# Patterns in EIPA Test Scores and Implications for Interpreter Education

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## ABSTRACT

The present study addresses existing skill gaps of sign language interpreters by analyzing a database of 1,211 scores from the Educational Interpreter Performance Assessment (EIPA) to answer four primary questions: what patterns are there in EIPA Romans across score levels, what patterns are there in EIPA indices within Romans across score levels, which discreet language and processing skills correlate most strongly with overall EIPA scores, and how does performance on those discreet language and processing skills compare between graduates and non-graduates of interpreter training programs. Characteristics of score patterns and correlations between indices on the test are examined and discussed in light of what they indicate about interpreter proficiency at all levels of performance on the EIPA. Six specific competencies are highlighted as being both areas of weakness for interpreters and areas of high impact on message clarity and overall EIPA scores: eye contact and movement, use of the verb directionality and pronominal system of American Sign Language (ASL), use of stress and emphasis for words and phrases, use of ASL register, use of space for comparison and contrast, sequence, and cause and effect, and use of the classifier system of ASL. These six competencies reflect interpreter proficiency in ASL. Therefore, interpreter training programs and professional development planning need to include stricter language screening, a stronger focus on teaching receptive and expressive abilities in ASL, and in teaching the specific application of these abilities to the process of interpreting.

## INTRODUCTION

The Educational Interpreter Performance Assessment (EIPA) is the only standardized test that measures interpreter skill in educational settings. It was created by Dr. Brenda Schick in cooperation with Boys Town National Research Hospital (BTNRH). The EIPA performance test is proctored by trained test administrators and rated in the BTNRH EIPA Diagnostic Center by trained rating teams. There is also an EIPA written test, but interpreters are not required to take it in order to take the EIPA performance test (see https://www.boystownhospital.org/professional-education/eipa for more information). The EIPA assessment and rating system have been statistically validated (Schick et al., 2006; Johnson et al., 2018).

### EIPA STRUCTURE

The EIPA performance test contains two components: expressive and receptive. The expressive component (Voice-to-Sign, or V-S) consists of multiple classroom vignettes, each covering different subject matter. The receptive component (Sign-to-Voice, or S-V) consists of a child

answering interview questions about their family, school, and hobbies. Interpreters have the option of taking the EIPA in one of two grade ranges, elementary or secondary, and in one of three sign systems: Manually Coded English (MCE), Pidgin Signed English (PSE) or American Sign Language (ASL). MCE refers to systems of signs that are intended to be visual analogues of English, containing as much of its structure and morphology as possible (Schick, 2003). PSE is a contact variety of ASL and English with lexical, semantic and pragmatic components of ASL combined with syntactic components of English (Woodward, 1973). ASL is a natural human language with its own complex phonology, morphology, syntax, semantics, and pragmatics. It is the language of the Deaf community in the United States and Canada (Hoffmeister, 1975).

The EIPA score report provides interpreters with an assessment of 37 different skill indices (see Appendix A). Each index is scored on a scale of 0-5. These 37 indices are broken into four domains, known as the *Romans*: Voice-to-Sign (Roman I), Sign-to-Voice (Roman II), Vocabulary (Roman III) and Overall Factors (Roman IV). Each Roman is given an average of the indices within it, and the four Romans are averaged together for an overall score ranging from 0-5, rounded to the nearest tenth of a point (Schick & Williams, 2004). The EIPA score report also provides interpreters with a summary of their strengths and weaknesses in interpreting. For this reason, many interpreters who do not work in educational settings or who do not intend to do so can benefit from taking the EIPA.

The EIPA skill levels correspond roughly to beginner (EIPA level 1), advanced beginner (EIPA level 2), intermediate (EIPA level 3), advanced intermediate (EIPA level 4), and advanced (EIPA level 5) (Schick et al., 2006). EIPA scores are rounded to the nearest tenth of a point, so there is gradation within each skill level. For example, an interpreter scoring an EIPA 3.0 will be closer to an advanced beginner than will an interpreter scoring an EIPA 3.5, and an interpreter scoring an EIPA 3.9 will be closer to advanced intermediate. Interpreters scoring in the beginner and advanced beginner levels (EIPA 0-2.9) are not recommended for classroom interpreting (Schick et al., 2006). Interpreters scoring in the intermediate level (EIPA 3.0-3.9) need continued supervision and continuing education (Schick et al., 2006). Interpreters scoring in the advanced intermediate and advanced levels (EIPA 4.0-5.0) are capable of working autonomously as classroom interpreters (Schick et al., 2006).

## HOW THE EIPA IS USED

According to the Individuals with Disabilities Education Act, Part B, Subpart A, Section 300.4, interpreters in educational settings are related service providers (https://sites.ed.gov/idea/). As such, each state determines the qualifications for interpreters working in educational settings (see http://naiedu.org/state-standards/ for the most current information on state requirements). Although some states accept EIPA scores as low as 3.0, an EIPA 3.5 is considered the minimally acceptable level for interpreters in education (Schick et al., 1999). At an EIPA 3.5, interpreters still produce a message with frequent semantic, grammatical, and prosodic errors that can lead to student misunderstanding (Schick et al., 1999).

National organizations concur that the minimum standard for educational interpreters should be an EIPA 4.0. From 2006-2016, the Registry of Interpreters for the Deaf (RID) offered a specialist certification to interpreters with an EIPA 4.0 or higher who had also passed the EIPA written test (https://rid.org/about-rid/about-interpreting/resources/for-educational-interpreters/).

The National Association of Interpreters in Education recommends interpreters in education achieve an EIPA 4.0 or better (NAIE, 2019).

More research is needed on the educational benefit that interpreters at different EIPA skill levels provide to students, because existing research indicates that the majority of interpreters in education score below an EIPA 4.0 (Johnson et al., 2018; Jones, 2005; Jones et al., 1997; Marschark et al., 2005; Monikowski & Winston, 2003; Schick & Williams, 2004; Schick et al., 1999; Schick et al., 2006). Recent research suggests that students may not receive educational benefit from an interpreter scoring an EIPA 3.0, but may receive educational benefit from an interpreter scoring an EIPA 4.0 (Cates & Delkamiller, in press).

**INTERPRETER SKILLS ON THE EIPA**

The comprehensive assessment that the EIPA conducts can be used to inform interpreters, researchers, and interpreter educators about national trends in interpreter skills. Johnson et al. (2018) present the most recent analysis of broad trends on EIPA test scores from 2002-2014 with a total of 18,010 scores. They found that there was no particular advantage to interpreters taking one language version over another, though interpreters on the MCE version of the test had slightly lower average scores than interpreters on the ASL and PSE versions. There was a very small difference between the elementary and secondary versions, with the secondary level scores being very slightly higher than the elementary level scores (this difference accounted for less than one half of a percent of variance in scores). They found that the variables correlating most strongly with the total score include composite variables for prosody, use of space, and the individual index *key vocabulary represented*. They showed that 96% of overall EIPA scores can be explained by the composite variables of prosody, use of space, and the individual indices *key vocabulary represented* and *follows principles of discourse mapping*.

This paper replicates part of and then extends the findings from Johnson et al. (2018) to answer four primary questions: what patterns are there in EIPA Romans across score levels, what patterns are there in EIPA indices within Romans across score levels, which discreet language and processing skills correlate most strongly with overall EIPA scores, and how does performance on those discreet language and processing skills compare between graduates and non-graduates of interpreter training programs?

**METHODS**

The data for this study come from a database of 1,211 EIPA scores. This database is provided by Training and Assessment Systems for K-12 Educational Interpreters (TASK-12), a collaboration of states working together to increase the qualifications and skill of interpreters in educational settings. TASK-12 is a project of Technical Assistance for Excellence in Special Education. The TASK-12 database contains scores from fourteen states over a period of six years, from 2012-2018. TASK-12 collects the EIPA score reports of all interpreters testing in TASK-12 states. When interpreters take the exam, they sign a waiver giving TASK-12 permission to collect this data. Scores are anonymized and stored in an Excel file by test year. There is no identifying information attached to the scores in this file, and as such some of the scores represent multiple attempts by the same individual. TASK-12 has granted permission for this analysis to be published in order to

assist practitioners, interpreter supervisors, educators, and stakeholders in improving the quality of interpreters working in educational settings.

This database contains the following demographic data (see Table 1): the state where the interpreter works, whether or not they graduated from an interpreter training program, and how many years they have been interpreting in schools. Demographic data are organized by state for reporting purposes, but scores are not divided out by state in the analysis because the goal of this paper is to analyze national trends.

All statistical analysis was done in SPSS. The initial analyses replicate some of the analyses from the Johnson et al. (2018) study to show that the TASK-12 database is representative of national trends on the EIPA. The additional analyses address the four primary questions of this study using score means and standard deviations, correlations, MANCOVA, and regression.

**Table 1.** *Demographic Data by State for EIPA Test Scores in the TASK-12 Database*

| State | *N* | ITP graduate | | Years interpreting in school | |
|---|---|---|---|---|---|
| | | Yes | No | *M* | *SD* |
| AK | 48 | 28 | 20 | 8.0 | 7.69 |
| AL | 65 | 24 | 41 | 4.3 | 6.67 |
| AR | 60 | 13 | 43 | 5.9 | 5.85 |
| AZ | 274 | 163 | 111 | 1.9 | 3.45 |
| IA | 147 | 108 | 39 | 3.3 | 4.16 |
| ID | 59 | 41 | 18 | 3.5 | 5.00 |
| KS | 126 | 73 | 53 | 7.2 | 6.57 |
| MT | 46 | 26 | 20 | 7.0 | 5.87 |
| NE | 58 | 30 | 28 | 7.9 | 8.12 |
| NH | 2 | 2 | 0 | 10.5 | 13.44 |
| NM | 43 | 32 | 11 | 3.8 | 3.97 |
| OK | 83 | 56 | 20 | 5.9 | 6.84 |
| OR | 72 | 31 | 41 | 6.3 | 7.51 |
| UT | 109 | 54 | 55 | 4.9 | 6.10 |
| WY | 19 | 4 | 14 | 5.7 | 4.55 |

**Results and Discussion**

**REPLICATION OF JOHNSON ET AL. (2018)**

Table 2 contains a comparison of the score distributions from this database and from the Johnson et al. (2018) study. This database contains a larger percentage of interpreters scoring between a 3.0 and a 3.9 and a smaller percentage of interpreters scoring below a 3.0 or at or above a 4.0 than the Johnson et al. (2018) study.

**Table 2.** *EIPA Score Range Percentages Compared with Johnson et al., 2018*

| EIPA overall score range | Johnson et al. (2018) | TASK-12 database |
|---|---|---|
| > 3.0 | 27% | 12% |
| 3.0-3.49 | 36% | 48% |
| 3.5-3.99 | 19% | 34% |
| 4.0+ | 18% | 6 % |

This paper will replicate two of the analyses from the Johnson et al. (2018) study that they ran on overall EIPA scores at or above a 3.0. There are 1,068 scores in the TASK-12 database at or above a 3.0, so these scores have been included in the analysis. These analyses include correlations of specific indices and composite variables with the overall EIPA score, and a regression analysis with four key variables as predictors of the overall EIPA score. These analyses were selected to test if the TASK-12 database is a good representation of national trends on the EIPA.

Johnson et al. (2018) created composite variables corresponding to skills in prosody and use of space "from all EIPA items across domains that assessed various forms" (p. 78) of these skills. However, they do not specify which indices were used. In order to perform a comparative correlation and regression analysis, composite variables for prosody and use of space have been calculated in the TASK-12 database using the indices listed in Table 3, which are the author's interpretation of indices measuring prosody and use of space, respectively.

**Table 3.** *Indices Included in Composite Variables*

| Composite variable | Roman | Index name |
|---|---|---|
| Prosody | I | Stress or emphasis for important words or phrases |
| | | Affect and emotions |
| | | Register |
| | | Sentence boundaries |
| | II | Register |
| | | Speech production: rate, rhythm, fluency, volume |
| | | Sentence and clausal boundaries indicated |
| | | Sentence types |
| | | Emphasize important words, phrases, affect, emotions |
| | III | Fluency (rhythm and rate) |
| Use of Space | I | Use of verb directionality/pronominal system |
| | | Comparison/contrast, sequence and cause/effect |
| | | Location/relationship using ASL classifier system |
| | | Follows grammar of ASL or PSE |
| | IV | Appropriate eye contact and movement |
| | | Indicates who is speaking |

Johnson et al. (2018) ran correlations for several indices and composite variables with the overall EIPA score, so these same correlations were run for the TASK-12 database. The results are compared in Table 4. Johnson et al. (2018) found that the skills correlating most strongly with the total score include the composite variables for prosody, use of space, and the individual index *key vocabulary represented*. Though most of the correlations for the TASK-12 database are smaller than those for the Johnson et al. (2018) study, the pattern of correlation strength is the same, with the composite variables for prosody, use of space, and the individual index *key vocabulary represented* having much stronger correlations with the overall EIPA score than the other skill indices selected. These results indicate the TASK-12 data reflect the national trends captured in the Johnson et al. (2018) study.

**Table 4.** *Variable Correlations with Overall EIPA Score: Comparison with Johnson et al., 2018*

| Variable | Correlation with overall EIPA score | |
| --- | --- | --- |
| | Johnson et al. (2018) | TASK-12 database |
| Prosody | .914** | .954** |
| Production of fingerspelling | .770** | .354** |
| Use of space | .905** | .816** |
| Amount of sign vocabulary | .770** | .418** |
| Key vocabulary represented | .854** | .705** |

\*\*Correlation is significant at the 0.01 level (two-tailed).

Johnson et al. (2018) ran a regression analysis using the composite variables of prosody and use of space, and the individual indices *key vocabulary represented* and *follows principles of discourse mapping* as the predictor variables for the overall EIPA score. These four variables accounted for .96 of the variance in overall EIPA scores. The results of the regression model for the TASK-12 data are the same as for the Johnson et al. (2018) study: the four variables account for .957 of the variance in overall EIPA scores ($F(4,1061) = 5873.71$, $p < .001$). These results indicate that the TASK-12 data reflect national trends as presented the Johnson et al. (2018) study. Therefore, these data are useful for a more detailed analysis of EIPA test scores.

**ANALYSIS OF SCORE TRENDS ON THE EIPA**

The second set of analyses contain only scores from the PSE and ASL versions of the EIPA since the MCE version is testing for different grammatical features. Table 5 contains the descriptive statistics for the 1,211 scores in the TASK-12 database, and Figure 1 contains a frequency distribution of these scores.

**Table 5.** *Descriptive Statistics for EIPA Scores in the Database*

| Statistic | | Number |
|---|---|---|
| *N* | | 1211 |
| *M* | | 3.36 |
| *SD* | | 0.37 |
| Range | | 3.1 |
| Min. | | 1.6 |
| Max. | | 4.7 |
| | 25 | 3.1 |
| Percentile | 50 | 3.4 |
| | 75 | 3.6 |

**Figure 1.** *Frequency Distribution of the EIPA Scores in the Database*
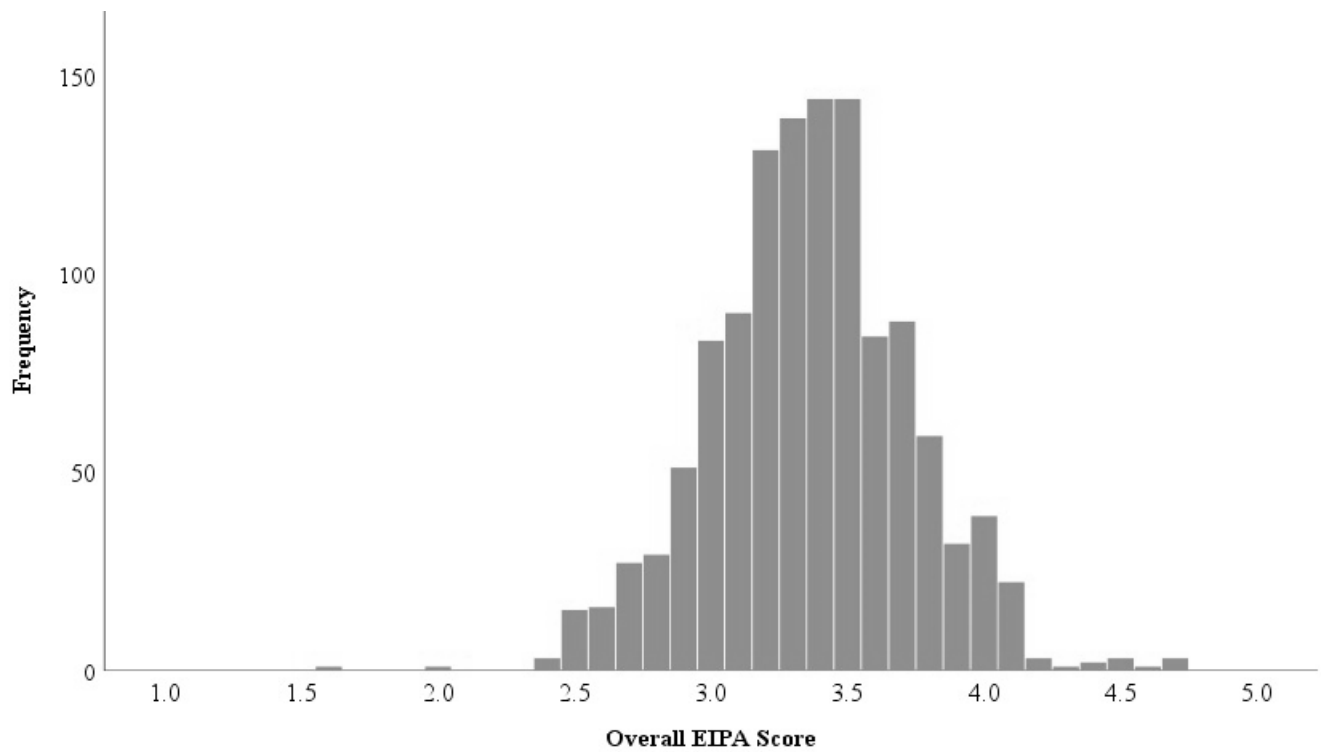


There are fewer than ten scores in the database for score levels below 2.5 and above 4.1. Therefore, the analysis of patterns across score levels will be conducted for scores between 2.5 and 4.1, for a total of 1,193 scores.

The means and standard deviations of each Roman by overall score level were analyzed to identify patterns in EIPA Romans across score levels. The means and standard deviations of each index by overall score level by Romans were analyzed to identify patterns in EIPA indices within Romans across score levels. Correlations between indices and with overall EIPA scores were

analyzed to identify which discreet language and processing skills correlate most strongly with overall EIPA scores. A one-way MANCOVA compares the performance on those identified discreet language and processing skills between graduates and non-graduates of ITPs.

## *PATTERNS OF RESULTS ACROSS SCORE LEVELS*

Table 6 shows the average scores and standard deviations for each of the four Romans at each total score level from 2.5 to 4.1. At every score level[i], the pattern of Romans from highest to lowest is Roman III (Vocabulary), Roman I (Voice-to-Sign), Roman II (Sign-to-Voice), and Roman IV (Overall Factors). This pattern indicates that interpreters have stronger vocabulary than interpreting skills regardless of their overall ability to interpret. Furthermore, at every score level, Roman III is higher than the overall EIPA score by more than half a point, and sometimes by more than one full point. This indicates that interpreter vocabulary skills strongly aid their overall EIPA score. At an EIPA 3.5 and above, the disparity between Roman III and overall scores is smaller. This indicates that interpreters rely less on vocabulary to aid their overall EIPA score as their overall interpreting ability increases.

**Table 6.** *Average Scores and Standard Deviations across Romans I-IV for Each EIPA Score Level*

| EIPA score | N | Roman I | | Roman II | | Roman III | | Roman IV | |
|---|---|---|---|---|---|---|---|---|---|
| | | M | SD | M | SD | M | SD | M | SD |
| 2.5 | 15 | 2.49 | 0.21 | 1.93 | 0.33 | 3.62 | 0.26 | 1.93 | 0.11 |
| 2.6 | 16 | 2.49 | 0.25 | 2.09 | 0.40 | 3.81 | 0.30 | 2.01 | 0.07 |
| 2.7 | 27 | 2.60 | 0.24 | 2.24 | 0.36 | 3.65 | 0.59 | 2.16 | 0.11 |
| 2.8 | 29 | 2.66 | 0.15 | 2.39 | 0.28 | 3.67 | 0.79 | 2.22 | 0.11 |
| 2.9 | 51 | 2.75 | 0.21 | 2.49 | 0.34 | 3.80 | 0.75 | 2.32 | 0.09 |
| 3.0 | 83 | 2.89 | 0.16 | 2.56 | 0.27 | 4.07 | 0.19 | 2.45 | 0.10 |
| 3.1 | 90 | 2.97 | 0.16 | 2.65 | 0.29 | 4.17 | 0.26 | 2.55 | 0.10 |
| 3.2 | 131 | 3.07 | 0.18 | 2.77 | 0.30 | 4.21 | 0.44 | 2.65 | 0.10 |
| 3.3 | 139 | 3.16 | 0.17 | 2.89 | 0.30 | 4.28 | 0.44 | 2.76 | 0.09 |
| 3.4 | 144 | 3.23 | 0.17 | 3.01 | 0.28 | 4.40 | 0.35 | 2.86 | 0.08 |
| 3.5 | 144 | 3.33 | 0.18 | 3.20 | 0.28 | 4.37 | 0.53 | 2.97 | 0.09 |
| 3.6 | 84 | 3.45 | 0.20 | 3.26 | 0.33 | 4.44 | 0.63 | 3.08 | 0.09 |
| 3.7 | 88 | 3.56 | 0.22 | 3.44 | 0.37 | 4.47 | 0.53 | 3.18 | 0.11 |
| 3.8 | 59 | 3.64 | 0.26 | 3.54 | 0.40 | 4.56 | 0.47 | 3.32 | 0.11 |
| 3.9 | 32 | 3.71 | 0.29 | 3.74 | 0.50 | 4.66 | 0.17 | 3.40 | 0.10 |
| 4.0 | 39 | 3.93 | 0.22 | 3.76 | 0.38 | 4.66 | 0.16 | 3.59 | 0.11 |
| 4.1 | 22 | 3.96 | 0.24 | 3.92 | 0.41 | 4.74 | 0.12 | 3.69 | 0.16 |

*PATTERNS OF RESULTS WITHIN DOMAINS*

Mean scores and standard deviations for each index are grouped by overall EIPA score by Roman in Appendices B-E. In these appendices, index means for each score level are arranged from lowest to highest. This arrangement reveals patterns in scoring across skill levels.

**Roman I.** Table 7 summarizes the score pattern for indices in Roman I (see Appendix B for complete score patterns), and the correlations of each index with the overall EIPA score.

**Table 7.** *Roman I Indices Ranked from Highest-to-Lowest Scoring, and Correlation with Overall*

*EIPA*

| Rank | Index | *r* with overall EIPA score |
|------|-------|------------------------------|
| 1 | Clearly mouths speaker's English | .313** |
| 2 | Sentence boundaries | .757** |
| 3 | Affect and emotions | .756** |
| 4 | Sentence types and clausal boundaries indicated | .769** |
|  | Use of verb directionality/pronominal system | .798** |
| 5 | Stress or emphasis for important words or phrases | .807** |
| 6 | Register | .808** |
| 7 | Comparison/contrast, sequence, and cause/effect | .799** |
|  | Follows grammar of ASL or PSE | .804** |
| 8 | Location/relationship using ASL classifier system | .758** |
|  | Production and use of nonmanual adverbial/adjectival markers | .639** |

**. Correlation is significant at the 0.01 level (2-tailed).

The index with the highest score across EIPA levels is *clearly mouths speaker's English*. However, it has the lowest correlation with the overall EIPA score of all Roman I indices. The next two highest scoring indices are *sentence boundaries* and *affect and emotions*, which have some structural overlap between ASL and English, particularly in the use of pausing at boundaries (Klatt, 1976; Wilbur, 2000), and the use of facial expression to covey affect and emotion (Ekman, 1980). Average scores on these indices are also consistently at or above the overall EIPA score. The four consistently lowest scoring areas are *use of space for comparison/contrast, sequence, and cause/effect* and *follows grammar of ASL or PSE*, followed by *location/relationship using ASL classifier system* and *production and use of nonmanual adverbial/adjectival markers*. These indices represent the greatest productive differences between ASL and English (Meier, 2002; Wilbur, 2000). Furthermore, average scores on these indices are consistently lower than the overall EIPA score. The index *follows grammar of ASL or PSE* measures a complex skill made up of many discreet skills with respect to grammar. This is addressed below in the analysis of the correlations between discreet and complex skill indices on the EIPA.

The consistent scoring pattern for indices in Roman I across overall EIPA levels suggests that some discreet skills are easier for interpreters than others, regardless of their overall skill. The

highest scoring indices are those that ASL and English have most in common linguistically, while the lowest scoring indices are those where ASL and English differ most linguistically. This score pattern indicates that interpreters have relative difficulty at all skill levels with rendering a grammatically correct interpretation in ASL or PSE (which relies on English word order but incorporates non-manual information and use of spatial grammar and classifiers from ASL).

**Roman II.** Table 8 summarizes the score pattern for indices in Roman II (see Appendix C for complete score patterns), and the correlations of each index with the overall EIPA score.

**Table 8**

*Roman II Indices Ranked from Highest-to-Lowest Scoring, and Correlation with Overall EIPA*

| Rank | Index | *r* with overall EIPA score |
|------|-------|------------------------------|
| 1 | Signs | .725** |
| 2 | Speech production: rate, rhythm, fluency, volume | .769** |
| 3 | Sentence and clausal boundaries indicated | .774** |
|   | Correct English word selection | .750** |
|   | Adds no extraneous words/sounds to message | .746** |
|   | Register | .773** |
|   | Sentence types | .768** |
| 4 | Emphasize important words, phrases, affect, emotions | .759** |
| 5 | Fingerspelling and numbers | .655** |
|   | Non-manual behaviors and ASL morphology | .685** |

**. Correlation is significant at the 0.01 level (2-tailed).

The index *signs* (sign comprehension) and *speech production: rate, rhythm, fluency, volume* are consistently the two highest scoring areas across overall score levels. However, no individual index has an average score higher than the overall EIPA score at any level with the exception of *signs* for EIPA 3.5. The two indices with the lowest scores across all levels are the comprehension indices *non-manual behaviors and ASL morphology* and *fingerspelling and numbers*. Interestingly, from EIPA 2.5-3.3, comprehension of non-manual behaviors is stronger than comprehension of fingerspelling, but after an EIPA 3.2, comprehension of fingerspelling is stronger than comprehension of non-manual markers. Reading fingerspelling is a complex cognitive process (Patrie & Johnson, 2011), so it is not surprising that it is a low-scoring index.

There is much more variation across levels for Roman II indices than for Roman I indices. This indicates that interpreters vary more in their discreet skills with ASL-to-English interpreting than in their discreet skills with English-to-ASL interpreting. Interestingly, nonmanual markers are weak in both Roman I and Roman II, indicating that this is a specific language feature with which interpreters struggle. However, in both Roman I and Roman II, nonmanual markers have lower correlations with the overall EIPA score than most other indices. This indicates that, though nonmanual markers are an area of difficulty for interpreters, their use does not impact the clarity of the whole interpretation as much as some other skill indices do.

However, for both Romans I and II, interpretation of emphatic information is a mid-to-lower ranking skill. This indicates that interpreters do not consistently show the relative importance of information in the source. This may be due to a lack of interpreter processing, a lack of interpreter skill in producing emphatic structures in the target languages, or a combination of both. Furthermore, the correlations of these indices with the overall EIPA are among the highest of the indices in both Romans I and II, which indicates that interpretation of emphatic information is a beneficial area of study for interpreters to improve the overall quality of their interpretations.

**Roman III.** Table 9 summarizes the score pattern for indices in Roman III (see Appendix D for complete score patterns), and the correlations of each index with the overall EIPA score.

**Table 9**

*Roman III Indices Ranked from Highest-to-Lowest Scoring, and Correlation with Overall EIPA*

| Rank | Index | $r$ with overall EIPA score |
|---|---|---|
| 1 | Production of numbers (clarity, fluency, rate) | .385** |
| | Amount of sign vocabulary | .587** |
| 2 | Signs made correctly | .642** |
| | Vocabulary consistent with the sign language or system chosen for testing | .604** |
| 3 | Spelled correctly | .451** |
| | Fluency (rhythm and rate) | .641** |
| 4 | Production of fingerspelling | .484** |
| 5 | Key vocabulary represented | .777** |
| 6 | Appropriate use of fingerspelling | .765** |

**. Correlation is significant at the 0.01 level (2-tailed).

All of the average scores for all Roman III indices are above the overall EIPA score for each level, with the exception of *appropriate use of fingerspelling* and *key vocabulary represented* (though the latter is above the total score for EIPA 4.0). This is not surprising since Roman III has the highest average of all domains across overall score levels.

These results indicate that interpreters have sufficient vocabulary to convey the words in the source message; however, the two lowest indices suggest that interpreters are not discriminating between the words for their relative importance in the discourse. Furthermore, *appropriate use of fingerspelling* and *key vocabulary represented* have the highest correlations with the overall EIPA score of all the Roman III indices, which suggests that these are important skills in academic interpreting.

In academic settings, fingerspelling helps students make connections between printed English words, signs, and concepts that students need to know (Emmorey & Petrich, 2012; Haptonstall-Nykaza & Schick, 2007; Lederberg et al., 2019). For example, when studying the

characteristics of plot in an English class, students need to know terms such as *rising action*, *climax*, and *falling action*. Therefore, an interpreter should fingerspell these terms along with conceptually appropriate signs and depictive structures to clearly render these concepts. This requires interpreters to analyze the incoming message with the teacher's goals in mind in order to identify terminology that may need to be fingerspelled. The scores on *appropriate use of fingerspelling* and *key vocabulary represented* indicate that interpreters either do not recognize key vocabulary in the source, or that they do not employ fingerspelling as a strategy for representing key vocabulary.

**Roman IV.** Table 10 summarizes the score pattern for indices in Roman IV (see Appendix E for complete score patterns), and the correlations of each index with the overall EIPA score.

**Table 10**

*Roman IV Indices Ranked from Highest-to-Lowest Scoring, and Correlation with Overall EIPA*

| Rank | Index | *r* with overall EIPA score |
|---|---|---|
| 1 | Appropriate eye contact and movement | .794** |
| 2 | Indicates who is speaking | .763** |
| 3 | Developed a sense of the whole message v-s | .836** |
| 4 | Demonstrated process decalage (lag time) appropriately v-s | .834** |
| | Demonstrated process decalage (lag time) appropriately s-v | .768** |
| | Developed a sense of the whole message s-v | .769** |
| 5 | Follows principles of discourse mapping | .831** |

**. Correlation is significant at the 0.01 level (2-tailed).

With the exception of appropriate eye contact and movement for EIPA 2.5 and EIPA 4.0, none of the average scores for the Roman IV indices are above the overall EIPA score at any level. This is not surprising because, just as Roman III is the highest scoring domain across levels, Roman IV is the lowest scoring domain across levels. *Appropriate eye contact and movement* and *indicates who is speaking* are consistently the two highest scoring indices. Eye contact and movement refers to the interpreter's functional and grammatical use of eye contact and movement. In ASL, the direction of eye gaze is a critical component of syntax, prosody and pragmatics (Wilbur, 2000; Thompson, 2006). Indicating who is speaking requires both the use of indexing and body shifting, characteristics of ASL that are part of the grammar (Wilbur, 2000). The lowest index, *follows principles of discourse mapping*, is one of the lowest scoring indices of all 37 indices for all skill levels on the EIPA. The EIPA glossary definition of discourse mapping includes message cohesion through use of space, transitions, and the indication of key points in the source message (Schick & Williams, 2013). Therefore, *follows principles of discourse mapping* is measuring a complex skill comprised of multiple discreet skills (use of space, stress, etc.). These discreet skills are addressed in more detail below.

When the results from the score analyses of Romans I-IV are considered together, a few patterns emerge. The first is that interpreters generally have stronger English-to-ASL interpreting

than they do ASL-to-English interpreting on the EIPA (Romans I and II), even though research suggests that novice interpreters are more accurate and fluent when interpreting ASL-to-English (Nicodemus & Emmorey, 2015). This pattern on the EIPA may be due to educational interpreters spending more time interpreting from English to ASL than from ASL to English in schools (Nicodemus & Emmorey, 2013).

The second pattern that emerges is that interpreters score higher on measures of accuracy (vocabulary, sentence boundaries) than on measures of equivalency (emphasis, information structure). This may be due to interpreters processing more at the lexical and phrasal levels of discourse instead of relying on goal-driven processing (Eysenck & Keane, 2000).

The third pattern that emerges is that skills are rankable across skill levels. In some indices, interpreters consistently score higher than their overall EIPA score, across score levels, and in others they consistently score lower. This pattern indicates that some skills are more readily learnable and/or leverageable by interpreters than others. These skills include mouthing the speaker's English, use of sentence boundaries in ASL, amount of ASL vocabulary, articulation (signs, fingerspelling, and numbers), sign fluency, vocabulary selection, and accurate spelling. Skills that are more difficult to learn and/or leverage include the grammar of ASL, nonmanual markers, use of space, and classifiers.

The fourth pattern that emerges is that not all indices carry the same weight for the overall clarity of an interpretation, so one cannot just rely on the individual index scores to identify areas where additional training is needed. For example, interpreters score lower on nonmanual markers than they do on emphatic information, but emphatic information is more important to the overall clarity of an interpretation than nonmanual markers, as indicated by their respective correlations with the overall EIPA score. Reliance on the individual index scores may lead interpreters to study less significant aspects of language and interpreting.

Furthermore, some indices measure complex skills, such as discourse mapping and grammar. These indices capture the gestalt of the skill, but do not provide interpreters with discreet skills they need to study for improvement. The following analyses address this issue by identifying discreet skills that have strong correlations with these complex skills.

**IDENTIFYING DISCREET SKILLS**

Some of the indices correlating most strongly with the overall EIPA score are complex skills that measure the overall clarity of an interpretation rather than discreet skills. For example, the index *follows the principles of discourse mapping* measures multiple skills such as grammar, use of space, and cohesion (Schick & Williams, 2013). The complex skill indices with strong correlations with the overall EIPA score (>0.8) include: *follows grammar of ASL/PSE* (grammar), *developed a sense of the whole message V-S* (sense V-S), *demonstrated process decalage (lag time) appropriately V-S* (process time), and *follows principles of discourse mapping* (discourse mapping). In order to determine discreet skills that interpreters can work on to improve the overall clarity of their interpretations, it is beneficial to look at other discreet skill indices that correlate most strongly with these complex skill indices. Table 11 presents a summary of the discreet skill indices that correlate above 0.8 with the complex skill indices. Complete correlation matrices are in Appendix F.

**Table 11**

*Correlations >0.8 of Discreet Skill Indices with Complex Skill Indices*

| Index | *r* | | | |
|---|---|---|---|---|
| | Grammar | Sense v-s | Process time | Discourse mapping |
| Stress or emphasis for important words or phrases | | .844[**] | .840[**] | .829[**] |
| Register | | .839[**] | .826[**] | .834[**] |
| Use of verb directionality/pronominal system | .867[**] | .831[**] | .827[**] | .852[**] |
| Comparison/contrast, sequence and cause/effect | .976[**] | .833[**] | .845[**] | .902[**] |
| Location/relationship using ASL classifier system | .899[**] | | .801[**] | .844[**] |
| Appropriate eye contact and movement | | .818[**] | .831[**] | .817[**] |

**. Correlation is significant at the 0.01 level (2-tailed).

There are two discreet skills that correlate strongly with all four of the complex skill indices: *use of verb directionality/pronominal system* (verb directionality), and *use of space for comparison and contrast, sequence, and cause and effect* (use of space). This indicates that an interpreter's ability to use space to structure their interpretation is critical to the clarity and comprehensibility of their product. This is true whether the target language is ASL or PSE. This finding is not surprising since the use of space and verb directionality are critical components of cohesion in ASL discourse (Winston, 1991).

Four discreet skills correlate strongly with three of the four complex skill indices: *stress or emphasis for important words or phrases* (stress), *register*, *location/relationship using ASL classifier system* (CL), and *appropriate eye contact and movement* (eye gaze). The indices for stress and register also correlate strongly (>0.8) with the overall EIPA score. Stress and register are both components of prosody, which, as discussed above, accounts for a good amount of variance in EIPA scores. In order to appropriately use verb directionality, space, stress, and register, interpreters must analyze the incoming message for more than just words and phrases. They need to analyze it for structure and intent (Macnamara, 2012).

Classifiers are another component of the system of ASL spatial grammar (Liddell, 2003), so it makes sense that their use correlates with discourse mapping and grammar. It is interesting that CL also correlates with process time, but not with sense V-S. This indicates that, in order to use classifiers, an interpreter needs to engage processing time, but that individual classifier constructions in an interpretation do not determine as much about the overall message clarity as the use of space and verb directionality.

Eye gaze is used in stress and emphasis, affect, the verb directionality/pronominal system of ASL, turn-taking, and marking the addressee of statements (Mather, 1987; Thompson, 2006; Thompson et al., 2006; Winston, 1991). Therefore, interpreters need to learn to control their eye gaze, which may be affected by their processing. While people think, their eyes move in different directions (Eckstein et al., 2017). This is particularly true for people engaged in complex processing tasks (Green et al., 2007), including simultaneous interpreting (Seeber, 2012; Stachowiak, 2017; Tiselius & Sneed, 2020). Therefore, the eyes have two competing forces during

simultaneous interpreting: processing demands and linguistic demands. Interpreters need to be aware of these competing demands. The correlation of eye gaze with process time in V-S interpreting indicates that interpreters with more effective process time have more effective use of eye gaze.

In total, six discreet skill indices correlate strongly with the complex skill indices that correlate with the overall EIPA score: verb directionality, use of space, stress, register, CL, and eye gaze. A regression model with these six indices as the predictor variables for overall EIPA scores shows that they account for .758 (almost 76%) of the variance in overall EIPA scores ($F(6,1204) = 632.764$, $p < .001$). As the pattern of results from Roman I above shows, stress, register, use of space, and CL are among the lower scoring indices for Roman I. Therefore, though these skills are critical to a clear interpretation, interpreters do not engage them consistently. This may be due to a lack of fluency in ASL, to a lack of processing while interpreting, or some combination of both. In order to tease apart what is due to language fluency and what is due to processing, interpreters should be assessed for their ASL language fluency separate from their interpreting, particularly in the areas of verb directionality, use of space, stress, and register.

### COMPARISON OF ITP GRADS AND NON-GRADS ON DISCREET SKILLS

Ideally, ITPs will include formal study of discourse features in ASL as well as discourse analysis in the process of teaching interpreting (Cogen & Cokely, 2015). Therefore, one would expect graduates from interpreter training programs to score higher on average on these indices than interpreters who did not graduate from interpreter training programs. In order to compare graduates (N = 684) and non-graduates (N = 512) of ITP programs, a random selection of graduates were taken to match the smaller number of non-graduates. A MANCOVA comparing ITP graduates and non-graduates on these six indices with years interpreting as a covariate shows ITP graduates score higher on all six indices than non-graduates (Table 12). However, effect sizes are small, accounting for less than 5% of the difference in scores for each index, and 2% of the difference between groups overall. Furthermore, raw score average differences between groups are within .1 on all indices, with standard deviations of .4 to .5. The largest difference between groups is in eye gaze. The smallest difference is in use of space. These results indicate that ITPs on average are providing a statistically significant but small benefit to interpreters in these six skill areas.

**Table 12**

*MANCOVA Comparing Graduates and Non-Graduates of ITPs on Six Skill Indices*

| Index | ITP Graduates | | Non-Graduates | | $F$ | $p$ | $\eta^2$ |
|---|---|---|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* | | | |
| Stress | 3.15 | 0.49 | 3.07 | 0.50 | 23.451 | <.000 | .044 |
| Register | 3.09 | 0.51 | 3.03 | 0.54 | 19.960 | <.000 | .038 |
| Verb directionality | 3.30 | 0.43 | 3.24 | 0.46 | 27.550 | <.000 | .051 |
| Use of space | 2.88 | 0.43 | 2.84 | 0.44 | 22.148 | <.000 | .042 |
| CL | 2.66 | 0.44 | 2.60 | 0.44 | 22.126 | <.000 | .042 |
| Eye gaze | 3.32 | 0.45 | 3.22 | 0.46 | 24.596 | <.000 | .046 |

It is possible that individual ITPs will differ in their effectiveness at training in these skill areas. The TASK-12 database does not differentiate between two-year or four-year programs, whether programs have a language screening for entry, how interpreters learned ASL, nor for how long they have been signing. Future research should take these background variables into account in order to provide a clearer picture of the benefit that ITPs provide to interpreters.

**RECOMMENDATIONS**

These analyses identify several areas of vocabulary and articulation that are relevant to interpreting, but that do not have as strong an impact on the overall clarity of an interpretation: mouthing the speaker's English, use of sentence boundaries in ASL, amount of ASL vocabulary, articulation (signs, fingerspelling, and numbers), sign fluency, vocabulary selection, and accurate spelling. Furthermore, these analyses identify six discreet skills that are important for the overall clarity of an interpretation: stress, register, verb directionality, use of space, classifiers, and eye gaze. Interpreter training programs can use these skills as criteria to evaluate interpreters on entry and exit, and to enhance their program coursework.

At a minimum to enter an ITP, students should be assessed for their vocabulary in both ASL and English, and on their articulation and fluency in ASL. These are higher-scoring skills on the EIPA, indicating that they are more readily learnable/leverageable by interpreters. Currently, there is no standard across ITPs for language screening before students begin interpreting coursework (Rowley & Kovacs-Houlihan, 2014), despite the fact that foundational language competence in ASL predicts student achievement in interpreter training programs (Garrett & Girardin, 2019). One negative side effect of allowing students without fluency in ASL into ITPs is that it forces programs to focus on basic language skills instead of higher order processing skills (Winston, 2005). If ITPs establish these minimum competencies with vocabulary, articulation, and fluency prior to program entry, then ITP coursework can focus on other higher-order features of discourse that impact the overall quality and clarity of interpreters' work.

ITPs should incorporate training specific to the six identified discreet skills as part of the ITP curriculum. Interpreter weaknesses in these areas may stem from a lack of fluency in these features, a lack of processing so that these features can be appropriately leveraged in an interpretation, or both (Dong & Li, 2020). Therefore, programs should also offer focused study of these linguistic features in advanced language courses.

Furthermore, programs should teach intensive discourse analysis in both English and ASL separate from the work of interpreting in order to train interpreters to attune their attention to goal-driven processing before they start trying to interpret. This can be done for English while students are still learning ASL. Once interpreters have studied advanced ASL language features and discourse analysis, they can begin to apply both to the work of interpreting. This will provide a robust foundation for language and processing, both necessary components of effective interpreting (Dong & Li, 2020).

During interpreting courses, students can use these six discreet skills to do self-assessments and peer assessments. Through reflective exercises, they can identify where these skills aren't applied because of a lack of processing, and where they aren't applied because of a lack of fluency. Such reflective exercises have been shown to positively influence interpreter skill as measured by

the EIPA (Fitzmaurice, 2018). Furthermore, this will guide peer feedback to encourage students to focus more on higher-order language features and less on sign production and semantic issues. It will also help students and instructors identify where students may need more explicit ASL language training, and will provide more guidance to language mentors and tutors.

Working interpreters can also use these analyses to guide their professional development planning. These analyses show that skills are rankable in terms of difficulty across interpreter skill levels, but that not all discreet skills have the same impact on the overall clarity of an interpretation. Therefore, this analysis can enable working interpreters who have taken the EIPA to evaluate their own areas more effectively for growth: both where growth is possible, and where it will be most beneficial. They can seek out training on the six discreet skills in order to leverage their professional development time most effectively. Furthermore, these results indicate that working interpreters, broadly speaking, would be best served by studying the structure of discourse, goals of discourse (particularly classroom discourse), and the ASL grammatical structures that convey discourse structure and goals, instead of or in addition to studying aspects of sign vocabulary and articulation.

## LIMITATIONS

The author acknowledges limitations of the present study. These limitations are also discussed in their relevant locations in this paper.

First and foremost, this analysis contains multiple attempts by some individuals on the EIPA, and thus is not an analysis from all unique test takers. However, as this analysis uses averages at each EIPA score level across multiple test takers, it is unlikely that this limitation affects the validity of the analysis.

Second, there are not even numbers of tests at each score level. Therefore, averages and standard deviations are more accurate reflections of population trends for some score levels than others.

Third, this analysis combines scores from both the ASL and PSE versions of the EIPA, as well as elementary and secondary levels. Given the lack of previously observed effects between ASL and PSE versions of the test, and given the very small effect of grade level on overall scores, it is unlikely that this limitation affects the validity of the analysis.

## CONCLUSION

This study replicated part of the findings from Johnson et al. (2018). This analysis established the TASK-12 database as a good random sample of EIPA scores for analysis. Furthermore, this study identified patterns in EIPA Romans across and within score levels. Results of the analyses indicate that interpreters approach the task of interpreting more like signing a series of statements than as creating a discourse in another language. This is supported by the scoring patterns that correlate with ASL grammar, developing a sense of the signed message, and discourse mapping- these are all low-scoring areas with the strongest correlations with the overall EIPA score. Furthermore, six discreet skill areas were identified that account for 76% of the variance in EIPA scores: stress, register, verb directionality, use of space, CL, and eye gaze. Interpreters who have graduated from

ITPs do show a small benefit over interpreters who have not graduated from ITPs in these six skill areas.

Taken together, these results can inform ITP curriculum, screening, and assessment, as well as provide currently working interpreters with guidance on identifying effective professional development.

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## APPENDIX A

*Indices on the EIPA*

Roman I
A Stress or emphasis for important words or phrases
B Affect and emotions
C Register
D Sentence boundaries
E Sentence types and clausal boundaries indicated
F Production and use of non-manual adverbial/adj. markers
G Use of verb directionality/pronominal system
H Comparison/contrast, sequence and cause/effect
I Location/relationship using ASL classifier system
J Follows grammar of ASL or PSE (ASL/PSE version only)
K Use of Eng. morphological markers (MCE version only)
L Clearly mouths speaker's English

Roman II
A Signs
B Fingerspelling and numbers
C Register
D Non-manual behaviors and ASL morphology
E Speech production: rate, rhythm, fluency, volume
F Sentence and clausal boundaries indicated
G Sentence types
H Emphasize important words, phrases, affect, emotions
I Correct English word selection
J Adds no extraneous words/sounds to message

Roman III
A Amount of sign vocabulary
B Signs made correctly
C Fluency (rhythm and rate)
D Vocabulary consistent with the sign language or system chosen for testing
E Key vocabulary represented
F Production of fingerspelling
G Spelled correctly
H Appropriate use of fingerspelling
I Production of numbers (clarity, fluency, rate)

Roman IV
A Appropriate eye contact and movement
B Developed a sense of the whole message V-S
C Developed a sense of the whole message S-V
D Demonstrated process decalage (lag time) appropriately V – S
E Demonstrated process decalage (lag time) appropriately S – V
F Follows principles of discourse mapping
G Indicates who is speaking

# APPENDIX B

*Score Patterns on Roman I for EIPA 2.5-4.1*

|  |  |  | Indices |  |  |  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Score | N |  | F | I | C | H | J | A | B | G | E | D | L |
| 2.5 | 15 | Mean | 1.57 | 2.00 | 2.17 | 2.21 | 2.22 | 2.28 | 2.50 | 2.53 | 2.55 | 2.83 | 4.32 |
|  |  | SD | 0.68 | 0.31 | 0.24 | 0.23 | 0.18 | 0.31 | 0.36 | 0.27 | 0.34 | 0.37 | 0.48 |
|  |  |  | F | I | J | H | C | A | G | E | B | D | L |
| 2.6 | 16 | Mean | 1.41 | 1.93 | 2.16 | 2.19 | 2.26 | 2.36 | 2.50 | 2.50 | 2.57 | 2.96 | 4.69 |
|  |  | SD | 0.87 | 0.37 | 0.34 | 0.34 | 0.28 | 0.28 | 0.31 | 0.31 | 0.43 | 0.28 | 0.38 |
|  |  |  | F | I | H | J | C | A | E | G | B | D | L |
| 2.7 | 27 | Mean | 1.83 | 2.14 | 2.29 | 2.31 | 2.34 | 2.43 | 2.65 | 2.66 | 2.70 | 2.81 | 4.46 |
|  |  | SD | 0.62 | 0.41 | 0.34 | 0.32 | 0.34 | 0.28 | 0.36 | 0.24 | 0.36 | 0.43 | 0.61 |
|  |  |  | F | I | J | H | C | A | E | G | B | D | L |
| 2.8 | 29 | Mean | 1.89 | 2.10 | 2.32 | 2.33 | 2.38 | 2.48 | 2.68 | 2.73 | 2.74 | 2.89 | 4.72 |
|  |  | SD | 0.50 | 0.22 | 0.20 | 0.20 | 0.32 | 0.30 | 0.29 | 0.20 | 0.33 | 0.33 | 0.43 |
|  |  |  | F | I | J | H | C | A | E | G | B | D | L |
| 2.9 | 51 | Mean | 2.00 | 2.21 | 2.44 | 2.45 | 2.50 | 2.60 | 2.75 | 2.82 | 2.88 | 3.05 | 4.63 |
|  |  | SD | 0.64 | 0.29 | 0.27 | 0.27 | 0.31 | 0.31 | 0.31 | 0.27 | 0.27 | 0.28 | 0.43 |
|  |  |  | F | I | J | H | C | A | E | B | G | D | L |
| 3.0 | 83 | Mean | 2.17 | 2.36 | 2.55 | 2.56 | 2.65 | 2.75 | 2.87 | 2.96 | 2.96 | 3.17 | 4.75 |
|  |  | SD | 0.45 | 0.25 | 0.26 | 0.26 | 0.30 | 0.24 | 0.30 | 0.34 | 0.23 | 0.27 | 0.32 |
|  |  |  | F | I | J | H | C | A | G | E | B | D | L |
| 3.1 | 90 | Mean | 2.26 | 2.37 | 2.63 | 2.63 | 2.79 | 2.81 | 3.02 | 3.03 | 3.10 | 3.27 | 4.77 |
|  |  | SD | 0.48 | 0.25 | 0.24 | 0.23 | 0.27 | 0.24 | 0.19 | 0.28 | 0.28 | 0.26 | 0.36 |
|  |  |  | F | I | H | J | C | A | G | E | B | D | L |
| 3.2 | 131 | Mean | 2.36 | 2.46 | 2.69 | 2.70 | 2.89 | 2.94 | 3.12 | 3.12 | 3.20 | 3.33 | 4.89 |
|  |  | SD | 0.48 | 0.27 | 0.24 | 0.25 | 0.30 | 0.26 | 0.23 | 0.31 | 0.31 | 0.35 | 0.20 |
|  |  |  | F | I | H | J | C | A | G | E | B | D | L |
| 3.3 | 139 | Mean | 2.50 | 2.58 | 2.79 | 2.80 | 3.02 | 3.05 | 3.19 | 3.23 | 3.29 | 3.46 | 4.88 |
|  |  | SD | 0.46 | 0.26 | 0.22 | 0.20 | 0.27 | 0.24 | 0.22 | 0.32 | 0.30 | 0.29 | 0.24 |
|  |  |  | F | I | H | J | C | A | G | E | B | D | L |
| 3.4 | 144 | Mean | 2.53 | 2.62 | 2.84 | 2.85 | 3.10 | 3.13 | 3.25 | 3.31 | 3.39 | 3.58 | 4.91 |
|  |  | SD | 0.46 | 0.26 | 0.24 | 0.23 | 0.25 | 0.25 | 0.24 | 0.29 | 0.30 | 0.26 | 0.21 |
|  |  |  | F | I | H | J | C | A | G | E | B | D | L |
| 3.5 | 144 | Mean | 2.66 | 2.72 | 2.96 | 2.97 | 3.19 | 3.21 | 3.38 | 3.40 | 3.48 | 3.64 | 4.90 |
|  |  | SD | 0.44 | 0.28 | 0.22 | 0.24 | 0.29 | 0.28 | 0.26 | 0.29 | 0.38 | 0.31 | 0.21 |
|  |  |  | I | F | H | J | C | A | G | E | B | D | L |
| 3.6 | 84 | Mean | 2.83 | 2.86 | 3.05 | 3.06 | 3.34 | 3.38 | 3.50 | 3.55 | 3.64 | 3.85 | 4.91 |
|  |  | SD | 0.26 | 0.44 | 0.25 | 0.26 | 0.34 | 0.33 | 0.29 | 0.35 | 0.41 | 0.30 | 0.23 |
|  |  |  | I | F | H | J | C | A | G | E | B | D | L |
| 3.7 | 88 | Mean | 2.94 | 3.00 | 3.18 | 3.19 | 3.43 | 3.45 | 3.61 | 3.66 | 3.79 | 3.86 | 4.91 |
|  |  | SD | 0.32 | 0.48 | 0.30 | 0.29 | 0.37 | 0.43 | 0.30 | 0.33 | 0.37 | 0.38 | 0.22 |
|  |  |  | F | I | J | H | C | A | E | G | B | D | L |
| 3.8 | 59 | Mean | 2.96 | 3.06 | 3.28 | 3.28 | 3.54 | 3.60 | 3.74 | 3.76 | 3.85 | 3.99 | 4.93 |
|  |  | SD | 0.66 | 0.32 | 0.28 | 0.29 | 0.39 | 0.34 | 0.41 | 0.27 | 0.45 | 0.38 | 0.17 |
|  |  |  | I | F | H | J | C | A | E | G | B | D | L |
| 3.9 | 32 | Mean | 3.10 | 3.15 | 3.33 | 3.34 | 3.71 | 3.73 | 3.79 | 3.80 | 3.93 | 4.07 | 4.91 |
|  |  | SD | 0.39 | 0.40 | 0.36 | 0.34 | 0.45 | 0.31 | 0.37 | 0.32 | 0.47 | 0.46 | 0.28 |
|  |  |  | I | F | H | J | C | A | G | E | B | D | L |
| 4.0 | 39 | Mean | 3.27 | 3.39 | 3.58 | 3.58 | 3.92 | 3.93 | 3.93 | 4.13 | 4.24 | 4.26 | 4.92 |
|  |  | SD | 0.32 | 0.59 | 0.32 | 0.29 | 0.32 | 0.30 | 0.63 | 0.33 | 0.44 | 0.39 | 0.13 |
|  |  |  | I | F | H | J | C | A | G | E | B | D | L |
| 4.1 | 22 | Mean | 3.34 | 3.46 | 3.62 | 3.65 | 3.90 | 3.93 | 4.09 | 4.11 | 4.21 | 4.32 | 4.91 |
|  |  | SD | 0.38 | 0.69 | 0.34 | 0.32 | 0.39 | 0.33 | 0.33 | 0.55 | 0.49 | 0.36 | 0.26 |

# APPENDIX C

*Score Patterns on Roman II for EIPA 2.5-4.1*

Indices

| Score | N | | B | D | H | G | C | F | J | I | E | A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.5 | 15 | Mean | 1.47 | 1.57 | 1.73 | 1.80 | 1.83 | 1.93 | 1.97 | 2.10 | 2.20 | 2.40 |
| | | SD | 0.58 | 0.53 | 0.26 | 0.37 | 0.59 | 0.42 | 0.44 | 0.47 | 0.32 | 0.51 |

| Score | N | | B | D | H | G | C | F | I | J | E | A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.6 | 16 | Mean | 1.56 | 1.84 | 1.91 | 1.97 | 2.03 | 2.06 | 2.09 | 2.16 | 2.31 | 2.53 |
| | | SD | 0.83 | 0.47 | 0.52 | 0.56 | 0.43 | 0.63 | 0.46 | 0.44 | 0.54 | 0.46 |

| Score | N | | B | D | H | C | G | I | F | J | E | A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.7 | 27 | Mean | 1.65 | 1.74 | 2.11 | 2.17 | 2.24 | 2.33 | 2.37 | 2.37 | 2.59 | 2.59 |
| | | SD | 0.76 | 0.53 | 0.38 | 0.39 | 0.38 | 0.44 | 0.43 | 0.41 | 0.37 | 0.42 |

| Score | N | | B | D | H | G | C | I | J | F | E | A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.8 | 29 | Mean | 1.93 | 2.14 | 2.22 | 2.28 | 2.40 | 2.45 | 2.47 | 2.48 | 2.62 | 2.69 |
| | | SD | 0.64 | 0.44 | 0.32 | 0.34 | 0.34 | 0.31 | 0.35 | 0.34 | 0.29 | 0.36 |

| Score | N | | B | D | H | G | C | I | J | F | E | A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.9 | 51 | Mean | 2.08 | 2.20 | 2.29 | 2.43 | 2.45 | 2.50 | 2.51 | 2.62 | 2.76 | 2.83 |
| | | SD | 0.63 | 0.44 | 0.35 | 0.42 | 0.39 | 0.41 | 0.43 | 0.35 | 0.34 | 0.41 |

| Score | N | | B | D | H | G | C | J | I | F | E | A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.0 | 83 | Mean | 2.11 | 2.20 | 2.41 | 2.51 | 2.54 | 2.58 | 2.60 | 2.69 | 2.85 | 2.94 |
| | | SD | 0.51 | 0.39 | 0.36 | 0.31 | 0.31 | 0.39 | 0.38 | 0.36 | 0.32 | 0.36 |

| Score | N | | B | D | H | C | J | G | I | F | E | A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.1 | 90 | Mean | 2.19 | 2.22 | 2.47 | 2.62 | 2.62 | 2.64 | 2.70 | 2.80 | 2.92 | 3.06 |
| | | SD | 0.50 | 0.40 | 0.35 | 0.37 | 0.37 | 0.35 | 0.37 | 0.36 | 0.31 | 0.34 |

| Score | N | | B | D | H | G | C | J | I | F | E | A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.2 | 131 | Mean | 2.38 | 2.42 | 2.59 | 2.68 | 2.76 | 2.77 | 2.79 | 2.87 | 3.00 | 3.11 |
| | | SD | 0.60 | 0.40 | 0.33 | 0.35 | 0.36 | 0.37 | 0.38 | 0.36 | 0.32 | 0.40 |

| Score | N | | D | B | H | G | J | C | I | F | E | A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.3 | 139 | Mean | 2.49 | 2.54 | 2.74 | 2.82 | 2.91 | 2.92 | 2.95 | 3.02 | 3.11 | 3.23 |
| | | SD | 0.38 | 0.57 | 0.36 | 0.34 | 0.37 | 0.34 | 0.36 | 0.32 | 0.32 | 0.39 |

| Score | N | | D | B | H | G | J | C | I | F | E | A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.4 | 144 | Mean | 2.58 | 2.60 | 2.86 | 2.95 | 3.04 | 3.04 | 3.06 | 3.15 | 3.23 | 3.34 |
| | | SD | 0.41 | 0.54 | 0.41 | 0.32 | 0.36 | 0.36 | 0.35 | 0.31 | 0.31 | 0.36 |

| Score | N | | D | B | H | G | C | J | I | F | E | A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.5 | 144 | Mean | 2.77 | 2.88 | 3.05 | 3.13 | 3.20 | 3.24 | 3.25 | 3.32 | 3.43 | 3.53 |
| | | SD | 0.42 | 0.56 | 0.35 | 0.34 | 0.31 | 0.36 | 0.37 | 0.31 | 0.31 | 0.36 |

| Score | N | | D | B | H | C | G | J | I | F | E | A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.6 | 84 | Mean | 2.83 | 2.95 | 3.08 | 3.21 | 3.21 | 3.27 | 3.35 | 3.38 | 3.45 | 3.58 |
| | | SD | 0.49 | 0.64 | 0.37 | 0.37 | 0.40 | 0.36 | 0.40 | 0.37 | 0.30 | 0.35 |

| Score | N | | D | B | H | G | C | J | I | F | E | A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.7 | 88 | Mean | 3.05 | 3.13 | 3.30 | 3.38 | 3.42 | 3.45 | 3.47 | 3.54 | 3.63 | 3.73 |
| | | SD | 0.51 | 0.64 | 0.35 | 0.40 | 0.41 | 0.40 | 0.49 | 0.40 | 0.36 | 0.43 |

| Score | N | | D | B | H | G | C | J | F | I | E | A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.8 | 59 | Mean | 3.14 | 3.22 | 3.35 | 3.47 | 3.58 | 3.58 | 3.64 | 3.66 | 3.71 | 3.83 |
| | | SD | 0.56 | 0.65 | 0.45 | 0.44 | 0.38 | 0.39 | 0.42 | 0.40 | 0.41 | 0.41 |

| Score | N | | D | B | H | G | C | J | F | I | E | A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.9 | 32 | Mean | 3.34 | 3.52 | 3.59 | 3.67 | 3.72 | 3.73 | 3.81 | 3.81 | 3.84 | 4.00 |
| | | SD | 0.67 | 0.73 | 0.60 | 0.53 | 0.52 | 0.49 | 0.52 | 0.52 | 0.50 | 0.48 |

| Score | N | | D | B | H | G | J | C | I | F | E | A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4.0 | 39 | Mean | 3.40 | 3.46 | 3.62 | 3.71 | 3.74 | 3.74 | 3.79 | 3.85 | 3.95 | 3.99 |
| | | SD | 0.53 | 0.63 | 0.45 | 0.42 | 0.41 | 0.43 | 0.39 | 0.43 | 0.44 | 0.33 |

| Score | N | | D | H | G | B | C | J | I | E | F | A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4.1 | 22 | Mean | 3.52 | 3.66 | 3.89 | 3.89 | 3.91 | 3.93 | 3.93 | 4.05 | 4.09 | 4.14 |
| | | SD | 0.52 | 0.42 | 0.38 | 0.65 | 0.48 | 0.47 | 0.44 | 0.41 | 0.40 | 0.49 |

# APPENDIX D

*Score Patterns on Roman III for EIPA 2.5-4.1*

| | | | | | | Indices | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Score | N | | H | E | F | C | G | D | B | A | I |
| 2.5 | 15 | Mean | 2.04 | 2.31 | 3.59 | 3.68 | 3.83 | 4.12 | 4.13 | 4.14 | 4.84 |
| | | SD | 0.51 | 0.53 | 0.65 | 0.45 | 0.79 | 0.40 | 0.45 | 0.58 | 0.15 |
| | | | H | E | F | G | C | D | A | B | I |
| 2.6 | 16 | Mean | 2.35 | 2.53 | 3.79 | 3.98 | 3.98 | 4.09 | 4.29 | 4.33 | 4.84 |
| | | SD | 0.29 | 0.31 | 0.74 | 0.93 | 0.53 | 0.56 | 0.47 | 0.40 | 0.21 |
| | | | H | E | F | C | G | B | D | A | I |
| 2.7 | 27 | Mean | 2.35 | 2.62 | 3.57 | 3.76 | 3.83 | 4.16 | 4.22 | 4.43 | 4.73 |
| | | SD | 0.44 | 0.39 | 0.71 | 0.60 | 0.95 | 0.41 | 0.42 | 0.44 | 0.27 |
| | | | H | E | C | F | D | G | B | A | I |
| 2.8 | 29 | Mean | 2.39 | 2.59 | 3.98 | 4.10 | 4.20 | 4.27 | 4.29 | 4.42 | 4.85 |
| | | SD | 0.38 | 0.28 | 0.55 | 0.69 | 0.44 | 0.79 | 0.37 | 0.46 | 0.18 |
| | | | H | E | F | C | G | B | D | A | I |
| 2.9 | 51 | Mean | 2.52 | 2.80 | 3.99 | 4.07 | 4.23 | 4.43 | 4.46 | 4.56 | 4.83 |
| | | SD | 0.37 | 0.32 | 0.56 | 0.39 | 0.59 | 0.29 | 0.29 | 0.36 | 0.20 |
| | | | H | E | F | C | G | D | B | A | I |
| 3.0 | 83 | Mean | 2.69 | 2.95 | 4.06 | 4.14 | 4.26 | 4.48 | 4.51 | 4.68 | 4.91 |
| | | SD | 0.33 | 0.34 | 0.49 | 0.39 | 0.53 | 0.32 | 0.28 | 0.31 | 0.14 |
| | | | H | E | F | C | G | D | B | A | I |
| 3.1 | 90 | Mean | 2.78 | 3.02 | 4.28 | 4.32 | 4.44 | 4.62 | 4.63 | 4.78 | 4.95 |
| | | SD | 0.31 | 0.31 | 0.52 | 0.37 | 0.54 | 0.25 | 0.24 | 0.27 | 0.12 |
| | | | H | E | F | C | G | D | B | A | I |
| 3.2 | 131 | Mean | 2.87 | 3.10 | 4.35 | 4.44 | 4.55 | 4.67 | 4.71 | 4.87 | 4.97 |
| | | SD | 0.31 | 0.29 | 0.38 | 0.33 | 0.37 | 0.24 | 0.21 | 0.19 | 0.09 |
| | | | H | E | F | G | C | B | D | A | I |
| 3.3 | 139 | Mean | 3.05 | 3.30 | 4.34 | 4.47 | 4.50 | 4.72 | 4.72 | 4.92 | 4.96 |
| | | SD | 0.30 | 0.30 | 0.51 | 0.44 | 0.32 | 0.27 | 0.27 | 0.16 | 0.11 |
| | | | H | E | F | G | C | D | B | A | I |
| 3.4 | 144 | Mean | 3.16 | 3.43 | 4.49 | 4.59 | 4.67 | 4.80 | 4.81 | 4.96 | 4.99 |
| | | SD | 0.37 | 0.32 | 0.31 | 0.29 | 0.29 | 0.20 | 0.21 | 0.13 | 0.06 |
| | | | H | E | F | G | C | D | B | A | I |
| 3.5 | 144 | Mean | 3.25 | 3.50 | 4.48 | 4.62 | 4.63 | 4.77 | 4.84 | 4.97 | 4.99 |
| | | SD | 0.36 | 0.34 | 0.37 | 0.38 | 0.24 | 0.23 | 0.18 | 0.10 | 0.06 |
| | | | H | E | F | G | C | D | B | I | A |
| 3.6 | 84 | Mean | 3.43 | 3.62 | 4.58 | 4.72 | 4.73 | 4.87 | 4.92 | 4.98 | 5.00 |
| | | SD | 0.43 | 0.35 | 0.31 | 0.30 | 0.25 | 0.21 | 0.13 | 0.07 | 0.00 |
| | | | H | E | F | G | C | D | B | I | A |
| 3.7 | 88 | Mean | 3.52 | 3.71 | 4.57 | 4.71 | 4.75 | 4.88 | 4.93 | 5.00 | 5.00 |
| | | SD | 0.40 | 0.35 | 0.34 | 0.37 | 0.24 | 0.18 | 0.14 | 0.03 | 0.00 |
| | | | H | E | F | G | C | B | D | I | A |
| 3.8 | 59 | Mean | 3.68 | 3.86 | 4.59 | 4.75 | 4.79 | 4.93 | 4.94 | 4.99 | 5.00 |
| | | SD | 0.39 | 0.35 | 0.32 | 0.27 | 0.27 | 0.16 | 0.12 | 0.05 | 0.00 |
| | | | H | E | F | G | C | D | B | A | I |
| 3.9 | 32 | Mean | 3.77 | 3.93 | 4.62 | 4.79 | 4.83 | 4.96 | 4.97 | 5.00 | 5.00 |
| | | SD | 0.47 | 0.38 | 0.30 | 0.24 | 0.20 | 0.10 | 0.09 | 0.00 | 0.00 |
| | | | H | E | F | G | C | D | B | I | A |
| 4.0 | 39 | Mean | 3.85 | 4.02 | 4.57 | 4.74 | 4.81 | 4.95 | 4.97 | 4.98 | 5.00 |
| | | SD | 0.46 | 0.39 | 0.35 | 0.33 | 0.22 | 0.14 | 0.09 | 0.07 | 0.00 |
| | | | H | E | F | C | G | D | B | A | I |
| 4.1 | 22 | Mean | 3.92 | 4.12 | 4.75 | 4.90 | 4.93 | 4.94 | 4.96 | 5.00 | 5.00 |
| | | SD | 0.42 | 0.35 | 0.23 | 0.26 | 0.18 | 0.17 | 0.11 | 0.00 | 0.00 |

## APPENDIX E

*Score Patterns on Roman IV for EIPA 2.5-4.1*

| | | | | | | Indices | | | |
|------|-----|------|------|------|------|------|------|------|------|
| Score | N | | F | C | E | D | B | G | A |
| 2.5 | 15 | Mean | 1.05 | 1.77 | 1.77 | 2.04 | 2.19 | 2.23 | 2.42 |
| | | SD | 0.30 | 0.32 | 0.32 | 0.19 | 0.21 | 0.38 | 0.31 |
| | | | F | C | E | D | G | B | A |
| 2.6 | 16 | Mean | 1.04 | 1.94 | 1.94 | 2.11 | 2.16 | 2.34 | 2.50 |
| | | SD | 0.28 | 0.48 | 0.48 | 0.19 | 0.38 | 0.24 | 0.27 |
| | | | F | E | C | D | B | G | A |
| 2.7 | 27 | Mean | 1.15 | 2.07 | 2.15 | 2.17 | 2.40 | 2.56 | 2.72 |
| | | SD | 0.21 | 0.36 | 0.41 | 0.20 | 0.25 | 0.35 | 0.43 |
| | | | F | D | E | C | B | G | A |
| 2.8 | 29 | Mean | 1.13 | 2.21 | 2.24 | 2.28 | 2.42 | 2.59 | 2.77 |
| | | SD | 0.31 | 0.17 | 0.32 | 0.32 | 0.24 | 0.36 | 0.33 |
| | | | F | E | C | D | B | G | A |
| 2.9 | 51 | Mean | 1.21 | 2.28 | 2.33 | 2.34 | 2.54 | 2.71 | 2.81 |
| | | SD | 0.28 | 0.35 | 0.36 | 0.27 | 0.26 | 0.32 | 0.26 |
| | | | F | E | D | C | B | G | A |
| 3.0 | 83 | Mean | 1.41 | 2.36 | 2.45 | 2.45 | 2.70 | 2.87 | 2.92 |
| | | SD | 0.29 | 0.33 | 0.22 | 0.33 | 0.23 | 0.27 | 0.24 |
| | | | F | E | C | D | B | G | A |
| 3.1 | 90 | Mean | 1.53 | 2.43 | 2.52 | 2.56 | 2.80 | 3.00 | 3.03 |
| | | SD | 0.28 | 0.31 | 0.34 | 0.24 | 0.17 | 0.25 | 0.18 |
| | | | F | E | C | D | B | G | A |
| 3.2 | 131 | Mean | 1.63 | 2.57 | 2.63 | 2.65 | 2.88 | 3.05 | 3.13 |
| | | SD | 0.29 | 0.32 | 0.34 | 0.26 | 0.22 | 0.30 | 0.26 |
| | | | F | E | D | C | B | G | A |
| 3.3 | 139 | Mean | 1.78 | 2.68 | 2.74 | 2.75 | 2.98 | 3.18 | 3.19 |
| | | SD | 0.25 | 0.32 | 0.22 | 0.35 | 0.19 | 0.29 | 0.23 |
| | | | F | E | D | C | B | G | A |
| 3.4 | 144 | Mean | 1.86 | 2.82 | 2.83 | 2.89 | 3.07 | 3.25 | 3.26 |
| | | SD | 0.28 | 0.33 | 0.19 | 0.33 | 0.21 | 0.30 | 0.25 |
| | | | F | D | E | C | B | G | A |
| 3.5 | 144 | Mean | 1.98 | 2.89 | 2.99 | 3.07 | 3.15 | 3.32 | 3.35 |
| | | SD | 0.26 | 0.21 | 0.32 | 0.33 | 0.22 | 0.36 | 0.25 |
| | | | F | E | D | C | B | G | A |
| 3.6 | 84 | Mean | 2.15 | 3.02 | 3.04 | 3.13 | 3.28 | 3.46 | 3.54 |
| | | SD | 0.35 | 0.34 | 0.20 | 0.36 | 0.22 | 0.32 | 0.29 |
| | | | F | D | E | C | B | G | A |
| 3.7 | 88 | Mean | 2.26 | 3.08 | 3.21 | 3.29 | 3.33 | 3.50 | 3.60 |
| | | SD | 0.38 | 0.28 | 0.38 | 0.39 | 0.43 | 0.37 | 0.30 |
| | | | F | D | E | C | B | G | A |
| 3.8 | 59 | Mean | 2.46 | 3.22 | 3.27 | 3.39 | 3.49 | 3.68 | 3.72 |
| | | SD | 0.38 | 0.30 | 0.41 | 0.45 | 0.27 | 0.41 | 0.32 |
| | | | F | D | E | C | B | G | A |
| 3.9 | 32 | Mean | 2.56 | 3.29 | 3.45 | 3.55 | 3.59 | 3.71 | 3.75 |
| | | SD | 0.41 | 0.31 | 0.47 | 0.54 | 0.27 | 0.30 | 0.37 |
| | | | F | D | E | C | B | G | A |
| 4.0 | 39 | Mean | 2.85 | 3.45 | 3.47 | 3.64 | 3.77 | 3.96 | 4.01 |
| | | SD | 0.38 | 0.29 | 0.44 | 0.43 | 0.23 | 0.39 | 0.34 |
| | | | F | D | E | B | C | G | A |
| 4.1 | 22 | Mean | 2.92 | 3.50 | 3.66 | 3.74 | 3.77 | 4.00 | 4.21 |
| | | SD | 0.42 | 0.32 | 0.36 | 0.25 | 0.40 | 0.56 | 0.49 |

## APPENDIX F

*Complete Correlation Tables*

| | | Overall | A | B | C | D | E | F | G | H | I | J | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Roman I | | | | | |
| Roman I | A | .807** | 1 | .841** | .862** | .782** | .792** | .602** | .785** | .784** | .730** | .783** | .291** |
| | B | .756** | .841** | 1 | .902** | .761** | .809** | .591** | .731** | .729** | .665** | .717** | .275** |
| | C | .808** | .862** | .902** | 1 | .810** | .818** | .594** | .784** | .790** | .721** | .777** | .313** |
| | D | .757** | .782** | .761** | .810** | 1 | .726** | .512** | .731** | .732** | .655** | .710** | .272** |
| | E | .769** | .792** | .809** | .818** | .726** | 1 | .640** | .753** | .746** | .696** | .747** | .275** |
| | F | .639** | .602** | .591** | .594** | .512** | .640** | 1 | .619** | .609** | .637** | .620** | .201** |
| | G | .798** | .785** | .731** | .784** | .731** | .753** | .619** | 1 | .861** | .823** | .867** | .248** |
| | H | .799** | .784** | .729** | .790** | .732** | .746** | .609** | .861** | 1 | .869** | .976** | .221** |
| | I | .758** | .730** | .665** | .721** | .655** | .696** | .637** | .823** | .869** | 1 | .899** | .202** |
| | J | .804** | .783** | .717** | .777** | .710** | .747** | .620** | .867** | .976** | .899** | 1 | .224** |
| | L | .313** | .291** | .275** | .313** | .272** | .275** | .201** | .248** | .221** | .202** | .224** | 1 |
| Roman II | A | .725** | .381** | .361** | .382** | .335** | .376** | .316** | .379** | .380** | .368** | .392** | .132** |
| | B | .655** | .322** | .291** | .312** | .282** | .313** | .286** | .316** | .307** | .302** | .321** | .101** |
| | C | .773** | .431** | .415** | .444** | .387** | .430** | .382** | .438** | .427** | .423** | .440** | .148** |
| | D | .685** | .351** | .328** | .353** | .341** | .337** | .309** | .350** | .348** | .342** | .356** | .104** |
| | E | .769** | .430** | .413** | .431** | .380** | .438** | .364** | .433** | .438** | .420** | .450** | .150** |
| | F | .774** | .441** | .409** | .426** | .388** | .424** | .369** | .429** | .427** | .425** | .440** | .147** |
| | G | .768** | .426** | .392** | .416** | .379** | .426** | .374** | .432** | .421** | .410** | .435** | .142** |
| | H | .759** | .423** | .388** | .423** | .379** | .424** | .369** | .427** | .419** | .415** | .433** | .145** |
| | I | .750** | .410** | .383** | .396** | .354** | .411** | .357** | .414** | .413** | .400** | .429** | .138** |
| | J | .746** | .398** | .369** | .392** | .349** | .403** | .377** | .417** | .407** | .400** | .420** | .133** |
| Roman III | A | .587** | .500** | .405** | .481** | .469** | .472** | .360** | .494** | .438** | .430** | .454** | .385** |
| | B | .642** | .554** | .458** | .536** | .564** | .490** | .423** | .540** | .522** | .489** | .517** | .374** |
| | C | .641** | .585** | .482** | .558** | .628** | .527** | .372** | .558** | .534** | .473** | .531** | .410** |
| | D | .604** | .515** | .449** | .512** | .490** | .502** | .459** | .546** | .545** | .531** | .545** | .328** |
| | E | .777** | .785** | .695** | .760** | .732** | .676** | .529** | .723** | .734** | .658** | .720** | .254** |
| | F | .484** | .405** | .350** | .388** | .456** | .345** | .236** | .398** | .397** | .360** | .400** | .283** |
| | G | .451** | .372** | .298** | .367** | .408** | .309** | .188** | .380** | .361** | .350** | .365** | .253** |
| | H | .765** | .776** | .688** | .745** | .717** | .661** | .533** | .716** | .718** | .648** | .705** | .219** |
| | I | .385** | .306** | .237** | .298** | .264** | .290** | .220** | .333** | .272** | .299** | .285** | .172** |
| Roman IV | A | .794** | .824** | .778** | .825** | .763** | .791** | .637** | .809** | .791** | .748** | .796** | .275** |
| | B | .836** | .844** | .788** | .839** | .775** | .786** | .630** | .831** | .833** | .786** | .825** | .300** |
| | C | .769** | .402** | .370** | .393** | .350** | .399** | .353** | .402** | .402** | .386** | .415** | .142** |
| | D | .834** | .840** | .772** | .826** | .791** | .780** | .641** | .827** | .845** | .801** | .844** | .323** |
| | E | .768** | .411** | .381** | .402** | .362** | .402** | .348** | .412** | .403** | .388** | .416** | .140** |
| | F | .831** | .829** | .781** | .834** | .768** | .781** | .631** | .852** | .902** | .844** | .904** | .229** |
| | G | .763** | .732** | .736** | .819** | .747** | .722** | .581** | .741** | .737** | .698** | .728** | .271** |

**. Correlation is significant at the 0.01 level (2-tailed).

|  |  | | Roman II | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  | Overall | A | B | C | D | E | F | G | H | I | J |
| Roman I | A | .807** | .381** | .322** | .431** | .351** | .430** | .441** | .426** | .423** | .410** | .398** |
|  | B | .756** | .361** | .291** | .415** | .328** | .413** | .409** | .392** | .388** | .383** | .369** |
|  | C | .808** | .382** | .312** | .444** | .353** | .431** | .426** | .416** | .423** | .396** | .392** |
|  | D | .757** | .335** | .282** | .387** | .341** | .380** | .388** | .379** | .379** | .354** | .349** |
|  | E | .769** | .376** | .313** | .430** | .337** | .438** | .424** | .426** | .424** | .411** | .403** |
|  | F | .639** | .316** | .286** | .382** | .309** | .364** | .369** | .374** | .369** | .357** | .377** |
|  | G | .798** | .379** | .316** | .438** | .350** | .433** | .429** | .432** | .427** | .414** | .417** |
|  | H | .799** | .380** | .307** | .427** | .348** | .438** | .427** | .421** | .419** | .413** | .407** |
|  | I | .758** | .368** | .302** | .423** | .342** | .420** | .425** | .410** | .415** | .400** | .400** |
|  | J | .804** | .392** | .321** | .440** | .356** | .450** | .440** | .435** | .433** | .429** | .420** |
|  | L | .313** | .132** | .101** | .148** | .104** | .150** | .147** | .142** | .145** | .138** | .133** |
| Roman II | A | .725** | 1 | .793** | .816** | .736** | .836** | .825** | .816** | .803** | .861** | .824** |
|  | B | .655** | .793** | 1 | .761** | .764** | .714** | .742** | .741** | .736** | .761** | .761** |
|  | C | .773** | .816** | .761** | 1 | .809** | .864** | .862** | .868** | .853** | .843** | .829** |
|  | D | .685** | .736** | .764** | .809** | 1 | .757** | .801** | .791** | .783** | .765** | .756** |
|  | E | .769** | .836** | .714** | .864** | .757** | 1 | .894** | .871** | .861** | .843** | .843** |
|  | F | .774** | .825** | .742** | .862** | .801** | .894** | 1 | .897** | .853** | .839** | .844** |
|  | G | .768** | .816** | .741** | .868** | .791** | .871** | .897** | 1 | .882** | .855** | .830** |
|  | H | .759** | .803** | .736** | .853** | .783** | .861** | .853** | .882** | 1 | .829** | .830** |
|  | I | .750** | .861** | .761** | .843** | .765** | .843** | .839** | .855** | .829** | 1 | .848** |
|  | J | .746** | .824** | .761** | .829** | .756** | .843** | .844** | .830** | .830** | .848** | 1 |
| Roman III | A | .587** | .318** | .285** | .344** | .292** | .341** | .344** | .342** | .334** | .334** | .323** |
|  | B | .642** | .338** | .272** | .369** | .305** | .357** | .358** | .358** | .362** | .360** | .339** |
|  | C | .641** | .295** | .263** | .327** | .274** | .328** | .325** | .325** | .321** | .317** | .323** |
|  | D | .604** | .300** | .242** | .344** | .258** | .331** | .342** | .340** | .323** | .331** | .320** |
|  | E | .777** | .381** | .323** | .439** | .350** | .420** | .430** | .414** | .414** | .404** | .395** |
|  | F | .484** | .191** | .177** | .252** | .217** | .231** | .243** | .244** | .235** | .226** | .210** |
|  | G | .451** | .162** | .170** | .223** | .197** | .201** | .212** | .222** | .213** | .193** | .187** |
|  | H | .765** | .379** | .329** | .437** | .356** | .418** | .424** | .407** | .410** | .397** | .410** |
|  | I | .385** | .237** | .200** | .257** | .205** | .252** | .261** | .241** | .255** | .245** | .238** |
| Roman IV | A | .794** | .351** | .283** | .416** | .321** | .423** | .423** | .415** | .412** | .386** | .402** |
|  | B | .836** | .407** | .346** | .459** | .379** | .458** | .460** | .454** | .448** | .433** | .424** |
|  | C | .769** | .888** | .829** | .874** | .810** | .889** | .884** | .883** | .879** | .884** | .880** |
|  | D | .834** | .392** | .324** | .437** | .352** | .436** | .446** | .432** | .434** | .428** | .425** |
|  | E | .768** | .862** | .809** | .861** | .823** | .881** | .884** | .879** | .870** | .862** | .872** |
|  | F | .831** | .396** | .334** | .454** | .365** | .458** | .448** | .443** | .449** | .434** | .425** |
|  | G | .763** | .345** | .288** | .419** | .351** | .423** | .419** | .393** | .414** | .354** | .392** |

**. Correlation is significant at the 0.01 level (2-tailed).

|  |  | Overall | A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  | **Roman III** |  |  |  |  |  |
| Roman I | A | .807** | .500** | .554** | .585** | .515** | .785** | .405** | .372** | .776** | .306** |
|  | B | .756** | .405** | .458** | .482** | .449** | .695** | .350** | .298** | .688** | .237** |
|  | C | .808** | .481** | .536** | .558** | .512** | .760** | .388** | .367** | .745** | .298** |
|  | D | .757** | .469** | .564** | .628** | .490** | .732** | .456** | .408** | .717** | .264** |
|  | E | .769** | .472** | .490** | .527** | .502** | .676** | .345** | .309** | .661** | .290** |
|  | F | .639** | .360** | .423** | .372** | .459** | .529** | .236** | .188** | .533** | .220** |
|  | G | .798** | .494** | .540** | .558** | .546** | .723** | .398** | .380** | .716** | .333** |
|  | H | .799** | .438** | .522** | .534** | .545** | .734** | .397** | .361** | .718** | .272** |
|  | I | .758** | .430** | .489** | .473** | .531** | .658** | .360** | .350** | .648** | .299** |
|  | J | .804** | .454** | .517** | .531** | .545** | .720** | .400** | .365** | .705** | .285** |
|  | L | .313** | .385** | .374** | .410** | .328** | .254** | .283** | .253** | .219** | .172** |
| Roman II | A | .725** | .318** | .338** | .295** | .300** | .381** | .191** | .162** | .379** | .237** |
|  | B | .655** | .285** | .272** | .263** | .242** | .323** | .177** | .170** | .329** | .200** |
|  | C | .773** | .344** | .369** | .327** | .344** | .439** | .252** | .223** | .437** | .257** |
|  | D | .685** | .292** | .305** | .274** | .258** | .350** | .217** | .197** | .356** | .205** |
|  | E | .769** | .341** | .357** | .328** | .331** | .420** | .231** | .201** | .418** | .252** |
|  | F | .774** | .344** | .358** | .325** | .342** | .430** | .243** | .212** | .424** | .261** |
|  | G | .768** | .342** | .358** | .325** | .340** | .414** | .244** | .222** | .407** | .241** |
|  | H | .759** | .334** | .362** | .321** | .323** | .414** | .235** | .213** | .410** | .255** |
|  | I | .750** | .334** | .360** | .317** | .331** | .404** | .226** | .193** | .397** | .245** |
|  | J | .746** | .323** | .339** | .323** | .320** | .395** | .210** | .187** | .410** | .238** |
| Roman III | A | .587** | 1 | .640** | .677** | .542** | .493** | .415** | .429** | .476** | .435** |
|  | B | .642** | .640** | 1 | .725** | .613** | .542** | .522** | .484** | .506** | .417** |
|  | C | .641** | .677** | .725** | 1 | .533** | .556** | .558** | .519** | .523** | .386** |
|  | D | .604** | .542** | .613** | .533** | 1 | .523** | .366** | .345** | .515** | .356** |
|  | E | .777** | .493** | .542** | .556** | .523** | 1 | .426** | .395** | .930** | .325** |
|  | F | .484** | .415** | .522** | .558** | .366** | .426** | 1 | .778** | .388** | .313** |
|  | G | .451** | .429** | .484** | .519** | .345** | .395** | .778** | 1 | .371** | .319** |
|  | H | .765** | .476** | .506** | .523** | .515** | .930** | .388** | .371** | 1 | .308** |
|  | I | .385** | .435** | .417** | .386** | .356** | .325** | .313** | .319** | .308** | 1 |
| Roman IV | A | .794** | .471** | .535** | .557** | .519** | .747** | .384** | .339** | .740** | .293** |
|  | B | .836** | .549** | .604** | .622** | .565** | .752** | .434** | .411** | .734** | .318** |
|  | C | .769** | .328** | .348** | .322** | .316** | .404** | .213** | .186** | .405** | .231** |
|  | D | .834** | .560** | .615** | .661** | .579** | .761** | .457** | .422** | .752** | .334** |
|  | E | .768** | .341** | .360** | .323** | .319** | .409** | .216** | .185** | .412** | .249** |
|  | F | .831** | .455** | .545** | .550** | .529** | .766** | .414** | .386** | .753** | .288** |
|  | G | .763** | .480** | .535** | .537** | .518** | .693** | .373** | .360** | .678** | .285** |

**. Correlation is significant at the 0.01 level (2-tailed).

|  |  | Roman IV |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|---|
|  |  | Overall | A | B | C | D | E | F |
| Roman I | A | .807** | .824** | .844** | .402** | .840** | .411** | .829** |
|  | B | .756** | .778** | .788** | .370** | .772** | .381** | .781** |
|  | C | .808** | .825** | .839** | .393** | .826** | .402** | .834** |
|  | D | .757** | .763** | .775** | .350** | .791** | .362** | .768** |
|  | E | .769** | .791** | .786** | .399** | .780** | .402** | .781** |
|  | F | .639** | .637** | .630** | .353** | .641** | .348** | .631** |
|  | G | .798** | .809** | .831** | .402** | .827** | .412** | .852** |
|  | H | .799** | .791** | .833** | .402** | .845** | .403** | .902** |
|  | I | .758** | .748** | .786** | .386** | .801** | .388** | .844** |
|  | J | .804** | .796** | .825** | .415** | .844** | .416** | .904** |
|  | L | .313** | .275** | .300** | .142** | .323** | .140** | .229** |
| Roman II | A | .725** | .351** | .407** | .888** | .392** | .862** | .396** |
|  | B | .655** | .283** | .346** | .829** | .324** | .809** | .334** |
|  | C | .773** | .416** | .459** | .874** | .437** | .861** | .454** |
|  | D | .685** | .321** | .379** | .810** | .352** | .823** | .365** |
|  | E | .769** | .423** | .458** | .889** | .436** | .881** | .458** |
|  | F | .774** | .423** | .460** | .884** | .446** | .884** | .448** |
|  | G | .768** | .415** | .454** | .883** | .432** | .879** | .443** |
|  | H | .759** | .412** | .448** | .879** | .434** | .870** | .449** |
|  | I | .750** | .386** | .433** | .884** | .428** | .862** | .434** |
|  | J | .746** | .402** | .424** | .880** | .425** | .872** | .425** |
| Roman III | A | .587** | .471** | .549** | .328** | .560** | .341** | .455** |
|  | B | .642** | .535** | .604** | .348** | .615** | .360** | .545** |
|  | C | .641** | .557** | .622** | .322** | .661** | .323** | .550** |
|  | D | .604** | .519** | .565** | .316** | .579** | .319** | .529** |
|  | E | .777** | .747** | .752** | .404** | .761** | .409** | .766** |
|  | F | .484** | .384** | .434** | .213** | .457** | .216** | .414** |
|  | G | .451** | .339** | .411** | .186** | .422** | .185** | .386** |
|  | H | .765** | .740** | .734** | .405** | .752** | .412** | .753** |
|  | I | .385** | .293** | .318** | .231** | .334** | .249** | .288** |
| Roman IV | A | .794** | 1 | .818** | .386** | .831** | .393** | .817** |
|  | B | .836** | .818** | 1 | .427** | .895** | .432** | .872** |
|  | C | .769** | .386** | .427** | 1 | .411** | .940** | .422** |
|  | D | .834** | .831** | .895** | .411** | 1 | .416** | .876** |
|  | E | .768** | .393** | .432** | .940** | .416** | 1 | .427** |
|  | F | .831** | .817** | .872** | .422** | .876** | .427** | 1 |
|  | G | .763** | .804** | .763** | .370** | .766** | .386** | .770** |

**. Correlation is significant at the 0.01 level (2-tailed).

[i] The only exception to this pattern is for an EIPA 3.9 where the mean of Roman II is 0.03 higher than the mean for Roman I. However, the standard deviation for Roman II is 0.50, as opposed to 0.29 for Roman I, so it is unlikely that this exception is significant.