GRAPHIC ORGANISER — The Muscular System

CHARACTERISTICS & FUNCTIONS OF THREE TYPES OF MUSCLE

Muscle	Characteristics	Example
Cardiac	Non-fatiguing, involuntary	Heart (only)
Skeletal	Fatiguing, voluntary	Biceps, Triceps, Soleus, etc.
Smooth	Involuntary, slow contraction	Internal organs, blood vessels

THREE TYPES OF SKELETAL MUSCLE CONTRACTION

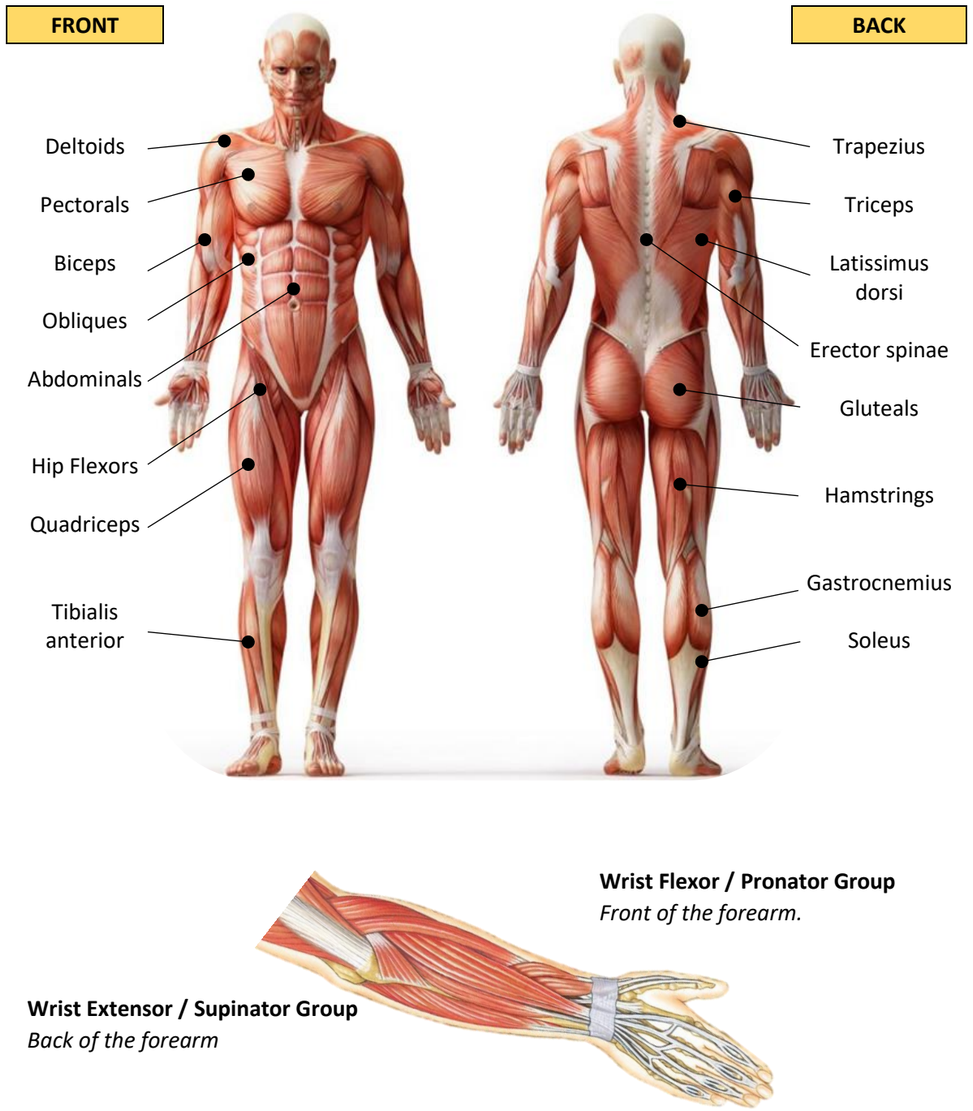
Contraction	As muscle contracts…	Used for…
Isometric	…no change in muscle length	Static holds (e.g. iron cross)
Concentric	…muscle shortens	Movement
Eccentric	…muscle lengthens	Slowing and braking movements

ANTAGONISTIC PAIRS

Muscles cannot push so are 'paired' with others that pull in the opposite direction.

Agonist: muscle that contracts to produce movement (also called prime mover)
Antagonist: muscle that relaxes (if contracted would make opposite joint movement)
Synergist: muscle that assists the agonist (in force production)
Fixator: muscle that assists the agonist (by stabilising the muscle's origin)

MAJOR SKELETAL MUSCLES



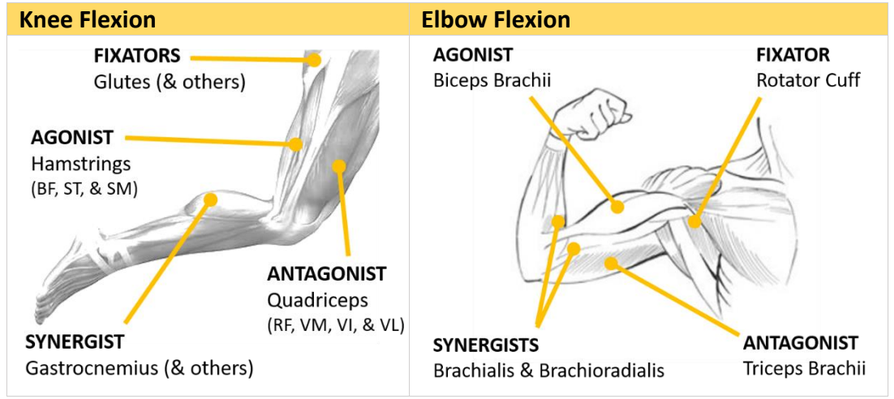
Wrist Flexor / Pronator Group
Front of the forearm.

Wrist Extensor / Supinator Group
Back of the forearm

MUSCLE FIBRE TYPES

Characteristics of different muscle fibre types

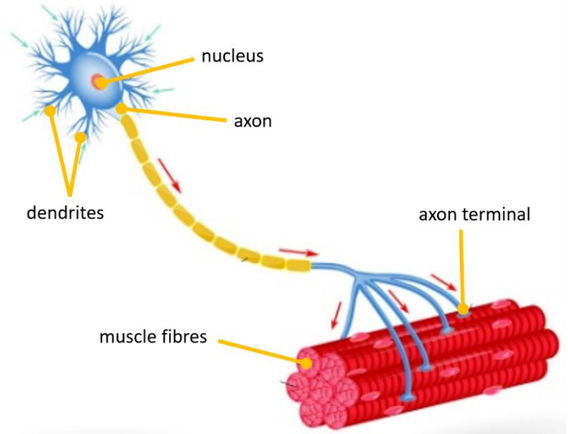
Fibre Type	Type I	Type IIa	Type IIx
Twitch Speed	Slow	Fast	Fast
Force	Low	High	Very High
Fatigue	Slow	Medium	Fast
Recovery	Slow	Medium	Fast
ATP Source	Oxidative	Ox. & Gly.	Glycolytic
Blood Supply	High	High	Low
Myoglobin	High	High	Low
Colour	Red	Red	White
Mitochondria	High	High	Low
Recruitment	First	Second	Third
Diameter	Small	Medium	Large
Suitable for…	Endurance	Games	Speed



NERVOUS CONTROL OF MUSCLE CONTRACTION

Motor Units

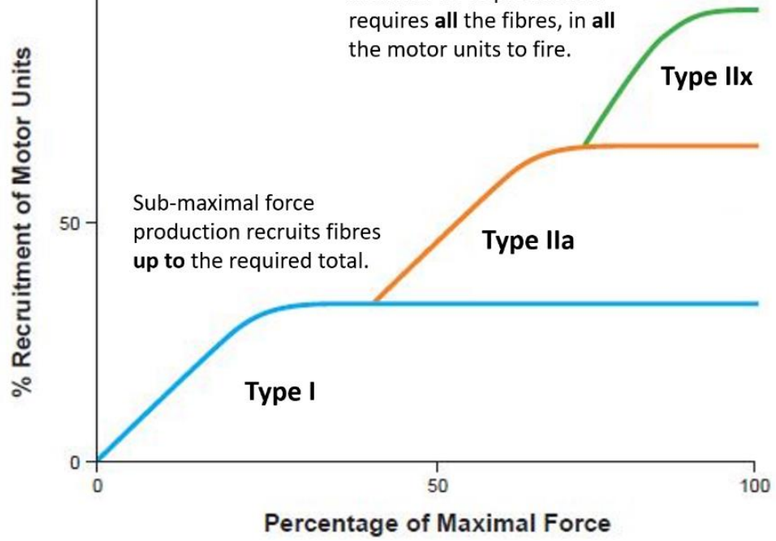
- A motor unit is a **motor neuron** and all the fibres it 'innervates'
- All the fibres in a motor unit are of the same type.
- A muscle (e.g. biceps brachii) is made up of several motor units.



- An electrical impulse is sent along the neuron.
- If the impulse if sufficient **all** the fibres in the motor unit contract.
- Otherwise **none** of them contract. This is the **'all or none law'**.
- To create more force more motor units must be 'innervated'.

NERVOUS CONTROL OF MUSCLE CONTRACTION

Fibre Type Recruitment



RESPONSES TO EXERCISE (Short Term)

1. Increased blood supply
2. Increased muscle temperature
3. Increased muscle pliability
4. Lactate (high intensity exercise)
5. Micro-tears (resistance exercise)

ADAPTATIONS TO EXERCISE (Long Term)

1. Hypertrophy
2. Increased tendon strength
3. Increase in myoglobin stores
4. Increase in number and size of mitochondria
5. Increased storage of glycogen
6. Increased storage of fat
7. Increase tolerance to lactate

ADDITIONAL FACTORS

Age: Loss of muscle mass, atrophy
Cramp: Involuntary, sustained skeletal muscle contraction

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