UNIVERSITY OF ESSEX

PS115 Statistics Assignment 2 (Computer-Based Assignment) 2021

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PS115   STATISTICS FOR PSYCHOLOGISTS

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This is the PS115 Computer-Based Assignment. The assignment is designed to test students' skills and knowledge about performing statistics, using SPSS and reporting their results.

You should complete this assignment offline and submit your answers via the link that you have been given. For the longer responses (e.g., reporting results in Section A), you may wish to type your answers into a Word document, so that you can copy and paste them into the survey.

You must submit your answers before the deadline: Friday, 30ᵗʰ April at 5pm UK time. It will take some time to enter all your responses into the survey, so be sure to leave yourself enough time.

You have been provided with two SPSS files that you need to complete this assignment: *Verbal.sav* and *Box.sav*. These files were emailed to you and can also be downloaded from the survey link.

IMPORTANT: These files are associated with YOUR student registration number, **so you should only use these files and not those that you have obtained from other students or elsewhere.** Different students will have different questions and data, and if you give answers for the incorrect data you may receive a mark of zero.

The answers that you enter should be your own work. Work which is plagiarised or identical to other students may receive a mark of zero. **Collusion with other students, including chatting about your questions and answers during the week, is not permitted and may be an academic offence. Sharing this paper, or the associated data files, is strictly prohibited.**

This assignment has two sections.

> In **Section A**, you will be asked to write a short results section based on some analysis you will perform in SPSS, as well as answering some additional questions. **Full details of this study are on pages 2-3.**

> In **Section B**, there are some additional questions based on a second set of data. **Full details of this study are on page 7.**

There are 75 marks available. Section A = 43 marks, Section B = 32 marks. The number of marks available for each question is shown in brackets.

For determining *statistical significance* you should use a significance level of .05. Unless otherwise stated, you should report numerical values *to three significant figures*.

SECTION A (INFORMATION)

The questions in Section A are about the Verbal Relations Study (Data file: Verbal.sav)

Information on the Verbal Relations Study
Participants in this study were given a series of problems, which are known as verbal relations problems (see Table 1). Three types of problems were used:

(1) *Visual relations problems:* These problems involve inferences about the properties of objects that can be made from sentences that include words such as *cleaner-dirtier*, *fatter-thinner*, or *larger-smaller*.

(2) *Spatial relations problems:* These problems involve inferences about the location of objects that can be made on the basis of information about the position of objects. They use words such as *above-below*, *left-right*, or *front-back*.

(3) *Control relations problems:* These problems involve inferences that are neither visual nor spatial. They use words such as *better-worse*, *smarter-dumber*, or *nicer-nastier*.

Table 1. Examples of the three types of verbal relations problems that were used in this study.

(1) visual relations problem	(2) spatial relations problem	(3) control relations problem
The dog is cleaner than the cat	The spoon is below the fork	Bob is smarter than Rick
The ape is dirtier than the cat	The knife is above the fork	Pete is dumber than Rick
Does it follow:	Does it follow:	Does it follow:
The dog is cleaner than the ape?	The knife is below the spoon?	Pete is smarter than Bob?

Each participant was given 90 verbal relations problems: 30 visual relations problems, 30 spatial relations problems, and 30 control relations problems. All problems were presented in auditory format via headphones (i.e., a recording of the problem being read aloud was played to the participant). Participants answered 'yes' or 'no' out loud. Voice-activation software was used to record the time taken (in milliseconds) to respond to each question. Participants' answers were recorded and scored according to whether the answers given were correct or incorrect.

For each participant, the number of correct answers out of 30 was recorded separately for each of the three types of problem. For each participant, the mean response time (in milliseconds) was also recorded separately for each of the three types of problem. The mean response time (for each participant) is referred to as the *latency*.

The psychologist conducting the study was interested in the role of mental imagery in solving these problems. As a result of this interest, the psychologist chose to include some blind participants in the study. The reason for this is that some blind people are known to have difficulties using mental imagery. The study therefore included two groups of participants: sighted participants and blind participants.

The age and sex of each participant was recorded. For the blind participants, the number of years that they had been blind was recorded. All relevant data were collected for all participants, with no missing values.

The data were entered into an *SPSS* data file using the following variable names (shown in bold type):

age   Age of participant in years
sex   Sex of participant   [**1** = male, **2** = female]
vision   Participant group   [**1** = sighted, **2** = blind]
time.bl   Number of years that the participant has been blind {blind participants only}
acc.vis   Number of visual relations problems correct out of 30
lat.vis   Latency for the visual relations problems (milliseconds)
acc.spat   Number of spatial relations problems correct out of 30
lat.spat   Latency for the spatial relations problems (milliseconds)
acc.cont   Number of control relations problems correct out of 30
lat.cont   Latency for the control relations problems (milliseconds)

The data for the first five participants are as follows when they are entered into the *SPSS* data file:

	age	sex	vision	time.bl	acc.vis	lat.vis	acc.spat	lat.spat	acc.cont	lat.cont
1	25	male	sighted	.	20.0	2087	19.0	964	18.0	1760
2	24	male	blind	14	20.0	3987	18.0	3682	28.0	1717
3	22	female	sighted	.	21.0	768	20.0	2152	23.0	831
4	21	female	blind	11	20.0	3819	15.0	2988	21.0	1939
5	24	male	sighted	.	23.0	1808	16.0	2608	19.0	1608

The psychologist who conducted this study made a number of predictions (**P**), which are recorded below:

P1a   Blind participants will get fewer of the visual relations problems correct than sighted participants.

P1b   Blind participants will be slower than sighted participants to answer the visual relations problems.

P1c   Among the blind participants, there will be a linear relationship between the time that they have been blind and their accuracy on the visual problems, such that those who have been blind longer will get fewer visual relations problems correct

P1d   Among the blind participants, there will be a linear relationship between the time that they have been blind and their latency on the visual problems, such that those who have been blind longer will have longer latency times.

P2a   Blind participants will get fewer of the spatial relations problems correct than sighted participants.

P2b   Blind participants will be slower than sighted participants to answer the spatial relations problems.

P2c   Among the blind participants, there will be a linear relationship between the time that they have been blind and their accuracy on the spatial problems, such that those who have been blind longer will get fewer spatial relations problems correct.

P2d   Among the blind participants, there will be a linear relationship between the time that they have been blind and their latency on the spatial problems, such that those who have been blind longer will have longer latency times.

P3a   Blind participants will *NOT* differ significantly from sighted participants in the number of control relations problems that they get correct.

P3b   Blind participants will *NOT* differ significantly from sighted participants in the time that they take to answer the control relations problems.

P3c   Among the blind participants, there will be *NO* statistically significant linear relationship between time that they have been blind and their accuracy on the control problems.

P3d   Among the blind participants, there will be *NO* statistically significant linear relationship between time that they have been blind and their latency on the control problems.

P4   For all three types of verbal relations problems, there will be a speed-accuracy trade-off such that participants who respond more quickly will make more errors.

In addition, there are a number of methodological assumptions (**M**) that the psychologist wishes to examine. The results of these analyses may influence how the data are interpreted, or what further analyses are performed.

M5a   The mean age of the sighted participants will *NOT* differ significantly from the mean age of the blind participants.

M5b   There will be *NO* significant difference in the proportion of males between the blind and sighted groups.

M6   For all three types of problem, performance will be significantly better than chance. In other words, the mean number of problems correct will be significantly greater than 15 (out of 30).

M7a   When combined together (e.g., by averaging or summing values), the number correct in visual, spatial and control relations problems will form an internally consistent measure.

M7b   When combined together (e.g., by averaging or summing values), the latency for visual, spatial and control relations problems will form an internally consistent measure.

SECTION A (RESULTS SECTION)

The questions in Section A are about the Verbal Relations Study. Use the following *SPSS* data file for Section A: **Verbal.sav**

Question A1 [35 marks]

For this question, you need *only* consider the following three predictions that relate to the number of spatial relations problems that participants got correct:

M6 For all three types of problem, performance will be significantly better than chance. In other words, the mean number of problems correct will be significantly greater than 15 (out of 30). **ONLY CONSIDER PERFORMANCE ON THE SPATIAL RELATIONS TASK – DO NOT EXAMINE PERFORMANCE ON THE OTHER TWO TASKS.**

P2a Blind participants will get fewer of the spatial relations problems correct than sighted participants.

P2c Among the blind participants, there will be a linear relationship between the time that they have been blind and their accuracy on the spatial problems, such that those who have been blind longer will get fewer spatial relations problems correct.

Use the data in the file that you have been provided with to write a summary appropriate for the results section in a formal report in psychology. Analyse and report only the information that is appropriate for each prediction. You should assume that the only variables of interest for your results section are the ones needed to investigate these two predictions.

You can answer this question with text only (i.e., you do not need to include tables or graphs). **You should write in full sentences. Marks will be awarded for clarity and correct interpretation of the statistical data.** In order to save space and time, you may use the abbreviations M6, P2a and P2c to refer to the predictions. Any other abbreviations that you use should be defined first. You may assume that parametric statistical tests can be used for analyses that involve measurement data (i.e., for analyses that involve at least one NON-categorical variable). Depending on your web browser, you may find that you have problems entering some symbols (e.g., "<") – this is a problem with how the text is displayed only, and will not affect your mark. If you wish to use Greek letters you can use the Roman equivalents or write them in words ("alpha", "beta", "chi" etc.).

Report your results for M6 here:

Report your results for P2a here:

Report your results for P2c here:

Question A2 [8 marks]

For this question, you need to think about the procedures appropriate for testing the following predictions/assumptions. You do *not* need to perform these tests, though it will help to look at the relevant variables when considering which test is most appropriate.

(a) Which statistical test would be most appropriate for testing prediction **P1b**?

(CIRCLE ONE ANSWER)

| Independent samples *t*-test | Paired samples *t*-test | Pearson's Correlation | Chi-squared goodness of fit test | Chi-squared test for contingency tables |

(b) Which statistical test would be most appropriate for testing prediction **P4**?

(CIRCLE ONE ANSWER)

| Independent samples *t*-test | Paired samples *t*-test | Pearson's Correlation | Chi-squared goodness of fit test | Chi-squared test for contingency tables |

(c) Which statistical test would be most appropriate for testing assumption **M5b**?

(CIRCLE ONE ANSWER)

| Independent samples *t*-test | Paired samples *t*-test | Pearson's Correlation | Chi-squared goodness of fit test | Chi-squared test for contingency tables |

(d) Which measure would you calculate to evaluate assumptions **M7a** and **M7b**? Write the name of this measure/procedure here:

_____

(e) Which one of these tests could also be used to examine **M7a** and **M7b**?

(CIRCLE ONE ANSWER)

Independent samples *t*-test	Paired samples *t*-test	Pearson's Correlation	Chi-squared goodness of fit test	Chi-squared test for contingency tables

(f) After examining prediction **P4** across all participants, the researcher decides to repeat this analysis for the *blind* and *sighted* groups separately.

(i) Without knowing the outcome, which of these analyses is likely to have more statistical power? (CIRCLE ONE ANSWER)

The analysis in the blind group   **The analysis in the sighted group**

(ii) Explain briefly *why* this analysis is likely to have greater statistical power:

_____

_____

_____

_____

END OF SECTION A

SECTION B (INFORMATION)

The questions in Section B are about the Closed Box Study (Data file: **Box.sav**)

Information on the Closed Box Study

A psychologist has conducted a study into children's problem solving. The task in this study required children to release a catch on a box to allow a doll to 'escape' from the closed box. Children could not touch the box, but had to use an object to release the catch. Four objects were on the same table as the box (a key, a tennis ball, a long pencil, and a cup), but only one of these (the long pencil) could actually be used to successfully release the catch. This long pencil is referred to as the *target object* (as it is the object that children needed to use to solve the task). Ninety-six children participated, all of who were in the third year of primary school (aged 7 to 8 years). Children were assigned alternately to one of two experimental conditions, and were tested individually. In one condition, the task was explained to the participant and then the experimenter drew the child's attention to the four objects and asked him/her to say what each of the four objects is usually used for. This condition is called the *object question condition*. In the other condition, the task was explained to the participant and then the experimenter drew the child's attention to the four objects as in the other condition. However, the child was not asked to say what each of the four objects is usually used for. This condition is called the *no question condition*. After the instructions, the child was told to start (and try to open the box). The experimenter recorded a number of measures of each child's task performance. First, what the first object picked up by the child was. Second, the number of seconds from the start of the task before the child picked up the target object. Third, the number of seconds from the start of the task before the child opened the box. All children did successfully open the box. In addition, the age in *months* and the sex of each child was recorded.

The data were entered in an *SPSS* data file. The variables are as follows:

Variable Name, Description [with coding]

cond	Experimental condition [**1 =** object question condition, **2** = no question condition]
sex	Sex of child [**1** = male, **2** = female]
age	Age in months
pick.1st	First object picked up [**1** = key, **2** = tennis ball, **3** = long pencil, **4** = cup]
pick.tar	Was the target object the first object that was picked? [**1** = no, **2** = yes]
time.tar	Time taken (seconds) to pick up the target object
time.box	Time taken (seconds) to open the box

The data are available for all 96 participants. There are no missing values.

The experimenter has made a number of predictions (**P**) concerning the two experimental conditions:

P1 The proportion of male participants will *NOT* differ significantly between the two experimental conditions.

P2 The mean age will *NOT* differ significantly between the two experimental conditions.

P3 The proportion of children that pick the target object as their first object will be greater in the no question condition than in the object question condition.

P4 The average time taken to pick up the target object will be lower for children in the no question condition than for children in the object question condition.

P5 The average time taken to open the box will be lower for children in the no question condition than for children in the object question condition.

SECTION B (SHORT-ANSWER QUESTIONS)

The questions in Section B are about the Closed Box Study.

Use the following *SPSS* data file for Section B: **Box.sav.**

Question B1

For this question you are required to obtain summary statistics that might be reported in the *Participants* section of a report.

(a) For the variable **age** (the *age in months* of participants), what is:

The mean: _____ months
(TO **ONE** DECIMAL PLACE)

The standard deviation: _____ months
(TO **ONE** DECIMAL PLACE)

The range: _____ months

(b) How many participants were there of each sex?

Number of boys: _____

Number of girls: _____

[4 marks]

Question B2

This question relates to the fourth prediction made by the experimenter:

P4   *The average time taken to pick up the target object will be lower for children in the no question condition than for children in the object question condition.*

(a) For each condition in the experiment, find the mean, the median, and the standard deviation of the variable **time.tar**. Write your answers in Table B2 below. (GIVE ANSWERS TO **TWO** DECIMAL PLACES)

Table B2. Time taken in seconds to pick up the target object by condition:

	Mean	Median	Standard Deviation
Object Question Condition			
No Question Condition			

(b) A *t*-test can be used to examine whether there is a statistically significant difference between the pair of mean times (in seconds) that you recorded in Table B2. Undertake the appropriate *t*-test, and report the outcome of this test below.

   (i)   Which kind of *t*-test did you use? (CIRCLE ONE ANSWER)

   One-sample *t*-test   **Related-samples *t*-test**   **Independent samples *t*-test**

   (ii) Report the test statistic (TO **TWO** DECIMAL PLACES):   *t* = _____

   (iii) Report the degrees of freedom   *df* = _____

   (iv) Report the exact *p*-value (TO **THREE** DECIMAL PLACES):   *p* = _____

   (v) Is the result statistically significant? (CIRCLE ONE ANSWER):   **Yes / No**

   (vi) In a sentence, state what you conclude from the test:

   _____

   _____

   _____

   _____

   _____

(c) There is a non-parametric test that is an alternative to the *t*-test that you used in part (b) of this question. Write the name of this test below. You do NOT need to carry out this test.

   Answer: _____

[14 marks]

Question B3

This question relates to the third prediction made by the experimenter:

P3   The proportion of children that pick the target object as their first object will be greater in the no question condition than in the object question condition.

(a) Complete Table B3 below to show the frequency with which each object was picked up first. Provide these data for each condition separately (in the first two rows of the table), and for both conditions combined (in the final row of the table).

Table B3. Frequency with which each object is picked first:

	Key	Tennis ball	Long pencil	Cup
Object Question Condition				
No Question Condition				
Both conditions combined				

(b) In <u>each</u> condition of the experiment, what *percentage* of children picked up the *target object* first? [The long pencil was the target object.] REPORT EACH PERCENTAGE TO **ONE** DECIMAL PLACE

Object Question Condition: _____ %   **No Question Condition: _____ %**

(c) Conduct the appropriate inferential statistical test to determine whether there is a statistically significant difference between the proportion of children in each condition who picked up the target object first.

(i)   What test did you use? Write the *full* name of the test here.

Test: _____

(ii) Report the outcome of the test as you would in a formal Results section, including a description of any effects and any relevant test statistics and values.

_____

_____

_____

_____

(iii)   Is the result statistically significant? (CIRCLE ONE ANSWER):   **Yes / No**

(d) On the basis of this test, what do you conclude about the experimenter's third prediction (*P3*)?
(CIRCLE ONE ANSWER)

A. Prediction P3 is supported

B. Prediction P3 is not supported

C. Prediction P3 is neither supported nor unsupported

[14 marks]

END OF SECTION B

END OF ASSIGNMENT

You must submit your answers ONLINE before the assignment deadline. It will take some time to enter all your responses into the survey, so be sure to leave yourself enough time.

At the end of your submission, we will ask you for your email address so we can send you a confirmation that your assignment has been received. If you don't receive an email, it means that we have not received your response - please try again. Please save this email- it is your proof that you have submitted your response, in case something goes wrong.