

Rubric-homework 4

Write your name here

12 May, 2022

1. (0.5 points)

```
full <- memory %>%
  group_by(task, word_frequency) %>%
  summarise("pred" = mean(recalled))
```

ANS: The average number of correctly recalled words by combination of the task and word frequency factors was:

Task	Word Frequency	Mean	Points
Free recall	High	12.76	0.125 pts
Free recall	Low	9.92	0.125 pts
Recognition	High	9.56	0.125 pts
Recognition	Low	14.72	0.125 pts

2. (0.5 points)

```
task <- memory %>%
  group_by(task) %>%
  summarise("mean" = mean(recalled))
```

ANS: The average number fo correctly recalled words by task was:

Task	Mean	Points
Free recall	11.34	0.25 pts
Recognition	12.14	0.25 pts

3. (0.5 points)

```
wf <- memory %>%
  group_by(word_frequency) %>%
  summarise("mean" = mean(recalled))
```

ANS: The average number fo correctly recalled words by word frequency was:

Word Frequency	Mean	Points
High	11.16	0.25 pts
Low	12.32	0.25 pts

4. (0.5 points)

```
grand_mean <- memory %>%
  summarise("mean" = mean(recalled)) %>%
```

```
pull(mean)
```

ANS: The average number of correctly recalled words was **11.74**

5. (0.5 points)

```
alpha <- task$mean - grand_mean
```

ANS: The main effect of the free recall task was **-0.4**, the main effect of the recognition task was **0.4**

6. (0.5 points)

```
beta <- wf$mean - grand_mean
```

ANS: The main effect for high frequency words was **-0.58**, the main effect of low frequency words was **0.58**

7. (0.5 points)

```
memory <- memory %>%
  mutate("prediction_null" = grand_mean,
         "error_null" = (recalled - prediction_null)^2)
```

8. (0.5 points)

```
memory <- memory %>%
  mutate("prediction_task" = case_when(task == "free_recall" ~ grand_mean + alpha[1],
                                       task == "recognition" ~ grand_mean + alpha[2]),
         "error_task" = (recalled - prediction_task)^2)
```

ANS: The predictions of the task main effects model by combination of the factor levels are:

Task	Word Frequency	Mean	Points
Free recall	High	11.34	0.125 pts
Free recall	Low	11.34	0.125 pts
Recognition	High	12.14	0.125 pts
Recognition	Low	12.14	0.125 pts

9. (0.5 points)

```
memory <- memory %>%
  mutate("prediction_wf" = case_when(word_frequency == "high" ~ grand_mean + beta[1],
                                     word_frequency == "low" ~ grand_mean + beta[2]),
         "error_wf" = (recalled - prediction_wf)^2)
```

ANS: The predictions of the word frequency main effects model by combination of the factor levels are:

Task	Word Frequency	Mean	Points
Free recall	High	11.16	0.125 pts
Free recall	Low	12.32	0.125 pts
Recognition	High	11.16	0.125 pts
Recognition	Low	12.32	0.125 pts

10. (0.5 points)

```
memory <- memory %>%
  mutate("prediction_add" = case_when(
    task == "free_recall" & word_frequency == "high" ~ grand_mean + alpha[1] + beta[1],
```

```

task == "free_recall" & word_frequency == "low" ~ grand_mean + alpha[1] + beta[2],
task == "recognition" & word_frequency == "high" ~ grand_mean + alpha[2] + beta[1],
task == "recognition" & word_frequency == "low" ~ grand_mean + alpha[2] + beta[2]
),
"error_add" = (recalled - prediction_add)^2)

```

ANS: The predictions of the additive model by combination of the factor levels are:

Task	Word Frequency	Mean	Points
Free recall	High	10.76	0.125 pts
Free recall	Low	11.92	0.125 pts
Recognition	High	11.56	0.125 pts
Recognition	Low	12.72	0.125 pts

11. (0.5 points)

```

memory <- memory %>%
  mutate("prediction_full" = case_when(
    task == "free_recall" & word_frequency == "high" ~ full$pred[1],
    task == "free_recall" & word_frequency == "low" ~ full$pred[2],
    task == "recognition" & word_frequency == "high" ~ full$pred[3],
    task == "recognition" & word_frequency == "low" ~ full$pred[4]),
  "error_full" = (recalled - prediction_full)^2)

```

ANS: The predictions of the full model are:

Task	Word Frequency	Mean	Points
Free recall	High	12.76	0.125 pts
Free recall	Low	9.92	0.125 pts
Recognition	High	9.56	0.125 pts
Recognition	Low	14.72	0.125 pts

12. (0.5 points)

```

sse_null <- sum(memory$error_null)
sse_task <- sum(memory$error_task)
sse_wf <- sum(memory$error_wf)
sse_add <- sum(memory$error_add)
sse_full <- sum(memory$error_full)

```

ANS: The SSE by model are:

Model	SSE	Points
Null	819.24	0.125 pts
Me Task	803.24	0.125 pts
Me Word Frequency	785.6	0.125 pts
Additive	769.6	0.125 pts
Full	369.6	0.125 pts

13. (0.5 points)

```
n_total <- nrow(memory)
mse_null <- 1/n_total * sum(memory$error_null)
mse_task <- 1/n_total * sum(memory$error_task)
mse_wf <- 1/n_total * sum(memory$error_wf)
mse_add <- 1/n_total * sum(memory$error_add)
mse_full <- 1/n_total * sum(memory$error_full)
```

ANS: The SSE by model are:

Model	MSE	Points
Null	8.19	0.125 pts
Me Task	8.03	0.125 pts
Me Word Frequency	7.86	0.125 pts
Additive	7.7	0.125 pts
Full	3.7	0.125 pts

14. Calculate the Bayesian Information Criterion (BIC) of each model. What is the BIC for each of the 5 models in this factorial design? **(1 point)**

```
# Code 15: Obtain the BIC of each model in the 2 by 2 between subjects
# factorial design.
#
# In this code chunk you can write the functions that you need in order
# calculate the BIC of each model.
```

ANS: [WRITE YOUR ANSWER HERE]

15. Which of the 5 models would you choose and why? **(1 point)**

ANS: The model with the lowest BIC was the Full model, which is the one that they should choose. However, try to grade on consistency, if there is an error on the code that made them get different BIC values, consider following the rule (choose the model with the lowest BIC) as a correct answer

16. Calculate the value of R^2 of the model that you choose in (14). What is the value of R^2 of the model you selected and how can you interpret it?

```
# Code 16: Calculate the value of R^2 of the model that you selected in (14).
#
# In this code chunk you can write the functions that you need in order
# calculate the R^2 value of the model you selected.
```

ANS: [WRITE YOUR ANSWER HERE]

17. Interpret the value of the predictions of the model that you selected, what do those values tell us about the research question? Are there differences on the effects of tasks and word frequency (how commonly a word is used in English) on the number of correctly recalled/recognized words?

ANS: [WRITE YOUR ANSWER HERE]

18. In one sentence, how would you summarize the results of the analysis?

ANS: