# ERQ marking: Localization

Below you will find three sample ERQs for the question:

Evaluate research on localization of function with regard to human behaviour.

For each of the samples, refer to the rubric to award marks. After each sample, there is a predicted grade as well as feedback on the strengths and limitations of the sample.

 (Source: https://www.thinkib.net/psychology/)

### ****Sample 1****

Localization of function is the theory that specific parts of the brain are responsible for specific behaviours. Psychologists are particularly interested in whether memory is localized in the brain - or distributed throughout the brain. Some of the studies on the localization of function are Sharot et al (2007) and Maguire (2000).

The aim of Sharot's study was to determine the role of biological factors in flashbulb memories. This was a quasi-experiment. The sample consisted of 24 participants who were in New York on the day of 9/11 terrorist attacks. The participants were put into an fMRI machine and were shown a series of 60 word cues on the screen. They were also simultaneously being shown either the word “Summer” or the word “September”. This was done in order to create a link between the main word cue and either summer holidays or the events of 9/11, depending on the word choice. Their brain activity was observed by the researchers while they recalled the event. The participants were then asked to rate their memories in terms of vividness, detail, and confidence, as well as write a description of their personal memories. Half of the participants reported having flashbulb memories of the attacks; these were the people located close to the World Trade Centre on September 11th. The results showed that the activation of the amygdala for these participants was higher when they recalled the events of the attack than when they recalled the events of the previous summer vacation. However, the levels of amygdala response in people who were further away from the site of the attack were equal when recalling both events.

The study reveals that the strength of amygdala activation correlates with flashbulb memories, which also may indicate flashbulb memories being localized to the amygdala. One limitation of the study is its low ecological validity, as responding to words flashed on a screen in an fMRI machine’s environment is highly artificial. The fMRI could also cause anxiety which could also activate the amygdala - leading to an artefact, or confounding variable. Another limitation is that the study is correlational and does not determine cause and effect. A strength of the study is that there is little to no possibility of there being demand characteristics in the experiment as there was no way for them to alter their own brain activity to meet the goals of the study. It appears from the study that at this aspect of memory - emotionally based episodic memories - may be localized.

A different study on the localization of function is the study done by Maguire. The aim of the study was to see whether the brains of London taxi drivers would be somehow different as a result of the exceptional training that they have to do to be certified. This was a quasi-experiment, as the independent variable was not manipulated by the researcher. The sample consisted of 16 right-handed male London taxi drivers, each of whom had to have completed the driving “Knowledge test” and have their license for at least 1.5 years to take part in the study. The taxi drivers’ MRI scans were compared with the MRI scans of 50 right-handed males who did not drive taxis (taken from an MRI database) in order to see whether there was a certain relationship between the number of years of driving a taxi and one’s brain anatomy. The results revealed that the posterior hippocampi of taxi drivers were significanly larger in comparison to those of the control subjects and the anterior hippocampi were much smaller. The findings also showed that the posterior hippocampus was involved when previously learned spatial information was being used (one function), whereas the anterior hippocampus was more involved during the encoding of new environmental layouts (another function).

One of the the possible limitations of the study is its sampling bias: only men were used in this experiment, and, despite the fact that most of London’s taxi drivers are male, the sole use of male participants makes it difficult for the study's findings to be generalized and applied to women. Thus, the study lacks external validity. One strength of the study was that researcher bias was avoided by employing a single-blind control; the researcher did not know whether they were looking at the scan of a taxi driver or a control participant and, therefore, could not influence the results in order to portray a certain favourable outcome. Another strength of the study is its high ecological validity: The participants of the study were not asked to do anything while being inside the scanner, only having their brain anatomy measured. The researchers were able to see through the indirect measure of neuroplasticity, how memory functions may be localized.  The study also appears to show how different aspects of memory - that is, storage and retrieval - may be distributed to different parts of the brain.

The two studies on the localization of function, done by Sharot et al (2007) and Maguire (2000) and described above, both have their limitations and strengths. Both studies have limitations that make it difficult to determine the exact role of the brain in memory, but other research and replications of their research will help to make the roles more clear.

**875 words**

**Focus on the question:** The introduction clearly sets up the essay.  Localizatoin is defined and studies identified.  The essay is focused on the demands of the question.  **2 marks.**

**Knowledge and understanding**: The response demonstrates a clear understanding of localization and psychological terminology is used effectively. **6 marks.**

**Use of research**: There are two studies used.  Both are well described and linked to the demands of the question. The results of Sharot's research could be a bit more precisely explained.  **5 marks**

**Critical thinking**: There is good evidence of critical thinking.  Both strengths and limitations of the study are addressed and they are relevant in the understanding of localization. Some statements, like about generalizability, are less relevant.   **5 marks**

**Clarity and organization**: The response is well-organized and language communicates effectively. **2 marks.**

**Total**: 20 marks

**Predicted**: 7

**Sample 2**

Localization of function is the theory that specific parts of the brain are responsible for certain behaviours or cognitive processes.  Localization can be carried out by studying brain damage - for example, Milner investigated the role of the hippocampus in memory formation. It may also be studied by seeing where neuroplasticity is happening. Maguire carried out an experiment on how cognitive processes may lead to neuroplasticity in the hippocampus. Both of these studies show us that cognitive processes may be localized in the brain.

Milner carried out a case study focusing on the role of the hippocampus in memory formation. HM was an amnesiac who was unable to transfer information from short-term memory to long-term memory as the result of a surgery that had removed tissue from his medial temporal lobe to stop his epilepsy. Milner gave HM different types of tests, including memory tests and IQ tests.  HM was also taught reverse mirror drawing. His behaviours were directly observed and interviews were done with HM and his family members. The results from the IQ test was above average. Memory tests showed that HM could not acquire new episodic knowledge or semantic knowledge. HM improved in reverse mirror-drawing, but he did not remember learning the skill. Therefore, his procedural memories were well maintained. From her findings, Milner concluded that the hippocampus is responsible for memory consolidation and the transfer of short-term to long-term memory. She also concluded that other parts of the brain were responsible for other aspects of memory.

The study was longitudinal since HM was studied over 50 years, which is a strength to the study. The benefits of a longitudinal study are that changes can be observed over time. Another strength of the study is that HM was studied in his natural environment, which indicates high ecological validity. A limitation of this study is that it is not easily replicated because it is difficult to find patients that have a similar case like HM.

The aim of Maguire’s study was to investigate the brains of London taxi drivers to see how their brains might be different from non-taxi drivers. The study was a natural experiment, meaning that the independent variable was not manipulated by Maguire. The study included 16 right-handed London taxi driver participants. As a part of the procedure, they were compared to 50 right-handed males who were not taxi drivers being the control group. The participants had to complete a mandatory test known as the ‘Knowledge’ test and had to have their license for 1.5 years.  An MRI was used to measure the density of grey matter in the brain. The results showed that the volume of the right posterior hippocampi had a correlation with the amount of time spent being a taxi driver. This relates to localization of function because the results indicate that the posterior hippocampus is involved in the processing of spatial memory. This indicates that their hippocampus experienced neuroplasticity when responding to environmental demands. Neuroplasticity is the result of the use of this part of the brain, helping researchers to determine its actual function.

A strength of this study is that it was a single-blind control, therefore it avoided researcher bias.  Another strength is that the study can be replicated since it is done in a well-controlled environment and has a well-standardized procedure. A standardized procedure is helpful in replicating the study. A limitation of this study was that it is a natural experiment, therefore, no cause and effect relationship that can be established; it was naturally occurring because the independent variable was not manipulated. The fact that only men were studied means that we cannot generalize the study to women.

In Milner’s case study, there may have been extraneous variables that affected the findings. The experiment is not in a controlled environment, thus it is difficult to establish a clear cause and effect. This case study is also reliant on qualitative data. The problem with this is that the data is reductionist. The data is reductionist because saying that the hippocampus is only responsible for memory can be too simplistic. In Milner's study, there is also the possibility of confirmation bias. Maguire’s study was a lab experiment; thus, the experiment was in a well-controlled environment. The benefits of lab experiments are that it is easy for researchers to manipulate an independent variable and control all other variables.  Maguire’s experiment can be replicated so that ecological validity can be determined. There is also the issue that participants may be uncomfortable in the MRI as it is loud and they have to keep still.

In conclusion, research has been able to show that specific types of memory are localized.

**777 words**

**Focus on the question:** The essay begins by defining localization of function and outlining the argument.  The studies are evaluated in line with the demands of the question.  Both strengths and limitations are addressed.  **2 marks.**

**Knowledge and understanding**: There is some understanding of localization of function and the role of the hippocampus, but this could be more developed. There are many psychological terms that are either not used correctly or are not developed with regard to the evidence.  **3 marks**

**Use of research**: There are two studies described.  For both studies, there is a good outline of the procedure and findings, although this could be more precise in some cases. For example, Milner knew the exact part of the brain that was responsible for HM's memory impairment as a result of Corkin's MRI scan. This is a rather significant omission.  **4 marks.**

**Critical thinking**: There is an attempt to evaluate the studies, but there are many errors and contradictions. **2 marks.**

**Clarity and organization**: The essay demonstrates satisfactory organization. Ideas are not always clearly expressed. **1 mark**

**Total**: 12 marks

### ****Sample 3****

This essay is going to evaluate the theory of the localization of function. There are many parts of the brain that have specific functions.  The amygdala is linked to fear and aggression. The insula gyrus is linked to disgusts.  There are four lobes of the brain: the frontal, occipital, temporal and parietal lobes. When you are thinking and planning, you are using your frontal lobe. The corpus collosum connects the two hemispheres and helps in the transfer of information from one side of the brain to the other. And the cingulate gyrus plays a role in pain perception.  This essay will focus on the role of the hippocampus.

A famous study was carried out by Milner. She studied a patient called HM who had an accident at the age of 7. He was hit by a cyclist, which caused a brain injury and he started having epileptic attacks. This injury slowly was ruining his life so that after 20 years he couldn’t have a normal life. In order to help him, his hippocampus was removed. HM developed both retrograde (couldn't remember the past) and anterograde amnesia (couldn't produce new memories). The procedure consisted following activities: HM had to do an IQ testing, cognitive testing, he had regular interviews featuring his family members, there was a constant observation of his behaviour and after all, he had his brain scanned on the MRI.

The research shows that after the surgery HM could not store new episodic or semantic memories. As he was able to speak, his working memory was working well, and his procedural memory was not damaged much. During the surgery, HM’s hippocampus was damaged and this damage caused most of the problems. His basal ganglia, however, was not damaged.

The limitation of this research is that it is not easy to replicate it, however, it is possible. Also, the research does not contain any information about the patient’s abilities before the trauma.  But the biggest limitation is ethics. The researcher received informed consent from HM, but he immediately forgot that he had given it.  This mean that he did not remember that he could withdraw from the study. This study is considered unethical and could not be replicated today.

The strength of this study is that it is a longitudinal study, even after HM’s death.

This study is strongly linked to the topic of localization of function. It demonstrates that a certain part of the brain controls a certain behaviour. MRI scans showed that the function of a hippocampus, which is a part of a human’s limbic system, has a function creating and saving a long-term memory. However, since this is such an extreme case, the results cannot be generalized.  Therefore, we cannot say that this is the role of the hippocampus in other populations.

**465 words**

**Focus on the question:** There is an attempt at focus, but it is not well sustained.  The introduction lists the functions of many different parts of the brain, but is not focused on the demands of the question.  **1 mark.**

**Knowledge and understanding**:  There is some relevant knowledge regarding localization and the role of hippocampus, but overall, a limited response.  Psychological terminology is not used effectively.   **2 marks.**

**Use of research**: There is only one study - limited use of research.  **2 marks**.

**Critical thinking**: There is an attempt at critical thinking, but it is formulaic and of marginal relevance to the question. In addition, there is only one study evaluated.  Limited in scope and development. **1 mark.**

**Clarity and organization**: Language and organization are not always clear. **1 mark.**

**Total**: 7 marks

**Predicted**: 3