

Preparation - Statistics in Bio-psychology

Example 1

Researchers wanted to compare the effectiveness of two drug rehabilitation programmes. Participants who had been referred to a drug rehabilitation service for heroin use were randomly assigned to receive either addiction counselling with methadone treatment or addiction counselling only. After two months of treatment each participant was assessed as either 'heroin free' or 'relapsed'. The data gathered by the researchers is shown in Table 1.

Table 1 - Participants assessed as 'heroin-free' or 'relapsed' after two different treatment programmes

	Heroin free	Relapsed
Counselling + methadone	36	17
Counselling only	20	21

1. Draw a suitable graph or chart to present the data in Table 1.
2. What level of measurement did the researchers have for their data? Explain your answer.
3. What would be a suitable statistical test to use to analyse the data? Justify your choice with reference to the design of the study.
4. Use the appropriate statistical test to decide whether the difference between the conditions was significant. Explain your conclusions, referring to the degrees of freedom, observed and critical values and whether a 1 or 2 tailed test was applied. NB. calculate the test by hand!
5. Explain the conclusion that should be drawn from these data.

Example 2

Researchers were interested in whether there was a relationship between aggression and abuse of anabolic steroids in amateur athletes. Anabolic steroids are drugs which mimic the effects of certain hormones, including testosterone. The researchers expected people who use steroids at a higher level would also be more aggressive. A sample of steroid-using athletes was recruited. All of them completed two self-report questionnaires. The first contained questions about the frequency with which they used steroids and the dosage they took. The second was a standardised measure of everyday aggression. The data gathered by the researchers is shown in Table 2.

Table 2 - Steroid use and aggression scores

Participant	Steroid use score	Aggression score
1	15	20
2	19	21
3	32	48
4	7	15
5	31	19
6	9	8
7	14	18
8	25	23
9	27	24
10	8	14

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2. What level of measurement did the researchers have for their data? Explain your answer.
3. What would be a suitable statistical test to use to analyse the data? Justify your choice with reference to the design of the study.
4. Use the appropriate statistical test to decide whether the null hypothesis should be rejected. Explain your conclusions, referring to the sample size, observed and critical values and whether a 1 or 2 tailed test was applied. NB. calculate the test by hand!
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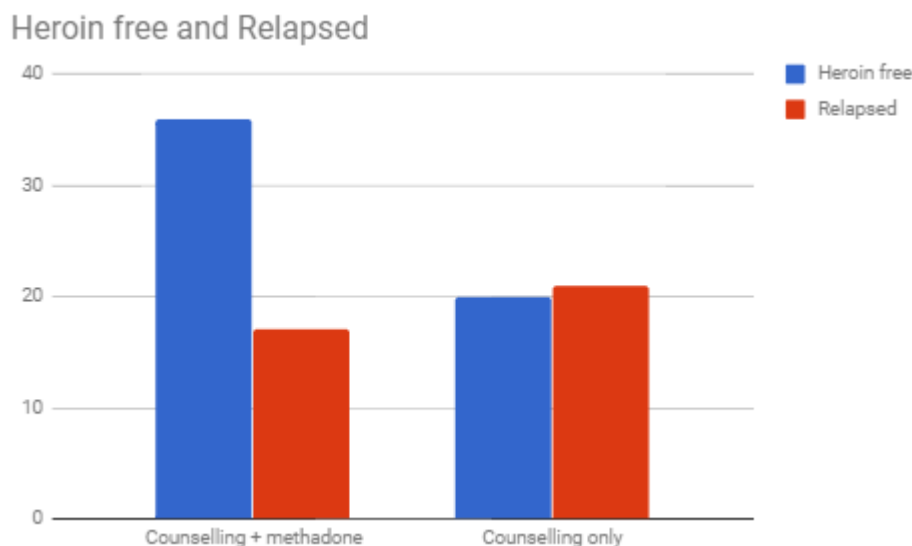
Question 1

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2. What level of measurement did the researchers have for their data? Explain your answer.

Nominal data, because each participant was assigned to a category and the frequencies of each were counted.

3. What would be a suitable statistical test to use to analyse the data? Justify your choice with reference to the design of the study.

Chi squared, because this is a comparison between the two treatments, so a test of difference is required; the data are nominal because the frequencies of 'heroin-free' and 'relapsed' were counted; and the design was unrelated because independent groups were used for the combined programme and the counselling-only programme.

4. Use the appropriate statistical test to decide whether the difference between the conditions was significant. Explain your conclusions, referring to the degrees of freedom, observed and critical values and whether a 1 or 2 tailed test was applied. NB. calculate the test by hand!

The critical value for significance is 3.84 (1 df; 2 tailed $p < 0.05$). This is because the table is 2x2, giving 1df. A 2 tailed test was chosen because the context does not suggest that a directional hypothesis was stated.

The calculated value of chi squared is 3.12. This is smaller than the critical value so the difference between the two programmes is not significant.

5. Explain the conclusion that should be drawn from these data.

The difference in outcome between the two programmes could have occurred by chance. Therefore, giving addicts counselling combined with methadone does not produce a different treatment outcome from counselling on its own.

Example 2

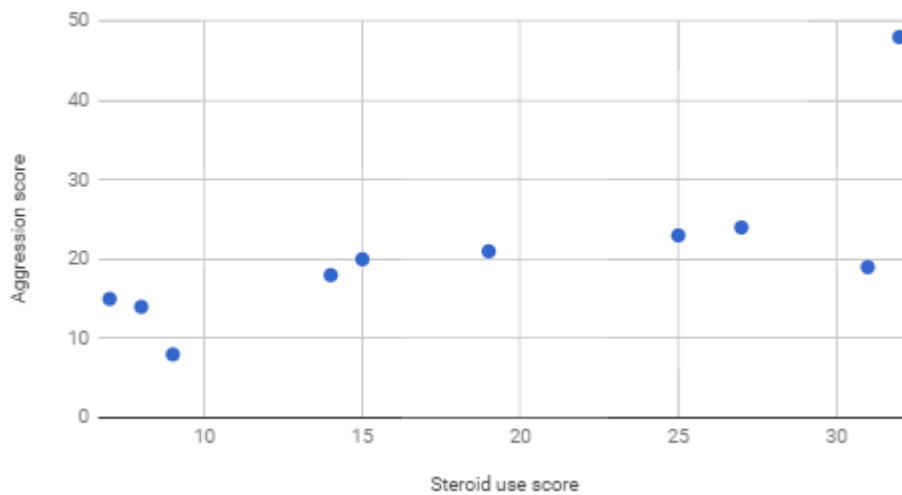
Researchers were interested in whether there was a relationship between aggression and abuse of anabolic steroids in amateur athletes. Anabolic steroids are drugs which mimic the effects of certain hormones, including testosterone. The researchers expected people who use steroids at a higher level would also be more aggressive. A sample of steroid-using athletes was recruited. All of them completed two self-report questionnaires. The first contained questions about the frequency with which they used steroids and the dosage they took. The second was a standardised measure of everyday aggression. The data gathered by the researchers is shown in Table 2.

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1. Draw a suitable graph or chart to present the data in Table 1.

Aggression score vs Steroid use score



2. What level of measurement did the researchers have for their data? Explain your answer.

The data are at least ordinal because each PP had their own scores for aggression and steroid use and these scores could be ranked in order of size.

3. What would be a suitable statistical test to use to analyse the data? Justify your choice with reference to the design of the study.

Spearman's rank order correlation, because the study is looking for a correlation between the aggression and steroid measures and the data are at least ordinal level because the scores for both measures can be ranked in order of size.

4. Use the appropriate statistical test to decide whether the null hypothesis should be rejected. Explain your conclusions, referring to the sample size, observed and critical values and whether a 1 or 2 tailed test was applied. NB. calculate the test by hand!

Calculated value of R is 0.83. Critical value of R ($N=10$; 1 tailed $p<0.05$) is 0.564. As calculated value is higher than critical value the correlation is significant. The correlation between the two scores is probably not due to chance. (NB. one tailed test applied because context suggests the expected direction).

5. Explain the conclusion that should be drawn from these data.

There is a significant association between anabolic steroid use and aggression levels. (NB. can't infer causality!)