**Assignment**

Utilizing any available disclosed database, develop a researchable set of hypotheses related

to the database. You may also conduct a brief survey for data collection if this is more

desirable. Clearly define quantitatively an analysable hypothesis, analyse your data with any

available tool (Excel is fine), and write up the results in a full quantitative report format.

Your method of statistical analysis must match your hypotheses. For instance, a t-test might

be appropriate to analyse survey data. Draw appropriate conclusions about your

hypotheses in your writeup.

Your final case examination should include:

• Title Page

• Abstract

• Brief introduction to the research problem or problems – State your research

questions and hypotheses within this section but you do not have to develop a

literature review.

• Methods – You will not generally have access to the methodology used to acquire

the data you have chosen but should use the techniques reviewed in class to

determine a variety of information about your subjects. Explain the details of the

variables you have selected to examine. Indicate the statistical test or tests you used

to make your inferences about your hypotheses.

• Results - Include key graphs and follow APA format when citing statistical results and

presenting figures or tables.

• Discussion and Conclusion

• References

Make sure you submit your data file used in the analysis in addition to the report in a Word

document.

Research papers must comply with the most recent APA (American Psychological

Association) Guidelines.

Sample Paper for Statistical Analysis

Abstract

Weight loss is a challenge for many and while diet and exercise are promoted to assist in this goal, the contribution of each to weight loss is unclear. This analysis reviews data collected on 180 participants who chronicled weight loss for two months after participating in different diet and exercise regimens. The analysis provides insight into the impact of diet, exercise level, and the combination of diet/exercise as a function of weight loss

Introduction

Society in general has focused on being healthy and staying fit by following different regiments in diet and exercise (Mayo Clinic, 2019). One of the challenges with this is that there are many diets that claim to enable people to lose weight and different exercise levels and routines that promote weight loss (Mayo Clinic, 2019).  Typically, it is not only diet or exercise that it is claimed that contribute to weight loss. The combination of diet and exercise is claimed to contribute to weight loss (Mayo Clinic, 2019).  The focus of this analysis is to explore how to lose weight effectively by analyzing three different dieting approaches and three exercise levels independently. The three research questions to be focused on are: Does diet contribute to weight loss? Do different exercise levels contribute to weight loss? Does diet and exercise contribute to weight loss? With these research questions, the null (H0) and alternative (HA) hypotheses are:

**Does diet contribute to weight loss?**

Null Hypothesis (H0):  There is not a statistically significant difference in weight loss as a function of diet.

Alternative Hypothesis (HA): There is a statistically significant difference in weight loss as a function of diet.

**Do different exercise levels contribute to weight loss?**

Null Hypothesis (H0):  There is not a statistically significant difference weight loss as function of exercise level.

Alternative Hypothesis (HA): There is a statistically significant difference in weight loss as function of combined exercise level.

**Does diet and exercise combined contribute to weight loss?**

Null Hypothesis (H0):  There is not a statistically significant difference in weight loss with combined exercise level and diet.

Alternative Hypothesis (HA): There is a statistically significant difference in weight loss with combined exercise level and diet.

Methods

The data contains 180 cases of individuals who either applied a diet or exercise level to lose weight. After two months of being on the diet or maintaining exercise levels, it was recorded how much weight was lost in kilos (SPSS, n.d.). The diet values are 1 -” none”, 2 - “Vegetarian”, and 3 - “Atkins” and the exercise levels are 1- “none”, 2 – “30 minutes per day”, and 3 - “60 minutes per day”. Figure 1 shows the weight loss distribution.

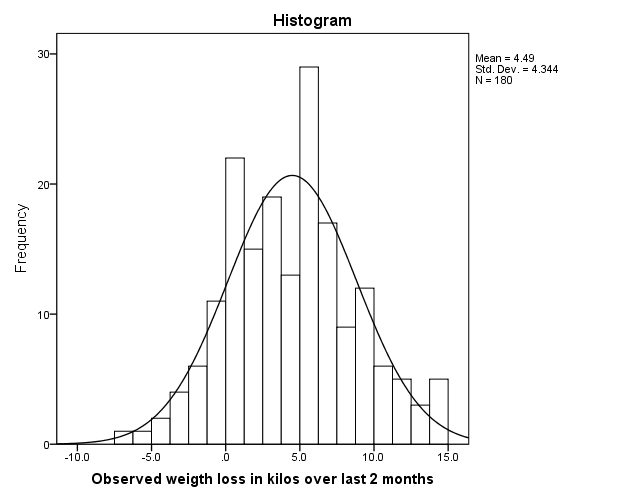
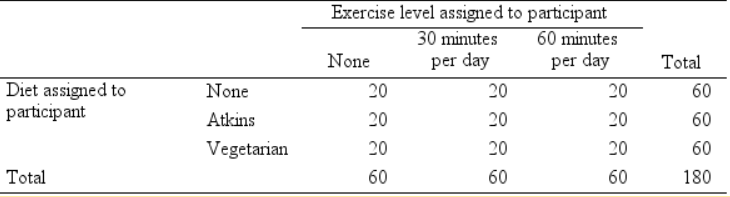


Figure 1. Histogram of weight loss distribution

Figure 1 shows the weight loss and the range is from 7-kilo weight loss (reflected by the negative sign) to a 15-kilo weight gain. Weight loss appears to be normally distributed. Table 1 shows the cross-tabulation of assigned diet and exercise level.

Table 1.

Cross-tabulation of assigned diet and exercise level.



The data are equally balanced across diet and exercise level categories at 60 as depicted in Table 1.The weight loss means are analyzed to support the hypotheses testing using a univariate ANOVA test. To get an understanding of patterns, Table 2 depicts a means table

Table 2.

Means table of diet and exercise

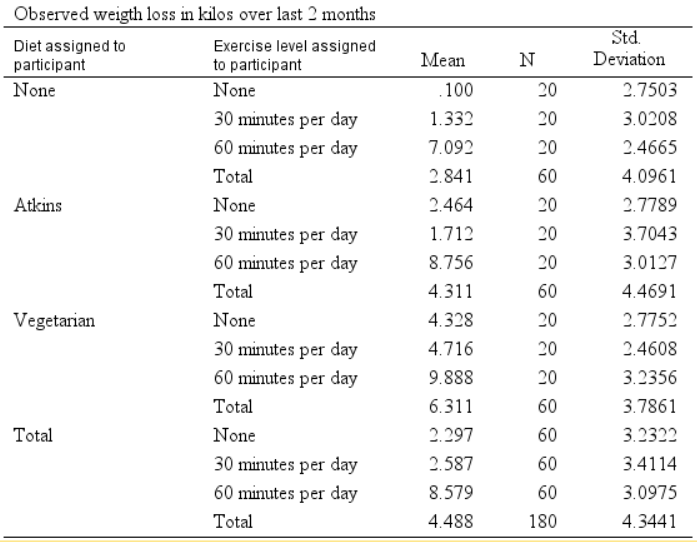


Table 2 shows that individuals with no diet and only exercise lost an average of 2.8 kilos. The Atkins diet resulted in an average of 4.3 kilos in weight loss combined with the exercise levels and the vegetarian diet showed an average of a 6.3 kilo weight loss . This shows that exercise combined with diet shows increased weight loss. Exercise alone shows a stronger affect with an low average of a 2.3 kilos weight loss to a 8.6 kilos weight loss.

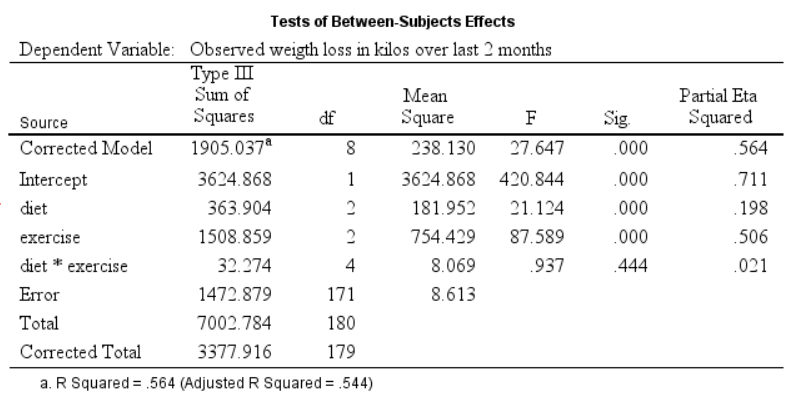
An ANOVA test is proper in the circumstances where each occurrence is independent, the standard deviation of the dependent variable is equal across the independent variables, and the dependent variable is normally distributed (Green & Salkind, 2016). Levene’s test was conducted to analyze the variances for equality (Green & Salkind, 2016). Levene’s test showed a p-value of .653 which supported a conclusion of equal variances across diet and exercise categories. Thus, an ANOVA test is proposed for this analysis.

**Results**

A univariate ANOVA test was completed due to one dependent variable of weight loss. A post-hoc test of Tukey’s HSD was used to test means that may not be equal since ANOVA tests the null hypothesis where means are all equal (Green & Salkind, 2016). Table 3 depicts the Tests Between Subject Effects which shows degrees of freedom, F-value, p-value or significance level for diet, exercise, and diet/exercise. The F-value is the ratio of two chi-square independent variable divided by degrees of freedom (Green & Salkind, 2016).

Table 3.

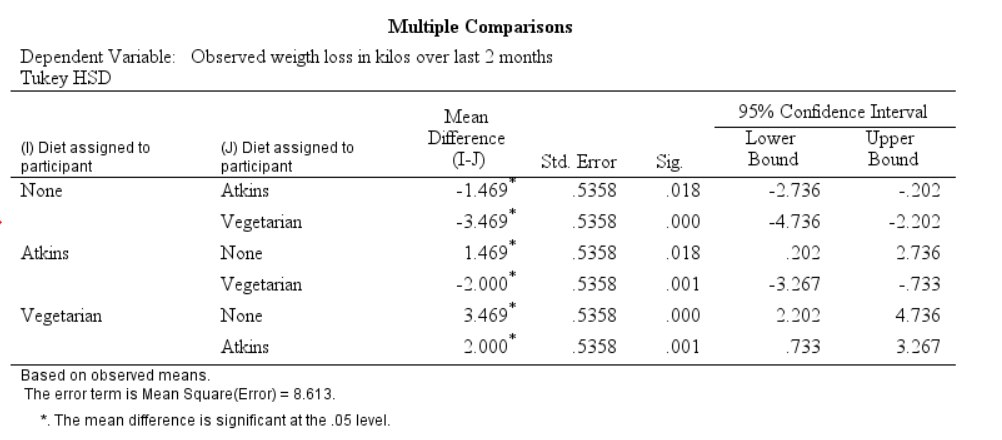
Test of Between-Subjects Effects.

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The interaction between diet and exercise shows degrees of freedom of 4, an F-value of .937, partial Eta Squared of .21, and a p-value (significance value) of .444. The p-value of .444 is > .05, thus no interaction can be supported. Looking at the primary independent variables, both diet and exercise have a p-value of .000 indicated these are statistically significant. Partial Eta Squared for exercise is .506 and for diet is .198.  Exercise has an impact that is 2.5 times that of diet. The adjusted R-square is .544 outlining that approx. 54% of the variance is explained by exercise and diet. The Sums of Squares Error – 1472.879 - represents the variance in weight loss not accounted for

The multiple comparisons table shows the mean error, the significance level, the standard error, and confidence intervals of different categories (Green & Salkind, 2016). Table 4 depicts the multiple comparisons between diet categories (SPSS, n.d.). Diet categories are none, meaning no diet change, Atkins, where participants adopted the high-protein, low-carb diet and vegetarian, where participants only ate non-meat items (Mayo Clinic, 2019),

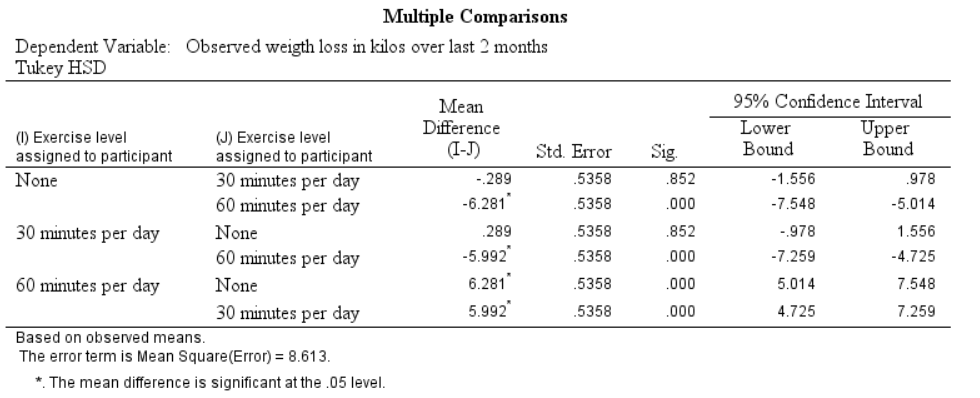
Table 4.

Multiple comparisons for diet. ****

The difference between no diet change and vegetarian is 3.469 kilos which is the most significant diet impact to weight loss. The p-value for no diet change is significant at .001. Participants on an Atkins diet compared to no diet lost 1.469 kilos and participants on a vegetarian diet lost 2 kilos more than the participants on the Atkins diet (p-value = .001). All mean differences are significant as denoted by the asterisks and the significance values of p < .05. Table 5 depicts the multiple comparison table for exercise levels.

Table 5.

Multiple comparisons for exercise level.

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Participants exercising 60 minutes per day lost the most weight. Compared to those participants that did not exercise at all, participants who exercised 60 minutes per day lost 6.281 kilos. This is denoted as significant with an asterisk and a p-value of .000. Those participants who exercised 30 minutes per day compared to 60 minutes per day lost 5.992 kilos. This is also significant with a p-value of .000.Participants who had no exercise compared to those that exercised 30 minutes is .289 kilos. Participants who exercised not at all or only 30 minutes per day had little weight loss or no weight loss.

Based on the multiple comparison charts for both exercise level and diet, the participants that exercised 60 minutes a day and those participants that were on the vegetarian diet lost the most weight. The Atkins diet was the next significant weight loss after vegetarian which was also deemed significant. In Figure 2, the estimated marginal means of weight loss over two months is depicted by exercise level and diet category.

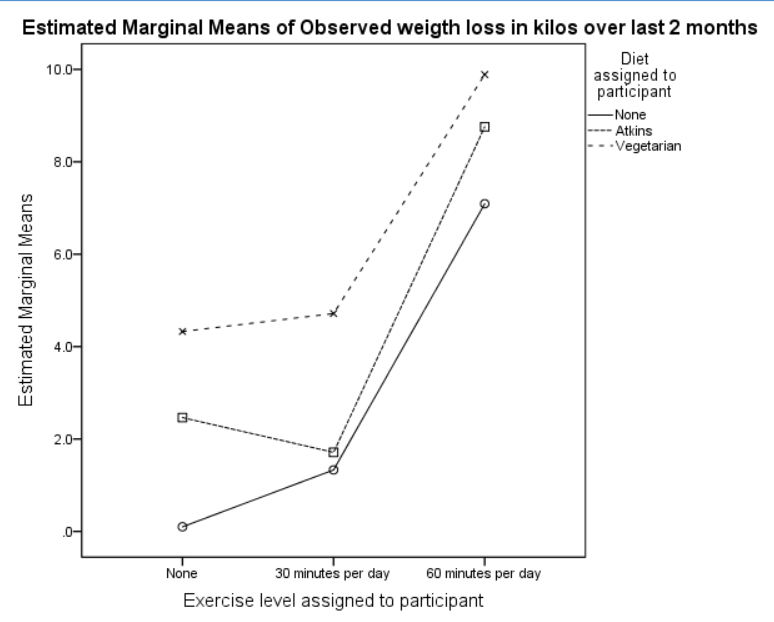
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Figure 2. Estimated marginal means of observed weight loss in kilos over last 2 months.

The estimated marginal means are the same means observed in Table 2 – the means table. The estimated marginal means table supports the conclusion highlighted from the multiple comparisons table. The vegetarian diet at all levels of exercises resulted in the highest weight loss. The highest weight loss mean was the combination of the vegetarian diet and the 60 minutes of exercise per day at 9.888 kilos. The Atkins diet at the 60 minutes a day exercise level resulted in a mean of 8.756 kilos. Increasing exercise levels from none to 30 minutes a day had very little impact on weight loss, regardless of diet category. Based on the graphic it would appear that both diet and exercise have an impact on weight loss; however, the graph does not show interaction as the exercise levels are represented as a single line for each diet group. The tests of between-subject effects for diet and exercise level had a p-value of .444 which supported no interaction.

Conclusion

A univariate ANOVA test was completed due to one dependent variable of weight loss. A post-hoc test of Tukey’s HSD was used to test means that may not be equal since ANOVA tests the null hypothesis where means are all equal (Green & Salkind, 2016).  The “Tests Between-Subject Effects” and “Multiple Comparisons” tables highlighted that exercise levels of none and 30 minutes a day were not significant with a p-value of .852. Additionally, there is no interaction between diet and exercise with a p-value of .444; however, the adjusted R-square is .544 supporting that 54.4% of the variance of the model is explained by diet and exercise for the variance in weight loss.

Exercise levels contributing to weight loss is considered significant at the 60 minute a day level with a p-value of .000 and resulting in the highest weight loss cross the exercise categories of none and 30 minutes a day. No exercise or 30 minutes or exercise had very little impact on weight loss. The vegetarian diet compared to no diet or the Atkins diet was more significance with the highest weight loss across the diet categories. The vegetarian diet was also supported by a p-value of .000 when compared to Atkins and no diet. Based on these findings, the null hypothesis (H0) of weight loss as a function of diet is rejected and null hypothesis (H0) of weight loss as a function of exercise level is also rejected. The null hypothesis (H0) of weight loss as a function of diet combined with exercise is accepted, although both contributed to the explained variance in the model.

Null Hypothesis (H0):  There is not a statistically significant difference in weight loss as a function of diet - Reject

Alternative Hypothesis (HA): There is a statistically significant difference in weight loss as a function of diet - Accept

Null Hypothesis (H0):  There is not a statistically significant difference weight loss as function of exercise level - Reject

Alternative Hypothesis (HA): There is a statistically significant difference in weight loss as function of exercise level - Accept

Null Hypothesis (H0):  There is not a statistically significant difference in weight loss with combined exercise level and diet – Accept

Null Hypothesis (H0):  There is not a statistically significant difference in weight loss with combined exercise level and diet - Reject

**References**

Green, S; Salkind, N. (2016). Using SPSS for Windows and Macintosh, Books a La Carte (8th Edition) (8th ed.). Pearson.

Laerd Statistics. (2018). ANOVA with Repeated Measures using SPSS Statistics. Retrieved from <https://statistics.laerd.com/spss-tutorials/one-way-anova-repeated-measures-using-spss-statistics-2.php>

Mayo Clinic. (2019). The Mayo Clinic Diet: A weight-loss program for life. Retrieved from <https://www.mayoclinic.org/healthy-lifestyle/weight-loss/in-depth/mayo-clinic-diet/art-20045460>

SPSS. (n.d.). SPSS Two Way ANOVA.