

## **Children's Acquisition of Literacy in Syllabic Scripts: Annotated Bibliography**

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### **Children's Acquisition of Literacy in Syllabic Scripts: Annotated Bibliography**

The Children's Acquisition of Literacy in Syllabic Scripts project synthesizes existing knowledge about children's acquisition of literacy in syllabic scripts, biliteracy in syllabic and alphabetic scripts, and the impact of learning exceptionalities on the acquisition of literacy in syllabic scripts. Although English-language sources on the topic are few, what research there is available suggests that whether children first learn an alphabetic or syllabic script before starting to learn the other type of script is not the most important factor in terms of their ultimate literacy and/or biliteracy. Instead, what is more significant is that children are exposed to a rich linguistic input in both of their languages, together with being provided with a supportive teaching environment, alongside clear and explicit teaching instruction.

The selected resources included below give an idea of the range of publications that were consulted for this research. The inclusion of publications in this list is not intended to imply superior quality. Works included are a sampling of the sources that influenced or backed up the ideas communicated in the report.

Search parameters comprised combinations of the following words/terms: acquisition, acquisition of literacy, alphabetic languages, alphabetic scripts, Arctic Quebec, Baffin, biliteracy, Cherokee, Cree, dysgraphia, dyslexia, education, Indigenous, Inuit, Inuktitut, Inuttitut, Inuttut, Keewatin, kivalliq, learning, learning exceptionalities, literacy, Nunavik, Nunavut, orthography, reading, reading deficits, reading development, reading difficulties, reading problems, school, script, syllabic, syllabic languages, syllabic scripts, writing, writing system

A final report synthesizing the literature on children's acquisition of literacy in syllabic scripts is available here: <https://hdl.handle.net/10680/2057>.

**Asfaha, Y. M., Kurvers, J., & Kroon, S. (2009). Grain size in script and teaching: Literacy acquisition in Ge'ez and Latin. *Applied Psycholinguistics*, 30(4), 709–724. <https://doi.org/10.1017/S0142716409990087>**

The psychological grain size theory states that differences in reading speed and accuracy across orthographies reflect diverse reading strategies developed in response to the availability/accessibility of the orthography's phonological units, the consistency with which these units map spelling to sound, and the granularity/grain size of the script. Asfaha and colleagues compared four groups of children in Eritrea, two of whom were learning to read the Ge'ez alphasyllabic script, whilst the other two were learning to read alphabetic Latin scripts (Kunama and Saho). In Grade 1, whilst children learning the Latin alphabet displayed greater letter knowledge, this did not translate into higher reading and spelling scores, with the Ge'ez students appearing to be learning to read and spell more quickly. Students learning Saho, taught via a syllable-based method, demonstrated better progress than students learning Kunama, which uses the grapheme to phoneme correspondence method traditionally used to teach alphabetic scripts. The requirement for the Ge'ez students to learn a larger number of symbols than children learning alphabetic scripts was compensated for by Ge'ez's use of the larger syllable, which is more accessible and easier to blend than the phoneme.

**Bajre, P., & Khan, A. (2019). Developmental dyslexia in Hindi readers: Is consistent sound-symbol mapping an asset in reading? Evidence from phonological and visuospatial working memory. *Dyslexia*, 25(4), 390–410. <https://doi.org/10.1002/dys.1632>**

Bajre and Khan studied the role of working memory (WM), phonological processing, and orthographic processing on the reading development of Grade 4 Hindi-speaking children with dyslexia. Although alphasyllabic Hindi has consistent grapheme-phoneme correspondence, it has a large, visually complex grapheme inventory, comprising approximately 400 symbols, placing a burden on WM when reading. Children with dyslexia scored lower than typically developing children across a battery of tests assessing WM, phonological processing, and orthographic knowledge, with the difference regarding WM expanding as task complexity increased. The speed, but not the accuracy, of children with dyslexia was compromised regarding the rapid automatized naming of akshara, suggesting that akshara representations existed but children with dyslexia had difficulty quickly retrieving them. Accordingly, dyslexia may relate to the quick retrieval of information in the correct sequential order which, given similar results on a visuospatial task, may not be language-specific, implying the existence of a general visual-processing deficit. In addition to visuospatial difficulties, children with dyslexia may also experience issues with visual attentional processing. The authors conclude that poor WM, phonological, and orthographic processing all contribute to the reading difficulties experienced by children with dyslexia, possibly helping to explain why the disorder manifests differently across languages.

**Bender, M. (2002). From "easy phonetics" to the syllabary: An orthographic division of labor in Cherokee language education. *Anthropology & Education Quarterly*, 33(1), 90–117. <https://doi.org/10.1525/aeq.2002.33.1.90>**

Whilst examining the Cherokee syllabary's semiotic and cultural significance, Bender also considers its position concerning other orthographies used in Cherokee bilingual education, namely, i) the International Phonetic Alphabet, ii) "International" or "Linguist's Phonetics," iii) "standard phonetics," Cherokee orthography based on the Latin alphabet, and iv) "easy phonetics," an Anglicized version of standard phonetics. Although children "were constantly visually exposed to the syllabary" (p. 97) from kindergarten through high school, it was not the primary orthography in use. Children were expected to use standard phonetics in the early grades, commencing with the syllabary in Grade 4. In elementary and middle school, easy phonetics were sometimes employed to make Cherokee, according to the teachers, "'easier to understand' or... 'see'" (p. 99). Bender found, however, that many children were unable to pronounce Cherokee words using standard phonetics, possibly given the use of easy phonetics. The existence of various writing systems suggests a hierarchy of accessibility, ranging from easy phonetics to the syllabary, one implication of which is that, compared to easy phonetics, standard phonetics, more closely linked with the syllabary, might be considered harder to read. Consequently, the syllabary was likely judged difficult, and, although treated as a nonphonetic system, the opposite is true.

**Berry, J. W., & Bennett, J. A. (1989). Syllabic literacy and cognitive performance among the Cree. *International Journal of Psychology*, 24(1-5), 429–450. <https://doi.org/10.1080/00207594.1989.10600057>**

Given "literacy and formal...schooling are usually confounded" (p. 430), Berry and Bennett sought to examine whether the perceptual and cognitive test performance of Northern Canadian Cree peoples was enhanced, not only by formal schooling, but also by syllabic literacy. Initially, 419 people were interviewed for a community literacy survey, with a random one third of interviewees subsequently participating in cognitive testing. The intention was to examine the relationship between, on the one hand, cognitive performance, and, on the other, syllabic literacy and/or formal schooling. A stronger degree of influence on cognitive performance was found for formal schooling, over syllabic literacy. The effect of schooling, alongside acculturation, was most keenly felt for English language tests, together with the Raven's (1963) *Matrices* test, and somewhat weaker for spatial tasks requiring the mental rotation of symbols, also required for syllabic script use. Formal schooling and syllabic reading ability were negatively correlated. Berry and Bennett argue that Cree peoples' spatial awareness is adaptive, given their traditional hunter-gatherer lifestyle, rather than being due to syllabic literacy and the requirement to mentally rotate symbols when utilizing the Cree syllabary.

**Berry, J. W., & Bennett, J. A. (1995). Syllabic literacy and cognitive performance among the Cree and Ojibwe people of Northern Canada. In I. Taylor & D. R. Olson (Eds.), *Scripts and literacy: Reading and learning to read alphabets, syllabaries and characters* (pp. 341-357). Kluwer Academic. [https://doi.org/10.1007/978-94-011-1162-1\\_22](https://doi.org/10.1007/978-94-011-1162-1_22)**

In this book chapter, Berry and Bennett summarize, six years later, the findings of their study on the syllabic literacy of the Cree and Ojibwe peoples of Northern Canada, previously reported in 1989 and described in the preceding bibliographic entry. Differences between the two sources

primarily pertain to background information, rather than the results of the study itself, the discussion, or the conclusions, concerning, for example, the increasing dominance of English amongst younger people in the relevant communities.

**Chang, L.-Y. (2015). *Visual orthographic variation and learning to read across writing systems*. [Doctoral dissertation, University of Pittsburgh]. D-Scholarship@Pitt: The University of Pittsburgh's Institutional Repository. [http://d-scholarship.pitt.edu/23959/1/ChangLY\\_ETD%282015%29.pdf](http://d-scholarship.pitt.edu/23959/1/ChangLY_ETD%282015%29.pdf)**

Chang examined the role of an orthography's visual complexity, comprising both the intricacy of individual graphemes and the total number thereof, together with its mapping principles, in learning to read. He conducted three studies, namely i) a content analysis of graphemes from 131 orthographies, taken from abjad, alphabetic, alphasyllabic, morphosyllabic, and syllabic writing systems, ii) a behavioural study on the perceptual processing of graphemes of varying complexity within and across writing systems, and iii) a computer modelling study on how visual orthographic variation affects learning. The content analysis found a strong, positive association between grapheme complexity and inventory size, both of which increase as an orthography's symbol-sound mapping level increases. The behavioural study discovered a negative correlation between grapheme complexity and the ability to efficiently discriminate graphemes, alongside a positive correlation between participant L1 complexity and effective discrimination. The modelling study also detected a positive correlation between grapheme complexity and network learning difficulty. Chang concluded that visual orthographic variation, both individual grapheme complexity and grapheme inventory size, affects the ability to visually discriminate graphemes, impacting the process of learning to read, whilst mapping principles contribute significantly, but not absolutely, to these "complexity effects" (p. v).

**Chang, L.-Y., Plaut, D. C., & Perfetti, C. A. (2016). Visual complexity in orthographic learning: Modeling learning across writing system variations. *Scientific Studies of Reading*, 20(1), 64–85. <http://dx.doi.org/10.1080/10888438.2015.1104688>**

Computer simulation was utilized to study the effect of visual complexity (defined in Chang (2015)) across orthographies on the perceptual learning of grapheme forms, an early stage of reading development. The study intended to eliminate the potential confound of mapping principles, focusing solely on the visual aspect of grapheme learning. Neural networks were trained on grapheme images taken from one of 131 diverse orthographies across five writing systems, and a strong, positive correlation was found between learning difficulty and diverse elements of the network's L1 grapheme complexity (the orthography on which it was trained). Orthographies with larger grapheme inventories required greater training, albeit the visual complexity of individual graphemes contributed independently to learning time. During a post-training perceptual judgment test, although there were some discrepancies, network performance broadly aligned with human performance in Chang (2015), in that accuracy in discriminating between two graphemes from the same orthography depended both on grapheme complexity and, less predictably, on the network's L1. Essentially, more visually

complex orthographies are processed less reliably and/or efficiently, suggesting a risk factor for reading difficulty.

**Cushman, E. (2011). The Cherokee syllabary: A writing system in its own right. *Written Communication*, 28(3), 255–281. <https://doi.org/10.1177%2F0741088311410172>**

Cushman describes how the Cherokee syllabary invented by Sequoyah was later rearranged by Moravian missionary, John Worcester, to align with the orthographic rules of the Latin alphabet. The syllabary has since been “view[ed]...through an alphabetic lens” (p. 255), and consequently misunderstood, by scholars and Cherokee learners alike. Its morphographic nature, whereby each character not only represents one sound, but also carries often highly contextual, morphological, and semantic information, is underestimated, possibly lost altogether. Cushman argues that Worcester’s rearrangement has reduced the syllabary to its most simple function, in that each character is thought to merely encode sound. Further, scholarly bias, that the alphabet is the writing system to which all others should aspire, may have obscured how the syllabary really functions. Cushman contends that the fact that L1 Cherokee users learn the syllabary with ease, whilst L1 English speakers’ knowledge of the English writing system interferes with learning the syllabary, supports her assertions. She believes that the “heuristic” (p. 256) Cherokee syllabary differs from a pure syllabary, and, to reach its full range of potential, it must emerge from the shadows of alphabetic writing and take its place as “[a] writing system in its own right” (p. 255).

**Daniels, P. T., & Share, D. L. (2018). Writing system variation and its consequences for reading and dyslexia. *Scientific Studies of Reading*, 22(1), 101–116. <https://doi.org/10.1080/10888438.2017.1379082>**

Starting from the premise that most research into dyslexia focuses on alphabetic languages, together with orthographic depth and psycholinguistic grain size theory, which are Anglo, Euro, and alphabetocentric, Daniels and Share propose that a language’s spelling-sound consistency is not the only factor which might contribute towards dyslexia. Given most people with dyslexia struggle to read in non-alphabetic languages, where there is less, if any, emphasis on grapheme-phoneme correspondence, “multiple dimensions of complexity” (p. 101) likely contribute towards dyslexia. The authors propose 10 such dimensions, namely i) linguistic distance, ii) nonlinearity, iii) visual complexity, iv) historical change, v) spelling constancy despite morphophonemic alternation, vi) omission of phonological elements, vii) allography, viii) dual purpose letters, ix) ligaturing, and x) inventory size. The effect of linguistic distance, including dialectal variation, whereby children are taught to read in a standard dialect which is not their own, can be greater regarding children with dyslexia than typically developing children (Schiff & Saiegh-Haddad, 2017). Further, Inoue and colleagues (2017) found that the Japanese writing system, comprising both logographic Kanji and syllabic Kana, produced individuals with dyslexia who may be disadvantaged regarding Kana, but not Kanji, the former of which is phonology-based, whilst the latter is not.

**Ellis, N. C., Natsume, M., Stavropoulou, K., Hoxhallari, L., Van Daal, V. H. P., Polyzoe, N., Tsipa, M. L., & Petalas, M. (2004). The effects of orthographic depth on learning to read alphabetic, syllabic, and logographic scripts. *Reading Research Quarterly, 39*(4), 438–468. <https://doi.org/10.1598/RRQ.39.4.5>**

Ellis and colleagues studied the impact of orthographic depth, the degree to which symbol-sound correspondences are consistent, on the reading acquisition of children learning a range of orthographies. In increasing order of depth, these orthographies were syllabic Japanese Hiragana, Albanian, Greek, English, and logographic Japanese Kanji. Matching items in the different orthographies for written word frequency, the authors found that Hiragana was read aloud most accurately, due to its high transparency and its syllabic nature permitting ease of segmentation into phonemes. Thereafter, Albanian, Greek, English, and Kanji were read aloud most accurately, in that order. The authors also found evidence of different reading strategies depending on orthographic depth. As scripts became deeper, there was less correlation between word length and reading time. Further, learners of deep orthographies provided more no-responses and whole word substitution errors, often using visually similar words, than learners of shallow orthographies, who made more nonword mispronunciations. These findings suggest that readers of shallow orthographies place more emphasis on the systematic decoding of written language, whilst readers of opaque scripts recognize words based on partial cues, especially symbols at the beginning and end of words.

**Fletcher-Flinn, C. M., Thompson, G. B., Yamada, M., & Naka, M. (2011). The acquisition of phoneme awareness in children learning the Hiragana syllabary. *Reading and Writing: An Interdisciplinary Journal, 24*(6), 623–633. <https://doi.org/10.1007/s11145-010-9257-8>**

Whilst explicit awareness of phonological units is considered crucial to learning to read in English, previous research has concluded that learners of languages which use non-alphabetic scripts would have poor phonemic awareness (Share, 1995). Despite this claim, Japanese children without knowledge of an alphabetic script have been found to demonstrate some phonemic understanding (Endo, 1991). Fletcher-Flinn and colleagues studied Japanese children learning the Hiragana syllabary in kindergarten and Grade 1, with one of their objectives being to compare the phonemic awareness of these children with English-speaking kindergarteners, possessing knowledge of the Latin alphabet. The authors found that the phoneme awareness of the more-advanced Japanese kindergarteners was not greatly below that of a comparable group of English-speaking children. Further, the phonemic awareness of the Grade 1 Japanese children was quite close to that of the more advanced English-speaking kindergarteners.

**Gleitman, L. R., & Rozin, P. (1973). Teaching reading by use of a syllabary. *Reading Research Quarterly, 8*(4), 447–483. <https://doi.org/10.2307/747169>**

Gleitman and Rozin promote the use of the syllable as a means for teaching beginning readers of English. They claim that the phonics method habitually used to teach reading in alphabetic scripts confounds two cognitive difficulties, (i) that the orthography directly maps sound, not meaning, and (ii) that the orthographic symbol corresponds to the phoneme, an extremely

abstract concept, which is difficult both to produce in isolation and to recognize and blend into words. They suggest that these difficulties may be lessened by teaching reading via the syllable, a more concrete and accessible phonological unit, which is easier to pronounce in isolation and to recognize and blend. Gleitman and Rozin demonstrated that kindergarteners were able to acquire a 23-symbol English-based syllabary with ease, and were, importantly, able to apply what they learned to previously unseen combinations of known symbols, creating new, multisyllabic words in the process. They suggest that, once some success in the more concrete syllabary method is achieved, greater understanding of the abstract letter-sound concept, or phonemic method, should follow.

**Harper, K. (2005). Inuit writing systems in Nunavut: Issues and challenges. In F. Trudel (Ed.), *Building capacity in Arctic societies: Dynamics and shifting perspectives. Proceedings of the second IPSSAS seminar, Iqaluit, Nunavut* (pp. 95-104). Université Laval. [http://alaskacollection.library.uaf.edu/monos/Building\\_capacity\\_in\\_Arctic\\_Societies\\_Dynamics\\_Shifting.pdf](http://alaskacollection.library.uaf.edu/monos/Building_capacity_in_Arctic_Societies_Dynamics_Shifting.pdf)**

Harper explains that some Inuit leaders, within and outside of Nunavut, are arguing for a change from syllabics to a roman-based orthography for the Inuktitut language. Extrapolated data from the 1986 census suggests that 95% of individuals with an Inuit dialect as a mother tongue live in communities employing a syllabic orthography, whilst 5% reside in areas using the non-standard roman orthography used to write the Inuinnaqtun dialect. Standardization by the Inuit Cultural Institution in 1976 resulted in one system with two orthographic forms, syllabic *Qaniujaaqpait* and roman *Qaliujaaqpait*, which are mirror images of one another. Practically nothing for adults is published in *Qaliujaaqpait*, albeit this orthography is used for teaching Inuktitut as a second language, and occasionally to teach first language Inuktitut in senior grades. Harper states that, although some Inuit leaders believe syllabics are holding the Inuit back, it is rare for a language to change its writing system. One suggestion he makes regarding language and orthography in Nunavut is that the government ought to undertake studies on the speed and ease with which individuals can learn to read in both syllabics and the roman orthography, alongside the implications of this for language teaching methodologies.

**McBride, C. (2016). *Children's literacy development: A cross-cultural perspective on learning to read and write* (2nd ed.). Routledge. <https://doi.org/10.4324/9781315849409>**

In analyzing how reading skills transfer across orthographies, McBride notes in Chapter 10: Biliteracy and Bilingualism that bilingual children may, depending on their specific languages and scripts, together with the method of instruction, find cross-linguistic phonological processing “relatively easy” (p. 179). Further, when learning a second script, this script’s idiosyncrasies will affect how easily a child learns to read in the L2. Compared to monolinguals, bilinguals better understand that a printed word invariably refers to a single object, irrespective of the picture with which it appears, likely due to experience with more than one language leading them to understand that an object’s label within a language remains constant, albeit they only perform better on a word-size task, concerning the arbitrariness between the length/complexity of a word and the physical size of its referent, if they are familiar with two



different writing systems (Bialystok, 1997; Bialystok et al., 2000). Although there is some transfer from L1 to L2 for reading comprehension purposes, at least in languages similar in alphabetic structure, L2 reading skills may ultimately be more important for L2 reading because they are closer to what is actually required, especially given that different writing systems may involve different central skills.

In Chapter 6: Dyslexia, McBride notes that children with dyslexia can read the regular German orthography accurately, albeit very slowly, with differences in language transparency leading to phonological problems arising at different times and places. Further, whilst phonological processing deficits are characteristic of dyslexia across alphabetic languages, phonological awareness does not always strongly correlate with reading ability in Chinese, with rapid automatized naming (“RAN”), morphological, and orthographic skills being more important. Across orthographies, RAN is universally important in diagnosing dyslexia, given it represents reading fluency and involves many reading-related cognitive processes. Whilst more research is required, McBride suggests a universal neural origin for dyslexia in Chinese and English, although there is conflicting evidence as to whether the same brain areas are involved in reading the two languages. Cross-cultural evidence suggests that some children have problems reading in every orthography, although it is unclear to what extent phonological processing represents the core difficulty in reading across scripts. Across orthographies, practice with word/character recognition, identification, and fluency will help to improve reading, alongside which educators should provide explicit instruction in reading and the code in question, so that children can learn to generalize the rules.

In considering whether it is possible to have difficulties reading one orthography but not another, McBride describes, in Chapter 10: Biliteracy and Bilingualism, some studies with interesting results. For example, in Spanish-speaking children learning English, the overlap for children with difficulties across languages was relatively high, at 55% (Manis & Lindsey, 2010), whilst another study of children reading all three Japanese scripts demonstrated that reading difficulties were very unusual in Hiragana, medium in Katakana, and moderately high in Kanji (Uno et al., 2009). As such, script related variations may impact whether and how children learn to read. Further, a statistically significant overlap was found for children experiencing reading difficulties in both Chinese and English who were taught in Beijing, but not for those taught in Hong Kong, likely due to the use of the Pinyin alphabetic/phonological method to teach Chinese in Beijing, compared to no phonological-based teaching of Chinese in Hong Kong (McBride-Chang et al., 2013). Accordingly, it may be possible to experience reading difficulties in one orthography but not in another, and there are some similarities, but also some differences, as regards biliteracy.

**McCarthy, S. (1995). The Cree syllabary and the writing system riddle: A paradigm in crisis. In I. Taylor & D. R. Olson (Eds.), *Scripts and literacy: Reading and learning to read alphabets, syllabaries and characters* (pp. 59-75). Kluwer Academic. [https://doi.org/10.1007/978-94-011-1162-1\\_5](https://doi.org/10.1007/978-94-011-1162-1_5)**

McCarthy suggests that, in the early days of the syllabary, the Cree Nation adapted the symbols of an analytic syllabary to a non-analytic form of writing, better suited to their culture. As such, although Cree, a mixed syllabic and alphabetic system, behaves in some ways like an alphabet, syllabic literacy is no more like alphabetic, than logographic, literacy. Although syllabic and alphabetic writing systems are both phonographic, they should not be “lump[ed]...together” (p. 63), given they differ at the level of representation, syllabic versus phonemic. Further, whilst Cree has syllabic and alphabetic symbols, it is essentially syllabic with morphemic principles. Regarding scripts, McCarthy proposes that, rather than the phonographic versus logographic distinction, a more significant difference is alphabetic/analytic versus syllabic/wholistic. In dealing with complete units of sounds, the syllabic script is wholistic, making possible a metaphorical association whereby “[t]he symbol does not ‘stand for’ the sound, it ‘is’ the sound” (p. 65). Syllabics, McCarthy argues, dovetail with the metaphorical mode of Cree expression, leading to a closer relationship between the writing system and the language and culture of its people. As such, a syllabary functions in Cree society in a way that an alphabet cannot.

**Nag, S., & Snowling, M. J. (2012). Reading in an alphasyllabary: Implications for a language universal theory of learning to read. *Scientific Studies of Reading, 16*(5), 404–423. <https://doi.org/10.1080/10888438.2011.576352>**

Nag and Snowling studied children in Grades 4-6 learning alphasyllabic Kannada, which contains over 400 orthographic symbols. Two symbols, comprising full symbol and diacritic forms, represent each sound. Kannada has high symbol-sound consistency, but mixed granularity, as both syllabic and phonemic mapping occurs. The researchers found that, overall, children performed better on syllable awareness tasks, with skilled readers displaying greater syllable and phoneme awareness. Good readers’ superior phonemic awareness reflects their greater symbol knowledge, resulting in closer attention being paid to symbols’ internal details and greater understanding of their phonemic constituents. Given the syllable’s salience in Kannada, syllable awareness was found to be a relatively stable predictor of reading accuracy. Like the alphabetic principle, knowledge of the alphasyllabic principle, that symbols map to phonemes and syllables, both of which must be used to decode print, also strongly predicts reading accuracy in Kannada. Reading fluency depends, however, on phoneme awareness and skills tapped by Rapid Automatized Naming. Significant variation in symbol knowledge and reading accuracy, contrasting with similarly aged learners of alphabetic scripts, most of whom have typically mastered the alphabet, suggests that, despite its consistency, Kannada’s extensive symbol set poses a challenge when learning to read.

**O’Brien, B. A., Mohamed, M. B. H., Yussof, N. T., & Ng, S. C. (2019). The phonological awareness relation to early reading in English for three groups of simultaneous bilingual children. *Reading and Writing: An Interdisciplinary Journal, 32*(4), 909–937. <https://doi.org/10.1007/s11145-018-9890-1>**

Groups of Malay-English, Mandarin-English, and Tamil-English simultaneously bilingual children each displayed syllable, prior to phoneme, awareness, demonstrating progression from large to

small phonological units. Alphasyllabic Tamil bilinguals showed the greatest phonemic awareness at the earliest point. Bilinguals in Mandarin, a morpho-syllabic language, and Malay, based on the Latin alphabet, showed similar progress, suggesting that the syllable was more accessible in these languages. The diverse levels of phonological awareness differentially related to English reading across the groups, with the syllable appearing to facilitate the process for Mandarin and Malay children, whilst Tamil children employed a smaller grain size procedure. In addition to grain size and oral language structure of the non-English language, the methods used to teach it may affect English reading, such that children develop explicit awareness of sounds that receive teaching emphasis. For example, teaching instruction in Malay emphasizes the syllable, whilst “Tamil is taught in a ‘phonetic manner’” (p. 919), although the syllable receives emphasis in the language’s written form. Finally, whilst phonological awareness contributed significantly to reading for each group across time, the contribution of vocabulary was more sporadic, suggesting its role may vary across learners, items, time, and age, evolving dynamically as reading is acquired.

**Page, C. (2017). Biliteracy across scripts: Implications for language development in Southeast Asia. *Journal of the Southeast Asian Linguistics Society*, 10(1), 36–44.**  
<http://hdl.handle.net/10524/52396>

Many children in Southeast Asia have a mother tongue which is written with a Latin-based alphabet, whereas the language taught to them at school uses an alphasyllabary. At school, children may be exposed to a syllabic orthography specifically created for their mother tongue, designed to aid learning. This approach has drawbacks, however, including that the script is not used by adults who are literate in the language. Accordingly, biliteracy in two scripts may well be preferable, and exposure to orthographies based on different scripts will not impede biliteracy. Pursuant to Cummins’ (1979, 2000) developmental interdependence and threshold hypotheses, L2 reading skills develop best when there exists a dual foundation of solid L1 reading skills and expanding L2 proficiency, irrespective of whether the languages are linguistically and/or orthographically related. Metalinguistic awareness, generally strong in bilinguals, facilitates literacy development across languages. Further, phonological skills developed in learning to read an alphabet or a syllabary support one another and can be transferred, as can competencies in reading comprehension, text approach strategies, and writing. Chinese-English bilingual research has demonstrated that proficiency in L1 phonological elements which do not exist in the L2, such as tone, can predict L2 reading success (Wang et al., 2005).

**Perfetti, C. A., & Dunlap, S. (2008). Learning to read: General principles and writing system variations. In K. Koda & A. M. Zehler (Eds.), *Learning to read across languages: Cross-linguistic relationships in first- and second-language literacy development* (pp. 13-38). Routledge. [https://sites.pitt.edu/~perfetti/PDF/Learning%20to%20read%20\(chapt\)-%20Dunlap.pdf](https://sites.pitt.edu/~perfetti/PDF/Learning%20to%20read%20(chapt)-%20Dunlap.pdf)**

In second language acquisition, the fundamental problem of learning how graphic forms map onto spoken language can be complicated by the existence of a second writing system. Perfetti and Dunlap consider a new writing system a “mild obstacle” (p. 13), however, assisted by likely

reading universals applying to all writing systems, compared with learning the actual language. There are, however, language specific variations in the details of learning to read across different orthographies. Perfetti and Dunlap describe how, in Japanese, the larger grain spoken unit of the syllable may be learned by a reader who has difficulty acquiring alphabetic mappings. Further, switching between Japanese Kana (syllabaries) and Kanji demonstrated a time-related cost in a semantic categorization task, suggesting the involvement of different cognitive systems, compared to switching between two different types of Kana (Shafiullah & Monsell, 1999). Also, in a semantic categorization task, Korean (alphabetic language) learners of English showed more reliance on the phonological/sublexical route, whereas Chinese (logographic language) learners of English placed more emphasis on the lexical route (Wang et al., 2003). Perfetti and Dunlap believe this demonstrates that reading strategies applied to one's native language transfer when learning a language with a different writing system.

**Perfetti, C., Pugh, K., & Verhoeven, L. (2019). Developmental dyslexia across languages and writing systems: The big picture. In L. T. Verhoeven, C. A., Perfetti, & K. Pugh (Eds.), *Developmental dyslexia across languages and writing systems* (pp. 441-461). Cambridge University Press. <https://doi.org/10.1017/9781108553377.020>**

Universal aspects of language operate alongside language/writing system specific factors in reading development and predicting dyslexia. For example, whilst phonological awareness is an important universal predictor of reading development, phonemic awareness is more important in alphabetic languages and syllabic awareness in (morpho)syllabic languages, with the specific writing system influencing how phonological difficulties are expressed in dyslexia. Overall, the research points to two factors being present in children with dyslexia, i) central phonological processing deficit, and ii) secondary rapid automatized naming (“RAN”) deficit. More cross-cultural research is needed regarding which brain areas are implicated in dyslexia and the comparable influence of genetic factors across languages, given the focus on European alphabetic languages to date. Perfetti and colleagues consider that dyslexia may have a single cause, namely a deficit in phonological functioning, leaving open the relevant phonological unit and direction of the causal chain, or there may, alternatively, be multiple causes. If there is a single cause across languages/writing systems, dyslexia will manifest differently according to phonological grain size and whether phonological deficits can be compensated for by meaning encoded in ortho-morphology. Interventions are likely to be differentially effective, depending on the language/writing system, and should be tailored accordingly.

**Peter, L., & Hirata-Edds, T. (2009). Learning to read and write Cherokee: Toward a theory of literacy revitalization. *Bilingual Research Journal*, 32(2), 207–227. <https://doi.org/10.1080/15235880903170041>**

Peter and Hirata-Edds consider literacy's role in Cherokee language revitalization as part of a 9-year, broader program of research examining the Cherokee Nation's attempts at reversing language shift via early childhood immersion. Upon entering the immersion centre, the only writing system children see and learn is the syllabary, and they are rarely, if ever, exposed to the English alphabet, including romanized Cherokee. The moraic syllabary, where each

character represents a mora, not a full syllable, has some disadvantages as a teaching method, including a lack of correspondence between morphological forms and pronunciation of syllabary characters, together with inconsistency, given Cherokee lacks a standardized written form. Further, children learn to speak English before Cherokee and learn to read Cherokee before English, whilst the opposite is true of their teachers, leading to important implications for teaching methodologies. As adult learners of the syllabary, the teachers had an oral grounding in Cherokee, which the children do not have. Thus, in relying on the methods via which they were taught written Cherokee, for example, memorization of the syllabary's sound-symbol correspondences, teachers are placing insufficient emphasis on children's higher-order language skills, inadvertently restricting their ability to develop more complex reading and writing skills.

**Peter, L., Hirata-Edds, T., & Montgomery-Anderson, B. (2008). Verb development by children in the Cherokee language immersion program, with implications for teaching. *International Journal of Applied Linguistics*, 18(2), 166–187. <https://doi.org/10.1111/j.1473-4192.2008.00199.x>**

Peter and colleagues studied the verbal morphology skills of children enrolled in the Cherokee kindergarten immersion program, taught to read and write using only syllabics. By the end of kindergarten, children were beginning to apply morphological rules to varying degrees but displayed limited ability concerning certain constructions. Regarding the likely contribution of the verbal system's complexity to the difficulties experienced, Mithun (1989) found that children learning English and Mohawk (which has similar morphological constructions to Cherokee) as simultaneous L1s did not experience such difficulties. The implication is that the L2 learning experience is the issue, rather than Cherokee's complexities. These findings accord with research in other immersion contexts, namely that children receive "'functionally restricted' language input" (p. 180), with limited opportunity to practice different verbs, leading to general functional competency in communicating but with gaps in accuracy. The authors recommend that teachers' professional development include additional instruction concerning teaching techniques and preparation of Cherokee language materials. Further, rather than relying on Stephen Krashen's (1985) idea of "comprehensible input" in the immersion classroom, more focus should be placed on language form within the natural communicative environment, drawing attention to specific language features, providing increased opportunities to practice diverse verb forms.

**Snowling, M. J., & Hulme, C. (2013). Children's reading impairments: From theory to practice. *Japanese Psychological Research*, 55(2), 186–202. <https://doi.org/10.1111/j.1468-5884.2012.00541.x>**

Deficient reading in children manifests via i) poor decoding (dyslexia), ii) poor language comprehension, and iii) difficulties with both decoding and comprehension. Most poor readers struggle with both decoding and comprehension. Predictors for poor reading vary across writing systems, for example, phoneme awareness and letter knowledge in alphabetic languages, and awareness of syllable tone and morphological constituents of words in

logographic Chinese. Knowledge of written symbols and naming speed for familiar objects/alphanumeric stimuli appear to be universal predictors. Orthographies mapping symbol to sound at more than one psycholinguistic grain size are more challenging to learn than those containing primarily small or large units. Outcomes for dyslexia may also depend on the language, for example, parental reading skills appear more significant in transparent orthographies than in English. Given literacy builds on oral language skills, a child with speech-language difficulties will be at risk for reading problems, regardless of the language. As nonalphabetic languages often contain extensive symbol sets, individual variations in symbol knowledge can exist until middle or high school, making symbol knowledge a robust predictor of literacy development. In Japanese, learning to read logographic and syllabic scripts may delay reading development, especially as the scripts involve different cognitive abilities.

**Usborne, E., Caouette, J., Qumaaluk, Q., & Taylor, D. M. (2009). Bilingual education in an Aboriginal context: Examining the transfer of language skills from Inuktitut to English or French. *International Journal of Bilingual Education and Bilingualism*, 12(6), 667–684. <https://doi.org/10.1080/13670050802684388>**

Usborne and colleagues tracked the transition of 110 students in the Inuktitut-English/French bilingual program in Nunavik from Grades 3 through 6. The children received instruction in Inuktitut from kindergarten through Grade 3, then followed the L2 stream from Grade 4 to the end of secondary school. Age significantly predicted L2 growth and was a non-significant predictor of Inuktitut growth. Further, baseline L2 and L1 skills in Grade 3 predicted later L2 skills. Contrastingly, early Inuktitut skills were the only significant predictor of later L1 skills. The research lends support to Cummins' (1986) interdependence hypothesis, in that, perhaps counterintuitively, and despite the difference in writing systems, a strong early basis in Inuktitut is predictive of later strength, not weakness, in the L2. Skills in the L2 almost caught up to the L1 within three years of schooling. Transfer of language skills was not, however, bidirectional, perhaps because the children had not reached the level of academic competency in the L2 to enable such transfer to occur. Whether language skills are being transferred or whether learning one's heritage language provides a sense of cultural empowerment which translates into better L1 and L2 skills is an area for future research.

**Verhoeven, L., & Perfetti, C. (2021). Universals in learning to read across languages and writing systems. *Scientific Studies of Reading*, 1–15. <https://doi.org/10.1080/10888438.2021.1938575>**

Verhoeven and Perfetti studied the visual complexity and number of graphemes, and the grapheme-phoneme mapping of 17 orthographies, representing abjad, alphabetic, alphasyllabic, morphosyllabic, and syllabic writing systems. Believing that "reading reflects a learned sensitivity to the systematic relationships between the surface forms of words and their meanings" (p. 1), the authors' aim was to establish cross-linguistic universals in learning to read. They propose that universal "operating principles" exist across orthographies concerning three areas of learning to read, i) becoming linguistically aware, ii) developing expertise in word identification, and iii) learning to comprehend, with three operating principles per category.

Alphasyllabaries are orthographically demanding, as their symbols can take many years to master, and, although one might think that English would be easier to read with a syllabary, this would be less efficient than an alphabet, as the language's phonological complexity would create too many syllables. Whilst they believe there are cross-linguistic universals in learning to read, supported by the engagement of similar brain regions across unrelated languages when reading, Verhoeven and Perfetti consider that these combine with language-related specifics, given that each language's structure and written form accommodate to the various levels of language – phonemes, syllables, morphemes – differently.

**Winskel, H., & Ratitamkul, T. (2019). Learning to read and write in Thai. In R. M. Joshi & C. McBride (Eds.), *Handbook of literacy in Akshara orthography* (pp. 217-231). Springer International Publishing.  
<https://doi.org/10.1007/978-3-030-05977-4>**

Whilst all writing systems and orthographies present difficulties for beginners, influencing the development of reading and writing skills, alphasyllabic Thai poses some specific challenges. Despite a high degree of consistency concerning sound-spelling mapping, Thai has multiple spelling-sound correspondences, resulting in spelling often trailing reading development until approximately Grade 2. Further, it is predominantly monosyllabic, with many very similarly spelled words, and complex combinations of vowels and diacritics must be memorized. Like phoneme awareness in alphabetic orthographies, syllable awareness is a good predictor of reading and spelling skills in Asian languages, albeit research on alphasyllabic Kannada suggests that, whilst children may be less aware of phonemes than syllables, competent readers tend to have good phoneme and syllable awareness (Padakannaya, Rekha, Vaid, & Joshi, 2002). In a more recent study of Thai literacy development, Winskel and Lemwanthong (2010) found a relatively high level of lexical errors, combined with a relatively poor performance in reading nonwords, as opposed to words, suggesting that children were using a larger, lexico-syllabic grain size in decoding both words and nonwords. Given its alphasyllabic nature, however, both larger, syllabic, and smaller, phonemic grain sizes, are important in learning to read and write Thai.

**Zevin, J. D. (2019). Modeling developmental dyslexia across languages and writing systems. In L. T. Verhoeven, C. A., Perfetti, & K. Pugh (Eds.), *Developmental dyslexia across languages and writing systems* (pp. 372-390). Cambridge University Press.  
<https://doi.org/10.1017/9781108553377.017>**

In English, and to some extent Chinese, there are different types of dyslexia, resulting from distinct pre-existing deficits. These are phonological dyslexia and the more semantics-based developmental delay/surface dyslexia. Zevin explains that previous research using computational modelling based on statistical regularities in language has shown how, in English, "lower-level perceptual difficulties" (p. 372), which can affect phonological categorization, may lead to identifiable symptoms of phonological dyslexia (Harm & Seidenberg, 1999). Comparable input data for phonological and semantic deficits resulted in different manifestations of dyslexia in English and Chinese. In English, phonological deficits produced a pattern akin to

phonological dyslexia, whilst the effect of semantic deficits was relatively small and limited to inconsistently spelled items, like surface dyslexia. In Chinese, however, phonological and semantic impairments both had widespread effects. These findings reflect the fact that semantic deficits in Chinese are more serious than in English, since Chinese characters encode meaning in a way that English graphemes do not. Thus, despite some reservations surrounding the model and the comparability of English graphemes and Chinese characters, the same core deficit leads to different outcomes across languages, despite the presumed existence of a universal reading model.