**INSTRUCTOR GUIDE**

**ACTIVITY TITLE: Muscle Talk**

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| \***Theme**: | Explore how the brain makes your body move, specifically looking at the electrical activity at your neuromuscular junction. |
| \***Objective**(s):*(What key learning do you want students to come away with?)*  | We want to convey to kids the basic principles underlying how your brain communicates with your muscles, and that connection is what makes your muscles move! You will get to listen to the electrical impulses of muscles at rest and during contraction. You can listen to the conversation between your brain and your muscles! |

 **LESSON OUTLINE:**

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| **1. Introduction:***Plan a script of what you will say to start.**- What will this be about? Why’s it interesting?* *(Hook)* | * **QUESTION**: **How do you move your body? How do you raise your hand in a classroom to answer questions? Or bring a Poptart to your mouth when you want to eat it?**
* A: When you brain decides to move a muscle, neurons from your motor cortex (called upper motor neurons) send projections to your spinal cord, where they connect with “lower motor neurons”.
* These lower motor neurons connect to many muscles fibers to make a motor unit.
* Muscle fibers are able to contract, which is what makes your muscles move!
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| **2. Building Background:***List questions you can use to immediately engage your audience and prepare their thinking for your activity.**-What prior knowledge might they have about/related to your topic?* *-What prior knowledge (background) do they need for your activity?* | * **Q: What do you think happens when your neuron sends a message to your muscle? How do neurons send messages? (they might have knowledge if they’ve gone to past Sat Sci events)**
* Neurons send messages electrochemically. Little molecules communicate large When motor neurons are active, they release a molecule (neurotransmitter) called acetylcholine.
* **Q: does anyone know what an action potential is?**
* Ache causes changes in the muscle (electrical potential changes), and an action potential occurs in the muscle fiber.
* When the action potentials fire, there is a cellular cascade causing muscles to contract!
	+ Changes shape due to myosin/actin chains sliding against each other
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| **3. Lesson & Activity:***Outline the key components of your lesson.***Plan/Note**:- key ideas/ vocabulary- scaffolds - images/media- extension questions\*Consider how to best deliver your content! \*Plan interactive components that encourage active thinking in your students. | * **What we are going to do is listen to the electrical impulses of muscles at rest and contraction! We are going to hear action potentials in your own arms!**
* Place two electrodes on the bicep or forearm of the student
* Ground the third electrode on their other arm
* Make sure the spikerbox is plugged into your phone so you can visualize the APs of your muscles in real time, paired with the audio
* **Q: What do you hear when you flex your muscle? What is happening then?**
* Those are APs!
* **Q: What happens when you flex your muscle even harder? Why?**
* There would be more APs because you are engaging your muscle fibers more!
	+ One motor neuron can synapse with multiple muscle fibers! A large muscle, like your bicep, may be 1 motor neuron that synapses on 1000s of muscle fibers.
	+ Small muscles, like the ones that make your eyes move, maybe have a 1:10 ratio.
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| **4. Wrap Up:***- Review key ideas**- Share takeaways and final thoughts**- Discuss connections to other questions and ideas. Extensions.**- Ask: Who could you teach what you learned here today?**- Ask/Suggest: What can I do to learn more?* | * Remember that the movements of you body, almost always start in your brain!
* Relate this to the 2nd movement activity, Are you in Control, to talk about what movements are not controlled with your brain!
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| **MATERIALS NEEDED: *\*\*(please list all items and quantities necessary for preparation)*** |
| EMG Spikerbox kit, conductive gel, applicators for gel, napkins for cleaning off gel, fully charged iPad/tablet or iPhone/smartphone with free Spikerbox app preloaded, extra 9V battery |

\*\*attach any printouts to end of document here

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| **Other Notes**  |
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**Extra Resources:**