**APPENDIX A**

**Items used in Asian language spelling tests**

|  |  |  |  |
| --- | --- | --- | --- |
| Item No. | Chinese | Malay | Tamil |
| Spelling | IPA transcription | English translation | Spelling | IPA transcription | English translation | Spelling | IPA transcription | English translation |
| 1 | 五 | /uː3/ | five | dan | /dan/ | and | பல | /pala/ | many |
| 2 | 个 | /kɤ5/ | one (qualifier) | ibu | /ibu/ | mother | படம் | /pad̪am/ | picture |
| 3 | 早 | /tsau3/ | morning | mata | /mata/ | eyes | கரம் | /kaɾam/ | hand |
| 4 | 门 | /mən2/ | door | guru | /guru/ | teacher | பழம் | /paɺam/ | fruit |
| 5 | 写 | /ɕeː3/ | write | dapur | /dapur/ | kitchen | தாய் | /t̪a:i/ | mother |
| 6 | 坐 | /tsʷoː4/ | sit | pantas | /pantas/ | fast | கணினி | /gaɳini/ | computer |
| 7 | 衣 | /[iː1](https://easypronunciation.com/)/ | clothes | tidur | /tidur/ | sleep | இன்பம் | /inbam/ | joy |
| 8 | 妈 | /maː1/ | mother | membaca | /məmbat͡ʃa/ | reading | விமானம் | /ʋima:nam/ | flight |
| 9 | 老 | /lau3/ | old | permainan | /pərmai͡nan/ | game | நாற்காலி | /na:ɺka:li/ | chair |
| 10 | 玩 | /wæn2/ | play | televisyen | /televiʃen/ | television | உடற்பயிற்சி | /ud̪eɺpajiɺt͡ʃi/ | exercise |

**APPENDIX B**

**Psycholinguistic characteristics of items in the Asian language spelling test**

**Chinese**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Item No. | Item | Phonological characteristics | Graphemic-orthographic characteristics | Morphological-semantic characteristics |
| Spelling | IPA transcription | English translation | No. of phonemes | Phonological complexitya | No. of graphemes/ characters | Graphemic complexityb | Visual complexity | Presence of homophones | Morphological complexityc |
| 1 | 五 | /uː3/ | five | 1 | complex | 1 | simple | 25 | yes | simple |
| 2 | 个 | /kɤ5/ | one (qualifier) | 2 | simple | 1 | complex | 19 | yes | simple |
| 3 | 早 | /tsau3/ | morning | 3 | complex | 1 | complex | 32 | yes | simple |
| 4 | 门 | /mən2/ | door | 3 | simple | 1 | simple | 21 | yes | simple |
| 5 | 写 | /ɕeː3/ | write | 2 | complex | 1 | complex | 33 | no | simple |
| 6 | 坐 | /tsʷoː4/ | sit | 2 | complex | 1 | complex | 35 | yes | simple |
| 7 | 衣 | /[iː1](https://easypronunciation.com/)/ | clothes | 1 | complex | 1 | simple | 34 | yes | simple |
| 8 | 妈 | /maː1/ | mother | 2 | complex | 1 | complex | 41 | yes | simple |
| 9 | 老 | /lau3/ | old | 3 | complex | 1 | simple | 32 | yes | simple |
| 10 | 玩 | /wæn2/ | play | 3 | simple | 1 | complex | 39 | yes | simple |

*Note.* aAn item was judged as complex if it contained a diphthong, long vowel, retroflex consonant or consonant cluster and as simple if none of these phonemic

units were present. bAn item was judged as complex if it contained at least one composed grapheme (composed character) and was otherwise considered simple. cAn item was judged as complex if it contained at least one pre- or suffix or represented a compound word formed of at least two root words and was otherwise considered simple.

**Malay**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Item No. | Item | Phonological characteristics | Graphemic-orthographic characteristics | Morphological-semantic characteristics |
| Spelling | IPA transcription | English translation | No. of phonemes | Phonological complexitya | No. of graphemes/ characters | Graphemic complexityb  | Visual complexity | Homophones | Morphological complexityc |
| 1 | dan | /dan/ | and | 3 | simple | 3 | simple | 11 | no | simple |
| 2 | ibu | /ibu/ | mother | 3 | simple | 3 | simple | 10 | no | simple |
| 3 | mata | /mata/ | eyes | 4 | simple | 4 | simple | 12 | no | simple |
| 4 | guru | /guru/ | teacher | 4 | simple | 4 | simple | 11 | no | simple |
| 5 | dapur | /dapur/ | kitchen | 5 | simple | 5 | simple | 11 | no | simple |
| 6 | pantas | /pantas/ | fast | 6 | simple | 6 | simple | 11 | no | simple |
| 7 | tidur | /tidur/ | sleep | 5 | simple | 5 | simple | 10 | no | simple |
| 8 | membaca | /məmbat͡ʃa/ | reading | 7 | simple | 7 | simple | 14 | no | complex |
| 9 | permainan | /pərmai͡nan | game | 8 | complex | 9 | simple | 12 | no | complex |
| 10 | televisyen | /televiʃen/ | television | 9 | simple | 10 | complex | 10 | no | simple |

*Note.* aAn item was judged as complex if it contained a diphthong, long vowel, retroflex consonant or consonant cluster and as simple if none of these phonemic

units were present. bAn item was judged as complex if it contained at least one composed grapheme (digraph) and was otherwise considered simple. cAn item was judged as complex if it contained at least one pre- or suffix or represented a compound word formed of at least two root words and was otherwise considered simple.

**Tamil**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Item No. | Item | Phonological characteristics | Graphemic-orthographic characteristics | Morphological-semantic characteristics |
| Spelling | IPA transcription | English translation | No. of phonemes | Phonological complexitya | No. of graphemes/ characters | Graphemic complexityb | Visual complexity | Homophones | Morphological complexityc |
| 1 | பல | /pala/ | many | 4 | simple | 2 | complex | 16 | no | simple |
| 2 | படம் | /pad̪am/ | picture | 5 | simple | 3 | complex | 13 | no | simple |
| 3 | கரம் | /kaɾam/ | hand | 5 | simple | 3 | complex | 18 | no | simple |
| 4 | பழம் | /paɺam/ | fruit | 5 | complex | 3 | complex | 18 | no | simple |
| 5 | தாய் | /t̪a:i/ | mother | 3 | complex | 2 | complex | 22 | no | simple |
| 6 | கணினி | /gaɳini/ | computer | 6 | complex | 3 | complex | 26 | no | simple |
| 7 | இன்பம் | /inbam/ | pleasure | 5 | simple | 4 | complex | 23 | no | simple |
| 8 | விமானம் | /ʋima:nam/ | flight | 7 | complex | 4 | complex | 19 | no | simple |
| 9 | நாற்காலி | /na:ɺka:li/ | chair | 7 | complex | 4 | complex | 19 | no | simple |
| 10 | உடற்பயிற்சி | /ud̪eɺpajiɺt͡ʃi/ | exercise | 11 | complex | 7 | complex | 15 | no | complex |

*Note.* aAn item was judged as complex if it contained a diphthong, long vowel, retroflex consonant or consonant cluster and as simple if none of these phonemic

units were present. bAn item was judged as complex if it contained at least one composed grapheme (built up akshara) and was otherwise considered simple. cAn item was judged as complex if it contained at least one pre- or suffix or represented a compound word formed of at least two root words and was otherwise considered simple.

**APPENDIX C**

**Extension of Phonological, Orthographic, and Morphological Assessment System (POMAS) by Bahr et al. (2012, 2015) for Chinese, Malay and Tamil**

**Chinese version**

|  |  |  |  |
| --- | --- | --- | --- |
| Overall error category | Language-specific error category | Further explanation | Example |
| Target | Error |
| Phonological | Phonetic radical addition, substitution or omissiona | A phonetical radical is a subcomponent of a character that provides a phonological clue to the pronunciation of the character. For example, the character 妈 (/ maː1/ - in English *mother*) is composed of the semantic radical 女 (/[nɥyː3](https://easypronunciation.com/)/ - in English ) on the left-hand side (**女**马) that conveys the semantic information of this character and the phonetic radical 马 (/ maː3/ - in English *horse*) on the right-hand side (女**马**) that provides a cue to the pronunciation of the whole character. | 妈 | 女 |
| Similar sounding character/word substitutiona | For example, same phoneme sequence, but different tone. | 写 | [些](http://hskhsk.pythonanywhere.com/cidian?q=%E4%BA%9B) |
| Graphemic-orthographic | Reconfiguration of characters or components of charactersa | Reconfigurations refer to reversions in the position of characters of components of characters. | 妈 |  |
| Similar formed or structured character/grapheme substitutiona |  | 早 | 草 |
| Addition, omission or protrusion of strokesa |  | 妈 |  |
| Morphological-semantic | Substitution of semantically related character/worda |  | 早 | 迟 |
| Substitution of homophone character/worda | A homophone is a word that is pronounced in the same way as another word, but is spelled differently. | 坐 | 做 |
| Morpheme omission (character, pre-/suffix or root)a | A morpheme is meaningful unit of language that cannot be further divided. In the case of Chinese we include the omission of semantic radicals or entire characters in this error category.  | 妈 | 马 |
| Others | Substitution by irrelevant word/nonword | This category refers to the substitution of the target by an existing or made up word that has no semantic or phonological resemblance with the target word.  | 坐 | 月 |
| No response |  | 写 |  |

*Note.* aDirectly based on Shen & Bear (2000) and Tong et al. (2009).

**Malay version**

|  |  |  |  |
| --- | --- | --- | --- |
| Overall error category | Language-specific error category | Further explanation | Example |
| Target | Error |
| Phonological | Single vowel substitutiona | We considered /i/, /e/, /ə/, /a/, /u/ and /o/ as Malay single vowels (Hassan, 1974; Onn, 1980: Yunus Maris, 1980). | dan | din |
| Single vowel additiona |  | pantas | pantasa |
| Single vowel omissiona |  | ibu | bu |
| diphthong substitution, addition or omissiona | We considered /ai̯/, /au̯/ and /oi̯/ as Malay diphthongs (Hassan, 1974; Onn, 1980: Yunus Maris, 1980). | permainan | permanan |
| Consonant substitutiona |  | mata | nata |
| Consonant additiona |  | guru | gurut |
| Consonant omission |  | dapur | dapu |
| Similar sounding word substitution |  |  |  |
| Partial reversal of phoneme sequencea | This category was used to refer to errors in which all of the sounds of the spoken word were represented, but in an incorrect order. | membaca | memcaba |
| Graphemic-orthographic | Similar formed or structured grapheme substitutiona | This category included digraph errors (e.g. errors in the representation of <sy>) or similar formed single letter reversals (e.g. <b> for <d>).  | dapur | bapur |
| Addition, omission or protrusion of strokes | This category referred to errors in the strokes needed to represent a single letter (e.g. <f> without the horizontal stroke).  | televisyen | lelevisyen |
| Morphological-semantic | Substitution of semantically related word |  | pantas | lambat |
| Morpheme omission (pre-/suffix or root)a | A morpheme is meaningful unit of language that cannot be further divided. In the case of Malay we include the omission of pre- and suffixes, as well as roots in this category. | permainan | mainan |
| Others | Substitution by irrelevant word/nonword | This category refers to the substitution of the target by an existing or made up word that has no semantic or phonological resemblance with the target word. | tidur | epal |
| No response |  | guru |  |

*Note.* aDirectly based on Bahr et al. (2012, 2015).

**Tamil version**

|  |  |  |  |
| --- | --- | --- | --- |
| Overall error category  | Language-specific error category  | Further Explanation  | Example  |
| Target  | Error  |
| Phonological  | Single vowel substitutiona  | We considered /i/, /i:/, /e/, /e:/, /a/, /a:/, /u/, /u:/, /o/ and /o:/ as Tamil single vowels (Schiffman, 1999).  | இன்பம்   | உன்பம்  |
| Single vowel additiona  |   | பல   | இபல   |
| Single vowel omissiona  |   | உடற்பயிற்சி  | டற்பயிற்சி   |
| Diphthong substitution, addition or omissiona  | We considered /aɪ/ and /aʊ/ as Tamil diphthongs.  | NA  | NA  |
| Short vowel vs. long vowel substitutiona  | We considered /i/, /e/, /a/, /u/, /o/ as short vowels and and /i:/, /e:/, /a:/, /u:/, /o:/ as long vowels in Tamil.  | கரம்   | காரம்   |
| Long vowel vs. short vowel substitutiona  |   | நாற்காலி   | நாற்கலி   |
| Consonant substitutiona  |   | படம்   | படன்  |
| Retroflex consonant substitution  | We considered /ɳ/, /ʈ/, /ɻ/ and /ɭ/ as retroflex consonants that are easily confused for their dental and alveolar counterparts /n/, /t̪/, /r/ and /l/.  | பழம்   | பரம்   |
| Consonant additiona  |   | பல  | பலம்   |
| Consonant omissiona  |   | கரம்   | கர  |
| Similar sounding word substitution  | This category referred to errors related to real words.  | படம்   | பட்டம்  |
| Partial reversal of phoneme sequencea  | This category was used to refer to errors in which all of the sounds of the spoken word were represented, but in an incorrect order.  | பல   | லப  |
| Graphemic-orthographic  | Similar formed or structured grapheme substitutiona  | This category included errors in which similarly formed or structured aksharas were confused (e.g. akshara for /ka/ vs. /sa/ or /pa/ vs. /ma/).  | கரம்   | சரம்   |
| Addition, omission or protrusion of strokes  | This category referred to errors in the strokes needed to represent one of the components of independent aksharas.  | ப  | I  |
| Addition, omission or substitution of diacriticsa  | This category referred to errors in the diacritics that need to be represented in a specific akshara.  | கரம்  | கரம  |
| Morphological-semantic  | Substitution of semantically related word  | This category referred to real words that were related to each other conceptually.  | நாற்காலி  | மேசை  |
| Morpheme omission (pre-/suffix or root)a  | A morpheme is meaningful unit of language that cannot be further divided. In the case of Tamil we include the omission of pre- and suffixes, as well as roots in this category.  | உடற்பயிற்சி  | பயிற்சி   |
| Others  | Substitution by irrelevant word/nonword  | This category refers to the substitution of the target by an existing or made up word that has no semantic or phonological resemblance with the target word.  | விமானம்   | காம்  |
| No response  |   |   |   |