Children's Acquisition of Literacy in Syllabic Scripts

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Abstract

This paper, emerging from questions from teachers, parents, and educational policy makers in Canadian Inuit communities, summarizes the results of a literature review of English-language sources addressing children's acquisition of literacy in syllabic scripts. Specifically, how first language literacy development in Inuktitut syllabics (*Qaniujaaqpait)* and English or French roman orthography (*Qaliujaaqpait*) differ (Harper, 2005), together with how learning two different scripts impacts biliteracy acquisition in Inuit children, including those with learning exceptionalities. Unsurprisingly, there are few salient English-language empirical studies, albeit Gleitman and Rozin (1973) demonstrated English-speaking children's ease in acquiring a 23-symbol English-based syllabary, proposing that syllabaries are a more concrete and effective starting point for early literacy. Limited research concerning Cherokee suggests that syllabics are not objectively harder to learn for mother tongue speakers, but that language loss, alongside ideologies privileging alphabetic writing, may compel preferential use of alphabetic systems for teaching Cherokee literacy (e.g. Peter & Hirata-Edds, 2009). First language literacy acquisition in syllabics is more broadly studied in Asian languages, whereby linguistic awareness (phonemes, syllables, lexemes) was the strongest predictor of learners' success (cf. Nag & Snowling, 2012). The research suggests that greater understanding of processes and practices supporting children's acquisition of literacy and biliteracy in syllabics is needed. Still, efforts to strengthen Inuktut oral language proficiency and use, and to enhance overall exposure to and opportunities to read a variety of Inuktut texts, will likely have a greater positive impact on children's acquisition of Inuktut literacy than efforts to change the script being used.

Keywords: Inuit, Inuktitut, syllabics, literacy, biliteracy, writing system, orthography, script

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This literature review developed to complement ongoing work with Kativik School Board in Nunavik, northern Québec, regarding Inuktitut-English/French bilingual education programming. Whilst Inuktitut is taught using syllabics in Nunavik, calls for a pan-Canadian Inuit script, based on the roman alphabet, have prompted discussions surrounding teaching children to write, originally, in roman orthography versus in syllabics. As such, the first aim of this paper is to synthesize what is currently known about the acquisition of literacy in syllabic scripts, in terms of strategies, practices, and outcomes. Secondly, the authors intend to summarize existing knowledge surrounding the acquisition of biliteracy in syllabic and alphabetic scripts, including the transfer of literacy skills from one script to another, in terms of learners' and teachers' experiences, together with strategies for teachers.

Thirdly, teachers in Inuit contexts have raised questions as to whether children with learning exceptionalities, such as dysgraphia and dyslexia, are disadvantaged when learning a syllabic as opposed to an alphabetic script. Accordingly, the paper aims to provide a summary of what is known, at the current time, about the experiences of children with learning exceptionalities who learn syllabics. The anticipation is that the outcomes may lay the foundation for Nunavik-specific investigation in the future, together with providing an evidence base for engaging in further conversations with educators and administrators in Nunavik about early literacy in the region, and promising practices to support literacy development in Inuktitut and a second language.

Overall, the literature review suggests that greater understanding of processes and practices supporting children's acquisition of literacy and biliteracy in syllabics is needed. Further, instead of focusing on changing the script being employed to teach literacy in Inuit contexts, a greater positive impact on children's acquisition of Inuktut literacy is likely to result from making efforts to strengthen

Inuktut oral language proficiency and use, together with enhancing children's overall exposure to and opportunities to read a variety of Inuktut texts. It is, therefore, contended that whilst efforts are being made to develop literacy in Indigenous languages, including Inuktitut, there is not, currently, enough research available on how to teach languages with different writing systems to children.

In terms of the authors' respective positions in relation to this topic, Shelley Tulloch is a professor of Anthropology at the University of Winnipeg. Her community-partnered research addresses Indigenous language vitality, including promising practices in teaching and learning Indigenous languages.. Nicola Donovan is a recent graduate of the University of Winnipeg, holding a BA Honours in Interdisciplinary Linguistics, and is due to commence an MScA Communications Science and Disorders program at McGill University in Fall 2022, with a view to becoming a Speech-Language Pathologist.

Methodology, Search Parameters, and Key Terms

With the objective of synthesizing existing knowledge about children's acquisition of literacy in syllabic scripts, the authors first undertook a thorough search of existing literature on the topic. 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. Once the literature review was concluded, a series of three annotated bibliographies was prepared, comprising i) Children's Acquisition of Literacy in Syllabic Scripts, ii) Children's Acquisition of Biliteracy in Syllabic and Alphabetic Scripts, and iii) Impact of Learning Exceptionalities on Children's Acquisition of Literacy in Syllabic Scripts, together with the present report.

By way of necessary background, writing systems are frequently divided into three categories, i) alphabetic, ii) syllabic, and iii) logographic, based on the level at which written symbols, or "graphemes,"[1] correspond to linguistic units. In alphabetic languages, each written symbol represents a single sound, or "phoneme,"[2] in the language. Contrastingly, in syllabic languages, each grapheme represents a full syllable. Finally, in logographic languages, each written symbol represents or "maps"[3] onto an entire word or morpheme.[4] The category of alphabetic languages is further broken down into three sub-types, primarily based on how the language handles vowels (Chang, 2015). Of particular interest to the current research is the alphabetic sub-category of alphasyllabaries, which are, in simple terms, a mixture of an alphabetic and a syllabic language, whereby written symbols map onto both phonemes and syllables.

Other important terms which warrant clarification at this stage include "phonological unit," which, in the context of this research, concerns whether a given orthography's written symbols represent phonemes, syllables, or words/morphemes. Similarly, the "granularity" or grain size of a script relates to the size of the written unit which corresponds, in a consistent manner, to the sound unit in any given language. In alphabetic languages, each written letter corresponds to one sound, whereas in syllabic languages, each written syllable reflects one sound, and in logographic languages, each written word/morpheme represents one sound (Nag & Snowling, 2012). Alphasyllabic languages employ a combination of granularity, with some

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[1] A "grapheme" is a written symbol that represents a linguistic unit (phoneme, syllable, or word/morpheme) in a given language's orthography.
[2] A "phoneme" is the smallest meaningful unit of sound that distinguishes one word from another in a given language e.g. [p] and [b] distinguish the words "pat" and "bat" in English.
[3] "Mapping" involves the way in which the written symbols of a given language correspond to its phonology, or how the symbols "map" spelling to sound. In terms of phonological unit size, mapping can take place at the level of small phonemic units, medium-sized syllabic units, or large units, comprising words or morphemes.
[4] A "morpheme" is the smallest unit of language that has its own meaning and can be either a full word or a part of a word. For example, in English, the word "playing" has two morphemes, "play" and "ing." Whilst it is clear that the morpheme "play" carries its own meaning, so does the morpheme "ing," which can attach to other verbs, for example, "running," "eating," "jumping," to indicate that the action denoted by the verb is ongoing.

symbols mapping to phonemes and others to syllables, to make this connection between written language and sound (Nag & Snowling, 2012).

An important theory in this regard is Ziegler and Goswami's (2005) "psychological grain size theory," which outlines important language specific variations which can affect the process of becoming literate across different writing systems. Specifically, the theory proposes that differences in reading speed and accuracy across orthographies reflect diverse reading strategies developed in response to i) the accessibility of the orthography's phonological units, ii) orthographic depth, and iii) the granularity or grain size of the script (Asfaha et al., 2009). Finally, "orthographic depth" concerns the consistency with which phonological units map spelling to sound, with orthographically transparent languages being more consistent than orthographically deep languages in this regard.

Literacy in Syllabic Scripts

As far as the current bilingual education system in Nunavik is concerned, children first acquire literacy in Inuktitut, using syllabics, and then move onto learning either English or French. The Inuktitut syllabic script is based on shapes for 14 consonants, which rotate to reflect the following vowel. Although Inuktitut has historically been written in syllabics, some Inuit leaders, together with the national Inuit organization, Inuit Tapiriit Kanatami, have been arguing for a change to a roman-alphabet-based orthography, with some believing that syllabics are holding Inuit peoples back (Harper, 2005). The idea is that this new pan-Canadian orthography would be adapted from the Latin-alphabet-based *Qaliujaaqpait*, currently used in the western Canadian Arctic.

Standardization in 1976 by the Inuit Cultural Institution resulted in one system with two orthographic forms, syllabic *Qaniujaaqpait* and roman *Qaliujaaqpait*, which are mirror images

of one another (Harper, 2005). Practically nothing for adults is published in *Qaliujaaqpait*, albeit it is used to teach Inuktitut as a second language, and occasionally to teach first language Inuktitut in senior grades (Harper, 2005). Given the move towards a roman orthography, Harper (2005) recommends that studies be undertaken on the speed and ease with which individuals can learn to read in both syllabics and roman orthography, alongside the implications of this for language teaching methodologies, albeit little, if any, research has been done on this issue to date.

Syllabic Scripts in North America

There is a close link between the orthography of alphasyllabic Cree, created in the 1830s by the missionary, James Evans, in Norway House, Manitoba (Murdoch, 1981), and syllabic Inuktitut, given Cree syllabics were later adapted for use in Inuktitut (Harper, 1985). In relation to Northern Canadian Cree peoples, Berry and Bennett (1989, 1995) sought to examine the relationship between, on the one hand, cognitive performance, and, on the other, syllabic literacy and/or formal schooling, given "literacy and formal…schooling are usually confounded" (Berry & Bennett, 1989, p. 430).

They found a stronger degree of influence of formal schooling than syllabic literacy on cognitive performance, most keenly felt in respect of English language tests, together with the Raven's (1963) *Matrices* test, a nonverbal ability test used to assess abstract reasoning (Berry & Bennett, 1989, 1995). The effect of formal schooling was somewhat weaker for spatial tasks requiring the mental rotation of symbols, also required for syllabic script use, whilst formal schooling and syllabic reading ability were, prima facie, negatively correlated, such that as the amount of formal schooling increased, syllabic reading ability decreased, and vice versa (Berry & Bennett, 1989, 1995).

Further analysis, taking into account participant age, revealed that formal schooling and syllabic reading ability were unrelated, likely reflecting the fact that younger people tended to have undergone more formal schooling and be less adept in syllabic reading, whilst the opposite was true of older people (Berry & Bennett, 1989, 1995). Berry and Bennett (1989, 1995) argue that Cree peoples' spatial awareness is adaptive, given a traditional hunter-gatherer lifestyle, rather than being due to syllabic literacy and the requirement to mentally rotate symbols when utilizing the syllabary.

Concerning another North American syllabary, Cherokee, Cushman (2011) describes how, although Sequoyah invented the system, it was later rearranged by a Moravian missionary, John Worcester, to align with the orthographic rules of the Latin alphabet. She contends that Worcester's rearrangement reduced the syllabary to its most simple function, such that each character is thought to merely encode sound, rather than also carrying highly contextual, morphological and semantic information (Cushman, 2011). Further, scholarly bias, namely that the alphabet is the writing system to which all others should aspire, obscures how the syllabary really functions (Cushman, 2011). The fact that first language ("L1") Cherokee users learn the syllabary with ease, whilst L1 English speakers' knowledge of the English writing system interferes with learning the syllabary is said to support these assertions (Cushman, 2011). The syllabary is viewed "through an alphabetic lens" (Cushman, 2011, p. 255), misunderstood by scholars and Cherokee learners alike.

Bender (2002) also looks at the Cherokee syllabary, as it pertains to 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. She

found that the syllabary was not the primary orthography in use in Cherokee bilingual education, although, from kindergarten through high school, children were "constantly visually exposed to [it]" (Bender, 2002, p. 97).

Children were expected to use standard phonetics in the early grades, commencing with the syllabary in Grade 4, albeit in elementary and middle school, easy phonetics were sometimes employed to make Cherokee, according to the teachers, "'easier to understand' or 'see'" (Bender, 2002, p. 99). Despite this, many children were unable to pronounce Cherokee words using standard phonetics, possibly given the use of easy phonetics (Bender, 2002). The existence of various writing systems suggests a hierarchy of accessibility, ranging from easy phonetics to the syllabary, with the potential implication that standard phonetics, more closely linked with the syllabary, might be considered harder to read than easy phonetics (Bender, 2002).

Also concerning Cherokee, Peter and Hirata-Edds (2009) studied children in the Cherokee immersion program, part of the Cherokee Nation's attempts at reversing language shift. The only writing system children in this program see and learn whilst in the immersion centre is the syllabary, and they are rarely, if ever, exposed to the English alphabet, including romanized Cherokee (Peter & Hirata-Edds, 2009). There are some disadvantages to using the syllabary 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 (Peter & Hirata-Edds, 2009).

Perhaps most significantly, in terms of teaching methodologies, children learn to speak English before Cherokee and learn to read Cherokee before English, whilst the opposite is true of their teachers (Peter & Hirata-Edds, 2009). As such, the teachers had an oral grounding in Cherokee, as adult learners of the syllabary, which the children do not have (Peter & Hirata-

Edds, 2009). 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 & Hirata-Edds, 2009).

Syllabic Scripts Outside of North America

As noted by Winskel and Ratitamkul (2019), in the context of the Thai alphasyllabary, all writing systems and orthographies present difficulties for beginners, influencing the development of reading and writing skills. To this end, research on syllabic and alphasyllabic languages outside of North America has yielded some interesting results. Nag and Snowling (2012) studied children learning alphasyllabic Kannada, spoken in parts of India. This language, containing over 400 orthographic symbols, has high symbol-sound consistency, but mixed granularity, as both syllabic and phonemic mapping occurs (Nag & Snowling, 2012). They found that, overall, children performed better on syllable than phoneme awareness tasks, with skilled readers displaying greater syllable and phoneme awareness (Nag & Snowling, 2012). In essence, children were better able to break speech up into syllables than into individual sounds, with skilled readers displaying greater ability in both areas than less skilled readers. Skilled readers' superior phonemic awareness reflects their greater symbol knowledge and is a predictor of later reading fluency (Nag & Snowling, 2012).

Reading accuracy, however, is predicted by syllable awareness, given the syllable's salience in Kannada, together with knowledge of the alphasyllabic principle, namely that symbols map to phonemes and syllables, both of which must be used to decode print (Nag & Snowling, 2012). 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 nevertheless poses a challenge when learning to read (Nag & Snowling, 2012).

Whilst alphasyllabic Thai has a high degree of consistency concerning sound-spelling mapping, it has multiple spelling-sound correspondences, resulting in spelling often trailing reading development until approximately Grade 2 (Winskel & Ratitamkul, 2019). Like phoneme awareness in alphabetic orthographies, syllable awareness is a good predictor of reading and spelling skills in Asian languages, albeit in light of its alphasyllabic nature, and similar to Kannada, both larger, syllabic, and smaller, phonemic grain sizes are important in learning to read and write Thai (Winskel & Ratitamkul, 2019). Further, despite some expectations to the contrary, the phoneme awareness of more advanced kindergarten and Grade 1 Japanese children learning the Hiragana syllabary has been found to be fairly similar to comparable groups of English-speaking children, possessing knowledge of the Latin alphabet (Fletcher-Flinn et al., 2011).

Gleitman and Rozin (1973) suggest that the difficulties inherent in the phonics method habitually used to teach reading in alphabetic scripts, namely that (i) the orthography directly maps sound, not meaning, and (ii) 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, may be lessened by teaching reading in alphabetic languages via the syllable. They opine that the syllable is a more concrete and accessible phonological unit than the phoneme, easier to pronounce in isolation and to recognize and blend (Gleitman & Rozin, 1973).

In their research, they demonstrate that kindergarteners were able to easily acquire a 23-symbol English-based syllabary, and were, importantly, able to apply what they learned to previously unseen combinations of known symbols, creating new, multisyllabic words

(Gleitman & Rozin, 1973). Whilst Gleitman and Rozen (1973) believe, however, that some success in the more concrete syllabary method will lead to greater understanding of the abstract letter-sound concept, or phonemic method, in much later research, Verhoeven and Perfetti (2021) propose that, although one might think that English would be easier to read with a syllabary, a syllabary would, in fact, be less efficient than an alphabet, as English's phonological complexity would simply create too many syllables.

Biliteracy in Syllabic and Alphabetic Scripts

Concerns have also been raised by teachers in Inuit contexts as to how the acquisition of biliteracy in two different writing systems, syllabic and alphabetic, affects children's learning. McCarthy (1995) specifically discusses alphasyllabic Cree, proposing that, although syllabic and alphabetic writing systems are both phonographic, they should not be "lump[ed]…together" (p. 63), given that they differ at the level of representation, syllabic versus phonemic. She is of the view that, although Cree, as a mixed syllabic and alphabetic system, behaves in some ways like an alphabet, syllabic literacy is no more like alphabetic, than logographic, literacy (McCarthy, 1995).

Furthermore, some researchers argue that when learning a second language, the existence of an additional writing system, such as alphabetic versus syllabic or vice versa, can complicate the fundamental problem of learning how graphemes map onto spoken language (Perfetti & Dunlap, 2008). Perfetti and Dunlap (2008) are of the view, however, that whilst there are language specific differences in learning to read across different writing systems, the process is assisted by likely reading universals which apply to all writing systems, such that a new writing system is a "mild obstacle compared with learning the language itself" (p. 13).

Similarly, Verhoeven and Perfetti (2021) propose, having studied the visual complexity

and number of graphemes, together with the grapheme-phoneme mapping, of 17 orthographies across various writing systems, that there are cross-linguistic universals in learning to read. These universals combine with language-related specifics, given that each language's structure and written form accommodate to the various levels of language differently (Verhoeven & Perfetti, 2021). Interestingly, they state that alphasyllabaries are orthographically demanding, as their symbols can take many years to master (Verhoeven & Perfetti, 2021). McBride (2016) also notes that bilingual children may, depending on the specific languages and scripts learned, together with the method of instruction received, find cross-linguistic phonological processing, for example, "relatively easy" (p. 179), whilst a second script's idiosyncrasies will affect how easily reading in the second language ("L2") is achieved.

Asfaha and colleagues (2009) compared four groups of children learning different African languages, two of which utilize the alphasyllabic Ge'ez script, whilst the other two are based on the alphabetic Latin script. They found that Ge'ez was easier to learn than Latin, despite the fact that Ge'ez students were required to learn a larger number of symbols than the Latin-script-learning children (Asfaha et al., 2009). Ge'ez's use of the syllable, more accessible and easier to blend than the phoneme, compensated for the higher number of symbols, highlighting the importance of the phonological unit's availability (Asfaha et al., 2009). Asfaha and colleagues (2009) further discovered that, when the two Latin-based languages were compared, the syllable-based teaching of one produced better outcomes than the grapheme-to-phoneme correspondence method used to teach the other.

Similarly, O'Brien and colleagues (2019) found that 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, with

alphasyllabic Tamil bilinguals showing the greatest phonemic awareness at the earliest point.

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 (O'Brien et al., 2019). Perhaps

unsurprisingly, the methods used to teach the non-English language were thought to have an

effect on reading in English, such that children develop explicit awareness of sounds that receive

teaching emphasis, for example, teaching instruction in alphabetic Malay emphasizes the

syllable, whilst alphasyllabic Tamil is taught phonetically (albeit the syllable receives emphasis

in the language's written form) (O'Brien et al., 2019).

Concerning orthographic depth, Ellis and colleagues (2004) studied children learning a

range of orthographies, of differing levels of orthographic depth. They found that the

orthographically shallowest language, syllabic Japanese Hiragana, was read aloud most

accurately, given its high transparency and syllabic nature, permitting ease of segmentation into

phonemes, whilst the orthographically deepest language, logographic Japanese Kanji, was read

aloud least accurately (Ellis et al., 2004). The researchers found evidence of different reading

strategies depending on orthographic depth, suggesting 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 (Ellis et al., 2004).

In research carried out on students in the Inuktitut-English/French bilingual program in

Nunavik, Usborne and colleagues (2009) found that, despite the difference in writing systems, a

strong early basis in Inuktitut was predictive of later strength, not weakness, in the L2, whether

English or French, with L2 skills almost catching up to the L1 within three years of schooling.

Transfer of language skills was not, however, bidirectional, in that early Inuktitut skills, not English or French skills, were the only significant predictor of later Inuktitut skills (Usborne et al., 2009). The suggestion is that transfer may be unidirectional because the children had not reached the level of academic competency in English or French to enable L2 to L1 transfer to occur (Usborne et al., 2009). Usborne and colleagues (2009) do, however, raise an interesting question as to whether language skills are really being transferred or whether learning their heritage language provides the children with a sense of cultural empowerment which translates into better L1 and L2 skills.

Likewise, Perfetti and Dunlap (2008) believe that reading strategies applied to one's native language transfer when learning a language with a different writing system. They describe how, in a semantic categorization task, learners of English who had Korean, an alphabetic language, as a native language showed more reliance on the phonological or sublexical route, whilst English learners who had logographic Chinese as their first language placed more emphasis on the lexical route (Wang et al., 2003, cited in Perfetti & Dunlap, 2008). McBride (2016) argues, however, that 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.

Page (2017) focuses on Southeast Asian languages, describing how many children in this part of the world have a mother tongue which is written with a Latin-based alphabet, albeit the language taught to them at school uses an alphasyllabary. Similar to Perfetti and Dunlap (2008) and Usborne and colleagues (2009), she considers that L2 reading skills develop best when there exists a dual foundation of solid L1 reading skills and expanding L2 proficiency (Page, 2017).

This development applies whether or not the languages in question are linguistically and/or orthographically related, given that bilinguals' generally strong metalinguistic awareness facilitates literacy development across languages (Page, 2017). For example, Chinese-English bilinguals' proficiency in L1 phonological elements which do not exist in the L2, such as tone, can predict L2 reading success (Wang et al., 2005, cited in Page, 2017).

In terms of improved metalinguistic awareness, bilinguals' greater ability, compared to monolinguals, to comprehend that a printed word invariably refers to a single object, irrespective of the picture with which it appears, is likely due to experience with more than one language leading them to understand that an object's label within a language remains constant (Bialystok, 1997, cited in McBride, 2016; Bialystok et al., 2000, cited in McBride, 2016). Contrastingly, only experience with more than one writing system appears to sensitize children to the arbitrariness between the length or complexity of a word and the physical size of its referent (Bialystok, 1997, cited in McBride, 2016; Bialystok et al., 2000, cited in McBride, 2016).

Not only do phonological skills developed in learning to read an alphabet or a syllabary support one another and can be transferred, the same applies to competencies in reading comprehension, text approach strategies, and writing (Page, 2017). Page (2017) describes how exposure to a syllabic orthography specifically created for the mother tongue, whilst designed to aid learning, can have drawbacks, least of all the sociolinguistic issue that the script is not used by adults who are literate in the language, and, as such, given exposure to orthographies based on different scripts will not impede biliteracy, biliteracy in two scripts may well be preferable. A potential downside to biliteracy in different scripts is that switching between Japanese syllabic Kana and logographic Kanji in a semantic categorization task has been shown to involve a time-related cost, suggesting the involvement of different cognitive systems, when compared to

switching between two different types of syllabic Kana (Shafiullah & Monsell, 1999, cited in

Perfetti & Dunlap, 2008).

Peter and colleagues (2008) discuss some practical implications for teaching biliteracy in

the context of the verbal morphology skills of children in a Cherokee kindergarten immersion

program, taught to read and write using only syllabics. They emphasize the importance of

teachers' professional development, including additional instruction concerning teaching

techniques and preparation of Cherokee language materials, and recommend that language is

provided to children within a natural communicative environment (Peter et al., 2008). Such

exposure will draw attention to specific language features, in turn providing increased

opportunities to practice the aspect of the language in question in diverse situations (Peter et al.,

2008).

According to Peter and colleagues (2008), relying on Stephen Krashen's (1985) idea of

"comprehensible input" in language immersion programs can lead to children receiving

"functionally restricted" (p. 180) language input, with limited opportunity to practice the aspect

of the language in question, in their case, different verbs. Albeit this restricted input can result in

general functional competency in communicating, there may be gaps in accuracy (Peter et al.,

2008). Children learning English and Mohawk (which has similar morphological constructions to

Cherokee) as simultaneous L1s did not experience the same difficulties as children in the

Cherokee immersion program (Mithun, 1989, cited in Peter et al., 2008), implying that the L2

learning experience is the issue, rather than the complexity of Cherokee's verbal system.

Impact of Learning Exceptionalities on Literacy in Syllabic Scripts

A further issue of significance is whether children with learning exceptionalities,

including dyslexia and dysgraphia, may suffer any disadvantage in learning a syllabic, rather

than an alphabetic, script. One particular source of concern in this regard is the requirement to

rotate consonant symbols in Inuktitut to reflect the following vowel, albeit little, if any, research

appears to have been done on this specific issue to date. Of relevance, however, is research by

Daniels and Share (2018), who propose that, given most people with dyslexia struggle to read in

non-alphabetic languages, where there is less, if any, emphasis on the spelling-sound

consistency-based learning typical of alphabetic languages, "multiple dimensions of complexity"

(p. 101) likely contribute towards dyslexia.

Daniels and Share (2018) propose 10 such dimensions, some of which are more relevant

to the Inuktitut syllabary than others, for example, visual uniformity and complexity may be

significant as far as rotating consonant symbols is concerned. Not only can visual uniformity and

complexity affect beginner language learning, in an experiment by Shimron and Navon (1981,

cited in Daniels & Share, 2018), Hebrew-English bilinguals identified Hebrew letters more

slowly than English letters, potentially due to their primarily rectangular, and somewhat similar,

appearance. Also, concerning dual purpose letters,[5] in Japanese, it is noted that some individuals

with dyslexia may be disadvantaged regarding syllabic Kana, but not logographic Kanji, the

former of which is phonology-based, whilst the latter is not (Inoue et al., 2017, cited in Daniels

& Share, 2018).

Snowling and Hulme (2013) note that, although predictors for poor reading frequently

vary across writing systems, knowledge of written symbols and naming speed for familiar

objects and alphanumeric stimuli appear to be universal predictors. Further, orthographies which

map symbol to sound at more than one psycholinguistic grain size are more challenging to learn

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[5] "Dual purpose letters" are characters or letters in a given script which serve multiple purposes, for example, characters in Japanese can be read both as native Japanese words and also as words borrowed from Chinese, with the exact word being referred to denoted by phonetic indicators (Daniels & Share, 2018).

than those containing primarily small or large units (Snowling & Hulme, 2013). Also, Perfetti

and Dunlap (2008) describe how, in Japanese, the larger grain of the syllable, used in spoken

language, may be learned by a reader who has difficulty acquiring alphabetic mappings.

Regarding dyslexia in Japanese, in particular, learning to read logographic and syllabic

scripts may delay reading development, especially as the scripts involve different cognitive

abilities (Snowling & Hulme, 2013). Further, as logographic, albeit not syllabic, languages often

contain extensive and opaque symbol sets, individual variations in symbol knowledge can exist

until middle or high school, making symbol knowledge a robust predictor of literacy

development (Wydell & Butterworth, 1999, cited in Snowling & Hulme, 2013). As previously

noted, according to Verhoeven and Perfetti (2021), the symbols for alphasyllabaries can also take

many years to master.

A study of children reading all three Japanese scripts demonstrated that reading

difficulties were very unusual in syllabic Hiragana, medium in syllabic Katakana, and

moderately high in logographic Kanji (Uno et al., 2009, cited in McBride, 2016). As such, script

related variations may impact whether and how children learn to read (McBride, 2016). Further,

a statistically significant overlap was found for Beijing-based children experiencing reading

difficulties in both Chinese and English, which was not found amongst children taught in Hong

Kong (McBride-Chang et al., 2013, cited in McBride, 2016).

This difference was likely due to the use of the Pinyin alphabetic teaching method in

Beijing, a system which uses the Latin alphabet to spell Chinese words based on their

pronunciation, which was not employed in Hong Kong (McBride-Chang et al., 2013, cited in

McBride, 2016). In other words, children in Beijing were more likely than would be expected by

chance alone to experience reading difficulties in both Chinese and English, compared to

children in Hong Kong, a distinction thought to be due to the different methodologies used in the

two cities to teach Chinese to children: a phonological method in Beijing, versus a non-

phonological method in Hong Kong.

Bajre and Khan (2019) looked at the role of working memory, phonological processing,

and orthographic knowledge in children with dyslexia reading in alphasyllabic Hindi. Hindi is a

language with consistent grapheme-phoneme correspondence, alongside a large, visually

complex grapheme inventory, comprising approximately 400 symbols (Bajre & Khan, 2019).

Their findings led them to conclude that the combined effect of poor working memory, poor

phonological processing, and poor orthographic knowledge contributes to the reading difficulties

experienced by children with dyslexia, possibly helping to explain why the disorder manifests

differently across languages (Bajre & Khan, 2019).

In their discussion of how universal aspects of language operate alongside language and

writing system specific factors in reading development and predicting dyslexia, Perfetti and

colleagues (2019) conclude that, overall, the research across languages points to two factors

being present in children with dyslexia, i) central phonological processing deficit, based on the

language in question's granularity, and ii) secondary rapid automatized naming ("RAN") deficit,

with the specific writing system influencing how phonological difficulties are expressed in

dyslexia. Not all scholars accept that phonological processing plays an important role across all

language types, however, with McBride (2016) stating that whilst phonological processing

deficits are characteristic of dyslexia across alphabetic languages, phonological awareness does

not always strongly correlate with reading ability in Chinese.

There does, however, seem to be a consensus that, across orthographies, RAN is

universally important in diagnosing dyslexia, given it represents reading fluency and involves

many reading-related cognitive processes (see, e.g., McBride, 2016; Perfetti et al., 2019; Snowling & Hulme, 2013). Further, and perhaps unsurprisingly, language transparency influences reading, with McBride (2016) noting that children with dyslexia are able to read the regular German orthography accurately, albeit very slowly.

Chang (2015) examined the role of orthographic visual complexity, both in terms of the intricacy of individual graphemes and the total number of graphemes in a given orthography, together with the orthography's mapping principles, in learning to read. A content analysis of graphemes from 131 orthographies found a strong, positive association between grapheme complexity and number of graphemes in the orthography, both of which increase as an orthography's symbol-sound mapping level increases (Chang, 2015). Across orthographies, therefore, more complex-looking graphemes tend to exist in orthographies with a higher number of total symbols, whilst both the complexity and number of graphemes tends to increase as one progresses from alphabetic, through syllabic, and onto logographic, languages.

A linked behavioural study on the perceptual processing of graphemes of varying complexity within and across writing systems 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 (Chang, 2015). In other words, as graphemes became more visually complex, participants found it more difficult to tell them apart. Nevertheless, individuals with a mother tongue which uses a more complex orthography found it easier to discriminate amongst different graphemes than people whose languages employ a less complex writing system. Finally, a computational modelling study on how visual orthographic variation affects learning also detected a positive correlation between grapheme complexity and network learning difficulty (Chang, 2015), such that the network

found it harder to learn more complex graphemes.

Chang (2015) concluded that visual orthographic variation, comprising 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). In a subsequent study, Chang and colleagues (2016) used computer simulation to study the effect of visual complexity across orthographies on the perceptual learning of grapheme forms, an early stage of reading development. Post-training 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 (Chang et al., 2016). Unsurprisingly, perhaps, Chang and colleagues (2016) concluded that, across 131 diverse orthographies from five writing systems, more visually complex orthographies are processed less reliably and/or efficiently, suggesting a risk factor for reading difficulty.

Further, Zevin (2019) notes that, in English, and to some extent Chinese, there are different types of dyslexia, resulting from distinct pre-existing deficits. These different types of the disorder are phonological dyslexia and the more semantics-based developmental delay/surface dyslexia. Using computational modelling, he found that comparable input data for phonological and semantic deficits resulted in different manifestations of dyslexia in English and Chinese (Zevin, 2019).

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, whilst in Chinese, phonological and semantic impairments both had

widespread effects, reflecting the fact that semantic deficits in Chinese are more serious than in English, given Chinese characters encode meaning in a way that English graphemes do not (Zevin, 2019). 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 (Zevin, 2019). In terms of application to syllabic writing systems, given that syllabic symbols do not encode meaning in the same way as Chinese logographic characters, it may be the case that dyslexia in children learning syllabic scripts manifests more similarly to dyslexia in English-speaking children than in Chinese speaking-children. Further research to investigate this suggestion would be a useful line of future enquiry.

An interesting point concerns the neurology of dyslexia, with McBride (2016) suggesting a universal neural origin for dyslexia in Chinese and English, albeit there is conflicting evidence as to whether the same brain areas are involved in reading the two languages. Perfetti and colleagues (2019) reach a similar conclusion regarding the lack of clarity surrounding the brain areas involved in reading different language types. They recommend that more cross-cultural research is needed regarding which brain areas are implicated in dyslexia, together with the comparable influence of genetic factors across languages, given the focus on European alphabetic languages to date (Perfetti et al., 2019).

It remains, at this stage, unclear whether dyslexia has one single cause, perhaps related to a deficit in phonological functioning, or whether it has multiple causes (Perfetti et al., 2019). In the event of a cross-linguistic single cause, dyslexia will likely manifest differently according to the phonological grain size of the language in question and whether phonological deficits can be compensated for by meaning encoded in the language's written morphology (Perfetti et al.,

2019). Given that the effectiveness of interventions is likely to depend on the specific language and writing system, they should be tailored accordingly (Perfetti et al., 2019). Nevertheless, across orthographies, practice with word and 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 (McBride, 2016).

Conclusions and the Future

In conclusion, English-language research on children's acquisition of literacy in syllabic scripts is, not unsurprisingly, sparse, with what research there is available suggesting that greater understanding of processes and practices supporting children's acquisition of literacy and biliteracy in syllabics is needed. Nevertheless, Gleitman and Rozin's (1973) proposal that syllabaries are a more concrete and effective starting point for early literacy, alongside Peter and Hirata-Edds' (2009) research on Cherokee, which indicates that syllabics are not necessarily harder to learn for mother tongue speakers, hints at the fact that syllabics may be easier for children to learn.

Given the limited research available, there does not, however, seem to be a clear and obvious answer as to whether it is easier for children to start to read and write in syllabics or an alphabet, and, it may be the case, as with so much of childhood development, that this will vary amongst children. In any event, it is likely to be less important whether young children start acquiring literacy in syllabics or roman orthography first, than the fact that they should be exposed to a rich linguistic input in both of their languages, together with being provided with a supportive teaching environment, with clear and explicit teaching instruction. As such, efforts to change the script used to teach literacy to children learning syllabic writing systems from

syllabics to a Latin-alphabet-based system may not yield tremendous gains in terms of children's

acquisition of literacy in the language.

Whilst language loss may not necessarily require that children be taught the Indigenous

language in a roman, as opposed to a syllabic, script, language loss may have an impact on the

methods used to teach Indigenous languages to children. According to Peter and Hirata-Edds

(2009), teachers' oral grounding in Cherokee, which the children they were teaching did not

possess, resulted in the use of teaching methods which may have underemphasized children's

higher order language skills, potentially and inadvertently stunting their linguistic progress. As

such, a useful area of future research might be to determine how best to devise teaching methods

which work for both sides, given the no doubt fairly common situation where the teacher has

learnt and the children are learning the language in question at different points in their lives and

with substantially different background linguistic knowledge.

Further, whilst there is some limited evidence suggesting that dyslexia may manifest

differently across languages which use different written scripts, research on children with

learning exceptionalities who learn languages which use syllabic scripts is another area which is

significantly understudied at the current time. Whilst there is some research available on children

with dyslexia, there appears to be virtually no research on children with other learning

exceptionalities, for example, dysgraphia, who learn to read and write in syllabic scripts. As

such, the experiences of children with learning exceptionalities who learn to read and write in

syllabics is another area of research ripe for future development, with important implications for

teaching literacy in syllabic Indigenous languages to children with learning exceptionalities.

References

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

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

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

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

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

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

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

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

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

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

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

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

Harper, K. (1985). The early development of Inuktitut syllabic orthography. *Études/Inuit/Studies*, *9*(1), 141–162. http://www.jstor.org/stable/42869443

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

McBride, C. (2016). *Children's literacy development: A cross-cultural perspective on learning to*

read and write (2nd ed.). Routledge. http://dx.doi.org/10.4324/9781315849409

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

Murdoch, J. S. (1981). *Syllabics: A successful educational innovation* [Master's thesis, University of Manitoba]. MSpace: The University of Manitoba's Digital Repository. http://hdl.handle.net/1993/9207

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

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

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

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

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

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, 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

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

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

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

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

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