PSYC077H7: Advanced Quantitative Methods  
Assessed Coursework: Resit – General Worksheet

This worksheet is designed to cover all material covered in AQM 2022 – 2023. Each part of this worksheets covers the material of each worksheet (i.e., Part A reflects material covered in Worksheet 1 and so on). While there are 200 marks available in the worksheet, the final grade will be out of 100. The weighting of each Part reflects the weighting of the respective worksheet (10% for Worksheet 1; 25% for Worksheet 2; 30% for Worksheet 3, and 35% for worksheet 4). This is already reflected in the marks for each question (i.e., 20 / 200 for Worksheet 1 is 10% of the overall mark).

# PART A (20 marks)

# Section 1 (10 marks)

The file “GeneralWorksheet\_PartA\_Mood.sav” contains scores of 71 subjects. The subjects completed a task and before the task mood ratings of positive as well as negative affect were taken.

1. Use SPSS (or similar) to calculate the descriptive statistics (including mean, standard deviation, skewness, and kurtosis) for mood ratings (positive mood and negative mood) separated by Gender and present them in table format (using APA). Comment on the pattern you see. How does mood ratings differ according to Gender? [4 marks]
2. Perform an analysis to see if there are any differences between positive and negative mood (separately) in men and in women. Perform an appropriate parametric statistical test to test this hypothesis and report the results in APA format. Report the type of test conducted. [4 marks]
3. If you were to instead test for gender differences for each of the positive and negative mood variables, what type of test would you have to conduct (you are not expected to run this test)? What does it mean if Levene’s test is significant and what would you need to do in this situation? [2 marks]

**Section 2 (10 marks)**

You are interested in examining the relationship between time spent on Instagram and depression in teenagers and adults. The file GeneralWorksheet\_PartA\_Instagram.sav includes data for daily minutes on Instagram and level of depression reported by adults and teenagers.

1. Draw a scatterplot to reflect the relationship between time spent on Instagram and depression in teenagers and adults. What pattern of relationship do you see? Does this relationship differ according to group? Comment. [3 marks]
2. Perform a regression analysis to assess the predictive utility of time spent on Instagram in explaining depression levels for each group separately. How good a predictor is ‘time spent on Instagram’ of depression for each group? Compare the results. [3 marks]
3. How would you determine if there is good external validity on your regression? Describe the different patterns that need to be consulted. [2 marks]
4. If someone in this sample had spent 40 minutes a day on Instagram, what would your model predict for his depression levels for teenagers? [2 marks]

**PART B (50 marks)**

**Section 1 (25 marks)**

The data file GeneralWorksheet\_PartB\_Gambling.sav contains data from a study looking at factors predicting gambling. Here, the roles of Neuroticism, Depression, Impulsiveness and Attentional Control were examined. Gambling was measured with the number of gambling incidents during a given week. Participants were selected from various gambling centre email lists and completed the above questionnaires.

1. How do the variables correlate with Gambling and also amongst each other? Comment on the coefficients. Comment on whether you are concerned about multicolinearity. [5 marks]
2. Run a standard regression using the ENTER method and comment on the model and coefficients. Comment on the explanatory power of the variables. [10 marks]
3. Repeat Question 2 using a hierarchical regression, with Neuroticism in Step 1, Impulsivity in Step 2, and Depression and Attentional Control in Step 3. Explain your findings and compare them to the results of Question 2. [10 marks]

**Section 2 (25 marks)**

You are interested in examining the factors that can predict a successful facial lift outcome. In the data file GeneralWorksheet\_PartB\_FLoutcome.sav a few of the variables that you have measured to predict the likelihood of facial lift success are presented: these are ‘Believe’ which measures the extent to which patient believes and has faith in the outcome; ‘Age of Surgeon’ which classifies the surgeon as young or old, and the final variable measures the extent of atrophy to face before surgery.

Perform a standard logistic regression analysis to assess the predictive utility of the variables under investigation in predicting the likelihood of success of facial lift. Please **do not include** the interaction of the two independent variables in the model.

1. Comment on the classification table(s) of interest. What percentage of the cases is correctly and incorrectly classified by the model’s attempt at each stage of the analysis? [8 marks]
2. Comment on the significance of the model(s) tested, the amount of variation explained by the model(s), and the -2LLs of interest. [10 marks]
3. Which variable(s) predict the likelihood of facial lift significantly? Provide an interpretation of the significance of Exp (B) of the significant variable(s). [7 marks]

**PART C (60 marks)**

**Section 1 (30 marks)**

Talking therapy is a popular method to reduce emotional vulnerability in adolescents. You would like to test the efficacy of talking therapy to adolescents with social phobia (an anxiety disorder). You randomly allocate your participants to an intervention group and a control group. The intervention group is encouraged to talk about their anxieties and the control group talks about the activities they’ve engaged in during the day. They do this for one week. You measure anxiety via a cognitive task that measures attention to negative and neutral stimuli using eye-movements in a visual search task. According to the literature longer dwell times on negative material can indicate an impaired ability to disengage from the processing of threat related material. Participants completed a version of this task before talking therapy, immediately after therapy, and a week after to see if any change in attentional bias as a result of therapy was sustained. Attentional bias is the difference in dwell times between negative and neutral stimuli and was measured in milliseconds. Whether individuals were light sleepers or heavy sleepers was also examined. The data is in the file: GeneralWorksheet\_PartC\_Therapy.sav.

1. Sketch and describe the design of this experiment; identify the factors, their corresponding levels, and state if the factor is within-subjects or between-subjects. Formulate two hypotheses for your experimental manipulations of interest. [6 marks]

Conduct an appropriate ANOVA to test for the main effects and interaction effects of interest. Address the following questions.

1. Produce two graphs that show the effects of therapy group across time as a function of sleep separately. Comment on the pattern you see. [12 marks]

1. Report and comment on the respective three-way interaction effect that would corroborate your observation in Question 2 above. What would you conclude from this interaction? Using linear and quadratic contrasts for intervention elaborate on the effects of training over time. [12 marks]

**Section 2 (20 marks**)

Rumination is a process by which negatively laden thoughts in working memory interfere with processing efficiency during task performance. You are interested in understanding how these laden thoughts interfere with attention during a time of high stress (before exams) and during a time of low stress (after exams). Participants are assigned to either a group where they are encouraged to worry for 5 minutes about a relevant concern, a group where they are encouraged to think about the positive impact of a near future event, or a group where they are asked to think about anything. During this period, participants are also asked to complete a simple attention task where participants are asked to locate a square among other shapes. The time it takes for them to respond is measured in milliseconds (ms). You test participants twice, once before exams and once after exams.

Conduct an appropriate ANOVA to understand the differential effects of your group manipulation on the attention task. The data is in the file: GeneralWorksheet\_PartC\_Attention.sav

1. Produce a graph that shows the response times in each of your three groups before and after exams. Comment on the pattern you see. [8 marks]
2. Does ruminating result in a poorer performance (longer response times) during an attention task?
3. Support your argument by stating the main effect(s) and interaction effect and a follow up description of the effects. Please include a simple effects analysis for the interaction. [10 marks]

1. Using the relevant formulae, calculate the df for the explained variance in the interaction effect. Show how the F-value for the interaction effect of ‘Time X Group’ is derived. [2 marks]

**Section 3 (10 marks)**

Working memory capacity (WMC) can also influence our ability to pay attention. To understand if WMC is influencing participant’s response times during the attention task before exams, re-examine your effects after covarying the effects of WMC on RTbefore (go back to the datafile GeneralWorksheet\_PartC\_Attention.sav).

Perform an appropriate analysis to covary for the effects of WMC that could possibly be influencing participants’ response times (ms) before exams.

1. How do the pattern of means (adjusted for covariate) change after controlling for the possible effects of WMC on response times? Is WMC significantly influencing response times before exams? How does the effect of Group on response times change when you partial out for WMC? [8 marks]
2. Calculate the effect size for the contrast looking at ‘Ruminate’ vs ‘positive’. Comment on the amount of variation in RT before explained by this contrast. [2 marks]

**PART D (70 marks)**

1. Assume that you are interested in investigating if there are common underlying dimensions to statistics course performance for Psychology students. You recruit 250 participants who complete a questionnaire that is supposed to tap into different aspects of statistics learning and student performance (see below). Items on this questionnaire are rated on a 1 – 10 point scale. The items included the following characteristics of learning such as feedback, attendance, coursework performance, maths and statistics anxiety, teacher interaction and so forth.

The data are in the file: “GeneralWorksheet\_PartD\_Statistics.sav”. Perform a factor analysis (with principal axis factoring), using an appropriate rotation, to investigate the latent structure of the data. Each of the questions carries 6 marks.

* 1. Comment on the appropriateness of this dataset for PCA, in terms of sample size and sampling adequacy. Provide relevant statistics to justify your answers. [6 marks]
  2. How many factors should be retained and how much overall variance can be explained?

What method of rotation have you used and why? Explain your answers quoting any relevant statistics. [6 marks]

* 1. Report the explained variance and the eigenvalues of each latent factor. How might you interpret these results in terms of the latent structure underlying performance in statistics? [6 marks]
  2. Is each of the factors reliable? Report on the reliability figures for each subscale. [6 marks]

1. In a study that looked at the effects of adaptive cognitive training using a dual n-back task on cognitive flexibility and emotional vulnerability, you are interested to see how the rate of improvement on the training task mediates the relationship between self-reported emotional vulnerability (predictor; assessed using a 0 – 100 mm scale: higher scores indicate greater emotional vulnerability), and avoidance of threat (outcome; higher scores indicate greater avoidance) as measured by attentional bias. How would we know if mediation has occurred? Describe all relevant relationships that would need to be considered using the example. [8 marks]
2. There is continuing debate over whether stressful life events in interaction with genetic risk factors for depression predict depressive severity in adolescents with clinically diagnosed depressed mothers. The data in the file GeneralWorksheet\_PartD\_Risk.sav shows data from 70 teenagers who were genetically screened for risk of developing depression (Risk), the average number of traumatic events they reported they had in the last two years prior to testing (events), and the severity of the depressive symptoms they experienced (Severity). Do ‘events’ moderate the effect of genetically determined risk factors in predicting depressive severity? Corroborate your answer with a simple slope analysis to show the moderating effect (if any) of Events on Risk factors, in predicting Severity and discuss the Johnson-Neyman significance regions. What conclusions can you draw from your moderation analysis? What do your results say about the Environment X Gene interaction in predicting depressive severity? [22 marks]
3. The table below shows the data from 9 experiments that looked at how attentional bias training away from threat (hours spent training per day for a week) would result in a change/reduction in attentional bias for angry faces in socially anxious individuals (change/reduction: post test – pre test, with higher scores indicative of greater reduction in attentional bias). You intend to use this information to conduct a meta analysis based on effect sizes from the studies obtained. Each question carries 8 marks.

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| --- | --- | --- | --- | --- | --- | --- |
| Study | Training per day (hrs) | Reduction/Change in AB (ms) | SD | *t* | N | *p* |
| A | 5.5 | 15.96 | 5.4 | 5.05 | 36 | 0.001 |
| B | 2 | 2.74 | 5.5 | 0.051 | 25 | 0.33 |
| C | 3.1 | 14.74 | 2.1 | 5.26 | 60 | 0.001 |
| D | 4.3 | 15.62 | 4.7 | 4.10 | 60 | 0.0001 |
| E | 2.1 | 13.78 | 3.6 | 1.78 | 14 | 0.05 |
| F | 0.5 | -2.70 | 6.1 | -0.33 | 18 | 0.87 |
| G | 3.3 | 13.44 | 3.2 | 5.23 | 30 | 0.012 |
| H | 7.8 | 18.32 | 3.3 | 6.20 | 32 | 0.0001 |
| I | 1.9 | -2.93 | 3.2 | -0.13 | 18 | 0.66 |

1. Calculate and interpret a composite measure of significance using Fisher’s Combined Test. Show all your work including the equation. You will need to consult a table of the χ2 statistic, which can be found in the appendices of most statistics textbooks (and the class handout). [8 marks]

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1. Calculate Cohen’s *d* for each of the studies. Calculate the composite effect size (expressed in Cohen’s *d*) and its 95% confidence interval. [8 marks]