

Brain, Behaviour, and Cognition: General Examination Feedback (May 2017)

As part of this general feedback document I would like to address some general points that relate to the two examinations on the Brain, Behaviour, and Cognition module – the Cognitive exam and Biological exam. I will then provide some comments on each of the specific exams, with indicative answers for all of the questions, and then finally some statistics for the cohort.

So, to begin, in both exams there was a tendency for students to provide highly descriptive answers to the questions. At this point in your degree you should be ensuring that you move away from producing descriptive work and instead focus your answers in terms of evaluation and critique – descriptive answers will not enable you to achieve the higher marks. It was also clear in both exams that there was minimal engagement with the core readings set for this module and minimal engagement with other primary sources – this is critical for obtaining higher marks. The other major issue with a large majority of the exams, and in particular with the Biological exam, was that students were simply not answering the specific question being asked, instead they were producing a broad account of the general topic area of the question, or in some cases completely veering off topic.

Despite the above, there were some promising papers and it was really good to see that a very large majority of you had taken on board the guidance provided in terms of ensuring that you include an introductory paragraph setting-up what your answers were going to discuss and a concluding paragraph to wrap everything up – so well done.

Now to the feedback on each of the separate exams, indicative answers and some cohort statistics →

Cognitive Exam:

Overall the answers provided on this exam were generally good – clearly written and concepts were explained well. However, on the whole, the answers were rather basic, superficial, and descriptive in nature, with a substantial number of them simply repeating bits of information from the lecture slides. To obtain higher marks students needed to go beyond the lecture notes and provide fuller more critical arguments with inclusion of relevant empirical studies to back-up any points being made. Other issues included: inappropriate use of capital letters, inappropriate use of the word ‘prove’ and ‘I’, and a lack of references.

Range of exam mark totals = 25-74; Cohort exam mark average = 57. Overall I'm pleased with this as students often find discussing Cognitive concepts quite challenging.

Indicative answers:

Q1. Compare and contrast the Prototype and Exemplar theories of Categorisation.

Indicative answer: This question would require students to have an understanding of concepts and how humans perform categorisation. It is expected that most answers would include the work of Rosch. Weak answers would simply describe the prototype and exemplar theories without offering any comparison or evaluation. A strong answer would also include relevant research studies to highlight the strengths and weaknesses of each theory. A very strong answer would draw further on empirical research in order to compare the two theories and consider any other alternatives and wider implications.

Q2. Critically discuss evidence for different types of long-term memory.

Indicative answer: There is a wealth of empirical evidence that can be drawn upon for this answer. Therefore, whilst it is expected that key theorists and researchers such as Tulving are likely to be seen in many papers, there may be a variety of research papers used. Whilst the empirical evidence is expected to be seen in all pass answers, stronger answers will address different types of memory (e.g., episodic versus semantic, explicit and implicit) and use the evidence to evaluate the strengths and weaknesses of the theories for these different types of memory. An important element of all answers is that they should focus upon differences in long-term memory and not STM or sensory store etc.

Q3. Using Psychological evidence, critically discuss whether human and animal language are *qualitatively* different.

Indicative answer: A number of studies looking at both human (e.g., Chomsky) and non-human (e.g., vervet monkeys, honeybees, and ape studies) language cover the issue of difference between the two. For higher marks it is vital that the evidence covered is used to deal with the issue of qualitatively different e.g., not just amount but type of language. Therefore, issues of semanticity, sentence structure, etc., must play a key role in the full answering of this question.

Q4. Critically discuss and evaluate the biases and heuristics that may influence human judgement and decision making.

Indicative answer: This question would require students to show an understanding of how humans make judgements and decisions. The students would need to include in their answers the relevant theories proposed regarding biases and heuristics, and provide a critical analysis of these theories based on findings from relevant empirical research. Weak answers would simply outline the different biases and heuristics. A strong answer would add to this by using relevant research studies to highlight the strengths and weaknesses of the various theories. A very strong answer would further this by providing a synthesis of argument and consider any wider implications.

Biological Exam:

Overall these scripts were rather disappointing and a number of students threw away marks by not even attempting all of the questions required. The fact that some questions were not even attempted in a number of the scripts is indicative of a lack of preparation. The topic areas for all of the questions on this exam were provided to students – both run through during the revision session and placed as a PDF on Moodle. Therefore, there should have been no reason why students could not have at least attempted to write something for each of the required questions, given that the topic area of questioning was known to students prior to sitting the exam. The fact that so few students actually attended lectures on this module may have also contributed to the general lack of overall understanding and knowledge of the broad range of topics covered. Having looked at the attendance record, 19 out of 40 (so half of the cohort) attended **less than half** of the lectures on this module. Given that this was a content heavy module (something that was highlighted to students at the start of the semester and something that the students highlighted themselves on the module evaluation forms) it would have been imperative to attend all sessions to ensure maximum opportunity and exposure the content of the module.

Section A of the exam was answered very well by most. However, for Section B a number of students did not answer the additional fourth question required for this section (despite having been reminded on multiple occasions both verbally in lectures, in writing on lecture slides and revision notes on Moodle, and on both the front cover and specific page on the exam script). Finally, for Section C this was answered very poorly, with a number of students not attempting the three questions required or providing very superficial and descriptive answers, with very limited references. The other major issue on this exam (particularly for Section C), was that students were not answering the specific questions being asked – instead they were either providing some general details about the topic area or were providing answers that had no relation to the question being asked. This was especially evident for the question asking about the pharmacological treatments for anxiety disorders – what should have been covered were the effects of various drugs (e.g., Benzodiazepines, Serotonin & GABA agonists) because the question asked for **PHARMACOLOGICAL** treatments – i.e., the science of drugs. Instead what I had were descriptions of counselling therapies and CBT.

Range of exam mark totals = 12-75; Cohort exam mark average = 46. Very disappointing with this, especially seeing as this exam usually produces the best marks for the module.

Indicative answers:

SECTION A: Answer **THREE** questions from this section

Question 1: List five causes of brain damage.

Any of the following: Brain tumour, Cerebrovascular disorder, Closed-head injury, Infection of the brain, Neurotoxins, Genetic factors. (5 marks)

Question 2: List the five main symptoms of Grand mal seizures.

Grand mal: Loss of consciousness, loss of equilibrium, Tonic-clonic convulsions, Rigidity (tonus), Tremors (clonus). (5 marks)

Question 3: Name five of the major internal features of a neuron.

Any of the following: Nucleus, Mitochondria, Endoplasmic reticulum, Cytoplasm, Ribosomes, Golgi complex, Microtubules, Synaptic vesicles, Neurotransmitters. (5 marks)

Question 4: Name any five structures of the Limbic system.

Any of the following: Amygdala, Hippocampus, Cingulate cortex, Fornix, Septum, Mammillary body. (5 marks)

Question 5: Briefly describe the difference between acute and chronic stress.

Acute stressors improve immune function (eustress)

Chronic stressors impair immune function (distress). (5 marks)

Question 6: Briefly describe the three main causes of drug relapse.

- Stress – drug use as a coping mechanism
- Priming – a single exposure leads to a relapse
- Environmental cues - Conditioned drug tolerance: Returning to place where drugs once taken (or even thinking about drug). (5 marks)

SECTION B: Answer **FOUR** questions from this section

Question 7: Compare and contrast x-ray Computed Tomography (CT) with Electroencephalography (EEG) as techniques for studying the brain.

CT structure of brain, creates x-ray scan of one horizontal section of brain – 8/9 sections per patient.

EEG measures gross electrical activity of brain with electrodes attached to scalp. Includes wave, ERP, & combined with MRI. (10 marks)

Question 8: Briefly discuss why apoptosis is more desirable than necrosis.

Necrotic cells break apart and spill their contents into extracellular fluid, which can lead to harmful inflammation. Apoptotic cell death on the other hand involves the DNA and other structures being cut apart and packed into membranes before the cell breaks apart. The attracted scavenger microglia prevent inflammation. (10 marks)

Question 9: Briefly explain ‘blind sight’ and provide a possible explanation for its occurrence.

Results from damage to primary visual cortex. Patients can respond to visual stimuli in their scotoma without having conscious awareness of it. Two neurological explanations: Parts of still functioning cells in the striate are able to mediate some visual abilities, or visual

pathways going to secondary visual cortex without going through primary visual cortex have visual ability without conscious awareness. (10 marks)

Question 10: Explain the mechanism of how a sound wave arriving at the auditory canal reaches the human brain's auditory pathway.

Tympanic membrane vibrates → transfers to 3 ossicles (malleus, incus, and stapes) → triggers vibrations of oval window → transfers vibrations to the fluid of the cochlea. Pressure change at oval window travels along organ of Corti as a wave. Hair cells mounted in basilar membrane and tectorial membrane rest on hair cells. Deflection produces force on hair cells, which increases firing of axons of auditory nerve. (10 marks)

Question 11: Briefly explain how the somatosensory system responds to stimuli and transmits information to the central nervous system?

Cutaneous receptors in the skin differing in function and speed. Dermatomes: carry information in nerves and enter spinal cord via dorsal roots. Two major pathways: dorsal-column medial-lemniscus and anterolateral. Info from one side of the body crosses over to the other side of the brain. (10 marks)

Question 12: Describe the process of neurotransmitter activity in the terminal button, synaptic cleft and at the post-synapse.

Exocytosis: vesicles that contain neurotransmitters congregate at pre-synaptic membrane voltage-activated calcium channels. When stimulated by action potential channels open and Ca^{2+} ions enter the button, which causes synaptic vesicles to fuse with presynaptic membrane and empty contents into the synaptic cleft. Then neurotransmitter molecules produce signals in postsynaptic neurons by binding to receptors in postsynaptic membrane (ligand). Influence on postsynaptic neuron depends on whether receptor is ionotropic or metabotropic. When molecule binds it opens channel on postsynaptic neuron causing post-synaptic potential. Message terminating mechanisms in the synapse: reuptake and enzymatic degradation. (10 marks)

Question 13: Briefly describe the pharmacological treatments for anxiety disorders.

- Benzodiazepines (Librium, Valium): Also used as hypnotics, anticonvulsants, muscle relaxants
- GABA_A agonists – bind to receptor and facilitate effects of GABA; highly addictive
- Serotonin agonists (buspirone, SSRI) Reduce anxiety without sedation, side effects
- Antidepressants – effective due to comorbidity of anxiety and depression. (10 marks)

Question 14: What is sham rage and what has it told us about the role of the hypothalamus in aggression?

Exaggerated and unfocused aggressive response (originally seen in cats who'd had their cortex removed). However, no such response would be seen if the hypothalamus was also removed, suggesting it must be critical in the expression of aggressive responses and that the function of the cortex is to either inhibit or direct the aggressive response (Bard). (10 marks)

SECTION C: Answer **THREE** questions from this section

Question 15: Describe the symptoms and evaluate the efficacy of potential treatments for Epilepsy.

Epilepsy: usually accompanied by seizure: aura, smell or hallucination, convulsions, changes in thought, mood and behaviour. The answer can include a discussion of the difference between partial and generalised epileptic seizures. Treatments: Antiepileptic medication -but

only reduces frequency and severity, doesn't cure; also, severe side effects. Brain surgery performed as last resort. (15 marks)

Question 16: Briefly evaluate the dopamine theory of schizophrenia.

Start by describing the dopamine theory of schizophrenia and explain how it was discovered. Link between dopamine and Parkinson's disease found, antipsychotic drugs work by decreasing dopamine levels; schizophrenia associated with dopamine over-activity, etc. Chlorpromazine antagonizes dopamine activity by binding and blocking dopamine receptors. Then discuss limitations: other receptors involved, timescale to alleviate symptoms, does not explain widespread brain damage, effectiveness of neuroleptics are questioned. (15 marks)

Question 17: Describe the Monoamine and Diathesis-stress theories of depression and evaluate which provides a better explanation.

- Monoamine theory: Underactivity of serotonin and norepinephrine synapses, depression untreated with drugs may result in proliferation of monoamine receptors (*up-regulation*), and autopsy studies, providing support for the monoamine theory. However, not all respond to monoamine agonists and support for theory is weak.
- Diathesis-stress theory: Some people inherit a diathesis (genetic-susceptibility) and when exposed to stress the system becomes sensitized, causing them to overreact to mild stressors. Support is indirect – depressed people release more stress hormones. However, not all depressed patients show evidence of excessive early stress. (15 marks)

Question 18: Briefly compare and contrast the characteristics of Autism and Williams Syndrome. What do the contrasting characteristics suggest for disorder pathology?

- Autism characteristics: Reduced ability to interpret emotions, reduced capacity for social interaction, and preoccupation with a single subject or activity. Heterogeneous – level of brain damage and dysfunction varies. Often considered a spectrum disorder.
- Williams syndrome characteristics: mental disorder and uneven pattern of abilities and disabilities. However, unlike autism, those with Williams syndrome are sociable, empathetic, and talkative. Autism and Williams syndrome seen as opposites. Those with Williams syndrome have good language skills, music skills and have an enhanced ability to recognize faces. However, their spatial cognition is poor and often have heart disorders.
- Important to answer second part of question: similar and different areas of the brain being involved. (15 marks)

Question 19: Explain, using evidence, how research with animals has informed us about the process of human drug addiction?

Discuss intracranial self-stimulation and brain pleasure centres (describe apparatus and procedure), including role of Mesotelencephalic Dopamine System. Can also discuss behavioural paradigms/methods: Drug self-administration and conditioned place preference. Role of nucleus accumbens. (15 marks)

Question 20: With the use of empirical evidence, evaluate the consolidation theory of memory.

Describe consolidation theory (consolidation of short-term memories to long-term memories) – work of Hebb, and discuss brain areas thought to be involved. Evidence from posttraumatic amnesia, gradients of retrograde amnesia after concussion. Use of ECS to study consolidation. Standard consolidation theory vs. multiple-trace theory. Could discuss reconsolidation. (15 marks)