Interpreting and Implementing the Long Term Athlete Development Model: English Swimming Coaches' Views on the (Swimming) LTAD in Practice

A Commentary

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INTRODUCTION

The article by Melanie Lang and Richard Light provides interesting information related to the difficult task of adapting a swimming training programme to the general guidelines that the sport governing bodies impose to obtain funding support for the competitive programme.

In general terms, a long term athlete development (LTAD) model is written by sport experts to define a general pathway of athlete development to achieve national or international performances in different sports or in a particular sport based on an interdisciplinary scientific knowledge. Numerous such models have been published and distributed for years in many countries and seek to guide the achievement of outstanding performances in many sports (see Canadian and English examples [1, 2]).

The programme application entails a considerable effort on the part of the participants (swimmers, coaches and clubs), but unfortunately this effort seems absolutely necessary to obtain international performances. The problem arises when external guidelines based on LTAD may contradict, in some cases, the competitive rules that should stimulate participation in this long-term programme, as the cited article tries to demonstrate.

However, I wish to deal with the conclusion of the article that concerned the impact of excessive volume upon development of technique. This led me to deal with the lack of attention that swimming-planning specialists devote to this highly influential factor in swimming performance.

DIFFERENT APPROACHES TO THE LTAD MODEL

A LTAD swimming framework has been developed in recent years for different countries such as Australia, England and Canada. Five phases or periods can be adapted to athlete development and are broadly named as: FUNdamentals, SwimSkills, Training to Train, Training to Compete and Training To Win. The first phases are in the beginning of the swimmer's sport participation periods (about 7 years old) and later phases are at the finishing period of the swimmer's competitive life, about or a little later than 22 years old. In the England, the LTAD is normally coordinated with a funding program such as "Swim 21". It is accredited and given public recognition (by Sport England in this case) that the club is "safe, effective and child friendly" [3, 4]. Their proposers consider it an important planning tool because:

> It is core to all we do; It is swimmer centred; It provides a clear pathway based on sound principles of growth and development; It provides a simple framework for all swimming providers and implementers; It provides guidelines for success on the world stage; It is central to the re-engineering of coach education and;You can't argue with it!! [4]

A sample of a different models of LTAD is shown in the Table 1. The phases are similar, but a different denomination is applied. Comments about "ef ficient technique" or "integration of efficient biomechanics and physiology" are included, but not detailed, in the manual [5].

All models include basic recommendations about annual training volumes for every period of development. Samples of these volumes are compiled in the Figure 1, where different models from US Swimming, Russia and English Swimming L TAD are compared. The volume path shows dif ferences between models in specific periods. However , all the models posit a correct distribution of training loads, such as strength, cardiovascular endurance, peak velocity and so on, during specific sensitive periods that will induce proper functional adaptations.

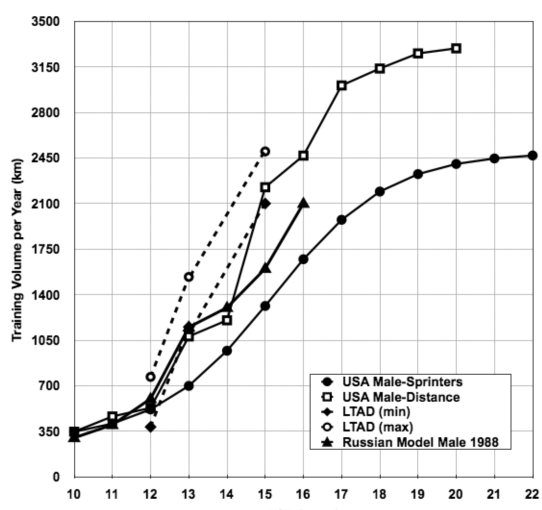

Figure 1. Comparison of US Swimming Workload Progression in Career Training for Male Sprinters (km per year) with the LTAD Minimum and Maximum Volumes and the Russian Swimming Model in 1998 [4, 6, 8]
A drastic increase of the training volume is observed in all the models during the 12 to 15 year period. Higher differences can be observed between the USA male sprinters trend and the British LTAD (maximum volumes). But LTAD (max) differences were double the USA volume per year at 13 and 15.

Table 1. Swimming Sport Participation Categories and General training Objectives, Technical Focus and Training loads (adapted from [5])

Sport Participation Category (Development stage)	Training Objective(s)	Biomechanical or Technical focus	Training load imposed
Reflexive awareness (0-2 years)	Stimulation of body		
Motor memory development (3-6 years)	Motor pattern development	Using appropriate stroke patterns	
Sport participation (6-9 years)	Stroke technique, aerobic development	Efficient technique	2 x 3 per week, 1500-4000 m/wk
Sport delineation I (9-12 years)	Technique development, aerobic base, muscular endurance	Efficient technique	3 x 6 per week, 5000-40000 m/wk
Sport delineation II (12-14 years)	Aerobic maintenance, technique	Efficient technique, integration of physiology and mechanics	6 x 10 per week, 30000-60000 m/wk
Sport mastery (14-20 years)	Integration of efficient biomechanics and physiology	Efficient technique	8 x 12 per week, 40000-100000 m/wk
Elite mastery (17-24+ years)	Integration of efficient biomechanics and physiology	Efficient technique	Event-length specific

LTAD MODELS AND SWIMMING PERFORMANCE

The workload progression models shown in Figure 1 all have in common a drastic increase of the training volume during the 12 to 15 years period (i.e., the sensitive period for the full development of cardiovascular endurance [6]). The correct application of the models should result in a progressive improvement of the performances, as Figure 2 indicates. The performance values in Figure 2 at age 1 1, however, shown an extraordinary mean value (USA ten best times, 2010 long course) that may be a result of combining very skilled swimmers, clever coaches and "very low volume of training". Even basic knowledge of swimming shows that this is impossible. What the models aim to do - namely a progressive build-up of workload volumes from 8 to 12 years - is contradicted by the swimmers' performances. In this way, the long-term objective is changed to a short-term aim. Another explanation may be that the long-term progression is started at 7 and not at 10 as the models proposed and the volumes are shifted to the left (related to age) in the figures. In this case, the sampled performances shown in the Figure 2 could be achieved.

However, this "fast track" in the performances (modelled in Figure 3) contradicts the final participation of elite swimmers as a study by US Swimming demonstrated:

> A small number of elite swimmers from the Top 100 at age 17-18 were ranked in the Top 100 at a younger age. Typically, a little over 10% were ranked as a 10 and under, about the same figure as a 1 1-12 year old, a little over 30% as a 13-14 year old, and a little over 50% as a 15-16 year old [male swimmers]. [7]

They concluded that most elite swimmers were unknown at young ages and about half the elite swimmers listed in the Top 100 at age 17-18 are new swimmers who were never listed in the Top 100 at any age.

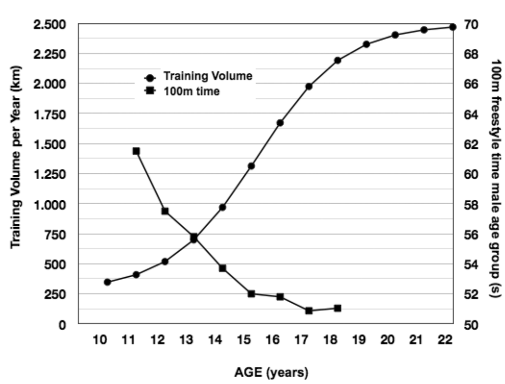

Figure 2. A Comparison between Training Volume Progression [6] and 100m Male Freestyle Performances (Average of Top Ten Age Group, USA Age-Group 2010 ranking, Collected from www.usswimming.org)

A first glance demonstrates a clear relation between the increase in training volume and the 100m times reduction during the critical phases of male maturation (11 to 15 years). However, the initial average time at 11 years (about 61.5 s), suggests higher volumes of training than the proposed model.

Table 2. Recommended Target Times to be Obtained by Future Age Group Swimmers (12 years old male or female) to be Able to Participate in National or International Competitions
This target or better times should be obtained with technically oriented training and with the lowest training volume possible to have enough room for improvement in the future (they can be considered medium or slow track times, see Figure 3).

Event	100m Freestyle	100m Backstroke	100m Breaststroke	100m Butterfly	200m Individual Medley	400m Freestyle
Target Times (min.s)	1.04	1.11	1.19	1.08	2.35	4.56

Based on these results, it would be appropriate to suggest criteria to define when an age-group swimmer is able to initiate a progressive training programme to start the Training to Train phase of the English L TAD. Vorontsov [8] recommended between a 85 and 100% training attendance plus training performances as 400m freestyle under 5.30 min, 1500 freestyle under 22.30 min, 400m individual medley (IM) under 6.00 min or 200m butterfly under 3 min. Age or sex does not matter and these training results can be achieved at age of 9 or 12, as the review of international age-group swimming rankings can confirm.

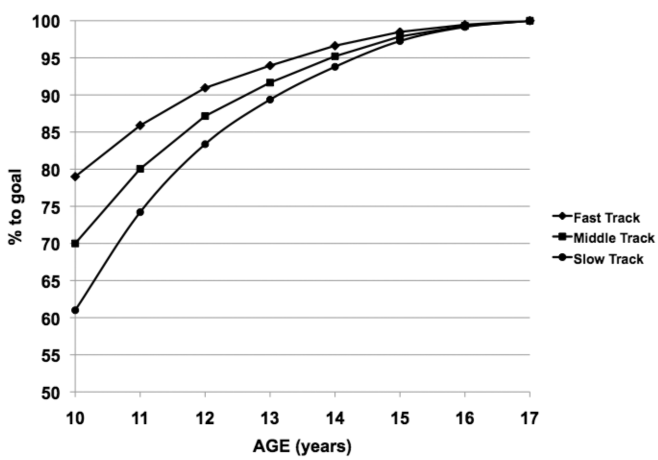

Figure 3. Possible Patterns of Results Progression to Achieve the Planned Goal (Adapted from [8])

LTAD AND SWIMMING TECHNIQUE

Reviewing the dif ferent LTAD model guidelines, we find some general recommendations about technique development in the first two periods. Later the technique is lost because more importance is given to the physiological aspects of a swimmer's planning. An example can be found in the training loads proposed by US Swimming (Rec[reational], End[urance]-1, End-2, End-3, Spr[int]-1, Spr-2 and Spr-3 [9]) where the technique is not incorporated and quantified in the training plan. It is dif ficult to consider swimming technique as relevant when it is omitted from the model.

A clear definition of the technique training loads and exercises should help to resolve this situation. An initial classification of the technical training will separate cyclic (stroke technique) and no cyclic (start and turns) exercises. Later more specific technical loads can be added to the plan (coordinative exercises, linking drills, feel-of-the-water drills, body-position exercises, competitive exercises, etc.). All these ideas are developed in a recently published (in Spanish language) book by Spanish Swimming Federation [10], of which I am the author. In this case, a documented and specific model that includes the technical loads or units in the training plan is developed. The technical load is defined, classified and included in the training plan (micro-cycles, meso-cycles and macro-cycles).

Brent S. Rushall [11] proposed a curriculum for swimming stroke development that includes skills competences adapted to each age group, swimmer's practice session behaviours 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 programmes.

A different approach has been developed in Australia [12] where blocks of stroke progressions are defined for every stroke, to be included as technical units (or loads) in the training sessions. These stroke-efficiency progressions are finished with linking drills to improve the whole stroke technique and are evaluated with the 8 x 50m progressive efficiency test or observational stroke-checklists.

These arguments arrive at a similar point to the article by Lang and Light, who claim the negative influence of high training volumes on stroke development. What should be taken into consideration is that the general model of stroke development, 'swim, swim and swim', is based on the belief that water feedback will naturally correct the swimmer's mistakes, thus making technique training unnecessary. I do not agree with this belief.

CONCLUSION

As an expert in swimming biomechanics, 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; i.e., they describe the technique development in an imprecise manner and fail to illustrate different procedures to train and evaluate its 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.

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