DATA ANALYSIS: HYPOTHESIS TESTING

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This study will focus on independent samples t test, paired samples t test and ANOVA using the Sun Coast Remediation dataset. Analysis was done using Excel Tool Pak which aid in data analysis.

Independent Samples t Test: Hypothesis Testing

Independent samples t test examines the difference between means of two variables that are independent of each other (Eyduran & Duman, 2019). The data utilized in this study is for Group A prior training scores and Group B revised training scores. The hypotheses were;

Ho: There is no statistically significant difference in mean values for Group A prior training scores and Group B revised training scores.

Ha: There is a statistically significant difference in mean values for Group A prior training scores and Group B revised training scores.

Results

The results of the analysis were given as follows;

t-Test: Two-Sample Assuming Unequal Variances

	Group A Prior Training Scores	Group B Revised Training Scores
Mean	69.79032258	84.77419355
Variance	122.0044952	96.45690141
Observations	62	62
Hypothesized Mean Difference	0	
df	87	
t Stat	-9.666557191	
P(T<=t) one-tail	9.69914E-16	
t Critical one-tail	1.662557349	
P(T<=t) two-tail	1.93983E-15	
t Critical two-tail	1.987608282	

According to the results, Group B Revised Training had a higher mean of 84.77 compared to the mean for Group A Prior Training Scores which was 69.79. The p value = 1.94E-15 which is less than .05. This implies that we reject the null hypothesis and conclude that there is a statistically significant difference in mean values for Group A prior training scores and Group B revised training scores. The mean for Group B revised training scores was significantly higher than Group A prior training scores.

Dependent Samples (Paired Samples) t Test: Hypothesis Testing

Paired samples t test is useful in a case where a given variable is measured at two different occasions mostly before and after treatment. In this study, pre-exposure µg/dL and post-exposure µg/dL scores were examined if there is a statistical significant difference in means. The hypotheses tested were given as follows;

Ho: There is no statistical significant difference in means for pre-exposure µg/dL and post-exposure µg/dL scores.

Ha: There is a statistical significant difference in means for pre-exposure µg/dL and post-exposure µg/dL scores.

Results

The output of the analysis was as shown below;

t-Test: Paired Two Sample for Means

	Pre-Exposure µg/dL	Post-Exposure µg/dL
Mean	32.85714286	33.28571429
Variance	150.4583333	155.5
Observations	49	49
Pearson Correlation	0.992236043	
Hypothesized Mean Difference	0	
df	48	
t Stat	-1.929802563	
P(T<=t) one-tail	0.029776357	
t Critical one-tail	1.677224196	
P(T<=t) two-tail	0.059552714	
t Critical two-tail	2.010634758	

According to the analysis, the mean for post-exposure µg/dL scores was higher compared to the mean for pre-exposure µg/dL scores. However, the p-value = .06 which is greater than .05. This implies that we fail to reject the null hypothesis and conclude that there is no statistically significant difference in means for pre-exposure µg/dL and post-exposure µg/dL scores.

ANOVA: Hypothesis Testing

Analysis of variance (ANOVA) test is appropriate in comparing means for more than 2 groups of a parametric variable. This study examines the different returns on investments for 4 projects A) Air, B) Soil, C) Water and D) Training. The main aim was to examine whether there was a significant difference in mean returns between the 4 projects. The hypotheses tested were given as follows;

Ho: There is no statistical significant difference in mean return on investments for air, soil, water and training projects.

Ha: There is a statistical significant difference in mean return on investments for air, soil, water and training projects.

The analysis was conducted in Excel and the results were as shown below;

Anova: Single Factor

SUMMARY

GroupsCountSumAverageVariance

A = Air201788.99.357895

B = Soil201829.13.042105

C = Water2014076.631579

D = Training201085.41.410526

ANOVA

Source of VariationSSdfMSFP-valueF crit

Between Groups182.8360.9333311.92311.76E-062.724944

Within Groups388.4765.110526

Total571.279

Analysis indicates that the mean was high when the soil project was implemented (M = 9.1%) return on investment. The second highest project was air (M = 8.9%) followed by water (M = 7.0%) and the least project was training with a mean of 5.4% return on investment.

Results showed that F (3, 76) = 11.92, p = 1.76E-06 which is less than .05 (Quirk, 2012). This implies that we reject the null hypothesis and conclude that there is a statistical significant difference in mean return on investments for air, soil, water and training projects.

References

Eyduran, E., & Duman, H. (2019). Application of independent sample t-test and normality tests in R-Lecture notes.

Quirk, T. J. (2012). One-way analysis of variance (ANOVA). In Excel 2007 for Educational and Psychological Statistics (pp. 163-179). Springer, New York, NY.