

Comparative Analysis of Age Restrictions and Rotten Tomatoes Scores on Disney+ and Netflix



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Introduction

In an increasingly competitive streaming market, platforms like Disney+ and Netflix constantly strive to differentiate themselves and appeal to their target audiences. Many view Disney+ as a family-friendly platform catering primarily to children and young viewers, while Netflix projects itself as a platform with a diverse range of content, including a significant focus on adult audiences. However, these perceptions often overlook the full diversity of content on each platform, especially with Disney+'s inclusion of franchises like Marvel and Star Wars, which attract viewers across age groups.

Understanding the actual differences in content offers valuable insights for various stakeholders. For instance, industry analysts and marketers use this knowledge to refine audience segmentation strategies, while consumers identify which platform aligns more closely with their preferences. Additionally, comparing the quality of content, measured by critical reception (e.g., Rotten Tomatoes scores), highlights whether these platforms differ in their ability to produce or host critically acclaimed movies.

By analyzing the age restrictions and Rotten Tomatoes scores of movies available on Disney+ and Netflix, we aim to answer two key questions:

- **Are the movies on Disney+ targeted toward younger audiences compared to Netflix?**
- **Are the movies on Netflix generally rated higher than those on Disney+ in terms of critical reception?**

The findings from this analysis could provide a deeper understanding of the distinct niches these platforms occupy and help address prevailing assumptions about their content strategies.

Detailed description of the problem

Research Questions

This analysis addresses two central research questions:

Age Restrictions: *Are movies on Disney+ generally aimed at younger audiences compared to those on Netflix?*

This question examines whether the perception of Disney+ as a platform predominantly for children and families holds true when compared to Netflix, which is often seen as catering to a broader and more mature audience.

Quality of Movies: *Is there a difference in the critical reception of movies on Netflix and Disney+, as measured by Rotten Tomatoes scores?*

This question explores whether the overall quality of movies, based on audience and critic ratings, differs between the two platforms, helping to clarify whether one platform consistently offers more critically acclaimed content.

Significance of the Problem

Answering these questions has both practical and theoretical implications.

- For consumers, it offers clarity on which platform might better align with their preferences in terms of content maturity and quality.
- For streaming platforms, it provides data-driven insights into audience perceptions and competitive positioning, potentially guiding future content acquisition and production strategies.
- For researchers, it contributes to the broader study of media consumption patterns and audience targeting in the era of digital streaming.

Description of the Data

The data set contains information about movies available on Disney+ and Netflix, with the following key variables:

Platform: A binary variable indicating the streaming service distributed along two columns for both platforms(Disney+ or Netflix).

Age Restriction: A categorical variable reflecting the movie's age classification. These categories follow standard film rating systems, indicating the appropriateness of the movie for different age groups. The given data was classified based on age category and after a primary research, I was able to put it under several categories which are X(18+), PG(7+), PG-13(13+), R(16+) and G(all). (Wikipedia (2024))

Rotten Tomatoes Score: A continuous variable representing the critical and audience reception of the movie, expressed as a percentage (0–100). Higher scores indicate better reception. (Tomatoes (2024))

Other Variables: Additional metadata such as title or release year may also be included but are secondary to the analysis.

The data will be analyzed in two steps:

A descriptive analysis will summarize the dataset and provide insights into the distributions of age restrictions and Rotten Tomatoes scores across the two platforms. Statistical hypothesis tests will be conducted to determine whether the observed differences in age restrictions and scores are statistically significant. This structured approach will allow for a comprehensive understanding of the differences (if any) between the two platforms, moving beyond anecdotal perceptions to evidence-based conclusions.

Methods

The statistical analysis and report writing for this project were conducted using R, a powerful language and environment for statistical computing and graphics.(R Core Team (2023))

The following R packages were utilized to streamline data processing, analysis, visualization, and report generation:

tidyverse(Wickham et al. (2019)), *lubridate*(Grolemund and Wickham (2011)), *reshape2*(Wickham (2007)), *waffle*(Rudis and Gandy (2023)), *gt*(Iannone et al. (2024)), *gtExtras*(Mock (2023)), *kableExtra*(Zhu (2024)), *scales*(Wickham, Pedersen, and Seidel (2023)), *rcompanion*(Mangiafico (2024)), *hrbrthemes*(Rudis (2024)), *viridis*(Garnier et al. (2024))

To address the two research questions, we employ a combination of descriptive and inferential statistical methods. Below is a detailed description of the methods used, along with their mathematical foundations.

Descriptive Analysis

This step provides a summary of the data to understand the general trends and patterns.

- **Summary Statistics**

- For Categorical Variable:

- We calculate frequency distributions to compare the proportions of different age restrictions across platforms.

- For Continuous Variable:

- * Mean ($\bar{x}$): Average score.
 - * Median: The middle value when the scores are ordered.
 - * Standard Deviation (s): Measure of score variability.
 - * Range: Difference between maximum and minimum scores.

- **Visualizations**

- **Waffle chart** to compare the distribution of age restrictions for Disney+ and Netflix.

- * A waffle chart is essentially a square grid where each cell represents a portion or percentage of the whole. These charts are great for displaying proportions, like election results or the composition of a population. (Chip (2023))

- **Box plots** or **Histograms** to visualize the distribution of Rotten Tomatoes scores for both platforms.

- * Princeton statistician *John Tukey* designed the box plot as an easy-to-draw data visualization as part of exploratory data analysis. The box plot has persisted into the computer age as an information-rich graphic that conveys key features of a numeric dataset at a glance. Unlike the bar chart, it uses statistical summaries

(median and interquartile range) that are robust in the presence of skewness and outliers and require no assumptions about the population. (Nuzzo (2016))

- * Histogram is one of the most important graphical objects in statistical practice. In addition, the histogram provides a consistent estimate of any density function with very few assumptions. Construction of a density histogram with arbitrary mesh is described. Asymptotic theory of optimal histograms is used to provide practical rules for choosing a bin width with real data. Cross-validation is shown to provide useful estimates of both the bin width and the bin origin. Examples are displayed using data from Sammy Sosa's best year for hitting home runs. (Scott (2010))

These descriptive methods provide a preliminary understanding of the data, helping us frame appropriate hypotheses for statistical testing.

Inferential Analysis

Hypothesis Testing (e.g., for Rotten Tomatoes Scores)

Objective: Test whether there is a difference in Rotten Tomatoes scores between the two platforms.

Approach: Since Rotten Tomatoes scores are continuous, we first test for normality using the **Shapiro-Wilk Test**:

An adaptation of the Shapiro–Wilk W test to the case of normality with a known mean is considered. The table of critical values for different sample sizes and several significance levels is given. The power of the test is investigated and compared with the Kolmogorov test and the two-step procedure consisting of the Shapiro–Wilk W and t tests. Additionally, the normalizing coefficients for the test statistic are given. (Hanusz, Tarasinska, and Zielinski (2016))

$$W = \frac{\left(\sum_{i=1}^n a_i x_{(i)}\right)^2}{\sum_{i=1}^n (x_i - \bar{x})^2}$$

Where x_i are the ordered data, and a_i are constants derived from expected normal order statistics.

Based on the normality results:

If normal, use a **two-sample t-test** (Cressie and Whitford (1986)):

$$t = \frac{(\bar{x}_1 - \bar{x}_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

Where:

$\bar{x}_1, \bar{x}_2$: Sample means. s_1^2, s_2^2 : Sample variances n_1, n_2 : Sample sizes

If not normal, use the **Mann-Whitney U Test**:

The Mann-Whitney U test, which is also known as the Wilcoxon rank sum test, tests for differences between two groups on a single, ordinal variable with no specific distribution (Mann & Whitney, 1947; Wilcoxon, 1945). In contrast, the independent samples t-test, which is also a test of two groups, requires the single variable to be measured at the interval or ratio level, rather than the ordinal level, and to be normally distributed. We accordingly refer to the Mann-Whitney U test as the nonparametric version of the parametric t-test. Both tests require two independently sampled groups and assess whether two groups differ on a single, continuous variable. The two tests, however, differ on the assumed distribution. A nonparametric test assumes no specific distribution, whereas a parametric test assumes a specific distribution. Thus, the Mann-Whitney U is conceptually similar to the t-test for determining whether two sampled groups are from a single population. When data do not meet the parametric assumptions of the t-test, the Mann-Whitney U tends to be more appropriate. (McKnight and Najab (2010))

Hypotheses: Null (H_0): The mean (or median) Rotten Tomatoes scores are equal for Disney+ and Netflix.

Alternative (H_a): The mean (or median) Rotten Tomatoes scores differ.

$$U = n_1 \cdot n_2 + \frac{n_1(n_1 + 1)}{2} - R_1$$

Where:

n_1, n_2 : Sample sizes of Disney+ and Netflix. R_1 : Sum of ranks for Disney+ movies.

Decision Rule: Compare U to a critical value or calculate the p-value. If $p < \alpha$ (e.g., $\alpha = 0.05$), reject H_0 .

Assumptions

Each statistical test is based on specific assumptions:

- Mann-Whitney U Test:
 - Independent samples.
 - Ordinal or continuous data.
 - The shape of the distributions does not affect the test result.
- Two-Sample t-Test:
 - Normally distributed data.
 - Homogeneity of variances (testable using Levene's test).

Evaluation

Evaluation of Age Restrictions

Waffle Chart Analysis

To provide a visual representation of age restrictions across Disney+ and Netflix, we used a waffle chart. Each cell in the chart represents a specific percentage of the total movies available on each platform, categorized by age ratings (e.g., G, PG, PG-13, R and X). This helps highlight the proportional differences in age restrictions between the platforms.

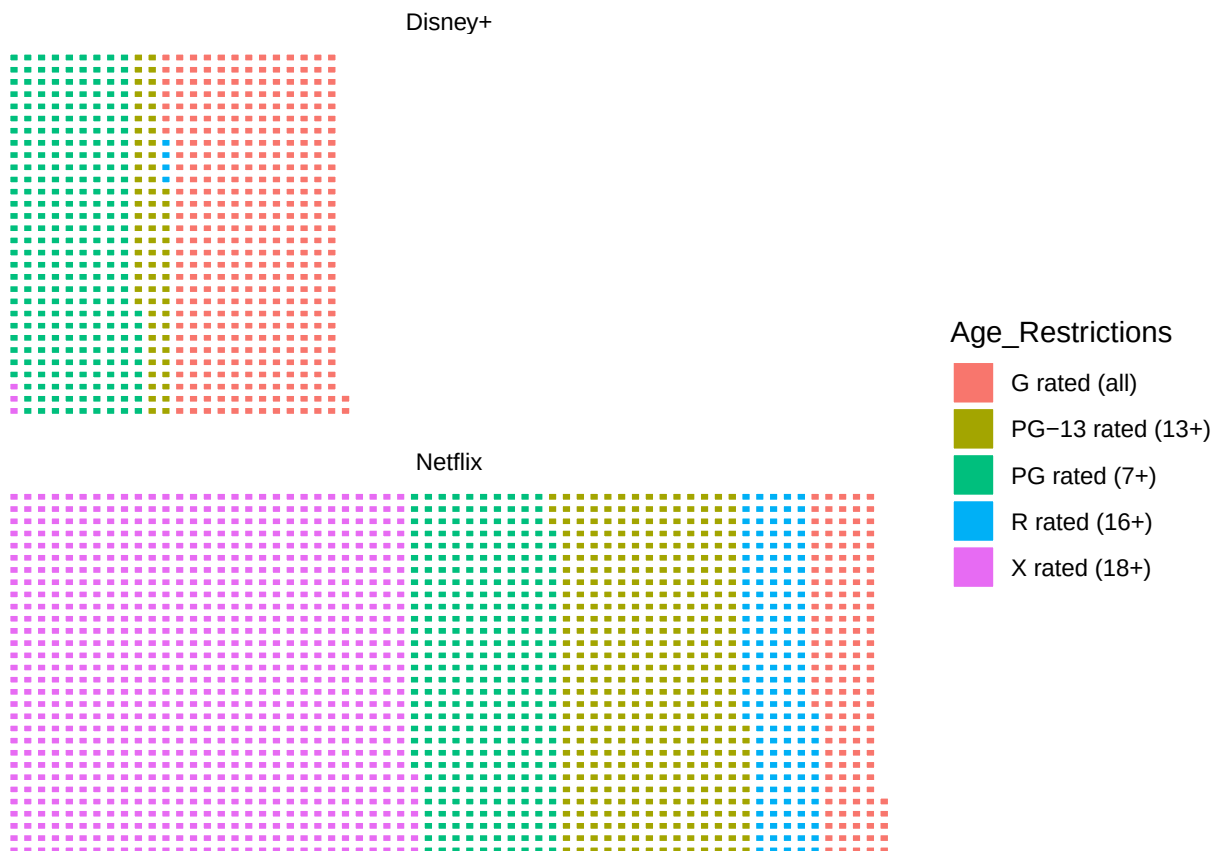


Figure 1: Waffle chart for age restrictions of Netflix and Disney+ movies

Key Observations:

- Disney+ has a higher proportion of movies rated for younger audiences (e.g., G and PG).
- Netflix shows a more balanced distribution, with a notable presence of movies rated PG-13, R and X, indicating a broader focus on adult content.

Frequency Table Analysis

To quantify the findings from the waffle chart, we created a frequency table to compare the count and percentage of movies under each age rating for both platforms.

Table 1: Age Restriction Spread

Agerestriction	Disney	Netflix
G rated (all)	369	143
PG 13 rated (13+)	70	404
PG rated (7+)	276	320
R rated (16+)	4	151
X rated (18+)	3	877

Key Observations:

- Lower Age group (G rated and PG rated):
 - On Disney+, approximately 89% of the movies fall into the lower age group category.
 - On Netflix, around 24% of the movies belong to the lower age group category.
- Higher Age group (PG-13 rated, R rated and X rated):
 - On Disney+, about 11% of the movies fall into the higher age group category.
 - On Netflix, nearly 76% of the movies belong to the higher age group category.

Evaluation of Rotten Tomatoes Ratings

Descriptive Statistics for Rotten Tomatoes Scores

To better understand the differences in Rotten Tomatoes ratings between Disney+ and Netflix, we first calculated the mean, median, standard deviation, and variance for the Rotten Tomatoes scores of movies on both platforms. These statistics help summarize the central tendency and dispersion of the ratings, allowing us to assess the overall quality of movies available on each platform.

Table 2: Rotten Tomatoes Ratings

Summary	Netflix	Disney
Mean Ratings	60.5	61.7
Median Ratings	60.0	61.0
Standard Deviation	12.8	13.0
Variance	164.2	168.9

- Mean: The average Rotten Tomatoes score shows that movies on Netflix have a slightly lower mean score (60.5) compared to Disney+ (61.7).

- Median: The median score also reflects this, with Netflix movies having a lower median (60.0) compared to Disney+ (61.0), indicating that more of Disney+'s movies are rated higher.
- Standard Deviation and Variance: The standard deviation and variance values indicate that both platforms exhibit a similar level of variability in their Rotten Tomatoes scores, though Netflix's scores are slightly less spread out.

Histogram Analysis

To visualize the distribution of Rotten Tomatoes scores for movies on both platforms, we created a histogram with overlaid normal distribution curves. This chart provides insight into the shape of the distributions and allows us to observe any skewness or outliers.

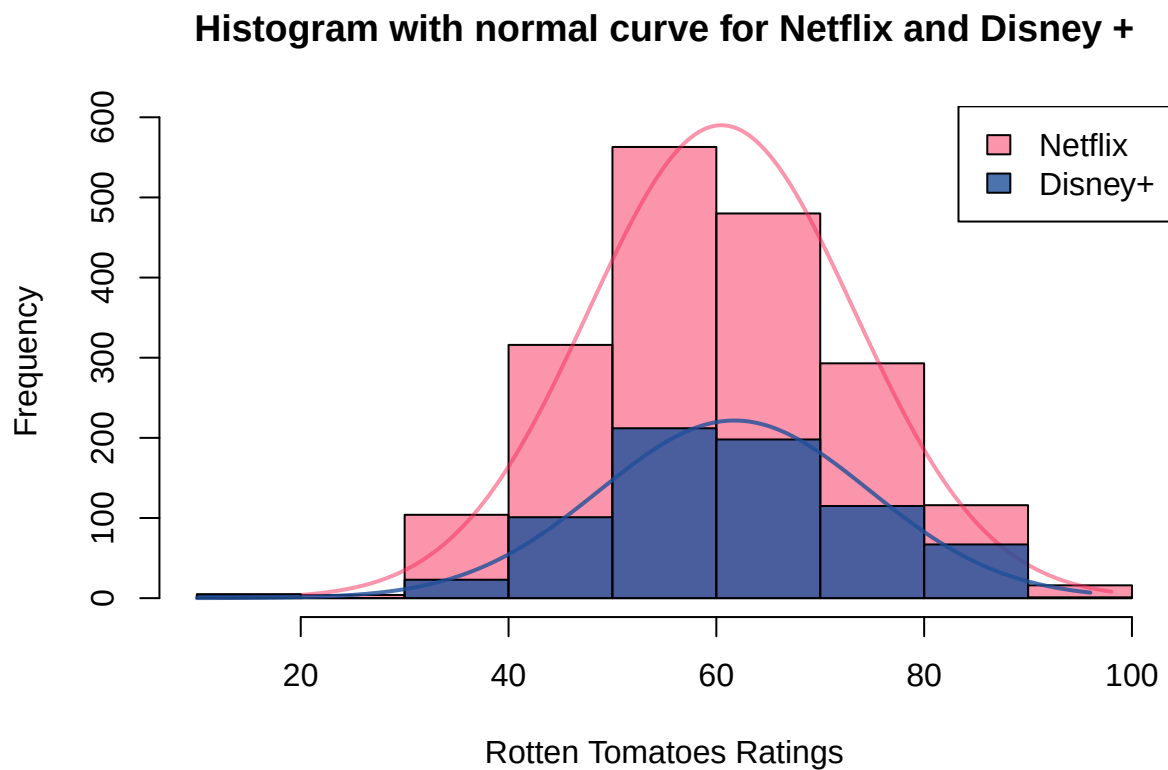


Figure 2: Histogram of Rotten Tomatoes Scores for Disney+ and Netflix

From the histogram, we observe that:

- Disney
 - The distribution appears slightly skewed to the right, indicating that most movies have higher ratings, but there is a small proportion of lower-rated movies.
 - Disney+'s ratings are slightly narrower
- Netflix:
 - The distribution is more uniform, however it seems to be skewed slightly to the left because the tail extends slightly more towards the lower end.
 - Netflix's ratings are more spread out, covering a broader range

To decide which statistical test to use, we conducted a Shapiro-Wilk test for normality on both platforms' Rotten Tomatoes scores.

- Null Hypothesis (H_0): The data follows a normal distribution.
- Alternative Hypothesis (H_a): The data does not follow a normal distribution.

The test results showed:

- Disney+: p-value < 0.05 (reject H_0 , data is not normally distributed).
- Netflix: p-value < 0.05 (reject H_0 , data is not normally distributed).

Since both platforms' data deviates from normality, we chose the **Mann-Whitney U test**, a non-parametric test, to compare the Rotten Tomatoes scores between Disney+ and Netflix.

Hypothesis Test for Rotten Tomatoes Scores

The hypothesis test for Rotten Tomatoes scores on both platforms was formulated as follows:

- Null Hypothesis (H_0): There is no difference in Rotten Tomatoes scores between Disney+ and Netflix.
- Alternative Hypothesis (H_a): There is a significant difference in Rotten Tomatoes scores between Disney+ and Netflix.

Using the Mann-Whitney U test, we calculated the test statistic and the p-value.

```
##                               Test p_value
## 1 Mann-Whitney U test        0.02
```

The result showed a p-value of 0.02, which is less than the significance level of 0.05.

Therefore, we reject the null hypothesis and conclude that there is a statistically significant difference in Rotten Tomatoes scores between Disney+ and Netflix.

Box Plot Analysis

Finally, to visually confirm the findings from the statistical test, we used a box plot to display the distribution of Rotten Tomatoes scores for both platforms. The box plot provides a clear visual comparison of the central tendency, spread, and potential outliers in the data.

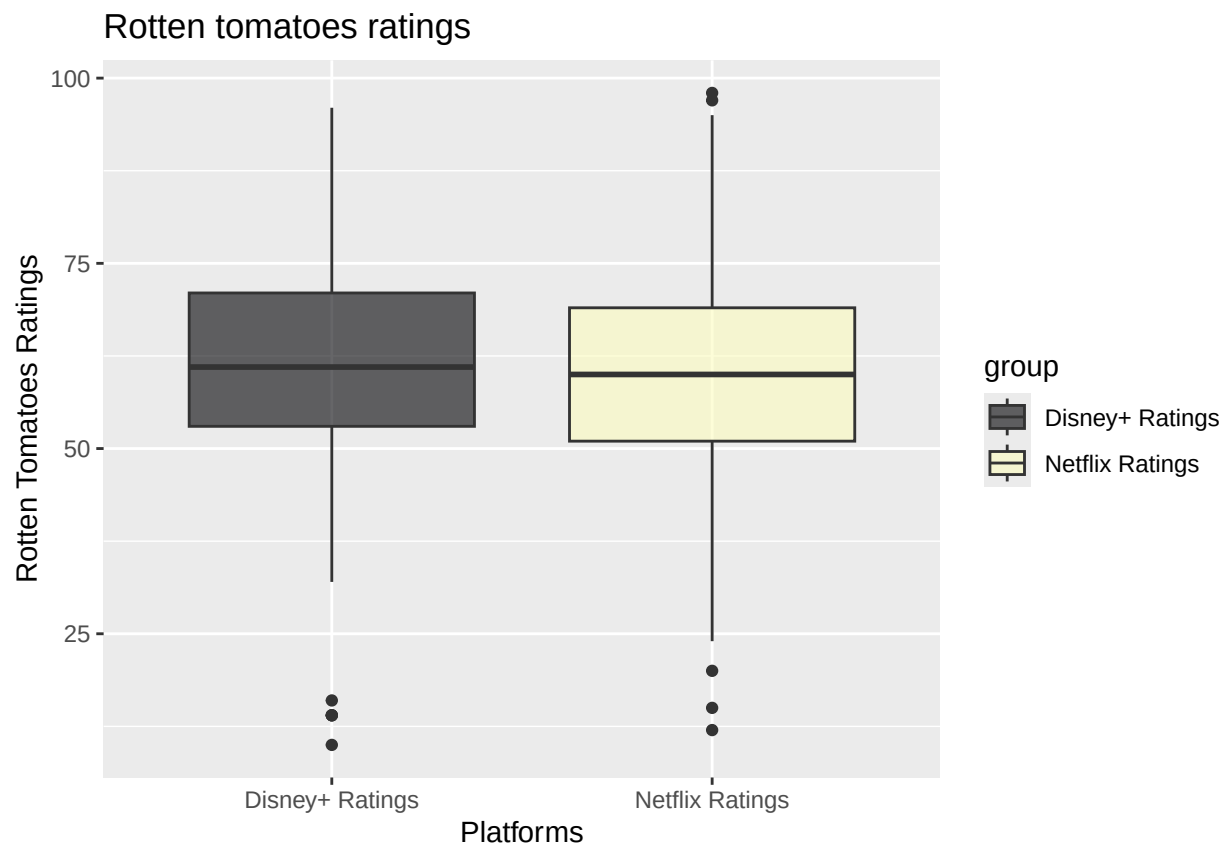


Figure 3: Box Plot of Rotten Tomatoes Scores for Disney+ and Netflix

Key Observations:

- Median Ratings:
 - Disney+: The median rating appears higher than Netflix's, indicating generally better reception for Disney+ content.

- Netflix: The median is slightly lower, suggesting slightly less favorable ratings.
- Interquartile Range (IQR):
 - Disney+: The IQR (middle 50% of data) is somewhat wide, showing a decent range of ratings.
 - Netflix: The IQR is narrower than Disney+, indicating less variability in mid-range ratings.
- Outliers: Both Disney+ and Netflix have low-end and high-end outliers, showing some content has received particularly low or high ratings.
- Whisker Spread: Both platforms have a similar range, but the spread below the lower quartile for Disney+ suggests it has more low-rated content than Netflix.

Final Summary

This analysis aimed to compare the content strategies of Disney+ and Netflix by investigating two key aspects:

- Age Restrictions: Are movies on Disney+ generally targeted at younger audiences compared to Netflix?
- Rotten Tomatoes Ratings: Do movies on Netflix receive higher critical reception than those on Disney+?

We employed a structured approach, combining descriptive analysis, statistical hypothesis testing, and visualizations to answer these research questions.

Findings and Interpretations

Age Restrictions

- Descriptive Analysis:
 - Around 84% of Disney+ movies are rated G or PG, highlighting its focus on family-friendly content.
 - Netflix displays a more diverse range of age restrictions, with approximately 76% of its movies rated PG-13, R, or X.
- Real-World Interpretation:
 - Disney+ prioritizes maintaining its family-friendly brand image, primarily catering to children and younger audiences.
 - Netflix's varied age ratings reflect its strategy to attract a broader demographic, including adults.

Rotten Tomatoes Ratings

- Descriptive Analysis:
 - Movies on Disney+ have a higher mean (61.7) and median (61.0) Rotten Tomatoes score compared to Netflix (mean: 60.5, median: 60.0).
 - Disney+'s scores are less variable, indicating consistent quality.
- Statistical Testing: A **Mann-Whitney U test** confirmed a significant difference in Rotten Tomatoes scores between the two platforms ($p < 0.05$).
- Real-World Interpretation: Disney+ consistently delivers higher mean and median Rotten Tomatoes scores, indicating solid and reliable content quality. However, its lower variability suggests that it may lack the range and diversity seen on Netflix. While Netflix's more varied content likely contributes to its higher critical reception, Disney+ might need to further diversify its offerings to enhance its competitive positioning in terms of critical acclaim.

Overall Conclusions

- Netflix offers a broader appeal, balancing content for both younger and adult viewers.
- Disney+ is more family-centric, with its movie library predominantly targeting younger audiences through G and PG-rated content. This aligns with its brand legacy and appeal to families and children, with a significant proportion of critically acclaimed movies.

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