Psychophysiological Correlates of Categorization of Gender in Advertisements

Monte Carlo Group

February 4, 2018

Background

Research Questions

- 1. Will transphobia affect responses to advertisements when participants read news stories about models? transgender identities?
  Predictor: Article Prime News_Identity in SPSS
  1. Identity
  2. Control

- 2.Will there be differences in attention, arousal, and negative affect to advertisements featuring hard to categorize models (androgynous) compared to advertisements featuring easy to categorize models (non-androgynous)?Will transphobia affect responses to advertisements featuring hard to categorize models (androgynous)?
  Predictor: Ease of Categorization (Categorical)
  Ease_of_categorization in SPSS
  1. Hard (Androgynous)
  2. Easy (Non-androgynous)

Research Questions

- 3.Will transphobia affect responses to advertisements featuring hard to categorize models (androgynous)? Will there be differences in attention, arousal, and negative affect to advertisements featuring transgender models compared to advertisements featuring cisgender models?
  Predictor: Actual identity (Categorical) Actual_Identity in SPSS
  1. Transgender: gender identification $\neq$ sex assigned at birth
  2. Cisgender: gender identification $=$ sex assigned at birth
- 4.Will transphobia affect responses to advertisements featuring transgender models? Transphobia (Continuous) Transphobia_GMC in SPSS

Data Description and Variable Selection

Dependent Variables

- Attention (HR) HR_Raw in SPSS
  decrease reflects focus (PSNS)
  increase reflects disengagement (SNS)

- Arousal (SC) EDA_Raw in SPSS
  decrease reflects less arousal (PSNS)
  increase reflects more arousal (SNS)

- Emotion (facial EMG) EMG_Raw1000 in SPSS
  associated with behavioral outcomes

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.

Model I

$lmer(HR\_RAW \sim Actual\_identity + News\_Identity + Ease\_Categorization + Transphobia\_GMC + Actual\_Identity \times News\_Identity + Actual\_Identity \times Ease\_Categorization + Actual\_Identity \times Transphobia\_GMC + News\_identity \times Ease\_Categorization + News\_Identity \times Transphobia\_GMC + Ease\_Categorization \times Transphobia\_GMC + (1|Participant), data = GLRB)$
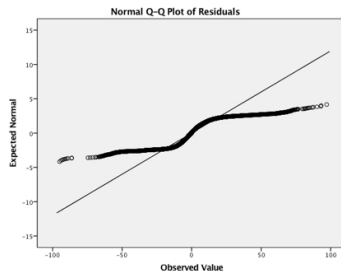
Assumption Check

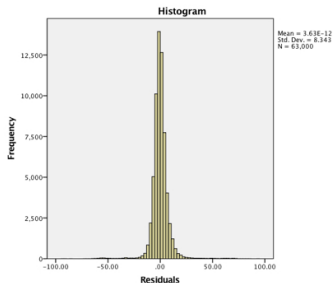- The independent variables are related linearly to the dependent variables.
- The errors are normally distributed.
- The random coefficient are normally distributed
- The errors have equal variance.

Assumption Check 1: Linearity
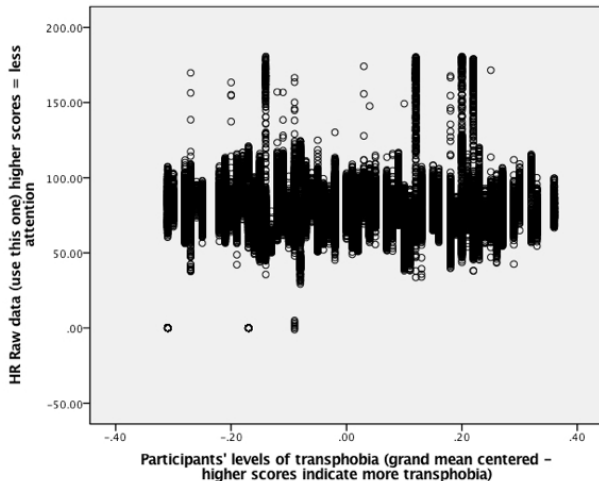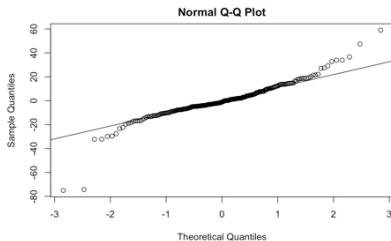
Assumption Check 2: Normality of Error Terms

Tests of Normality

	Kolmogorov–Smirnov[a]		
	Statistic	df	Sig.
Residuals	.119	63000	.000

a. Lilliefors Significance Correction
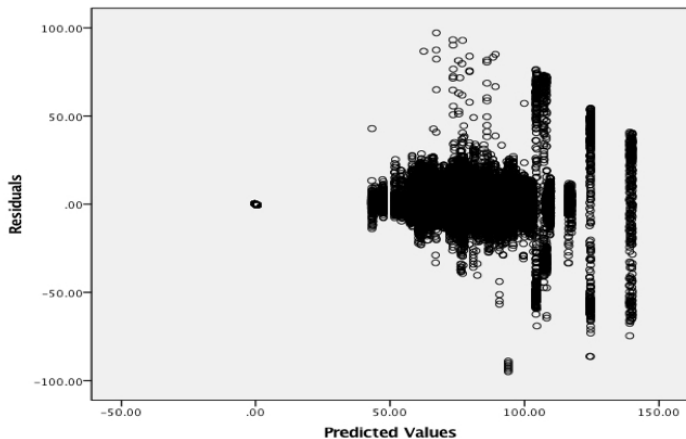
Assumption Check 3: Normality of Random Coefficient
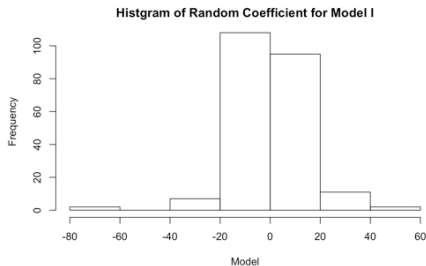
Shapiro-Wilk normality test

data: m2
W = 0.9053, p-value = 9.634e-11

Assumption Check 4: Equal Variance

Pairwise Comparisons

Type III Tests of Fixed Effects[a]

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	221	6366.187	.000
Actual_Identity	1	62768	16.835	.000
News_Identity	1	221	6.845	.010
Ease_Categorization	1	62768	.233	.629
Transphobia_GMC	1	221.000	.007	.931
Actual_Identity * News_Identity	1	62768	29.540	.000
Actual_Identity * Ease_Categorization	1	62768	5.030	.025
Ease_Categorization * News_Identity	1	62768	1.095	.295
Actual_Identity * Transphobia_GMC	1	62768	12.976	.000
News_Identity * Transphobia_GMC	1	221.000	.646	.422
Ease_Categorization * Transphobia_GMC	1	62768	.501	.479

a. Dependent Variable: HR Raw data (use this one) higher scores = less attention.

Independent Variable:New Identity

Estimates[a]

Article prime condition	Mean	Std. Error	df	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Identity	81.173[b]	1.358	221	78.496	83.850
Control	75.994[b]	1.426	221	73.183	78.805

a. Dependent Variable: HR Raw data (use this one) higher scores = less attention.

b. Covariates appearing in the model are evaluated at the following values: Participants' levels of transphobia (grand mean centered – higher scores indicate more transphobia) = –.0027.

Pairwise Comparisons[a]

(I) Article prime condition	(J) Article prime condition	Mean Difference (I–J)	Std. Error	df	Sig.[c]	95% Confidence Interval for Difference[c] Lower Bound	95% Confidence Interval for Difference[c] Upper Bound
Identity	Control	5.179[*]	1.970	221	.009	1.298	9.061
Control	Identity	–5.179[*]	1.970	221	.009	–9.061	–1.298

Based on estimated marginal means

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

a. Dependent Variable: HR Raw data (use this one) higher scores = less attention.

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

Independent Variable:Actual Identity

Estimates[a]

Models actual gender identity	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
Transgender	78.449[b]	.985	221.507	76.507	80.391
Cisgender	78.718[b]	.985	221.507	76.777	80.660

a. Dependent Variable: HR Raw data (use this one) higher scores = less attention.

b. Covariates appearing in the model are evaluated at the following values: Participants' levels of transphobia (grand mean centered – higher scores indicate more transphobia) = –.0027.

Pairwise Comparisons[a]

(I) Models actual gender identity	(J) Models actual gender identity	Mean Difference (I–J)	Std. Error	df	Sig.[c]	95% Confidence Interval for Difference[c]	
						Lower Bound	Upper Bound
Transgender	Cisgender	–.270[*]	.067	62768	.000	–.400	–.139
Cisgender	Transgender	.270[*]	.067	62768	.000	.139	.400

Based on estimated marginal means

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

a. Dependent Variable: HR Raw data (use this one) higher scores = less attention.

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

Independent Variables:Ease Categorization

Estimates[a]

Ease of categorization of model into gender categories (created from AndFemMasc variable)	Models actual gender identity	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
Hard (Androgynous)	Transgender	78.539[b]	.986	222.521	76.595	80.483
	Cisgender	78.660[b]	.986	222.521	76.715	80.604
Easy (Non–androgynous)	Transgender	78.358[b]	.986	222.521	76.414	80.302
	Cisgender	78.777[b]	.986	222.521	76.833	80.721

a. Dependent Variable: HR Raw data (use this one) higher scores = less attention.

b. Covariates appearing in the model are evaluated at the following values: Participants' levels of transphobia (grand mean centered – higher scores indicate more transphobia) = -.0027.

Pairwise Comparisons[a]

Ease of categorization of model into gender categories (created from AndFemMasc identity	(I) Models actual gender identity	(J) Models actual gender identity	Mean Difference (I–J)	Std. Error	df	Sig.[c]	95% Confidence Interval for Difference[c]	
							Lower Bound	Upper Bound
Hard (Androgynous)	Transgender	Cisgender	-.120	.094	62768	.202	-.305	.064
	Cisgender	Transgender	.120	.094	62768	.202	-.064	.305
Easy (Non–androgynous)	Transgender	Cisgender	-.419*	.094	62768	.000	-.604	-.234
	Cisgender	Transgender	.419*	.094	62768	.000	.234	.604

Based on estimated marginal means

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

a. Dependent Variable: HR Raw data (use this one) higher scores = less attention.

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

Independent Variables:Interaction

Estimates[a]

Models actual gender identity	Article prime condition	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
Transgender	Identity	80.856[b]	1.359	221.510	78.178	83.534
	Control	76.041[b]	1.427	221.510	73.229	78.854
Cisgender	Identity	81.490[b]	1.359	221.510	78.812	84.168
	Control	75.947[b]	1.427	221.510	73.134	78.759

a. Dependent Variable: HR Raw data (use this one) higher scores = less attention.

b. Covariates appearing in the model are evaluated at the following values: Participants' levels of transphobia (grand mean centered – higher scores indicate more transphobia) = –.0027.

Pairwise Comparisons[a]

Models actual gender identity	(I) Article prime condition	(J) Article prime condition	Mean Difference (I–J)	Std. Error	df	Sig.[c]	95% Confidence Interval for Difference[c]	
							Lower Bound	Upper Bound
Transgender	Identity	Control	4.815[*]	1.971	221.512	.015	.931	8.698
	Control	Identity	–4.815[*]	1.971	221.512	.015	–8.698	–.931
Cisgender	Identity	Control	5.543[*]	1.971	221.512	.005	1.660	9.427
	Control	Identity	–5.543[*]	1.971	221.512	.005	–9.427	–1.660

Based on estimated marginal means

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

a. Dependent Variable: HR Raw data (use this one) higher scores = less attention.

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

Model II

$lmer(EMG\_RAW1000 \sim Actual\_identity + News\_Identity + Ease\_Categorization + Transphobia\_GMC + Actual\_Identity \times News\_Identity + Actual\_Identity \times Ease\_Categorization + Actual\_Identity \times Transphobia\_GMC + News\_identity \times Ease\_Categorization + News\_Identity \times Transphobia\_GMC + Ease\_Categorization \times Transphobia\_GMC + (1|Participant), data = GLRB)$
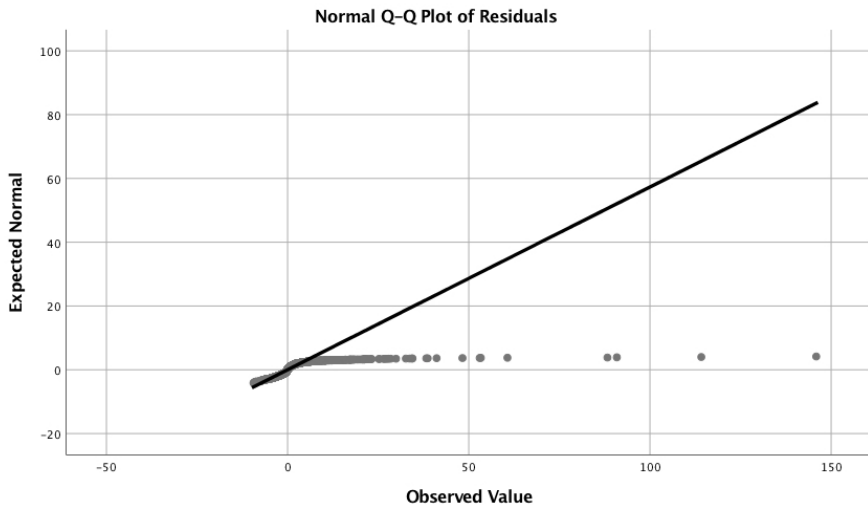
Assumption Check 1: Linearity
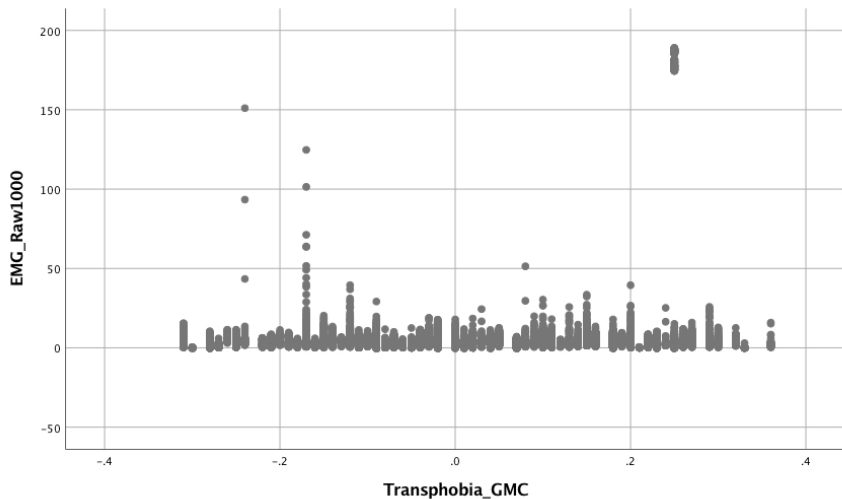
Assumption Check 2: Normality of Error Terms
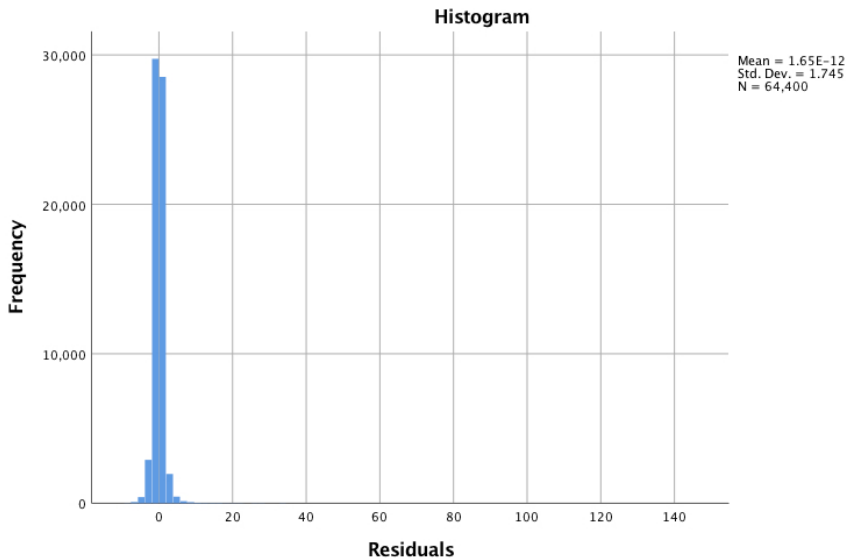
Normal Q–Q Plot of Residuals

Assumption Check 2: Normality of Error Terms

Tests of Normality

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

a. Lilliefors Significance Correction
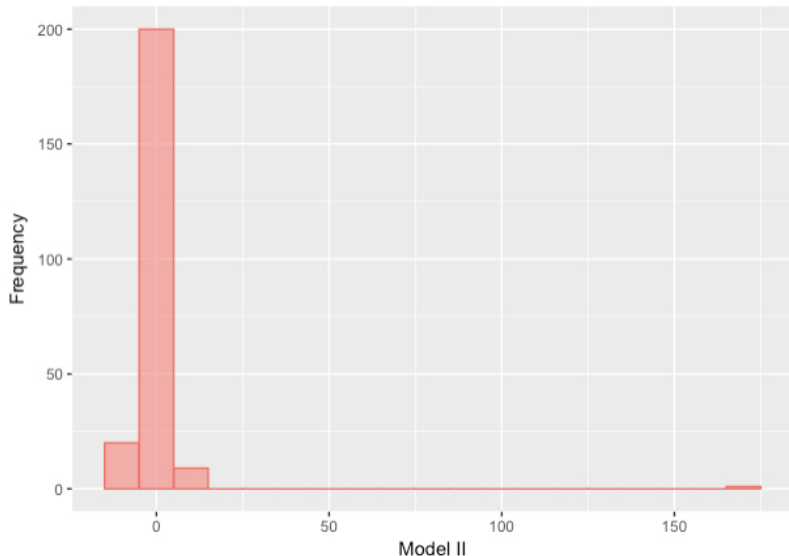
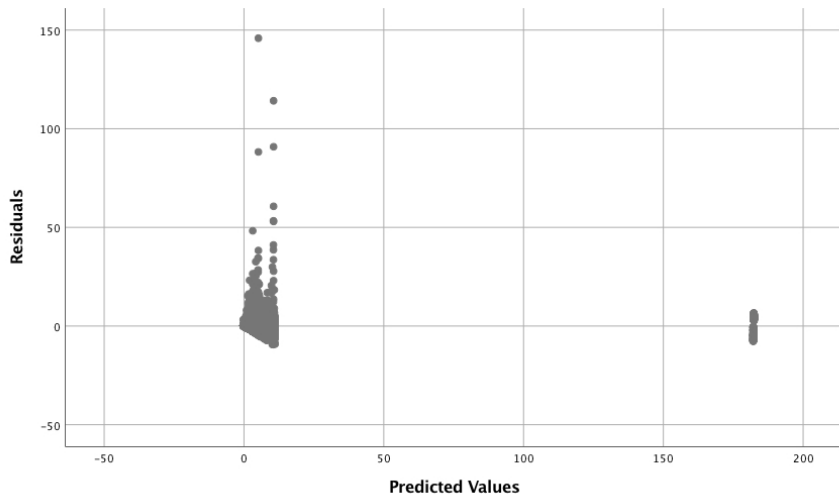# Assumption Check 3: Normality of Random Coefficient

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Shapiro-Wilk normality test

data:  m2
W = 0.20024, p-value < 2.2e-16
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Assumption Check 4: Equal Variance

Pairwise Comparisons

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.

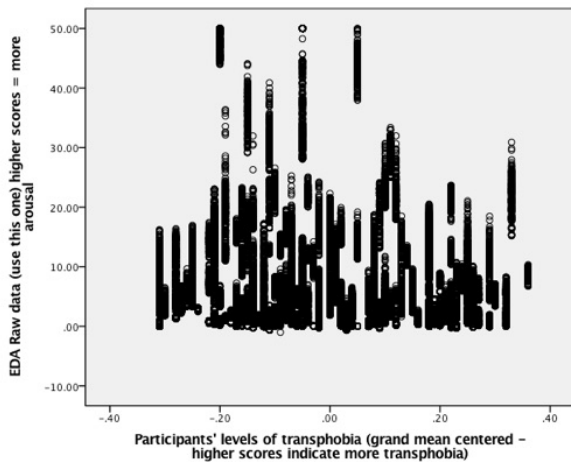b. Covariates appearing in the model are evaluated at the following values: Transphobia_GMC = .00.

6. Ease_Categorization * Actual_Identity[a]

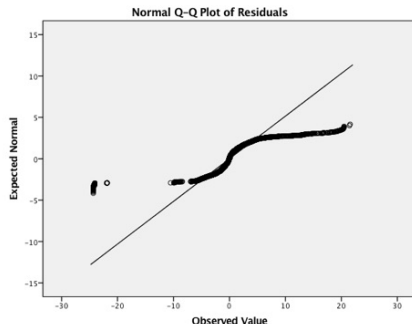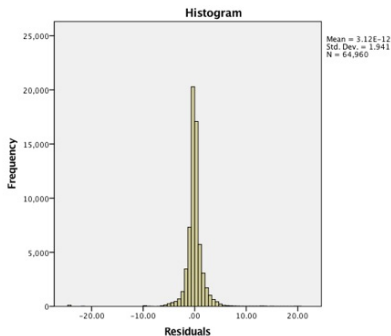| Ease_Categorization	Actual_Identity	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
1	1	4.491[b]	.794	226.102	2.926	6.057
	2	4.208[b]	.794	226.102	2.643	5.774
2	1	4.480[b]	.794	226.102	2.915	6.045
	2	4.193[b]	.794	226.102	2.627	5.758

Model III

$lmer(EDA\_RAW \sim Actual\_identity + News\_Identity + Ease\_Categorization + Transphobia\_GMC + Actual\_Identity \times News\_Identity + Actual\_Identity \times Ease\_Categorization + Actual\_Identity \times Transphobia\_GMC + News\_identity \times Ease\_Categorization + News\_Identity \times Transphobia\_GMC + Ease\_Categorization \times Transphobia\_GMC + (1|Participant), data = GLRB)$

Assumption Check 1: Linearity
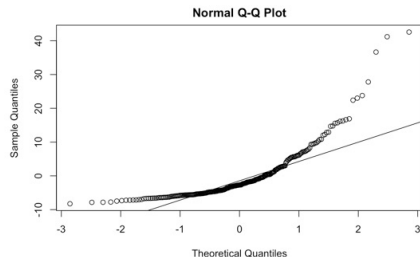
Assumption Check 2: Normality of Error Terms

Histogram

Mean = 3.12E-12
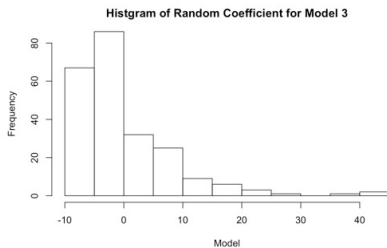Std. Dev. = 1.941
N = 64,960

Normal Q–Q Plot of Residuals

Tests of Normality

	Kolmogorov–Smirnov[a]		
	Statistic	df	Sig.
Residuals	.161	64960	.000

a. Lilliefors Significance Correction

Histgram of Random Coefficient for Model 3

Normal Q-Q Plot

Shapiro-Wilk normality test

data: m2
W = 0.76008, p-value < 2.2e-16

Assumption Check 4: Equal Variance
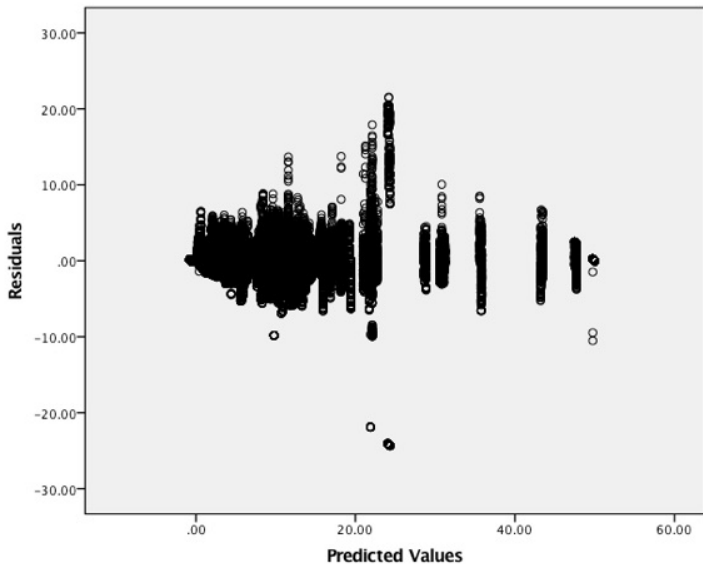
Pairwise Comparsion

Type III Tests of Fixed Effects[a]

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	228.000	1210.253	.000
Actual_Identity	1	64721.000	258.526	.000
News_Identity	1	228.000	.007	.935
Ease_Categorization	1	64721.000	2.647	.104
Transphobia_GMC	1	228.000	1.356	.245
Actual_Identity * News_Identity	1	64721.000	.160	.689
Actual_Identity * Ease_Categorization	1	64721.000	9.465	.002
Ease_Categorization * News_Identity	1	64721.000	7.317	.007
Actual_Identity * Transphobia_GMC	1	64721.000	10.954	.001
News_Identity * Transphobia_GMC	1	228.000	2.157	.143
Ease_Categorization * Transphobia_GMC	1	64721.000	13.413	.000

a. Dependent Variable: EDA_Raw_log.

Pairwise Comparsion

Estimates[a]

Models actual gender identity	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
Transgender	.776[b]	.022	228.107	.732	.820
Cisgender	.787[b]	.022	228.107	.743	.831

a. Dependent Variable: EDA_Raw_log.

b. Covariates appearing in the model are evaluated at the following values: Participants' levels of transphobia (grand mean centered – higher scores indicate more transphobia) = –.0032.

Pairwise Comparisons[a]

(I) Models actual gender identity	(J) Models actual gender identity	Mean Difference (I–J)	Std. Error	df	Sig.[c]	95% Confidence Interval for Difference[c]	
						Lower Bound	Upper Bound
Transgender	Cisgender	–.011[*]	.001	64721.000	.000	–.012	–.010
Cisgender	Transgender	.011[*]	.001	64721.000	.000	.010	.012

Based on estimated marginal means

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

a. Dependent Variable: EDA_Raw_log.

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

Pairwise Comparsion

Estimates[a]

Ease of categorization of model into gender categories (created from AndFemMasc variable)	Models actual gender identity	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
Hard (Androgynous)	Transgender	.778[b]	.022	228.322	.733	.822
	Cisgender	.787[b]	.022	228.322	.742	.831
Easy (Non–androgynous)	Transgender	.774[b]	.022	228.322	.730	.819
	Cisgender	.788[b]	.022	228.322	.743	.832

a. Dependent Variable: EDA_Raw_log.

b. Covariates appearing in the model are evaluated at the following values: Participants' levels of transphobia (grand mean centered – higher scores indicate more transphobia) = –.0032.

Pairwise Comparisons[a]

Ease of categorization of model into gender categories (created from AndFemMasc variable)	(I) Models actual gender identity	(J) Models actual gender identity	Mean Difference (I–J)	Std. Error	df	Sig.[c]	95% Confidence Interval for Difference[c]	
							Lower Bound	Upper Bound
Hard (Androgynous)	Transgender	Cisgender	–.009[*]	.001	64721.000	.000	–.011	–.007
	Cisgender	Transgender	.009[*]	.001	64721.000	.000	.007	.011
Easy (Non–androgynous)	Transgender	Cisgender	–.013[*]	.001	64721.000	.000	–.015	–.011
	Cisgender	Transgender	.013[*]	.001	64721.000	.000	.011	.015

Based on estimated marginal means

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

a. Dependent Variable: EDA_Raw_log.

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

Conclusion and Discussion