

High Powered Plyometrics

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HOW TO COMPLETE THIS PROGRAM

Thank you for choosing Exercise ETC's home study for your continuing education needs.

To earn your CEC's/CEU's you will need to read the enclosed book High Powered Plyometrics by James Radcliffe and Robert Farentinos. After you have read the book, complete the test questions and record your answers on the enclosed answer sheet. Remember to choose the best or most correct answer. Finally, mail the test answer sheet and the evaluation form back to Exercise ETC. The address is:

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LEARNING OBJECTIVES

After reading High Powered Plyometrics by James Radcliffe and Robert Farentinos, the participant will be able to:

1. Understand the scientific concepts of developing explosive power.
2. Explain the phases of the stretch- shortening cycle.
3. Define the components involved in the stretch- shortening cycle.
4. Explain the planning process associated with implementing a plyometric program.
5. Describe the elements of evaluation in imitating plyometric program design.
6. Identify equipment, facilities and attire associated with plyometric training.
7. Explain guidelines to assure safe and appropriate performance.
8. Identify tests to evaluate readiness and performance changes in program development.
9. Explain biomechanical alignment and technique of plyometric exercises.
10. Understand the concept of single response and multiple response drills.
11. Explain the volume intensity relationship in plyometric program design.
12. Describe complex training.
13. Define jumps in place, standing jumps, hops, bounds and depth jumps.
14. Identify plyometric exercises for the lower body, legs, and hips.
15. Identify plyometric exercises for the trunk and upper body.
16. Explain progressions of program design for plyometric training.
17. Explain the integration of plyometrics into a year round training program.



CEC/CEU TEST FOR: High Powered Plyometrics

Please choose the best answer. Put all answers on the answer sheet.

QUESTIONS FOR HIGH POWERED PLYOMETRICS

1. The term “Plyometric” translated from the Greek language means to:
 - a. jump higher and move faster
 - b. decrease time
 - c. increase more length
 - d. explode greater and farther
2. The plyometric concept was implemented into training programs in the 1960’s by:
 - a. Radcliffe
 - b. Verkhoshansky
 - c. Burkhardt
 - d. Farentinos
3. Power is defined as:
 - a. application of force through a range of motion per unit of time
 - b. speed, strength and work
 - c. force times distance
 - d. mass times force
4. In eccentric muscle actions:
 - a. muscle maintains it’s original length
 - b. muscle undergoes tension and lengthens
 - c. muscle releases tension and lengthens
 - d. muscle releases tension and shortens

5. In concentric muscle contractions the work performed is called:
- a. isometric
 - b. negative
 - c. positive
 - d. explosive
6. When performing an eccentric muscle action the:
- a. internal force is equal to the external force
 - b. internal force is greater than the external force
 - c. external force is greater than the internal force
 - d. external and internal forces are exactly the same
7. Every movement in the direction of gravity is under the control of a/an
- a. concentric muscle contraction
 - b. eccentric muscle action
 - c. isometric muscle action
 - d. isotonic muscle contraction
8. Which of the following is a **TRUE** statement regarding muscle actions:
- a. there is more motor activation in eccentric muscle actions
 - b. more oxygen consumption in eccentric muscle actions
 - c. higher mechanical efficiency in concentric muscle actions
 - d. energy cost of negative work is less than that of positive work
9. In eccentric muscle actions performed at moderate to high speeds:
- a. slow twitch fibers are activated
 - b. type-I fibers are recruited
 - c. fast twitch fibers are preferentially recruited
 - d. type- II fibers are exclusively recruited
10. Force production during an eccentric muscle action is greater because:
- a. more fast twitch fibers are available
 - b. higher mechanical output available
 - c. more hormonal production and recruitment of muscle fibers
 - d. higher tension at the point of the muscles insertion

11. The amount of deformation on a muscle is called:
- a. tension
 - b. force
 - c. strain
 - d. load
12. The property of muscle tissue that enables a greater muscular tension is known as:
- a. stretch response
 - b. stretch reflex
 - c. inhibition
 - d. proprioception
13. The concept of pre-stretch refers to:
- a. muscles natural resting length
 - b. concentric shortening of the muscle
 - c. stretching statically before an activity
 - d. stretch lengths slightly greater than resting lengths
14. Muscle strength is defined as:
- a. maximum force or tension a muscle can generate
 - b. force times distance
 - c. work divided by time
 - d. mass times velocity
15. The concept of elasticity is:
- a. muscles ability to deform and create muscle stiffness
 - b. to use strain to react in the original direction with greater force
 - c. to pre-stretch a muscle followed by a slow controlled maximum force
 - d. post activation potentiation of muscle fibers shortened through max force
16. Stored elastic energy is directly related to the:
- a. concentric shortening of muscle
 - b. eccentric pre stretch of the agonist muscle
 - c. energy that the muscle dissipates as heat during a muscle contraction
 - d. energy that is stored as a result of maximal isometric tension of a muscle fiber

17. When the eccentric contraction stretches a muscle's length, and the concentric muscle action is performed immediately after it is termed?
- a. stretch reflex
 - b. kinetic energy
 - c. stretch-shortening cycle
 - d. plyometrics
18. The concept of elastic- reactive refers to:
- a. time frame from the concentric to the eccentric contraction
 - b. time frame from the eccentric to the concentric contraction
 - c. potentiation of type I fibers
 - d. myotatic potentiation
19. The proprioceptive mechanisms responsible for muscular contraction are:
- a. golgi tendons
 - b. muscle spindles
 - c. potentiation fibers
 - d. type II fast twitch fibers
20. The amortization phase of the stretch-shortening cycle is characterized by:
- a. time that elapses between the concentric and eccentric contractions
 - b. time that elapse between the eccentric and concentric contractions
 - c. length of the time between the pre-stretch of the muscle and the eccentric contraction
 - d. length of time between the positive and negative phases of muscular contraction
21. If the amortization phase of the stretch-shortening cycle is slow:
- a. elastic energy dissipates as heat
 - b. elastic energy translates to kinetic energy
 - c. force production is translated to greater power
 - d. the concentric muscle action will create greater force production
22. In the eccentric muscle action, the elastic component of muscle is utilized more effectively if the:
- a. magnitude of the pre- stretch is greater
 - b. length of the pre-stretch is greater
 - c. rate of pre-stretch is greater
 - d. exchange duration is maximal

23. Training with a pre-stretch improves primarily the efficiency of which of the following systems?
- a. muscular system
 - b. musculoskeletal system
 - c. neuromuscular system
 - d. integumentary system
24. The ability to reach maximum strength during the movement in a brief time is referred to as:
- a. explosive power
 - b. reactive force
 - c. acceleration
 - d. speed-strength
25. The fundamental prerequisite to develop power is:
- a. muscular endurance
 - b. muscular hypertrophy
 - c. muscular strength
 - d. muscular peak time to tension
26. Which of the following are types of overload available to plyometric training?
- a. open chain, closed chain, complex chain
 - b. static, active, dynamic
 - c. single plane, bi-planer, multi-plane
 - d. resistive, spatial, temporal
27. Which of the following overload principles would be used when performing a movement very rapidly with high intensity?
- a. open chain
 - b. dynamic
 - c. multi-plane
 - d. temporal
28. Prepubescent children should not perform intense plyometric exercises primarily because they:
- a. have not reached puberty
 - b. do not have the emotional maturity
 - c. are in the growth process and their musculoskeletal system have not fully developed
 - d. will not obtain any benefits based upon the research

29. At which of the following age ranges are moderate intensity plyometrics suggested for preparation for future strength training?
- a. 10-12 –years
 - b. 12-14- years
 - c. 14-16- years
 - d. 16-18- years
30. The rate of concentric action is commonly refer to as:
- a. amortization phase
 - b. stretch-shortening
 - c. summation phase
 - d. coupling time
31. The delay time between the cessation of the eccentric phase and onset of concentric muscle action is known as:
- a. stretch reflex
 - b. coupling time
 - c. synchronization rate
 - d. stretch-shortening rate
32. The optimal time frame from the cessation of the eccentric and onset of the concentric muscle action is:
- a. nano second
 - b. one- tenth of a second
 - c. one-half of a second
 - d. one-second
33. Which of the following has the shortest amortization and summation phases to perform the activity?
- a. bounding
 - b. squat jumping
 - c. depth jumping
 - d. sprinting
34. The key marker to determine when to use the overload process in plyometric training is:
- a. assessments
 - b. strength levels
 - c. quality of technique
 - d. distance covered

35. Which of the following is the ideal surface to perform plyometric training?
- a. concrete
 - b. grass
 - c. mini tramp
 - d. water
36. Which of the following would **NOT** be an appropriate surface for plyometric training?
- a. hardwood floors
 - b. aerobic studios
 - c. tarten floor
 - d. 3 inch floor mats
37. Angle boxes are used for which of the following exercises?
- a. depth jumps
 - b. vertical jumps
 - c. stand in place jumps
 - d. lateral jumps
38. The starting height of plyometric boxes start at:
- a. 5 inches
 - b. 8 inches
 - c. 10 inches
 - d. 12 inches
39. The recommendations for the weights of medicine balls for plyometric training are:
- a. 2-3 pounds for single-limb work and 8-10 pounds for total body exercises
 - b. 3-4 pounds for single limb work and 12-15 pounds for total body exercises
 - c. no greater than 15% of bodyweight
 - d. one pound for every 30 pounds of body weight
40. When performing plyometric training on stair steps the height of the steps should be:
- a. no more than 6 to 8 inches high
 - b. 8 inches
 - c. 10 inches
 - d. 12 inches

41. The concept of specificity is implemented by warming up prior to a plyometric training session by performing the following:
- a. static stretching
 - b. jogging
 - c. PNF stretching
 - d. dynamic flexibility and technical form running
42. The following are examples of “Dynamic Work”:
- a. squats, jerks, loaded sprints
 - b. jumps, throws, starts
 - c. jog, skip, crawl
 - d. agility, recovery strides
43. A prerequisite of lower body strength to perform depth jumps would be:
- a. squat body weight
 - b. for women, squat body weight, for men two times body weight
 - c. squat 1.5 to 2 times body weight
 - d. leg press 2 times body weight
44. When performing plyometric exercises the foot should contact the surface:
- a. on the toe
 - b. on the heel
 - c. with full to mid forefoot
 - d. with a toe to heel relationship
45. Using sensible teaching progressions, which plyometric exercise would be taught first?
- a. hopping
 - b. squat jump
 - c. split jump
 - d. ankle flip
46. Which of the following plyometric training progressions would be moving from simple to complex?
- a. torso counter-movements to full leg movements to lower leg
 - b. lower leg movements to full leg to torso counter movements
 - c. full leg movements to lower leg to torso counter-movements
 - d. squat jump to knee tuck to pogo

47. When using medicine balls for plyometric training which of the following is the most appropriate progression?
- a. passing, tossing, throwing
 - b. tossing, passing, throwing
 - c. swinging, passing, tossing
 - d. swinging, passing, repetitive throws
48. Which of the following is the most appropriate breathing technique when performing a plyometric movement?
- a. inhale during the stretch phase
 - b. exhale during the stretch phase
 - c. exhale during descent
 - d. exhale once shortening has been executed
49. Specificity as it applies to implementing plyometric training refers to:
- a. performing movement patterns associated with the activity
 - b. performing amplitudes and intensities corresponding to action sequences of the activity
 - c. performing force production activities with dynamic correspondence
 - d. performing unidirectional movement patterns associated with the demands of the activity
50. Performing plyometric jumps "undamped" means:
- a. without delay
 - b. with more coupling time
 - c. with more flexion
 - d. without potentiation
51. All progressions and advancement in the stretch-shortening cycle exercise execution should stress :
- a. toe heel landing position
 - b. plantar flexion
 - c. active tension upon landing
 - d. hip extension

52. In an effort to minimize ground reaction time and promote undamped, high tension, optimum-impulse takeoffs, you want to:
- a. flex the hips and knees and tense the stretch components
 - b. extend the knees and hips and dorsi flex the ankle
 - c. extend the knees and hips and plantar flex the ankle
 - d. flex the hips and knees and relax the stretch components
53. To obtain as quick of a release as possible on landing when performing plyometric exercises:
- a. land on toes
 - b. land on the ball of foot
 - c. roll the foot from heel to toe
 - d. dorsi flex the foot and lock the ankle
54. Blocking or Thumbs-up Rule refers to the following:
- a. flexing the shoulders and extending the elbow
 - b. arms project in a forward and upward motion
 - c. hands in a neutral position with thumbs up, arms in a forward and upward punching motion
 - d. palms of the hand in a pronated position, shoulder rotation and flexion with elbow extension
55. In order to initiate a more forceful follow-through with movements involving the upper body:
- a. absorb the force through a greater range of motion
 - b. prevent the motion from going beyond full flexion or extension
 - c. generate force from the surface up
 - d. relax the upper extremities
56. Delayed-onset muscle soreness (DOMS) has been specifically related to which of the following muscle actions?
- a. concentric
 - b. isometric
 - c. isotonic
 - d. eccentric

57. Individuals with no or little training status may require how many days to repair musculoskeletal tissue as a result of plyometric training?
- a. 2 days
 - b. 3 days
 - c. 5 days
 - d. 7 days
58. When developing plyometric training programs the following is true regarding volume and intensity.
- a. they are inversely related
 - b. they are directly related
 - c. they are significantly the same
 - d. their relationship is curvilinear in nature
59. Which of the following is an example of a single-response drill?
- a. lateral jumps
 - b. sprint
 - c. takeoff
 - d. 2 sets of 2 repetitions of an explosive medicine ball toss
60. Which of the following is an example of a multiple-response drill?
- a. depth jump
 - b. vertical jump
 - c. triple jump
 - d. standing jump
61. To create maximum velocity of a movement you must:
- a. increase power
 - b. increase force
 - c. maximize force and minimize time
 - d. maximize ground reaction and minimize potentiation
62. Plyometric exercises of low impact and landing require how much rest/recovery between bouts?
- a. 30 to 60 s.
 - b. 1 to 2 min.
 - c. 2 to 3 min.
 - d. a 1 to 1 ratio

63. Depth jumps require how much rest/recovery between bouts?
- a. 30 to 60 s.
 - b. 1 to 2 min.
 - c. 2 to 3 min.
 - d. a 2 to 1 ratio
64. The frequency of plyometric training should be limited to how many days a week?
- a. 1 to 2 days
 - b. 2 to 3 days
 - c. 3 to 4 days
 - d. no more than 4 days
65. When training plyometrics and strength on the same day with the priority being speed/strength the following applies:
- a. plyometrics will have a lower volume and will be performed first
 - b. strength will have a higher volume and will be performed first
 - c. plyometrics will have a higher volume and will be performed first
 - d. strength will have a higher volume and will be performed last
66. Which of the following is NOT an example of “complex training”?
- a. hang clean followed by a jerk
 - b. squat followed by a depth jump
 - c. bench press followed by a medicine ball chest pass
 - d. snatch followed by bounds
67. Which of the following quantities is developed when performing depth jumps from a height of 29 inches?
- a. explosive power
 - b. speed
 - c. strength
 - d. dynamic strength
68. At what height does research suggest that there is little value to obtain the benefits of depth jumps?
- a. 16 to 24 inches
 - b. 25 to 30 inches
 - c. 32 to 40 inches
 - d. greater than 43 inches

69. Jumps are defined as:

- a. triple extension of the hip, knee, and ankle
- b. takeoff movement landing on two feet
- c. vertical displacement
- d. movement that requires projection of both the upper and lower extremities to gain elevation

70. The difference between squat jumps and counter jumps is that counter jumps require a:

- a. maximal force production
- b. controlled landing
- c. pre-stretch movement
- d. greater strength

71. The most appropriate progressions for jump training would be:

- a. depth jumps, squat jumps, countermovement jumps
- b. squat jumps, countermovement jumps, depth jumps
- c. countermovement jumps, depth jumps, squat jumps
- d. countermovement jumps, squat jumps, depth jumps

72. Which of the following jumps are characterized by high volume low intensity:

- a. in-place jumps
- b. long jumps
- c. standing jumps
- d. meso-endurance jumps

73. In jump training with the eventual outcome to develop explosive power what would be the most appropriate training progression?

- a. in-place jumps, long jumps, short-end jumps
- b. long jumps, in-place jumps, meso-endurance jumps
- c. meso-endurance jumps, in-place jumps, long jumps
- d. in-place jumps, meso-endurance jumps, long jumps

74. In jumps that have a horizontal component, the overload in volume is related to which of the following principles?

- a. resistive overload
- b. spatial overload
- c. temporal overload
- d. force overload

75. When performing meso-endurance jumps, the overload is consistent with which of the following principles?
- a. resistive overload
 - b. spatial overload
 - c. temporal overload
 - d. force overload
76. Which of the following defines bounding?
- a. exclusively moving the feet together
 - b. movement taking off from one leg and landing on the other
 - c. movement taking off on one leg and landing on the same leg
 - d. exclusively moving in an alternate fashion to gain vertical height
77. In terms of teaching bounding progressions, which of the following would use for base development?
- a. single leg bounds
 - b. alternate bounds
 - c. galloping
 - d. sprinting
78. Which of the following is an example of a hopping movement?
- a. skipping
 - b. prancing
 - c. galloping
 - d. single leg hop
79. Which of the following best describes the leap?
- a. movements taking off from one leg and landing on the same leg
 - b. single leg hops
 - c. single response drill
 - d. galloping
80. A ricochet movement is what type of training?
- a. speed strength
 - b. vertical displacement
 - c. horizontal displacement
 - d. overspend

81. Which of the following jump movements is a beginning exercise that focuses on reactive forces of the ankle?
- a. pogo
 - b. split jump
 - c. scissors jump
 - d. star jump
82. Which of the following is a basic drill to develop power in the lower extremities with emphasis on maximum height with every effort?
- a. knee-tuck jump
 - b. quick leap
 - c. squat jump
 - d. depth jump
83. Which of the following movements emphasizes single response, capacity to lessen impact on landing, and targets vertical hip projection?
- a. rocket jump
 - b. box jump
 - c. star jump
 - d. double- leg butt kick
84. Which of the following is the most appropriate progressions for jump training?
- a. pogo, double –leg butt kick, double scissors jump, depth jump
 - b. squat jump, single stride jump, knee tuck jump. Box jump
 - c. box jump, quick leap, depth jump, scissors jump
 - d. depth jump leap, box jump, depth jump, split jump
85. When performing the depth jump, the initial movement of the jump is to:
- a. jump off the platform
 - b. step off the edge of the platform
 - c. fall off the edge of the platform
 - d. leap off the platform
86. Which of the following depth jump training progressions from simple to complex is most appropriate to implement for a trained participant?
- a. depth jump, box jump, depth leap, depth jump leap
 - b. box jump, depth jump, depth leap, depth jump leap
 - c. depth jump leap, depth leap, box jump, depth jump
 - d. depth jump, depth leap, depth jump leap, box jump

87. The major difference between the upper extremity plyometric training methods of swings and twists is that:
- a. twists are single planer movements
 - b. swings are multi-planer movements
 - c. twists do not involve the shoulder and arms
 - d. swings do not involve the torso
88. The biggest difference between tosses and throws are:
- a. tosses are simple movements
 - b. throws are complex movements
 - c. tosses are performed using two hands
 - d. throws are performed over the head
89. The upper extremity exercise that is a multiple response activity with emphasis on achieving maximal height above the body is:
- a. medicine ball scoop throw
 - b. shovel toss
 - c. medicine ball scoop toss
 - d. medicine ball overhead throw
90. The horizontal swing exercise has specificity for which of the following sports?
- a. soccer
 - b. sprinting
 - c. diving
 - d. hammer throw
91. Which of the following upper extremity plyometric exercises would have specificity to the game of soccer?
- a. vertical swing
 - b. shovel toss
 - c. bar twist
 - d. stepping two-arm overhead throw
92. Which of the following would be an appropriate progression for upper extremity plyometric training?
- a. med ball over and under, med ball half twist, shovel toss
 - b. shovel toss, med ball full twist, med ball over and under
 - c. bar twist, med ball over and under, med ball full twist
 - d. bar twist, shovel toss, med ball full twist

93. Which of the following upper extremity training progressions from simple to complex is most appropriate to implement for a trained participant?
- a. med ball half toss, twist toss, leg toss
 - b. floor kip, shovel toss, multiple hop with overhead toss
 - c. med ball scoop toss, twist toss, horizontal swing
 - d. vertical swing, bar twist, med ball scoop toss
94. Which of the following is important to maintain the validity of the vertical jump test?
- a. use the right arm, when measuring the starting height
 - b. no counter-jump should be employed
 - c. no steps are allowed in the jump
 - d. six attempts are performed
95. To identify the appropriate box heights for the plyometric depth jumps:
- a. box height should be 1/3 of body height
 - b. measure the distance of the tibia
 - c. performing a depth jump off a box should replicate the vertical jump
 - d. starting point for everyone is at 12 inches
96. If an athlete performed a standing long jump at 6 feet 11 inches what percentile would they perform at?
- a. 90%
 - b. 80%
 - c. 75%
 - d. 50%
97. In the seated medicine ball chest pass test, what is the marker to determine if a lighter weight ball needs to be used?
- a. if the athlete shifts the ball to the side to throw
 - b. they can not maintain an upright vertical posture alignment
 - c. if the pass covers a distance shorter than 30 feet
 - d. if the pass does not go greater than 10 meters
98. Where do the mountain and river routines best fit into the periodized model of training?
- a. post-season
 - b. off-season
 - c. pre-season
 - d. competitive season

99. Once base plyometric movements like pogo, prancing, and galloping have been perfected, where else in the workout can they be integrated?
- a. cool-down
 - b. strength training
 - c. dynamic warm-up
 - d. sprint resistance
100. According to the authors, plyometric training should be implemented:
- a. in-season
 - b. pre-season
 - c. off-season
 - d. in cycles of all seasonal training