

1. Understanding Statistical vs. Practical Significance

- **Statistical Significance:** This indicates whether the observed differences between groups are unlikely to have occurred by chance. For example, a p-value below a certain threshold (e.g., 0.05) suggests that there is a statistically significant difference between the groups.
- **Practical Significance:** This goes a step further by asking whether the observed differences are large enough to be meaningful in a real-world context. Even if a difference is statistically significant, it might not be practically significant if the effect size (mean difference) is very small.

2. Interpreting Mean Differences

- The mean difference provides a specific metric that quantifies how much one group differs from another. For instance, if the mean difference in log-transformed sales between **Office Supplies** and **Furniture** is 0.5, this suggests that, on average, sales in one category are higher than in the other by a certain amount (in this case, in log terms).
- This information helps to determine whether the difference is worth considering in business decisions. A small mean difference (e.g., 0.01) may indicate that, while there is a statistically significant difference, the practical impact on sales or strategy could be negligible.

3. Guiding Business Decisions

- **Resource Allocation:** If the mean difference indicates that one category has significantly higher sales, businesses may want to allocate more resources (e.g., marketing, inventory) to that category to capitalize on its performance.
- **Strategic Focus:** Understanding which product categories differ significantly in sales can help shape promotional strategies. For example, if **Technology** has substantially higher mean sales compared to **Furniture**, a business might prioritize promotions for Technology items.
- **Performance Evaluation:** Monitoring these differences over time allows businesses to assess whether certain product categories are gaining or losing market traction.

4. Illustrating Changes Over Time

- By comparing mean differences across various time periods (e.g., quarterly or annually), businesses can observe trends in customer preferences and adjust their strategies accordingly.

Example Scenario

Imagine you find the following mean differences after conducting Dunn's post-hoc test:

- **Office Supplies vs. Furniture:** Mean Difference = 0.6 (statistically significant)
- **Office Supplies vs. Technology:** Mean Difference = 0.02 (statistically significant)
- **Furniture vs. Technology:** Mean Difference = 0.1 (not statistically significant)

Interpretation:

- The significant mean difference between **Office Supplies** and **Furniture** suggests that Office Supplies has substantially higher log sales, warranting further investment in that category.
 - The mean difference of 0.02 between **Office Supplies** and **Technology** is minimal, suggesting that while statistically significant, the difference may not warrant a change in strategy.
 - The lack of significant difference between **Furniture** and **Technology** indicates that there is no strong rationale for changing how these categories are treated.
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P-Adjusted Values

- **Definition:** P-adjusted values (p-adj) are the results of adjusting p-values to account for the multiple comparisons problem. This adjustment is crucial when you perform several statistical tests simultaneously, as it helps control the likelihood of Type I errors (false positives).
- **Interpretation:** A low p-adj value (typically < 0.05) indicates that there is a statistically significant difference between the groups being compared, after accounting for the number of comparisons made. It reflects the reliability of your findings in terms of statistical significance.

Mean Differences

- **Definition:** Mean difference refers to the difference in the average values (means) of the variable of interest (e.g., log-transformed sales) between two groups. It quantifies the actual change or effect size that is being observed between groups.

- **Interpretation:** The mean difference provides insight into the magnitude of the difference between groups. A large mean difference might indicate a practically significant effect, even if the p-value is not below the threshold for significance, emphasizing the importance of considering effect size alongside statistical significance.

Comparison and Context

When discussing your results, you can present them together to provide a more comprehensive understanding:

- **Statistical Significance:** Use the p-adjusted values to indicate whether the differences between groups are statistically significant.
- **Effect Size:** Use the mean differences to illustrate how substantial these differences are in a practical sense.

Example

- **P-Adjusted Value:** A p-adj of 0.001 indicates a statistically significant difference between categories.
- **Mean Difference:** A mean difference of 0.1455 suggests that the average sales (log-transformed) of one category is significantly higher than another by that amount.

In summary, comparing **p-adjusted values** and **mean differences** allows you to address both the statistical significance and the practical implications of your findings, giving a fuller picture of the results from your analysis.