One-way Repeated Measures ANOVA and Simple Linear Regression

Question & Solution

Questions

To complete this part of the assignment you must have (a) the data file called PSYC206_DataAnalysisPartB.sav, which you can find on LEO and (b) access to SPSS. You will need to use SPSS and the data file to answer the research questions described in the background section. Based on the research questions, you will need to decide which statistical analyses you should perform, run these analyses, and report your findings in APA 6th edition style.

1.   Using SPSS and the data file provided, conduct the analyses required to test the hypotheses in the study described below.

2.   Save your SPSS output file with the analyses you conducted as YOUR-STUDENT-NUMBER.SPV (please submit your output file on LEO as per instructions below and ensure it is in spv format). Your output file should only include the specific analyses conducted in order to write the results section (i.e., assumption testing, descriptive statistics, inferential statistics). Additional or redundant analyses included in your output file may result in a loss of marks for the SPSS Analysis section of the marking criteria.

3.   Write a results section in which you report and interpret the results of the analyses. These sections must include the following:

a.   Discussion of assumption testing for the one-way repeated measures ANOVA ONLY. For the purpose of this report, it is NOT necessary to discuss or to provide evidence of assumption testing for the simple linear regressions.

b.   The descriptive statistics for recall in each condition (i.e., M, SD) presented in a Table. The Table must conform to APA formatting standards.

c.   A description of the results of the analyses with reference to the inferential statistics for:

i.   the main effect and for any follow-up tests conducted should be provided in text

ii.   the simple linear regressions, which should be provided in text for the model (i.e., F, df, p) and R2. Regression coefficients should be provided in a Table ONLY and NOT duplicated in text.

d.   In the text, you should refer to any Tables, but you must not replicate the statistical information already detailed in any Tables. Note: It is NOT acceptable to copy and paste SPSS output into your assignment.

4.   Write a discussion section in which you provide a discussion of the results in relation to the research questions. That is, what are the answers to the research questions? What is your interpretation of the findings, in light of the relevant theory and past research? What are the potential implications or applications?

5.   Submit your report via the Turnitin submission link and your output file via the output file upload link on LEO by 5pm on Friday 25th May, 2018.

Background

The funnier something is, the more likely people are to remember it. This is a phenomenon known as the humour effect, whereby the presentation of information in a humorous format results in better memory performance (Takahahi & Inoue, 2009). Little is known about exactly why humour assists in recall, but it has been argued that this is due to the fact non-humorous materials are encountered more often than humorous materials, so when people encounter humorous materials, they stand out in comparison (Takahahi & Inoue, 2009). This is known as the distinctiveness effect; that is because the material stands out/is distinctive from the rest of the information, it produces a memory record that stands out from the others and therefore is easier to recall (Schmidt, 1991). This humour effect has been shown in a wide variety of settings, including, advertising, and education.

Humour is often employed by educators to gain and sustain interest, with evidence suggesting that using humorous examples in a lecture enables greater recall of the information than using serious examples (Kaplan & Pascoe, 1977). The humour effect has been found whether the information is presented in a written format, spoken verbally, via video or through the use of humorous cartoons (Schmidt & Williams, 2001). However little is known about whether the

way one presents the humour matters, i.e. if there is a difference in recall if one presents the information verbally or via an image. It is also unknown whether combining both visual and verbal humour together improves recall over and above either one alone. Furthermore, previous research has shown that the level of interest one has in the topic affects recall (Schiefele & Krapp, 1996) but it is unknown whether topic interest can still predict recall even when humour is employed.

In order to investigate these gaps in the literature, a lecturer wanted to look at the effect that different ways of presenting humour will have on the recall of information presented in statistics lectures. To assess the different types of humour, the lecturer over a period of four weeks presented course material to the same 20 students, once with no humour (no humour), once making only verbal jokes (verbal humour), once including only funny cartoons on slides (visual humour), and finally making both verbal jokes and including funny cartoons on slides (combined humour). The dependent variable of recall was measured via a 10 question quiz at the conclusion of each lecture, with higher scores indicating greater recall of the presented information. Furthermore, at the commencement of the semester, students were asked to rate on a scale their level of interest in statistics, with higher scores indicating more interest in the topic of statistics.

In line with previous research related to the humour effect, the lecturer anticipated that including any form of humour in the lecture will improve recall of the information. Specifically, she anticipated that recall would be better in each of the three humour conditions compared to the no humour condition, and that the combined humour condition would produce greater recall than either of the verbal or the visual humour conditions alone. Furthermore she anticipated that there would be no difference in the recall between the visual humour and the verbal humour conditions. To test these hypotheses, conduct a one-way repeated measures ANOVA, along with assumption checks and all possible pairwise comparisons (with appropriate consideration of familywise error).

She also hypothesised that level of interest in the topic of statistics would predict recall of information in each of the three humour conditions such that greater interest would predict greater recall. She was also interested in determining how much variance in recall was accounted for by interest in statistics, separately for each of the three humour conditions. Conduct three simple linear regressions to address these research questions.

References

Kaplan, R. M., & Pascoe, G. C. (1977). Humorous lectures and humorous examples: Some effects upon comprehension and retention. Journal of Educational Psychology, 69, 61-65.

Schiefele, U., & Krapp, A. (1996). Topic interest and free recall of expository text. Learning and Individual Differences, 8, 141-160. doi: 10.1016/S1041-6080(96)90030-8

Schmidt, S. R. (1991). Can we have a distinctive theory of memory? Memory and Cognition, 19, 523-542. doi: 10.3758/BF03197149

Schmidt, S. R., & Williams, A. R. (2001). Memory for humourous cartoons. Memory and Cognition, 29, 305 – 311. doi: 10.3758/BF03194924

Takahashi, M., & Inoue, T. (2009). The effects of humor on memory for non-sensical pictures. Acta Psychologica, 132, 80-84. doi: 10.1016/j.actpsy.2009.06.001

Solution

Introduction:

The studies about applied humour in teaching suggested that the recall and the interest in the subject is highly depend upon mixture of humour presented at the time of class. This is the main course to see the effect of humour on the recall, here 20 students of statistics taught up to four weeks with no humour, verbal humour, visual humour and combined humour and record their recall on the basis of 10 questions score. After semester they asked for level of interest in the statistics.

Analysis:

Here study suggest that the level of interest is related with the pattern of study either no humour, verbal humour, visual humour or combined humour.

Table 1: Descriptive statistics

	Range	Minimum	Maximum	Mean	Std. Deviation
Topic Interest	13	2	15	7.80	3.41
No Humour	5	2	7	3.90	1.45
Verbal humour	5	3	8	5.10	1.45
Visual humour	5	3	8	5.40	1.23
Combined	5	5	10	7.70	1.22

Table 2: Tests of within subject effect

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Humour	Sphericity Assumed	151.35	3.00	50.45	93.82	0.00
	Greenhouse-Geisser	151.35	2.23	67.99	93.82	0.00
	Huynh-Feldt	151.35	2.53	59.71	93.82	0.00
	Lower-bound	151.35	1.00	151.35	93.82	0.00
Error(Humour)	Sphericity Assumed	30.65	57.00	0.54		
	Greenhouse-Geisser	30.65	42.29	0.72		
	Huynh-Feldt	30.65	48.16	0.64		
	Lower-bound	30.65	19.00	1.61		

We can report that when using an ANOVA with repeated measures with a Greenhouse Geisser correction, the mean scores for Recall were statistically significantly different ($F(2.226, 30.650) = 93.822$, $p < 0.0005$).

Table 3: Pairwise comparison

(I) Humour	(J) Humour	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference Lower Bound	Upper Bound
No humour	Verbal humour	-1.200[*]	.186	.000	-1.749	-.651
	Visual humour	-1.500[*]	.224	.000	-2.158	-.842
	Combined humour	-3.800[*]	.304	.000	-4.696	-2.904
Verbal humour	No humour	1.200[*]	.186	.000	.651	1.749
	Visual humour	-.300	.206	.975	-.908	.308
	Combined humour	-2.600[*]	.245	.000	-3.321	-1.879
Visual humour	No humour	1.500[*]	.224	.000	.842	2.158
	Verbal humour	.300	.206	.975	-.308	.908
	Combined humour	-2.300[*]	.206	.000	-2.908	-1.692
Combined humour	No humour	3.800[*]	.304	.000	2.904	4.696
	Verbal humour	2.600[*]	.245	.000	1.879	3.321
	Visual humour	2.300[*]	.206	.000	1.692	2.908

*. The mean difference is significant at the .05 level.

We can see that there was a significant difference in Recall score between no humour and verbal humour ($p = 0.0005$), between no humour and visual humour ($p = 0.0005$), between no humour and combined humour ($p = 0.0005$), between verbal humour and combined humour ($p = 0.0005$), and between visual humour and combined humour ($p = 0.0005$), but no significant differences between verbal humour and visual humour ($p = 0.975$).
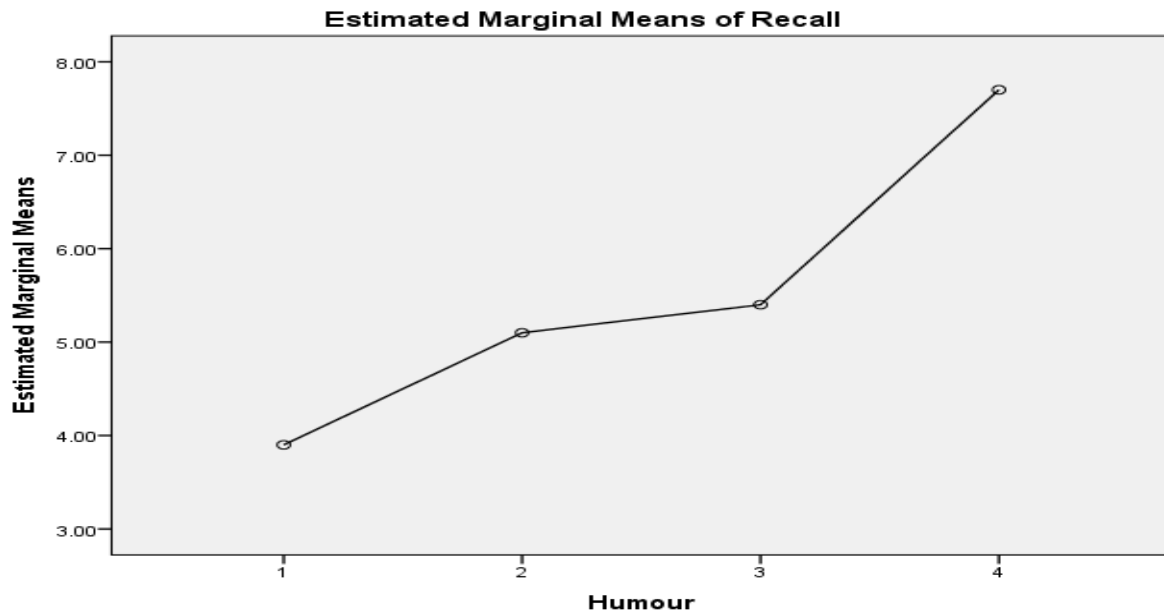
Figure 1 : Marginal means of recall (where 1 = no humour, 2 = verbal humour, 3 = visual humour and 4 = combined humour)

The graph above shows that the recall for no humour is least while verbal and visual humour has approximately equal recall score and the combined humour shows the highest recall score.

Here it is also seen that the humour techniques affect the interest in subject too. To see the impact of humour style on interest use the regression analysis.

Analyse the recall score in verbal humour with the help of topic interest.

$$Recall\ score_{verbalhumour} = \beta_0 + \beta_1 \times topic\ interest + e$$

Table 4:

	B	SE(B)	β	t	P
(Constant)	2.794	.608		4.596	.000
Topic interest	.296	.072	.697	4.124	.001

N = 20, R^2 = 0.486

Regression equation will be

$$Recall\ score_{verbalhumour} = 2.794 + 0.296 \times topic\ interest$$

A simple linear regression was calculated to predict participants' recall score while used verbal humour based on the topic interest. A significant regression equation was found

(F(1,18) = 17.008, p = 0.001), with an R^2 = 0.486, participants' average recall score increased 0.296 for each point increase in topic interest.

Analyse the recall score in visual humour with the help of topic interest.

$$Recall\ score_{visualhumour} = \beta_0 + \beta_1 \times topic\ interest + e$$

	B	SE(B)	β	t	P
(Constant)	3.580	.550		6.508	.000
Visual humour	.233	.065	.646	3.595	.002

N = 20, R^2 = 0.418

Regression equation will be

$$Recall\ score_{visualhumour} = 3.580 + 0.233 \times topic\ interest$$

A simple linear regression was calculated to predict participants' recall score while used visual humour based on the topic interest. A significant regression equation was found (F(1,18) = 12.925, p = 0.002), with an R^2 = 0.418, participants' average recall score increased by 0.233 for each point increase in topic interest.

Analyse the recall score in combined humour with the help of topic interest.

$$Recall\ score_{combinedhumour} = \beta_0 + \beta_1 \times topic\ interest + e$$

	B	SE(B)	β	t	P
(Constant)	6.720	.668		10.060	.000
Combined humour	.126	.079	.352	1.595	.128

N = 20, R^2 = 0.

Regression equation will be

$$Recall\ score_{combinedhumour} = 6.720 + 0.126 \times topic\ interest$$

A simple linear regression was calculated to predict participants' recall score while used combined humour based on the topic interest. A regression equation was found ($F(1,18) = 2.545$, p = 0.128) which is insignificant, with an $R^2 = 0.124$.

Conclusion:

A repeated measures ANOVA with a Greenhouse-Geisser correction determined that mean CRP concentration differed statistically significantly between time points ($F(2.226, 30.650) = 93.822, p < 0.0005$). Post hoc tests using the Bonferroni correction revealed that humour elicited a improvisation in Recall score from no humour to verbal humour (3.09 ± 0.677 v/s 5.1 ± 0.677 , respectively), which was statistically significant ($p = 0.0005$). However, improvisation in Recall score from verbal humour to visual humour (5.1 ± 0.677 v/s 5.4 ± 0.576, respectively), which was statistically not significant ($p = 0.975$). Again, improvisation in Recall score from visual humour to combined humour (5.4 ± 0.576 v/s 7.7 ± 057, respectively), which was statistically significant ($p < 0.0005$). Therefore, we can conclude that humour affect the recall score significantly but the visual humour or verbal humour singly affect similarly there are no difference between the recall score when impose visual or verbal humour singly however humour used in combined way as mixture of verbal and visual it shows maximum recall score.

Also the topic interest predict the recall score significantly in verbal and visual humour while it is not significant in the case of combined humour.