

Strength Training for Skeletally Immature Athletes

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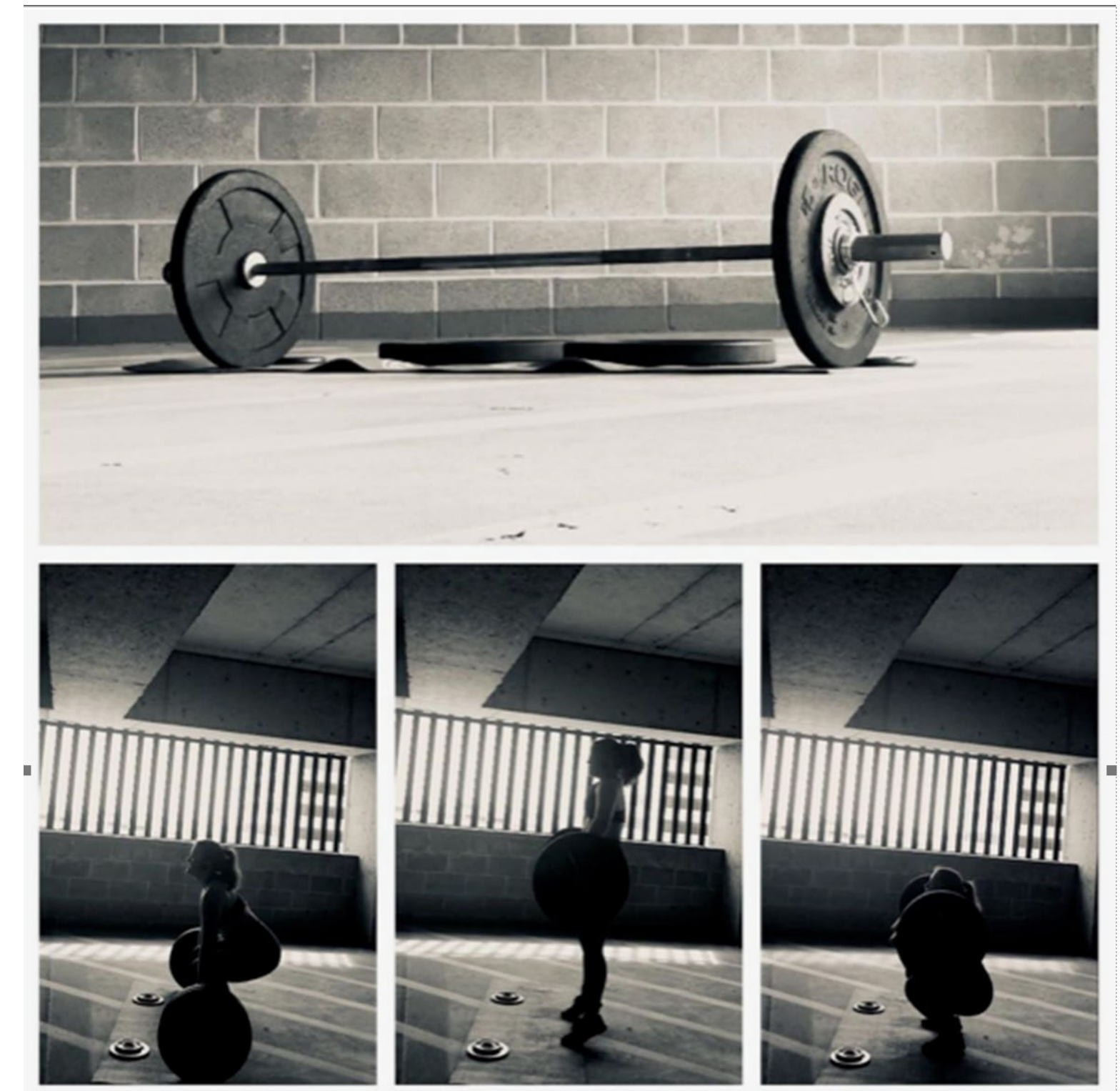
Strength Training for Skeletally Immature Athletes

Learning Objectives

- Discuss strength training in young athletes and the proven benefits.
- List guidelines for safe and effective strength training in children and adolescents.

Outline

- Differences between weightlifting, strength training and resistance training.
- What age is too young for strength training.
- What ages can compete in powerlifting, Olympic weightlifting, and CrossFit.
- Risks and benefits of strength and resistance training.
- Starting lifting program guidelines.
- Preparation exercises.



Disclosures

- I have no disclosure to report.

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Weightlifting vs. Resistance Training

- **Resistance Training**

- Bodyweight exercises
- Lifting weights: dumbbell, barbell, kettlebell
- Banded exercises

(Below are the competition movements. There are many more that are involved in training.)

- **Weightlifting**

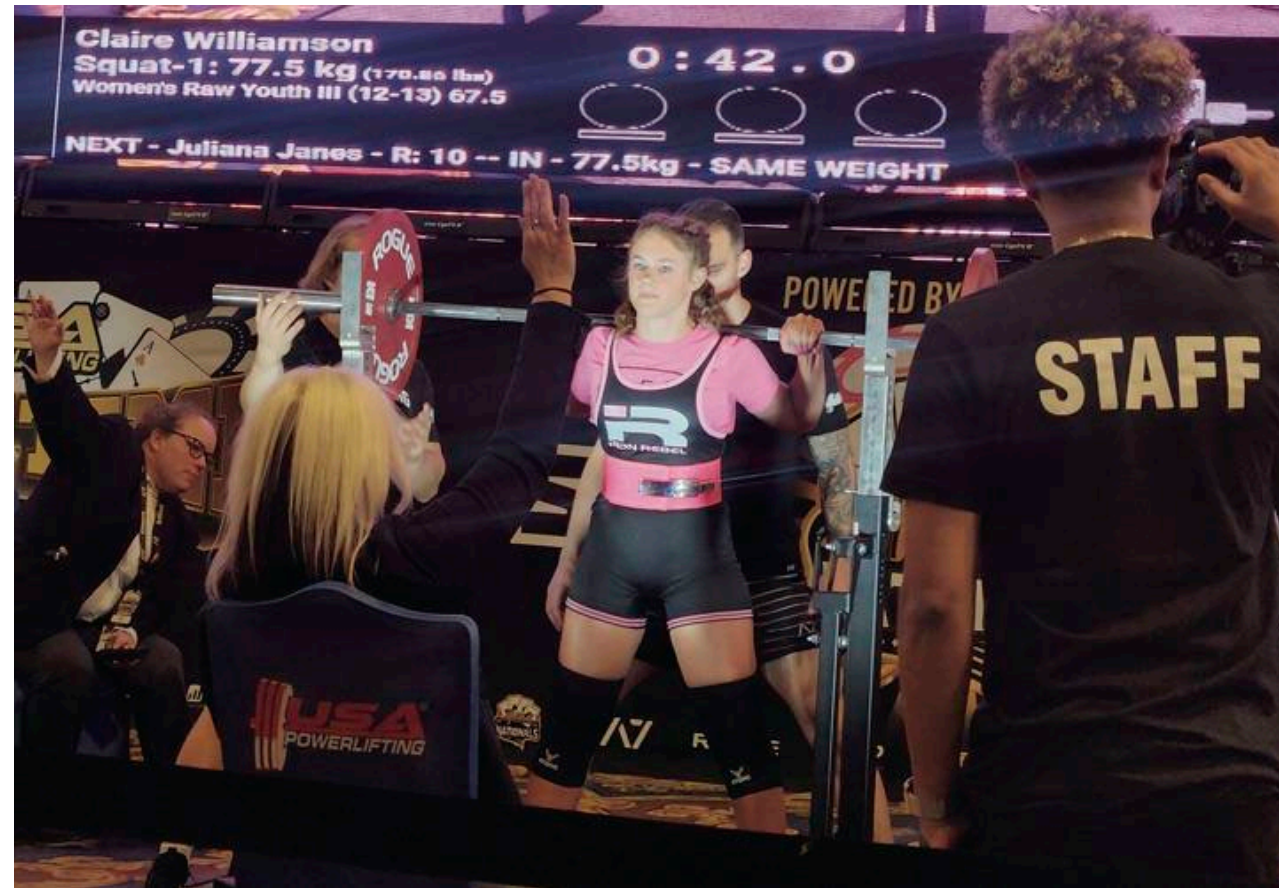
- Powerlifting
 - Squat, Benchpress, Deadlift
- Olympic style
 - Snatch, Clean and Jerk

- **CrossFit**

- Toes to bar, Double-unders, Chest to bar pull-up, Thrusters, Muscle-Ups, Snatch, Wall Balls, Burpees, Deadlift, Power/Squat Clean, and often additional as it varies year to year

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Weightlifting vs. Resistance Training



Claire Williamson, 13yo, Harvard, NE
U.S. Powerlifting National Championship 2023
Combined total weight: 540.1lb (245 kg)
Squat 203.9lb (92.5 kg)
Bench 99.2lb (45 kg)
Deadlift 237.5lb (107.5 kg)



Rylee Beebe, 16yo, USA
2023 Quarterfinals - 11th Worldwide
Back Squat 210lb (95kg)
Clean and Jerk 165lb (74.8kg)
Snatch 140lb (63.5)
Deadlift 255lb (115.7kg)



Prince Keil Delos Santos, 16yo, Georgia
2023 IWF World Youth Championships
Snatch 310.9lb (141kg)
Clean and Jerk 394.6lb (179kg)



Strength Training for Skeletally Immature Athletes

How young is too young?

- American Academy of Pediatricians (AAP)
 - **Prepubertal children are able to gain strength by an increase in neurologic recruitment of muscle fibers, and gains in strength can be made with low injury rates if resistance training programs are well supervised with an emphasis on proper technique.**
 - Resistance Training for Children and Adolescents. Stricker MD, Paul. et al. The American Academy of Pediatrics. Clinical Report. June 01, 2020. Vol145, Iss6. (1)
- American College of Sports Medicine (ACSM)
 - **Proper training guidelines, program variation and competent supervision will make strength training programs safe, effective and fun for children and adolescents. Instructors should understand the physical and emotional uniqueness of children, and, in turn, participants should appreciate the benefits and risks associated with strength training. If age-related guidelines are followed, it is the opinion of ACSM that strength training can be enjoyable, beneficial and healthy experience for children and adolescents.**
 - Youth Strength Training. ACSM Sports Medicine Basics. Faigenbaum, A. and Micheli, L. 2017. (2)
- American Medical Society for Sports Medicine (AMSSM)
 - **Strength training, or resistance training, can safely begin in a supervised environment when your child is developmentally mature enough to follow and accept coaching instruction, generally around 7-8 years old.**
 - When and how should my child begin strength training?. PlayStayThrive. AMSSM. (8)
- American Academy of Family Physicians (AAFP)
 - No official stance. Reference AAP and ACSM.

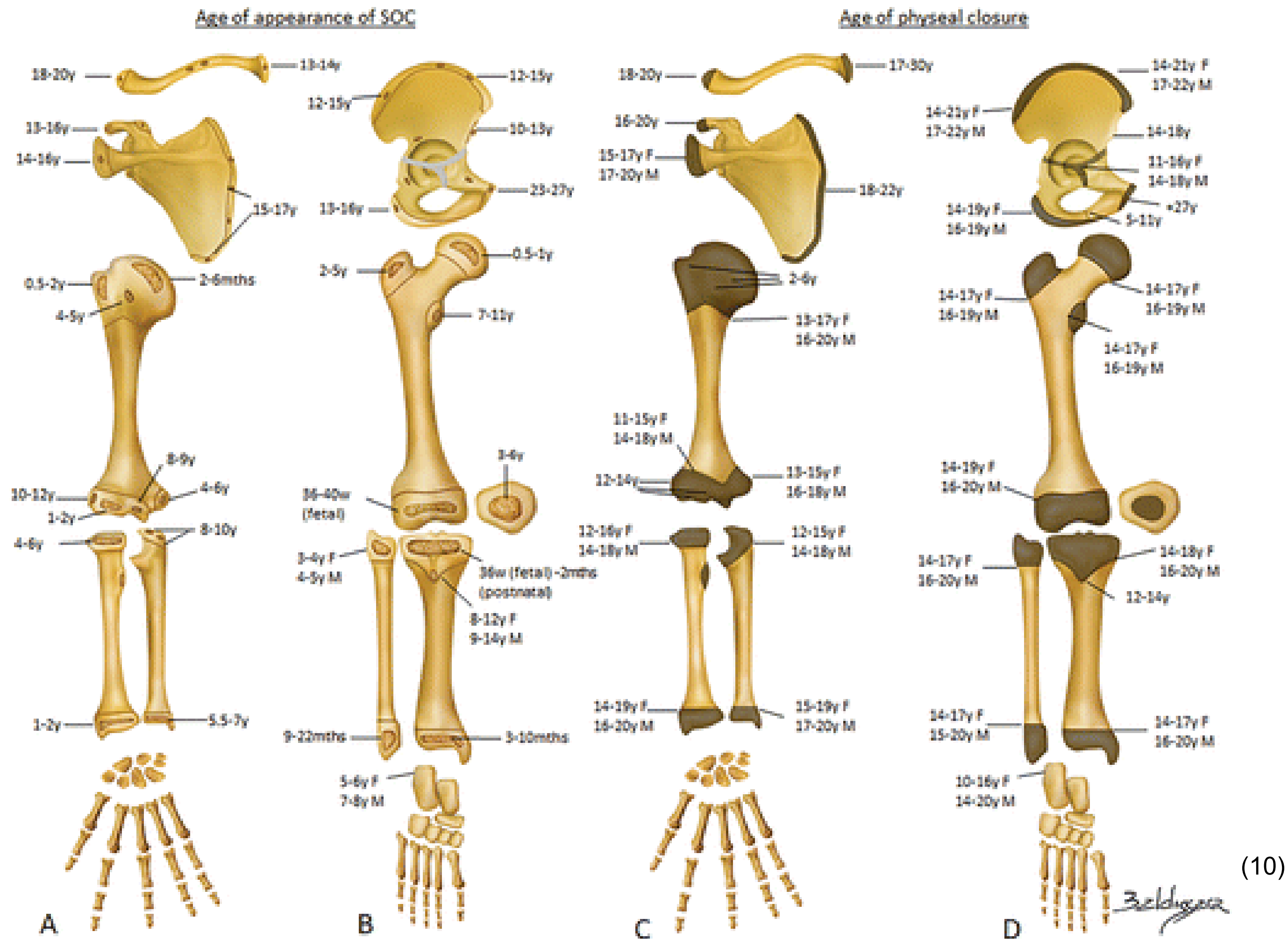
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How young is too young?

- **Maturity level that allows the child/adolescent to accept and follow instruction.**
 - In general, if child/adolescent is ready for team or competitive sports, they are ready for some form of resistance/strength training
- **Competent supervision by adequately and formerly trained adult.**
 - IMO: the most frequently broken rule
 - Adult strength training education cannot be directly applied to children/adolescents.
 - Supervising adult needs to understand the unique emotional and physical differences of children/adolescents particularly those that are skeletally immature
- **Proper evaluation of health readiness and instruction by qualified medical professional.**
 - E.g. primary care physician (MD/DO), primary care provider (PA/NP)
 - IMO: I do not believe that Urgent Care Pre-Participations exams are adequate for evaluation as there is often little-to-none physician/provider and patient relationship to adequately know maturity level of readiness as well as to be able to discuss any co-morbid condition considerations or needed follow-ups.
- **Focus of strength training should be on resistance training.**
 - Building strong tendon insertions while allowing muscle strengthening and lengthening to allow for continue growth.
- **Training should be safe and fun!**

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How young is too young?



(10)

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Competitive Weightlifting

- The International Weightlifting Federation⁽³⁾:
 - YOUTH: 13-17 years of age
 - JUNIOR: 15-20 years of age
 - SENIOR: ≥ 15 years of age
 - MASTERS: ≥ 35 years of age
- USA Powerlifting⁽⁴⁾:
 - 8-9 years of age
 - 10-11 years of age
 - 12-13 years of age
- CrossFit⁽⁵⁾:
 - Coaching and training children from 3 to 18 years of age
 - CrossFit Open:
 - 14-15 years of age
 - 16-17 years of age

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Risks

- **Injuries**

- **Improper technique**

- Inadequately trained supervision
- Lack of supervision
- Low maturity, not accepting correction/instruction
- Speed versus quality technique

- **“Maxing out”, 1 repetition maximum (1RM)**

- Should only be performed under direct supervision of trained professionals
 - Preferably coach with USAWL, CF or other formal coaching certification
- Unless training for lifting competition, it is not necessary, and risk is not usually greater than benefit

- **Over-training**

- Inadequate rest especially when lifting training combined with other sports
- Apophysitis, apophyseal fracture, stress fracture, tendonitis, tendinosis, tendon rupture

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Benefits

- **Benefit to individual**
 - Confidence
 - Health maintenance
 - Weight maintenance
 - Increase bone density
 - Team experience and team building
- **Benefit to individual as an athlete**
 - Neuromuscular development and adaption
 - Balance; open and closed kinetic chain movements
 - Decrease over-use injuries
 - Increase strength at entheses' (growth plates)
 - Decreased injuries in other activities

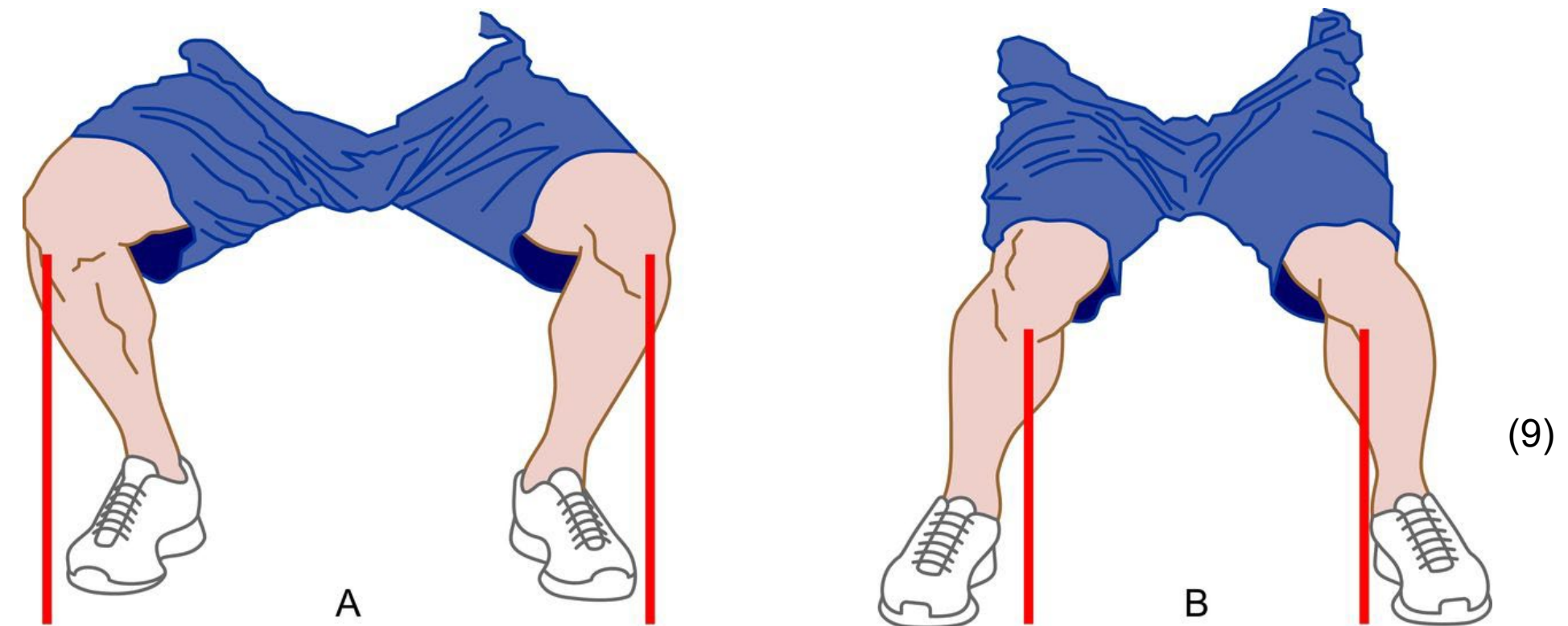
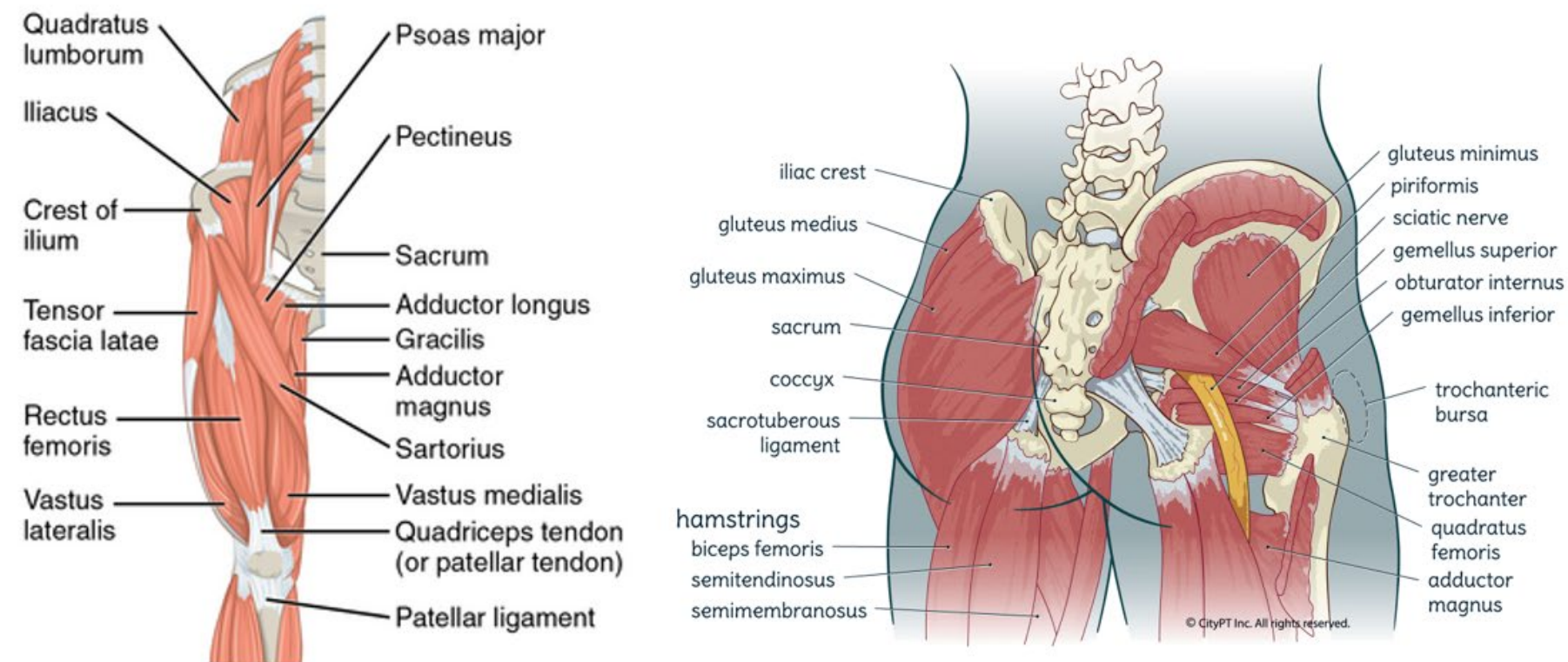
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Progressive Lifting

- Slow progression.
- Changes to program: sets, reps, and weight should occur every 2-4 weeks at soonest.
- Never increase until proper technique is observed.
- If technique is difficult to learn, re-evaluate for underlying musculoskeletal deficiencies (weak stabilizers or tight tendons)
 - Consider alternative movements to address underlying problems
- Example recommendations derived from “Resistance Training Roadmap” from the Resistance Training for Children and Adolescents Article (AAP) ⁽¹⁾:
 - **Start** by learning an individual's current level of strength:
 - Begin with 1-2 sets of 8-12 repetitions with low resistance
 - Low resistance=weight individual can complete 8-12 reps without significant fatigue ($\leq 50\%$ 1 RM)
 - Increase weight in 5%-10% increments with at least 24-48hours between each session (evaluate for delayed onset muscle soreness)
 - Reduce the number of repetitions when increasing weight to ensure proper technique and avoiding strains/injuries
 - **Maintenance:**
 - Program can be progressed to 2-4 sets of 6-12 repetitions with a low to moderate training intensity ($\leq 70\%$ 1 RM).
 - Training sessions should be 20-30minutes and performed 2-3 times per week on **nonconsecutive days**
 - Never increase rep/weight until proper technique is observed
- Only under supervision by certified coach or musculoskeletal clinical specialist (AT, PT, OT, etc.)
 - Periodic phases of lower repetition ranges (<6) at a higher training intensity ($>70\%$ 1RM)
 - 1 RM
- **CRITICAL: REQUIRED PART OF LIFTING SESSION**
 - **Dynamic warm-up** exercises before lifting to warm up muscles
 - **Cool-down** movements and stretches
- ***Make it variable and make sure athlete HAS FUN!***

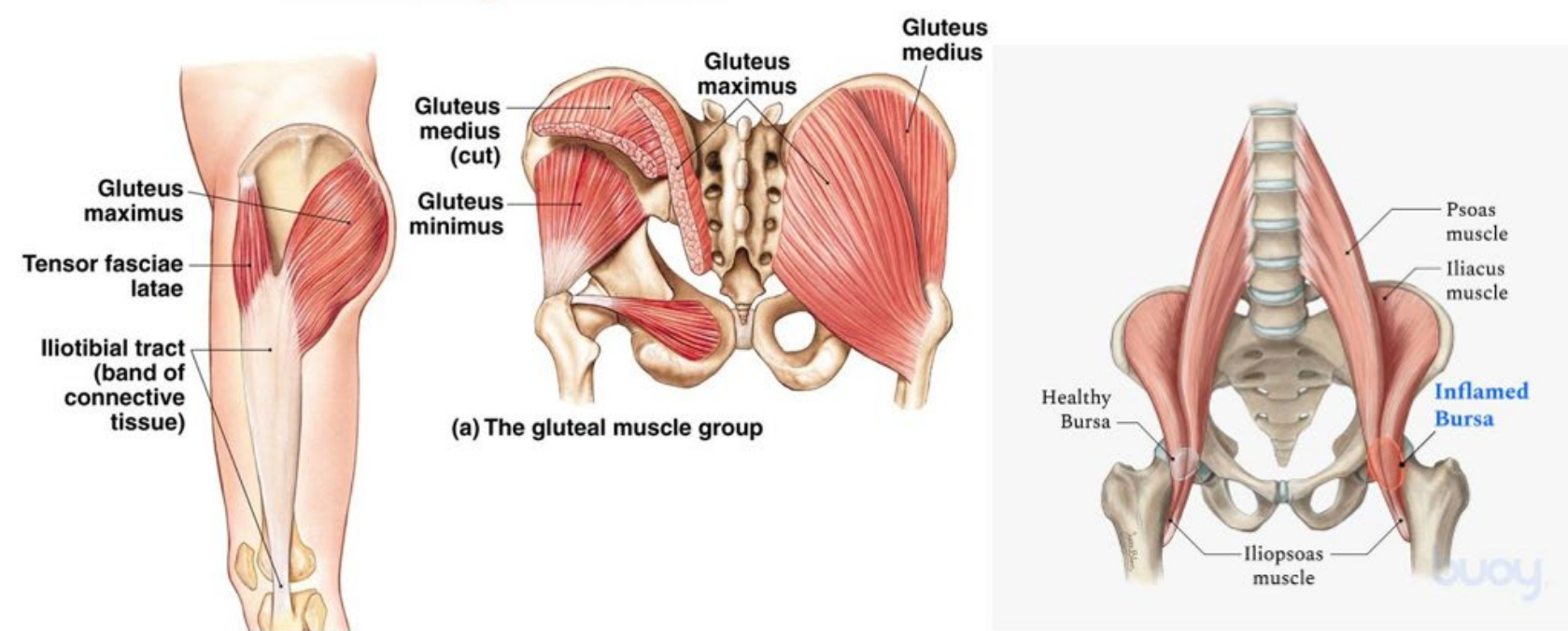
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Prepare the Core



Evaluate for:
Gluteal weakness
Gluteal Amnesia

Evaluate for:
Gluteal weakness
Gluteal Amnesia
Tight posterior chain



Core Muscles

- Abdominal muscles (oblique, transverse, rectus abdominus)
- Back muscles (paraspinals, multifidus, quadratus lumborum)
- Hip flexors: psoas, iliopsoas, rectus femoris (quad)
- Hip abductors: gluteus max/med/min, tensor fascia latae
- Hip extensors: Hamstrings



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Evaluate for pelvic core
and ankle core weakness:
Farmer Carry

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Prepare the Core



CORE ACTIVATION and STRENGTHENING

Created by OrthoNebraska Physical Therapy Jan 22nd, 2023

View at www.my-exercise-code.com using code: 76PYE9H



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DEAD BUG



While lying on your back with your knees and hips bent to 90 degrees, use your stomach muscles and maintain pelvic neutral position. Do not allow your spine to move. Imagine a string is pulling naval to ground.



Hold pelvic neutral and then slowly straighten out a leg without touching the floor. At the same time raise an opposite arm over head. Do not allow your spine to arch during this movement.

Return to starting position and then repeat on the opposite side. 1 set is completion of both sides.

Repeat 10 Times
Complete 3 Sets

Hold 3 Seconds
Perform 4 Times a Week

ALTERNATING SUPERMANS



- 1) Begin with a pad under torso (optional) and lay flat with arms and legs fully extended.
- 2) Next raise/extended opposite arm and opposite leg while maintaining neutral cervical spine.
- 3) Return to the starting position and repeat with opposite limbs.
- 4) Remember to breath during the movements and do not compensate through shoulder shrugging or arching through your back.

Repeat 10 Times
Complete 3 Sets

Hold 3 Seconds
Perform 4 Times a Week

PRONE SUPERMAN (once mastered alternating exercise above)



While lying face down, slowly raise your arms and legs upward off the ground. Then lower slowly back to the ground.

Repeat 10 Times
Complete 3 Sets

Hold 3 Seconds
Perform 4 Times a Week



WALL SITS WITH TAPS

Lower into squat position on wall. Engage the core drawing in the lumbar spine against the wall *BREATH* Can hold arms crossed touching alternating shoulder OR in front of you.

Optional: Hold 2-5lb medicine ball straight out in front of you.

Repeat 5 Times
Complete 2 Sets

Hold 15 Seconds
Perform 3 Times a Week

BRIDGING



While lying on your back with knees bent, tighten your lower abdominal muscles, squeeze your buttocks and then raise your buttocks off the floor/bed as creating a "Bridge" with your body. Hold and then lower yourself slowly. Repeat.



Repeat 10 Times
Complete 3 Sets

Hold 5 Seconds
Perform 4 Times a Week



PALLOF PRESS

Grasp a cable or resistance band of recommended weight. Step away from anchor and stand with feet shoulder width apart. Bend knees for slight squat (feeling quads and hamstring are activated, pushing knees slightly out) and place even weight through each foot. Grasp handle of cable next to your abdomen just below your chest with both hands as shown. Then exhale slowly as you press your hands away from you so your arms are straight but DO NOT ALLOW THE RESISTANCE TO PULL YOUR HANDS OUR ARMS OUT OF STRAIGHT ALIGNMENT WITH WHERE THEY STARTED AT YOUR ABDOMEN (no rotation, should feel abs, glutes, hamstring, quads, and abductors all activated). Perform 2 breaths. Slowly over 3-5 seconds return to starting position. Repeat.

Repeat 10 Times
Complete 2 Sets

Hold 3 Seconds
Perform 3 Times a Week



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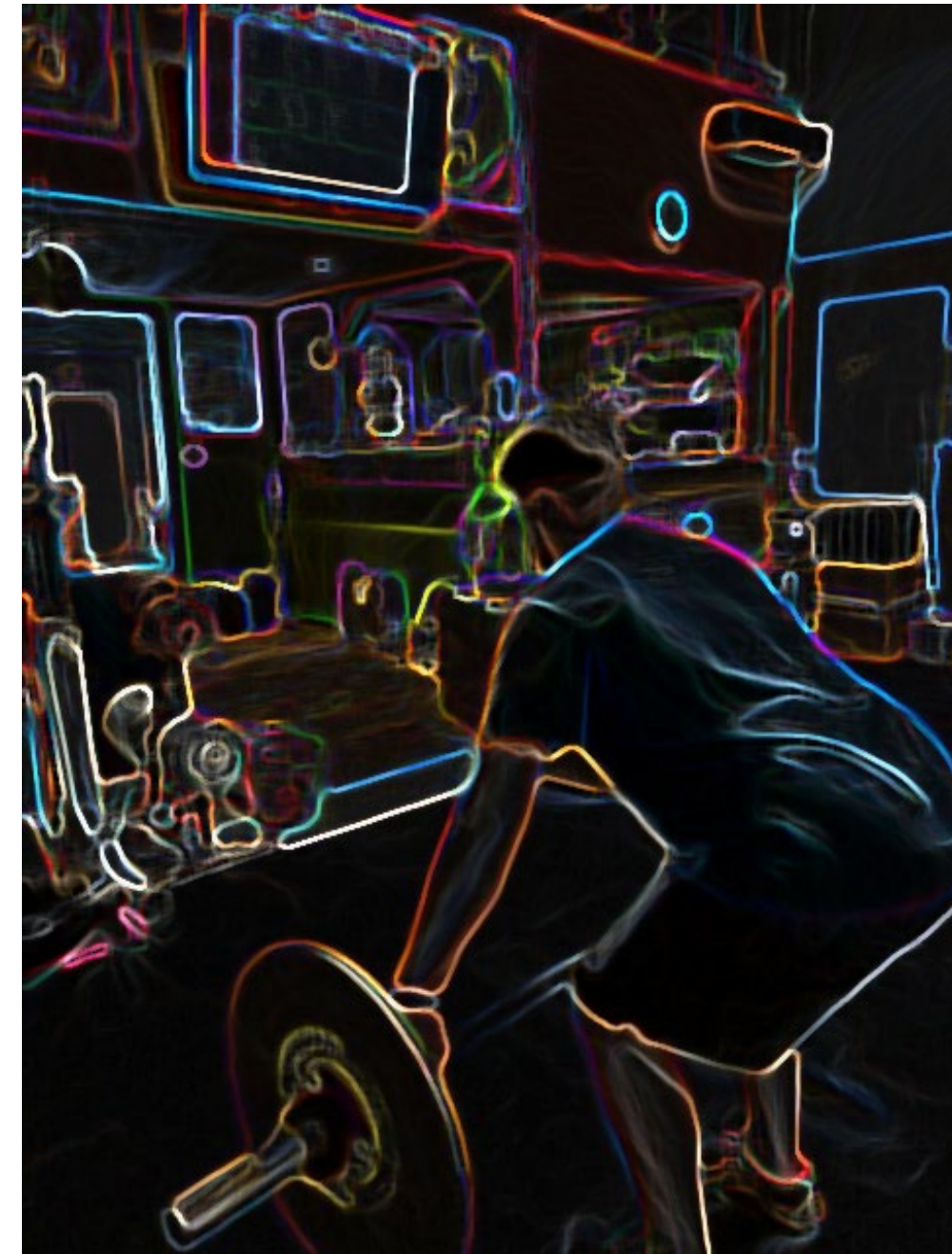
Clinical Recommendations

- Benefits of strength training in young athletes are multifactorial.
- Guidelines for safe and effective strength training in children and adolescents include:
 - Child can follow directions and accept coaching instruction.
 - Proper pre-participation exam by qualified medical professional.
 - Proper training and program variation with focus on resistance training.
 - Qualified and competent supervision emphasizing proper technique.
 - Be safe and have fun!

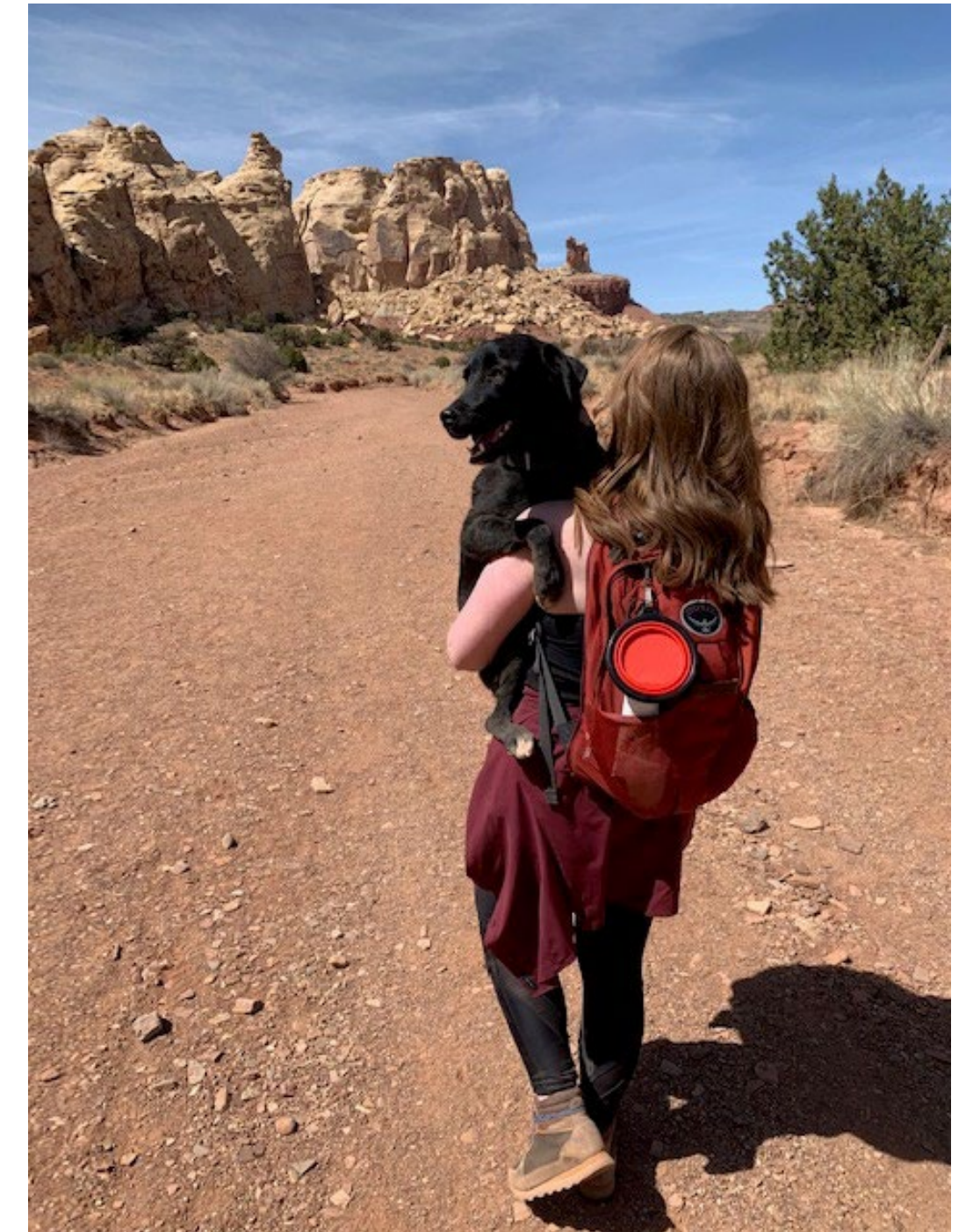
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Questions?

“Functional Powerlifting”



75lb



50lb

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Resources

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