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Forename(s)

Candidate signature

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INTERNATIONAL AS PSYCHOLOGY

Unit 2 Biopsychology, Development and Research Methods 1

Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:

- a calculator, which you are expected to use where appropriate.

Instructions

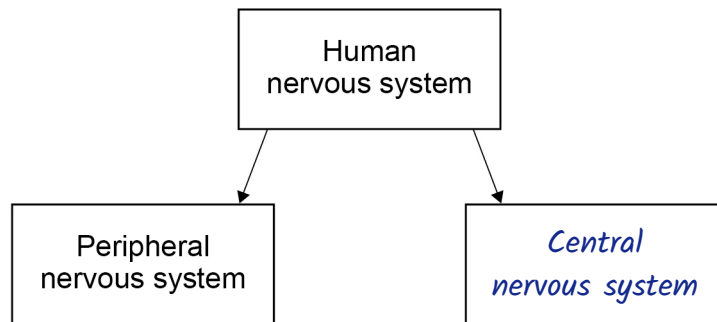
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- All working must be shown.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 90.

For Examiner's Use	
Section	Mark
A	
B	
C	
TOTAL	



Section A: BiopsychologyAnswer **all** questions in the spaces provided.**0 1**Complete **Figure 1** by writing the name of the missing division of the nervous system in the box.**Figure 1****[1 mark]****0 2**

Describe the function of a motor neuron.

[2 marks]

A motor neuron carries motor commands (nerve impulses) away from the CNS to effectors, such as skeletal muscles and glands, allowing for movement or action, e.g. muscle contraction.



0 3

Describe what is meant by excitation in the process of synaptic transmission.

[3 marks]

Excitation is when a neurotransmitter released into the synaptic cleft binds to receptors on the post-synaptic neuron and causes an increase in neural activity in the post-synaptic neuron. The post-synaptic membrane becomes more positively charged (depolarised), which increases the likelihood that an action potential will be triggered, so the receiving neuron is more likely to fire and pass on the electrical impulse.

Some neurotransmitters therefore have an excitatory effect. Examples of excitatory neurotransmitters include dopamine, serotonin and acetylcholine (although some, such as dopamine and serotonin, can also be inhibitory depending on the receptor). Whether the post-synaptic neuron fires depends on summation: the excitatory inputs must outweigh the inhibitory inputs.

Turn over for the next question**Turn over ►**

0	4
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Oleg had a bicycle accident. A scan of his brain showed damage to the motor centre of his right hemisphere.

Explain how the damage to the motor centre in Oleg's brain might affect his behaviour.

[3 marks]

The motor centre (motor cortex), in the frontal lobe, is responsible for initiating and coordinating voluntary movements, by sending signals to the muscles of the body.

Damage to this area means that Oleg might have problems with voluntary muscle movement, e.g. loss of fine motor control and poor coordination, so he may find it hard to walk, write or pick things up, or he may even experience paralysis.

Because of contralateral control, each hemisphere controls movement on the opposite side of the body. As the damage is only in the motor centre of Oleg's right hemisphere, it will only affect the mobility of the left side of his body, e.g. his left arm and leg, while movement on his right side should be unaffected.



0 5

Describe the fight or flight response. Refer to the role of adrenaline in your answer.

[9 marks]

The fight or flight response is an automatic, physiological reaction to a perceived threat and is part of the autonomic nervous system (ANS).

Higher brain centres, the cortex and the limbic system (e.g. the amygdala), carry out an appraisal of a situation and identify it as potentially dangerous. The hypothalamus then activates the sympathetic branch of the ANS, so the body switches from the parasympathetic (rest and digest) state to the sympathetic (arousal) state.

In the acute response (the sympathomedullary pathway), the sympathetic nervous system sends a neural message to the adrenal medulla, instructing it to increase the release of adrenaline and noradrenaline into the bloodstream. Adrenaline acts within seconds on target organs: it speeds up heart rate, constricts blood vessels and raises blood pressure, so oxygenated blood reaches the skeletal muscles more quickly. It also increases breathing rate, dilates the pupils, increases sweating and inhibits digestion and saliva production. Energy reserves are released, leading to raised levels of glucose and fatty acids in the blood to supply the muscles and brain.

If the threat continues, the hypothalamus stimulates the pituitary gland to release adrenocorticotrophic hormone (ACTH) (the hypothalamic pituitary adrenal axis). ACTH travels in the bloodstream to the adrenal cortex, stimulating the release of corticosteroids (cortisol and corticosterone) into the bloodstream, which maintain the supply of glucose for energy and suppress the immune system.

These physiological changes enable a person to escape from (flight) or face (fight) a perceived threat: there is energy for running, and

Turn over ►

constricted blood vessels and faster clotting mean the body is prepared to minimise blood loss if injured. A negative feedback loop via the hypothalamus monitors the hormone levels in the blood, and when the threat has passed the parasympathetic nervous system returns the body to its resting state.

Extra space



0 6

Discuss research into plasticity **and** functional recovery after trauma.**[12 marks]**

Plasticity is the ability of the brain to change and adapt its structure and function in the light of experience, learning and trauma. Blakemore and Mitchell (1973) studied the development of the visual cortex in cats. Kittens raised in an environment of only vertical stripes developed visual cortex neurons that responded mainly to vertical lines and were unable to perceive horizontal lines, demonstrating that early experience shapes the developing brain. Maguire et al (2000) used MRI scans and found that London taxi drivers had a larger posterior hippocampus than a control group of non-taxi drivers, and the volume was positively correlated with the time spent as a taxi driver, showing that the adult brain changes with extensive spatial navigation experience.

Functional recovery is the recovery of abilities lost after brain damage caused by trauma, such as a stroke or head injury, where undamaged areas of the brain take over the functions of damaged areas.

Mechanisms of recovery include a reduction of swelling of brain tissue, axonal sprouting (the growth of new nerve endings from surviving neurons, which connect with other undamaged neurons to form new pathways) and neurogenesis, the growth of new neurons. Villablanca and Hovda (2000) found that when one damaged hemisphere was removed soon after birth (hemispherectomy), the remaining hemisphere was able to take over many of its functions. Kapur (1997) found that doctors had a better recovery after brain damage compared to the general population, suggesting that education and cognitive reserve aid recovery. Age also plays a role, as more significant change is possible in younger brains: Teuber (1975) found that soldiers under the age of 20 with brain

Turn over ►

injuries had a much better recovery of movement and visual problems than older soldiers.

A strength of this research is that it is supported by objective scientific evidence. Maguire used MRI scans to measure the size of the hippocampus, which is not open to the researcher's interpretation, increasing the validity of the conclusion that the brain shows plasticity. However, Maguire's study is correlational, so it is possible that people with a larger hippocampus are more likely to become taxi drivers, rather than taxi driving causing the change.

A limitation is that much of the research into functional recovery uses case studies or studies with small participant numbers, e.g. hemispherectomy patients or brain-damaged soldiers. These individuals have unique types and degrees of brain damage and the researcher often has no measure of their abilities before the trauma, so it is difficult to establish cause and effect and to generalise the results to the wider population.

Another limitation is that some research, such as Blakemore and Mitchell's study, used non-human animals. Although this allows experience to be controlled in a way that would be unethical with humans, the brains of cats are less complex than human brains, so there are issues with generalising the findings from animals to humans. The study also raises ethical issues, as the kittens suffered lasting harm.

A strength of the research is its real-life application. Knowledge about plasticity has given importance to rehabilitation and treatment, such as physiotherapy and speech therapy after a stroke or brain injury, which



Extra space

encourage the brain to form new connections and so promote recovery.

This shows the research has practical value.

However, it is difficult to predict the level of recovery a person will make, so the research has low predictive validity. There are huge individual differences in recovery because many factors play a part, such as age, education, determination, the amount of practice and the degree of damage. For example, Kapur's findings suggest that education influences recovery, so it cannot simply be assumed that a younger brain will always recover better.

Overall, there is strong and consistent evidence that the brain is plastic and can recover function after trauma, although the extent of recovery varies greatly between individuals.



Section B: Cognitive DevelopmentAnswer **all** questions in the spaces provided.Only **one** answer per question is allowed.

For each question completely fill in the circle alongside the appropriate answer.

CORRECT METHOD



WRONG METHODS



If you want to change your answer you must cross out your original answer as shown.



If you wish to return to an answer previously crossed out, ring the answer you now wish to select as shown.

**0 7**In which of Piaget's stages of intellectual development is a child **most** likely to demonstrate the ability to perform mental operations such as conservation?Shade **one** box only.**[1 mark]****A** Concrete operational stage**B** Formal operational stage**C** Pre-operational stage**D** Sensorimotor stage**0 8**

According to Piaget's stages of intellectual development, which age group is associated with the pre-operational stage?

Shade **one** box only.**[1 mark]****A** 0–2 years**B** 3–6 years**C** 7–11 years**D** 12+ years

09

Kemal is a 4-year-old boy who takes part in an experiment. The researcher puts a model of three mountains on a table in front of Kemal. A doll is placed on a chair opposite Kemal. The researcher shows Kemal a selection of pictures with different views of the mountains. Kemal's task is to choose the picture that he thinks is the same view as the doll's view of the mountains.

Using your knowledge of Piaget's theory of cognitive development, explain the choice of picture you think Kemal is likely to make and why he is likely to make that choice.

[6 marks]

Kemal is likely to choose the picture that shows his own view of the mountains, rather than the picture showing the doll's view.

According to Piaget's theory, because Kemal is 4 years old he is most likely to be in the pre-operational stage of intellectual development (approximately 2 to 7 years). A key feature of this stage is egocentrism, which means Kemal probably cannot see the world from someone else's viewpoint; he assumes that everyone sees the world in the same way that he does. He therefore believes that the doll sees the same view of the three mountains as he does.

Kemal also probably cannot decentre, because pre-operational children tend to focus on only one aspect of a situation, in this case his own perspective. He does not yet realise that, because the doll is sitting opposite him, the doll will see a different representation of the mountains, e.g. features that are at the front for Kemal will be at the back for the doll.

This is what Piaget and Inhelder (1956) found in the three mountains task: children of four years usually chose the picture of their own view.

According to Piaget, it will not be until Kemal is approximately seven years old, in the concrete operational stage, that he will be able to decentre and choose the correct picture of the doll's view.

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1 0

Baillargeon investigated violation of expectation in young children. Outline the procedure from **one** violation of expectation study.

[4 marks]

In Baillargeon's drawbridge study, infants aged about 5 months first had a familiarisation stage to become familiar with the task. In the habituation stage, they were repeatedly shown a screen rotating through 180 degrees like a drawbridge until they looked at it less.

A box was then placed behind the screen. In the expected (possible) event, the screen rotated until it reached the box and stopped at about 112 degrees. In the unexpected (impossible) event, the screen appeared to rotate through the box, a full 180 degrees, as the box was secretly removed.

The researchers measured how long each infant looked at each event.

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1 1

Evaluate research into theory of mind.

[6 marks]

A strength of research into theory of mind (ToM) is that it is carefully controlled. For example, Baron-Cohen et al (1985) selected groups of children with matched mental ages and used a standardised procedure, the Sally-Anne false belief task, with each child. This suggests the evidence supporting the theory has high internal validity.

Research is also supported by other studies. A meta-analysis of 178 studies by Wellman et al (2001) consistently found that children under the age of four have not developed ToM and fail false belief tasks, increasing confidence in the findings.

However, false belief tasks are not suitable for very young children, as they require participants to have sufficiently developed language and memory skills. Results from very young children might be misattributed to a lack of ToM, so it is unclear to what extent language interfered with the results.

There are also generalisation issues, as some research used samples of children with developmental deficits, e.g. children on the autistic spectrum, so findings may not apply to typically developing children.

Research into individual differences suggests a role for nurture: children from larger and/or more affluent families outperform their peers, suggesting an environmental influence on ToM development, so ToM is not simply the result of maturation.

Finally, ToM is based on abstract concepts that cannot be observed directly and have to be inferred from behaviour, so research may not truly measure it, reducing validity.

Turn over ►

1 2

Discuss Vygotsky's theory of cognitive development.

[12 marks]

Vygotsky's theory emphasises the role of social and cultural factors in cognitive development. He argued that children are born with elementary mental functions, such as attention, sensation and perception, which are transformed into higher mental functions, such as problem solving, reasoning and memory, through social interaction. Each child develops the tools of their own culture, especially language, from the people around them, and internalises the world view of other people through social interaction.

Language plays a central role in thought. At first speech is social (pre-intellectual) and is used to communicate with others. Children then use egocentric speech, talking aloud to themselves to guide their actions. At around 7 to 8 years of age, language becomes internalised and becomes intellectual (inner) speech, which is used for thinking.

Cognitive development occurs through the child's interaction with older or more knowledgeable others (MKOs), such as parents, teachers or peers.

Vygotsky introduced the concept of the zone of proximal development (ZPD): the difference between what a child can achieve on their own (actual ability) and what they can achieve with the help of an MKO (potential ability). Learning takes place within the ZPD through instruction. The MKO provides scaffolding, support that is adjusted to the child's needs, e.g. breaking a task into smaller steps, demonstrating and encouraging, and this support is gradually withdrawn as the child becomes competent. The child is therefore seen as an apprentice to a more knowledgeable other.

There is research evidence to support scaffolding. Wood and Middleton



(1975) observed mothers helping their four-year-old children to build a model from blocks. The most effective mothers adjusted their help to the child's performance, giving more specific instructions when the child struggled and less help when the child was succeeding. This supports Vygotsky's idea that learning is most effective when an MKO works within the child's ZPD. However, this was an observation of a small sample, so the findings may be affected by observer bias and are difficult to generalise.

A strength of Vygotsky's theory is its practical application to education. It has led to techniques such as peer tutoring, in which a more able student helps a less able one, and guided learning, in which teachers support children within their ZPD rather than waiting for them to discover things alone. This shows the theory has useful real-world value. However, guidance and instruction may not always have a positive influence. Too much help from an MKO may lead to a lack of motivation and independence, as the child may come to rely on others rather than working things out for themselves.

Vygotsky's theory can be contrasted with Piaget's theory. Piaget argued that children learn through independent discovery and must be biologically ready before they can move on to the next stage. Unlike Piaget's notion of readiness, Vygotsky believed that development could be accelerated to some extent, e.g. through the ZPD and collaborative learning with an MKO. Vygotsky's theory also focuses on the process of cognitive development rather than its outcomes, whereas Piaget described the outcomes in the form of age-related stages. However, concepts such as the ZPD are vague and hard to measure precisely, so the theory is

Turn over ►

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difficult to test scientifically.

Overall, Vygotsky's theory provides a convincing explanation of how social interaction, language and culture drive cognitive development, supported by research and with valuable applications to education, although it may underestimate the role of biological maturation.



Section C: Research Methods 1

Answer **all** questions in the spaces provided.

A psychologist wanted to see if spending time doing outdoor activities is related to happiness. He constructed a questionnaire about this which contained 10 questions. The psychologist decided to carry out a pilot study of his questionnaire using a sample of students from a local university.

1	3
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What is a pilot study?

[2 marks]

A pilot study is a small-scale preliminary trial run of a study, carried out on a small sample before the main study, so the researcher can check aspects of the study, e.g. whether the instructions and questions are clear, and make changes.

1	4
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Explain **one** possible reason why the psychologist decided to do a pilot study of his questionnaire.

[3 marks]

The psychologist can check whether the students understand the 10 questions about outdoor activities and happiness. If any questions are ambiguous or confusingly worded, students may interpret them differently or misunderstand them, so their answers would not accurately measure the relationship between outdoor activities and happiness, lowering validity. The pilot study lets him identify and reword unclear questions before the main study, saving time and money.

Turn over ►



1 5

Name **one** sampling technique and briefly explain how the psychologist could have used this technique in his pilot study.

[3 marks]

Sampling technique Opportunity sampling.

Explanation He could have gone to a lecture at the local university and, at the end of the lecture, asked the students who were present and available at the time to take part by filling in his questionnaire about outdoor activities and happiness.

The questionnaire constructed by the psychologist collected qualitative data.

1 6

Write **one** question the psychologist could have used to collect qualitative data for this pilot study.

[2 marks]

'How does it make you feel when you spend time doing outdoor activities? Please explain in your own words.'



After completing the questionnaire study using the final version of his questionnaire, the psychologist analysed the results. The data from this study suggested that people who spent more time outdoors reported more happiness.

The psychologist then conducted an experiment to investigate if the location where people exercise affects happiness. For this experiment he obtained a sample of 20 students from a different university.

The psychologist asked the students to exercise each day for five days. The students were randomly allocated to **either** Condition 1 **or** Condition 2.

Condition 1: walking for 60 minutes in a gym.

Condition 2: walking for 60 minutes in a park.

At the end of the fifth day, each student rated their happiness on a scale of 7 to 1, where 7 = extremely happy and 1 = extremely unhappy.

1	7
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Name and briefly explain the experimental design used by the psychologist in this experiment.

[3 marks]

Experimental design Independent groups design.

Explanation Different students took part in each condition: each student took part in only one condition, either walking for 60 minutes in a gym (Condition 1) or walking for 60 minutes in a park (Condition 2), having been randomly allocated to their condition.

1	8
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Briefly explain how the independent variable in this experiment was operationalised.

[2 marks]

The IV, the location of exercise, was operationalised as either walking for 60 minutes in a gym or walking for 60 minutes in a park, each day for five days.

Turn over ►



1 9

Explain **one** possible problem with asking students to rate their happiness.

[2 marks]

The rating is subjective to each student: one student's rating of 5 may mean something different from another student's 5, so the happiness ratings of different people cannot be compared objectively.

2 0

Identify **one** possible extraneous variable in this experiment and explain why it should have been controlled.

[3 marks]

Extraneous variable: the weather on each day of the study.

This should have been controlled because walking in the park during sunny weather might make the Condition 2 students happier, whereas rain would not affect students in the gym. Any difference in happiness ratings could then be due to the weather rather than the location of exercise (the IV), reducing the internal validity of the experiment.



The ratings data collected in the experiment is in **Table 1**.

Table 1: Happiness ratings (score out of 7) of students in Condition 1 and Condition 2

Condition 1 (in a gym)	Condition 2 (in a park)
3	4
4	6
2	4
5	7
3	6
2	4
1	1
3	6
4	5
1	4

2 1 . 1

Calculate the range for the happiness ratings for **Condition 1**. Show your working.

[2 marks]

Highest score = 5, lowest score = 1

Range = $5 - 1 = 4$

2 1 . 2

Explain why the range is an appropriate measure of dispersion for the happiness ratings for **Condition 1**.

[2 marks]

The data set for Condition 1 has no outliers (scores range from 1 to 5 and are evenly spread), so the range is not distorted by an extreme score and gives a good representation of the spread of the data. It is also quick and easy to calculate.

Turn over ►



2 1 . 3

Calculate the median for the happiness ratings for **Condition 2**. Show your working.

[2 marks]

Scores in order: 1, 4, 4, 4, 4, 5, 6, 6, 6, 7

The middle two scores are the 5th and 6th scores: 4 and 5

Median = $(4 + 5) \div 2 = 4.5$

2 1 . 4

Explain why the median is an appropriate measure of central tendency for the happiness ratings for **Condition 2**.

[2 marks]

There is an outlier in Condition 2 (a rating of 1), and the median is not affected by this extreme score, unlike the mean. Also, the ratings were self-reported on a scale, so they are ordinal data, for which the median is the appropriate average.

The psychologist wanted to display the median happiness ratings for **Condition 1** and **Condition 2** on a graph.

2 2

Name an appropriate graph to display the medians for **Condition 1** and **Condition 2**. Briefly explain why the graph you have named is appropriate.

[2 marks]

Bar chart.

The data are in two separate conditions (gym and park), which are categorical, discrete groups, so each median can be shown as a separate bar.

30

END OF QUESTIONS



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