

University of New South Wales
PSYC3051 Physiological Psychology
Session 2, 2013

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Time and Location

Lectures: Tues 5-6 (Mathews LT D)
 Thur 1-2 (Mathews LT D)

Labs: Tues 3 - 5, (Weeks 3-10, 12 Mathews 203)
 Thur 2 - 4, (Weeks 3-10, 12 Mathews 203)
 Fri 9 - 11, (Weeks 3-10, 12 Mathews 203)
 Fri 11 - 1, (Weeks 3-10, 12 Mathews 203)

Textbooks

There is no textbook set for this course. The course is organized around review articles taken from journals such as the Annual Review of Psychology, the Annual Review of Neuroscience, Trends in Neurosciences, Nature Neuroscience Reviews or similar. These articles can be downloaded via the University Library holdings or in some cases from the Moodle website. You may also find the textbooks listed below helpful. Please note that you are not required to purchase either of these books. They are listed simply to provide you with another source of information for some of the materials covered in the lectures.

Textbooks:

Carlson, N. R. (2012). *Physiology of Behavior*. 11th Edn. Pearson Education.
Pearce, J.M. (2008). *Animal Learning & Cognition*. 3rd Edn. Psychology Press.

Journal Articles:

McNally:

Schultz W (2007) Behavioral dopamine signals. Trends in Neurosciences, 30(5) pp. 203 – 210.
(doi:10.1016/j.tics.2007.03.007).
Tsai, H.C., Zhang, F., Adamantidis, A., Stuber, G.D., Bonci, A., de Lecea, L., & Deisseroth, K. (2009). Phasic firing in dopaminergic neurons is sufficient for behavioral conditioning. Science, 324, 1080-1084
(doi: 10.1126/science.1168878)

Maren S, Quirk GJ (2004). Neuronal signalling of fear memory. Nat Reviews Neuroscience 5, 844-852.
McNally, G.P., Johansen, J.P., & Blair, H.T. (2011). Placing prediction into the fear circuit. Trends in Neurosciences, 34, 283 – 292.
Bernstein JG, Boyden ES. (2011). Optogenetic tools for analyzing the neural circuits of behaviour. Trends in Cognitive Sciences, 15, 592-600. (doi: 10.1016/j.tics.2011.10.003).

Westbrook:

Pearce, J. M., & Bouton, M. E. (2001). Theories of associative learning in animals. *Annual Review of Psychology*, 52, 111-139.

(doi:10.1146/annurev.psych.52.1.111)

Rescorla, R. A. (1988). Behavioral studies of Pavlovian conditioning. *Annual Review of Neuroscience*, 11, 329-352. (doi:10.1146/annurev.ne.11.030188.001553)

Mackintosh, N. J. (1974) The psychology of animal learning. Chapter 6 (pages 271 – 347) *Instrumental learning: avoidance and punishment*. (copy available on Moodle).

Dickinson, A. & Balleine, B.W. (2002). The role of learning in motivation. In CR Gallistel (Ed) *Learning, Motivation & Emotion*, Volume 3 of Steven's Handbook of Experimental Psychology, Third Edition (pp. 497-533).

New York: John Wiley & Sons (copy available on Moodle)

Killcross:

Graybiel, A. M. (2008). Habits, rituals, and the evaluative brain. *Annual Review of Neuroscience*, 31, 359-387.

(doi:10.1146/annurev.neuro.29.051605.112851)

Miller, E. K., & Cohen, J. D. (2001). An integrative theory of prefrontal cortex function. *Annual Review of*

Neuroscience, 24, 167-202.

(doi:10.1146/annurev.neuro.24.1.167)

Wallis, J. D. (2007). Orbitofrontal cortex and its contribution to decision-making. *Annual Review of Neuroscience*, 30, 31-56.

(doi:10.1146/annurev.neuro.30.051606.094334)

Clemens:

Berridge KC. Motivation concepts in behavioral neuroscience. *Physiol Behav.* 2004 Apr;81(2):179-209. Review. PMID: 15159167 [PubMed - indexed for MEDLINE]

Belin D, Mar AC, Dalley JW, Robbins TW, Everitt BJ. High impulsivity predicts the switch to compulsive cocaine-taking. *Science.* 2008 Jun 6;320(5881):1352-5. doi: 10.1126/science.1158136.

Nora D. Volkow, Gene-Jack Wang, Joanna S. Fowler, and Dardo Tomasi. *Addiction Circuitry in the Human Brain.* *Annu Rev Pharmacol Toxicol.* 2012 February 10; 52: 321–336. doi:10.1146/annurevpharmtox-010611-134625.

Jiang Y, Langley B, Lubin FD, Renthal W, Wood MA, Yasui DH, Kumar A, Nestler EJ, Akbarian S, Beckel-Mitchener AC. Epigenetics in the nervous system. *J Neurosci.* 2008 Nov 12;28(46):11753-9. doi: 10.1523/JNEUROSCI.3797-08.2008

Assessment

1. Formative MCQ examples, released Friday 16th August, end Week 3

The formative midterm test will be released on Moodle on the Friday following Prof McNally's final lecture. It will be open to you to allow you to test yourself on the sorts of questions you will expect in the final exam, but will receive no formal mark. The material will be based on all lecturers across the course so you should not expect to be able to answer them all at this stage. Questions covering Lectures 1 – 6 (McNally) will be clearly indicated and can be used to test your understanding of the course up to this point. Additional questions will be relevant as the remainder of the course progresses. Feedback on the questions will be available in tutorials.

2. Research Proposal and poster preparation (worth 40% of your final mark for the course; assessment by presentations in tutorials in weeks 6 to 8 and submitted poster on template made available in week 3)

You are expected to conceive, design, and propose a research project in Behavioural Neuroscience. The specific research area and research question is determined by you. However, it is expected to be based upon the current literature. You will be expected to review systematically the relevant literature, identify an outstanding question of interest, and design an experiment that will address this question. This project will be assessed in two parts. The first part comprises oral presentations of your research proposal in Weeks 6, 7 or 8 laboratory classes (12.5% of the marks for this assignment). In the first presentation (5 minutes maximum) you will very briefly review your proposed topic area and identify a research question, together with a brief description of how you would approach this. Your tutor will provide you with feedback in the time available – if your presentation takes the full time allotted, then there will be little or no time for feedback, so plan your presentation carefully. Based on this feedback, you will prepare a second presentation, which covers in more detail your research question, a proposed experiment, and some potential findings and possible interpretations and implications. You will have 10 minutes for this. Completion of the oral presentations is a condition of completing the entire assessment. The second part is a poster presentation of your proposed experiment, based on a template to be supplied to you in week 3, to be presented in class in week 10, and hard/electronic copy submitted at the end of week 10 following the procedures below (87.5% of your mark for this assignment). This poster will be based on the presentations given in class, allowing you to incorporate feedback from your presentations (and those of others) into your final completed work.

3. Final examination (worth 60% of your mark for the course)

The final examination will be held in the usual end of session examination period, and will assess the lecture material, excluding that assessed in the midterm. This will take the format of an 75-question multiple choice examination over 2 hours, with 15 questions from each of the 4 sections of the course delivered by different lecturers (lecture content and associated readings), and 15 questions derived from practical classes in weeks 4-7 and associated readings.

Please see the Psychology Student Manual for general advice and regulations concerning assessment, class attendance, and other relevant matters. Please also note that this course may require work outside of scheduled class-time.

Course Materials

A website is available via Moodle (<http://telt.unsw.edu.au>). This site will contain usual course materials (overheads, readings etc.) as well as a link to digital streaming lecture recordings, where available.

Course Aims and Objectives

Lectures

This course deals with elementary learning processes and their neurobiological substrates. These include: an overview of the role of appetitive and aversive motivation in learning, behavior and psychopathology. learning about relations between stimuli (e.g., Pavlovian conditioning); learning about relations between actions and outcomes (e.g., instrumental conditioning); how goals are represented and how they drive behavior; and the development of habitual and compulsive behaviours. Emphasis will be placed on contemporary theories and approaches, including discussion of the role of molecular signaling cascades and neuronal coding in learning and memory, the role of neural systems in supporting behaviour, and examples of where changes in such systems are thought to underpin human mental disorders.

The course is divided into four sections:

McNally: Neural circuits of appetitive and aversive motivation

Westbrook: Behavioural studies of learning

Killcross: Neural basis of action and choice

Clemens: Neurobiology of addiction and animal models of mental disorders

Lab course

The primary goal of laboratory component of the course is to provide “hands on” experience in various aspects of research in physiological psychology. As such, a significant component of the course will involve handling and experimentation on animal subjects (rats). Given the “hands on” approach in this tutorial course, it is imperative that you contact your lecturer as soon as possible if obligations of any kind prevent you from taking part in these activities.

Course Guide

McNally (6 lectures, weeks 1-3):

Neural circuits of appetitive and aversive motivation

Westbrook (7 lectures, weeks 4-7):

Behavioural studies of learning

Killcross (5 lectures, weeks 7-9):

Neural basis of action and choice

Clemens (6 lectures, weeks 10-12):

Neurobiology of addiction and animal models of mental disorders

Laboratory classes (Weeks 2 – 10)

Please note: Labs commence in Week 3 and run for weeks 3-8, 10- 12 in Mathews 203.

Week 3: Introduction to research proposal presentation

Week 4: Introduction to practical sessions

Laboratory practical 1

Week 5: Laboratory practical 2

Week 6: Research proposal presentation 1

Week 7: Research proposal presentation 2

Week 8: Research proposal presentation 3

Week 9: Prepare poster presentation for assessment

No Labs

Week 10: Poster presentation and submission

Week 11: Laboratory practical 3

Week 12: Laboratory practical 4