Muscle Contractions

Static vs Dynamic:

**Static Contractions**
- **no visible movement occurs**
- muscle force is equal to load
- eg. Holding something without moving it, pulling an immovable object, postural muscle
- maximal static contractions occur in sports like Judo, wrestling and gymnastics

**Dynamic Contractions**
- **visible movement of the load**
- muscle forces change while the load is moved
- Eccentric dynamic contraction - muscle lengthens during force production
- Concentric dynamic contraction – muscle shortens during force production
Types of Strength Training Contractions

1. **Isometric (Static)**
   - No visible movement of joint
   - Increased strength at one joint angle
   - **Examples**: planks, arm holds
   - **Purpose**: rehab or core strength
   - **Limitation**: strengthens at only one joint angle

2. **Isotonic (Dynamic)**
   - Controlled shortening or lengthening of muscle fibres
   - Uneven force throughout ROM
   - **Examples**: dumbbells, push-ups
   - **Purpose**: affordable muscular strength and endurance gains
   - **Limitation**: force changes throughout ROM
3. **Isokinetic**
   - Muscular contraction at a constant speed (dynamic)
   - Force (max resistance) is constant throughout the range of motion (ROM)
   - Maximal strengthening occurs at all joint angles
   - Examples: Cybex machine
   - Purpose: rehab and research
   - Limitation: very expensive

4. **Plyometric**
   - Combines a rapid eccentric contraction followed by a quick concentric contraction done repeatedly
   - The reflex causes a greater muscle contraction
   - **Examples**: jump squats, jump lunges
   - **Purpose**: increased strength gains, fast twitch fibre training, increase foot speed, increased agility
• **Limitation**: not for beginners, increased risk of injury due to high forces