Explore the effect of sleep on our memory in *our growing brain*

# OUR GROWING BRAIN

Does sleep affect learning and memory? Let's investigate in this experiment.

Aim: To investigate if the number of hours of sleep affect your memory during the next day.

Our memory includes past experiences, knowledge and thoughts. It involves initial encoding of sensory information followed by the storage and retrieval of information. All information entering the brain passes through **sensory memory** before entering our **short-term memory** (STM). After this point, information can be transferred to long-term memory (LTM) or discarded altogether.
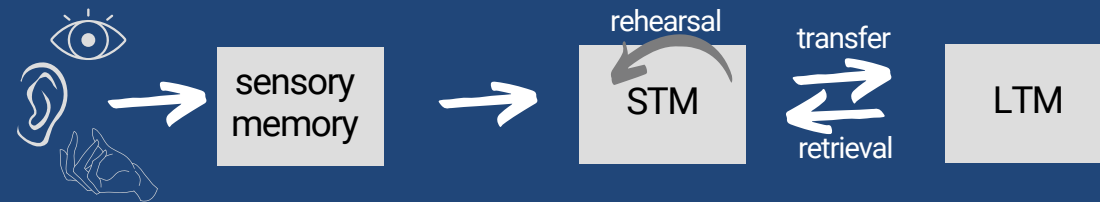
Short-term memory has limited capacity and information is stored for a short time.

Many factors affect our short-term memory *capacity*. But does sleep? What implications might this have for our ability to learn during the next school day?

WATCH THESE

Scientific ethics

In studies that rely on **human participation,** key principles of scientific ethics must be considered. For any participants in your study, you should:

- obtain informed consent - this means that you explain clearly to your participants what is involved and then ask them if they consent to being involved. There is an example of what you could use here.
- ensure all participants know they can withdraw from your study at any point.
- assure participants that results with be confidential. In practice, that might mean that participants are not recorded by "name", but rather assigned a number.

Materials

- 20 Participants
- Access to a device
- Online memory test
- Table to record results
- Pen and paper
- A form to collect participant details.

How do you select your participants?

1. Identify your "target population". If you are an S2 pupil, you might say that S2 pupils are your target population, or people aged 13-14.
2. It is important that the participants in your study will represent the full target population. For example, you shouldn't choose only males; or only pupils who are in the dance team. Sampling techniques will aim to reduce **bias**. This website will describes sampling techniques.

Suggested sampling strategy: Assign all possible participants a number, put the numbers in a hat, and then randomly pull out numbers as the chosen participants.

METHOD

1 Collect your participants and provide a copy of the "Memory and Sleep: Participant Form". You should update this to include unique participant numbers for each person. Participants should state the number of hours of sleep they had the previous night.

Memory and Sleep Study
You have been invited to take part in our study to investigate how the number of hours of sleep you have had the night before affects your memory during the next day. This study will require you to state the number of hours of sleep you had last night before taking part in an online memory test. This test will display a string of letters on the screen, starting with few and building up to more. The letters will remain on the screen for a few seconds and then disappear. When they have been removed from the screen, you will be asked to write down as many of the letters as you can recall. Your responses will be collected and you will be given a "short term memory capacity". This will be compared to the number of hours of sleep you had the previous night.

You can withdraw from the study at any time.
Your personal details will not be stored so you could be identified as a participant in the study.

Informed consent:
I agree to taking part in this study: _____
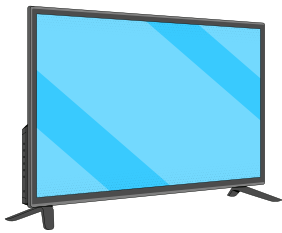
2 Ensure all your participants have a pen and paper handy and are facing the device you will be presenting from.

3 Start the online memory test. This will begin by showing two letters for a brief period of time. As the researcher, you need to write these down on a piece of paper as the online test does not reveal them at the end! The participants must not write them down yet.
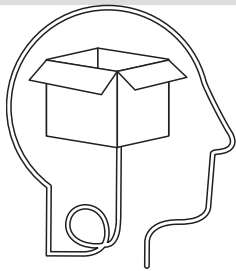
4 When instructed to on the screen, the participants should write down any of the letters they can recall.

5 Repeat the process by following the on-screen instructions. A longer string of letters will now appear - write these down. Participants must not write them down yet.

6 When the letters disappear from view, the participants should recall as many as possible. Repeat this process until everyone's short-term memory has been exceeded! Collect in the papers and mark them, recording the maximum number of letters correctly recalled alongside the number of hours sleep each participant had the night before. Here is a results file you can use.
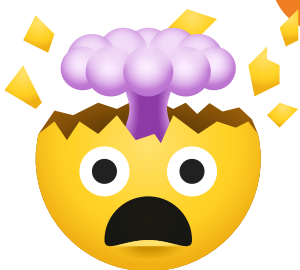
RESULTS
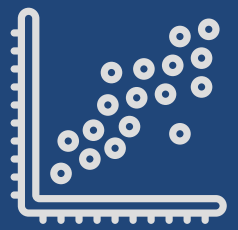
An example of the results you may obtain are shown below. These can also be found in the copy of the results file here. You can make your own copy of this file, delete the values that are there and input your own results data.

Hours of sleep	Max number of letters correctly recalled
5	4
8	6
10	7
12	8
4	3
2	3
8	7
9	8
9	8
10	15
5	5
6	6
7	8
8	10
6	9
7	7
10	15
9	14
8	14
8	11

Notice the absence of any information that could identify an individual participant - this is important to maintain confidentiality in studies involving human participants.
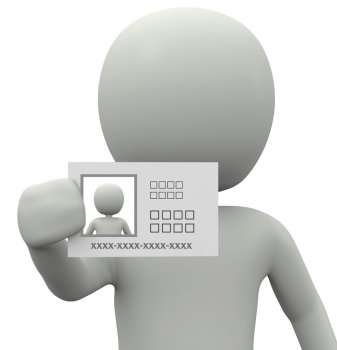
Follow the instructions within the Google Sheet file to generate a chart from your own data.

The correct chart to choose is a scatter graph.
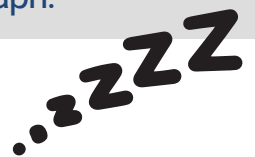
The data above produces the scatter graph opposite. A trendline has been added and shows that there is a *positive correlation* between the number of hours of sleep a person has and the capacity of their short-term memory.

Observational Studies
The term "correlation" is key here. This is no independent variable in this study because so many other factors vary between participants that we can't control, e.g. fitness level, diet, genetics. We can't say that more sleep *caused* greater STM capacity; but we can say there is a *link / correlation* based on this data.

Does hours of sleep affect short term memory?

Number of letters recalled (y-axis) vs Hours of sleep (x-axis)
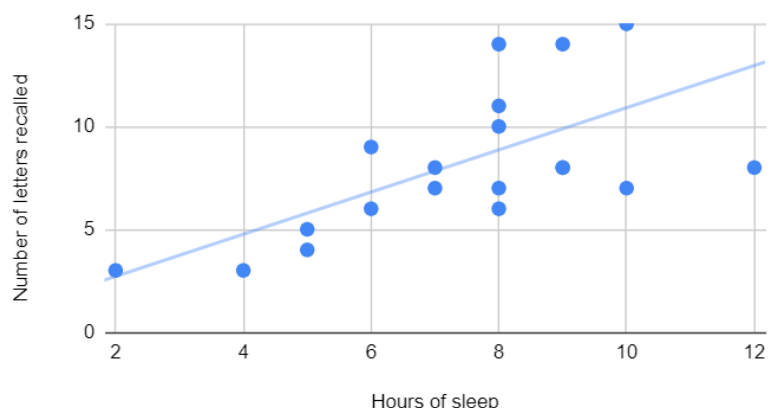
For more information of correlation and cause, click here.