

PSYC 2113 – Introduction to Statistical Methods in Psychology**Workbook - Winter 2021 - Instructor: Daniel Voyer****READ ALL THESE INSTRUCTIONS CAREFULLY**

This document presents a list of activities that you have to complete by a specific date and hand-in for grading. There are two components, each worth 15% of your final grade (total = 30%). The main grading criteria are whether you have completed all the activities and have done your best to get correct answers. Grades will be deducted for missing activities or for those where insufficient effort or a clear lack of understanding are apparent.

FORMAT: For each component, the following is expected:

- 1- The document will start with a cover page with a title, your name and ID number and the due date (shown below). The title will correspond to the number of the assignment (Workbook 1 or Workbook 2).
- 2- The following pages of the document will show your work for each of the elements of the workbook. They could be handwritten responses to computation exercises or SPSS outputs. It is your responsibility to keep your work in a safe place and collate it in this one document by the due date (you can also paste a photo of handwritten work in a Word document).
- 3- The final document for each workbook will start with the cover page and the remainder of the material will follow. **IMPORTANT:** The components in your workbook have to be in the same order presented in this document or 1 mark will be deducted.
- 4- The material is to be uploaded on D2L on the date shown below. For assignments passed late without prior permission, 2 marks will be deducted per day. Late assignments will simply not be accepted if they are more than 5 days late.
- 5- The assignments are individual work and plagiarism will be dealt with as per academic regulations (see course syllabus and academic calendar for regulations).
- 6- You need to complete the Virtual Lab bonus assignment (see course syllabus) before January 25th, 2021 at 11:59 pm. If you do not, technical issues with Virtual Lab are not a valid excuse for a late workbook.
- 7- Of course, talk to Dr. Voyer or the TAs if you need help. Virtually is better than e-mail to deal with most questions.

IMPORTANT ADVICE: Some of the activities below require you to create data sets. Make sure that you save your data in a safe place when done with data entry. Some of them will be used in more than one activity.

Workbook 1 – Due February 26, 2021 – on D2L before 11:59 pm

Workbook 1.1- Variables and constants

1.1.1. Generate two examples of quantitative variables and two examples of qualitative variables.

1.1.2. Operationally define the following (come up with original examples):

- a) Treatment compliance in medical patients taking daily medication
- b) Hyperactivity in children during recess
- c) Evaluation of anxiety before an exam

1.1.3. You can have a measure that is reliable but not valid. Give an example.

1.1.4. Which method of knowing would be best to determine the percentage of Canadians who have consumed cannabis in the last year? Explain briefly why you think it would be the best method

1.1.5. Still in reference to determining the percentage of Canadians who have consumed cannabis in the last year, if you were asked to collect such data, which data gathering technique do you believe would be best? Again, explain briefly why you think it would be the best method. Name at least one factor that should be kept constant (controlled) in whatever method you select.

Workbook 1.2- Statistical software

Use SPSS to create a data file with two variables based on a data set with 30 participants. Your two variables should be continuous measures ranging from 0 to 75. Try to use the whole range of values for both variables but try to enter the data so that they produce a negative relationship (high score on Variable 1 associated with low scores on Variable 2) reflecting a negative correlation. In the end, if I used temperature in Celsius as variable 1 and number of large coffees sold (in a day) at the Woodstock Road Tim Horton's, my data file would look something like this:

Temp	Sales
10	72
12	65
15	66
20	40
33	7
8	75
etc (30 in	total)

For your workbook: Include a printout of your data with the labels showing (Selecting all the data and clicking “Print” under “File” should take care of that). IMPORTANT: Save the data file in a safe place. You will need it for activities 1.4 and 2.5.

1.3 Descriptive statistics

1.3.1- Fill in the remaining spots (N=104; note that this is a partial table so the Cumulative f will not total to 104 and the cumulative % will not total to 100%)

Grouped Frequency Distribution for the MRT Data

Class interval	Frequency(<i>f</i>)	Relative %	Cumulative <i>f</i>	Cumulative %
0-3	1	0.96	1	0.96
4-7	3	2.88	4	3.85
8-11	3			
12-15	4			
16-19	11			
- - -	- -			

1.3.2 Calculate the mean, median and standard deviation for the following data (set1 = 20, 24, 23, 26, 27, 22). Now, I used the same data but replaced the two largest scores with outliers (set2= 20, 24, 23, 56, 57, 22). Calculate the mean, median and standard deviation for these new data. What do you notice about the mean, median, and standard deviation?

1.3.3. Calculate the z-scores for someone who got a score of 30 in set1. What would be the raw score of someone with a z-score of -1.30 in set1?

1.3.4. My student wrote the Graduate Record Examination and her score are on the 93rd percentile for the quantitative section and on the 37th percentile for verbal reasoning. What do these scores tell us in terms of her performance relative to the group of test-takers?

Workbook 1.4- Use SPSS to calculate the mean, median, and standard deviation of the two variables from the data you created in activity 1.2.

Workbook 1.5- Hypothesis testing

1.5.1. A quality control expert wants to test the null hypothesis that a new solar panel is no more effective than the older model. State the null (H_0) and alternative (H_1) hypotheses in such a way that they reflect a two-tailed test. What would be the consequence of a Type I error in this context?

1.5.2. According to a research report, burning one gallon of gasoline typically emits about 8.9 kg of CO₂. An oil company wants to test a new type of gasoline designed to produce lower CO₂ levels. Here are their hypotheses:

$$H_0: \mu(\text{new fuel}) = 8.9$$

$$H_1: \mu(\text{new fuel}) < 8.9$$

Does this hypothesis test require a one-tailed or two-tailed test? What would be the consequence of a Type 2 error in this context?

1.5.3: Administrators at a large university is curious if they should build another cafeteria. They plan to survey a sample of their students to see if there is strong evidence that the proportion interested in a meal plan is higher than 40% in which case they will consider building a new cafeteria. State the null (H_0) and alternative (H_1) hypotheses in such a way that they reflect a two-tailed test. What would be the consequence of a Type 1 error for this example?

Workbook 2 – Due April 9, 2021 – on D2L before 11:59 pm

Workbook 2.1- z-test and t-test

The data below come from a study designed to examine the following research hypothesis:

Depressed participants who spent one year in cognitive behavioral therapy will show significantly fewer symptoms of depression than a group that dropped out after the first week.

Answer the following questions using these data (n = 10 in each group).

	1-year	Dropped-out
Mean	6.9	9.0
SD	1.4333	1.3111
n	10	10

Remember: Variance (S^2) = SD squared

2.1.1. Clinical criterion for depression on the test used by the therapist is a score of 7.5. Use a one-sample t-test to test the null hypothesis the mean for the group that dropped-out is not significantly different from the clinical criterion.

2.1.2. Compute a two-samples t-test to test the null hypothesis that the two groups are not significantly different from each other.

Workbook 2.2- Two samples t-test with SPSS.

Use SPSS to create a data set that involves two independent groups with 25 people in each group. This means that you need one variable that reflects group membership (independent variable) and one variable that reflects your dependent variable, with scores between 0 and 75 (Make sure that you use the whole range). When creating your data, ensure that the data for one of the groups reflect a significantly higher mean than data for the other group. Make sure that you name both variables and label the values for the group variable to reflect each group. Be creative. Come up with your own variables and labels. For example, if my groups reflected gender and my dependent variable was the score on the Mental Rotation Test (MRT), in “Data View”, my data file would look like this:

Straight numbers:

Gender	MRT
1	65
1	69
2	61
2	72
etc (25 in	Each group)

Showing value labels:

Gender	MRT
Male	15
Male	19
Female	11
Female	12
etc (25 in	each group)

Use SPSS to compute a two-samples t-test with these data. **For your workbook**, paste the t-test results in the document.

Workbook 2.3- ANOVA calculations

The data below represent the results of a study in which adolescent girls indicated whether their best friend was younger, the same age, or older than them. They then rated (from 1 = not helpful at all, to 10 = very helpful) how helpful their best friend was when they faced problems in their life. The data below represent this helpfulness rating ($n = 10$ in each group; total $N = 30$).

	Younger	Same age	Older	Totals
ΣX_g	49	55	77	181
ΣX^2	253	311	601	1165

a) Compute the analysis of variance on these data to determine whether there are significant differences among the group means

b) Compute the percentage of variance accounted for by the effect of the independent variable on the dependent variable.

Workbook 2.4- Analysis of Variance SPSS.

Use SPSS to create a data set that involves three independent groups with 18 people in each group (54 in total). As in Activity 2.3, this means that you need one variable that reflects group membership (independent variable) and one variable that reflects your dependent variable, with scores between 0 and 75 (Make sure that you use the whole range). Here, however, the independent variable will have 3 groups (3 levels). When creating your data, ensure that the data for one of the groups reflect a significantly higher mean than data for the other two groups. As before, make sure that you name both variables and label the values for the group variable to reflect each group. Also, be creative and come up with your own variables and labels. For example, if my groups reflected different treatment groups and my dependent variable was the score on the Mental Rotation Test (MRT), in “Data View”, my data file would look like this:

Showing value labels:

Group	MRT
Control	11
Control	9
Treatment	15
Treatment	19
Placebo	10
Placebo	12
etc (18 in	each
	group)

For your workbook: Use SPSS to compute an analysis of variance (the group variable is the independent variable and the score variable is the dependent variable). Paste the results in your workbook. If you did the data entry correctly, the ANOVA results should be significant with $p < .05$. If not, fix the data (or lose marks).

Workbook 2.5- Correlation and regression with SPSS

With the data you created under Workbook 1.2, Use **SPSS or R** to compute a Pearson correlation and a regression analysis (which variable is the predictor and which one is the dependent variable is your choice). Print the results and include them in your workbook. If you did the data entry correctly, the correlation and regression results should be negative and significant with $p < .05$. If not, fix the data (or lose marks).

ALL DONE!