current competition as well as the physical preparation for future competition. This means developing capacities that will enhance performance over a range of racing distances during the formative years. The specific physiological demands faced by children are quite different from those required by mature age swimmers, even when the racing distance may be similar.

Young swimmers also need continuous mental reinforcement. This is accomplished in part by maintaining an environment containing numerous opportunities for feedback. In addition to verbal feedback from coach to athlete, non-verbal communication is very important. The coach must be able to provide reinforcement by his/her physical presence (i.e. moving around the pool during training is desirable), using eye contact, and recognition of how each swimmer is performing. Although physical training requirements may be simple for juniors, training requirements from the mental perspective are very complex. Each day the coach must be able to express the core training objectives in a different way, so swimmers do not loose interest. This may require considerable planning and lateral thinking on the part of the coach.

Developing a healthy attitude toward competition is also a major objective for junior squads. As mentioned above, it's natural for young swimmers to want to

compare themselves with each other. Healthy attitudes about competition include being able to find a 'win-win' situation from every race experience, independent of a race outcome (i.e. who finished first). In other words, the coach and swimmer must learn to evaluate the process as much as the product. If a swimmer can improve his/her execution of race skills, pacing and strategy, or any number of other performance components, then he/she has 'won' in terms of personal improvement. The young swimmer must first be judged against him/her self in terms of performance relative to individual potential. The inevitable comparisons with other swimmers should be a secondary consideration, because each swimmer has little or no control over the performance of other swimmers in a race. Swimmers must learn to accept the results of competition and keep them in perspective. In this regard the coach is the most significant role model for swimmers as they develop attitudes and behaviours toward competition. The coach must also be aware of the influence that parents have upon the attitudes of their children. Therefore, the coach assumes a role of counselor or educator to the parents of squad members.

Strength Training

The misconception that young children (i.e. below the age of 12) should not participate in a land based program has been widely refuted by various research studies, worldwide. Provided the basic components of the initial program include flexibility, general body strength (working against one's own body weight) and movement coordination there is no lower age limit to training. Equipment should be used sparingly; however, jump-ropes, lightweight rubber cords, medicine balls and Swiss-Ball exercises are commonly used. Individual sessions may be short (15-20 minutes), they must always be well supervised and appropriate to the child's level of development.

Prior to puberty, exercise sessions will progressively increase each year (on the model that core strength and range of movement are the primary objectives of any exercise program).[*] The number of sessions may progress from 1-2 per week to daily in some cases. The length of each session may also increase. The total training contribution of land-based strength specific work is the product of intensity, frequency and duration of sessions. The overall objective is an even development of all muscle groups.

Learning 'how' to exercise is a major objective during the pre-maturation years. Insist upon warm-up, correct exercise technique, and integration of land-based exercises with the swimming program. Speed of movement can be progressively

[*] Note: many swimmers will achieve these strength goals by participating in other sports programs during the year. For example, swimming training may take place over 24-36 weeks for most junior swimmers (depending upon age and pool availability). Other team/individual sports programs may overlap with this timeframe.

increased once correct technique is maintained. Body weight and simple resistance exercise are performed in ‘sets’ of 20-30 repetitions; multiple ‘sets’ are progressively added. Land based exercises are used for muscle strength-endurance training, this will complement the muscle endurance improvements that result from swimming training. Keep the exercise program simple (i.e. two exercises in each of the major muscle groups) to fit within the overall training time per session.

When the adolescent is ready for a more formalised strength training program (i.e. introduction to gym equipment) the “circuit training” method is usually applied. Athletes move from one station to the next, performing a fixed number of repetitions (or exercising for a fixed time interval) at each station, resting between stations. In general, rest and repetitions are used to manipulate the relative strength / endurance characteristics of the session. Longer rest between stations and/or lower number of repetitions at each station (performed at a greater percentage of one’s maximum capacity) will favour muscle strength development. Shorter rest and greater repetitions (performed at a lower percentage of one’s maximum capacity) will favour muscle endurance development.

After one or more seasons of circuit training the athlete may progress to more specialised programs that suit individual needs. Swimmers should periodically undergo assessment to determine their relative strength deficiencies. Specific exercises are prescribed on an individual basis (i.e. developing ‘leg power’ for one swimmer, or shoulder stability and strength for another). Strength training should always be integrated into the swimming program so that overall swimming performance is enhanced, not replaced. A ‘stronger’ swimmer who does not swim faster has not trained efficiently.

Developmental Considerations

There are numerous accounts of how young children progress from novice to elite swimmer. All models for sporting development embrace the principles of human growth and development. It's important for the coach to understand how much children are capable of achieving and what aspects of their sporting development are most sensitive to change during certain periods of physical growth and maturation. The coach should also be aware that certain skills and physiological capacities interact with other factors at later stages of development. For example, stroke technique development during the early stages of training (when physical load is low) will affect the ability to swim efficiently or make stroke modifications during later stages of training (when physical load is high). Some physiological capacities, such as aerobic endurance, develop quite rapidly during the critical period of biological maturation and then increase only slightly in the following years. Other capacities, such as the rapid increase in muscle strength

and power, take off after puberty. Only then are the full effects of power training realised.

It's true that every child will mature at a slightly different rate. Research on populations gives us normative information regarding the likely chronological age at which certain biological markers are reached. In reality, any two 10 year-old swimmers may be 1-2 years apart in their biological ages. Research has suggested that physical training itself may also impact on some aspects of biological maturation. These points are made to emphasise the fact that variation between individuals must always be recognised by the coach when planning a training program.