EDUC/PSY 6600

Name:

Research Design & Analysis I

**Unit 5 Assignment**

**ANOVA with Repeated Measures**

Please complete the following exercises. Feel free to work with classmates, but each student must turn in **UNIQUE** work, not photocopies or identical replicates. When applicable, use **APA format** in communicating your results in text. **Show your work!** If any question involves any math at all, show your work. When it doubt, write it out. Always show more than you think you need.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1) WRITE-UP - Textbook Problems | | | | | | | | | | | | | | |
| Cohen Chap | | | Exercises | | | | Pts | | | Off | | |
|  | 15 | A | | \*2, 4, 5 | | | | 5 | | |  | | |
|  | B | | \*3, \*4**,** 5, \*6 | | | | 5 | | |  | | |
|  | C | | 1, 3 | | | | 5 | | |  | | |
|  | 16 | A | | \*2, \*4, 5 | | | | 2 | | |  | | |
|  | B | | \*4 , 5, 8 | | | | 3 | | |  | | |
|  | C | | 1a, 2a, 3a | | | | 5 | | |  | | |
|  | | | | | | | | | | |  | | |
| 2) SUMMARY – Supplementary Reading | | | | | | | | | | | | | |
|  |  | | | | | | Pts | | | Off | |
|  | Half Page | | | Read the Unit 5 Journal Article on Canvas. Summarize any mention or use/abuse of the concepts in the above chapters. | | | 5 | | | |  | |
|  |  | | |  | | |  | | | |  | |
| 3) R SYNTAX – Section B & C: add to the skeleton R notebook and knit to .pdf & upload | | | | | | | | | | | | | |
|  | Cohen Chap | | | Exercises | | | Pts | | | | Off | |
|  | 15 | | B | 3, 4**,** 5, 6 | | | 5 | | | |  | |
|  | C | 1, 3 | | | 5 | | | |  | |
|  | 16 | | B | 4 ,5, 8 | | | 5 | | | |  | |
|  | C | 1a, 2a, 3a | | | 5 | | | |  | |
|  |  | |  |  | | |  | | | |  | |
| Grading | | | | | | Earned | | | Possible | | | | | |
|  | ***correctness*** | | | | *a subset of spot-checked items: must show work, especially items from back of book or done in class* |  | | | 50 | | | | | |
|  | ***COMPLETENESS*** | | | | *more than one item is missing or skipped: 25/50*  *roughly half the assignment is completed: 10/50* |  | | | 50 | | | | | |
|  |  | |  | |  |  | | | 100 | | | | | |

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| **15** | | **A** | | **2. Visual examination for interaction**  DIGIT LETTER MIXED  10  8  6  4  2  Type of Stimuli  Short Term Memory | |
| The data in the following table are from an experiment on short-term memory involving three types of stimuli: digits, letters, and a mixture of digits and letters. | | | | |
| Draw a **graph** of these data (1 line per subject) and…   |  |  |  |  | | --- | --- | --- | --- | | Subject | Digit | Letter | Mixed | | 1 | 6 | 5 | 6 | | 2 | 8 | 7 | 5 | | 3 | 7 | 7 | 4 | | 4 | 8 | 5 | 8 | | 5 | 6 | 4 | 7 | | 6 | 7 | 6 | 5 |   Describe the **degree of the interaction** between the  various pairs of levels. | | | | |
| **15** | | **A** | | **4. RM ANOVA – calculations by hand** | |
| In exercise 12A #7, eight subjects were tested for problem-solving performance in each of four drug conditions, yielding the following means and standard deviations:  **Grand Mean**   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | Marijuana | Amphetamine | Valium | Alcohol | | **M** | 7 | 8 | 5 | 4 | | **SD** | 3.25 | 3.95 | 3.16 | 2.07 | | | | | |
| If the **SAME** eight subjects were tested in all four conditions, and if the **SSsub = 190.08**, how large would the **F ratio** for the RM ANOVA be?  **Formula 12.7**  **Formula 15.2B**  **Formula 15.3A**    **Formula 12.5B**  **Formula 12.4B**  **Formula 12.9**    **Formula 15.2C**  **Formula 15.3B**    **Formula 15.1**  **Formula 15.4**  **FRM ( \_\_\_\_\_ , \_\_\_\_\_) = \_\_\_\_\_\_\_\_\_\_** | | | | |
| **15** | | **A** | | **5. 1-way RM ANOVA – calculations by hand** | |
| In exercise 13B #16, independent groups of subjects performed a video game after being given one of four possible doses of caffeine (including zero). In this exercise, we will imagine that the subjects had been matched into blocks of four before being randomly assigned to one dosage level or another.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Block # | 0 mg | 100 mg | 200 mg | 300 mg | mean | | 1 | 25 | 16 | 6 | 8 | **13.75** | | 2 | 19 | 15 | 14 | 18 | **16.5** | | 3 | 22 | 19 | 9 | 9 | **14.75** | | 4 | 15 | 11 | 5 | 10 | **10.25** | | 5 | 16 | 14 | 9 | 12 | **12.75** | | 6 | 20 | 23 | 11 | 13 | **16.75** | | **mean** | **19.5** | **16.3333** | **9**  0 100 200 300  Caffeine (mg)  5  Driving Errors  10  15  20  25 | **11.6667** | **14.125** | | | | | |
| 1. **Graph** these data, with caffeine amount on the x-axis and   the blocks represented by separate lines. The outcome is  the number of driving errors each subject makes in the  video simulation game.  Describe the **general trend** of the data with respect to caffeine  dosage.  Does the amount of the subject-by-dosage-level interaction look relatively **large or small**? | | | | |
| b) Calculate the **F ratio** for a one-way RM ANOVA on these data.  **Formula 14.3:**  , ,  **Formula 15.1**  **Formula 15.2C**  **Formula 15.3B**    **Formula 15.3A**    **Formula 15.2B**  **Formula 15.4**  **FRM ( \_\_\_\_\_ , \_\_\_\_\_) = \_\_\_\_\_\_\_\_ , p = \_\_\_\_\_\_\_\_**  Can the null hypothesis be rejected at the **.05 level**? *Fcrit( \_\_\_, \_\_\_\_) = \_\_\_\_\_\_\_\_*  yes no  At the **.01 level**? *Fcrit( \_\_\_, \_\_\_\_) = \_\_\_\_\_\_\_\_*  yes no | | | | |
| **15** | | **B** | | **3. 1-way RM ANOVA Code: R notebook** | |
| A psycophysiologist wishes to explore the effects of public speaking on the systolic blood pressure of young adults. **Three conditions** are tested. The subject must vividly imagine delivering a speech to **one person**, to a s**mall class** of 20 persons, or to a **large audience** consisting of hundreds of fellow students. Each subject has his or her **systolic blood pressure measured (mmHg)** under all three conditions. Two subjects are randomly assigned to each of the six possible treatment orders. (The data are in the textbook.) | | | | |
| 1. Perform an RM ANOVA on the blood pressure data and write the **results in words**, as they would appear in a journal article.   (Note: you will need to over-ride the defualt and make No correction for spericity violations)    **FRM ( \_\_\_\_\_ , \_\_\_\_\_) = \_\_\_\_\_\_\_\_\_\_**  Does the size of the audience have a **significant effect** on blood pressure at the .05 level? yes no | | | | |
| 1. What might you do to minimize the possibility of **carryover effect**? | | | | |
| 1. Calculate the from the F ratio you calculated in part a.   *(note the two values from R, but also calculate by hand)*  **Formula 15.5**  ges = general eta-squared = \_\_\_\_\_\_\_\_\_  pes = partial eta-squared = \_\_\_\_\_\_\_\_\_  **=**  Does this look like a **large** effect? yes no  How could this effect size be **misleading** in planning future experiments?  yes  no | | | | |
| 1. Test all the pairs of means with **protected t tests**   **p =**  **p =**  **p =**  one  Small  LARGE  (Fisher’s LSD) ~~using the error term from the RM ANOVA.~~    Which pairs **differ** significantly at the **.05 level**? | | | | |
| **15** | | **B** | | **4. 1-way RM ANOVA Code: R notebook** | |
| A statistics professor wants to know if it really matters which textbook she uses to teach her course. She selects **four textbooks** that differ in approach and then matches her **36 students into blocks of four** based on their similarity in math background and aptitude. Each student in each block is randomly assigned to a different text. At some point in the course, the professor gives a surprise 20-question **quiz**. The number of questions each student answers correctly appear in the table in the textbook. | | | | |
| 1. Perform an RM ANOVA on the data, and present the results of your ANOVA in a **summary table**.      |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Source** | **SS** | **df** | **MS** | **F** | **p** | | RM = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |  |  |  |  | | Residual: (RM x Sub) |  |  |  |  |  |   Does it **make a difference** which textbook the professor uses?  yes  no | | | | |
| 1. Considering your answer to part a, what **type of error** could you be making?   type I  type II | | | | |
| 1. If ~~you were to assume a maximum violation of~~ the **sphericity assumption** was corrected for using the **Greenhouse-Geisser (afex default)** epsilon adjustment to the degrees of freedom.   Note: the sum-of-squares remain the same, the degrees of freedom do change…     |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Source** | **SS** | **df** | **MS** | **F** | **p** | | RM = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |  |  |  |  | | Residual: (RM x Sub) |  |  |  |  |  |   Would your F ratio from part (a) be significant at the **.01 level?**  yes  no | | | | |
| 1. Test **all the pairs of means with Tukey’s HSD**.   **p =**  **p =**  **p =**  Book A  Book B  Book C  Book D  **p =**  **p =**  **p =**    Which pairs differ significantly at the **.05 level**? | | | | |
| **15** | | **B** | | **5. 1-way independent groups ANOVA vs. RM ANOVA Code: R notebook** | |
| 1. Continue with #4…Perform an 1-way Independent groups ANOVA on the data.      |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Source** | **SS** | **df** | **MS** | **F** | **p** | | Between-Group = \_\_\_\_\_\_\_\_\_\_ |  |  |  |  |  | | Within-Group = Residual |  |  |  |  |  | | | | | |
| 1. Does the choice of **text make a significant difference** when the groups of subjects are considered to be independent (i.e., the matching is ignored)?   yes  no | | | | |
| 1. **Compare** your solution to this exercise with your solution to exercise #4.   Which part of the F ratio remains **unchanged**?  What can you say about the **advantages of matching** in this case? | | | | |
| **15** | | **B** | | **6. 1-way RM ANOVA Code: R notebook** | |
| A neuropsychologist is exploring short-term memory deficits in people who have suffered damage to the left cerebral hemisphere. He suspects that memory for some types of material will be more affected than memory for other types. To test this hypothesis he presented six brain-damaged subjects with stimuli consisting of strings of digits, strings of letters, and strings of digits and letters mixed. The longest string that each subject in each stimulus condition could repeat correctly is presented in a table in the textbook. (One subject was run in each of the six possible orders.) | | | | |
| 1. Perform an RM ANOVA (assume sphericity IS NOT violated)   **FRM ( \_\_\_\_\_ , \_\_\_\_\_) = \_\_\_\_\_\_\_\_ , p = \_\_\_\_\_\_\_\_**  Is your calculated F value significant at the **.05 level**?  yes no | | | | |
| 1. Would your conclusion in part a **change** if you could **not assume that sphericity** exists in the population underlying this experiment?   **FRM ( \_\_\_\_\_ , \_\_\_\_\_) = \_\_\_\_\_\_\_\_ , p = \_\_\_\_\_\_\_\_**  yes no  **Explain**. | | | | |
| 1. Based on the **graph you drew** of these data for exercise 15A #2, would you say that the RM ANOVA is appropriate for these data?   yes no  **Explain**. | | | | |
| 1. Test **all the possible pairs** of means with   **p =**  **p =**  **p =**  digit  letter  mixed  ~~separate matched t tests (or two-group ANOVAs)~~  **Fisher’s LSD** at the **.01 level.** | | | | |
| **15** | | **C** | | **1. RM anxiety over time – separately by gender Code: R notebook** | |
| 1. Use **SPLIT FILE** to perform **separate** RM ANOVAs for **men and women** to test for a significant change in **anxiety level over time** (baseline, pre-quiz, and post-quiz). Request **pairwise tests** and fill out the ~~table~~ FIGURES below with the appropriate **p-values IF the omnibus F-test was significant**.   **FRM ( \_\_\_\_\_ , \_\_\_\_\_) = \_\_\_\_\_\_\_\_**  **p = \_\_\_\_\_\_\_\_**  **FRM ( \_\_\_\_\_ , \_\_\_\_\_) = \_\_\_\_\_\_\_\_**  **p = \_\_\_\_\_\_\_\_**  WOMEN  MEN  **p =**  **p =**  **p =**  pre  post  baseline  **p =**  **p =**  **p =**  pre  post  baseline  Write up your results in **APA style**. | | | | |
| 1. Perform **matched t tests** for each pair of RM levels, STILL BY GENDER. Fill out the table below with the appropriate **p-values IF the omnibus F-test was significant.**   **p =**  **p =**  **p =**  pre  post  baseline  **p =**  **p =**  **p =**  pre  post  baseline  WOMEN  MEN  Compare these **p values** to those produced in the ***Pairwise Comparisons*** results box of the RM ANOVA output produced for part (a) above. | | | | |
| **15** | | **C** | | **3. RM stats quiz – experimental quiz vs. regular stats quiz** | |
| Perform an RM ANOVA to determine whether there is a significant difference in mean scores between the experimental stats quiz and the regular stats quiz. **Code: R notebook** | | | | |
| **Compare this F ratio** with the **matched t value** you obtained from exercise #3 in chapter 11 C.  **RM ANOVA: F( \_\_\_\_\_\_ , \_\_\_\_\_\_ ) = \_\_\_\_\_\_\_\_\_\_\_\_ , p = \_\_\_\_\_\_\_\_\_\_\_**  **Matched pair: t( \_\_\_\_\_ ) = \_\_\_\_\_\_\_\_\_\_\_\_ , p = \_\_\_\_\_\_\_\_\_\_\_** | | | | |
| **16** | **A** | | **2. Mixed Design ANOVA – calculations by hand** | | |
| A researcher tested two groups of subjects – six alcohol abusers and six moderate social drinkers – on a reaction time task. Each subject was measured twice: before and after drinking 4 ounces of vodka. A mixed-design ANOVA produced the following SS components:  AND | | | | |
| Complete the analysis and present the results in a **summary table**.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Source | SS | df | MS | F | p | | Between-Subjects |  |  |  |  |  | | Groups = \_\_\_\_\_\_\_\_\_\_\_\_\_ |  |  |  |  |  | | **Residual**: Within-Groups |  |  |  |  |  | | Within-Subjects |  |  |  |  |  | | RM = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |  |  |  |  | | INTER: Group x RM |  |  |  |  |  | | **Residual**: INTER(Sub x RM) |  |  |  |  | | | Total |  |  |  |   **FCV ( \_\_\_\_\_ , \_\_\_\_\_) = \_\_\_\_\_\_\_\_\_\_**  **dfRM**  ( c – 1 )  **dfSub x RM**  k( c - 1 )( n - 1)  **dfGroup x RM**  ( k - 1)\*( c - 1 )  **dfTOTAL**  ( nT – 1 )  **dfBet-Sub**  ( nk – 1 )  **dfWith-Sub**  nk( c – 1 )  **dfGroup**  ( k – 1 )  **dfWith-group**  k( n - 1 ) | | | | |
| **16** | **A** | | **4.RM plots – viewing interactions** | | |
| The following table shows the number of ounces of popcorn consumed by each subject while viewing two emotion-evoking films, one evoking happiness and one evoking fear. Half the subjects ate a meal just before the film (preload condition), whereas the others did not (no load condition). | | | | |
| **Graph** the data for all the subjects on one graph. 🡪 **Let the repeated measure by the x-axis**  Happy Fear  25  20  15  10  5  Emotion of Film  Popcorn Intake (oz)  *(Make a key to show the between-subject groups with color, shape, and linetypes)*   |  |  |  | | --- | --- | --- | |  | Happiness | Fear | | Preload | 10  13  8  16 | 12  16  11  17 | | No Load | 26  19  27  20 | 20  14  20  15 | | | | | |
| 1. Does there appear to be about the same amount of **subject x treatment** interaction in each group?   yes no | | | | |
| 1. Does there appear to be a considerable amount of **group x repeated-measure** interaction?   yes no | | | | |

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| **16** | **A** | **5.Source of RM variation** | |
| If you calculate an RM ANOVA and then assign the subjects to subgroups to create a mixed design, the observed F ratio for the **RM factor may get considerably larger.** Under which of the following conditions is this likely? | | |
| a) The degrees of freedom associated with the error term are reduced considerably.  b) There is a good deal of subject x RM treatment interaction  c) There is a good deal of (sub)group x RM treatment interaction  d) There is a good deal of subject-to-subject variabilibty | | |

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| **16** | **B** | **4. Mixed Design ANOVA – Code: R notebook** | |
| In exercise 15 B #2 subjects performed a clerical task under three noise conditions. Now suppose a new group of subject is added to study the effects of the same three conditions on the performance of a simpler, more mechanical task. The data is presented in the textbook. | | |
| 1. Perform a mixed-design ANOVA, and display the results in a **summary table.**      |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Source | SS | df | MS | F | p | | Between-Subjects |  |  |  |  |  | | Groups = \_\_\_\_\_\_\_\_\_\_\_\_\_ |  |  |  |  |  | | **Residual**: Within-Groups |  |  |  |  |  | | Within-Subjects |  |  |  |  |  | | RM = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |  |  |  |  | | INTER: Group x RM |  |  |  |  |  | | **Residual**: INTER(Sub x RM) |  |  |  |  | | | Total |  |  |  | | | |
| 1. Calculate the **generalized eta squared** for the main effect of the **type-of-task** factor.   For simplicity: DO NOT correct for violations of spericity.  *(record the two values from R by running the model’s name “fit\_tasks”, but also calculate by hand)*  ges = general eta-squared = \_\_\_\_\_\_\_\_\_  pes = partial eta-squared = \_\_\_\_\_\_\_\_\_  **=**  **Formula 16.8**  Does this look like a **large effect size**?  yes no  **Explain**. | | |
| **16** | **A** | **5. Mixed Design ANOVA Code: R notebook** | |
| Dr. Jones is investigating various conditions that affect mental effort – which, in this experiment, involves solving anagrams. Subjects were randomly assigned to one of three experimental conditions. Subjects in the first group were told that they would not be getting feedback on their performance. Subjects in the second and third groups were told they would get feedback, but only subjects in the third group were told (erroneously) that anagram solving was highly correlated with intelligence and creativity (Dr. Jones hoped this information would produce ego involvement). The list of anagrams given to each subject containced a random mix of problems at four levels of difficulty determined by the number of letters presented (five, six, seven, or eight). The number of anagrams correctly solved by each subject in each condition and at the each difficulty level is given in the textbook. | | |
| 1. Draw a **degrees of freedom tree** for this experiment.   **dfTOTAL**  ( nT – 1 )  **dfBet-Sub**  ( nk – 1 )  **dfWith-Sub**  nk( c – 1 )  **dfRM**  ( c – 1 )  **dfSub x RM**  k( c - 1 )( n - 1)  **dfGroup x RM**  ( k - 1)\*( c - 1 )  **dfGroup**  ( k – 1 )  **dfWith-group**  k( n - 1 ) | | |
| 1. Perform a mixed analysis of variance, and display the results in a summary table.  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Source | SS | df | MS | F | p | | Between-Subjects |  |  |  |  |  | | Groups = \_\_\_\_\_\_\_\_\_\_\_\_\_ |  |  |  |  |  | | **Residual**: Within-Groups |  |  |  |  |  | | Within-Subjects |  |  |  |  |  | | RM = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |  |  |  |  | | INTER: Group x RM |  |  |  |  |  | | **Residual**: INTER(Sub x RM) |  |  |  |  | | | Total |  |  |  |   Would any of your conclusions change if you do **not assume sphericity**?  yes no  **Explain**. | | |
| 1. Perform post hoc pairwise comparisons for both main effects, using the appropriate error term from part b in each case.  |  |  | | --- | --- | | **Type of Feedback** *(adjust = “\_\_\_\_\_\_\_\_\_\_\_”)*  **p =**  **p =**  **p =**  none  feedback  + Ego | **Difficulty**  *(adjust = “\_\_\_\_\_\_\_\_\_\_”)* | |  | **p =**  **p =**  **p =**  5  6  8  7  **p =**  **p =**  **p =** |   Explain why these follow-up tests are appropriate given your results in part b.  Briefly state the conclusion of this analysis. | | |
| **16** | **A** | **8. Mixed Design ANOVA Code: R notebook** | |
| Exercise 15B #6 described a neuropsychologist studying subjects with brain damage to the left cerebral hemisphere. Such a study would probably include a group of subjects with damage to the right hemisphere and a group of control subjects without brain damage. The data the previous exercise, along with data for the two comparison groups just mentioned are presented below. | | |
| Perform a mixed-design ANOVA and test the **three F ratios at the .05 level**.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Source | SS | df | MS | F | p | | Between-Subjects |  |  |  |  |  | | Groups = \_\_\_\_\_\_\_\_\_\_\_\_\_ |  |  |  |  |  | | **Residual**: Within-Groups |  |  |  |  |  | | Within-Subjects |  |  |  |  |  | | RM = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |  |  |  |  | | INTER: Group x RM |  |  |  |  |  | | **Residual**: INTER(Sub x RM) |  |  |  |  | | | Total |  |  |  |   **What** can you **conclude** about the effects of brain damage on short-term recall for these types of stimuli? | | |
| 1. Draw a **graph** of these data, subject by subject.   DIGIT LETTER MIXED  10  8  6  4  2  Type of Stimuli  Longest Repeated  peated  m Memory  *(Make a key to show the between-subject groups with color, shape, and linetypes)*   |  |  |  |  | | --- | --- | --- | --- | |  | Digit | Letter | Mixed | | LEFT Brain Damage | 6  8  7  8  6  7 | 5  7  7  5  4  6 | 6  5  4  8  7  5 | | RIGHT Brain Damage | 9  8  9  7  7  9 | 8  8  7  8  6  8 | 6  7  8  8  7  9 | | CONTROL no Damage | 8  10  9  9  8  10 | 8  9  10  7  8  10 | 7  9  8  9  8  9 |   Do the **assumptions** of the mixed-design ANOVA seem **reasonable** in this case?  yes no  **Explain**. | | |
| 1. Perform **post hoc pairwise** comparisons for both main effects.  |  |  | | --- | --- | | **Brain Damage** *(adjust = “\_\_\_\_\_\_\_\_\_\_\_”)* | **Stimuli**  *(adjust = “\_\_\_\_\_\_\_\_\_\_”)* | | **p =**  **p =**  **p =**  neither  left  right | **p =**  **p =**  **p =**  digit  letter  mixed |   Briefly state the conclusion of this analysis. | | |

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| **16** | **C** | **1. Anxiety: Time x Major Code: R notebook** | |
| 1. Perform a mixed-design ANOVA with the **three anxiety measures** as the RM levels, and **major** as the between-subjects factor. Request a plot of the cell means, and post hoc test for both the RM factor (LSD) and for major (Tukey). Report the **results** of the ANOVA in **APA style**. | | |
| **16** | **C** | **2. Heart Rate: time x gender Code: R notebook** | |
| 1. Perform a mixed-design ANOVA with the **three heart-rate measures** as the RM levels and **gender** as the between-subjects factor. Request a plot of the cell means and post hoc test for the RM factor (LSD). Report the **results** of the ANOVA in **APA style**. | | |
| **16** | **C** | **3. Stat Quizzes: time x Experimental condition Code: R notebook** | |
| 1. Perform a mixed-design ANOVA with the **two 10-point quizzes (statquiz & exp\_sqz)** as the RM levels and **exp\_cond** as the between-subjects factor. Request a plot of the cell means. Report the **results** of the ANOVA in **APA style**. If the interaction is significant, explain the pattern you see in the plot of the cell means. | | |