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"It takes 10 years of extensive training to excel in anything. "
Herbert Simon - Nobel Laureate

Introduction

The objective of this paper is to shed some light on some of the key issues facing the British Columbian and Canadian sport systems. To achieve this objective, this article will briefly:

- describe British Columbia's athlete development model, which has been accepted world wide and endorsed by the Coaching Association of Canada;
- identify some of the major gaps in the current British Columbian and Canadian sport systems;
- explain SportMap, a tool developed by British Columbia's System Integration Group.

Background

Scientific research has concluded that it takes eight to twelve years of training for a talented athlete to reach elite levels (Bloom, 1985; Ericsson et al., 1993; Ericsson and Charness, 1994). This is called the ten year or 10,000 hour rule. For athletes, coaches and parents this translates as slightly more than three hours of practice daily for ten years (Salmela, 1998). Unfortunately, parents and coaches in many sports still approach training with an attitude best characterized as the "peaking by Friday" approach (Balyi and Hamilton, 1999). We now know that a long-term commitment to training is required to produce elite athletes in all sports.

A specific and well-planned training, competition and recovery regime will ensure optimum development throughout an athlete's career. Ultimately success comes from training and performing well over the long-term rather than winning in the short term. There is no short cut to success in athletic preparation. Rushing competition will always result in shortcomings in physical, technical, tactical and mental abilities

MODELS OF LONG-TERM ATHLETE DEVELOPMENT AND TRAINING REQUIREMENTS OF DIFFERENT SPORTS:

In principle, sports can be classified as either early specialization or late specialization sports (Balyi and Hamilton, 1999). Early specialization refers to the fact that some sports, such as gymnastics, rhythmic gymnastics, figure skating, diving and table tennis require early sport-specific specialization in training.

Late specialization sports, such as athletics, combative sports, cycling, racquet sports, rowing and all team sports require a generalized approach to early training. In these sports, the emphasis of training should be on the development of general, fundamental motor and technical-tactical skills. Reviewing the existing literature helped us to conclude that early specialization sports require a four-stage model, while late specialization sports require a five-stage model:

Early Specialization Model	Late Specialization Model
<ol style="list-style-type: none">1. Training to Train2. Training To Compete3. Training to Win4. Retirement / Retaining	<ol style="list-style-type: none">1. FUNdamental2. Training to Train3. Training to Compete4. Training to Win5. Retirement / Retaining

Since there are only a few sports that can be categorized as early specialization sports, this document will focus on late specialization sports. Each early specialization sport should develop a sport-specific model: a generic model would lead to serious oversimplifications. The challenge for early specialization sports is either to combine the FUNdamental and Training Train Stages or to amalgamate them into a single stage, such as the Training to Train Stage. For late specialization sports, specialization *prior to age ten* is not recommended since it contributes to early burn out, drop out and retirement from training and competition (Harsanyi, 1985)

One of the most important periods of motor development for children is between the ages of nine to twelve (Balyi and Hamilton, 1995; Rushall; 1998; Viru et al., 1998). During this time children are developmentally ready to acquire the fundamental movement skills that are the cornerstones of all athletic development. These fundamental skills include running, throwing, and jumping, hopping and bounding, the ABC's of athletics. The introduction of the ABC's of athleticism (*agility, balance, coordination, speed*) during this period will lay the foundation of athletic excellence for later years.

Fundamental movement skills should be practised and mastered before sport-specific skills are introduced. The development of these skills, using a positive and fun approach, will contribute significantly to future athletic achievements. Participation in a wide range of sports is also encouraged. This emphasis on motor development will produce athletes who have a better trainability for long-term sport specific development. If the fundamental motor skill training is not developed between the

ages of nine to twelve, skills cannot be recaptured at a later time (although carefully planned and implemented remedial programs can contribute to limited success).

THE FIVE STAGE MODEL OF LATE SPECIALIZATION SPORTS

Stage 1 – The Fundamental Stage™

AGE: Both Males & Females 6 to 10 years old.¹

The FUNdamental stage is well structured and fun! The emphasis is on the overall development of the athlete's *physical capacities*, and *fundamental movement skills*, and the ABC's of athleticism - Agility, Balance, Coordination and Speed. Participation in as many sports as possible is encouraged. Speed, power and endurance are developed using FUN games. Correct running, jumping and throwing techniques are taught, using the ABC's of athletics.

Strength training during this stage should include exercises using the athletes own body weight, medicine ball and Swiss ball exercises. Athletes should be introduced to the simple rules and ethics of sports. No periodization takes place, but all programs are structured and monitored. Activities revolve around the school year, and during summer and winter holidays multi-sport camps are recommended. If athletes and parents have a preferred sport, participation once or twice per week is recommended, but participation in other sports three or four times per week is essential for future excellence. If the athletes later decide to leave the competitive stream, the skills they have acquired during the Fundamental stage will still benefit them when they engage recreational activities, which will enhance their quality of life and health.

Stage 2 – The Training to Train Stage™

AGE: Males 10 to 14years old / Females 10 to 13 years old.¹

During the Training to Train stage young athletes learn how to train and they also learn the basic skills of a specific sport. As well, they are introduced to the basic technical/tactical skills and ancillary capacities including: warm up and cool down, stretching, hydration and nutrition, recovery and regeneration, mental preparation, taper and peak, integrated pre-competition routines and post-competition recovery.

¹ It must be noted that the ages described above are general guidelines. The individual tempo of development / maturation will influence how athletes will reach the various stages of long-term development. However, they all will go through the same stages. Some early maturing athletes may have as much as a four-year physiological advantage over their late maturing peers. Ross et al. 1977

During competitions athletes' play to *win* and to do their best, but the major focus of training is on learning the basics as opposed to competing. Training and competition ratios are optimized because too many competitions waste valuable training time and conversely, not enough competition inhibits the practice of technical skills and learning how to cope with the physical and mental challenges presented during competition.

A 75 percent training to 25 percent competition ratio is recommended by experts during the Training to Train stage, however these percentages vary according to sport and individual specific needs. Athletes undertaking this type of preparation will be better prepared for competition in both the short and long-term, than athletes who focus solely on winning. During this phase, athlete's train in competitive situations daily, in the form of practice matches or competitive games and drills.

The Training to Train stage addresses the *critical or sensitive* periods of physical and skill development. Athletes who miss this stage of training will never reach their full potential, regardless of remedial program they may participate in. The reason why so many athletes plateau during the later stage of their careers is primarily because of an over emphasis on *competition* instead of on *training* during this important period in their athletic development.

Stage 3 – The Training to Compete Stage™

AGE: Males 14 to 18 years old/ Females 13 to 17 years old.

This phase of development is introduced after the goals and objectives of the *Training to Train* stage have been achieved. The training to competition and competition specific training ratio now changes to 50:50. Fifty percent of training is devoted to the development of technical and tactical skills, and fitness improvements, and fifty percent is devoted to competition-specific training.

During the Training to Compete stage, high intensity individual and sport-specific training is provided to athletes year round. Athletes, who are now proficient at performing both basic and sport specific skills, learn to perform these skills under a variety of competitive conditions during training. Special emphasis is placed on *optimum preparation* by modeling training and competition. Fitness programs, recovery programs, psychological preparation and technical development are now individually tailored to a greater degree. This emphasis on individual preparation addresses each athlete's individual strength and weaknesses.

Stage 4 – The Training to Win Stage™

AGE: Males 18 years and older / Females 17 years and older.

This is the final stage of athletic preparation. All of the athlete's physical, technical, tactical, mental, and ancillary capacities are now fully established and the focus of training has shifted to the *optimization of performance*. Athletes are trained to peak for major competitions. Training is characterized by high intensity and relatively high volume. Frequent "prophylactic" breaks help to prevent physical and mental burnouts. Training to competition ratio in this stage is 25:75, with the percent competition ratio including competition specific training activities.

Stage 5 – The Retirement / Retraining Stage™

This stage refers to the activities performed after an athlete has retired from competition permanently. During this final stage, ex athletes move into sport related careers that may include coaching, officiating, sport administration, small business enterprises, master's competition, media, etc.

GAPS IN THE BRITISH COLUMBIAN AND CANADIAN SPORT SYSTEMS:

Analyzing the British Columbian / Canadian sport system from the point of view of performance delivery, it seems, that the following gaps are inhibiting the system:

- The system of competition or the non-existence of a system of competition often inhibits optimal training and performance. Competitive calendar planning is not based on technical knowledge but on traditions and improvisations.
- Administration and coaching practice focuses on training and competition. Talent identification and recruitment are largely neglected although retirement / retaining has received more attention recently.
- The best coaches work at the elite level in the BC sport system. Volunteers or Level 1 coaches coach the FUNdamental and Training to Train stages. However, this is ironic because it is the Fundamental and Training to Train stages that are the most critical to Long Term athlete development. Coaching at these levels requires knowledgeable and experienced coaches who can correctly perform and demonstrate skills for the children.

- Individuals coaching at these levels should also be well acquainted with the physiological, cognitive and emotional development patterns of children and adolescents. The damage done due to incompetent coaching during the FUNdamental, and Training to Train stages cannot be fully repaired during the Training to Compete and Training to Win stages.
- The higher the performance level of the athlete, the better the support programs are. Unfortunately, this means that there is very little or no support at all for the developmental athlete.
- Due to the shortcomings of athlete development during the FUNdamental, Training to Train and Training to Compete stages, many athletes will never reach their optimal performance levels or genetic ceilings/ potential. Regardless of the sophistication of the support programs at the elite level, they do not compensate for the shortcomings in the system as listed above. Thus, the newly established National Sport Centres will not be able to fulfill their role unless changes are made to the sport system to encourage preparation at early training ages.
- Although Canada is considered to be a world leader in coaching education, Women in sport development, ethics and anti-harassment issues, doping control and athlete assistance, Canada's technical short and long-term periodization programs lack sophistication and integration.
- Canada is the only developed country without a centralized sport science program. In fact, it is the only developed country without having any sport scientists working full time in the sport system.
- The existing Canadian sport science and sport medicine programs are not full integrated and sequenced with sport-specific technical-tactical activities.
- A high ratio of competition to training activities inhibits optimal athletic development, especially in team sports.
- The basic components of athletic preparation are not being implemented in a systemic manner (e.g. The ABC's of athleticism and the ABC's of athletics).
- Male training programs are superimposed on female athletes and this is inappropriate, in light of the physiological and developmental differences between the two genders.

- Adult training programs are superimposed on young athletes. This is detrimental because it means that coaching is conducted without regard to the principles of childhood development.
- Adult competition schedules are superimposed on young athletes. As a result, too much time is spent competing and not enough time is spent learning and mastering basic and sport specific skills.
- Optimal trainability is disregarded during the “critical” or “sensitive” periods of athlete development – about 2 % of coaches use anthropometrical measurements to identify Peak Height Velocity, Peak Strength Velocity and Peak Weight Velocity to optimize the periods of accelerated adaptation to training. Therefore young athletes are not introduced to skills at the time when they are developmentally ready to learn them.
- A focus on winning rather than development characterizes the preparation of the developmental athlete.

BUILDING THE BC SPORT SYSTEM

Since its inception in 1999, the **BC Sport System Integration Group** (SIG) has championed the ideas behind “SportMap: A Blueprint for Sport Excellence”. SportMap is a system designed to encourage cooperation among leaders in the BC sport system. It is also a comprehensive curriculum of sport education for athletes, coaches and parents.

SportMap is a holistic and scientific approach to integrating athlete development. It has been tested by the Pacific Sport Group, the BC Network of National and Regional Sport Centres and SportMedBC on behalf of the System Integration Group, the BC Games Society, the National Coaching Institute of British Columbia, the Coaches Association of British Columbia, the Premier’s Sport Awards, BC School Sports, Sport BC and the Sport and Community Development Branch of the Government of British Columbia.

These organizations advocate the importance of:

- Sport education and skill-building within the sport system in British Columbia.
- Athlete development models as planning maps for sport organizations.
- Information-sharing among athletes, coaches and other adults (most notably parents) on sport values and principles of athlete-development.
- Coordination and shared leadership among the recognized multi-sport organizations in British Columbia.

SUMMARY

The Long-term athlete development model, consisting of the FUNdamental, Training to Train, Training to Compete, and Training to Win stages, has become the foundation for British Columbia's sport system. "SportMap: A Blueprint for Sport Excellence" is a system integration/ building tool which encourages cooperation and integration among leaders in the BC sport system. Of course, BC's goals cannot be fully realized unless national integration takes place.

Other sport-specific, long-term athlete development models (with their collaterals) designed by NSO's and PSO's , federal and provincial agencies including the Canadian Olympic Association, Sport Canada and the Coaching Association of Canada could facilitate this process. Alpine Canada and the Canadian Ski Coaches Federation are leaders in this regard. In 1999, they developed "The Alpine Integration Model "(AIM), with the help of national and provincial organizations, clubs and experts from across Canada. This model integrates and sequences Alpine's athlete development both horizontally and vertically. (The outcome of this process should yield results at the 2010 Winter Olympics in Vancouver-Whistler).

Hopefully the National Summit on Sport and the National Sport Plan will ensure horizontal and vertical integration of the Canadian sport system, and will provide leadership and financing for the new system.

Overview of Long-term Athlete Development

FUNDamental	Training to Train	Training to Compete	Training to Win
Chronological / Biological Age <i>Male & Female: 6 -10</i>	Biological Age <i>Male: 10- 14 Female: 10- 13</i>	Chronological / <i>Biological Age</i> <i>Male: 14- 18 Female: 13- 17</i>	Chronological Age <i>Male: 18+ Female: 17 +</i>
FUN and participation General, overall development	Emphasis on general physical conditioning	Sport and individual specific physical conditioning	Maintenance (or possible improvement) of physical capacities
Athleticism: ABC's of running, jumping and throwing	Shoulder, elbow, core, spine and ankle stability	Shoulder, elbow, core, spine and ankle stability	Shoulder, elbow, core, spine and ankle stability
ABC's of movement Agility, Balance, Co-ordination and Speed	FUNDamental technical skills progressively more specific skills towards the end of the stage	Sport-specific technical and playing skills under competitive conditions	Further development of technical, tactical and playing skills
Speed, power and endurance through FUN and games	FUNDamentals of tactical preparation	Advanced tactical preparation	Modelling all possible aspects of training and performance
Proper running, jumping and throwing technique	Participation in complementary sports; (similar energy system and movement pattern requirements)	Individualization of technical - tactical skins	Frequent prophylactic breaks
Medicine ball. Swiss ball and own body exercises for strength	Individualization of fitness and technical training	Advanced mental preparation Sport and individual specific "ancillary capacities"	All aspects of training Individualized
Introduction to simple rules and ethics of sport	Introduction to mental preparation	Specialization	Develop further "ancillary capacities" (there is no "ceiling limit")
Talent Identification	FUNDamentals of ancillary capacities	Double or Multiple Periodization	High Performance Triple or multiple Periodization
NO periodization, but well structured programs	Recruitment	Sport-specific technical, tactical and fitness training 6 -9 times per week	Sport-specific technical, tactical and fitness training 9-12 times per week
Sport participation 5 -6 times per week	Single Periodization Sport -specific training 4 times per week, with participation in other sports		

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