Belgian Federation Sports Physiotherapy

Current recommendations for muscle strengthening in young athletes

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FIFA MEDICAL CENTRE OF EXCELLENCE

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Mythology : « A popular belief that is probably not true » *(Cambridge dictionary)*

Mythology of youth resistance training

Avery D Faigenbaum ,[1] Andrea Stracciolini ,[2] James P MacDonald,[3,4] Tamara Rial Rebullido [5]

Deep-seated and unfounded beliefs exist among some health professionals, teachers, coaches and parents that resistance training is unsafe, ineffective or unnecessary for children and adolescents. These beliefs constitute a mythology, existing despite the evidence that refutes it. Because of this phenomenon, there is

Br J Sports Med 2022;**56**:997–998.

Myth #1

« Resistance training stunts bone growth »

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- **No negative effect on physeal health or linear growth**

  McQuilliam 2020, Stricker 2020, Bergeron 2015, Specker 2015, Behringer 2010, Ishikawa 2013

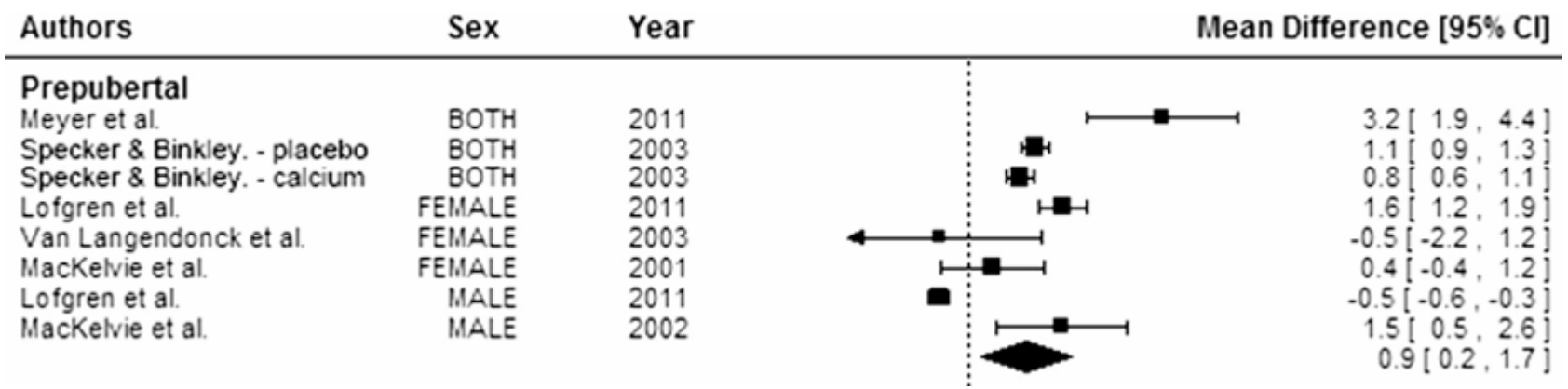
Myth #1
« Resistance training stunts bone growth »

- No negative effect on physeal health or linear growth

- **Resistance training can strengthen bone during childhood & adolescence**

Does Exercise Influence Pediatric Bone? A Systematic Review

Clin Orthop Relat Res (2015) 473:3658–3672



Exercise during childhood leads to greater annual increase in bone accrual

Myth #1
« *Resistance training stunts bone growth* »

- No negative effect on physeal health or linear growth

- **Resistance training can strengthen bone during childhood & adolescence**

Effects of Weight-Bearing Activities on Bone Mineral Content and Density in Children and Adolescents: A Meta-Analysis

Journal of Bone and Mineral Research, Vol. 29, No. 2, February 2014, pp 467–478

Effects of Weight-Bearing Exercise on Bone Health in Girls: A Meta-Analysis

Sports Med (2013) 43:875–892

Significant positive effects of weight-bearing exercises on bone mineral content and/or density (small effect sizes)

Myth #2

« Resistance training is unsafe for young people »

Myth #2
« *Resistance training is unsafe for young people* »

Lack of high-quality epidemiological data because resistance training can represent many different activities

Resistance training among young athletes: safety, efficacy and injury prevention effects

A D Faigenbaum[1] and **G D Myer**[2,3,4]

Br J Sports Med. 2010

- This paper suggests that most injuries related to youth resistance training are a result of inadequate professional supervision, which underlies poor exercise techniques and inappropriate training loads.
- The risk of musculoskeletal injury resulting from age-appropriate resistance training, weightlifting and plyometrics does not appear to be any greater than other sports and recreational activities in which children and adolescents regularly participate.

Appropriate supervision is the key

Myth #2

« Resistance training is unsafe for young people »

Weightlifting for Children and Adolescents: A Narrative Review

Pierce et al.
Sports Health 2021

Discipline & procedures	Technique
• Insist on good behavior	• Be aware that weightlifting can be very tiring for beginners
• Do not allow athletes to train unsupervised	• Be aware that familiarity with the barbell and other apparatus can be quite threatening for begin
• Insist on correct warm-up/ stretching/warm-down	• Sound, mechanically correct lifting technique emphasizing proper “back position management”
• While not lifting, ensure athletes are aware of others who are active	• Instill correct breathing on all lifts
• Instill correct spotting techniques	• Use light loads when new skills are being learned
• Make sure that spotters are used correctly where/when required	• Teach beginners how to “miss” lifts correctly
• Allow no limit (maximum) attempts for early beginners	• Progress loading at each individual’s rate using appropriate monitoring techniques
• Develop evidence-based methodology (periodization and programming) being used	• Use a “progressive stages” strategy when teaching lifts
• Do not allow athletes to progress too quickly	• Do not advance progressions too quickly so that beginners are continually failing

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Weightlifting for Children and Adolescents: A Narrative Review

Pierce et al.
Sports Health 2021

Athlete—make sure the athletes:
• Use suitable footwear to facilitate a stable base
• Use correct, suitable clothing to allow movement
• Take care of their hands (ie, callouses, blisters, cracks)
Medical
• First-aid kit antiseptic and hand lotion should be available
• Disinfectants should be available for cleaning the bar, etc
• Ice should be available for treatment of sprains, strains, and general fatigue
• Have an established emergency withdrawal procedure

• Training platforms are well–spaced out (at least 1 m apart)
• Lifting surfaces are nonslip, firm, and level
• Barbells are evenly loaded and unloaded
• The use of collars with early beginners
• Squat racks and other apparatus are stable and pins in good working order
• There is an adequate supply of magnesium carbonate chalk and resin
• Discs are replaced in storage racks immediately after use
• The bar knurling is kept clean and disinfected
• Bars are straight and revolve easily
• The training environment has a reasonable temperature/humidity that is maintained training area

Myth #3

« Resistance training is ineffective or unnecessary for young people »

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« Resistance training is ineffective or unnecessary for young people »

A meta-analysis of maturation-related variation in adolescent boy athletes' adaptations to short-term resistance training

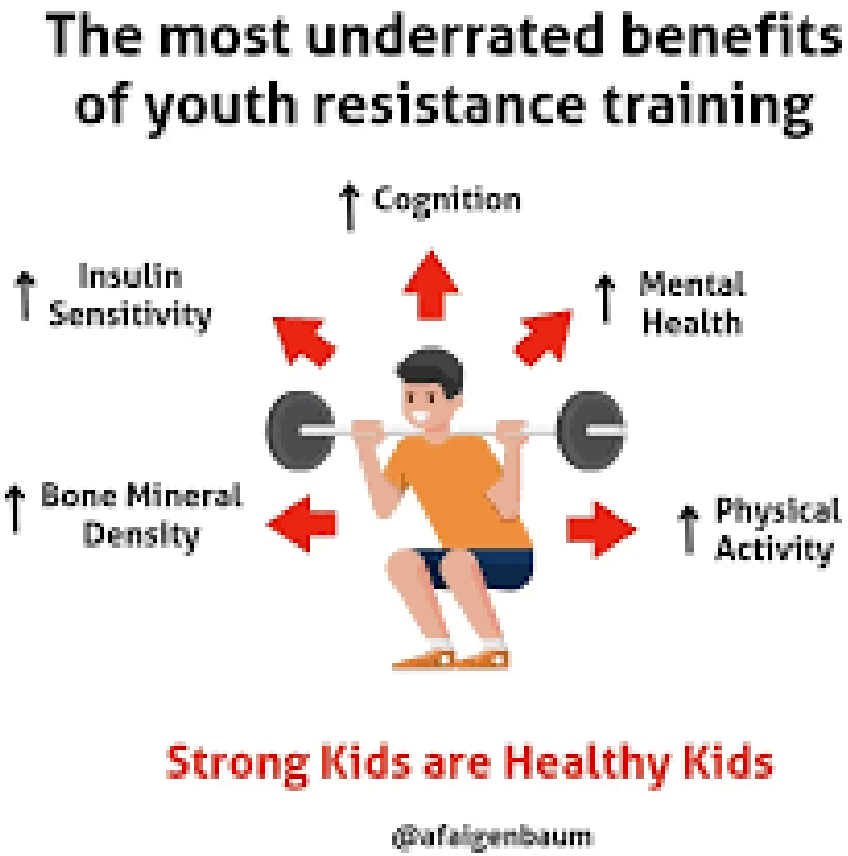
Jason Moran[a], Gavin R. H. Sandercock[a], Rodrigo Ramírez-Campillo[b], César Meylan[c], Jay Collison[a] and Dave A. Parry[a]

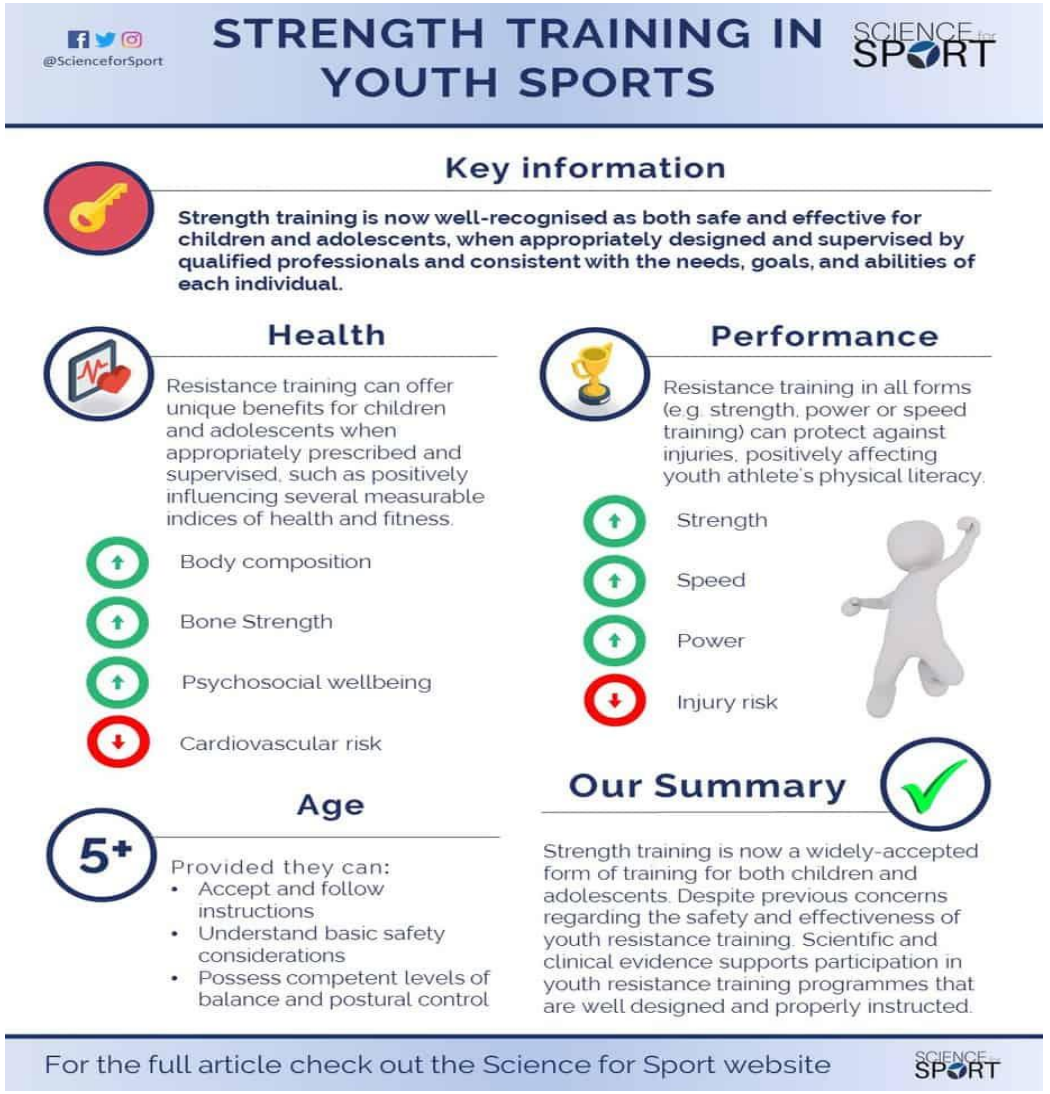
JOURNAL OF SPORTS SCIENCES, 2017
VOL. 35, NO. 11, 1041–1051

	Before PHV	During & after PHV
Amplitude of strength gains	Significant but small effect size	Significant & large effect size
Mechanism of strength gains	Improved neuromuscular activation	Improved neuromuscular activation & muscle hypertrophy

Myth #3

« Resistance training is ineffective or unnecessary for young people »



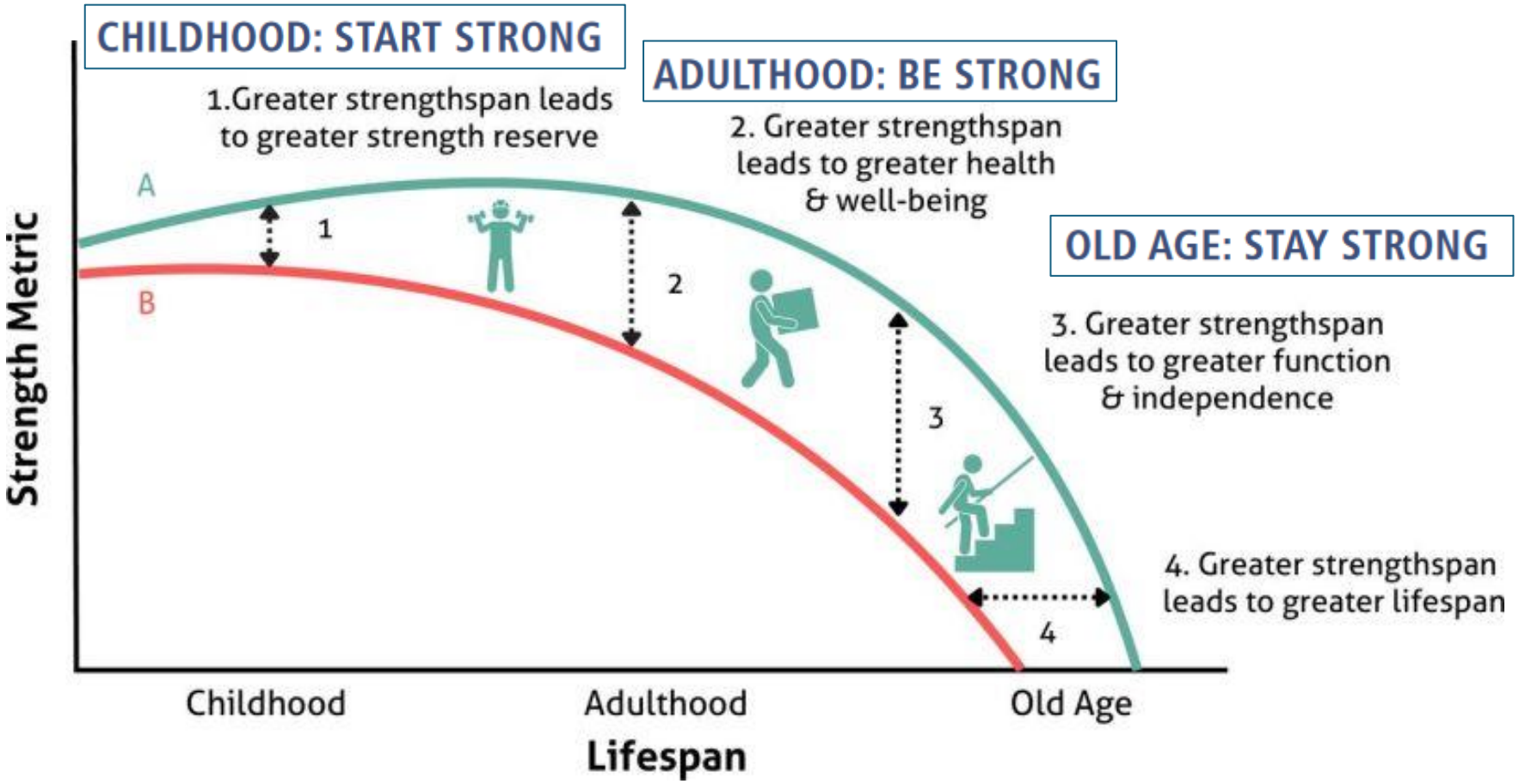


Myth #3

« Resistance training is ineffective or unnecessary for young people »

Bridging the gap between strengthspan and lifespan

To cite Faigenbaum AD, Garcia-Hermoso A, MacDonald JP, *et al*. *Br J Sports Med* 2024;**58**:758–760.



Myth #3

« Resistance training is ineffective or unnecessary for young people »

CHILDHOOD: START STRONG

ADULTHOOD: BE STRONG

OLD AGE: STAY STRONG

Muscular weakness in adolescence is associated with disability 30 years later: a population-based cohort study of 1.2 million men

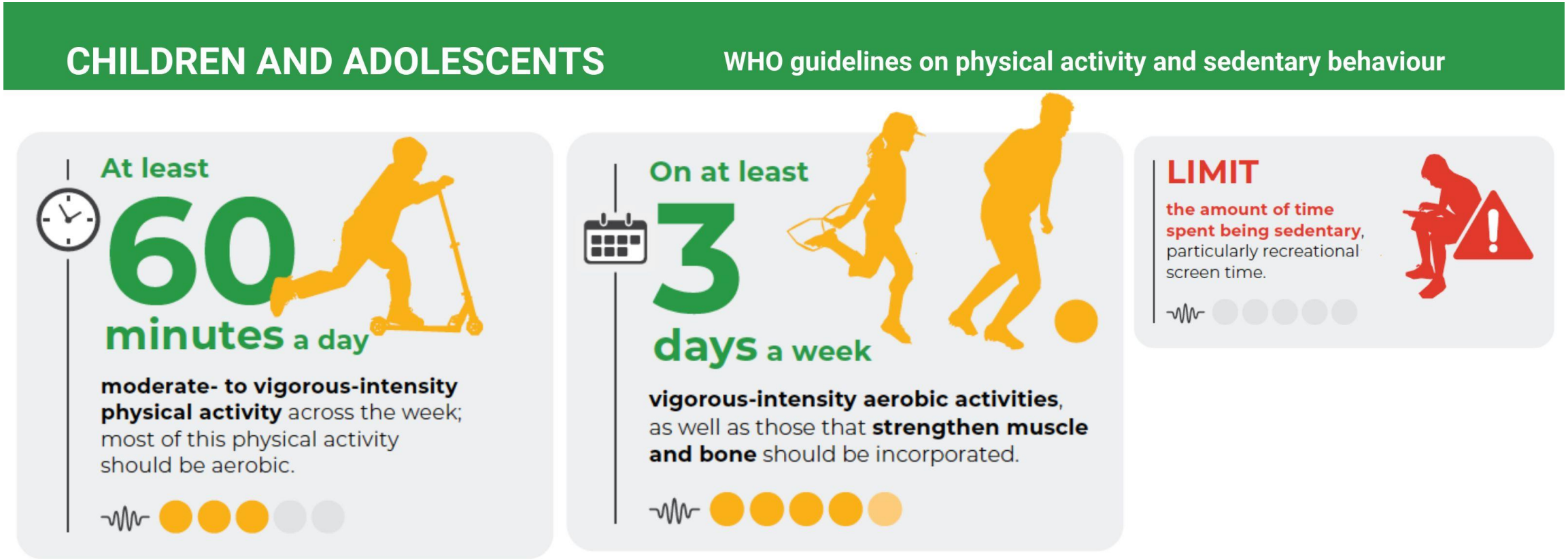
To cite: Henriksson H, Henriksson P, Tynelius P, *et al*. *Br J Sports Med* 2019;**53**:1221–1230.

Muscle-strengthening activities are associated with lower risk and mortality in major non-communicable diseases: a systematic review and meta-analysis of cohort studies

To cite: Momma H, Kawakami R, Honda T, *et al*. *Br J Sports Med* 2022;**56**:755–763.

Myth #3

« Resistance training is ineffective or unnecessary for young people »



Myth #4

« Wait until 12 years old to start with resistance training »

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Free-Weight Resistance Training in Youth Athletes: A Narrative Review

Stephen J. McQuilliam[1] · David R. Clark[1] · Robert M. Erskine[1,2] · Thomas E. Brownlee[1]

Sports Medicine (2020)
50:1567–1580

Irrespective of age, following an initial focus on fundamental movement techniques, strength development can be periodised within a long-term athlete program.

As strength fundamentally underpins power, it is important to first develop this, while concurrently refining the technical skills required for weightlifting.

Chronological age (years) Biological age	10 11 12 13 14 15 16 17 18 19 20 21 >21 Pre-PHV PHV Post-PHV		
Training focus: Functional movements	FOUNDATIONAL MOVEMENTS		
Training focus: Weightlifting	TECHNICAL DEVELOPMENT	INTRODUCTION TO LOAD	HIGH-INTENSITY LOADING
Training focus: Traditional resistance training	INCREASE IN TRAINING INTENSITY		
Recommendations	General strength Emphasis on functional movements 1-3 sets x 8-10 reps	Strength development increases in training intensity 2-3 sets x 6-8 reps 70-80% 1RM	High intensity resistance training Traditional and weightlifting movements 3-4 sets x 1-6 reps 70-100% 1RM

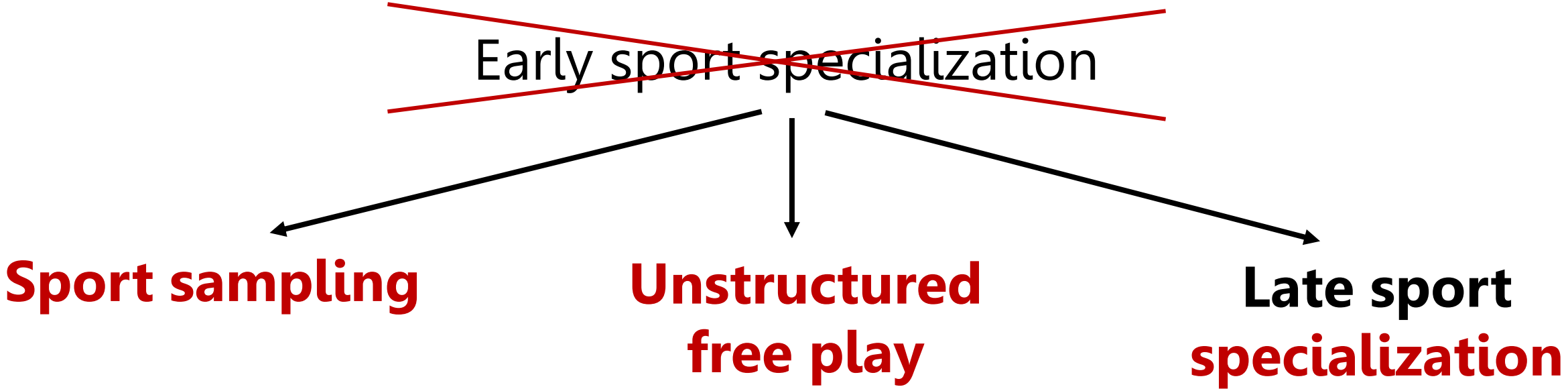
So…no potential danger from resistance training in youth ?

- Unqualified instructor/supervisor
- Inadequate integration of resistance training in long-term athletic development plan
- Early sport specialization in « resistance sports »

Early Sport Specialization

« Intentional and focused participation in a single sport for a majority of the year that restricts opportunities for engagement in other sports and activities »

Bell 2021
J Athl Train


Early sport specialization
Sport sampling
Unstructured free play
Late sport specialization

Take-home messages

RT induces positive health outcomes for the whole life

RT can strengthen bone during childhood & adolescence

RT is safe for young people when properly supervised

RT can be started young when adequately implemented in LTAD plan

As well as EVERY sport, avoid early specialization in RT