Think, then Move!

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Think, then Move!

Upper motor neurons run down the corticospinal tract where they synapse with lower motor neurons in the spinal cord.

I command thee, biceps, to contract!

Muscles are bundles of muscle fibers.

Lower motor neurons synapse on muscle fibers.

Acetylcholine is released at synapse (neuromuscular junction), causing an action potential in the muscle and a twitch.

From: Backyardbrains.com
Biology: Neurons do the work

From: Understanding FASD: A Comprehensive Guide
http://sites.duke.edu/rise/resources/teaching-material/
Biology: Acetylcholine is the key

From: Animated Neuroscience & the Actions of Nicotine, Cocaine, & Marijuana in the Brain
Chemistry & physics: It’s the ions!

outside

Na$^+$

K$^+$

Cl$^-$

-70 mv

inside

= other anions
Biology, chemistry & physics: Currents flow

Adapted from: Neuroscience, Sinauer Press
Physics: Currents lead to Action Potentials!

Adapted from: Neuroscience, Sinauer Press
How about some real Action Potentials! Let’s “grip and squeeze”

Flexor Digitorum Superficialis

Flexor Digitorum Profundus

Flexor Pollicis Longus
Real Action Potentials: grip and squeeze

Weak: 1 motor unit

Moderate: > frequency more motor units

Strong: high frequency random firing

From: RA Mezzarine et al., (2013) DOI: 10.5772/54870
Let’s do it!

Muscle fatigue: What happens to the APs?

From: Backyardbrains.com
Let’s quantitate what happens: Use your iphone, iPad, computer!

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Rest</th>
<th>Grip time-1</th>
<th>Grip time-2</th>
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<tr>
<td>Amplitude (mm)</td>
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<td>Frequency (Hz)</td>
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