PSYC234: Lecture 6 post-lecture worksheet

This worksheet is to help you consolidate what you learned during Lecture 6. It contains two activities.

This worksheet could be completed as part of the independent study hours for PSYC234. **It is optional but recommended**. **It is recommended that you complete this worksheet in advance of the WBA.**

Once you have finished, compare your answers to the answer sheet provided on Moodle. You can also use this sheet and the answer sheet for revision purposes when preparing for the class test.

Activity 1: Calculating test statistics manually

Wilcoxon rank-sum test

You are a researcher interested in whether the number of cups of coffee drank affects how many admin tasks participants can get done in an hour. You assign to one of two conditions (drink 4 cups of coffee a day or drink 0 cups of coffee a day). After a week, you ask participants to come into the lab and ask them to complete a range of admin tasks. You count how many admin tasks they manage to complete. The data is below.

Use this data to calculate the test statistic manually:

1. First rank the data

Group	Tasks completed	Rank
4 cups	**5**	2
4 cups	**18**	7
4 cups	**14**	4.5
0 cups	**6**	3
0 cups	**4**	1
0 cups	**17**	6
0 cups	**14**	4.5

2. Sum the ranks

- 4 cups = 13.5
- 0 cups = 14.5

3. Calculate the mean rank

- 4 cups = 3*4 = 12. 12/2 = 6
- 0 cups = 4*5 = 20. 20/2 = 10

4. Calculate the sum of ranks minus mean rank

- 4 cups = 13.5-6 = 7.5
- 0 cups = 14.5-10 = 4.5

5. What is the test statistic?

- Test statistic = The lowest sum of ranks. Test statistic = 4.5

6. What might R report as the test statistic and why?

- R reports the test statistic (*W*) as the sum of ranks minus the mean rank for the first factor level. R may therefore report the test statistic as 4.5 or 7.5.

Wilcoxon signed-rank test

You are a researcher interested in whether a reading intervention helps children. You assess children's reading skills and then give them all an intensive reading intervention. You then measure their reading abilities again.

Use this data to calculate the test statistic manually

1. Calculate the difference between "Before intervention" and "After intervention"
2. Note whether the difference is positive or negative
3. Rank the difference

Before intervention	After intervention	Difference	+ or -	Rank
23	27	-4	-	2
34	34	Exclude		
67	91	-24	-	4
65	67	-2	-	1
21	44	-23	-	3

4. Next, add up positive ranks and negative ranks:

    - Positive ranks: 0
    - Negative ranks: 10

5. What is the test statistic (*T*) (i.e. the test statistic if you were calculating the test statistic manually)?

   - *T* = 0

6. R reports a test statistic "V" instead of R. What might V equal to? Why might V equal to two values?

   - *V* = 0 or 10. V is equal to the sum of positive ranks. But whether ranks are positive or negative depends on whether you enter "before" or "after" first into the wilcox.test function (as this determines whether you calculate the difference by doing before-after or after-before).

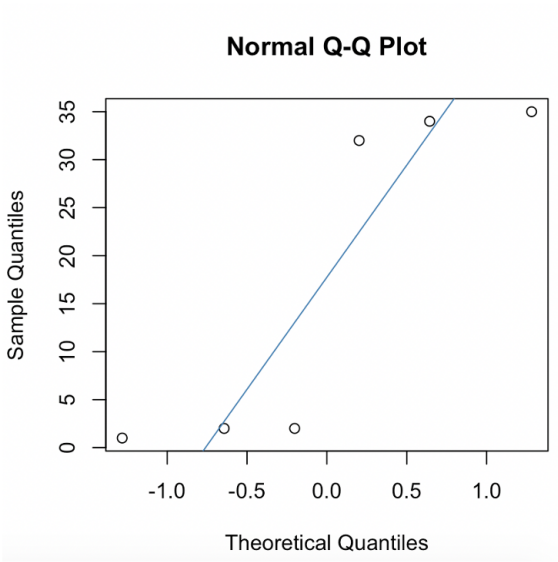
Activity 2: Interpreting R output

Interpret the following R output. Part 1 uses an independent groups design. Part 2 uses a repeated measures design. Please note, this data is different to that used in Activity 1 (so the test statistics will be different).

Part 1: An independent groups design

1A: Testing the assumption of normality

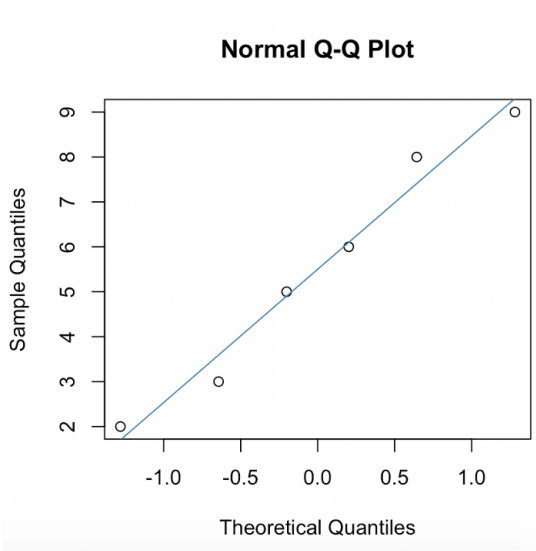
Group 1:




```
        Shapiro-Wilk normality test

data:  group1$Outcome
W = 0.72773, p-value = 0.01196
```

Group 2:




```
        Shapiro-Wilk normality test

data:  group2$Outcome
W = 0.95764, p-value = 0.8014
```

Interpretation:

- Group 1: The assumption of normality is violated. Quite a few points deviate from the line in the Q-Q plot and the Shapiro-Wilk test is significant.
- Group 2: The assumption of normality is not violated. The dots generally follow the line well in the Q-Q plot and the Shapiro-Wilk test is non-significant.

1B: Interpret the descriptive statistics and the model output

Descriptive statistics:

	Group	med	min	max	`n()`
	<int>	<dbl>	<int>	<int>	<int>
1	1	17	1	35	6
2	2	5.5	2	9	6

Model output:

```
        Wilcoxon rank sum test with continuity correction

data:  Outcome by Group
W = 19, p-value = 0.9357
alternative hypothesis: true location shift is not equal to 0
```

What can we conclude? Report in APA format.

The Wilcoxon rank-sum test revealed no significant difference between Group 1 (Median = 17, Range = 1-35) and Group 2 (Median = 5.5, Range = 2-9; W = 19, p = 0.936).

Note: In practice, you should also calculate the effect size and report that.

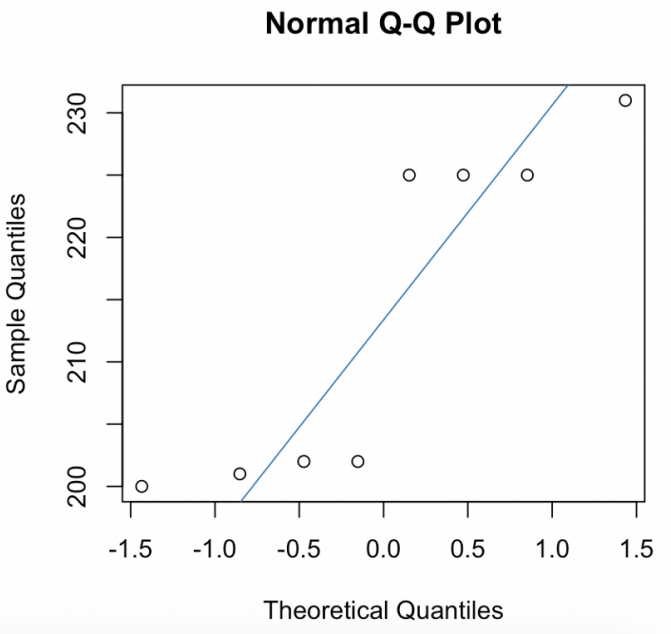
How was the p-value calculated?

The normal approximation with the continuity correction

Part 2: A repeated measures design

You are a researcher interested in whether the amount of chocolate eaten is different before and after the participant goes a diet.

2B: Testing the assumption of normality




```
        Shapiro-Wilk normality test

data:  data2$Difference
W = 0.76888, p-value = 0.01318
```

What can we conclude?

The assumption of normality is violated. Some points deviate quite a bit from the line in the Q-Q plot and the Shapiro-Wilk test is significant.

2B: Interpret the descriptive statistics and the model output

Descriptive statistics:

	median_before	median_after	min_before	min_after	max_before	max_after	n()
1	232	18	230	4	235	33	8

Model output:

```
        Wilcoxon signed rank test with continuity correction

data:  data2$Before and data2$After
V = 36, p-value = 0.01368
alternative hypothesis: true location shift is not equal to 0
```

What can we conclude? Report in APA format.

The Wilcoxon signed-rank test revealed that participants ate significantly more grams of chocolate before the diet (Median = 232, Range = 230-235) than after the diet (Median = 18; Range = 4-33), $V = 36$, $p = 0.014$.

Note: In practice, you should also calculate the effect size and report that.

What method was used to calculate the p-value?

The normal approximation with the continuity correction.