

## Title: Biological Approach

### 1.2 Methods of the Biological Approach – How?

**Key Question: How do psychologists from the biological approach demonstrate these key assumptions in their research?**

WHAT YOU NEED TO KNOW
You will need to outline and provide a study as an example of a relevant research method for each of the three key assumptions of the biological approach:
1. Patterns of behaviour can be inherited – <b>twin study</b> a. Key study: McGuffin et al (1996)
2. Animal research may inform our understanding of human behaviour – animal experiment a. Key study: Fadda et al (1996)
3. Cognitions, emotions and behaviours are products of the anatomy and physiology of our nervous and endocrine system – use of <b>MRI scan</b> a. Key study: HM (Corkin, 1997)

### Introduction

All of the principles described above underpin certain research methods. For example, if a psychologist believes that we inherit much of our behaviour, then it makes sense to use twin and family studies to verify this.

Here are the main research methods associated with the biological approach to psychology:

PRINCIPLE	RESEARCH METHOD
1. Patterns of behaviour can be inherited.	<b>Correlational</b> research – twin and family studies.
2. Animal research may inform our understanding of human behaviour.	Experimental research on animals that have similar brain structures to humans.
3. Cognitions, emotions and behaviours are products of the anatomy and physiology of our nervous and endocrine system.	Use of brain imaging technology, such as <b>PET</b> and <b>fMRI</b> scans (brain processes) and <b>MRI</b> scans (brain structure).

The key studies that may be used to demonstrate how psychologists use these research methods are the same as those outlined above. Alternatives are also given for animal research and brain imaging technology.

RESEARCH METHOD	KEY STUDY
<b>Correlational</b> research – twin and family studies.	<b>McGuffin et al. (1996)</b> – researched 177 twins (68 <b>monozygotic [MZ]</b> , 109 <b>dizygotic [DZ]</b> ) who had one or more episodes of hospital-treated major depression.
<b>Experimental</b> research on animals that have similar brain structures to humans.	<p><b>Fadda et al. (1996)</b> – trained an experimental group of rats to run a maze, and then compared the <b>ACh</b> levels in these rats with a control group who had not been trained, but just introduced to the maze on the day of the experiment. To investigate the role of <b>ACh</b> in memory.</p> <p><b>OR</b></p> <p><b>Rosenzweig, Bennett and Diamond (1972)</b> – kept 12 male rats from a range of litters in one of three different conditions: standard lab cage; enriched environment cage, with many toys and much stimulation and handling; impoverished environment cage, with no handling and no toys. To investigate the role of environment in brain development.</p>
Use of brain imaging technology, such as PET and fMRI scans (brain processes) and MRI scans (brain structure).	<p><b>Corkin et al. (1997)</b> – used an <b>MRI scan</b> in 1992 and 1993 to investigate the extent of the temporal medial lobe damage in H.M. after <b>Scoville’s 1953</b> surgery.</p> <p><b>OR</b></p> <p><b>Fink (1996)</b> – used a PET scan to investigate autobiographical memory.</p>

### Key Studies:

**Fadda et al. (1996)** as outlined in Section 1a), plus

### Key Study 4: Rosenzweig, Bennett and Diamond (1972)

**Aim:** To investigate the effects on rats’ brain growth and chemistry of a highly stimulating environment when compared with the effects of an impoverished environment.

**Method:** Three male rats were chosen from each litter. They were then randomly assigned to one of three conditions. One rat remained in the laboratory cage with the rest of the colony; another was assigned to the "enriched" environment cage with many toys; and the third was assigned to the "impoverished" cage – a small isolated cage. There were 12 rats in each of these conditions for each of the 16 experiments,

for various periods of time, ranging from 4 to 10 weeks. Following this they were humanely sacrificed so that autopsies could be carried out on their brains to determine if any differences had developed.

**Results:** The brains of the enriched rats were different from the impoverished rats in many ways. The **cerebral cortex** of the enriched rats was significantly heavier and thicker; the enriched environment produced larger **neurons**, and the **synapses** of the enriched rats' brains were 50% larger than those of the impoverished rats.

**Conclusions:** The enriched environment had significantly increased the **cerebral cortex** of the rats' brains, by enlarging the **neurons** and **synapses** and increasing the chemical activity of the brain.

## Evaluation

**Strengths:** This was a well-designed experiment that was one in a series by these researchers.

**Limitations:** One potential issue with the research is that the results are correlational. We are unable to conclude whether the enriched environment caused the neurons to increase in size, or whether there are other factors that may have contributed to these difference. For example, it is possible that some of the rats were born with larger neurons as the researchers did not take a baseline measurement of the rats' brain size. Consequently, we are unable to establish causation and further research is required to determine whether enriched environments actually cause physiological differences in brain development.

## Critical Thinking Points

***Could the changes be due to increased handling, rather than enriched environment?***

In response to this possible criticism, further experiments were carried out, wherein the impoverished rats were handled as much as the other two groups, and the differences were still found. Also, sometimes, the rats in the enriched environments were not handled, but still they retained the increased brain growth.

***Can the results be generalised to humans?*** Marian Diamond, one of the authors of the original article, has applied the results of work in this area to the process of human intellectual development throughout life. She says, "For people's lives, I think we can take a more optimistic view of the ageing brain .... the main factor is stimulation."

## Key Study 5: Fink (1996)

**Aim:** To investigate activation of brain areas during emotional (affect-laden) autobiographical memory.

**Method:** PET scans were conducted on seven male volunteers, under three different conditions:

1. Resting (Control group).

2. Impersonal – where they were played sentences from someone else’s biography, with which they were familiar, but which had no emotion attached.
3. Personal – where they were played sentences from their own autobiography. This was the familiar, emotional (affect-laden) condition.

**Results:** 1. When comparing the **Impersonal** and **Rest** conditions, there was an increase in blood flow in the temporal lobes in both sides of the brain in the Impersonal condition.

2. When comparing the **Personal** and **Rest** conditions, the same increase as above was noted in the Personal condition, plus extra blood flow to the right temporal lobe and prefrontal cortex areas.

3. When comparing the **Personal** and **Impersonal** conditions, the **Personal** condition demonstrated a mainly right hemispheric activation, including the right temporal lobe and prefrontal cortex areas, including the **hippocampus**, **parahippocampus**, and **amygdala**.

**Conclusion:** The right hemisphere contains the key regions for autobiographical memory processing. Surrounding right hemispheric “satellite” regions such as the **amygdala**, **hippocampus** and **parahippocampus** support the memory in these areas.

## Evaluation

This supports previous research that has suggested that the right brain hemisphere processes episodic memory and the left hemisphere processes semantic memory.

However, it is not clear if it is the increased familiarity with one’s own autobiography, the emotion or the self-referencing (thinking about oneself) that resulted in the increased blood flow to the right hemisphere.

The study is small (7 participants) and contains no women. In the Personal – Impersonal condition comparison, only 5 out of the 7 participants showed the changes recorded. One showed no difference between the two conditions, and another showed changes in a different area of the brain. Therefore, the validity of the results is open to question.

## Critical Thinking Points

***Do we all experience our autobiographies emotionally in the same way?*** This experiment assumed that the autobiographical memory would be the emotional “affect-laden” memory, and the non-autobiographical memory the non-emotional one. But can we be sure this would be true for all participants?

***What thoughts were going through the minds of participants under the Resting (Control) condition?*** They will still have been thinking something, and may even have been remembering their last medical scan. Can this be a true control?

## Possible Exam Questions

### Short answer questions

1. Explain how psychologists using the biological approach demonstrate one of these key assumptions through their research methods.
2. Describe how one particular research method is used in the biological approach.

### Essay question

3. Discuss two or more research methods used in the biological approach.

*[“Discuss” is a more demanding term than either “explain” or “describe”. You will need to consider how and why these research methods are used, what their strengths and limitations are, writing a considered and balanced review that includes a range of arguments, factors or hypotheses. Your conclusions should be presented clearly and supported by relevant studies. ]*