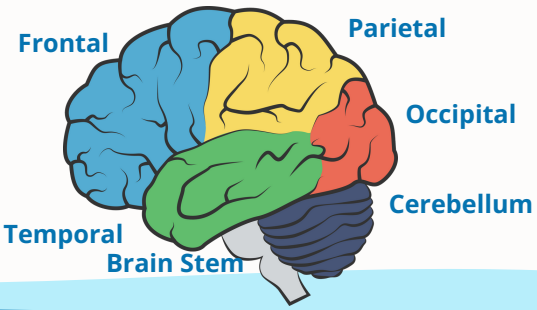
Physical Changes Following a Brain Injury

- Vary from person to person
- Dependent on the part of the brain that has been affected.

The parts of the brain.

- The brain is made up of two hemispheres – left and right. These are joined by tissue known as the **corpus collosum,** this tissue acts like a highway to transmit information from the left side of the brain to the right side.
- Collectively the left and right hemispheres are known as the **Cerebrum.**
- The left and right hemispheres are each made up of areas known as l**obes**, each hemisphere has a frontal, parietal, temporal and occipital lobe. The brain cells in each lobe are responsible for different functions.
- The left side of the brain is more concerned with creativity and the right side with logical function.
- Below the Cerebrum sits another part of the brain which is known as the **Cerebellum**.
- The **Cerebellum** acts as a relay station, all information passing from the brain to the body and from the body to the brain passes through the cerebellum, where it is interpreted and altered to fine tune our responses/movement.
- **Frontal Lobes** – these sit at the front of the skull and are responsible for functions such as memory, emotions, impulse control, problem solving, social interaction and motor function.
- **Parietal lobes** – sits directly behind the frontal lobes and are responsible for sensory perception and integration – managing information to do with things such as taste, hearing, sight, touch and smell. Has a role in attention and in awareness of the space around us.
- **Temporal lobes**- sit below the Parietal lobes, they are involved in processing auditory information and have a role in learning and memory.
- **Occipital lobes** – at the back of the brain, contain the major visual processing areas.



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Information

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How does the Brain communicate with the body?

- The brain sends and receives signals from the **motor cortex** to the muscles in the Face, neck, trunk and limbs to produce movement.
- The **cerebellum** refines and coordinates movement.
- The **motor cortex** is situated in the **Frontal** lobes of the brain. Each area of the body is supplied impulses from a specific part of the motor cortex with different numbers of brain cells / or smaller and larger areas of the motor cortex controlling different parts of the body. The hands, Face and Arms have a much larger area of representation in the motor cortex as these parts of the body produce more fine and complex movements than areas such as the trunk and legs.
- The **Brainstem** is the "stalk" of the brain that connects the brain to the **spinal cord**, it is made up of fibres that run through the hole at the base of the skull into the spinal canal.
- The areas that control each body part are represented by **Homunculus Man.**
- There are large bundles of nerves that run in "pathways" from the cerebrum down through the cerebellum and the brainstem, into the spinal cord and then out to the muscles in the body. These are known as the **motor pathways.**
- There are also **sensory pathways** that carry information from the muscles and joints back up to the cerebellum where they are interpreted and fed back to the motor cortex, the signals being sent from the motor cortex are then altered to refine the movement being produced in the body.
- The **motor pathways** travel down from the cerebrum through the cerebellum and into the brain stem where they cross over and then travel down the spinal cord and out to the muscles on the opposite side of the body. So the left side of the brain controls movement on the right side of the body, and the right side of the brain controls movement on the left side of the body.
- Information travels from the brain through the motor pathways down to the muscles of the body/limbs to produce movement, and information passes from the body/limbs back up to the brain through the sensory pathways so that the brain can interpret and refine movement by fine tuning the signals it sends to produce smooth co-ordinated movement.
- If this process is interrupted or slowed then movement may become uncoordinated or jerky.

Altered muscle tone

- Muscles have a certain amount of tension in them when they are at rest, this is known as "**muscle tone**"
- Tone is referred to as "low/ reduced" "normal" or "high/ increased" the medical term for low/reduced tone is "**hypotonia**." The medical term for high/increased tone is "**hypertonia**"
- **Hypotonia** (reduced tone) occurs with damage to the peripheral nerves
- **Hypertonia** (increased tone) occurs with damage to the central nerves.

- In a brain that is functioning well the signals to these muscle groups are controlled so that movement can occur in either direction and the limbs and trunk can rest in a "neutral" position.
- The brain "switches on" the muscles on one side of the limb/joint and "switches off" the muscles on the other side to allow movement to occur.
- Following damage to the motor cortex the ability for the brain to switch these signals on and off and to refine signals to produce smooth movement may be affected.
- The muscles on one side of the limb may receive more signal and not be able to "switch off" this results in these muscles being more resistant to stretch and often in them resting in a shortened position, pulling the joints into bent or straight positions rather than the joint resting in a neutral position. These muscles are referred to as having increased tone
- If the muscle stays in this positon for a long period of time then it physically becomes shorter.
- If joints stay in one position for a long time then the joint structure can change resulting in a "contracture" of that joint.
- There are dominant muscle groups in the body, these are the muscles that hold us up against gravity and those that allow us to feed ourselves. So the muscles that straighten the legs and back (extensor muscles) and the muscles that allow the arms to bend so that the hand can reach the mouth (flexor muscles)

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- When the brain is functioning well it is able to “dampen down” the signals that are sent to these dominant muscle groups to allow for a balance between the dominant muscles and the non-dominant muscles.
- Following damage to the motor cortex this dampening down effect may be affected resulting in the dominant muscles having increased tone.
- Muscle strength is best within the middle range of the muscles movement, high tone muscles become shorter and tighter and the muscles opposite high tone muscles become longer and are often weaker.
- Muscles that have increased tone are not necessarily strong when it comes to voluntary movement.