

# Psychophysiological Correlates of Categorization of Gender in Advertisements

Monte Carlo Group

February 4, 2018

# Background

## 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

# 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

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 1

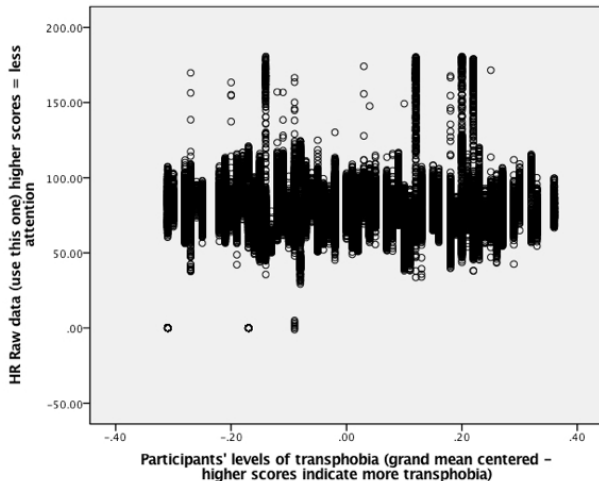
```
lmer(HR_RAW ~ Actual_identity + News_Identity +  
Ease_Categorization + Transphobia_GMC + Actual_Identity ×  
News_Identity + Actual_Identity × Ease_Categorization +  
Actual_Identity × Transphobia_GMC + News_identity ×  
Ease_Categorization + News_Identity × Transphobia_GMC +  
Ease_Categorization × Transphobia_GMC + (1|Participant), data =  
GLRB)
```

# Assumption Check

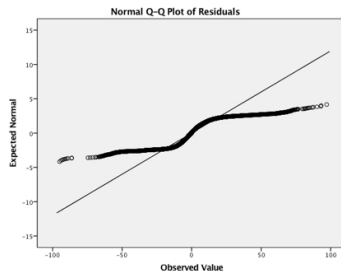
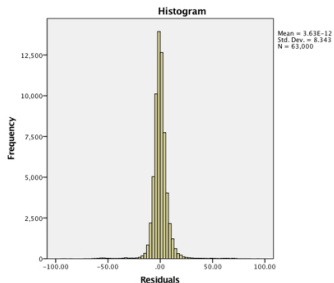
- ▶ The independent variables are related linearly to the dependent variables.
- ▶ The errors are normally distributed.
- ▶ The random coefficient are normally distributed
- ▶ The errors have equal variance.



# Assumption Check 1: Linearity



# Assumption Check 2: Normality of Error Terms



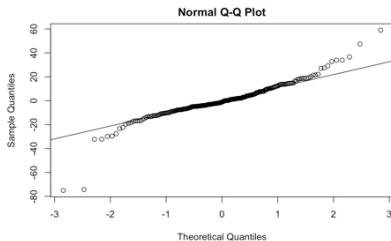
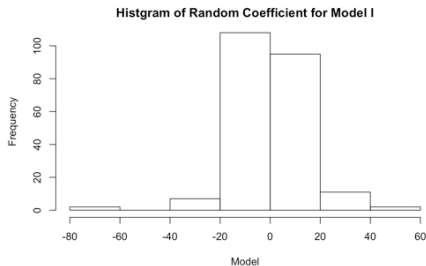
## Tests of Normality

Kolmogorov-Smirnov<sup>a</sup>

	Statistic	df	Sig.
Residuals	.119	63000	.000

a. Lilliefors Significance Correction

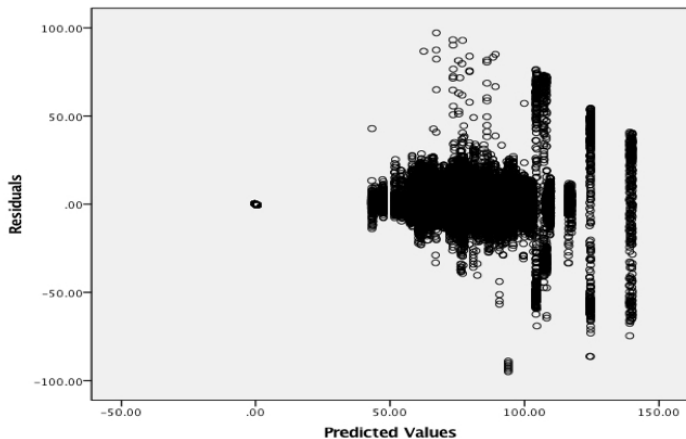
# Assumption Check 3: Normality of Random Coefficient



Shapiro-Wilk normality test

data: m2  
 $W = 0.9053$ ,  $p\text{-value} = 9.634\text{e-}11$

## Assumption Check 4: Equal Variance



# Pairwise Comparisons

**Type III Tests of Fixed Effects<sup>a</sup>**

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<sup>a</sup>**

Article prime condition	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
Identity	81.173 <sup>b</sup>	1.358	221	78.496	83.850
Control	75.994 <sup>b</sup>	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<sup>a</sup>**

(I) Article prime condition	(J) Article prime condition	Mean Difference (I-J)	Std. Error	df	Sig. <sup>c</sup>	95% Confidence Interval for Difference <sup>c</sup>	
						Lower Bound	Upper Bound
Identity	Control	5.179 <sup>*</sup>	1.970	221	.009	1.298	9.061
Control	Identity	-5.179 <sup>*</sup>	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<sup>a</sup>

Models actual gender identity	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
Transgender	78.449 <sup>b</sup>	.985	221.507	76.507	80.391
Cisgender	78.718 <sup>b</sup>	.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<sup>a</sup>

(I) Models actual gender identity	(J) Models actual gender identity	Mean Difference (I-J)	Std. Error	df	Sig. <sup>c</sup>	95% Confidence Interval for Difference <sup>c</sup>	
						Lower Bound	Upper Bound
Transgender	Cisgender	-.270 <sup>*</sup>	.067	62768	.000	-.400	-.139
Cisgender	Transgender	.270 <sup>*</sup>	.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<sup>a</sup>**

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

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. <sup>c</sup>	95% Confidence Interval for Difference <sup>b</sup>	
							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 <sup>*</sup>	.094	62768	.000	-.604	-.234
	Cisgender	Transgender	.419 <sup>*</sup>	.094	62768	.000	.234	.604

Based on estimated marginal means

<sup>\*</sup>. 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<sup>a</sup>**

Models actual gender identity	Article prime condition	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
Transgender	Identity	80.856 <sup>b</sup>	1.359	221.510	78.178	83.534
	Control	76.041 <sup>b</sup>	1.427	221.510	73.229	78.854
Cisgender	Identity	81.490 <sup>b</sup>	1.359	221.510	78.812	84.168
	Control	75.947 <sup>b</sup>	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<sup>a</sup>**

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

Based on estimated marginal means

<sup>\*</sup>. The mean difference is significant at the .05 level.

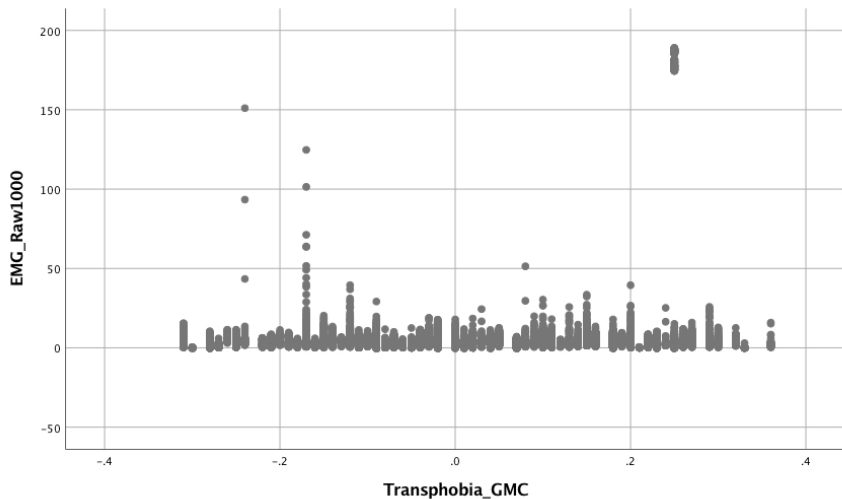
a. Dependent Variable: HR Raw data (use this one) higher scores = less attention.

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

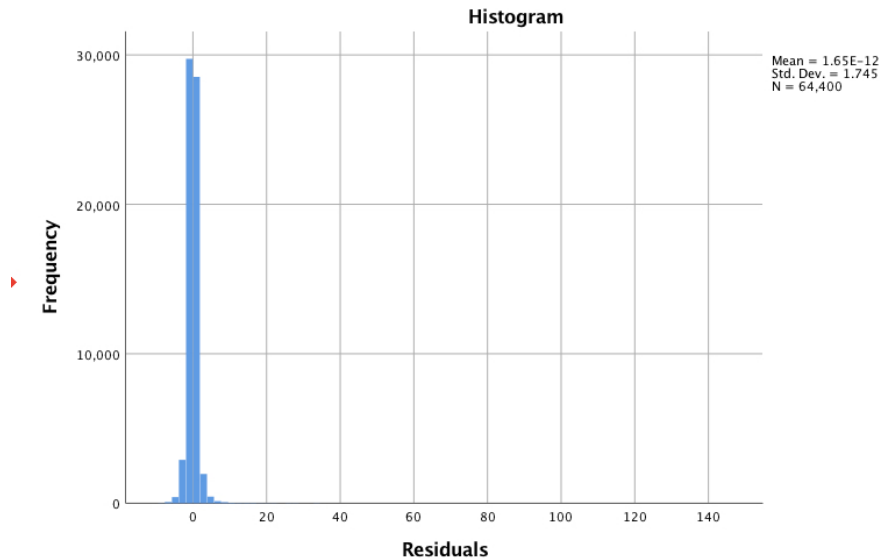
## Model II

*lmer(EMG\_RAW1000 ~ Actual\_identity + News\_Identity + Ease\_Categorization + Transphobia\_GMC + Actual\_Identity × News\_Identity + Actual\_Identity × Ease\_Categorization + Actual\_Identity × Transphobia\_GMC + News\_identity × Ease\_Categorization + News\_Identity × Transphobia\_GMC + Ease\_Categorization × Transphobia\_GMC + (1|Participant), data = GLRB)*

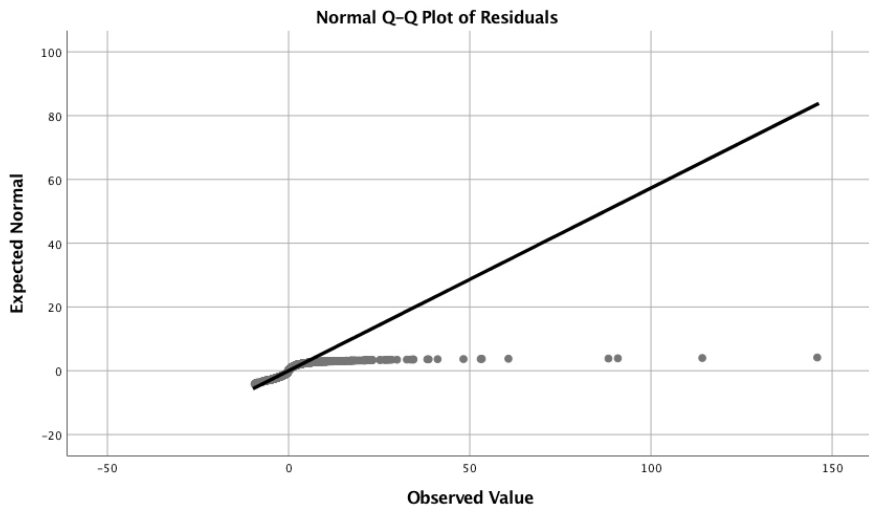
# Assumption Check 1: Linearity



## Assumption Check 2: Normality of Error Terms



## Assumption Check 2: Normality of Error Terms



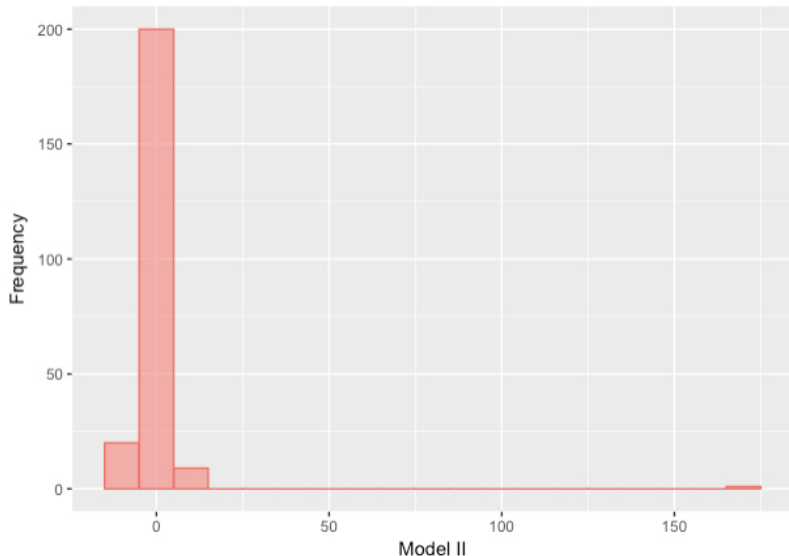
## Assumption Check 2: Normality of Error Terms

### Tests of Normality

	Kolmogorov-Smirnov <sup>a</sup>		
	Statistic	df	Sig.
Residuals	.192	64400	.000

a. Lilliefors Significance Correction

## Assumption Check 3: Normality of Random Coefficient



## Assumption Check 3: Normality of Random Coefficient

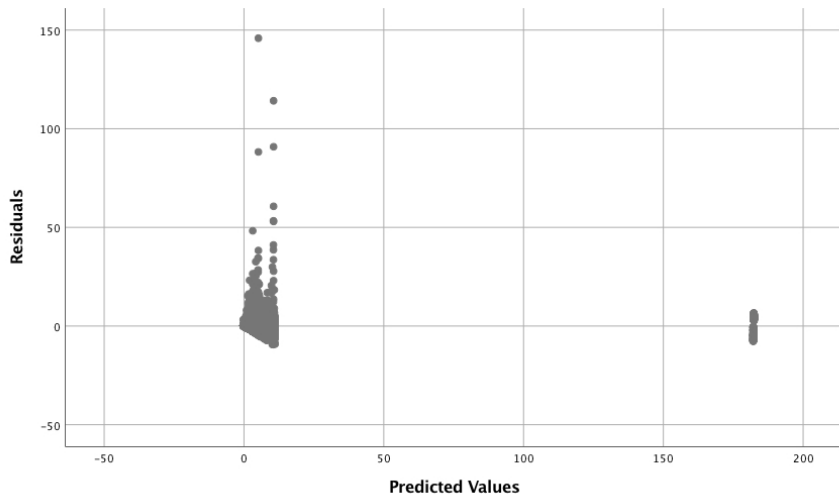
Shapiro-Wilk normality test

data: m2

W = 0.20024, p-value < 2.2e-16



## Assumption Check 4: Equal Variance



# Pairwise Comparisons

**Type III Tests of Fixed Effects<sup>a</sup>**

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	226.000	30.217	.000
News_Identity	1	226.000	1.245	.266
Ease_Categorization	1	64163.000	1.060	.303
Actual_Identity	1	64163.000	430.493	.000
Transphobia_GMC	1	226.000	2.011	.158
News_Identity * Ease_Categorization	1	64163.000	1.561	.211
News_Identity * Actual_Identity	1	64163.000	88.594	.000
News_Identity * Transphobia_GMC	1	226.000	1.783	.183
Ease_Categorization * Actual_Identity	1	64163.000	.022	.881
Ease_Categorization * Transphobia_GMC	1	64163.000	6.374	.012
Actual_Identity * Transphobia_GMC	1	64163.000	10.216	.001

a. Dependent Variable: EMG\_Raw1000.

# Independent Variables

## 1. News\_Identity

Estimates<sup>a</sup>

News_Identity	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
1	5.207 <sup>b</sup>	1.104	226.000	3.032	7.381
2	3.480 <sup>b</sup>	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<sup>a</sup>

(I) News_Identity	(J) News_Identity	Mean Difference (I-J)	Std. Error	df	Sig. <sup>b</sup>	95% Confidence Interval for Difference <sup>b</sup>	
						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<sup>a</sup>

Ease_Categorization	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
1	4.350 <sup>b</sup>	.794	226.034	2.784	5.915
2	4.336 <sup>b</sup>	.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<sup>a</sup>

(I) Ease_Categorization	(J) Ease_Categorization	Mean Difference (I-J)	Std. Error	df	Sig. <sup>b</sup>	95% Confidence Interval for Difference <sup>b</sup>	
						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<sup>a</sup>

Actual_Identity	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
1	4.486 <sup>b</sup>	.794	226.034	2.920	6.051
2	4.200 <sup>b</sup>	.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<sup>a</sup>

(I) Actual_Identity	(J) Actual_Identity	Mean Difference (I-J)	Std. Error	df	Sig. <sup>c</sup>	95% Confidence Interval for Difference <sup>c</sup>	
						Lower Bound	Upper Bound
1	2	.285 <sup>*</sup>	.014	64163.000	.000	.258	.312
2	1	-.285 <sup>*</sup>	.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: Interaction

## 4. News\_Identity \* Ease\_Categorization<sup>a</sup>

News_Identity	Ease_Categorization	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
1	1	5.222 <sup>b</sup>	1.104	226.034	3.047	7.397
	2	5.191 <sup>b</sup>	1.104	226.034	3.016	7.366
2	1	3.478 <sup>b</sup>	1.143	226.034	1.226	5.729
	2	3.481 <sup>b</sup>	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<sup>a</sup>

News_Identity	Actual_Identity	Mean	Std. Error	df	95% Confidence Interval	
					Lower Bound	Upper Bound
1	1	5.284 <sup>b</sup>	1.104	226.034	3.109	7.459
	2	5.129 <sup>b</sup>	1.104	226.034	2.954	7.304
2	1	3.687 <sup>b</sup>	1.143	226.034	1.436	5.939
	2	3.272 <sup>b</sup>	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.

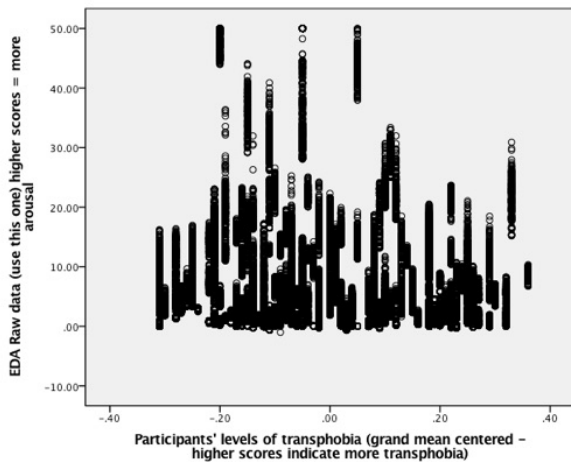
## 6. Ease\_Categorization \* Actual\_Identity<sup>a</sup>

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

## Model III

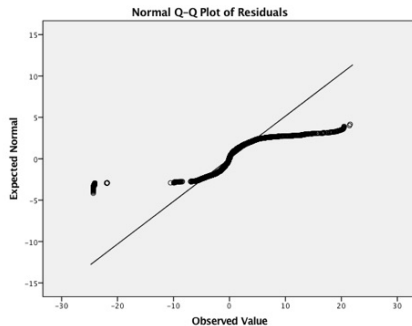
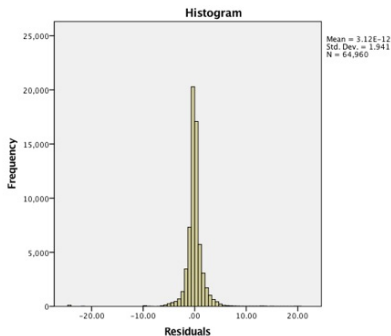
*lmer(EDA\_RAW ~ Actual\_identity + News\_Identity +  
Ease\_Categorization + Transphobia\_GMC + Actual\_Identity ×  
News\_Identity + Actual\_Identity × Ease\_Categorization +  
Actual\_Identity × Transphobia\_GMC + News\_identity ×  
Ease\_Categorization + News\_Identity × Transphobia\_GMC +  
Ease\_Categorization × Transphobia\_GMC + (1|Participant), data =  
GLRB)*

# Assumption Check 1: Linearity





# Assumption Check 2: Normality of Error Terms

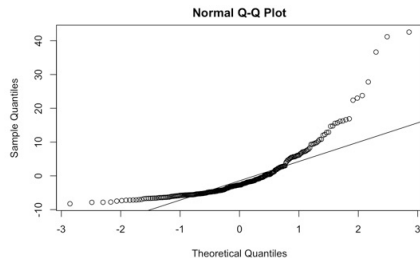
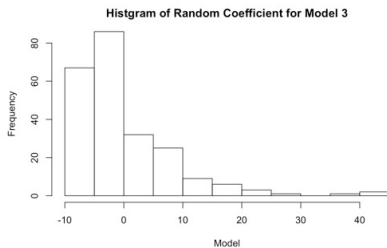


## Tests of Normality

Kolmogorov-Smirnov <sup>a</sup>		
	Statistic	Sig.
Residuals	.161	.000

a. Lilliefors Significance Correction

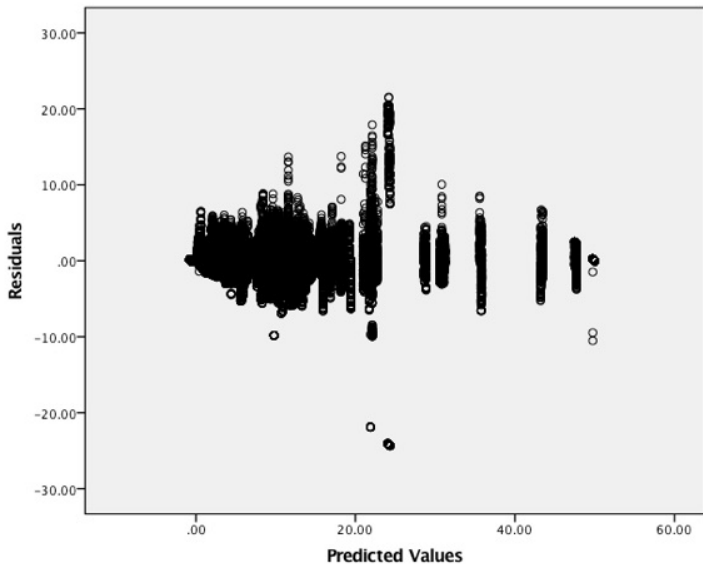
# Assumption Check 3: Normality of Random Coefficient



Shapiro-Wilk normality test

data: m2  
 $W = 0.76008$ ,  $p\text{-value} < 2.2e-16$

## Assumption Check 4: Equal Variance



# Pairwise Comparson

**Type III Tests of Fixed Effects<sup>a</sup>**

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 Comparision

**Estimates<sup>a</sup>**

Models actual gender identity	Mean	Std. Error	df	95% Confidence Interval	
				Lower Bound	Upper Bound
Transgender	.776 <sup>b</sup>	.022	228.107	.732	.820
Cisgender	.787 <sup>b</sup>	.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<sup>a</sup>**

(I) Models actual gender identity	(J) Models actual gender identity	Mean Difference (I-J)	Std. Error	df	Sig. <sup>c</sup>	95% Confidence Interval for Difference <sup>c</sup>	
						Lower Bound	Upper Bound
Transgender	Cisgender	-.011 <sup>*</sup>	.001	64721.000	.000	-.012	-.010
Cisgender	Transgender	.011 <sup>*</sup>	.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 Comparson

**Estimates<sup>a</sup>**

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 <sup>b</sup>	.022	228.322	.733	.822
	Cisgender	.787 <sup>b</sup>	.022	228.322	.742	.831
Easy (Non-androgynous)	Transgender	.774 <sup>b</sup>	.022	228.322	.730	.819
	Cisgender	.788 <sup>b</sup>	.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<sup>a</sup>**

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. <sup>c</sup>	95% Confidence Interval for Difference <sup>c</sup>	
							Lower Bound	Upper Bound
Hard (Androgynous)	Transgender	Cisgender	-.009 <sup>*</sup>	.001	64721.000	.000	-.011	-.007
	Cisgender	Transgender	.009 <sup>*</sup>	.001	64721.000	.000	.007	.011
Easy (Non-androgynous)	Transgender	Cisgender	-.013 <sup>*</sup>	.001	64721.000	.000	-.015	-.011
	Cisgender	Transgender	.013 <sup>*</sup>	.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