Training in Sports

1. Given below are functions of Sports Management in List-I and their Explanation in List-II : (2024)

List - I	List - II
I. Planning	1. It is a function of guiding, inspiring and instructing people to accomplish organizational goals.
II. Controlling	2. Preparing a layout for the future course of action.
III. Directing	3. Ensuring that proper talent is serving that specific job.
IV. Staffing	4. Establishing performance standards, measuring actual performance and comparing them for irregularities.

Match the items of List-I with List-II and choose the correct option from the following:

	I	II	III	IV
(a)	1	2	3	4
(b)	1	2	4	3
(c)	2	4	1	3
(d)	2	4	3	1

Ans. (c) I-2, II-4, III-1, IV-3

2. In which of the following fitness component an athlete gives better performance, if he/she has more slow twitch fibre in comparison to fast twitch fibres. (2024)

(a) Speed

(b) Strength

(c) Endurance

(d) Flexibility

Ans. (c) Endurance

3. Jump for smash in volleyball is an example of _____ . (2024)

(a) Static strength

(b) Maximum strength

(c) Explosive strength

(d) Strength endurance

Ans. (c) Explosive strength

4. Comment on the concept of Talent Identification and Talent Development.

(2024)

Ans. Talent Identification: Recognizing participants with the potential at an earlier age to become elite performers in the future. For the talent identification process Physiological, Physical Fitness, Psychological, and Technical Components are taken into consideration. For the identification, various methods such as drills, test batteries, electronic gadgets, parameters, standard norms, performance and other techniques are adopted.

Talent Development: Providing athletes with a suitable learning environment to accelerate or realize their potential. It is a complete systematic, scientific and long-term process.

5 What do you understand by Aggression in sports? Explain any 2 types of Aggression by giving suitable examples from sports. (2024)

Ans. Aggression is a type of behaviour aimed at causing physical or psychological harm to another person.

or

The term aggression refers to a range of behaviour that can result in both physical and psychological harm to one self, others or objects in the environment.

Types of Aggression:

1. Instrumental Aggression: This type of aggression is necessary to achieve performance goals and is displayed in a planned manner. The purpose of this aggression is not to cause harm to the opponent but to achieve one's goals.

For example, in Football, the player moves ahead and snatches the ball from the opponent with great aggression to score a goal and not to harm the opponent. This type of aggression is visible in contact games such as Wrestling, Kabaddi and Boxing, aggressive attack can help the player to win.

2. Hostile Aggression: In this type of aggression, the purpose is to cause physical or psychological harm. This aggression is usually caused as a reaction to someone's action. The main aim is to injure the opponent in order to be able to win. In this type of aggression, the person is biased and this is caused due to hopelessness.

For example, in the game of Kabaddi, after catching the raider, the players try to inflict injury upon him or in a game of hockey or football, hitting with the stick or kicking purposely to make the other person fall, displays hostile aggression.

3. Assertive behaviour: Assertive behaviour can also be called aggression, when a player uses it to improve sports performance. These are forceful behaviour not intended to injure the opponent and are within the rules of the games. The intention is to establish dominance rather than harm.

Example: A rugby player using aggression to tackle his opponent to win the ball.

Previous Years' CBSE Board Questions

10.2 Introduction to sports Training Cycle – Micro, Meso, Macro Cycle

VSA (1 mark)

1. Explain the term 'Sports Training'. *(2018)*

SA (3 marks)

2. Explain any three principles of training in brief. *(AI 2014)*

10.3 Types and Method to develop – Strength, Endurance and Speed

MCQ

3. Fartlek Training is used to develop _____.
   (a) Endurance
   (b) Strength
   (c) Flexibility
   (d) Speed *(2023)* R

4. The ability to tolerate higher concentration of _____ can help in improving endurance performance.
   (a) Lactic acid
   (b) Hydrochloric acid
   (c) Acetic acid
   (d) Sulphuric acid *(2023)*

5. Match the following

(1)		(i)	Lower body flexibility
(2)		(ii)	Upper body strength
(3)		(iii)	Abdominal strength the Endurance
(4)		(iv)	Speed

	1	2	3	4
(a)	(iii)	(ii)	(i)	(iv)
(b)	(iii)	(i)	(iv)	(ii)
(c)	(iii)	(i)	(ii)	(iv)
(d)	(iii)	(iv)	(i)	(ii)

(Term-I, 2021-22) Ev

6. Fartlek training was developed in
   (a) Sweden (b) The USA
   (c) India (d) The UK. *(2020)*

7. If a muscle contracts and changes its length to produce force, the contraction type is :
   (a) Isotonic (b) Isometric
   (c) Isokinetic (d) None of these
   (2020) An

VSA (1/2 mark)

8. Differentiate between Isometric and Isotonic exercise with suitable example. *(Term-II, 2021-22)*

9. Which method will you suggest to develop endurance? *(AI 2019)*

10. What is Endurance? How endurance can be developed through Fartlek method? *(Delhi 2016)* U

11. What is movement speed? Explain the methods to develop speed endurance. *(Delhi 2015)*

12. Define acceleration runs. *(AI 2014)*

13. Explain any two methods for speed development. *(Delhi 2014)*

SA (3/4 marks)

14. What is Fartlek training? Write in brief. *(Delhi 2017)*

15. What is Endurance? Explain its types. *(Delhi 2017)*

16. What do you mean by Interval Training and how endurance can be developed by this method? *(Delhi 2016 C)*

17. Differentiate between 1 : 1 and 1 : 2 ratio interval training, with suitable examples. *(AI 2015)* Ap

18. What do you understand by relative strength? Explain the importance of body weight in determining relative strength. *(Delhi 2015)*

19. Dynamic strength is divided into three parts. Write in brief about each. *(AI 2015)*

20. What is endurance? Explain the various methods for its development. *(AI 2014)*

LA (5 marks)

21. What are the types of 'strength'? Explain isotonic method to improve strength. *(Delhi 2019)* R

22. Write in detail about strength improving methods – Isometric, Isotonic and Isokinetic. *(AI 2019)*

10.4 Type and Method to Develop – Flexibility and coordinative Ability

VSA (1/2 mark)

23. What is active and passive flexibility? *(Term-II, 2021-22)* R

24. Elucidate any 2 types of coordinative ability with suitable example. *(Term-II, 2021-22)*

25. Define flexibility and its types. *(2020)*

26. Suggest any two methods to improve flexibility. *(Delhi 2019)* R

LA (5 marks)

27. What do you understand by coordinative ability? Discuss about different types of coordinative abilities. *(AI 2019)*

10.5 Circuit Training - Introduction and Its Importance

LA (5 marks)

28. Define Circuit Training. Draw a diagram of 8 (Eight) stations and explain its advantages. *(Delhi 2019)* Ap

29. What is circuit training? Draw a diagram of 10 stations to improve general fitness. How can load be increased in circuit training? *(2018)*

CBSE Sample Questions

10.3 Types and Method to develop – Strength, Endurance and Speed

MCQ

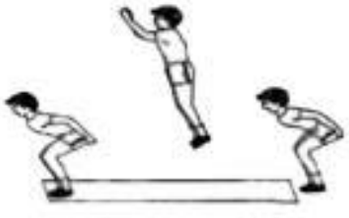
1. Jumping on the spot is an example of _____ .
   (a) Iso-metric (b) Iso-tonic
   (c) Iso-kinetic (d) Iso-kinesthetic
   (2022-23)

2. Take-off in Long jump is an example of _____ strength.
   (a) Explosive strength (b) Maximum strength
   (c) Strength endurance (d) Static strength
   (2022-23)

3. Name the component which is measured by this test?

   (a) Endurance (b) Speed
   (c) Flexibility (d) coordinative ability
   (Term-I, 2021-22)

4. Identify the component of fitness which is tested through this exercise.



   (a) Maximum strength (b) Explosive strength
   (c) Strength endurance (d) Static strength
   (Term-I, 2021-22)

5. Interval Training is used for developing
   (a) Flexibility (b) Agility
   (c) Endurance (d) Speed. *(2020-21)*

6. Resistance ability against fatigue is called
   (a) Strength (b) Speed
   (c) Endurance (d) Agility. *(2020-21)*

7. Acceleration of an object will increase as the net force increases depending on its
   (a) Density (b) Mass
   (c) Shape (d) Volume. *(2020-21)*

8. Ability to achieve maximum speed from stationary position is called _____ .
   (a) Speed endurance (b) Acceleration ability
   (c) Locomotors ability (d) Movement speed
   (2020-21)

VSA (2 marks)

9. Define explosive strength with the help of example. *(Term-II, 2021-22)*

10. What is the meaning of the Isotonic method and it is used for developing which ability ? *(Term-II, 2021-22)*

11. List down any four advantages of fartlek training method. *(2022-23)*

SA (3 marks)

12. What are the salient features of the Fartlek training method? *(Term-II, 2021-22)*

10.4 Type and Method to Develop – Flexibility and coordinative Ability

SA (3 marks)

13. Define flexibility and explain methods to develop flexibility. *(Term-II, 2021-22)*

LA (5 marks)

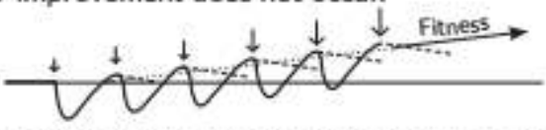
14. Define flexibility along with its types. Explain any two methods used to develop flexibility. *(2022-23)*

Previous Years' CBSE Board Questions

1. The process of preparation, by a sportsperson to achieve a desired goal is called sports training. It is a technical and systematic process of training to achieve the utmost level of performance.

2. **Principles of training are :**

Progressive loading : Biological systems can adapt to loads that are higher than the demands of normal daily activity. Training loads must be increased gradually, to allow the body to adapt and to avoid injury. Varying the type, volume, and intensity of the training load allows the body an opportunity to recover, and to over-compensate (Figure). Loading must continue to increase as adaptation occurs, otherwise the training effect will become flat and further improvement does not occur.



(b) Adaptation : Adaptations to the demands of training occur gradually, over long periods of time. Efforts to accelerate the process may lead to injury, illness, or "overtraining". Many adaptive changes reverse when training stops. Conversely, an inadequate training load will not provide an adequate stimulus, to produce a response.

(c) Specificity : Energy pathways, enzyme systems, muscle fiber types, and neuro-muscular responses adapt specifically to the type of training to which they are subjected. For example, strength training has little effect on endurance. Conversely, endurance training activates aerobic pathways, with little effect on speed or strength. However, a well-rounded training programme should have a variety of activities.

3. (a) : Endurance

4. (a) : Lactic acid

5. (c) 6. (a) 7. (a)

8. (i) **Isometric Exercises:** Isometric exercise or isometrics are a type of strength training in which the joint angle and muscle length do not change during contraction. Isometrics are done in static positions, rather than being dynamic through a range of motion. Thus isometric exercise is a form of exercise involving the static contraction of a muscle without any visible movement in the angle of the joint. This is in contrast to isotonic contractions, in which the contraction strength does not change, though the muscle length and joint angle do.

Resistance in isometric exercises typically involves contractions of the muscle using:

– The body's own structure and ground
– Structural items (pushing against a fence)

Free weights, weight machines, or elastic equipment (holding a weight in a fixed position)

Pressure-plate-type equipment that has a digital display of maximal force.

Depending on the goal of the exercise, the exertion can be maximal or sub-maximal.

Important features –

– Isometric means iso- same and metric –length.
– There is no change in the length of the muscle
– In strict sense of physics (where work done is Force multiplied by distance moved in the direction of the force; the work done here is zero because distance moved is zero).
– Isometric exercises need almost no equipment and require less time.
– As there is no movement it is useful for rehabilitation of the injured.
– Archery, gymnastics have isometric movements.

(ii) **Isotonic Exercises :** In these exercises the contracting muscle shortens against a constant load, as when lifting a weight. (In contrast, isometric exercise is when muscular contractions occur without movement of the involved parts of the body.) Isotonic comes from the Greek "iso-", equal + "tonos", tone = maintaining equal (muscle) tone. These exercises are very useful in sports and very good for strength development. Calisthenics, running and jumping on the spot, weight training are examples.

Important Features

- Lengthening and shortening of the muscles can be seen and are called eccentric contraction and concentric contraction.
- Exercise can be done without equipment or with minimal equipment.
- It increases the flexibility and length of the muscles and are good for conditioning.

9. Fartlek method is good to develop endurance. It blends continuous training with interval training.

10. Endurance fitness is the ability to sustain the necessary activity level for a specific competitive sport. It includes both cardiovascular and muscular endurance. Endurance is one of the main fitness components, important for success in many sports. Such as distance running and triathlon. In many other sports, including football good endurance is also very important as part of the overall fitness profile.

- It is the ability to sustain an activity
- It is also the ability to resist fatigue
- It can be measured by the number of repetitions of the activity

11. **Movement speed :** It is the ability that determines how quickly a person can carry out a movement or perform a skill (tennis serve, kicking a ball, hitting a baseball). Coordination is a very important factor in this type of speed, it´s also related to a correct learning in the specific sport movement or technique. It can be measured

by how quickly a particular movement is accomplished.

Speed Endurance : Speed endurance is the ability to perform movements at high speed under conditions of fatigue. This ability depends on technique, local muscular endurance and lactic acid tolerance ability.

Both submaximal aerobic exercise and interval training can improve the body's ability to buffer and tolerate lactate. However, only intense interval training can increase various important components of anaerobic power and capacity.

(a) Repetitions should last from 30 seconds up to 2-3 minutes as opposed to 5-10 seconds for speed drills.

(b) Rest intervals between repetitions is reduced to prevent complete recovery.

12. Acceleration runs are those in which the speed of the runner has to increase very quickly. For a 100-meter sprinter, the acceleration phase consists of 64% of the race (from a time standpoint).

Speed is improved by improving explosive strength, technique, flexibility, and frequency of movement.

13. **Methods to develop speed :** The methods for developing speed can be categorized as primary, secondary, or tertiary. This scheme is largely a matter of practicality and is based on skills.

(a) Primary Method : The primary method for speed development is execution of sound movement technique in a specific task. Initially, athletes should perform tasks at submaximal learning speeds to establish proper mechanics. As they progress toward mastery, the speed may be increased.

(b) Secondary Methods : Secondary methods of speed and agility training include sprint resistance and sprint assistance. These target the development of special skills in modified performance conditions.

Sprint Resistance : This method includes gravity-resisted running (*e.g.* upstairs sprinting) or other means of achieving an overload effect such as harness, parachute, sled, or weighted vest.

Sprint Assistance : Sprint assistance includes gravity-assisted running such as, high-speed towing or other means of achieving an over-speed effect. The objective is to provide assistance without significantly altering the athlete's movement mechanics, primarily as a means of improving stride rate.

(c) Tertiary Methods : Tertiary methods of speed and agility training include mobility, strength, and endurance training. These target the development of general skills and abilities.

14. Fartlek training involves training continuously, but by varying the intensity and type of exercise. For example, a running session could include sprinting for 10 seconds, fast walking for 20 seconds, jogging for 1 minute and repeating this. One can also add sessions like running uphill or on sand.

Advantages of Fartlek Training

1. It is an off season training method but is very useful in developing endurance in athletes.
2. It has a psychological advantage over the other training methods because the changing scenes help in delaying fatigue.
3. It is the best method to improve endurance in sports where endurance is a basic requirement *e.g.* cross-country running.

15. Endurance can be classified according to physical parameters as Muscular, Cardiovascular and Aerobic or Anaerobic.

Aerobic Endurance : The ability of the body to make efforts for a long period of time when oxygen is adequately available. The heart rate in this type of effort is between 140 and 160 per min. It has a positive impact on our health.

Anaerobic Endurance : The ability of the body to make efforts intensive but in a short period of time in conditions of low oxygen availability.

According to nature of activity –

(a) Basic Endurance also known as aerobic endurance. It is the ability to perform movements in which various body muscles are involved. This concerns when the activity is performed for a prolonged period, usually at a slow pace for example as in walking, jogging etc.

(b) Specific endurance is the ability to stand against fatigue in sport specific conditions. The better is the sport specific endurance, the better will the participant perform at this specific sport. For example, the endurance requirements of a 1500m runner, would be quite different from a wrestler.

(c) General endurance characterizes the ability of the whole body to sustain endurance exercises and reduce fatigue. The better the general endurance the better one can stand longer efforts at various sports disciplines. For example, if a 1500m runner has high levels of general endurance, he/she, can perform at a relatively high level also at 10K. However, it would not be easy to compete with 10K runners who have been developing their distance specific endurance.

According to Duration of Activity -

(i) Speed Endurance : It is the ability to prolong the amount of time where a near maximal speed can be maintained. During activity such as this, accumulation of blood lactate disturbs the excitation-contraction of the muscles. The muscle's mechanical properties are disturbed, resulting in a decrease in force production, peak force and velocity. Speed-endurance training can improve the clearance rate of lactate and reduce early lactate formation. Speed endurance is crucial to a large number of athletes and a lack of it result in reduced sports capability.

(ii) Short term Endurance : When sports and events consist predominantly of bouts of exercise lasting between 30 seconds and 2 minutes, "short-term" muscular endurance training is advantageous. A circuit training set up is suitable for this type of resistance training.

(iii) Middle term Endurance : Middle term endurance is needed for such sports that need activities ranging from 2 to 11 minutes. It depends on both speed endurance (to

a limited degree) and strength endurance. The endurance needed for middle distance runners such as 1500 m, is an example.

(iv) Long term Endurance : "Long term" muscular endurance is required for events lasting more than 11 minutes. Light loads are used so that exercises can be sustained for a prolonged period. Rest periods are kept to a minimum and ideally the athlete should progress so that the only rest between exercises is the time it takes to move between equipment.

16. **Interval training : Intervals are periods of intense exercising, with rest or low intensity periods in between. For example, one may run 100 meters at 85% intensity and then 200 at 50% to recover. This makes one rep. One set may include 5-10, such reps. The heart rate can go up to 180 beats/ min, and come down to 120-130 beats/min during recovery period.**

This training method is based upon 'effort and recover' principle. Here the load can be increased by increasing the effort period or reducing the recovery period. This method is very effective for developing endurance of track runners.

Advantages :

- Can mix aerobic and anaerobic exercise, thus provides good training for team games.
- Generally, more workout can be done in less time.
- The progress of athlete can be measured by observation and recovery period planned.
- The recovery phase can be used by trainers for counselling.
- It makes it easier for a coach to see when the athlete isn't trying.

Disadvantages:

- It can be hard to keep going when you start to fatigue.
- Cardiac output should be monitored.
- Can become boring.

17. In interval training 1: 1 means load and the rest is equal . *e.g.*, 1 minute exercise followed by 1 minute of rest. Similarly, 1 : 2 means that the period of rest is double of the load. *e.g.*, 1 minute exercise followed by 2 minute of rest.

Intervals are periods of intense exercising, with rest or low intensity periods in between.

For example (1 : 1) one may run 100 meters at 85% intensity and then 100 m at 50% to recover. This makes one rep. One set may include 5-10, such reps. The heart rate can go up to 180 beats/ min, and come down to 120-130 beats/min during recovery period.

For Example (In 1 : 2) one may run 100 m at high intensity and then 200 m at low intensity to recover. In this case this will make one rep.

Interval training method is based upon 'effort and recover' principle. Here the load can be increases by increasing the effort period or reducing the recovery period. This method is very effective for developing endurance of track runners.

18. Relative strength is strength in relation to our body weight. It has a determining importance in sports in which the athlete shifts his body in space without any additional external weight. (H/J and L/J) as well as in sports in which he has restrict his our weight within the framework of weight within the framework of weight division (*e.g.*, boxing, wrestling, etc.)

(a) It improves performance in many sports. Maximizes motor unit recruitment and improves neuromuscular efficiency.

(b) When the strength is maintained keeping the body weight low, the relative strength is high.

19. **Dynamic strength** : It is the force a contracting muscle can apply in moving an object to a prescribed distance. The length of the contracting muscle shortens while moving the load.

In different sports different muscle- strength come into play. These can be

- Maximum Strength
- Explosive Strength
- Strength Endurance

Maximum strength : If is the highest level of muscle force that can be produced. Maximum strength is the ability of a muscle or specific group of muscles to recruit and engage all motor units to generate maximal tension against an external resistance. It requires high levels of neuromuscular efficiency to enhance both intra- and intermuscular coordination.

This is used in those sports that requires to tackle heavy resistance, such as weight lifting, hammer throw, shot-put, discus throw, javelin throw etc. In other sports like high jump, long jump, pole vault it is required for a short period of time.

Explosive Strength : If produces a maximal amount of force in a minimal amount of time. It happens by muscle lengthening followed by rapid acceleration through the shortening phase. It is the ability to overcome resistance at high speed.

Explosive strength is based on the ability of the contractile element to rapidly generate tension, while power enhances the ability of elastic tissue to minimize the transition time from lengthening to shortening during the stretch-shorten cycle.

This is used in sprint starts and other sports especially during start and spurt moments. It is also used in weightlifting, shotput, hammer throw etc.

Strength Endurance : If is the ability to maintain muscular contraction or a consistent level of muscle force for extended periods.

20. Endurance fitness is the ability to sustain the necessary activity level for a specific competitive sport. It includes both cardiovascular and muscular endurance. It is the ability to sustain an activity. It is also the ability to resist fatigue.

The following methods are used for developing endurance:

(a) Continuous training also known as continuous exercise, is any type of physical training that involves activity without rest intervals. Continuous training can be

performed at low, moderate, or high exercise intensities. This type of exercise is, as the name suggests, continuous and rests are not allowed. To achieve this one must exercise at a constant rate that is within the aerobic training zone (60-80% max heart rate). Continuous training should last for bouts of at least 20 minutes (when starting) and increase up to 2 hours or more. Cross country run is an example of this training method.

It can be of two types :

- **Slow continuous** or low intensity training, the heart rate is maintained between 140-160, beats per minute.
- **Fast continuous** or high intensity training, the heart rate is maintained between 175-180 beats per minute.

(b) Interval training : Intervals are periods of intense exercising, with rest or low intensity periods in between. For example, one may run 100 meters at 85% intensity and then 200 at 50% to recover. This makes one rep. One set may include 5-10, such reps. The heart rate can go up to 180 beats/ min, and come down to 120-130 beats/min during recovery period.

This training method is based upon 'effort and recover' principle. Here the load can be increased by increasing the effort period or reducing the recovery period. This method is very effective for developing endurance of track runners.

(c) Fartlek training : Fartlek training involves training at a continuously, but varying the intensity and type of exercise. For example, a running session could include sprinting for 10 seconds, fast walking for 20 seconds, jogging for 1 minute and repeating this. One can also add sessions like running uphill or on sand.

It blends continuous and interval training, which the athletes themselves can plan. The duration however, should be more than 45 minutes.

(d) Circuit training : Circuits can be used to increase either strength, aerobic fitness or both. There are usually between 8 and 15 stations and at each one a different exercise can be done for 1 minute . Rest can be incorporated in the regimen, depending on the level of the participants.

21. Strength is one of the main fitness components, important for success in many sports. Certain sports, such as weight lifting, wrestling and weight throwing, it is the most important physical attribute. In many other sports, including team sports, being strong is also very important part of the overall fitness.

Types of Strength

(a) Dynamic strength : The force a contracting muscle can apply in moving an object a prescribed distance. The length of the contracting muscle shortens while moving the load. Dynamic strength and Isotonic strength are synonymous terms because it is related to movements. For example – dynamic strength is required in doing pushups. As you will note in such cases there is a diminishing tendency, in which muscles may stop working after some time. Movements are visible while one is using dynamic strength.

(b) Static strength : The force a muscle can apply to an Immovable object without appreciably shortening the length of the muscle. Isometric and static strength are synonymous terms.

It is the ability of muscles to act against resistance. Use of static strength is not common in sports however, in weightlifting it is used in phases.

Isotonic Exercises

In these exercises the contracting muscle shortens against a constant load, as when lifting a weight. (In contrast, isometric exercise is when muscular contractions occur without movement of the involved parts of the body.)

These exercises are very useful in sports and very good for strength development. Calisthenics, running and jumping on the spot, weight training are examples.

Benefits of isotonic exercise :

(a) Supports quality of life by building range of motion muscles that help with activities of daily living.
(b) Little or no special equipment is required.
(c) Strengthens muscles.
(d) Improves bone density and reduces risk of osteoporosis.
(e) Boosts cardiovascular health.

22. The different kinds of exercises that help to improve strength can be put into three groups -

(i) Isometric Exercises

Isometric exercise or isometrics are a type of strength training in which the joint angle and muscle length do not change during contraction. Isometrics are done in static positions, rather than being dynamic through a range of motion. Thus isometric exercise is a form of exercise involving the static contraction of a muscle without any visible movement in the angle of the joint.

Resistance in isometric exercises typically involves contractions of the muscle using:

Depending on the goal of the exercise, the exertion can be maximal or sub-maximal.

Important features :

(a) There is no change in the length of the muscle
(b) In strict sense of physics –where work done is Force multiplied by distance moved in the direction of the force; the work done is zero because distance moved is zero.
(c) Isometric exercises need almost no equipment and require less time.
(d) As there is no movement it is useful for rehabilitation of the injured. Archery, gymnastics have isometric movements.

(ii) Isotonic Exercises

In these exercises the contracting muscle shortens against a constant load, as when lifting a weight.

These exercises are very useful in sports and very good for strength development. Calisthenics, running and jumping on the spot, weight training are examples.

Important Features :

(a) Lengthening and shortening of the muscles can be seen and are called eccentric contraction and concentric contraction.
(b) Exercise can be done without equipment or with minimal equipment.

(c) It increases the flexibility and length of the muscles and are good for conditioning.

(iii) Isokinetic Exercises

Isokinetic exercise is a type of strength training in which specialized machines, or dynamometers, maintain a constant speed of movement. It typically blends the intense contractions of isometric exercises with the range of motion achieved in isotonic exercises, and can provide a maximal strength workout. The dynamometers are generally expensive and complex, and typically found in rehabilitation or health-care facilities.

Important features :

(a) These are a combination of isotonic and isometric exercises.

(b) In this case machines allow resistance over a complete range of motions.

(c) These type of movements are usually applied in water sports, climbing, skating etc.

Related Theory

- Study in 1984 found that heart rate and blood pressure increased significantly with isometric exercises. Because of this, isometric exercises are not recommended for people with heart problems or high blood pressure.

23. **(a) Active Flexibility :** Active flexibility is the ability to do movements for prolonged periods without external support. It can be of two types :

– Dynamic flexibility (also called kinetic flexibility) is the ability to perform dynamic (or kinetic) movements of the muscles to bring a limb through its full range of motion in the joints, without external support.

– Static-active flexibility (also called active flexibility) is the ability to assume and maintain extended positions. It is required when the sportsperson remains in a position for longer periods, such as racing car drivers. Lifting the leg and keeping it high without any external support (other than from own leg muscles).

(b) Passive Flexibility :

– Static-passive flexibility (also called passive flexibility) is the ability to assume extended positions and then maintain them using only your weight, the support of your limbs, or/and some other apparatus (such as a chair). Note that the ability to maintain the position does not come solely from your muscles, as it does with static-active flexibility. Passive flexibility is always more than active flexibility. Being able to perform the splits is an example of static-passive flexibility.

24. **(i) Orientation Ability :** It is the coordinative ability of an individual to determine body position and its parts to react upon a moving body. It depends on sensory organs like the eyes and kinesthetic senses. Its application can be seen in games such as basketball, football, volleyball, table tennis etc., in which the ball and the opponents are moving bodies.

(ii) Coupling Abilities : It is the coordinative ability of individual to use different body parts to react in sports or games to produce perfect sporting movement is known as coupling abilities. It can be seen in boxing, wrestling etc.

(iii) Reaction Ability : It is the coordinative ability of individual to react quickly to a signal. The signal can be in the form of light, sound etc. Reaction ability is further described into simple reaction ability and complex reaction ability.

25. Flexibility is the capacity of a joint or muscle to move through its full range of motion.

Type of flexibility

(a) Active flexibility

(b) Passive flexibility

26. **Methods to improve flexibility :**

(a) Stretch and hold method

(b) Dynamic Stretching method

(c) Ballistic method (yoga, Dance)

(d) Proprioceptive Neuro – muscular facilitation techniques (partner exercises or stretching on equipments)

27. Coordinative ability can be defined as: The ability to transition between a series of smaller tasks involved in a larger task. Coordination is the ability to repeatedly execute a sequence of movements smoothly and accurately. This may involve the senses, muscular contractions and joint movements.

Types of Coordinative Abilities

There are different types of coordinative abilities which are significant in different sports. The various types of coordinative abilities are:

(i) Orientation Ability : It is the coordinative ability of an individual to determine body position and its parts to react upon a moving body. It depends on sensory organs like the eyes and kinesthetic senses. Its application can be seen in games such as basketball, football, volleyball, table tennis etc., in which the ball and the opponents are moving bodies.

(ii) Coupling Abilities : It is the coordinative ability of individual to use different body parts to react in sports or games to produce perfect sporting movement is known as coupling abilities. It can be seen in boxing, wrestling etc.

(iii) Reaction Ability : It is the coordinative ability of individual to react quickly to a signal. The signal can be in the form of light, sound etc. Reaction ability is further described into simple reaction ability and complex reaction ability.

(iv) Balance Ability : It is the ability of individual to maintain or regain balance quickly in the body during and/or after the movement is known as balance ability. For example, regaining balance after a handstand on parallel bars.

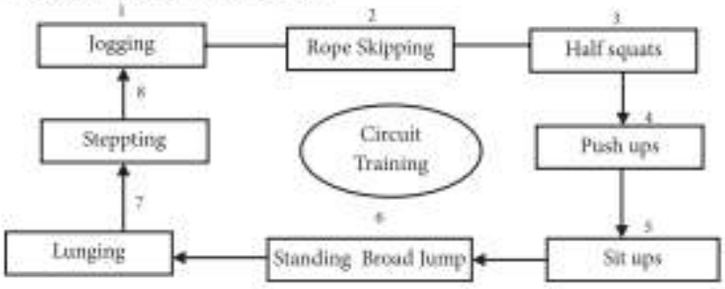
(v) Rhythm Ability : Rhythm ability is the ability to observe or perceive a movement and to do the movement with the required rhythm. In rhythm gymnastics or figure skating, the sportsperson has to observe an external rhythm, given in the form of music and to express his movements. Rhythm ability is also required in synchronized swimming.

(vi) Adaptation Ability : Adaptation ability is the ability to adjust or change effectively on the basis of changes or

anticipated changes in the situation. The change in the situation can be expected or can be sudden or unexpected. It is the ability to solve a motor task, effectively even though the situation may have changed without any hint

(vii) Differentiation Ability : Differentiation ability is the ability to achieve a high degree accuracy and economy of different body movements and to synchronize these movements into a united whole. The precision and accuracy of this ability depends on movement experience and the degree of mastery over motor action that is gained by practice of the activity/action.

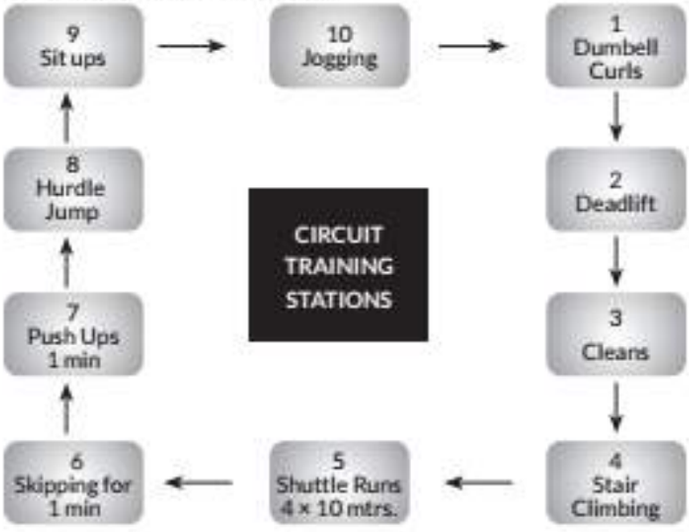
28. It is a form of body conditioning which uses a number of exercises one after the other. Circuit training can be used to increase strength and/or aerobic fitness. In circuit training 8 to 15 stations of different exercises can be used, with suitable times of rest.



Advantage of Circuit Training :

(a) It can easily be structured to provide a training of whole body.
(b) It can be adjusted to suit age, fitness and health of the individual.
(c) It can be done in large groups.
(d) Trainee is able to gain good results in a short period.
(e) The coach can easily watch and supervise the training.
(f) It is ideal for the people who don't have much time spare for regular exercise.
(g) It can be administered inside or outside.
(h) Minimum number of equipment is required for this training.
(i) It is less cost effective. (Any four)

29. Circuit training is the training method in which exercise of various kinds are performed with or without apparatus with given dosage.



Ways to increase the load in circuit training :

1. Number of repetition can be increased per exercise
2. Frequency can be increased.
3. Additional load can be increased.
4. Interval between exercises can be reduced
5. Number of rounds can be increased.

CBSE Sample Questions

1. (b) : Iso-tonic (1)
2. (a) : Explosive strength (1)
3. (c) : Flexibility (0.80)
4. (b) : Explosive strength (0.80)
5. (c) : Endurance (1)
6. (c) : Endurance (1)
7. (b) : mass (1)
8. (b) : Acceleration ability (1)

9. **Explosive Strength:** It is the ability to overcome resistance with high speed.
It is used in take-off jumping events like long jump, high jump, triple jump, jumping in volleyball for smashing or spiking, jumping for rebound in basketball. (2)

10. **Isotonic method :** Isotonic exercises were introduced by De Lorene in 1954. This term comes from the Greek word 'iso' which means 'same or equal' maintaining equal (muscle) tone or tension'. In this one muscle group contracts the opposite relaxes during which the muscle changes its length. These are those exercises in which direct movements are visible to the 3rd person. In this case, personal muscular efforts are evidenced by visible movements. In isotonic exercises rapid movements are accomplished by reflex alteration of contraction and relaxation of antagonistic flexors and extensors of the joints concerned. Type of contraction where we notice the movements of objects is called isotonic contraction *e.g.* doing exercise with light weight or dumbbells etc. Most of the exercises fall under this category Used to develop Strength. (2)

11. **Fartlek Training Method :** The Fartlek method of training was introduced and practiced in Sweden.
'Fartlek' is a Swedish term which means 'speed play' (playing with speed). This training method was first introduced by Gosta Holmer. It is a type of cross country running. Fartlek is usually conducted over a hilly region track, and it allows variation in pace. It is one of the best methods of conditioning for most of the sports in which endurance is the basic requirement. This training can be performed at hilly path, river bed, forest, muddy road or sandy path etc. Self-discipline is most important and vital in this type of training. In Fartlek, the change of pace or speed is not pre planned so some exercises can also be included in this method. These exercises may be performed by stopping and running temporarily at different intervals. The type of exercises that can be included along with running are hopping, jumping, squat jump, double hop jump etc.

Advantages of Fartlek Training

(i) It is an off season training method but is very useful in developing endurance in athletes.

(ii) It has a psychological advantage over the other training methods because the changing scenes help in delaying fatigue.

(iii) It is the best method to improve endurance in sports where endurance is a basic requirement *e.g.* cross-country running.

(iv) Balancing adjustments of ankles, knees and thighs improves due to the uneven surface. **(2)**

12. Features of Fartlek Training:

(i) This training is usually conducted over a hilly region track but it can also be conducted at forest, river bed, muddy road, etc.

(ii) It is an off-season training method.

(iii) Self-discipline is most important in this type of training.

(iv) It is proved as best method to improve endurance in sports where endurance is a basic requirement. **(3)**

13. Flexibility can be defined as the maximum range of motion at a joint that is the extent of movement possible about a joint without undue strain. Flexibility is not a general quality; it is specific to a particular joint, such as the knee or to a series of joints. This means that an individual can have a better range of motion in some joints than in others.

I. Ballistic Stretching: The individual performs these stretching exercises while in motion. This dynamic method uses the momentum generated from repeated bouncing movements to stretch the muscles. Although it is very effective, most experts do not recommend this method because it may overstretch the muscles and can cause muscle soreness or injury. This method includes various exercises like swinging the trunk sidewards, forward, backward, swinging the legs etc.

II. Static Stretching: It is an extremely popular and effective technique. Static stretching involves gently and slowly moving into the stretch position and holding it for a certain period of time. Movement should take place through the full range of motion until a little tension or tightness is felt in the muscles or group of muscles. As the muscle relaxes, the stretch should be extended and held again. Stretching should not be painful. Care must be taken not to force the joint to move too far, which may cause an injury. Stretching should be held from 10 to 30 seconds and a maximum of five repetitions for each exercise.

III. Passive stretching: Passive stretching techniques are usually performed with a partner who applies a stretch to a relaxed joint. Partner stretching requires closer communication between partners, and the slow application of the stretch in order to 4 prevent injuries due to forceful manipulation of the body segment.

IV. Proprioceptive Neuromuscular Facilitation (PNF) or Contract : PNF technique is the most appropriate method for increasing or developing flexibility in the shortest possible time. This method is used by sportsmen for gaining flexibility. It involves use of muscle contraction before stretching to achieve maximum muscle relaxation. The following procedure is used for PNF technique :

(i) Move into the stretch position so that the stretch sensation can be felt.

(ii) The partner holds the limb in this stretched position.

(iii) Push against your partner for 6 to 10 seconds by contracting the antagonistic muscles and then relax. During contraction, the partner tries to resist any movement of the limb.

(iv) The partner then moves the limb further into the stretch until the stretch sensation is felt.

(v) Repeat the whole procedure for 4 to 5 times. **(3)**

14. Flexibility is specific to a particular movement or joints, and the degree of flexibility can vary around the body. Flexibility is basically the range of motion at a particular joint - how far it can move.

Types of Flexibility

(a) **Active Flexibility :** Active flexibility is the ability to do movements for prolonged periods without external support.

(b) **Passive Flexibility :**

- Static-passive flexibility (also called passive flexibility) is the ability to assume extended positions and then maintain them using only your weight, the support of your limbs, or/and some other apparatus (such as a chair). Note that the ability to maintain the position does not come solely from your muscles, as it does with static-active flexibility. Passive flexibility is always more than active flexibility. Being able to perform the splits is an example of static-passive flexibility. **(5)**