

PSYC278: Lab Final Assignment

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Instructions

Please include your code and the output where relevant. The output is relevant if it directly answers the question being asked. Below is how you should organize your homework:

- Where applicable, include your code in the document and format it so that if it is copied into RStudio, your answers to the questions can be reproduced (do not use screenshots).
- Round your answers to two decimal places, with the exception of p -values, which should be reported to three decimal places unless $p < .001$.
- All questions describe hypothetical experiments. Unless otherwise specified, assume that all tests are two-tailed with $\alpha = 0.05$ (*two-tailed*).
- Upload your final assignment as a .pdf file.

Total Points Possible: 25

Part I (14 pts.)

Q1. A researcher wants to know if one's self-esteem can be accurately perceived by others. The researcher recruited 200 participants for the study, and asked the participants to rate their *Self_Esteem* on a 1-7 point likert-type scale prior to visiting the lab. Once participants arrived in the lab, they were randomly assigned to meet with one other individual and rate their perception of the other's self-esteem (*Perceived_Esteem*) on the same scale. Please find the data in the attached file ***Final_Q1.txt*** on Canvas.

- a) Report the median and variance of *Perceived_Esteem*. (1 pt.)
- b) Create one grouped frequency table containing both frequency and relative frequency of *Perceived_Esteem*. Please group the scores by six intervals with an interval bin size of 1. (2 pt.)
- c) Assuming a linear relationship between *Perceived_Esteem* and *Self_Esteem*, compute an unstandardized ordinary least-squares regression to predict *Perceived_Esteem* using *Self_Esteem*. Please 1) report the regressions results in APA format, 2) interpret the coefficient estimates under the study's background (i.e. what does the two values mean?). (3 pt.)
- d) In the population in which the sample was drawn from, what *Perceived_Esteem* score would you predict for an individual that has a *Self_Esteem* score of 5.5? (1 pt.)

Q2. A stock trader has kept records for the past several years of the daily selling price of a particular stock named *APP*. The distribution of the stock's price (in Canadian dollars) is *normally* shaped with $\mu = 140.56$

and a standard deviation, $SD = 10.75$. What percentage of selling prices were between \$80.50 and \$110.45? **(1 pt.)**

Q3. Anthony is deciding whether to go to graduate school in business or law. He has taken nationally administered aptitude tests for both fields, and he scores 77 on the business exam and 82 on the law exam. The national average is $\mu = 70$ ($\sigma = 7.3$) in business and $\mu = 66$ ($\sigma = 2.4$) in law. Based solely on Anthony's relative standing on these tests, which field should he enter? Assume that the scores making up the national averages on both tests are *normally* distributed. **(1 pt.)**

Q4. A local clinic develops a novel therapeutic program designed to help obese children lose weight. The clinic hires you as a statistical consultant to help evaluate the effectiveness of the program. You decide to recruit a sample of 25 children, whom you weigh (in lbs.) prior to beginning the program and three months later following its completion. The table below contains the data points that you recorded.

id	weight_before	weight_after
01	206.51	81.42
02	136.56	110.33
03	231.42	92.16
04	106.70	48.34
05	142.14	109.75
06	182.78	122.86
07	44.41	182.47
08	125.24	181.35
09	141.53	166.58
10	137.78	93.79
11	159.19	68.60
12	153.98	99.85
13	134.87	171.10
14	212.93	132.90
15	99.15	143.97
16	142.50	102.99
17	198.82	79.10
18	161.13	148.34
19	156.57	117.82
20	175.57	95.44
21	169.47	130.60
22	154.22	159.10
23	188.89	159.10
24	174.80	163.87
25	150.32	117.42

For easier data access:

Weight before the program: 206.51, 136.56, 231.42, 106.70, 142.14, 182.78, 44.41, 125.24, 141.53, 137.78, 159.19, 153.98, 134.87, 212.93, 99.15, 142.50, 198.82, 161.13, 156.57, 175.57, 169.47, 154.22, 188.89, 174.80, 150.32

Weight after the program: 81.42, 110.33, 92.16, 48.34, 109.75, 122.86, 182.47, 181.35, 166.58, 93.79, 68.60, 99.85, 171.10, 132.90, 143.97, 102.99, 79.10, 148.34, 117.82, 95.44, 130.60, 159.10, 159.10, 163.87, 117.42

- (a) State the null hypotheses $\alpha = 0.05_{(two-tailed)}$ **(1 pt.)**
- (b) Is this program effective? What do you conclude? Report in APA. **(2 pt.)**
- (c) What is the power of the experiment? **(1 pt.)**

Q5. A past study suggests that compared to a placebo, naltrexone can alleviate gambling problems with an effect size of 0.3. A psychologist plans to further examine the effectiveness of naltrexone. This study plans to recruit a group of gamblers with problems for the naltrexone condition and another group for the placebo condition. Before data collection, the psychologist needs to calculate the sample size. How many participants does this study need to reach a power of 0.8? ($\alpha = 0.05_{(two-tailed)}$) (1 pt.)

Part II (11 pts.)

Q6. A psychopharmacologist at UBC is interested in whether the effects of marijuana vary depending on a person's history using it. An experiment is conducted in which 36 moderate users, 36 heavy users, and 36 non-users (no prior use of marijuana) are randomly sampled from the university student population. Within each usage level, half of the participants are randomly assigned to a placebo condition and the other half to an experimental condition. (There are $n = 18$ individuals per cell.) In the placebo condition, each participant vaporizes 0.25 grams of inert marijuana that is devoid of its psychoactive compounds. In the experimental condition, each participant vaporizes 0.25 grams of regular marijuana. Five minutes after completing the vaporization session, each participant is given a reaction time test. The results of this experiment are contained in the *marijuana-data.txt* file linked in the assignment description on Canvas. Unfortunately, when the psychopharmacologist asked his RA to enter the data, he forgot to mention that it needed to be in tidy format. The variable name tags of 'none', 'moderate', and 'heavy' correspond to 'no prior use', 'moderate prior use', and 'heavy prior use', respectively.

For the following questions, disregard the placebo group and treat the data as if it were a single factor experiment only involving the experimental group at each level of 'prior use' (i.e. none, moderate, and heavy).

- Conduct a one-way ANOVA to examine if the effect of marijuana on reaction time varies based on prior use. Report your findings in APA format. In doing so, be sure to provide a conceptual interpretation of what the result indicates. (2 pt.)
- Compute and report the estimated effect size ($\hat{\omega}^2$) that corresponds to the result you reported in 2A. Provide a specific interpretation of what this effect estimate means. (2 pt.)
- Still treating this as a single factor ANOVA and disregarding the placebo group, use Tukey's Honestly Significant Difference test to perform all possible pairwise comparisons on reaction time. Organize your results in a table that includes the headers, 'Comparison', ' Q ' (for the studentized range statistic), and ' p ' (for the p -value). (3 pt.)
- Interpret the results from the Tukey's Honestly Significant Difference test based on the study background (1 pt.).
- Create a barplot plot that illustrates the means of each level of 'prior use of marijuana'. Represent levels of 'prior use' as the factor on the x -axis. Further, be sure to include error bars representing the ± 1 standard error away from the group mean. Appropriate axes labels and title are needed (3 pt.)