

PSYCH 258

COGNITIVE PSYCHOLOGY

Online Labs

General Learning Outcomes

In completing the online labs, you will:

- Engage in a unique [experiential learning](#) activity that is beyond the scope of the lectures.
- Apply empirical research findings to theoretical concepts in cognition, as done by cognition researchers.
- Develop your scientific research, data visualization, digital literacy, and written communication skills, which are [important abilities](#) that are highly valued by employers and post-graduate schools.

Submitting

You will use different Open Educational Resources (free!) to do the lab experiments, and collect data on the results. Each lab has questions that you must answer based on the lab and related lecture/textbook material. Your lab must be submitted as a single file using [eClass](#) (PDF preferred). eClass will only accept these document file types: Microsoft Word (.docx), Portable Document Format/Adobe Acrobat (.pdf), and OpenDocument Text/LibreOffice (.odt). Use complete sentences; do not use point form. It is your responsibility to ensure that your lab has been properly submitted. You should receive a confirmation email from eClass as soon as your submission is successful. Labs submitted without appropriate data (when required) will be considered incomplete, and will be penalized for lateness if not submitted with data on time.

Marks

Each lab consists of an interactive cognition experiment, done on your own time. Depending on the lab, you must include a graph, table, or other data (e.g., a screenshot) of your results, and answer a number of questions for marks. Marks are assigned based on the completeness, relevance, and specificity of your answers. If your answer is incomplete, irrelevant, vague, or is lacking detail, marks will be deducted. Partial marks are assigned at the discretion of the teaching assistant. Note that each lab is not equally weighted towards your final grade.

You do **not** need to refer to any external sources in your lab; however, you are encouraged to read the textbook for background information on each lab. Any external sources *must* be correctly cited and referenced in APA style.

Due Dates & Policy

Each lab must be submitted by the **end of the day** (i.e., 11:59pm) on the day in which it is due, or it will be considered late. Late submissions will lose 1 mark per 24-hour period, starting immediately after the deadline (e.g., if you submit your assignment 1 minute after the deadline, you will lose 1 mark). If you submit it 23 hours and 59 minutes after the deadline, you will still lose only 1 mark. But if you submit it 24 hours and 1 minute after the deadline, you will lose 2 marks.

⚠ If you edit or make any changes to your eClass submission after the due date, you will receive a **late penalty**.

⊘ Do **not** email labs to the instructor or the TA. Late (or early) labs may be submitted via eClass. However, after seven days past the due date, you will no longer be able to submit your lab online. If you have exceptional extenuating circumstances, please contact the instructor.

Alternate Assignment

If you have a compelling reason why you cannot do the online labs, an alternate assignment may be provided. You must make arrangements with the instructor **before** lab #1 is due.

Technical Support

“Technical problems” will not be accepted as an excuse for a late or incomplete lab. However, should an online lab be unavailable (e.g., the website, web page, or lab is taken down by its owners), the weight of that lab will be added to your final exam.

eClass Support has [eClass for Students](#) tutorials, ranging from System Setup to Submitting Assignments. For help with eClass, see the [IST eClass support knowledgebase](#) or contact [IST eClass support](#). For other IT problems, contact [IST](#).

⚠ It is strongly recommended that you make **backups** of your answers to each lab (and your data). “My computer crashed” is not an acceptable excuse for a missing, incomplete, or late lab. Google Drive is your friend.

How To Take a Screenshot

Some labs present a graph or a summary of your data, but do not allow you to access your raw data. In that case, you will be asked to take a screenshot of the results on your device’s screen, and include them in your submission as proof that you completed the lab. These websites will help you take a screenshot:

- [take-a-screenshot.org](#) -- has how-to instructions for Windows, Mac, ChromeOS, Android, iOS, and Linux
- [Keyboard shortcut for print screen](#) -- instructions for Windows 10 or 11
- [How to take a screenshot in Windows 11](#) -- gives four different methods
- [Open Snipping Tool and take a screenshot](#) -- instructions for the Snipping Tool in Windows 10 or 11
- [How to take a screenshot on your Mac](#) -- instructions from Apple Support

How to Make a Graph

Some labs require you to make a graph based on data copied from a web page, or in a CSV spreadsheet file. Here are some instructions:

- [Create a chart from start to finish](#) (Microsoft Excel)
- [How to Make a Line Graph in Excel](#) video
- [Inserting Charts](#) (LibreOffice Calc)
- [Add & edit a chart or graph](#) (Google Sheets)

The Fine Print

The University of Alberta is committed to the highest standards of [academic integrity](#) and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the [Code of Student Behaviour](#) and avoid any behaviour which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence.

Academic dishonesty is a serious offence and can result in suspension or expulsion from the University. These resources from Student Conduct and Accountability, and the University of Alberta Library can help:

- [Academic Integrity: Introduction to Academic Culture](#) - videos on citing, quoting, summarizing, and paraphrasing
- [How to Avoid Plagiarism](#) - plagiarism definition, and tips for avoiding plagiarism
- [Foundational Research Tutorial: Plagiarism](#) - video on plagiarism with examples
- [Citing, Quoting, Paraphrasing & Summarizing](#) - how-to document that compares and contrasts them
- [Don't Do It \(Cheating & Plagiarism\)](#) - Faculty of Science document on academic misconduct and resulting penalties

Online Labs

Online Lab #1: Deary-Liewald & Go/No-Go Tasks (10 marks) -- due Monday, Sept 16


Learning Outcomes:

- Participate in online experiments on reaction times.
- Apply your knowledge of research designs to these experiments.
- Apply your understanding of Donders' subtraction method to your results.

Background:

- read section 2.4 The Cognitive Approach in chapter 2 of the textbook, and the lecture notes on the work of F.C. Donders (1868); also read this introduction to simple and choice reaction time tasks: https://www.psytoolkit.org/lessons/simple_choice_rts.html
- RT means reaction time, or how long it takes you to respond after a stimulus is presented; longer RTs mean that you are slower, and shorter RTs mean that you are faster

Instructions:

- go to the web page for part 1 of this lab (called Deary-Liewald task): https://www.psytoolkit.org/experiment-library/deary_liewald.html
 - read the Introduction, then run the demo
 - carefully read the instructions on how to do the demo; it will include some training trials
 - when the experiment is over, take a screenshot of your results (you do **not** need to click the **Show data** button to get your raw data)
 - next, go to the web page for part 2 of this lab (called Go/No-go task): <https://www.psytoolkit.org/experiment-library/go-no-go.html>
 - read the Introduction, then run the demo
 - carefully read the instructions on how to do the demo; there are **no** training trials
 - when this experiment is over, you **must** click the **Show data** button to get your raw data
 - copy your data into a spreadsheet (e.g., Microsoft Excel, LibreOffice Calc, Google Sheets), and calculate the mean of the "go" trials only
-  **Note:** if you made any errors (pressing the space bar on a no-go trial), run the demo again.

Data:

- give your mean reaction times for the simple and choice conditions in the Deary-Liewald task, and the go condition of the go/no-go task
- include your screenshot of the Deary-Liewald task

Questions:

- a) What are the independent and dependent variables in the Deary-Liewald task? What are the independent and dependent variables in the go/no-go task? (If you need a refresher on these concepts, see this page on [research designs](#).) (4 marks)
- b) Which reaction time should be the fastest, which should be the slowest, and why (according to Donders' breakdown of RT into its components via the subtraction method)? What did you actually find (give your RT data)? (4 marks)
- c) Using the subtraction method, calculate your RT for stimulus identification, and your RT for response selection; show your work. (2 marks)

Online Lab #2: Visual Search (10 marks) -- due Tuesday, Oct 1


Learning Outcomes:

- Participate in online experiments on visual search, and develop your data visualization skills.
- Apply and develop your data literacy skills.
- Apply your understanding of Feature Integration Theory to your results.

Background:

- read section 5.5.1 Binding Information chapter 5 of the textbook, and the lecture notes on attention

Instructions:

- go to the web page for this lab (called Feature vs. Conjunction Search):
<https://isle.hanover.edu/isle3/Ch09Attention/Ch09Search.html>
- read the Background and Instructions tabs
- click on the Stimulus Settings tab; use default settings, except for:
Distractor Color: Hue = 257, Sat = 100, Lum = 100
- click on the Method Settings tab; use default settings, except for:
Type of Search = Feature
Smallest Number of Distractors = 4
- click on the Experiment tab to do the experiment
- when you are done, you will be shown a graph of your results; click Download Data and save your data file (it will be a CSV spreadsheet file)
- then repeat this experiment, but change the type of search to Conjunction; save your data file using a different file name
- then repeat it again, but change the type of search to Spatial Configuration; again, save your data file with another different file name
-  **Note:** in this lab, ignore the target-absent trials.

Data:

- create a line graph of number of distractors (X-axis) vs. reaction time for target present trials (Y-axis); include axis lines, titles, and units for each axis (see [Figure Setup](#) for more)
- plot three curves on your graph, one for each type of search: feature, conjunction, and spatial configuration; include a legend for these curves (**4 marks**)

Questions:

- a) What are the independent and dependent variables in this lab? (**2 marks**)
- b) According to Feature Integration Theory, which type of search should have the shallowest slope, and which one should have the steepest slope? Why? (**2 marks**)
- c) Calculate the slope for each of the feature, conjunction, and spatial configuration conditions. Use the values from the 4- and 64- distractor conditions. You can use the slope calculator at <https://www.omnicalculator.com/math/slope-intercept-form>. Did your results match the expectation in question b)? (**2 marks**)

Online Lab #3: Numerical Memory (6 marks) -- due Tuesday, Oct 15






Learning Outcomes:

- Participate in online experiments on digit span in short-term memory.
- Apply your knowledge of short-term and working memory to these experiments.

Background:

- read section 6.2.2 Short-Term Memory in chapter 6 of the textbook, and the lecture notes on short-term memory

Instructions:

- ⚠ **Note:** For best results, wear headphones  while doing this lab, and do the lab in a quiet location.
- ⚠ **Note:** If you encounter a “#null” error, it is because you have not created an APA account or logged in.
 - go to the APA Online Psychology Laboratory website: <https://onl.apa.org/index.html>
 - click STUDENT LOGIN, then CREATE AN ACCOUNT
 - click on Numerical Memory and enter the class ID (887572), then click Launch Experiment
 - click on the  DESCRIPTION tab and read through all of the background information
 - click on the  EXPERIMENT tab, then click the START button to begin the experiment
 - carefully pay attention to the instructions on how to do the experiment; it will include some practice trials
 - click the Save Data button, then click the  Data icon on the left side, then select Numerical Memory, then select University of Alberta - PSYCH258, and click Get Report
 - download your data in Excel (CSV) format
 - the data file will have data from the entire class; your data is in the row with your ProfileID (you can find your ProfileID in your profile; click the  Profile icon on the left side)

Data:

- the number of items you got in the correct sequence in auditory format and visual format are provided in a spreadsheet (do not submit the spreadsheet with your lab)

Questions:

- a) How did you do in each condition? Compare your performance between the two conditions. **(1 mark)**
- b) Calculate the mean of your performance across the two conditions. How do you compare to the average capacity of short-term memory, according to measurements of digit span presented in the textbook? Next, download the results CSV and calculate the mean of each condition across all students. How do you compare to these means? **(3 marks)**
- c) How would the components of the working memory model (Baddeley & Hitch, 1974; Baddeley, 2000) explain any differences in a person's performance between the auditory and visual conditions? **(2 marks)**

Online Lab #4: Mental Rotation (6 marks) -- due Monday, Oct 28

Learning Outcomes:

- Participate in an online experiment on mental rotation.
- Apply your knowledge of mental imagery and working memory to this experiment.

Background:

- read sections 10.3.2 Mental Rotation in chapter 10 and 6.3 The Working Memory Model in chapter 6 of the textbook, and the lecture notes on visual imagery

Instructions:

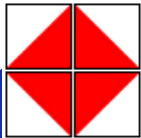
- go to the TopHat textbook website: <https://app.tophat.com/e/782021>
- log in
- click on Interactive Labs in the left panel, then click on Chapter 10 Interactive Lab: Mental Rotation
- read the background information and lab procedure sections
- carefully pay attention to the instructions on how to do the experiment; it will give you two practice trials
- when you are done the lab, take a screenshot of the results

Data:

- include your screenshot of the mental rotation graph

Questions:

- a) What are the independent and dependent variables in this lab? (2 marks)
- b) Imagine you ran the experiment again, but this time you were also given a set of items to remember before each mental rotation trial, which you had remember right after the trial:
 - you hear a sequence of 4 notes, which you have to sing back after the trial
 - you are shown a sequence of 4 words, which you have to say back after the trial
 - you are shown 4 blocks arranged in a pattern, which you have to recreate after the trial--for example:



How would your performance on the mental rotation task be affected by each of these conditions? Explain why in terms of your working memory. (3 marks)

- c) Your sister is taking a dance class, but she is having problems copying the different moves from the instructor. You ask her if the instructor faces the class or has their back to the students. Why might this make a difference? (1 mark)

Online Lab #5: Fitts's Law (7 marks) -- due Monday, Nov 18

Learning Outcomes:

- Participate in an online experiment on reaction time.
- Apply and develop your critical thinking and data literacy skills.
- Apply your knowledge of Fitts's Law to this experiment.

Background:

- read Box 1.3 in the human factors coursepack reading (pp. 14-15); also read the Fitts's Law introduction here: <https://www.psytoolkit.org/lessons/fitts.html>

Instructions:

- go to the web page for this lab (called Fitts's Law): <https://www.psytoolkit.org/experiment-library/fitts.html>
- read the Introduction, then run the demo
- carefully read the instructions on how to do the demo
- take a screenshot of the scatter plot of your results, then press the space bar
- click the **Show data** button to see your raw data
- copy your raw data into a spreadsheet
- go to the linear regression calculator at: <https://www.socscistatistics.com/tests/regression/default.aspx>
- copy the 5th column (column E) of the data (the Fitts calculation) and paste it into the X Values box
- copy the 6th column (column F) of the data (your response time) and paste it to the Y Values box
- then click the **Calculate the Regression Equation** button
- take a screenshot of the graph that includes the blue regression line and the regression equation (note: you can also copy or save this image directly)

Data:

- include the screenshot of the scatter plot of your results from PsyToolKit
- include an image of your scatter plot with the regression line from Social Science Statistics

Questions:

- a) What is/are the independent variable(s) in this experiment? What is/are the dependent variable(s)? **(2 marks)**
- b) The regression line is a "best fit" through your data; it predicts how changing Fitts's calculation affects your reaction time. Give your regression equation, in the form $\hat{y} = bX + a$. If Fitts's Law predicted your data perfectly, what would the slope (b) be? What would the Y-intercept (a) be? **(3 marks)**
- c) In this experiment, you moved your mouse pointer to different locations--something commonly done in a Graphical User Interface (GUI) on a computer. If you were a interface designer, what two things would you do in designing a user interface (e.g., clickable icons, menus, etc.) to best take advantage of Fitts's Law? **(2 marks)**

Online Lab #6: Artificial Intelligence (7 marks) -- due Monday, Dec 2

Learning Outcomes:

- Interact with an online AI chatbot.
- Apply your knowledge of human learning and memory to working with an AI.
- Apply your critical thinking skills to your results and to your understanding of AI.

Background:

- read the section Alan Turing and the Turing Test (pp. 2-4) in the reading AI foundations: History lessons (Taulli, 2019) posted on eClass
- OpenAI's ChatGPT (Chat Generative Pre-trained Transformer) is a [large-language model](https://www.cloudflare.com/en-ca/learning/ai/what-is-large-language-model/) artificial intelligence (AI) neural network that interprets and generates text based on prompts written by a human; read more at: <https://www.cloudflare.com/en-ca/learning/ai/what-is-large-language-model/>

Instructions:

- go to the web page for ChatGPT: <https://chatgpt.com/>
- choose one cognitive phenomenon, effect, or mnemonic discussed in lectures or the textbook that can be applied to improving human learning/remembering (e.g., retrieval practice)
- write a prompt asking ChatGPT to briefly summarize and give a specific application of this to improve learning (maximum 400 words), and to provide an APA style reference to a primary research source for the information that it provides

Data:

- give your prompt(s), and the paragraph(s) and reference(s) produced by ChatGPT (do not take a screenshot of this; you can copy and paste the text) **(1 mark)**
- following best practices and the Code of Student Behaviour, you must provide a reference to ChatGPT; use these [APA Style guidelines](#) on how to do this **(1 mark)**

Questions:

- a) Find and read the research article given by ChatGPT. If the article is behind a paywall, access it via the [UAlberta Library website](#). How accurately did the AI summarize this article? Did it get anything wrong? **(1 mark)**
- b) Evaluate the application given by ChatGPT. Based on what you have learned in the course, how good was the advice? **(1 mark)**
- c) How could you use ChatGPT itself to help you implement the advice on learning that it provided? **(1 mark)**
- d) Do you think ChatGPT can pass the Turing Test? Why or why not? Relate your answer to Searle's forms of AI. **(2 marks)**

Scoring Rubric

This rubric is intended to provide a general sense of how student answers are differentiated, scored, and resulting marks awarded.

Online Lab #1 (10 marks)

Screenshot of the Deary-Liewald task must be included.

- Correct, specific identification of independent and dependent variables for Deary-Liewald task: **2 marks**.
Correct, specific identification of independent and dependent variables for Go/No-Go task: **2 marks**.
- Correct ordering of three reaction times: **1½ marks**.
Correct explanation of all three reaction times: **2 marks**.
Description of your results, and relation to prediction: **½ mark**.
- Correct calculation of two reaction times, including showing work: **2 marks**.

Online Lab #2 (10 marks)

Line graph provided with all required components (X-axis, X-axis title with units; Y-axis, Y-axis title with units; data points/curves; legend): **4 marks**.

- Correct, specific identification of independent and dependent variables: **2 marks**.
- Correct identification of shallowest and steepest search slopes: **1 mark**.
Explanation in terms of underlying concepts: **1 mark**.
- Correct calculation of slopes for each condition: **1½ marks**.
Correct conclusion about data matching prediction: **½ mark**.

Online Lab #3 (6 marks)

- Description of results: **1 mark**.
- Correct calculation of mean: **1 mark**. Correct application of mean to average capacity of short-term memory: **1 mark**. Correct calculation of and application to student mean data: **1 mark**.
- Correct application of both conditions to working memory model: **2 marks**.

Online Lab #4 (6 marks)

- Correct, specific identification of independent and dependent variables: **2 marks**.
- Correct prediction of all three conditions, each with explanation: **3 marks**.
- Correct application of concept to example: **1 mark**.

Online Lab #5 (7 marks)

Screenshot of PsyToolkit scatter plot, and scatterplot with regression line must be included.

- Correct, specific identification of independent and dependent variables: **2 marks**.
- Regression equation: **1 mark**. Correct identification of slope and Y-intercept for ideal Fitts's Law: **2 marks**.
- Correct application of Fitts's Law to two aspects of user interface: **2 marks**.

Online Lab #6 (7 marks)

Student prompt, ChatGPT response, and ChatGPT-generated reference: **1 mark**.

APA style reference to ChatGPT itself: **1 mark**.

- Correct assessment of ChatGPT article summary: **1 mark**.
- Correct assessment of ChatGPT application of cognitive phenomenon or effect: **1 mark**.
- Correct application of how to use ChatGPT to implement application given above: **1 mark**.
- Explanation for answer provided and correct terminology applied: **2 marks**.