SPSS Descriptive Statistics

**Summarize**

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| **Notes** |  |  |
| Output Created |  | 23-SEP-2023 15:49:59 |
| Comments |  |  |
| Input | Active Dataset | Example |
| Filter | <none> |
| Weight | <none> |
| Split File | <none> |
| N of Rows in Working Data File | 3566 |
| Missing Value Handling | Definition of Missing | For each dependent variable in a table, user-defined missing values for the dependent and all grouping variables are treated as missing. |
| Cases Used | Cases used for each table have no missing values in any independent variable, and not all dependent variables have missing values. |
| Syntax |  | SUMMARIZE /TABLES = langpost verbal homework mixgrd CMverbal /FORMAT = NOLIST TOTAL /CELLS = COUNT MEAN STDERR STDDEV VARIANCE MIN MAX. |
| Resources | Processor Time | 00:00:00.02 |
| Elapsed Time | 00:00:00.03 |

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| **Warnings** |
| The parameter, STDDEV is redundant with another parameter already specified and has been ignored. |

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| **Case Processing Summary** |  |  |  |  |  |  |
|  | Cases |  |  |  |  |  |
| Included |  | Excluded |  | Total |  |
| N | Percent | N | Percent | N | Percent |
| langpost | 3566 | 100.0% | 0 | 0.0% | 3566 | 100.0% |
| verbal | 3566 | 100.0% | 0 | 0.0% | 3566 | 100.0% |
| homework | 3566 | 100.0% | 0 | 0.0% | 3566 | 100.0% |
| mixgrd | 3566 | 100.0% | 0 | 0.0% | 3566 | 100.0% |
| CMverbal | 3566 | 100.0% | 0 | 0.0% | 3566 | 100.0% |

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| **Report** |  |  |  |  |  |
|  | langpost | verbal | homework | mixgrd | CMverbal |
| N | 3566 | 3566 | 3566 | 3566 | 3566 |
| Mean | 41.46 | 10.035692091979802 | 2.443036735838472 | .24 | 10.0357 |
| Std. Deviation | 8.814 | 2.032639290215606 | .531218761229908 | .428 | .80779 |
| Variance | 77.691 | 4.132 | .282 | .183 | .653 |
| Minimum | 9 | 2.133000000000000 | 1.333000000000000 | 0 | 5.78 |
| Maximum | 58 | 16.633000000000000 | 3.667000000000000 | 1 | 12.48 |

SPSS Model 1a: Single-Level Empty Means, No Random Intercept

**Mixed Model Analysis**

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| **Notes** |  |  |
| Output Created |  | 23-SEP-2023 15:49:59 |
| Comments |  |  |
| Input | Active Dataset | Example |
| Filter | <none> |
| Weight | <none> |
| Split File | <none> |
| N of Rows in Working Data File | 3566 |
| Missing Value Handling | Definition of Missing | User-defined missing values are treated as valid data. |
| Cases Used | Statistics are based on all cases with valid data for all variables in the model. |
| Weight Handling |  | not applicable |
| Syntax |  | MIXED langpost BY schoolID /METHOD = REML /CRITERIA = DFMETHOD(RESIDUAL) /PRINT = SOLUTION TESTCOV /FIXED = . |
| Resources | Processor Time | 00:00:00.06 |
| Elapsed Time | 00:00:00.08 |

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| **Warnings** |
| A(n) FIXED subcommand has no specifications and will therefore be ignored. |
| DFMETHOD specified in subcommand CRITERIA, is ignored because the model has only fixed effects. |

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| **Model Dimension**a |  |  |  |
|  |  | Number of Levels | Number of Parameters |
| Fixed Effects | Intercept | 1 | 1 |
| Residual |  |  | 1 |
| Total |  | 1 | 2 |

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| a. Dependent Variable: langpost. |  |  |  |

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| **Information Criteria**a |  |
| -2 Restricted Log Likelihood | 25642.70568365 |
| Akaike's Information Criterion (AIC) | 25644.70568365 |
| Hurvich and Tsai's Criterion (AICC) | 25644.70680630 |
| Bozdogan's Criterion (CAIC) | 25651.88460299 |
| Schwarz's Bayesian Criterion (BIC) | 25650.88460299 |

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| The information criteria are displayed in smaller-is-better form.a |  |
| a. Dependent Variable: langpost. |  |

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| **Coefficients of Determination** |  |  |
| Pseudo-R Square Measures | Marginal | .000 |
| Conditional | .000 |

**Fixed Effects**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type III Tests of Fixed Effects**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| Intercept | 1 | 3565 | 78912.549 | <.001 |

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| a. Dependent Variable: langpost. |  |  |  |  |

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| **Estimates of Fixed Effects**a |  |  |  |  |  |  |  |
| Parameter | Estimate | Std. Error | df | t | Sig. | 95% Confidence Interval |  |
| Lower Bound | Upper Bound |
| Intercept | 41.464 | .148 | 3565 | 280.914 | <.001 | 41.174 | 41.753 |

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| a. Dependent Variable: langpost. |  |  |  |  |  |  |  |

**Covariance Parameters**

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| --- | --- | --- | --- | --- | --- | --- |
| **Estimates of Covariance Parameters**a |  |  |  |  |  |  |
| Parameter | Estimate | Std. Error | Wald Z | Sig. | 95% Confidence Interval |  |
| Lower Bound | Upper Bound |
| Residual | 77.691 | 1.840 | 42.220 | <.001 | 74.166 | 81.382 |

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| a. Dependent Variable: langpost. |  |  |  |  |  |  |

SPSS Model 1b: Two-Level Empty Means, Random Intercept

**Mixed Model Analysis**

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| **Notes** |  |  |
| Output Created |  | 23-SEP-2023 15:49:59 |
| Comments |  |  |
| Input | Active Dataset | Example |
| Filter | <none> |
| Weight | <none> |
| Split File | <none> |
| N of Rows in Working Data File | 3566 |
| Missing Value Handling | Definition of Missing | User-defined missing values are treated as valid data. |
| Cases Used | Statistics are based on all cases with valid data for all variables in the model. |
| Weight Handling |  | not applicable |
| Syntax |  | MIXED langpost BY schoolID /METHOD = REML /CRITERIA = DFMETHOD(SATTERTHWAITE) /PRINT = SOLUTION TESTCOV /FIXED = /RANDOM = INTERCEPT | COVTYPE(UN) SUBJECT(schoolID). |
| Resources | Processor Time | 00:00:00.13 |
| Elapsed Time | 00:00:00.31 |

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| **Warnings** |
| A(n) FIXED subcommand has no specifications and will therefore be ignored. |
| The covariance structure for random effect with only one level will be changed to Identity. |

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| **Model Dimension**a |  |  |  |  |  |
|  |  | Number of Levels | Covariance Structure | Number of Parameters | Subject Variables |
| Fixed Effects | Intercept | 1 |  | 1 |  |
| Random Effects | Intercept | 1 | Identity | 1 | schoolID |
| Residual |  |  |  | 1 |  |
| Total |  | 2 |  | 3 |  |

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| a. Dependent Variable: langpost. |  |  |  |  |  |

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| **Information Criteria**a |  |
| -2 Restricted Log Likelihood | 25190.95304485 |
| Akaike's Information Criterion (AIC) | 25194.95304485 |
| Hurvich and Tsai's Criterion (AICC) | 25194.95641375 |
| Bozdogan's Criterion (CAIC) | 25209.31088352 |
| Schwarz's Bayesian Criterion (BIC) | 25207.31088352 |

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| The information criteria are displayed in smaller-is-better form.a |  |
| a. Dependent Variable: langpost. |  |

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| **Coefficients of Determination** |  |  |
| Pseudo-R Square Measures | Marginal | .000 |
| Conditional | .223 |

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| **Intraclass Correlation Coefficients** |  |  |
| Overall ICCs | Adjusted | .223 |
| Conditional | .223 |

**Fixed Effects**

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| --- | --- | --- | --- | --- |
| **Type III Tests of Fixed Effects**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| Intercept | 1 | 174.931 | 14847.851 | <.001 |

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| a. Dependent Variable: langpost. |  |  |  |  |

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| **Estimates of Fixed Effects**a |  |  |  |  |  |  |  |
| Parameter | Estimate | Std. Error | df | t | Sig. | 95% Confidence Interval |  |
| Lower Bound | Upper Bound |
| Intercept | 41.079 | .337 | 174.931 | 121.852 | <.001 | 40.414 | 41.744 |

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| a. Dependent Variable: langpost. |  |  |  |  |  |  |  |

**Covariance Parameters**

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| --- | --- | --- | --- | --- | --- | --- |
| **Estimates of Covariance Parameters**a |  |  |  |  |  |  |
| Parameter |  | Estimate | Std. Error | Wald Z | Sig. | 95% Confidence Interval |
|  | Lower Bound |
| Residual |  | 62.229 | 1.518 | 40.998 | <.001 | 59.324 |
| Intercept [subject = schoolID] | Variance | 17.814 | 2.307 | 7.720 | <.001 | 13.820 |

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| **Estimates of Covariance Parameters**a |  |  |
| Parameter |  | 95% Confidence Interval |
|  | Upper Bound |
| Residual |  | 65.276 |
| Intercept [subject = schoolID] | Variance | 22.962 |

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| a. Dependent Variable: langpost. |  |  |

SPSS Model 1c: Add 2 School-Level Predictors

**Mixed Model Analysis**

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| **Notes** |  |  |
| Output Created |  | 23-SEP-2023 15:49:59 |
| Comments |  |  |
| Input | Active Dataset | Example |
| Filter | <none> |
| Weight | <none> |
| Split File | <none> |
| N of Rows in Working Data File | 3566 |
| Missing Value Handling | Definition of Missing | User-defined missing values are treated as valid data. |
| Cases Used | Statistics are based on all cases with valid data for all variables in the model. |
| Weight Handling |  | not applicable |
| Syntax |  | MIXED langpost BY schoolID WITH hw2 mixgrd /METHOD = REML /CRITERIA = DFMETHOD(SATTERTHWAITE) /PRINT = SOLUTION TESTCOV /FIXED = hw2 mixgrd /RANDOM = INTERCEPT | COVTYPE(UN) SUBJECT(schoolID) /TEST = "F-test of Model Total-R2" hw2 1; mixgrd 1. |
| Resources | Processor Time | 00:00:00.14 |
| Elapsed Time | 00:00:00.20 |

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| **Warnings** |
| The covariance structure for random effect with only one level will be changed to Identity. |

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| **Model Dimension**a |  |  |  |  |  |
|  |  | Number of Levels | Covariance Structure | Number of Parameters | Subject Variables |
| Fixed Effects | Intercept | 1 |  | 1 |  |
| hw2 | 1 |  | 1 |  |
| mixgrd | 1 |  | 1 |  |
| Random Effects | Intercept | 1 | Identity | 1 | schoolID |
| Residual |  |  |  | 1 |  |
| Total |  | 4 |  | 5 |  |

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| a. Dependent Variable: langpost. |  |  |  |  |  |

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| **Information Criteria**a |  |
| -2 Restricted Log Likelihood | 25179.61603036 |
| Akaike's Information Criterion (AIC) | 25183.61603036 |
| Hurvich and Tsai's Criterion (AICC) | 25183.61940115 |
| Bozdogan's Criterion (CAIC) | 25197.97274670 |
| Schwarz's Bayesian Criterion (BIC) | 25195.97274670 |

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| The information criteria are displayed in smaller-is-better form.a |  |
| a. Dependent Variable: langpost. |  |

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| **Coefficients of Determination** |  |  |
| Pseudo-R Square Measures | Marginal | .011 |
| Conditional | .225 |

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| **Intraclass Correlation Coefficients** |  |  |
| Overall ICCs | Adjusted | .216 |
| Conditional | .214 |

**Fixed Effects**

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| --- | --- | --- | --- | --- |
| **Type III Tests of Fixed Effects**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| Intercept | 1 | 167.525 | 6767.201 | <.001 |
| hw2 | 1 | 172.305 | .636 | .426 |
| mixgrd | 1 | 188.574 | 7.918 | .005 |

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| a. Dependent Variable: langpost. |  |  |  |  |

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| **Estimates of Fixed Effects**a |  |  |  |  |  |  |  |
| Parameter | Estimate | Std. Error | df | t | Sig. | 95% Confidence Interval |  |
| Lower Bound | Upper Bound |
| Intercept | 41.548 | .505 | 167.525 | 82.263 | <.001 | 40.551 | 42.545 |
| hw2 | .507 | .635 | 172.305 | .798 | .426 | -.747 | 1.761 |
| mixgrd | -1.993 | .708 | 188.574 | -2.814 | .005 | -3.390 | -.596 |

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| a. Dependent Variable: langpost. |  |  |  |  |  |  |  |

**Covariance Parameters**

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| --- | --- | --- | --- | --- | --- | --- |
| **Estimates of Covariance Parameters**a |  |  |  |  |  |  |
| Parameter |  | Estimate | Std. Error | Wald Z | Sig. | 95% Confidence Interval |
|  | Lower Bound |
| Residual |  | 62.201 | 1.517 | 41.015 | <.001 | 59.298 |
| Intercept [subject = schoolID] | Variance | 17.165 | 2.234 | 7.683 | <.001 | 13.300 |

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| **Estimates of Covariance Parameters**a |  |  |
| Parameter |  | 95% Confidence Interval |
|  | Upper Bound |
| Residual |  | 65.245 |
| Intercept [subject = schoolID] | Variance | 22.153 |

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| a. Dependent Variable: langpost. |  |  |

**Custom Hypothesis Test (F-test of Model Total-R2)**

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Contrast Estimates**a,b |  |  |  |  |  |  |  |
| Contrast | Estimate | Std. Error | df | Test Value | t | Sig. | 95% Confidence Interval |
| Lower Bound |
| L1 | .507 | .635 | 172.305 | 0 | .798 | .426 | -.747 |
| L2 | -1.993 | .708 | 188.574 | 0 | -2.814 | .005 | -3.390 |

|  |  |
| --- | --- |
| **Contrast Estimates**a,b |  |
| Contrast | 95% Confidence Interval |
| Upper Bound |
| L1 | 1.761 |
| L2 | -.596 |

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| a. F-test of Model Total-R2 |  |
| b. Dependent Variable: langpost. |  |

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| --- | --- | --- | --- | --- |
| **Test of Contrasts**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| F-test of Model Total-R2 | 2 | 180.262 | 4.681 | .010 |

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| a. Dependent Variable: langpost. |  |  |  |  |

SPSS Model 1d: Add 2 School-Level Predictors WITHOUT Random Intercept

**Mixed Model Analysis**

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| **Notes** |  |  |
| Output Created |  | 23-SEP-2023 15:50:00 |
| Comments |  |  |
| Input | Active Dataset | Example |
| Filter | <none> |
| Weight | <none> |
| Split File | <none> |
| N of Rows in Working Data File | 3566 |
| Missing Value Handling | Definition of Missing | User-defined missing values are treated as valid data. |
| Cases Used | Statistics are based on all cases with valid data for all variables in the model. |
| Weight Handling |  | not applicable |
| Syntax |  | MIXED langpost BY schoolID WITH hw2 mixgrd /METHOD = REML /CRITERIA = DFMETHOD(RESIDUAL) /PRINT = SOLUTION TESTCOV /FIXED = hw2 mixgrd /TEST = "F-test of Model Total-R2" hw2 1; mixgrd 1. |
| Resources | Processor Time | 00:00:00.06 |
| Elapsed Time | 00:00:00.21 |

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| **Warnings** |
| DFMETHOD specified in subcommand CRITERIA, is ignored because the model has only fixed effects. |

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| **Model Dimension**a |  |  |  |
|  |  | Number of Levels | Number of Parameters |
| Fixed Effects | Intercept | 1 | 1 |
| hw2 | 1 | 1 |
| mixgrd | 1 | 1 |
| Residual |  |  | 1 |
| Total |  | 3 | 4 |

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| a. Dependent Variable: langpost. |  |  |  |

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| **Information Criteria**a |  |
| -2 Restricted Log Likelihood | 25621.50843226 |
| Akaike's Information Criterion (AIC) | 25623.50843226 |
| Hurvich and Tsai's Criterion (AICC) | 25623.50955554 |
| Bozdogan's Criterion (CAIC) | 25630.68679043 |
| Schwarz's Bayesian Criterion (BIC) | 25629.68679043 |

|  |  |
| --- | --- |
| The information criteria are displayed in smaller-is-better form.a |  |
| a. Dependent Variable: langpost. |  |

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| **Coefficients of Determination** |  |  |
| Pseudo-R Square Measures | Marginal | .006 |
| Conditional | .006 |

**Fixed Effects**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type III Tests of Fixed Effects**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| Intercept | 1 | 3563.000 | 37056.996 | <.001 |
| hw2 | 1 | 3563.000 | 2.161 | .142 |
| mixgrd | 1 | 3563 | 18.040 | <.001 |

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| a. Dependent Variable: langpost. |  |  |  |  |

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| **Estimates of Fixed Effects**a |  |  |  |  |  |  |  |
| Parameter | Estimate | Std. Error | df | t | Sig. | 95% Confidence Interval |  |
| Lower Bound | Upper Bound |
| Intercept | 41.637 | .216 | 3563.000 | 192.502 | <.001 | 41.213 | 42.061 |
| hw2 | .411 | .280 | 3563.000 | 1.470 | .142 | -.137 | .959 |
| mixgrd | -1.474 | .347 | 3563 | -4.247 | <.001 | -2.155 | -.794 |

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| a. Dependent Variable: langpost. |  |  |  |  |  |  |  |

**Covariance Parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Estimates of Covariance Parameters**a |  |  |  |  |  |  |
| Parameter | Estimate | Std. Error | Wald Z | Sig. | 95% Confidence Interval |  |
| Lower Bound | Upper Bound |
| Residual | 77.251 | 1.830 | 42.208 | <.001 | 73.746 | 80.923 |

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| a. Dependent Variable: langpost. |  |  |  |  |  |  |

**Custom Hypothesis Test (F-test of Model Total-R2)**

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Contrast Estimates**a,b |  |  |  |  |  |  |  |
| Contrast | Estimate | Std. Error | df | Test Value | t | Sig. | 95% Confidence Interval |
| Lower Bound |
| L1 | .411 | .280 | 3563.000 | 0 | 1.470 | .142 | -.137 |
| L2 | -1.474 | .347 | 3563 | 0 | -4.247 | <.001 | -2.155 |

|  |  |
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| **Contrast Estimates**a,b |  |
| Contrast | 95% Confidence Interval |
| Upper Bound |
| L1 | .959 |
| L2 | -.794 |

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| a. F-test of Model Total-R2 |  |
| b. Dependent Variable: langpost. |  |

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| --- | --- | --- | --- | --- |
| **Test of Contrasts**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| F-test of Model Total-R2 | 2 | 3563 | 11.131 | <.001 |

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| --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |

SPSS Model 2a: Add L2-CM and Cluster-MC-L1 Student Verbal

**Mixed Model Analysis**

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| --- | --- | --- |
| **Notes** |  |  |
| Output Created |  | 23-SEP-2023 15:50:00 |
| Comments |  |  |
| Input | Active Dataset | Example |
| Filter | <none> |
| Weight | <none> |
| Split File | <none> |
| N of Rows in Working Data File | 3566 |
| Missing Value Handling | Definition of Missing | User-defined missing values are treated as valid data. |
| Cases Used | Statistics are based on all cases with valid data for all variables in the model. |
| Weight Handling |  | not applicable |
| Syntax |  | MIXED langpost BY schoolID WITH hw2 mixgrd CMverb10 WCverb /METHOD = REML /CRITERIA = DFMETHOD(SATTERTHWAITE) /PRINT = SOLUTION TESTCOV /FIXED = hw2 mixgrd CMverb10 WCverb /RANDOM = INTERCEPT | COVTYPE(UN) SUBJECT(schoolID) /TEST = "F-test of Model Total-R2" hw2 1; mixgrd 1; CMverb10 1; WCverb 1 /TEST = "F-Test of Verbal Slopes (Change in Total-R2)" CMverb10 1; WCverb 1 /TEST = "L2 Contextual Effect of Verbal" CMverb10 1 WCverb -1. |
| Resources | Processor Time | 00:00:00.19 |
| Elapsed Time | 00:00:00.25 |

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| **Warnings** |
| The covariance structure for random effect with only one level will be changed to Identity. |

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| **Model Dimension**a |  |  |  |  |  |
|  |  | Number of Levels | Covariance Structure | Number of Parameters | Subject Variables |
| Fixed Effects | Intercept | 1 |  | 1 |  |
| hw2 | 1 |  | 1 |  |
| mixgrd | 1 |  | 1 |  |
| CMverb10 | 1 |  | 1 |  |
| WCverb | 1 |  | 1 |  |
| Random Effects | Intercept | 1 | Identity | 1 | schoolID |
| Residual |  |  |  | 1 |  |
| Total |  | 6 |  | 7 |  |

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| --- | --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |  |

|  |  |
| --- | --- |
| **Information Criteria**a |  |
| -2 Restricted Log Likelihood | 23615.07406508 |
| Akaike's Information Criterion (AIC) | 23619.07406508 |
| Hurvich and Tsai's Criterion (AICC) | 23619.07743777 |
| Bozdogan's Criterion (CAIC) | 23633.42965845 |
| Schwarz's Bayesian Criterion (BIC) | 23631.42965845 |

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| --- | --- |
| The information criteria are displayed in smaller-is-better form.a |  |
| a. Dependent Variable: langpost. |  |

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| --- | --- | --- |
| **Coefficients of Determination** |  |  |
| Pseudo-R Square Measures | Marginal | .377 |
| Conditional | .484 |

|  |  |  |
| --- | --- | --- |
| **Intraclass Correlation Coefficients** |  |  |
| Overall ICCs | Adjusted | .172 |
| Conditional | .107 |

**Fixed Effects**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type III Tests of Fixed Effects**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| Intercept | 1 | 172.109 | 13161.283 | <.001 |
| hw2 | 1 | 178.461 | .013 | .909 |
| mixgrd | 1 | 197.054 | 4.723 | .031 |
| CMverb10 | 1 | 207.396 | 182.470 | <.001 |
| WCverb | 1 | 3372.684 | 1795.256 | <.001 |

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| a. Dependent Variable: langpost. |  |  |  |  |

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Estimates of Fixed Effects**a |  |  |  |  |  |  |  |
| Parameter | Estimate | Std. Error | df | t | Sig. | 95% Confidence Interval |  |
| Lower Bound | Upper Bound |
| Intercept | 41.579 | .362 | 172.109 | 114.723 | <.001 | 40.864 | 42.295 |
| hw2 | -.053 | .459 | 178.461 | -.115 | .909 | -.957 | .852 |
| mixgrd | -1.121 | .516 | 197.054 | -2.173 | .031 | -2.138 | -.104 |
| CMverb10 | 3.660 | .271 | 207.396 | 13.508 | <.001 | 3.126 | 4.194 |
| WCverb | 2.423 | .057 | 3372.684 | 42.370 | <.001 | 2.311 | 2.535 |

|  |  |  |  |  |  |  |  |
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| a. Dependent Variable: langpost. |  |  |  |  |  |  |  |

**Covariance Parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Estimates of Covariance Parameters**a |  |  |  |  |  |  |
| Parameter |  | Estimate | Std. Error | Wald Z | Sig. | 95% Confidence Interval |
|  | Lower Bound |
| Residual |  | 40.550 | .987 | 41.065 | <.001 | 38.660 |
| Intercept [subject = schoolID] | Variance | 8.395 | 1.133 | 7.411 | <.001 | 6.444 |

|  |  |  |
| --- | --- | --- |
| **Estimates of Covariance Parameters**a |  |  |
| Parameter |  | 95% Confidence Interval |
|  | Upper Bound |
| Residual |  | 42.533 |
| Intercept [subject = schoolID] | Variance | 10.937 |

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| a. Dependent Variable: langpost. |  |  |

**Custom Hypothesis Test 1 (F-test of Model Total-R2)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Contrast Estimates**a,b |  |  |  |  |  |  |  |
| Contrast | Estimate | Std. Error | df | Test Value | t | Sig. | 95% Confidence Interval |
| Lower Bound |
| L1 | -.053 | .459 | 178.461 | 0 | -.115 | .909 | -.957 |
| L2 | -1.121 | .516 | 197.054 | 0 | -2.173 | .031 | -2.138 |
| L3 | 3.660 | .271 | 207.396 | 0 | 13.508 | <.001 | 3.126 |
| L4 | 2.423 | .057 | 3372.684 | 0 | 42.370 | <.001 | 2.311 |

|  |  |
| --- | --- |
| **Contrast Estimates**a,b |  |
| Contrast | 95% Confidence Interval |
| Upper Bound |
| L1 | .852 |
| L2 | -.104 |
| L3 | 4.194 |
| L4 | 2.535 |

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| --- | --- |
| a. F-test of Model Total-R2 |  |
| b. Dependent Variable: langpost. |  |

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| --- | --- | --- | --- | --- |
| **Test of Contrasts**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| F-test of Model Total-R2 | 4 | 253.515 | 498.718 | <.001 |

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| --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |

**Custom Hypothesis Test 2 (F-Test of Verbal Slopes (Change in Total-R2))**

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Contrast Estimates**a,b |  |  |  |  |  |  |  |
| Contrast | Estimate | Std. Error | df | Test Value | t | Sig. | 95% Confidence Interval |
| Lower Bound |
| L1 | 3.660 | .271 | 207.396 | 0 | 13.508 | <.001 | 3.126 |
| L2 | 2.423 | .057 | 3372.684 | 0 | 42.370 | <.001 | 2.311 |

|  |  |
| --- | --- |
| **Contrast Estimates**a,b |  |
| Contrast | 95% Confidence Interval |
| Upper Bound |
| L1 | 4.194 |
| L2 | 2.535 |

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| --- | --- |
| a. F-Test of Verbal Slopes (Change in Total-R2) |  |
| b. Dependent Variable: langpost. |  |

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| --- | --- | --- | --- | --- |
| **Test of Contrasts**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| F-Test of Verbal Slopes (Change in Total-R2) | 2 | 389.198 | 988.863 | <.001 |

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| --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |

**Custom Hypothesis Test 3 (L2 Contextual Effect of Verbal)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Contrast Estimates**a,b |  |  |  |  |  |  |  |
| Contrast | Estimate | Std. Error | df | Test Value | t | Sig. | 95% Confidence Interval |
| Lower Bound |
| L1 | 1.237 | .277 | 226.195 | 0 | 4.468 | <.001 | .692 |

|  |  |
| --- | --- |
| **Contrast Estimates**a,b |  |
| Contrast | 95% Confidence Interval |
| Upper Bound |
| L1 | 1.783 |

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| --- | --- |
| a. L2 Contextual Effect of Verbal |  |
| b. Dependent Variable: langpost. |  |

SPSS Model 2b: Add Random Cluster-MC-L1 Student Verbal

**Mixed Model Analysis**

|  |  |  |
| --- | --- | --- |
| **Notes** |  |  |
| Output Created |  | 23-SEP-2023 15:50:00 |
| Comments |  |  |
| Input | Active Dataset | Example |
| Filter | <none> |
| Weight | <none> |
| Split File | <none> |
| N of Rows in Working Data File | 3566 |
| Missing Value Handling | Definition of Missing | User-defined missing values are treated as valid data. |
| Cases Used | Statistics are based on all cases with valid data for all variables in the model. |
| Weight Handling |  | not applicable |
| Syntax |  | MIXED langpost BY schoolID WITH hw2 mixgrd CMverb10 WCverb /METHOD = REML /CRITERIA = DFMETHOD(SATTERTHWAITE) /PRINT = SOLUTION TESTCOV /FIXED = hw2 mixgrd CMverb10 WCverb /RANDOM = INTERCEPT WCverb | COVTYPE(UN) SUBJECT(schoolID) /TEST = "F-test of Model Total-R2" hw2 1; mixgrd 1; CMverb10 1; WCverb 1 /TEST = "F-Test of Verbal Slopes (Change in Total-R2)" CMverb10 1; WCverb 1 /TEST = "L2 Contextual Effect of Verbal" CMverb10 1 WCverb -1. |
| Resources | Processor Time | 00:00:00.17 |
| Elapsed Time | 00:00:00.30 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Model Dimension**a |  |  |  |  |  |
|  |  | Number of Levels | Covariance Structure | Number of Parameters | Subject Variables |
| Fixed Effects | Intercept | 1 |  | 1 |  |
| hw2 | 1 |  | 1 |  |
| mixgrd | 1 |  | 1 |  |
| CMverb10 | 1 |  | 1 |  |
| WCverb | 1 |  | 1 |  |
| Random Effects | Intercept + WCverb | 2 | Unstructured | 3 | schoolID |
| Residual |  |  |  | 1 |  |
| Total |  | 7 |  | 9 |  |

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| --- | --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |  |

|  |  |
| --- | --- |
| **Information Criteria**a |  |
| -2 Restricted Log Likelihood | 23595.78283814 |
| Akaike's Information Criterion (AIC) | 23603.78283814 |
| Hurvich and Tsai's Criterion (AICC) | 23603.79408673 |
| Bozdogan's Criterion (CAIC) | 23632.49402487 |
| Schwarz's Bayesian Criterion (BIC) | 23628.49402487 |

|  |  |
| --- | --- |
| The information criteria are displayed in smaller-is-better form.a |  |
| a. Dependent Variable: langpost. |  |

|  |  |  |
| --- | --- | --- |
| **Coefficients of Determination** |  |  |
| Pseudo-R Square Measures | Marginal | .378 |
| Conditional | .495 |

|  |  |  |
| --- | --- | --- |
| **Intraclass Correlation Coefficients** |  |  |
| Overall ICCs | Adjusted | .189 |
| Conditional | .117 |

**Fixed Effects**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type III Tests of Fixed Effects**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| Intercept | 1 | 176.881 | 13486.392 | <.001 |
| hw2 | 1 | 177.677 | .045 | .832 |
| mixgrd | 1 | 200.922 | 3.416 | .066 |
| CMverb10 | 1 | 208.991 | 187.083 | <.001 |
| WCverb | 1 | 151.568 | 1285.811 | <.001 |

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| a. Dependent Variable: langpost. |  |  |  |  |

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Estimates of Fixed Effects**a |  |  |  |  |  |  |  |
| Parameter | Estimate | Std. Error | df | t | Sig. | 95% Confidence Interval |  |
| Lower Bound | Upper Bound |
| Intercept | 41.528 | .358 | 176.881 | 116.131 | <.001 | 40.822 | 42.234 |
| hw2 | -.095 | .446 | 177.677 | -.213 | .832 | -.976 | .786 |
| mixgrd | -.934 | .505 | 200.922 | -1.848 | .066 | -1.930 | .063 |
| CMverb10 | 3.621 | .265 | 208.991 | 13.678 | <.001 | 3.099 | 4.143 |
| WCverb | 2.449 | .068 | 151.568 | 35.858 | <.001 | 2.314 | 2.583 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |  |  |  |

**Covariance Parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Estimates of Covariance Parameters**a |  |  |  |  |  |  |
| Parameter |  | Estimate | Std. Error | Wald Z | Sig. | 95% Confidence Interval |
|  | Lower Bound |
| Residual |  | 39.758 | .991 | 40.119 | <.001 | 37.862 |
| Intercept + WCverb [subject = schoolID] | UN (1,1) | 8.467 | 1.135 | 7.456 | <.001 | 6.510 |
| UN (2,1) | -.694 | .238 | -2.910 | .004 | -1.161 |
| UN (2,2) | .223 | .086 | 2.593 | .010 | .105 |

|  |  |  |
| --- | --- | --- |
| **Estimates of Covariance Parameters**a |  |  |
| Parameter |  | 95% Confidence Interval |
|  | Upper Bound |
| Residual |  | 41.748 |
| Intercept + WCverb [subject = schoolID] | UN (1,1) | 11.012 |
| UN (2,1) | -.227 |
| UN (2,2) | .476 |

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| --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |

**Custom Hypothesis Test 1 (F-test of Model Total-R2)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Contrast Estimates**a,b |  |  |  |  |  |  |  |
| Contrast | Estimate | Std. Error | df | Test Value | t | Sig. | 95% Confidence Interval |
| Lower Bound |
| L1 | -.095 | .446 | 177.677 | 0 | -.213 | .832 | -.976 |
| L2 | -.934 | .505 | 200.922 | 0 | -1.848 | .066 | -1.930 |
| L3 | 3.621 | .265 | 208.991 | 0 | 13.678 | <.001 | 3.099 |
| L4 | 2.449 | .068 | 151.568 | 0 | 35.858 | <.001 | 2.314 |

|  |  |
| --- | --- |
| **Contrast Estimates**a,b |  |
| Contrast | 95% Confidence Interval |
| Upper Bound |
| L1 | .786 |
| L2 | .063 |
| L3 | 4.143 |
| L4 | 2.583 |

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|  |  |
| --- | --- |
| a. F-test of Model Total-R2 |  |
| b. Dependent Variable: langpost. |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Test of Contrasts**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| F-test of Model Total-R2 | 4 | 182.372 | 374.710 | <.001 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |

**Custom Hypothesis Test 2 (F-Test of Verbal Slopes (Change in Total-R2))**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Contrast Estimates**a,b |  |  |  |  |  |  |  |
| Contrast | Estimate | Std. Error | df | Test Value | t | Sig. | 95% Confidence Interval |
| Lower Bound |
| L1 | 3.621 | .265 | 208.991 | 0 | 13.678 | <.001 | 3.099 |
| L2 | 2.449 | .068 | 151.568 | 0 | 35.858 | <.001 | 2.314 |

|  |  |
| --- | --- |
| **Contrast Estimates**a,b |  |
| Contrast | 95% Confidence Interval |
| Upper Bound |
| L1 | 4.143 |
| L2 | 2.583 |

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| --- | --- |
| a. F-Test of Verbal Slopes (Change in Total-R2) |  |
| b. Dependent Variable: langpost. |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Test of Contrasts**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| F-Test of Verbal Slopes (Change in Total-R2) | 2 | 175.639 | 733.586 | <.001 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |

**Custom Hypothesis Test 3 (L2 Contextual Effect of Verbal)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Contrast Estimates**a,b |  |  |  |  |  |  |  |
| Contrast | Estimate | Std. Error | df | Test Value | t | Sig. | 95% Confidence Interval |
| Lower Bound |
| L1 | 1.173 | .273 | 235.104 | 0 | 4.295 | <.001 | .635 |

|  |  |
| --- | --- |
| **Contrast Estimates**a,b |  |
| Contrast | 95% Confidence Interval |
| Upper Bound |
| L1 | 1.710 |

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| --- | --- | --- | --- | --- | --- | --- | --- |
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| --- | --- |
| a. L2 Contextual Effect of Verbal |  |
| b. Dependent Variable: langpost. |  |

SPSS Model 2c: Add Cross-Level Interactions with Cluster-MC-L1 Student Verbal

**Mixed Model Analysis**

|  |  |  |
| --- | --- | --- |
| **Notes** |  |  |
| Output Created |  | 23-SEP-2023 15:50:00 |
| Comments |  |  |
| Input | Active Dataset | Example |
| Filter | <none> |
| Weight | <none> |
| Split File | <none> |
| N of Rows in Working Data File | 3566 |
| Missing Value Handling | Definition of Missing | User-defined missing values are treated as valid data. |
| Cases Used | Statistics are based on all cases with valid data for all variables in the model. |
| Weight Handling |  | not applicable |
| Syntax |  | MIXED langpost BY schoolID WITH hw2 mixgrd CMverb10 WCverb /METHOD = REML /CRITERIA = DFMETHOD(SATTERTHWAITE) /PRINT = SOLUTION TESTCOV /FIXED = hw2 mixgrd CMverb10 WCverb hw2\*WCverb mixgrd\*WCverb CMverb10\*WCverb /RANDOM = INTERCEPT WCverb | COVTYPE(UN) SUBJECT(schoolID). |
| Resources | Processor Time | 00:00:00.25 |
| Elapsed Time | 00:00:00.52 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Model Dimension**a |  |  |  |  |  |
|  |  | Number of Levels | Covariance Structure | Number of Parameters | Subject Variables |
| Fixed Effects | Intercept | 1 |  | 1 |  |
| hw2 | 1 |  | 1 |  |
| mixgrd | 1 |  | 1 |  |
| CMverb10 | 1 |  | 1 |  |
| WCverb | 1 |  | 1 |  |
| hw2 \* WCverb | 1 |  | 1 |  |
| mixgrd \* WCverb | 1 |  | 1 |  |
| CMverb10 \* WCverb | 1 |  | 1 |  |
| Random Effects | Intercept + WCverb | 2 | Unstructured | 3 | schoolID |
| Residual |  |  |  | 1 |  |
| Total |  | 10 |  | 12 |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |  |

|  |  |
| --- | --- |
| **Information Criteria**a |  |
| -2 Restricted Log Likelihood | 23598.02811882 |
| Akaike's Information Criterion (AIC) | 23606.02811882 |
| Hurvich and Tsai's Criterion (AICC) | 23606.03937691 |
| Bozdogan's Criterion (CAIC) | 23634.73593429 |
| Schwarz's Bayesian Criterion (BIC) | 23630.73593429 |

|  |  |
| --- | --- |
| The information criteria are displayed in smaller-is-better form.a |  |
| a. Dependent Variable: langpost. |  |

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| **Coefficients of Determination** |  |  |
| Pseudo-R Square Measures | Marginal | .379 |
| Conditional | .496 |

|  |  |  |
| --- | --- | --- |
| **Intraclass Correlation Coefficients** |  |  |
| Overall ICCs | Adjusted | .189 |
| Conditional | .117 |

**Fixed Effects**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type III Tests of Fixed Effects**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| Intercept | 1 | 172.367 | 13123.011 | <.001 |
| hw2 | 1 | 178.582 | .010 | .920 |
| mixgrd | 1 | 196.770 | 4.851 | .029 |
| CMverb10 | 1 | 206.871 | 180.850 | <.001 |
| WCverb | 1 | 128.605 | 569.479 | <.001 |
| hw2 \* WCverb | 1 | 142.965 | .184 | .668 |
| mixgrd \* WCverb | 1 | 228.418 | 4.087 | .044 |
| CMverb10 \* WCverb | 1 | 181.858 | .313 | .576 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |

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| --- | --- | --- | --- | --- | --- | --- |
| **Estimates of Fixed Effects**a |  |  |  |  |  |  |
| Parameter | Estimate | Std. Error | df | t | Sig. | 95% Confidence Interval |
| Lower Bound |
| Intercept | 41.583 | .363 | 172.367 | 114.556 | <.001 | 40.867 |
| hw2 | -.046 | .459 | 178.582 | -.100 | .920 | -.952 |
| mixgrd | -1.137 | .516 | 196.770 | -2.202 | .029 | -2.155 |
| CMverb10 | 3.644 | .271 | 206.871 | 13.448 | <.001 | 3.110 |
| WCverb | 2.390 | .100 | 128.605 | 23.864 | <.001 | 2.192 |
| hw2 \* WCverb | -.056 | .130 | 142.965 | -.429 | .668 | -.314 |
| mixgrd \* WCverb | .321 | .159 | 228.418 | 2.022 | .044 | .008 |
| CMverb10 \* WCverb | -.044 | .078 | 181.858 | -.560 | .576 | -.198 |

|  |  |
| --- | --- |
| **Estimates of Fixed Effects**a |  |
| Parameter | 95% Confidence Interval |
| Upper Bound |
| Intercept | 42.300 |
| hw2 | .860 |
| mixgrd | -.119 |
| CMverb10 | 4.179 |
| WCverb | 2.588 |
| hw2 \* WCverb | .202 |
| mixgrd \* WCverb | .634 |
| CMverb10 \* WCverb | .110 |

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| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |

|  |  |
| --- | --- |
| a. Dependent Variable: langpost. |  |

**Covariance Parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Estimates of Covariance Parameters**a |  |  |  |  |  |  |
| Parameter |  | Estimate | Std. Error | Wald Z | Sig. | 95% Confidence Interval |
|  | Lower Bound |
| Residual |  | 39.740 | .990 | 40.131 | <.001 | 37.845 |
| Intercept + WCverb [subject = schoolID] | UN (1,1) | 8.472 | 1.136 | 7.459 | <.001 | 6.514 |
| UN (2,1) | -.710 | .238 | -2.984 | .003 | -1.177 |
| UN (2,2) | .223 | .086 | 2.582 | .010 | .104 |

|  |  |  |
| --- | --- | --- |
| **Estimates of Covariance Parameters**a |  |  |
| Parameter |  | 95% Confidence Interval |
|  | Upper Bound |
| Residual |  | 41.729 |
| Intercept + WCverb [subject = schoolID] | UN (1,1) | 11.018 |
| UN (2,1) | -.244 |
| UN (2,2) | .477 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |

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| --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |

SPSS Model 3a: Add L2-CM and Consant-C-L1 Student Verbal

**Mixed Model Analysis**

|  |  |  |
| --- | --- | --- |
| **Notes** |  |  |
| Output Created |  | 23-SEP-2023 15:50:01 |
| Comments |  |  |
| Input | Active Dataset | Example |
| Filter | <none> |
| Weight | <none> |
| Split File | <none> |
| N of Rows in Working Data File | 3566 |
| Missing Value Handling | Definition of Missing | User-defined missing values are treated as valid data. |
| Cases Used | Statistics are based on all cases with valid data for all variables in the model. |
| Weight Handling |  | not applicable |
| Syntax |  | MIXED langpost BY schoolID WITH hw2 mixgrd CMverb10 verb10 /METHOD = REML /CRITERIA = DFMETHOD(SATTERTHWAITE) /PRINT = SOLUTION TESTCOV /FIXED = hw2 mixgrd CMverb10 verb10 /RANDOM = INTERCEPT | COVTYPE(UN) SUBJECT(schoolID) /TEST = "F-test of Model Total-R2" hw2 1; mixgrd 1; CMverb10 1; verb10 1 /TEST = "F-Test of Verbal Slopes (Change in Total-R2)" CMverb10 1; verb10 1 /TEST = "L2 Between Effect of Verbal" CMverb10 1 verb10 1. |
| Resources | Processor Time | 00:00:00.16 |
| Elapsed Time | 00:00:00.23 |

|  |
| --- |
| **Warnings** |
| The covariance structure for random effect with only one level will be changed to Identity. |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Model Dimension**a |  |  |  |  |  |
|  |  | Number of Levels | Covariance Structure | Number of Parameters | Subject Variables |
| Fixed Effects | Intercept | 1 |  | 1 |  |
| hw2 | 1 |  | 1 |  |
| mixgrd | 1 |  | 1 |  |
| CMverb10 | 1 |  | 1 |  |
| verb10 | 1 |  | 1 |  |
| Random Effects | Intercept | 1 | Identity | 1 | schoolID |
| Residual |  |  |  | 1 |  |
| Total |  | 6 |  | 7 |  |

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| --- | --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |  |

|  |  |
| --- | --- |
| **Information Criteria**a |  |
| -2 Restricted Log Likelihood | 23615.07406508 |
| Akaike's Information Criterion (AIC) | 23619.07406508 |
| Hurvich and Tsai's Criterion (AICC) | 23619.07743777 |
| Bozdogan's Criterion (CAIC) | 23633.42965845 |
| Schwarz's Bayesian Criterion (BIC) | 23631.42965845 |

|  |  |
| --- | --- |
| The information criteria are displayed in smaller-is-better form.a |  |
| a. Dependent Variable: langpost. |  |

|  |  |  |
| --- | --- | --- |
| **Coefficients of Determination** |  |  |
| Pseudo-R Square Measures | Marginal | .377 |
| Conditional | .484 |

|  |  |  |
| --- | --- | --- |
| **Intraclass Correlation Coefficients** |  |  |
| Overall ICCs | Adjusted | .172 |
| Conditional | .107 |

**Fixed Effects**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type III Tests of Fixed Effects**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| Intercept | 1 | 172.109 | 13161.283 | <.001 |
| hw2 | 1 | 178.461 | .013 | .909 |
| mixgrd | 1 | 197.054 | 4.723 | .031 |
| CMverb10 | 1 | 226.195 | 19.963 | <.001 |
| verb10 | 1 | 3372.684 | 1795.256 | <.001 |

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| --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Estimates of Fixed Effects**a |  |  |  |  |  |  |  |
| Parameter | Estimate | Std. Error | df | t | Sig. | 95% Confidence Interval |  |
| Lower Bound | Upper Bound |
| Intercept | 41.579 | .362 | 172.109 | 114.723 | <.001 | 40.864 | 42.295 |
| hw2 | -.053 | .459 | 178.461 | -.115 | .909 | -.957 | .852 |
| mixgrd | -1.121 | .516 | 197.054 | -2.173 | .031 | -2.138 | -.104 |
| CMverb10 | 1.237 | .277 | 226.195 | 4.468 | <.001 | .692 | 1.783 |
| verb10 | 2.423 | .057 | 3372.684 | 42.370 | <.001 | 2.311 | 2.535 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |  |  |  |

**Covariance Parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Estimates of Covariance Parameters**a |  |  |  |  |  |  |
| Parameter |  | Estimate | Std. Error | Wald Z | Sig. | 95% Confidence Interval |
|  | Lower Bound |
| Residual |  | 40.550 | .987 | 41.065 | <.001 | 38.660 |
| Intercept [subject = schoolID] | Variance | 8.395 | 1.133 | 7.411 | <.001 | 6.444 |

|  |  |  |
| --- | --- | --- |
| **Estimates of Covariance Parameters**a |  |  |
| Parameter |  | 95% Confidence Interval |
|  | Upper Bound |
| Residual |  | 42.533 |
| Intercept [subject = schoolID] | Variance | 10.937 |

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| --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |

**Custom Hypothesis Test 1 (F-test of Model Total-R2)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Contrast Estimates**a,b |  |  |  |  |  |  |  |
| Contrast | Estimate | Std. Error | df | Test Value | t | Sig. | 95% Confidence Interval |
| Lower Bound |
| L1 | -.053 | .459 | 178.461 | 0 | -.115 | .909 | -.957 |
| L2 | -1.121 | .516 | 197.054 | 0 | -2.173 | .031 | -2.138 |
| L3 | 1.237 | .277 | 226.195 | 0 | 4.468 | <.001 | .692 |
| L4 | 2.423 | .057 | 3372.684 | 0 | 42.370 | <.001 | 2.311 |

|  |  |
| --- | --- |
| **Contrast Estimates**a,b |  |
| Contrast | 95% Confidence Interval |
| Upper Bound |
| L1 | .852 |
| L2 | -.104 |
| L3 | 1.783 |
| L4 | 2.535 |

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|  |  |
| --- | --- |
| a. F-test of Model Total-R2 |  |
| b. Dependent Variable: langpost. |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Test of Contrasts**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| F-test of Model Total-R2 | 4 | 261.093 | 498.718 | <.001 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |

**Custom Hypothesis Test 2 (F-Test of Verbal Slopes (Change in Total-R2))**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Contrast Estimates**a,b |  |  |  |  |  |  |  |
| Contrast | Estimate | Std. Error | df | Test Value | t | Sig. | 95% Confidence Interval |
| Lower Bound |
| L1 | 1.237 | .277 | 226.195 | 0 | 4.468 | <.001 | .692 |
| L2 | 2.423 | .057 | 3372.684 | 0 | 42.370 | <.001 | 2.311 |

|  |  |
| --- | --- |
| **Contrast Estimates**a,b |  |
| Contrast | 95% Confidence Interval |
| Upper Bound |
| L1 | 1.783 |
| L2 | 2.535 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |
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|  |  |
| --- | --- |
| a. F-Test of Verbal Slopes (Change in Total-R2) |  |
| b. Dependent Variable: langpost. |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Test of Contrasts**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| F-Test of Verbal Slopes (Change in Total-R2) | 2 | 426.868 | 988.863 | <.001 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |

**Custom Hypothesis Test 3 (L2 Between Effect of Verbal)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Contrast Estimates**a,b |  |  |  |  |  |  |  |
| Contrast | Estimate | Std. Error | df | Test Value | t | Sig. | 95% Confidence Interval |
| Lower Bound |
| L1 | 3.660 | .271 | 207.396 | 0 | 13.508 | <.001 | 3.126 |

|  |  |
| --- | --- |
| **Contrast Estimates**a,b |  |
| Contrast | 95% Confidence Interval |
| Upper Bound |
| L1 | 4.194 |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |
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|  |  |
| --- | --- |
| a. L2 Between Effect of Verbal |  |
| b. Dependent Variable: langpost. |  |

**Output Export**

|  |  |  |
| --- | --- | --- |
| **Notes** |  |  |
| Output Created |  | 23-SEP-2023 15:50:01 |
| Comments |  |  |
| Input | Active Dataset | Example |
| Filter | <none> |
| Weight | <none> |
| Split File | <none> |
| N of Rows in Working Data File | 3566 |
| Syntax |  | OUTPUT EXPORT /CONTENTS EXPORT=ALL LAYERS=PRINTSETTING MODELVIEWS=PRINTSETTING /DOC DOCUMENTFILE='filesave\SPSS\_Output.docx' NOTESCAPTIONS=YES WIDETABLES=WRAP PAGEBREAKS=YES PAGESIZE=INCHES(8.5, 11.0) TOPMARGIN=INCHES(1.0) BOTTOMMARGIN=INCHES(1.0) LEFTMARGIN=INCHES(1.0) RIGHTMARGIN=INCHES(1.0). |
| Resources | Processor Time | 00:00:00.02 |
| Elapsed Time | 00:00:04.57 |
| Files Saved | Viewer | SPSS\_Output |
| Document File | \\Client\C$\Dropbox\APA\_ClusteredMLM\Download\SPSS\_Output.docx |
| Image File Count | 0 |

|  |  |
| --- | --- |
| **Export Summary** |  |
| Viewer | SPSS\_Output |
| Document File | \\Client\C$\Dropbox\APA\_ClusteredMLM\Download\SPSS\_Output.docx |

**Dataset Name**

|  |  |  |
| --- | --- | --- |
| **Notes** |  |  |
| Output Created |  | 23-SEP-2023 15:50:10 |
| Comments |  |  |
| Input | Filter | <none> |
| Weight | <none> |
| Split File | <none> |
| N of Rows in Working Data File | 3566 |
| Syntax |  | DATASET NAME Example WINDOW=FRONT. |
| Resources | Processor Time | 00:00:00.00 |
| Elapsed Time | 00:00:00.00 |

|  |
| --- |
| **Warnings** |
| The active dataset will replace the existing dataset named Example. |

**Dataset Declare**

|  |  |  |
| --- | --- | --- |
| **Notes** |  |  |
| Output Created |  | 23-SEP-2023 15:50:10 |
| Comments |  |  |
| Input | Filter | <none> |
| Weight | <none> |
| Split File | <none> |
| N of Rows in Working Data File | 3566 |
| Syntax |  | DATASET DECLARE Schools. |
| Resources | Processor Time | 00:00:00.00 |
| Elapsed Time | 00:00:00.00 |

|  |
| --- |
| **Warnings** |
| Dataset name Schools already defined. |

SPSS Descriptive Statistics

**Summarize**

|  |  |  |
| --- | --- | --- |
| **Notes** |  |  |
| Output Created |  | 23-SEP-2023 15:50:11 |
| Comments |  |  |
| Input | Active Dataset | Example |
| Filter | <none> |
| Weight | <none> |
| Split File | <none> |
| N of Rows in Working Data File | 3566 |
| Missing Value Handling | Definition of Missing | For each dependent variable in a table, user-defined missing values for the dependent and all grouping variables are treated as missing. |
| Cases Used | Cases used for each table have no missing values in any independent variable, and not all dependent variables have missing values. |
| Syntax |  | SUMMARIZE /TABLES = langpost verbal homework mixgrd CMverbal /FORMAT = NOLIST TOTAL /CELLS = COUNT MEAN STDERR STDDEV VARIANCE MIN MAX. |
| Resources | Processor Time | 00:00:00.03 |
| Elapsed Time | 00:00:00.02 |

|  |
| --- |
| **Warnings** |
| The parameter, STDDEV is redundant with another parameter already specified and has been ignored. |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Case Processing Summary** |  |  |  |  |  |  |
|  | Cases |  |  |  |  |  |
| Included |  | Excluded |  | Total |  |
| N | Percent | N | Percent | N | Percent |
| langpost | 3566 | 100.0% | 0 | 0.0% | 3566 | 100.0% |
| verbal | 3566 | 100.0% | 0 | 0.0% | 3566 | 100.0% |
| homework | 3566 | 100.0% | 0 | 0.0% | 3566 | 100.0% |
| mixgrd | 3566 | 100.0% | 0 | 0.0% | 3566 | 100.0% |
| CMverbal | 3566 | 100.0% | 0 | 0.0% | 3566 | 100.0% |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Report** |  |  |  |  |  |
|  | langpost | verbal | homework | mixgrd | CMverbal |
| N | 3566 | 3566 | 3566 | 3566 | 3566 |
| Mean | 41.46 | 10.035692091979802 | 2.443036735838472 | .24 | 10.0357 |
| Std. Deviation | 8.814 | 2.032639290215606 | .531218761229908 | .428 | .80779 |
| Variance | 77.691 | 4.132 | .282 | .183 | .653 |
| Minimum | 9 | 2.133000000000000 | 1.333000000000000 | 0 | 5.78 |
| Maximum | 58 | 16.633000000000000 | 3.667000000000000 | 1 | 12.48 |

SPSS Model 1a: Single-Level Empty Means, No Random Intercept

**Mixed Model Analysis**

|  |  |  |
| --- | --- | --- |
| **Notes** |  |  |
| Output Created |  | 23-SEP-2023 15:50:11 |
| Comments |  |  |
| Input | Active Dataset | Example |
| Filter | <none> |
| Weight | <none> |
| Split File | <none> |
| N of Rows in Working Data File | 3566 |
| Missing Value Handling | Definition of Missing | User-defined missing values are treated as valid data. |
| Cases Used | Statistics are based on all cases with valid data for all variables in the model. |
| Weight Handling |  | not applicable |
| Syntax |  | MIXED langpost BY schoolID /METHOD = REML /CRITERIA = DFMETHOD(RESIDUAL) /PRINT = SOLUTION TESTCOV /FIXED = . |
| Resources | Processor Time | 00:00:00.08 |
| Elapsed Time | 00:00:00.08 |

|  |
| --- |
| **Warnings** |
| A(n) FIXED subcommand has no specifications and will therefore be ignored. |
| DFMETHOD specified in subcommand CRITERIA, is ignored because the model has only fixed effects. |

|  |  |  |  |
| --- | --- | --- | --- |
| **Model Dimension**a |  |  |  |
|  |  | Number of Levels | Number of Parameters |
| Fixed Effects | Intercept | 1 | 1 |
| Residual |  |  | 1 |
| Total |  | 1 | 2 |

|  |  |  |  |
| --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |

|  |  |
| --- | --- |
| **Information Criteria**a |  |
| -2 Restricted Log Likelihood | 25642.70568365 |
| Akaike's Information Criterion (AIC) | 25644.70568365 |
| Hurvich and Tsai's Criterion (AICC) | 25644.70680630 |
| Bozdogan's Criterion (CAIC) | 25651.88460299 |
| Schwarz's Bayesian Criterion (BIC) | 25650.88460299 |

|  |  |
| --- | --- |
| The information criteria are displayed in smaller-is-better form.a |  |
| a. Dependent Variable: langpost. |  |

|  |  |  |
| --- | --- | --- |
| **Coefficients of Determination** |  |  |
| Pseudo-R Square Measures | Marginal | .000 |
| Conditional | .000 |

**Fixed Effects**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type III Tests of Fixed Effects**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| Intercept | 1 | 3565 | 78912.549 | <.001 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Estimates of Fixed Effects**a |  |  |  |  |  |  |  |
| Parameter | Estimate | Std. Error | df | t | Sig. | 95% Confidence Interval |  |
| Lower Bound | Upper Bound |
| Intercept | 41.464 | .148 | 3565 | 280.914 | <.001 | 41.174 | 41.753 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |  |  |  |

**Covariance Parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Estimates of Covariance Parameters**a |  |  |  |  |  |  |
| Parameter | Estimate | Std. Error | Wald Z | Sig. | 95% Confidence Interval |  |
| Lower Bound | Upper Bound |
| Residual | 77.691 | 1.840 | 42.220 | <.001 | 74.166 | 81.382 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |  |  |

SPSS Model 1b: Two-Level Empty Means, Random Intercept

**Mixed Model Analysis**

|  |  |  |
| --- | --- | --- |
| **Notes** |  |  |
| Output Created |  | 23-SEP-2023 15:50:11 |
| Comments |  |  |
| Input | Active Dataset | Example |
| Filter | <none> |
| Weight | <none> |
| Split File | <none> |
| N of Rows in Working Data File | 3566 |
| Missing Value Handling | Definition of Missing | User-defined missing values are treated as valid data. |
| Cases Used | Statistics are based on all cases with valid data for all variables in the model. |
| Weight Handling |  | not applicable |
| Syntax |  | MIXED langpost BY schoolID /METHOD = REML /CRITERIA = DFMETHOD(SATTERTHWAITE) /PRINT = SOLUTION TESTCOV /FIXED = /RANDOM = INTERCEPT | COVTYPE(UN) SUBJECT(schoolID). |
| Resources | Processor Time | 00:00:00.13 |
| Elapsed Time | 00:00:00.19 |

|  |
| --- |
| **Warnings** |
| A(n) FIXED subcommand has no specifications and will therefore be ignored. |
| The covariance structure for random effect with only one level will be changed to Identity. |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Model Dimension**a |  |  |  |  |  |
|  |  | Number of Levels | Covariance Structure | Number of Parameters | Subject Variables |
| Fixed Effects | Intercept | 1 |  | 1 |  |
| Random Effects | Intercept | 1 | Identity | 1 | schoolID |
| Residual |  |  |  | 1 |  |
| Total |  | 2 |  | 3 |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |  |

|  |  |
| --- | --- |
| **Information Criteria**a |  |
| -2 Restricted Log Likelihood | 25190.95304485 |
| Akaike's Information Criterion (AIC) | 25194.95304485 |
| Hurvich and Tsai's Criterion (AICC) | 25194.95641375 |
| Bozdogan's Criterion (CAIC) | 25209.31088352 |
| Schwarz's Bayesian Criterion (BIC) | 25207.31088352 |

|  |  |
| --- | --- |
| The information criteria are displayed in smaller-is-better form.a |  |
| a. Dependent Variable: langpost. |  |

|  |  |  |
| --- | --- | --- |
| **Coefficients of Determination** |  |  |
| Pseudo-R Square Measures | Marginal | .000 |
| Conditional | .223 |

|  |  |  |
| --- | --- | --- |
| **Intraclass Correlation Coefficients** |  |  |
| Overall ICCs | Adjusted | .223 |
| Conditional | .223 |

**Fixed Effects**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type III Tests of Fixed Effects**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| Intercept | 1 | 174.931 | 14847.851 | <.001 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Estimates of Fixed Effects**a |  |  |  |  |  |  |  |
| Parameter | Estimate | Std. Error | df | t | Sig. | 95% Confidence Interval |  |
| Lower Bound | Upper Bound |
| Intercept | 41.079 | .337 | 174.931 | 121.852 | <.001 | 40.414 | 41.744 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |  |  |  |

**Covariance Parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Estimates of Covariance Parameters**a |  |  |  |  |  |  |
| Parameter |  | Estimate | Std. Error | Wald Z | Sig. | 95% Confidence Interval |
|  | Lower Bound |
| Residual |  | 62.229 | 1.518 | 40.998 | <.001 | 59.324 |
| Intercept [subject = schoolID] | Variance | 17.814 | 2.307 | 7.720 | <.001 | 13.820 |

|  |  |  |
| --- | --- | --- |
| **Estimates of Covariance Parameters**a |  |  |
| Parameter |  | 95% Confidence Interval |
|  | Upper Bound |
| Residual |  | 65.276 |
| Intercept [subject = schoolID] | Variance | 22.962 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |

|  |  |  |
| --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |

SPSS Model 1c: Add 2 School-Level Predictors

**Mixed Model Analysis**

|  |  |  |
| --- | --- | --- |
| **Notes** |  |  |
| Output Created |  | 23-SEP-2023 15:50:11 |
| Comments |  |  |
| Input | Active Dataset | Example |
| Filter | <none> |
| Weight | <none> |
| Split File | <none> |
| N of Rows in Working Data File | 3566 |
| Missing Value Handling | Definition of Missing | User-defined missing values are treated as valid data. |
| Cases Used | Statistics are based on all cases with valid data for all variables in the model. |
| Weight Handling |  | not applicable |
| Syntax |  | MIXED langpost BY schoolID WITH hw2 mixgrd /METHOD = REML /CRITERIA = DFMETHOD(SATTERTHWAITE) /PRINT = SOLUTION TESTCOV /FIXED = hw2 mixgrd /RANDOM = INTERCEPT | COVTYPE(UN) SUBJECT(schoolID) /TEST = "F-test of Model Total-R2" hw2 1; mixgrd 1. |
| Resources | Processor Time | 00:00:00.14 |
| Elapsed Time | 00:00:00.13 |

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| --- |
| **Warnings** |
| The covariance structure for random effect with only one level will be changed to Identity. |

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| --- | --- | --- | --- | --- | --- |
| **Model Dimension**a |  |  |  |  |  |
|  |  | Number of Levels | Covariance Structure | Number of Parameters | Subject Variables |
| Fixed Effects | Intercept | 1 |  | 1 |  |
| hw2 | 1 |  | 1 |  |
| mixgrd | 1 |  | 1 |  |
| Random Effects | Intercept | 1 | Identity | 1 | schoolID |
| Residual |  |  |  | 1 |  |
| Total |  | 4 |  | 5 |  |

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| --- | --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |  |

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| --- | --- |
| **Information Criteria**a |  |
| -2 Restricted Log Likelihood | 25179.61603036 |
| Akaike's Information Criterion (AIC) | 25183.61603036 |
| Hurvich and Tsai's Criterion (AICC) | 25183.61940115 |
| Bozdogan's Criterion (CAIC) | 25197.97274670 |
| Schwarz's Bayesian Criterion (BIC) | 25195.97274670 |

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| The information criteria are displayed in smaller-is-better form.a |  |
| a. Dependent Variable: langpost. |  |

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| **Coefficients of Determination** |  |  |
| Pseudo-R Square Measures | Marginal | .011 |
| Conditional | .225 |

|  |  |  |
| --- | --- | --- |
| **Intraclass Correlation Coefficients** |  |  |
| Overall ICCs | Adjusted | .216 |
| Conditional | .214 |

**Fixed Effects**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type III Tests of Fixed Effects**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| Intercept | 1 | 167.525 | 6767.201 | <.001 |
| hw2 | 1 | 172.305 | .636 | .426 |
| mixgrd | 1 | 188.574 | 7.918 | .005 |

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| --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Estimates of Fixed Effects**a |  |  |  |  |  |  |  |
| Parameter | Estimate | Std. Error | df | t | Sig. | 95% Confidence Interval |  |
| Lower Bound | Upper Bound |
| Intercept | 41.548 | .505 | 167.525 | 82.263 | <.001 | 40.551 | 42.545 |
| hw2 | .507 | .635 | 172.305 | .798 | .426 | -.747 | 1.761 |
| mixgrd | -1.993 | .708 | 188.574 | -2.814 | .005 | -3.390 | -.596 |

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| a. Dependent Variable: langpost. |  |  |  |  |  |  |  |

**Covariance Parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Estimates of Covariance Parameters**a |  |  |  |  |  |  |
| Parameter |  | Estimate | Std. Error | Wald Z | Sig. | 95% Confidence Interval |
|  | Lower Bound |
| Residual |  | 62.201 | 1.517 | 41.015 | <.001 | 59.298 |
| Intercept [subject = schoolID] | Variance | 17.165 | 2.234 | 7.683 | <.001 | 13.300 |

|  |  |  |
| --- | --- | --- |
| **Estimates of Covariance Parameters**a |  |  |
| Parameter |  | 95% Confidence Interval |
|  | Upper Bound |
| Residual |  | 65.245 |
| Intercept [subject = schoolID] | Variance | 22.153 |

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| a. Dependent Variable: langpost. |  |  |

**Custom Hypothesis Test (F-test of Model Total-R2)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Contrast Estimates**a,b |  |  |  |  |  |  |  |
| Contrast | Estimate | Std. Error | df | Test Value | t | Sig. | 95% Confidence Interval |
| Lower Bound |
| L1 | .507 | .635 | 172.305 | 0 | .798 | .426 | -.747 |
| L2 | -1.993 | .708 | 188.574 | 0 | -2.814 | .005 | -3.390 |

|  |  |
| --- | --- |
| **Contrast Estimates**a,b |  |
| Contrast | 95% Confidence Interval |
| Upper Bound |
| L1 | 1.761 |
| L2 | -.596 |

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| --- | --- |
| a. F-test of Model Total-R2 |  |
| b. Dependent Variable: langpost. |  |

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| --- | --- | --- | --- | --- |
| **Test of Contrasts**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| F-test of Model Total-R2 | 2 | 180.262 | 4.681 | .010 |

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| --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |

SPSS Model 1d: Add 2 School-Level Predictors WITHOUT Random Intercept

**Mixed Model Analysis**

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| --- | --- | --- |
| **Notes** |  |  |
| Output Created |  | 23-SEP-2023 15:50:11 |
| Comments |  |  |
| Input | Active Dataset | Example |
| Filter | <none> |
| Weight | <none> |
| Split File | <none> |
| N of Rows in Working Data File | 3566 |
| Missing Value Handling | Definition of Missing | User-defined missing values are treated as valid data. |
| Cases Used | Statistics are based on all cases with valid data for all variables in the model. |
| Weight Handling |  | not applicable |
| Syntax |  | MIXED langpost BY schoolID WITH hw2 mixgrd /METHOD = REML /CRITERIA = DFMETHOD(RESIDUAL) /PRINT = SOLUTION TESTCOV /FIXED = hw2 mixgrd /TEST = "F-test of Model Total-R2" hw2 1; mixgrd 1. |
| Resources | Processor Time | 00:00:00.08 |
| Elapsed Time | 00:00:00.09 |

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| --- |
| **Warnings** |
| DFMETHOD specified in subcommand CRITERIA, is ignored because the model has only fixed effects. |

|  |  |  |  |
| --- | --- | --- | --- |
| **Model Dimension**a |  |  |  |
|  |  | Number of Levels | Number of Parameters |
| Fixed Effects | Intercept | 1 | 1 |
| hw2 | 1 | 1 |
| mixgrd | 1 | 1 |
| Residual |  |  | 1 |
| Total |  | 3 | 4 |

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| --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |

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| --- | --- |
| **Information Criteria**a |  |
| -2 Restricted Log Likelihood | 25621.50843226 |
| Akaike's Information Criterion (AIC) | 25623.50843226 |
| Hurvich and Tsai's Criterion (AICC) | 25623.50955554 |
| Bozdogan's Criterion (CAIC) | 25630.68679043 |
| Schwarz's Bayesian Criterion (BIC) | 25629.68679043 |

|  |  |
| --- | --- |
| The information criteria are displayed in smaller-is-better form.a |  |
| a. Dependent Variable: langpost. |  |

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| --- | --- | --- |
| **Coefficients of Determination** |  |  |
| Pseudo-R Square Measures | Marginal | .006 |
| Conditional | .006 |

**Fixed Effects**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type III Tests of Fixed Effects**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| Intercept | 1 | 3563.000 | 37056.996 | <.001 |
| hw2 | 1 | 3563.000 | 2.161 | .142 |
| mixgrd | 1 | 3563 | 18.040 | <.001 |

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| a. Dependent Variable: langpost. |  |  |  |  |

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Estimates of Fixed Effects**a |  |  |  |  |  |  |  |
| Parameter | Estimate | Std. Error | df | t | Sig. | 95% Confidence Interval |  |
| Lower Bound | Upper Bound |
| Intercept | 41.637 | .216 | 3563.000 | 192.502 | <.001 | 41.213 | 42.061 |
| hw2 | .411 | .280 | 3563.000 | 1.470 | .142 | -.137 | .959 |
| mixgrd | -1.474 | .347 | 3563 | -4.247 | <.001 | -2.155 | -.794 |

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| a. Dependent Variable: langpost. |  |  |  |  |  |  |  |

**Covariance Parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Estimates of Covariance Parameters**a |  |  |  |  |  |  |
| Parameter | Estimate | Std. Error | Wald Z | Sig. | 95% Confidence Interval |  |
| Lower Bound | Upper Bound |
| Residual | 77.251 | 1.830 | 42.208 | <.001 | 73.746 | 80.923 |

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| --- | --- | --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |  |  |

**Custom Hypothesis Test (F-test of Model Total-R2)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Contrast Estimates**a,b |  |  |  |  |  |  |  |
| Contrast | Estimate | Std. Error | df | Test Value | t | Sig. | 95% Confidence Interval |
| Lower Bound |
| L1 | .411 | .280 | 3563.000 | 0 | 1.470 | .142 | -.137 |
| L2 | -1.474 | .347 | 3563 | 0 | -4.247 | <.001 | -2.155 |

|  |  |
| --- | --- |
| **Contrast Estimates**a,b |  |
| Contrast | 95% Confidence Interval |
| Upper Bound |
| L1 | .959 |
| L2 | -.794 |

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| --- | --- |
| a. F-test of Model Total-R2 |  |
| b. Dependent Variable: langpost. |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Test of Contrasts**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| F-test of Model Total-R2 | 2 | 3563 | 11.131 | <.001 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |

SPSS Model 2a: Add L2-CM and Cluster-MC-L1 Student Verbal

**Mixed Model Analysis**

|  |  |  |
| --- | --- | --- |
| **Notes** |  |  |
| Output Created |  | 23-SEP-2023 15:50:11 |
| Comments |  |  |
| Input | Active Dataset | Example |
| Filter | <none> |
| Weight | <none> |
| Split File | <none> |
| N of Rows in Working Data File | 3566 |
| Missing Value Handling | Definition of Missing | User-defined missing values are treated as valid data. |
| Cases Used | Statistics are based on all cases with valid data for all variables in the model. |
| Weight Handling |  | not applicable |
| Syntax |  | MIXED langpost BY schoolID WITH hw2 mixgrd CMverb10 WCverb /METHOD = REML /CRITERIA = DFMETHOD(SATTERTHWAITE) /PRINT = SOLUTION TESTCOV /FIXED = hw2 mixgrd CMverb10 WCverb /RANDOM = INTERCEPT | COVTYPE(UN) SUBJECT(schoolID) /TEST = "F-test of Model Total-R2" hw2 1; mixgrd 1; CMverb10 1; WCverb 1 /TEST = "F-Test of Verbal Slopes (Change in Total-R2)" CMverb10 1; WCverb 1 /TEST = "L2 Contextual Effect of Verbal" CMverb10 1 WCverb -1. |
| Resources | Processor Time | 00:00:00.14 |
| Elapsed Time | 00:00:00.38 |

|  |
| --- |
| **Warnings** |
| The covariance structure for random effect with only one level will be changed to Identity. |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Model Dimension**a |  |  |  |  |  |
|  |  | Number of Levels | Covariance Structure | Number of Parameters | Subject Variables |
| Fixed Effects | Intercept | 1 |  | 1 |  |
| hw2 | 1 |  | 1 |  |
| mixgrd | 1 |  | 1 |  |
| CMverb10 | 1 |  | 1 |  |
| WCverb | 1 |  | 1 |  |
| Random Effects | Intercept | 1 | Identity | 1 | schoolID |
| Residual |  |  |  | 1 |  |
| Total |  | 6 |  | 7 |  |

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| --- | --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |  |

|  |  |
| --- | --- |
| **Information Criteria**a |  |
| -2 Restricted Log Likelihood | 23615.07406508 |
| Akaike's Information Criterion (AIC) | 23619.07406508 |
| Hurvich and Tsai's Criterion (AICC) | 23619.07743777 |
| Bozdogan's Criterion (CAIC) | 23633.42965845 |
| Schwarz's Bayesian Criterion (BIC) | 23631.42965845 |

|  |  |
| --- | --- |
| The information criteria are displayed in smaller-is-better form.a |  |
| a. Dependent Variable: langpost. |  |

|  |  |  |
| --- | --- | --- |
| **Coefficients of Determination** |  |  |
| Pseudo-R Square Measures | Marginal | .377 |
| Conditional | .484 |

|  |  |  |
| --- | --- | --- |
| **Intraclass Correlation Coefficients** |  |  |
| Overall ICCs | Adjusted | .172 |
| Conditional | .107 |

**Fixed Effects**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type III Tests of Fixed Effects**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| Intercept | 1 | 172.109 | 13161.283 | <.001 |
| hw2 | 1 | 178.461 | .013 | .909 |
| mixgrd | 1 | 197.054 | 4.723 | .031 |
| CMverb10 | 1 | 207.396 | 182.470 | <.001 |
| WCverb | 1 | 3372.684 | 1795.256 | <.001 |

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| --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Estimates of Fixed Effects**a |  |  |  |  |  |  |  |
| Parameter | Estimate | Std. Error | df | t | Sig. | 95% Confidence Interval |  |
| Lower Bound | Upper Bound |
| Intercept | 41.579 | .362 | 172.109 | 114.723 | <.001 | 40.864 | 42.295 |
| hw2 | -.053 | .459 | 178.461 | -.115 | .909 | -.957 | .852 |
| mixgrd | -1.121 | .516 | 197.054 | -2.173 | .031 | -2.138 | -.104 |
| CMverb10 | 3.660 | .271 | 207.396 | 13.508 | <.001 | 3.126 | 4.194 |
| WCverb | 2.423 | .057 | 3372.684 | 42.370 | <.001 | 2.311 | 2.535 |

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| --- | --- | --- | --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |  |  |  |

**Covariance Parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Estimates of Covariance Parameters**a |  |  |  |  |  |  |
| Parameter |  | Estimate | Std. Error | Wald Z | Sig. | 95% Confidence Interval |
|  | Lower Bound |
| Residual |  | 40.550 | .987 | 41.065 | <.001 | 38.660 |
| Intercept [subject = schoolID] | Variance | 8.395 | 1.133 | 7.411 | <.001 | 6.444 |

|  |  |  |
| --- | --- | --- |
| **Estimates of Covariance Parameters**a |  |  |
| Parameter |  | 95% Confidence Interval |
|  | Upper Bound |
| Residual |  | 42.533 |
| Intercept [subject = schoolID] | Variance | 10.937 |

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| a. Dependent Variable: langpost. |  |  |

**Custom Hypothesis Test 1 (F-test of Model Total-R2)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Contrast Estimates**a,b |  |  |  |  |  |  |  |
| Contrast | Estimate | Std. Error | df | Test Value | t | Sig. | 95% Confidence Interval |
| Lower Bound |
| L1 | -.053 | .459 | 178.461 | 0 | -.115 | .909 | -.957 |
| L2 | -1.121 | .516 | 197.054 | 0 | -2.173 | .031 | -2.138 |
| L3 | 3.660 | .271 | 207.396 | 0 | 13.508 | <.001 | 3.126 |
| L4 | 2.423 | .057 | 3372.684 | 0 | 42.370 | <.001 | 2.311 |

|  |  |
| --- | --- |
| **Contrast Estimates**a,b |  |
| Contrast | 95% Confidence Interval |
| Upper Bound |
| L1 | .852 |
| L2 | -.104 |
| L3 | 4.194 |
| L4 | 2.535 |

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| --- | --- |
| a. F-test of Model Total-R2 |  |
| b. Dependent Variable: langpost. |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Test of Contrasts**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| F-test of Model Total-R2 | 4 | 253.515 | 498.718 | <.001 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |

**Custom Hypothesis Test 2 (F-Test of Verbal Slopes (Change in Total-R2))**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Contrast Estimates**a,b |  |  |  |  |  |  |  |
| Contrast | Estimate | Std. Error | df | Test Value | t | Sig. | 95% Confidence Interval |
| Lower Bound |
| L1 | 3.660 | .271 | 207.396 | 0 | 13.508 | <.001 | 3.126 |
| L2 | 2.423 | .057 | 3372.684 | 0 | 42.370 | <.001 | 2.311 |

|  |  |
| --- | --- |
| **Contrast Estimates**a,b |  |
| Contrast | 95% Confidence Interval |
| Upper Bound |
| L1 | 4.194 |
| L2 | 2.535 |

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| --- | --- |
| a. F-Test of Verbal Slopes (Change in Total-R2) |  |
| b. Dependent Variable: langpost. |  |

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| --- | --- | --- | --- | --- |
| **Test of Contrasts**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| F-Test of Verbal Slopes (Change in Total-R2) | 2 | 389.198 | 988.863 | <.001 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |

**Custom Hypothesis Test 3 (L2 Contextual Effect of Verbal)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Contrast Estimates**a,b |  |  |  |  |  |  |  |
| Contrast | Estimate | Std. Error | df | Test Value | t | Sig. | 95% Confidence Interval |
| Lower Bound |
| L1 | 1.237 | .277 | 226.195 | 0 | 4.468 | <.001 | .692 |

|  |  |
| --- | --- |
| **Contrast Estimates**a,b |  |
| Contrast | 95% Confidence Interval |
| Upper Bound |
| L1 | 1.783 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |
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| --- | --- |
| a. L2 Contextual Effect of Verbal |  |
| b. Dependent Variable: langpost. |  |

SPSS Model 2b: Add Random Cluster-MC-L1 Student Verbal

**Mixed Model Analysis**

|  |  |  |
| --- | --- | --- |
| **Notes** |  |  |
| Output Created |  | 23-SEP-2023 15:50:12 |
| Comments |  |  |
| Input | Active Dataset | Example |
| Filter | <none> |
| Weight | <none> |
| Split File | <none> |
| N of Rows in Working Data File | 3566 |
| Missing Value Handling | Definition of Missing | User-defined missing values are treated as valid data. |
| Cases Used | Statistics are based on all cases with valid data for all variables in the model. |
| Weight Handling |  | not applicable |
| Syntax |  | MIXED langpost BY schoolID WITH hw2 mixgrd CMverb10 WCverb /METHOD = REML /CRITERIA = DFMETHOD(SATTERTHWAITE) /PRINT = SOLUTION TESTCOV /FIXED = hw2 mixgrd CMverb10 WCverb /RANDOM = INTERCEPT WCverb | COVTYPE(UN) SUBJECT(schoolID) /TEST = "F-test of Model Total-R2" hw2 1; mixgrd 1; CMverb10 1; WCverb 1 /TEST = "F-Test of Verbal Slopes (Change in Total-R2)" CMverb10 1; WCverb 1 /TEST = "L2 Contextual Effect of Verbal" CMverb10 1 WCverb -1. |
| Resources | Processor Time | 00:00:00.17 |
| Elapsed Time | 00:00:00.30 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Model Dimension**a |  |  |  |  |  |
|  |  | Number of Levels | Covariance Structure | Number of Parameters | Subject Variables |
| Fixed Effects | Intercept | 1 |  | 1 |  |
| hw2 | 1 |  | 1 |  |
| mixgrd | 1 |  | 1 |  |
| CMverb10 | 1 |  | 1 |  |
| WCverb | 1 |  | 1 |  |
| Random Effects | Intercept + WCverb | 2 | Unstructured | 3 | schoolID |
| Residual |  |  |  | 1 |  |
| Total |  | 7 |  | 9 |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |  |

|  |  |
| --- | --- |
| **Information Criteria**a |  |
| -2 Restricted Log Likelihood | 23595.78283814 |
| Akaike's Information Criterion (AIC) | 23603.78283814 |
| Hurvich and Tsai's Criterion (AICC) | 23603.79408673 |
| Bozdogan's Criterion (CAIC) | 23632.49402487 |
| Schwarz's Bayesian Criterion (BIC) | 23628.49402487 |

|  |  |
| --- | --- |
| The information criteria are displayed in smaller-is-better form.a |  |
| a. Dependent Variable: langpost. |  |

|  |  |  |
| --- | --- | --- |
| **Coefficients of Determination** |  |  |
| Pseudo-R Square Measures | Marginal | .378 |
| Conditional | .495 |

|  |  |  |
| --- | --- | --- |
| **Intraclass Correlation Coefficients** |  |  |
| Overall ICCs | Adjusted | .189 |
| Conditional | .117 |

**Fixed Effects**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type III Tests of Fixed Effects**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| Intercept | 1 | 176.881 | 13486.392 | <.001 |
| hw2 | 1 | 177.677 | .045 | .832 |
| mixgrd | 1 | 200.922 | 3.416 | .066 |
| CMverb10 | 1 | 208.991 | 187.083 | <.001 |
| WCverb | 1 | 151.568 | 1285.811 | <.001 |

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| a. Dependent Variable: langpost. |  |  |  |  |

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Estimates of Fixed Effects**a |  |  |  |  |  |  |  |
| Parameter | Estimate | Std. Error | df | t | Sig. | 95% Confidence Interval |  |
| Lower Bound | Upper Bound |
| Intercept | 41.528 | .358 | 176.881 | 116.131 | <.001 | 40.822 | 42.234 |
| hw2 | -.095 | .446 | 177.677 | -.213 | .832 | -.976 | .786 |
| mixgrd | -.934 | .505 | 200.922 | -1.848 | .066 | -1.930 | .063 |
| CMverb10 | 3.621 | .265 | 208.991 | 13.678 | <.001 | 3.099 | 4.143 |
| WCverb | 2.449 | .068 | 151.568 | 35.858 | <.001 | 2.314 | 2.583 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |  |  |  |

**Covariance Parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Estimates of Covariance Parameters**a |  |  |  |  |  |  |
| Parameter |  | Estimate | Std. Error | Wald Z | Sig. | 95% Confidence Interval |
|  | Lower Bound |
| Residual |  | 39.758 | .991 | 40.119 | <.001 | 37.862 |
| Intercept + WCverb [subject = schoolID] | UN (1,1) | 8.467 | 1.135 | 7.456 | <.001 | 6.510 |
| UN (2,1) | -.694 | .238 | -2.910 | .004 | -1.161 |
| UN (2,2) | .223 | .086 | 2.593 | .010 | .105 |

|  |  |  |
| --- | --- | --- |
| **Estimates of Covariance Parameters**a |  |  |
| Parameter |  | 95% Confidence Interval |
|  | Upper Bound |
| Residual |  | 41.748 |
| Intercept + WCverb [subject = schoolID] | UN (1,1) | 11.012 |
| UN (2,1) | -.227 |
| UN (2,2) | .476 |

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| a. Dependent Variable: langpost. |  |  |

**Custom Hypothesis Test 1 (F-test of Model Total-R2)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Contrast Estimates**a,b |  |  |  |  |  |  |  |
| Contrast | Estimate | Std. Error | df | Test Value | t | Sig. | 95% Confidence Interval |
| Lower Bound |
| L1 | -.095 | .446 | 177.677 | 0 | -.213 | .832 | -.976 |
| L2 | -.934 | .505 | 200.922 | 0 | -1.848 | .066 | -1.930 |
| L3 | 3.621 | .265 | 208.991 | 0 | 13.678 | <.001 | 3.099 |
| L4 | 2.449 | .068 | 151.568 | 0 | 35.858 | <.001 | 2.314 |

|  |  |
| --- | --- |
| **Contrast Estimates**a,b |  |
| Contrast | 95% Confidence Interval |
| Upper Bound |
| L1 | .786 |
| L2 | .063 |
| L3 | 4.143 |
| L4 | 2.583 |

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| --- | --- |
| a. F-test of Model Total-R2 |  |
| b. Dependent Variable: langpost. |  |

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| --- | --- | --- | --- | --- |
| **Test of Contrasts**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| F-test of Model Total-R2 | 4 | 182.372 | 374.710 | <.001 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |

**Custom Hypothesis Test 2 (F-Test of Verbal Slopes (Change in Total-R2))**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Contrast Estimates**a,b |  |  |  |  |  |  |  |
| Contrast | Estimate | Std. Error | df | Test Value | t | Sig. | 95% Confidence Interval |
| Lower Bound |
| L1 | 3.621 | .265 | 208.991 | 0 | 13.678 | <.001 | 3.099 |
| L2 | 2.449 | .068 | 151.568 | 0 | 35.858 | <.001 | 2.314 |

|  |  |
| --- | --- |
| **Contrast Estimates**a,b |  |
| Contrast | 95% Confidence Interval |
| Upper Bound |
| L1 | 4.143 |
| L2 | 2.583 |

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| --- | --- |
| a. F-Test of Verbal Slopes (Change in Total-R2) |  |
| b. Dependent Variable: langpost. |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Test of Contrasts**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| F-Test of Verbal Slopes (Change in Total-R2) | 2 | 175.639 | 733.586 | <.001 |

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| --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |

**Custom Hypothesis Test 3 (L2 Contextual Effect of Verbal)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Contrast Estimates**a,b |  |  |  |  |  |  |  |
| Contrast | Estimate | Std. Error | df | Test Value | t | Sig. | 95% Confidence Interval |
| Lower Bound |
| L1 | 1.173 | .273 | 235.104 | 0 | 4.295 | <.001 | .635 |

|  |  |
| --- | --- |
| **Contrast Estimates**a,b |  |
| Contrast | 95% Confidence Interval |
| Upper Bound |
| L1 | 1.710 |

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| a. L2 Contextual Effect of Verbal |  |
| b. Dependent Variable: langpost. |  |

SPSS Model 2c: Add Cross-Level Interactions with Cluster-MC-L1 Student Verbal

**Mixed Model Analysis**

|  |  |  |
| --- | --- | --- |
| **Notes** |  |  |
| Output Created |  | 23-SEP-2023 15:50:12 |
| Comments |  |  |
| Input | Active Dataset | Example |
| Filter | <none> |
| Weight | <none> |
| Split File | <none> |
| N of Rows in Working Data File | 3566 |
| Missing Value Handling | Definition of Missing | User-defined missing values are treated as valid data. |
| Cases Used | Statistics are based on all cases with valid data for all variables in the model. |
| Weight Handling |  | not applicable |
| Syntax |  | MIXED langpost BY schoolID WITH hw2 mixgrd CMverb10 WCverb /METHOD = REML /CRITERIA = DFMETHOD(SATTERTHWAITE) /PRINT = SOLUTION TESTCOV /FIXED = hw2 mixgrd CMverb10 WCverb hw2\*WCverb mixgrd\*WCverb CMverb10\*WCverb /RANDOM = INTERCEPT WCverb | COVTYPE(UN) SUBJECT(schoolID). |
| Resources | Processor Time | 00:00:00.28 |
| Elapsed Time | 00:00:00.36 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Model Dimension**a |  |  |  |  |  |
|  |  | Number of Levels | Covariance Structure | Number of Parameters | Subject Variables |
| Fixed Effects | Intercept | 1 |  | 1 |  |
| hw2 | 1 |  | 1 |  |
| mixgrd | 1 |  | 1 |  |
| CMverb10 | 1 |  | 1 |  |
| WCverb | 1 |  | 1 |  |
| hw2 \* WCverb | 1 |  | 1 |  |
| mixgrd \* WCverb | 1 |  | 1 |  |
| CMverb10 \* WCverb | 1 |  | 1 |  |
| Random Effects | Intercept + WCverb | 2 | Unstructured | 3 | schoolID |
| Residual |  |  |  | 1 |  |
| Total |  | 10 |  | 12 |  |

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| --- | --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |  |

|  |  |
| --- | --- |
| **Information Criteria**a |  |
| -2 Restricted Log Likelihood | 23598.02811882 |
| Akaike's Information Criterion (AIC) | 23606.02811882 |
| Hurvich and Tsai's Criterion (AICC) | 23606.03937691 |
| Bozdogan's Criterion (CAIC) | 23634.73593429 |
| Schwarz's Bayesian Criterion (BIC) | 23630.73593429 |

|  |  |
| --- | --- |
| The information criteria are displayed in smaller-is-better form.a |  |
| a. Dependent Variable: langpost. |  |

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| --- | --- | --- |
| **Coefficients of Determination** |  |  |
| Pseudo-R Square Measures | Marginal | .379 |
| Conditional | .496 |

|  |  |  |
| --- | --- | --- |
| **Intraclass Correlation Coefficients** |  |  |
| Overall ICCs | Adjusted | .189 |
| Conditional | .117 |

**Fixed Effects**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type III Tests of Fixed Effects**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| Intercept | 1 | 172.367 | 13123.011 | <.001 |
| hw2 | 1 | 178.582 | .010 | .920 |
| mixgrd | 1 | 196.770 | 4.851 | .029 |
| CMverb10 | 1 | 206.871 | 180.850 | <.001 |
| WCverb | 1 | 128.605 | 569.479 | <.001 |
| hw2 \* WCverb | 1 | 142.965 | .184 | .668 |
| mixgrd \* WCverb | 1 | 228.418 | 4.087 | .044 |
| CMverb10 \* WCverb | 1 | 181.858 | .313 | .576 |

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| --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |

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| --- | --- | --- | --- | --- | --- | --- |
| **Estimates of Fixed Effects**a |  |  |  |  |  |  |
| Parameter | Estimate | Std. Error | df | t | Sig. | 95% Confidence Interval |
| Lower Bound |
| Intercept | 41.583 | .363 | 172.367 | 114.556 | <.001 | 40.867 |
| hw2 | -.046 | .459 | 178.582 | -.100 | .920 | -.952 |
| mixgrd | -1.137 | .516 | 196.770 | -2.202 | .029 | -2.155 |
| CMverb10 | 3.644 | .271 | 206.871 | 13.448 | <.001 | 3.110 |
| WCverb | 2.390 | .100 | 128.605 | 23.864 | <.001 | 2.192 |
| hw2 \* WCverb | -.056 | .130 | 142.965 | -.429 | .668 | -.314 |
| mixgrd \* WCverb | .321 | .159 | 228.418 | 2.022 | .044 | .008 |
| CMverb10 \* WCverb | -.044 | .078 | 181.858 | -.560 | .576 | -.198 |

|  |  |
| --- | --- |
| **Estimates of Fixed Effects**a |  |
| Parameter | 95% Confidence Interval |
| Upper Bound |
| Intercept | 42.300 |
| hw2 | .860 |
| mixgrd | -.119 |
| CMverb10 | 4.179 |
| WCverb | 2.588 |
| hw2 \* WCverb | .202 |
| mixgrd \* WCverb | .634 |
| CMverb10 \* WCverb | .110 |

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| a. Dependent Variable: langpost. |  |

**Covariance Parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Estimates of Covariance Parameters**a |  |  |  |  |  |  |
| Parameter |  | Estimate | Std. Error | Wald Z | Sig. | 95% Confidence Interval |
|  | Lower Bound |
| Residual |  | 39.740 | .990 | 40.131 | <.001 | 37.845 |
| Intercept + WCverb [subject = schoolID] | UN (1,1) | 8.472 | 1.136 | 7.459 | <.001 | 6.514 |
| UN (2,1) | -.710 | .238 | -2.984 | .003 | -1.177 |
| UN (2,2) | .223 | .086 | 2.582 | .010 | .104 |

|  |  |  |
| --- | --- | --- |
| **Estimates of Covariance Parameters**a |  |  |
| Parameter |  | 95% Confidence Interval |
|  | Upper Bound |
| Residual |  | 41.729 |
| Intercept + WCverb [subject = schoolID] | UN (1,1) | 11.018 |
| UN (2,1) | -.244 |
| UN (2,2) | .477 |

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| a. Dependent Variable: langpost. |  |  |

SPSS Model 3a: Add L2-CM and Consant-C-L1 Student Verbal

**Mixed Model Analysis**

|  |  |  |
| --- | --- | --- |
| **Notes** |  |  |
| Output Created |  | 23-SEP-2023 15:50:12 |
| Comments |  |  |
| Input | Active Dataset | Example |
| Filter | <none> |
| Weight | <none> |
| Split File | <none> |
| N of Rows in Working Data File | 3566 |
| Missing Value Handling | Definition of Missing | User-defined missing values are treated as valid data. |
| Cases Used | Statistics are based on all cases with valid data for all variables in the model. |
| Weight Handling |  | not applicable |
| Syntax |  | MIXED langpost BY schoolID WITH hw2 mixgrd CMverb10 verb10 /METHOD = REML /CRITERIA = DFMETHOD(SATTERTHWAITE) /PRINT = SOLUTION TESTCOV /FIXED = hw2 mixgrd CMverb10 verb10 /RANDOM = INTERCEPT | COVTYPE(UN) SUBJECT(schoolID) /TEST = "F-test of Model Total-R2" hw2 1; mixgrd 1; CMverb10 1; verb10 1 /TEST = "F-Test of Verbal Slopes (Change in Total-R2)" CMverb10 1; verb10 1 /TEST = "L2 Between Effect of Verbal" CMverb10 1 verb10 1. |
| Resources | Processor Time | 00:00:00.13 |
| Elapsed Time | 00:00:00.18 |

|  |
| --- |
| **Warnings** |
| The covariance structure for random effect with only one level will be changed to Identity. |

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| --- | --- | --- | --- | --- | --- |
| **Model Dimension**a |  |  |  |  |  |
|  |  | Number of Levels | Covariance Structure | Number of Parameters | Subject Variables |
| Fixed Effects | Intercept | 1 |  | 1 |  |
| hw2 | 1 |  | 1 |  |
| mixgrd | 1 |  | 1 |  |
| CMverb10 | 1 |  | 1 |  |
| verb10 | 1 |  | 1 |  |
| Random Effects | Intercept | 1 | Identity | 1 | schoolID |
| Residual |  |  |  | 1 |  |
| Total |  | 6 |  | 7 |  |

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| --- | --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |  |

|  |  |
| --- | --- |
| **Information Criteria**a |  |
| -2 Restricted Log Likelihood | 23615.07406508 |
| Akaike's Information Criterion (AIC) | 23619.07406508 |
| Hurvich and Tsai's Criterion (AICC) | 23619.07743777 |
| Bozdogan's Criterion (CAIC) | 23633.42965845 |
| Schwarz's Bayesian Criterion (BIC) | 23631.42965845 |

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| --- | --- |
| The information criteria are displayed in smaller-is-better form.a |  |
| a. Dependent Variable: langpost. |  |

|  |  |  |
| --- | --- | --- |
| **Coefficients of Determination** |  |  |
| Pseudo-R Square Measures | Marginal | .377 |
| Conditional | .484 |

|  |  |  |
| --- | --- | --- |
| **Intraclass Correlation Coefficients** |  |  |
| Overall ICCs | Adjusted | .172 |
| Conditional | .107 |

**Fixed Effects**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type III Tests of Fixed Effects**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| Intercept | 1 | 172.109 | 13161.283 | <.001 |
| hw2 | 1 | 178.461 | .013 | .909 |
| mixgrd | 1 | 197.054 | 4.723 | .031 |
| CMverb10 | 1 | 226.195 | 19.963 | <.001 |
| verb10 | 1 | 3372.684 | 1795.256 | <.001 |

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| a. Dependent Variable: langpost. |  |  |  |  |

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Estimates of Fixed Effects**a |  |  |  |  |  |  |  |
| Parameter | Estimate | Std. Error | df | t | Sig. | 95% Confidence Interval |  |
| Lower Bound | Upper Bound |
| Intercept | 41.579 | .362 | 172.109 | 114.723 | <.001 | 40.864 | 42.295 |
| hw2 | -.053 | .459 | 178.461 | -.115 | .909 | -.957 | .852 |
| mixgrd | -1.121 | .516 | 197.054 | -2.173 | .031 | -2.138 | -.104 |
| CMverb10 | 1.237 | .277 | 226.195 | 4.468 | <.001 | .692 | 1.783 |
| verb10 | 2.423 | .057 | 3372.684 | 42.370 | <.001 | 2.311 | 2.535 |

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| a. Dependent Variable: langpost. |  |  |  |  |  |  |  |

**Covariance Parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Estimates of Covariance Parameters**a |  |  |  |  |  |  |
| Parameter |  | Estimate | Std. Error | Wald Z | Sig. | 95% Confidence Interval |
|  | Lower Bound |
| Residual |  | 40.550 | .987 | 41.065 | <.001 | 38.660 |
| Intercept [subject = schoolID] | Variance | 8.395 | 1.133 | 7.411 | <.001 | 6.444 |

|  |  |  |
| --- | --- | --- |
| **Estimates of Covariance Parameters**a |  |  |
| Parameter |  | 95% Confidence Interval |
|  | Upper Bound |
| Residual |  | 42.533 |
| Intercept [subject = schoolID] | Variance | 10.937 |

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|  |  |  |  |  |  |  |

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| a. Dependent Variable: langpost. |  |  |

**Custom Hypothesis Test 1 (F-test of Model Total-R2)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Contrast Estimates**a,b |  |  |  |  |  |  |  |
| Contrast | Estimate | Std. Error | df | Test Value | t | Sig. | 95% Confidence Interval |
| Lower Bound |
| L1 | -.053 | .459 | 178.461 | 0 | -.115 | .909 | -.957 |
| L2 | -1.121 | .516 | 197.054 | 0 | -2.173 | .031 | -2.138 |
| L3 | 1.237 | .277 | 226.195 | 0 | 4.468 | <.001 | .692 |
| L4 | 2.423 | .057 | 3372.684 | 0 | 42.370 | <.001 | 2.311 |

|  |  |
| --- | --- |
| **Contrast Estimates**a,b |  |
| Contrast | 95% Confidence Interval |
| Upper Bound |
| L1 | .852 |
| L2 | -.104 |
| L3 | 1.783 |
| L4 | 2.535 |

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| --- | --- |
| a. F-test of Model Total-R2 |  |
| b. Dependent Variable: langpost. |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Test of Contrasts**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| F-test of Model Total-R2 | 4 | 261.093 | 498.718 | <.001 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |

**Custom Hypothesis Test 2 (F-Test of Verbal Slopes (Change in Total-R2))**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Contrast Estimates**a,b |  |  |  |  |  |  |  |
| Contrast | Estimate | Std. Error | df | Test Value | t | Sig. | 95% Confidence Interval |
| Lower Bound |
| L1 | 1.237 | .277 | 226.195 | 0 | 4.468 | <.001 | .692 |
| L2 | 2.423 | .057 | 3372.684 | 0 | 42.370 | <.001 | 2.311 |

|  |  |
| --- | --- |
| **Contrast Estimates**a,b |  |
| Contrast | 95% Confidence Interval |
| Upper Bound |
| L1 | 1.783 |
| L2 | 2.535 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
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|  |  |
| --- | --- |
| a. F-Test of Verbal Slopes (Change in Total-R2) |  |
| b. Dependent Variable: langpost. |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Test of Contrasts**a |  |  |  |  |
| Source | Numerator df | Denominator df | F | Sig. |
| F-Test of Verbal Slopes (Change in Total-R2) | 2 | 426.868 | 988.863 | <.001 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a. Dependent Variable: langpost. |  |  |  |  |

**Custom Hypothesis Test 3 (L2 Between Effect of Verbal)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Contrast Estimates**a,b |  |  |  |  |  |  |  |
| Contrast | Estimate | Std. Error | df | Test Value | t | Sig. | 95% Confidence Interval |
| Lower Bound |
| L1 | 3.660 | .271 | 207.396 | 0 | 13.508 | <.001 | 3.126 |

|  |  |
| --- | --- |
| **Contrast Estimates**a,b |  |
| Contrast | 95% Confidence Interval |
| Upper Bound |
| L1 | 4.194 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

|  |  |
| --- | --- |
| a. L2 Between Effect of Verbal |  |
| b. Dependent Variable: langpost. |  |