Data Analysis

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**Data Analysis:**

**Independent Samples *t* Test:**

 ***Ho****:* No statistically significant difference exist in mean values for the Prior Training Scores and Revised Training Scores

***Ha:*** Statistically significant difference exists in mean values for the Prior Training Scores and Revised Training Scores

 **Statistical output results**

|  |
| --- |
| t-Test: Two-Sample Assuming Unequal Variances |
|  |  |  |  |
|  | *Group A Prior Training Scores* | *Group B Revised Training Scores* |  |
| Mean | 69.79032 | 84.77419 |  |
| Variance | 122.0045 | 26.96457 |  |
| Observations | 62 | 62 |  |
| Hypothesized Mean Difference | 0 |  |  |
| df | 87 |  |  |
| t Stat | -9.66656 |  |  |
| P(T<=t) one-tail | 9.7E-16 |  |  |
| t Critical one-tail | 1.662557 |  |  |
| P(T<=t) two-tail | 1.94E-15 |  |  |
| t Critical two-tail | 1.987608 |   |  |

 From the results, it indicates that the mean values are lower for Group B that is Revised Training Scores; however, the results also indicate a *p* value of 1.94E-15 < 0.05. Therefore, we fail to agree the null hypothesis and assume that there is a statistically significant change in mean values between Prior Training Scores and Revised Training Scores.

**Dependent Samples (Paired Samples) *t* Test:**

 *Ho:* There is no statistically significant difference in mean values for the Pre-Exposure and Post-Exposure

*Ha:* There is a statistically significant difference in mean values for the Pre-Exposure and Post-Exposure

**Statistical output results**

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| --- |
| t-Test: Paired Two Sample for Means |
|  |  |  |
|  | *Pre-Exposure μg/dL* | *Post-Exposure μg/dL* |
| Mean | 32.85714 | 33.28571 |
| Variance | 150.4583 | 155.5 |
| Observations | 49 | 49 |
| Pearson Correlation | 0.992236 |  |
| Hypothesized Mean Difference | 0 |  |
| df | 48 |  |
| t Stat | -1.9298 |  |
| P(T<=t) one-tail | 0.029776 |  |
| t Critical one-tail | 1.677224 |  |
| P(T<=t) two-tail | 0.059553 |  |
| t Critical two-tail | 2.010635 |   |

**Interpretations**

From the results, it indicates that the mean values for Pre-Exposure are lower than for the Post-Exposure; however, the results also indicate a *p* value of 0.059553 > 0.05. Therefore, we assume the null hypothesis and agree that there is no statistically significant difference in mean values for the Pre-Exposure and Post-Exposure (Yuksel, N., Kanık, A. E., & Baykara, T., 2000).

**ANOVA: Hypothesis Testing**

The null and alternative hypotheses are:

 *Ho:* The mean groups are equal for all Air, Soil, Water and Training (Creswell, J. W. 2008).

 *Ha:* The mean groups are not equal for all Air, Soil, Water and Training

**Statistical output results**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Anova: Single Factor |  |  |  |  |
|  |  |  |  |  |  |  |
| SUMMARY |  |  |  |  |  |
| *Groups* | *Count* | *Sum* | *Average* | *Variance* |  |  |
| A = Air | 20 | 178 | 8.9 | 9.357895 |  |  |
| B = Soil | 20 | 182 | 9.1 | 3.042105 |  |  |
| C = Water | 20 | 140 | 7 | 6.631579 |  |  |
| D = Training | 20 | 108 | 5.4 | 1.410526 |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| ANOVA |  |  |  |  |  |  |
| *Source of Variation* | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
| Between Groups | 182.8 | 3 | 60.93333 | 11.9231 | 1.76E-06 | 2.724944 |
| Within Groups | 388.4 | 76 | 5.110526 |  |  |  |
|  |  |  |  |  |  |  |
| Total | 571.2 | 79 |   |   |   |   |

**Interpretation**

 The Summary table indicates that the mean strengths range from a low of 108 for training to the highest of 182 for soil. Our sample means are different.

 In the ANOVA table, the p-value is 1.75888E-06. The p-value is less than the significance level 0.05, therefore we reject the null hypothesis and conclude that our sample data provide sufficient proof to determine that the four population means are not equivalent.

References

Creswell, J. W. (2008). *Qualitative, quantitative, and mixed methods approaches*.

Yuksel, N., Kanık, A. E., & Baykara, T. (2000). Comparison of in vitro dissolution profiles by ANOVA-based, model-dependent and-independent methods. *International journal of pharmaceutics*, *209*(1-2), 57-67.