Psych 3L03 Neuroscience Laboratory
(2002-2003, Term 1)

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   Lab: Room B139, Psychology Building, Ext. 27565
   Email: sunhong@mcmaster.ca
2. Teaching Assistants:
   Ms. Jenny Campos, Room B138, Ext. 27565, CamposJL@mcmaster.ca
   Mr. George Chan, Room B138, Ext. 27565, ChanGSW@mcmaster.ca
3. Date & Time: Wedensday, 11:30-14:20
4. Classroom: Psychology Building, Room 116 (experiment) & 316 (lecture)
5. Virtual Classroom: http://www.learnlink.mcmaster.ca

This page was last updated on

Table of Contents

1. course objectives
2. brief description
3. list of content
   1. project 1: brain mechanisms of skill learning in rats
   2. project 2: spatial ability in humans
   3. project 3: neuroanatomy of the sheep brain
4. schedule
5. evaluation
   1. detailed requirement
6. student grades
7. readings

COURSE OBJECTIVES

In this course students will have the opportunity
(1) to learn various neuroscience techniques through hands-on experience in performing experiments using animals and human subjects,
(2) to gain experience in research design, including forming experimental hypotheses, designing experiments, collecting data, analyzing data, interpreting the empirical results, critically evaluating research papers, and
(3) to practice communicating your findings through written and oral presentations.
BRIEF DESCRIPTION

In this course, students will conduct 3 laboratory projects (two formal experimental projects and one neuroanatomy exercise).

The 1st lab project is a structured project involving behavioral measurement and electrophysiological recording from animals (rats). The project will be designed by the whole class (through classroom discussion) and all the students and TAs will be involved in data collection. The results from the work of the whole class will be pooled for data analysis.

The 2nd lab project is a group project. The class will be divided into groups (4-5 students each) and each group will design and conduct its own experiment. You are expected to do library research to derive your hypothesis. You will do most of your work without direct supervision but the TAs and the instructor will be available to you as resource persons and should be consulted on a regular basis during the development, running and analysis of the experiments. As a group, you should provide written reports on the progress and eventually give an oral presentation to the whole class about your study.

During the course of these two projects, we will review topics such as research ethics, research design, statistics, use of spreadsheet software, data collection and presentation, etc.

For the 3rd project, each student will perform a dissection of a sheep brain (2 students will be provided with one brain). You are required to recognize and memorize some important brain structures with the help of a sheep brain atlas. A quiz will be conducted afterward.

LIST of CONTENT

Lectures

1. General research issues
   1. Ethics in research using animals
   2. Ethics in research using human subjects
   3. Research design
   4. Basic statistical analysis
   5. Writing of lab report
   6. Oral presentation
2. Topics related to the lab projects
3. Spreadsheet software: Microsoft Excel (tutorial)

Projects

<table>
<thead>
<tr>
<th>#</th>
<th>Title</th>
<th>Techniques Involved</th>
<th>Process</th>
</tr>
</thead>
</table>

Brain mechanisms for skill learning: behavioural training, recording of population field potential, histology & demonstration

Human spatial ability: movement measurement, virtual reality independent, group project

Sheep brain anatomy: gross dissection tutorials & self-learning

Demonstrations
1. Single cell recording: Neural responses to visual stimulation in pigeons
2. Histology: Verification of recording sites in rat brains.

SCHEDULE

<table>
<thead>
<tr>
<th>Wk</th>
<th>Date</th>
<th>During Class</th>
<th>After Class (in addition to the assignment due next week)</th>
<th>Due</th>
</tr>
</thead>
</table>
| 1  | Sep 11| 1. Introduction to the course (1.5 hour)  
2. Introduction to Project 2 (0.5h)  
3. P2 lecture: overview of research on spatial processing  
4. Demo: Literature search | 1. Review course outline  
2. Get familiar with LearnLink, posting comments for the design of the course  
3. Project 1: review a textbook chapter on neural mechanisms of learning and memory (incl. LTP)  
| 2  | Sep 18| 1. Ethical issues with research using animals (1 h)  
2. Animal handling, a hands-on tutorial (1h)  
3. Project 1: Discussion of paper by Rioult-Pedotti et al (0.5h)  
4. P1: Brief introduction to | 1. Review statistics textbook on testing of significance  
2. Excel tutorial -- basics (1h, at computer lab, Room 403 of Psychology) | 1. Quiz on Rioult-Pedotti’s paper |
<table>
<thead>
<tr>
<th>Date</th>
<th>Activity Details</th>
</tr>
</thead>
</table>
| 3 Sep 25 | 1. Discussion of the design of our experiment (0.5h)  
2. Schedule students' participation in the experiment (0.5h)  
3. P1: conduct experiment for behavioural training (1 h, 10 students) |
| 4 Oct 2 | 1. P1: observing electrophysiological recording (video & lab visit, ½h)  
2. P1: results and data analysis (½h)  
3. P1: discussion on the review article (½h)  
4. Lecture on writing lab report, part 1 (intro and method) (1h) |
| 5 Oct 9 | 1. P1: discussion of our results (½h)  
2. Lecture: basics of research design  
3. P1: discussion of the design of our study  
4. Lecture on writing lab report |

1. P1: prepare for scheduling (next week) of students' participation in the experiment  
2. P2: form a group (of 4-5 students) and start literature search & reading background papers  
3. P2: 1st formal group meeting to decide on the project direction  
4. P2: reading closely related research papers  
5. P1 lab report "introduction" and "method"
<table>
<thead>
<tr>
<th>Date</th>
<th>Event Details</th>
</tr>
</thead>
</table>
| 6 Oct 16 | 1. Lecture and discussion: ethics in research using human subjects (1 hour)  
2. P2: group discussion on the experimental design  
3. Instructor meets with each group |
| 7 Oct 23 | 1. Lecture: Overview of the brain structures (0.5 h)  
2. Sheep brain dissection tutorial  
3. P2 pilot data collection (in groups) |
| 8 Oct 30 | 1. Sheep brain dissection review (optional)  
2. Instructor meets with each group |
| 9 Nov 6 | 1. Sheep brain dissection review (optional)  
2. Instructor meets with each group |
| 10 Nov 13 | 1. Sheep brain practical exam  
2. Instructor meets with each group  
3. Comments on the group projects  
4. Lecture: presentation technique |
| 11 Nov 20 | 1. Project 2, Group presentation: Group 1  
2. concluding remarks and comments on science career |
|       | 1. P1 lab report "results" and "discussion report" |
|       | 1. P2 literature review |
|       | 1. P1 lab report revision  
2. P2 proposal |
|       | 1. P2 data collection |
|       | 1. P2 data collection |
|       | 1. P2 data analysis |
|       | 1. P2 background info for the presentation |
# Project 2: Group presentation: Group 2 & 3

## Background info for the presentation

End of term

## Evaluation

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>DETAILS</th>
<th>GRADE (%)</th>
<th>DUE</th>
<th>Identifier for file name &amp; page heading</th>
<th>hardcopy requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project 1 (25%)</td>
<td>quiz on Rioult-Pedotti’s paper</td>
<td>.5</td>
<td>2 week</td>
<td>Sept 17 noon</td>
<td>P1QuizNNpaper</td>
</tr>
<tr>
<td></td>
<td>P1 behavioral training procedure and data collection</td>
<td>.5</td>
<td>3 week</td>
<td>Sept 24 noon</td>
<td>P1Training</td>
</tr>
<tr>
<td></td>
<td>excel assignment 1</td>
<td>0</td>
<td>3 week</td>
<td>Sept 24 noon</td>
<td>P1Excel1</td>
</tr>
<tr>
<td></td>
<td>excel assignment 2</td>
<td></td>
<td>4 week</td>
<td>Oct 1 noon</td>
<td>P1Excel2</td>
</tr>
<tr>
<td></td>
<td>1st draft: Introduction and Method</td>
<td>11(7)</td>
<td>5 week</td>
<td>Oct 11 noon (PC 415)</td>
<td>P1Rpt-pt1</td>
</tr>
<tr>
<td>Project 2</td>
<td>50%</td>
<td>5th draft: Results, Discussion and Abstract, References, etc.</td>
<td>13(9)</td>
<td>6</td>
<td>Oct 18 noon (PC 415)</td>
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<tr>
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<td>---</td>
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</tr>
<tr>
<td>revision: whole lab report</td>
<td>0(8)</td>
<td>8</td>
<td>Nov 6 class</td>
<td>P1Rpt-Revised</td>
<td>yes (also the 1st draft)</td>
</tr>
<tr>
<td>literature review</td>
<td>5</td>
<td>7</td>
<td>Oct 23 class</td>
<td>P2Literature</td>
<td>yes</td>
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<tr>
<td>proposal</td>
<td>5</td>
<td>8</td>
<td>Oct 30 class</td>
<td>P2Proposal</td>
<td>yes</td>
</tr>
<tr>
<td>oral presentation (rated by instructor, TAs and whole class)</td>
<td>10</td>
<td>11</td>
<td>Nov 18 noon Nov 25 noon</td>
<td>P2Update P2PresentSlides</td>
<td></td>
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<tr>
<td>quality of the experimental work</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lab report</td>
<td>10</td>
<td>end of term</td>
<td>P2Report</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>Lab notebook</td>
<td>5</td>
<td>end of term</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>individual contribution to the group (rated by group peers)</td>
<td>10</td>
<td>end of term</td>
<td>P2PeerEvaluation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project 3</td>
<td></td>
<td></td>
<td></td>
<td>neuroanatomy (sheep brain) test</td>
<td>15</td>
</tr>
<tr>
<td>Participation</td>
<td></td>
<td></td>
<td></td>
<td>rated by instructor and TAs</td>
<td>10</td>
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</tbody>
</table>

**TOTAL** | 65 | 35 |
DETAILED REQUIREMENTS

1. In addition to the occasional hard copy requirements, with the exception of group lab notebook (P2), ALL documents should be submitted electronically using anonymous ftp to ftp://psyftp.mcmaster.ca. You can use various software to do ftp. If, and only if, you have difficulty sending files through ftp, you could send the file through an email attachments to the instructor at sunhong@mcmaster.ca.

   1. Use expression "3L_AssignmentType_LastName_FirstName" in all of the following (if applicable):
      1. in the file name (plus file extension, e.g., .xls or .doc or .ppt)
      2. in the page heading in your Word or Excel file (plus the page number and total number of pages)
      3. in the email subject heading, if you are sending through email attachment

   2. replace "AssignmentType" with the proper identifier (see table above).

   3. replace "LastName_FirstName" with "Group" for the group project.

2. Assignments

   1. the first 4 assignments due from week 2 to week 4 will be graded, but for most students, feedback may not be provided individually. Instead, general comments will be provided to the whole class. P1 lab report will be graded and feedback will be provided to each student.

3. Full Lab Reports (P1 and P2, for detailed requirement see guide)

   1. All written reports submitted must be double-spaced, one-sided, 8.5x11 inch with 1 inch margins using a 12-point font.

   2. Late penalty will imposed at 10% of that part per day.

   3. You should submit both hard copy and electronic files, which include both text and figures (in Microsoft Word format, with figure copied from Excel graph) and data (in Excel format) for the analysis. The Excel should have clear label (e.g., create each chart in a separate sheet and rename the sheet into Fig 1) of the corresponding figure.

4. Project 1

   1. You are required to submit the first draft of the lab report in two parts over a two-week period. The first part includes the introduction and methods (worth 11%) and the second part includes the rest of what is required for a full lab report (results, discussion, etc…) (worth 13%). Grades will be given according to style (APA format), grammar, and content. The lab report is worth 24% of your year’s total grade. However, after you have received feedback and a grade for this first draft, you will have the option (not required) to make revisions and hand in a second draft in its entirety. The second draft will be worth 1/3 of the 24% (8%) and the grade for the first draft will now be 2/3 of the 24% (16%). This revision will be graded with a much higher standard including previous requirements and also on the quality of the writing, coherency, and clarity of thought.

5. Project 2
1. The same criterion used for grading the report of project 1 will be used for project 2. In addition, the quality of the research (incl., how you conduct the experiments and perform data analysis) will also be graded separately.

2. You are required to append with your report a photocopy of important articles (at least 3) cited in your report.

3. The electronic version of the lab report will be posted on web. Thus preparation of the "web" version of the lab report is encouraged.

4. Project 2
   1. Progress
      1. You are required to report the progress of your group project (2~3 pages, double space) at least twice before the start of the experiment:
         1. Literature review
            1. The literature review should be written individually by each member in the group (members in the same group can review the same or different articles). You are required to also submit a photocopy (or electronic file) of important articles (at least 3) cited in your report, if the articles are not included in the list of papers provided by the instructor. See instructor's guide on literature search and how to locate the articles after you find the citations.
            2. You should provide detailed review of the articles closely related to your research, much like writing an introduction of a lab report. You should comment on how the research would be related to your project.
            3. To demonstrate the work you have done, at the end of your literature review, you are also encouraged to list (and possibly provide a sentence or two of summary -- could be in point form) the articles that you have researched but eventually decide not to discuss in detail.

      2. Proposal
         1. The proposal should be submitted by the group as a whole.
         2. The format of proposal could be a short version of the introduction and method of a typical lab report. You are encouraged to write in the format of a formal introduction and method (longer than 2~3 pages) at this point, as that will be required later anyway.

      2. Data analysis should be performed during the process of running the experiment, rather than at the end of the experiment. You are
encouraged to present your results often to the instructor or teaching assistants to seek feedback.

2. Each group is free to organize itself as it thinks best (e.g., dividing responsibility, working in sub-group, or working together). But it might be practical to designate one member of the group as the facilitator/organizer for each stage of the project and he or she will be eventually responsible for the performance of that stage.

3. Presentation
   1. Before the presentation, an electronic file including background information regarding the project (updated since the last progress reports, e.g., literature review and proposal, and summary of the results if available) should be sent to the instructor electronically. This file will then be posted on the web for other students to review before the presentation.
   2. Everyone in the group should participate in the final oral presentation and group members must try to participate equally in the presentations.
   3. Oral presentation will be graded for group performance as well as for the performance of each individual.
   4. Presentation should incorporate proper audiovisual aids (e.g., powerpoint slides) and handout (if necessary). The final version of the presentation slides (e.g., powerpoint file) should be sent to the instructor electronically afterwards.

4. Peer evaluation within the group
   1. at the end of the project, each member should provide written evaluation on the contribution of each member of the group
   2. both grades (in terms of %) and written justification should be provided for ALL the aspects of project (e.g. including intellectual contribution and contribution of time and effort, etc).
   3. Normally, all group members will be given the same grade for the joint performance in project 2 (e.g., oral presentation, lab report, etc), but the instructor reserves the right to use the grades from peer evaluation as a factor to adjust other parts of the P2 grade for certain individuals (e.g., those who contribute very little to the joint effort).

5. Laboratory notebook (P2)
   1. It must contain enough information to allow yourself or others to repeat the work exactly as you have done it. Record in your notebook everything that you did and observed as you carried out the experiment as well as each of the steps and the results when you analyze your data. Fasten copies of any graphs or images obtained during the course of the experiment or analysis into the book.
   2. The first page of the notebook is reserved for a table of contents. All subsequent pages are numbered. The table of contents should
indicate the title of the experiment and the page number in the book.

3. Recordings in the notebook should be written at the time when the experiment/analysis is carried out (NOT at the end of the term and right before the notebook is due!).

5. Participation grade will be given considering the student's performance in the following aspects:
   1. Attend class and group meeting and arrive on time
   2. Active learning
      1. Contribute to class and group discussion
      2. Contribute to LearnLink discussion
      3. Contribute to experiment
      4. Contribute to literature search (students are encouraged to share suitable articles to the group, possibly through learnlink)
      5. Show initiative in organizing group activities
   3. Provide extensive and informative feedback to the oral presentation of other groups.
   4. Provide feedback and suggestion to the teaching of this course

6. Final Grade
   1. The instructor reserves the right to adjust final marks up or down, on an individual basis, in the light of special circumstances and/or the individual's overall performance in the course. Furthermore, the instructor reserves the right to change the weight of any portion of this marking scheme.
   2. Final grades will be assigned according to the following conventional scheme:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>90-100</td>
</tr>
<tr>
<td>A</td>
<td>85-89</td>
</tr>
<tr>
<td>A-</td>
<td>80-84</td>
</tr>
<tr>
<td>B+</td>
<td>77-79</td>
</tr>
<tr>
<td>B</td>
<td>73-76</td>
</tr>
<tr>
<td>B-</td>
<td>70-72</td>
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<tr>
<td>C+</td>
<td>67-69</td>
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<tr>
<td>C</td>
<td>63-66</td>
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<td>C-</td>
<td>60-62</td>
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<td>D+</td>
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<tr>
<td>D-</td>
<td>50-52</td>
</tr>
<tr>
<td>F</td>
<td>0-49</td>
</tr>
</tbody>
</table>

Student Grades

READINGS

1. Required Readings


2. Recommended Readings
   1. Guide to writing lab report

3. Literature search guide by Dr. Sun for Independent Project

4. Web Links Relevant to the Course
   1. guide to writing research reports by Paul C. Cozby
      1. http://www.uwsp.edu/psych/apa4b.htm
   2. some useful links from a course taught by Dr. Christopher Green of York Univ
   3. Sheep brain dissection
      5. http://lshome.utsa.edu/Courses/IntroNeurolab/Assign02Anat/HTM L/sheepdissproc.htm