



Science Behind the Story (SBS)
How Your Brain and Your Body Talk (🌈 A Brain Facts Story)
(3rd Grade- 8-9yrs)

This story describes how the brain is able to send information to and from the body.

- 🌈 The brain is made up of billions of cells called neurons. (like puzzle pieces – afferents & efferents)

The human brain contains billions of neurons (Von Bartheld, 2016). These neurons make connections with other neurons, glial cells and other cells in the body, primarily through axons (Yuste, 2015). Information that is sent to the brain from is sent via afferent axons and information that is sent from the brain are sent via efferent axons (Mai & Paxinos, 2011).

- 🌈 There are 2 main ways that neurons “talk” – chemically and electrically. (both are REALLY fast)

Neurons communicate with other cells through a synapse and the term synapse was first described by Sherrington in 1897 (Bennet, 1999). While there are many parts of a neuron that take part in making up a synapse (Breedlove, 2020), the most prevalent synapse involves the axon of one neuron synapsing on the dendrite of another neuron.

The primary mode of communication among neurons is via chemical or electrical synapses (Alcami, 2019). Chemical synapses involve the release of a substance, typically a neurotransmitter, which travels out of the neuron and goes across a space, known as the synaptic cleft, and attaches to receptors on other cells (Alcami, 2019; Pereda, 2014). Electrical synapses involve proteins on both cells that are communicating which line up to allow for the transfer of ions from one cell to the other (Alcami, 2019, Pereda, 2014). Both modes of communication occur quickly. It takes from 0.3 - 50 msec for information to be communicated at chemical synapses (Jonsson, 2016; Yu, 2019) and at electrical synapse information is communicated even faster than that (Yu, 2019). In fact, it was neurotransmission (or communication of cells within the brain) that inspired the new 6G technology (Yu, 2019).

- 🌈 Neurons connect different parts of the brain together and they connect the brain to different parts of the body. (nerves)

Nerves are defined as a collection of axons that are bundled together (Breedlove, 2020). These nerves (or bundles of axons) are what make up the afferent and efferent fibers that carry information to and from the brain (which is part of the central nervous system). Different parts of your brain send and receive signals from different parts of your body (Breedlove, 2020). Your brain communicating with the various parts of your body, which is mediated by neurons sending information to other cells via synapses, allows you to do all of the behaviors that you need and want to do. The more neurons talk to other cells via synapses, the stronger their connection become and the less cells you need to produce the same behaviors (Yu, 2017). This is what makes the nervous system so energy efficient.

National Standards:

Next Generation Science Standards

- Crosscutting Concepts:
 - **Systems and System Models:** A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.
 - A system can be described in terms of its components and their interactions.
 - A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot.
 - **Structures & Functions:** The way an object is shaped or structured determines many of its properties and functions.
 - Substructures have shapes and parts that serve functions.
 - **Cause & Effect:** Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.
 - Cause and effect relationships are routinely identified, tested, and used to explain change.

References:

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