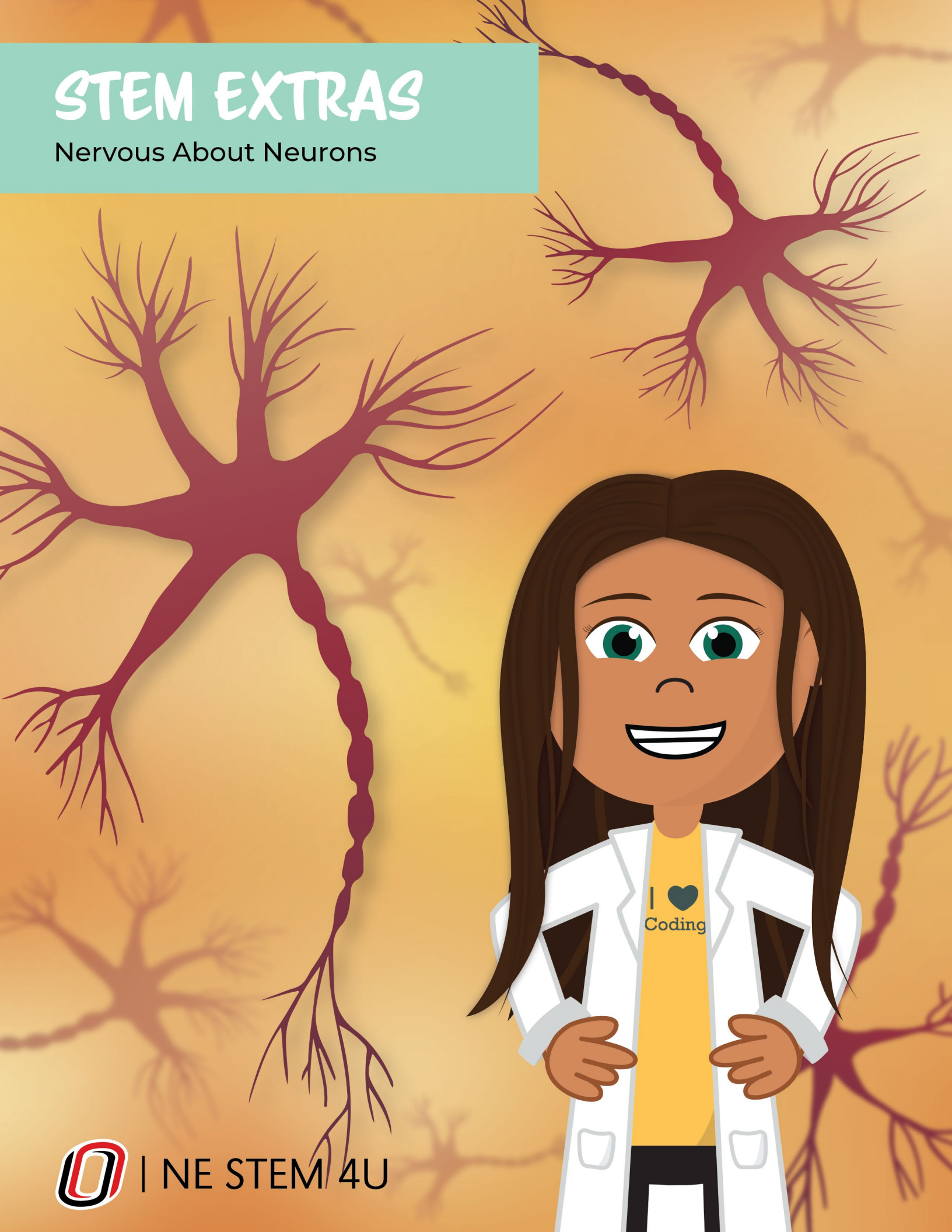


STEM EXTRAS

Nervous About Neurons



Nervous About Neurons

NGSS

MS-LS1-1; MS-LS1-2; MS-LS1-3

Objective

The student will understand how a neuron functions and the basic components of a neuron.

The student will be able to build and explain the key components of their own beaded neuron.

Vocabulary

Neuron: Nerve cell and primary functional unit of the nervous system. Comes in various shapes and sizes.

Dendrites: Area where neurons receive most of their information and look a bit like tree branches. There are receptors on dendrites designed to pick up signals from other neurons that come in the form of neurotransmitters.

Cell body (soma): The area in a neuron where electrical charges are interpreted. Contains the DNA or genetic material of the cell and takes all the information from the dendrites and puts it into the axon hillock.

Axon: If the signal from the dendrites is strong enough, then the signal travels to the axon. The signal is called action potential at this point.

Axon Terminal: The last step in the action potential. When the signal reaches this point, it can cause the release of neurotransmitters, which will interact with dendrites of another nerve cell to continue the signal.

Background

The brain of a mammal is said to contain approximately 100 billion neurons. Neurons are the fundamental functional unit in the nervous system, specifically playing a role in

action potential of a signal and transferring information. This information transfer can be to other nerve cells, muscle cells, or even gland cells. Key components of a neuron include the dendrites, the soma or cell body, the axon, and the synaptic terminal.

Dendrites extend from the neuron cell body and often look like “tree branches.” They have contact points that allow for communication with another neuron, receiving a signal from a chemical called a neurotransmitter.

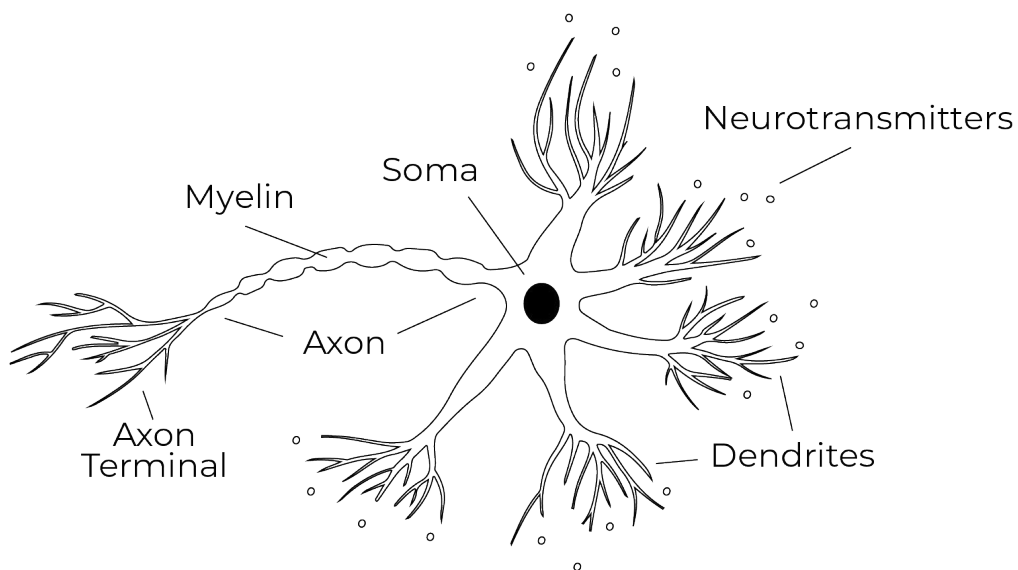
The sending and receiving of messages by neurons is facilitated by electrical impulses along the axon of the neuron. This axon is covered with a myelin sheath that acts as insulator material to prevent the signal from degradation. It also functions to speed up the signal.

After traveling down the axon, the signal reaches the axon terminal, which, with a strong enough signal, will release neurotransmitters to alert the next nerve cell of the communication signal via the synaptic cleft (interaction point between two nerve cells).

Example:

You touch a hot cookie sheet that was just pulled out of the oven. In this moment, you feel immense pain because the skin and muscle cells that were injured communicate with nerve cells, which create a signal cascade that reaches the nerve cells in your brain to indicate the painful event of burning your hand on the cookie sheet.

Diagram of a typical Neuron



Materials

Large Group:

- Rope
- Plastic containers
- Pool noodle
- Plastic Balls
- Plastic Cups

Per Group (work in pairs):

- Flexible wire
- Three assorted colors of beads

Procedure

Group Activity

1. Two large groups will build a large neuron.
2. Each group must assign roles of axon, axon terminal, dendrites, cell body, and neurotransmitters.
3. The students will work together to build and then act out the job of a neuron.
4. Both groups will work together to demonstrate how a signal transfers from one neuron to the next.

Note: The plastic container can represent the soma of the neuron, with rope portions coming off as dendrites. Holes in plastic cups are made and attached to the rope, which acts as a “receptor” point. Then, the pool noodle threaded through rope is the axon (enclosed in a myelin sheath) that is then connected to more pieces of rope tied to the pool noodle, functioning as axon terminals. The plastic balls are used as neurotransmitter chemicals.

Partner Activity

1. Provide a sheet of paper for partner teams to plan out their design for a neuron. Partner teams can design a neuron like the cards or be creative for a neuron that they claim would be for a new species... The neuron **must have the essential parts** (dendrites, soma, axon, and axon terminal).
2. Assign partners to build their own neuron using supplies available at the front table.

3. Provide an opportunity for partner teams to showcase their designs. Place all designs on a table and have each partner team describe the parts of their neuron.

Review what students learned and have students reflect on their thoughts on the activity.

Guiding Questions

- Why is the myelin sheath important for a neuron signal?
- What would happen if neurotransmitters were not released?
- When people are paralyzed, describe how that relates to their neurons for lack of movement or inability to feel.
- Do people with quick reflexes have neurons that fire quicker? Why?

Career/Future Application

Neurology, neuroscience; *Everything we do is dependent on neurons.*

Sources

<https://www.brainfacts.org/brain-anatomy-and-function/anatomy/2012/the-neuron>

<https://www.khanacademy.org/science/biology/human-biology/neuron-nervous-system/a/overview-of-neuron-structure-and-function>

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