D. Clin. Psy. 2\textsuperscript{nd} Year Statistics Examination 2010

Maximum time allowed 3 hours

\textbf{Instructions}
Please read the following instructions carefully before beginning the exam:

1. You are not allowed to communicate in any way with other candidates during the exam.
2. You are allowed to use textbooks and lecture notes if you wish.
3. Please do not change the dataset in any way unless explicitly told to do so. Although you may be asked to identify outliers or suggest transformations, \textit{please do not actually make any such changes unless explicitly told to do so.}
4. Please write your candidate number clearly at the top of each page of your answer booklet.
5. You must answer all questions. Failure to answer a question will mean a mark of zero being given for that question. Always attempt to answer all questions.
6. The numbers in brackets at the end of each question refer to the basic marks available for that question. Bear this in mind when answering. Please note however that there will not necessarily be a one-to-one correspondence between the number of marks available and the apparent number of specific answers to any one question. For example, harder questions may be assigned more marks than easier ones, regardless of the number of responses required.
7. Some questions will include brackets that indicate a possible plural, e.g. statistic(s). This in no way indicates that a plural is or is not expected.
8. If you have any questions about the exam, or you need more paper, quietly raise your hand and wait for an invigilator to come to your desk.
9. Please write clearly on the answer sheet.
10. The amount of space given for a question is not an indication of the length of answer expected.
11. All questions should be marked on the answer sheet. If you do not have enough space to finish your answer please continue in the \textit{additional paper} booklet, marking the question number carefully. If you use extra paper please ensure that each page is marked with your candidate number and that all sheets are tied together with the answer booklet.
12. Please do not write answers purely in list form or in shorthand, unless you are forced to do so due to constraints of time. Marks will be given for clear and concise answers.
13. When you have finished answering all the questions please raise your hand and wait for an invigilator to check your answer sheet. You may then leave.
14. Questions 1 – 10 do not require SPSS. Only question 11 requires you to use SPSS.
15. Note that 54\% of the possible marks are allocated to question 11.

The data file for the SPSS section is online at:

\url{http://tinyurl.com/dclinstats10}
Please answer all the questions in this exam. Remember that your answers need only be brief. This exam is a test of your knowledge of statistics and your practical knowledge of SPSS not a test of critical skills.

Please also note that there are a maximum of 52 marks to be gained in this exam. Therefore, as a rough guide, you should aim to spend no more than 3 minutes on a question worth 1 mark.

Section I
Note: This section does not require you to use SPSS

Multiple Choice Questions
Please circle the correct answer below.

1. For large sample sizes, the t-distribution is almost identical to the normal distribution
   
   True       False       [1]

2. The Bonferroni correction is not used in one-tailed tests.
   
   True       False       [1]

3. If two independent events have probabilities of 0.1 and 0.25 then the probability of both occurring is one-fortieth.
   
   True       False       [1]

4. There is no such thing as a one-way mixed ANOVA.
   
   True       False       [1]

5. If an individual score is identified as an outlier, you must remove the entire case from your analysis.
   
   True       False       [1]
6. On analyzing the data from a treatment-versus-control group study, you find that none of your predicted effects are significant. Explain why this might have happened, with reference to power analysis, effect size and sample size [4]
7. Among the population seen by your adult mental health service, 45% of people define themselves as religious. What is the probability that one or more of your next 4 referrals is non-religious? [3]

8. Describe the central limit theorem and its relationship to null hypothesis testing. [4]
Research into schizotypy has shown that certain groups of people have similar experiences to the
positive symptoms of schizophrenia but remain functioning members of society. A study was
conducted to explore the incidence of delusional ideation in New Religious Movements (NRMs). An
NRM group including Hare Krishnas and Druids was compared to two control groups (non-religious
and Christian), and to a fourth group of deluded, psychotic in-patients on two delusions measures,
the Peters et al. Delusions Inventory (PDI) and the Delusions Symptom-State Inventory (DSSI).
Both of these measures yielded a single score and can be considered continuous variables. How
would you analyse this study? Please state the name of the statistical technique(s) and the
independent and dependent variables. Please also describe the kinds of conclusions the analysis
would allow the researcher to come to. Can you think of any weaknesses in the study's design? [4]
10. A study was conducted to investigate the effects of eye movements on the vividness of recall of emotional memory. Subjects first observed three events of high emotional valence, each of which would be used in one of these conditions: (i) eye-movements, (ii) finger-tapping and (iii) no-treatment. Next, each event was recalled and then rated for vividness on a continuous scale. During recall the condition associated with that event was applied. Then, after a delay of 15 minutes, the memories were recalled again in the absence of the treatments and the vividness rating repeated. Thus each subject provided memory scores for every condition, and at two time points. How would you analyse this study? Please state the name of the statistical technique(s) and the independent and dependent variables. Please also describe the kinds of conclusions the analysis would allow the researcher to come to. Can you think of any weaknesses in the study's design? [4]
Section II

11. Introduction: This section requires that you use SPSS for Windows. Read each question carefully and write your answers in the spaces provided. As before, if you need to continue beyond the space available please use the additional paper provided, marking the question number clearly in the margin.

When conducting statistical tests for this exam, it is not necessary to consider issues of normality and other assumptions relating to the specific test, unless explicitly instructed to do so.

The data file you have been given (exam10.sav) contains data from a study conducted to investigate the effectiveness of relaxation training for anxiety reduction in two groups of clients, a group suffering from agoraphobia (group = 0) and another group with generalized anxiety disorder (group = 1). Each client’s anxiety (BAI scores) was recorded before training (anx_pre) and after training (anx_post). Change in anxiety was calculated from these two measures (anx_diff). In addition the investigators recorded clients’ age (age) and a measure of social support (socsup). Apart from the categorical variable group, all variables should be considered continuous.

a) Consider the variable representing age (age). Make brief notes about the distribution of the variable in relation to issues of normality and outliers. Would you suggest any remedial changes to the variable, and if so, what would they be (do not apply them to the data in SPSS)? [3]
b) Is there a relationship between age (\texttt{age}) and pre-training anxiety (\texttt{anx\_pre})? Please quote the name of the statistical test you did, the relevant statistic(s) and the probability values(s). If the test is significant, comment on the direction/source of the effect. [3]

c) Consider the variable representing pre-training anxiety (\texttt{anx\_pre}). Make brief notes about the distribution of the variable in relation to issues of normality and outliers, separately for agoraphobic and for GAD clients. Would you suggest any remedial changes to the variable, and if so, what would they be (do not apply them to the data in SPSS)? [3]
d) Is there an overall difference in anxiety pre-training (anx_pre) and post-training (anx_post), ignoring the diagnostic categories? Please quote the name of the statistical test you did, the relevant statistic(s) and the probability values(s). If a test is significant, comment on the direction/source of the effect. [3]
e) Is the change in anxiety level (anx_diff) different for the two client groups? Please quote the name of the statistical test you did, the relevant statistic(s) and the probability values(s). If a test is significant, comment on the direction/source of the effect. [3]

f) Split the sample into two roughly equal age groups. Call this new variable age_grp. Describe briefly how you did this (you do not need to discuss which buttons were pressed or which SPSS commands were used). Quote how many cases were actually in each group. [2]
g) Perform a statistical analysis to see whether the effect of presenting problem (represented by variable group) on treatment effect (anx_diff) is different for the two age groups (age_grp). Please quote the name of the statistical test you did, the relevant statistic(s) and the probability values(s). If a test is significant, comment on the direction/source of the effect. [3]
h) Draw a graph representing the nature of any effect(s) found in the previous section. Please comment on the meaning of the pattern of results. [2]
i) Is the presenting problem (group) predictive of improvement (anx_diff) after controlling for age (age) and social support (socsupp)? Quote any relevant statistics and describe the test you used. [3]

j) Please discuss the overall pattern of findings in this series of analyses. What conclusions can be drawn about the efficacy of relaxation training on anxiety in the two clinical groups? What are the weaknesses in the study, and how might these be addressed? [3]
End of examination

Please check your answers carefully. Please also make sure that your candidate number is written clearly at the top of every page of your answer booklet and if you have used any extra paper please make sure that every page is labeled with your candidate number and that these extra sheets are tied together with your answer booklet.