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Sport conditioning for children

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Problems & limitation with children's training

- Ethical consideration
- Limited number of investigation
- Growing body of information on the possibility of musculoskeletal injury as a result of specific types of sport training

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Physical performance in young athletes

Things we should focus on:

- Motor ability
- Strength
- Pulmonary function
- Cardiovascular function
- Aerobic capacity
- Running economy
- Anaerobic capacity
- Thermal stress

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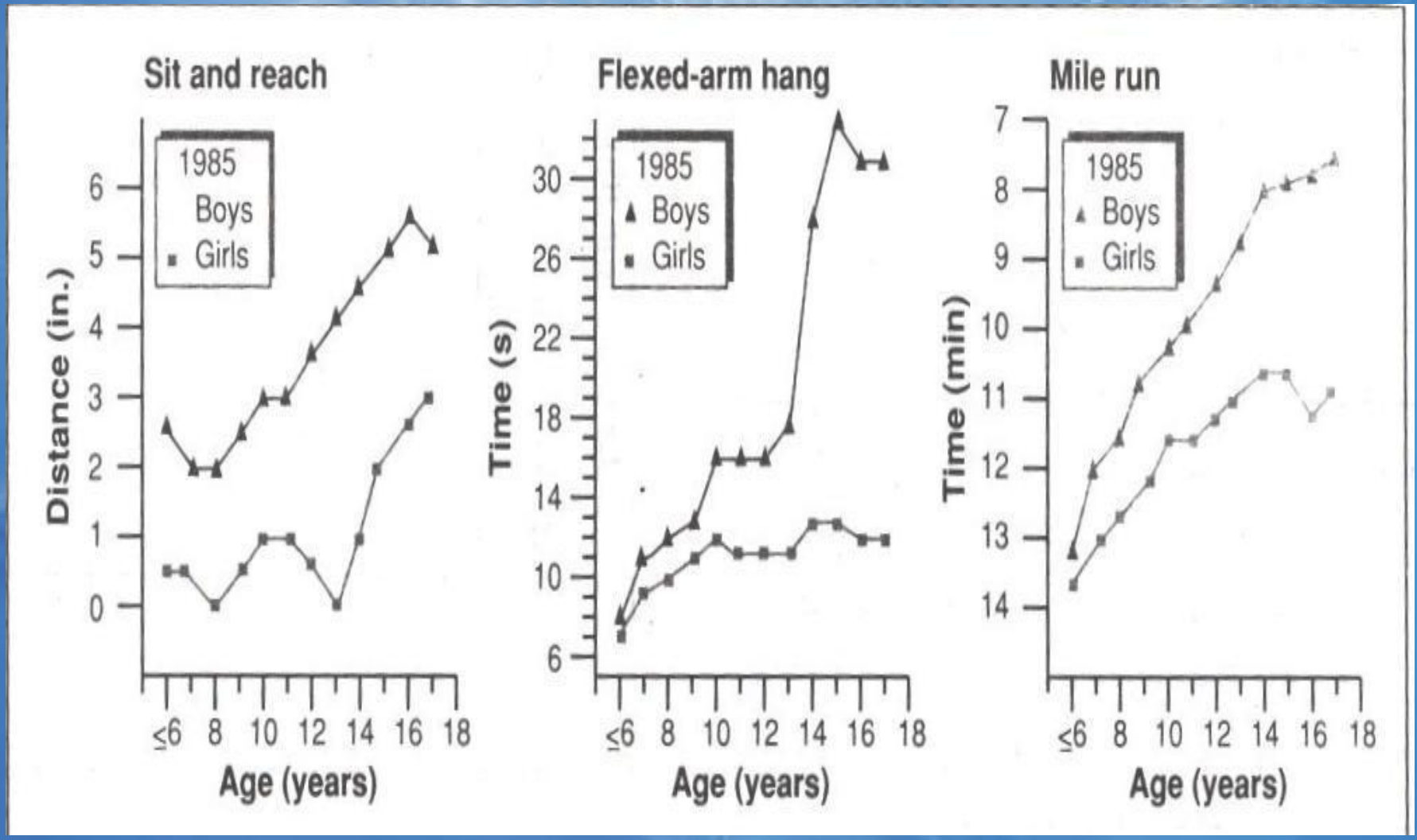
Motor ability and strength trend in young athletes

- Motor ability increase for the first 18 years
- Strength improves with M.mass increase with age
- Gain in strength also depend on neural maturation, “myelination”



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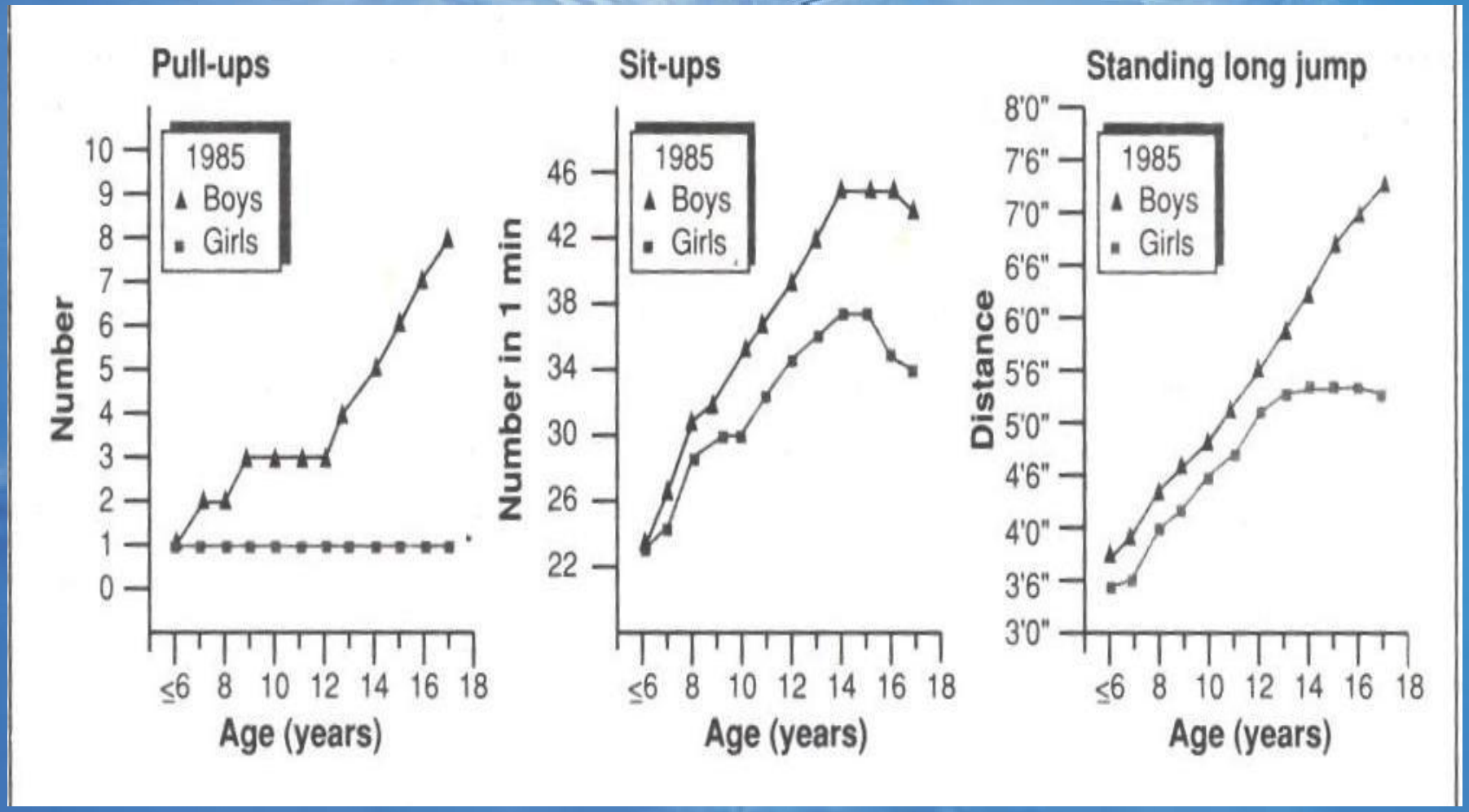

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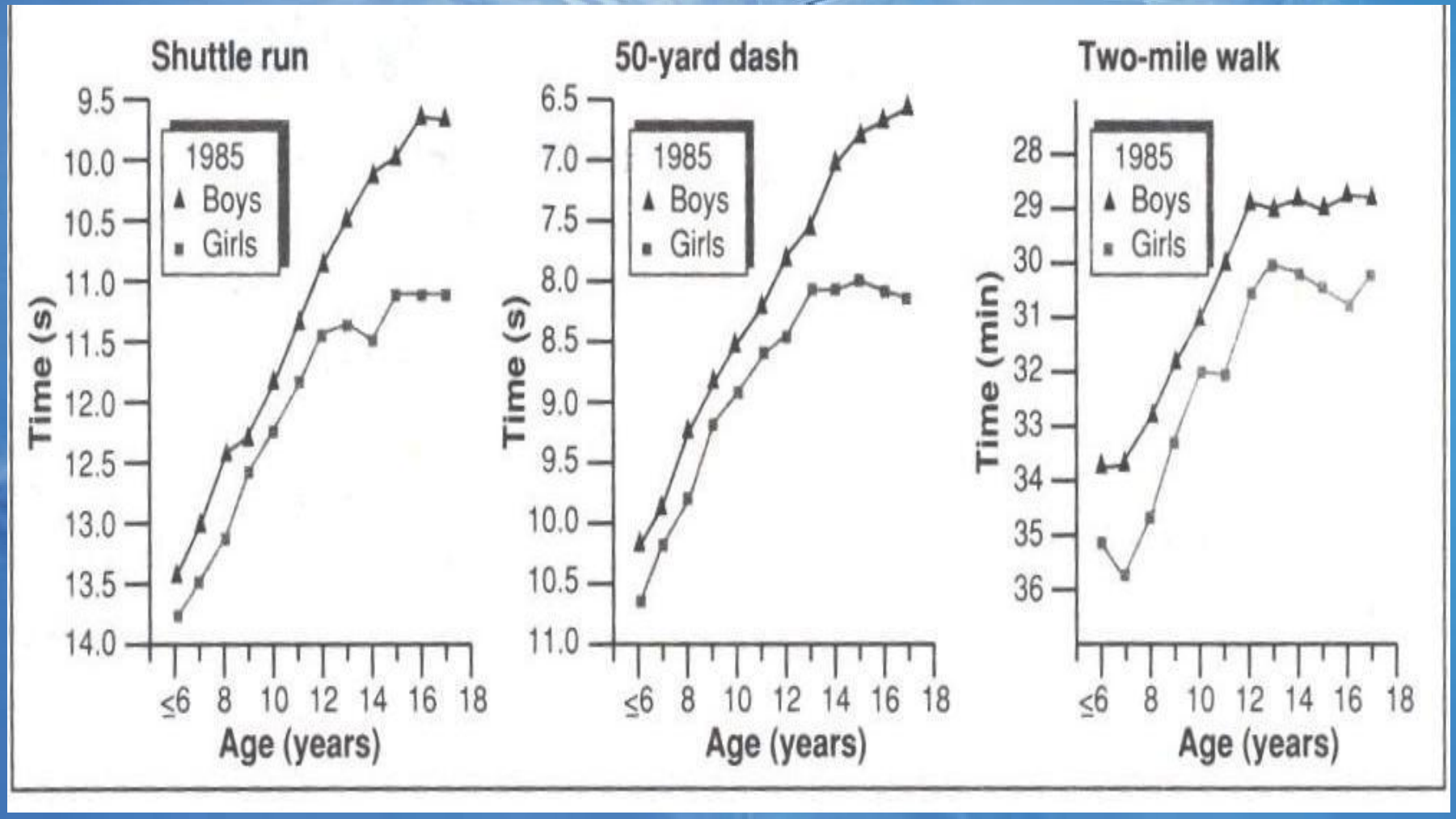
Shuttle run
Time (s)
9.5
10.0
10.5
11.0
11.5
12.0
12.5
13.0
13.5
14.0
1985
Boys
Girls
≤6
8
10
12
14
16
18
Age (years)
50-yard dash
Time (s)
6.5
7.0
7.5
8.0
8.5
9.0
9.5
10.0
10.5
11.0
1985
Boys
Girls
≤6
8
10
12
14
16
18
Age (years)
Two-mile walk
Time (min)
28
29
30
31
32
33
34
35
36
1985
Boys
Girls
≤6
8
10
12
14
16
18
Age (years)

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Training the young athlete

The issues of most concern for young athlete

- Resistance (strength) training
- Aerobic training
- Anaerobic training

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Strength gain during prepubescent

- Improved motor skill coordination
- Increased motor unit activation
- Other undetermined neurological adaptation

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Basic guidelines for resistance exercise progression in children

- 7 or younger: introducing basic exercises with little or no weight
- 8-10: gradually increase the number of exercise & load
- 11-13: teach all basic exercise, continue progressive loading, introduce more advance exercise
- 14-15: progress to more advance programs, add sport-specific component, increase volume
- 16 or older: move to entry-level adult programs

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Resistance training in children

- Strength training can only be effective in the postpubertal age.
- Improvement in strength during the prepubertal age, presumed to be neural in origin and not accompanied by increases in muscle size.
- A properly supervised resistance training program has been found to be beneficial in the pediatric population with no harm to the epiphyseal plates.

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Aerobic and anaerobic training in children

- Aerobic capacity improves less than adults with aerobic training
- Anaerobic capacity appears to improve following training:
  * increase of PC-ATP and glycogen resting level.
  * increase of PFK activity
  * increase of M.B. lactate levels

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Aerobic trainability

Possible explanations

- Biologic mechanisms

  plasma volume & cellular aerobic capacity are two reasonable candidate to explain maturity related difference.

- Increase in VO_{2max} in pediatric studies are generally, no more than one third of those expected in adults.

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Trainability to short-burst activities

- Children can improve their power production, but whether is metabolic, strength or even aerobic adaptations is not clear.
- It is not possible to judge whether children are more or less capable of improvement in the various forms of anaerobic fitness than adults.

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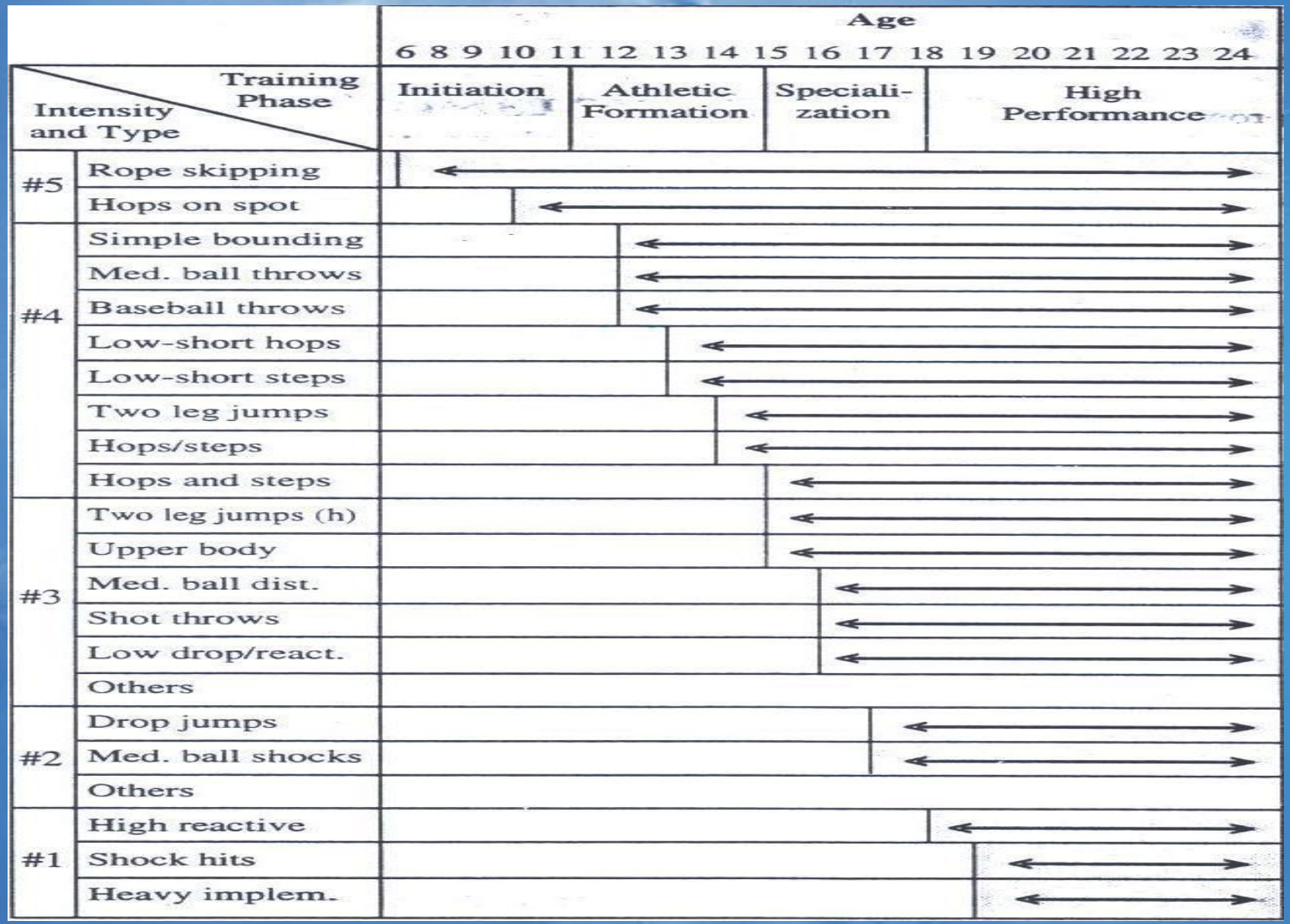
Thermoregulation in children during physical activity

- Children generate more heat per body mass than adults.
- Sweating rate is significantly less in children (at least in boys).
- Less prone to dehydration.
- Children tolerate exercise, in very hot climate more poorly than adults.

Pathways for the training response

- Repeated muscle contractions (training)
- Mediator A — heat, catecholamines, muscle stretch, lactate?
- Gene action B — gene to trigger the adaptation process
- Mediator C — anabolic hormones, enzyme production
- Phenotypic expression D — ↑ protein synthesis, augmented neural activity; ↑ plasma volume

Long term planning



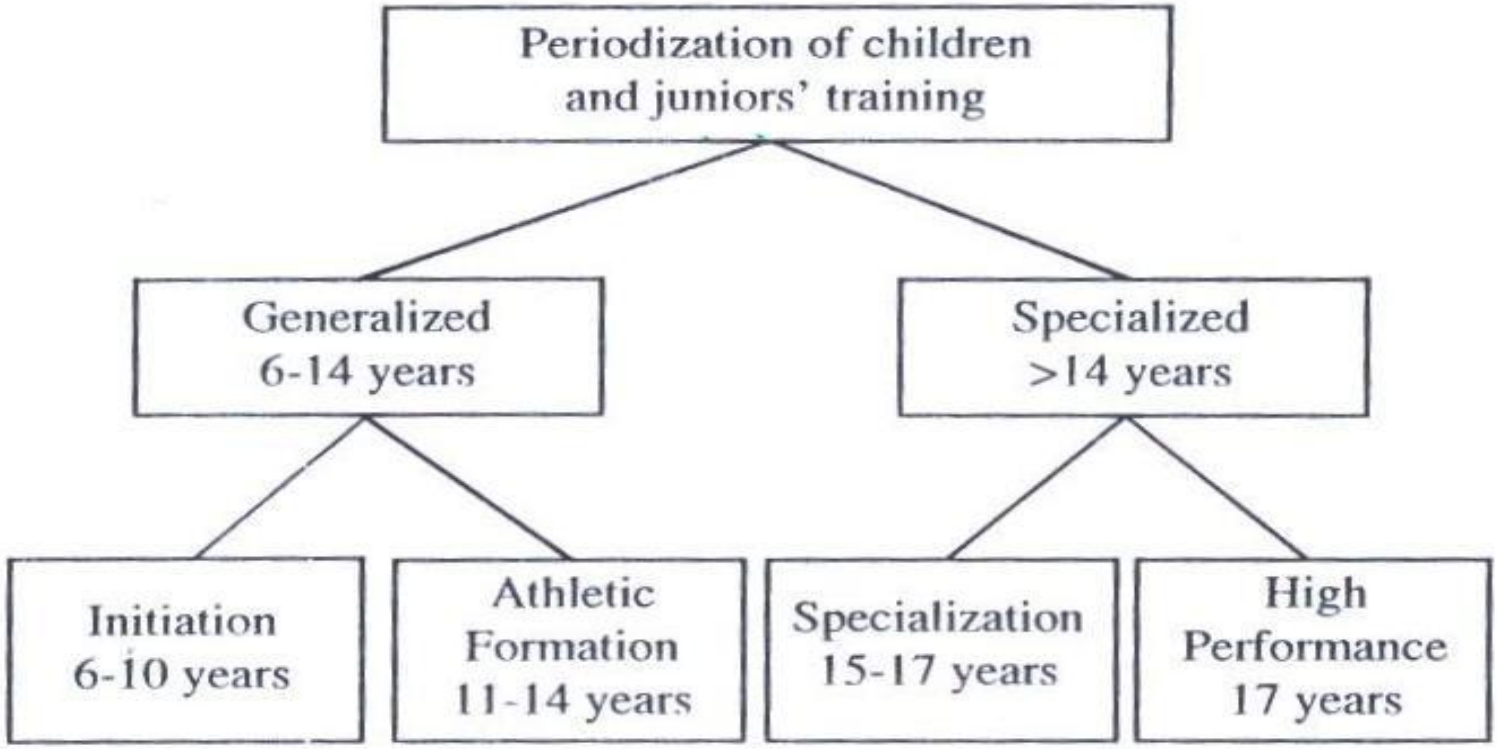


Figure 34. The periodization of long-term athletic development. (The proposed phases consider the normal dynamics of maturation.)

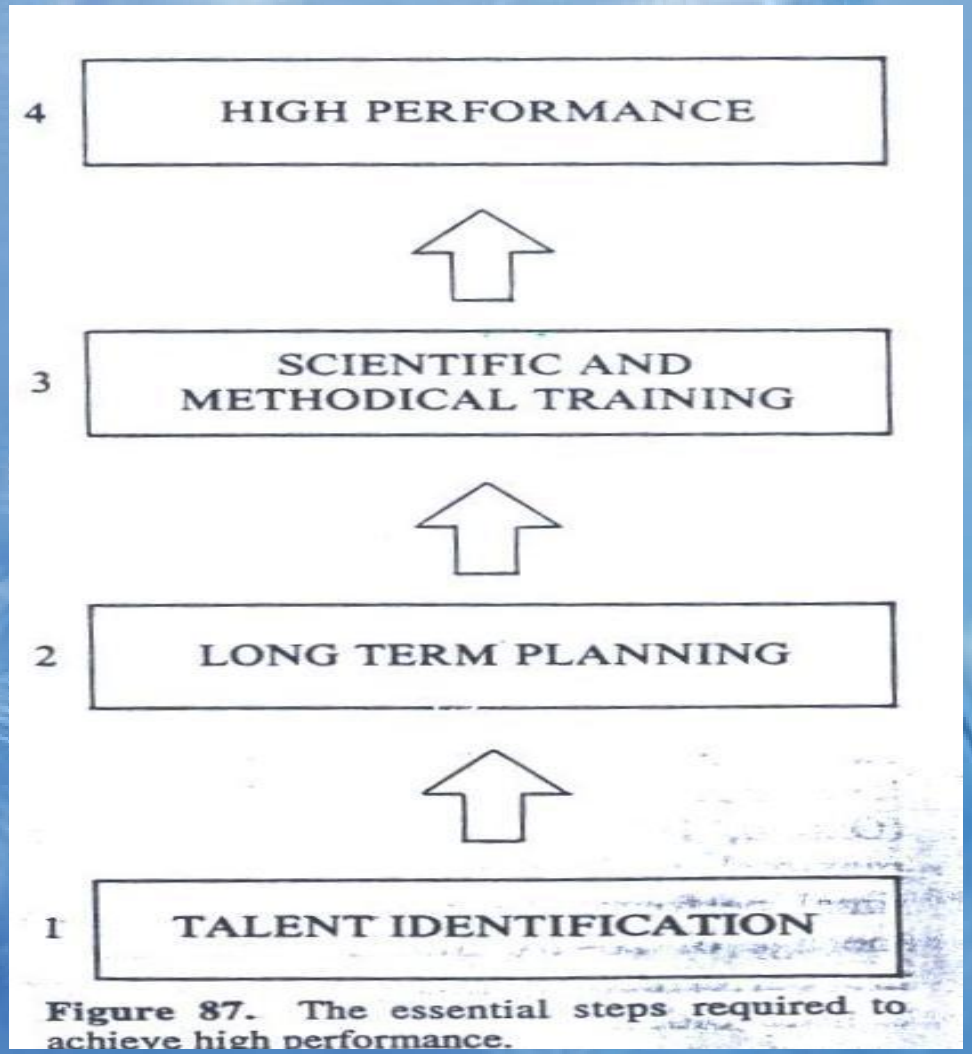


Figure 87. The essential steps required to achieve high performance.

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Activity recommendations for children

- Ex. Type: large muscle, rhythmic, aerobic
- Frequency: 3-5 day/ wk
- Intensity: 50-80% VO_{2max}, functional capacity.
- Duration: 30-50 min

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Specializing versus playing two or more sports in the early years

- Playing two or three sports in high school is an advantage. Those athletes experience a variety of competition that one-sport players do not get.

  tom osborne
- We love for our players to have played more than one sport in high school.

  stella sampras
- I absolutely think that young athletes ought to play more than one sport. Parents are making them specialize way early.

  bill clark
- The player who has only participated in volleyball has seldom has enough athletic experience to be good.

  mark pavlik

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Something to remember

- It is a grave mistake to submit children to the training programs of adults.
- Children are not simply small adults.

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