FLEXIBILITY

Explain how different physiological adaptations which take place after flexibility training could benefit an athlete.

**Adaptation - benefits**

| Adaptation                                                                 |
|---|---|
| 1. Increased elasticity/increased length (of muscles and connective tissue) |
| 2. Increased resting elasticity                                             |
| 3. Greater range of movement at a joint                                     |
| 4. (Greater range of movement (ROM)) before the stretch reflex is initiated/stretch reflex inhibited |

**Benefit to athlete**
- Increased distance/speed/efficiency/generate force/stretch further
- OR Decreased risk of injury
- OR Improved posture/or other general improvement in health
- OR Improved performance of motor skill/technique
- OR reduced resistance in antagonist

Describe how you would perform a stretch during a PNF session. Explain the physiological principle behind this type of training.

1. muscle is taken to the point of resistance
2. isometric contraction is performed (for approx 5 seconds)
3. against immovable object or partner
4. immediately muscle is relaxed/allow recovery
5. take slightly beyond point of resistance/repeat
6. hold stretch for approx 10–30 seconds

**Sub max 3 marks for explanation**

7. when muscle is stretched it triggers the muscle spindles
8. response is to contract/shorten the muscle
9. when muscle is contracted it triggers the golgi tendon organs
10. response is to relax/lengthen the muscle
11. if stretch is immediate then the muscle spindle (stretch reflex) is momentarily over ridden allowing greater stretch/inhibiting stretch reflex
Define the term flexibility. Using examples explain factors that can affect the flexibility of a performer in sport. Critically evaluate different types of training used to develop flexibility.

<table>
<thead>
<tr>
<th>Flexibility definition</th>
<th>Range of motion around/possible at a joint/joint of joints</th>
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</thead>
<tbody>
<tr>
<td>Dynamic Flexibility</td>
<td>RoM taking into account the speed of movement/reflects a joint's resistance to movement</td>
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<td></td>
<td>Eg performing a straddle jump at speed.</td>
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<tr>
<td>Static Flexibility</td>
<td>RoM at a joint without taking into account the speed of movement/maximum static RoM tissues will allow with an external force</td>
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<td>Eg when holding still any static stretch</td>
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<tr>
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<td>Static flexibility a prerequisite/essential to dynamic flexibility</td>
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Factors affecting

2. Joint type
   - Eg ball and socket joint has a wider RoM planes of movement than a hinge joint.

3. Joint shape/articulating bones
   - Shallow socket of shoulder increases RoM decreases stability.  
   - Deep socket of Hip decreases RoM increases stability.

4. Elasticity/length of surrounding connective tissues
   - All points below increase RoM flexibility if increased
   - Elasticity/length of surrounding muscles
   - Elasticity/length of surrounding tendons
   - Elasticity/length of surrounding ligaments
   - Strength of opposing muscle group
   - Elasticity of Epimerendomyso/muscles/fascia joint capsule
   - Nerves/Muscle spindle activation point before initiating stretch reflex.

5. Muscle/fat mass
   - Excessive muscle/fat mass can decreases RoM.
   - Eg body builders/rugby players at the shoulder.

6. Temperature/viscous
   - Warmer internal muscles/connective tissues increase elasticity/RoM.

7. Gender
   - Females generally more RoM flexible than males.
   - Due to the hormone oestrogen.

8. Age
   - Flexibility/RoM decreases with age
   - Connective tissues harden/decrease in elasticity with age.

9. Training
   - Stretching within a training programme may maintain/increase RoM.
   - Generally more physically active individuals will have a greater flexibility than those inactive.

10. Others
    - Clothing restrictions eg golfer with waterproof jacket.
    - Injuries to joint tissues decreases RoM.
    - External temperature +ve to RoM.

Types of training

11. Stretching
    - Stretching is the training method to increase RoM/flexibility
    - There are a number of different methods of stretching.

12. Static stretching (Description)
    - Lengthening the muscle/connective tissues ‘just beyond the point of resistance’
    - Held still/static/relaxed for min 10-30+ secs
    - Stretch reflex subsides after 5/6 secs.
    - Connective/soft tissue around joint is lengthened.
    - Repeated 3-6 times.

13. Static active (description)
    - Athlete/performer/voluntary/unassisted moves the joint/muscle into its stretched position.
    - No external assistance/force.
    - Contraction of an agonist muscle to create force to stretch the target antagonist muscle.
    - Any appropriate example of a static active stretch.

14. Static passive (description)
    - Involves an external force/resistance.
    - Eg partner moves athlete into a position.
    - Eg equipment used like Dyna band/rope.
    - Any appropriate example of a static passive stretch.
| 15. **Static stretching**  
**Description**: one of the safest/simplest methods of stretching  
**Pros**:  
+ effective in increasing RoM/flexibility  
+ aids muscle relaxation at end of training  
+ reduces muscle tension  
- slows down the process of increasing RoM/flexibility  
- tends to prepare muscles for dynamic movements that may follow  
- may possibly decrease subsequent speed/power work  
- static more appropriate for maintenance (retaining present RoM) and developmental (improving RoM) stretching  
- static maintenance stretching more appropriate at end of session/cool down to return muscles to their pre-exercise length/flexibility when a performer has good RoM/flexibility  
- static developmental stretching more appropriate for muscles around joints with poor RoM/flexibility  
- eg 2–3 stretches of the active muscles at the end of a session/cool down  
- if static stretching used in warm up limit time of the stretch (to max 20 secs) to minimize loss of subsequent speed/power work  
- athlete uses momentum to move body/muscle tissue through its full/extreme range of movements  
- eg swinging/circling/bouncing type movements  
- any appropriate example of a ballistic stretch  
- improves subsequent speed/power to follow  
- better suited to more ballistic/dynamic activities eg martial arts  
- limited increase in muscle length  
- greater risk of injury due to momentum/extreme RoM  
- creates muscle tension does not allow sufficient time for tissues to adapt to the stretch  
- more appropriate for athletes who are already flexible  
- ballistic stretching not appropriate for recreational/BBall performers  
| 17. **Ballistic (Description)**  
**Description**: takes the muscle through its full RoM range.  
**Pros**:  
+ uses momentum but entry and exit of stretch is under control  
+ does not take muscle to its extreme RoM point  
+ any appropriate example of a dynamic stretch eg lunges, squats  
- less risk of injury as exit is under control  
- can be performed active or passively  
- improves subsequent speed/power to follow  
- better improves dynamic flexibility in most activity  
- does not aid muscle relaxation after training  
- more appropriate for athletes who are already flexible  
- dynamic stretching more appropriate pre-exercise during warm up.  
| 18. **Dynamic (Description)**  
**Description**: Proprioceptive Neuromuscular Facilitation  
**Pros**:  
+ partner/performer takes joint to a position just beyond its point of resistance/static stretch and holds  
+ the muscle undergoes an isotonic contraction against a resistance for min 6–10+ secs  
+ muscle is then relaxed and stretched again/processed repeated  
+ eg contract-relax/CRAC/contract–relax/antagonist-contraction/active/contract-relax  
+ seeks to decrease/inhibit the stretch reflex mechanism  
+ performer usually achieves a greater range of movement in each consecutive/second stretch  
- quicker flexibility gains than static  
- equal/better flexibility gains than other methods  
- aids muscle relaxation  
- mostly require a partner to assist  
- more complex/time consuming technique  
- greater discomfort and risks compared to static  
- PNF more appropriate for maintenance (retaining present RoM) and developmental (improving RoM) stretching  
- PNF maintenance stretching more appropriate at end of session/cool down to return muscles to their pre-exercise length/flexibility when a performer has good RoM/flexibility  
- PNF developmental stretching more appropriate for muscles around joints with poor RoM  
- eg 2–3 stretches of the active muscles at the end of a session/cool down  
- if PNF stretching used in warm up limit time of the stretch (max 20 secs) to minimize loss of subsequent speed/power work  
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