Psychology 390 section 1 Research in Human Cognitive Neuroscience, Winter 2023

Location: PAS 2259

Time: Section 1 Mon 8:30-10:20, Wed 8:30- 10:20

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Instructor: Professor Mike Dixon office: PAS 4035

tel 519 888 4567 32877 office hours: by appointment (held in PAS 2259)

(email me or see me in class)

Course is listed on Desire to Learn

<https://learn.uwaterloo.ca>

**Expanded Course Description**

This course is an “in person” experiential learning lab course that will introduce students to some of the techniques used in conducting experiments in human cognitive neuroscience with a particular emphasis on psychophysiology. Students will be taught how to program a simple experiment in PsychoPy/Python and accurately acquire response time data. They will be taught how to gather a number of psychophysiological measures. The psychophysiological measures acquired will reflect brain-body relationships e.g., how psychological reactions can influence heart rate, and changes in skin conductance (i.e., sweat increases or decreases related to the processing of external information). Students will be taught how to apply these different measures to conduct research in a number of diverse areas including a slot machine simulator, video game playing, and distortions of body schema. Students will gain experience by collecting data on themselves and their lab team members (the data is solely for educational purposes not for formal research).

This course is first and foremost an experiential learning course where students will learn by doing. After being introduced to the theory and practice of these experimental techniques (and completing labs to solidify their learning), students will be asked to work in small teams, program their own experiments, and collect sample data on themselves and team members and write up a final report on their self-generated project. As an experiential learning course, this course will allow you to: practice and apply techniques of psychological measurement and quantitative analysis; collect data to assess the validity of a hypothesis; experience and evaluate research from the standpoint of a study participant, and from the standpoint of an experimenter.

**Course Requirements and Evaluation: 4 Labs and a Final Report**

Marks in this course will be based on 4 labs (lab 1 = 10% lab 2 = 20%, lab 3 = 10%, and lab 4 = 20%), and the final project report (40%). All labs and the final report will be submitted via electronic drop boxes on the *Learn* site.

A note on Late Lab and Final Reports. All late Reports will be penalized. For every day that an assignment is late, 10% will be deducted from your assignment grade. For example, if you received 100% on lab report 1 but handed it in two days late you would receive 80% on this lab.

**LABS:**

10% **Laboratory Report 1:** Students will learn to program in PsychoPy (a python based platform). Each student will submit via *Learn*’s electronic dropbox, a program that they have created using PsychoPy, along with an excel workbook containing both raw and analyzed response time and error data. Part of Lab 1 will involve answering a short-answer quiz on LEARN.

20% **Laboratory Report 2:** Students will work alone. Students will record their heart rate, filter their heart rate, and record beats per minute as they play a simple (non-violent) video game. Using Powerlab and “LabChart” software students will then learn to analyze their heart rate and graph the results in Excel. Then each team member will write up their own individual APA-formatted Method Section outlining the apparati and procedures used in the video game study. Finally, they will analyse the data on the vagal tone changes (heart-rate variability) of a person (me!) at rest, and under mental stress. Files for the video game (Chart and Excel), word files for the method section, and excel files for the vagal tone analysis will be submitted via the electronic dropbox on *Learn*.

10% **Laboratory Report 3:** Students will work in teams of 5. Using Powerlab and LabChart software students will record Skin Conductance Responses for an experiment involving an illusion involving a distortion of body schema (the “rubber hand” illusion). Each student will submit via electronic dropbox on *Learn*, the LabChart files which they recorded and an excel file summarizing their results. They will also complete a short-answer quiz as part of this lab.

20% **Laboratory Report 4:** Students will learn more complex data analytic techniques involving analyzing the physiological responses of people playing on a slot machine simulator. Students will learn how to analyze event-related individual psychophysical responses to wins, losses, and a special type of slot-machine loss called a “near miss”. Each student will submit via *Learn’s* electronic dropbox the LabChart files they analysed and an excel file with the relevant data analyses.

**Final Report** - Worth 40% of student's mark.

Each student will create an experiment (typically in PsychoPy), interface the experiment with Powerlab (the psychophysiological data acquisition system), collect sample data using either electrocardiogram variables (heart rate, inter-beat intervals, vagal tone), or skin conductance changes as the dependent variables, and analyse these data. Participants will collect data on themselves and one other student (i.e., students will be paired to serve as participants in each other’s experiments). Each student will: write a 250 word abstract, write a brief (4 page double spaced) introduction summarizing research on their topic, write a 3-4 page method section, write a 2-page results section summarizing their findings, and a 4-page discussion, followed by references in APA format. Before conducting the experiment, all projects must be approved by me. A one-page proposal must be submitted via electronic dropbox for approval prior to any programming or data collection. This proposal is due on Mar 15th. The final lab report is due in the exam period on April 17th and must be submitted via electronic dropbox.

Here are some possible experiments.

1. Electrodermal and heart rate responses to different types of video-games (strategic vs, racing or RPG games) *NB* video games must be non-violent.
2. Electrodermal and heart rate responses to happy, neutral and sad movie clips.
3. Psychophysical responses to faces showing positive, neutral and negative (angry) faces.
4. Psychophysical responses to classically conditioned stimuli.
5. Vagal tone changes during deep breathing vs mental stress (e.g., counting backwards by 3 from 1486). One idea is to compare vagal tone of a yoga practicioner to a control
6. Lie detection.
7. Skin conductance responses to loot boxes – anticipation, and opening of common versus rare items
8. SCR and Heart Rate reactions to frustration.
9. SCR and Heart Rate responses to different types of music.
10. Restorative effects of Nature scenes, and audio clips

A note on Powerlab and the Imacs. Each powerlab system costs in excess of $8000. The IMacs cost $1,300 each. Treat them with extreme care. Coffee or other drinks can only be consumed in containers with spill-proof lids!

**Alternatives to labs in case of illness, self-isolation protocols, or government lockdowns.**

In the event of illness or required isolation due to Covid-19, alternatives to these in person labs will be provided. In the event of a prolonged illness or self-isolation protocols that prevents students from attending class **students are to contact me to discuss these alternatives.** These alternatives will range from a re-weighting of the labs that students were able to complete, or in the cases where students are not ill but must be in self isolation, or in the case of a university closure due to a government-imposed lockdown, students will be provided with versions of the labs that can be done at home. The latter will involve replacing psychophysiological measures with subjective measures of arousal in contexts such as video-game play (lab 2) or simulated slot-machine play (lab4). For lab 3 students will be assigned extra readings on distortions of body schema and will write a five-page (double spaced) summary of these readings. If there is a lockdown (or students have to self-isolate) during the time in which they were to have completed the final report they will be provided with an at-home alternative to the final report.

**Schedule of Topics**

Note: All readings will be available within *Learn*. As mentioned, all submissions will be via electronic drop box in *Learn*.

Jan 9 Overview of Research in Human Cognitive Neuroscience

* Cognitive Neuroscience using behavioural measures

Jan 11 Overview of PsychoPy

Jan 16- Programming and Running a Stroop Experiment

Reading: Dixon M. J., Smilek, D., Cudahy, C., Merikle, P.M. (2000)

Five plus two equals yellow *Nature,* 406, 365.

Intro to LABORATORY 1 - Strategic and Automatic Influences on Stroop

Performance

Jan 18 - LABORATORY 1 in class data collection and analysis.

Jan 23 - LABORATORY 1 in class data collection and analysis.

Jan 25- Finish LABORATORY 1 complete in-class work on data analysis and short answer quiz

***DEADLINE: Laboratory 1 must be submitted by Jan 25 (at or before 11:59 p.m.)***

Jan 30

Reading: John L Andreassi, J.L. (2000). Heart Activity and Behavior I: Developmental Factors, Motor and Mental Activities, Perception, Attention, and Orienting Responses. Chapter In Psychophysiology: Human Behaviour and Physiological Response. Lawrence Erlbaum Associates, London

Reading: Laborde, S., Mosley, E., Thayer, J.F. (2017) Heart rate variability Heart Rate Variability and Cardiac Vagal Tone in Psychophysiological Research – Recommendations for Experiment Planning, Data Analysis, and Data Reporting, Frontiers in Psychology, 2

* Psychophysiology of the human heart
* Introduction to Powerlab

Feb 1

* Introduction to LabChart Software

Feb 6

LABORATORY 2 Heart Rate Responses to Playing a Video Game (Tonic effects), and Heart Rate Changes under Mental Stress (Phasic effects)

* Reading: Turner, R. J., Carroll, D. and Courtney, H. (1983). Cardiac and metabolic responses to space invaders: An instance of metabolically-exaggerated cardiac adjustment? *Psychophysiology, 20,* 544-549.

Feb 8

* + LABORATORY 2 data collection and analysis for Laboratory 2.

Feb 13

* + LABORATORY 2 data analysis and completion of Laboratory 2.

***DEADLINE: Laboratory 2 must be submitted by Feb 13th (at or before 11:59 p.m.)***

Feb 15

Introduction to electrodermal measures, and recording of skin conductance levels and skin conductance responses (SCRs) using Powerlab.

Reading: Dawson, M.E., Schell, A.M., and Filion, D. (2007). The Electrodermal System. In Handbook of Psychopysiology, 3RD Edition, (J.T. Cacioppo, L.G. Tassinary, G.G. Bernston Eds.), Cambridge University Press.

Reading Armel, K.C., and Ramachandran, V. S. (2003). Projecting sensations to external objects: Evidence from skin conductance response. *Proceedings of the Royal Society, B: Biological Sciences, 270,* 1499-1506.

LABORATORY 3 - The rubber hand illusion

Feb 27 Data collection and analysis of Laboratory 3.

Mar 1 Finish Lab 3

***DEADLINE: Laboratory 3 must be submitted by Mar 1 (at or before 11:59 p.m.)***

March 6

LABORATORY 4 Analyzing Slot Machine Outcomes: Wins, Losses and Near Misses.

Readings: Dixon, M.J., MacLaren, V., Jarick, M., Fugelsang, J.A., and Harrigan, K.A. (2013). The Frustrating effects of just missing the jackpot: Slot machine near-misses trigger large skin conductance responses, but no post-reinforcement pauses. *Journal of Gambling Studies, 29,* 661-674. doi: 10.1007/s10899-012-9333-x*.*

Dixon, M.J., Larche, C.J., Stange, M., Graydon, C. & Fugelsang, J.A. (2017). Near-Misses and Stop Buttons in Slot Machine Play: An Investigation of How They Affect Players, and May Foster Erroneous Cognitions, *Journal of Gambling Studies*.

Mar 8 - LABORATORY 4 - Data Analysis for Laboratory 4.

Mar 13 - LABORATORY 4 - Data Analysis for Laboratory 4.

Mar 15 - LABORATORY 4 - Data Analysis for Laboratory 4.

***DEADLINE: Laboratory 4 must be submitted Mar 15 (at or before 11:59 p.m.)***

***DEADLINE: 1 Page Proposal for the final paper must be submitted Mar 15 (at or before 11:59 p.m.)***

Mar 20, Begin Work on student projects

Mar 22, 27,29 , April 3, 5 In-class work on the student projects.

**DEADLINE: FINAL REPORTS DUE APRIL 17th (at or before 11:59 p.m.)**

## Academic Integrity

In order to maintain a culture of academic integrity, members of the University of Waterloo are expected to promote honesty, trust, fairness, respect and responsibility. See the [Office of Academic Integrity webpage](https://uwaterloo.ca/academic-integrity/) for more information.

### Discipline

A student is expected to know what constitutes academic integrity, to avoid committing academic offences, and to take responsibility for his/her actions. Check [the Office of Academic Integrity](https://uwaterloo.ca/academic-integrity/) for more information. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about “rules” for group work/collaboration should seek guidance from the course professor, academic advisor, or the Undergraduate Associate Dean. When misconduct has been found to have occurred, disciplinary penalties will be imposed under Policy 71 – Student Discipline. For information on categories of offenses and types of penalties, students should refer to [Policy 71 - Student Discipline](https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71). For typical penalties check [Guidelines for the Assessment of Penalties](https://uwaterloo.ca/secretariat/policies-procedures-guidelines/guidelines/guidelines-assessment-penalties).

### Concerns about a Course Policy or Decision

Informal Stage. We in the Psychology Department take great pride in the high quality of our program and our instructors. Though infrequent, we know that students occasionally find themselves in situations of conflict with their instructors over course policies or grade assessments. If such a conflict arises, the Associate Chair for Undergraduate Affairs (Richard Eibach) is available for consultation and to mediate a resolution between the student and instructor: Email: reibach@uwaterloo.ca; Ph 519-888-4567 ext. 38790

### Grievance

A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70 - Student Petitions and Grievances, Section 4. When in doubt, please be certain to contact Richard Eibach, the Associate Chair for Undergraduate Affairs who will provide further assistance; reibach@uwaterloo.ca.

### Appeals

A decision made or penalty imposed under [Policy 70 - Student Petitions and Grievances](https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70) (other than a petition) or [Policy 71 - Student Discipline](https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71) may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to [Policy 72 - Student Appeals](https://uwaterloo.ca/secretariat-general-counsel/policies-procedures-guidelines/policy-72).

### Note for Students with Disabilities

The [AccessAbility Services](https://uwaterloo.ca/disability-services/) office, located on the first floor of the Needles Hall extension (NH 1401), collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with [AccessAbility Services](https://uwaterloo.ca/disability-services/) at the beginning of each academic term.

### Accommodation for course requirements for Psychology courses.

*Policies of the Psychology department pertaining to course requirements are available on the* [*department website*](https://uwaterloo.ca/psychology/current-undergraduate-students/policies/psychology-department-policies/accommodations-course-requirements-assignments-tests-quizzes)*.*

**Mental Health Support**

All of us need a support system. The faculty and staff in Arts encourage students to seek out mental health support if they are needed.

**On Campus**

• Counselling Services: counselling.services@uwaterloo.ca / 519-888-4567 ext. 32655

• [MATES:](https://uwaterloo.ca/campus-wellness/services/uw-mates) one-to-one peer support program offered by Federation of Students (FEDS) and Counselling Services

• Health Services Emergency service: located across the creek form Student Life Centre

**Off campus, 24/7**

• [Good2Talk:](https://good2talk.ca/) Free confidential help line for post-secondary students. Phone: 1-866-925-5454

• Grand River Hospital: Emergency care for mental health crisis. Phone: 519-749-4300 ext. 6880

• [Here 24/7](http://here247.ca/): Mental Health and Crisis Service Team. Phone: 1-844-437-3247

• [OK2BME:](https://ok2bme.ca/) set of support services for lesbian, gay, bisexual, transgender or questioning teens in Waterloo. Phone: 519-884-0000 extension 213

Full details can be found online on the Faculty of Arts [website](https://uwaterloo.ca/arts/get-mental-health-support-when-you-need-it)

Download [UWaterloo and regional mental health resources (PDF)](https://uwaterloo.ca/arts/sites/ca.arts/files/uploads/files/counselling_services_overview_002.pdf)

Download the [WatSafe app](https://uwaterloo.ca/watsafe/) to your phone to quickly access mental health support information

**Territorial Acknowledgement**

### We acknowledge that we are living and working on the traditional territory of the Attawandaron (also known as Neutral), Anishinaabe and Haudenosaunee peoples. The University of Waterloo is situated on the Haldimand Tract, the land promised to the Six Nations that includes ten kilometres on each side of the Grand River.