BRAIN CHEMISTRY

What are neurons?

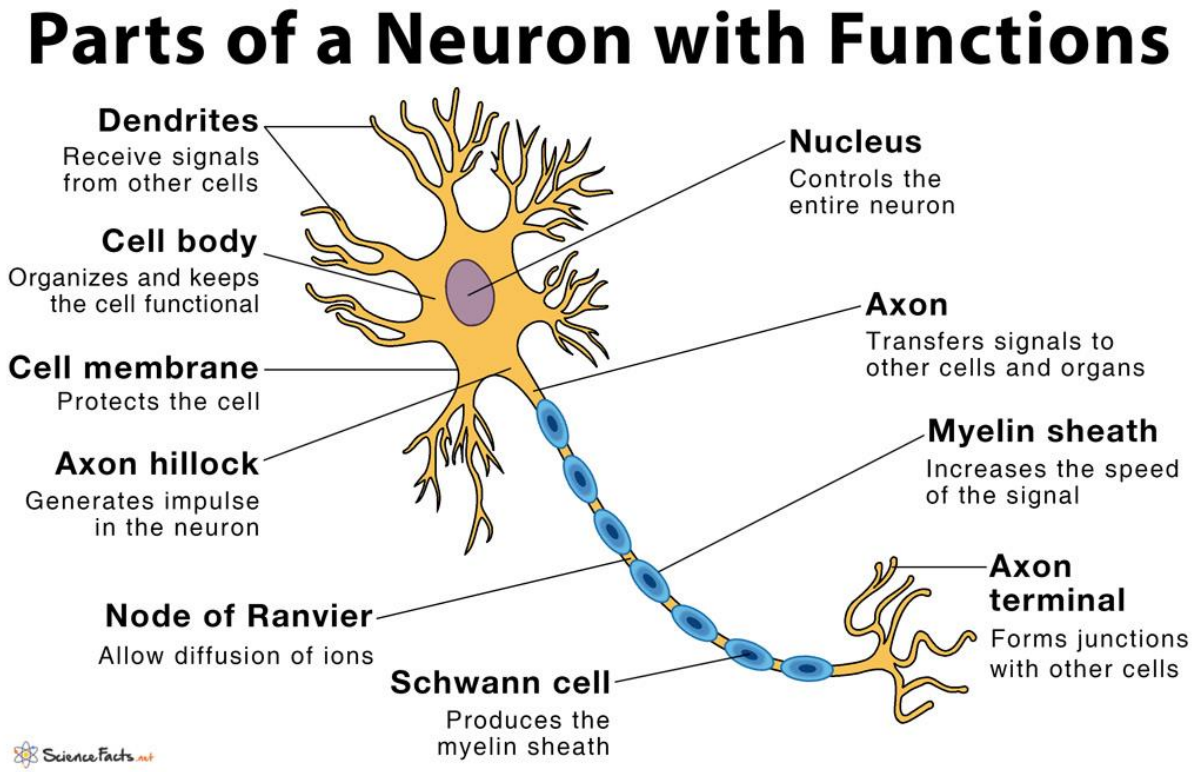
Neurons are information messengers. They use electrical and chemical signals to send information between different areas of the brain, as well as between the brain, the spinal cord, and the entire body.

They are essential for every action that our body and brain carry out. It is the complexity of neuronal networks that gives us our personalities and our consciousness.

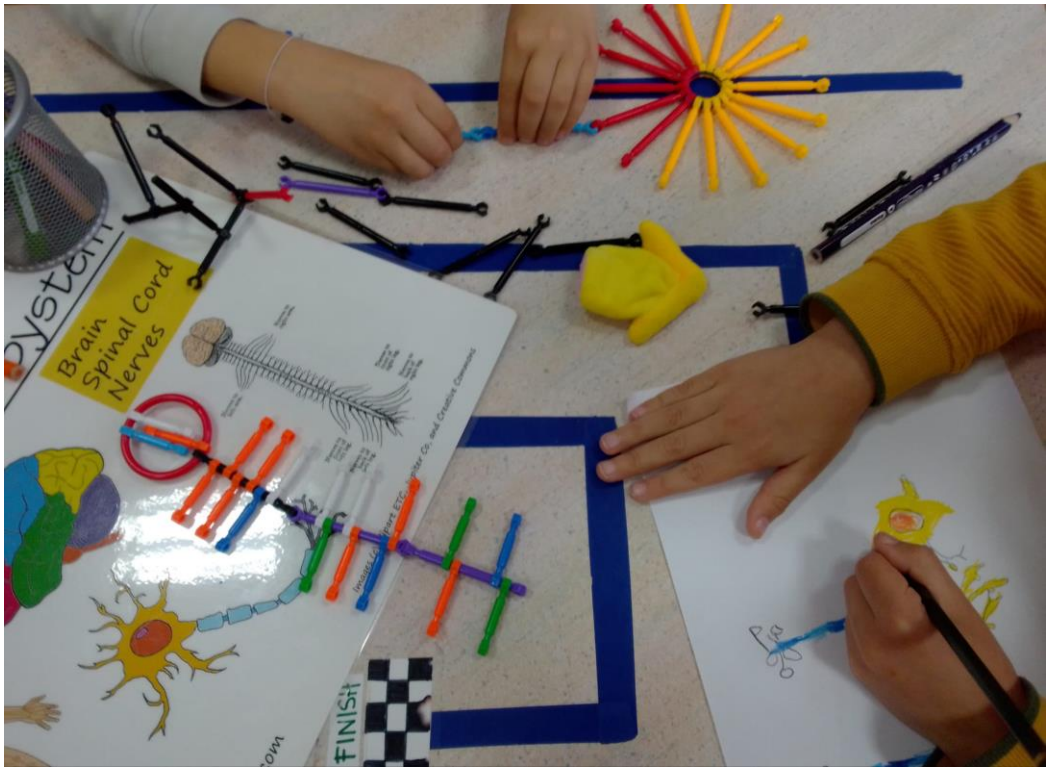
Video material that we have looked at:

https://www.youtube.com/watch?v=6qS83wD29PY (2-minute neuroscience: The neuron)

What does a neuron look like?



Izrada modela neurona sa svim potrebnim djelovima (dendrites, cell body, axon, axon terminal)



Izrada modela kralježnične moždine

Analogy that we used

We thought of a neuron as a tree.

A neuron has three main parts: dendrites, an axon, and a cell body or soma, which can be represented as the branches, roots and trunk of a tree.

A dendrite (tree branch) is where a neuron receives input from other cells. Dendrites branch as they move towards their tips, just like tree branches do, and they even have leaf-like structures on them called spines.

The axon (tree roots) is the output structure of the neuron; when a neuron wants to talk to another neuron, it sends an electrical message called an action potential throughout the entire axon.

The soma (tree trunk) is where the nucleus lies, where the neuron's DNA is housed, and where proteins are made to be transported throughout the axon and dendrites.

Neuron structure

Axon
-long, thin structure in which action potentials are generated
-the transmitting part of the neuron-transfers signals to other cells and organs
-after initiation, action potentials travel down axons to cause release of neurotransmitter

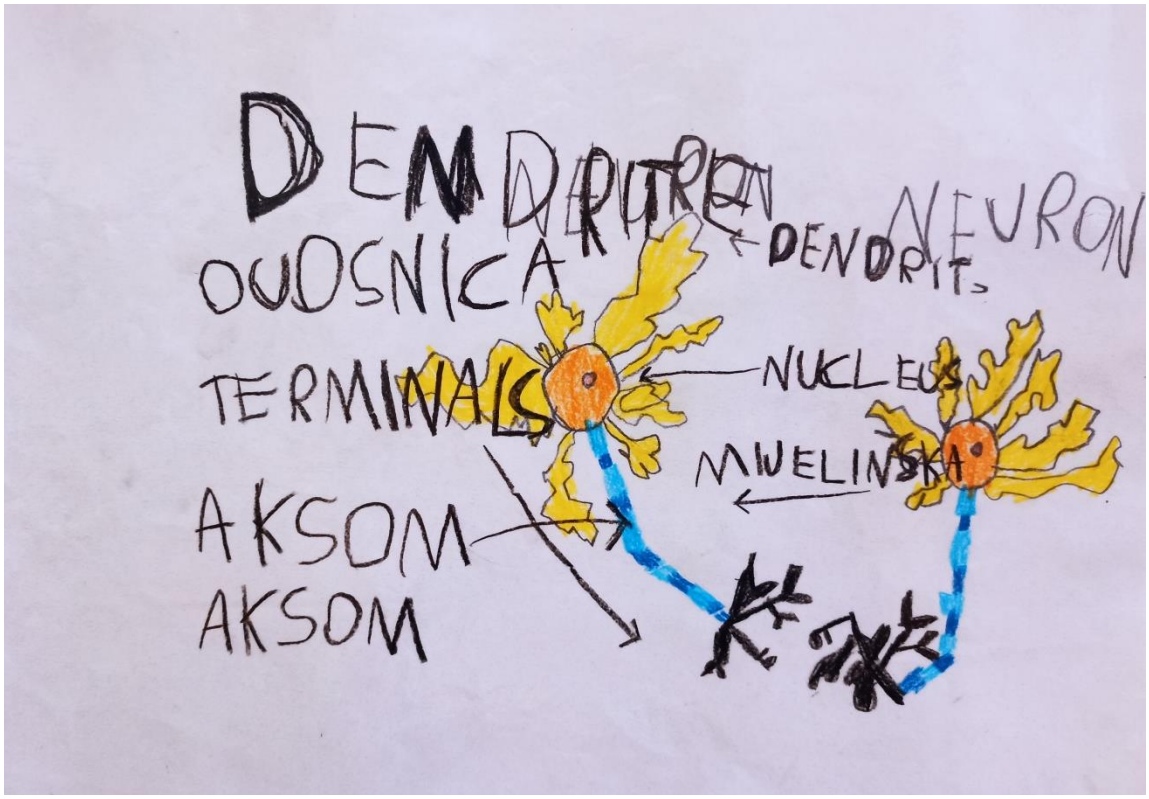
Dendrite
-receiving part of the neuron-recives signals from other cells
-dendrites receive synaptic inputs from axons

Myelin sheet
-increases the speed of the signal

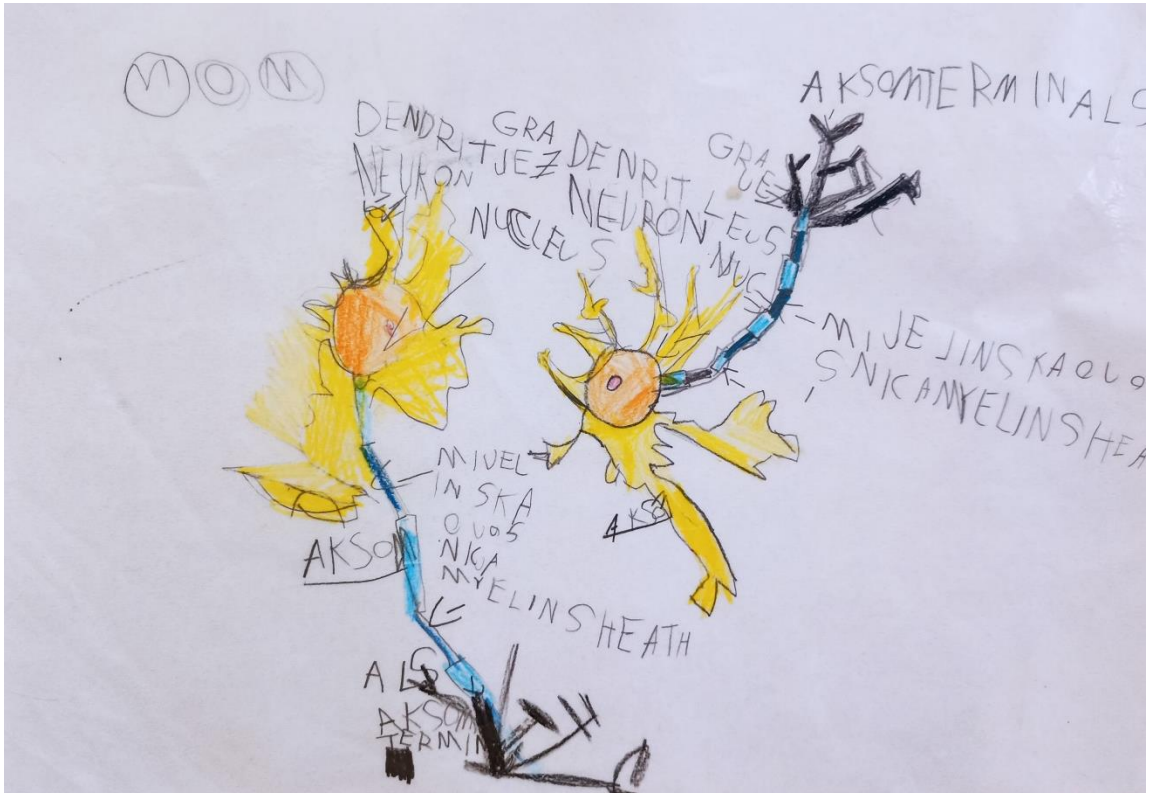
Axon terminal
-forms junctions with other cells

Video material that we have looked at:

https://www.youtube.com/watch?v=Ta_vWUsrjho (Structure of neuron)



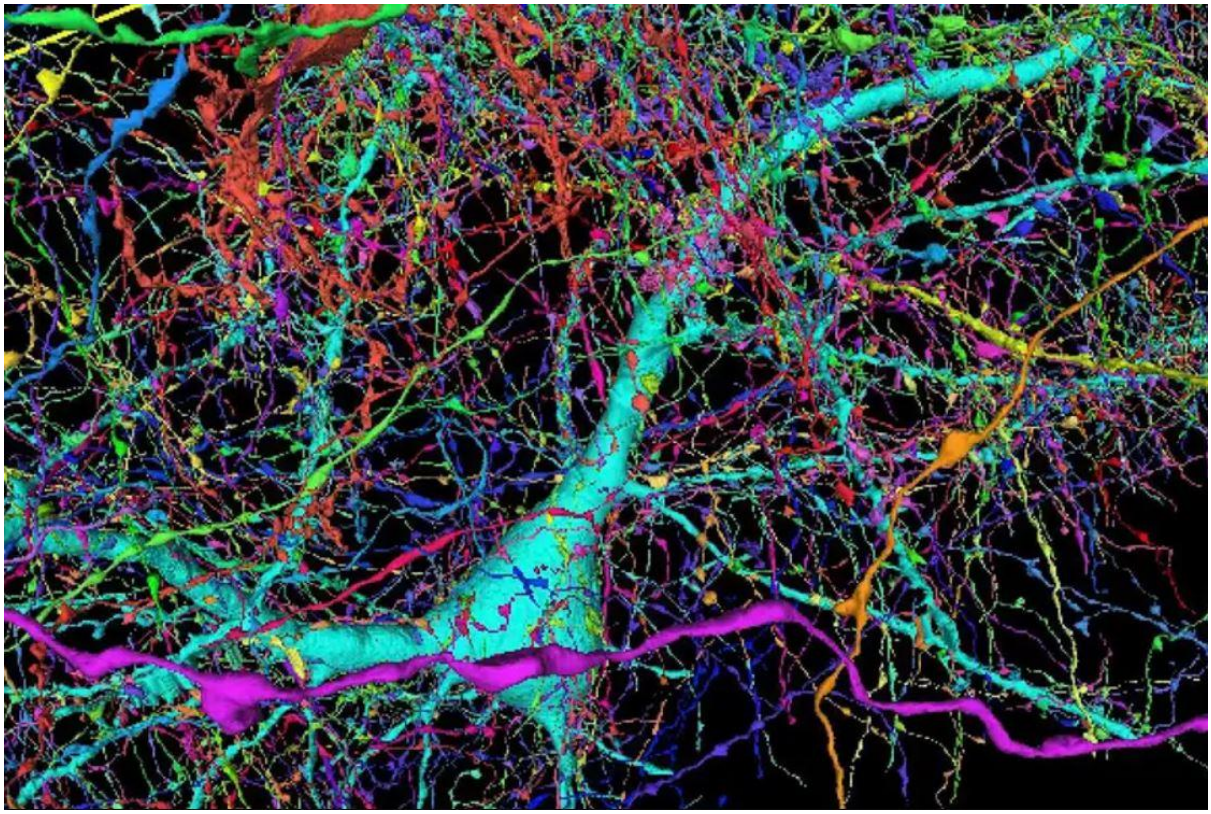
Struktura neurona



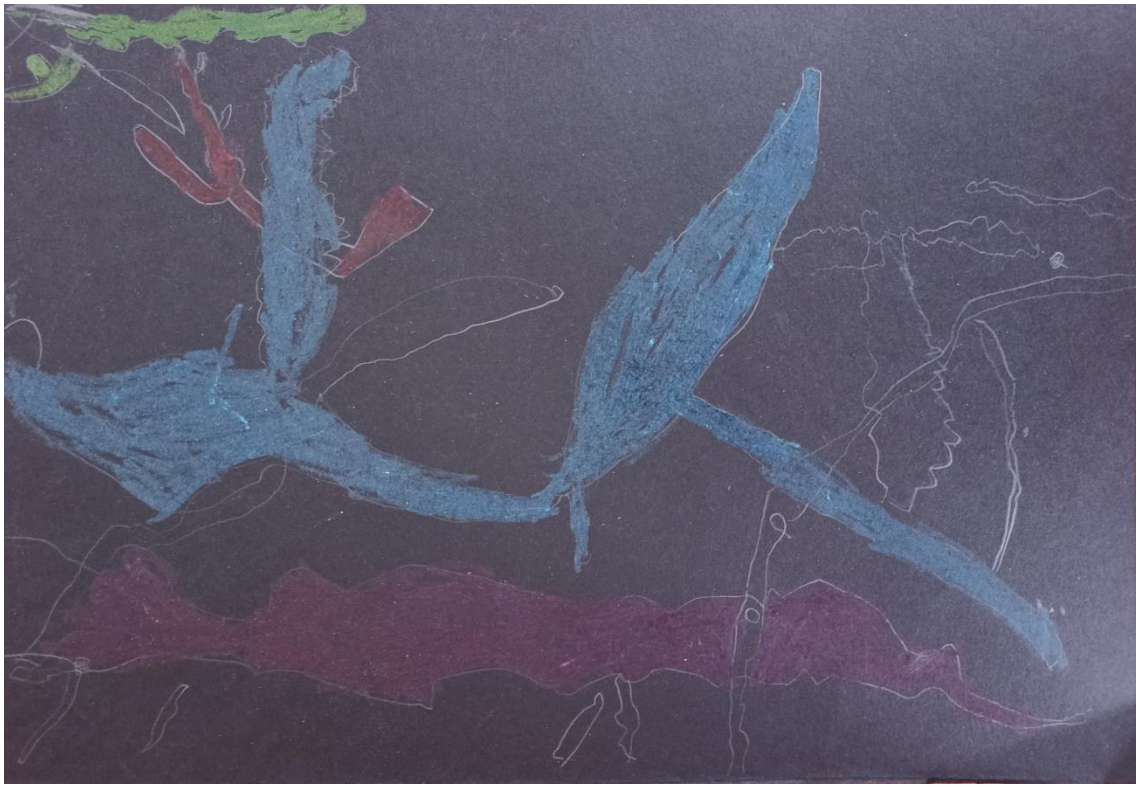
‘’To san ja crta. To je neuron. Zato šta san želia napravit dva neuron.’’ K.Š

Brain neurons

The billions of neurons (nerve cells) in your brain come in many different types and sizes, but they all work the same way. Neurons serve as essential messengers that transmit the information your brain needs to regulate every aspect of your mind and body.



‘’Google has helped create the most detailed map yet of the connections within the human brain.’’



How neurons work?

Neurons communicate with each other by sending chemicals called neurotransmitters.

Every neuron consists of a cell body that has structures sticking out on two sides. These structures are called dendrites and extend from one side of the cell body. Their branches contain receptors that bind with neurotransmitters coming from other neurons.

After dendrites take in neurotransmitters, they send the chemicals into the cell body. The cell body turns the chemicals into an electrical signal that travels down a long, tail-like structure on the other side of the cell body called the axon.

As the electrical wave reaches the end of the axon, it triggers the release of neurotransmitters that are stored in the axon. The neurotransmitters leave the neuron and travel to the dendrites of a nearby neuron.

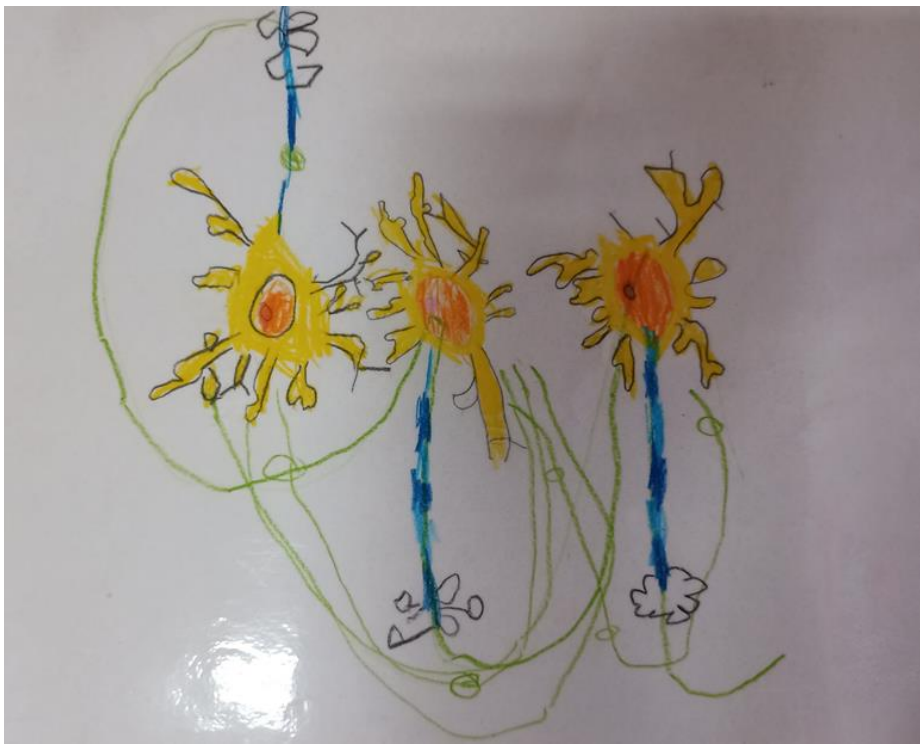
Video material that we have looked at:

https://www.youtube.com/watch?v=HUuUUJktL6E (What are neurons and how do they work?)

Pokretna igra (djeca postaju neuroni koji se međusobno premrežavaju kako bi prenijeli informaciju od mozga do tijela)

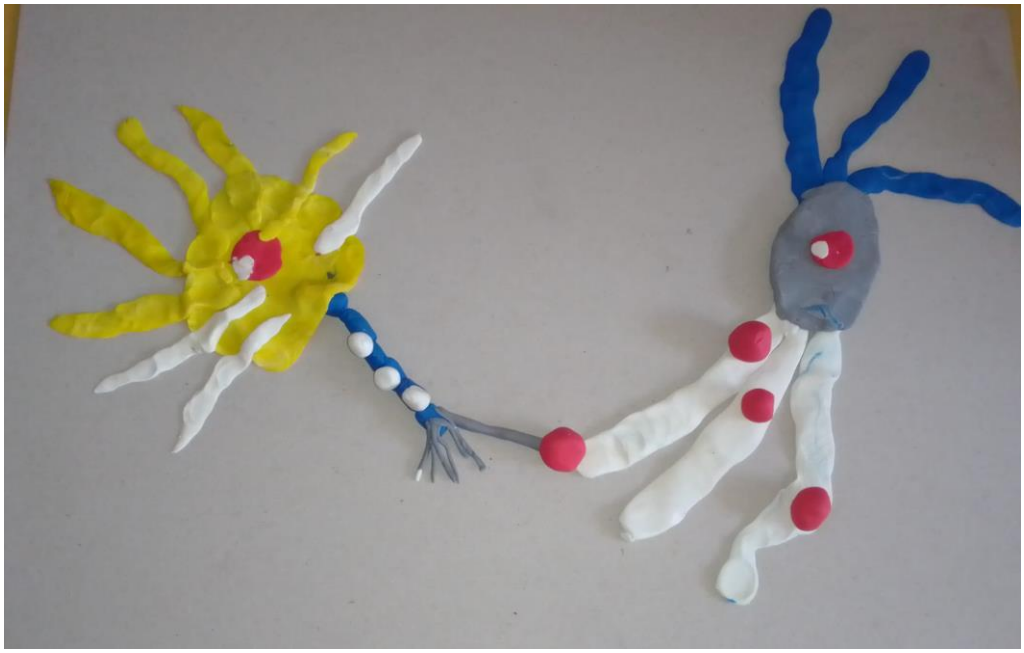
Vizualizacija premrežavanja neurona.

Djeca su izradila modele neurona i međusobno ih spojila kako bi omogućila prijenos informacije.



What are neurotransmitters?

Neurotransmitters are often referred to as the body's chemical messengers. They are the molecules used by the nervous system to transmit messages between neurons, or from neurons to muscles.



''Tu san radila neurone. I napravila san molekule. Oni su se spojili da bi mogli dalje govorit drugome informaciju od mozga. Te molekule to su te informacije-unutra su ti te riječi koje mozak želi reći.'' L.K.

''Pa to je čovjek-neuron. Pa mislia sam mu nacrtat bas cilo tijelo. Vidi mu mozak gore. Mozak služi za mišljenje šta bi moga rasit. A neuron služi za prenit informaciju. Onda znamo šta radit.'' M.B.

What is a molecule?

A molecule is two or more atoms connected by chemical bonds, which form the smallest unit of a substance that retains the composition and properties of that substance.

Izrada molekula serotonina i dopamine pomoću atoma od plastelina (u bojama podijeljenima prema kemijskim elementima) i kemijskih veza (čačkalice).

What is an atom?

An atom is a particle of matter that uniquely defines a chemical element.

Izrada atoma kemijskih elemenata koji tvore molekule dopamina i serotonina (ugljik, dušik, vodik i kisik).

What is a chemical element?

An element is a fundamental item that can't be easily broken into smaller pieces.

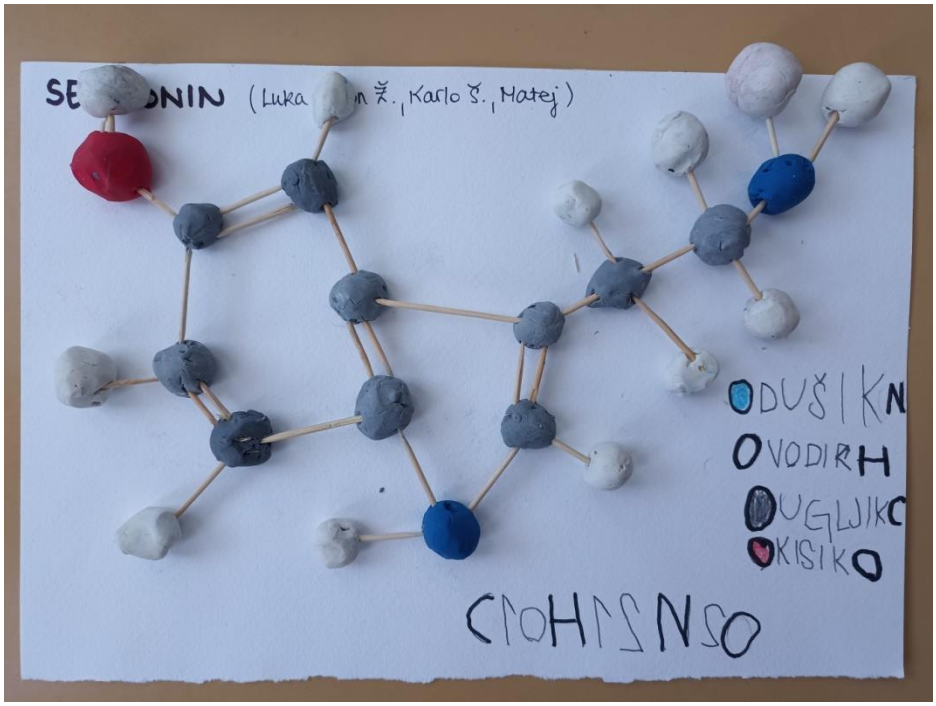
Brojanje i zapisivanje broja atoma određenog kemijskog elementa u molekulama dopamine i/ili serotonina.

Kemijske elemente imenujemo i stavljamo njihovu oznaku (dušik N, vodik H, ugljik C i kisik O).

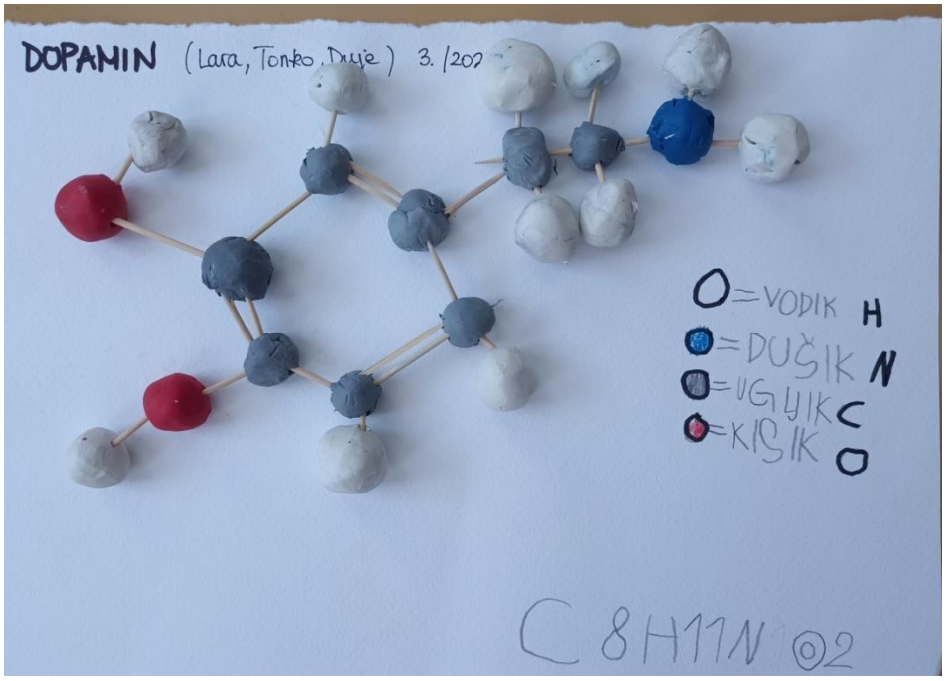
Analogija koju koristimo- svaki kemijski element ima svoje ime (npr.ugljik) i nadimak (npr. C).

What is a chemical formula?

The simplest types of chemical formulae are called empirical formulae, which use letters and numbers indicating the numerical proportions of atoms of each type,



Samostalno modeliranje molekule i podjela atoma po bojama omogućila je djeci lakše prebrojavanje atoma, ali i iščitavanje kemijske formule.



What is dopamine?

Dopamine is a type of neurotransmitter. It's made in brain and acts as a chemical messenger, communicating messages between nerve cells in your brain and your brain and the rest of your body.

Dopamine is known as the "feel-good" hormone. It gives you a sense of pleasure. It also gives you the motivation to do something when you're feeling pleasure.

Dopamine is part of your reward system. This system is designed, from an evolutionary standpoint, to reward you when you're doing the things you need to do to survive — eat, drink, compete to survive and reproduce.

As humans, our brains are hard-wired to seek out behaviors that release dopamine in our reward system. When you're doing something pleasurable, your brain releases a large amount of dopamine. You feel good and you seek more of that feeling.

This is why junk food and sugar are so addictive. They trigger the release of a large amount of dopamine into your brain, which gives you the feeling that you're on top of the world and you want to repeat that experience.

As a neurotransmitter, dopamine is involved in:
-movement
-memory
-pleasurable reward and motivation
-behavior and cognition
-attention
-sleep and arousal
-mood
-learning
If you have the right balance of dopamine, you feel:
-happy
-motivated
-alert
-focused

If you have a low dopamine level, you might feel: tired, unmotivated and unhappy.

You may also have: memory loss, mood swings, sleep problems and concentration problems.

If you have a high dopamine level, you might feel: euphoric and energized.

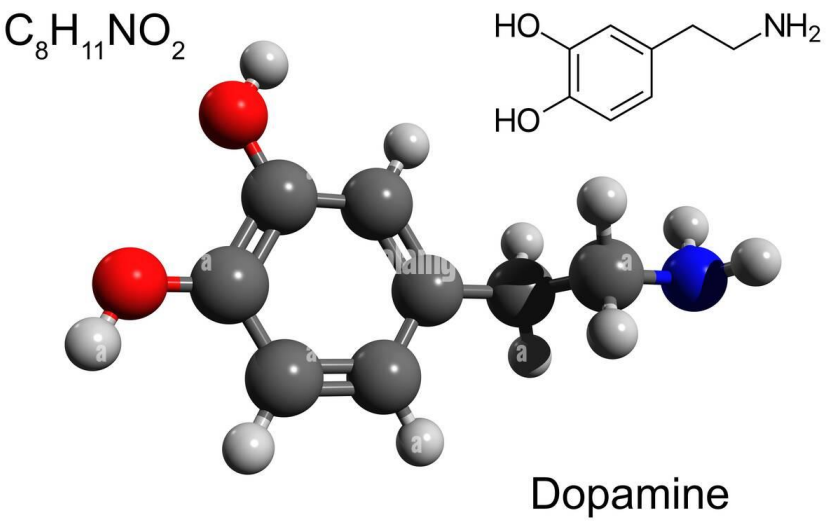
The negative side of having high levels of dopamine include: having trouble sleeping, having poor impulse control and being more aggressive.

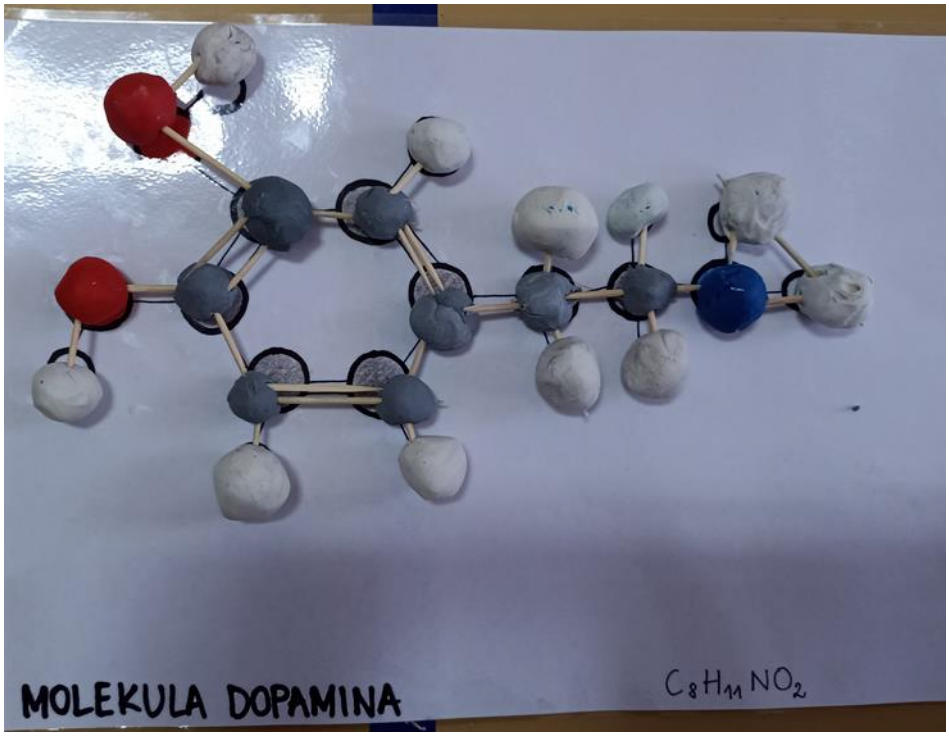
''Ovo san ja kako trčin. Preuzbuđen san i pun dopamina. Zato šta san presretan zato šta trčin. To je moja vježba, jedno od mojeg najdražeg.'' M.B.

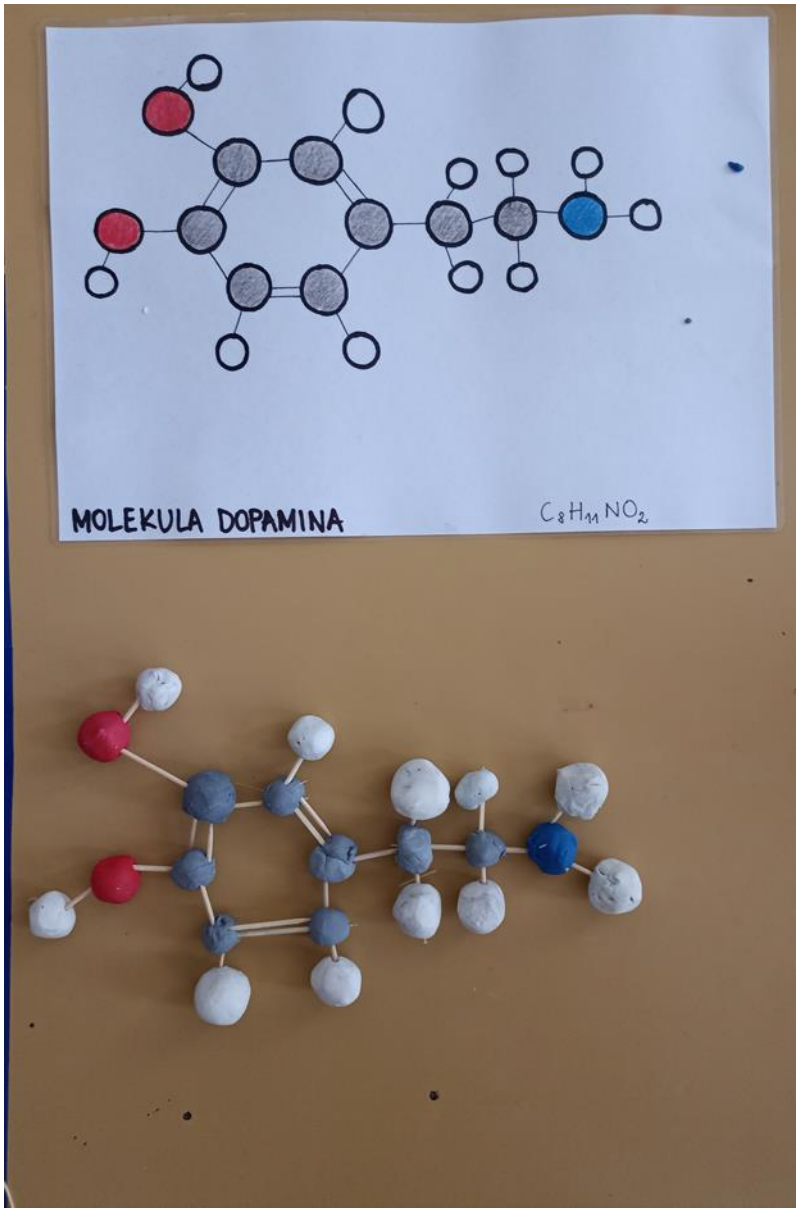
„Ja san nacrtala ovi neuron. Pun je dopamine. Puno se smije jer je dobila krunu. Uzbuđena je. Ona je princeza.'' L.K.

''Ja san preuzbuđen kad jeden muffin. Tijelo mi je onda puno dpamina. Donia san recept pa da napravimo, pa da sva druga djeca budu puna dopamina. To je baš dobar osjećaj.'' L.M.

Dopamine molecule






MOLEKULA DOPAMINA
$C_8H_{11}NO_2$

Serotonin

Serotonin is a chemical that carries messages between nerve cells in the brain and throughout your body. These chemical messages tell your body how to work.

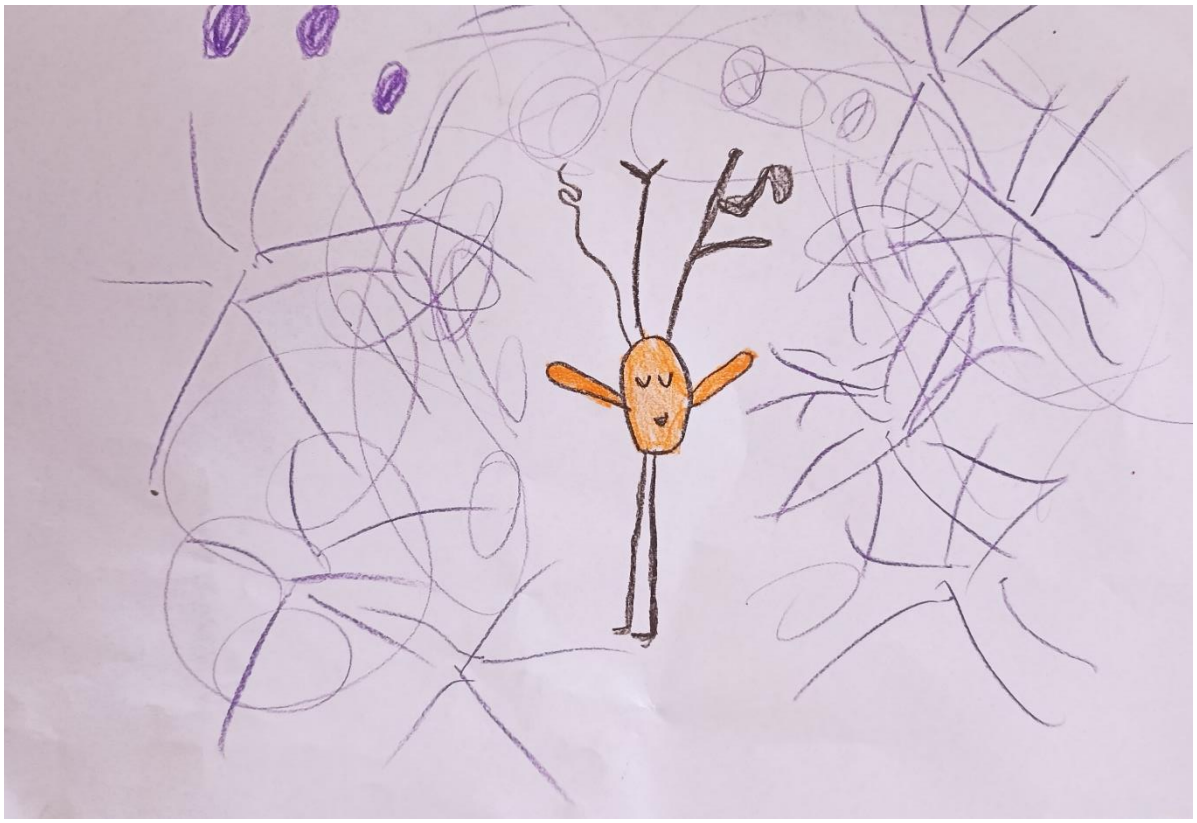
Serotonin plays several roles in your body, including influencing learning, mood, memory, happiness as well as regulating body temperature, sleep and hunger.

Serotonin in your brain regulates your mood. It's often called your body's natural "feel good" chemical. When serotonin is at normal levels, you feel more focused, emotionally stable, happier and calmer.

Low levels of serotonin are associated with depression.

Serotonin, together with another neurotransmitter dopamine, plays a role in the quality of your sleep (how well and how long you sleep). Your brain also needs serotonin to make melatonin, a hormone that regulates your sleep-wake cycle.

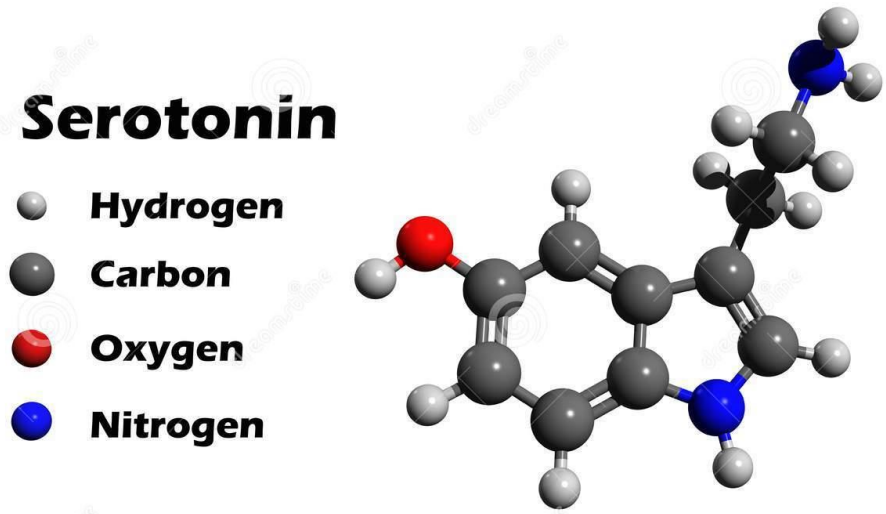
It is released by platelets in your blood to help heal wounds. It also causes the tiniest blood vessels, arterioles, to narrow, which slows blood flow and helps clots to form. This is an important process in wound healing.

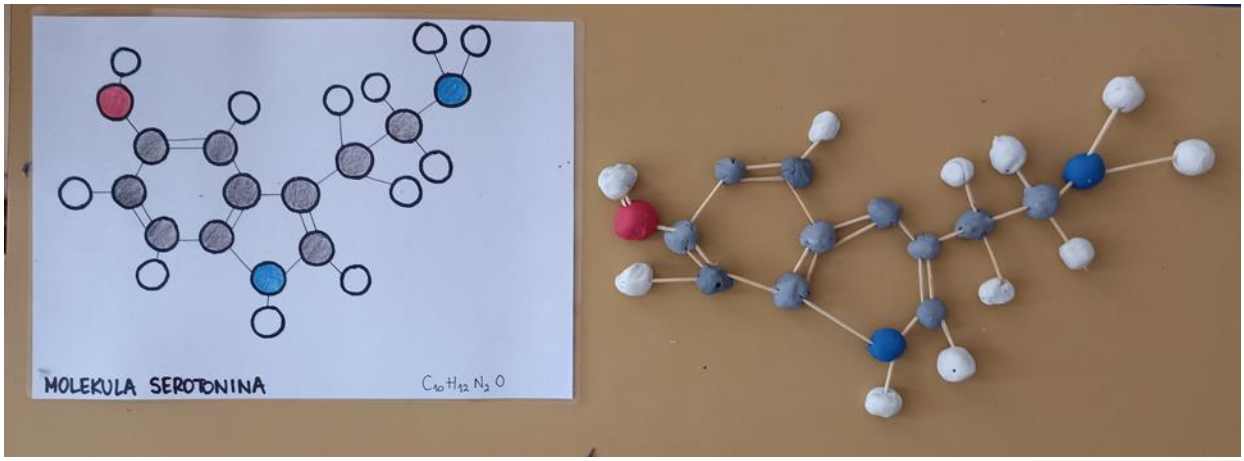


''Ovo je moj neuron. On je pun serotonina.'' A.D.

''Ovo je moj neuron. On ti je pun serotonina, pa spava. Ja volin spavat. To mi je najbolje. Moje tijelo se smiri. Onda se odmori kad san umoran.'' F.K.

Serotonin molecule





DV MARJAN, OBJEKT POTOČNICA 1 (IVANA BARIČEVIĆ I ANA LAZAREVIĆ)