

Cognition (LS4106)

Final Exam

Examiners: Anindita Bhadra and Anuradha Bhat

Total Marks: 50

Time: 3 hours


Section A

Please answer in brief, and answer the questions serially.

1. "Language is indispensable for the development of theory of mind". Do you agree with this statement? Provide justification for your answer. (3)
2. Outline the milestones for the development of Theory of Mind in human infants. (5)
3. Discuss the role of synapses in the formation and recall of memories. (2)
4. Discuss the following statements in the context of human memory: (5X1 = 5)
 - (i) A picture is worth a thousand words.
 - (ii) Practice makes perfect.
 - (iii) Create associations.
 - (iv) Use your ears.
 - (v) Try a rhyme.
5. Using examples, explain the differences between episodic and semantic memory. (3)
6. Dev is convinced that the world is conspiring against him and he is unable to concentrate on anything. He avoids gatherings and remains withdrawn. He has trouble multi-tasking and finds it difficult to remember names of people. What kind of psychiatric disorder do you think Dev might be suffering from? (2)
7. Why do you think it is more difficult to remember a cell phone number as compared to an ATM PIN? (2)
8. Raju has been found shaking his baby sister hard and they had to be separated from each other. Raju was harshly punished, but he doesn't seem to understand why his behaviour was problematic. When asked, he explained that he was playing with his sister, just as he plays with his other toys. Do you think Raju's parents need to pay special attention to him? Why? What other behaviours should they be watching for in Raju? (3)

Section B

1. "In Aesop's fable, a thirsty crow spied a pitcher containing a small amount of water.. The crow began placing the stones in the pitcher, thereby raising the water until it could drink.." "Do Corvids Have the Brains for Complex Cognition? How does this compare with those of non-human primates? Support your answer with examples. (3)
2. Despite decades of discussions and arguments, there is no consensus on a universal definition of animal intelligence or method to measure it.
 - a) Why is it so difficult to have a common definition for intelligence? Explain the different views of behavioural ecologists versus comparative psychologists. (2)
 - b) Recently several comparative and evolutionary psychologists and cognitive ecologists have converged on some idea to measure this trait. What is this method



and what do studies on this measure reveal about intelligence among different classes of vertebrates (e.g. mammals and birds) (3)

3. It is thought that humans have unique cognitive properties that can only be seen to some extent among non-human primates such as apes and chimps. What are the three "unique properties" that are under debate as being present in only a few other primates apart from humans? (2)
4. The excellent navigation abilities among social insects (such as ants and bees), birds, and mammals allows them to move across a variety of habitat conditions (deserts, forests, grasslands) for foraging, mate searching and homing. What specific mechanisms do they use to find their way around? Explain with examples. (5)
5. In a research study, structural MRIs of the brains of humans with extensive navigation experience, licensed London taxi drivers, were analyzed and compared with those of control subjects who did not drive taxis. Given below is the result of this study:

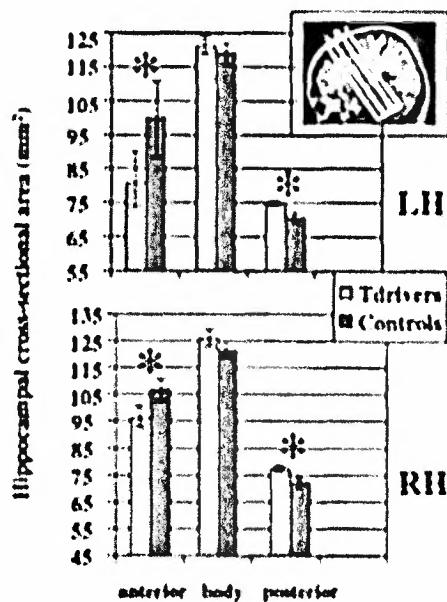


Fig. 1. Volumetric analysis findings. The mean of the cross-sectional area measurements (uncorrected for ICV) for the three regions of the left hippocampus (LH). (Lower). The means for the right hippocampus (RH).

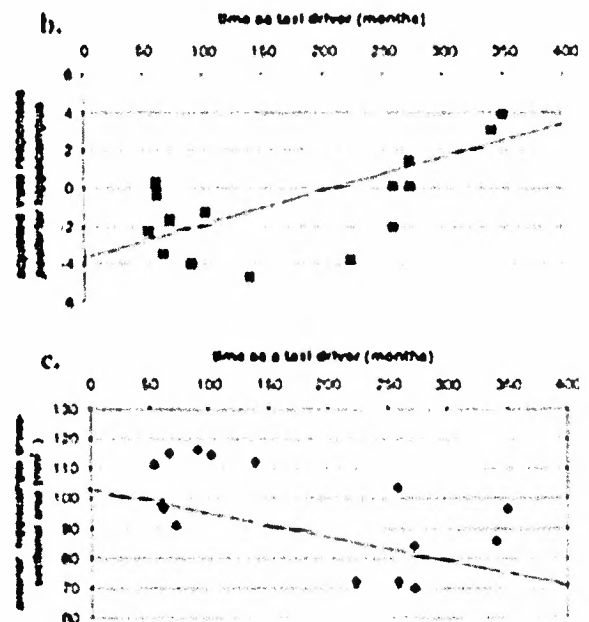


Fig. 2. Correlation of volume change with time as a taxi driver. The volume of gray matter (VBM, Voxel-based morphometry) in the right hippocampus was found to correlate significantly with the amount of time spent learning to be and practicing as a licensed London taxi driver.

- a) Based on the graphs above, explain the results of these findings in the context of structural changes in the hippocampus among taxi drivers and non-taxi drivers (controls). (3)

[Handwritten signature]

[Handwritten signature]

[Handwritten signature]

- b) What does this study tell us in the context of the capacity for local plastic change in the structure of the healthy adult human brain in response to environmental demands?
(2)

Section C

Answer the following Multiple-choice questions by selecting one of the following options.
One mark for each correct answer. (5)

1. Grid cells and place cells are involved in
 - a) maintaining biological rhythms in our body
 - b) spatial navigation among mammals
 - c) speech and development of language
 - d) all of the above
2. "Intelligence, based on mental and behavioral flexibility, has apparently evolved independently in different classes of vertebrates (e.g. birds and mammals), and in different orders of the same class (e.g. cetaceans and primates), as well as in different families of the same order." This speaks strongly against a _____ view of the evolution of intelligence- i.e. a single evolutionary line culminating, for example, in *Homo sapiens*.
 - a) Orthogenetic
 - b) Divergent
 - c) Convergent
 - d) None of the above
3. After exiting the occipital lobe, visual information is passed along two pathways, the ventral and the dorsal visual streams. The ventral stream (inferior temporal cortex) is responsible for ----- while the dorsal (parietal cortex) stream is involved with-----
 - a) object location and identification respectively
 - b) Object identification and location respectively
 - c) learning and memory respectively
 - d) none of the above
4. The suprachiasmatic nucleus influences the release of melatonin by its effect on the
 - a) Pituitary gland
 - b) Pineal gland
 - c) Thyroid gland
 - d) Hypothalamus
5. Odometry is a method for measuring
 - a) brain activity
 - b) distance based on counting steps
 - c) sleep patterns
 - d) hearing abilities in mammals



Anurag Bho

