**Appendix 1. Descriptive and Inferential Statistical Results.** All charts prepared with DATAtab (DATAtab Team 2022).

Tables A1–A28: Descriptive and inferential statistics for Time as independent variable.

Tables A29–A48: Descriptive and inferential statistics for assessing relationships between categorical variables.

Table A49–A59: Statistics for ‘fire’, ‘to complete, finish’, and ‘cacao’.

Tables A60–A63: Statistics for Time and Region.

**Table A1**. Descriptive statistics of 22A according to time. a) Dated texts. b) All texts according to Period (Early Classic, Late Classic).

a. Dated texts (Gregorian Years)

|  | Gregorian |
| --- | --- |
| Mean | 699.82 |
| Median | 728 |
| Modal | 692 |
| Std. Deviation | 95.37 |
| Minimum | 445 |
| Maximum | 874 |
| Range | 429 |
| Mean ± Std. | 699.82 ± 95.37 |

b. Texts by Period (Early Classic vs. Late Classic)

| Period | Frequency | % |
| --- | --- | --- |
| EC | 28 | 22.4% |
| LC | 97 | 77.6% |
| Total | 125 | 100% |
| Invalid | 0 | 0% |
| Total | 125 | 100% |

**Figure A1**. Distribution of texts in dataset. a) Distribution of dated texts (N = 74). The dashed horizontal bar represents the median, and the dashed diamond represents the Standard Deviation. b) Distribution of all texts by period (Early Classic, Late Classic) (N = 125).

|  |  |
| --- | --- |
| **Chart, diagram, box and whisker chart  Description automatically generated****a** | **Chart, bar chart  Description automatically generated****b** |

**Table A2**. Tests for normal distribution of all dated texts (Gregorian years).

|  |  |  |
| --- | --- | --- |
|  | Statistics | p |
| Kolmogorov-Smirnov | 0.19 | 0.008 |
| Kolmogorov-Smirnov (Lilliefors Corr.) | 0.19 | <.001 |
| Shapiro-Wilk | 0.87 | <.001 |
| Anderson-Darling | 3.47 | <.001 |

**Figure A2.** Tests of normal distribution for dated texts. a) Histogram. b) Normal Probability Plot.

|  |  |
| --- | --- |
| **a** | **b** |

**Table A3**. Descriptive statistics for 22A according to Media (portable, monumental) and Time.

a. Media according to Time (Gregorian)

|  |  | Monument | Portable |
| --- | --- | --- | --- |
|  | Frequency | 67 | 7 |
|  | % | 90.54% | 9.46% |
| Gregorian | Mean | 698.7 | 710.57 |
|  | Median | 714 | 755 |
|  | Modal | 692 | 457 |
|  | Std. Deviation | 94.01 | 115.24 |
|  | Minimum | 445 | 457 |
|  | Maximum | 874 | 795 |

b. Media according to Time (Period)

|  |  | Early Classic | Late Classic | Total |
| --- | --- | --- | --- | --- |
|  |  | n | % | n | % | n | % |
| Media | Monument | 10 | 8% | 61 | 48.8% | 71 | 56.8% |
|  | Portable | 18 | 14.4% | 36 | 28.8% | 54 | 43.2% |
|  | Total | 28 | 22.4% | 97 | 77.6% | 125 | 100% |

**Table A4**. Statistical tests for relationship between Media types and Time (Period). a) Mann-Whitney U-Test results. b) Chi-Square Test results. c) Observed and expected frequencies, with higher than expected values in bold.

| a. | Statistics for Chi-Square Test |
| --- | --- |
|  |     | Values    |
|  | Chi2    | 6.54    |
|  | Df | 1 |
|  | p   | .011    |
|  | Cramér’s V | .23 |
| b. | Observed and expected (italics) frequencies |  |
|  |     |     | Period     |     |
|  |     |     | LC    | EC    | Total    |
|  | Media     | Monument    | **61** | 10    | 71    |
|  |  |  | *55.1* | *15.9* | 71 |
|  |  | Portable    | 36    | **18** | 54    |
|  |     |  | *41.9* | *12.1* | 54 |
|  |     | Total    | 97    | 28    | 125    |
| c. | Statistics for Mann-Whitney U-Test (N = 86) |
|  |     | Values    |
|  | Mann-Whitney U    | 1,548    |
|  | Z    | -2.55    |
|  | Asymptotic Significance (2-tailed)    | .011    |
|  | Exact Significance (2-tailed)    | .067    |
|  | Effect size (r) | .29 (small effect) |

**Table A5.** Statistics for Mann-Whitney U-Test of dated texts (Gregorian years, N = 74) according to Media. a) Descriptive statistics. b) Ranks. c) Statistics for Mann-Whitney U-Test,

a. Descriptive Statistics

|  |  | N | Mean | Median | Standard deviation |
| --- | --- | --- | --- | --- | --- |
| Gregorian | portable | 7 | 710.57 | 755 | 115.24 |
|  | monument | 67 | 698.7 | 714 | 94.01 |

b. Ranks

|  | N | Mean Rank | Sum of Ranks |
| --- | --- | --- | --- |
| portable | 7 | 44.21 | 309.5 |
| monument | 67 | 36.8 | 2,465.5 |
| Total | 74 |  |  |

c. Statistics for Mann-Whitney U-Test

|     | Values    |
| --- | --- |
| Mann-Whitney U    | 187.5    |
| Z    | -0.87    |
| Asymptotic Significance (2-tailed)    | .385    |
| Exact Significance (2-tailed)    | .392    |

**Table A6**. Descriptive statistics for 22A according to Graphemic Type and Time.

a. Target Grapheme Types according to Time (Gregorian)

|  |  | N | Mean | Median | Standard deviation |
| --- | --- | --- | --- | --- | --- |
| Gregorian | Syllabogram | 62 | 692.5 | 720 | 99.55 |
|  | Logogram | 12 | 737.67 | 744.5 | 59.46 |

b. Target Grapheme Types according to Time (Period)

|  | Early Classic | Late Classic | Total |
| --- | --- | --- | --- |
|  | n | % | n | % | n | % |
| Syllabogram | 27 | 21.6% | 80 | 64% | 107 | 85.6% |
| Logogram | 1 | 0.8% | 17 | 13.6% | 18 | 14.4% |
| Total | 28 | 22.4% | 97 | 77.6% | 125 | 100% |

**Table A7**. Inferential statistical tests: Grapheme Type according to Time. a) Period. b) Gregorian.

| a. | Statistics for Mann-Whitney U-Test for grapheme type by Period |
| --- | --- |
|     | Values    |
| Mann-Whitney U    | 773.5    |
| Z    | -1.85    |
| Asymptotic Significance (2-tailed)    | .065    |
| Exact Significance (2-tailed)    | .185    |
| b.  | Statistics for Chi-Square Test for grapheme type by Period |
|  | Values |
| Chi2    | 3.43    |
| df    | 1    |
| p    | .064    |
| r | 0.1 (small effect) |
| c. | Statistics for Mann-Whitney U-Test for grapheme type by time (Gregorian) |
|     | Values    |
| Mann-Whitney U    | 296    |
| Z    | -0.81    |
| Asymptotic Significance (2-tailed)    | .417    |
| Exact Significance (2-tailed)    | .424    |

**Table A8**. Descriptive statistics for 22A according to Broad Phonological Class of initial consonant of target syllabogram or logogram.

a. Broad phonological class according to time (Gregorian years)

|  |  | N | Mean | Median | Standard deviation |
| --- | --- | --- | --- | --- | --- |
| Gregorian | Obstruent | 57 | 688.47 | 702 | 98.81 |
|  | Sonorant | 17 | 737.88 | 756 | 72.98 |

b. Broad phonological class according to time (Period)

|  | Early Classic | Late Classic | Total |
| --- | --- | --- | --- |
|  | n | % | n | % | n | % |
| Sonorant | 1 | 0.8% | 25 | 20% | 26 | 20.8% |
| Obstruent | 27 | 21.6% | 72 | 57.6% | 99 | 79.2% |
| Total | 28 | 22.4% | 97 | 77.6% | 125 | 100% |

**Table A9**. Inferential statistics results: Broad Phonological Class and Time. a) Chi-Square Test for Period. b) Statistics for Mann-Whitney U-Test for Gregorian. c) Ranks of Mann-Whitney U-Test.

|  |  |
| --- | --- |
| a. | Chi-Square Test for independence of phonological class and period (all dated texts) |
|  |  | Values |
|  | Chi2    | 6.5    |
|  | df    | 1    |
|  | p    | .011    |
| b. | Mann-Whitney U-Test for independence of phonological class and time (dated texts) |
|     | Values    |
| Mann-Whitney U    | 301.5    |
|  | Z    | -2.35    |
|  | Asymptotic Significance (2-tailed)    | .019    |
|  | Exact Significance (2-tailed)    | .019    |

c. Ranks

|  | N | Mean Rank | Sum of Ranks |
| --- | --- | --- | --- |
| Obstruent | 57 | 34.29 | 1,954.5 |
| Sonorant | 17 | 48.26 | 820.5 |
| Total | 74 |  |  |

**Table A10.** Distribution of 22A according to Narrow Phonological Class 1 and Time.

a. Descriptive statistics for Narrow Phonological Class 1 for dated texts (Gregorian)

|  |  | Stop | Affricate | Liquid | Nasal | Fricative | Semivowel |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Frequency | 45 | 10 | 8 | 8 | 2 | 1 |
| Gregorian | Mean | 679.56 | 714.4 | 774.38 | 694.75 | 759.5 | 791 |
|  | Std. Deviation | 107.49 | 43.27 | 33.93 | 83.5 | 33.23 | NaN |
|  | Minimum | 445 | 669 | 711 | 518 | 736 | 791 |
|  | Maximum | 874 | 791 | 810 | 771 | 783 | 791 |

b. Descriptive statistics for Narrow Phonological Class 1 for all texts (Period)

|  | Liquid | Stop | Nasal | Affricate | Fricative | Semivowel | Total |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Early Classic | 0 | 27 | 1 | 0 | 0 | 0 | 28 |
| Late Classic | 10 | 58 | 10 | 11 | 3 | 5 | 97 |
| Total | 10 | 85 | 11 | 11 | 3 | 5 | 125 |

**Table A11**. Kruskal-Wallis Test statistics results for Narrow Phonological Class 1 and Time (Gregorian). a) Ranks. c) Statistics for Kruskal-Wallis Test. d) Dunn-Bonferroni Tests.

a. Ranks

| Groups | N | Mean Rank |
| --- | --- | --- |
| Affricate | 10 | 34.8 |
| Fricative | 2 | 54.5 |
| Liquid | 8 | 59.56 |
| Nasal | 8 | 34.25 |
| Stop | 45 | 33.19 |
| Total | 73 |  |

b. Statistics for Kruskal-Wallis Test

|  | Values |
| --- | --- |
| Chi2 | 12.13 |
| df | 4 |
| p | .016 |

c. Dunn-Bonferroni Tests

|  | Test Statistic | Std. Error | Std. Test Statistic | p | Adj. p |
| --- | --- | --- | --- | --- | --- |
| Liquid - Stop | 26.37 | 8.13 | 3.24 | .001 | .012 |

Adj. p: Values adjusted with Bonferroni correction.

**Table A12.** Kruskal-Wallis Test statistics results for Narrow Phonological Class 1 and Time (Period). a) Ranks. c) Statistics for Kruskal-Wallis Test. d) Dunn-Bonferroni Tests.

a. Ranks

| Groups | N | Mean Rank |
| --- | --- | --- |
| Liquid | 10 | 77 |
| Stop | 85 | 57.15 |
| Nasal | 11 | 71.32 |
| Affricate | 11 | 77 |
| Fricative | 3 | 77 |
| Semivowel | 5 | 77 |
| Total | 125 |  |

b. Statistics

|  | Values |
| --- | --- |
| Chi2 | 13.67 |
| df | 5 |
| p | .018 |

c. Dunn-Bonferroni-Tests

|  | Test Statistic | Std. Error | Std. Test Statistic | p | Adj. p |
| --- | --- | --- | --- | --- | --- |
| Liquid - Stop | 19.85 | 8.75 | 2.27 | .023 | .348 |
| Liquid - Nasal | 5.68 | 11.43 | 0.5 | .619 | 1 |
| Liquid - Affricate | 0 | 11.43 | 0 | 1 | 1 |
| Liquid - Fricative | 0 | 17.22 | 0 | 1 | 1 |
| Liquid - Semivowel | 0 | 14.33 | 0 | 1 | 1 |
| Stop - Nasal | -14.17 | 8.38 | -1.69 | .091 | 1 |
| Stop - Affricate | -19.85 | 8.38 | -2.37 | .018 | .268 |
| Stop - Fricative | -19.85 | 15.37 | -1.29 | .196 | 1 |
| Stop - Semivowel | -19.85 | 12.04 | -1.65 | .099 | 1 |
| Nasal - Affricate | -5.68 | 11.16 | -0.51 | .611 | 1 |
| Nasal - Fricative | -5.68 | 17.04 | -0.33 | .739 | 1 |
| Nasal - Semivowel | -5.68 | 14.11 | -0.4 | .687 | 1 |
| Affricate - Fricative | 0 | 17.04 | 0 | 1 | 1 |
| Affricate - Semivowel | 0 | 14.11 | 0 | 1 | 1 |
| Fricative - Semivowel | 0 | 19.11 | 0 | 1 | 1 |

Adj. p: Values adjusted with Bonferroni correction.

**Table A13**. Descriptive statistics for Narrow Phonological Class 2 with respect to Time.

a. Descriptive statistics for Narrow Phonological Class 2 for dated texts (Gregorian)

|  |  | Alveolar | Velar | Bilabial | Glottal | Palatal | Alveopalatal |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Frequency | 31 | 24 | 14 | 3 | 1 | 1 |
| Gregorian | Mean | 693.65 | 702.42 | 704.5 | 660.33 | 791 | 791 |
|  | Std. Deviation | 93.57 | 108.4 | 76.42 | 126.75 | NaN | NaN |
|  | Minimum | 475 | 445 | 518 | 514 | 791 | 791 |
|  | Maximum | 810 | 874 | 795 | 736 | 791 | 791 |

b. Descriptive statistics for Narrow Phonological Class 2 for all texts (Period)

|  |  | Alveolar | Velar | Bilabial | Alveopalatal | Palatal | Glottal | Total |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Period | EC | 6 | 20 | 1 | 0 | 0 | 1 | 28 |
|  | LC | 30 | 40 | 21 | 2 | 2 | 2 | 97 |
|  | Total | 36 | 60 | 22 | 2 | 2 | 3 | 125 |

**Table A14**. Kruskal-Wallis Test statistics results for Narrow Phonological Class 2 and Time (Gregorian). a) Ranks. c) Statistics for Kruskal-Wallis Test. d) Dunn-Bonferroni Tests.

a. Ranks

| Groups | N | Mean Rank |
| --- | --- | --- |
| Alveolar | 31 | 35.69 |
| Bilabial | 14 | 36.96 |
| Glottal | 3 | 30.83 |
| Velar | 24 | 37.98 |
| Total | 72 |  |

b. Statistics for Kruskal-Wallis Test

|  | Values |
| --- | --- |
| Chi2 | 0.39 |
| df | 3 |
| p | .942 |

c. Dunn-Bonferroni-Tests

|  | Test Statistic | Std. Error | Std. Test Statistic | p | Adj. p |
| --- | --- | --- | --- | --- | --- |
| Alveolar - Bilabial | -1.27 | 6.73 | -0.19 | .85 | 1 |
| Alveolar - Glottal | 4.86 | 12.64 | 0.38 | .701 | 1 |
| Alveolar - Velar | -2.29 | 5.68 | -0.4 | .688 | 1 |
| Bilabial - Glottal | 6.13 | 13.3 | 0.46 | .645 | 1 |
| Bilabial - Velar | -1.01 | 7.03 | -0.14 | .885 | 1 |
| Glottal - Velar | -7.15 | 12.8 | -0.56 | .577 | 1 |

Adj. p: Values adjusted with Bonferroni correction.

**Table A15.** Kruskal-Wallis Test statistics results for Narrow Phonological Class 2 and Time (Period). a) Ranks. c) Statistics for Kruskal-Wallis Test. d) Dunn-Bonferroni Tests.

a. Ranks

| Groups | N | Mean Rank |
| --- | --- | --- |
| Alveolar | 36 | 66.58 |
| Glottal | 3 | 56.17 |
| Bilabial | 22 | 74.16 |
| Alveopalatal | 2 | 77 |
| Velar | 60 | 56.17 |
| Palatal | 2 | 77 |
| Total | 125 |  |

b. Statistics for Kruskal-Wallis Test

|  | Values |
| --- | --- |
| Chi2 | 10.12 |
| df | 5 |
| p | .072 |

c. Dunn-Bonferroni-Tests

|  | Test Statistic | Std. Error | Std. Test Statistic | p | Adj. p |
| --- | --- | --- | --- | --- | --- |
| Alveolar - Velar | 7.13 | 5.71 | 1.25 | .212 | 1 |
| Alveolar - Bilabial | -9.26 | 7.29 | -1.27 | .204 | 1 |
| Alveolar - Alveopalatal | -12.1 | 19.09 | -0.63 | .526 | 1 |
| Alveolar - Palatal | -12.1 | 19.09 | -0.63 | .526 | 1 |
| Alveolar - Glottal | 8.74 | 15.82 | 0.55 | .581 | 1 |
| Velar - Bilabial | -16.39 | 6.45 | -2.54 | .011 | .166 |
| Velar - Alveopalatal | -19.23 | 18.78 | -1.02 | .306 | 1 |
| Velar - Palatal | -19.23 | 18.78 | -1.02 | .306 | 1 |
| Velar - Glottal | 1.6 | 15.45 | 0.1 | .917 | 1 |
| Bilabial - Alveopalatal | -2.84 | 19.32 | -0.15 | .883 | 1 |
| Bilabial - Palatal | -2.84 | 19.32 | -0.15 | .883 | 1 |
| Bilabial - Glottal | 17.99 | 16.1 | 1.12 | .264 | 1 |
| Alveopalatal - Palatal | 0 | 26.16 | 0 | 1 | 1 |
| Alveopalatal - Glottal | 20.83 | 23.88 | 0.87 | .383 | 1 |
| Palatal - Glottal | 20.83 | 23.88 | 0.87 | .383 | 1 |

Adj. p: Values adjusted with Bonferroni correction.

**Table A16**. Descriptive statistics for Broad Phonological Class 2 variable with respect to Time.

a. Broad Phonological Class 2 with respect to Time (Gregorian)

|  |  | Plain | Glottalic |
| --- | --- | --- | --- |
|  | Frequency | 33 | 22 |
| Gregorian | Mean | 660.12 | 724.55 |
|  | Std. Deviation | 108.95 | 69.2 |
|  | Minimum | 445 | 514 |
|  | Maximum | 795 | 874 |

b. Broad Phonological Class 2 with respect to Time (Period)

|  | Early Classic | Late Classic | Total |
| --- | --- | --- | --- |
|  | n | % | n | % | n | % |
| Glottalic | 3 | 3.13% | 27 | 28.13% | 30 | 31.25% |
| Plain | 24 | 25% | 42 | 43.75% | 66 | 68.75% |
| Total | 27 | 22.4% | 69 | 77.6% | 96 | 100% |

**Figure A3**. Graphic distribution of Broad Phonological Class 2 with respect to Time. a) Gregorian. b) Period (Early Classic, Late Classic).

|  |  |
| --- | --- |
| **Chart, box and whisker chart  Description automatically generated****a** | **Chart, bar chart  Description automatically generated****b** |

**Table A17**. Inferential statistics for Broad Phonological Class 2 with respect to Time. a)-b) Mann-Whitney U-Test results for dated (Gregorian) dataset. c)-d) Mann-Whitney U-Test results for dated and undated (Period) dataset.

a. Gregorian: Ranks

|  | N | Mean Rank | Sum of Ranks |
| --- | --- | --- | --- |
| Glottalic | 22 | 33.2 | 730.5 |
| Plain | 33 | 24.53 | 809.5 |
| Total | 55 |  |  |

b. Gregorian: Statistics

|  | Values |
| --- | --- |
| Mann-Whitney U | 248.5 |
| Z | -1.97 |
| Asymptotic Significance (2-tailed) | .049 |
| Exact Significance (2-tailed) | .051 |

c. Period: Ranks

|  | N | Mean Rank | Sum of Ranks |
| --- | --- | --- | --- |
| Glottalic | 30 | 57.2 | 1,716 |
| Plain | 66 | 44.55 | 2,940 |
| Total | 96 |  |  |

d. Period: Statistics

|  | Values |
| --- | --- |
| Mann-Whitney U | 729 |
| Z | -2.65 |
| Asymptotic Significance (2-tailed) | .008 |
| Exact Significance (2-tailed) | .04 |

**Table A18**. Descriptive statistics for Grammatical Class 1 and Grammatical Class 2 variables with respect to Time.

a. Grammatical Class 2 and Time (Gregorian).

|  |  | Noun | GramMorph | Verb |
| --- | --- | --- | --- | --- |
|  | Frequency | 58 | 8 | 8 |
| Gregorian | Mean | 694.21 | 732.75 | 707.63 |
|  | Std. Deviation | 100.94 | 94.12 | 38.02 |
|  | Minimum | 445 | 514 | 669 |
|  | Maximum | 874 | 810 | 782 |

b. Grammatical Class 1 and Time (Gregorian).

|  |  | N | Mean | Std. Deviation | Std. Error Mean |
| --- | --- | --- | --- | --- | --- |
| Gregorian | Noun | 66 | 698.88 | 100.25 | 12.34 |
|  | Verb | 8 | 707.63 | 38.02 | 13.44 |

c. Grammatical Class 2 and Time (Period).

|  |  | Early Classic | Late Classic | Total |
| --- | --- | --- | --- | --- |
|  |  | n | % | n | % | n | % |
| Grammatical Class2 | GramMorph | 1 | 0.8% | 8 | 6.4% | 9 | 7.2% |
|  | Noun | 27 | 21.6% | 81 | 64.8% | 108 | 86.4% |
|  | Verb | 0 | 0% | 8 | 6.4% | 8 | 6.4% |
|  | Total | 28 | 22.4% | 97 | 77.6% | 125 | 100% |

d. Grammatical Class 1 and Time (Period).

|  |  | Early Classic | Late Classic | Total |
| --- | --- | --- | --- | --- |
|  |  | n | % | n | % | n | % |
| Grammatical Class1 | Noun | 28 | 22.4% | 89 | 71.2% | 117 | 93.6% |
|  | Verb | 0 | 0% | 8 | 6.4% | 8 | 6.4% |
|  | Total | 28 | 22.4% | 97 | 77.6% | 125 | 100% |

**Table A19**. Inferential statistics for Grammatical Class 1 and 2 with respect to Time (Period).

a. Grammatical Class 1: Ranks

|  | N | Mean Rank | Sum of Ranks |
| --- | --- | --- | --- |
| Noun | 117 | 62.04 | 7,259 |
| Verb | 8 | 77 | 616 |
| Total | 125 |  |  |

b. Grammatical Class 1: Statistics for Mann-Whitney U-Test

|  | Values |
| --- | --- |
| Mann-Whitney U | 356 |
| Z | -1.56 |
| Asymptotic Significance (2-tailed) | .118 |
| Exact Significance (2-tailed) | .261 |

c. Grammatical Class 2: Ranks

| Groups | N | Mean Rank |
| --- | --- | --- |
| GramMorph | 9 | 70.06 |
| Noun | 108 | 61.38 |
| Verb | 8 | 77 |
| Total | 125 |  |

d. Grammatical Class 2: Statistics for Kruskal-Wallis Test

|  | Values |
| --- | --- |
| Chi2 | 3.36 |
| df | 2 |
| p | .186 |

e. Grammatical Class 2: Dunn-Bonferroni-Tests

|  | Test Statistic | Std. Error | Std. Test Statistic | p | Adj. p |
| --- | --- | --- | --- | --- | --- |
| GramMorph - Noun | 8.68 | 9.08 | 0.96 | .339 | 1 |
| GramMorph - Verb | -6.94 | 12.71 | -0.55 | .585 | 1 |
| Noun - Verb | -15.63 | 9.59 | -1.63 | .103 | .309 |

Adj. p: Values adjusted with Bonferroni correction.

**Table A20**. Inferential statistics for Grammatical Class 1 and 2 with respect to Time (Gregorian).

a. Grammatical Class 1: Ranks for Mann-Whitney U-Test

|  | N | Mean Rank | Sum of Ranks |
| --- | --- | --- | --- |
| Noun | 66 | 38.17 | 2,519.5 |
| Verb | 8 | 31.94 | 255.5 |
| Total | 74 |  |  |

b. Grammatical Class 1: Statistics for Mann-Whitney U-Test

|     | Values    |
| --- | --- |
| Mann-Whitney U    | 219.5    |
| Z    | -0.78    |
| Asymptotic Significance (2-tailed)    | .438    |
| Exact Significance (2-tailed)    | .445    |

c. Grammatical Class 2: Ranks for Kruskal-Wallis Test

| Groups | N | Mean Rank |
| --- | --- | --- |
| Noun | 58 | 36.78 |
| GramMorph | 8 | 48.31 |
| Verb | 8 | 31.94 |
| Total | 74 |  |

d. Grammatical Class 2: Statistics for Kruskal-Wallis Test

|  | Values |
| --- | --- |
| Chi2 | 2.63 |
| df | 2 |
| p | .268 |

e. Grammatical Class 2: Dunn-Bonferroni-Tests

|  | Test Statistic | Std. Error | Std. Test Statistic | p | Adj. p |
| --- | --- | --- | --- | --- | --- |
| Noun - GramMorph | -11.54 | 8.1 | -1.42 | .154 | .463 |
| Noun - Verb | 4.84 | 8.1 | 0.6 | .55 | 1 |
| GramMorph - Verb | 16.38 | 10.74 | 1.52 | .127 | .382 |

Adj. p: Values adjusted with Bonferroni correction.

**Table A21**. Inferential statistics results: Grammatical Class 1 (no cases of grammatical morphemes included) and Period.

a. Chi-Square Test for independence of grammatical class and period (all texts).

|  |  |
| --- | --- |
|  | Values |
| Chi2    | 0.21    |
| df    | 1    |
| p    | .646    |

b. Observed and expected (italics) frequencies

|     |     | GRclass     |     |
| --- | --- | --- | --- |
|     |     | Noun    | Verb    | Total    |
| Period     | EC    | 7    | 0    | 7    |
|  |  | *6.83* | *0.17* |  |
|     | LC    | 33    | 1    | 34    |
|  |  | *33.17* | *0.83* |  |
|     | Total    | 40    | 1    | 41    |

**Table A22**. Inferential statistics results: Grammatical Class 1 and Period with specified frequencies based on linguistic (Ch’olan) data for nouns and verbs with C1VC1 shapes.

a. Observed and specified (italics) frequencies

|     | Grammatical Class 1        |
| --- | --- |
|     | Nouns    | Verbs | Total    |
| LC    | 89    | 8    | 97    |
|  | *58.9* | *38.1* |  |
| EC    | 28    | 0    | 28    |
|  | *17* | *11* |  |
| Total    | 117    | 8    | 125    |
|  | *75.9* | *49.1* |  |

b. Chi-Square Test for independence

|  |  |
| --- | --- |
| Chi2    | 57.28    |
| df    | 1    |
| p    | < 0.001    |

**Table A23**. Inferential statistics results: Grammatical Class 1 and Period with specified frequencies based on linguistic (Ch’olan) data for nouns and verbs with C1VC1 shapes, accounting for overrepresentation (more C1VC1 shapes in nouns class than verbs class, proportionately).

a. Observed, specified (italics) expected, and expected (bold) frequencies

|     | Grammatical Class 1        |
| --- | --- |
|     | Noun    | Verb    | Total    |
| EC    | 7    | 0    | 7    |
|  | *5.8* | *1.2* | *7* |
|  | **6.83** | **0.17** | **7** |
| LC    | 33    | 1    | 34    |
|  | *28.1* | *5.9* | *34* |
|  | **33.17** | **0.83** | **34** |
| Total    | 40    | 1    | 41    |
|  | *33.9* | *7.1* | *41* |
|  | **40** | **1** | **41** |

b. Chi-Square Test for independence

|  |  |
| --- | --- |
| Chi2    | 6.37    |
| df    | 1    |
| p    | .012    |

**Table A24.** Descriptive statistics for Locus variable and Time. a) Dated texts. b) Texts according to period.

a. Locus variable in dated texts (Gregorian years, N = 74).

|  | Top left | Top | Left | Top right | Right | Unchecked | Bottom left | Bottom right |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Frequency | 37 | 12 | 10 | 5 | 4 | 3 | 2 | 1 |
| Mean | 715.54 | 637.83 | 713.1 | 715.4 | 659.5 | 677.67 | 782.5 | 714 |
| Std. Deviation | 89.23 | 101.98 | 122.64 | 65.6 | 95.08 | 39.5 | 0.71 | NaN |
| Minimum | 445 | 445 | 520 | 642 | 520 | 633 | 782 | 714 |
| Maximum | 810 | 756 | 874 | 783 | 734 | 708 | 783 | 714 |

b. Locus variable in all texts by Period (Early Classic vs. Late Classic, N = 125).

|  | Top | Left | Top left | Top right | Right | Bottom right | Bottom left | Unchecked | Total |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| EC | 7 | 9 | 11 | 0 | 1 | 0 | 0 | 0 | 28 |
| LC | 14 | 26 | 42 | 5 | 3 | 2 | 2 | 3 | 97 |
| Total | 21 | 35 | 53 | 5 | 4 | 2 | 2 | 3 | 125 |

**Table A25**. Locus variable: results of Kruskal-Wallis Test for dated texts (Gregorian). a) Ranks. b) Statistics of Kruskal-Wallis Test. c) Dunn-Bonferroni Tests.

a. Locus variable in dated texts (Gregorian): Ranks

| Groups | N | Mean Rank |
| --- | --- | --- |
| Bottomleft | 2 | 56.5 |
| Left | 10 | 42.3 |
| Right | 4 | 24.38 |
| Top | 12 | 19.08 |
| Topleft | 37 | 39.07 |
| Topright | 5 | 35.4 |
| Total | 70 |  |

b. Locus variable in dated texts (Gregorian): Statistics

|     | Values    |
| --- | --- |
| Chi2    | 13.42    |
| df    | 5    |
| p    | .02    |

c. Locus variable in dated texts (Gregorian): Dunn-Bonferroni Tests

|  | Test Statistic | Std. Error | Std. Test Statistic | p | Adj. p |
| --- | --- | --- | --- | --- | --- |
| Top - Topleft | -19.98 | 6.75 | -2.96 | .003 | .046 |

Adj. p: Values adjusted with Bonferroni correction.

**Table A26**. Locus variable: results of Kruskal-Wallis Test for all texts by Period (Early Classic vs. Late Classic). a) Ranks. b) Statistics of Kruskal-Wallis Test. c) Dunn-Bonferroni Tests.

c. Locus variable in all texts (Period): Ranks

| Groups | N | Mean Rank |
| --- | --- | --- |
| Bottomleft | 2 | 75.5 |
| Bottomright | 2 | 75.5 |
| Left | 35 | 59.81 |
| Right | 4 | 60.25 |
| Top | 21 | 55.17 |
| Topleft | 53 | 62.84 |
| Topright | 5 | 75.5 |
| Total | 122 |  |

d. Locus variable in all texts (Period): Statistics

|     | Values    |
| --- | --- |
| Chi2    | 4.23    |
| df    | 6    |
| p    | .645    |

**Table A27**. Descriptive statistics for Function variable with respect to time.

a. Gregorian

|  |  | Duplication | C1VC1shape | NonseqDupl | Abbreviation |
| --- | --- | --- | --- | --- | --- |
|  | Frequency | 59 | 10 | 3 | 2 |
| Gregorian | Mean | 693.93 | 733 | 664.33 | 761 |
|  | Median | 714 | 715 | 731 | 761 |
|  | Modal | 692 | 692 | 514 | 751 |
|  | Std. Deviation | 98.96 | 64.45 | 130.47 | 14.14 |
|  | Minimum | 445 | 669 | 514 | 751 |
|  | Maximum | 810 | 874 | 748 | 771 |
|  | Range | 365 | 205 | 234 | 20 |
|  | Mean ± Std. | 693.93 ± 98.96 | 733 ± 64.45 | 664.33 ± 130.47 | 761 ± 14.14 |

b. Period

|  |  | Duplication | NonseqDupl | C1VC1shape | Abbreviation | Total |
| --- | --- | --- | --- | --- | --- | --- |
| Period | LC | 76 | 3 | 13 | 5 | 97 |
|  | EC | 26 | 1 | 1 | 0 | 28 |
|  | Total | 102 | 4 | 14 | 5 | 125 |

**Table A28**. Kruskal-Wallis Tests for Function and Time (Gregorian; Period).

a. Dated texts (Gregorian): Ranks

| Groups | N | Mean Rank |
| --- | --- | --- |
| Duplication | 59 | 36.85 |
| C1VC1shape | 10 | 40.05 |
| NonseqDupl | 3 | 31.67 |
| Abbreviation | 2 | 52.75 |
| Total | 74 |  |

b. Dated texts (Gregorian): Statistics

|     | Values    |
| --- | --- |
| Chi2    | 1.42    |
| df    | 3    |
| p    | .7    |

c. All texts (Period): Ranks

| Groups | N | Mean Rank |
| --- | --- | --- |
| Duplication | 102 | 61.07 |
| NonseqDupl | 4 | 61.38 |
| C1VC1shape | 14 | 72.54 |
| Abbreviation | 5 | 77 |
| Total | 125 |  |

d. All texts (Period): Statistics

|     | Values    |
| --- | --- |
| Chi2    | 3.86    |
| df    | 3    |
| p    | .277    |

**Table A29**. Locus and Media: Chi-Square Test. a) Statistics. b) Observed vs. Expected frequencies (italics).

a. All texts (N = 122): Statistics

|  |  |
| --- | --- |
| Chi2    | 20.47    |
| df    | 6 |
| p    | .002    |

b. Observed

|     | Locus     |     |
| --- | --- | --- |
|     | Left    | Top left    | Top    | Top right    | Right    | Bottom left    | Bottom right    | Total    |
| portable    | 26    | 16    | 9    | 1    | 1    | 0    | 1    | 54    |
|  | *15.49* | *23.46* | *9.3* | *2.21* | *1.77* | *0.89* | *0.89* |  |
| monument    | 9    | 37    | 12    | 4    | 3    | 2    | 1    | 68    |
|  | *19.51* | *29.54* | *11.7* | *2.79* | *2.23* | *1.11* | *1.11* |  |
| Total    | 35    | 53    | 21    | 5    | 4    | 2    | 2    | 122    |

**Table A30**. Locus and Broad Phonological Class: Chi-Square Test. a) Statistics. b) Observed vs. Expected frequencies (italics).

a. All texts (N = 122): Statistics

|  |  |
| --- | --- |
| Chi2 | 13.36 |
| df | 6 |
| p | .038 |

b. Observed vs. Expected (italics) frequencies

|  |  | Broad Class |  |
| --- | --- | --- | --- |
|  |  | Obstruent | Sonorant | Total |
| Locus | Bottomleft | 2 | 0 | 2 |
|  |  | *1.59* | *0.41* |  |
|  | Bottomright | 1 | 1 | 2 |
|  |  | *1.59* | *0.41* |  |
|  | Left | 31 | 4 | 35 |
|  |  | *27.83* | *7.17* |  |
|  | Right | 3 | 1 | 4 |
|  |  | *3.18* | *0.82* |  |
|  | Top | 20 | 1 | 21 |
|  |  | *16.7* | *4.3* |  |
|  | Topleft | 38 | 15 | 53 |
|  |  | *42.14* | *10.86* |  |
|  | Topright | 2 | 3 | 5 |
|  |  | *3.98* | *1.02* |  |
|  | Total | 97 | 25 | 122 |

**Table A31**. Locus and Narrow Phonological Class 1: Chi-Square Test. a) Statistics. b) Observed vs. Expected frequencies (italics).

a. All texts (N = 122): Statistics

|  |  |
| --- | --- |
| Chi2 | 49 |
| df | 30 |
| p | .016 |

b. Observed vs. Expected (italics) frequencies

|  |  | Narrow Phonological Class 1 |  |
| --- | --- | --- | --- |
|  |  | Fricative | Stop | Nasal | Liquid | Affricate | Semivowel | Total |
| Locus | Bottomleft | 1 | 1 | 0 | 0 | 0 | 0 | 2 |
|  |  | *0.05* | *1.38* | *0.16* | *0.16* | *0.16* | *0.08* |  |
|  | Bottomright | 0 | 1 | 1 | 0 | 0 | 0 | 2 |
|  |  | *0.05* | *1.38* | *0.16* | *0.16* | *0.16* | *0.08* |  |
|  | Left | 0 | 30 | 1 | 1 | 1 | 2 | 35 |
|  |  | 0.86 | 24.1 | 2.87 | 2.87 | 2.87 | 1.43 |  |
|  | Right | 0 | 3 | 0 | 1 | 0 | 0 | 4 |
|  |  | *0.1* | *2.75* | *0.33* | *0.33* | *0.33* | *0.16* |  |
|  | Top | 1 | 17 | 0 | 1 | 2 | 0 | 21 |
|  |  | *0.52* | *14.46* | *1.72* | *1.72* | *1.72* | *0.86* |  |
|  | Topleft | 1 | 30 | 6 | 6 | 7 | 3 | 53 |
|  |  | *1.3* | *36.49* | *4.34* | *4.34* | *4.34* | *2.17* |  |
|  | Topright | 0 | 2 | 2 | 1 | 0 | 0 | 5 |
|  |  | 0.12 | 3.44 | 0.41 | 0.41 | 0.41 | 0.2 |  |
|  | Total | 3 | 84 | 10 | 10 | 10 | 5 | 122 |

**Table A32**. Locus and Broad Phonological Class 2: Chi-Square Test. a) Statistics. b) Observed vs. Expected frequencies (italics).

a. Dated and undated texts (N = 96): Statistics

|  |  |
| --- | --- |
| Chi2 | 16.89 |
| df | 7 |
| p | .018 |
| Cramér’s V | .42 |

b. Observed vs. Expected (italics) frequencies

|  | Broad Class 2 |  |
| --- | --- | --- |
|  | Glottalic | Plain | Total |
| Topleft | 12 | 25 | 37 |
|  | *11.56* | *25.44* |  |
| Top | 10 | 9 | 19 |
|  | *5.94* | *13.06* |  |
| Bottomright | 1 | 0 | 1 |
|  | *0.31* | *0.69* |  |
| Left | 4 | 27 | 31 |
|  | *9.69* | *21.31* |  |
| Bottomleft | 1 | 0 | 1 |
|  | *0.31* | *0.69* |  |
| Right | 2 | 1 | 3 |
|  | *0.94* | *2.06* |  |
| Unchecked | 0 | 2 | 2 |
|  | *0.63* | *1.38* |  |
| Topright | 0 | 2 | 2 |
|  | *0.63* | *1.38* |  |
| Total | 30 | 66 | 96 |

**Table A33**. Locus variable and Function: Chi-Square Test. a) Statistics. b) Observed vs. Expected frequencies (italics).

a. All texts (N = 122): Statistics

|  |  |
| --- | --- |
| Chi2 | 42.73 |
| df | 21 |
| p | .003 |

b.

|  |  | Function |  |
| --- | --- | --- | --- |
|  |  | Duplication | NonseqDupl | C1VC1shape | Abbreviation | Total |
| Locus | Bottomleft | 2 | 0 | 0 | 0 | 2 |
|  |  | *1.62* | *0.07* | *0.23* | *0.08* |  |
|  | Bottomright | 1 | 1 | 0 | 0 | 2 |
|  |  | *1.62* | *0.07* | *0.23* | *0.08* |  |
|  | Left | 32 | 0 | 3 | 0 | 35 |
|  |  | *28.4* | *1.15* | *4.02* | *1.43* |  |
|  | Right | 2 | 0 | 2 | 0 | 4 |
|  |  | *3.25* | *0.13* | *0.46* | *0.16* |  |
|  | Top | 14 | 1 | 6 | 0 | 21 |
|  |  | *17.04* | *0.69* | *2.41* | *0.86* |  |
|  | Topleft | 44 | 1 | 3 | 5 | 53 |
|  |  | *43.01* | *1.74* | *6.08* | *2.17* |  |
|  | Topright | 4 | 1 | 0 | 0 | 5 |
|  |  | *4.06* | *0.16* | *0.57* | *0.2* |  |
|  | Total | 99 | 4 | 14 | 5 | 122 |

**Table A34**. Grapheme Type and Function: Chi-Square Test. a) Statistics. b) Observed vs. Expected frequencies (italics).

a. All texts (N = 122): Statistics

|  |  |
| --- | --- |
| Chi2 | 118.51 |
| df | 3 |
| p | <.001 |

**b.** Observed vs. Expected (italics) frequencies.

|  |  | Grapheme Type |  |
| --- | --- | --- | --- |
|  |  | Syllabogram | Logogram | Total |
| Function | Duplication | 102 | 0 | 102 |
|  |  | *87.31* | *14.69* |  |
|  | Abbreviation | 1 | 4 | 5 |
|  |  | *4.28* | *0.72* |  |
|  | NonseqDupl | 4 | 0 | 4 |
|  |  | *3.42* | *0.58* |  |
|  | C1VC1shape | 0 | 14 | 14 |
|  |  | *11.98* | *2.02* |  |
|  | Total | 107 | 18 | 125 |

**Table A35**. Grapheme type and Region: Chi-Square Test. a) Statistics. b) Observed vs. Expected frequencies (italics).

a. Chi-Square Results

|  |  |
| --- | --- |
| Chi2    | 19.98    |
| df    | 8    |
| p    | .01    |
| Cramér’s V | .4 |

b. Observed frequencies and expected (italics) frequencies

|     |     | Grapheme Type    |     |
| --- | --- | --- | --- |
|     |     | Syllabogram    | Logogram    | Total    |
| Region     | Central    | 10    | 3    | 13    |
|  |  | *11.13* | *1.87* |  |
|     | Usumacinta\_west    | 25    | 2    | 27    |
|  |  | *23.11* | *3.89* |  |
|     | Usumacinta    | 22    | 0    | 22    |
|  |  | *18.83* | *3.17* |  |
|     | Unprovenienced    | 37    | 5    | 42    |
|  |  | *35.95* | *6.05* |  |
|     | Eastern    | 9    | 5    | 14    |
|  |  | *11.98* | *2.02* |  |
|     | Northern    | 1    | 2    | 3    |
|  |  | *2.57* | *0.43* |  |
|     | Southern    | 1    | 1    | 2    |
|  |  | *1.71* | *0.29* |  |
|     | Usumacinta\_petexbatun    | 1    | 0    | 1    |
|  |  | *0.86* | *0.14* |  |
|     | Teotihuacan    | 1    | 0    | 1    |
|  |  | *0.86* | *0.14* |  |
|     | Total    | 107    | 18    | 125    |

**Table A36**. Grapheme Type and Broad Phonological Class 2: Chi-Square Test. a) Statistics. b) Observed vs. Expected frequencies (italics). Dated and undated texts (N = 101).

a. Chi-Square Results

|  |  |
| --- | --- |
| Chi2    | 28.28 |
| df    | 1 |
| p    | <.001 |
| Cramér’s V | .54 |

b. Observed frequencies and expected (italics) frequencies

|  |  | Grapheme Type |  |
| --- | --- | --- | --- |
|  |  | Syllabogram | Logogram | Total |
| Broad Class 2 | Glottalic | 16 | 14 | 30 |
|  |  | *25* | *5* |  |
|  | Plain | 64 | 2 | 66 |
|  |  | *55* | *11* |  |
|  | Total | 80 | 16 | 96 |

**Table A37**. Grammatical Class 2 and Media. a) Chi-square Independence test for grammatical class (nouns, verbs, grammatical morphemes). b) Observed and expected frequencies.

a. Chi-Square Test

|  |  |
| --- | --- |
| Chi2 | 11.38 |
| df | 2 |
| p | .003 |
| Cramér’s V | 0.3 |

b. Observed and expected (italics) frequencies

|  |  | Grammatical Class2 |  |
| --- | --- | --- | --- |
|  |  | GramMorph | Noun | Verb | Total |
| Media | Monument | 8 | 55 | 8 | 71 |
|  |  | *5.11* | *61.34* | *4.54* |  |
|  | Portable | 1 | 53 | 0 | 54 |
|  |  | *3.89* | *46.66* | *3.46* |  |
|  | Total | 9 | 108 | 8 | 125 |

**Table A38**. Grammatical Class 2 and Broad Phonological Class. a) Chi-square Independence test for grammatical class (nouns, verbs, grammatical morphemes). b) Observed and expected frequencies.

a. Chi-Square Test

|  |  |
| --- | --- |
| Chi2 | 20.51 |
| df | 2 |
| p | <.001 |
| Cramér’s V | 0.41 |

b. Observed and expected (italics) frequencies

|  |  | Grammatical Class2 |  |
| --- | --- | --- | --- |
|  |  | GramMorph | Noun | Verb | Total |
| Media | Sonorant | 7 | 19 | 0 | 26 |
|  |  | *1.87* | *22.46* | *1.66* |  |
|  | Obstruent | 2 | 89 | 8 | 99 |
|  |  | *7.13* | *85.54* | *6.34* |  |
|  | Total | 9 | 108 | 8 | 125 |

**Table A39**. Grammatical Class 2 and Narrow Phonological Class 1. a) Chi-square Independence test for grammatical class. b) Observed and expected frequencies.

a. Chi-Square Test

|  |  |
| --- | --- |
| Chi2 | 134.21 |
| df | 10 |
| p | <.001 |
| Cramér’s V | 0.73 |

b. Observed and expected (italics) frequencies

|  |  | Grammatical Class2 |  |
| --- | --- | --- | --- |
|  |  | GramMorph | Noun | Verb | Total |
| Narrow Class 1 | Liquid | 6 | 4 | 0 | 10 |
|  |  | *0.72* | *8.64* | *0.64* |  |
|  | Stop | 2 | 83 | 0 | 85 |
|  |  | *6.12* | *73.44* | *5.44* |  |
|  | Nasal | 1 | 10 | 0 | 11 |
|  |  | *0.79* | *9.5* | *0.7* |  |
|  | Affricate | 0 | 3 | 8 | 11 |
|  |  | *0.79* | *9.5* | *0.7* |  |
|  | Fricative | 0 | 3 | 0 | 3 |
|  |  | *0.22* | *2.59* | *0.19* |  |
|  | Semivowel | 0 | 5 | 0 | 5 |
|  |  | *0.36* | *4.32* | *0.32* |  |
|  | Total | 9 | 108 | 8 | 125 |

**Table A40**. Grammatical Class 2 and Narrow Phonological Class 2. a) Chi-square Independence test for grammatical class. b) Observed and expected frequencies.

a. Chi-Square Test

|  |  |
| --- | --- |
| Chi2 | 49.04 |
| df | 10 |
| p | <.001 |
| Cramér’s V | 0.44 |

b. Observed and expected (italics) frequencies

|  |  | Grammatical Class2 |  |
| --- | --- | --- | --- |
|  |  | GramMorph | Noun | Verb | Total |
| Narrow Class 1 | Alveolar | 6 | 22 | 8 | 36 |
|  |  | *2.59* | *31.1* | *2.3* |  |
|  | Velar | 0 | 60 | 0 | 60 |
|  |  | *4.32* | *51.84* | *3.84* |  |
|  | Bilabial | 1 | 21 | 0 | 22 |
|  |  | *1.58* | *19.01* | *1.41* |  |
|  | Alveopalatal | 0 | 2 | 0 | 2 |
|  |  | *0.14* | *1.73* | *0.13* |  |
|  | Palatal | 0 | 2 | 0 | 2 |
|  |  | *0.14* | *1.73* | *0.13* |  |
|  | Glottal | 2 | 1 | 0 | 3 |
|  |  | *0.22* | *2.59* | *0.19* |  |
|  | Total | 9 | 108 | 8 | 125 |

**Table A41**. Grammatical Class 2 and Broad Phonological Class 2: Chi-square Independence Test. a) Statistics. b) Observed and expected frequencies.

a. Chi-Square Test

|  |  |
| --- | --- |
| Chi2 | 8.1 |
| df | 2 |
| p | .017 |
| Cramér’s V | 0.29 |

b. Observed and expected (italics) frequencies

|  | Grammatical Class2 |  |
| --- | --- | --- |
|  | Noun | GramMorph | Verb | Total |
| Glottalic | 28 | 2 | 0 | 30 |
|  | 26.88 | 0.63 | 2.5 |  |
| Plain | 58 | 0 | 8 | 66 |
|  | 59.13 | 1.38 | 5.5 |  |
| Total | 86 | 2 | 8 | 96 |

**Table A42**. Grammatical Class 2 and Function. a) Chi-square Independence test for grammatical class. b) Observed and expected frequencies.

a. Chi-square Test

|  |  |
| --- | --- |
| Chi2 | 31.02 |
| df | 6 |
| p | <.001 |
| Cramér’s V | 0.35 |

b. Observed frequencies and Expected frequencies (italics).

|  |  | Function |  |
| --- | --- | --- | --- |
|  |  | Abbreviation | C1VC1shape | Duplication | NonseqDupl | Total |
| Grammatical Class | Noun | 5 | 12 | 90 | 1 | 108 |
|  |  | *4.32* | *12.1* | *88.13* | *3.46* |  |
|  | Verb | 0 | 2 | 6 | 0 | 8 |
|  |  | *0.32* | *0.9* | *6.53* | *0.26* |  |
|  | GramMorph | 0 | 0 | 6 | 3 | 9 |
|  |  | *0.36* | *1.01* | *7.34* | *0.29* |  |
|  | Total | 5 | 13 | 103 | 4 | 125 |

**Table A43**. Function with respect to Region. a) Chi-square Independence test for grammatical class. b) Observed and expected frequencies.

a. Chi-square Test

|  |  |
| --- | --- |
| Chi2 | 59.4 |
| df | 24 |
| p | <.001 |
| Cramér’s V | 0.4 |

b. Observed frequencies and Expected frequencies (italics).

|  | Function |  |
| --- | --- | --- |
|  | Duplication | Abbreviation | NonseqDupl | C1VC1shape | Total |
| Central | 9 | 3 | 1 | 0 | 13 |
|  | *10.61* | *0.52* | *0.42* | *1.46* |  |
| Eastern | 8 | 1 | 0 | 5 | 14 |
|  | *11.42* | *0.56* | *0.45* | *1.57* |  |
| Unprovenienced | 36 | 0 | 1 | 5 | 42 |
|  | *34.27* | *1.68* | *1.34* | *4.7* |  |
| Northern | 1 | 1 | 0 | 1 | 3 |
|  | *2.45* | *0.12* | *0.1* | *0.34* |  |
| Southern | 0 | 0 | 1 | 1 | 2 |
|  | *1.63* | *0.08* | *0.06* | *0.22* |  |
| Usumacinta | 22 | 0 | 0 | 0 | 22 |
|  | *17.95* | *0.88* | *0.7* | *2.46* |  |
| Usumacinta\_west | 24 | 0 | 1 | 2 | 27 |
|  | *22.03* | *1.08* | *0.86* | *3.02* |  |
| Usumacinta\_petexbatun | 1 | 0 | 0 | 0 | 1 |
|  | *0.82* | *0.04* | *0.03* | *0.11* |  |
| Teotihuacan | 1 | 0 | 0 | 0 | 1 |
|  | *0.82* | *0.04* | *0.03* | *0.11* |  |
| Total | 102 | 5 | 4 | 14 | 125 |

**Table A44**. Chi-square of Independence Test for Function with respect to Grapheme Type. a) Chi-square statistics. b) Observed and expected frequencies.

a. Chi-Square Test

|  |  |
| --- | --- |
| Chi2 | 118.51 |
| df | 3 |
| p | <.001 |
| Cramér’s V  | 0.97 |

b. Observed and expected (italics) frequencies

|  | Function |  |
| --- | --- | --- |
|  | Abbreviation | C1VC1shape | Duplication | NonseqDupl | Total |
| Logogram | 4 | 14 | 0 | 0 | 18 |
|  | *0.72* | *2.02* | *14.69* | *0.58* |  |
| Syllabogram | 1 | 0 | 102 | 4 | 107 |
|  | *4.28* | *11.98* | *87.31* | *3.42* |  |
| Total | 5 | 14 | 103 | 4 | 125 |

**Table A45**. Chi-square of Independence Test for Function with respect to Broad Phonological Class 1. a) Chi-square statistics. b) Observed and expected frequencies.

a. Chi-Square Test

|  |  |
| --- | --- |
| Chi2 | 8.42 |
| df | 3 |
| p | .038 |
| Cramér’s V  | 0.26 |

b. Observed and expected (italics) frequencies

|  | Function |  |
| --- | --- | --- |
|  | Duplication | Abbreviation | NonseqDupl | C1VC1shape | Total |
| Sonorant | 22 | 3 | 1 | 0 | 26 |
|  | *21.22* | *1.04* | *0.83* | *2.91* |  |
| Obstruent | 80 | 2 | 3 | 14 | 99 |
|  | *80.78* | *3.96* | *3.17* | *11.09* |  |
| Total | 102 | 5 | 4 | 14 | 125 |

**Table A46**. Chi-square of Independence Test for Function with respect to Narrow Phonological Class 1. a) Chi-square statistics. b) Observed and expected frequencies.

a. Chi-Square Test

|  |  |
| --- | --- |
| Chi2 | 25.82 |
| df | 15 |
| p | .04 |
| Cramér’s V  | 0.26 |

b. Observed and expected (italics) frequencies

|  | Function |  |
| --- | --- | --- |
|  | Duplication | Abbreviation | NonseqDupl | C1VC1shape | Total |
| Liquid | 10 | 0 | 0 | 0 | 10 |
|  | *8.16* | *0.4* | *0.32* | *1.12* |  |
| Stop | 68 | 2 | 3 | 12 | 85 |
|  | *69.36* | *3.4* | *2.72* | *9.52* |  |
| Nasal | 9 | 1 | 1 | 0 | 11 |
|  | *8.98* | *0.44* | *0.35* | *1.23* |  |
| Affricate | 9 | 0 | 0 | 2 | 11 |
|  | *8.98* | *0.44* | *0.35* | *1.23* |  |
| Fricative | 3 | 0 | 0 | 0 | 3 |
|  | *2.45* | *0.12* | *0.1* | *0.34* |  |
| Semivowel | 3 | 2 | 0 | 0 | 5 |
|  | *4.08* | *0.2* | *0.16* | *0.56* |  |
| Total | 102 | 5 | 4 | 14 | 125 |

**Table A47**. Chi-square of Independence Test for Function with respect to Narrow Phonological Class 2. a) Chi-square statistics. b) Observed and expected frequencies.

a. Chi-Square Test

|  |  |
| --- | --- |
| Chi2 | 55.32 |
| df | 15 |
| p | <.001 |
| Cramér’s V  | 0.38 |

b. Observed and expected (italics) frequencies

|  | Function |  |
| --- | --- | --- |
|  | Duplication | Abbreviation | NonseqDupl | C1VC1shape | Total |
| Alveolar | 33 | 1 | 0 | 2 | 36 |
|  | *29.38* | *1.44* | *1.15* | *4.03* |  |
| Velar | 46 | 2 | 0 | 12 | 60 |
|  | *48.96* | *2.4* | *1.92* | *6.72* |  |
| Bilabial | 18 | 2 | 2 | 0 | 22 |
|  | *17.95* | *0.88* | *0.7* | *2.46* |  |
| Alveopalatal | 2 | 0 | 0 | 0 | 2 |
|  | *1.63* | *0.08* | *0.06* | *0.22* |  |
| Palatal | 2 | 0 | 0 | 0 | 2 |
|  | *1.63* | *0.08* | *0.06* | *0.22* |  |
| Glottal | 1 | 0 | 2 | 0 | 3 |
|  | *2.45* | *0.12* | *0.1* | *0.34* |  |
| Total | 102 | 5 | 4 | 14 | 125 |

**Table A48**. Chi-square of Independence Test for Function with respect to Broad Phonological Class 2. a) Chi-square statistics. b) Observed and expected frequencies.

a. Chi-Square Test

|  |  |
| --- | --- |
| Chi2 | 37.73 |
| df | 3 |
| p | <.001 |
| Cramér’s V  | 0.63 |

b. Observed and expected (italics) frequencies

|  |  | Function |  |
| --- | --- | --- | --- |
|  |  | Duplication | C1VC1shape | Abbreviation | NonseqDupl | Total |
| Broad Class 2 | Glottalic | 13 | 12 | 2 | 3 | 30 |
|  |  | *24.06* | *4.38* | *0.63* | *0.94* |  |
|  | Plain | 64 | 2 | 0 | 0 | 66 |
|  |  | *52.94* | *9.63* | *1.38* | *2.06* |  |
|  | Total | 77 | 14 | 2 | 3 | 96 |

**Table A49**. Results of Statistics for Mann-Whitney U-Test to spellings of ‘fire’ and ‘to complete, finish’. Estimated date of 9.3.0.0.0 (495 ce) for possibly earliest instance is included.

a. Descriptive statistics

|     |     | N    | Mean    | Median    | Standard deviation    |
| --- | --- | --- | --- | --- | --- |
| Gregorian    | L    | 13    | 719    | 738    | 88.15    |
|     | S    | 7   | 716 | 692 | 34.42 |

b. Ranks

|     | N    | Mean Rank    | Sum of Ranks    |
| --- | --- | --- | --- |
| L    | 13    | 10.69    | 139 |
| S    | 7   | 10.14 | 71 |
| Total    | 20 |     |     |

c. Statistics for Mann-Whitney U-Test

|     | Values    |
| --- | --- |
| Mann-Whitney U    | 43    |
| Z    | -0.2 |
| Asymptotic Significance (2-tailed)    | .841 |
| Exact Significance (2-tailed)    | .877 |

**Table A50**. Results of Statistics for Mann-Whitney U-Test to spellings of ‘fire’ and ‘to complete, finish’. Estimated date of 9.3.0.0.0 (495 ce) for possibly earliest instance is omitted.

a. Descriptive statistics

|     |     | N    | Mean    | Median    | Standard deviation    |
| --- | --- | --- | --- | --- | --- |
| Gregorian    | L    | 12    | 737.67    | 744.5    | 59.46    |
|     | S    | 7    | 716 | 692 | 34.42 |

b. Ranks

|     | N    | Mean Rank    | Sum of Ranks    |
| --- | --- | --- | --- |
| L    | 12    | 10.5 | 126 |
| S    | 7 | 9.14 | 64 |
| Total    | 19 |     |     |

c. Statistics for Mann-Whitney U-Test

|     | Values    |
| --- | --- |
| Mann-Whitney U    | 36 |
| Z    | -0.52 |
| Asymptotic Significance (2-tailed)    | .606 |
| Exact Significance (2-tailed)    | .65 |

**Table A51**. Chi-Square Test of Independence for spellings of *käkäw* with 22A with respect to Time (Period).

a. Chi-Square Test

|  |  |
| --- | --- |
| Chi2    | 17.3    |
| df    | 1    |
| p    | <.001    |
| Cramér’s V | .37 |

b. Observed frequencies and expected frequencies (italics).

|     |     | Lexeme     |     |
| --- | --- | --- | --- |
|     |     | Other    | käkäw    | Total    |
| Period     | LC    | 82    | 15    | 97    |
|  |  | *73.72* | *23.28* |  |
|  | EC    | 13    | 15    | 28    |
|     |  | *21.28* | *6.72* |  |
|     | Total    | 95    | 30    | 125    |

c. Fishers Exact Test

|  |  |
| --- | --- |
|     | p    |
| Left-sided    | 1    |
| Two-sided    | <.001    |
| Right-sided    | <.001    |

**Table A52**. *käkäw* spellings with and without 22A and time (period)

a. Chi-Square Test results

|  |  |
| --- | --- |
| Chi2    | 22.44    |
| df    | 1    |
| p    | <.001    |
| Cramér’s V | 0.27 |

b. Observed frequencies

|     |     | 22A     |     |
| --- | --- | --- | --- |
|     |     | No    | Yes    | Total    |
| Period     | LC    | 235    | 16    | 251    |
|     | EC    | 35    | 14    | 49    |
|     | Total    | 270    | 30    | 300    |

c. Expected frequencies

|     |     | 22A     |     |
| --- | --- | --- | --- |
|     |     | No    | Yes    | Total    |
| Period     | LC    | 225.9    | 25.1    | 251    |
|     | EC    | 44.1    | 4.9    | 49    |
|     | Total    | 270    | 30    | 300    |

**Table A53**. Removal of *käkäw* from dataset: Broad Phonological Class 1 and Time (Period).

1. Descriptive statistics

|  |  | N | Mean | Median | Standard deviation |
| --- | --- | --- | --- | --- | --- |
| Period | Sonorant | 26 | 1.96 | 2 | 0.2 |
|  | Obstruent | 69 | 1.83 | 2 | 0.38 |

1. Mann-Whitney U-Test: Ranks

|  | N | Mean Rank | Sum of Ranks |
| --- | --- | --- | --- |
| Sonorant | 26 | 52.67 | 1,369.5 |
| Obstruent | 69 | 46.24 | 3,190.5 |
| Total | 95 |  |  |

1. Mann-Whitney U-Test: Statistics

|  | Values |
| --- | --- |
| Mann-Whitney U | 775.5 |
| Z | -1.7 |
| Asymptotic Significance (2-tailed) | .088 |
| Exact Significance (2-tailed) | .314 |

**Table A54**. Removal of *käkäw* from dataset: Broad Phonological Class 1 and Time (Gregorian).

a. Descriptive statistics

|  |  | N | Mean | Median | Standard deviation |
| --- | --- | --- | --- | --- | --- |
| Gregorian | Obstruent | 55 | 690.98 | 702 | 94.68 |
|  | Sonorant | 17 | 737.88 | 756 | 72.98 |

b. Mann-Whitney U-Test: Ranks

|  | N | Mean Rank | Sum of Ranks |
| --- | --- | --- | --- |
| Obstruent | 55 | 33.29 | 1,831 |
| Sonorant | 17 | 46.88 | 797 |
| Total | 72 |  |  |

c. Mann-Whitney U-Test: Statistics

|  | Values |
| --- | --- |
| Mann-Whitney U | 291 |
| Z | -2.34 |
| Asymptotic Significance (2-tailed) | .019 |
| Exact Significance (2-tailed) | .02 |
| Effect size (small) | 0.28 |

**Table A55**. Removal of *käkäw* from dataset: Narrow Phonological Class 1 and Time (Period).

a. Descriptive statistics

|     | Liquid     | Stop     | Nasal     | Affricate     | Fricative     | Semivowel     | Total     |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EC    | 0     | 12     | 1     | 0     | 0     | 0     | 13     |
| LC    | 10     | 43     | 10     | 11     | 3     | 5     | 82     |
| Total    | 10     | 55     | 11     | 11     | 3     | 5     | 95    |

b. Kruskal-Wallis Test: Ranks

| Groups | N | Mean Rank |
| --- | --- | --- |
| Liquid | 10 | 54.5 |
| Stop | 55 | 44.14 |
| Nasal | 11 | 50.18 |
| Affricate | 11 | 54.5 |
| Fricative | 3 | 54.5 |
| Semivowel | 5 | 54.5 |
| Total | 95 |  |

c. Kruskal-Wallis Test: Statistics

|  | Values |
| --- | --- |
| Chi2 | 7.79 |
| df | 5 |
| p | .168 |

**Table A56**. Removal of *käkäw* from dataset: Narrow Phonological Class 1 and Time (Gregorian).

a. Descriptive statistics

|  | N | Mean | Std. Deviation |
| --- | --- | --- | --- |
| Liquid | 8 | 774.38 | 33.93 |
| Nasal | 8 | 694.75 | 83.5 |
| Stop | 45 | 679.56 | 107.49 |
| Affricate | 9 | 705.89 | 35.94 |
| Fricative | 2 | 759.5 | 33.23 |
| Total | 72 | 697.29 | 95.45 |

b. Kruskal-Wallis Test: Ranks

| Groups | N | Mean Rank |
| --- | --- | --- |
| Liquid | 8 | 59.19 |
| Nasal | 8 | 34.25 |
| Stop | 45 | 33.11 |
| Affricate | 9 | 31.28 |
| Fricative | 2 | 54.5 |
| Total | 72 |  |

c. Kruskal-Wallis Test: Statistics

|  | Values |
| --- | --- |
| Chi2 | 12.75 |
| df | 4 |
| p | .013 |

d. Significant Dunn-Bonferroni-Test

|  | Test Statistic | Std. Error | Std. Test Statistic | p | Adj. p |
| --- | --- | --- | --- | --- | --- |
| Liquid - Stop | 26.08 | 8.02 | 3.25 | .001 | .011 |
| Liquid - Affricate | 27.91 | 10.16 | 2.75 | .006 | .06 |

Adj. p: Values adjusted with Bonferroni correction.

**Table A57**. Removal of *käkäw* from dataset: Narrow Phonological Class 2 and Time (Period).

a. Descriptive statistics

|  | Alveolar | Glottal | Bilabial | Alveopalatal | Velar | Palatal | Total |
| --- | --- | --- | --- | --- | --- | --- | --- |
| EC | 6 | 1 | 1 | 0 | 5 | 0 | 13 |
| LC | 30 | 2 | 21 | 2 | 25 | 2 | 82 |
| Total | 36 | 3 | 22 | 2 | 30 | 2 | 95 |

b. Kruskal-Wallis Test: Ranks

| Groups | N | Mean Rank |
| --- | --- | --- |
| Alveolar | 36 | 46.58 |
| Glottal | 3 | 38.67 |
| Bilabial | 22 | 52.34 |
| Alveopalatal | 2 | 54.5 |
| Velar | 30 | 46.58 |
| Palatal | 2 | 54.5 |
| Total | 95 |  |

c. Kruskal-Wallis Test: Statistics

|  | Values |
| --- | --- |
| Chi2 | 3.63 |
| df | 5 |
| p | .604 |

**Table A58**. Removal of *käkäw* from dataset: Narrow Phonological Class 2 and Time (Gregorian).

a. Descriptive statistics

|  | Alveolar | Velar | Bilabial | Glottal | Alveopalatal | Palatal |
| --- | --- | --- | --- | --- | --- | --- |
| Frequency | 31 | 22 | 14 | 3 | 1 | 1 |
| Mean | 693.65 | 709.95 | 704.5 | 660.33 | 791 | 791 |
| Median | 711 | 731 | 707 | 731 | 791 | 791 |
| Modal | 692 | 692 | 518 | 514 | 791 | 791 |
| Std. Deviation | 93.57 | 98.18 | 76.42 | 126.75 | NaN | NaN |
| Minimum | 475 | 445 | 518 | 514 | 791 | 791 |
| Maximum | 810 | 874 | 795 | 736 | 791 | 791 |

b. Kruskal-Wallis Test: Ranks

| Groups | N | Mean Rank |
| --- | --- | --- |
| Alveolar | 31 | 34.47 |
| Bilabial | 14 | 35.75 |
| Glottal | 3 | 29.83 |
| Velar | 22 | 37.57 |
| Total | 70 |  |

c. Kruskal-Wallis Test: Statistics

|  | Values |
| --- | --- |
| Chi2 | 0.54 |
| df | 3 |
| p | .909 |

**Table A59**. Removal of *käkäw* from dataset: Broad Phonological Class 2 and Time (Period).

a. Descriptive statistics

|  |  | N | Mean | Median | Standard deviation |
| --- | --- | --- | --- | --- | --- |
| Period | Glottalic | 30 | 1.9 | 2 | 0.31 |
|  | Plain | 36 | 1.75 | 2 | 0.44 |

b. Mann-Whitney U-Test: Ranks

|  | N | Mean Rank | Sum of Ranks |
| --- | --- | --- | --- |
| Glottalic | 30 | 36.2 | 1,086 |
| Plain | 36 | 31.25 | 1,125 |
| Total | 66 |  |  |

c. Mann-Whitney U-Test: Statistics

|  | Values |
| --- | --- |
| Mann-Whitney U | 459 |
| Z | -1.56 |
| Asymptotic Significance (2-tailed) | .118 |
| Exact Significance (2-tailed) | .301 |

**Table A60**. Removal of *käkäw* from dataset: Broad Phonological Class 2 and Time (Gregorian).

a. Descriptive statistics

|  |  | N | Mean | Median | Standard deviation |
| --- | --- | --- | --- | --- | --- |
| Gregorian | Glottalic | 20 | 734.75 | 737 | 53.36 |
|  | Plain | 33 | 660.12 | 692 | 108.95 |

b. Mann-Whitney U-Test: Ranks

|  | N | Mean Rank | Sum of Ranks |
| --- | --- | --- | --- |
| Glottalic | 20 | 32.95 | 659 |
| Plain | 33 | 23.39 | 772 |
| Total | 53 |  |  |

c. Mann-Whitney U-Test: Statistics

|  | Values |
| --- | --- |
| Mann-Whitney U | 211 |
| Z | -2.19 |
| Asymptotic Significance (2-tailed) | .029 |
| Exact Significance (2-tailed) | .03 |
| r (effect size) | .3 (medium) |

**Table A58**. Removal of *k’ahk’* from dataset: Broad Phonological Class 2 and Time (Gregorian), N = 44.

a. Descriptive statistics

|  |  | N | Mean | Median | Standard deviation |
| --- | --- | --- | --- | --- | --- |
| Gregorian | Glottalic | 11 | 703.36 | 731 | 77.1 |
|  | Plain | 33 | 660.12 | 692 | 108.95 |

b. Mann-Whitney U-Test: Ranks

|  | N | Mean Rank | Sum of Ranks |
| --- | --- | --- | --- |
| Glottalic | 11 | 25.86 | 284.5 |
| Plain | 33 | 21.38 | 705.5 |
| Total | 44 |  |  |

c. Statistics for Mann-Whitney U-Test

|  | Values |
| --- | --- |
| Mann-Whitney U | 144.5 |
| Z | -1 |
| Asymptotic Significance (2-tailed) | .315 |
| Exact Significance (2-tailed) | .325 |
| r (effect size) | .15 (small) |

**Table A59**. Removal of *k’ahk’* from dataset: Broad Phonological Class 2 and Time (Gregorian), N = 55.

a. Descriptive statistics

|  |  | N | Mean | Median | Standard deviation |
| --- | --- | --- | --- | --- | --- |
| Gregorian | Glottalic | 12 | 709 | 731 | 76.06 |
|  | Plain | 43 | 621.4 | 661 | 122.25 |

b. Mann-Whitney U-Test: Ranks

|  | N | Mean Rank | Sum of Ranks |
| --- | --- | --- | --- |
| Glottalic | 12 | 36.71 | 440.5 |
| Plain | 43 | 25.57 | 1099.5 |
| Total | 55 |  |  |

c. Statistics for

|  | Values |
| --- | --- |
| Mann-Whitney U | 153.5 |
| Z | -2.13 |
| Asymptotic Significance (2-tailed) | .033 |
| Exact Significance (2-tailed) | .035 |
| r (effect size) | .29 (small) |

**Table A60**. Kruskal-Wallis Test statistics results for Region (Regions with 2 or more cases of 22A) with respect to Time (Period). a) Ranks. c) Statistics for Kruskal-Wallis Test. d) Dunn-Bonferroni Tests.

a. Ranks

| Groups | N | Mean Rank |
| --- | --- | --- |
| northern | 4 | 71 |
| Usumacinta | 28 | 58.46 |
| central | 36 | 53.13 |
| Usumacinta\_West | 27 | 71 |
| Eastern | 18 | 51.5 |
| Usumacinta\_Pasion | 2 | 71 |
| Southern | 2 | 41.75 |
| Total | 117 |  |

b. Statistics for Kruskal-Wallis Test

|  | Values |
| --- | --- |
| Chi2 | 13.52 |
| df | 6 |
| p | .035 |

c. Dunn-Bonferroni Tests (only close-to-significant pairwise group comparisons)

|  | Test Statistic | Std. Error | Std. Test Statistic | p | Adj. p |
| --- | --- | --- | --- | --- | --- |
| Central - Usumacinta\_West | -17.87 | 6.04 | -2.96 | .003 | .065 |

Adj. p: Values adjusted with Bonferroni correction.

**Table A62**. Kruskal-Wallis Test statistics results for Region (only regions with 15 or more cases of 22A) with respect to Time (Period). a) Ranks. c) Statistics for Kruskal-Wallis Test. d) Dunn-Bonferroni Tests.

a. Ranks

| Groups | N | Mean Rank |
| --- | --- | --- |
| Usumacinta | 28 | 54.82 |
| Central | 36 | 49.85 |
| Usumacinta\_West | 27 | 66.5 |
| Eastern | 18 | 48.33 |
| Total | 109 |  |

b. Statistics for Kruskal-Wallis Test

|  | Values |
| --- | --- |
| Chi2 | 10.67 |
| df | 3 |
| p | .014 |

c. Dunn-Bonferroni Tests (significant pairwise group comparisons)

|  | Test Statistic | Std. Error | Std. Test Statistic | p | Adj. p |
| --- | --- | --- | --- | --- | --- |
| Central - Usumacinta\_West | -16.65 | 5.69 | -2.93 | .003 | .02 |
| Usumacinta\_West - Eastern | 18.17 | 6.8 | 2.67 | .008 | .045 |

Adj. p: Values adjusted with Bonferroni correction.

**Table A63.** Chi-Square Test. Regional differentiation across Time (Period) with respect to use of 22A. Only regions with 20 or more instances included.

a. Observed and expected frequencies

|  | Early Classic | Late Classic | Total |
| --- | --- | --- | --- |
| Usumacinta | 6 | 22 | 28 |
|  | 5.23 | 22.77 |  |
| Central | **11** | 25 | 36 |
|  | 6.73 | 29.27 |  |
| Usumacinta\_West | 0 | **27** | 27 |
|  | 5.04 | 21.96 |  |
| Total | 17 | 74 | 91 |

b. Chi-Square Test

|  |  |
| --- | --- |
| Chi2 | 9.68 |
| df | 2 |
| p | .008 |
| Cramér’s V  | 0.33 (medium effect size) |