**ONLINE SUPPLEMENTARY MATERIALS**

**Appendix A**

**Language contact survey**

|  |  |
| --- | --- |
| 1. How much time did you spend communicating in English with your instructors outside of class? | Typically, how many days per week?  0 1 2 3 4 5 6 7  On those days, typically how many hours per day?  0 0-1 1-2 2-3 4-5 more than 5 |
| 2. How much time did you spend communicating in English with your classmates, friends, and roommate outside of class? | Typically, how many days per week?  0 1 2 3 4 5 6 7  On those days, typically how many hours per day?  0 0-1 1-2 2-3 4-5 more than 5 |
| 3. How much time did you spend in communicating with service personnel in English? | Typically, how many days per week?  0 1 2 3 4 5 6 7  On those days, typically how many hours per day?  0 0-1 1-2 2-3 4-5 more than 5 |
| 4. How much time did you use English outside the classroom for class-related things? | Typically, how many days per week?  0 1 2 3 4 5 6 7  On those days, typically how many hours per day?  0 0-1 1-2 2-3 4-5 more than 5 |
| 5. How much time did you use English outside the classroom for non-class-related things? | Typically, how many days per week?  0 1 2 3 4 5 6 7  On those days, typically how many hours per day?  0 0-1 1-2 2-3 4-5 more than 5 |
| 6. How much time did you spend reading English newspapers, magazines, or books outside of class? | Typically, how many days per week?  0 1 2 3 4 5 6 7  On those days, typically how many hours per day?  0 0-1 1-2 2-3 4-5 more than 5 |
| 7. How much time did you spend doing emails or internet in English outside of class? | Typically, how many days per week?  0 1 2 3 4 5 6 7  On those days, typically how many hours per day?  0 0-1 1-2 2-3 4-5 more than 5 |
| 8. How much time did you spend watching movies, TV, or videos in English outside of class? | Typically, how many days per week?  0 1 2 3 4 5 6 7  On those days, typically how many hours per day?  0 0-1 1-2 2-3 4-5 more than 5 |
| 9. How much time did you spend writing essays or homework assignments in English outside of class? | Typically, how many days per week?  0 1 2 3 4 5 6 7  On those days, typically how many hours per day?  0 0-1 1-2 2-3 4-5 more than 5 |

**Appendix B**

**Descriptive statistics of prosodic properties**

Mean *SD* 95% CI

Lower limit Upper limit

Rising tone choice

Time 1 0.31 0.21 0.28 0.34

Time 2 0.31 0.20 0.28 0.34

Time 3 0.25 0.19 0.22 0.28

NS data 0.24 0.25 0.18 0.29

Falling tone choice

Time 1 0.46 0.22 0.43 0.50

Time 2 0.49 0.22 0.46 0.53

Time 3 0.42 0.24 0.39 0.46

NS data 0.44 0.30 0.38 0.50

Level tone choice

Time 1 0.23 0.22 0.20 0.26

Time 2 0.20 0.21 0.17 0.23

Time 3 0.33 0.29 0.29 0.37

NS data 0.33 0.27 0.27 0.38

Prominence ratio

Time 1 0.38 0.07 0.37 0.39

Time 2 0.36 0.07 0.35 0.37

Time 3 0.37 0.07 0.36 0.38

NS data 0.27 0.07 0.25 0.29

Pitch range

Time 1 56.31 28.89 52.10 60.50

Time 2 76.18 47.56 69.20 83.10

Time 3 62.75 30.93 58.00 67.50

NS data 81.04 49.50 70.70 91.40

**Appendix C**

**Descriptive statistics of the TOEFL ITP score, orientation to language study, and amount of language contact**

*TOEFL ITP Score, Descriptive Statistics*

Mean *SD* 95% CI

Time 1 459.35 17.76 454.77 465.06

Time 2 511.90 20.22 505.56 517.46

Time 3 524.32 24.02 517.26 532.37

*Note.* Score ranges and corresponding CEFR levels are as follows: 627-677 for C1, 543-626 for B2, 460-542 for B1, and 337-459 for A2 (<https://www.ets.org/toefl_itp/research/performance-descriptors/>).

*Orientation Toward English Study, Descriptive Statistics*

Mean *SD* 95% CI

Integrative orientation

Time 1 5.77 0.99 5.43 6.01

Time 2 5.74 0.85 5.49 5.99

Time 3 5.78 0.99 5.52 6.04

Instrumental orientation

Time 1 4.75 0.76 4.52 4.97

Time 2 4.71 0.72 4.50 4.92

Time 3 4.66 0.95 4.38 4.94

*Note.* Six items (7-point Likert scale) measured integrative and instrumental orientation. Participants read statements in sthe survey and rated the degree of agreement on a 7-point scale ranging from ‘strongly disagree’ (1) to ‘strongly agree’ (7).

*Reported Amount of Target Language Contact, Descriptive Statistics*

Mean *SD* 95% CI

Time 1 27.01 14.29 23.06 31.47

Time 2 35.51 25.96 28.40 43.66

Time 3 39.06 23.48 32.17 45.96

*Note.* The mean refers to the average number of hours per week spent on all nine activities.

**Appendix D**

**Research Question 1 Type III ANOVA tables and Mixed Effect Model summary tables**

*Rising Tones, Type III ANOVA Table with Satterthwaite's method*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | SS | MS | *df* | *F* ratio | *p* |
| Rising Tones | 0.53 | 0.26 | 2, 470.76 | 8.30 | <.001 |

*Rising Tones, Mixed Effects Models Summary Table*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Fixed effects | Estimate | *SE* | *df* | *t* ratio | *p* |
| Time 1 (intercept) | 0.31 | 0.02 | 91.21 | 16.15 | <.001 |
| Time 2 | -0.01 | 0.02 | 469.06 | -0.54 | .591 |
| Time 3 | -0.07 | 0.02 | 471.73 | -3.78 | <.001 |
| Random Effect | Variance | *SD* | Marginal *R2* | Conditional *R2* |  |
| Participant | 0.01 | 0.09 | 0.03 | 0.23 |  |

*Falling Tones, Type III ANOVA Table with Satterthwaite's method*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | SS | MS | *df* | *F* ratio | *P* |
| Falling Tones | 0.53 | 0.26 | 2, 469.86 | 6.49 | .002 |

*Falling Tones, Mixed Effects Models Summary Table*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Fixed effects | Estimate | *SE* | *df* | *t* ratio | *p* |
| Time 1 (intercept) | 0.46 | 0.02 | 93.51 | 21.54 | <.001 |
| Time 2 | 0.03 | 0.02 | 468.00 | 1.36 | .176 |
| Time 3 | 0.05 | 0.02 | 470.92 | -2.23 | .026 |
| Random Effect | Variance | *SD* | Marginal *R2* | Conditional *R2* |  |
| Participant | 0.01 | 0.10 | 0.02 | 0.21 |  |

*Level Tones, Type III ANOVA Table with Satterthwaite's method*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | SS | MS | *df* | *F* ratio | *p* |
| Level Tones | 2.04 | 1.02 | 2, 469.51 | 26.99 | <.001 |

*Level Tones, Mixed Effects Models Summary Table*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Fixed effects | Estimate | *SE* | *df* | *t* ratio | *p* |
| Time 1 (intercept) | 0.22 | 0.03 | 67.76 | 8.55 | <.001 |
| Time 2 | -0.02 | 0.02 | 468.45 | -0.93 | .354 |
| Time 3 | 0.12 | 0.02 | 470.11 | 5.88 | <.001 |
| Random Effect | Variance | *SD* | Marginal *R2* | Conditional *R2* |  |
| Participant | 0.02 | 0.14 | 0.06 | 0.39 |  |

*Prominence Ratio, Type III ANOVA Table with Satterthwaite's method*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | SS | MS | *df* | *F* ratio | *p* |
| Prominence Ratio | 0.05 | 0.03 | 2, 472.72 | 5.60 | .004 |

*Prominence Ratio, Mixed Effects Models Summary Table*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Fixed effects | Estimate | *SE* | *df* | *t* ratio | *p* |
| Time 1 (intercept) | 0.38 | 0.01 | 169.82 | 64.66 | <.001 |
| Time 2 | -0.02 | 0.01 | 469.56 | -3.30 | .001 |
| Time 3 | 00.01 | 0.01 | 474.54 | -1.13 | .260 |
| Random Effect | Variance | *SD* | Marginal *R2* | Conditional *R2* |  |
| Participant | 0.00 | 0.02 | 0.02 | 0.08 |  |

*Pitch Range, Type III ANOVA Table with Satterthwaite's method*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | SS | MS | *df* | *F* ratio | *p* |
| Pitch Range | 33684 | 16842 | 2, 466 | 15.80 | <.001 |

*Pitch Range, Mixed Effects Models Summary Table*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Fixed effects | Estimate | *SE* | *df* | *t* ratio | *p* |
| Time 1 (intercept) | 56.86 | 3.69 | 85.44 | 15.42 | <.001 |
| Time 2 | 18.84 | 3.50 | 463.75 | 5.38 | <.001 |
| Time 3 | 4.50 | 3.60 | 467.10 | 1.25 | .212 |
| Random Effect | Variance | *SD* | Marginal *R2* | Conditional *R2* |  |
| Participant | 326.3 | 18.06 | 0.05 | 0.27 |  |

*Pitch Range, Type III ANOVA Table with Satterthwaite's method*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | SS | MS | *df* | *F* ratio | *p* |
| Pitch Range | 33684 | 16842 | 2, 466 | 15.80 | <.001 |

*Pitch Range, Mixed Effects Models Summary Table*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Fixed effects | Estimate | *SE* | *df* | *t* ratio | *p* |
| Time 1 (intercept) | 56.86 | 3.69 | 85.44 | 15.42 | <.001 |
| Time 2 | 18.84 | 3.50 | 463.75 | 5.38 | <.001 |
| Time 3 | 4.50 | 3.60 | 467.10 | 1.25 | .212 |
| Random Effect | Variance | *SD* | Marginal *R2* | Conditional *R2* |  |
| Participant | 326.3 | 18.06 | 0.05 | 0.27 |  |

**Research Question 2 Type III ANOVA tables and Mixed Effect Model summary tables**

*Rising Tones, Type III ANOVA Table with Satterthwaite's method*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | SS | MS | *df* | *F* ratio | *p* |
| TOEFL ITP | 0.19 | 0.19 | 1, 315.94 | 6.17 | .014 |
| Lang. Contact | 0.16 | 0.16 | 1, 205.15 | 5.20 | .024 |
| Integrative Mot. | 0.03 | 0.03 | 1, 106.03 | 0.98 | .325 |
| Instrumental Mot. | 0.06 | 0.06 | 1, 120.43 | 2.02 | .158 |

*Rising Tones, Mixed Effects Models Summary Table*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Fixed effects | Estimate | *SE* | *df* | *t* ratio | *p* |
| (intercept) | 0.48 | 0.17 | 294.38 | 2.79 | .006 |
| TOEFL ITP | -0.00 | 0.00 | 315.94 | -2.48 | .014 |
| Lang. Contact | -0.00 | 0.00 | 205.15 | -2.28 | .024 |
| Integrative Mot. | 0.02 | 0.02 | 106.03 | 0.99 | .325 |
| Instrumental Mot. | 0.02 | 0.02 | 120.43 | 1.42 | .158 |
| Random Effect | Variance | *SD* | Marginal *R2* | Conditional *R2* |  |
| Participant | 0.01 | 0.09 | 0.07 | 0.26 |  |
| Time | 0.00 | 0.00 |  |  |  |

*Falling Tones, Type III ANOVA Table with Satterthwaite's method*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | SS | MS | *df* | *F* ratio | *p* |
| TOEFL ITP | 0.06 | 0.06 | 1, 0.25 | 1.44 | .684 |
| Lang. Contact | 0.00 | 0.00 | 1, 187.16 | 0.00 | .951 |
| Integrative Mot. | 0.00 | 0.00 | 1, 99.28 | 0.02 | .895 |
| Instrumental Mot. | 0.05 | 0.05 | 1, 110.83 | 1.22 | .272 |

*Falling Tones, Mixed Effects Models Summary Table*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Fixed effects | Estimate | *SE* | *df* | *t* ratio | *p* |
| (intercept) | 0.78 | 0.23 | 0.377 | 3.35 | .431 |
| TOEFL ITP | -0.00 | 0.00 | 0.25 | -1.20 | .684 |
| Lang. Contact | 0.00 | 0.00 | 187.16 | 0.06 | .951 |
| Integrative Mot. | 0.00 | 0.02 | 99.28 | 0.13 | .895 |
| Instrumental Mot. | -0.02 | 0.02 | 110.83 | -1.10 | .272 |
| Random Effect | Variance | *SD* | Marginal *R2* | Conditional *R2* |  |
| Participant | 0.01 | 0.09 | 0.01 | 0.18 |  |
| Time | 0.00 | 0.01 |  |  |  |

*Level Tones, Type III ANOVA Table with Satterthwaite's method*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | SS | MS | *df* | *F* ratio | *p* |
| TOEFL | 0.66 | 0.66 | 1, 333.65 | 16.36 | <.001 |
| Lang. Contact | 0.10 | 0.10 | 1, 299.13 | 2.54 | .112 |
| Integrative Mot. | 0.00 | 0.00 | 1, 173.93 | 0.03 | .871 |
| Instrumental Mot. | 0.00 | 0.00 | 1, 204.55 | 0.12 | .731 |

*Level Tones, Mixed Effects Models Summary Table*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Fixed effects | Estimate | *SE* | *df* | *t* ratio | *p* |
| (intercept) | -0.47 | 0.21 | 329.81 | -2.22 | .027 |
| TOEFL ITP | 0.00 | 0.00 | 333.65 | 4.05 | <.001 |
| Lang. Contact | 0.00 | 0.00 | 299.13 | 1.60 | .112 |
| Integrative Mot. | 0.00 | 0.02 | 173.93 | 0.16 | .870 |
| Instrumental Mot. | -0.01 | 0.02 | 204.55 | -0.35 | .731 |
| Random Effect | Variance | *SD* | Marginal *R2* | Conditional *R2* |  |
| Participant | 0.03 | 0.16 | 0.07 | 0.44 |  |
| Time | 0.00 | 0.00 |  |  |  |

*Prominence Ratio, Type III ANOVA Table with Satterthwaite's method*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | SS | MS | *df* | *F* ratio | *p* |
| TOEFL ITP | 0.00 | 0.00 | 1, 279.19 | 0.67 | .413 |
| Lang. Contact | 0.00 | 0.00 | 1, 132.45 | 0.34 | .562 |
| Integrative Mot. | 0.00 | 0.00 | 1, 80.03 | 1.30 | .257 |
| Instrumental Mot. | 0.00 | 0.00 | 1, 83.29 | 1.76 | .188 |

*Prominence Ratio, Mixed Effects Models Summary Table*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Fixed effects | Estimate | *SE* | *df* | *t* ratio | *p* |
| (intercept) | 0.42 | 0.06 | 244.53 | 6.98 | <.001 |
| TOEFL ITP | -0.00 | 0.00 | 279.19 | -0.82 | .413 |
| Lang. Contact | -0.00 | 0.00 | 132.45 | -0.58 | .562 |
| Integrative Mot. | -0.00 | 0.01 | 80.03 | -1.14 | .257 |
| Instrumental Mot. | 0.01 | 0.01 | 83.29 | 1.33 | .188 |
| Random Effect | Variance | *SD* | Marginal *R2* | Conditional *R2* |  |
| Participant | 0.00 | 0.02 | 0.02 | 0.08 |  |
| Time | 0.00 | 0.00 |  |  |  |

*Pitch Range, Type III ANOVA Table with Satterthwaite's method*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | SS | MS | *df* | *F* ratio | *p* |
| TOEFL ITP | 2329.49 | 2329.49 | 1, 307.90 | 3.11 | .079 |
| Lang. Contact | 106.09 | 106.09 | 1, 199.40 | 0.14 | .707 |
| Integrative Mot. | 421.08 | 421.08 | 1, 102.59 | 0.56 | .455 |
| Instrumental Mot. | 30.42 | 30.42 | 1, 118.83 | 0.04 | .841 |

*Pitch Range, Mixed Effects Models Summary Table*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Fixed effects | Estimate | *SE* | *df* | *t* ratio | *p* |
| (intercept) | 26.09 | 27.00 | 288.64 | 0.97 | .335 |
| TOEFL ITP | 0.08 | 0.04 | 307.90 | 1.77 | .079 |
| Lang. Contact | 0.04 | 0.10 | 199.40 | 0.38 | .707 |
| Integrative Mot. | -1.96 | 2.61 | 102.59 | -0.75 | .455 |
| Instrumental Mot. | 0.55 | 2.72 | 118.83 | 0.20 | .841 |
| Random Effect | Variance | *SD* | Marginal *R2* | Conditional *R2* |  |
| Participant | 182.11 | 13.49 | 0.02 | 0.21 |  |
| Time | 0.00 | 0.00 |  |  |  |