Nerve Conduction Velocity Experiment

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Peripheral Nerve Fibers

- The axons are bundled together into groups called fascicles, and each fascicle is wrapped in perineurium

- Axons have different threshold and conduction velocity

Compound Action Potential (CAP)

- An action potential having more than one peak/spike

  - A nerve trunk contains many nerve fibres differing widely in their excitability and different speeds of conduction of action potential.
  - Multiple peaks are recorded, fastest conducting nerve fibre first followed by the slower ones

Compound Action Potential (CAP)

- The number of peaks observed in the CAP increases as the recording electrodes move away from stimulation site
  - First the fastest neuron

Compound Action Potential (CAP)

- The number and size of the peaks depend on the types of fibers contained in the nerve being studied.

- If the stimulus intensity is not large enough to stimulate all fibers, the shape of the compound action potential recorded varies with the types of fibers induced.

Nerve Conduction Velocity

- **Velocity** is a vector expression of the displacement that an object or particle undergoes with respect to time

- The standard unit of **velocity** magnitude (also known as speed) is the meter per second (m/s)

MNCV = Motor nerve conduction velocity

MNCV case example:

$$\text{MNCV} = \frac{\text{Distance (A–B)}}{\text{Time (A–B)}} = \frac{340 - 40\ \text{mm}}{10 - 4\ \text{ms}} = \frac{300\ \text{mm}}{6\ \text{ms}}$$

MNCV = 50 m/s for median nerve segment S1–S2

Factors Effecting Nerve Conduction Velocity

- Axon diameter
- Myelination
- Temperature
- Ion Concentration
- Number of open ion channels

The Spread of Current Through Neurons

- Passive spread of current

  $\Delta V_x = \Delta V_0 e^{-x/\lambda}$

  λ = "*length constant*"= square root (r_m/r_a)

Resistance membrane/resistance of axon

- As the age advances conduction velocity decreases
  - An average reduction of about 20-40% in maximal isometric strength in various muscles.
  - There is a decrease in number of nerve fiber, a reduction in fiber diameter and changes in the fiber membrane.

Why do we record from two sites?

- Synaptic delay at neuromuscular junction