

unit guide

Biological Basis of Behaviour

TPS-2-301 TPS-3-301

http://www.sbu.ac.uk/psycho/teaching/BBB-main.shtml

Faculty of Arts and Human Science

Department of Psychology

2008-2009

become what you want to be

Table of contents

| 1.0 | UNIT DETAILS | . 3 |
|------|--|-----|
| 2.0 | SHORT DESCRIPTION | . 3 |
| 3.0 | AIMS OF THE UNIT | . 4 |
| 4.0 | LEARNING OUTCOMES | . 4 |
| 4.1 | KNOWLEDGE AND UNDERSTANDING | . 4 |
| 4.2 | INTELLECTUAL SKILLS | . 4 |
| 4.3 | PRACTICAL SKILLS | . 5 |
| 4.4 | TRANSFERABLE SKILLS | . 5 |
| 5.0 | ASSESMENT OF THE UNIT | . 5 |
| 5.1 | NOTES ABOUT SUBMITTING COURSEWORK | . 6 |
| 6.0 | FEEDBACK | .7 |
| 7.0 | INTRODUCTION TO STUDYING THE UNIT | . 7 |
| 7.1 | OVERVIEW OF THE MAIN CONTENT | . 7 |
| 7.2 | OVERVIEW OF TYPES OF CLASSES | .7 |
| 7.3 | IMPORTANCE OF STUDENT SELF-MANAGED LEARNING TIME | . 8 |
| 8.0 | THE PROGRAMME OF TEACHING, LEARNING AND ASSESSMENT | . 8 |
| 9.0 | LEARNING RESOURCES | 28 |
| 9.1 | CORE MATERIALS | 28 |
| 9.2 | OPTIONAL MATERIALS | 28 |
| NOTE | S | 30 |

1.0 UNIT DETAILS

| Unit Title: | Biological Basis of Behaviour |
|---------------------------------------|---------------------------------------|
| Unit Level: | 2 and 3 |
| Unit Reference Number: | TPS-2-301 |
| | TPS-3-301 |
| Credit Value: | 1 |
| Student Study Hours: | 150 |
| Contact Hours: | 48 |
| Private Study Hours: | 102 |
| Pre-requisite Learning: | Completion of level 1 or admission to |
| | Graduate Diploma |
| Co-requisite Units: | None |
| Course(s): | Psychology (BA/BSc) |
| | Graduate Diploma in Psychology |
| Year and Semester | Semester 1, 2006 |
| Unit Coordinator: | Hillary Katz |
| UC Contact Details (Tel, Email, Room) | katzh@lsbu.ac.uk |
| | Room E336 Ext. 8165 |
| Teaching Team & Contact Details | |
| (If applicable): | Jacqui Lawrence lawrencj@lsbu.ac.uk |
| , | Ext. 5883 Room E344 |
| | |
| Subject Area: | Psychology |
| Summary of Assessment Method: | Coursework and examination |
| | |

2.0 SHORT DESCRIPTION

This unit examines the biological processes that underlie and shape the behaviour and psychological capacities of human beings. These include basic bodily functions, such as autonomic responses and feeding, sexual activity and emotions but also higher functions such as perception, action, learning, memory, language and awareness. One major issue the unit takes up is the validity of these categories as conceptions of what the nervous system does; for each may involve both specialised areas as well be part of broader, interconnected circuitry across many other areas.

The unit will examine the structure and functional organisation of the nervous system in connection with other systems of the body in order to see how such capacities come about. It also considers the evolution of the nervous system as the context for the development of these capacities and seeks to understand the interplay of genetic and environmental factors in their formation and functioning.

Although a great deal of experimental and clinical evidence is available on various aspects of the relationship between the brain and behaviour, there is still a great deal to be learned and adequate explanatory concepts and theories are yet to be fully developed. Psychology is just one of many fields concerned with how the nervous system underpins behaviour, and each contributes to and understanding of how this highly complex and fascinating organ operates.

3.0 AIMS OF THE UNIT

The unit aims to provide a foundational understanding of the nervous system; notably, the elements, subsystems and interconnections which make possible the major behavioural and psychological capacities we possess.

It considers facts but also seeks to instil critical thinking with respect to the method, concepts and reasoning which underlies knowledge in this field. It is hoped that the unit will equip students to be able to evaluate current and future research findings and to be able sensibly to consider their social and ethical implications.

4.0 LEARNING OUTCOMES

4.1 KNOWLEDGE AND UNDERSTANDING

On completion of the unit you should be able to:

- Identify basic structures and interactions within the nervous system
- Evaluate critically research strategies in the field and the interpretation of results
- Describe how the nervous system develops and factors influencing this process
- Describe functional systems of the brain that underlie regulatory, sensory-motor and higher cognitive capacities
- Discuss major conceptual/theoretical issues relating to the relationship between the brain and behaviour
- Discuss the effects of and factors relating to recovery from brain damage
- Discuss the relevance of applications to contemporary society.

4.2 INTELLECTUAL SKILLS

- Investigation: Accessing and organising information from scientific literature
- Verbal expression: Formulation and expression of understanding
- Critical analysis: Ability to evaluate research findings and conclusions
- Synthesis: Ability to conceptualise factual information and theory

4.3 PRACTICAL SKILLS

• Basic understanding of laboratory methods of brain recording and interpretation.

4.4 TRANSFERABLE SKILLS

- Independent study: Ability to organize and apply academic resources
- Communication: information gathering and writing skills
- Evidence-based argumentation and debate
- IT: Ability to access and review printed and electronic literature

5.0 ASSESMENT OF THE UNIT

Summary

| Coursework (essay) | 40% |
|-----------------------------|-----|
| End of semester examination | 60% |

Assessed Coursework

The essay will require the evaluation of an article (to be handed out in class) relating to observations about the relationship between the brain and behaviour. You will need to consider the conclusions reached (looking critically at the source of data, methods and interpretations), pointing out where statements may be superficial, unwarranted or even false. You will need to back up your argument with relevant information from other sources in the literature and show good understanding of the neurobiology of the topic.

The essay should be approximately 2000 words in length for year 2 Single Honours students and 2500 words for year 3 Combined Honours students. For students on the Graduate Diploma the word length is also 2500.

Non-assessed coursework

A set of study questions will be handed out in the workshops. Each requires further consideration of the topic under discussion.

End of semester examination

The examination will cover material from the lectures, workshops and required reading.

5.1 NOTES ABOUT SUBMITTING COURSEWORK

Coursework deadlines are published in Course/Field Guides and on Psychology notice boards. It is your responsibility to ensure that you are aware of these dates. All coursework must be submitted to the AHS Faculty Office in Borough Road.

1. When handing in coursework, you must:

- complete the coursework submission form and attach it to the front of your coursework;
- take the coursework to the Faculty Office. Your submission form will be date stamped and a receipt issued. Please keep all receipts;
- keep a copy of your essay.

Students may be required to provide electronic copy of written work submitted. In such instances, the individual student will be written to requesting electronic submission. Failure to provide electronic copy within TWO WEEKS of a written request will result in the work being deemed an incomplete submission, and no mark will be given. The work will then have to be referred for a capped mark. When extenuating circumstances have already been accepted for a unit, this will not negate the proper investigation of any component of that unit for any allegation of academic misconduct, nor the subsequent imposition of any appropriate penalty for proven misconduct.

You must not hand coursework to your unit co-ordinator or other lecturer.

- 2. Unless you have obtained a formal extension from your year tutor, coursework submitted:
 - <u>up to two weeks</u> after the deadline date will receive a maximum mark of the pass mark (40%);
 - more than two weeks after the deadline will not be marked.
- 3. Extensions are only granted for valid reasons (see Course/Field guide). The Year Tutor will normally require concrete evidence (e.g. medical certificate). If you want an extension of the deadline date, you must:
 - get a copy of the form for late submission from the Faculty Office;
 - fill in Part A of the form, giving reasons why you cannot meet the existing deadline date;
 - supply the Year Tutor with relevant documentary evidence;
 - submit the form to the Year Tutor who will fill in Part B the decision whether to agree the request rests with the Year Tutor;
 - attach the form to the front of your coursework when you submit it (keep a copy for your records);
 - each extension form is only valid for <u>one</u> piece of coursework;
 - the maximum extension is two weeks.

Students should note that extensions are only granted in exceptional circumstances. In order for an illness or other personal problem to be accepted as grounds for an extension, the Year Tutor will need to convince herself that the problem occurred at such a time, and was of such a duration, that a student's ability to complete the assignment to the best of their ability was significantly reduced.

6.0 FEEDBACK

Feedback on assessments will normally be given to students 20 within working days after the submission of an assignment.

7.0 INTRODUCTION TO STUDYING THE UNIT

This unit requires a steady build up of understanding based on the assimilation of factual information and discussion. Therefore, it is important that you attend the lectures and workshops regularly and stay up to date with the assigned reading. The initial sessions will provide information about the brain that is critical for the assimilation of subsequent material on affective, motor, perceptual and cognitive processes. Without an understanding of the former, the latter will become increasingly difficult.

The unit has been designed for psychology students, and even if biology is not your favourite subject, you are likely to find the information and issues we discuss interesting to learn about.

There will be opportunity in the lectures and especially the workshops to review the material and ask question about anything that was not understood.

7.1 OVERVIEW OF THE MAIN CONTENT

Explanations of mental processes and behaviour in terms of the structure and function of the nervous system are becoming increasingly common and increasingly important, especially given the advances in brain imaging technology. But information is also obtained from a variety of other sources, both clinical and experimental.

This unit will examine important discoveries about the relationship between the brain and behaviour. We shall discuss links between genetic, biochemical, physiological, psychological and environmental factors.

The initial sessions deal with the structural and functional features of the nervous system as a physical entity, followed by discussion of how these mediate key experiential and behavioural capacities. The latter include motor performance, perception, emotion, thought, learning and language.

The unit will also consider how factors such as hormones, nutrition, environment stimulation affect development and damage brain functioning.

7.2 OVERVIEW OF TYPES OF CLASSES

Lectures will be held every Friday during the semester from 1-3 P.M., with workshops occurring fortnightly from week 2-12 from 3-5 P.M. No workshop is scheduled for week 1.

Weeks when you do not attend a workshop are reserved for self-managed study.

7.3 IMPORTANCE OF STUDENT SELF-MANAGED LEARNING TIME

Time for self-managed study is built into the unit. It should be used to read the text and related material, answer study questions, prepare for workshops, watch recommended videos and undertake study in connection with the coursework essay. The CD and Web site connected with the textbook offers ways to revise and consolidate material, including practice exam questions.

8.0 THE PROGRAMME OF TEACHING, LEARNING AND ASSESSMENT

The programme provides a rich and varied opportunity to learn about current facts and findings, debates and applications in the field of brain and behaviour. The lectures are complemented by workshops in which discussions, audio-visual presentations and demonstrations will take place, linked together by textbook and additional reading,

Lectures

The lectures are intended to provide core information about topics and background necessary for undertaking workshop activities, further reading and coursework. Relevant chapters of the textbook (given in the schedule below) should be read in conjunction with these.

Workshops

The workshops are designed to help consolidate and extend your understanding of selected topics by considering specific research papers, methods, applications as well as conceptual issues and debates. The activities connected with workshops vary but each involves the presentation and discussion of new material, so attendance and participation is important. The workshop will contribute -in some cases directly - to the knowledge, skills and confidence you need to perform well on the coursework and the end-of-semester examination. For each a set of study questions will be handed out. These are formative and do not form part of the assessment.

Part of every workshops will be set aside to answer questions arising from lectures and reading, and to provide feedback on the formative work undertaken.

The workshops form an integral part of the unit, and you are responsible for learning the material presented there, some of which will be relevant to coursework and the examination. it is advisable, therefore, that you pay attention and keep notes on the presentations and discussions that take place.

Attendance

Regular attendance at lectures and workshops is expected.

WEEKLY SCHEDULE

| Week | Lecture topic | Workshop | Handout |
|------|--|--|---|
| 1 | Introduction to unit and field | none | - |
| 2 | Neuroanatomy and development | Consciousness (1) Discussion | Damasio paper |
| 3 | Neurons | " | - |
| 4 | Methods of investigation | Brain recording (2) | Background to GSR |
| 5 | Sensory systems | " | |
| 6 | Perception 1 | Somatosensation (3) Video and discussion | Nicolelis, M. A. L. and Ribeiro, S. (2006) Seeking the neural code |
| 7 | Perception 2 Experience and plasticity | u | |
| 8 | Motor Behaviour | Disorders of movement (4) Video and discussion of treatments | 'Understanding Parkinson's disease' Moussa et al. 1997 |
| 9 | Hormones and behaviour | " | - |
| 10 | Emotion | 'Why girls will be girls' (5) Discussion of article | Tyre, P. and J. Scelfo (2006) Why girls will be girls |
| 11 | Learning and memory | " | - |
| 12 | Thought and language | Amnesia (6) Video and discussion | - |

Lecture 1 Introduction to biological psychology

Aims

- To situate the study of the relationship between the brain and behaviour both historically and in relation to related disciplines
- To lay the conceptual groundwork for issues to be taken up later in the unit, especially in respect to genetics and natural selection

Topics

Origin of the field; the connection between biology and behaviour; approaches to the study of the brain and behaviour; functional organisation of the brain; evolutionary perspective, neural correlates of consciousness

Learning outcomes

By the end of this session students will be able to:

- describe the structure and requirements of the unit
- discuss conceptual and historical background to research in biological psychology
- describe the importance of evolutionary theory for brain and behaviour
- describe the fields that contribute to the study of brain and behaviour
- discuss concepts relating to the relationship between brain and behaviour, including awareness.

Required Reading: Kalat chapter 1

Optional reading:

Greenspan, R. (1995). Understanding the genetic constitution of behaviour. <u>Scientific</u> <u>American. 272</u>, 74-79.

Plomin, R. (1990) <u>Nature and Nurture: An introduction to human behavioural</u> <u>genetics</u>. Pacific Grove, California: Brooks/Cole.

WORKSHOP 1: Mind-brain problem

Aims

- To consider the emergence of consciousness as a function of developing brain
- To consider from a phylogenetic and neurological perspective what aspects of the nervous system might account for consciousness
- To discuss conceptual issues concerning the relationship between mind and brain
- To consider ethical issues that stem from the timing of the onset of consciousness

Content

- Audiotape discussion with D. Dennett and S. Greenfield
- Seminar discussion of key issues raised

Learning outcomes

- Appreciation of difficulty in describing kinds and levels of consciousness
- Understanding of issues concerning the development of consciousness
- Appreciation of ethical, applied and conceptual issues of this topic

Required Reading

- Damasio, A.R. (1999) How the Brain creates the mind, Scientific American (Dec.)
- Kalat textbook: Module 1.2, Chapter 1

Optional reading

Anil, K. S. B. J. Baars and D. B. Edelman (2005) Criteria for consciousness in humans and other mammals, <u>Consciousness and Cognition</u>, 14, 119-139.

Chalmers, D.J. (1995) The puzzle of conscious experience, Scientific American

Howard, R. S. and Miller, D.H. (1995) The persistent vegetative state *BMJ* 1995;310:341-342 (11 February) (Link on Blackboard)

Koch, C (2004) The Quest For Consciousness A Neurobiological Approach,

Roberts and Company Publishers

Lecture 2 The nervous system

Aims

- To provide basic information on structural and functional systems of the brain
- To consider the development of the brain
- To consider endogenous and exogenous influences on brain development

Topics: Basic neuroanatomy; circuits and systems; interaction with other systems of the body; development of the nervous system

Learning outcomes

By the end of the lecture and associated work, the student will be able to:

- Describe major parts of the nervous system and their interconnection.
- Describe basic connections with other systems
- Describe in an elementary way how the brain develops

Self-managed study

Review the following material to help consolidate information about the structure of the brain: 'The Human Brain' Open University [574.1]

CD ROM: 'Sylvius' Fundamentals of Human Neural Structure.

Websites: http://www.med.harvard.edu/AANLIB/home.html

Required Reading: Kalat chapters 4 and 5

Optional reading about the nervous system

England, M. A. and Wakely, J. (1991) A colour atlas of the brain and spinal cord, Wolfe Publishing, London.

Gleeson, J. G. and C.A. Walsh (2000) Neuronal migration disorders: from genetic diseases to developmental mechanisms. <u>Trends in</u> Neurosciences' 23, 352- 358.

Kempermann, G. and F.H. Gage (1999) New nerve cells for the adult brain, <u>Scientific American</u>, May issue.

- Pielage, J. and Klambt, C. (2001) Glial cells aid axonal target selection Trends in Neurosciences, 24 (8) 432-433(2).
- Shatz, C. Z. (1992). Developing Brain, Scientific American, 267, 34-41.

Web site: Explore the Brain and Spinal cord: <u>http://faculty.washington.edu/chudler/introb.html#diso</u>

Lecture 3 <u>Neurons and neural conductance</u>

Aims

- To discuss the structure and physiological operation of the nervous system on the microscopic level of neurons and supportive cells.
- To discuss activation and communication amongst nerve cells
- To provide a basic appreciation of neurotransmitter substances

| Topics: | Neurophysiology, | synaptic | transmission; | neurotransmitter |
|---------|------------------|--------------|---------------|------------------|
| | substances; | glial cells, | drug effects | |

Learning outcomes

By the end of the lecture students will be able to describe:

- how nerve cells receive, integrate and send signals
- basic types of nerve cells
- neurotransmitters and modes of action

Required Reading: Kalat chapters 2 and 3

Optional reading:

Fields, R. D. (2008) White matter, Scientific American, March
Shepard, G.M. (Ed.) (1990). <u>The Synaptic Organisation of the Brain</u>, Oxford.
Snyder, S. H. (1986) Drugs and the Brain, Scientific American Library, New York

Useful Web site: Virtual neurophysiology laboratory http://www.hhmi.org/grants/lectures/vlab2/#top

Lecture 4 <u>Studying the relationship between brain and behaviour</u>

Aims

- To provide information about strategies to study brain-behaviour relationships
- To outline techniques and methods currently in use
- To compare and contrast the different kinds of information each provides

Topics: Purposes of research; use of animals, clinical research; experimental techniques; brain recording; brain imaging including MRI, fMRI, PET, EEG; research strategies

Video clip of MEG [Brain story: All in the mind]

Learning outcomes

By the end of the lecture students will be able to:

- Compare and contrast the utility of different imaging methods in current use
- Discuss the advantages and disadvantages of different imaging methods
- Discuss the relationship between behavioural/cognitive events and brain processes

Self-managed study

Video: 'The Man Who Made Up His Mind' [612.8]

Required reading: Kalat Module 4.3, chapter 4

Optional reading

Cohen, M.S. & Bookheimer, (1994). Localisation of brain function using magnetic resonance imaging. <u>Trends in Neurosciences</u>, <u>17</u>, 268-77.

Sergent, J. (1994). Brain imaging studies of cognitive functions. <u>Trends in Neuroscience</u>, <u>17</u>, 221-27.

WORKSHOP 2:

Recording from the nervous system

Aims

- To provide background to methods used to record from the nervous system
- To gain first-hand experience in the use of such devices
- To record and analyse data relating to electrical changes in the nervous system
- To consider the appropriate application and interpretation of such methods
- To consolidate understanding of functional responses by the brain and the pathways involved

Content

- There will be a discussion of the use of brain recording instruments followed by a demonstration of Galvanic Skin Responses to various stimuli.
- Discussion will take place about the traces and a comparison will be made between different conditions.

Learning outcomes

- To understand issues relating to the use of recording devices involving electrodes
- To be able to make basic analyses of information provided by GSR
- To be able to access and critically present information concerning the application of GSR

Coursework

Connected with this workshop is a hand-out giving background to GSR and a set of (non-assessed) study questions that will be useful in consolidating your understanding of the material.

Lecture 5.

Introduction to sensory systems

Aims

- To describe the function and purpose of different sensory modalities
- To describe how the brain receives, encodes and responds to sensory information
- To show how the detection of stimuli is reflected in the activity of the brain
- To consider the somatosensory system in some detail

Topics: Body senses (e.g., somatosensation, vestibular); reception, transduction, coding, pathways and receptive fields

Learning outcomes

By the end of the lecture students will be able to describe:

- basic features of sensory systems
- connectivity and pathways of the nervous system
- how encoding and transmission of stimuli takes place
- functional and anatomical mapping of somatosensation
- deficits associated with neural disorder of somatosensation.

Required reading

Kalat, chapter 7

Nicolelis, M. A. L. and Ribeiro, S. (2006) Seeking the neural code, Scientific American. 295 (6), 48-55.

Optional reading:

Kalat, chapter on the auditory system

Smith, D. V. and R. F. Margolskee (2001) Making sense of taste. <u>Scientific</u> <u>American</u>. March issue. Aims

- To describe the functional organisation of the visual system
- To explain how stimulation from the outside world is received and processed by various subsystems of the brain
- To discuss mechanism that mediate the perception of form
- To describe the effects of damage to regions of the visual system

Topics: nature of visual stimuli, anatomy and physiology of visual system,

functional pathways, perception of contrast; perception of form and motion, perceptual neglect

Video clip: 'Brain story: The mind's eye'

Object recognition deficits - 'Phantoms of the Brain (2) [612,82]

Learning outcomes

By the end of the lecture students will be able to describe:

- early and late stages of processing visual stimuli
- the functional specialised pathways of vision
- the relationship between physiological mechanisms and visual experience

Self-managed study

Zeki, S. (1992). The visual image in mind and brain. <u>Scientific American</u>, <u>267</u>, 42-51.

Cowey, A. (1996) Visual awareness: Still at sea with seeing? <u>Current Biology, 6</u>, 45 - 47.

Required reading: Kalat chapter 6

Optional reading:

Cowey, A. and Stoerig, P (1993) Insights into blindsight. <u>Current Biology</u>, 3, 236-238.

Damasio, A.R. (1985). Knowledge without awareness: An autonomic index of facial recognition by prosopagnosics, <u>Science</u>, <u>228</u>, 1453-4.

Goodale, M. and Milner, D. (2003) Sight unseen, Oxford University Press

Jeffreys, D.A. (1989). A face-responsive potential recorded from the human scalp. <u>Experimental Brain Research</u>, <u>78</u>, 193-202.

Konishi, M. (1993). Listening with two ears. Scientific American, 268, 34-41.

Zeki, S. (1994). <u>A Vision of the Brain</u>, Blackwell.

WORKSHOP 3: Somatosensation

Aims

- To review clinical evidence of changes in sensation due to nervous system damage and disease
- To evaluate symptoms in relation to possible causes and the possibilities for recovery
- To appreciate variation in the effect of nervous system damage on somatosensation
- To illustrate the level and type of understanding required by mock examination

Content

• Video: 'The Man Who Lost His Body'

Or Phantoms limb – in 'Phantoms of the Brain'

Learning outcomes

- To be able to describe symptoms relating to nervous system damage
- To understand variations in the behavioural/mental effects across types of injury
- To understand problems inherent in the recovery from such deficits
- To evaluate individual progress and understanding by mock examination

Reading

Melzack, R. (1992) Phantom limb, Scientific American, April, pp. 90-97.

Lecture 7 Experience and plasticity and repair of the nervous system

Aims

- To consider how the nervous system changes as a function of experience
- To consider how the nervous system changes after damage during development and adulthood
- To consider various interventions associated with recovery and repair

Topics: plasticity in the nervous system, environmental deprivation and enrichment, recovery of function, treatments and interventions

Learning outcomes

By the end of the lecture students will be able to:

- Describe changes on a neural level that take place in response to experience
- Understand the mechanisms by which changes in response to damage occur
- Describe experiments on regrowth and repair of the nervous system

Self-managed study

Sperry experiment on 'Exploring Biological Psychology CD

Required reading

Kalat Module 5.2

Kolb, B. and Whishaw, I. Q. (1998) Brain plasticity and behavior, *Annual Review of Psychology*, 49, 1-13.

Optional reading

Kass et al (1990) Reorganization of retinotopic cortical maps in adult mammals after lesions of the retina, <u>Science</u>, 248, 229-231.

Kempermann, G. and Gage, FH (1999) New nerve cells for the adult brain. Scientific American, 280, 38-43.

Young et al., (1994). Brain reorganisation in humans, Nature, 386, 592-4.

Lecture 8 Control of movement: Action

Aims

- To consider the systems relating to the planning and execution of action
- To consider interaction between motor and perceptual systems

Topics: motor pathways, reflexes, control and coordination of movement, cortical mechanisms, predictive error, neuromotor disorders

Video clip: Parkinson's disease and treatment

'The brain: Vision and movement. Part 2'

Learning outcomes

By the end of the lecture students will be able to:

- Describe the neural basis of motor actions
- Discuss the role of different cortical areas in executing and monitoring movement
- Evaluate the effect of damage to specific parts of action systems
- Understand links between sensory and motor systems, especially with respect to predictive sensory feedback

Required reading: Kalat chapter 8

Optional reading

Glover, S. (2004). Separate visual representations in the planning and control of action. *Behavioral and Brain Sciences*, 27, 3-24.

Thelen, E. (1995) Motor development: A new synthesis: <u>American</u> <u>Psychologist</u>, <u>50</u>, 79-95.

Thach, W. T. (1998) What is the role of the cerebellum in motor learning and cognition. Trends in Cognitive Science, 331-337.

WORKSHOP 4: Motor dysfunction and recovery

In groups of 3-4 discuss and plan a way in which cases of Parkinson's might be treated being sure to include a specific rationale for your treatment in terms of brain deficits, problems that might be associated with it and a means to evaluate its effectiveness.

Aims

- To learn about the causes and symptoms of Parkinson's disease
- To discuss treatments for Parkinson's disease and their mechanism of action
- To plan a programme of treatment and evaluation

Content

- Video: 'The Brain: Movement' on Parkinson's disease
- Discussion of possible treatments and design therapeutic regime

Learning outcomes

- To be able to describe the major symptoms of Parkinson's disease
- To describe treatments for Parkinson's disease along with a rationale based on an understanding of the physiology of brain deficits and function
- To think critically about problems related to proposed remedies of brain deficits

Required reading

Moussa B. H. Youdim and P. Riederer (1997) Understanding Parkinson's disease and treatment. <u>Scientific American</u>, January, 52-59.

Lozano, A. M. and S. K. Kalia, (2005) New Movement in Parkinson's, <u>Scientific</u> <u>American</u>, July, 58-65.

Optional reading

Mice That Resist Parkinson's http://darwin.apnet.com/inscight/09301997/grapha.htm

Jong-Hoon Kim et al., (2002) Dopamine neurons derived from embryonic stem cells function in an animal model of Parkinson's disease, Nature 418, 50 - 56

Brain stimulation and Parkinson's disease, New Scientist. July 2000

Lecture 9. Hormones and behaviour

Aims

- To review the role of the endocrine system in the development and activation of the nervous system
- To discuss the interaction of hormones and behaviour

Topics: Neuroendocrine system; types of hormones; the pituitary gland; organisational and activational effects on the nervous system; sexual differentiation

Learning outcomes

By the end of the lecture and associated workshop students will:

- To be able to describe the physiological basis of sexual differentiation of the brain and behaviour
- To appreciate the link between hormonal factors and sexual preference
- To appreciate the link between hormonal factors and cognitive styles

Required reading: Kalat chapter 11

Optional reading:

Baron-Cohen, S., Lutchmaya, S. and Knickmeyer, R. (2006) Prenatal

testosterone in mind: Amniotic fluid studies Bradford Books, MIT Press.

Hines, M (2005) Brain Gender, Oxford University Press

LeVay, S. (1993). The Sexual Brain. MIT Press: Cambridge.

- Nelson, R.J. (1995). <u>An Introduction to Behavioural Endocrinology</u>. Sinauer Assoc. Sunderland: Ma.
- Robinson, S.J. and Manning J. T. (2000) The ratio of 2nd to 4th digit length and male homosexuality, Evolution and Human Behaviour, 21, 333-345.
- Schlinger B.A.; Soma K.K.; London S.E. (2001) Neurosteroids and brain sexual differentiation. Trends in Neurosciences, 24 (8), 429-431

Zhou et al., (1995). On the brain of transsexuals. Nature, 378, 68-70.

Lecture 10. Emotions: Social cognition and behaviour

Aims

- To describe systems of reward and reinforcement in the brain and underlying chemical transmission
- To learn about brain systems that mediate emotional responses, recognition and expression especially in connection with social cognition
- To consider clinical cases of affective brain disorders
- To describe how emotional dysregulation is related to behavioural disorders

Video clip: Orbito-frontal damage- 'Brain series no. 4: Stress and emotion'

Topics: Emotional expression and recognition, role of amygdala, orbito- and frontal cortex

Learning outcomes

By the end of the lecture students should be able to:

- Describe circuits related to emotional expression and social cognition
- Differentiate between the function of brain areas in respect to emotional perception and expression
- Describe affective disorders connected with developmental disorders and acquired behavioural dysfunction.

Required reading: Kalat chapter 12

Gallese, V., Keysers, C and Rizzolatti (2004) A unifying view of the basis of

social cognition Trends in Cognitive Sciences, 8(9), 396-403.

Ramachandran, V.S. and Oberman, L.M. (2006) Broken mirrors: A theory of autism, Scientific American, November, 39-45

Optional reading

Coricelli, G. Dolan, R.J. and Sirigu, A. (2007) Brian, emotion and decision making: the paradigmic example of regret, Trends in Cog. Sci. 11(6) 258-265.

Damasio, A (1999) The feeling of what happens. Body and emotions in the making of consciousness, Heinemann, NY

LeDoux, J.E. (2007), Emotional memory, Scholarpedia, 2(7):1806.

- Pessoa, L. (2008) On the relationship between emotion and cognition, *Nature Reviews Neuroscience* 9, 148-158.
- Singer, T. Seymour, B. O'Doherty. J.P. (2006) Empathetic neural responses are modulated by the perceived fairness of others, Nature, 439(7075) 466-469.

WORKSHOP 5: Sexual differentiation of brain and behaviour

In groups of 2-3, critically evaluate the argument and conclusions of the article: 'Why girls will be girls' which appeared in a popular magazine in 2006. It summarises the work of Louann Brizendine, a neuropsychiatrist, on hormones and sex difference in behaviour.

Each group will contribute to a discussion based on an evaluation of the validity of evidence and conclusions in the report.

Aims

- To evaluate the presentation of facts to a lay audience about the relationship between brain and behaviour
- To consider critically the validity of evidence and conclusions on the basis of empirical evidence
- To discuss shortcomings and suggest alternative hypotheses and conclusions

Learning outcomes

By the end of the workshop students will be able to:

- Assess critically the results of studies relating to hormones, gender identity and behaviour
- Discuss facts and issues associated with research in this area

Required reading (in advance of workshop)

Tyre, P. and J. Scelfo (2006) Why girls will be girls, Newsweek, July 31, 46-47.

Optional reading

Kimura, D. (1992). Sex differences in the brain. <u>Sci. Amer.</u>, <u>267</u>, 80-87.

Tebartz, L. et al., (2000) Increased amygdala volumes in females and depressed humans. A quantitative magnetic resonance imaging study. <u>Neurosci. Letters</u> <u>281</u>, 103- 106.

11. Learning and Memory

Aim:

- To consider basic cellular mechanisms and systems of learning and memory
- To consider experimental and clinical deficits in learning and memory

Topics: Simple systems, sensitization; conditioning; post-tetanic potentiation; neural basis of working and long-term; memory disorders

Learning outcomes

By the end of the lecture and associated workshop students will be able to:

- Distinguish different kinds of learning and memory systems
- Relate learning to specific cellular processes in the brain

Required reading: Kalat Chapter 13

Tsien, J. Z. (2007) The memory code, Scientific American, 297(1) July, 34-41.

Optional reading

Bak, M. (2001) Glial cells: the neighbors you might want to keep http://www.neuroscion.com/news/commentaryarchive.html#15032001

(Commentary on article by Ullian, E.M. et al. (2001). Control of synapse number by glia. Science, 291:657-661.)

- Eichenbaum, H and N.J. Neal (2004) From conditioning to conscious recollection. Oxford University Press.
- Fields, R.D. (2005) Making memory stick, Scientific American 59-65.
- Mc Gaugh, J.L., Weinnberger, N.M. & Lynch, G. (Eds) (1995). Brain and

memory: Modulation and Mediation of Neuroplasticity. Oxford Press: NY.

Sherry, D.F. & Vaccarino, A.L. (1989). Hippocampus and memory for food caches in black-capped chickadees, <u>Behavioral Neuroscience</u>, 103, 303-318.

Web site: Learning by the spinal cord:

http://www.nytimes.com/library/national/science/health/092199hth-spinalcord.html

12. Language and awareness

Aims

- To consider localisation and lateralisation of functions with respect to language ability and awareness
- To describe the biological underpinnings of selected disorders of language

Topics: Lateralisation of brain processes; language comprehension and production; disorders of speech, reading and writing; cognitive neuropsychology of language

Video clip: Learning to read – 'Brain story: Growing the mind'

Learning objectives

By the end of the lecture students will be able to:

- Discuss theories and facts relating to brain laterality
- Describe language systems and disorders that arise from damage to specific brain regions
- Discuss evidence of hemispheric difference in awareness

Required reading: Kalat chapters 14 and 15

Self-managed study: Video 'Fragments of Genius' [153.9087]

Optional reading:

Damasio, A.R. & Damasio, H. (1992). Brain and language. Sci. American, 267,

62-71.

- Hickok, G, G. Bellugi and E. S. Klima (2001) Sign Language in the Brain, Sci. Amer. June issue, 42- 49.
- O'Kusky et al. (1988), The corpus callosum is larger with right hemisphere cerebral speech dominance. <u>Annuals of Neurology</u>, <u>24</u>, 379-383.

WORKSHOP 6:

Memory disorders

The workshop focuses on observation and critical discussion of clinical evidence of different forms of amnesia and the associated systems of the brain that lie behind such deficits.

Aims

- To illustrate clinical cases of different types of memory loss
- To discuss and evaluate manifestation in terms of brain systems
- To consider specific physiological processes that underlie memory

Content

Video:

'Memories are made of this'

Brain stories 'Growing the Mind ' (amnesia segment)

Learning outcomes

By the end of the workshop students will be able to:

- Describe major types of memory deficits arising from brain damage
- Appreciate the difficulties affecting people with such deficits
- Link evidence of memory deficits with brain systems

Required reading

Kalat Module 13.1 Tsien, J. Z. (2007) The memory code, Scientific American, 297(1) 34-41

Optional Reading

Goldman-Rakic, P.S. (1992). Working memory and the mind. Sci. Amer. 267,

72-79.

9.0 LEARNING RESOURCES

9.1 CORE MATERIALS

Kalat, J.W. (2007). Biological Psychology, 8th ed., Wadsworth

This textbook has a Web site for student that includes chapter reviews, interactive tests and useful links.

9.2 OPTIONAL MATERIALS

Other useful textbooks

Carlson, N.R. (1998). Physiology of Behaviour, 6th edition, Allyn & Bacon.

Pinel, J.P.J. (1997). <u>Biopsychology</u>, 3rd edition, Allyn & Bacon.

Rosenzweig, Breedlove, M. and Watson (2005). Biological Psychology.

An Introduction to Behavioural, Cognitive and Clinical Neuroscience. 2nd Edition. Sinaeur Associates: Sunderland, Ma.

Additional reading

Mind and Brain (1993) Scientific American. Freeman.

- Andreassi, J.L. (1995). <u>Psychophysiology: Human Behaviour and Physiological</u> <u>Response</u>. Lawrence Erlbaum Associates: Hove.
- Baron-Cohen , S. (2002) The extreme male brain theory of autism, Trends in Cognitive Science, 6, 248-254.Baron-Cohen, S., Lutchmaya, S. and Knickmeyer, R. (2006) Prenatal testosterone in
- Baron-Cohen, S., Lutchmaya, S. and Knickmeyer, R. (2006) Prenatal testosterone in mind: Amniotic fluid studies Bradford Books, MIT Press.

Christof, K. (2004) The quest for consciousness: A Neurobiological Approach, Roberts

and Co., Englewood, Colorado.

- Coricelli, G. Dolan, R.J. and Sirigu, A. (2007) Brian, emotion and decision making: the paradigmic example of regret, Trends in Cognitive Science, 11(6) 258-265.
- Damasio, A.R. (1994). <u>Descarte's Error: Emotion, Reason and the Human Brain</u>. Avon Press: New York.

Damasio, A. R. (1999) The feeling of what happens. Body and emotions in the making of consciousness, Heinemann, NY

Fields, R.D. (2005) Making memory stick, Scientific American, pp. 59-65.

Frith, U. (1997). Autism. In: <u>Mysteries of the Mind</u>. Scientific American, Special Issue. pp. 92-101 Gazzaniga, M.S. (Ed.) (1995). The Cognitive Neurosciences. MIT Press: Cambridge, Ma.

- Gershon, R., Melzak & Rieder, R.O. (1993). <u>Major Disorders of Mind and Brain</u>. Scientific American, <u>267</u>, 88-95.
- Johnson, M. H. (Ed) (1993). <u>Brain Development and Cognition</u>. A Reader, Blackwell: Oxford.
- Koch, C. (2004) <u>The Quest For Consciousness</u> A Neurobiological Approach, Roberts and Company Publishers
- Kolb, B. & Whishaw, I.Q. (1994). <u>Fundamental of Human Neuropsychology</u>. New York: Freeman.

Leonard, B.T. (1992). Fundamentals of Psychopharmacology. Wiley: N.Y.

- Llinas, R.R. (1990). <u>The Workings of the Brain; Development, Memory and Perception</u>. Freeman: San Francisco.
- Martin, G. N. (1998). Human Neurophysiology. Prentice Hall.
- McKim, W.A. (1986). <u>Drugs and Behaviour: An Introduction to behavioral</u> <u>pharmacology</u>. Englewood Cliffs: New Jersey, Prentice-Hall.
- Pinel, J.P.J. (1991). <u>Current research in biopsychology</u>. Allyn and Bacon: Needham Heights, Ma.
- Plomin, R. (1990). <u>Nature and Nurture: An introduction to human behavioural genetics</u>. Pacific Grove, California: Brooks/Cole.
- Posner, M.I. & Raichle, M.E. (1994). Images of the Mind. Scientific American Library, Freeman and Co: San Francisco.
- Ramachandran, V.S. and Oberman, L.M. (2006) Broken mirrors: A theory of autism, Scientific American, November, 39-45
- Singer, T. Seymour, B. O'Doherty. J.P. (2006) Emphatetic neural responses are modulated by the perceived fairness of others, Nature, 439(7075) 466-469.
- Snyder, S.H. (1996). <u>Drugs and the Brain</u>. Scientific American Library, Freeman: Houndmills, Basingstoke.
- Squire, L.R. & Butters, N. (Eds.) (1992). <u>Neuropsychology of Memory</u>. 2nd ed. Guilford Press: NY.
- Winson, J. (1997). The Meaning of Dreams. In: <u>Mysteries of the Mind</u>. Scientific American, Special Issue.

NOTES