

Planning and Periodization for the Junior Athlete

Train to Train and Lear to Compete Stages



Montreal, January 24, 2009



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NCI BC
Charles Cardinal
NCI Quebec**





Periodization for the Junior Athlete

2009 CS4L Workshop

Ottawa, January 21



Istvan Balyi
ATP & NCI BC



**SUPPORTING
LIMERICK
SPORT**



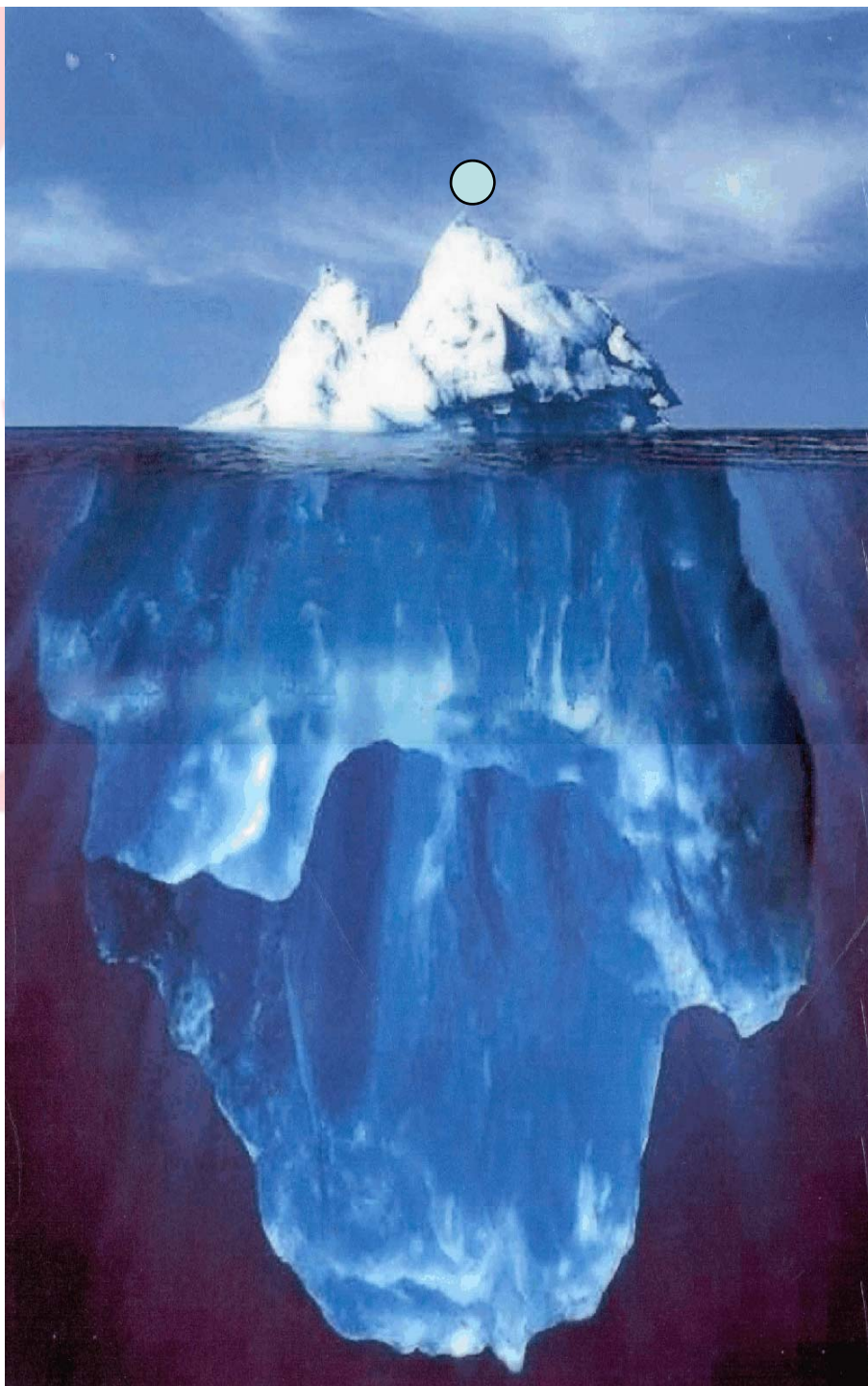
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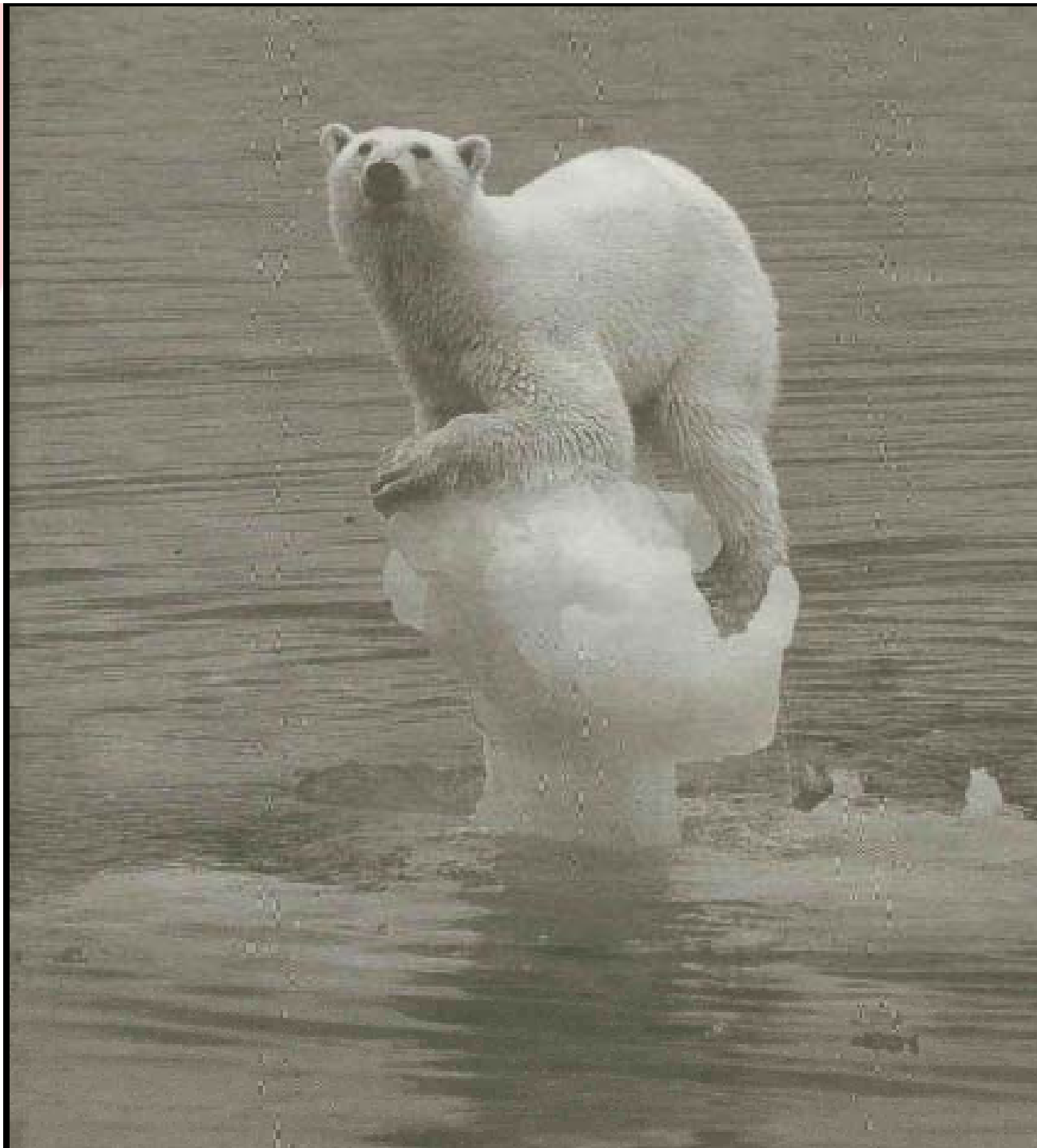
SATURDAY DECEMBER 14, 2002



There Off . . . pictured above in the University of Limerick arena for the launch of the coaches programme, from left, Liam Mogan, Coach Education Officer NCTC, Pat Duffy, Director NCTC, Istivan Balyie, international coach, and Eamon Coughlan (LL)

Eamonn launches new coaching scheme







Kate Pace World - Champion – Downhill
Kerrin -Lee Gartner – Olympic Gold - Downhill

insanity

doing the same
thing over and
over and expecting
different results

Larson







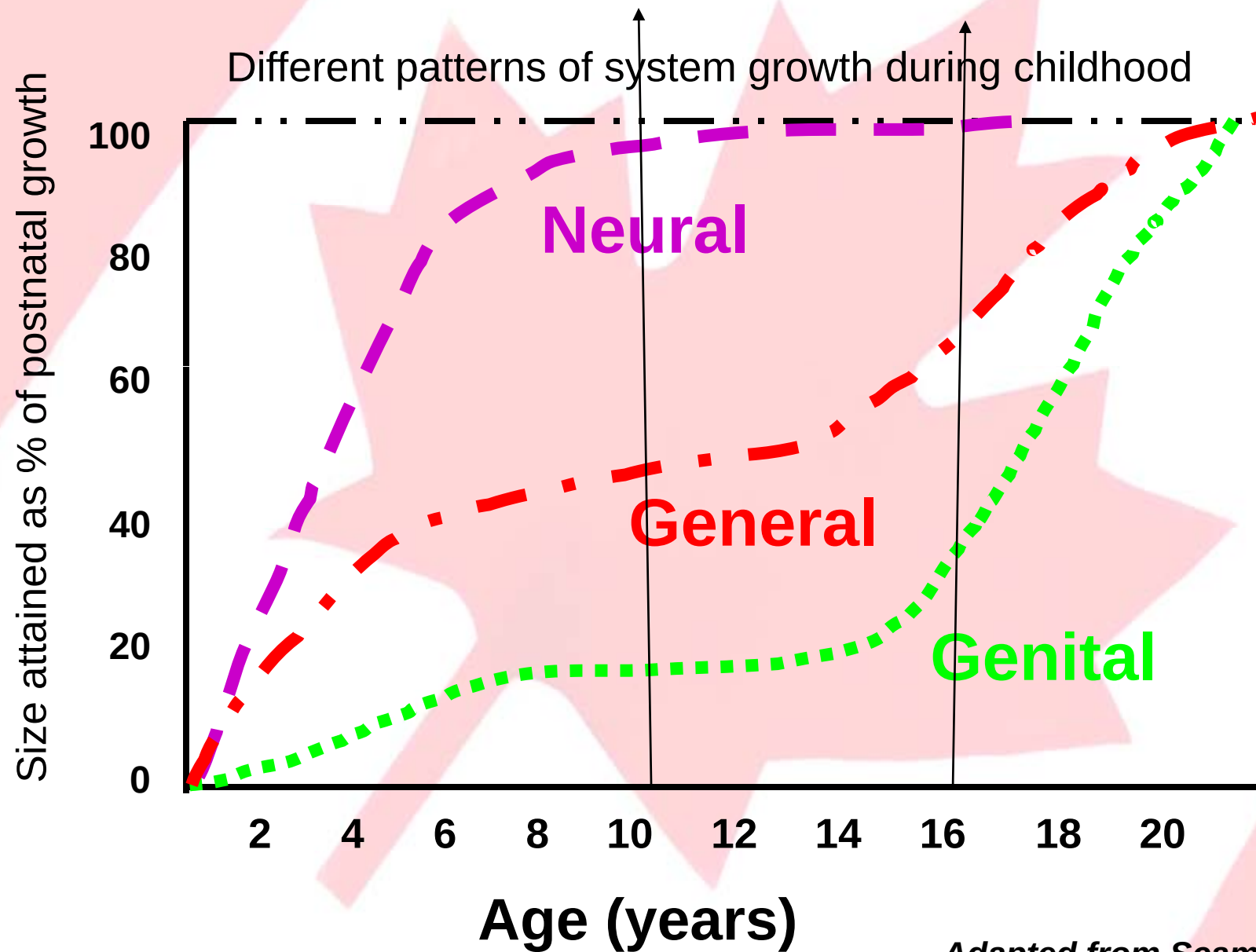




Objective of the Presentation

- **Train to Train focus**
 - **Females 11-15**
 - **Males 12-16**
- **Overview of Periodization**
 - **Periods, phases, mesocycles, microcycles, sessions and units**
- **Overview of Growth and Development**
 - **Chronological age, relative age, developmental age**
 - **Early, average and late maturers**
 - **Trainability = “windows of opportunity, optimal trainability”**
- **Program design - reactive periodization**
- **Conclusions**

Influence of maturation:



Adapted from Scammon, 1930

Pediatric Anaerobic Performance

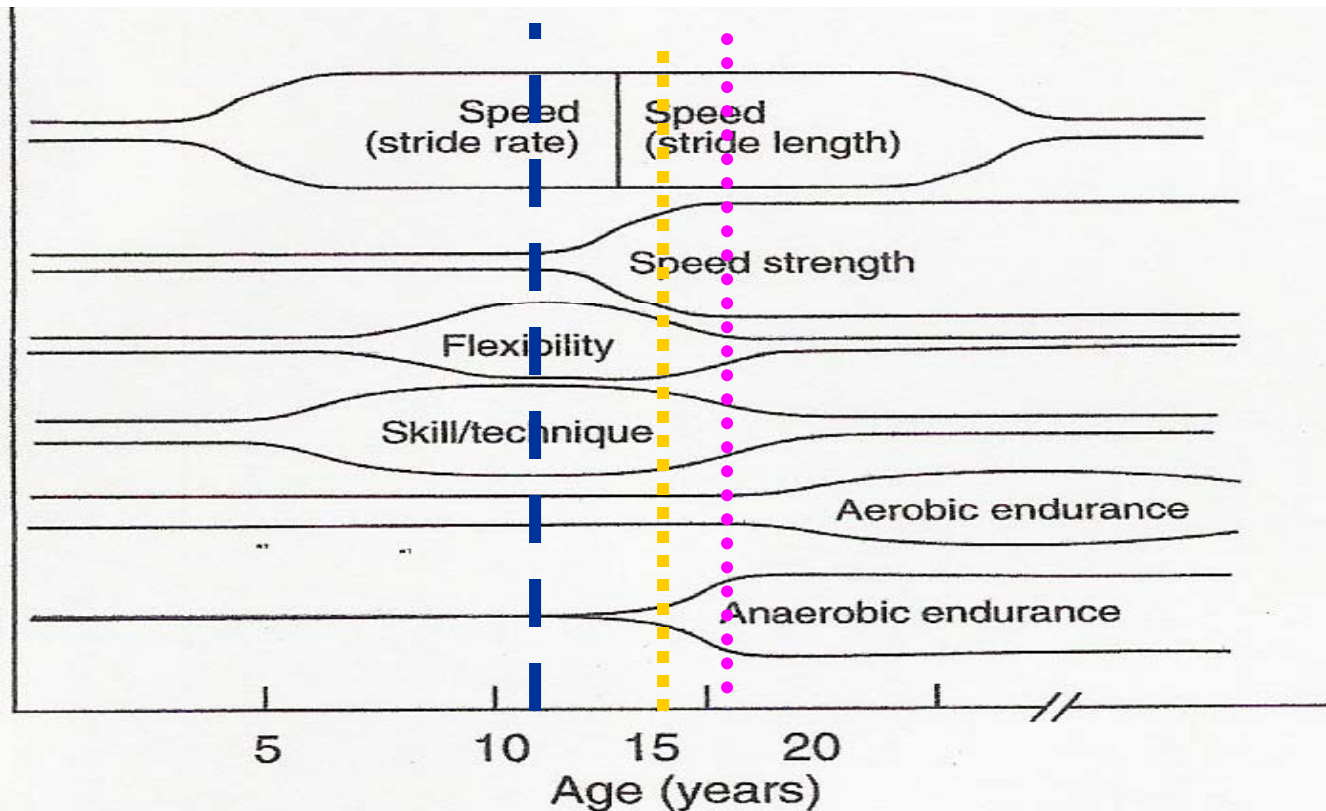


Figure 11.1 The important training areas (“sensitive phases”) at different ages.

Adapted from Mero, Vuorimaa, and Häkkinen 1990.

Seven Stages of Canadian Long-Term Athlete Development

Active Start



FUNDamental



Learning to Train



Training to Train



Training to Compete



Training to Win



Active for Life



Talent ID

The Big Picture

Late Specialisation Sports - Generic Model

- **Active Start**
 - FUNdamental Movements (0-6)
- **FUNdamental Stage**
 - FUNdamental movement skills (6-8 females / 6-9 males)
- **Learning to Train**
 - FUNdamental sports skills (8- 11 females / 9-12 males)
- **Training to Train**
 - Building the "engine" and sport specific skills (11-15 females / 12-16 males)
- **Training to Compete***
 - Optimising "engine" and sport / event / position specific skills (15-21+/- females / 16-23+/- males)
- **Training to Win***
 - Maximising "engine" and sport / event / position specific skills (18 + females / 19 + males)
- **Active for Life*** Enter at any age!!!

Many

3

2

1

Early, Average and Late Maturer

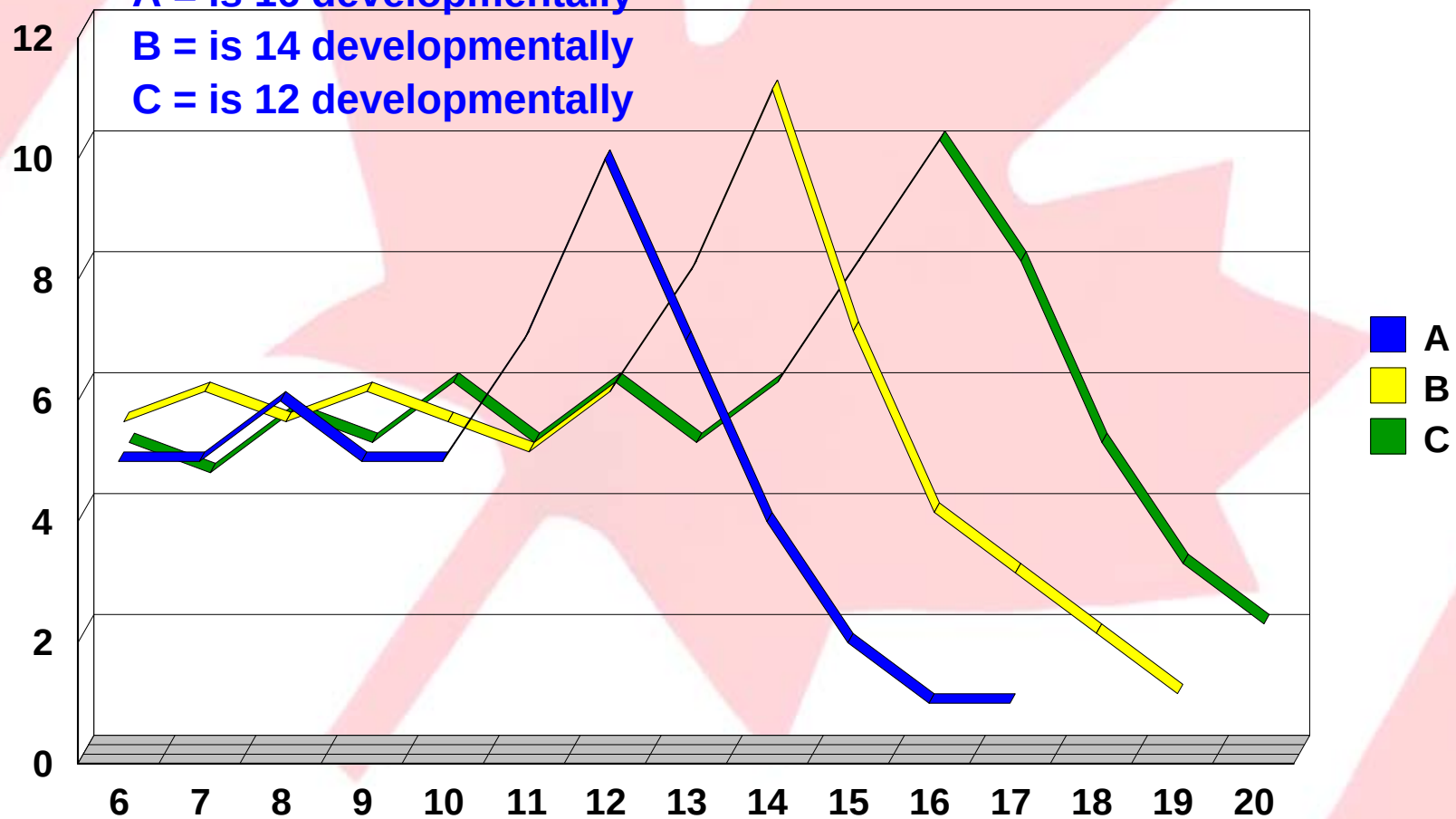
All 3 Athletes are 14 years of age Chronologically

At age 14 chronologically

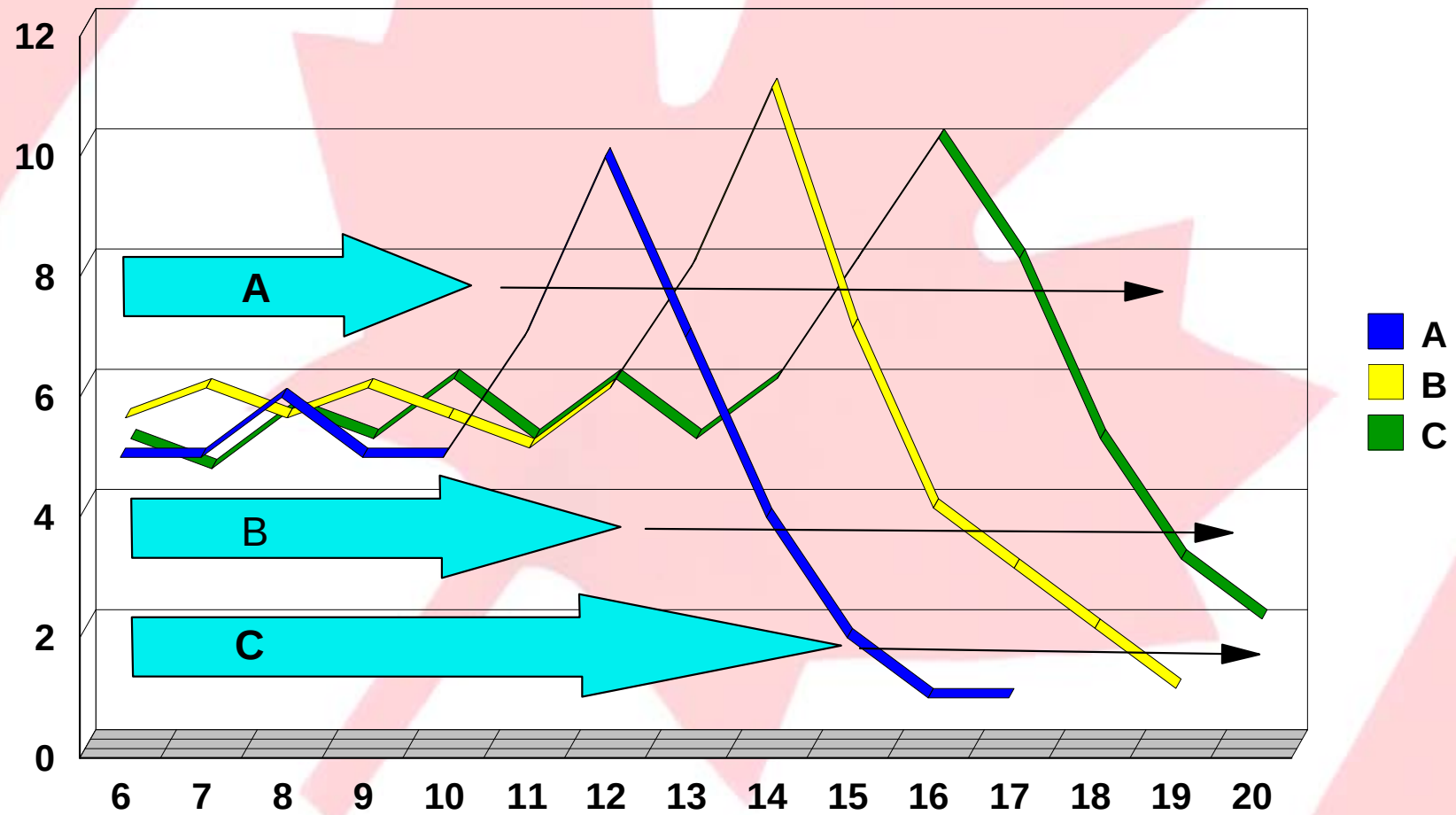
A = is 16 developmentally

B = is 14 developmentally

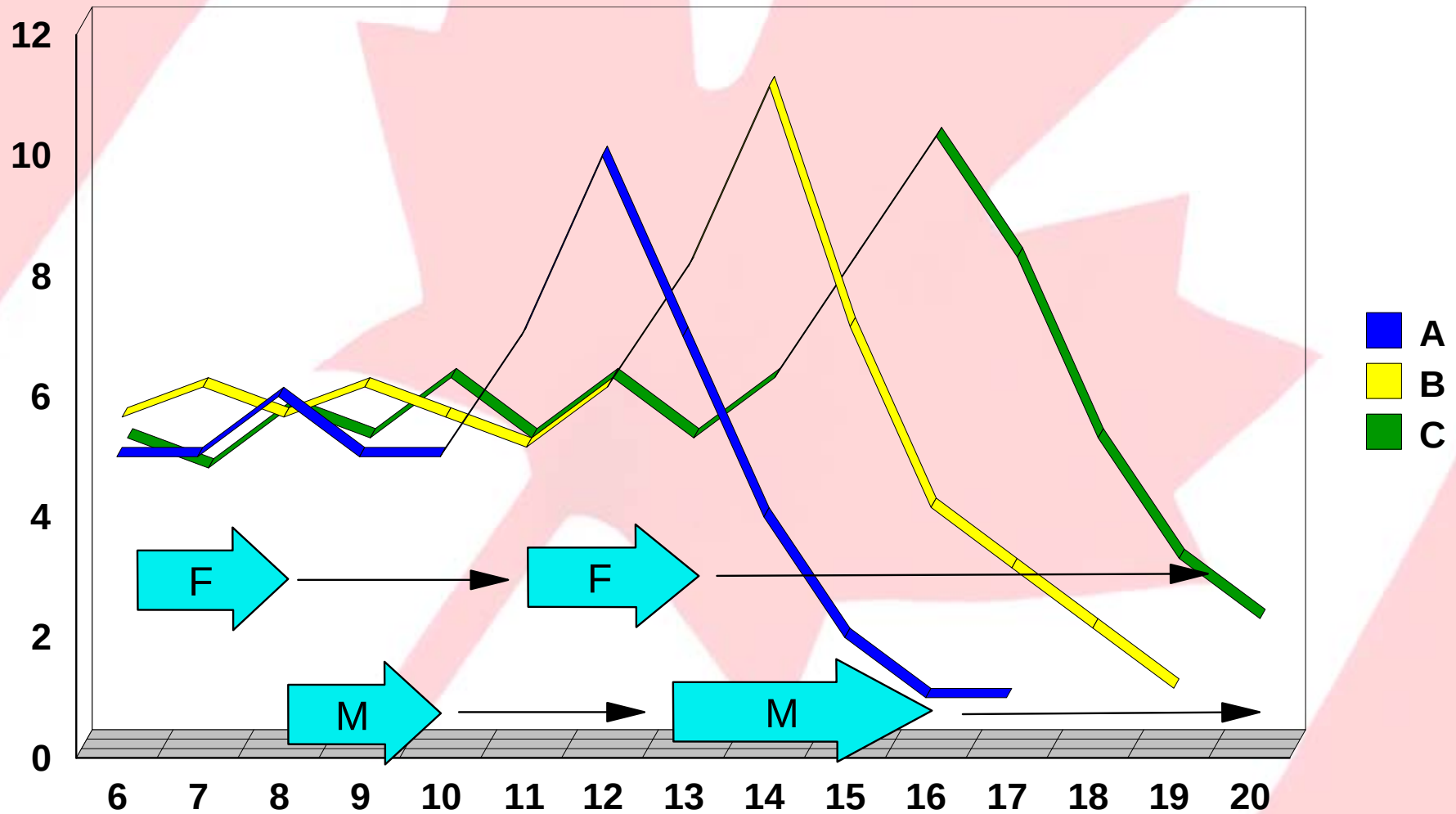
C = is 12 developmentally



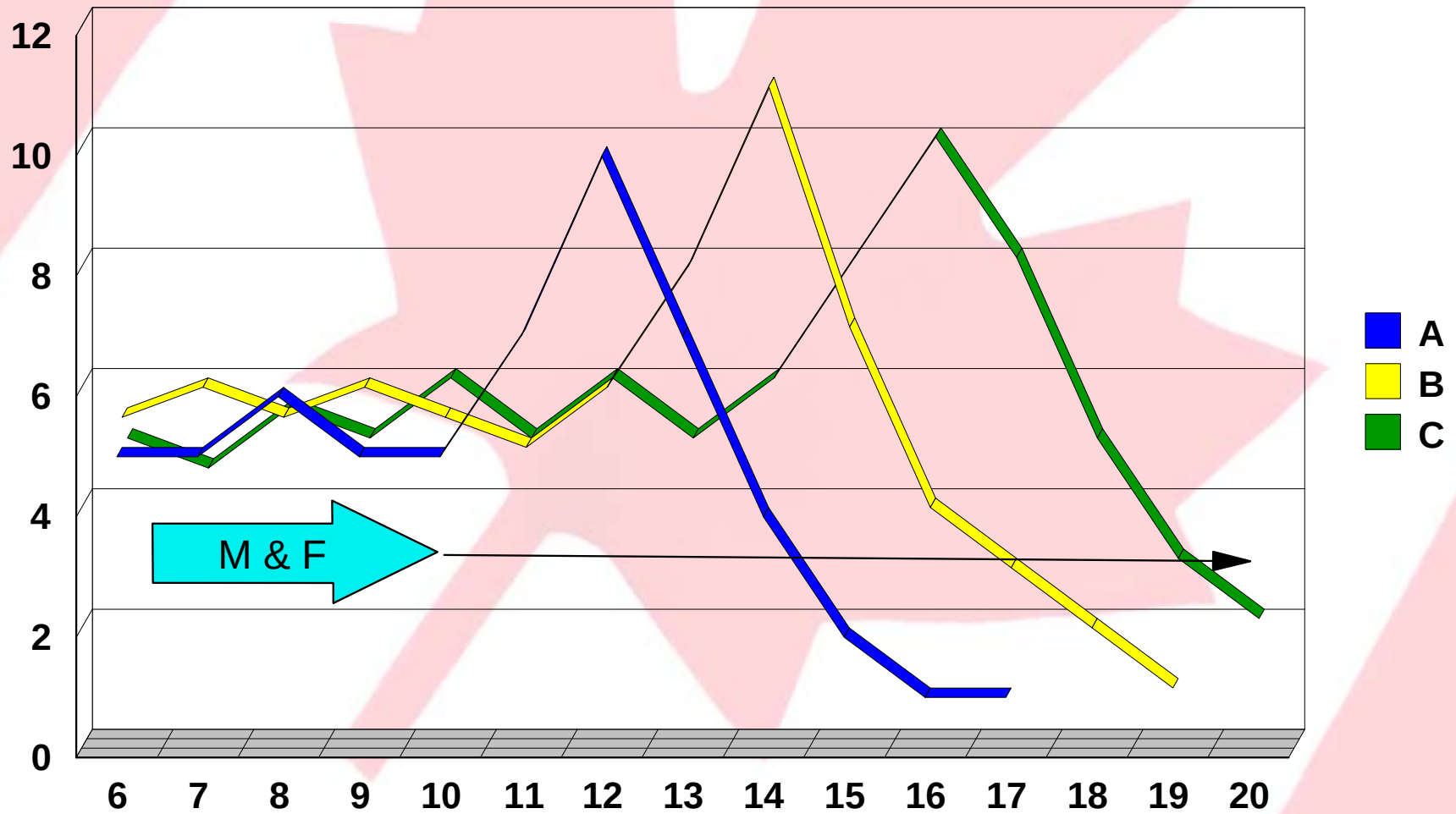
Skill Trainability



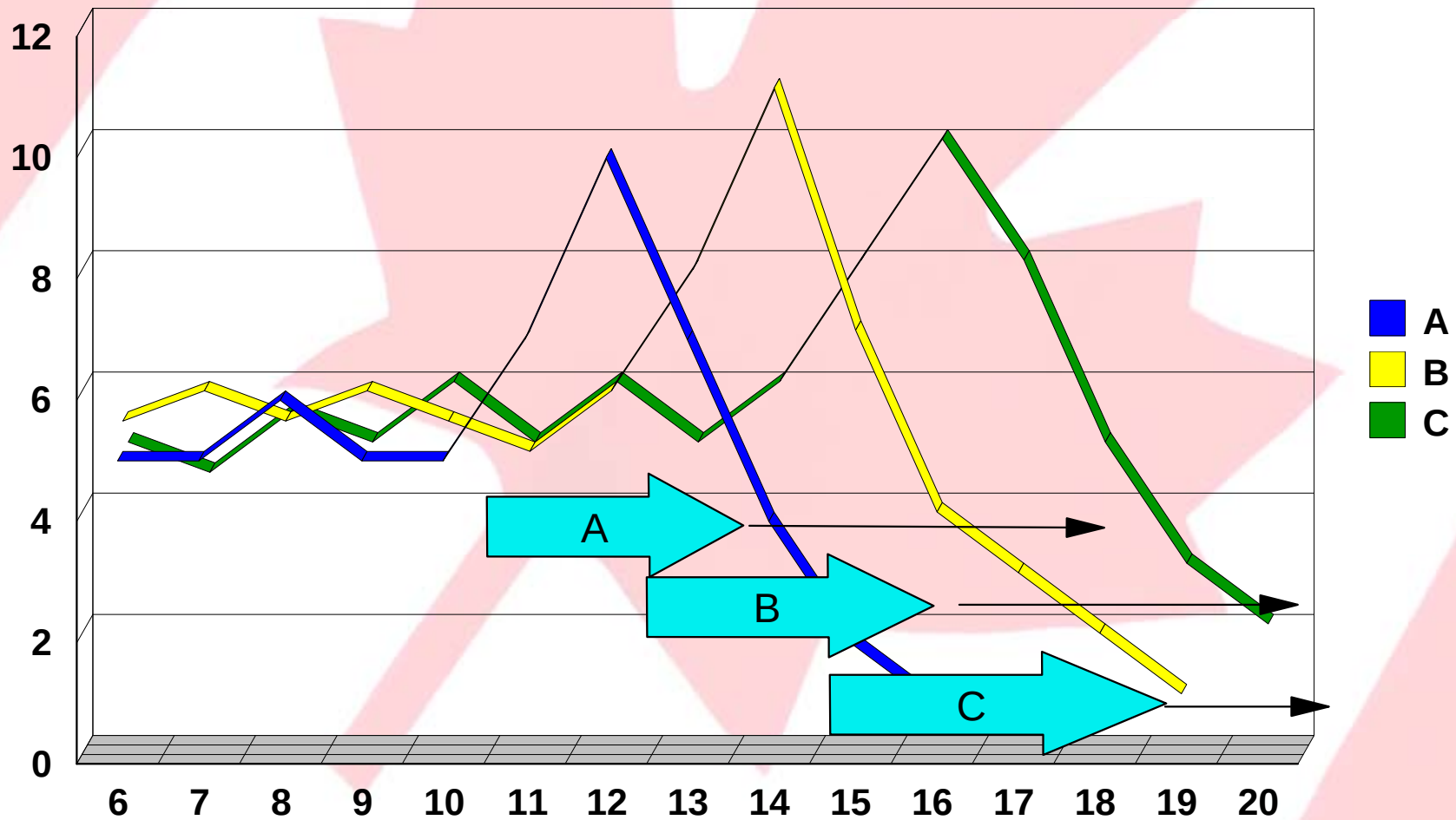
Speed Trainability



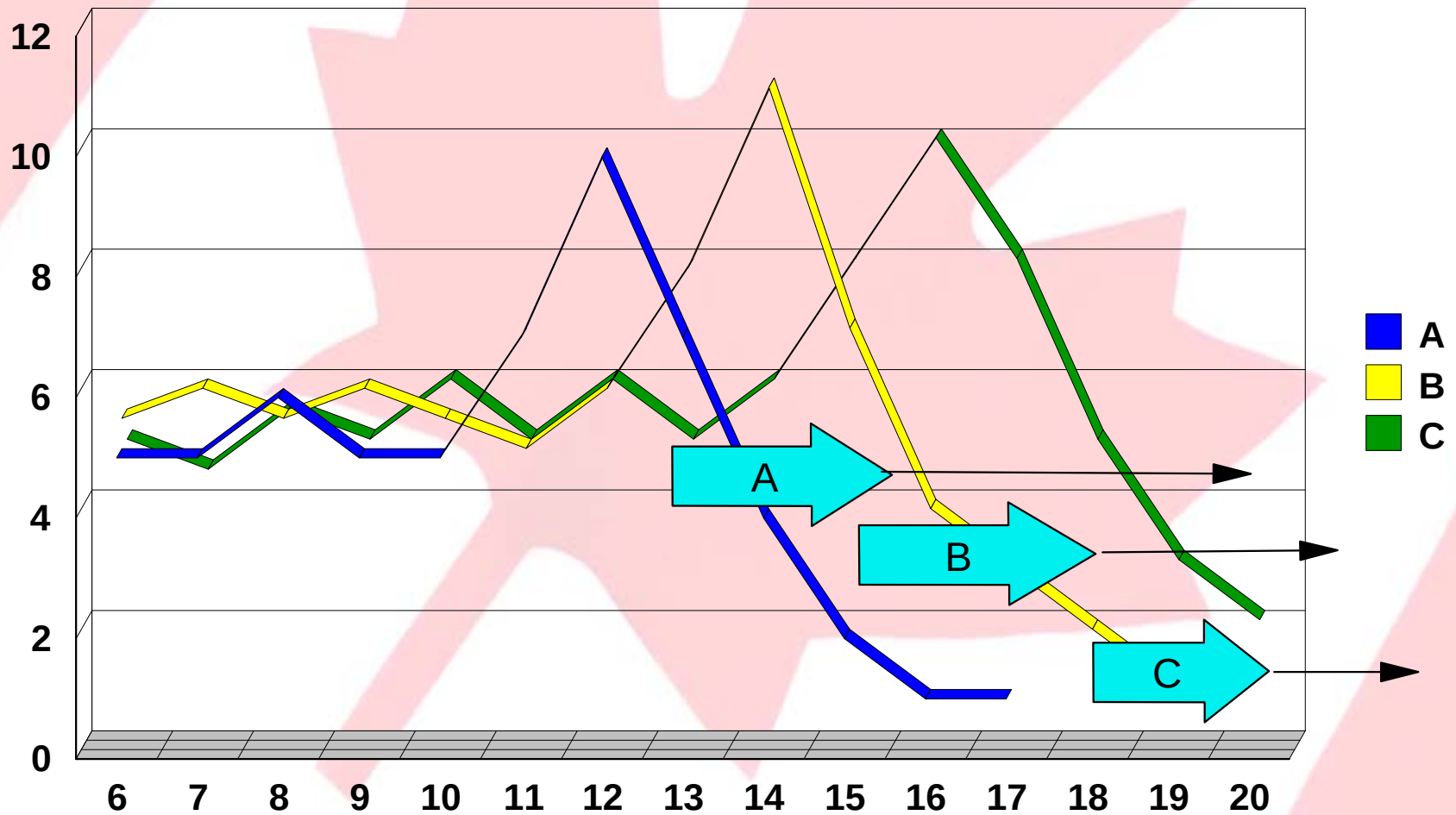
Suppleness Trainability



Endurance Trainability



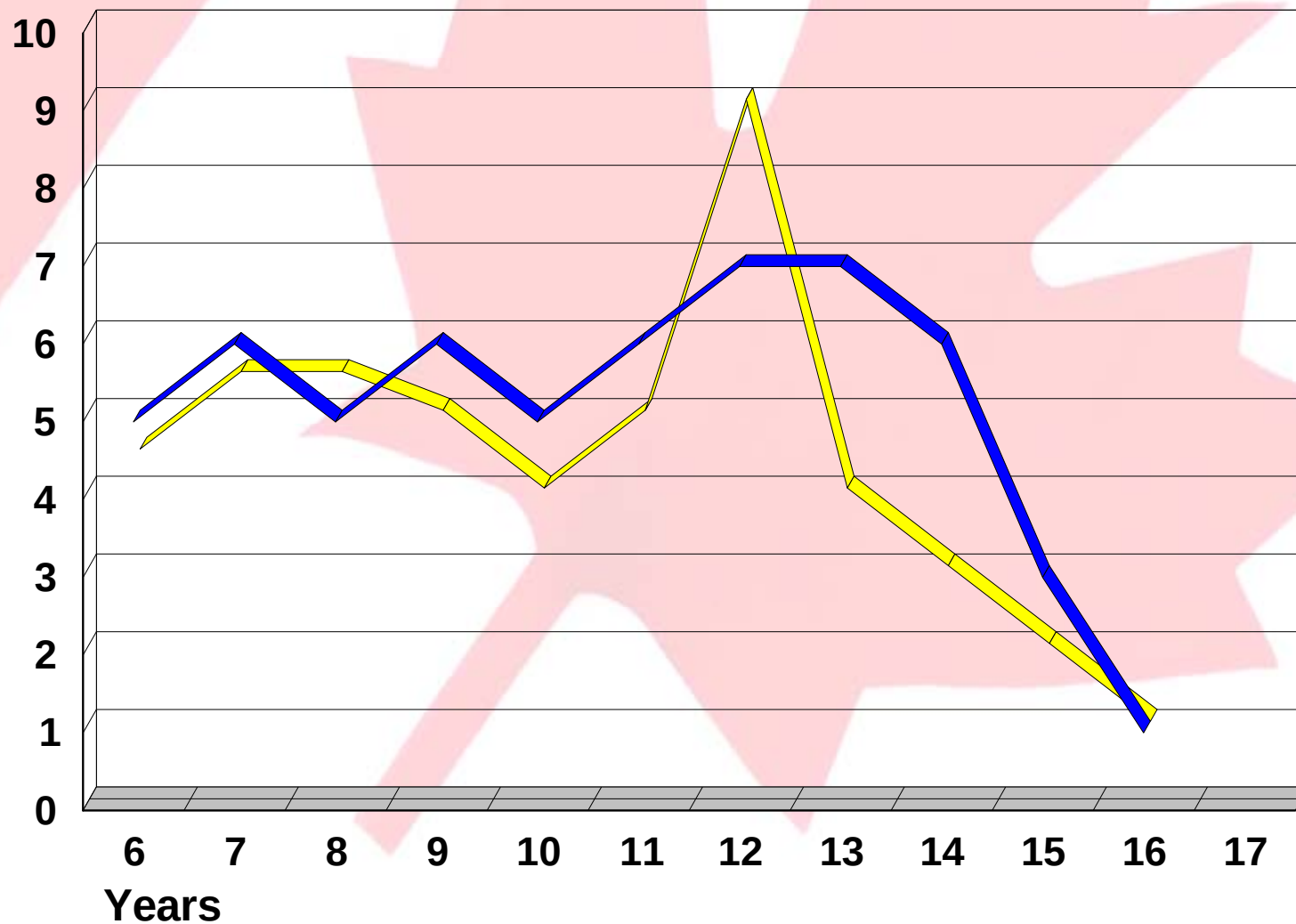
Strength Trainability



Rapid Transit and Slow Transit

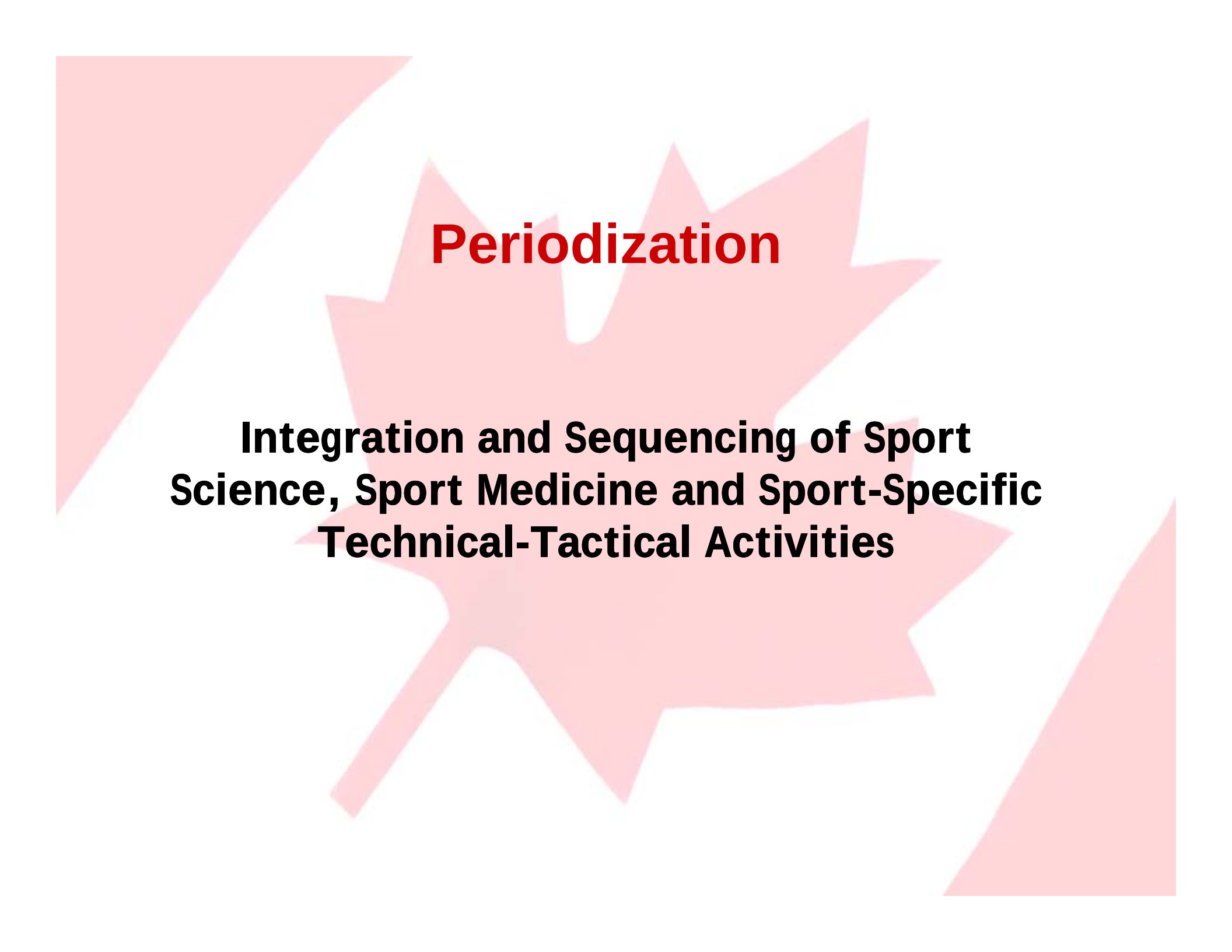
(Tanner, 1989)

cm



Reactive Periodization

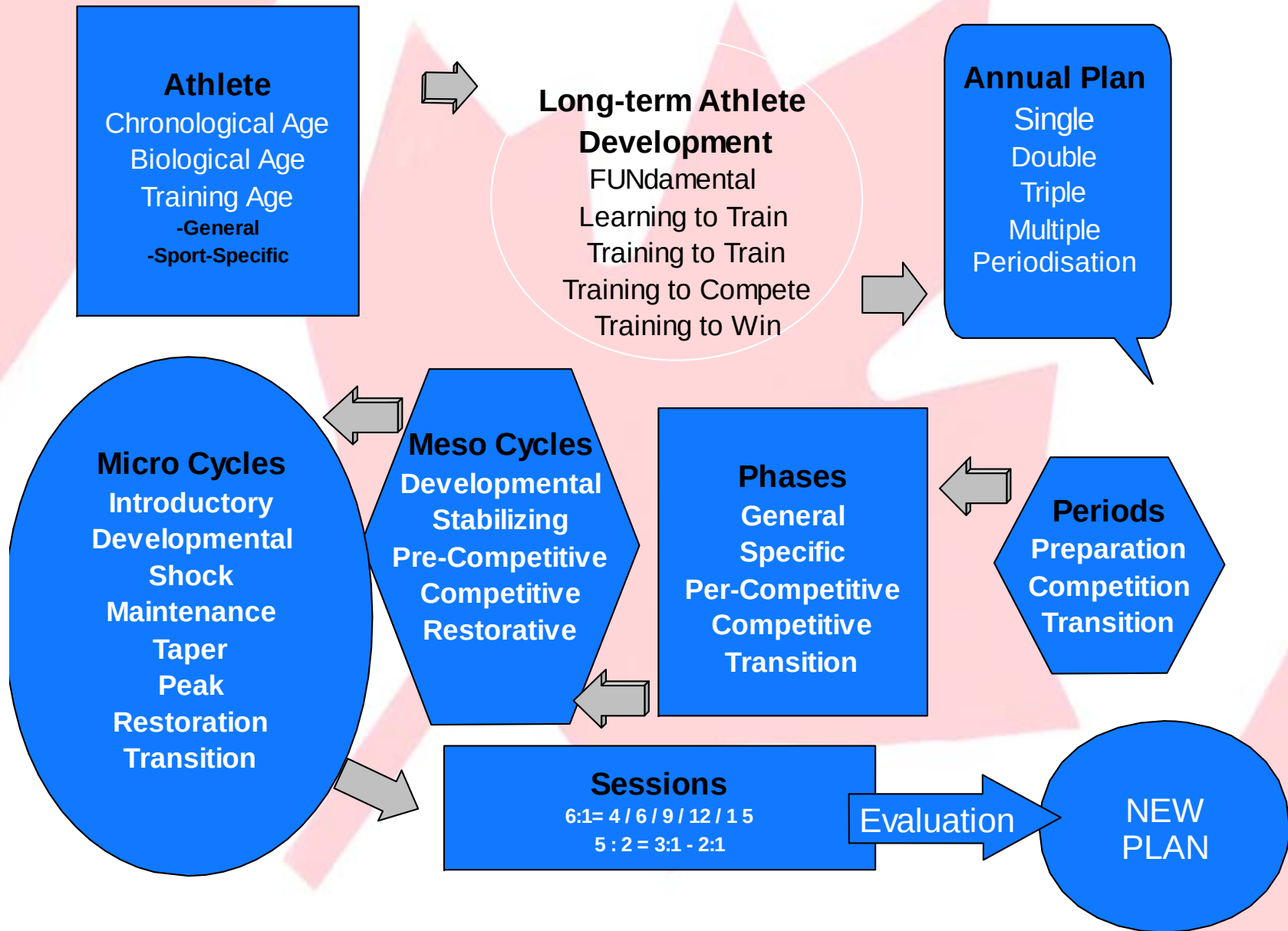
- **Monitoring the onset of the growth spurt, PHV and deceleration of growth is a must to design/ adjust the plan**
- **Reacting to the velocity of growth**
- **Adjusting training, competition and recovery program design**
- **“Adolescent maintenance”**
- **Viru = “If there is a conflict between the long-term plan and competition demands, the first must take priority!”**

A large, light pink maple leaf is centered on a white background. The leaf's points extend towards the corners of the frame. In the top-left and bottom-right corners, there are additional pink shapes that look like folded corners of a page or abstract geometric forms.

Periodization

**Integration and Sequencing of Sport
Science, Sport Medicine and Sport-Specific
Technical-Tactical Activities**

For whom ?





The “Flow” of Periodization

Planning of Training

Structure and Hierarchy

Athlete

Long Term Athlete Development

Quadrennial Plan (Olympic Cycle)
Annual Plan

Cycles of Annual Plan

Periods

Phases

Mesocycles

Microcycles

Sessions

Planning of Training Structure and Hierarchy

Athlete

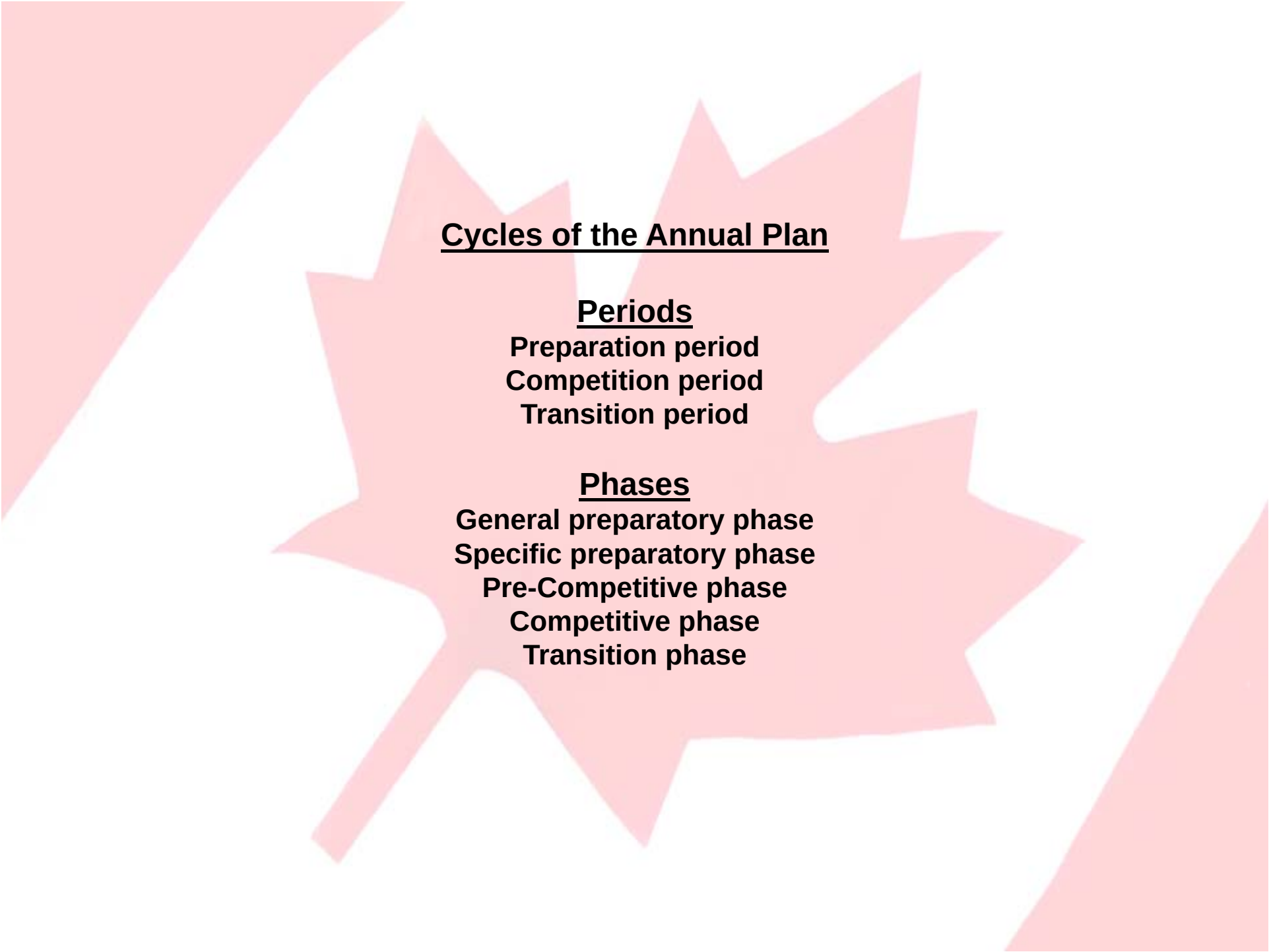
**Chronological Age
Developmental Age
Training Age (General)
Sport-Specific Training Age**

Long Term Athlete Development

**Active Start
Fundamental Phase
Learn to Train
Train to Train Phase
Train to Compete Phase
Train to Win Phase
Active for Life**

Annual Plan

**Single periodization
Double periodization
Triple periodization
Multiple periodization**

A large, light pink maple leaf is centered on a white background. The leaf has a long stem and several pointed lobes. In the top-left and bottom-right corners, there are pink triangular shapes that appear to be part of the leaf's design.

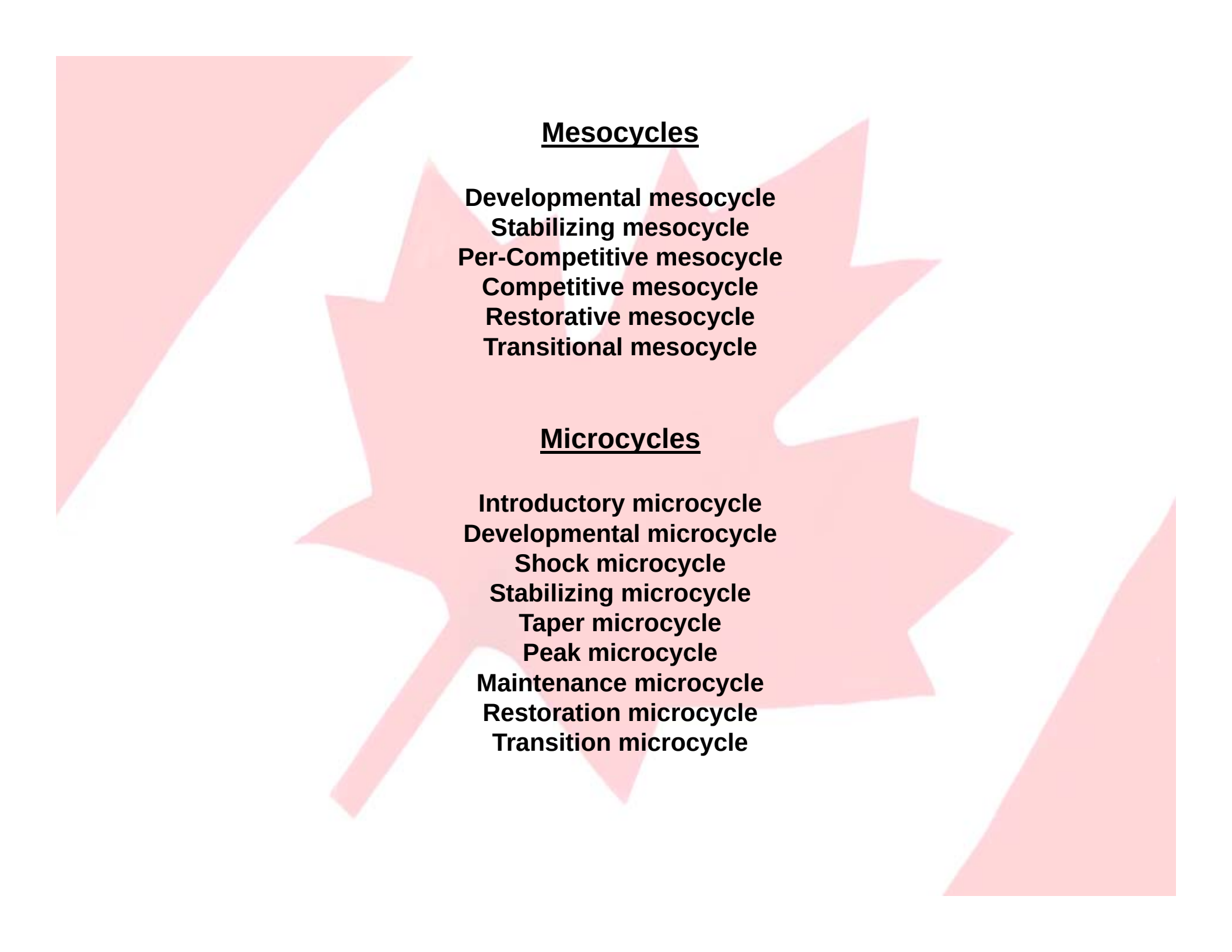
Cycles of the Annual Plan

Periods

Preparation period
Competition period
Transition period

Phases

General preparatory phase
Specific preparatory phase
Pre-Competitive phase
Competitive phase
Transition phase

A large, light pink maple leaf is centered on a white background. The leaf's veins are visible, and its edges are slightly irregular. In the top-left and bottom-right corners, there are solid pink triangular shapes that appear to be part of the leaf's overall design.

Mesocycles

Developmental mesocycle
Stabilizing mesocycle
Per-Competitive mesocycle
Competitive mesocycle
Restorative mesocycle
Transitional mesocycle

Microcycles

Introductory microcycle
Developmental microcycle
Shock microcycle
Stabilizing microcycle
Taper microcycle
Peak microcycle
Maintenance microcycle
Restoration microcycle
Transition microcycle

A large, stylized pink maple leaf is centered on a white background. The leaf has a long stem and several pointed lobes. In the top-left and bottom-right corners, there are pink triangular shapes that appear to be part of the leaf's design or the background.

Sessions / Microcycle

6:1 (4; 6; 9; 12; 15; 18; 18+)

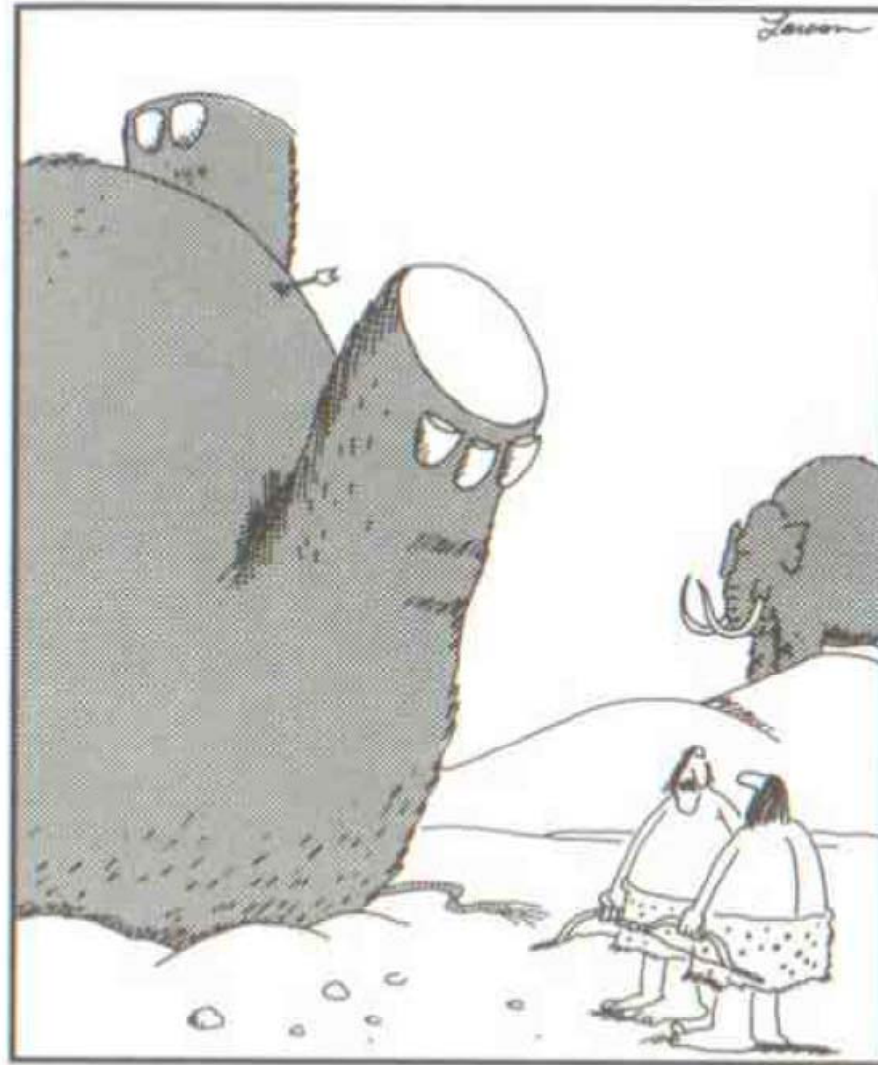
5:1 (5; 8; 9; 10; 10+)

4:1 (4; 6; 7; 8; 8+)

3:1 (3; 5; 6; 6+)

3:1 – 2:1 = 5:2

Planning



"We should write that spot down."

Adaptation to Training

(Modified after Nadori and Yakovlev)

External Load

- Volume
- Intensity
- Frequency
- Specificity

Supercompensation Overcompensation

Usual Daily Activity

Internal Load

- Physiological
- Biochemical changes
- Psychological
- Tissue damage
- Microtraumas

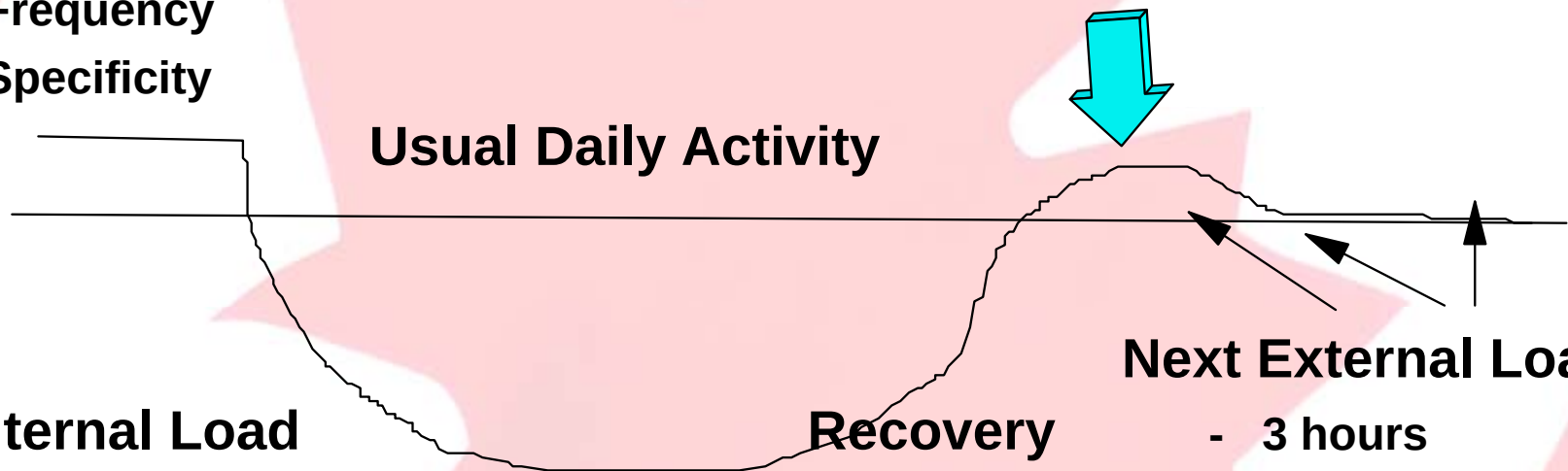
Recovery Restoration

Fatigue

- Metabolic
- Neural

Next External Load

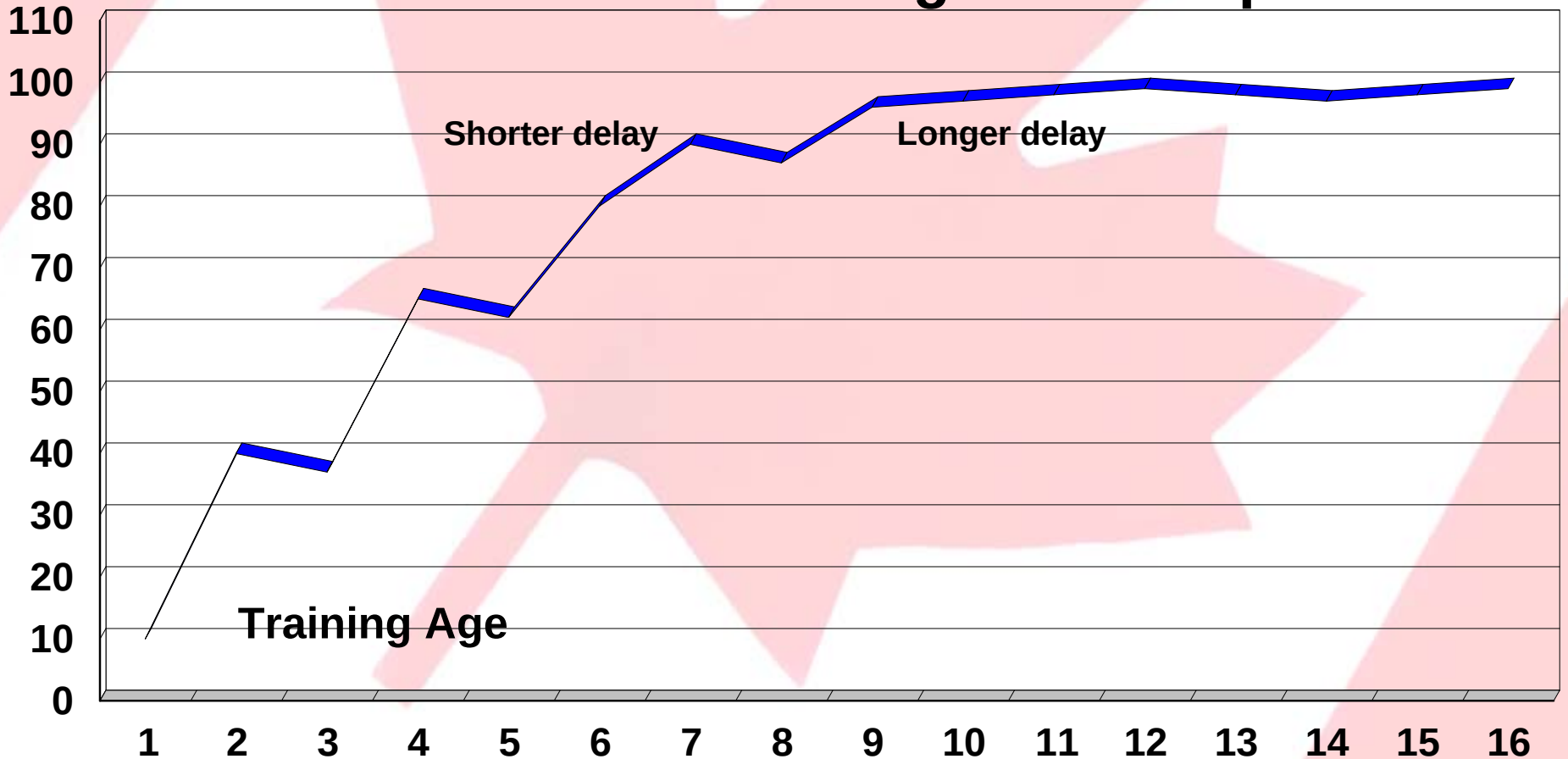
- 3 hours
- 6 hours
- 24 hours
- 36 hours
- 48 hours



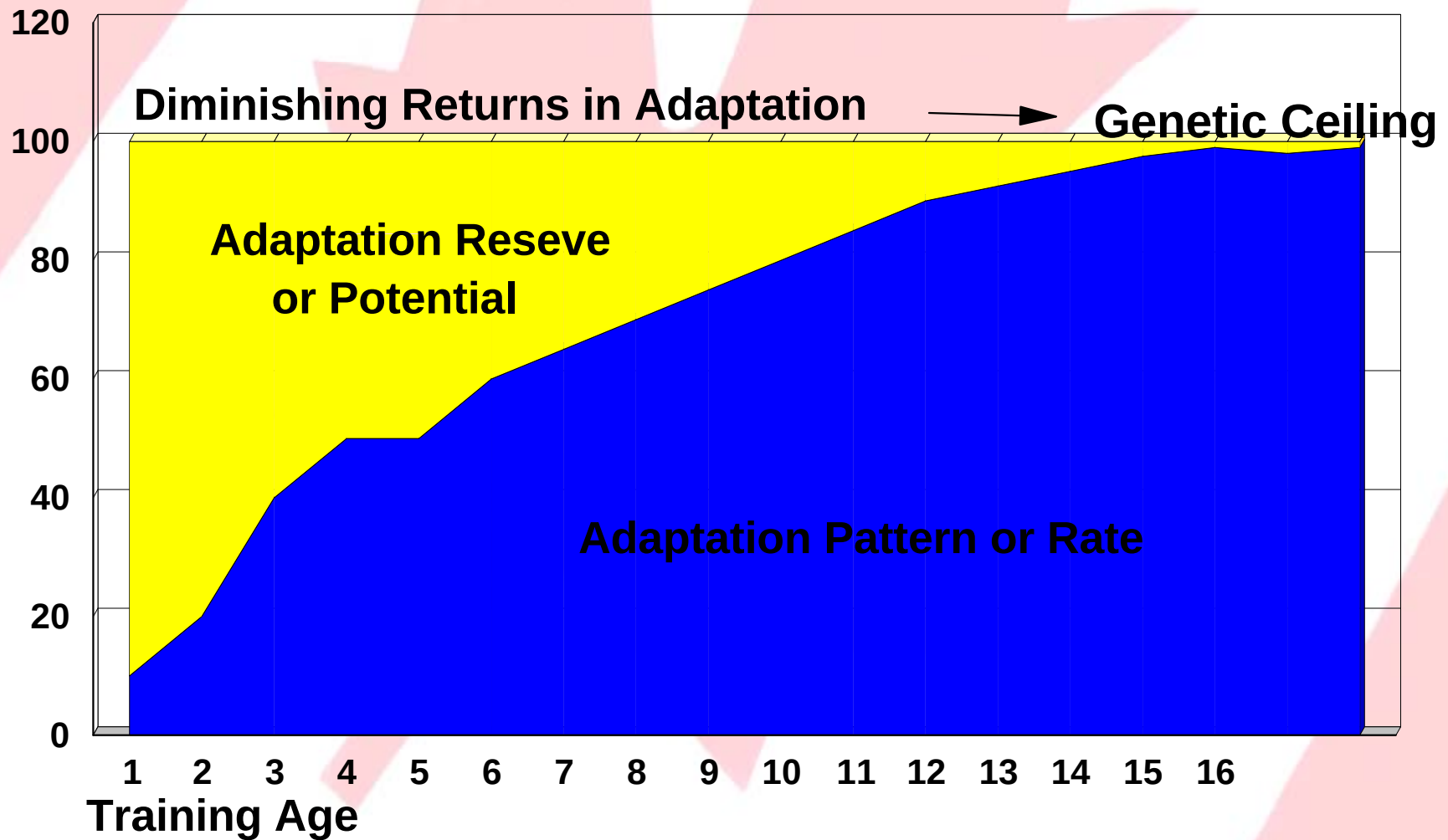
Delayed Onset of Training Effect

Diminishing Returns / Adaptation Reserves
(Balyi, 1997)

Schematical Illustration of Long-term Adaptation to Tr

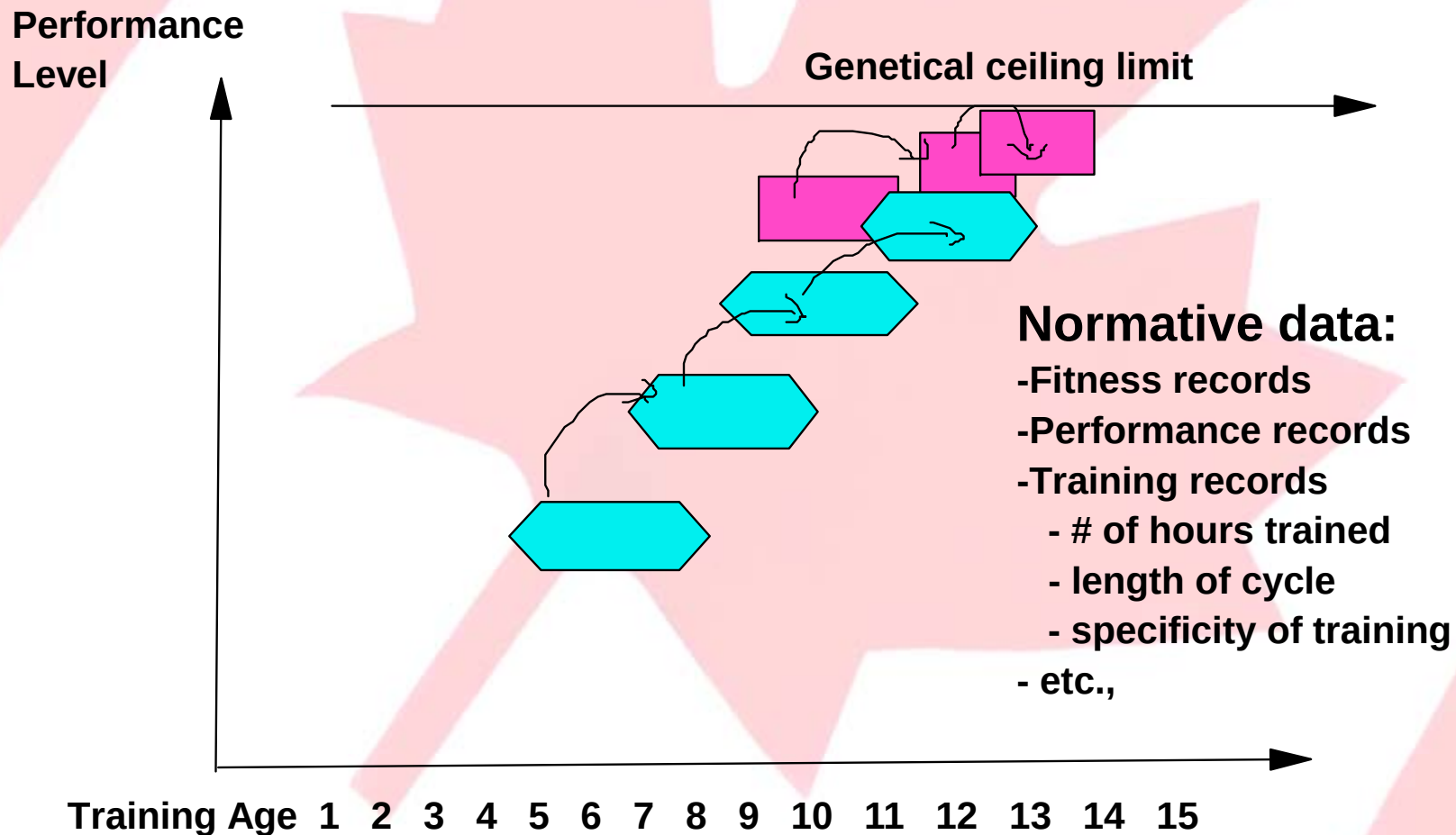


Target Zone

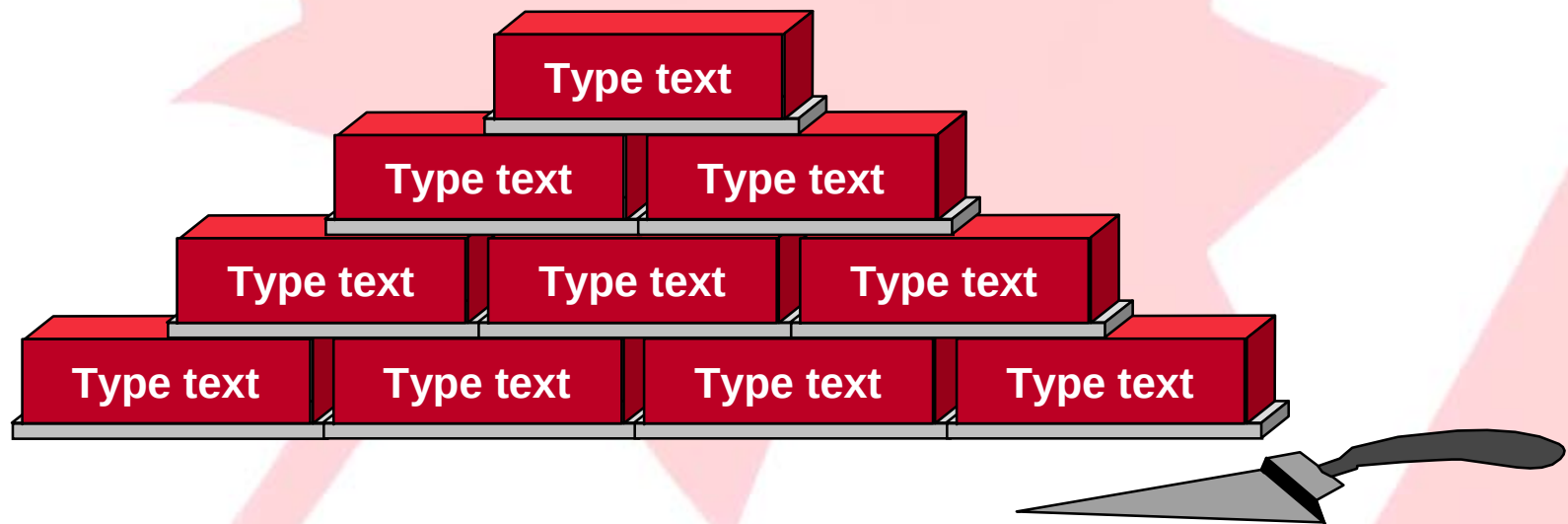


Developmental Age – Priority of Training - Trainability

Program Design

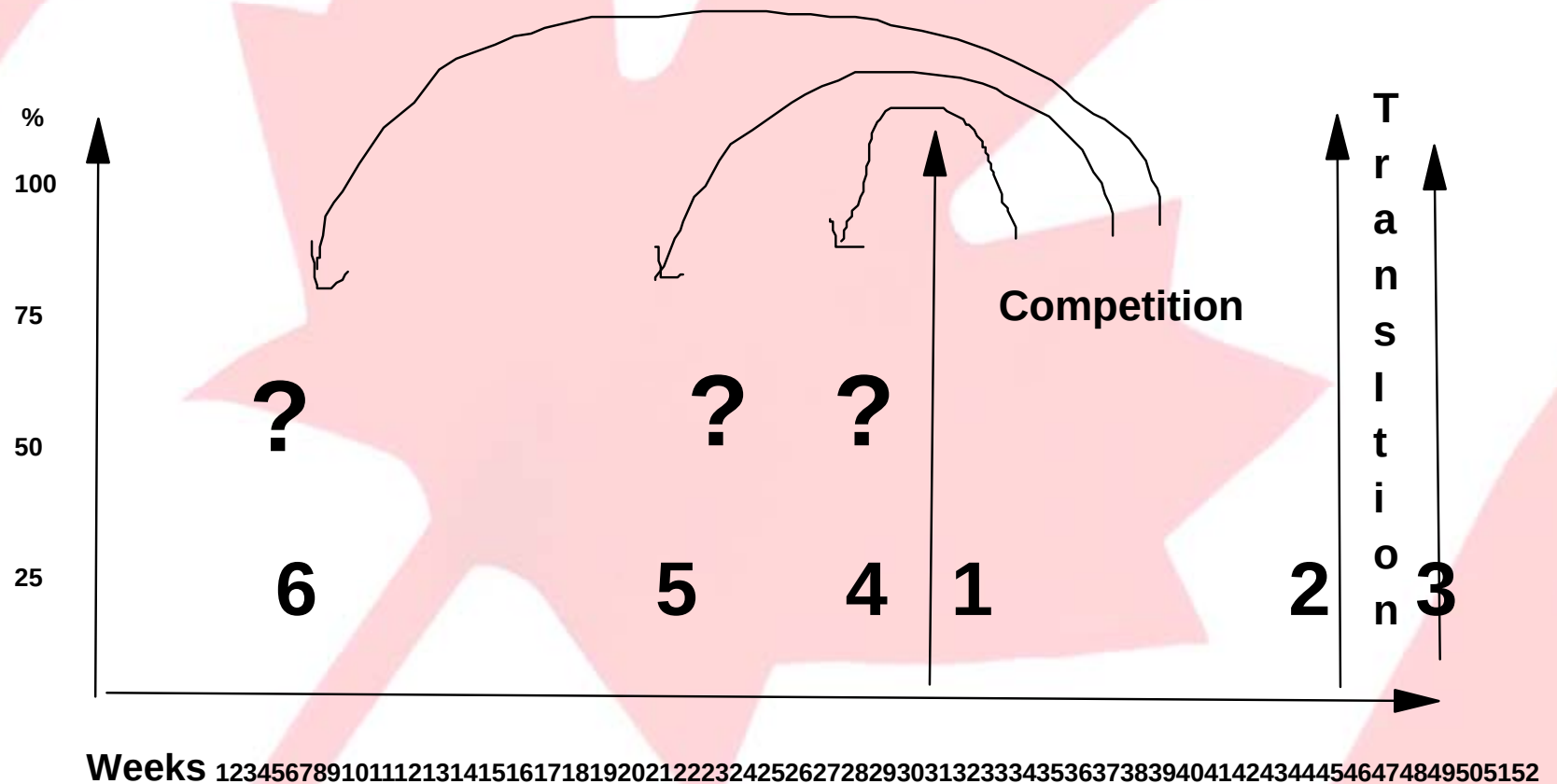


Quantification of Annual Plans



Year 1 - Steps 1 - 3

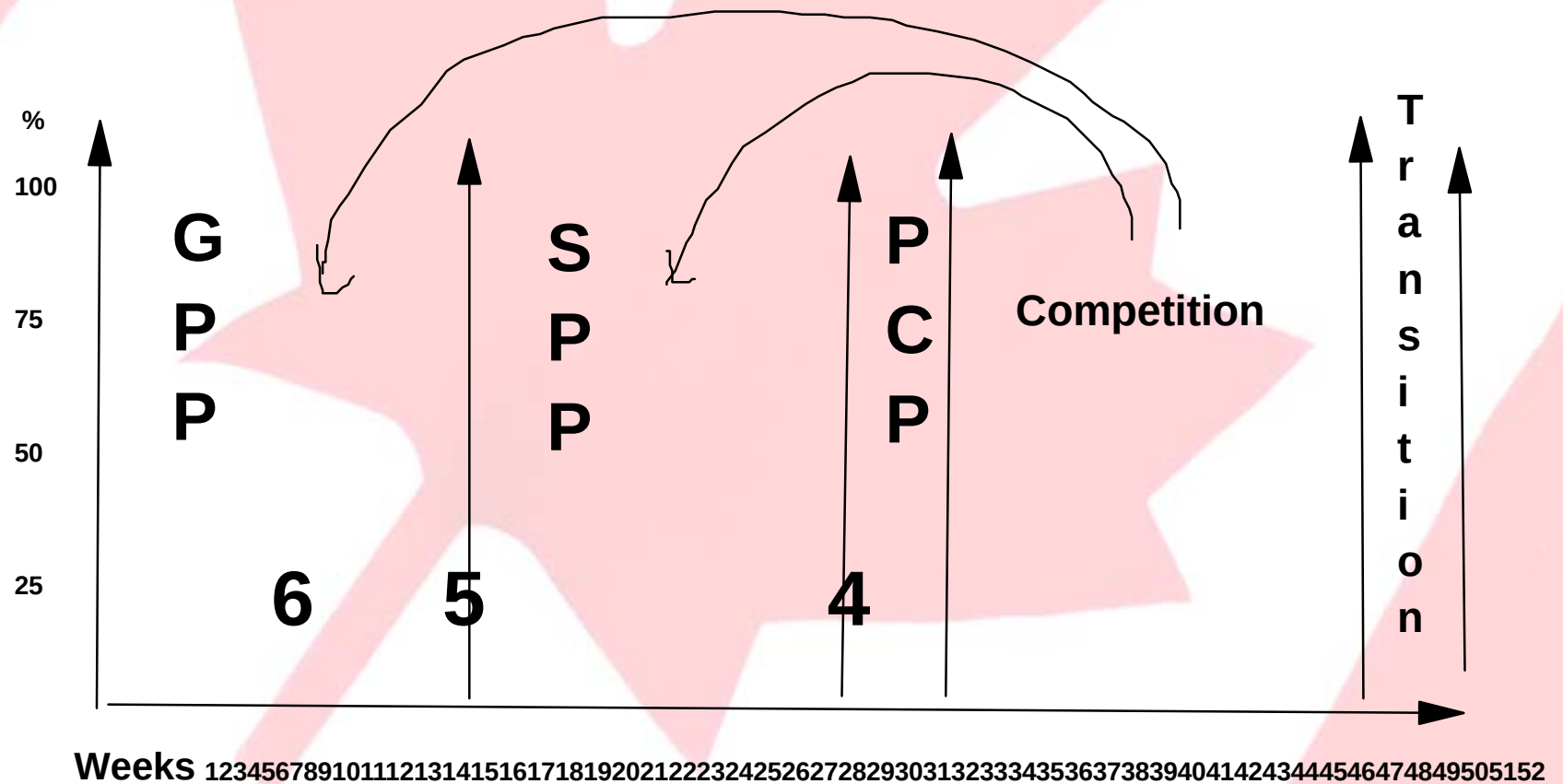
Competition and Transition Phases



Similar procedure is used for double or multiple

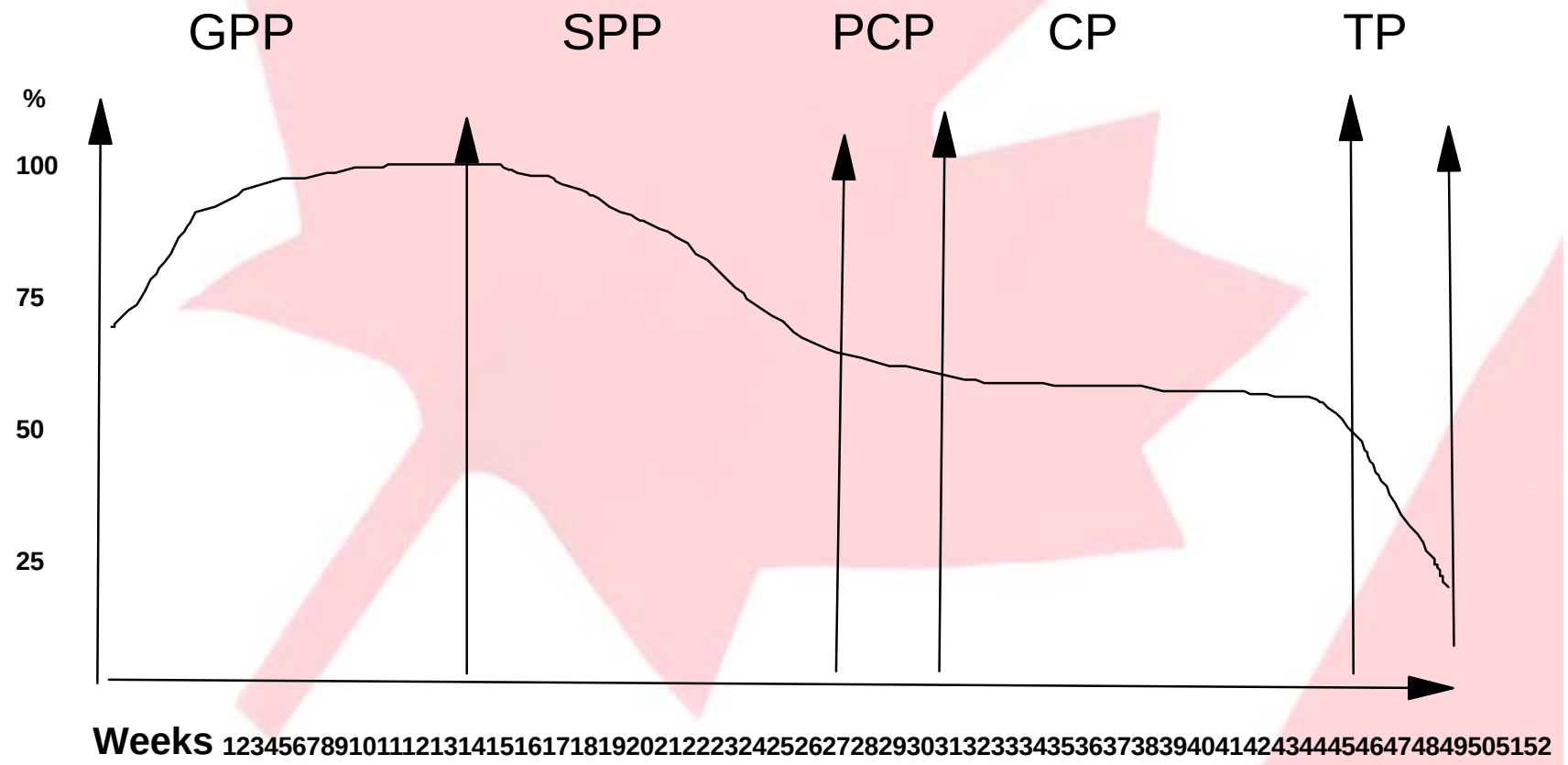
Year 1 - Steps 4 - 6

General, Specific and Pre-Competitive Phases



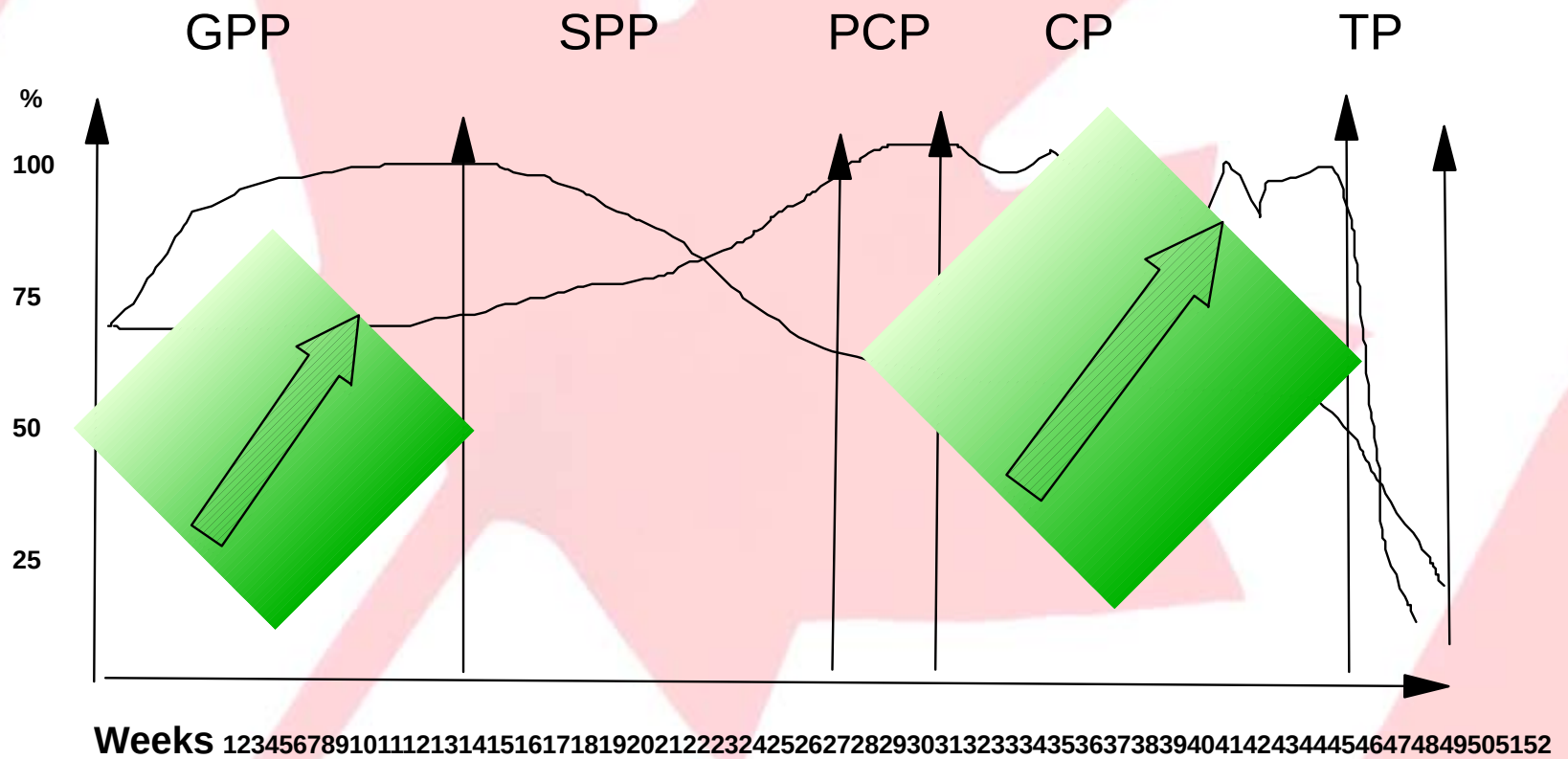
Year 1 - Step 7

Plot the Volume of Training



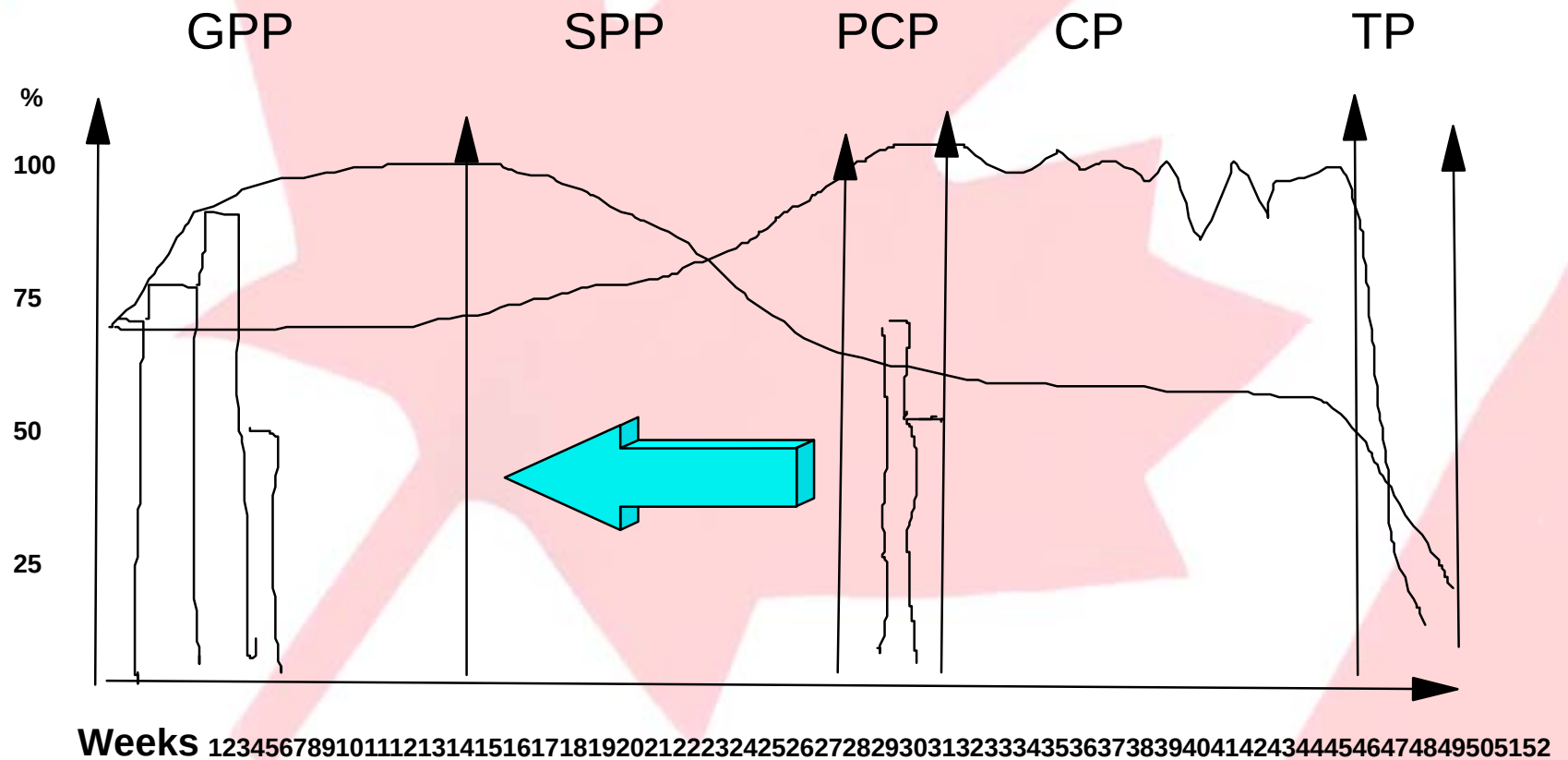
Year 1 - Step 8

Plot the Intensity of Training



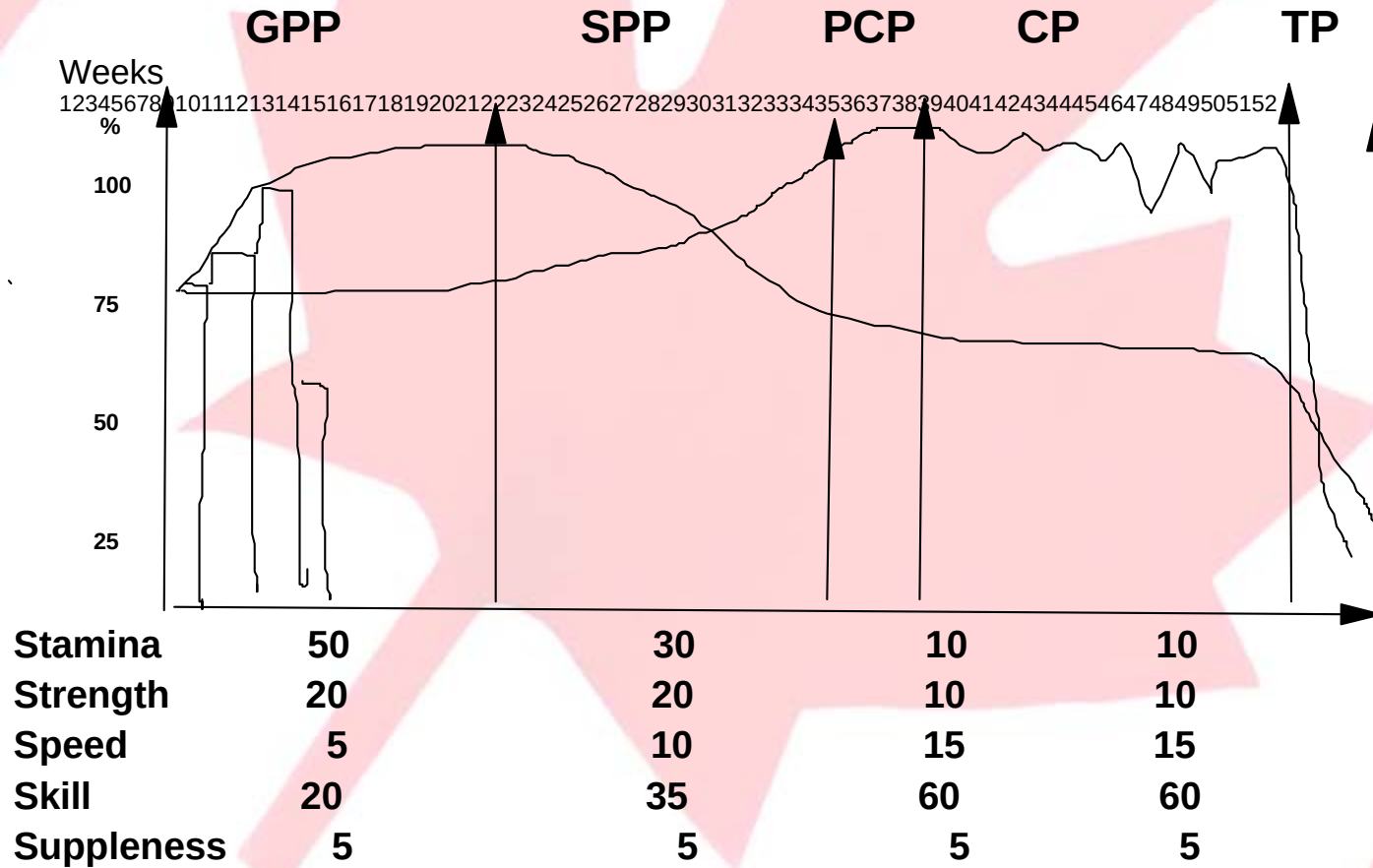
Year 1 - Step 9

Macro and Micro Cycle Planning



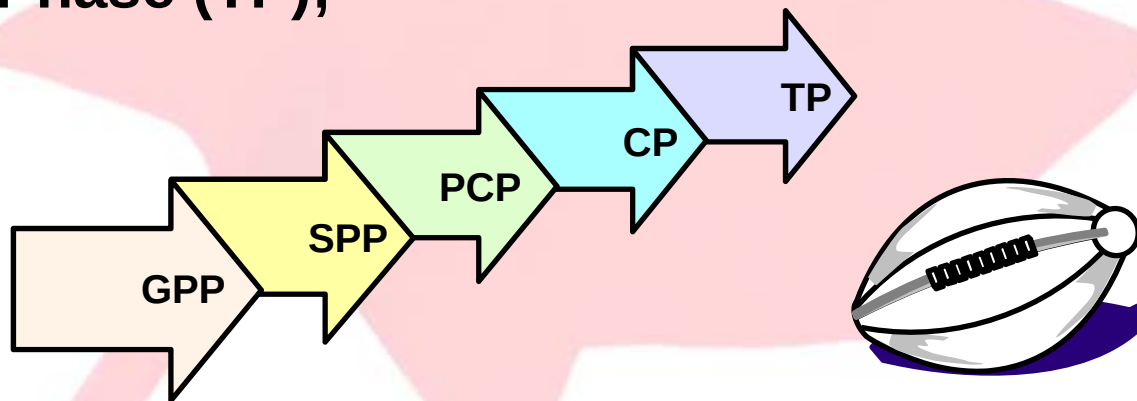
Year 1 - Step 10

Quantitification



Phases of the Annual Plan

- **General Preparatory Phase (GPP);**
- **Specific Preparatory Phase (SPP);**
- **Pre-Competitive Phase (PCP);**
- **Competitive Phase (CP);**
- **Transition Phase (TP);**

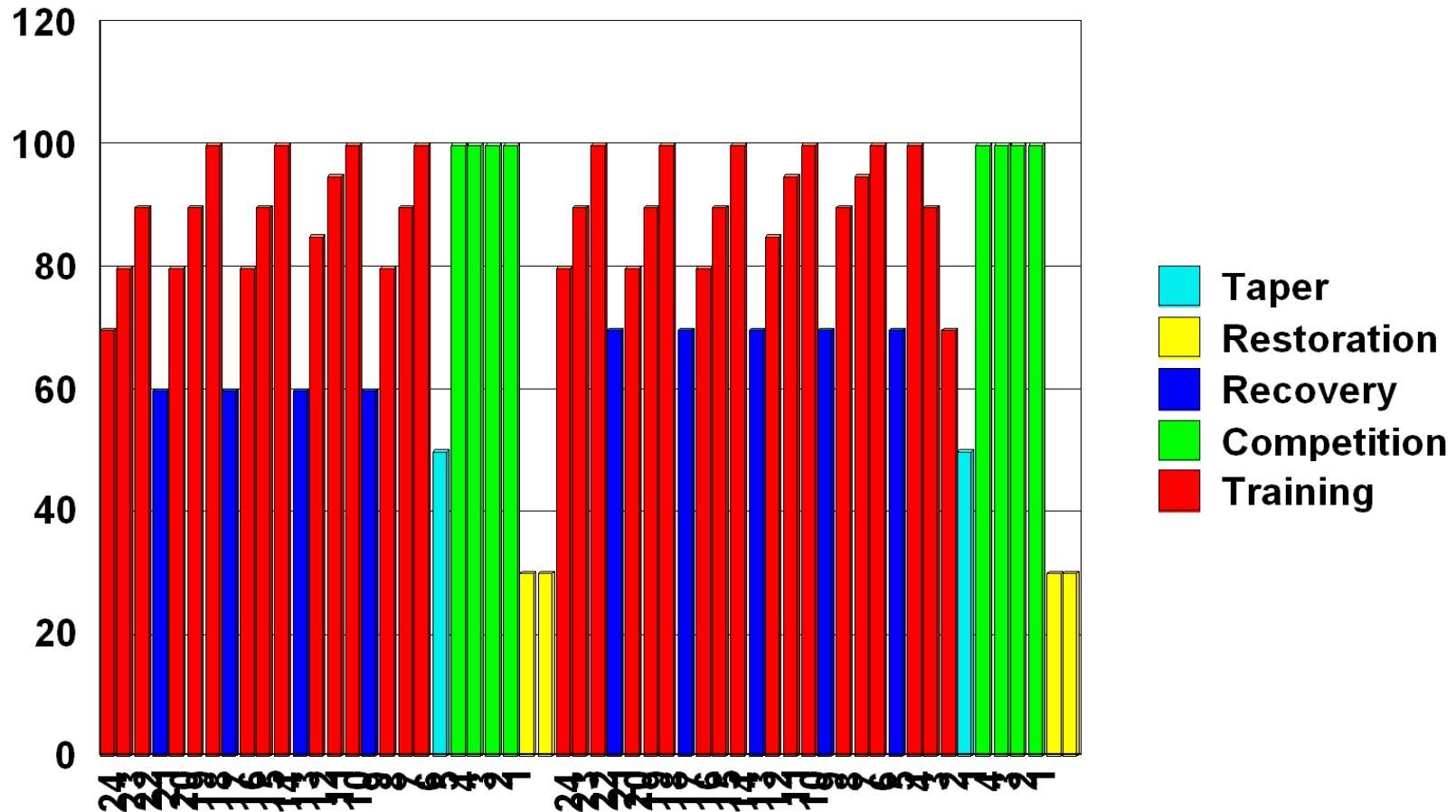


LTA

Year 1 - Training to Train (2 x 24 + 2)

Age Group 10 Males and 9 Females

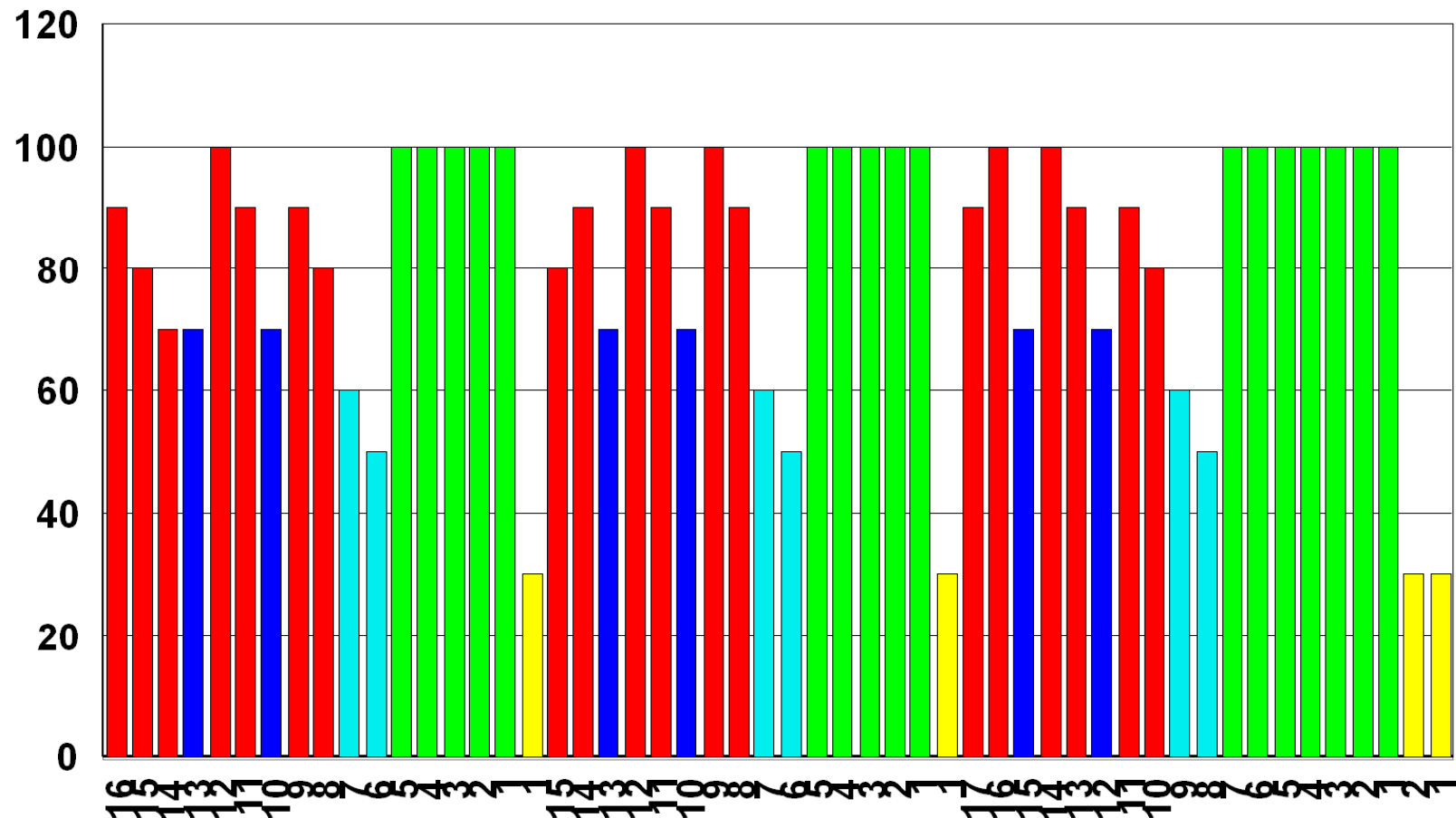
Competitions 4 + 4 = 8



Year 5 - Phase 1, 2 & 3

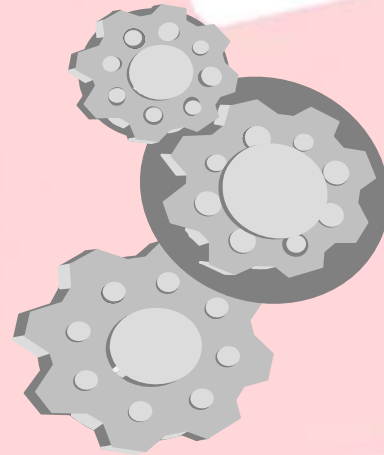
(11 + 5 + 1 / 10 + 5 + 1 / 10 + 7 + 2)

Training and Competition Load



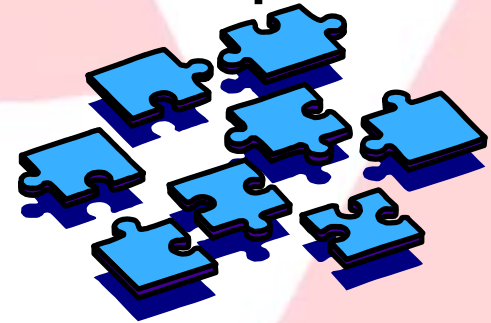
Meso cycles

- **Annual Cycle, Periods, Phases, Meso Cycles, Micro Cycles, Sessions, Units**
 - f **Traditional mesos**
 - f **Non-traditional mesos**
 - f **Insanity mesos**



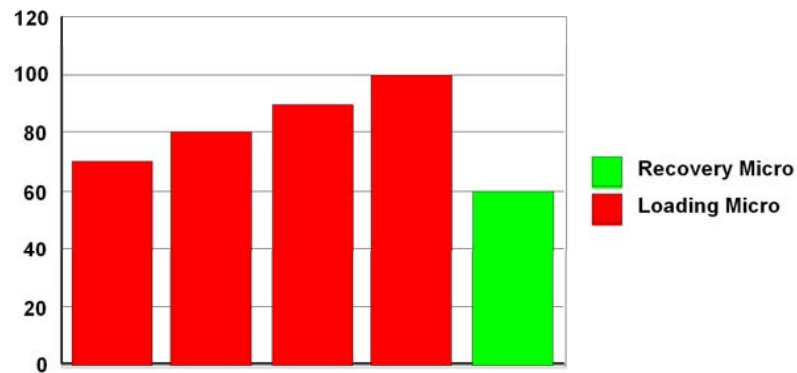
Training content

- The content of a meso cycle is dependent on how far or how close the cycle is from competition (location-location-location)
- The farther away the cycle is from competition the higher the volume and lower the intensity is
- The closer the cycle is to competition the lower the volume and higher the intensity is
- Frequency is very steady / frequency reduction can be implemented in power sports BUT not in endurance sports

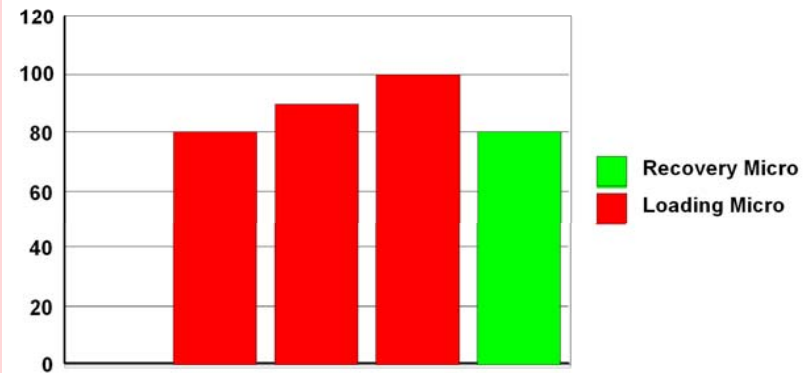


Traditional Meso Cycles

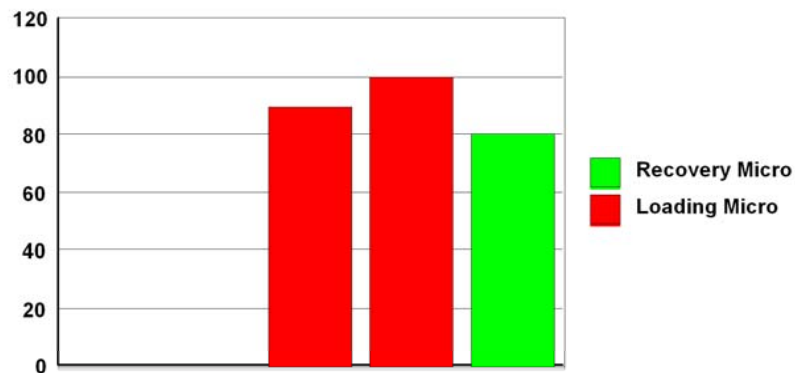
Traditional 4 : 1 Meso cycle



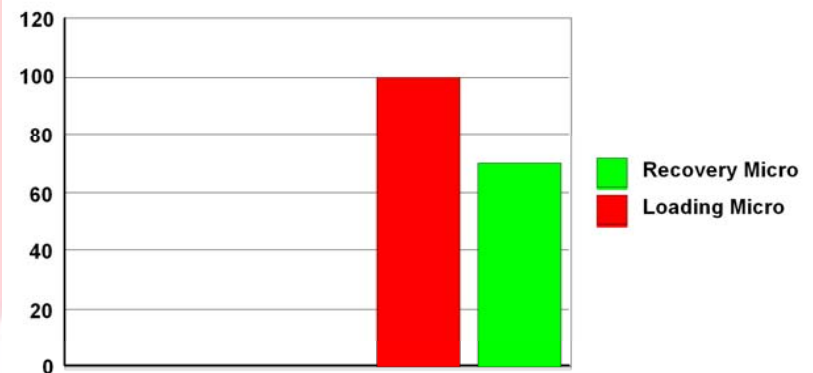
Traditional 3 : 1 Meso cycle



Traditional 2 : 1 Meso cycle

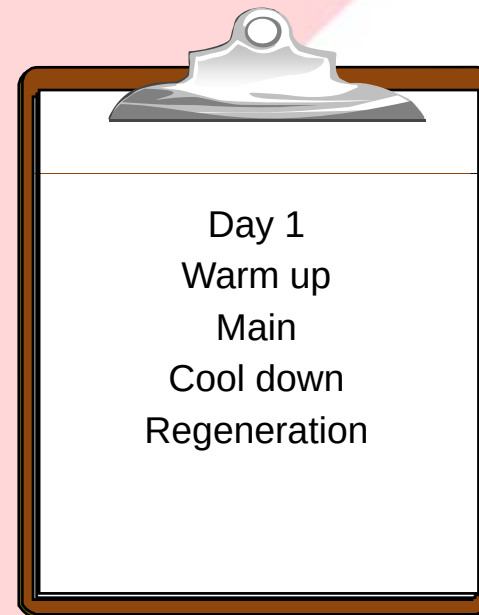


Traditional 1 : 1 Meso cycle



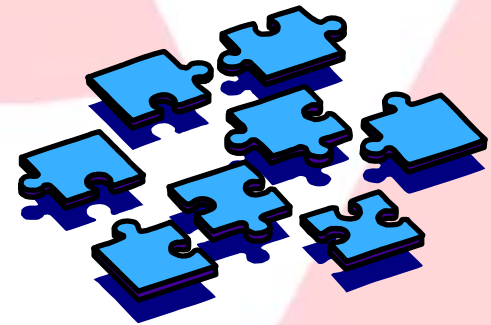
Micro Cycles

- **Introductory**
- **Developmental**
- **Shock**
- **Stabilizing**
- **Competitive**
 - f **Taper**
 - f **Peak**
 - f **Modeling**
- **Restorative**
- **Transitional or active rest micro**



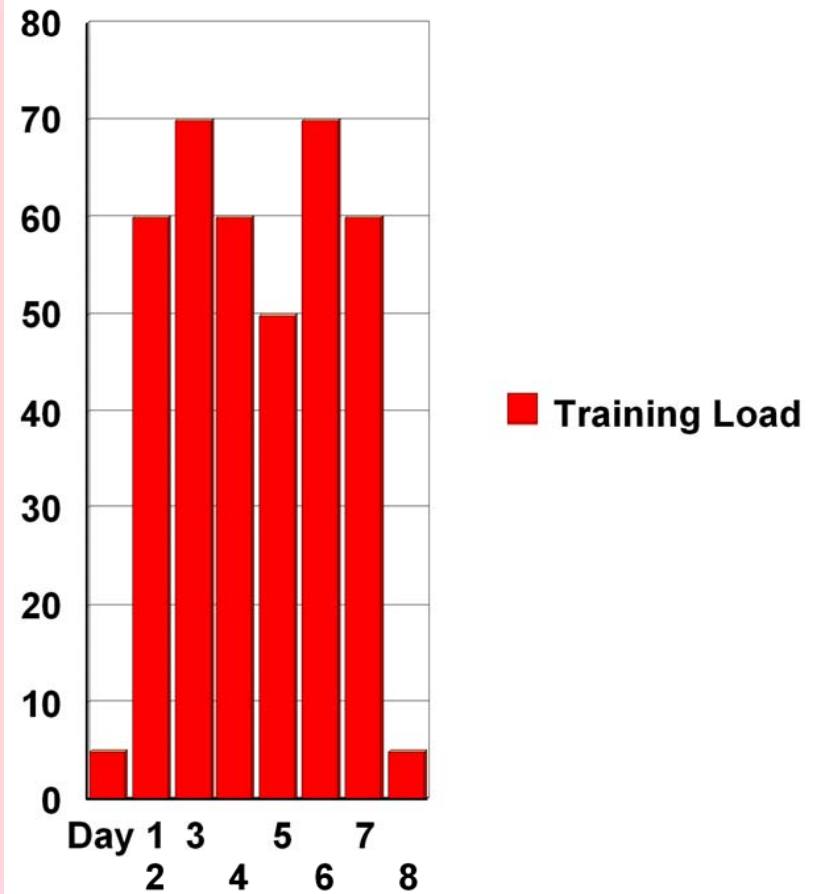
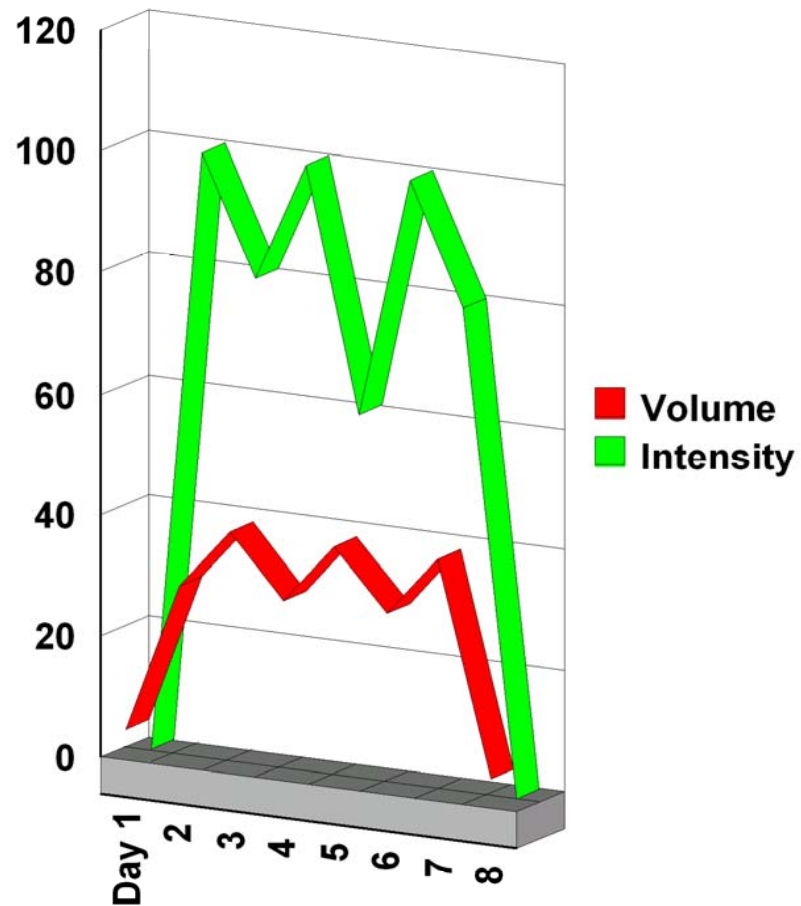
Training content

- The content of a micro cycle is dependent on how far or how close the cycle is from competition (location-location-location)
- The farther away the cycle is from competition the higher the volume and lower the intensity is
- The closer the cycle is to competition the lower the volume and higher the intensity is



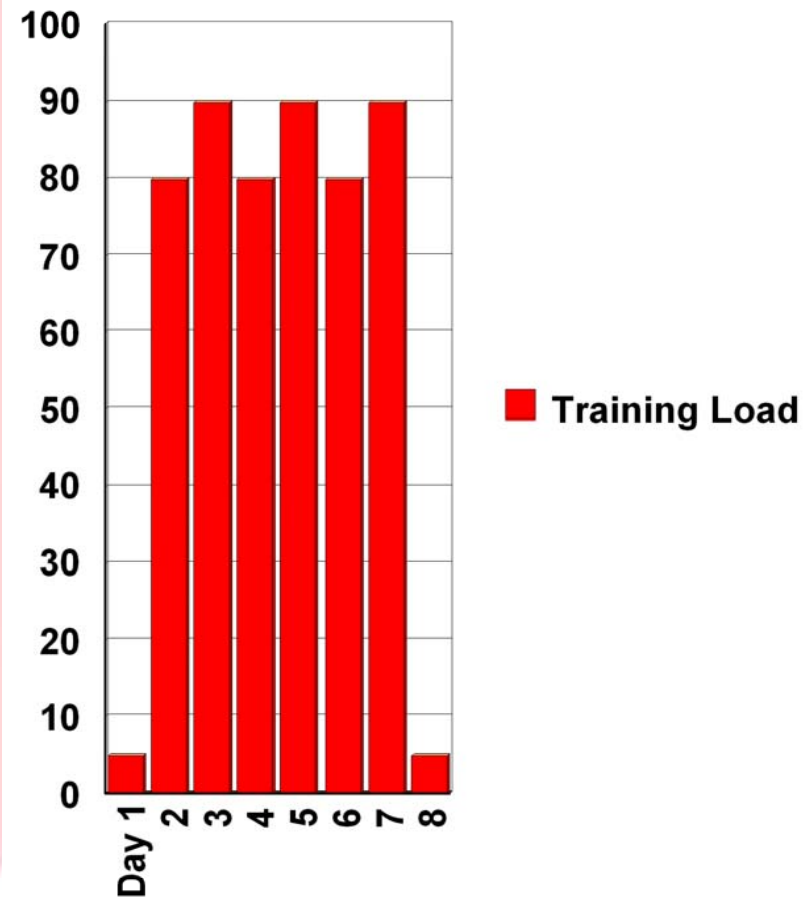
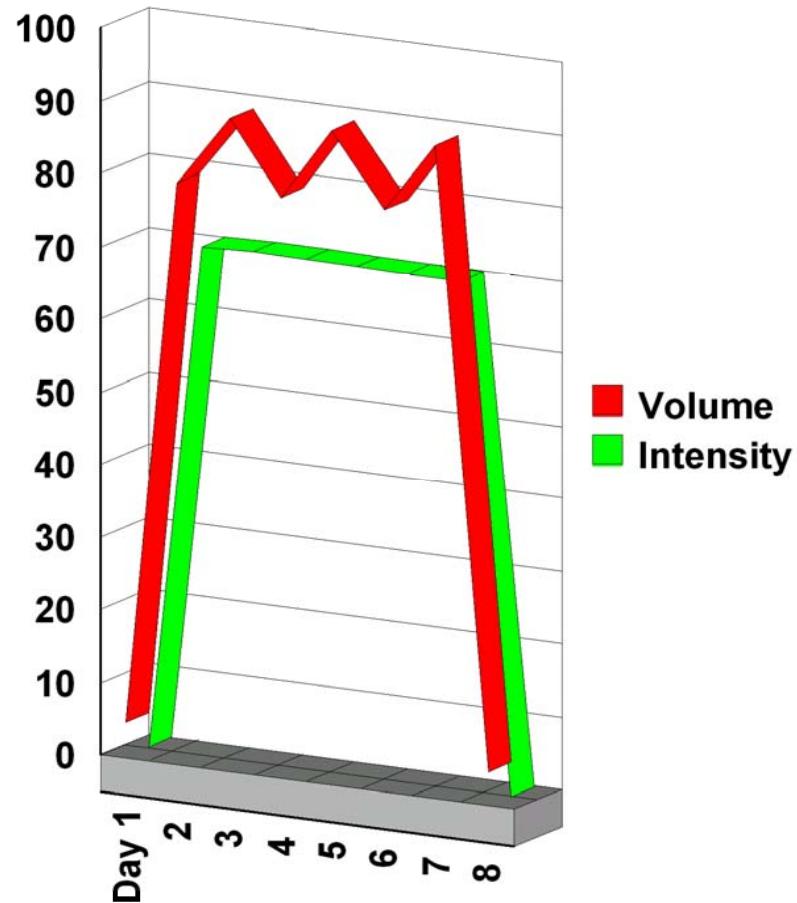
Introductory Micro Cycle

Neural Adaptation



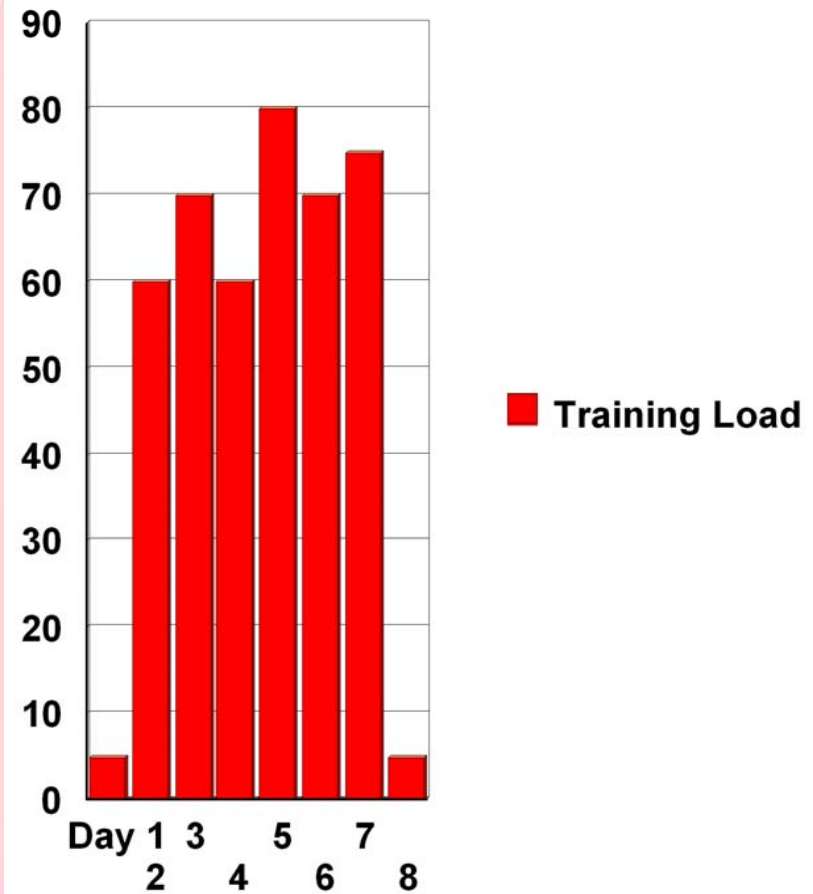
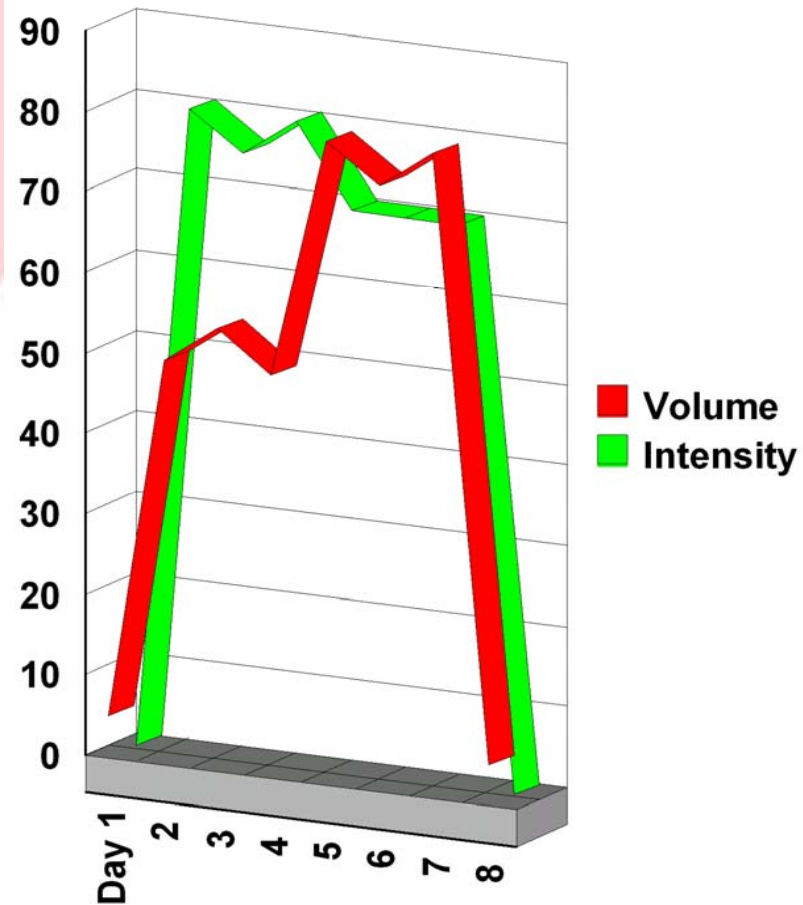
Introductory Micro Cycle

Metabolic Adaptation



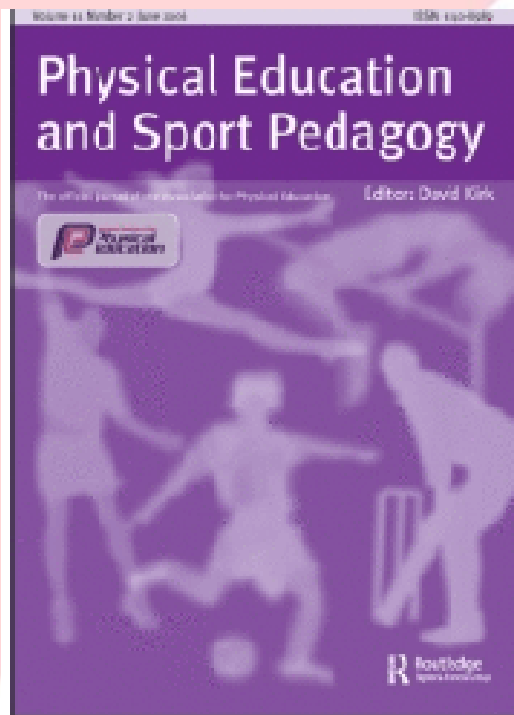
Introductory Micro Cycle

Mixed Neural-Metabolic Adaptation



“Windows of Optimal Trainability”

- **Adaptation and trainability - definitions**
- **“Critical” or “Sensitive” Periods (Tanner)**
- **Accelerated adaptation to training (Virus, et al)**
- **“Windows of trainability” (LTAD)**
- **“Windows of opportunity for trainability” (Bar-Or and Rowland)**



Physical Education & Sport Pedagogy

Publication details, including instructions for authors and subscription information:

<http://www.informaworld.com/smpp/title~content=t713674664>

Critical Periods in the Development of Performance Capacity During Childhood and Adolescence

Atko Viru; Jaan Loko; Maarike Harro; Anne Volver; Livian Laaneots; Mehis Viru

Online Publication Date: 01 January 1999

To cite this Article: Viru, Atko, Loko, Jaan, Harro, Maarike, Volver, Anne, Laaneots, Livian and Viru, Mehis (1999) 'Critical Periods in the Development of Performance Capacity During Childhood and Adolescence', Physical Education & Sport Pedagogy, 4:1, 75 — 119

To link to this article: DOI: 10.1080/1740898990040106

URL: <http://dx.doi.org/10.1080/1740898990040106>

- Chronological age
- Skeletal age
- Developmental age
- **Relative age**
- Training age
- Sport-specific training age



Maturation de l'individu (hâtive, normale ou tardive)

Early, Average and Late Maturers





13 year old boys



13

14

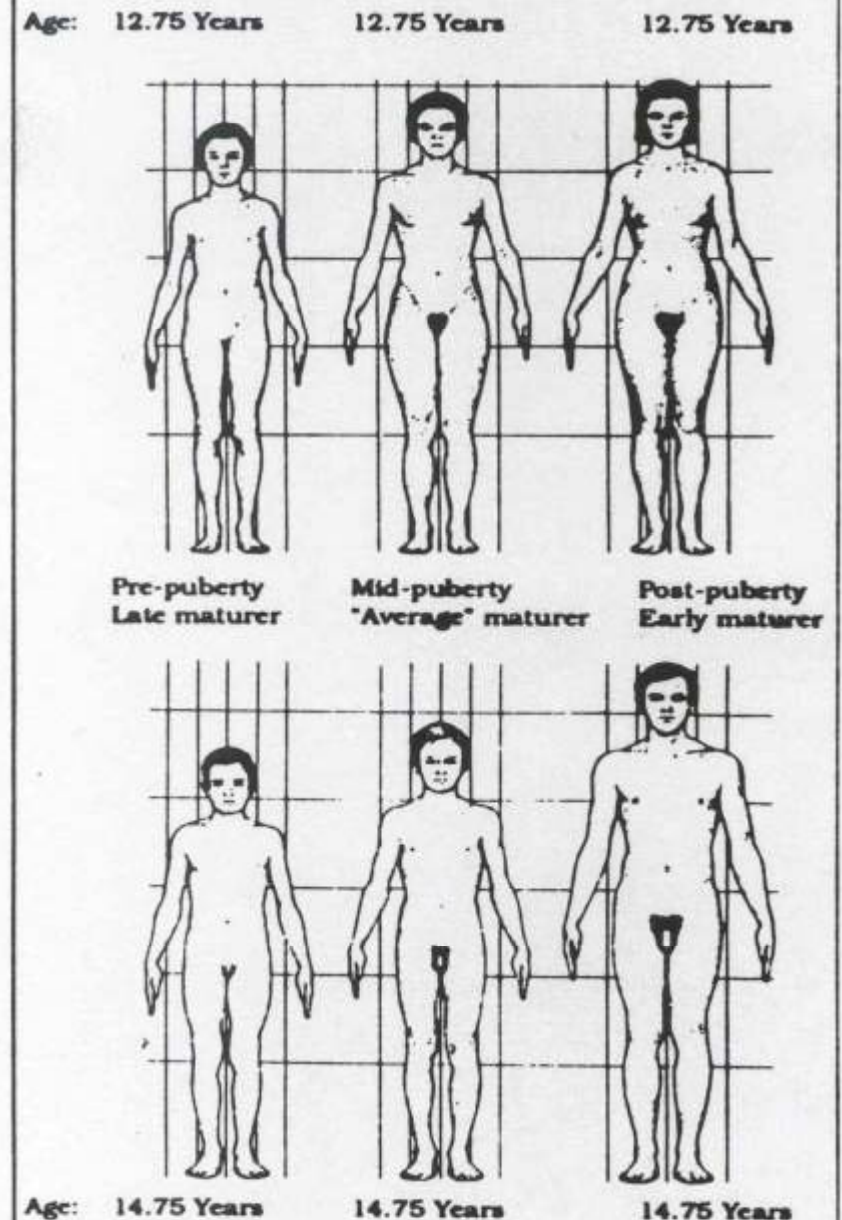
13

14

**Early,
Average and
Late maturers**

**Maturation de
l'individu (hâtive,
normale ou
tardive)**

Figure 1



From "Growing Up" by J.M. Tanner. Copyright © 1973 by SCIENTIFIC AMERICAN, Inc. All rights reserved.

Trainability - Capacité d'entraînement

- **Based on chronological age:**

- Speed
- Suppleness

- **Based on developmental age**

- Skill
- Stamina
- Strength

- **Biological markers**

- onset of PHV
- PHV
- onset of menarche

- **Fondée sur l'âge chronologique :**

- Vitesse
- Flexibilité (souplesse)

- **Fondée sur l'âge de développement :**

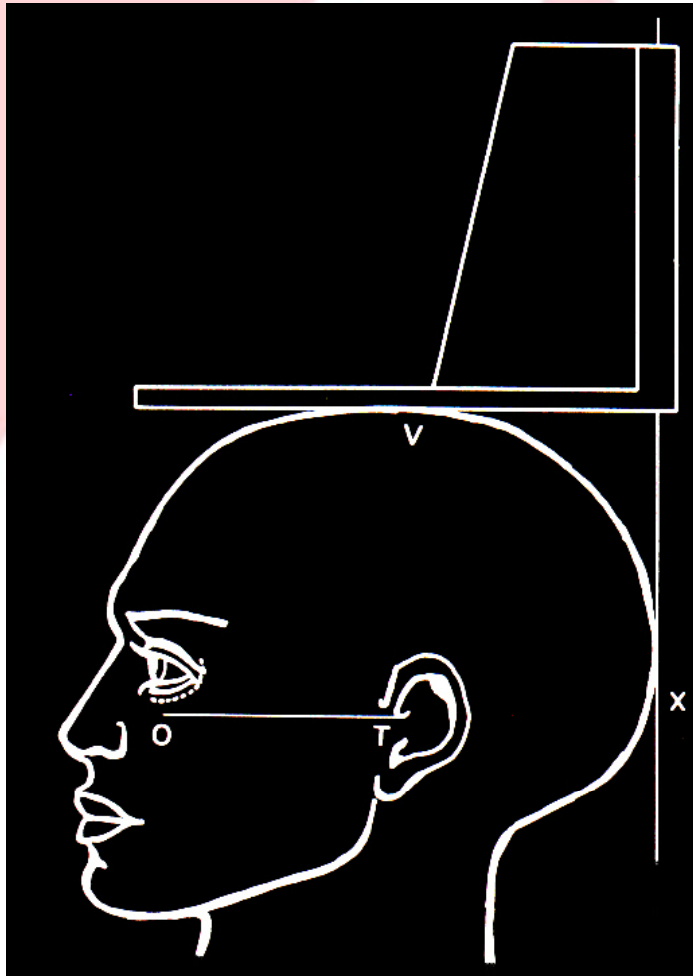
- Habiletés
- Endurance
- Force
- Jalons biologiques (début du pic de croissance rapide-soudaine et croissance rapide-soudaine)

Developmental age - PHV

- **How to measure ?**
- **What to measure ?**
- **When to measure ?**
- **What tools to use for the measurements ?**
- **Who should measure ?**
- **How to administer measurement data ?**

- **Comment le mesurer?**
- **Quoi mesurer?**
- **Quand mesurer?**
- **Quels outils utiliser pour mesurer?**
- **Qui devrait mesurer?**
- **Comment administrer les données de mesure?**

Âge de développement
- pic de croissance rapide-soudaine



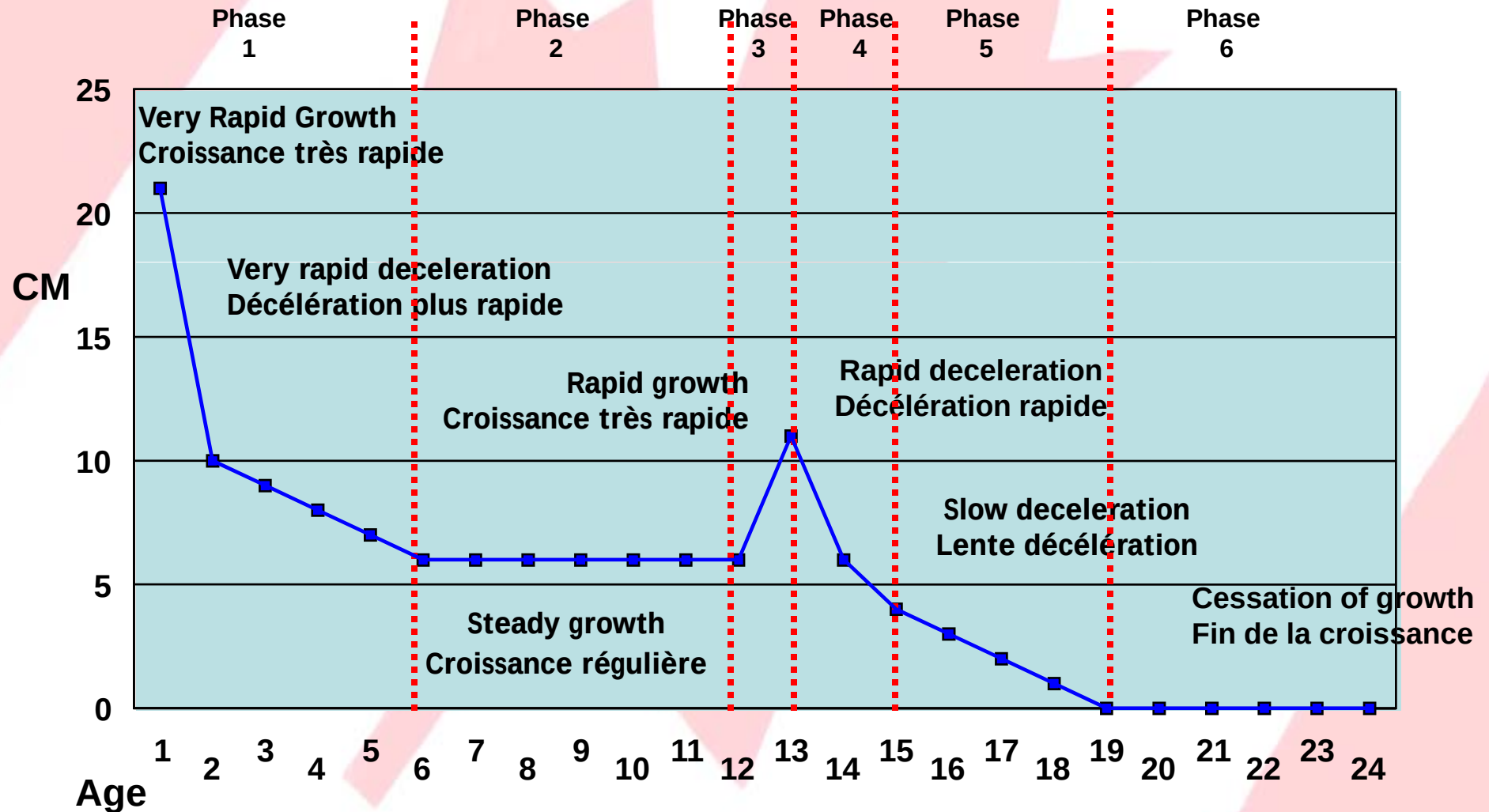
The orbitale (O) is located on the lower or most inferior margin of the eye socket. The tragion (T) is the notch above or superior to the tragus or flap of the ear, at the superior aspect of the zygomatic bone. This position corresponds almost exactly to the visual axis when the subject is looking directly ahead.







Phases of Measurement Phases de croissance



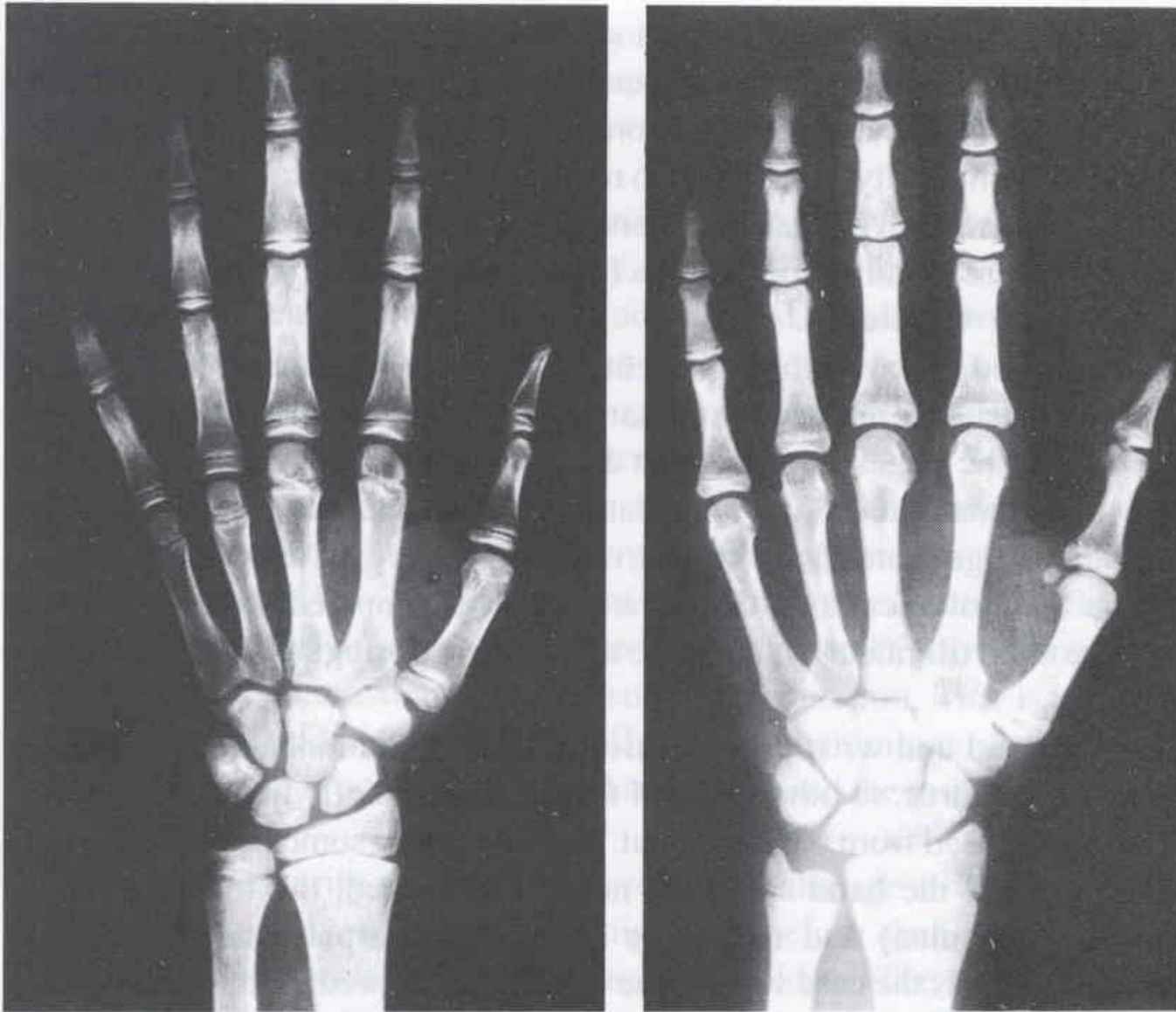
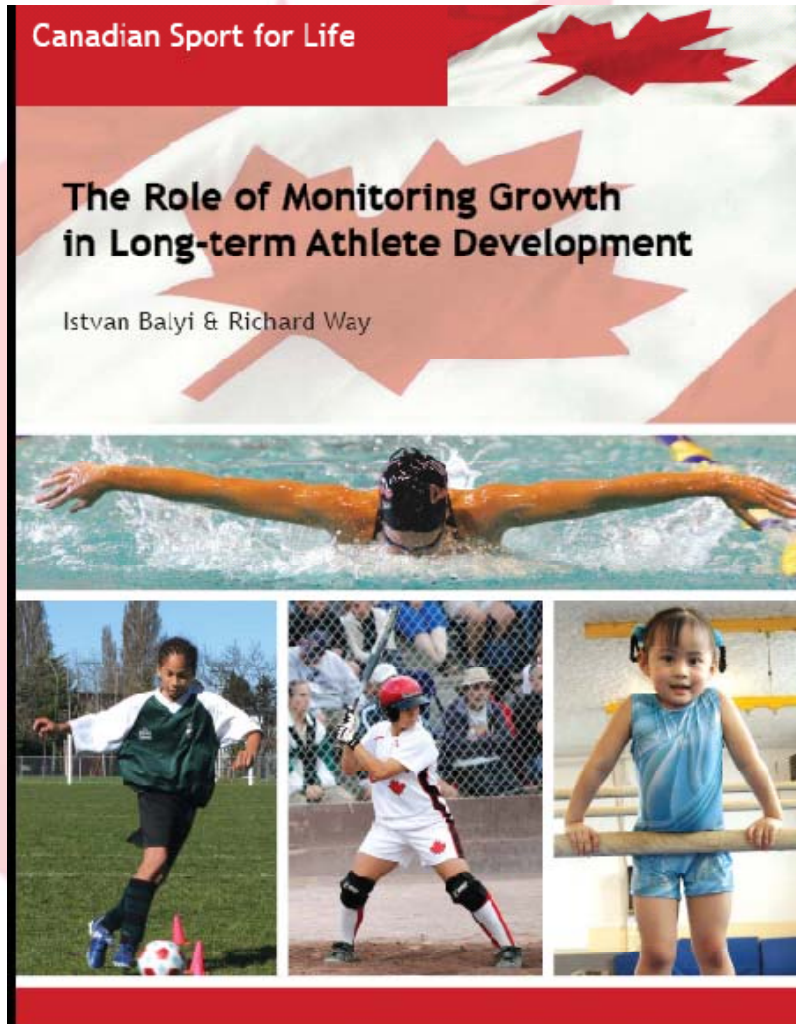


Figure 29 Radiographs of two boys both aged 140 years: (left) bone age 120 'years'; (right) bone age 160 'years'

www.ltad.ca
Later this year



Other resources in the Long-term Athlete Development series



Istvan Balyi presents Long-term Athlete Development (DVD)

Watch LTAD guru, Istvan Balyi, give his world-renowned lecture on the LTAD concept. Ideally suited for presentation to sports studies and sports science students, and a useful resource for coaches, athletes and parents alike.

Code: DV00024



Preparing for a Life in Sport (leaflet/poster)

Sport-generic leaflet that gives a bite-sized overview of LTAD alongside answers to FAQs, then folds out into an A3 poster displaying the LTAD model. Ideal for display, quick reference or teaching purposes. Endorsed by Sport England, Sport Scotland, The Youth Sport Trust, The National Council for School Sport, Coaching Northern Ireland, Sports Council for Northern Ireland, Sports Council for Wales.

Code: BLTAD



Coaching for Long-term Athlete Development (book)

A comprehensive introduction to the LTAD model and its practical applications. Learn how to use the LTAD approach to identify and develop talented athletes, and to maximise your performers' ability achievements and commitment.

Code: B23709

sports coach UK

COACHING THE YOUNG DEVELOPMENTAL PERFORMER

COACHING THE YOUNG DEVELOPMENTAL PERFORMER

Istvan Balyi, Dr Craig Williams



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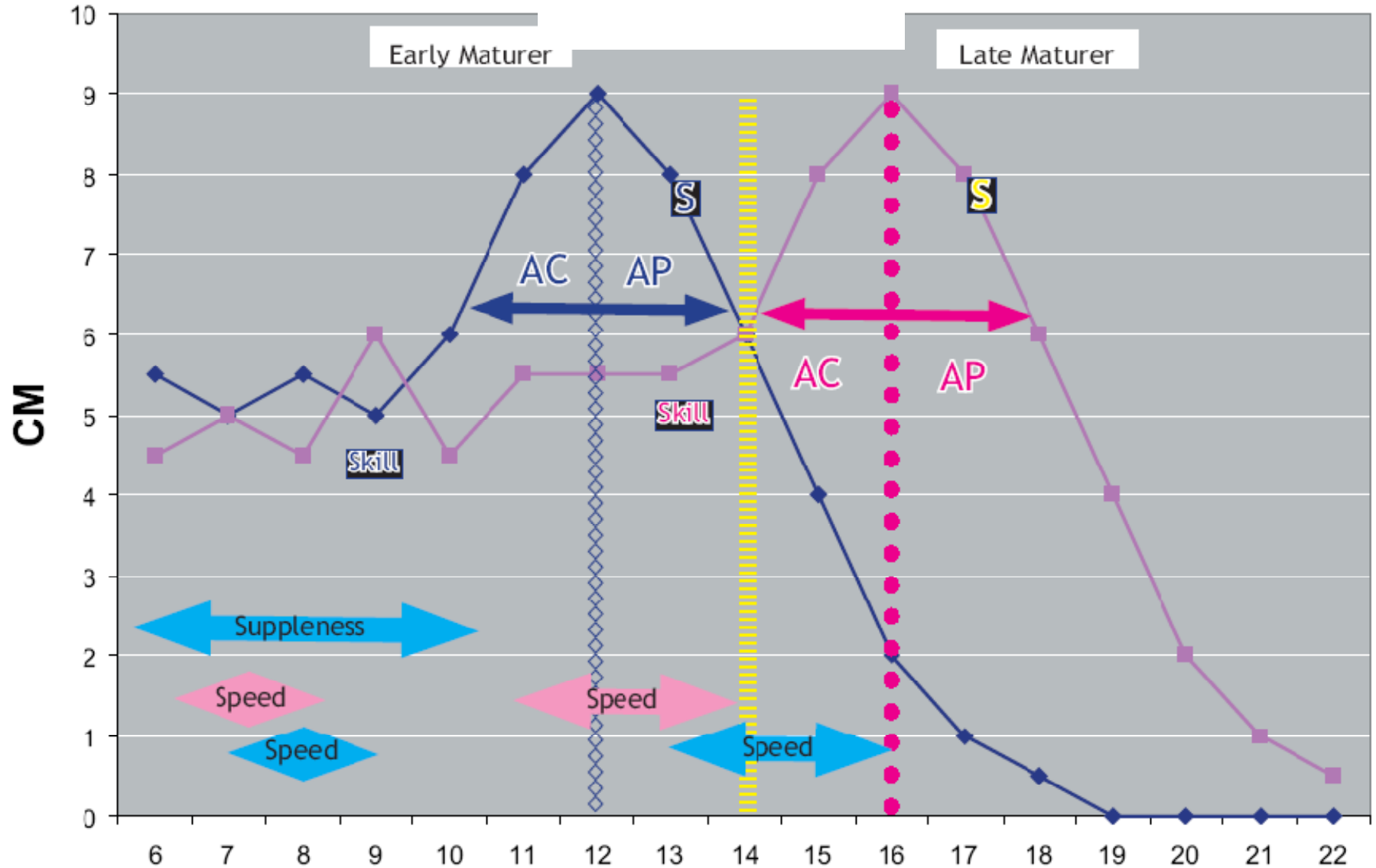


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Training Priorities Based on PHV

AC = Aerobic Capacity
AP = Aerobic Power
S = Strength



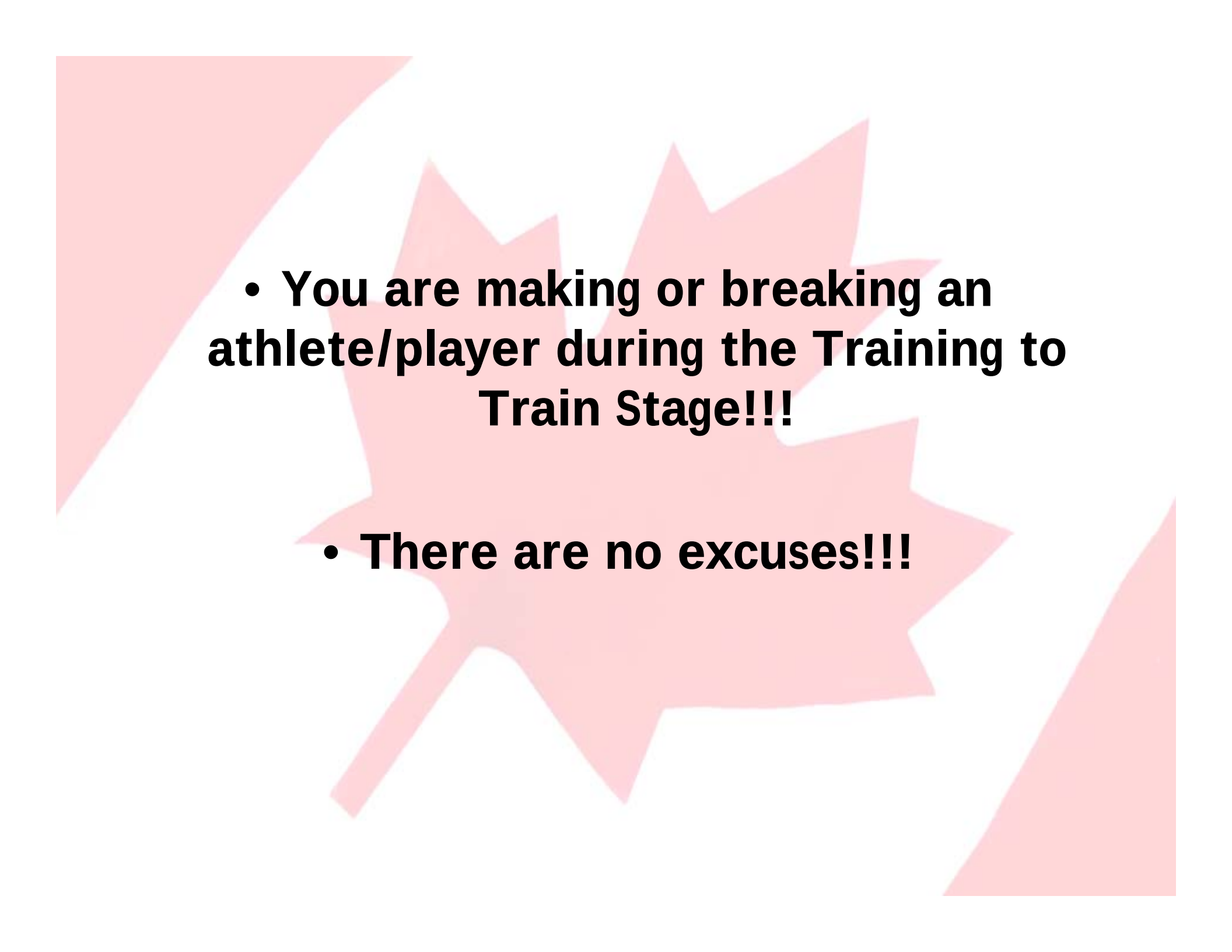
Development Age of a 14 year old

Conclusion:

- **Growth measurements are needed to monitor growth and development**
- **The onset of PHV, PHV and the onset of menarche should be determined in order to be able to adjust training, competition and recovery programs according to the velocity of growth**
- **Plotting PHV will help to identify the onset of the growth spurt, and the peak of the growth (after growth decelerates)**
-
- **The onset of the menarche is about a year after growth decelerates, thus the coach can estimate the time of the onset of menarche**

Conclusion:

- **Before the onset of the growth spurt standing height should be measured on every birthday, or at the beginning of the annual training cycle in clubs**
- **Standing height, sitting height and arm span should be measured every three month after the onset of the growth spurt**
- **Skill, Speed and Suppleness is based on chronological age, while Stamina and Strength are based the onset of the growth spurt and the peak of growth immediately after deceleration of growth begins**

A large, stylized pink maple leaf is centered on a white background. The leaf has a prominent stem and several pointed lobes. In the corners of the image, outside the leaf's outline, are solid pink triangular shapes: one in the top-left, one in the bottom-right, and a smaller one in the top-right.

- **You are making or breaking an athlete/player during the Training to Train Stage!!!**

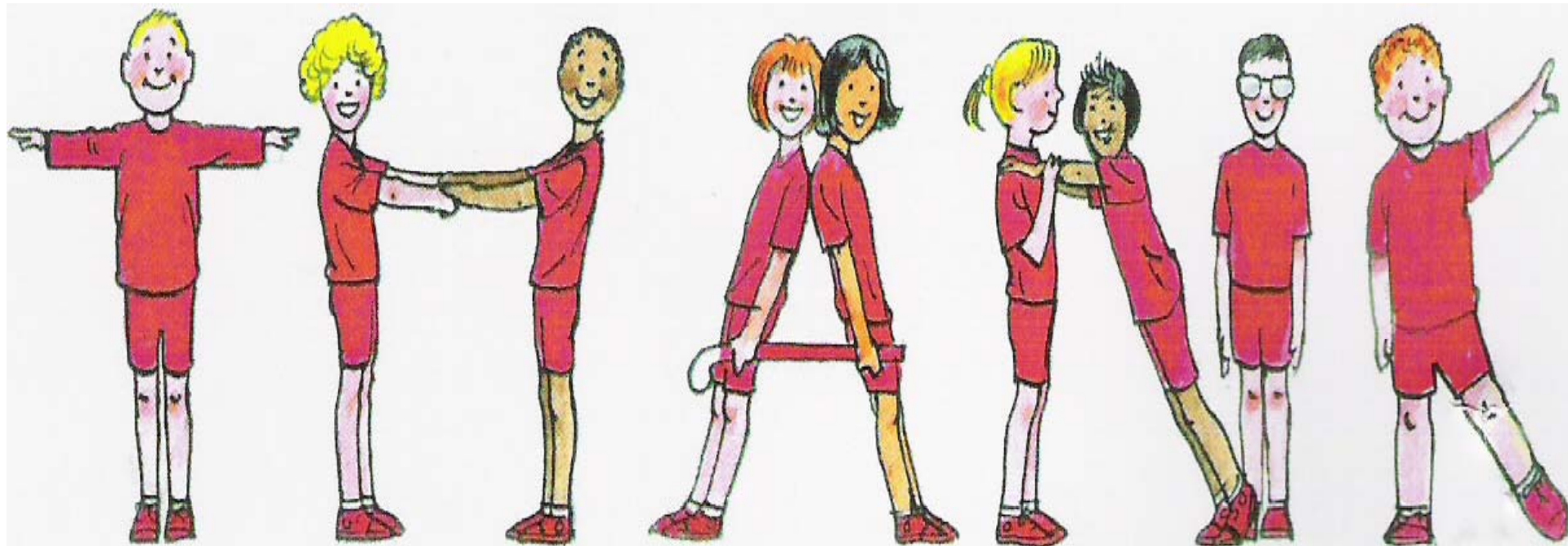
- **There are no excuses!!!**

A large, light pink maple leaf is centered on a white background. The leaf has a prominent stem and several pointed lobes. In the top-left and bottom-right corners, there are pink triangular shapes that appear to be part of the leaf's design.

Thank-you Merci

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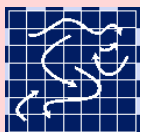
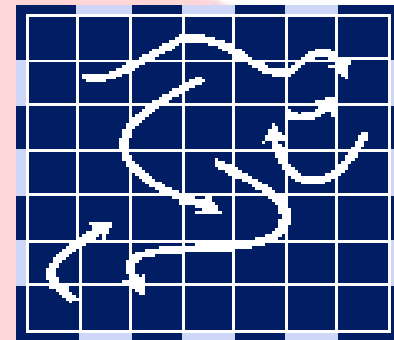
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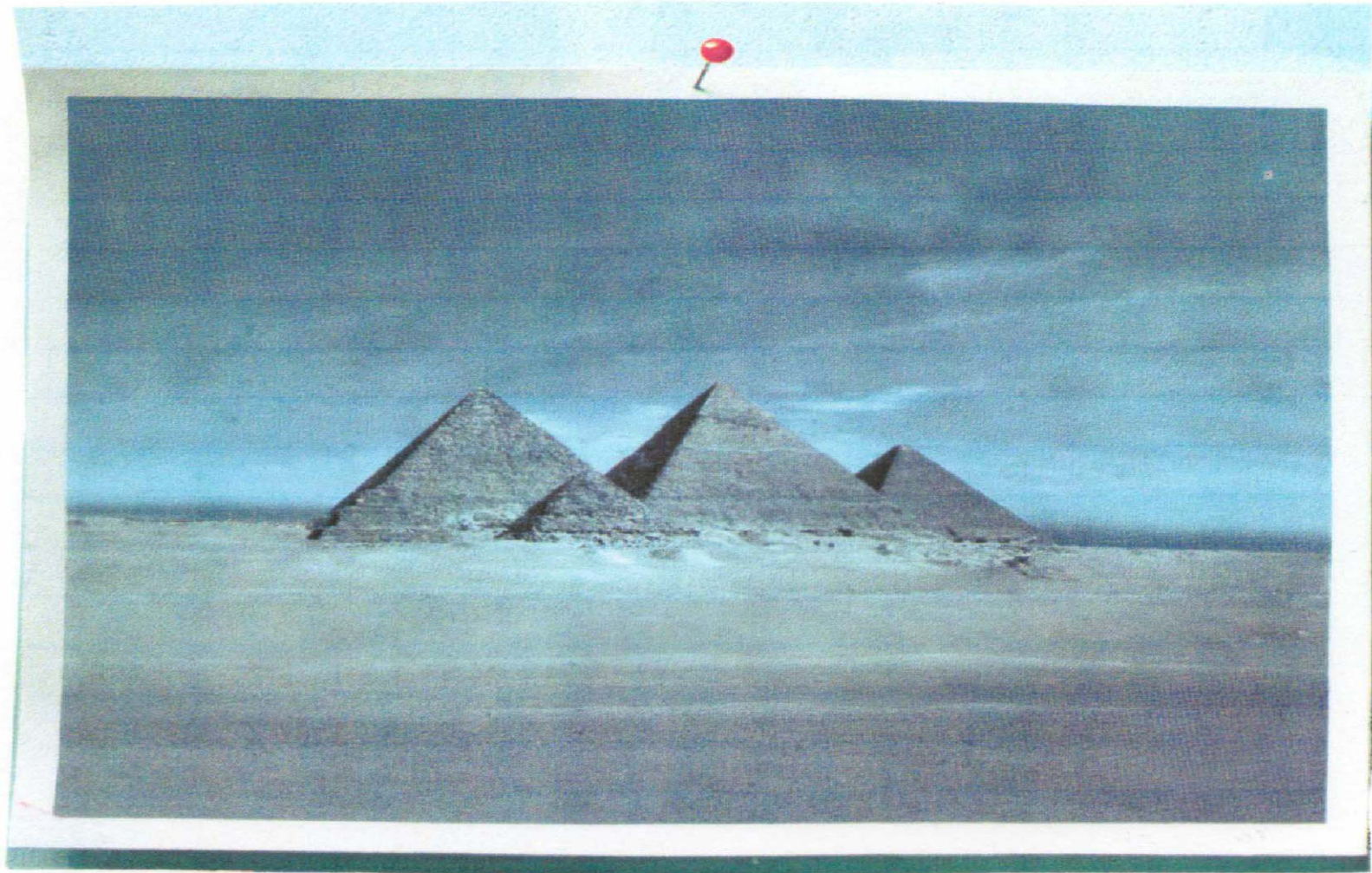


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Questions ?



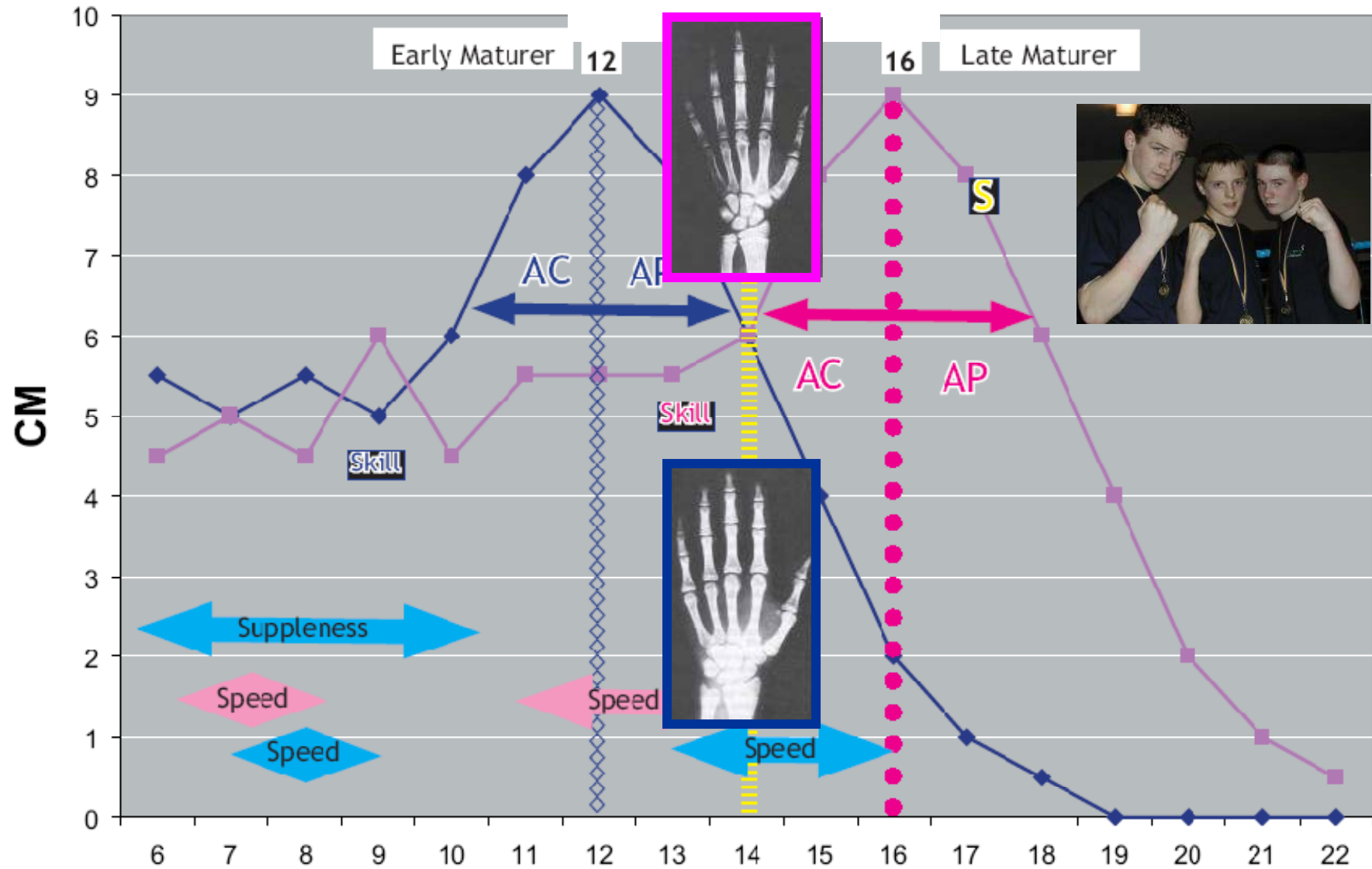


It's not just the bricks, it's how you put them together.

Training Priorities Based on PHV

AC = Aerobic Capacity
AP = Aerobic Power
S = Strength

CA = Chronological Age
DA = Developmental Age

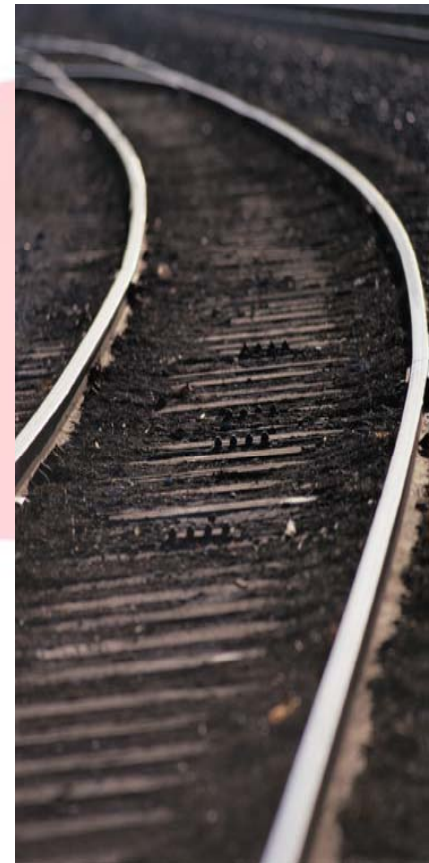


Development Age of a 14 year old

Definitions

- **Growth** refers to observable step-by-step changes in quantity, “measurable changes in body size, for example, height, weight, fatness.” **(Malina, 1986)**
- **Maturation** refers to “qualitative system changes, both structural and functional in nature, in the organism’s progress toward maturity, for example, the change of cartilage to bone in the skeleton.” **(Tihanyi, 1990)**

- **Development** refers to “the interrelationship between growth and maturation in relation to the passage of time.
- The concept of development also includes the social, emotional, intellectual and motor realms of the child.” **(Tihanyi, 1990)**



- **Chronological age** refers to “the number of years and days elapsed since birth” (**Haywood, 1993**)
- **Skeletal age** refers to the maturity of the skeleton “determined by the degree of ossification of the bone structure.” (**Haywood, 1993**)



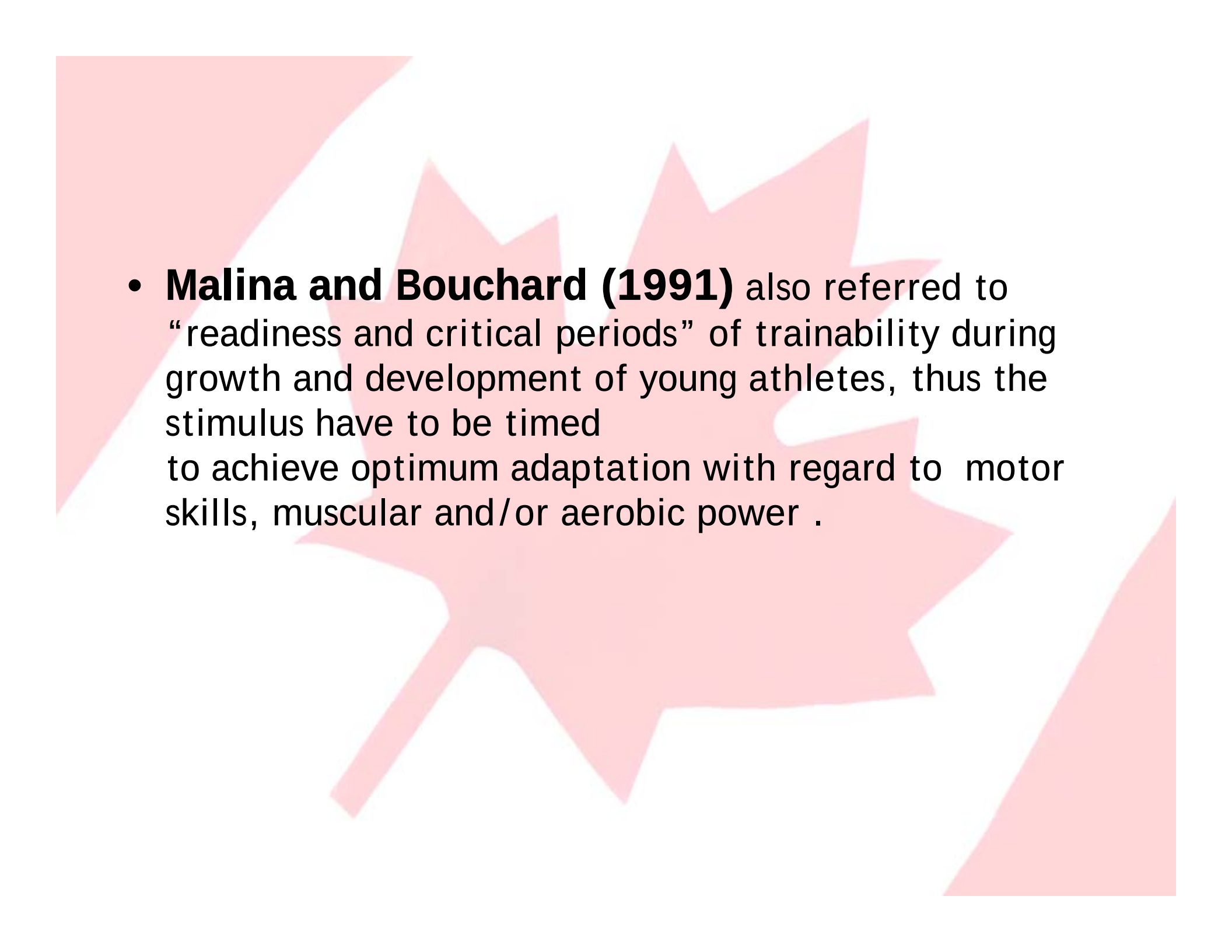
- **Critical periods of development:** A critical period refers to a point in the development of a specific behaviour when experience or training has an optimal effect on development. The same experience, introduced at an earlier or later time, has no effect on, or retards later skill acquisition. **(Zaichkowsky, Zaichowsky and Martinek, 1980)**



Trainability

- **Malina and Bouchard (1991)** defined trainability as “the responsiveness of developing individuals at different stages of growth and maturation to the training stimulus.”.



- 
- **Malina and Bouchard (1991)** also referred to “readiness and critical periods” of trainability during growth and development of young athletes, thus the stimulus have to be timed to achieve optimum adaptation with regard to motor skills, muscular and/or aerobic power .

- **Adaptation** refers to a stimuli or a series of stimuli which induces functional and/or morphological changes in the organism. Naturally, the level or degree of adaptation is dependent on the genetical endowment of an individual. However, the general trends or patterns of adaptation are identified by physiological research and the facts and guidelines of the different adaptation processes, such as adaptation to muscular endurance or maximum strength, are clearly delineated.

- Diagnostics before and after maturation
- Moving scales during PHV

