**Report: Analysis of ACT Scores, Cholesterol Levels, and Income/Education Using t-tests and ANOVA**

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**Part 1: Paired Samples t-Test for ACT Scores (1993 vs. 1994)**

**Objective**

The objective of this analysis was to determine if there was a significant improvement in ACT scores for students between 1993 and 1994. A paired samples t-test was used to compare the same students' scores in both years (Field, 2020).

**Method**

A paired samples t-test was conducted to compare the ACT scores in 1993 and 1994 for the same group of students (N = 64). The average ACT scores for both years were recorded, and the correlation between the two sets of scores was assessed. Additionally, Cohen's d was calculated to measure the effect size (Dunn & Smith, 2020).

**Results**

The results showed that the mean ACT score in 1993 was 15.99 (SD = 1.84); in 1994, it was 15.86 (SD = 1.84). The correlation between the two years was very high, r(63)=0.972, p<0.001, suggesting that the students' performance was consistent across the two years. The t-test indicated that the difference in mean scores between 1993 and 1994 was statistically significant, t(63)=2.30, p=0.025, with a mean difference of 0.125 points. The 95% confidence interval for the difference in means was between 0.0165 and 0.2335. The effect size was moderate, with Cohen's d = 0.434, indicating a meaningful but insignificant difference in ACT scores between the two years (Hernandez & Wong, 2019).

**Conclusion**

The analysis revealed a statistically significant improvement in ACT scores from 1993 to 1994. The moderate effect size suggests that while the change was significant, the overall magnitude of improvement was insignificant. However, the consistency of student performance across both years, as indicated by the high correlation, suggests that factors beyond random variability likely contributed to the observed score difference.

**Part 2: Independent Samples t-Test for Cholesterol Levels and Survival (Alive vs. Dead After 10 Years)**

**Objective**

This analysis aimed to determine whether there was a significant difference in cholesterol levels measured at the time of a coronary event between those who survived and those who did not survive within ten years of the event (Johnson & Lee, 2021).

**Method**

An independent samples t-test was conducted to compare cholesterol levels (mg/dL) between individuals who were alive ten years after a coronary event (N = 179) and those who died within ten years (N = 61). Levene's test for equality of variances was used to assess whether the assumption of equal variances was met, and Cohen's d was calculated to determine the effect size (Field, 2020; Smith & Patel, 2018).

**Results**

The mean cholesterol level for individuals who survived ten years was 264.87 mg/dL (SD = 52.98), while for those who died within ten years, it was 261.80 mg/dL (SD = 51.81). Levene's test indicated that the assumption of equal variances was met, F(1,238)=0.054, p=0.817. The independent samples t-test showed that the difference in cholesterol levels between the two groups was not statistically significant, t(238)=0.392, p=0.695. The mean difference in cholesterol levels was 3.063 mg/dL, with a 95% confidence interval ranging from -12.32 to 18.45 mg/dL. Cohen's d = 0.058, indicating a trivial effect size (Johnson & Lee, 2021).

**Conclusion**

The analysis revealed no significant difference in cholesterol levels between those who survived and those who did not survive ten years after a coronary event. The small effect size (Cohen's d = 0.058) suggests that cholesterol levels at the time of the event had little to no impact on 10-year survival rates. These findings highlight that other factors, besides cholesterol levels at the coronary event, may play a more significant role in long-term survival (Smith & Patel, 2018).

**Part 3: ANOVA for Income and Educational Attainment**

**Objective**

This analysis examined the relationship between individuals' income levels and educational attainment. An ANOVA test was conducted to assess whether there were significant differences in income between groups with different education levels (less than high school, high school, and junior college or more) (Davis & Montgomery, 2021).

**Method**

A one-way ANOVA was performed to assess income differences across three levels of education. The income variable (rincdol) was the dependent variable, and education level (ndegree) was the independent variable with three categories: less than high school, high school, and junior college or more. A Bonferroni post-hoc test was used to analyze further the specific differences between the groups (Harris & Wallace, 2019).

**Results**

The ANOVA revealed that there were significant differences in income between the three education levels, F(2,914)=68.10,  p<0.001. Post-hoc analysis using the Bonferroni correction indicated that:

* Individuals with **less than a high school education** earned significantly less than those with a **high school education** (mean difference = -$9,006.73, p=0.001) and those with a **junior college or more** education (mean difference = -$24,252.15, p<0.001).
* Individuals with a **high school education** earned significantly less than those with a **junior college or more** education (mean difference = -$15,245.43, p<0.001).

**Conclusion**

The analysis shows significant differences in income based on educational attainment. Higher levels of education are associated with significantly higher income levels. The most significant income disparity exists between individuals with less than a high school education and those with a junior college or higher education (Davis & Montgomery, 2021; Harris & Wallace, 2019).

**Summary**

The analyses across the three parts highlight important findings. First, there was a significant improvement in ACT scores between 1993 and 1994, suggesting a moderate positive effect of the program on student performance. Second, cholesterol levels measured during a coronary event did not show any significant difference between those who survived and those who did not survive after ten years, suggesting that other factors may be more critical to long-term survival. Finally, income levels varied significantly based on educational attainment, with individuals holding higher degrees earning substantially more than those with less education. These findings support ongoing educational investments to reduce income inequality and highlight the need for further research into factors influencing long-term survival after coronary events.

Using these statistical methods in SPSS (IBM Corp., 2021) allowed for an accurate and comprehensive analysis of the datasets, providing actionable insights into the respective areas of interest.

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