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| 1. Name and contact information of PI. Jacqueline Kent-Marvick |
| Answers will be submitted in Canvas. Not necessary to answer here. |
| 2. Name of the study. |
| Answers will be submitted in Canvas. Not necessary to answer here. |
| 3. Due date for the analysis. |
| Answers will be submitted in Canvas. Not necessary to answer here. |
| 4. What is the general purpose of this study/analyses? (exploration, hypothesis confirmation,  quality improvement, learning, other) What are the implications for how test-wise and study-wise error rates, inferences from tests, and generalizability of results are handled? |
| This is an analysis conducted as a learning exercise. The data are fabricated. The results of this analysis  could not be generalized to any real population. |
| 5. What are the research questions for this study? Field 13.3 |
| Does dose of puppy therapy affect happiness when controlling for love of dogs? |
| 6. What are the research hypotheses for the research questions? |
| There were no pre-determined research hypotheses. |
| 7. What is the study design? (Can a specific design described in a study design text like  Experimental and Quasi-Experimental Designs for Generalized Causal Inference by Shadish, Cook,  and Campbell be identified?) What threats to validity may be applicable to this study design? Are  there any procedures that can be put in place to address these threats? |
| We don’t need to identify this for this learning exercise. |
| 8. What were IRB status and procedures? Any other ethical considerations necessary for this  study? |
| We don’t need to identify this for this learning exercise. |
| 9. When was study data collected? |
| We don’t need to identify this for this learning exercise. |
| 10. How was the study data collected? |
| We don’t need to identify this for this learning exercise. |
| 11. What were the data handling procedures? |
| We don’t need to identify this for this learning exercise. |
| 12. What are the variables in the dataset and the level of measurement for each one?  Are those  set correctly in the dataset?  A note about the **Happiness** and **Puppy\_love variables**: I would normally  classify those variables as ordinal level of measurement. I think Field could have chosen better  variables for this example. For purpose of this example, you will need to classify both of those  variables as **Continuous**. For any other exercise in this class, a variable with 10 or fewer ordered  categories *should be classified as ordinal level of measurement*. |
| Person = Nominal or ID; Dose = Ordinal; Happiness = Continuous (should be ordinal); Puppy\_love =  Continuous (should be ordinal). |
| 13. Describe data accuracy. Any issues? If so, how will they be addressed? (Some potential  things to check about data accuracy might include: data types match levels of measurement,  typographical errors in data entry, values which don’t make sense for the phenomena represented by  the variable, categories which don’t make sense for the phenomena represented by the variable,  decisions about how to address problems identified) |
| Level of measurement for Person needed to be changed to Nominal/ID, and Dose needed to be changed to  Ordinal |
| 14. Describe any additional data manipulation needed before analysis? (Do any variables need to  be reverse coded? Do summary scores for instruments need to be calculated? Are there any other  data transformations that need to be done to help meet statistical assumptions?) |
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| 15. Describe missing data. Any issues? |
| No missing data. |
| 16. Describe outliers. Any issues? |
| No outliers. |
| 17. After initial data cleaning and review, have needed descriptive statistics been calculated before proceeding with analysis? What descriptive statistics will be needed for the study report? |
| For Person and Dose = bar plots, frequencies and percents. For Happiness and Puppy\_love = histograms,  box plots, m(sd) and sd |
| 18. Will any participant information be included in the study report? (APA Methods Participants  section) |
| We don’t need to identify this for this learning exercise. |
| 19. What statistical test(s) will be conducted? Which variable(s) will be used in those test(s)? |
| ANCOVA |
| 20. What are the assumptions for the statistical tests employed? |
| Additivity and linearity (qq plot); normally distributed sampling distribution (Shapiro-Wilk or K-S test); homoscedasticity/homogeneity of variance (Levene’s test); independent observations (known from study design); independence of covariate and treatment effect (Perform ANOVA with covariate as dependent variable and treatment effect as IV); homogeneity of regression slope (perform a preliminary ANCOVA which includes the interaction between the CV and the IV and look for a non-significant interaction) |
| 21. Do the data meet those assumptions?  a. Test the assumption of independence of the covariate and the independent variable by  conducting an ANOVA using Puppy\_love as the dependent variable and Dose as the  independent variable. Is the result of the test significant? NO. Do we meet this assumption?  Yes (?)  b. Test the assumption of homogeneity of regression slope.  i. This can be looked at graphically using a scatter plot between the covariate  and the dependent variable split by groups of the independent variable. In the Jamovi  library install the scatr package. Create a scatter plot by going to Analyses –  Exploration – Scatterplot. Put Happiness on the X-Axis. Put Puppy\_love on the Y-Axis.  Put Dose in the Group. Click Linear under Regression line. Are the slopes between  Happiness and Puppy\_love for the different groups the same? Do we pass this  assumption? They are similar  ii. This can be looked at numerically by calculating an ANCOVA model which  includes the interaction between Dose and Puppy\_love. Analyses – ANOVA –  ANCOVA. Put Happiness in the Dependent variable box. Put Dose in the Fixed  Factors box. Put Puppy\_love in the Covariates box. Open the Model dropdown. Select  both Dose and Puppy\_love in the Components box at the same time (Ctrl click). Click  on the arrow button on the bottom with the dropdown arrow and select Interaction. You  should see the interaction term Dose\*Puppy\_love get added to the Model Terms box.  Look at the interaction term in the ANCOVA output. Is the term significant. Yes. Do we  meet the homogeneity of regression slope assumption? No. Does the group scatterplot and the  ANCOVA model with the interaction give us the same result? Not sure.  iii. A note about this example in the Field text: When I first learned about  ANCOVA, I was taught that violating the homogeneity of regression slope assumption  was a very serious violation. I was taught that you really shouldn’t conduct an  ANCOVA when this assumption is violated and you should probably analyze the  groups separately as an alternative. Field went ahead and calculated the final  ANCOVA with post-hoc contrasts despite this violation. I probably wouldn’t do that. |
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| 22. NHST steps (for each test):  a. State the null and alternative hypothesis.  b. Establish the criteria for rejection (alpha level).  c. Calculate the test statistic.  d. Draw conclusion about the null.  e. Conduct post-hoc analyses if any.  f. Report results. |
| State the null and alternative hypotheses; Set the criterion for rejections (alpha level); Calculate the test statistic; Draw conclusion about the null hypothesis; Report the results. |
| a. What is the null and alternative hypotheses for the ANCOVA |
| null hypothesis for the effect of the independent variable = **There is no difference in means between when controlling for the effect of the covariage..**  alternative hypothesis for the effect of the first categorical variable = **There is a difference in means between the groups when controlling for the effects of the covariate.** |
| b. What is the criteria for rejection? |
| 0.05 |
| c. Calculate the ANCOVA  i. Put Happiness in Dependent variable  ii. Put Dose in Fixed Factors  iii. Put Puppy\_love in Covariates  iv. Check the box for omega squared under Effect Size  v. Check everything under Assumption Checks  vi. Select simple for Dose in Contrasts  vii. In Post Hoc Tests move Dose to the box on the right. Check Bonferroni.  viii. In Estimated Marginal Means move Dose to Term 1 in Marginal Means, check  Marginal means plots and Marginal means tables under Output. Check Equal cell  weights under General Options  ix. What are the results for Dose in the ANCOVA table? |
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| d. What is your decision about the null hypothesis for the ANCOVA? |
| Reject the null |
| e. How do your post-hoc tests compare to Field?  i. Compare the results of Contrasts with the contrasts in Field Output 13.10  ii. Compare the results of Post Hoc Comparisons – Dose with Field Output 13.11  iii. Compare the results of Estimated Marginal Means – Dose with Field Output  13.7 |
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| f. Look at how Field reports results in section 13.10 |
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| ANCOVA is a type of linear model. Run the code in the .Rmd file. How do the results of lm() in RStudio  compare with the linear model results shown by Field in Output 13.1? |
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