**Music Genres vs Phyiscal Activity**

From the stacked bar charts:

　⬚ **Metal and Rock**: These genres are associated with moderate to high levels of physical activity, likely reflecting more upbeat or energetic music's effect on the listener.
　⬚ **Electronic**: Showed variability, with some periods of high steps and calorie burn, possibly linked to its use during workouts or active sessions.
　⬚ **Pop and Country**: These genres generally align with moderate activity levels, showing consistent but not extreme physical activity.
　⬚ **Other Genres**: Categories like "Sports" and "Other" had mixed results, possibly due to data variability or external factors influencing activity.

Monthly Weighted Calories Burned by Genre (Stacked)

Monthly Weighted Step Count by Genre (Stacked)
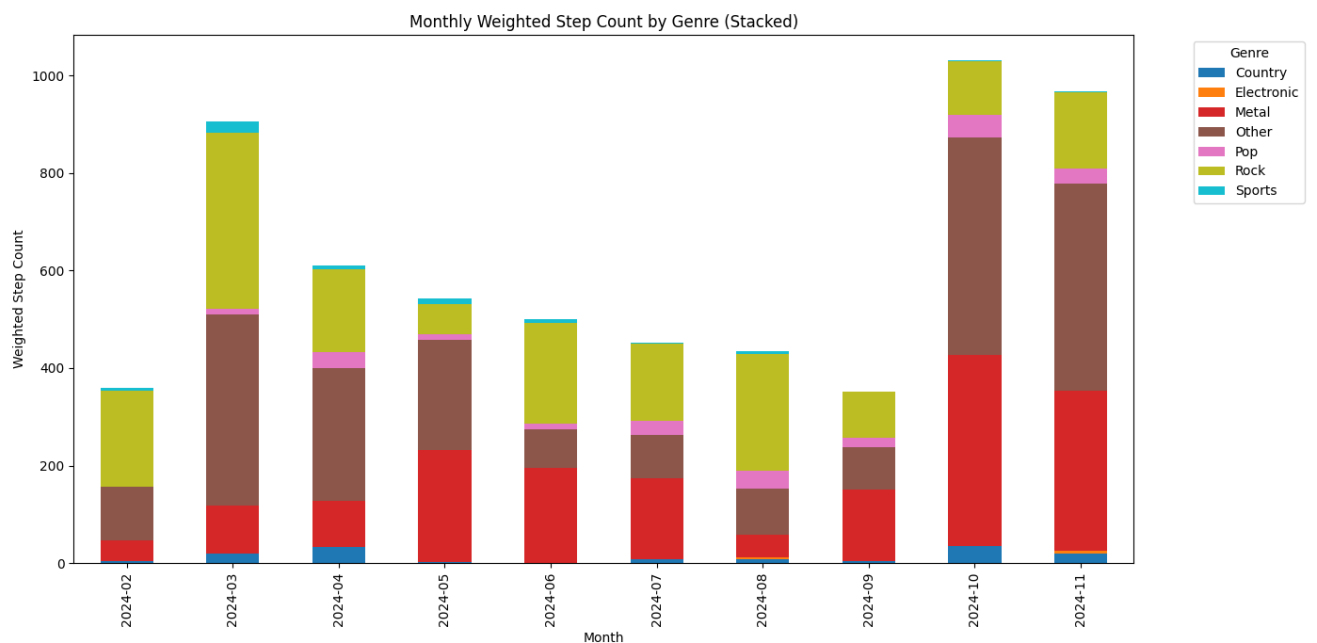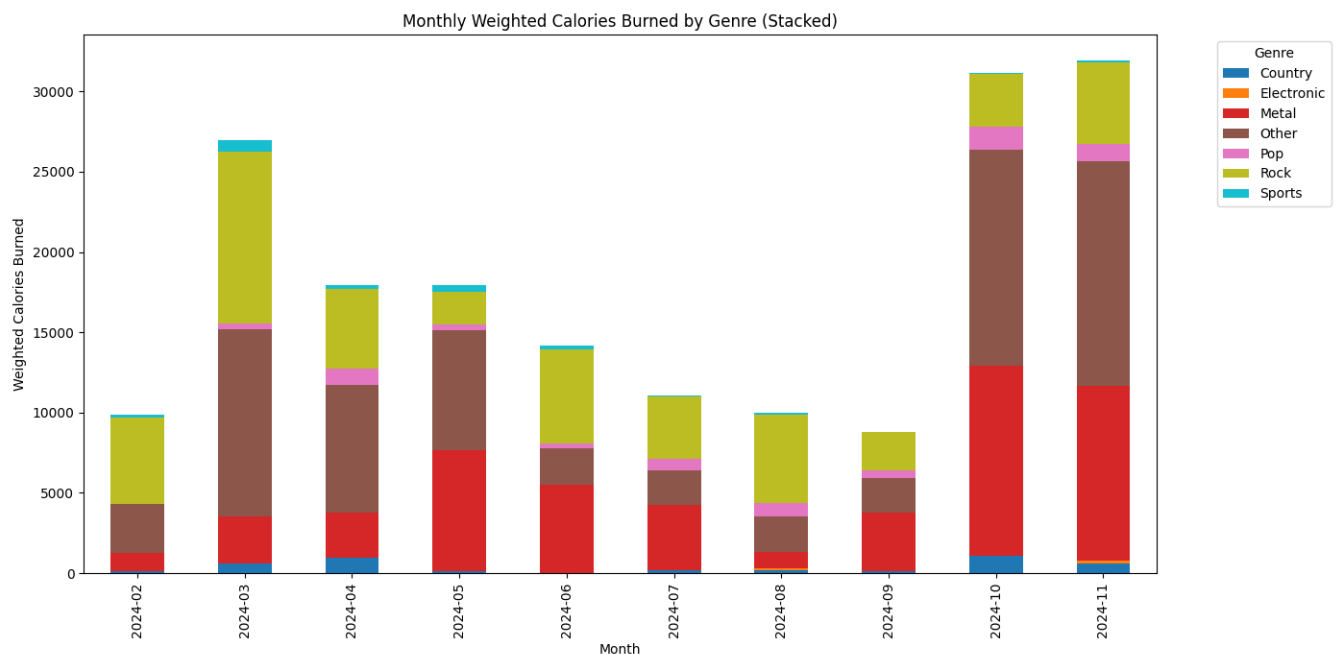
Chi-Square Test

To test for a relationship between music genres (broad_genre) and activity levels (activity_level categorized by calories burned), a chi-square test was conducted:

- **Chi-Square Statistic**: 13.59
- **P-value**: 0.327
- **Degrees of Freedom**: 12

The p-value is greater than the significance level (0.05), leading to the conclusion that there is no statistically significant association between music genres and activity levels based on calories burned.

Conclusion

- The analysis indicates that **music genres may have a minor influence on physical activity**, with energetic genres like Metal, Rock, and Electronic showing some association with higher activity levels (e.g., more steps or calories burned).
- However, the overall relationship is not strong, and external factors likely play a more significant role in determining physical activity levels.

Listening time vs Exercise Intenstiy

Based on the analysis and visualizations:

1. **Scatter Plot Observations**:
   o The scatter plots for both **Steps per Minute vs Listening Time** and **Calories Burned per Minute vs Listening Time** show widely dispersed points with no clear pattern or clustering.
   o The regression lines are nearly flat, indicating a very weak or non-existent relationship between listening time and exercise intensity metrics.

Calories Burned per Minute vs Listening Time (Filtered Daily Data)

Steps per Minute vs Listening Time (Filtered Daily Data)
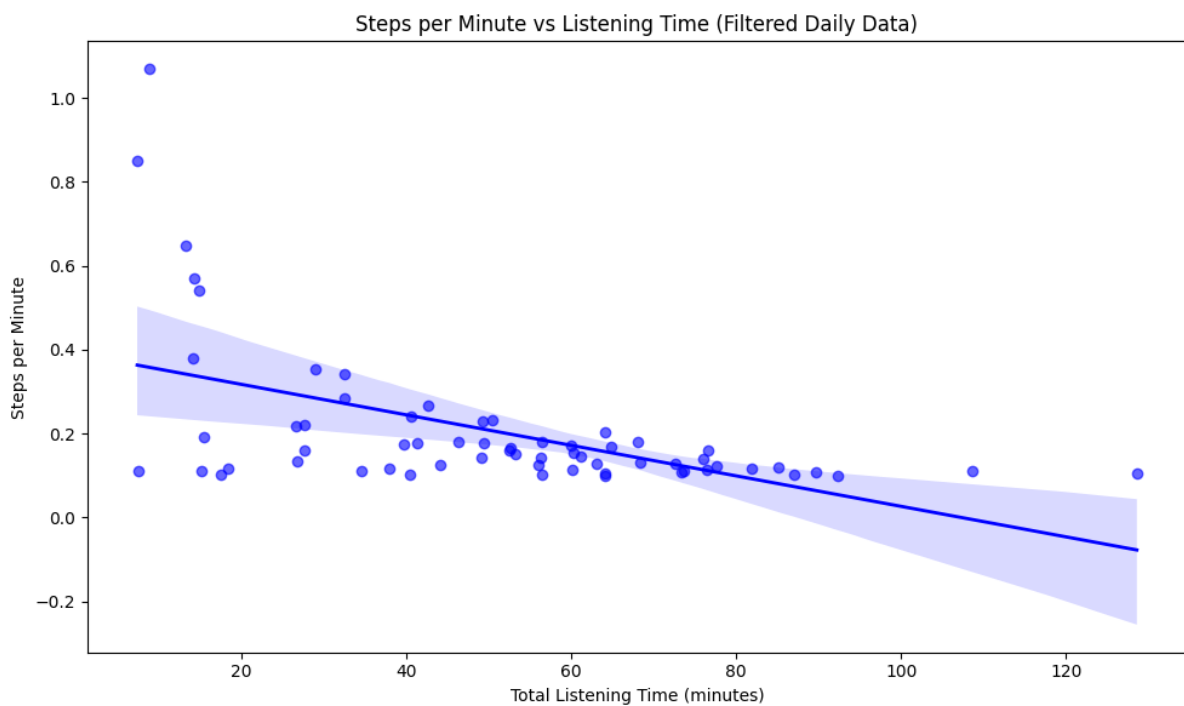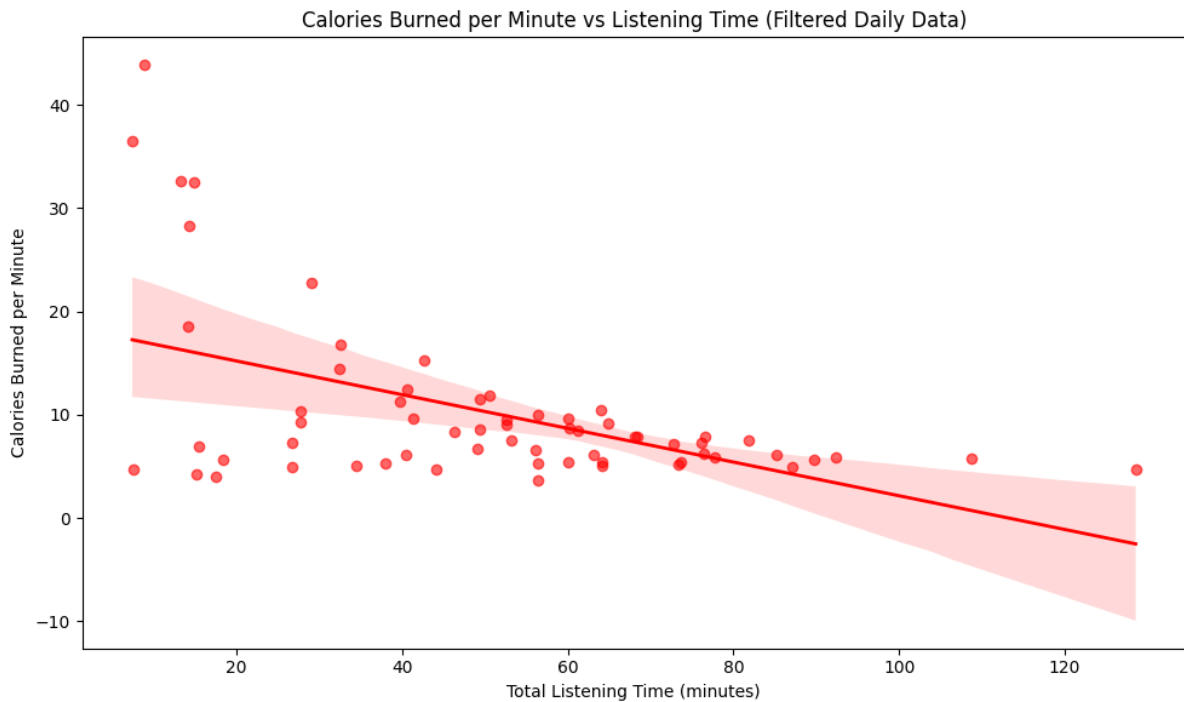
Pearson Correlation Test

- **Correlation Coefficient:** 0.092
  This indicates a very weak positive correlation between average listening time and calories burned per minute.
- **P-value:** 0.131
  Since the p-value is greater than 0.05, the result is not statistically significant. Thus,

we fail to reject the null hypothesis and conclude that there is no significant linear relationship between the variables.

OLS Regression Results

- **Intercept:** 5.3730
  The baseline calorie burn rate is approximately 5.37 calories per minute when total listening time is 0.
- **Coefficient for Total Listening Time:** 0.0042
  This implies a slight increase in calorie burn rate (0.0042 calories per minute) for every additional minute of listening time. However, the p-value (0.132) suggests that this effect is not statistically significant.
- **R-squared:** 0.009
  Only 0.9% of the variation in calories burned per minute is explained by the model, indicating that listening time is a poor predictor of calorie burn rates.

Conclusion:

- Both the correlation and regression results show statistically significant relationships, but the strength of the relationship is weak.
- While the findings suggest a small positive impact of listening time on calories burned per minute, the weak relationship implies that other factors, such as physical activity type or intensity, play a larger role.

Audio Exposure vs Calories Burned

- **Observation**:
  - The regression line shows a **slight positive slope**, indicating a weak **positive correlation** between **average audio exposure (dB)** and **calories burned**.
  - Higher audio exposure **might** correspond to slightly more calories burned, but the relationship is weak and has significant variability.
  - The **confidence interval (shaded area)** is wide, especially at lower audio exposure levels, indicating a lack of strong predictive power.

Audio Exposure vs Calories Burned
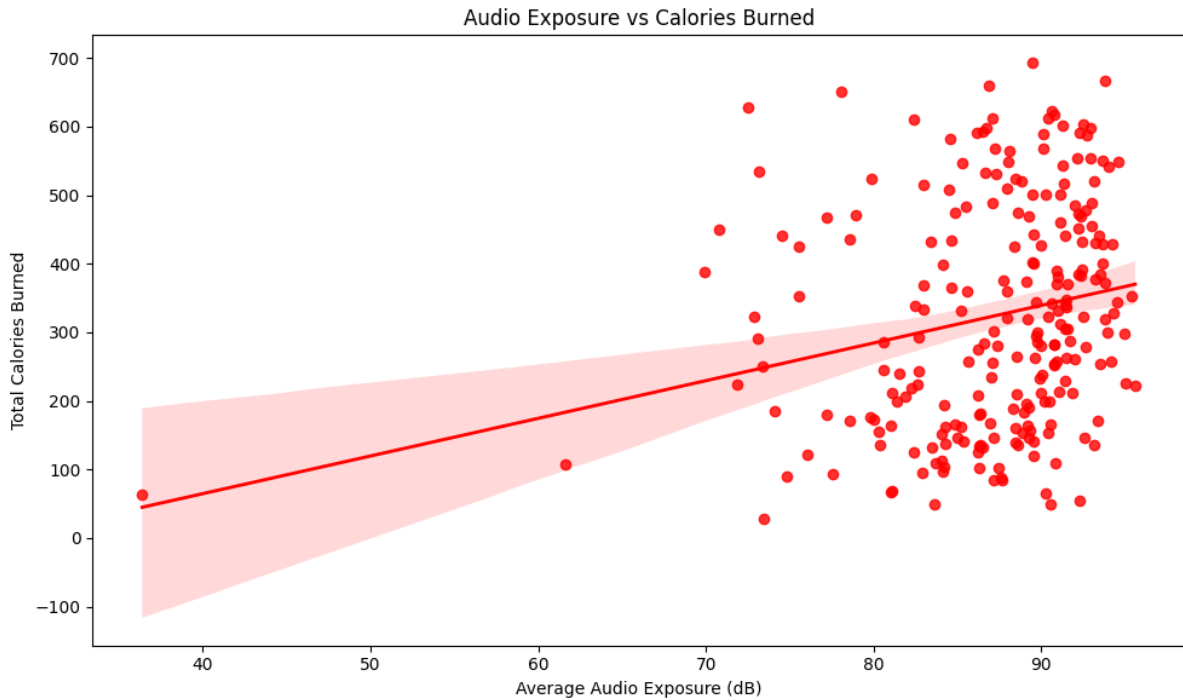
Pearson Correlation Test

- **Correlation Coefficient**: 0.2509
- **P-value**: 0.0016

The positive correlation coefficient of 0.25 indicates a weak but statistically significant positive relationship between audio exposure and calories burned per minute. The p-value (< 0.05) confirms that this correlation is unlikely to have occurred by chance.

OLS Regression Results

- **R-squared**: 0.042
  - This indicates that about 4.2% of the variance in calories burned per minute can be explained by total headphone audio exposure. While this is low, it suggests that listening time has a small impact.
- **P-value for Listening Time**: 0.002
  - The p-value indicates that audio exposure has a statistically significant effect on calories burned per minute.
- **Coefficient for Listening Time**: 0.0175
  - For every additional minute of audio exposure time, the model predicts an increase of 0.0175 calories burned per minute on average.
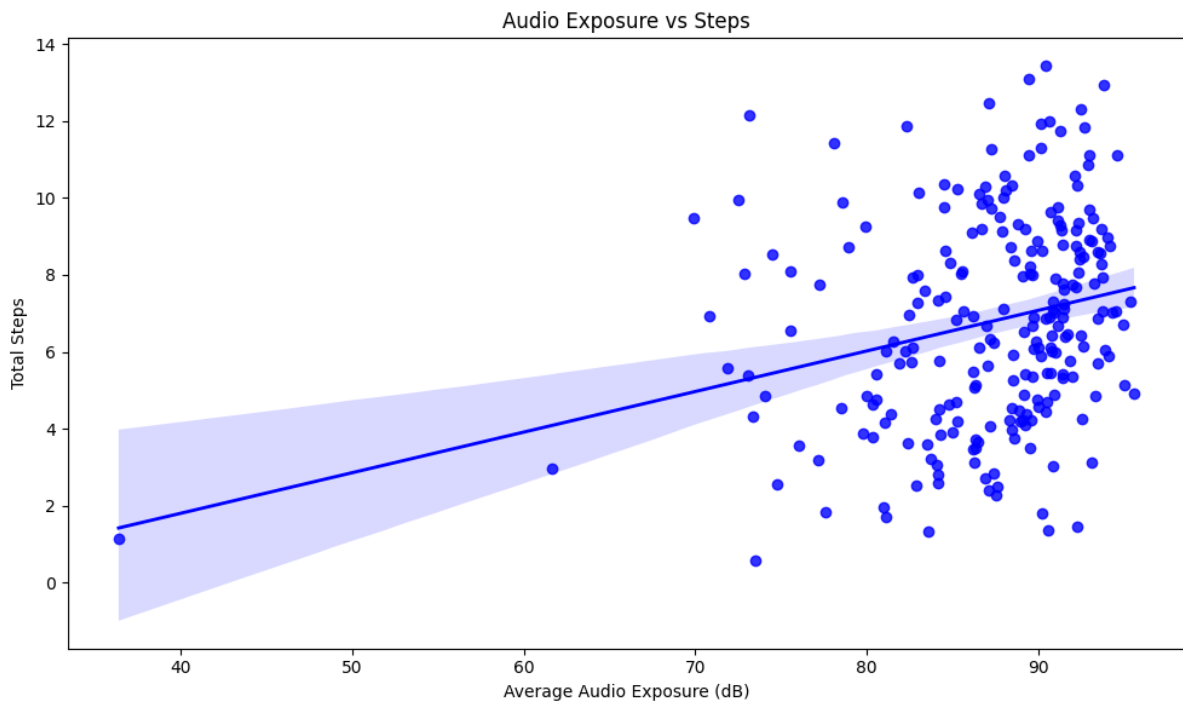
Conclusion:

  - There is **no strong evidence** that audio exposure significantly impacts calorie burn levels. The weak correlation suggests other factors likely play a more dominant role.

Audio Exposure vs Steps

- **Observation**:
    - The regression line here also shows a **slight positive slope**, indicating a weak **positive correlation** between **average audio exposure (dB)** and **steps**.
    - As audio exposure increases, there is a slight tendency for step counts to increase, but again, the relationship is not strong.
    - The wide spread of points around the line and the large confidence interval at lower audio exposure levels reflect high variability.

Audio Exposure vs Steps

Conclusion:

- Similar to calories burned, **audio exposure does not strongly correlate** with step counts. While there may be a slight trend, it is not meaningful or robust enough to suggest a significant association.

 Key Finding: Headphone audio exposure (measured in dB) shows a **weak positive correlation** with both calorie burn levels and step counts, but the relationships are not strong or consistent enough to draw meaningful conclusions.
 Implications: Audio exposure is likely **not a major factor** influencing physical activity. Other variables, such as the type of activity or environmental factors, are likely more significant.

Prolonged listening to specific music genres vs walking speed & asymmetry

1. Walking Speed by Average Prolonged Listening Category

- **Observations**:
  - The median walking speed (central line in each box) remains consistent across all categories, with slight variation.
  - The <60 min and 60-90 min categories show slightly higher median walking speeds compared to >120 min.
  - There is no strong evidence suggesting that prolonged listening impacts walking speed significantly.
  - The distribution (IQR) of walking speed is wide across all categories, indicating high variability within each group.

Walking Speed by Average Prolonged Listening Category
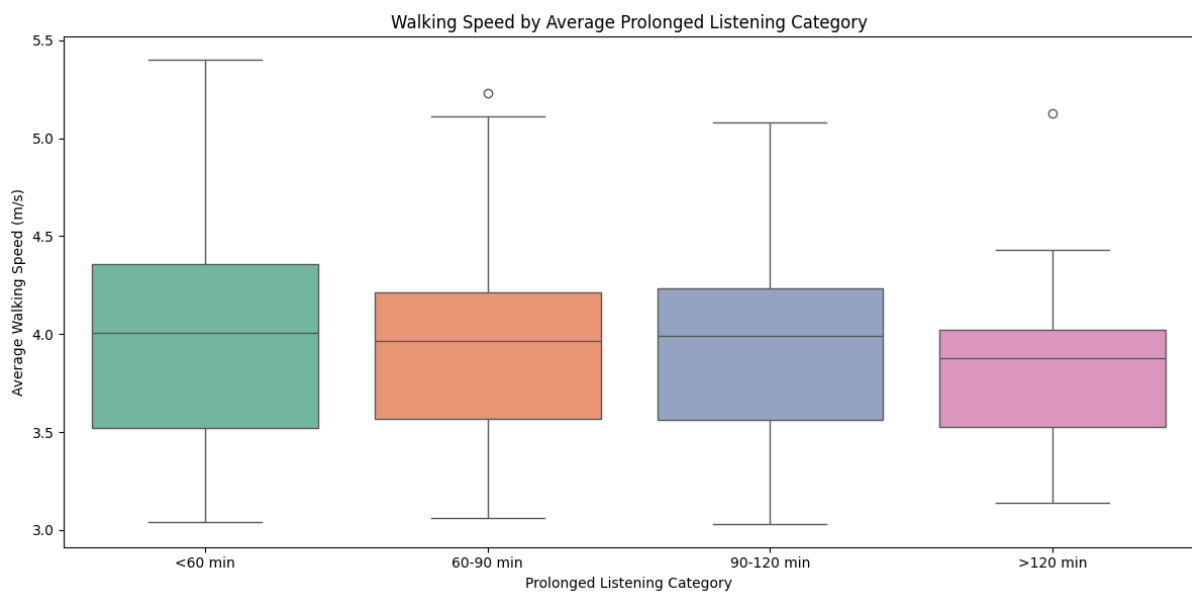
Walking Asymmetry ANOVA:

- **F-Statistic**: 0.733
  - Indicates the ratio of variance between groups to variance within groups. A lower value suggests that group means are not significantly different.
- **P-Value**: 0.533
  - A p-value > 0.05 indicates no significant difference between the groups for walking asymmetry.
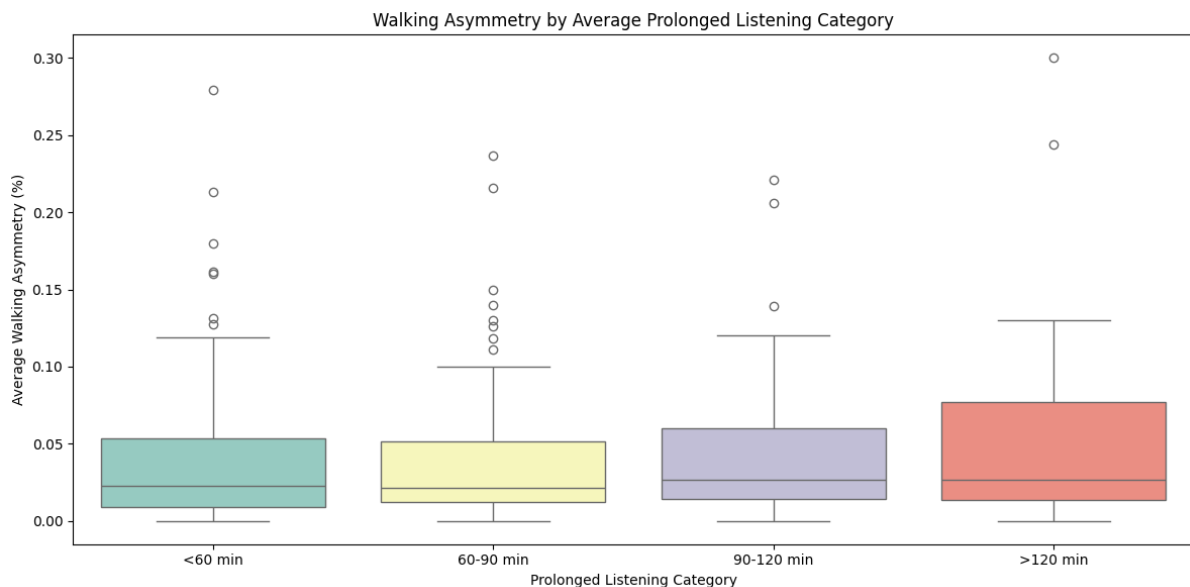
Conclusion:

- No strong correlation is observed between prolonged listening duration and walking speed.
- Any small differences may be due to external factors rather than listening habits.

Walking Asymmetry by Average Prolonged Listening Category

- **Observations**:
  - The median walking asymmetry remains nearly constant across all categories.
  - Variability (IQR) increases slightly in the >120 min category, but the difference is not significant.
  - Outliers are more prominent in higher listening categories, indicating occasional deviations in walking asymmetry on specific days.

Walking Asymmetry by Average Prolonged Listening Category

Conclusion:

- Prolonged listening does not show a significant effect on walking asymmetry.
- The slight increase in variability in higher categories could be influenced by small sample sizes or external factors.

Music Genres vs Headphone Exposure Levels

1. **Bar Plot Observations**:
   - The average headphone audio exposure levels are similar across genres such as "Rock," "Metal," "Sports," "Country," and "Other."
   - The height of the bars indicates that **no significant differences in average audio exposure levels** were found between the genres.
   - The error bars (representing variability) show some genres (e.g., "Sports" and "Other") have slightly more variability, indicating that listeners of these genres may have more diverse volume preferences.
2. **Key Takeaways**:
   - There is no evidence to suggest a strong relationship between **music genre** and **headphone audio exposure levels**.
   - Average audio exposure is consistent across genres, and the differences in variability are minimal.

Mean Headphone Audio Exposure by Music Genre
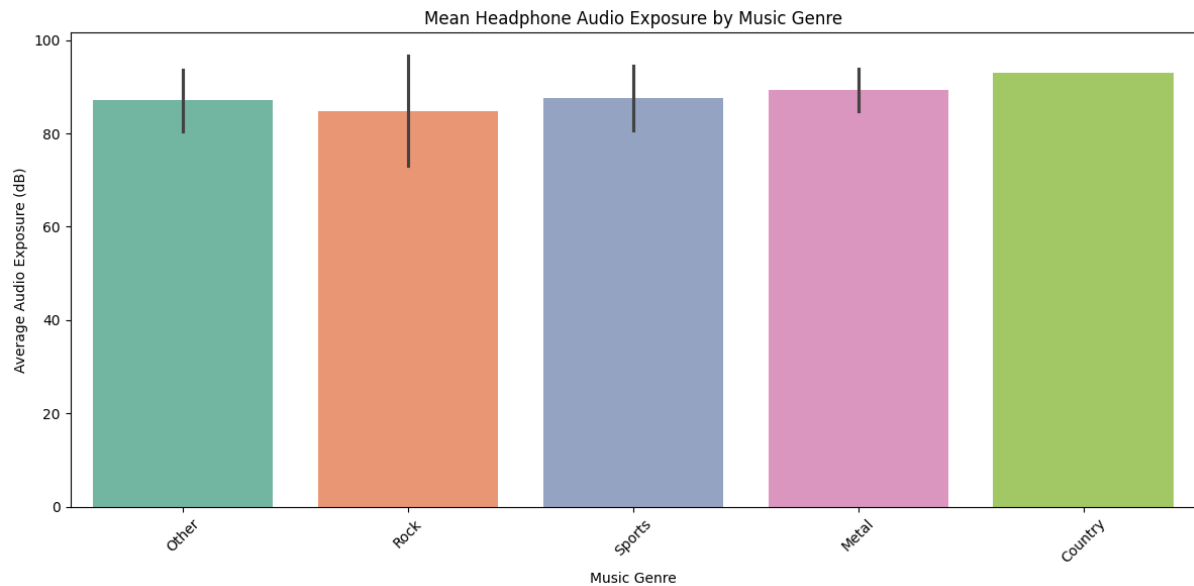
ANOVA Test Results:

- **F-Statistic**: 0.701, a measure of the variance between group means relative to the variance within groups.
- **P-Value**: 0.6498, indicating the probability of observing this result if the null hypothesis (no difference between group means) is true. Since the p-value is **greater than 0.05**, we fail to reject the null hypothesis.

Conclusion

The analysis suggests that **music genres do not significantly influence headphone audio exposure levels**. While individual preferences and behaviors may vary, no meaningful trend or relationship was observed between genres and exposure levels in the aggregated data.