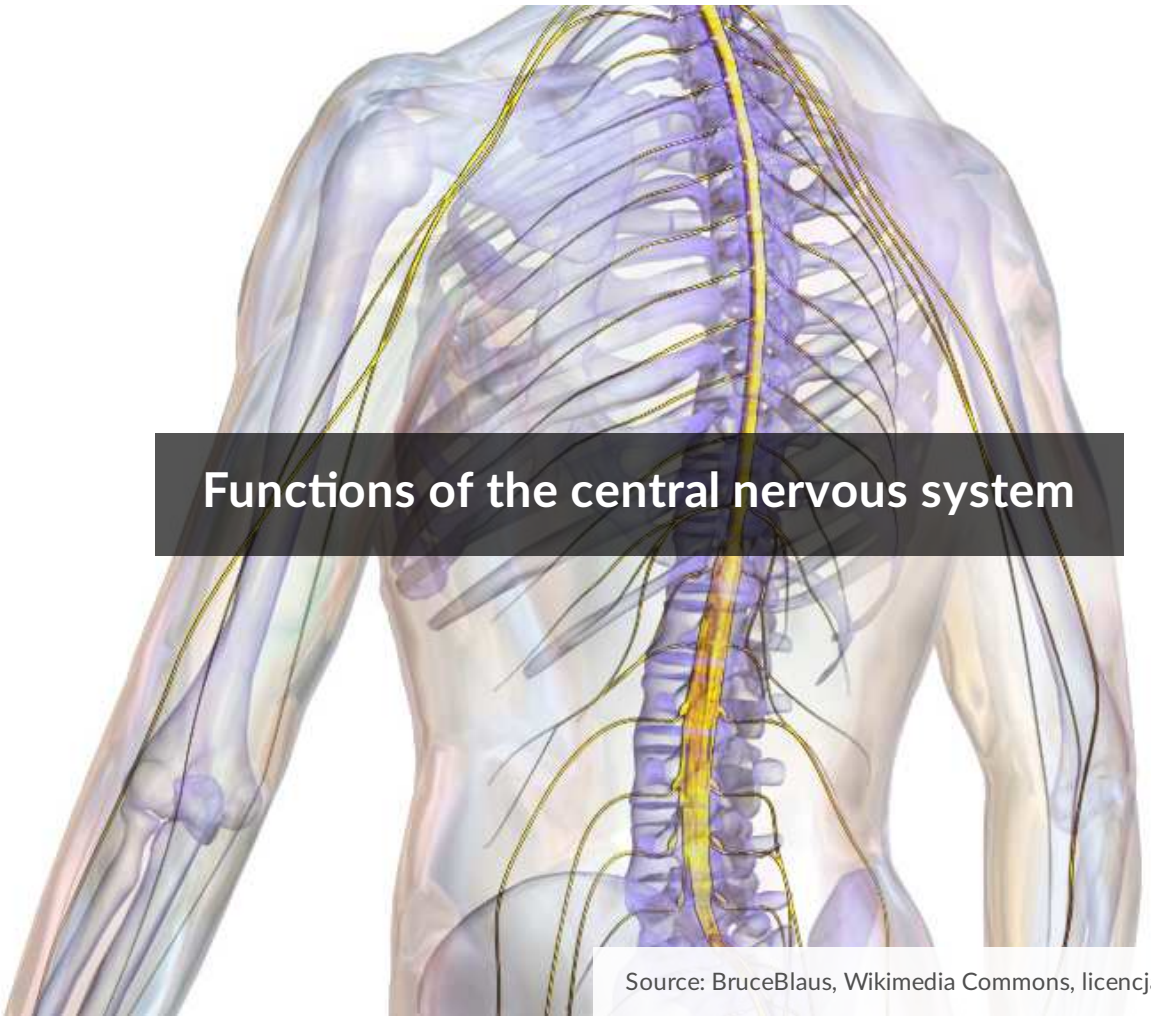
Functions of the central nervous system

- Functions of the central nervous system
- Lesson plan (Polish)
- Lesson plan (English)



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Link to the lesson

Before you start you should know

- information in the nervous system is transferred via neurons;
- activities of the nervous system (autonomic nervous system) direct functions of our body without us being conscious of it;
- information from inside the body and from the environment via nerves can reach the central nervous system.

You will learn

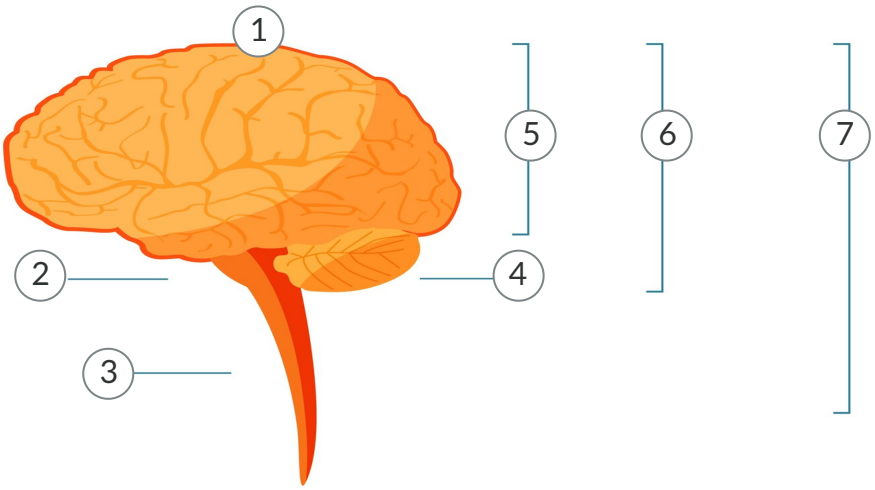
- to explain where the encephalon is located, its structure and functions;
- to compare the functions of the cerebral hemispheres;
- to explain the significance of training in brain development;
- to explain where the spinal cord is located, its structure and functions.

Nagranie dostępne na portalu epodreczniki.pl

Nagranie dźwiękowe dotyczące czynności ośrodkowego układu nerwowego.

Central nervous system

The central nervous system guides the functioning of the internal organs of a body, analyzes the stimuli that reach the organism, controls its reactions, is responsible for the development of brain functions, such as associating, memorizing, learning. It is made up of concentrations of nerves arranged in a specific way. The bodies of neural cells are attached to each other, creating grey matter. Bundles of axons create the white matter. The central nervous system is composed of the encephalon and the spinal cord.



1

the cerebral cortex

2

brainstem

3

spinal cord

4

encephalon

5

brain

6

cerebrum

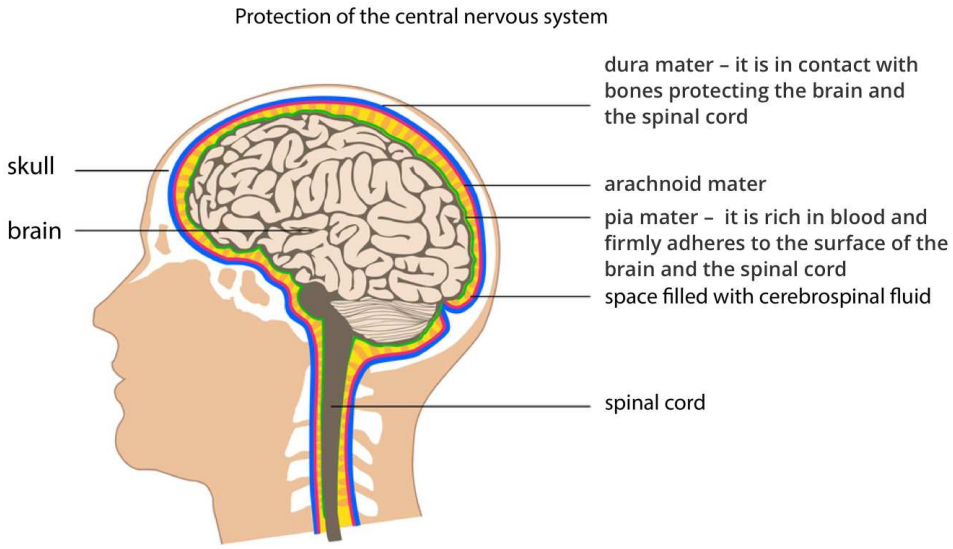
7

central nervous system (CNS)

Central nervous system

The central nervous system as the control centre for the vital functions of the body must be especially protected against injuries and against external factors. The encephalon and the spinal cord are protected by:

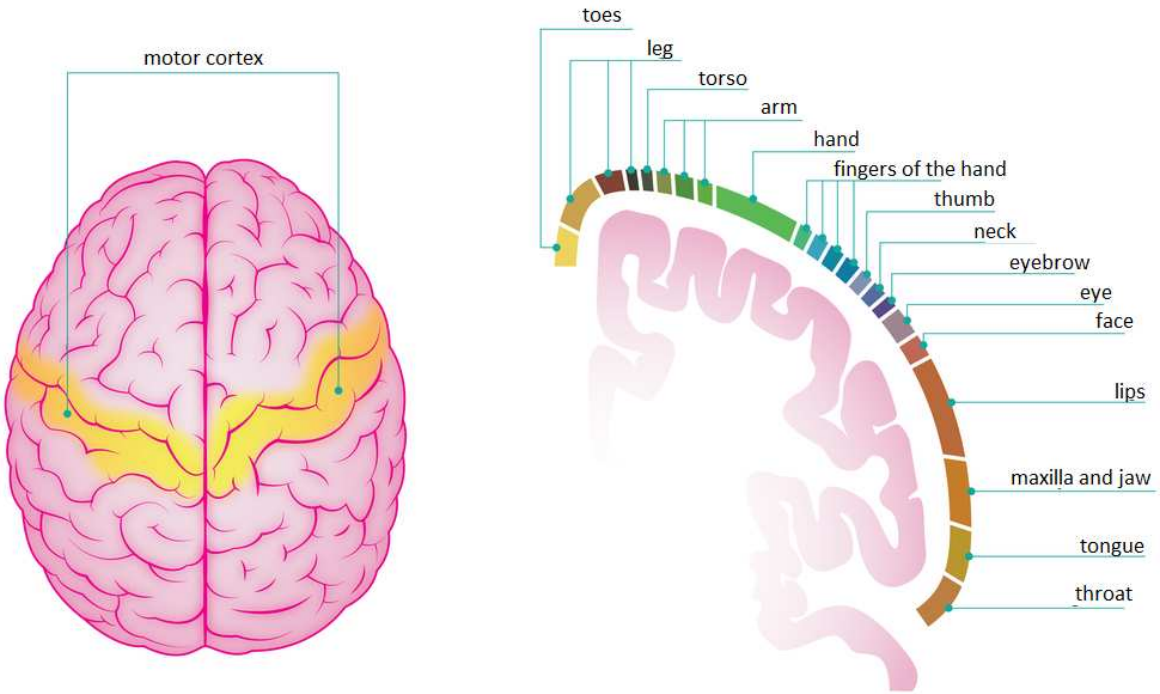
- bone elements – cranial bones protect the encephalon, whereas the spinal canal protects the spinal cord;
- cerebrospinal fluid, a derivative of blood plasma, which cushions shakes and provides neural cells with nutrients, as well as receives from them products of metabolism;
- 3 membranes of connective tissue called meninges.



Protection of the central nervous system

Brain

The brain is the biggest part of the encephalon. Its outer layer, which is the cerebral cortex, is composed of a gray matter and is characterised by the specific folds. Underneath the cerebral cortex there is a white matter. Brain, even though it is only 2% of the body mass, uses 20% of the energy our body produces. The brain is composed of dozens of millions of neural cells, and each single cell can have around 25 thousands connections with other neurons. During your life, the brain can create new neural connections, thanks to which we have the ability to learn. Tasks that require performing new activities, practicing physical skills and solving theoretical problems, favour creating new connections and increase the brain efficiency. For small children, plays that require precise movements, e.g. DIY are the key factor for brain development. For older children, it is important to develop the brain via reading, writing, speaking and practising all tasks that require gaining new skills.

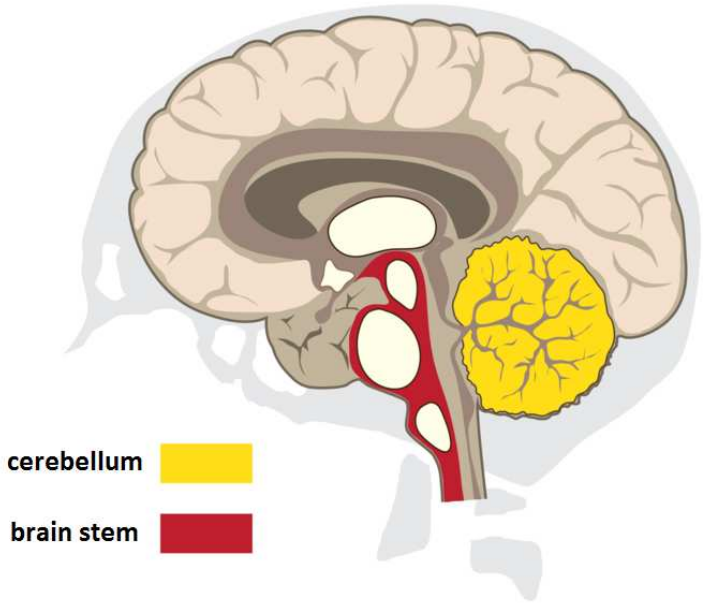


View of the brain from above (on the left), cross section through one of the hemispheres along the motor cortex (on the right).

Cerebellum and the brain stem

The second biggest part of the encephalon is the cerebellum. Similarly to the brain it has a folded cortex and 2 hemispheres. The cerebellum is responsible for skeletal muscle tonus, maintaining body balance and motor coordination, e.g. when eating with a fork and knife, and when learning to ice-skate.

Between the cerebellum and the spinal cord there is the brain stem. Its part is the medulla oblongata. It is the centre for reflexes which condition your life and are not dependant on our will, e.g. breathing, heartbeat, chewing and swallowing, sucking and metabolism. The medulla oblongata injury can lead to death.

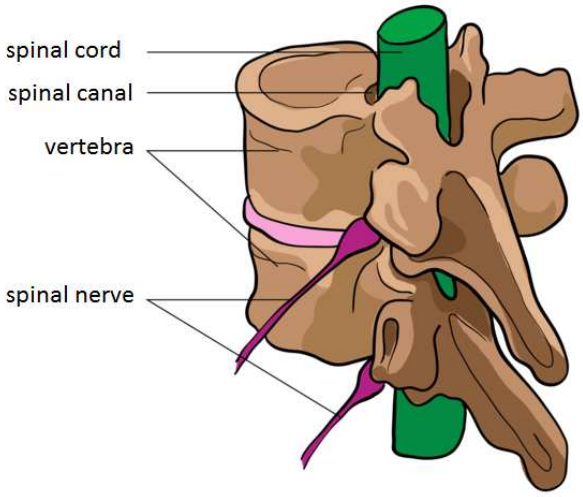


Cerebellum and the brain stem

> **Task 1**
>
> Can cerebellum influence the reading efficiency? Answer this question.

Spinal cord

The spinal cord is cylindrical and is located in the spinal canal of the spine. Just like the encephalon, it is composed of the gray and white matter. Unlike the encephalon, it has the white matter on the outside, whereas the gray matter is on the inside. In a transverse cross-section, the gray matter has the shape of the letter H. Inside the spinal cord there is a central canal filled with cerebrospinal fluid, which is also present in the area between the spinal cord and its meninges. From the spinal cord, in a symmetrical way, on both sides of the spine, there are 31 pairs of spinal nerves which belong to the central nervous system. The spinal cord acts as an intermediary in transferring information which runs from the receptors and from the encephalon to the effectors. As the neural centre for involuntary (inborn) reflexes, it directs those functions of the body which happen without us being aware of them.



Location of the spinal cord

Exercise 1

Select the correct sentences.

- [ ] Involuntary reflexes are learnt and when unused, they disappear
- [ ] The central nervous system controls vital functions of the body
- [ ] The spinal cord is composed of the gray and white matter
- [ ] Conditioned reflexes are stable, unchangeable and inborn

Summary

- The central nervous system is composed of the encephalon and the spinal cord.
- The encephalon consists of the brain, the cerebellum and the brain stem.
- The cerebral cortex is the outer part of the brain. It is there where we have the centres for coordinating life functions, associating information, interpreting stimuli and directing movements that are dependant on our will (voluntary).
- The cerebellum controls the tension of the muscles and is responsible for maintaining balance.
- In the medulla oblongata there are centres responsible for maintaining basic life functions.

- The spinal cord acts as an intermediary in transferring information between the encephalon and other parts of the body.
- The central nervous system is protected by bones, meninges and cerebrospinal fluid.

Homework

> **Task 2.1**
>
> Suggest two activities suitable for elderly people to do in order to maintain the mental ability.

Keywords

encephalon, spinal cord, central nervous system

Glossary

effector

Nagranie dostępne na portalu epodreczniki.pl

Nagranie dźwiękowe słówka effector

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efektor – narząd wykonawczy, który reaguje na przesłany impuls nerwowy
brain

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Nagranie dźwiękowe słówka brain

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mózg – część mózgowia złożona z 2 półkul mózgowych; u człowieka posiada szczególnie dobrze rozwiniętą korę mózgową odpowiedzialną za czynności psychiczne
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Nagranie dźwiękowe słówka cerebellum

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Nagranie dźwiękowe słówka meninges

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płyn mózgowo-rdzeniowy – przesącz osocza krwi, który chroni mózgowie i rdzeń kręgowy, zaopatruje je w substancje odżywcze i odbiera od nich produkty przemiany materii
medulla oblongata

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Nagranie dźwiękowe słówka medulla oblongata

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rdzeń przedłużony – część mózgowia podtrzymująca podstawowe funkcje życiowe

Lesson plan (Polish)

Temat: Czynności ośrodkowego układu nerwowego

Autor: Elżbieta Szedzianis

Adresat

Uczeń klasy VII szkoły podstawowej.

Podstawa programowa

9. Układ nerwowy. Uczeń:

1) rozpoznaje elementy ośrodkowego i obwodowego układu nerwowego (na modelu, rysunku, według opisu itd.) oraz określa ich funkcje.

Cel lekcji

Uczniowie opisują budowę i funkcję ośrodkowego układu nerwowego.

Kryteria sukcesu

- rozpoznasz na schemacie narządy ośrodkowego układu nerwowego i podasz ich nazwy;
- opiszesz funkcje narządów ośrodkowego układu nerwowego;
- wyjaśnisz, jak narządy ośrodkowego układu nerwowego są chronione przed urazami i wpływem czynników zewnętrznych.

Kompetencje kluczowe

- porozumiewanie się w języku ojczystym;
- porozumiewanie się w językach obcych;
- kompetencje matematyczne i podstawowe kompetencje naukowo-techniczne;
- kompetencje informatyczne;
- umiejętność uczenia się;
- kompetencje społeczne i obywatelskie.

Metody/formy pracy

Praca z tekstem, pogadanka, metoda warsztatowa, pokaz, obserwacja zastępcza.

Praca indywidualna oraz praca zbiorowa.

Środki dydaktyczne

- abstrakt;
- tablica interaktywna lub tradycyjna;
- tablety/komputery;
- dwa surowe jajka;
- marker;
- dwa jednakowe słoiki;
- dzbanek z wodą;
- pogniecione kartki.

Fazy lekcji

Wstępna

Nauczyciel podaje temat i cel lekcji oraz wyświetla kryteria sukcesu.

Realizacyjna

1. Nauczyciel prosi uczniów, żeby wyszukali w treści abstraktu definicje kory mózgowej, mózgu, mózgowia oraz ośrodkowego układu nerwowego. Następnie uczniowie przedstawiają zakres tych pojęć w postaci dowolnego schematu.
2. Uczniowie wykonują ćwiczenie interaktywne. Nauczyciel zwraca uwagę, że terminy „mózg", „móżdżek" i „mózgowie" nie są synonimami.
3. Nauczyciel poleca uczniom, żeby sporządzili tabelę, przedstawiającą poszczególne narządy ośrodkowego układu nerwowego oraz ich funkcje.
4. Nauczyciel pyta podopiecznych, czy można wskazać najważniejszą część ośrodkowego układu nerwowego i prosi o uzasadnienie odpowiedzi. Pomaga uczniom sformułować wnioski.
5. Uczniowie wyjaśniają, w jaki sposób mózgowie i rdzeń kręgowy są chronione przed urazami i wpływem czynników zewnętrznych.
6. Nauczyciel na skorupce jajka zapisuje określenia: „mózgowie" i „opona twarda". Oznajmia, że jajko z napisami jest modelem mózgowia. Wkłada jajko do niewielkiego przezroczystego słoika i pyta uczniów, czego modelem jest słoik. Potrząsa słoikiem (modelem czaszki) tak mocno, że jajko (model mózgowia) ulega uszkodzeniu. Drugi słoik , z identycznie opisanym jajkiem, podaje ochotnikowi, który zadeklarował, że wie, jak ochronić model mózgowia. Uczeń wlewa wodę do słoika albo wypełnia go pogniecionymi kartkami i potrząsa.
7. Uczniowie opisują w zeszytach struktury chroniące mózgowie i rdzeń kręgowy, zwracając uwagę na związek budowy i funkcji.

Podsumowująca

Uczniowie wypisują na kartkach pojęcia poznane na lekcji w dwóch rubrykach: „Znam i rozumiem" oraz „Znam za słabo". Planują sposób uczenia się.

Słownictwo

W tej lekcji zostaną użyte m.in. następujące pojęcia oraz nagrania

Pojęcia

effector

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Nagranie dźwiękowe słówka effector

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rdzeń przedłużony – część mózgowia podtrzymująca podstawowe funkcje życiowe

Teksty i nagrania

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Functions of the central nervous system

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- The spinal cord acts as an intermediary in transferring information between the encephalon and other parts of the body.
- The central nervous system is protected by bones, meninges and cerebrospinal fluid.

Lesson plan (English)

Topic: Central nervous system functions

Author: Elżbieta Szedzianis

Target group

7th grade students of an eight-year elementary school

Core curriculum

9. The nervous system. Student:

1) recognizes the elements of the central and peripheral nervous system (on the model, drawing, as described, etc.) and determines their functions.

Lesson objective

The students describe the build and the functions of the central nervous system and the peripheral nervous system.

Key Success Criteria

- you will recognize the organs of the central nervous system on a schematic drawing and you will name them;
- you will describe the functions of the organs that belong to the central nervous system;
- you will explain what organs of the peripheral nervous system are protected against injury and against the influence of external factors.

Key Competences

- communicating in the mother tongue;
- communicating in a foreign language;
- Mathematical competence and basic competences in science and technology;
- digital competence;
- learning to learn;
- social and civic competences.

Methods/Forms of work

work with text, a talk, workshop method, presentation, substitute observation.

Individual work and work in groups.

Teaching measures

- abstract;
- interactive or traditional whiteboard;
- tablets/computers;
- two raw eggs;
- permanent marker;
- two same-sized jars;
- a jug with water;
- crumpled sheets of paper.

Lesson plan overview (Process)

Introduction

The teacher gives the topic of the lesson, defines the purpose of the course and gives students the criteria for success.

Realization

1. The teacher asks the students to look for the definition of the cerebral cortex, brain, encephalon and central nervous system in the abstract. Then, the students present the scope of these notions as a diagram.
2. The students complete interactive exercises. The teacher emphasizes the fact that the notions “brain”, “cerebellum” and “encephalon” are not synonyms.
3. The teacher asks the students to prepare a table that presents the organs of the central nervous system and their functions.
4. Then, he asks them if it is possible to select the most important element of the central nervous system and asks the students to justify their answers. He helps the students to draw conclusions.
5. The students explain how encephalon and the spinal cord are protected against injuries and the influence of external factors.
6. The teacher writes the words “encephalon” and “dura matter” on the shell of the egg. He explains that this egg is the model of the encephalon. He puts the egg into a small see-through jar and asks the students, what the jar represents. He shakes the jar (model of the cranium) so hard that the egg (model of the encephalon) gets damaged. The other jar (with identically described egg) is given to a volunteer who declared that he knows how to protect the model of the encephalon. The student pour water into the jar or fills it up with crumpled sheets of paper, then he shakes it.
7. The students describe in their notebooks the structures that protect the encephalon and the spinal cord, emphasizing the connection between their build and their functions.

Summary

The students write down on sheets of paper the notions they learnt during the class, dividing them into two groups: “I know and I understand” and “I know but not well enough”. They plan how to learn them

The following terms and recordings will be used during this lesson

Terms

effector

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Nagranie dźwiękowe słówka effector

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Texts and recordings

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- 3 membranes of connective tissue called meninges.

The brain is the biggest part of the encephalon. Its outer layer, which is the cerebral cortex, is composed of a gray matter and is characterised by the specific folds. Underneath the cerebral cortex there is a white matter. Brain, even though it is only 2% of the body mass, uses 20% of the energy our body produces. The brain is composed of dozens of millions of neural cells, and each single cell can have around 25 thousands connections with other neurons. During your life, the brain can create new neural connections, thanks to which we have the ability to learn. Tasks that require performing new activities, practicing physical skills and solving theoretical problems, favour creating new connections and increase the brain efficiency. For small children, plays that require precise movements, e.g. DIY are the key factor for brain development. For older children, it is important to develop the brain via reading, writing, speaking and practising all tasks that require gaining new skills.

The second biggest part of the encephalon is the cerebellum. Similarly to the brain it has a folded cortex and 2 hemispheres. The cerebellum is responsible for skeletal muscle tonus, maintaining body balance and motor coordination, e.g. when eating with a fork and knife, and when learning to ice-skate.

Between the cerebellum and the spinal cord there is the brain stem. Its part is the medulla oblongata. It is the centre for reflexes which condition your life and are not dependant on our will, e.g. breathing, heartbeat, chewing and swallowing, sucking and metabolism. The medulla oblongata injury can lead to death.

The spinal cord is cylindrical and is located in the spinal canal of the spine. Just like the encephalon, it is composed of the gray and white matter. Unlike the encephalon, it has the white matter on the outside, whereas the gray matter is on the inside. In a transverse cross-section, the gray matter has the shape of the letter H. Inside the spinal cord there is a central canal filled with cerebrospinal fluid, which is also present in the area between the spinal cord and its meninges. From the spinal cord, in a symmetrical way, on both sides of the spine, there are 31 pairs of spinal nerves which belong to the central nervous system. The spinal cord acts as an intermediary in transferring information which runs from the receptors and from the encephalon to the effectors. As the neural centre for involuntary (inborn) reflexes, it directs those functions of the body which happen without us being aware of them.

- The central nervous system is composed of the encephalon and the spinal cord.
- The encephalon consists of the brain, the cerebellum and the brain stem.
- The cerebral cortex is the outer part of the brain. It is there where we have the centres for coordinating life functions, associating information, interpreting stimuli and

directing movements that are dependant on our will (voluntary).

- The cerebellum controls the tension of the muscles and is responsible for maintaining balance.
- In the medulla oblongata there are centres responsible for maintaining basic life functions.
- The spinal cord acts as an intermediary in transferring information between the encephalon and other parts of the body.
- The central nervous system is protected by bones, meninges and cerebrospinal fluid.