SWIMMING PEDAGOGY
AND
A CURRICULUM FOR
STROKE DEVELOPMENT
SECOND EDITION

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PREFACE

This book is inspired by the observation that few swimming coaches know much about teaching motor skills, perhaps the single most-important characteristic of an effective swimming coach. It covers two extents of teaching: altering an established movement skill and implementing a total curriculum for developing competitive swimming strokes.

Why is there a need for such a book? There are many answers to that question. Some of the reasons that could be proffered are listed below.

1. Many swimming coaches are not trained teachers despite a strong case being made for teaching being the major element in effective swimming coaching.

2. Swimming coaches talk a very good *"game"*. When discussing techniques, often correct elements are described and advocated. However, their swimmers do not exhibit those features. Knowledge alone does not make a good coach. Communicating that knowledge and effecting permanent behavior changes in swimmers do.

3. The myopic approach of using physical conditioning as the only avenue for stimulating *"improvements"* in swimmers is doomed to failure. While occasional champions emerge despite such coaching, the conditioning approach fails in many ways and in turn, deprives many swimmers of the opportunity to improve. Some of the general verified principles associated with conditioning in swimming that illustrate its limiting effects follow.

    *   Physiological capacities do not change after maturity. With judicious training, those capacities may be maximized but cannot be improved.
    *   During growth, many improvements result from physical development alone, not from any *"secret"* swimming program element. Unfortunately, because age-group swimmers improve due to maturation and more often than not despite the swimming coaching to which they are subjected, many coaches assume credit for that biological phenomenon. That incorrect association leads to many false and/or ridiculous claims about activities and content that *"work"*. Such is the formation of superstitious behaviors (in the true psychological sense) and is the explanation for *"false positive coaching effects"*.
    *   When a swimmer is low in fitness, aerobic conditioning that is specific to certain swimming races can be achieved within about 12 weeks (Bonifazi et al., 1998) of at least one hour of appropriate work per day (Troup, 1990).
    *   For higher intensity performances, training can be *"peaked"* in as little as one month (Steinacker et al., 1998; Villani, Fernhall, & Miller, 1999), while not all adaptations are physiological (Myburgh et al., 1995).
    *   For 12-month trained swimmers, a physical conditioning approach is very likely to lead to a form of training staleness that has been postulated as a significant cause of overtraining (Wilson, Aydt, & Raglin, 2001).
    *   12-month training has the potential to cause techniques to deteriorate (Wilmore & Costill, 1998). That is one more reason to require swimming coaches to stress technique instruction over physical conditioning.
    *   Attempts to condition for longer than the above general amounts increases the threat of a swimmer becoming overtrained – a state that reduces adaptation and performance capability.
    *   Continued training beyond those general amounts causes swimmers to cope with excessive stress and strain. Those extended experiences reduce the level of work application, develop

ploys and excuses to miss parts or all of training sessions, lose interest in improving focusing instead on surviving, etc., in swimmers.

Some coaches are so focused on physical conditioning as being the avenue for swimming performance improvements, that the structuring of programs is treated meticulously and according to *"exact"* formulations, so that it outwardly appears to be a very exact science. However, such an approach is based on several false premises and/or the denial of some important performance principles.

- Individual variations between swimmers is so pervasive that programs *"designed"* to produce certain types of adaptation (e.g., anaerobic adaptation) are only successful with approximately one of every three swimmers (Howat & Robson, 1992). Inter-individual variations in physical structures require correct techniques to be instructed in such a way that performance principles are adhered to but outward appearances make swimmers seem to swim differently.
- Gender differences and changes in physiology from pre-puberty through adolescence to maturity produce different physiological, biomechanical, and psychological responses to the same training stimuli.
- Classifications of training stimuli, for example, (a) any non-specific speed swimming; (b) minimum aerobic pace; (c) anaerobic threshold; (d) maximal oxygen uptake; (e) lactate tolerance; (f) peak lactate production; and (g) alactate speed/power, have not been validated in science (Personal communication, 1999, from Joel M Stager, Director of the Counsilman Center for Swimming Research, Indiana University, Bloomington, Indiana). The design of these categories seems to be based on supposition and not on well-founded physiological research. When such classifications are used to make training decisions for swimmers, the truth of the belief-bases upon which they are founded is no more valid than religious ideals. Their effects on performance are unimpressive.

Consequently, programming of swimming activities to be practiced and attributions of their *"value"* is largely invalid and results in inappropriate training activities. While a coach can talk convincingly about the content of *"his/her"* program, it is the swimmers who suffer. At best, only a few program participants would gain much benefit from this focused, but less than appropriate, orientation. As far as swimming fitness is concerned, it appears that as long as swimmers swim *"enough"* and do a sufficient amount of *"fast"* swimming they will be as fit as they need to be to race well as opposed to being overtrained or bored from relatively vast volumes of inappropriate swimming disguised as training.

This writer was acquainted recently with a phenomenon that has been talked about for many years about swimmer behaviors that develop in programs that emphasize physical conditioning. More often than not, ensuing behaviors are detrimental to other aspects of swimming training. When talking to some adolescent swimmers who participate in a conditioning-oriented program where the coach acts as the classic *"pool cop"* (telling the swimmers when to start and stop, calling out their times, recording their times on a board, etc.), one confided that he sang songs in his mind all practice. His aim was to sing all the songs included on the entire compact disk of the artist he was echoing. Another two described how they went over their school work for the day. One recalled as much as possible of what happened in his classes as a way of conducting additional learning. Another thought about and planned the homework he had been set. Several other swimmers opined they did similar things to these. In the mid-1970's, a graduate student and this writer inquired of the thought content at practices of swimmers who also participated in a conditioning-oriented training program. Similar results were obtained. Elsewhere, this writer has discussed the use of distraction

techniques as a way of reducing the awareness of pain and boredom (Rushall, 1977, 2000). It is a common strategy that is supported by many anecdotal stories in situations of repetitively boring activities. However, songs and school work are irrelevant to swimming. Only when thinking is task-relevant does performance improve (Chorkawy, 1982; Ford, 1982). If irrelevant mental activities represent the type of thinking that is occurring in many swimmers, how could they improve when they are not even thinking about their swimming? Research would suggest that improvement would be minimal to non-existent. At most, skills would become less variable and fitness would be sustained at a moderate but not maximal level. Training swimmers with a conditioning approach and no mental direction has minimal effect on performance improvement in growing swimmers and to all intents and purposes, no effect on mature swimmers.

Because swimming is a 12-month sport, maintaining a relevant conditioned state is all that is required. Prior to important meets, concentrated periods of just a few weeks of specific training are all that is needed to *"peak"*. When a swimmer is in *"tolerable"* fitness, technique changes and developments are possible. That skill emphasis indicates how a swimmer can improve in performance without changing any underlying physical state. Consequently, the success of swim coaching is dependent upon the capabilities of a coach to improve the movement economy and effectiveness of swimmers. To do that, coaches have to be very effective teachers. Skill improvements are possible in all age groups. Consistent improvements do not result from poor instruction and a strong emphasis on conditioning.

Improvements in swimmers' speeds are caused by several general factors.

1. *Growth.* The majority of swimmers are maturing through childhood or adolescence. Changes in physical capacities and mechanical attributes provide for improvements in force production and performance extension. Coaching has little to do with these factors and much to do with reducing their influence. Given the skilled nature of swimming, the skill-development phases of growth that occur in both genders, roughly in the 7-9 years age range and for boys again in the early post-pubertal years, render it essential that correct coaching (instruction) occur at those times to stimulate maximum performance changes. Neglecting that facet of development is unconscionable.

2. *Being taught how to swim faster.* Appropriate instruction can be used to teach swimmers how to improve in swimming speeds (e.g., developing more beneficial force, reducing unnecessary movements, and reducing resistances). The emphasis here is on *teaching*. Unless swimmers' performance-behaviors are changed for the better, effective teaching does not occur. The capability of a coach to change swimmers effectively and permanently is the mark of successful coaching. Without that demonstration, coaches are merely, at best, *"supervisors"*.

3. *Serendipity.* In the absence of coach-instruction, some swimmers do change for the better to varying degrees. Having the good luck to make unexpected and fortunate discoveries about swimming techniques (e.g., through watching others, discussing actions with swimmers/persons other than the coach, trying *"different"* actions largely through trial-and-error, etc.), swimmers happen upon something that improves their performance. That influence is limited. The improvement factors usually are few, and if they reach a *"comfort level of satisfaction"* will be maintained and changed no more. A very few swimmers *"discover"* more factors than others and go on to be extremely successful. This yields the observations of some swimmers achieving despite their coaching. However, the majority of swimmers will languish in the realm of mediocrity and eventually realize that reinforcements from achievement improvements no longer are frequent or satisfying in the sport.

An obvious index of coaching ineffectiveness is when a mature swimmer no longer improves in performance to any notable degree. In this age of professional swimming, many mature swimmers continue to compete without any notable performance improvements (a few hundredths of a second here and there is not notable despite such margins often being achieved to break a world record). Swimmers' growth masks much coaching incompetence, which is perhaps one reason why the majority of swimmers are in their growth years. Mature swimmers leave the sport for many reasons but perhaps the most pervading is the realization of the futility of appropriating so much time, effort, and resources to the activity without any accompanying performance achievements. This book contends that should not occur if coaches *coach*.

One question has to be asked of conditioning-oriented or non-instructional coaches: *"What do swimmers do to improve in their swimming speeds?"* When a *"program"* of sets of repetitions with target performance levels is presented at the start of a practice session, apart from trying harder with its very restricted benefits, what is the avenue for improvement in swimming speeds over various distances? In-depth physiological explanations are appropriate only in very limited circumstances. Customarily, there appears to be a coach's belief that if swimmers swim by following *"their program"*, performance improvements will ensue. But what is the mechanism that causes that improvement? The harsh-reality answer to that question is *"There is none"*. Without changes in movement economy (endurance) or effectiveness (power), swimming performances will not change. The coaching belief that programs change swimmers is an institutionalized falsehood. Swimmers suffer because of that universally perpetuated delusion.

Many swimming coaches are oblivious to the dynamics of sport pedagogy. They have not been trained in motor learning, psychology, and/or teaching. That accounts for the lack of emphasis or even exclusion of productive technique work in swimming settings. It is a pity that such ignorance permeates the sport when correct technique is the single-most important characteristic for competitive swimming success.

This book attempts to focus on the important factors involved in teaching when coaching swimming. It describes swimming pedagogy.

No apologies are made for haranguing about *"bad"* coaching, although it might be produced with the best of intentions. It is necessary to make some sense out of what is known about performance and coaching for the benefit of swimmers, not coaches. Swimming is a sport of skill. Therefore, swimming coaching requires an emphasis on the instruction of good skill content for high levels of success to be achieved.

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PREFACE TO THE SECOND EDITION

Section 3 is a new in this edition. It adds most of the topics that required some coverage to better consider the learning of techniques and skills in competitive swimming. Those topics illustrate the wide-spread lack of knowledge about age-group swimmers and their developmental stages. I have tried to make the scientifically justified point that children and adolescents are not miniature adults, and should not be subjected to many swimming experiences that are appropriate for adults. As the discussion points were added, some minor statements were also added to other established sections.

An example of the lack of swimming coaching knowledge is the failure to appreciate the alterations in physical responses to exercise based on gender and age. While analyses of children show proportions of Type I (slow) and Type II (fast) twitch fibers, it is wrong to assume or imply that they will respond similarly to adults. Because fibers exist in children does not lock them into the more clearly defined response categories (aerobic, maximal aerobic, anaerobic, maximal anaerobic, and ATP-CP functioning) that are usually measured and attributed to adults. It is fallacious to believe that children are mostly aerobic animals and that somehow anaerobic work threatens their welfare. Were that belief true, the human species would have become extinct many eons ago if ever it established itself. Swimming coaches and many narrow-discipline scientists do not appreciate the nuances of growth and development and consequently threaten segments of the human species because of poor practices guided by misinformation.

One of the world's foremost aquatic biomechanists is Professor Raúl Arellano. His eloquent reaction to the Long Term Athlete Development (LTAD) model of British Swimming explains some aspects of the endemic weakness in competitive swimming with regard to technique.

> *I have been concerned about the lack of consideration shown by the training plans (long-term and short-term) to technique development. Swimming drills [*"loads"*] are included, but not quantified or differentiated from the physiological water exercises. A similar situation is observed in LTAD models; that is, they describe the technique development in an imprecise manner and fail to illustrate different procedures to train and evaluate progress. The early performances obtained by young swimmers in most countries are based on overload rather than skill development programmes that induce low rates of participation of early, top-ranked, age-group swimmers in long-term elite swimming. Experts must pay serious attention to correct this fundamental error in LTAD models* (Arellano, 2010, p. 418).

A final addition has been the inclusion of new aspects of stroke techniques (e.g., the use of the upper arm as a propelling surface; the change in the breaststroke pull and recovery) in the curriculum part of the book. Those changes seem to have come about by reducing the unproductive phases and movements in some strokes. The changes result in an increase in swimming efficiency. The efficiency of competitive swimming movements is best described as the amount of energy expended to achieve a particular velocity. Movement efficiency has been shown to be a much more valuable index of performance effectiveness than any single or group of physiological factors. The primary factor that governs movement/swimming efficiency is the technique used.

One further impetus to write a second edition was the compliment paid by Professor Arellano (Arellano, 2010) about the first edition. Such an appraisal for an author is one of the intangible benefits of the work required to produce of volume of this type on this topic.

> *Brent S. Rushall proposed a curriculum for swimming stroke development that includes skills competencies adapted to each age group, swimmers' practice session behaviors plus swimming coaches' assessment forms oriented to observe the efficiency of the coach's stroke-*

technique work. This model of stroke development could be easily integrated in the different LTAD programs (p 418).

Technique is the most important feature of competitive swimming. Even at the highest level of performance in the sport, technique is the most significant factor that differentiates performers. Hopefully, by reading this book, you will be convinced of that scientifically justified reality and alter or promote swimming coaching to adopt it.

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