

EMG Simulator Exercise

The EMG Simulator will assist you to better understand the properties of motor unit potentials (MUP) and the changes that occur in the MUP with alterations in properties of muscle fibers and motor units.

There are many parameters that may be altered in either

- a) Properties of an entire motor unit
- b) Properties of muscle fibers
- c) Firing rate or force
- d) Needle position
- e) Needle type

These questions will help you understand how different changes in the above properties affect the findings on needle EMG:

1. Add a single motor unit. Observe morphology and parameters (duration, amplitude, phases, rise time, firing rate)
 - a) Move needle approximately 1 mm in 3 or 4 different directions (left screen). You are recording the same motor unit. What properties change? Why? **Morphology may change slightly, such as extra phase or turn. Because recording different group of muscle fibers from the motor unit; they have different distribution around the recording surface.**
 - b) Move the needle to the edge of the motor unit (center screen). Which parameters change the most? **Rise time and amplitude. Because recording fewer muscle fibers and are distant.**
 - c) Move the needle closer to the endplate (right screen). What happen to the MUP? **Becomes initially, or predominantly, negative. Because recording at the site of origin of action potentials.**
2. Add a second motor unit (to compare with the first).
 - a) Which parameter changes would most likely produce increase in MUP amplitude? **Increasing number of fibers in motor unit and / or increasing muscle fiber diameter.**
 - b) What changes occur in MUP with only increasing fiber diameter? **Large increase in MUP amplitude. Minimal increase in MUP duration.**
 - c) What changes occur in MUP with only decreasing fiber diameter? **Large decrease in MUP amplitude. Small decrease in duration. Small increase in phases.**
 - d) Increasing territory radius and number of fibers in a motor unit produces what changes in MUP? What pathophysiologic process does this reflect? **Increases amplitude and duration of MUP. Reflects reinnervation after neurogenic process.**
 - e) Which parameter change would be most responsible for producing increased polyphasicity in a MUP? **Increasing range of variability in fiber diameter.**

- f) What does increasing jitter do to a MUP? What disorders does this occur in?
Produced varying MUP amplitude. Seen in neuromuscular junction disorders and reinnervating neurogenic or myopathic processes, too.
 - g) What happens to a MUP when you change to a bigger recording area (button on top taskbar)? **Produces a slight increase in duration and amplitude of MUP. This is similar to what occurs with recording from a monopolar electrode.**
3. Add 3rd motor unit.
- a) Increasing the force to 75% would mimic what finding? **Reduced recruitment.**