**Strength Training for Young Athletes**

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LEARNING OBJECTIVES

After reading *Strength Training for Young Athletes*, the participant will be able to:

1. Understand an in-depth and educational review of safe and effective exercises for performance.

2. Identify the biomechanics and proper lifting techniques to increase muscular strength in young athletes.

3. Recognize how to prevent injuries in sport and recreational activities.

4. Understand common injuries and special considerations of resistance training for young athletes.

5. Identify numerous ways to increase muscular endurance and power for sport specific training.

6. Recognize corrective training techniques, flexibility and strength exercises for optimal results.

7. Know how to design resistance-training routines for various sports in and off-season programs.

8. Easily understand and identify all of the muscles functions during exercise.

9. Understand about neuromuscular maturity, bone development, and reproductive maturity for the young athlete.

10. Learn how social and personal benefits help improve body image and self-confidence.

11. Identify the best options, and consider the factors to ensure a safe training environment for all participants.

12. Recognize how to create a well-designed training program using multi and single joint exercises.
13. Understand the physical and psychological developmental stages for young athletes.

14. Identify the differences and advantages of exercise duration, and the number of training days per week to ensure training success.

15. Recognize the best types of core, replacement, injury prevention and advanced exercises needed for sport specific training programs.

16. Know how to design a periodization training model for a prepubescent child and athlete.

17. Recognize how variations such as resistance, repetitions, and sets vary accordingly based on the programming and age of young athletes.

18. Understand several professional associations and societies guidelines for strength training with children.

19. Understand functional anatomy and muscle biomechanics to safely design resistance-training programs for young athletes and children.

20. Know the safety, efficacy and positioning of power exercises and resistance training exercises for children.
CEC/CEU Test for Strength Training For Young Athletes
Please choose the BEST answer for each question.

1. Strength training can best be described as the ability to produce maximal _____.
   a. Flexion
   b. Metabolism
   c. Force
   d. Synthesis

2. A properly designed resistance-training program can _____.
   a. Help children prepare for athletic competition
   b. Provide health benefits
   c. Help prevent injury
   d. All of the above

3. In studies, children as young as _____ have benefited from some resistance-training programs.
   a. 5 years old
   b. 6 years old
   c. 7 years old
   d. 8 years old

4. A short-term resistance-training program for children of about 8-20 weeks, can often result in strength gains of _____to _____ percent.
   a. 10 - 20
   b. 20 - 30
   c. 30 - 50
   d. 60 – 80
5. Initial strength changes usually result from low volume training. Low volume can be best described as _____.
   a. Sets times reps times load
   b. Performing the same exercises
   c. All multi-joint exercise
   d. Simple range of motion

6. A variety of progressive-resistance programs seem to work very well for untrained children over _____ periods of time.
   a. Long
   b. Short
   c. Various
   d. Interval

7. Approximately _____ percent of boys and _____ percent of girls in America play organized sports.
   a. 20 - 20
   b. 40 - 20
   c. 75 - 50
   d. 50 - 25

8. A well-designed resistance program can help children develop _____.
   a. Concentration to detail
   b. Poise under fatigue
   c. Positive characteristics
   d. All of the above

9. Becoming muscle bound as a result of resistance training is _____.
   a. Probable
   b. Not possible
   c. Absolutely true
   d. A myth

10. The key component to hooking a child on a weight training or resistance program is _____.
    a. Pure luck
    b. Parental genetics
    c. Seeing progress
    d. Performing the same exercises
11. Resistance training for young athletes or children, is a process designed to meet the ever-changing training _____ of a child.
   a. Needs
   b. Wants
   c. Desires
   d. Goals

12. According to the NEISS report, the most common training injuries in young athletes are _____.
   a. Ankles
   b. Joints and tendons
   c. Sprains and strains
   d. Muscle tears

13. Generally, the risk of injury associated with resistance programs is _____ for children than adults.
   a. Greater
   b. Less
   c. Similar
   d. Incidental

14. An area of concern for children who weight train is the potential damage to _____.
   a. A single joint
   b. Growth plates
   c. Nerve compression
   d. Overuse syndrome

15. Another concern about resistance training in children is the potential for _____.
   a. Soft tissue injuries
   b. Damage to the epiphyses
   c. Fracture of the lumbosacral
   d. All of the above
16. A study of adolescent power lifters using near maximal resistance, revealed that 50 percent of the injuries were to the _____.
   a. Upper extremities
   b. Low back
   c. Knees
   d. Lower extremities

17. _____ is described as how fast a force can be applied over a range of motion.
   a. Strength
   b. Power
   c. One RM
   d. Plyometrics

18. The NSCA position continues to recommend that prepubescent children should weight train with weights they can lift at least _____ repetitions.
   a. Six
   b. Eight
   c. Ten
   d. Twelve

19. Which lift is NOT a competition power lift?
   a. The squat
   b. The dead lift
   c. The bench press
   d. The overhead press

20. A good strength-training program does NOT rely on _____.
   a. Comprehension
   b. Militaristic discipline
   c. Preparation
   d. Core assessment

21. Which segment of the body is the first to adapt to exercise stimuli?
   a. Dendrites
   b. Joints
   c. Connective tissue
   d. The central nervous system
22. Hypertrophy is another word for _____.
a. Increase in muscle size
b. Increase in muscle cell size
c. Neither
d. Both

23. A well-trained nervous system is highly capable of better stimulation of _____. to produce force.
a. PNF
b. Muscles
c. Static resistance
d. Neuromuscular facilitation

24. Prepubescent children usually lack growth factors and _____. to help stimulate hypertrophy.
a. Androgens
b. Proteins
c. Amino acids
d. Anti-oxidants

25. Testosterone is _____. to _____. times lower in concentration in girls compared to boys.
a. 50 - 100
b. 10 - 20
c. 10 - 30
d. 25 - 50

26. The word anabolic can be best described as _____.
a. To build
b. To reproduce
c. A precursor
d. A stimulant

27. All of the major organizations that support resistance training for children promote the following concepts EXCEPT _____.
a. Training should be individualized
b. Warm up and cool down periods should be used
c. Proper spotting techniques should be used
d. It should impose hard work
28. Physical and psychological differences in children is a result from what biologists refer to as _____.
   a. Active release technique
   b. Nurture or nature
   c. Mass to power ratio
   d. None of the above

29. _____ is a motor learning term for the number of trials performed in learning a skill.
   a. Motor patterns
   b. Electronic muscle stimulation
   c. Mass practice
   d. System characteristics

30. Another word for genetic potential is _____.
   a. Neuromuscular maturity
   b. Phenotypic expression
   c. Genotype
   d. Beta

31. From the onset of birth, all children grow at different rates. Growth occurs in what is called a _____.
   a. Pulsatile
   b. Magnum
   c. Midas
   d. Oasis

32. Which one is a modifying factor that can affect bone development and maturation?
   a. Exercise
   b. Disease
   c. Menarche
   d. All of the above

33. The greatest bone mineral content peaks occur in boys from ages _____ to _____.
   a. 11 - 13
   b. 12 - 14
   c. 13 - 15
   d. 14 - 16
34. Peak muscle mass in women occurs between the ages of _____.
   a. 18 - 25
   b. 16 - 23
   c. 20 - 27
   d. 25 - 30

35. The number of muscle cells is _____ in girls when compared to boys.
   a. The same
   b. Less than
   c. Greater than
   d. A one to two ratio

36. Adolescent boys who have been training for at least _____ were able to increase their blood testosterone levels following a resistance-training program.
   a. Six months
   b. One year
   c. 18 months
   d. Two years

37. Degeneration of the bone where the patella tendon attaches to the tibia is known as _____.
   a. Worn cartilage
   b. A medial meniscus tear
   c. Osgood-Schlatter disease
   d. Joint disease

38. Which is NOT one of the three major muscle actions?
   a. Isometric
   b. Dynamic concentric
   c. Eccentric dynamic
   d. Dynamic eccentric

39. During a _____ action, the muscle contracts but no movement takes place.
   a. Dynamic
   b. Isometric
   c. Eccentric
   d. Eccentric dynamic
40. What type of action takes places when the muscle contracts and shortens, and movement occurs?
   a. Dynamic concentric
   b. Eccentric contraction
   c. Dynamic eccentric
   d. Internal rotation

41. What type of action takes place during a lift when the muscle is active and lengthens?
   a. External rotation
   b. Internal rotation
   c. Dynamic eccentric
   d. None of the above

42. What type of training involves the lowering of a weight with the load greater than can be lifted concentrically?
   a. Eccentric only
   b. Dynamic only
   c. Static only
   d. Eccentric dynamic only

43. Research has demonstrated that using both _____ and _____ motions in repetitions will help achieve better strength gains.
   a. Concentric / eccentric
   b. Dynamic / static
   c. Static / eccentric dynamic
   d. Dynamic eccentric / dynamic

44. The breakdown of stored carbohydrates (glycogen) without the use of oxygen produces _____.
   a. Adenosine tri-phosphate
   b. Creatine phosphate
   c. Lactic acid
   d. Adenosine-di-phosphate
45. If the energy source being used is aerobic, then the muscular contraction is _____ and the duration of the activity is _____.
   a. Maximal - very short
   b. Near maximal – moderate
   c. Sub maximal - long
   d. Sub maximal - near maximal

46. Growth cartilage at the apophyseal insertions ensures a solid connection between the _____ and _____.
   a. Tendon – bone
   b. Bicep- Scapula
   c. Trapezius - deltoid
   d. None of the above

47. According to data from the President’s Council on Physical Fitness and Sports, _____ percentage of girls between 6 to 17 years old cannot perform one pull-up.
   a. Twenty
   b. Forty
   c. Sixty
   d. Eighty

48. _____ is known as a popular way of varying the training volume and intensity of an adult’s workout.
   a. Plyometrics
   b. Periodization
   c. Speed training
   d. Active rest

49. When designing a strength-training model for a prepubescent child, they should use _____ and _____ repetitions.
   a. 3 sets and 10 to 15
   b. 3 sets and 6 to 10
   c. 2-3 sets and 6 to 8
   d. 1-2 sets and 6 to 8
50. If the training session is designed to maintain gains in strength and power, then rest periods should be _____.
   a. Less than 30 seconds  
   b. Less than one minute  
   c. At least two minutes  
   d. 90 to 120 seconds

51. Medicine ball training provides a type of _____ training.
   a. Plyometric  
   b. Isometric  
   c. Static resistance  
   d. Interval

52. Schedule issues may affect the frequency of training, however training fewer than _____ days a week may not be optimal.
   a. Three  
   b. Four  
   c. Five  
   d. None of the above

53. Common motor performance tests for children are _____ and _____.
   a. Bench press – squats  
   b. Sprints – jumps  
   c. Push ups – sit-ups  
   d. Core assessments - lateral movements

54. When setting up the resistance training facility, how many feet should separate each piece of equipment.
   a. Four  
   b. Six  
   c. Eight  
   d. Ten

55. Increased blood lactate levels are due to a _____.
   a. Increase in proteins  
   b. Increase in carbohydrates  
   c. Increase in amino acids  
   d. By-product of lactic acid
56. Which one is NOT a factor involving proper exercise technique.
   a. Giving lifters feedback
   b. Use of collars
   c. Spotting technique
   d. Athleticism

57. A weak lower back may result in _____ when performing a squat.
   a. Improper foot stance
   b. Planter-flexion
   c. Rounding of the back
   d. Excess stress on the tibia

58. The major goal of the spotting is _____.
   a. Encourage the lifter in performance
   b. Prevent injury
   c. Determine technique
   d. Count repetitions

59. Dynamic lifts such as power cleans are generally not spotted because they are performed at _____.
   a. Low velocity
   b. Medium velocity
   c. High velocity
   d. No velocity with intervals

60. Which one is NOT one of the major types of grip used with a barbell?
   a. Mixed
   b. Cross
   c. Underhand
   d. Overhand

61. When performing a T-bar row exercise, the machines center of rotation is located _____ the feet of the lifter.
   a. Near
   b. Well behind
   c. Well in front of External rotation of the humerus
   d. 45 degrees to
62. An example of a unilateral exercise is _____.
   a. Single leg knee curls
   b. Single leg knee extensions
   c. Most dumbbell exercises
   d. All of the above

63. A single joint exercise requires the action of _____ muscle group(s) as a prime mover.
   a. Two
   b. Three
   c. One
   d. Zero

64. Multi joint exercises are often used to train the muscles of the _____.
   a. Upper back
   b. Forearms
   c. Biceps
   d. Calves

65. Leaning back to start the exercise is often a common technique error for which exercise?
   a. Bent-over dumbbell laterals
   b. Superman exercise on a Swiss ball
   c. Lat pull-down
   d. Front lateral raise

66. Which is an example of a multi-joint upper body exercise?
   a. Barbell bench press
   b. Machine overhead press
   c. Seated machine row
   d. All of the above

67. The most effective exercise for the latissimus dorsi is _____.
   a. The bar not raised all the way up
   b. Pulling the bar down behind the head
   c. Alternating pulling the bar behind the head and to the chest
   d. Pulling the bar down to the top of the chest
68. When performing a seated cable row, the lifter sits on the seat with the torso forming a _____ degree angle with the thighs.
   a. 90
   b. 50
   c. 45
   d. 100

69. When performing a barbell bent over row, the lifter bends forward from the waist so the torso is at a _____ degree angle to the floor.
   a. 90
   b. 45
   c. 0
   d. 100

70. A common technique error when performing a pull-up is _____.
   a. Failing to extend the elbow at the end of repetition
   b. Raising the legs to start the pulling motion
   c. Failure to get the chin above the bar
   d. All of the above

71. Which muscle is NOT trained when performing a machine bench press?
   a. Pectoralis minor
   b. Anterior deltoid
   c. Triceps
   d. Bicep femoris

72. If a lifter feels shoulder pain during a machine decline press at the chest touch position, they should _____.
   a. Keep the upper arms closer to the torso
   b. Keep the upper arms farther away from the torso
   c. Use a mixed grip to neutralize the movement
   d. Adduct the radial head of the deltoid to a different position

73. When performing a barbell incline press, the proper hand positioning should be _____.
   a. Shoulder width
   b. Slightly wider than shoulder width
   c. Slightly less than shoulder width
   d. In centerline with the sternum
74. When performing a barbell overhead press, the elbows are ____ the barbell.
   a. In front of
   b. Directly below
   c. Both A and B
   d. None of the above

75. When performing a barbell overhead press, the knees ____.
   a. Form a right angle to the lifter
   b. Are at 90 degrees
   c. Are hyper-extended
   d. Are slightly bent

76. What type of grip should be used if the lifter feels shoulder pain while doing a machine overhead press?
   a. Palms facing each other
   b. Palms facing the lifter
   c. Back of the hand facing the lifter
   d. A mixed grip

77. When designing a routine for adolescent children, what machine is excellent for increasing strength of the lower back and hips?
   a. Seated leg extension
   b. Hyperextension
   c. Lat pulldown
   d. Decline press

78. The hands are approximately ____ apart while doing a barbell upright row.
   a. 4 inches
   b. 6 inches
   c. 8 inches
   d. 12 inches

79. Which of the following is considered a variation of a squat?
   a. The body weight squat
   b. The free weight squat
   c. The resistive ball squat
   d. All of the above
80. Which of the following is NOT a multi-joint lower body exercise?
   a. Dumbbell lunge
   b. Hip sled
   c. Leg extension
   d. Dumbbell squat

81. The rotator cuff is a group of muscles that rotate and stabilize the upper arm or _____ in the shoulder joint.
   a. Posterior deltoid
   b. Humerus
   c. Anterior deltoid
   d. Radial tuberosity

82. Which one is NOT a muscle trained in rotator cuff exercises?
   a. Teres minor
   b. Infraspinatus
   c. Front deltoid
   d. Subscapularis

83. Using the hands to push the pads on a peck dec instead of the elbows, allows more use of the _____.
   a. Posterior deltoid
   b. Anterior deltoid
   c. Minor rhomboids
   d. Major rhomboids

84. The straight bar emphasizes the _____ when performing a two arm triceps push down.
   a. Long head
   b. Short head
   c. Lateral and long head
   d. Short and long head

85. When performing a dumbbell triceps kickback, the proper starting position is _____.
   a. The opposite hand and knee are on the bench
   b. The same hand and knee are on the bench
   c. No knee is on the bench
   d. None of the above
86. Which upper back muscles are trained in the bench dip?
   a. Rhomboids
   b. Latissimus dorsi
   c. Both A and B
   d. Neither A nor B

87. When performing a shoulder internal rotation exercise, the elbow of the arm with which the dumbbell is held is at a _____ degree angle.
   a. 180
   b. 120
   c. 60
   d. 90

88. The seated calf raise exercise puts the most amount of emphasis on the_____.
   a. Achille’s tendon
   b. Soleus
   c. Gastrocnemius
   d. Posterior tibialis

89. During a seated leg extension, the lifter’s toes should be _____.
   a. Relaxed
   b. Dorsiflexed
   c. Planterflexed
   d. Ridged

90. The torso should hang down and form a _____ degree angle with the legs on a back extension machine exercise.
   a. 15
   b. 45
   c. 60
   d. 90
91. When a child performs an advanced exercise such as a power clean, the amount of resistance used should always allow _____ or more repetitions.
   a. 6
   b. 8
   c. 10
   d. 12

92. When performing a dead lift or a power clean, make sure the bar_____the body at all times.
   a. Is far away from
   b. Is a few inches from
   c. Touches
   d. None of the above

93. When designing an off-season program for alpine skiing, always use _____ for the single joint exercises.
   a. More repetitions
   b. 8 to 10 RM
   c. Lower weights
   d. All of the above

94. When designing an off-season program for baseball, the lifter should rest for _____ between sets for large muscle groups, and for _____ for small muscle groups.
   a. One minute – Two minutes
   b. Two minutes – one minute
   c. Two minutes - 90 seconds
   d. 90 seconds – 60 seconds

95. When designing an in season program for baseball, abdominal exercises should consist of _____.
   a. 20 – 30 repetitions
   b. 30 – 50 repetitions
   c. Zero abdominals in season
   d. None of the above
96. When creating a routine and modifying all the exercises for children, ideally its best to increase stress on ____.
   a. Attachments
   b. Ligaments
   c. Muscles
   d. Tendons

97. Blood lactate is a by-product of ____.
   a. Aerobic threshold
   b. An-aerobic metabolism
   c. Protein synthesis
   d. Creatine

98. When designing a pre season program for football, the lifter should rest for ____ between sets.
   a. One to 1.5 minutes
   b. Two minutes
   c. Two to three minutes
   d. 30 seconds

99. Which of the following is NOT a core exercise for a golf program?
   a. Bench presses
   b. Squats
   c. Lateral raises
   d. Lunges

100. To help develop and increase intensity to a well-designed program for swimmers, the rest period between sets should be ____.
    a. Less than one minute
    b. Less than 30 seconds
    c. Only supersets
    d. Only in intervals