# Psychophysiological Correlates of Categorization of Gender in Advertisements

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# Background

# Research Question

- 1.
- 2.
- 3.
- 4.

# Data Description and Variable Selection

# Methodology

The reason we use Linear Mixed Effect Model:

- A multi-level problem with a hierarchical structure
- One of assumption for multi-level modeling is independence for error terms.
- Obviously there are interaction between variables, so we choose Linear Mixed Effect Model instead of ANOVA.

# Exploratory Data Analysis

# Model I

# Assumption Check

- The independent variables are related linearly to the dependent variables.
- The errors are normally distributed.
- The random coefficient are normally distributed
- The errors have equal variance.

# Assumption Check 1: Linearity

# Assumption Check 2: Normality of Error Terms

# Assumption Check 3: Normality of Random Coefficient

# Assumption Check 4: Equal Variance

# Final Model

# Model II

$$lmer(EMG_{RAW1000} \sim Actual_{identity} + News_{Identity} + Ease_{Categorization} + Transphobia_{GMC} + Actual_{Identity} \times News_{Identity} + Actual_{Identity} \times Ease_{Categorization} + Actual_{Identity} \times Transphobia_{GMC} + News_{identity} \times Ease_{Categorization} + News_{Identity} \times Transphobia_{GMC} + Ease_{Categorization} \times Transphobia_{GMC} + (1|Participant), data = GLRB)$$

# Exploratory Data Analysis

**Type III Tests of Fixed Effects[a]**

| Source | Numerator df | Denominator df | F | Sig. |
|---|---|---|---|---|
| Intercept | 1 | 228.000 | 28.840 | .000 |
| News_Identity | 1 | 228.000 | .974 | .325 |
| Ease_Categorization | 1 | 64165.000 | .963 | .327 |
| Actual_Identity | 1 | 64165.000 | 428.003 | .000 |
| News_Identity * Ease_Categorization | 1 | 64165.000 | 1.145 | .285 |
| News_Identity * Actual_Identity | 1 | 64165.000 | 93.458 | .000 |
| Ease_Categorization * Actual_Identity | 1 | 64165.000 | .022 | .881 |

a. Dependent Variable: EMG Raw data * 1000 (use this one) higher scores = more negative affect.

# Independent Variables

## 1. News_Identity

**Estimates[a]**

| News_Identity | Mean | Std. Error | df | 95% Confidence Interval | |
|---|---|---|---|---|---|
| | | | | Lower Bound | Upper Bound |
| 1 | 5.207[b] | 1.104 | 226.000 | 3.032 | 7.381 |
| 2 | 3.480[b] | 1.143 | 226.000 | 1.228 | 5.731 |

a. Dependent Variable: EMG_Raw1000.

b. Covariates appearing in the model are evaluated at the following values: Transphobia_GMC = .00.

**Pairwise Comparisons[a]**

| (I) News_Identity | (J) News_Identity | Mean Difference (I-J) | Std. Error | df | Sig.[b] | 95% Confidence Interval for Difference[b] | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower Bound | Upper Bound |
| 1 | 2 | 1.727 | 1.589 | 226.000 | .278 | -1.403 | 4.857 |
| 2 | 1 | -1.727 | 1.589 | 226.000 | .278 | -4.857 | 1.403 |

Based on estimated marginal means

a. Dependent Variable: EMG_Raw1000.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

# Independent Variables

## 2. Ease_Categorization

**Estimates[a]**

| Ease_Categorization | Mean | Std. Error | df | 95% Confidence Interval | |
|---|---|---|---|---|---|
| | | | | Lower Bound | Upper Bound |
| 1 | 4.350[b] | .794 | 226.034 | 2.784 | 5.915 |
| 2 | 4.336[b] | .794 | 226.034 | 2.771 | 5.902 |

a. Dependent Variable: EMG_Raw1000.

b. Covariates appearing in the model are evaluated at the following values: Transphobia_GMC = .00.

**Pairwise Comparisons[a]**

| (I) Ease_Categorization | (J) Ease_Categorization | Mean Difference (I–J) | Std. Error | df | Sig.[b] | 95% Confidence Interval for Difference[b] | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower Bound | Upper Bound |
| 1 | 2 | .013 | .014 | 64163.000 | .330 | -.014 | .040 |
| 2 | 1 | -.013 | .014 | 64163.000 | .330 | -.040 | .014 |

Based on estimated marginal means

a. Dependent Variable: EMG_Raw1000.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

# Independent Variables

### 3. Actual_Identity

**Estimates[a]**

| Actual_Identity | Mean | Std. Error | df | 95% Confidence Interval | |
|---|---|---|---|---|---|
| | | | | Lower Bound | Upper Bound |
| 1 | 4.486[b] | .794 | 226.034 | 2.920 | 6.051 |
| 2 | 4.200[b] | .794 | 226.034 | 2.635 | 5.766 |

a. Dependent Variable: EMG_Raw1000.

b. Covariates appearing in the model are evaluated at the following values: Transphobia_GMC = .00.

**Pairwise Comparisons[a]**

| (I) Actual_Identity | (J) Actual_Identity | Mean Difference (I–J) | Std. Error | df | Sig.[c] | 95% Confidence Interval for Difference[c] | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower Bound | Upper Bound |
| 1 | 2 | .285* | .014 | 64163.000 | .000 | .258 | .312 |
| 2 | 1 | -.285* | .014 | 64163.000 | .000 | -.312 | -.258 |

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Dependent Variable: EMG_Raw1000.

c. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

# Independent Variables:Interction

**4. News_Identity * Ease_Categorization[a]**

| News_Identity | Ease_Categorization | Mean | Std. Error | df | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| 1 | 1 | 5.222[b] | 1.104 | 226.034 | 3.047 | 7.397 |
| | 2 | 5.191[b] | 1.104 | 226.034 | 3.016 | 7.366 |
| 2 | 1 | 3.478[b] | 1.143 | 226.034 | 1.226 | 5.729 |
| | 2 | 3.481[b] | 1.143 | 226.034 | 1.230 | 5.733 |

a. Dependent Variable: EMG_Raw1000.

b. Covariates appearing in the model are evaluated at the following values: Transphobia_GMC = .00.

**5. News_Identity * Actual_Identity[a]**

| News_Identity | Actual_Identity | Mean | Std. Error | df | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| 1 | 1 | 5.284[b] | 1.104 | 226.034 | 3.109 | 7.459 |
| | 2 | 5.129[b] | 1.104 | 226.034 | 2.954 | 7.304 |
| 2 | 1 | 3.687[b] | 1.143 | 226.034 | 1.436 | 5.939 |
| | 2 | 3.272[b] | 1.143 | 226.034 | 1.020 | 5.524 |

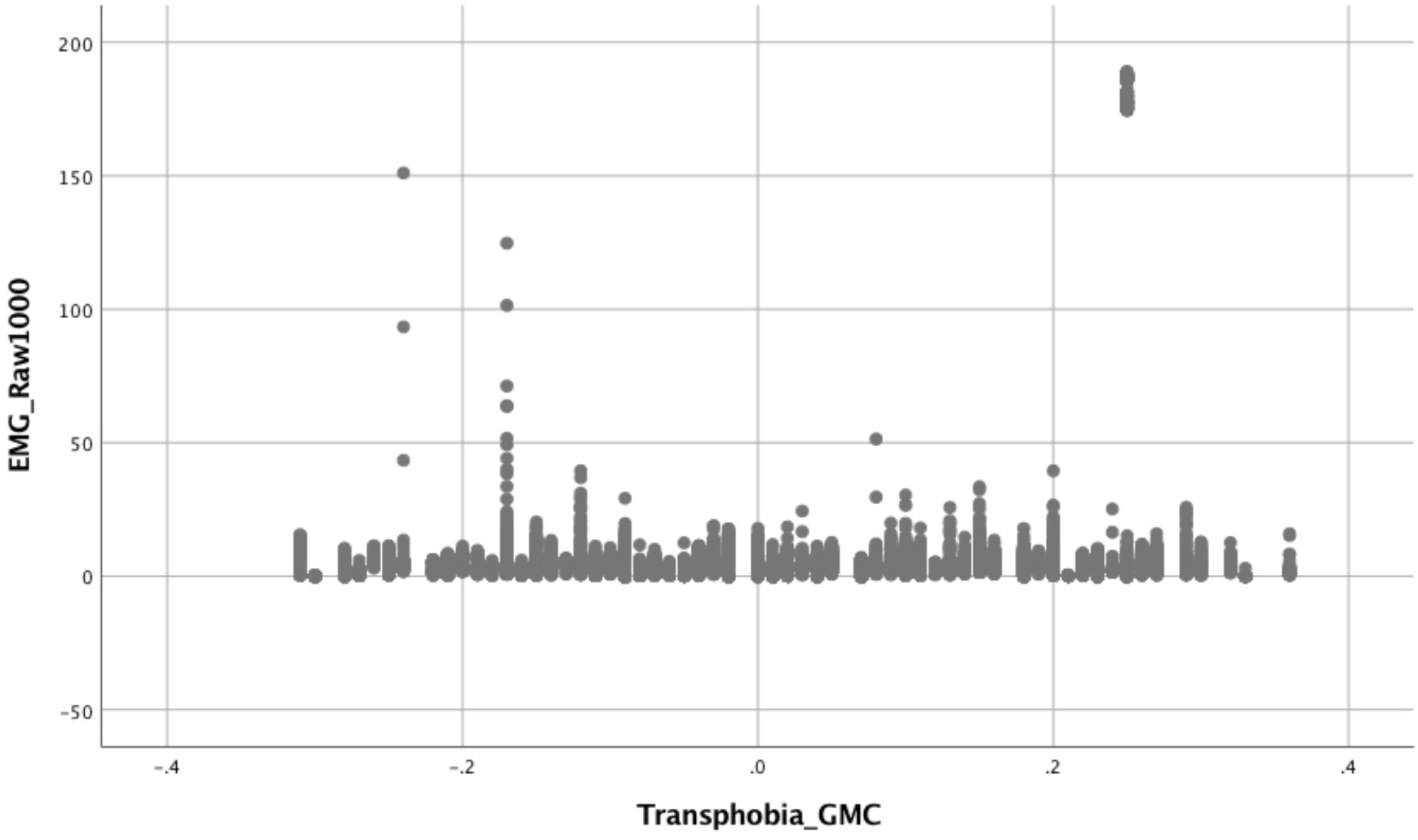
a. Dependent Variable: EMG_Raw1000.

b. Covariates appearing in the model are evaluated at the following values: Transphobia_GMC = .00.

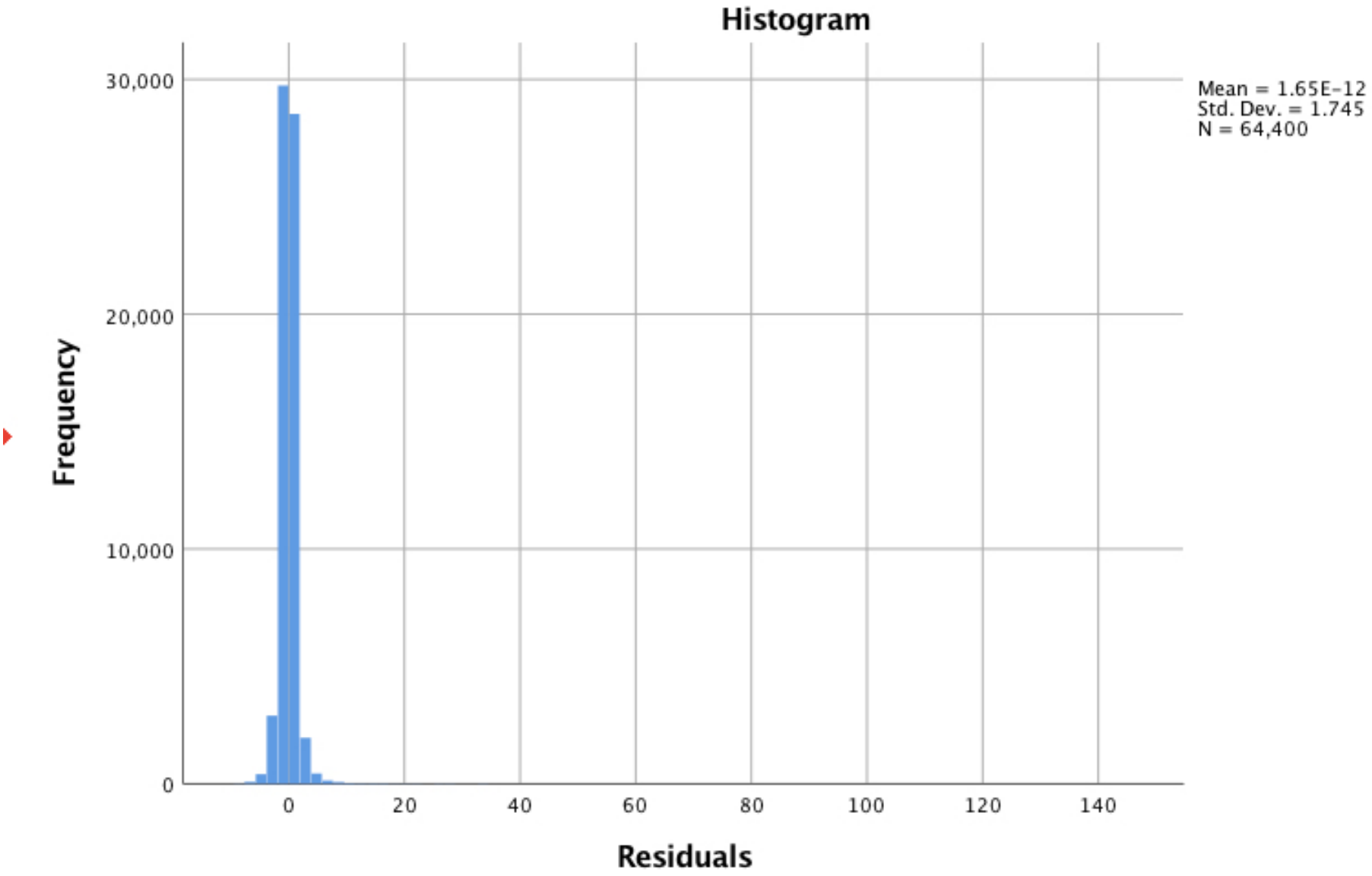
**6. Ease_Categorization * Actual_Identity[a]**

| Ease_Categorization | Actual_Identity | Mean | Std. Error | df | 95% Confidence Interval | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| 1 | 1 | 4.491[b] | .794 | 226.102 | 2.926 | 6.057 |
| | 2 | 4.208[b] | .794 | 226.102 | 2.643 | 5.774 |
| 2 | 1 | 4.480[b] | .794 | 226.102 | 2.915 | 6.045 |
| | 2 | 4.193[b] | .794 | 226.102 | 2.627 | 5.758 |

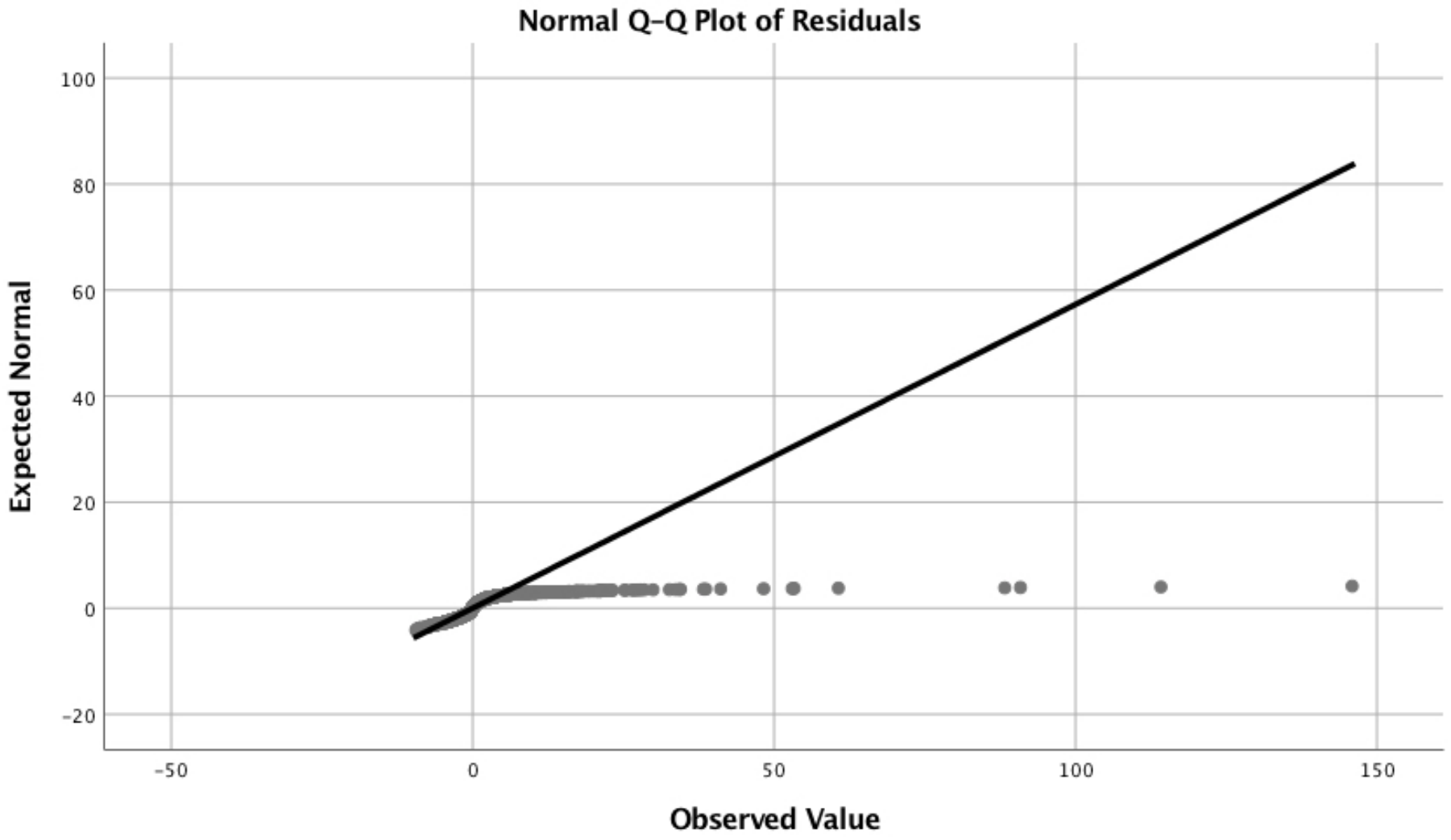
# Assumption Check 1: Linearity



# Assumption Check 2: Normality of Error Terms



# Assumption Check 2: Normality of Error Terms



# Assumption Check 2: Normality of Error Terms

**Tests of Normality**

| | Kolmogorov-Smirnov[a] | | |
|---|---|---|---|
| | Statistic | df | Sig. |
| Residuals | .192 | 64400 | .000 |

a. Lilliefors Significance Correction

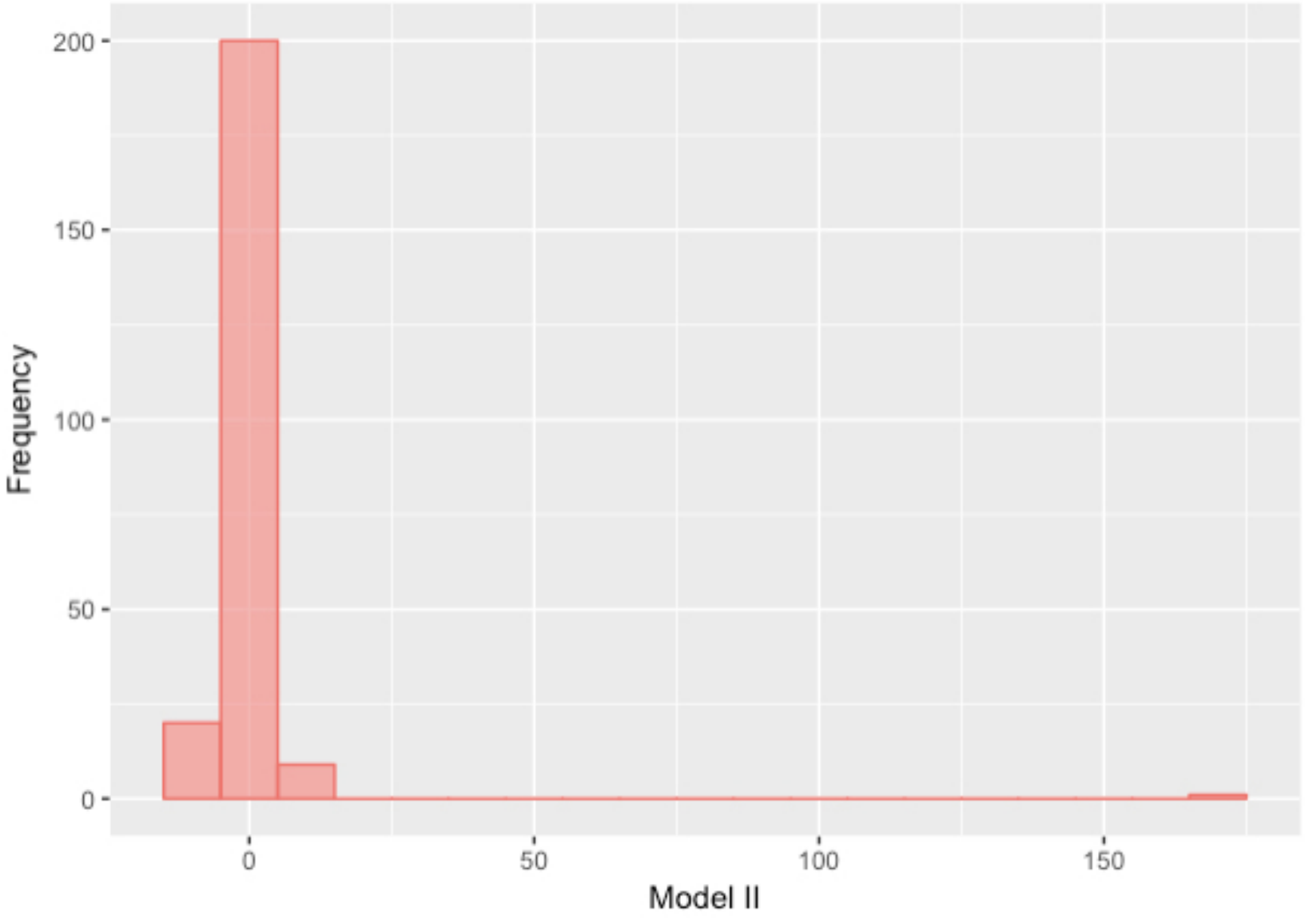
# Assumption Check 2: Normality of Error Terms

**Descriptive Statistics**

| | N | Range | Minimum | Maximum | Mean | | Std. Deviation | Variance | Skewness | | Kurtosis | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Statistic | Statistic | Statistic | Statistic | Statistic | Std. Error | Statistic | Statistic | Statistic | Std. Error | Statistic | Std. Error |
| Residuals | 64400 | 155 | -9 | 146 | .00 | .007 | 1.745 | 3.044 | 22.255 | .010 | 1357.753 | .019 |
| Valid N (listwise) | 64400 | | | | | | | | | | | |

- Statistics Skewness tolerance range is -2 to +2.
- Statistics Kurtosis tolerance range is -2 to +2.

# Assumption Check 3: Normality of Random Coefficient

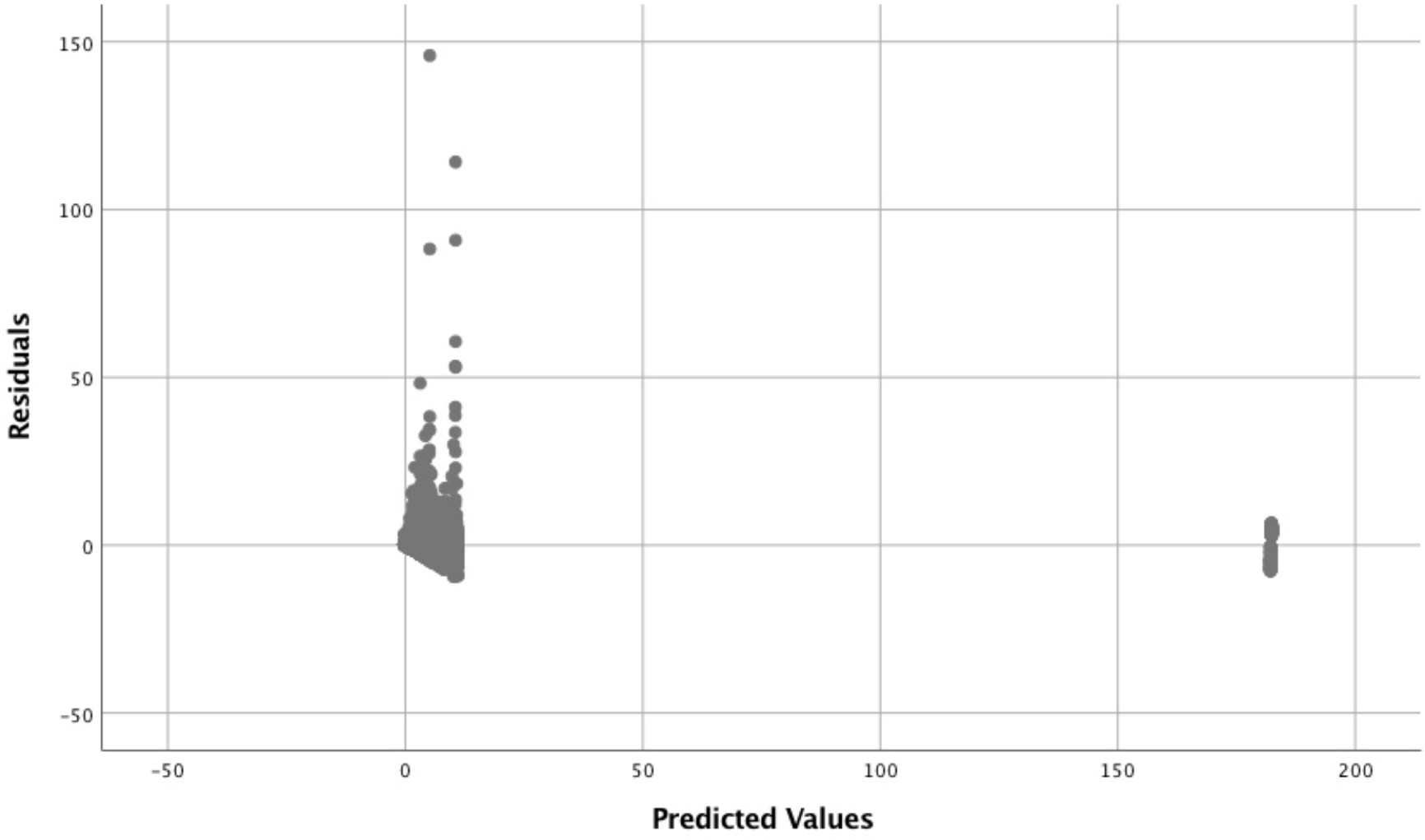


# Assumption Check 3: Normality of Random Coefficient

```
        Shapiro-Wilk normality test

data:  m2
W = 0.20024, p-value < 2.2e-16
```

# Assumption Check 4: Equal Variance



# Model III

# Assumption Check 1: Linearity

# Assumption Check 2: Normality of Error Terms

# Assumption Check 3: Normality of Random Coefficient

# Assumption Check 4: Equal Variance

# Final Model

# Conclusion and Discussion