**Practice Assignment 7: Height, Age, and Gender Analysis**

**To: Dr.Bingenheimer**

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**RE: One-Way ANOVA & Regression Analysis of Student Height**

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**Figure 1: Scatterplot of Height with Age**

A graph showing the age of years

Description automatically generated

According to Figure 1, a positive trend is evident in the scatterplot. As age increases, height also rises. The data shows a straight-line trend, indicating consistency since it is not curvilinear. Lastly, there are a few outliers.

**Figure 2:Logistic Regression: Correlation Between Age and Height**

|  |  |
| --- | --- |
| **Variables** | **Values** |
| **Height (cm)** |  |
| **Mean (SD)** | 126.11 (17.45) |
| **Age (years)** |  |
| **Mean (SD)** | 7.60 (1.43) |
| **Height(cm) & Age (years)** |  |
| **Pearson Correlation (r)** | 0.808 |
| **r2** | 0.653 |
| **p-value** | 0.000 |

Figure 2 shows a correlation between age and height. The Pearson correlation is statistically significant, revealing a strong positive relationship. As age increases, height also tends to increase. Approximately 65.3 percent of the variance in height is explained, indicating that other factors contribute to height, not merely age.

**Figure 3: Logistic Regression: Correlation Between Age and Dummy Variable for Sex**

|  |  |
| --- | --- |
| **Variables** | **Values** |
| **Height (cm)** |  |
| **Mean (SD)** | 126.11 (17.45) |
| **Male Dummy Variable**  **(1=Male, 0=Female)** |  |
| **Mean (SD)** | 0.49(0.50) |
| **Male Dummy Variable**  **(1=Male, 0=Female)** |  |
| **Pearson Correlation (r)** | 0.018 |
| **r2** | 0.000 |
| **p-value** | 0.283 |

Based on the dummy variable for sex, the Pearson correlation and p-value indicate no correlation between being male and height, as supported by the p-value being greater than 0.05. The regression fit (r²) is 0.000, which means that 0% of the variance in height is explained by the dummy variable, suggesting no meaningful contribution.

**Figure 4: Independent t-test of Height Between Girls and Boys**

|  |  |
| --- | --- |
| **Variables** | **Values** |
| **Female Mean (SD)** | 125.79(16.92) |
| **Male Mean (SD)** | 126.43(17.99) |
| **Height (cm)** |  |
| **Levene’s Test** | p=0.065 |
| **Two-sided p-value** | 0.565 |

In Figure 4, Levene’s test p-value is more significant than 0.05, indicating that equal variances are assumed. The two-sided p-value, with equal variances assumed, is also greater than 0.05, suggesting no significant difference in height between males and females.

**Figure 5: Correlation Between Height and Grade Dummy Variable**

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** | **Mean(SD)** | **Pearson r with Height (cm)** | **p-value** |
| **Height (cm)** | 126.11 (17.45) |  |  |
| **Kindergarten** | 0.167(0.373) | -0.530 | 0.000 |
| **First Grade** | 0.218(0.413) | -0.299 | 0.000 |
| **Second Grade** | 0.197(0.400) | -0.028 | 0.191 |
| **Third Grade** | 0.201(0.401) | 0.253 | 0.000 |
| **Fourth Grade** | 0.217(0.412) | 0.559 | 0.000 |

In Figure 4, negative correlations (Kindergarten = -0.530, p < 0.001) suggest that lower grades are associated with shorter height. Additionally, positive correlations (Fourth Grade = 0.559, p < 0.001) indicate that higher grade levels correspond to greater height. For second grade, the p-value of 0.191 implies that being in 2nd grade does not have a meaningful correlation with height and is not statistically significant.

**Figure 6: One-Way ANOVA (Height by Grade)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Variables** | **N** | **Mean Height(cm)** | **SD** | **F value** | **p-value** |
| **Kindergarten** | 167 | 105.47 | 10.62 |  |  |
| **First Grade** | 218 | 116.23 | 10.86 |  |  |
| **Second Grade** | 197 | 125.13 | 11.33 |  |  |
| **Third Grade** | 201 | 134.91 | 11.81 |  |  |
| **Fourth Grade** | 217 | 144.65 | 10.71 |  |  |
| **Between Groups** | df=4 |  |  | 374.12 | <0.001 |

**Figure 7: Tukey’s Post Hoc Test for Height Differences Between Grades**

|  |  |  |
| --- | --- | --- |
| **Comparison** | **Mean Difference (cm)** | **p-value** |
| **Kindergarten vs. First Grade** | -10.76 | <0.001 |
| **First Grade vs. Second Grade** | -8.90 | <0.001 |
| **Second Grade vs. Third Grade** | -9.78 | <0.001 |
| **Third Grade vs. Fourth Grade** | -9.73 | <0.001 |

An ANOVA test was conducted to compare height across various grade levels. Figure 6 illustrates a significant effect of grade on height (p<0.001). We reject the null hypothesis that all grade levels have the same average height and will perform Tukey’s Post Hoc Test to determine which grade levels differ. Figure 7 displays the results of Tukey’s Post Hoc Test, indicating that each grade level has a significantly different mean height, with p-values all less than 0.05. Heights significantly increase from Kindergarten to Fourth Grade.