**Hands-on-Training in Data Analysis by Kreativstorm. Homework-W4**

Main Research Question: How do pick-up lines and a person’s scent influence relationship initiation?

All the answers (except the ones about mean scores) need to be justified, e.g., if you say that there is homogeneity of variance, provide evidence for your claim, if you transformed a variable, explain why.

**RQ1: Is there any evidence to suggest that the cute-direct pick-up approach will lead to more relationship receptivity than the direct-direct approach? Yes**

1. What is your dependent variable? Receptivity
2. What is(are) your independent variable(s)? Pick up.
3. Are the scores in each cell independent? Yes. Durbin-Watson significant value indicate that there is independence in the observation as the value indicate 1.86 which it’s within the range (1.5-2.5).
4. Are there any significant outliers? There is no Outlier. The Z scores of both variables on the cell are below 3.3.
5. How is your dependent variable distributed in each cell? The dependent variable under the tests of normality (Shapiro-Wilk) is not normally distributed.
6. Do you need to perform any transformations? No. There is no need to perform any transformation because the value (0.001) will not change.
7. Is there homogeneity or heterogeneity of variance? Yes, there is homogeneity of variance in the distribution according to the Levene test which shows a significant value of 0.282 greater than 0.05.(P>0.05)
8. What is the mean score of receptivity in the experimental condition? 3.86
9. What is the mean score of receptivity in the control condition? 3.65
10. What is your answer to RQ1? Report on the findings (no less than 150 words). Don’t forget to mention the assumptions.

**Design the hypothesis testing:**

* Null Hypothesis (H0): There is no significant difference in relationship receptivity between the cute-direct pick-up approach and the direct-direct approach.
* Alternative Hypothesis (Ha): There is a significant difference in relationship receptivity between the cute-direct pick-up approach and the direct-direct approach.

**Findings:**

1. There are no outliers according to the Z score test.

2. The dependent variables is not normally distributed according to the test of normality (Shapiro-Wilk test) and because of this violation, one-way ANOVA is considered “robust” for the test.

3. There is Homogeneity of variance according to the Levene test (P>0.282).

4. Determining if your sample sizes are equal. The sample sizes are different and large in sizes. Such size can provide a more reliable and powerful results.

5. Choosing a post hoc test. The test is not allowed for dependent variable with fewer than three groups.

6. ANOVA test has a significant value of 0.007.

7. The “Cute direct” experimental condition mean is different from the” Direct -direct” control mean.

8. The Eta-squared effect sizes is 0.037. This suggest that there is 3.7% proportion of variance in the dependent variable that can be attributed to the independent variable, which is small.

**Conclusion:**

Since ANOVA is statistically significant at 0.007 (p < .05), we therefore reject the null hypothesis and conclude that there is a significant difference in relationship receptivity between the cute-direct pick-up approach and the direct-direct approach.

**RQ2: Is there any evidence to suggest that the presence of androstadienone spray will lead to more relationship** **receptivity than no spray? Yes**

1. What is your dependent variable? Receptivity
2. What is(are) your independent variable(s)? Androstadienone spray
3. Are the scores in each cell independent? Yes.

The Durbin-Watson significant value indicate that there is independence in the observation as the value shows 1.80 which is within the range of (1.5-2.5)

1. Are there any significant outliers? There is no outlier, the z scores for both variables fall below 3.3.
2. How is your dependent variable distributed in each cell? The test of normality indicate that the dependent variable is not normally distributed.
3. Do you need to perform any transformations? Yes, transformation is required to normalize the data to carry out the test. Common transformations include the natural logarithm (ln), square root (√x), or Box-Cox transformations. Transformations can help make the residuals more normal and may improve the validity of the results.
4. Is there homogeneity or heterogeneity of variance? There is no homogeneity of variance. The Levene test shows 0.0001, which is less than 0.05 (P<0.05).
5. What is the mean score of receptivity in the experimental condition? 3.85
6. What is the mean score of receptivity in the control condition?3.69?
7. What is your answer to RQ2? Report on the findings (no less than 150 words). Don’t forget to mention the assumptions.

**Design the Hypothesis:**

* Null Hypothesis (H0): The presence of androstadienone spray has no effect on relationship receptivity.
* Alternative Hypothesis (Ha): The presence of androstadienone spray leads to more relationship receptivity.

**Findings:**

1.There are no outliers according to the Z score test on the variables.

2. The dependent variable is not normally distributed according to the test of normality (Shapiro-Wilk test) p<0.036. This is a violation of the normality test and One-way ANOVA is considered robust for such test.

3. There is no Homogeneity of variance according to the Levene test which is 0.001 (P<0.05).

4. The sample sizes are different and large. Such sizes can provide a more reliable and powerful results.

5. Choosing a post hoc test. The test is not allowed for dependent variable with fewer than three groups.

6. Welch’s ANOVA is used for the test because of the violation of the tests of homogeneity of variances, which has a value of 0.034.(P< 0.05).

7. The “Spray” experimental condition mean is different from the “No spray” control condition means.

8. Calculating the effect size. One-way ANOVA effect sizes is 0.022. This suggest that there is 2.2% proportion of variance in the dependent variable that can be attributed to the independent variable, which is small.

**Conclusion:**

Since Welch’s ANOVA is statistically significant at 0.034 (P < .05), we therefore reject the null hypothesis and conclude that there is a statistical significance to suggest that the presence of androstadienone spray leads to more relationship receptivity.

**RQ3: Is there any evidence to suggest that the impact of the androstadienone spray on attractiveness effect will be enhanced by the pick-up approach?** Yes.

1. What is your dependent variable? Attractiveness effect (Receptivity)
2. What is(are) your independent variable(s)? Scent (Androstadienone spray) and Pick-up.
3. Are the scores in each cell independent? They are not because the Durbin-Watson significant shows that there is no independence in the observation. The value shows 0.129 significance which is less than the established Durbin-Watson value range (1.5-2.5).
4. Are there any significant outliers? There is no outlier, because the Z scores for the variables fall below 3.3.
5. How is your dependent variable distributed in each cell? The significance value on the normality test indicate that the variables are not normally distributed.
6. Do you need to perform any transformations? Transformation is required to normalize the dependent variable for proper analysis based on the violations on the test of normality and Durbin-Watson independence of observation. Common transformations include the natural logarithm (ln), square root (√x), or Box-Cox transformations. Transformations can help make the residuals more normal and may improve the validity of the results.
7. Is there homogeneity or heterogeneity of variance? There is no homogeneity of variance. The Levene test significance value is 0.0001. (P<0.05).In consequence of this, two-way ANOVA is required to handle the heterogeneity of the variance.

N.B. If group sample sizes are equal or approximately equal and large, there is normality and the ratio of the largest group variance to the smallest group variance is less than 3, the two-way ANOVA is somewhat robust to heterogeneity of variance in these circumstances (Jaccard, 1998).

Reminder: Standard deviation is square root of variance ().

1. Is there any interaction between the two factors? Yes

There is Interaction between the two variables (scent\*pick up) at 0.003, which is less than 0.05 (P<0.05). This suggest that there is statistical interaction effect between the two variables, but at a small effect.

1. **What is your answer to RQ3? Report on the findings (no less than 200 words). Don’t forget to mention the assumptions. You can use η2 instead of ω2**

**Design the Hypothesis testing:**

* Null Hypothesis (H0): There is no significant difference in the impact of androstadienone spray on attractiveness effect between different pick-up approaches.
* Alternative Hypothesis (Ha): The impact of androstadienone spray on attractiveness effect is significantly enhanced by the pick-up approach.

**Findings:**

1. There are no outliers according to the Z score test.

2. Test of normality for the dependent variable is not normally distributed according to Shapiro-Wilk test with significance at 0.001 and 0.036 (p<0.001 and p<0.036)

3.There is no homogeneity of variance according to Levene test significance at 0.0001.(P<0.05).

4. The sample sizes are large and different. Such samples sizes can provide a more reliable result.

5. Choosing a post hoc test. The test is not allowed for dependent variable with fewer than three groups, which is the case here.

6. There is interaction between the two variables (scent\*pick up) at 0.003, which is less than 0.05 (P<0.05). This suggest that there is a statistical interaction effect between the independent variables but a small effect.

7. The partial Eta Squared of the test has an effect size of 0. 046.This indicate that the independent variables have a relative low impact on the variability in the dependent variable with 4.6%.

**Conclusion:**

Due to the statistical interaction effect between the independent variables, we therefore reject the null hypothesis and conclude that the impact of androstadienone spray on attractiveness effect is significantly enhanced by the pick-up approach but with relatively small effect present.

1. **Answer the main research question by taking the above findings into account (no less than 200 words). Don’t forget to mention the assumptions.**

Main Research Question: How do pick-up lines and a person’s scent influence relationship initiation?

In line with the above findings which has some similarities in the above question, I therefore design the hypothesis.

**Develop Hypothesis testing:**

* Null Hypothesis (H0): There is no significant influence of pick-up lines or a person's scent on relationship initiation.
* Alternative Hypothesis (Ha): Either pick-up lines or a person's scent (or both) significantly influence relationship initiation.

Using Standard multiple Regression for independent variables:

The significance value in ANOVA is 0.002

P<0.002

**Conclusion**:

Since p< 0.002, we therefore reject the null hypothesis, and conclude that either pick-up lines or a person's scent significantly influence relationship initiation. But we need to know the extent of the effect.